

Enhancing Bank Performance through e-HRM Practices: The Moderating Role of Technology Adoption

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Abstract

To enhance performance in the banking sector, financial institutions are increasingly adopting electronic human resource management (e-HRM) practices to manage the rapid digitalisation of HR functions. This study investigates the impact of e-recruitment and selection, e-training and development, and HR analytics on bank performance, while examining the moderating role of technology adoption. A quantitative research design was employed, with data collected from employees of commercial banks across Sindh, Pakistan. Structural equation modeling tested the hypothesised relationships among the variables. Findings reveal that e-HRM practices positively and significantly influence bank performance. Additionally, technology adoption significantly moderates this relationship, indicating that the effect of e-HRM on performance is stronger in banks with higher levels of technological readiness. This underscores the critical role of organisational and technological preparedness in maximising the benefits of digital HR initiatives. The study contributes to the e-HRM literature by highlighting how technology enhances the effectiveness of HR practices in achieving organisational outcomes. Practically, it suggests that investments in e-HRM systems must be accompanied by appropriate technological infrastructure. These insights are valuable for bank managers and policymakers aiming to improve sector performance through digital HR innovations.

Keywords: e-recruitment and selection, e-training and development, HR analytics, bank performance, and technology adoption

1. Introduction

In this digital era, the banks have transformed their dealings with their employees based on digital advancements. With the implementation of electronic human

resource management (e-HRM) tools, that includes e-Recruitment and Selection (eRS), e-Training and Development (eTD), and HR Analytics (HRA), the financial institutions can assist in the performance of their human resource (HR) processes, uplift their decision-making quality, and derive strategic insights from the digital data of their workforce (Waheed, Asghar, & Khan, 2020; Amin, Saleem, & Aziz, 2025). The electronic recruitment and selection facilitates the efficient identification and acquisition of the most qualified candidates for the appropriate position. The upskilling of employees to acquire new skills is assisted through the digital platforms with the e-training and development process; however, the HR analytics offers data-driven insights into workforce trends for the efficient performance of the organisation. In this competitive computerised financial landscape, the above practices are becoming essential for banks to execute successfully. Therefore, with the adoption of such practices, the financial institutions are improving their service quality, operational efficiency, and position in the marketplace (Hanif, Usman, Hanif, & Sabir, 2023). The HRM of financial institutions, specifically like banks are significantly involved in the process of transformation due to the acceptance of new technological reforms. Though the banks are optimising their human resource operations to improve their decision-making process, and acquire strategic insights from workforce data through the use of Electronic Human Resource Management (e-HRM) approaches. In this research study, the practices that are focused on e-Recruitment and Selection (eRS), e-Training and Development (eTD), and HR Analytics (HRA) to identify their impact on the bank's performance (Waheed, Asghar, & Khan, 2020; Amin, Saleem, & Aziz, 2025). The eRS assists in the process of the efficient and thorough identification and selection of candidates, the eTD enables identifiable skill development via digital platforms, and the HRA offers data-driven insights into workforce trends so that the performance of the organisation can be analysed. Hanif, Usman, Hanif, and Sabir (2023) are also of the opinion that these behaviors are increasingly vital determinants of bank performance. They are assisting the banking sector in achieving enhanced service quality, operational efficiency, and competitive advantage in an increasingly digitalized financial environment. Thus, upto which extent the banks are getting benefits from such digital HR practices may differ according to the organisation structure. The researchers are increasingly in search of identifying the technology adoption among the employees of the organisation as it is considered as a crucial determinant influencing the effectiveness of e-HRM practices in achieving desired performance (Mohiuddin, 2025; Shah, Mushtaq, Iqbal, & Sherazi, 2025). The technology adoption (TA) involves several dimensions, including the bank's information technology infrastructure, the digital competencies of its employees, and the organisation's openness in the adoption of new technologies. Therefore, in this research, the researchers are employing the TA as a moderating variable that might enhance or reduce the relationship between these practices affecting the performance of the organisation. Based on the various researches the TA is considered as an element of e-HRM because of the widespread acknowledgement of the advantages of digital HR solutions in the organisations. In the rapid digital landscape advancements, the technologically skilled financial institutions are more likely to achieve

performance enhancements through e-HRM. This is due to their capacity to utilize advanced tools more effectively and integrate them into more extensive strategy frameworks.

Further, the transformation of HRM in the digital era emphasizes the importance of digital adoption for the effectiveness of HRA. The digitalisation and automation significantly modify the HR roles and procedures, enhancing the efficiency of employees. Based on the data-driven decision-making, the higher authorities can take the appropriate decisions (Zakaria, Hadiyan, and Pandawan 2025). The e-HRM integrates workforce management with evolving competitive problems and rapidly advancing technological capabilities (Shahiduzzaman, 2025). This identifies that the digital adaptation is a crucial advantage for all organizations. Moreover, the studies on digital transformation of human resources disclose that the enhanced strategic significance of analytics, artificial intelligence, and cloud-based systems helps in facilitating the workforce efficiency and providing a competitive edge (Jain & Chatterjee, 2025). In the modern digital economy, these progresses signify a shift from conventional human resource practices to more intellectual, adoption of technology-driven strategies can enhance the sustainable performance of the banking sector.

