



ARTIFICIAL INTELLIGENCE AND BLOCKCHAIN-ENABLED HUMAN RESOURCE
ANALYTICS FOR STRATEGIC WORKFORCE INTELLIGENCE

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Abstract

Purpose. The current research analyses the impact of both AI-based HR analytics and blockchain technology integration on workforce intelligence in knowledge organizations in Islamabad, Pakistan, through the mechanism of decision making based on data analytics.

Design/Methodology/Approach. A cross-sectional and quantitative research design was used for the study. Information was gathered from 325 human resource practitioners, middle-level and top-level managers in banks, information technology firms, telecom companies, and government agencies using a self-completed questionnaire. For testing of the hypothesized relationships, measurement of reliability and validity was done first, then correlation, hierarchical regression analysis, and structural equation modelling.

Findings. The findings show that the use of artificial intelligence HR analytics ($\beta = 0.412$, $p < .001$) and adoption of blockchain technology ($\beta = 0.336$, $p < .001$) both have significant positive influence on decision making driven by data, which further strongly influences SWI ($\beta = 0.489$, $p < .001$). Mediation model explains 61.2% of the variance in SWI.

Practical Implications. These findings create a data-driven framework for human resources managers, digital transformation agents, and policy makers to collaboratively utilize AI and blockchain technology to increase their efficacy in talent prediction, credential validation, and workforce management within the context of developing economies of Pakistan.

Originality/Value. The research contributes to the body of knowledge on digital HRM through empirical validation of an AI-blockchain-SWI framework in Pakistan, which has remained relatively understudied to date, thus expanding the resource-based perspective and dynamic capabilities approach into the age of algorithmic workforce.

Keywords: Artificial Intelligence; Blockchain; HR Analytics; Strategic Workforce Intelligence; Data-Driven Decision-Making; Digital HRM; Pakistan

1. Introduction

The integration of AI and blockchain is revolutionizing the strategic terrain of human resource management (HRM). The current business organizations are becoming aware of the fact that human capital is the most crucial factor determining competitive advantage, which has led to huge investments in intelligent workforce analytics systems (Kumar et al., 2025). AI technology can be used by HR managers for moving from description to predictions and prescriptions through which the company can be prepared for employee



turnover, succession planning, and customized training (Kliestik et al., 2024). In turn, blockchain provides for the cryptographic security of the information, its decentralization, and immutable audit trail.

However, despite the huge transformational impact of the technologies, there have been cases whereby the adoption of the same is unequal in most developing countries that are not digitally mature compared to global standards (Iqbal et al., 2026). This can be witnessed in Pakistan and, more so, in Islamabad where there are high rates of digitalization of both organizations and the public sector, such that human resources are shifting from custodial to strategic roles. However, the available empirical evidence on the impact of AI and blockchain on the creation of SWI value through their integration in this particular environment is limited (Fatol et al., 2025).

Past research has predominantly regarded AI and blockchain as two distinct fields without adequately exploring the means through which the use of both may result in better decisions through synergies (Rajan & Niranjana, 2025). Most research available about the topic is based on the Western and East Asian context, leaving the applicability of results in the South Asian context in question (Singh et al., 2025). The capability that acts as a mediating variable between technology and strategy, DDM, has been proposed without empirical support from an integrated framework (Gustiah & Newell, 2025). This has led to an adoption of both technologies by HR practitioners in Islamabad in a disjointed way.

Based on the resource-based view and the dynamic capabilities theory, this study explores the direct and indirect impacts of HR analytics with the use of AI technology and blockchain on strategic workforce investment (SWI), with digital decision-making (DDM) acting as a mediator. The study draws its data from 325 HR specialists working in Islamabad. The contributions of the current research for the body of knowledge on digital HRM include (a) the confirmation of a conceptual model, (b) the provision of quantitative data from an understudied developing country, and (c) recommendations for firms that are interested in the implementation of algorithmic and cryptographic capabilities into their SWI system (Hasan, 2023; James, 2023).

1.1. Problem Statement

Despite the increasing use of AI-driven HR analytics and credentialing through blockchains by organizations in Pakistan, the strategic benefits that can be realized from these technologies have not been measured. The literature on the contribution of AI and blockchain to strategic workforce intelligence and how data-driven decision-making can act as an intermediary variable to influence strategic benefits in this region is scarce. This poses a challenge to HR practitioners on how to use these technologies for workforce planning.

