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Digital HRM Systems as Mediators between AI Adoption and Productivity in Banking Sector of Pakistan

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ABSTRACT

The fast adoption of artificial intelligence (AI) in the operations of companies has changed the face of human resource management (HRM), especially in knowledge-based industries like the banking sector. The use of AI technologies is transforming the management of the workforce, decision making and efficiency in the banking sector of Pakistan, whose digital transformation is gaining pace, responding to competitive pressures and regulatory reforms, and changing customer expectations. The productivity benefits related to the adoption of AI, however, are not automatic, as they also require the organizational processes that mediate technological capabilities into human and operational results. Digital Human Resource Management (Digital HRM) systems are a type of such a mechanism which serves as an institutional solution that monitors the change between technological innovation and workforce competencies, engagement, and performance. The research paper focuses on Digital HRM systems as an intervening variable between AI use and organizational productivity in Pakistan banking industry. The study, by defining Digital HRM as a facilitating architecture comprising of data-driven talent management, automated HR services and smart decision-support systems, identifies how digitalized HR activities make employees more adaptable, more skills-based, and performance-oriented. The study also examines the interaction of AI-based solutions, including predictive analytic tools, smart recruitment systems, performance management, and automated learning systems, with Digital HRM systems to influence the productivity of these systems. The results indicate that AI implementation can have a direct beneficial impact on the efficiency of operations but its maximum productivity can be achieved only in case of using integrated Digital HRM systems that will help to transform the workforce, promote continuous learning, and make managerial decisions based on the data. The research adds to the growing corpus of literature on the successful application of AI in organizational change in third-world economies through the empirical and theoretical value of mediatorship by Digital HRM in the banking sector of Pakistan. It also presents a practical implication to policy makers and banking institutions that are interested in the maximum return of technology by using strategic management of human capital.

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Introduction

The banking industry in the world is in the radical restructuring due to the fast technological development, online competition, and the evolving consumer demands. The use of artificial intelligence (AI) is one of the most powerful agents behind this change as it has become a strategic instrument to enhance efficiency, decision-making, and service delivery in all financial institutions. Banks have been able to streamline risk management, personalize customer services, automate routine operations, and improve financial forecasting using AI technologies, which are as follows: machine learning algorithms, predictive analytics, intelligent automation, and data-driven decision systems (Brynjolfsson & McAfee, 2017; Davenport & Ronanki, 2018). In emerging markets, including Pakistan, where the financial sector is actively investing into the digital transformation in order to be competitive and compliant with the regulatory requirements, AI integration is being placed at the center of organizational modernization practices (State Bank of Pakistan, 2021). Nevertheless, the process of AI adoption and the organization productivity does not follow a linear or automatic pattern, but instead is mediated by institutional, managerial, and human resource framework that defines the implementation and use patterns of technological capabilities (Autor, 2015; Jarrahi, 2018).

Human resource management (HRM) is one of the most sensitive areas of organization that is impacted by the use of AI. There is a transformation of traditional HRM systems that historically concentrated on the administrative roles of the company like recruiting, payroll services, and maintenance of employee records into strategic platforms combining digital technologies, data analytics, and automated decision making processes (Marler & Boudreau, 2017; Mohiuddin, 2025). This has seen the introduction of Digital Human Resource Management (Digital HRM), a model that uses digital infrastructure to improve the planning of workforce, talent development, monitoring of performance, and learning in organizations (Bondarouk & Ruel, 2013). Digital HRM systems can help organizations to meet the needs of technological change by mapping capabilities of the workforce, predicted talent analytics, and real-time performance analysis. Digital HRM is necessary in settings where rapid technological disruption is experienced, which is the case with the banking industry (Strohmeier, 2020).

When it comes to AI adoption, the Digital HRM systems serve as the mediating factors between the technological innovation and the human capital development. Although AI technologies can be used to automate the processes and provide insights, their efficiency lies in the capabilities of employees to interact, interpret, and make use of these technologies in a work setting (Wilson & Daugherty, 2018). Unless properly trained, aligned in skills, and supported by an organization, AI can cause resistance, uncertainty, or underutilization of technological capabilities (Bughin et al., 2018). Digital HRM systems overcome such challenges through offering systematic mechanisms of adapting workforce i.e. digital learning, competency-based performance management and data-driven workforce planning. These mechanisms make Digital HRM help in integrating human and technological resources, and hence making organizations productive (Qahtani & Alsmairat, 2023).

