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# Adoption of Digital Technology for the Efficient Use of Human Resources in the Health Sector of Bangladesh: Barriers and the Ways to Overcome

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**ABSTRACT** ***Background:*** Bangladesh has initiated efforts to implement digital tools for Human Resources for Health (HRH) management. ***Objective:*** This study aimed to identify the barriers to adopting digital technology for HRH management and propose solutions to enhance its efficiency in Bangladesh. ***Methods:*** A cross-sectional mixed-method study was conducted between March and June 2023. The study included 320 Human Resources (HR) and Information Systems (IS) personnel at various managerial levels from purposively selected hospitals across multiple districts in Bangladesh. Data was collected using a structured questionnaire, validated for accuracy, coded, and analyzed using SPSS version 23. Additionally, qualitative insights were obtained through Key Informant Interviews (KIIs) with 10 key informants. ***Results:*** Among the respondents, 75% were categorized as HRIS adapters, 21% as statisticians, and 2% as pioneers or stragglers. Approximately 67% of participants reported HRIS systems as challenging to use, and 72% found them difficult to learn. Despite these challenges, all respondents recognized the potential of HRIS to enhance organizational efficiency, although 83.8% considered the associated costs prohibitive. Furthermore, 95% and 97% of participants, respectively, emphasized the need for senior management to support HRIS adaptation and middle management to facilitate its implementation. Key barriers identified included unreliable power supply, insufficient internet connectivity, limited motivation to enforce relevant policies, inadequate digital literacy interventions, resource shortages for technological infrastructure, constrained budgetary allocations, and poor coordination among government institutions. Recommendations to address these barriers included enhancing motivation for digital adoption, ensuring a dedicated power supply, providing 24/7 internet access, and increasing resource and budgetary allocations for technological devices. ***Conclusion:*** The findings underscore a shared understanding of the importance of IT skills, databases, and software systems for effective HRIS implementation.

**Keywords:** Human Resources for Health, Healthcare Sector, Digital Technology, Barriers, Bangladesh.

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## INTRODUCTION

Over the past decade, healthcare systems worldwide have experienced significant transformations, driven by rapid globalization and the exponential growth of information and communication technology (ICT). The adoption of digital technologies in healthcare has increased considerably over this period. Digital transformation in healthcare can serve as the foundation

for reforming systems to enhance efficiency and effectiveness, ultimately benefiting populations. The emergence of modern ICT has revolutionized various aspects of human life, including healthcare, which has seen remarkable advancements due to the digital revolution [1]. This transformation has unlocked new opportunities for medical services in rural areas undergoing development and renewal [2].

Healthcare is a crucial component of Bangladesh's economy, with enhancing the sector being integral to achieving the Sustainable Development Goals (SDGs). Health outcomes are directly linked to economic performance. However, the healthcare system in Bangladesh faces challenges such as high costs, limited resources, inconsistent quality, and disparities in access. As part of the Digital Bangladesh Vision 2021, significant progress has been made in integrating ICT into healthcare, especially through digital services. Research on the implementation of electronic health records (eHealth) in developing countries has demonstrated that eHealth and mobile health (mHealth) services can improve healthcare accessibility, service quality, and collaborative practices [3].

The World Health Organization underscores that Human Resources for Health (HRH) is the cornerstone of any healthcare system, ensuring the delivery of high-quality services that improve population health outcomes (Indicators AH,20). Recent years have witnessed a surge in advocacy, investment, and actions at global, regional, and national levels, driven by evidence linking equitable HRH distribution to better health outcomes [4]. The importance of systematically documenting and regularly updating data on health workforce numbers, deployment, and movement has been emphasized in global efforts to strengthen health systems.

In low- and middle-income countries (LMICs), however, there is a lack of centralized, organized data to support evidence-based HRH management decisions. HRH data is often fragmented across various sources, including government and private sector databases, labor force surveys, and national censuses, many of which are not designed for HRH planning and management [5]. This lack of integrated data can lead to uneven HRH distribution, imbalances in production, and inadequate skill mixes, leaving remote and underserved areas without sufficient services. Moreover, weak governance and poor stewardship of health systems exacerbate these challenges in LMICs [6].