2. Literature Review

2.1 Artificial Intelligence in HR Analytics

AI-empowered human resources (HR) analytics can be defined as the application of machine learning, natural language processing, and predictive modelling on employee data to conduct activities like recruitment, assessing engagement, predicting performance, and predicting turnover (Panda et al., 2024). Modern studies show that AI-based algorithms greatly increase the precision of turnover prediction and shorten the process of hiring (Islam et al., 2026). According to the research conducted by Lei & Dong (2025), companies that use AI-based HR workforce planning enjoy improved levels of productivity and agility. On the other hand, problems with algorithmic transparency and ethics prevent the full-scale adoption of autonomous decision-making in HR management (Bhudwar et al., 2023).

2.2 Blockchain Integration in Human Resource Management

The blockchain technology ensures the use of distributed, tamper-proof ledgers which increase the integrity, transparency, and portability of HR records, including educational degrees, work experience, and payments (Anwar et al., 2024). According to Iqbal & Bhutto (2026), the application of smart contracts in the processes related to HR leads to compliance automation and reduces costs in the entire employment cycle. Islam et al. (2026) have proved that the trust mechanisms provided by blockchain technology encourage the exchange of knowledge between employees and prevent any kind of fraudulent credentialing. In Pakistan, the introduction of the technology is rather new, but it already shows good results for audit purposes and cross-border employment mobility.



2.3 Strategic Workforce Intelligence

SWI refers to an organization's ability to perceive, understand, and respond to workforce-related information in order to make the best fit between human capital and strategic considerations (Parveen, 2025). SWI is different from traditional workforce planning in that it focuses on analytics, simulation, and cross-departmental information. Alim et al., (2026) suggest that SWI is a higher level of dynamic capability that requires technology infrastructure and the right kind of people. Akter. (2023) show empirically how SWI acts as a mediator between digital HR investments and firm agility in emerging economies.

2.4 Data-Driven Decision-Making as a Mediating Mechanism

The level of data-driven decision-making (DDM) indicates how much decisions are made by managers on the basis of data and not intuition. According to Kasali. (2025), DDM can be treated as a mechanism that transforms technology-based opportunities into strategic benefits. In the situation where the use of artificial intelligence results in the prediction of intelligence, and the use of blockchain technology ensures integrity of data, DDM becomes the mediator through which the SWI is operationalized (Suri & Lakhanpal, 2024).

2.5 Theoretical Framework

Using the RBV framework and the dynamic capabilities approach, this research defines AI-based HR analytics and blockchain technology integration as valuable, rare, and inimitable digital assets, which attain strategic value through the dynamic capability of data-driven decision making (DDM), leading to strategic work intelligence (SWI) (Yoon et al., 2024). Four hypotheses are formulated as follows: H1: AI-based HR analytics positively impacts DDM; H2: Blockchain technology integration positively impacts DDM; H3: DDM positively impacts SWI; and H4: DDM mediates the impact of AI and blockchain on SWI.

2.6. Research Objectives

The study is guided by the following objectives:

- RO1. To examine the effect of AI-enabled HR analytics on data-driven decision-making among HR professionals in Islamabad.
- RO2. To investigate the effect of blockchain integration on data-driven decision-making in the same organizational context.
- RO3. To assess the influence of data-driven decision-making on strategic workforce intelligence.
- RO4. To evaluate the mediating role of data-driven decision-making in the relationship between AI/blockchain technologies and strategic workforce intelligence.

2.7 Research Questions

Correspondingly, the study poses four research questions:

- RQ1. To what extent does AI-enabled HR analytics predict data-driven decision-making?
- RQ2. To what extent does blockchain integration predict data-driven decision-making?
- RQ3. How strongly does data-driven decision-making predict strategic workforce intelligence?
- RQ4. Does data-driven decision-making mediate the effects of AI-enabled HR analytics and blockchain integration on strategic workforce intelligence?