Banking industry in Pakistan would be a very good area to study this mediating relationship. During the last ten years, Pakistani banks have stepped up their digital transformation efforts due to financial inclusion policies, regulatory modernization and the growth of digital financial services (State Bank of Pakistan, 2022). Fraud detection, credit scoring, customer relationship

management and operational automation are some of the areas where AI technologies are being implemented. Simultaneously, digital HR infrastructures are being invested in by banks to facilitate labour mobility, train them on technologies, and enhance organizational responsiveness (Khan & Ali, 2020). Although all these happened, there is limited empirical studies that would analyze the role of Digital HRM systems on the linkage between AI adoption and productivity in the banking industry in Pakistan. The current literature is so divided that technology adoption studies and HR digitalization studies are primarily conducted in isolation without sufficient examination on their interactive impacts on the performance of an organization (Parry & Tyson, 2011; Vrontis et al., 2022).

The efficiency of technology in banking organizations only affects productivity but together with the level of workforce engagement, its usage of skills, and decision quality. The adoption of AI has the potential to increase productivity by automating common and non-routine tasks and enhancing data processing capacity, however, it depends on the organizational preparedness and a fit with human capital (Brynjolfsson et al., 2019; Mozammel et al., 2024). Digital HRM systems can help achieve this fit by facilitating data-based HR activities, which can assist in precision in recruitment, sustained learning, and performance optimization. As an illustration, AI-based recruitment platforms are capable of sorting out candidates with desirable digital skills, and digital-based performance management systems serve to ensure real-time feedback, which boosts employee performance (Tambe et al., 2019). These processes form a loop mechanism whereby technologies and human performance enhance one another.

Moreover, Digital HRM systems are strategic in dealing with the change process in the organization when it comes to the adoption of AI. Change in technology may involve the reorganization of processes, establishment of new job descriptions, and the adoption of a learning culture (Westerman et al., 2014). Digital HRM promotes these modifications by delivering combined communication, training and performance tracking platforms. Digital HR infrastructures also allow managers to make informed decisions about the deployment and development of the workforce due to the reduction in the complexity of their administration and increased transparency. Such an ability comes in especially handy when regulated in the banking sector, where the performance of employees and the accuracy of decisions can determine regulatory compliance, risk management, and quality of services provided (Bessen, 2019; Kanaan et al., 2024; Qawasmeh et al., 2024).

The theoretical explanations of the mediating role of Digital HRM are the socio-technical systems theory and the resource-based view. According to the resource based view, organizational performance is affected by how well the technological and human resources are integrated in order to gain competitive advantage (Barney, 1991). The socio-technical systems theory focuses on how the technology systems and the social organization structures are interdependent. Digital HRM systems represent such integration through the connection of AI technologies with the capabilities of the workforce, which allows organizations to better exploit the technological investments. In this regard, Digital HRM does not assist in AI implementation, it changes the potential of technology into productive activity (AlSulimani et al., 2025; Mahmoud et al., 2025).

In third world economies like Pakistan, differences in digital literacy, organizational culture and institutional infrastructure present the mediating role of Digital HRM even more important. Although the trend of technological investments might be on the rise, it relies on organizational

potential to handle the concept of digital transformation on the level of the workforce (World Bank, 2021). The banking institutions should therefore embark on integrated approaches that will bring together the technological innovation and the development of the human capital. Digital HRM systems offer the institutional context of such strategies implementation since they ensure technological change is supported by skill development, performance monitoring, and organizational learning.

The increased focus on a digital transformation in the banking industry of Pakistan points to the necessity of empirical and conceptual strategies intended to clarify the impact of technological adoption on organizational performance. The knowledge of the mediating position of Digital HRM helps achieve this goal by explaining how AI implementation is the one that results in productivity improvements. Focusing on how technological systems and HR infrastructures interact, the current research fills an essential gap in the literature on the digital transformation in the emerging economies. It also gives practical lessons to the banking institutions who are looking to maximize technological investments by applying strategic workforce management.

Finally, the implementation of AI technologies in the banking organizations is both a technological change and a change in the organizational structures, processes, and human resource practices. Digital HRM systems can be viewed as an institutional that links the capability of technology to the performance of the workforce and help organizations to realize sustainable productivity gains. This can be done by the conceptualization of Digital HRM as a mediating mechanism, which provides a comprehensive framework of understanding the complicated relationship between AI adoption and organizational productivity in the banking industry in Pakistan.