Though with these developments, there is still a need for more empirical research that specifically examines how TA moderates the impact of individual e-HRM operations on bank performance. In this regard, the practices involve eRS, eTD, and HRA. Most of the existing research on electronic human resource adoption has highlighted the direct relationship or descriptive reports, while the individual contextual factors that affect performance outcomes need more attention in developing countries like Pakistan. Understanding this moderation is crucial as it clarifies the conditions in which eHRM approaches can provide the beneficial performance. This will also provide the financial institutions a practical guidance on where to focus their investments in technology, along with the capability enhancement of employees.

Zakaria et al. (2025) and Shahiduzzaman (2025) believe that the organizations that develop digital adoption not only enhance the operational efficiency of HR but they also maximize the strategic potential across all functions of the organization. In this competitive digital era, when technologies such as artificial intelligence, big data analytics, and cloud platforms are rapidly expanding, the banking sector should also build digital adoption techniques. With this adoption, the banking sector can increase its efficiency in service delivery through improved talent acquisition, faster workforce learning, and more predictive workforce planning. Gathering all these practices results in enhanced performance analytics, such as increased profitability, increased customer satisfaction, and increased process efficiency.

This research contributes to the literature of eHRM by focusing on certain e-HRM practices, such as eRS, eTD, and HRA in the banking sector of developing countries. Also, the factor of TA is considered as the moderator showing its direct and indirect relationship with independent variables, along with the dependent variable of bank performance (BP). As the banking sector is operating their businesses through rapid technology advancement and competitiveness, this study can be found beneficial in

the modern digital age. This research provides a conceptual framework for banks seeking to leverage eHRM for competitive advantage in the digital economy.

2. Problem Statement

In this competitive era, the banks are facing issues due to the variation of technological advancements, which shows the existence between eHRM methods and enhanced organizational performance. In this regard, the e-RS platforms, eTD systems, and HRA demonstrate the digital technologies that achieve optimal efficacy when supported by an appropriate information technology infrastructure that can assist employees to use these tools competently (Amin, Saleem, & Aziz, 2025; Khatoon, Javed, & Ahmed, 2025). Studies demonstrate that the adoption of artificial intelligence (AI) and eHRM systems enhances employee engagement and productivity (Shah, Mushtaq, Iqbal, & Sherazi, 2025). Therefore, it is essential to examine the function of TA as a moderator between eHRM practices and BP. The banks risk investing in eHRM systems without achieving the intended performance benefits if they lack the proper TA. This study can be found beneficial for the successful implementation of eHRM by offering practical guidance for HR managers, IT planners, and policymakers in the banking sector.

3. Literature Review

3.1 E-Recruitment and Selection and Bank Performance

The eRS refers to the use of online recruitment platforms, the applicant tracking systems, and digital talent acquisition tools that improve the efficiency, scope, and provide a fair hiring process in the organization. The eRS can significantly enhance the organizational performance by improving the quality of the staff, by managing the recruitment time, along with reducing the recruitment costs (Asike, Dinsar, and Muslimin, 2025). Literature on e-HRM indicates that the organizations experience enhanced workflow efficiency and improved administrative effectiveness through the utilization of eRS systems (Roy and Jegan, 2019; Waheed, Asghar, and Khan, 2020). Based on the research on the banking industry shows a positive association between digitalized recruitment processes and successful organizational outcomes. Such an association has been found through the hybrid eHRM procedures, encompassing digital recruitment tools, and enhanced competitiveness and performance in the banking sector (Qawasmeh & Qawasmeh, 2023). The digital instruments in HRM procedures have demonstrated enhancements in workforce quality and compatibility, subsequently influencing the competitive advantages (Khatoon et al., 2025). Furthermore, the extensive literature on HR digital transformation examines how digital tools in talent processes can enhance workforce quality and compatibility. As the eRS can improve speed, reach, and alignment with strategic talent needs, it can facilitate the organisation with better workforce composition and performance outcomes. Hence, the following hypothesis is proposed:

H1: eRS has a positive and significant impact on BP.

3.2 E-Training and Development and Bank Performance

The eTD describes the provision of training, including skill enhancement programs, and educational elements through the digital platforms. Such digital approach can assist the banking sector to rapidly upskill the employees' abilities, provide them with personalized training sessions based on their needs, and maintain staff relevance within the evolving market changing aspects. One of the research findings on digital maturity discloses that the advanced human resource technologies, including sTD systems, are essential for improving employee capacities and facilitating strategic ways in human

resource procedures (Shahiduzzaman, 2025).

Instruments that promote ongoing learning and knowledge management enhance an organization's agility and efficacy within the framework of eHRM transformation (El Garem, 2026). Literature on the eHRM transformation indicates that e-learning platforms and artificial intelligence-enabled training sessions can enhance the employees adaptability, can reduce the training expenses, and enhance the ability to respond to competitive demands. Hence, these are considered as the important performance determinants in banks experiencing the technological transformations. With the adoption of sTD banking sector can foster continuous education and skill enhancement among its employees, hence inspiring the quality of human capital and increasing the operational efficiency of the organization. Hence, the following hypothesis is proposed:

H2: eTD has a positive and significant impact on BP.

