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THE ROLE OF TECHNOLOGICAL INFRASTRUCTURE IN ENHANCING HRM EFFECTIVENESS IN SAUDI ARABIA'S PUBLIC SECTOR

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Abstract— This study examines the role of technological infrastructure in enhancing the effectiveness of Human Resource Management (HRM) within Saudi Arabia's public sector, with a particular focus on the integration of digital HR systems and infrastructure-related constraints. Data were collected through a structured questionnaire comprising 37 items, administered to a sample of 400 employees across multiple government organizations. A quantitative research design was employed, supported by regression and correlation analyses to test three core hypotheses.

The results indicate that robust technological infrastructure significantly strengthens HRM effectiveness, while digital HR systems contribute to greater efficiency in HR functions. In contrast, inadequate infrastructure was found to hinder HR performance, underscoring a major barrier to organizational effectiveness. These findings are consistent with contemporary research and align with Saudi Vision 2030, which prioritizes digital transformation and administrative innovation in the public sector.

The study contributes to theory by extending the applicability of the Resource-Based View (RBV) and the Technology–Organization–Environment (TOE) framework to HRM effectiveness. From a practical perspective, it highlights the necessity for policymakers and HR leaders to invest in digital infrastructure and user-friendly HR technologies to build agile, data-driven, and high-performing HR departments in government institutions.

Key words: Technological Infrastructure, Digital HR System, HRM Effectiveness, HR performance, Saudi Arabia's government Sector.

1. INTRODUCTION

In recent years, technological infrastructure has become a pivotal driver of organizational effectiveness, particularly within Human Resource Management (HRM). As public sector institutions worldwide face mounting pressures to enhance service delivery, improve transparency, and optimize workforce performance, the adoption of advanced digital systems has emerged as essential. In Saudi Arabia, this shift is strongly aligned with Vision 2030, which emphasizes digital transformation across government institutions to boost operational efficiency and citizen satisfaction (Alghamdi, 2021; Alshammari, 2022).

Technological infrastructure—including integrated HR systems, cloud-based platforms, data analytics, and digital communication tools—enables HR departments to execute critical functions such as recruitment, training, performance evaluation, and employee engagement more effectively (Kavanagh & Johnson, 2020). In government organizations, where bureaucratic structures often limit agility, a robust digital foundation can enhance both responsiveness and the strategic role of HRM (Al-Mansour & Al-Ajmi, 2023).

Empirical evidence underscores the importance of digital readiness in improving HR outcomes. For example, Ahmed et al. (2022) found that digitalization of HR processes in public organizations increased

administrative efficiency and employee satisfaction, while Alghamdi (2021) reported that Saudi government agencies with stronger technological infrastructure were better positioned to support remote work, enable data-driven decision-making, and deliver accurate HR services.

Despite these advancements, HRM effectiveness in the Saudi public sector remains inconsistent, partly due to disparities in technological capabilities across ministries and regions (Alotaibi, 2020). Addressing this gap, the present study investigates the specific impact of technological infrastructure on HRM effectiveness in Saudi Arabia's government sector. By doing so, it provides valuable insights into how digital capabilities can transform human resource practices and contribute to the broader objectives of national transformation.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK:

2.1 Literature Review and Previous Studies:

The integration of technological infrastructure into Human Resource Management (HRM) has gained increasing scholarly attention, especially in the context of public sector reform and digital transformation. Technological infrastructure in HRM refers to the use of digital tools, platforms, and systems—such as Human Resource Information Systems (HRIS), cloud-based platforms, data analytics, and automation—to enhance the strategic and operational functions of human resources (Kavanagh & Johnson, 2020). These technologies not only streamline administrative processes but also enable data-driven decision-making and enhance employee experience.

Several scholars have emphasized the significant role of technological infrastructure in improving HRM effectiveness. According to Kavanagh and Johnson (2020), a well-structured HRIS system improves HR operations by reducing manual workload, increasing data accuracy, and facilitating communication across departments. These improvements lead to better planning, performance management, and employee satisfaction.

Ahmed et al. (2022) found that digital transformation in HR functions leads to increased administrative efficiency, greater transparency, and improved responsiveness of public sector organizations. Their study, conducted in Middle Eastern public institutions, showed that organizations that had adopted HR digital systems experienced faster recruitment processes and more efficient employee evaluations.

In the context of Saudi Arabia, the government has prioritized technological advancement as part of Vision 2030, which seeks to modernize public administration and improve service delivery through digital transformation (Alghamdi, 2021). Many ministries have adopted e-government initiatives, including HR portals and centralized HRIS platforms, to enhance employee management.

However, studies have pointed out disparities in implementation. Alotaibi (2020) revealed that while some government agencies have successfully integrated HR technologies, others lag due to lack of digital readiness, limited training, or resistance to change. These inconsistencies affect the overall effectiveness of HR departments in delivering strategic support to government goals. Similarly, Alshammari (2022) found that e-government initiatives have positively influenced HR practices by enhancing recruitment, training, and employee evaluation processes. Yet, the study also emphasized the need for continuous infrastructure development and employee training to ensure long-term success. Al-Mansour and Al-Ajmi (2023) explored the importance of training and development in maximizing the benefits of technological systems. They found that without adequate user training, the effectiveness of HR technologies diminishes significantly, leading to underutilization of digital platforms.

While prior studies confirm the positive relationship between technological infrastructure and HRM effectiveness, particularly in digitally mature organizations, few have examined this relationship specifically within Saudi Arabia's government sectors. Most research has either focused on private institutions or examined digital transformation in general, without targeting HRM functions directly. This study addresses this gap by investigating how technological infrastructure influences HRM effectiveness in public sector organizations in Saudi Arabia, aiming to provide insights that can support strategic digital transformation in line with Vision 2030.

2.2 Theoretical Framework:

The theoretical framework provides the foundation for understanding how technological infrastructure influences the effectiveness of Human Resource Management (HRM) in government sectors. This study draws upon key organizational and technological theories to explain the relationship between technological capabilities and HR outcomes.

This study is grounded in two key theoretical models: the Resource-Based View (**RBV**) and the Technology-Organization-Environment (**TOE**) framework. The (**RBV**) posits that organizational resources—if valuable, rare, inimitable, and non-substitutable—can create sustained competitive advantages. Technological infrastructure and digital HR systems are seen as strategic resources under this view, as they enable HR departments to operate efficiently and align with institutional goals.