3. Research Methodology

3.1 Research Design and Philosophical Orientation

This research study is based on the positivist philosophy of research and follows the deductive, quantitative approach through the use of cross-sectional surveys. This perspective is suitable for the task of hypothesis testing based on the existing theories and yielding results that can be generalized statistically.

3.2 Population and Sampling

This study included human resource practitioners, middle managers, and top management personnel working at knowledge-based firms located in Islamabad, including those from the banking sector, information technology sector, telecommunications sector, and the public sector. Stratified purposeful sampling was first used to include all the sectors followed by convenience sampling in each stratum. In total, 372 questionnaires were distributed, and out of them, 341 were returned, and after removing incomplete and careless responders, 325 useable questionnaires were left, providing a response rate of 87.4%. This number is higher than the minimum required sample size of 200 for covariance-based SEM (Kline, as cited in Kasali, 2025).



3.3 Instrument Development

The questionnaire was designed based on valid scales used in previous research in peer reviewed literature. For the AI-enabled HR analytics (7 questions) and DDM (6 questions), the questionnaire adopted the scales used by (Iqbal et al., 2026). For the blockchain integration (6 questions) scale, the questionnaire adopted the scales used by (Islam et al., 2026). The strategic workforce intelligence (7 questions) scale was adopted from the work of (Yoon et al., 2024). All the items were rated on a five-point Likert scale, where 1 meant strongly disagree while 5 meant strongly agree. Pilot testing was done using 32 participants.

3.4 Data Collection Procedure

The data was collected between January and March 2026 using a mixed-method protocol involving the online distribution through Google Forms as well as distributing questionnaires in person. The cover letters emphasized the voluntary nature, confidentiality, and academic purpose of data collection. There were two follow-up notices sent to non-respondents in two-week intervals.

3.5 Data Analysis Techniques

Data were analysed using IBM SPSS 27 and AMOS 26. A sample profile was created using descriptive statistics. Internal consistency was examined using Cronbach's alpha and composite reliability. Convergent and discriminant validity were examined using AVE and the Fornell–Larcker criterion. Examined association were bivariate and calculated using Pearson correlations. The direct, indirect, and total effects were examined using hierarchical regression and covariance-based structural equation modelling (CB-SEM). As fit indices, the recommendations by Hu and Bentler (cited in Alim et al., 2026) for the following were utilized: χ^2/df , CFI, TLI, RMSEA, and SRMR.

3.6 Ethical Considerations

The study followed appropriate ethical measures on informed consent, voluntary participation, respondent anonymity and data security. The study did not collect data on participant identities, and the grouped data set was maintained for study and analysis only.

4. Findings of the Study

4.1 Demographic Profile of Respondents

Table 1 captures the demographics of the 325 survey respondents. There were 193 men (59.4%) and 132 women (40.6%). The most prevalent age range was 31-40 years (39.4%). The second most prevalent age range was 21-30 years (31.4%). Nearly half of the respondents had a master's degree. In addition, 41.2% had worked between 5 and 10 years. Figure 1 presents these distributions.