3.3 HR Analytics and Bank Performance

HRA refers to the application of data analysis and statistical methods to human resources data to analyse the employees' performances. This procedure highlights the evidence-based decision-making, predictive workforce planning, and the strategic alignment between HR and business objectives. Literature emphasizes that the HRA is an important factor of eHRM and significantly influences the competitiveness and performance of the organization (Jain & Chatterjee, 2025; Asike et al., 2025). The HRA is found as an important tool that allows professionals to identify trends, predict turnover, enhance workforce distribution, and strengthen the retention approaches in the banking sector (Siddiqui, Zafar, & Hussain, 2025). Literature on the implementation of HRA discloses that the effective adoption enhances predictive capacities, increases strategic agility, and provides measurable value to decision-making processes in the organization. Thus, the HRA is predicted to positively influence the BP by providing data-driven insights that enhance decision-making quality and improve the performance of the employees along with the organization. Hence, the following hypothesis is proposed:

H3: HRA has a positive and significant impact on BP.

3.4 Moderating Role of Technology Adoption with eRS, eTD, and HRA on BP

In the process of technological adoption, the infrastructure of an organization, the digital capabilities of its employees, and its overall ability to adopt and effectively utilise the digital tools are considered as important contextual facilitators. Literature on eHRM consistently highlights that the impact of eHRM systems is about the recruitment, training, and use of the analytics tools, which provide the foundation for the digital capabilities and their technology adoption process. Researchers are of the opinion that organisational competencies are a combination of digital literacy, technological integration, and adaptive capacities that assist in achieving the desirable outcomes from the digital human resource initiatives in the organisation (Shahiduzzaman, 2025; El Gareem, 2026).

Furthermore, literature on the overcoming obstacles in HRA adoption emphasizes that factors related to technical support, data governance, and organizational awareness towards the technology substantially influence the effective implementation of analytics systems. This perception is supported by the theoretical frameworks like the Resource-Based View (RBV) and technical competence theory, which declare that the technology adoption serves as a strategic asset that allows firms to maximize the benefits of digital expenditures in the organization. According to Asike et al. (2025) and Qawasmeh and Qawasmeh (2023), inadequate adoption can delay even well-designed e-HRM practices from achieving the desired targets for the organization. This can be the outcome of employees' lack of essential skills related to technology, inadequate organizational technical infrastructure, and persistent challenges to adopt the technology. The TA among the employees is expected to enhance the positive impacts of eRS, eTD, and HRA on BP. Thus, the TA enhances an organization's ability to adopt and utilize eHRM structures. Hence, based on the above discussion, the following hypotheses are proposed:

H4: eRS has a positive and significant impact on BP while taking the TA as a moderator.

H5: eTD has a positive and significant impact on BP while taking the TA as a moderator.

H6: HRA has a positive and significant impact on BP while taking the TA as a moderator.

Table I. Summary of Literature Support for Hypotheses

Hypotheses	Theoretical and Empirical Support
H1: e-Recruitment and Selection → Bank Performance	Digital HR recruitment speeds hiring and aligns workforce needs with strategy, improving outcomes (Waheed et al., 2020; Qawasmeh & Qawasmeh, 2023).
H2: e-Training and Development → Bank Performance	E-training builds workforce skills and adaptability, enhancing operational efficiency (Shahiduzzaman, 2025; El Garem, 2026).
H3: HR Analytics → Bank Performance	HR analytics provides strategic insights that inform decision-making and performance management (Siddiqui et al., 2025).
H4: Technology Adoption moderates e-RS → Bank Performance	Organizational digital adoption enables effective use of digital HR tools, strengthening performance effects (Shahiduzzaman, 2025; El Garem, 2026).
H5: Technology Adoption moderates e-TD → Bank Performance	
H6: Technology Adoption moderates HRA → Bank Performance	

Source: Authors' own conceptualization

4. Conceptualization of the Study

This conceptualization of this study is based on the fact that eHRM practices function as strategic organizational capabilities that enhance the performance of employees ultimately with the organization, along with the technological transformation. The conceptual framework includes TA as a moderating variable, the BP as the dependent variable, and three essential facets of e-HRM practices as independent factors. The core concept of this study is that eHRM practices enhance the employees' efficiency, decision-making quality of the authority, and organizational responsiveness, ultimately resulting in achieving the desired performances. The eRS is an independent process of using the digital platforms, through which the applicant tracking systems are managed, and the online assessment tools to attract and hire the competent applicants. With this process, the organizations can easily access to the qualified candidate, maintain the transparency, and improve the cost-effectiveness.

The second independent variable eTD is referring to the use of digital learning platforms, virtual training systems, and online development modules to enrich the skills and the abilities of the employees. This process assists in enhancing the digital skills of organisational employees so that they will compete with the fluctuations and technological progress of the markets. Thus, the eTD enhances the employee productivity, innovation, and service quality, hence improving overall organizational performance. The third independent variable is HRA, which assesses the degree to which organizations utilize data-driven solutions to analyze employee information and support HR decision-making. The organizations that effectively utilize the HRA

are expected to achieve more accurate decisions on recruitment, retention process, and productivity, ultimately leading to improved organizational outcomes.

The dependent variable, BP, identifies the overall effectiveness of the organisation. It is composed of several systems of measurement, like operational efficiency, service quality, employee productivity, and financial performance. The TA as a moderator of this study, identifies that the organizations that incorporate the technological infrastructure, digital competencies, system integration abilities, and accessibility to technological innovation directly impact on organizational performance. The conceptual model suggests that eRS, eTD, and HRA individually have positive effects on BP, while the moderator (TA) enhances the interrelations among these three elements, see Figure 1.