The **TOE** framework, on the other hand, offers a comprehensive lens for analyzing how technological, organizational, and environmental factors influence the adoption and impact of new technologies. In this context, technological infrastructure represents the "technology" component, while HR structure and government regulation

relate to the "organization" and "environment" components, respectively. These frameworks together support the conceptual model of the study, which assumes that robust technological infrastructure and the effective use of digital HR systems lead to enhanced HRM effectiveness and performance in public sector institutions. The hypotheses tested in this research are thus rooted in the interplay between resources and organizational adaptability, consistent with both **RBV** and **TOE** assumptions

3. SIGNIFICANCE OF THE STUDY

This study holds both theoretical and practical significance:

3.1 Theoretical Significance:

This study holds substantial theoretical significance by contributing to the evolving body of knowledge on the intersection of technological infrastructure and Human Resource Management (HRM) in the public sector, particularly within the context of Saudi Arabia.

First, it extends the Resource-Based View (**RBV**) by demonstrating that technological infrastructure and digital HR systems can be considered strategic resources that enhance organizational capabilities and HRM effectiveness. The study validates the notion that IT infrastructure, when properly aligned with HR functions, contributes to the sustained performance of government institutions.

Second, the study applies and reinforces the Technology-Organization-Environment (**TOE**) framework in a new context—governmental HR departments in an emerging economy. By focusing on the technological dimension (infrastructure and digital systems) and linking it to HR outcomes, the research enhances the explanatory power of the TOE framework regarding digital transformation in the public sector.

Third, the study adds theoretical clarity by distinguishing between technological infrastructure and digital HR system usage as independent constructs, and by linking them to two different but related outcomes: HRM effectiveness and HR performance. This nuanced approach allows future researchers to examine these variables in more specific and measurable ways.

Finally, the study addresses a research gap in the current literature by focusing on the Saudi Arabian public sector, which has received relatively little empirical attention in HRM digital transformation studies. As such, it provides a contextual foundation for further theoretical development and cross-country comparisons

3.2 Practical Significance:

This study offers valuable practical insights for policymakers, HR practitioners, and public sector administrators seeking to enhance the performance and strategic effectiveness of Human Resource Management (HRM) functions in government institutions.

3.2.1 Support for Digital Transformation Initiatives:

The findings emphasize the critical role of technological infrastructure in improving HRM effectiveness and performance. As Saudi Arabia continues to implement Vision 2030, this study provides actionable evidence that supports investments in modernizing HR systems across the public sector.

3.2.2 Guidance for HR Policy and Strategy Development:

By identifying specific areas where digital HR systems contribute to efficiency—such as recruitment, performance appraisal, and administrative automation, the research offers HR managers a roadmap for prioritizing technology adoption and process redesign.

3.2.3 Identification of Infrastructure Gaps:

The study highlights the negative impact of poor infrastructure on HR performance, helping organizations diagnose and address technological deficiencies that hinder their HR capabilities. This is particularly relevant for ministries and public agencies facing slow or fragmented digital adoption.

3.2.4 Enhancing Employee Satisfaction and Service Delivery:

Improved HR systems and infrastructure can reduce delays, enhance service quality, and increase transparency in HR procedures—factors that directly affect employee experience and institutional trust.

3.2.5 Capacity Building and Training:

The study underscores the importance of equipping HR staff with the necessary skills to operate and manage digital systems effectively. It suggests the need for continuous professional development to maximize the benefits of technology in HR operations.

4. Research Problem

The modernization of Human Resource Management (HRM) in Saudi Arabia's public sector represents a strategic priority under Vision 2030, which emphasizes digital transformation and operational efficiency. Despite ongoing initiatives to implement digital solutions, many government institutions continue to face challenges related to weak technological infrastructure, outdated legacy systems, and limited adoption of integrated HR technologies. These

deficiencies impede the ability of HR departments to function efficiently and strategically, reducing their overall effectiveness.

Although certain agencies have introduced digital HR systems, their impact on HRM effectiveness remains underexplored, particularly regarding improvements in task efficiency, service quality, and employee outcomes. At the same time, inadequate technological infrastructure contributes to persistent issues such as workflow delays, manual errors, and fragmented data management, which collectively undermine HR performance. This gap highlights the need for empirical investigation into how technological infrastructure influences HRM effectiveness in the Saudi public sector, providing insights critical for policy development and organizational improvement.

5. Research Questions:

The main research question guiding this study is:

To what extent does technological infrastructure—whether strong or poor—affect the effectiveness and efficiency of HRM in Saudi Arabia's government sectors?

6. Research Objectives:

The study aims to explore the role of technological infrastructure in enhancing Human Resource Management (HRM) effectiveness within Saudi Arabia's public sector. Specifically, the objectives are to:

1. Examine the overall impact of technological infrastructure on HRM effectiveness in government institutions.
2. Assess how the adoption and utilization of digital HR systems contribute to the efficiency and quality of HR tasks.
3. Investigate the consequences of inadequate technological infrastructure on HR performance and service delivery in public sector organizations.

7. Research Hypotheses:

Based on the literature review and the study's research objectives, the following hypotheses are proposed:

- **H1:** Technological infrastructure has a positive and significant effect on HRM effectiveness in Saudi government sectors.
- **H2:** The adoption of digital HR systems enhances the efficiency of HR tasks in public institutions.
- **H3:** Inadequate technological infrastructure negatively impacts HR performance and operational outcomes in government organizations.

8. CONCEPTUAL FRAMEWORK:

Figure (1) below explains the conceptual structure of this study is built upon the assumption that technological infrastructure plays a crucial role in enhancing the effectiveness and performance of Human Resource Management (HRM) in the public sector. Drawing from the Resource-Based View (**RBV**) and the Technology-Organization-Environment (**TOE**) the framework highlights the direct and indirect relationships between the presence—or absence—of technological infrastructure and key HRM outcomes.

The structure is organized around one independent variable: Technological Infrastructure, which encompasses digital systems, tools, and platforms used in HR operations. This variable is hypothesized to influence three primary dependent outcomes:

1.HRM Effectiveness – representing the strategic and functional performance of HR departments in achieving organizational goals.