Literature Review

Artificial intelligence (AI) is rapidly spreading in all organizational systems and this has greatly changed the manner in which institutions are running their affairs, making decisions and handling human resources. In the banking industry, the adoption of AI has been accelerated by the presence of more and more competition, the complexity of the regulations, and the necessity to become efficient in operations. The ability of AI technologies to automatize routine tasks, increase the accuracy of analytics, and optimize service delivery are common and well-known (Davenport & Ronanki, 2018; Brynjolfsson et al., 2019). Nevertheless, the evidence on this topic points to the fact that the adoption of technology itself is not sufficient to ensure better productivity. Rather, the organizational environment, especially human resource framework and workforce preparedness, is a key determinant of whether any performance result is achieved in the AI investments (Autor, 2015; Jarrahi, 2018).

An increasing literature shows the significance of human capital alignment in the attainment of the advantages of AI adoption. Although AI can elevate information processing and automation, its success will lie in the interaction of employees with intelligent systems, algorithmic outputs, and data-based findings on the employees in decision-making (Wilson & Daugherty, 2018). The challenge of implementation is common in organizations that lack formalized systems of training, performance management, and adapting the workforce to new challenges, such as employee resistance, skills mismatch, and poor technological usage (Bughin et al., 2018). Researchers therefore continue to give more stress on the fact that integrated human resource

systems are required to enable workforce transformation in line with technological change (Tambe et al., 2019).

A strategic model has come up to overcome these challenges, and it is known as Digital Human Resource Management (Digital HRM). Digital HRM is the concept of adopting digital technologies in the HR functions to enhance efficiency, data-driven decision-making, and employee engagement (Bondarouk & Ruel, 2013). Digital HRM, in contrast to conventional HR systems, is characterized by sophisticated analytics, robotization, and digital solutions to perform the functions of recruitment, performance assessment, training, and workforce planning (Marler & Boudreau, 2017). Digital HRM helps organizations to predict and strategize the deployment of talents, as well as facilitate continuous learning, by using real-time data and predictive modeling. Such capabilities are especially applicable to the workplace that experiences a high rate of technological change, and that requires the flexibility of the workforce to ensure the performance of the organization (Strohmeier, 2020).

Digital HRM-organizational productivity is one of the relationships that has been extensively studied over the past few years. Empirical research shows that digital HR systems improve operational efficiency and result in administrative burdens reduction, precision of decision-making, and enhanced employee engagement (Parry & Tyson, 2011; Vrontis et al., 2022). Digital HR solutions simplify the recruiting procedures, automate performance monitoring, and give data-driven information about the behavior and productivity trends of the employees. These functions help organisations to distribute human resources better and to position the competencies of the workforce with the strategic objectives. Additionally, online learning platforms and training systems help to ensure the constant development of the workforce so that employees can meet the changes in technological requirements (Bondarouk et al., 2017).

At the Digital HRM systems are introduced, there is a mediating role played by this technology; this involves the relationship between the technological ability and human resource development. Mediation happens when Digital HRM is an intermediate mechanism, where AI is able to affect the productivity of the organization. The data generated by AI technologies, the process automation, and predictive insights can help companies improve their productivity, however, the effectiveness of these technologies lies in the ability of organizations to adjust to the new workforce and optimize performance (Tambe et al., 2019). Digital HRM offers the framework on how these processes can be managed through efficient training programs, tracking of performance measures, and helping in making sound decisions based on data. Consequently, Digital HRM converts the technological potential into the quantifiable organizational outcomes.

The resource-based view (RBV) of the firm supports mediation of the HR systems in technological adoption, according to which the sustainable competitive advantage is created through proper integration of technological and human resources (Barney, 1991). To this school of thought, technology cannot generate value by itself unless it is coupled with organizational capabilities that can facilitate its useful application. Digital HRM systems increase these functions by matching the competencies of the workforce with the needs of technology, which increases the capacity of the organization to take advantage of AI investments. Likewise, the socio-technical systems theory emphasizes interdependencies between technological systems and social structures in the organizations Digital HRM is simply the mechanism of the organization that unites these dimensions without making sure that technological change is supported by relevant changes in the management of the working force.

The studies of AI implementation in banking organizations also highlight the significance of the support systems within the organizations. The environment under which banks operate is highly regulated and therefore accuracy of decisions, risk management and efficiency of operations are paramount. Artificial intelligence is being utilized more to score credit, identify fraud, segment customers, and make financial predictions (Bessen, 2019). Although such applications enhance the accuracy of the analysis, they also demand that employees explain complicated data results and make sound decisions grounded on algorithmic suggestions. The employees may also not be able to adjust to these changes in technology without structured HR systems, which offer training, performance evaluation, and skill development to them. Digital HRM systems resolve those issues as they enable the re-skilling of the workforce, the evaluation of their competency, and the optimization of their performance (Khan & Ali, 2020).