In Bangladesh, HRH management has faced numerous challenges, as highlighted in the country's health policy discourse [7]. The World Health Organization has classified Bangladesh as a country experiencing a "severe health workforce shortage," with existing HRH unevenly concentrated in urban areas. To achieve Universal Health Coverage (UHC) and health-related SDG targets, effective HRH planning and management are critical priorities. Developing a comprehensive system for collecting, organizing, and sharing HRH information is a fundamental step toward improving HRH management. This need was emphasized during the first Global Forum on Human Resources for Health in Kampala in 2008 [8]. Aligned with global standards, Bangladesh's government introduced an internet-based Human Resource Information System (HRIS) in 2017 to enhance HRH management. Integrated into the Directorate General of Health Services' (DGHS) Management Information System (MIS), HRIS serves as a centralized platform for processing national HRH data across health systems [9]. This study investigates the adoption of digital technology in Bangladesh's health sector to improve HRH utilization.

Previous research in Bangladesh has largely focused on eHealth applications, such as mHealth, telemedicine, electronic health records (EHRs), and telecare. However, there is limited research on the current state of digital technology adoption in the healthcare sector. Understanding the present state of digital transformation is essential to optimize HRH allocation. This study's findings will provide insights into the progress of digital technology adoption, identify existing barriers, and offer recommendations for leveraging digital technology to improve HRH efficiency in Bangladesh.

### Objective

To determine the barriers to the adoption of digital technology for the efficient use of human resources in the health sector of Bangladesh and the ways to overcome them.

## METHODS

### Quantitative Study Design

This study adopted a cross-sectional mixed-method approach, incorporating both quantitative and qualitative methodologies. The research was conducted in hospitals across five districts—Lakshmipur, Feni,

Noakhali, Comilla, and Cox's Bazar. These districts represent varying stages of digital technology adoption, categorized as adopters, prospectors, and laggards in terms of human resource efficiency. Data collection was carried out from March 2023 to June 2023. A semi-structured questionnaire was used to gather information from the respondents. The quantitative component primarily focused on assessing the adoption and challenges of digital technology in human resource management within the healthcare sector.

**Study Population**

The study population consisted of mid-level and top-level managers, as well as senior executives, from the Human Resources (HR) and Information Systems (IS) departments of selected hospitals in the districts of Lakshmipur, Feni, Noakhali, Comilla, and Cox's Bazar in Bangladesh. These districts were identified as pilot areas for implementing digital technologies for the Human Resource Information System (HRIS) in the health sector by the Bangladesh government.

The districts of Lakshmipur, Feni, Noakhali, Comilla, and Cox's Bazar were purposively selected for this study. A list of HR personnel from hospitals in these districts was obtained from the chief administrators of the respective hospitals. All mid-level and top-level managers were invited to participate in the survey. Survey questionnaires were distributed via email, and where email communication was not feasible, the principal investigator or designated data collectors approached participants in person to distribute the questionnaires.

The minimum sample size for the study was calculated to be 320 respondents, ensuring adequate representation for meaningful analysis.

**Inclusion Criteria**

Personnel from Human Resources (HR) and Information Systems (IS) departments.

Individuals who were available and willing to participate.

**Exclusion Criteria**

Individuals who declined to participate or did not respond to emails.

Those who were unavailable during the data collection period.

**Data Collection and Quality Control**

A self-administered questionnaire was employed for data collection. It consisted of two sections:

1. Basic demographic information of respondents and hospitals.
2. Questions addressing the adoption and challenges of digital technology in HR management, focusing on 13 key factors (e.g., inattentiveness of senior executives, IT capabilities of staff, perceived cost, IT infrastructure, and government regulations).

The questionnaire was developed based on prior research [10]. A pilot test was conducted in a separate hospital setting, and feedback was incorporated to finalize the questionnaire. The principal investigator contacted respondents via phone to clarify any issues with completing the questionnaire. Out of 371 returned questionnaires, 320 were deemed valid for analysis after thorough scrutiny.

**Ethical Considerations**

Ethical clearance was obtained from the Research Ethics Committee (REC) of the Faculty of Allied Health and Life Science (FAHS), DIU. Strict measures were taken to ensure anonymity and confidentiality, with only the principal investigator having access to the data.