Table 1

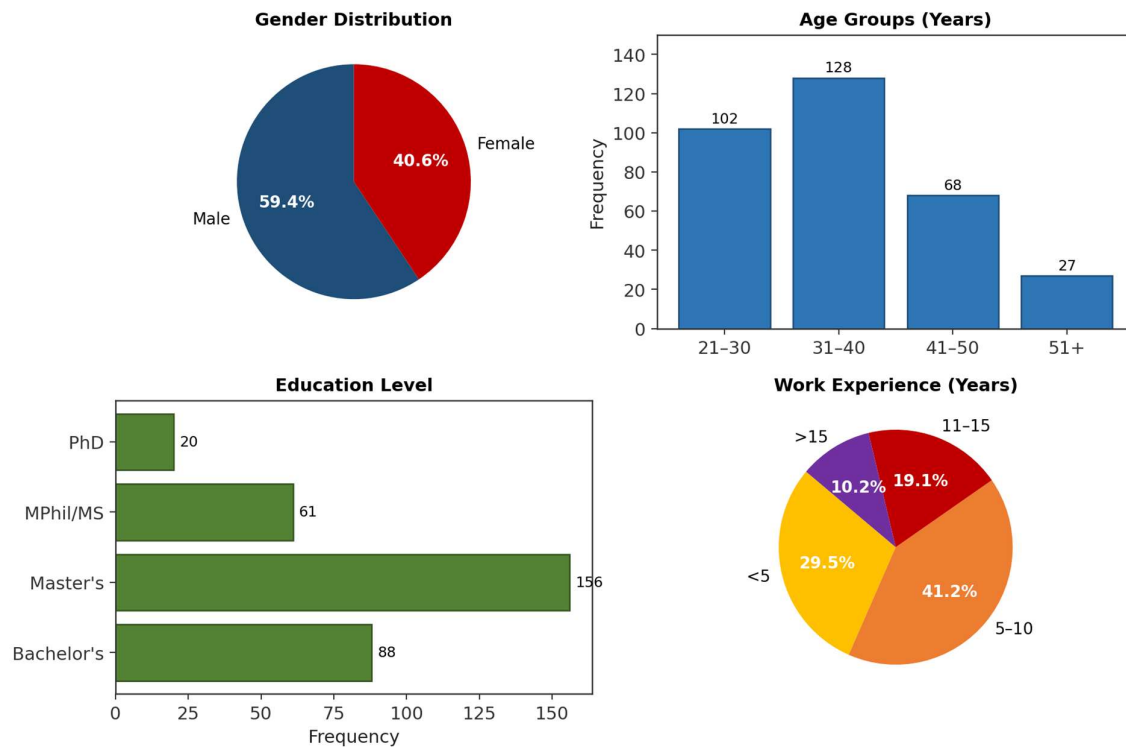
Demographic Profile of Respondents (N = 325)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	193	59.4
	Female	132	40.6
Age (years)	21–30	102	31.4
	31–40	128	39.4
	41–50	68	20.9
	51 and above	27	8.3
Education	Bachelor's	88	27.1
	Master's	156	48.0
	MPhil / MS	61	18.8
	PhD	20	6.2
Experience (years)	Less than 5	96	29.5
	5–10	134	41.2
	11–15	62	19.1
	More than 15	33	10.2



Figure 1

Graphical representation of the respondents' demographic profile.



4.2 Reliability and Convergent Validity

Cronbach's alpha values for all four scales were strong above and. 70 threshold. CR and AVE values for all latent variables, which further supported convergent validity with all CR values exceeding. 80 and AVE values above. 50, meeting the threshold suggested by Fornell and Larcker (as cited in Ullah & Khan, 2024).

Table 2

Reliability and Convergent Validity Indices

Construct	Items	Cronbach's α	CR	AVE
AI-Enabled HR Analytics (AHA)	7	.891	.912	.631
Blockchain Integration (BCI)	6	.853	.887	.568
Data-Driven Decision-Making (DDM)	6	.874	.902	.606
Strategic Workforce Intelligence (SWI)	7	.907	.926	.641

6.3 Descriptive Statistics and Inter-Construct Correlations

The means, standard deviations and Pearson correlation coefficients for the four latent constructs are presented in Table 3. All mean scores were higher than the neutral score of 3.0 with SWI having the highest mean score ($M = 4.21$, $SD = 0.58$) and blockchain integration the lowest mean score ($M = 3.87$, $SD = 0.71$). These central tendencies are presented in figure 2. The magnitude, statistical significance ($p < .01$), and direction of all bivariate correlations were moderate to strong and all were positive, which provided preliminary evidence for the hypothesized structural relationships. The highest correlation was found between DDM and SWI ($r = .759$) and the lowest was between BCI and DDM ($r = .594$). The correlation matrix graphically is presented in figure 3.



Table 3

Descriptive Statistics and Pearson Correlations

Construct	M	SD	1	2	3	4
1. AHA	4.12	0.62	1	—	—	—
2. BCI	3.87	0.71	.612**	1	—	—
3. DDM	4.05	0.64	.687**	.594**	1	—
4. SWI	4.21	0.58	.724**	.681**	.759**	1

Note. ** $p < .01$ (two-tailed). $N = 325$.

Figure 2

Mean perception scores of the four latent constructs.