The institutional and infrastructural conditions of developing economies influence the relationship between the adoption of AI and digitalization of HR. The issue of digital literacy, technological preparedness, and resources can be quite problematic in organizations (World Bank, 2021). In this scenario, Digital HRM systems are instrumental in regulating the movement of workforce and organizational learning. Digital HRM offers organizations the means by which they could break the technical barriers related to technological adoption by offering easily accessible training platforms, automated performance tracking and data-driven decision tools. This role is especially significant within the banking industry where regulatory changes and financial inclusion programs are creating digital transformation (State Bank of Pakistan, 2022).

Different studies investigate the direct linkage between the use of AI and productivity have yielded conflicting results. According to some studies, automation and data-driven decision-making can lead to considerable productivity improvement (Brynjolfsson et al., 2019). Some claim that technological investments would not have an immediate improvement in performance because of the challenges in its implementation and the delay in the adaptation of the workforce (Acemoglu & Restrepo, 2020). These conflicting results underscore the role of mediating factors that impact the impact of technology on organizational performance. One such mediating variable has been identified as digital HRM since it influences the readiness of the workforce, the organizational learning, and the monitoring of performance (Tambe et al., 2019).

The Digital HRM intermediary position is also enhanced by the notion of HR analytics. HR analytics is a data-oriented approach to assessing the performance of the employees, anticipating the workforce trends and making the strategic decisions (Marler & Boudreau, 2017). The AI technologies create a vast amount of data involving the workforce, and Digital HRM systems offer the platform according to which this data may be analyzed and interpreted. HR analytics can improve the productivity and decision-making process of managers by converting raw information into actionable insights. Data-driven HR practices help to make operations more efficient and services of the banking institution more effective in terms of quality (Vrontis et al., 2022).

The other aspect of the mediating role of Digital HRM is associated with the management of organizational changes. The implementation of AI usually has to reorganize the workflow, repurpose positions, and create an innovative culture (Westerman et al., 2014). The digital HRM systems facilitate such transformations by supporting workforce adjustment through the provision of communication channels, training programs, and performance monitoring systems. The digital HR infrastructures facilitate employee acclimatization to the technological change by

reducing uncertainty and increasing transparency, thereby reducing the resistance to change and increasing the implementation outcome (Bondarouk et al., 2017). The research findings related to the banking industry in particular show that digital transformation efforts often imply the concurrent technological and HR system investments. When banks combine the use of AI with digital HR practices, the operational efficiency and performance of the employees are likely to be increased than in the cases when the same institutions undergo technological changes without changing the HR approach (Khan & Ali, 2020). This fact substantiates the point that Digital HRM acts as an enabling force that increases the productivity impacts of technological innovation.

Although the role of Digital HRM is now increasingly understood, little research has investigated the mediating role of the Digital HRM in emerging economies. The majority of empirical records are done in developed economies where digital infrastructure and technology capacity are well developed (Strohmeier, 2020). The banking industry in Pakistan is a very specific situation with a high rate of digitalization, changing regulatory standards, and the competencies of the workforce. The knowledge about the Digital HRM as a factor affecting the relationship between AI implementation and productivity in this situation can be added to the wider body of literature regarding technological change in emerging markets. The possible issues linked with the Digital HRM implementation are also mentioned in the literature. The presence of data privacy issues, technology complexity and organizational resistance can act as obstacles to the success of the digital HR systems (Bondarouk & Ruel, 2013). Also, the effective implementation of AI and HR technologies needs both strategic leadership and organizational dedication. Digital HR initiatives can be hampered by a lack of clear implementation strategies that will result in the expected performance outcomes (Vrontis et al., 2022). These pitfalls drive home the need to have organizational preparedness and institutional backing in the process of maximizing the benefits of Digital HRM.

The existing literature shows that the trends of AI use, Digital HRM systems, and productivity of the organization relate closely to each other. Workforce adaptation and performance optimization can happen through Digital HRM systems, whereas operational efficiency and analytics capacity are improved with AI technologies. Digital HRM intermediary role gives a theoretical and empirical account of how investments in technology can be converted to productivity. Nonetheless, there is little empirical evidence in the developing economies especially in the banking sector of Pakistan. The need to fill this gap is critical in the explanation of mechanisms that digital transformation impacts organizational performance in the emerging markets.