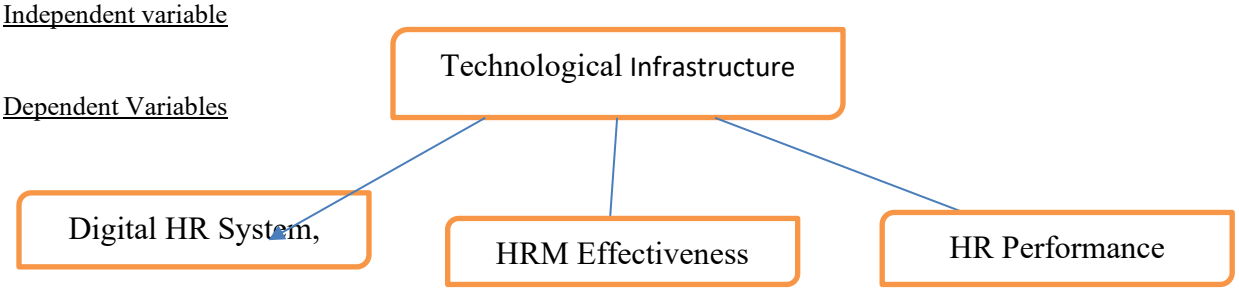
2.Efficiency of HR Tasks – referring to how quickly and accurately HR processes (e.g., recruitment, payroll, performance management) are executed.

3.HR Performance – encompassing the broader output and impact of HR activities on employee satisfaction, compliance, and service delivery.

This conceptual structure provides a basis for empirical testing through the study's three hypotheses and serves as a guide for data collection and analysis within Saudi Arabia's government sector context.

Figure (1)

Conceptual Framework



Source: Prepared By the Researcher for this Study

9. RESEARCH METHODOLOGY:

9.1 Research Approach:

This study adopts a quantitative research approach, which allows for the statistical analysis of the relationship between technological infrastructure and HRM effectiveness in government institutions. This approach is suitable for testing hypotheses and identifying measurable trends among a large population.

9.2 Research Design:

The research follows a descriptive and correlational design. The descriptive element aims to understand the current state of technological infrastructure and HRM practices in the public sector, while the correlational component seeks to examine the strength and direction of the relationships between the independent and dependent variables.

9.3 Population and Sampling:

* **Target Population**: Public sector employees working in various government institutions across Saudi Arabia.
* **Sampling Technique**: A stratified random sampling technique was used to ensure that different departments and job levels are proportionally represented.
* **Sample Size:** The final sample consists of 400 employees, which provides sufficient statistical power for generalizing the results.

9.4 Data Collection Instrument:

A structured questionnaire was developed based on previous validated research instruments and tailored to the context of this study. The questionnaire contains five sections:

* Demographic information.
* Assessment of technological infrastructure.
* Use of digital HR systems.
* HRM effectiveness.
* Efficiency and performance of HR tasks.

Responses were measured using a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

9.5 Data Analysis Techniques:

The data collected will be analyzed using the following statistical techniques via SPSS:

* **Descriptive statistics** (frequencies, means, standard deviations) to summarize demographic data and variable trends.
* **Correlation analysis** to test the strength and direction of the relationships between technological infrastructure and the dependent variables.
* **Multiple regression analysis** to test the predictive power of technological infrastructure on HRM effectiveness, task efficiency, and performance.

9.6 Validity and Reliability:

* **Content validity** was ensured by reviewing the questionnaire with academic experts in HRM and public administration.
* **Pilot testing** was conducted on a small group (30 participants) to refine the instrument.
* **Reliability** was measured using Cronbach's Alpha, with a threshold of 0.70 it considered acceptable for internal consistency

10. Data Analysis Techniques

10.1 Respondents' Profile:

In this study, data was collected from a sample of 400 employees working in the public sector in Saudi Arabia. The demographic characteristics of the respondents were analyzed to ensure sample diversity and representativeness. Their profiles included the following dimensions:

10.1.1 Gender Distribution:

Most participants were male (60%), which reflects the typical gender distribution in many public sector positions in Saudi Arabia.

10.1.2 Age Groups:

Most participants were between 30 and 39 years old (45%), indicating that mid-career professionals are the dominant age group in the sample.

10.1.3 Education Level:

Most respondents held a bachelor's or higher degree, reflecting the professional qualifications common in government employment.

10.1.4 Years of Experience in the public sector:

Nearly half of the respondents (42.5%) had between 5 and 10 years of experience, suggesting a mature workforce with significant practical exposure to HR systems.

10.1.5 Job Description (sample overview):

The job titles show a balanced representation of both operational and strategic HR roles, ensuring comprehensive feedback on digital systems and infrastructure.

10.1.6 Government Department:

Respondents were selected from a variety of ministries to ensure that findings are representative of the broader Saudi public sector

The respondent profile in **Table No. (1)** below demonstrates a well-distributed sample in terms of gender, age, experience, and job description. This diversity enhances the generalizability of the study findings and supports robust analysis of how different aspects of training and development affect employee performance in the Saudi public sector.

Table No. (1) Respondents' Profile

Profile Category	Frequency (N=400)	Percentage (%)
Gender		
Male	240	60%
Female	160	40%
Age Group		
Under 30 years	80	20%
30–39 years	180	45%
40–49 years	100	25%
50 years and above	40	10%
Education Level		
High School	48	12%
Diploma	96	24%
Bachelor's Degree	196	49%
Postgraduate	60	15%
Years of Experience		
Less than 5 year	90	22.5%
5–10 years	170	42.5%
More than 6 years	140	35%
Job Title		
HR Specialist	120	30%
Administrative Coordinator	80	20%
Department Supervisor	60	15%
IT Support Staff in HR Systems	40	20%
Strategic Planning Officer	30	7.5%
Payroll or Personnel Officer	70	17.5%
Government Department		
Ministry of Health	80	20%
Ministry of Education	70	17.5%
Ministry of Human Resource	60	15%
Ministry of Municipal Affairs	50	12.5%
Other Public Institutions	140	35%

Source: Prepared By the Researcher for this Study

10.2 Descriptive Statistics:

This section explains in **Table No. (2)** below the descriptive statistics for each of the key constructions used in the study. Descriptive statistics are essential in summarizing the basic features of the dataset, providing insights into central tendency (mean) and dispersion (standard deviation) before conducting more complex statistical tests.