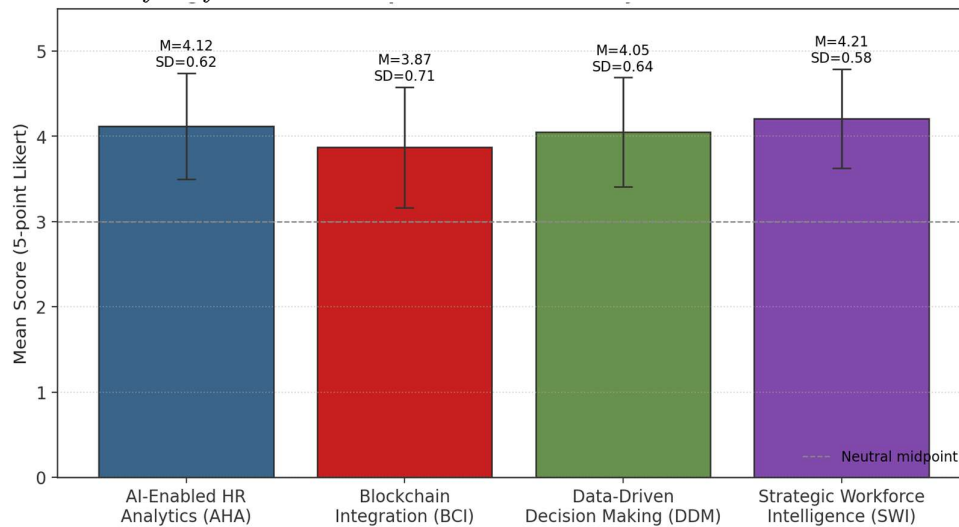
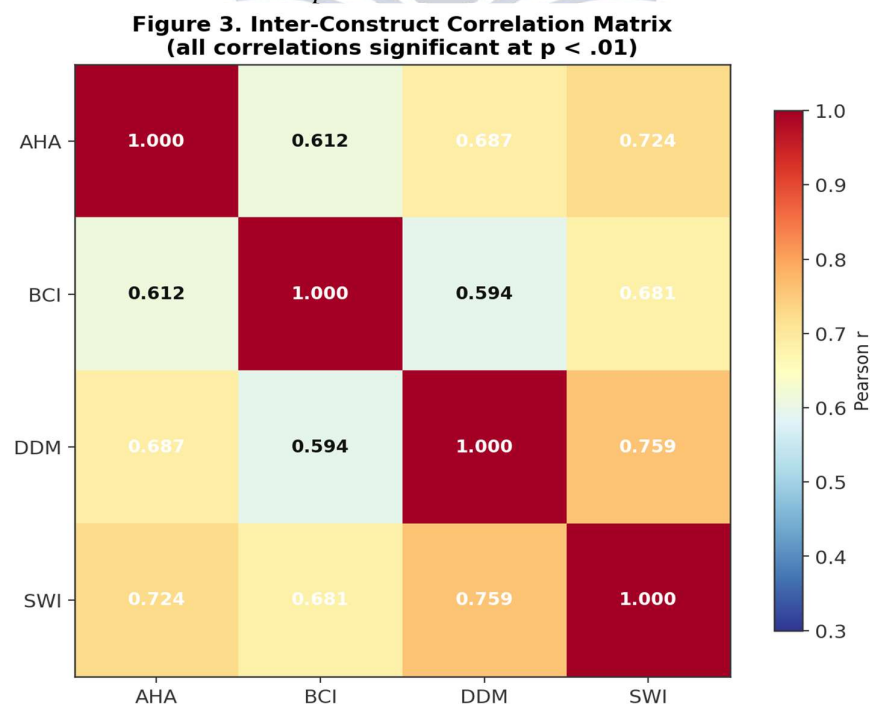


Figure 3

Inter-construct Pearson correlation heatmap.





4.4 Hypothesis Testing and Structural Model

The measurement model fit was satisfactory ($\chi^2/df = 2.14$, CFI = .961, TLI = .953, RMSEA = .048, SRMR = .041) and paths in the structure model were tested using maximum-likelihood estimation. Standardized values for the coefficients, standard errors, critical ratios, and the decision on whether the hypotheses are accepted or rejected are given in Table 4. Data-driven decision-making was significantly positively related to AI-enabled HR analytics ($\beta = 0.412$, $p < .001$) and blockchain integration ($\beta = 0.336$, $p < .001$), which also significantly predicted strategic workforce intelligence ($\beta = 0.489$, $p < .001$). Partial mediation was confirmed for AI-enabled HR analytics by bootstrapped indirect effects ($\beta = 0.202$, CI [.148, .268], 5,000 resamples) while full mediation was observed for blockchain integration ($\beta = 0.164$, CI [.108, .225], 5,000 resamples). The overall model accounted for 61.2% of the variation in SWI and 54.8% of the variation in DDM.