**Study Questionnaire**

A semi-structured questionnaire was used for quantitative data collection. Questions were adapted from prior studies (Masum AK.2015). The questionnaire development involved contributions from a team comprising students, teachers, and statisticians, with the principal investigator overseeing the process and ensuring accuracy.

**Data Processing and Analysis**

All collected data were thoroughly reviewed and coded to identify and rectify errors. The data were then entered into a database and analyzed using SPSS software, focusing on study objectives and key indicators.

**Qualitative Study Design**

The qualitative component utilized Key Informant Interviews (KII) to gain deeper insights into barriers and potential solutions related to adopting digital technology in HR management in Bangladesh's health sector.

**Data Collection Tools and Techniques**

Key informants were selected purposively based on their knowledge, experience, and managerial roles. Ten

informants participated voluntarily, and interviews were conducted using a structured KII guide developed through a literature review. Interviews addressed barriers in HR management and digital technology adoption, along with potential solutions. Open-ended questions facilitated in-depth exploration, with each interview lasting 10–15 minutes. Interviews were audio recorded and later transcribed.

**Key Informant Characteristics**

**The table below summarizes the characteristics of the key informants:**

| Participant ID | Position | Sex | Age (Years) | Years of Experience |
|---|---|---|---|---|
| **01** | Director of the Hospital | Male | 43 | 15 |
| **02** | Academician | Female | 37 | 8 |
| **03** | Researcher | Male | 41 | 10 |
| **04** | Researcher | Female | 40 | 12 |
| **05** | Academician | Male | 52 | 14 |
| **06** | Director of the Hospital | Female | 45 | 17 |
| **07** | Academician | Male | 32 | 5 |
| **08** | Manager of the Hospital | Female | 39 | 11 |
| **09** | Manager of the Hospital | Male | 38 | 9 |
| **10** | Director of the Hospital | Male | 56 | 21 |

**Qualitative Data Coding and Analysis**

An inductive thematic analysis approach, as proposed by Braun and Clarke, was employed to analyze qualitative data. The principal investigator carefully reviewed the transcripts to gain a thorough understanding and generate initial codes. These codes were then categorized into broader themes. The study team reviewed and refined these themes, organizing them into relevant categories. Finally, the narratives were drafted to present the findings comprehensively.

## RESULTS

Table 1 provides a detailed baseline profile of the study respondents, summarizing their demographic and professional characteristics. The age distribution shows that the majority of respondents (75.0%) were aged between 30–50 years, followed by those under 30 years (22.5%), and only a small proportion (2.5%) aged above 50 years.

In terms of gender, 80.0% of the respondents were male, while 20.0% were female, reflecting the predominance of male professionals in the study population.

The educational qualifications of the respondents indicate a nearly equal distribution between graduates (49.4%) and postgraduates (50.6%), demonstrating a highly educated workforce. Regarding the HRIS adoption stage, 75.0% of the respondents were categorized as adopters of digital technology, while 21.0% were statisticians. Only a small fraction of the participants was classified as prospectors (2.0%) or laggards (2.0%).

**Table 1: Baseline Profile of Respondents**

| Characteristic | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Age Group** | <30 Years | 72 | 22.5 |
| | 30–50 Years | 240 | 75.0 |
| | >50 Years | 8 | 2.5 |
| **Gender** | Male | 256 | 80.0 |
| | Female | 64 | 20.0 |
| **Educational Qualification** | Graduate | 158 | 49.4 |
| | Postgraduate | 162 | 50.6 |
| **HRIS Adoption Stage** | Adopters | 240 | 75.0 |

| | | | |
|---|---|---|---|
| | Statisticians | 67 | 21.0 |
| | Prospectors | 6 | 2.0 |
| | Laggards | 7 | 2.0 |
| **Total Respondents** | **-** | **320** | **100.0** |