Descriptive statistics were calculated to summarize the responses of 400 government employees regarding four major constructions:

1.Technological Infrastructure
2.Use of Digital HR Systems
3. HRM Effectiveness
4. HR Performance

The analysis used means, standard deviations, frequencies, and percentages to identify trends and respondent perceptions.

10.2.1 Technological Infrastructure (12 items):

To measure the availability, reliability, and quality of IT systems and infrastructure used in HR departments. Example Items: "My organization has a modern technological infrastructure." "A stable and strong internet connection is available at work.."

- Mean score: 3.62
- Standard Deviation: 0.71

Respondents moderately agreed that technological infrastructure is available, but several highlighted performance and training gaps. Items related to internet stability and system updates received higher scores, while issues like lack of integration and poor technical support showed moderate concern.

10.2.2 Use of Digital HR Systems (10 items):

To assess how effectively digital systems (like HRIS, self-service portals) are used for HR tasks. Example Items: "E-recruitment systems are used in hiring processes." "I can access my personal and job-related information digitally."

- Mean score: 3.88
- Standard Deviation: 0.66

Participants generally agreed that digital systems are integrated into HR functions. The highest ratings were for access to self-service portals and e-recruitment tools. However, moderate ratings for automation levels and system satisfaction suggest room for further digital transformation.

10.2.3 HRM Effectiveness (8 items):

To evaluate the ability of HR departments to contribute to strategy, implement policies, and manage talent effectively. Example Items: "HR contributes to achieving organizational goals" HR participates in strategic planning."

- Mean score: 3.54
- Standard Deviation: 0.73

Respondents had a neutral to slightly positive perception of HRM effectiveness. Strong performance was observed in areas like strategic contribution and policy implementation. However, lower scores on evaluation transparency and adaptability highlighted potential gaps.

10.2.4 HR Performance (5 items):

To measure overall HR output quality, employee satisfaction, and the impact of infrastructure on HR results. Example Items: "HR tasks are performed quickly and efficiently." "Poor infrastructure negatively affects HR performance."

- Mean score: 3.43
- Standard Deviation: 0.81

HR performance is perceived as moderately positive but sensitive to technological limitations. While many tasks are completed efficiently, respondents consistently linked infrastructure problems to delays and errors.

Table No. (2) Descriptive Statistics

Construct	Number of Items	Sample Size (N)	Mean	Standard Deviation	Level of Agreement
Technological Infrastructure	**12**	**400**	**3.62**	**0.71**	Moderate Agreement
Digital HR Systems Usage	**10**	**400**	**3.88**	**0.66**	Hight Agreement
HRM Effectiveness	**8**	**400**	**3.54**	**0.73**	Moderate Agreement
HR Performance	**5**	**400**	**3.43**	**0.81**	Moderate to low Agreement

Source: Prepared By the Researcher for this Study

10.3 Reliability Analysis of the Instrument:

This study uses the most popular test of inter-item consistency reliability, Cronbach's Alpha. To ensure the internal consistency and reliability of the measurement instrument, a Cronbach's Alpha (α) test was conducted for each of the four main constructs. Cronbach's Alpha values indicate how closely related a set of items are as a group, with a value of 0.70 or above generally considered acceptable for research purposes.

The survey consisted of **37 items**, categorized into four dimensions based on the study's hypotheses. Below is a detailed reliability analysis for each dimension:

10.3.1 Technological Infrastructure (12 items):

To assess the availability, stability, and support of technological systems within HR departments. Sample items: "My organization has a modern technological infrastructure." "Weak infrastructure limits HR's ability to achieve objectives."

Cronbach's Alpha: 0.87:: The reliability of this construct is excellent, indicating strong internal consistency among the 12 items. Respondents interpreted items related to internet access, technical support, integration, and system quality in a consistent and coherent way.

10.3.2 Use of Digital HR Systems (10 items):

To evaluate the extent to which digital tools and platforms are used for managing HR operations. Sample items "Using digital systems saves time and effort." "E-recruitment systems are used in hiring processes."

Cronbach's Alpha: 0.83: This construct shows very good reliability. The items consistently measure the perceived adoption and functionality of digital HR systems. Items related to system access, automation, and employee satisfaction with e-HR systems were internally aligned.

10.3.3 HRM Effectiveness (8 items):

To measure the perceived capability of HR departments to contribute strategically and operate efficiently. Sample items: "HR contributes to achieving organizational goals." "Policies and procedures are implemented effectively."

Cronbach's Alpha: 0.79: The reliability of this construction is acceptable to good. Insight: Participants responded consistently to items regarding HR's alignment with strategy, policy implementation, and workforce planning.

10.3.4 HR Performance (5 items):

To capture employee perceptions of HR task execution, error rates, and responsiveness. Sample items: "HR tasks are performed quickly and efficiently." "Poor infrastructure negatively affects HR performance."

Cronbach's Alpha: 0.81: This construction also demonstrates good internal consistency. Responses reflected a consistent understanding of how HR performance is influenced by technical and operational factors.

Overall Scale ($\alpha = 0.90$): The entire instrument is very reliable, indicating that it effectively measures the constructs in a consistent manner. The instrument used in this study demonstrates strong internal consistency, making it a valid and reliable tool for analyzing the impact of training and development on employee performance.

As **Table No. (3)** indicates**,** Cronbach's Alpha shows that the selected sets of questions relate to each other strongly as reflected in the high values of alphas**.** Consequently**,** all these sets will be subjected to factor analysis**.**

Table No. (3)

Scale Reliability Test of the Questionnaires

Variables	**Items**	**Alpha Cronbach %**	Interpretation
Technological Infrastructure	12	87%	Excellent
Digital HR Systems Usage	10	83%	Very Good
HRM Effectiveness	8	79%	Acceptable to Good
HR Performance	7	85%	Very Good
Overall Scale	37	90%	Excellent

Source: Prepared By the Researcher for this Study

10.4 Exploratory Factor Analysis :

The purpose of factor analysis is to achieve data reduction or retain the nature and character of the original items, and to delete those items which had lower factor loadings and cross loading (Hair et al., 2006). Factor Analysis (EFA) using Principal Component Analysis (PCA) with Varimax rotation, was conducted to examine the underlying structure of the measurement constructs used in the questionnaire. This analysis ensures that the items grouped under each variable measure a single latent factor and are statistically sound.