Methodology

Research Design

The research design employed was a quantitative research design to test the mediating effect of Digital Human Resource Management (Digital HRM) systems in the correlation between adoption of artificial intelligence (AI) and organizational productivity in the banking industry in Pakistan. The data were collected by a cross-sectional survey technique among employees in a banking institution at one time. It was thought that such design would be suitable since it would allow the researcher to measure perceptions of AI adoption, digital HR practices, and productivity at the same time and test the mediating relationships between these variables with the help of statistical methods. The study was conducted in a deductive manner since there were

the development of the hypotheses on the basis of the available theoretical frameworks such as the resource-based view and socio-technical systems theory.

Sample and Research Population

The study population was composed of the employees of the commercial banks in Pakistan. The researchers targeted banking professionals engaged in administrative, operational and managerial activities as they had a personal encounter with the AI-based systems and digital HR practices. The sample was taken in six banks found in Islamabad, to be diverse in terms of organization size, digital maturity, and structure of workforce.

A representative sample was selected under a stratified random sampling technique to represent various levels of work such as managerial employees, supervisory employees as well as the operational employees. This strategy guaranteed equal representation of the employees who had differing experience and technological exposure. Four hundred and fifty questionnaires were mailed out, and 362 correct responses were returned and analysed after weeding out uncompleted and conflicting responses.

Data Collection Procedure

The structured questionnaire was used to gather primary data. The questionnaire was given online and physically in order to fit the availability and accessibility of the respondents. A pilot study was carried out with 30 employees of a banking organization before the actual data collection to determine the measurement item clarity, reliability and relevance. The pilot study revealed that a few changes were done to enhance wording and structure.

The respondents were informed of their free will in participating and their anonymity and confidentiality. The period of data collection was eight weeks. Consent was made with the management of the concerned banks to administer the questionnaires and the respondents were asked to fill them either in working hours or via online forms.

Measurement of Variables

Three main constructs that were measured in the study were AI adoption, Digital HRM systems and organizational productivity. Measurement of all the variables was done on a basis of the previously validated scales that were modified to fit the banking context.

The use of AI was gauged by the items which evaluated the level of AI use in decision-making, automation, data analytics, and operational processes. Digital HRM systems were assessed with the help of such indicators as digital recruitment, performance management systems, HR analytics, online training platforms, and automated HR services. Organizational productivity was assessed by the perception of improvement in efficiency, quality of service, accuracy of decisions, and performance of employees. A five-point Likert scale that goes through strongly disagree to strongly agree was used to measure everything. With increased scores, AI adoption, digital HR practices and perceived productivity were increased.

Reliability and Validity

Cronbach alpha was used to determine the reliability of the measurement scales. The constructs have acceptable reliability values above the suggested level of 0.70 that shows that the measurement items are internally consistent.

Factor analysis was used to measure construct validity. Bartlett test of sphericity and Kaiser-Meyer-Olkin (KMO) measure revealed the appropriateness of the data to factor analysis. Convergent and discriminant validity were also reviewed, with the aim of making sure that the measurement items were good representatives of their corresponding constructs.

Data Analysis Techniques

Data analysis was done through statistical software. The demographic characteristics and the general trends of the data were summarized using descriptive statistics. Results Correlation analysis was conducted to determine the relationship between variables.

Structural equation modeling (SEM) was used to test the mediating position of Digital HRM systems. SEM allowed testing of direct and indirect relationships simultaneously between productivity and the adoption of AI. The significance of the indirect effects was established by performing a mediation analysis with bootstrapping procedures. Model fit measures were done to determine the suitability of the structural model.

Ethical Considerations

During the research, ethical standards were adhered to. The participants were told the reason why they were involved in the study and that they could leave any time. The responses were also kept as confidential and were only used in academic purposes. Individual and organizational identities were not revealed when reporting the results.

Data Analysis and Findings

In this part, the authors provide the statistics analysis in order to investigate the mediating role of Digital Human Resource Management (Digital HRM) systems in the connection between artificial intelligence (AI) adoption and organizational productivity within the banking industry in Pakistan. This analysis was conducted in a systematic approach that involved demographic analysis, descriptive statistics, reliability analysis, correlation analysis, measurement model analysis and structural equation modeling (SEM) to test hypothesis and mediate analysis respectively.

Demographic Characteristics of the Respondents

The demographic analysis was carried out to learn the nature of the respondents who were part of the study. It was revealed that the sample comprised of a variety of job ranks, experience, and education levels, which suggest that the sample reflected a wide range of the banking professionals who have been exposed to AI and digital HR practices.