Table 2 illustrates the preferences of respondents regarding the implementation and readiness for Human Resource Information Systems (HRIS). A significant majority (66.3%) agreed that senior executives are ready to experiment with new information systems, with an identical proportion favoring the creation of new systems over improving existing ones. While 43.8% of respondents believed that all human resource staff are computer literate, 24.4% disagreed, highlighting a potential gap in digital readiness. Additionally, 49.4% agreed that human resources possess basic IT skills for using HRIS. Most respondents (68.8%) acknowledged the availability of sufficient software and database resources within their organizations to support HRIS. Furthermore, 78.1% believed that HRIS applications would be compatible with existing operational practices, whereas 59.4% felt some degree of incompatibility. Lastly, 75.0% agreed that HRIS aligns with organizational values and beliefs, reflecting an overall positive perception of HRIS implementation potential within the studied organizations.

**Table 2: Preferences of the Respondents**

| Question | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| Senior Executives (SE) are ready to experiment with new information systems. | 110 (31.3%) | 212 (66.3%) | 8 (2.5%) | 0 (0.0%) | 0 (0.0%) |
| Senior Executives prefer creating something new rather than improving existing ones. | 110 (31.3%) | 212 (66.3%) | 8 (2.5%) | 0 (0.0%) | 0 (0.0%) |
| All human resource staff are computer literate. | 56 (17.5%) | 140 (43.8%) | 30 (9.4%) | 78 (24.4%) | 16 (5.0%) |
| All human resources possess basic IT skills for information systems. | 54 (16.9%) | 158 (49.4%) | 38 (11.9%) | 62 (19.4%) | 8 (2.5%) |
| The organization has sufficient software and database resources for HRIS. | 56 (17.5%) | 220 (68.8%) | 14 (4.4%) | 30 (9.4%) | 0 (0.0%) |
| HRIS applications will be compatible with existing operational practices. | 54 (16.9%) | 250 (78.1%) | 16 (5.0%) | 0 (0.0%) | 0 (0.0%) |
| HRIS applications will be incompatible with existing operational practices. | 38 (11.9%) | 190 (59.4%) | 38 (11.9%) | 46 (14.4%) | 8 (2.5%) |
| HRIS applications are consistent with our organizational values and beliefs. | 56 (17.5%) | 240 (75.0%) | 24 (7.5%) | 0 (0.0%) | 0 (0.0%) |

Table 3 presents the responses to key aspects regarding the usage of Human Resource Information Systems (HRIS) and the level of support from management within the organization. It reflects employees' perceptions of the complexity and benefits of HRIS, as well as the involvement of top and senior management in its adoption and decision-making processes. The first set of items addresses the perceived complexity and learning curve of HRIS, with the majority of respondents indicating that HRIS is not perceived as complex (66.9%) or hard to learn (71.9%). In terms of organizational benefits, most participants agreed that HRIS would reduce operational costs (83.8%) and unanimously acknowledged its potential to increase organizational profitability (100%). Regarding management support, a substantial proportion of respondents (86.3%) felt that top management had allocated sufficient resources for HRIS adoption. Additionally, all respondents (100%) agreed that top management is aware of the benefits of HRIS. Furthermore, the table highlights the centralized decision-

making structure within the organization, with 95% of respondents confirming that major decisions require top management approval, and 97.5% indicating that senior management must be consulted before any decisions are made. The data reflect strong organizational support for HRIS adoption and indicate a clear, centralized decision-making process.

**Table 3: Basic Importance of HRIS Usage and Management Support**

| **Aspect** | Response | Frequency (n) | Percentage (%) |
|---|---|---|---|
| HRIS is complex to us | Yes | 106 | 33.1 |
| | No | 214 | 66.9 |
| HRIS is hard to learn | Yes | 90 | 28.1 |
| | No | 230 | 71.9 |
| HRIS will cut operations cost | Yes | 268 | 83.8 |
| | No | 52 | 16.3 |
| HRIS will increase organization's profitability | Yes | 320 | 100.0 |
| | No | 0 | 0.0 |
| Top management allocated adequate resources for HRIS adoption | Yes | 276 | 86.3 |
| | No | 44 | 13.8 |
| Top management is aware of HRIS benefits | Yes | 320 | 100.0 |
| | No | 0 | 0.0 |
| All major decisions need top management approval | Yes | 304 | 95.0 |
| | No | 16 | 5.0 |
| Senior management has to be asked before any decision is taken | Yes | 312 | 97.5 |
| | No | 8 | 2.5 |

Table 4 highlights several challenges encountered in the adoption of digital technology in healthcare systems. The majority of respondents (86%) identified a lack of uninterrupted power supply as a significant barrier, while only 14% disagreed. A more pronounced issue was the unavailability of strong internet connections, reported by 95% of respondents. Furthermore, 89% acknowledged a lack of strong motivation to implement relevant policies, reflecting the critical role of leadership and commitment in driving digital transformation.