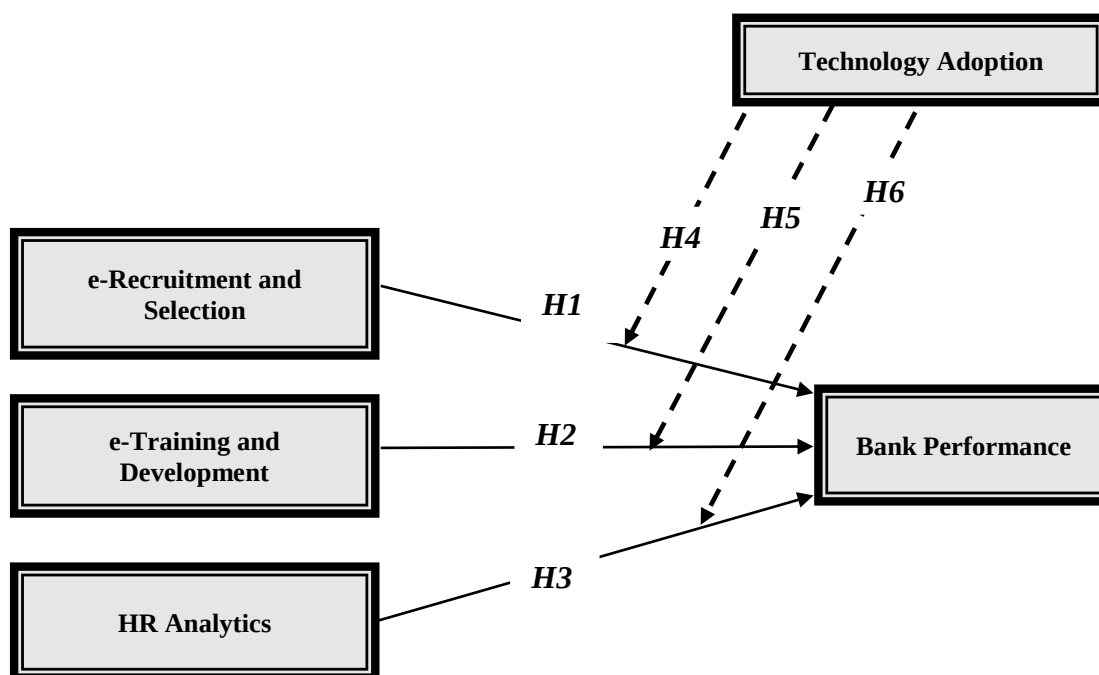


Figure 1. Conceptual Model

Source: Authors' own conceptualization

5. Research Methodology

5.1 Research Design

The researchers had employed a quantitative, cross-sectional, and explanatory research methodology to examine the relationships among e-HRM practices, TA, and BP. Based on a deductive approach, the hypotheses were generated from existing concepts and empirically evaluated literature (Saunders et al., 2019). As in this technological era the quantitative designs are strongly recommended for examining

the statistical effects of moderating factors and establishing connections across various dimensions (Saunders et al., 2019).

5.2 Population and Sampling

The data were collected from the targeted population based on the employees of private commercial banks in Hyderabad and Karachi. The researcher selected these cities as they are considered significant financial hubs with extensive utilization of digital banking systems and HRM technological adoption. A simple random sampling procedure was employed, so that every participant can get equal chance of participation (Creswell, 2014). This method reduces the chances of sample biasness. The sample was collected from the private banks like Habib Bank Limited, MCB Bank, United Bank Limited, Allied Bank Limited, Alfalah State Bank, Meezan Bank, Standard Chartered Pakistan, Bank AL Habib, and Faysal Bank.

5.3 Data Collection Instrument

The researchers collected the primary data by means of a structured questionnaire that was derived from validated instruments in recent research on eHRM. With this process, it increased the construct validity and reliability of the established scales (Joseph F. Hair et al., 2019).

Section A: HR 4.0 Practices (Independent Variables)

The items that measure eRS, eTD, and HRA were adapted from the researches of Zhao et al. (2025), Drouin-Rousseau et al. (2023), and Chhetri et al. (2023). Each concept consisted of six items that were used to assess the employees' adoption of eHR practices.

Section B: Moderator – Technology Adoption

The TA that refers to acceptance of new technology was evaluated with the use of six questions that were adapted from Chhetri et al. (2023). These items evaluated infrastructure support, personnel readiness, management support, and trust in the utilization of digital workforce tools.

Section C: Dependent Variable – Bank Performance

With the assistance of six items that were derived from the study of Ghimire (2024) and HRM performance literature, the factor of BP was evaluated. These items were designed to capture perceived gains in areas such as productivity, efficiency, profitability, service delivery, and customer satisfaction.

5.4 Demographic Section

In addition to that, the questionnaire contained a demographic part that was designed to collect information on the respondents' backgrounds. According to Creswell (2014), researchers are able to better understand sample composition and control for any variations between respondent groups with the use of demographic data. Some of the demographic variables that were collected are as follows: Gender, Age, Marital Status,

Education and Experience. These variables make it possible for the descriptive analysis of respondent profiles and make them ready for assessment of whether perceptions differ across demographic categories, see Table II.

All of the items in the questionnaire were evaluated using a Likert scale with seven points, ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). The seven-point scales are recommended because, in comparison to shorter scales, they can either increase response sensitivity or improve reliability (Hair et al., 2019).