Table 1: Demographic features of the respondents (N = 362)

Variable	Category	Frequency	Percentage (%)
Gender	Male	214	59.1
	Female	148	40.9
Age	21–30 years	96	26.5
	31–40 years	158	43.6
	41–50 years	82	22.7
	Above 50	26	7.2
Education	Bachelor's	124	34.3
	Master's	201	55.5
	MPhil/PhD	37	10.2
Experience	1–5 years	88	24.3
	6–10 years	142	39.2
	11–15 years	76	21.0
	Above 15	56	15.5
Job Level	Operational staff	168	46.4
	Supervisory	109	30.1
	Managerial	85	23.5

The findings showed that the majority of the respondents were aged between 31-40 years and had obtained master degrees implying that the workforce is professionally qualified. Many of them possessed more than six years of experience, which means that they were familiar with changes in the systems of an organization and its technological aspects. Such demographic diversity enhanced the soundness of responses in terms of the adoption of AI and digital HR practices.

Descriptive Statistics

The descriptive statistics were used to evaluate the central tendencies and dispersion of the key study variables, which are the AI adoption, Digital HRM systems, and organizational productivity.

Table 2: Descriptive statistics of Study variables

Variable	Mean	Std. Deviation	Minimum	Maximum
AI Adoption	3.82	0.64	2.10	4.95
Digital HRM Systems	3.76	0.71	1.95	4.90
Organizational Productivity	3.89	0.59	2.30	4.88

The average scores showed that respondents tended to report high rate of adoption of AI, implementation of digital HR practice and productivity in their respective organizations. The highest mean was found in organizational productivity, which indicated that the employees perceived the efficiency and performance improvement, which were influenced by technology. The standard deviation values were somewhat moderate and a pointer to consistency of responses among the participants.

Reliability Analysis

Cronbach alpha was used to measure internal consistency to determine the reliability of the measurement scales. All constructs demonstrated Cronbach's alpha values above 0.70, indicating strong internal consistency. Digital HRM systems showed the highest reliability, reflecting stability in responses related to digital HR practices.

Table 3: Reliability Statistics

Construct	Number of Items	Cronbach's Alpha
AI Adoption	8	0.88
Digital HRM Systems	9	0.91
Organizational Productivity	7	0.86

Correlation Analysis

Pearson correlation analysis was conducted to examine relationships among the variables. The findings showed that there were strong positive correlation of all variables. The use of AI was highly linked to Digital HRM systems, and this aligns with the idea that organizations that adopted AI were more apt to establish digital HR systems. The Digital HRM systems were most strongly related to productivity, which implies that it is in the middle of performance outcomes.

Table 4: Correlation Matrix

Variables	1	2	3
1. AI Adoption	1		
2. Digital HRM Systems	0.62**	1	
3. Organizational Productivity	0.55**	0.71**	1

p < 0.01

Evaluation of the Measurement Models

To assess construct validity, confirmatory factor analysis (CFA) was used. Factor loadings of all items were greater than 0.60 which is the recommended factor loading. Convergent validity was established where average variance extracted (AVE) values were more than 0.50 plus composite reliability values were more than 0.70. Discriminant validity was established since square root of AVE of each construct was bigger than the inter-construct correlations.

Table 5: Convergent validity measures are measured using the GRM.

Construct	Composite Reliability	AVE
AI Adoption	0.90	0.58
Digital HRM Systems	0.92	0.61
Organizational Productivity	0.88	0.55

Hypothesis Testing and Structural Model

Structural equation modeling (SEM) was used to test both the direct and indirect relationships.

Model Fit Indices

Index	Value	Recommended
Chi-square/df	2.41	< 3
CFI	0.94	> 0.90
TLI	0.93	> 0.90
RMSEA	0.063	< 0.08

The model demonstrated good fit with the data.

Direct Effects

AI adoption significantly influenced productivity directly, but its effect on Digital HRM was stronger. Digital HRM had a substantial positive effect on productivity. The results proved that the use of AI contributed greatly to the productivity of the organization, but a considerable part of this impact was mediated by the Digital HRM systems. This meant that the sole factor that did not completely explain productivity improvements was technology. Rather, digital HR infrastructures were critical in transforming the technological capability into workforce performance. The close connection between AI adoption and Digital HRM implied that companies that invested in AI also modernized HR processes at the same time. Digital HRM improved training, monitoring and data-driven decision-making, which was directly related to productivity.