Financial constraints were also evident, with 85% citing a lack of funding as a barrier to the adoption of digital technology. Additionally, 75.6% of respondents pointed to insufficient training on the importance of digital technology, emphasizing the need for capacity-building initiatives. Limited interventions to enhance knowledge about digital technologies among hospital managers were another notable challenge, reported by 83.2% of participants. These findings underscore the multifaceted nature of barriers to digital transformation and the need for targeted strategies to address these issues effectively.

**Table 4: Some challenges to adoption of Digital technology**

| **Aspect** | **Response** | **Percentage (%)** |
|---|---|---|
| Lack of Uninterrupted Power Supply | Yes | 86% |
| | No | 14% |
| Unavailability of Strong Internet Connections | Yes | 95% |
| | No | 5% |
| Lack of Strong Motivation to Implement the Relevant Policies | Yes | 89% |
| | No | 11% |
| Lack of Funding for the Adoption of Digital Technology | Yes | 85% |
| | No | 15% |

| | | |
|---|---|---|
| Lack of Training on the Importance of the Adoption of Digital Technology | Yes | 75.6% |
| | No | 24.4% |
| Limited Interventions on Increasing knowledge about Digital Technologies to Improve quality of care among the hospital managers | Yes | 83.2% |
| | No | 16.8% |

**Qualitative Findings**

***Theme 1: Barriers to the Adoption of Digital Technology***

**Lack of Uninterrupted Power Supply**

Respondents emphasized the critical need for reliable power supply to enable the use of digital technologies in hospitals. Modern technologies for ensuring uninterrupted power are also needed (KII: 2, 3).

**Unavailability of Strong Internet Connections**

Strong internet connectivity is essential for efficient healthcare delivery and management. Respondents urged the government to prioritize robust internet services (KII: 2, 3).

**Lack of Strong Motivation to Implement Policies**

The lack of motivation among leadership hinders the implementation of digitalization policies. Top-level management's procrastination is a recurring issue (KII: 2, 3).

**Inadequate Training and Knowledge**

Limited training opportunities restrict healthcare providers' ability to adopt digital technologies effectively. Workshops, seminars, and hands-on training are needed (KII: 5, 7).

**Resource Allocation for Digital Devices**

Respondents highlighted insufficient resource allocation as a major barrier. Increased funding and strategic health financing are necessary for digital adoption (KII: 1, 6).

**Budgetary Allocation**

Inadequate government expenditure on healthcare limits technological advancements. Respondents called for innovation in resource mobilization to increase the health budget (KII: 4, 6).

**Lack of Coordination Between Government Institutions**

Poor inter-ministerial coordination undermines digital initiatives. Respondents stressed the need for unified efforts and community engagement (KII: 5, 8).

***Theme 2: Overcoming Barriers to Digital Technology Adoption***

**Hands-on Training**

Interactive workshops and training programs can enhance healthcare providers' knowledge and interest in digital technology (KII: 6, 7).

**Motivation for Adoption**

Strong motivation among healthcare workers is key to implementing digital technology effectively (KII: 1, 4).

**Special Power Supply Provision**

Installing dedicated power systems and exploring alternative energy sources, such as solar power, can address power challenges (KII: 1, 3).

**Continuous Internet Services**

24/7 strong internet connectivity is crucial for managing resources and delivering high-quality care (KII: 3, 6).

**Need-Based Resource Allocation**

Resource allocation should be aligned with the specific needs of healthcare facilities rather than political influence. Strategic and need-based planning is essential (KII: 1, 4).