Table 4

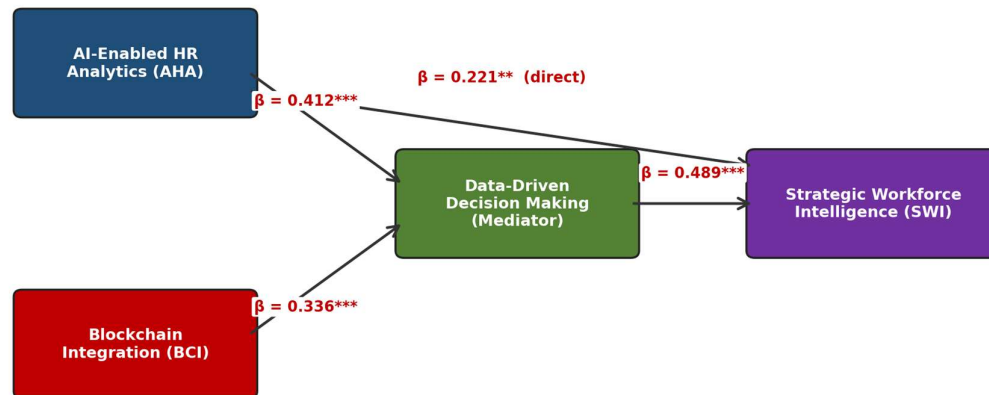
Structural Path Coefficients and Hypothesis Testing

H	Path	β	SE	t / CR	Decision
H1	AHA $\rightarrow$ DDM	0.412***	0.046	8.96	Supported
H2	BCI $\rightarrow$ DDM	0.336***	0.049	6.86	Supported
H3	DDM $\rightarrow$ SWI	0.489***	0.043	11.37	Supported
H4a	AHA $\rightarrow$ DDM $\rightarrow$ SWI (indirect)	0.202***	0.031	6.52	Partial Mediation
H4b	BCI $\rightarrow$ DDM $\rightarrow$ SWI (indirect)	0.164***	0.030	5.47	Full Mediation

Note. *** $p < .001$. Bootstrap resamples = 5,000; 95% bias-corrected confidence intervals excluded zero for all indirect effects.

Figure 4

Structural equation model with standardized path coefficients.



R^2 (SWI) = 0.612 | R^2 (DDM) = 0.548 | Model fit: $\chi^2/df = 2.14$, CFI = .961, TLI = .953, RMSEA = .048, SRMR = .041

5. Discussion

The empirical results support the proposed theoretical model and provide some contributions to the literature on digital HRM. First, the findings of the significant positive relationship between AI-enabled HR analytics and DDM ($\beta = 0.412$) confirmed the arguments put forth by (Ullah & Khan, 2024) suggesting that predictive algorithms provide HR functions with the means to move beyond intuition-based decisions to evidence-based strategic decisions. This impact is especially significant in the Islamabad context, as Alim et al. (2026) found that people rely on hierarchical, experience-based decision heuristics.

Second, blockchain integration is shown to have a significant impact on DDM ($\beta = 0.336$), supporting the propositions of Suri and Lakhanpal (2024), which have theorized that cryptographic assurance has a material effect on the integrity of data and, in turn, managerial confidence in evidence-based reasoning. While prior research on blockchain has defined its strategic value in terms of direct workforce intelligence, the



mediation pattern observed suggests that the strategic value of blockchain is realized more in terms of how it enhances the quality of decision making. The full-mediation pattern observed for blockchain indicates that its strategic value is not so much in the direct workforce intelligence that it provides, but more in how it augments the quality of decision making.