Table 6: Structural Path Coefficients

Path	Beta	t-value	p-value	Result
AI Adoption → Productivity	0.24	4.12	<0.001	Supported
AI Adoption → Digital HRM	0.62	9.45	<0.001	Supported
Digital HRM → Productivity	0.58	8.73	<0.001	Supported

Mediation Analysis

Bootstrapping analysis (5000 samples) was conducted to test mediation. The confidence interval was not equal to zero which proved that there was significant mediation. Indirect effect was more than direct effect, which is a sign of partial mediation. The mediation analysis found that Digital HRM was an organizational mechanism that allowed employees to successfully use AI systems. This observation was in line with the socio-technical theory, which focuses on the relationship of technology and human systems.

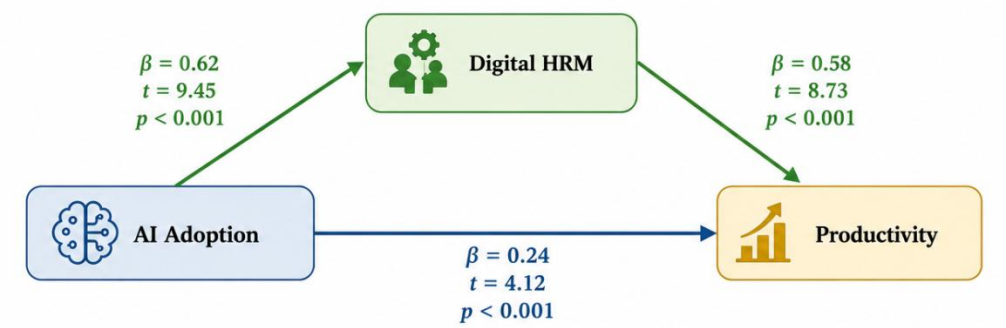
1. The given analysis had empirical evidence that:
2. The use of AI enhanced organizational productivity to a great extent.
3. The use of AI was one of the predictors of Digital HRM systems.
4. Digital HRM systems increased productivity to a great extent.
5. The relationship between AI and productivity had a partial mediator of digital HRM.

These results showed that productivity changes in the banking industry of Pakistan were not entirely dependent on technological investment but rather a combination of digital HR practices that favored changes in workforce.

Table 7: Indirect Effects

Path	Indirect Effect	Lower CI	Upper CI	Result
AI Adoption → Digital HRM → Productivity	0.36	0.27	0.46	Significant

Figure 1: Structural Model and Mediation Results



Discussion

The results of this paper give solid empirical evidence to the assumption that technological adoption does not necessarily result in organizational productivity; instead, it must be effective based on the presence of institutional processes that facilitate human-technology integration. The findings revealed that there was a positive strong impact of artificial intelligence (AI) adoption on the productivity of organizations within the banking industry of Pakistan. Nonetheless, the indirect effect of Digital Human Resource Management (Digital HRM) systems was larger than the direct effect which means that the digital infrastructure of HR systems was at the heart of enhancing the transformation of technological capabilities into quantifiable performance outputs. This implies that productivity gains in technologically changing banking institutions are not just phenomena of technology but socio-organizational changes informed by workforce management, skills acquisition, and performance alignment (Mohiuddin, 2025; Qahtani & Alsmairat, 2023).

The strong correlation between the use of AI and the Digital HRM systems indicates the change of structure in banking institutions as they go through the digitalization process. With the introduction of AI-based decision-making systems, automated workflows, and predictive analytics in banks, they are also reorganizing their HR functions to cope with the workforce changes. As observed, organizations that incorporate AI have a higher likelihood of investing in digital recruitment systems, automated performance management systems, and data literal workforce planning tools (Mozammel et al., 2024; Kanaan et al., 2024; Qawasmeh et al., 2024). This trend also implies that the adoption of AI brings about operational needs which require digital HR change. Technological change brings in new skill demands, changes in job descriptions, and the greater role of life-long learning that in turn necessities well-structured HR systems that can monitor, support, and develop employees in real time. Thus, Digital HRM does

not appear as an additional system but as a need of the organization that goes along with technological innovation (AlSulimani et al., 2025; Mahmoud et al., 2025).