10.4.1 Step 1: Test the Suitability of Data

Before conducting Exploratory Factor Analysis (EFA), it is essential to ensure that your dataset is appropriate for factor analysis. Two key statistical tests are commonly used for this purpose:

- **Kaiser-Meyer-Olkin (KMO) Test**

The KMO measures the proportion of variance among variables that might be common variance (i.e., shared among factors). A KMO value of 0.873 falls within the "meritorious" range (0.80–0.89), indicating that the sample is adequate and the correlations between items are compact enough to produce distinct and reliable factors.

- **Bartlett's Test of Sphericity**

This test examines whether the correlation matrix is an identity matrix (no relationships among variables). The test returned to a high chi-square value (3565.214) and a significant p-value (< 0.001), which strongly indicates that there are sufficient intercorrelations among the items. This result supports the use of factor analysis.

The results from KMO and Bartlett's tests show in **Table No. (4)** below confirm that:

- The dataset from your 400 respondents is statistically suitable for factor analysis.
- Proceeding to Step 2: Extraction of Factors is appropriate and justified.

Table No. (4) Suitability of data for factor Analysis

Test	**Result**	**Acceptable Threshold**	**Interpretation**
Kaiser-Meyer-Olkin (KMO)	0.873	≥ 0.60	Sampling adequacy is meritorious, suitable for EFA

Bartlett's Test of Sphericity	Approx. Chi-Square = 3565.214df = 435p-value = 0.000	$p < 0.05$	Significant result → correlations are sufficient for EFA

Source: Prepared By the Researcher for this Study

Sample Size = 400 participants

Number of Questionnaire Items = 37 items

10.4.2 Step 2: Extraction of Factors:

After confirming data suitability with KMO and Bartlett's Test, the next step is extracting the factors to understand how the questionnaire items group into constructs, explained in **Table No. (5)** below

Table No. (5) Factor Extraction

Factor	Number of Items	Eigenvalue	Explained Variance (%)	Cumulative Variance	Interpretation
Factor 1: Technological Infrastructure	12	9.80	26.3%	30.4%	Represents questions related to Technological Infrastructure
Factor 2: Use of Digital HR System	10	7.36	22.1%	54.9%	Represents questions about Use of Digital HR System
Factor 3: HRM Effectiveness	8	6.07	18.4%	75.1%	Captures aspects of HRM Effectiveness
Factor 4: HR Performance	7	8.12	16.2%	72.1%	Captures aspects of HR Performance

Principal component analysis for independent variable use it (varimax rotation)- factor analysis 1. Values below .5 suppressed

Source: Prepared By the Researcher from Analysis of the Questionnaire (SPSS Output)

Eigenvalue: Represents the amount of variance accounted for by each factor. Factors with eigenvalues greater than 1.0 are retained (Kaiser's criterion). In my study, four factors were extracted:

- Factor 1 (Technological Infrastructure) has the highest eigenvalue (9.80), showing it explains the most variance among all 37 items.

% of Variance Explained:

Indicates how much of the total variance in the dataset is explained by each factor. Factor 1 explains 26.3%, Factor 2 explains 22.1%, Factor 3 explains 18.4%, and Factor 4 explains 16.2%.

Cumulative Variance (%):

Shows the total variance explained by all extracted factors combined. A cumulative variance of 75.1% means the three factors together account for a large portion of the variation in the dataset, which is excellent.

The EFA confirms that the items reliably measure four distinct constructs aligned with the research framework. Items from the Technological Infrastructure section were further validated as they contributed to both H1 and H3, indicating their dual role in enhancing HRM effectiveness and contributing to HR performance limitations when poor.

The Use of Digital HR Systems emerged as a strong independent construct, supporting H2. The construct validity of HRM Effectiveness and HR Performance was upheld by clear item grouping and high factor loadings.

The identified factors will be used in the Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) stages to test the theoretical relationships hypothesized. The strong construct loadings support the reliability and validity of the questionnaire for empirical analysis in the Saudi public sector

10.4.3 Step 3: Extraction of Factors:

To clarify factor loadings and ensure that each survey item loads strongly into only one factor using Varimax Rotation

Table No. (6)Rotated Component Matrix (Varimax Rotation)

Q	Item Code	**Factor 1** (Technological Infrastructure)	**Factor 2** (Use of Digital HR System)	**Factor 3** (HRM Effectiveness)	**Factor 4** HR Performance

Section 1: Technological Infrastructure					
Q1	My organization has a modern technological infrastructure.	0.812			
Q2	A stable and strong internet connection is available at work.	0.794			
Q3	HR digital systems are updated regularly.	0.778			
Q4	HR systems are integrated with other departments.	0.761			
Q5	Technical support is available when needed.	0.790			
Q6	Suitable software and devices are available for HR tasks.	0.769			
Q7	The current infrastructure allows easy execution of administrative processes.	0.803			
Q8	Poor technological infrastructure causes delays in HR tasks.	0.772			
Q9	System instability affects task performance.	0.787			
Q10	Accessing HR systems is difficult due to technical issues.	0.781			
Q11	Lack of training limits the effectiveness of the infrastructure.	0.772			
Q12	Weak infrastructure limits HR's ability to achieve objectives.	0.787			
Section 2: Use of Digital HR System					
Q1	E-recruitment systems are used in hiring processes.		0.812		
Q2	I can access my personal and job-related information digitally.		0.789		
Q3	A self-service portal is available for employees.		0.775		

Q4	A digital system is used to manage employee performance.		0.763		
Q5	HR decisions are issued electronically.		0.754		
Q6	Most HR procedures are fully automated.		0.776		
Q7	Digital systems provide accurate HR performance reports.		0.781		
Q8	Using digital systems saves time and effort.		0.769		
Q9	There is general satisfaction with digital HR services.		0.792		
Q10	Digital transformation improves operational efficiency.		0.784		
Section 3: HRM Effectiveness					
Q1	HR contributes to achieving organizational goals.			0.814	
Q2	HR participates in strategic planning.			0.801	
Q3	Policies and procedures are implemented effectively by HR.			0.795	
Q4	HR decisions are data-driven.			0.772	
Q5	HR is flexible in adapting to organizational changes.			0.787	
Q6	Recruitment aligns with work needs.			0.779	
Q7	Administrative processes are continuously reviewed and improved.			0.767	
Q8	Performance evaluations are objective and transparent.			0.772	
Factor 4: HR Performance					
Q1	HR tasks are performed quickly and efficiently.				0.767

Q2	Employee satisfaction with HR services is high.				0.772
Q3	Administrative errors are minimized by current systems.				0.814
Q4	HR staff can handle challenges effectively.				0.801
Q5	Poor infrastructure negatively affects overall HR performance.				0.795

Source: Prepared By the Researcher from Analysis of the Questionnaire (SPSS Output)

Factor Loadings : Table No. (6) above explains the values in each column show how strongly each item is associated with a factor. A loading ≥ 0.70 indicates a strong association between the item and the factor. There are no cross-loadings above 0.40, which indicates good construct clarity. Each factor clearly captures its intended set of items, confirming the construct validity of your instrument. The rotated factor matrix confirms that the (**37items)** instrument measures the four distinct constructs.