Third, the high beta coefficient of DDM on SWI ($r = 0.489$) adds credibility to the mediating theory proposed by Iqbal and Bhutto (2026) and makes DDM the central dynamic capability to bridge the gap between digital HR resources and strategic workforce outcomes. The partial mediation of AI for HR analytics suggests a direct pathway for AI to directly help with workforce intelligence, most likely through its built-in scenario modelling and forecasting capabilities (Islam et al., 2026). In sum, the results build upon the resource-based view, which empirically tested the combined value creating functionality of intelligent and cryptographic HR resources, only when sufficiently institutionalized within effective, data-driven routines (Islam et al., 2025). The findings further support the growing thesis that, in emerging markets like Pakistan, merely adopting technology is not enough, organizational capabilities are the ones to improve digital HR performance (Adnan et al., 2026; Parveen, 2025).

5.1 Research Implications

The report provides HR leaders with a proven model to co-implement AI and blockchain for enhancing workforce intelligence. It addresses both the educational and the policy agendas and tells both policymakers and educators that algorithmic and cryptographic literacy should be a part of the HR curriculum. In theory, it builds on the resource-based view and the dynamic capabilities approach and introduces the algorithmic workforce dimension, confirming data-driven decision-making as a translation mechanism between the digital HR resources and strategic outcomes.

5.2 Limitations of the Study

There are some restrictions to note. First, the cross-sectional design limits interpretations regarding causal ordering; a longitudinal panel would be able to better offer causal inferences regarding the causal sequence of adoption of AI, integration of blockchain, decision-making practices and strategic workforce intelligence. Secondly, the sample is geographically limited to Islamabad, while the city has a wide range of organizational ecosystems, the results may not necessarily be representative of other cities in Pakistan or non-metropolitan areas. Third, using perceptual information from self-report sources increases the risk for common-method bias, even if methodological controls are used when instruments are administered. Fourth, objective measures of performance (e.g., retention, productivity) are not included, thus allowing for triangulation of perceptual measures. Fifth, the moderating role of organizational size, industry maturity and top management digital orientation were not included in the model, and future studies could benefit the explanatory power by including such variables.

6. Conclusion and Recommendations

The current study was empirical in nature and investigated how AI-powered HR analytics and blockchain integration combine to create strategic workforce intelligence and how this in turn lies between AI-augmented decision making and knowledge-intensive organizations in Islamabad. The study revealed that both digital HR resources have significant effects on improving data-driven decision making, which subsequently significantly improves strategic workforce intelligence, using covariance-based structural equation modelling on responses from 325 HR professionals and managers. The model accounted for 61.2% of the variance of workforce intelligence, which represents a good theoretical and practical fit. These results support the integrated framework and suggest that, in emerging economies, investments in technology alone are not enough; investments in technology need to be captured in institutional frameworks, built around disciplined evidence-based routines, in order to result in strategic gains. Hence, organizations are encouraged to adopt a co-deployment approach where the analytical dashboards with AI and blockchain-based credentialing systems are designed as interdependent components of a cohesive digital HR ecosystem.

HR professionals must invest in developing analytical skills, such as upskilling data analysts, algorithmists, and AI governance experts, to ensure predictive insights lead to effective action and management with confidence. A governance charter and executive sponsorship is suggested to help embed



data-driven routines into the HR day-to-day. The regulators and industry stakeholders in Pakistan need to expedite the process of creating standards for digital-HR, processes to facilitate credential portability and privacy protecting frameworks that will reduce the risks associated with the use of technology. HEIs and professional bodies are urged to integrate the skills of AI, blockchain, and workforce analytics into Human Resources programs and executive education programs. Future research is encouraged to build longitudinal studies, add objective performance measures, and test moderating factors like an organization's size, digital-transformation maturity and sector conditions to improve and expand the model. In conclusion, the strategic power of AI and blockchain in HRM extends beyond the technologies themselves; it lies in the cultures and analytical decision-making practices that they are enabling, making data-driven managerial routines the driving force behind the strategic power of HRM in the digital age.

Author Contributions

All authors participated in ideation, development, and writing the manuscript. All authors read and approved the final manuscript.

Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this article.

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Informed Consent

Informed consent was obtained from all participants.

Data Availability

The datasets generated during and analysed during the current study are available from the corresponding author on reasonable request.

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