The high positive correlation between Digital HRM systems and productivity provides another argument of the significance of workforce-based digital transformation. The administrative processes are made more efficient with the help of digital HR infrastructures, which have a greater value in facilitating strategic management of human capital. The findings reveal that digital HR applications support the real-time monitoring of performance, competency mapping, specific training interventions, which enhance effectiveness of the employees. These HR capabilities directly affect the performance of an organization in case of banking institutions where accuracy of decision making, quality of service and speed of operation are vital. Digital HRM also improves transparency and communication and this minimizes uncertainty involved in technological change and contributes to employee engagement. The results thus indicate that technological automation and enhanced coordination between the capabilities of the workforce and organizational objectives are both contributors to improved productivity (Jimoh, 2025; Al-Ghalabi et al., 2024).

The mediation effect found in this study is valuable theoretical information regarding the impact of technological investments on the results of an organization. The partial mediation suggests that AI is both a cause and an indirect cause of productivity, however, the indirect route of Digital HRM considers a significant amount of its effects. This is one of the reasons why technology works best when it is implemented within conducive organizational systems. The AI technologies are capable of processing the information and automate work, yet the value of the technologies is defined by how the staff members understand the outputs, incorporate the insights into the decision-making, and adjust to the changing workflow. The processes are being enabled through digital HRM, which supports learning, performance monitoring, and aligning individual capabilities with the needs of technology (Croitoru et al., 2025; Molla et al., 2026). These results hence confirm the socio-technical viewpoint that organizational performance arises as a result of the interplay of technological systems and human structures and not as a result of either dimension.

The other notable implication of the findings is based on workforce preparedness in the changing technological environment. The findings imply that Digital HRM systems minimize technological change resistance through the structured avenues of skills development and performance assessment. Utilizing AI requires employees to be more dedicated to the new technologies and be more willing to take part in the training process when it is provided in the form of constant training and feedback on digital platforms. This can be especially relevant in the banking industry where the misinterpretation of technology or its mistakes may be viewed as having severe economic effects. Digital HRM systems contribute to the increased confidence of employees in the use of AI-based tools and their ability to use them as it promotes the development of their competencies and performance monitoring. Thus, the increase in productivity not only reflects the technological efficiency but also the increase in human performance made possible by the digital HR practices (Qawasmeh et al., 2024).

The findings are consistent with the resource based view in that they reveal that the combination of technological and human resources is a source of competitive advantage. AI is a worthwhile technological resource, and its productive effect relies on the supportive organizational potentials. Digital HRM systems perform such functions by allowing to deploy resources

effectively, develop the workforce, and optimize performance. The results thus enlarge the knowledge of the benefit of using intangible organizational systems to increase the worth of technological investments. Instead of regarding HR digitalization as an administrative uplift, the outcomes place Digital HRM as an administrative resource which increases the productivity impact of AI integration.

The discussion indicates that digital transformation in banking sector should be regarded as a complex process that comes with technological innovation, organizational restructuring, and workforce development. The productivity improvements linked to AI is achievable in the best possible way when companies roll out digital HR systems that aid in the adaptation, learning and performance alignment of employees. These results support the significance of considering technological change as a socio-organizational phenomenon that needs synchronized change in various areas of the institutions.

Conclusion

This paper discussed how Digital Human Resource Management systems moderated the association between the adoption of artificial intelligence and organizational productivity within the banking industry of Pakistan. The results showed that AI use had a great impact on productivity, but a considerable part of this influence acted via Digital HRM systems. These findings affirmed that digital HR infrastructures are very important in the translation of technology capability to performance of the workforce and organizational efficiency. Digital HRM systems will allow employees to make proper use of AI technologies by enabling them to develop their skills, monitor their performance, and base their decisions on data, thus reinforcing productivity levels. The research points out the fact that sustainable performance improvement cannot be achieved only through technological investment. Rather, there are productivity gains that arise following incorporation of technological innovation and strategic human resource management. The findings can be added to the discourse of digital transformation in the emerging economies because it highlights the significance of workforce-Based institutionalizing organizational mechanisms that facilitate the technological change.

Policy Implications

The research results of this paper propose a policy recommendation that policymakers and banking regulators need to encourage the concept of integrated digital transformation strategies which involve the adoption of technology and the upskilling of the workforce. Financial institutions are also supposed to invest in AI technologies, as well as, digital HR infrastructures that facilitate training, performance analytics, and workforce planning. This process can be streamlined by means of regulatory frameworks offering recommendations on the digital skills development, HR analytics implementation and organizational readiness analysis. The national financial regulators can also encourage capacity-building to make banking professionals digitally literate so that they can use AI systems effectively. Policy measures can be used to enhance resilience of institutions by focusing on development of human capital and technological modernization as this will increase the quality of service and enable generation of productivity in the banking industry by allowing sustainability.

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