Table II. Demographic

	Category	Frequency	Percentage
Gender	Male	274	73.46
	Female	99	26.54
	Total	373	100.0
Age	25-30 Years	209	56.03
	31-40 Years	73	19.57
	41-50 Years	32	8.58
	50 and More Years	59	15.82
	Total	373	100.0
Marital Status	Single	48	12.87
	Married	269	72.12
	Divorced/Widow	56	15.01
	Total	373	100.0
Education	Bachelor's Degree	109	29.22
	Master's Degree	170	45.58
	M.Phil./ Ph.D. Degree	94	25.20
	Total	373	100.0
Experience	1-5 Years	60	16.1
	6-10 Years	136	36.46
	11-15 Years	115	30.83
	16 & Above	62	16.62
	Total	373	100.0

Source: Authors' own calculation

6. Data Collection Procedure

At the time of data collection, 450 questionnaires were sent out to employees who worked in a variety of departments and worked at different levels of the organisational hierarchy within the selected banks through Google Forms. Nonetheless, certain forms were also distributed using emails and courier services. Achieving a response rate of 82.88%. A total of 373 valid samples were utilized to get results. It was made clear to the participants that the study was being conducted for academic purposes, and they were given the assurance that their responses would be kept anonymous and confidential. The participation was entirely voluntary, and in order to get the highest possible response rates (Saunders et al., 2019).

6.1 Validity and Reliability

The content validity was verified by utilising measuring items that were taken from the literature. It was modified with some minor changes of words in order to fit the items with the banking context. It was determined through a pilot test that clarity and

comprehension both met the standards. An evaluation of the reliability of the internal consistency was carried out with the help of Cronbach's alpha. According to Hair et al. (2019), acceptable values imply that items consistently measure the constructs for which they were designed for data analysis.

6.2 Data Analysis Techniques

The data analysis process was executed to ensure the dataset's appropriateness for statistical analysis (Hair et al., 2022). The initial phase entailed doing data screening in SPSS, which included the assessment of missing values, outliers, and normalcy. Descriptive statistics, including the mean, standard deviation, and frequency distributions, were employed to concisely summarize the demographic characteristics of the respondents and their overall responses. A reliability analysis was conducted using Cronbach's alpha to assess the internal consistency of all constructs. (Hair et al., 2022) Items with values exceeding the required threshold signify that they effectively measure the intended variables. A correlation analysis was subsequently conducted to examine the nature and extent of the relationships between the variables see Table III and IV. Structural Equation Modelling (SEM) was employed using AMOS for hypothesis testing. Construct validity, encompassing convergent and discriminant validity, was assessed via confirmatory factor analysis (CFA). Following the validation of the measurement model, the structural model was rigorously assessed to analyze the direct relationships between e-HRM practices and the BP while taking TA as a moderator. This technique aimed to examine the impact of TA on the correlation between e-HRM practices and bank performance. This strategy is typically recommended for moderation testing in multivariate analysis (Hayes, 2022). The combined use of SPSS and AMOS produced a comprehensive analytical framework that facilitated accurate assessment of measurement reliability, model validity, and proposed relationships.

Table III. Descriptive Statistics

	N	Mean	Std. Dev	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
eRS	373	4.51	2.33	-.301	.141	.151	.238
eTD	373	4.25	2.50	-.426	.141	-.549	.238
HRA	373	4.27	1.16	-.311	.141	-.461	.238
BP	373	4.16	1.42	-.528	.141	.779	.238
TA	373	3.94	2.19	-.644	.141	.229	.238
Valid N (list-wise)	373						

Note(s): eRS, e-Recruitment and Selection; eTD, e-Training and Development; HRA, HR Analytics; BP, Bank Performance, TA, Technology Adoption;

Source: Authors' own calculation

Table IV. AVE, CR, and Cronbach's alpha

Construct	Item Code	Factor Loading above 0.7	CR > 0.7	AVE above 0.5	α above 0.7
e-Recruitment and Selection (eRS)	eRS 1	0.894	0.903	0.715	0.812
	eRS 2	0.887			
	eRS 3	0.878			
	eRS 4	0.873			
	eRS 5	0.710			
e-Training and Development (eTD)	eTD 1	0.872	0.879	0.720	0.820
	eTD 2	0.828			
	eTD 4	0.808			
	eTD 5	0.802			
	eTD 6	0.754			
HR Analytics (HRA)	HRA 1	0.865	0.794	0.906	0.855
	HRA 2	0.858			
	HRA 3	0.789			
	HRA 4	0.781			
	HRA 5	0.766			
	HRA 6	0.728			
Bank Performance (BP)	BP 1	0.851	0.687	0.918	0.879
	BP 3	0.843			
	BP 4	0.821			
	BP 5	0.798			
	BP 6	0.782			
Technology Adoption (TA)	TA 2	0.867	0.699	0.933	0.838
	TA 3	0.860			
	TA 5	0.851			
	TA 6	0.685			

Note(s): CR, Critical ratio. *** $p < 0.001$; eRS, e-Recruitment and Selection; eTD, e-Training and Development; HRA, HR Analytics; BP, Bank Performance, TA, Technology Adoption;

Source: Authors' own calculation

6.3 Ethical Considerations

The ethical research guidelines were followed throughout the investigation. The data were employed solely for research purposes, and participation was completely voluntary. Confidentiality was maintained throughout the entire procedure. Participants were informed of their right that if they are not willing to participate in the study, they can withdraw at any time without any hesitation, in regard to accepted ethics of the research (Saunders et al., 2019).