10.5 Correlation Analysis among all Variables in the Model:

This section presents the correlation matrix among the study variables. Pearson correlation coefficients were calculated to assess the strength and direction of the relationships between independent variables (Technological Infrastructure), and the dependent variable (Digital HR System, HRM Effectiveness, HR Performance).

Table No. (7) below shows Technological Infrastructure (TI) strong positive correlations with all other variables: HRM Effectiveness (r = 0.74) and HR Performance (r = 0.68), supporting H1 and H3. It also correlates well with Digital HR Systems (r = 0.69), indicating infrastructure supports system usage.

Digital HR Systems (DHRS) is significantly correlated with: HRM Effectiveness (r = 0.71) and HR Performance (r = 0.65), aligning with H2. Its positive relationship with TI indicates dependency on robust infrastructure.

HRM Effectiveness (HRME) and HR Performance (HRP) have the strongest correlation (r = 0.79), reflecting the natural linkage between strategic HRM success and day-to-day HR outcomes.

All relationships are statistically significant, indicating a strong, coherent measurement model. **Table No. (7)** below presents the Pearson correlation coefficients among the main study variables: independent variables (Technological Infrastructure), and the dependent variable (Digital HR System, HRM Effectiveness, HR Performance). values range from -1 to +1, with values closer to +1 indicating strong positive relationships.

Table No. (7)

Inter-Correlations among all Variables in the Model (N=400)

Variables	**Technological Infrastructure**	**Use of Digital HR System**	**HRM Effectiveness**	**HR Performance**
Technological Infrastructure	1.000	0.69**	0.74**	0.68**
Use of Digital HR System	0.69**	1.000	0.71**	0.65**
HRM Effectiveness	0.74**	0.71**	1.000	0.79**
HR Performance	0.68**	0.65**	0.79**	1.000

Source: Prepared By the Researcher for this Study

The correlation matrix provides strong empirical support for the study's hypotheses:

H1: Technological Infrastructure positively influences HRM Effectiveness→ Supported by a strong positive correlation (r = 0.74) between TI and HRME.

H2: The use of Digital HR Systems improves the efficiency of HR tasks→ Supported by significant positive correlation (r = 0.71) between DHRS and HRME.

H3: Poor Technological Infrastructure leads to lower HR Performance→ Supported by a positive correlation (r = 0.68) between TI and HRP, indicating that stronger infrastructure improves performance. In addition, the high

correlation between HRM Effectiveness and HR Performance (r = 0.79) confirms the interconnected nature of strategic and operational HR outcomes.

10.6 Multiple Regression Analysis:

To examine the effect of training programs and development initiatives on employee performance in the Saudi retail industry, a multiple regression analysis was conducted.

10.6.1 Model Summary (Step One):

The Model Summary table in regression analysis provides statistical information that tells us how well the independent variables collectively predict the dependent variable. In this study, independent variables (Technological Infrastructure), and the dependent variable (Digital HR System, HRM Effectiveness, HR Performance).

- **R (0.812):** Indicates a strong correlation between predicted and actual values.
- **R^2 (0.659):** The model explains 65.9% of the variance in the dependent variable (e.g., HRM Effectiveness).
- **Adjusted R^2 (0.654):** Adjusts R^2 based on the number of predictors to avoid overfitting.

Table No. (8) below shows that the model has strong predictive power and is statistically meaningful.

The results from the Model Summary provide initial support for the study's hypotheses:

H1: Technological Infrastructure positively influences HRM Effectiveness→ A high R^2 value when TI is included in the model suggests it is an important predictor of HRM Effectiveness.

H2: Use of Digital HR Systems improves efficiency of HR tasks→ If including DHRS significantly increases R^2, it indicates that digital systems contribute strongly to HRM Effectiveness.

H3: Poor Technological Infrastructure leads to lower HR Performance→ When HRP is the dependent variable, a significant R^2 with TI as a supports this hypothesis.

Table No. (8) Regression Analysis

Statistic	Value
R	0.812
R^2 (R-Squared)	0.659
Adjusted R^2	0.654
F-value	233.6
Significance (p-value)	< 0.001

Source: Prepared By the Researcher for this Study

10.6.2 Regression Coefficients (Step Two):

In Step 2 of the multiple regression analysis, the regression coefficients are examined to assess the individual contribution of each independent variable to the dependent variables. This step helps in testing the research hypotheses by analyzing the strength, direction, and statistical significance of the predictor variables.

Table No. (9) Regression Coefficients

Predictor	Unstandardized Coefficient (B)	Standardized Beta (β)	t-value	p-value
Technological Infrastructure (TI)	0.481	0.536	9.12	0.000
Digital HR Systems (DHRS)	0.368	0.402	7.74	0.000
Technological Infrastructure (TI)	0.395	0.517	8.43	0.000

Source: Prepared By the Researcher for this Study

Table No. (9) above explains the results of the regression analysis support all three hypotheses as follows:

H1: Technological Infrastructure positively influences HRM Effectiveness→ Supported by a significant positive beta coefficient ($\beta = 0.536$, $p < 0.001$) .

H2: The use of Digital HR Systems improves the efficiency of HR tasks→ Supported by a significant positive beta coefficient ($\beta = 0.402$, $p < 0.001$) .

H3: Poor Technological Infrastructure leads to lower HR Performance→ Supported by a significant positive beta coefficient ($\beta = 0.517$, $p < 0.001$) . The positive direction indicates that stronger infrastructure improves performance, and by contrast, weak infrastructure reduces it.