## DISCUSSION

This study explored the barriers to adopting digital technology for the efficient use of human resources in Bangladesh's health sector and proposed strategies to overcome these challenges [11]. The findings contribute to the broader understanding of the adoption status of Human Resource Information Systems (HRIS) and the associated difficulties faced by healthcare institutions in low- and middle-income countries (LMICs), including Bangladesh. One significant finding was that despite several major barriers, such as poor internet connectivity and inadequate power supply, a substantial proportion (75%) of respondents had implemented HRIS. These

infrastructure challenges align with prior studies in LMICs, such as Bangladesh, where digital divides hinder the widespread adoption of digital technologies [9]. This result is consistent with the World Health Organization's (2017) recommendation that strengthening health systems requires comprehensive national e-health policies and infrastructure improvements.

A key barrier identified was the lack of training on digital technologies, cited by 75.6% of respondents. This finding echoes the results of a study in Pakistan, where inadequate training and expertise were significant barriers to integrating ICT in healthcare [12]. It also aligns with observations from Kenya, where capacity-building programs were emphasized as essential for effective HRIS adoption [13]. These findings suggest that without proper training and awareness, the potential benefits of digital health technologies for improving human resources for health (HRH) remain largely untapped.

The study also highlighted the critical role of policy support and leadership in the effective implementation of HRIS. While 86.3% of respondents acknowledged sufficient funding from senior management, qualitative data revealed a lack of motivation and enthusiasm to implement key policies effectively. This finding aligns with a study, who noted that bureaucratic inefficiencies and poor inter-ministerial coordination often undermine the implementation of robust policy frameworks in Bangladesh [14]. Similar challenges have been documented in other LMICs, where policy creation and implementation frequently lack alignment, leading to limited progress [15].

Financial constraints emerged as another significant obstacle, with over 84% of respondents identifying insufficient funding for implementing digital technologies. This observation supports the claims of a study, who argued that a lack of financial resources is a major barrier to HRH development in Bangladesh [16]. The findings emphasize the need for enhanced collaboration between public and private sectors to mobilize funding for investments in digital health technologies.

The study's findings resonate with both national and international experiences in implementing digital health systems. Inadequate financial resources, insufficient training, and infrastructural shortcomings are common barriers observed in LMICs. However, addressing these barriers requires more than policy reforms. It necessitates effective resource allocation, practical and continuous training programs, and strategies to enhance motivation among healthcare workers.

By identifying these barriers and providing actionable recommendations, this study contributes to the ongoing discourse on digital health adoption in LMICs. It highlights the importance of tailored interventions to bridge the digital divide, improve the quality of healthcare delivery, and optimize the use of human resources in Bangladesh's health sector. These insights underscore the need for concerted efforts at multiple levels—policy, infrastructure, and workforce development—to achieve meaningful advancements in digital health.

## CONCLUSION

The study's findings shed light on the benefits and challenges of implementing Human Resource Information Systems (HRIS) in Bangladesh's healthcare sector. While most respondents acknowledged the importance of HRIS databases and software in enhancing organizational effectiveness, a significant proportion struggled with understanding and utilizing the technology. This highlights a critical gap in digital literacy and training among healthcare workers, which must be addressed to facilitate smoother adoption. There was a consensus that the implementation of HRIS could substantially improve the financial performance and operational efficiency of healthcare facilities. Despite concerns about its cost, the findings suggest that the long-term benefits—such as better decision-making, optimized resource management, and enhanced operational efficiency—outweigh the initial investment barriers.

The study also underscores the necessity of addressing key infrastructural and systemic challenges. These include unreliable power supplies, limited internet connectivity, and inadequate funding, all of which impede the effective adoption of HRIS and other digital technologies. Overcoming these barriers requires strategic interventions, including effective resource allocation, comprehensive policy reforms, and practical, hands-on training programs for healthcare staff. In conclusion, while the adoption of HRIS presents several challenges, it also offers transformative potential for improving human resource management and overall healthcare delivery in Bangladesh. By addressing the highlighted obstacles through a multi-pronged approach, Bangladesh's healthcare sector can harness the full benefits of digital

transformation, contributing to a more efficient and resilient health system.

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