6.4 Results

This segment shows the outcomes of the analysis. Table III identifies the descriptive statistics with mean, standard deviation, skewness, and kurtosis for the variables used

in this research. The values of skewness were close to zero specify a normal distribution, though the values of kurtosis within the range ± 1 can be ignored in general. According to statistical strategies, both values of the skewness and kurtosis should remain within ± 2.58 . In this research, all the values are within the justified limits, confirming that the data were distributed normally. The results also illustrate a universal pact among respondents regarding eHRM practices and also disclosed that eRS noted a mean of 4.51 (SD = 2.33), eTD had a mean of 4.25 (SD = 2.50), HRA had a mean value of 4.27 (SD = 1.16), BP presented a mean of 4.16 (SD = 1.42), and TA testified a mean of 3.94 (SD = 2.19). All these results specify a consistent observation among respondents about these constructs. According to Pearson's correlation coefficient, Table IV presents the results of the reliability and validity analysis for the constructs used in the study, including eRS, eTD, HRA, BP, and TA as moderator. The factor loadings for all measurement items are above the recommended threshold of 0.70, indicating strong indicator reliability and confirming that each item adequately represents its respective construct. The Composite Reliability (CR) values for all constructs range from 0.687 to 0.903, which are close to or above the recommended threshold of 0.70, demonstrating acceptable internal consistency. Similarly, the Average Variance Extracted (AVE) values range from 0.715 to 0.933, exceeding the minimum acceptable value of 0.50, which confirms good convergent validity of the constructs. Moreover, the values of Cronbach's alpha (α) of all the included variables range between **0.812 and 0.879**, representing a high level of internal reliability between these measurement items. The overall model fitness was calculated by the chi-square statistic. The model confirmed an acceptable fit with CMIN/df = 2.64, which is lower than the recommended threshold of 3 and significant at $p > 0.005$ (Hair et al., 2021). Though the demographic or the control variables might be reducing the degree of freedom and also affect the model estimates (De Battisti & Siletti, 2019), that's why they were not included in this analysis. Further model fit indices accessible in Table V further confirmed the appropriateness of the model. The obtained values of AGFI (0.916), GFI (0.905), CFI (0.911), NFI (0.925), and RMSEA were all within the satisfactory range, indicative of a good model fit (Hair et al., 2021).

Table V. Model Fit

	CMIN/df	GFI	AGFI	NFI	CFI	RMSEA
Model fit indicators	2.64	0.905	0.916	0.925	0.911	0.034
Suggested Values	<3	>0.90	>0.90	>0.90	>0.90	<0.05

Note (s): CMIN= χ^2 /chi-square/df; df = degree of freedom; GFI= goodness-of-fit index; AGFI= adjusted goodness-of-fit index; NFI= normed fit index; CFI= comparative fit index; RMSEA= root mean square error of approximation

Source: Authors' own calculation

6.5 Structural model (Direct Effects)

The structural equation modeling (SEM) was executed in AMOS, and the results are presented in Table VI and Figure 2, which examine the relationships between the independent and dependent variables. For H1, the structural path results indicate a strong positive relationship between eRS and BP ($\beta = 0.656$, CR = 8.410). Since the significance level is 0.000, which is below 0.05, H1 is accepted. For H2, the results demonstrate a positive relationship between eTD and BP ($\beta = 0.392$, CR = 7.396). With a significance level of 0.000, which is below 0.05, H2 is also accepted. For H3, the findings reveal a positive effect of HRA on BP ($\beta = 0.233$, CR = 4.236). The significance level of 0.001 confirms that H3 is accepted.

Table VI. Hypothesis Testing (Direct Effect)

Hypothesis	Direct Effect		Est. β (path co-efficient)	SE	CR (t-value)	P	Decision
H1	eRS	→ BP	0.656	0.078	8.410	0.000	Accepted
H2	eTD	→ BP	0.392	0.053	7.396	0.000	Accepted
H3	HRA	→ BP	0.233	0.055	4.236	0.001	Accepted

Note(s): CR, Critical ratio. *** $P < 0.001$; eRS, e-Recruitment and Selection; eTD, e-Training and Development; HRA, HR Analytics; BP, Bank Performance, TA, Technology Adoption;