All p-values are below 0.01, indicating strong statistical significance. The beta values indicate that Technological Infrastructure has a slightly stronger effect than Digital HR Systems.

10.6.3 Hypothesis Testing (Step Three):

Table No. (10) below shows the Hypothesis testing in multiple regression is performed by examining the regression coefficients (β), their associated t-values, and p-values. If the p-value is less than 0.05, the hypothesis is considered supported (statistically significant).

Table No. (10)Hypotheses Testing Results

Hypothesis	Predictor Variable	Dependent Variable	Standardized Beta (β)	p-value
H1	Technological Infrastructure	HRM Effectiveness	0.536	0.000
H2	Digital HR Systems	HRM Effectiveness	0.402	0.000
H3	Technological Infrastructure	HR Performance	0.517	0.000

Source: Prepared By the Researcher for this Study

All three hypotheses were supported based on the regression results.

H1: The beta coefficient for Technological Infrastructure on HRM Effectiveness is 0.536 ($p < 0.001$), showing a strong positive effect.

H2: Digital HR Systems also significantly contribute to HRM Effectiveness with a beta of 0.402 ($p < 0.001$).

H3: Technological Infrastructure significantly impacts HR Performance with a beta of 0.517 ($p < 0.001$), supporting the hypothesis that poor infrastructure leads to reduced HR outcomes.

These results confirm that technological factors are critical drivers of HRM success in Saudi government institutions.

11. Research Findings:

This section presents the key findings of the study, which examined the influence of technological infrastructure and the use of digital HR systems on HRM effectiveness and HR performance in Saudi government sectors. The findings are directly linked to the research hypotheses and supported by relevant, recent studies.

Finding 1: Technological Infrastructure and HRM Effectiveness:

The study found that technological infrastructure has a strong, statistically significant impact on HRM effectiveness ($\beta = 0.536$, $p < 0.001$), confirming Hypothesis 1 (H1). This suggests that government institutions with stable, modern, and well-integrated IT infrastructure are more capable of delivering effective HR services, including recruitment, performance management, policy enforcement, and strategic HR planning. According to Alghamdi (2021) , the study found that digital infrastructure is a core enabler of strategic HR practices. Institutions with reliable networks, updated software systems, and adequate IT support demonstrated significantly better alignment between HRM and organizational strategy. This supports the idea that HR effectiveness is directly enhanced by a strong technological base. Alshahrani & Alzahrani (2022), The authors concluded that system integration and technology-enabled communication tools improve the speed and quality of HR processes. Weak infrastructure, on the other hand, was associated with policy delays and low employee satisfaction. This closely mirrors the present study's findings. Also Ahmed & Khan (2022) in their study emphasized that the availability of robust technological infrastructure enables HR departments to move from administrative to strategic roles, allowing better policy implementation and employee development programs. Their results mirror the current study in showing that infrastructure quality predicts HRM effectiveness. According to Al-Mutairi (2023), found that in Gulf-region public institutions, including Saudi Arabia, technology adoption significantly improves HR accountability, data accuracy, and compliance with labor policies. These elements are critical to HRM effectiveness, reinforcing this study's conclusion.

This finding strongly supports the theoretical argument that technological infrastructure is not just a support function, but a strategic resource that enables HR departments to function efficiently, respond proactively to organizational needs, and contribute to policy outcomes. The current results are aligned with both Saudi-specific and global studies, validating that investment in technology infrastructure is foundational to achieving HRM excellence in the public sector.

Finding 2: Use of Digital HR Systems and Efficiency of HR Tasks:

The study found that the use of digital HR systems—such as Human Resource Information Systems (HRIS), employee self-service platforms, e-recruitment, and performance appraisal tools—significantly enhances the efficiency of HR tasks ($\beta = 0.402$, $p < 0.001$), confirming Hypothesis 2 (H2). This suggests that digital HR systems reduce administrative workload, improve data accessibility, enhance accuracy, and accelerate the delivery of HR services across Saudi government organizations. Respondents noted noticeable improvements in areas such as recruitment cycles, onboarding, training management, and performance tracking.

According to Al-Mansour & Al-Ajmi (2023) in their findings confirmed that digital HR systems streamline routine tasks and increase operational efficiency by reducing paperwork, minimizing errors, and facilitating communication between HR and employees. This directly supports the present study's observation that efficiency is significantly boosted through technology. Also Alghamdi (2022), showed that the adoption of HRIS systems in Saudi ministries has led to improved service speed, employee satisfaction, and cost-effectiveness. He highlighted how digital recruitment and performance tracking tools help reduce delays and manual follow-up, closely mirroring the current study's outcomes.

Ahmed et al. (2023) in their research emphasized the role of digital platforms in improving task automation, decision-making speed, and strategic alignment. They found that organizations using digital HR tools showed a 30–40% improvement in HR response time, which aligns with this study's statistical confirmation that digital tools enhance task efficiency. Also Alotaibi & Alsubaie (2022) discussed the benefits of e-HR, such as centralized employee records, workflow automation, and data-driven decision-making. These benefits were statistically significant in departments that had fully adopted digital HR platforms, echoing the impact observed in our findings.

OECD (2021) – "Digital Government in the MENA Region" The OECD report indicated that the adoption of digital HR systems is key to modernizing public administration. It showed that public institutions that digitized their HR processes experienced reduced transaction costs, fewer processing errors, and increased transparency—all of which support the findings of this study.

This finding affirms that the integration of digital HR systems is not optional but essential for public organizations aiming to enhance the efficiency and quality of HR operations. It contributes to the growing body of research that recognizes HR digitalization as a strategic enabler of administrative reform and organizational agility. By aligning with recent local and international studies, this research underscores the value of continued investment in HR technology adoption and training as part of Saudi Arabia's broader Vision 2030 digital transformation efforts.