Source: Authors' own calculation

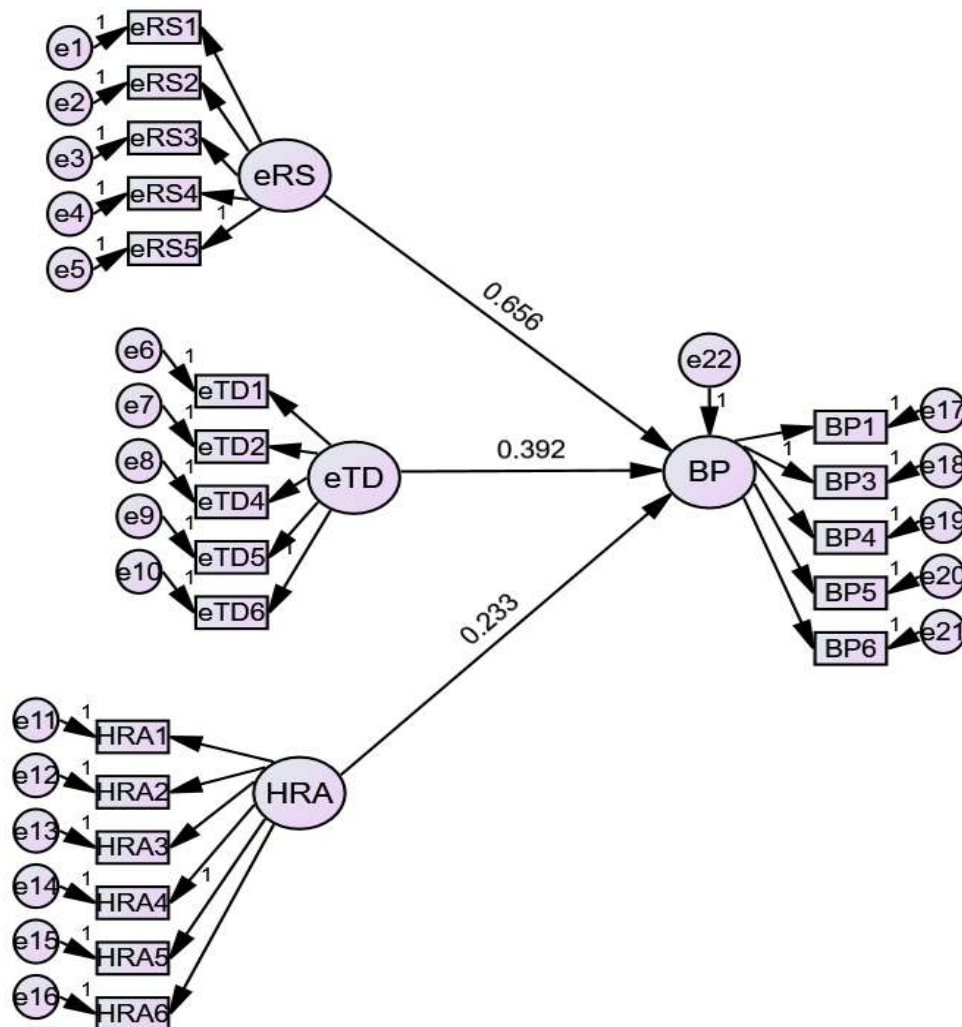


Figure 2. Structural equation model (Direct Effect)

Source: Authors' own calculation.

6.6 Structural model (Moderation Effects)

Regarding the moderator's effects, H4 examines the relationship between eRS and BP significantly moderated by TA. The results show $\beta = 0.523$ and $CR = 8.573$, indicating a positive and significant relationship. Since the significance level (0.002) is below 0.05, H4 is accepted. Similarly, H5 investigates the Moderator's role of TC between eTD and BP. The results show $\beta = 0.378$ and $CR = 8.042$, with a significance level of 0.000, confirming H5. Finally, H6 examines the moderator role of TC between HRA and BP. The results show $\beta = 0.415$ and $CR = 6.587$, with a significance level of 0.001, confirming H6 see Table VII and Figure 3. Overall, the statistical analysis supports all six hypotheses proposed in this study. The results indicate a positive relationship between HRM practices and business performance,

both directly and through the moderator's role of technology adoption. These findings are consistent with previous research (Ashraful et al., 2021; Aboramadan, 2022; Abbas et al., 2022; Aftab et al., 2023; Al-Alawneh et al., 2024; Mahesh et al., 2024).

Table VII. Hypothesis Testing (Direct Effect)

Hypothesis	Moderation		Est. β (path co-efficient)	SE	CR (t-value)	P	Decision
H4	eRS x TA	→ BP	0.523	0.061	8.573	0.002	Accepted
H5	eTD x TA	→ BP	0.378	0.047	8.042	0.000	Accepted
H6	HRA x TA	→ BP	0.415	0.063	6.587	0.001	Accepted

Note(s): CR, Critical ratio. *** $P < 0.001$; eRS, e-Recruitment and Selection; eTD, e-Training and Development; HRA, HR Analytics; BP, Bank Performance, TA, Technology Adoption;

Source: Authors' own calculation

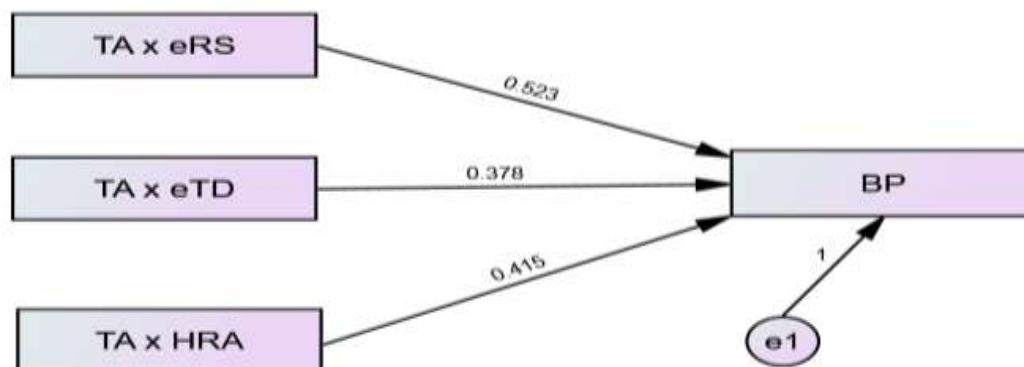


Figure 3. Structural equation model (Moderation Effect)

Source: Authors' own calculation.