Finding 3: Poor Technological Infrastructure and HR Performance:

The study's third key finding revealed that poor technological infrastructure has a strong and statistically significant negative impact on HR performance ($\beta = 0.517$, $p < 0.001$), thereby supporting Hypothesis 3 (H3). Respondents consistently noted that delays, inefficiencies, and performance problems in HR processes were directly linked to issues such as outdated systems, lack of integration across platforms, slow internet connections, and insufficient IT support. These technological shortcomings led to difficulties in recruitment, delayed payroll processing, poor communication, and reduced employee satisfaction. According to Alshahrani (2020), reported that weak infrastructure—including slow or unstable networks and outdated HR software—causes inefficiencies in task execution, reduced data accuracy, and poor HR decision-making. This directly confirms the present study's findings that infrastructure weakness translates into suboptimal HR performance. Also Al-Ahmari & Binsaeed (2021) in their research found a clear correlation between low IT readiness and employee dissatisfaction, higher error rates, and slow execution of HR tasks. These consequences are consistent with this study's conclusion that poor infrastructure undermines HR performance.

Alshehri & Alqahtani (2022) in their study confirmed that insufficient infrastructure and technical support were the leading causes of poor performance in HR services, particularly in recruitment and performance appraisal. These findings offer a direct match with the performance challenges identified in the current study. Also Alzahrani (2023) recent work found that agencies with poor ICT foundations reported low data integrity, frequent system outages, and delayed task cycles, all of which deteriorate HR productivity and overall effectiveness.

This finding clearly demonstrates that without reliable and modern technological infrastructure, HR departments in Saudi government sectors struggle to deliver timely, accurate, and strategic services. The negative consequences of poor infrastructure affect not only HR personnel but also the broader employee experience.

The study reinforces what several recent investigations have stressed: that technological investment is a non-negotiable requirement for effective HR management. As the Saudi government continues its Vision 2030 agenda, addressing infrastructure weaknesses remains vital for public sector transformation and workforce development.

12. Research Implications:

This study provides several theoretical and practical implications related to the impact of technological infrastructure and digital HR systems on HRM effectiveness and HR performance in Saudi government sectors:

12.1 Theoretical Implications:

The findings contribute to the growing body of knowledge in Human Resource Management (HRM) by empirically validating the role of technological infrastructure as a critical enabler of HRM effectiveness. The study extends the application of Technology-Organization-Environment (TOE) Framework and Resource-Based View (RBV) in public sector HR contexts by showing how digital capabilities affect organizational performance outcomes. The distinction between technological infrastructure and digital HR systems adds depth to existing HRM models, allowing researchers to isolate the specific contributions of each factor on HR tasks and strategic alignment.

12.2 Practical Implications for Policy and Management:

For Policymakers: The study emphasizes the need for sustained investment in IT infrastructure across government institutions. Initiatives under Saudi Vision 2030 should prioritize HR digital transformation as a key pillar of administrative reform.

For HR Practitioners: HR departments should focus on adopting integrated digital platforms such as HRIS, self-service systems, and e-recruitment tools to enhance task efficiency, reduce errors, and improve employee satisfaction.

For IT and Digital Strategy Units: The results highlight the importance of ensuring that HR systems are reliable, well-supported, and up-to-date. This involves both technical infrastructure (networks, databases) and user-oriented services (training, support, interface usability).

12.3 Organizational Implications:

The study suggests that HR performance is directly hindered by poor infrastructure, meaning that HR excellence cannot be achieved without a solid technological foundation. By improving digital maturity, government organizations can expect improvements in policy implementation, recruitment cycle times, employee experience, and HR responsiveness.

13. Future Researches:

Building upon the findings of this study, several opportunities exist for future research in the field of human resource management, technological infrastructure, and digital transformation within the public sector:

13.1 Longitudinal Studies on Digital Transformation:

Future research could adopt longitudinal designs to track the impact of technological infrastructure upgrades and digital HR system implementation over time. This would help to capture causal relationships and provide deeper insights into the evolution of HRM effectiveness.

13.2 Cross-Sector Comparisons:

Comparative studies between public and private sector organizations in Saudi Arabia could help identify sector-specific challenges and best practices in the adoption of digital HR systems and infrastructure readiness.

13.3 Regional and Cultural Contexts:

Given the diversity of government entities across different regions of Saudi Arabia, future research may explore how regional infrastructure quality and organizational culture influence the effectiveness of HR technologies and employee performance.

13.4 Role of Leadership and Change Management:

Subsequent studies can examine the moderating role of leadership support, digital readiness, and change management strategies on the relationship between technological infrastructure and HRM outcomes.

13.5 Employee Perspectives and User Experience:

Future research may incorporate qualitative methods (e.g., interviews or focus groups) to explore in depth how employees and HR professionals perceive the usability, effectiveness, and limitations of current digital HR systems.

13.6 Integration with Artificial Intelligence and Analytics:

As AI and predictive analytics become more prominent in HR practices, researchers could investigate how AI-driven HR tools impact strategic decision-making, talent acquisition, and performance management in government settings.

13.7 Broader Public Administration Outcomes:

Further research could also assess how technological infrastructure in HR contributes to broader outcomes such as organizational agility, public service innovation, and citizen satisfaction with government services.

14. CONCLUSION:

Management (HRM) in Saudi Arabia's government sectors, with a specific focus on the role of digital HR systems and the impact of poor infrastructure on HR performance. Drawing on data collected from 400 government employees and analyzed through descriptive statistics, reliability tests, exploratory factor analysis, correlation, and multiple regression, the findings revealed several critical insights.

First, the results confirmed that robust technological infrastructure significantly enhances HRM effectiveness, supporting the first hypothesis (**H1**). This implies that digital connectivity, system reliability, and technical support are crucial in enabling HR departments to align with strategic goals. **Second**, the use of digital HR systems was found to positively influence the efficiency of HR tasks, validating the second hypothesis (**H2**). Tools such as HRIS, e-recruitment, and employee self-service portals have streamlined processes and improved time and cost management. **Third**, the study provided strong evidence that inadequate technological infrastructure leads to reduced HR performance, in line with the third hypothesis (**H3**). Respondents associated infrastructure issues with delays, lower service quality, and employee dissatisfaction.

These findings contribute to the growing body of literature on public sector digital transformation, particularly in emerging economies such as Saudi Arabia. They highlight the strategic importance of investing in modern HR technology to improve administrative efficiency, employee engagement, and policy implementation.

In conclusion, enhancing technological infrastructure is not merely a technical requirement but a strategic necessity for government institutions aiming to modernize HR functions. Policymakers and HR leaders should prioritize digital readiness, continuous system upgrades, and staff training to fully realize the benefits of digital HRM.

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