7. Discussion

This research study provides the considerable evidence that eHRM strategies positively impact BP. With the encouragement of transparent, data-driven, and efficient hiring procedures, eRS can significantly assist in achieving the desired organisational outcomes (Drouin-Rousseau et al., 2023; Zhao et al., 2025). eRS in the banks may attract the candidates with competencies while simultaneously by reduced recruiting time using AI-driven screening, using online evaluations, and more structured hiring processes in the organization. This enriches both the operational efficiency as well as quality services of the banks. The literature identifies the impact of eTD on BP. The digital learning platforms also offer personalised training options that increase the employees' skills, their adaptability, and make them ready for the future technological challenges, featuring AI-driven and interactive programs (Drouin-Rousseau et al., 2023; Zhao et al., 2025). These platforms will provide employees with the opportunity to acquire and develop new skills to meet the challenges of the new era. This research also pointed out that online and gamified

learning environments can significantly enhance the employee productivity and engagement, particularly in technology-dependent organizations (Chhetri et al. 2023; Shah et al. 2025).

Further, it was also perceived that HRA plays a vital role in maintaining the most substantial performance of banks. With the assistance of HRA, the managers can easily point out the skill deficiencies among the employees, enhance workforce planning, and make decisions on the evidence collected, resulting in improved employee productivity, operational efficiency, and overall organizational performance (Chhetri et al., 2023; Ghimire, 2024; Zhao et al., 2025). The above discussions give a strong support to this study by emphasising the importance of HRA in enhancing organizational competitiveness and enabling informed decision-making in the organization (Siddiqui et al., 2025; Jain & Chatterjee, 2025). Whereas the TA was seen as a significant moderator. Banks were exhibiting elevated technology adoption and also encompassing sufficient infrastructure, and individual technology acceptance, and management endorsement, encountered more significant impacts from eHRM practices (Chhetri et al., 2023; Zhao et al., 2025; Mohiuddin, 2025).

The findings indicate that eHRM initiatives alone are insufficient; their success needs to be assisted with the organization's modification with new technologically equipped systems to integrate new systems into their daily operations of the organization (Shahiduzzaman, 2025; Khatoon et al., 2025). To improve the impact of eHRM on BP, the results highlight the importance of TA. The banks that integrate advanced human resource practices with substantial technological acceptance are better equipped to enhance staff productivity, operational efficiency, customer satisfaction, and overall organizational performance (Waheed et al., 2020; Zakaria et al., 2025). El Garem (2026) and Hanif et al. (2023) also identified that there is a need for research in eHRM solutions and developing organizational capabilities to effectively leverage technology in the contemporary digital age.

8. Implications

The findings of this study provide some policy-making, theoretical, and practical implications. First of all, the banking sector should practically integrate eRS, eTD, and HRA into its human resource approach. At the same time, they should participate in TA initiatives to ensure the efficient operation of these systems. With the proper investments in artificial intelligence-enabled recruitment tools, digital learning platforms, and data-driven HR decision-making, the enhance employee engagement, efficiency, and service delivery, ultimately resulting in improved BP. Researchers believe that the managers must foster a culture encouraging the implementation of eHRM techniques to achieve the positive outcomes (Chhetri et al., 2023; Zhao et al., 2025).

The theoretically implication of this study addresses a deficiency in the comprehension of how eHRM programs yield performance enhancements just when organizations possess adequate technological capabilities and resources in their concerned organizations (Shahiduzzaman, 2025; Mohiuddin, 2025). The findings also support the adoption of theoretical frameworks, like the resource-based approach and

technological acceptance models. These frameworks show that organizational resources and acceptance are essential to enhance the eHRM initiatives. The policy makers and bank leadership should promote the standardisation and implementation of eHRM practices. Furthermore, they must offer guidance on investments in technological infrastructure and the digital upskilling of employees. An industry-wide enhancement in efficiency, competitiveness, and innovation in HRM can be attained through the implementation of these methodologies (Waheed et al., 2020; Zakaria et al., 2025).

9. Conclusion

In conclusion, the findings of the study determine that the eRS, eTD, and HRA all together can significantly improve the BP. However, the approach of an organization to enhance and to integrate digital systems is essential for gaining the benefits of eHRM practices. TA helps to enhance these linkages, highlighting the importance of these approaches within the organization. In the private banks, those who work according to the digital era, these findings highlight the strategic significance that eHRM plays in enhancing productivity, operational efficiency, and service delivery responsibilities.

10. Limitations

This study possesses several limitations, although it has significant findings. The cross-sectional design complicates the determination of a causal relationship between e-HRM practices, TA, and BP. The research was done only in the cities of Sindh, particularly in Hyderabad and Karachi, which may restrict the generalizability of the findings to other places or countries due to geographical constraints. Moreover, the use of self-structured survey data may introduce common method bias; nevertheless, procedural safeguards such as guarantees of anonymity and verified measurement scales have been implemented to mitigate this risk. The quantitative approach is also one of the limitations that can restrict the different perceptions of the employees and management related to the acceptance and implementation of technological tools. One of the limitations was conducting the study in the private sector, which can limit the approach of the public sector to enhance its vision towards the adoption of new technological initiatives.

11. Future Research

Future studies should manage these limitations by conducting longitudinal studies to examine the evolving impact of e-HRM practices and TA over time by comparing both the private and public sectors. Enhancing the generalizability of the findings as well as offering comparative insights can be achieved by broadening the research scope to include public banks, additional financial institutions, and various industries. Future research is very important to evaluate the influence of mediating variables, such as employee engagement, job satisfaction, and organisational commitment, on the relationship between e-HRM practices and performance outcomes. Finally, it concludes that future research might investigate the impact of emerging technologies,

like artificial intelligence and machine learning, on advanced HR decision-making and organisational performance in different manufacturing and also servicing companies with higher digital maturity.

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