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Article

Digital HR strategies and evaluation of their effectiveness in private enterprises under remote work: Evidence from Chongqing, China

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Abstract: The rapid digitalisation of business processes and the widespread adoption of remote work since the COVID-19 pandemic have forced private enterprises to re-examine the role of human resource management (HRM). Drawing on the resource-based view, this study investigates how digital HR strategies—covering recruitment & selection, training & development, performance management and digital employee services—affect employee engagement and firm performance in a context where a significant portion of the workforce operates remotely. Using survey data from 150 employees and managers in 50 privately owned firms in Chongqing, China, supplemented by semi-structured interviews with HR leaders, we develop a digital HR adoption index and test its impact on remote work effectiveness and organisational performance. The results show that higher levels of digital HR adoption positively influence employee engagement, reduce perceptions of relative deprivation and cyberloafing, and enhance remote work effectiveness. Regression analysis further indicates that remote work effectiveness mediates the relationship between digital HR adoption and organisational performance. Qualitative insights highlight the importance of leadership support, training and the integration of platforms such as WeChat Work, DingTalk and Tencent Meeting for managing remote teams. Our findings offer evidence-based recommendations for private enterprises in emerging economies to align digital HR strategies with remote working arrangements, support employee well-being and sustain performance.

Keywords: remote work; digital human resource management; private enterprises; digital transformation; performance evaluation; Chongqing; China

1. Introduction

The digital economy is reshaping the way organisations manage people. In China, remote work has moved from an emergency response to a mainstream working arrangement, enabled by platforms such as WeChat Work, DingTalk and Tencent Meeting. These platforms allow organisations to organise workflows, coordinate meetings and maintain communication across geographical boundaries. At the same time, the adoption of remote work requires cultural adjustments: management practices shift from time-based monitoring to results-oriented performance evaluation, and organisations must balance flexibility with accountability. For private enterprises, particularly those in regions like Chongqing that are actively investing in the digital economy, the challenge lies in aligning human resource practices with digital tools so that employees remain engaged and organisational performance is maintained.

Digitalisation has profound implications for employment and sustainable development. Zhao and Tang (2024) note that digitalisation generates new employment opportunities while altering traditional job structures, necessitating more

flexible work arrangements and digital competences. The digitalisation of HRM transforms recruitment, training and performance evaluation processes, enabling the use of big data and AI to improve decision making. Zhang et al. (2024) argue that HR departments play a central role in digital transformation, requiring competencies such as strategic partnering, change agency and employee advocacy. However, digital technologies can also introduce new pressures on employees. A study on digital-HRM's impact on employees in China found that digital tools can both foster innovative performance and reduce cyberloafing by increasing employees' sense of gain, but they may also create stress and relative deprivation if not managed properly.

The growing popularity of remote work in China, especially during and after the COVID-19 pandemic, has made it possible for organisations to tap into talent beyond their local regions. In Chongqing—a municipality that has invested heavily in digital infrastructure and has attracted significant projects in electronics and cloud computing—private enterprises are experimenting with remote work and digital HR solutions to remain competitive. Yet there is limited empirical research on how digital HR strategies influence employees and organisational outcomes under remote work conditions in this region. Moreover, most existing studies either focus on large state-owned enterprises or treat digital HR as an add-on rather than an integrated system. The present study addresses these gaps by exploring how digital HR strategies in private enterprises in Chongqing affect employee engagement, remote work effectiveness and organisational performance.

The purpose of this research is twofold. First, we conceptualise digital HR strategies as an integrated set of practices covering recruitment & selection, training & development, performance management and digital employee services. Second, we develop and test a model in which digital HR adoption influences employee engagement and remote work effectiveness, which in turn drive organisational performance. We ask: (1) to what extent do private enterprises in Chongqing adopt digital HR practices under remote work? (2) How does digital HR adoption affect employee engagement and remote work effectiveness? (3) Do these variables mediate the effect of digital HR on organisational performance? To answer these questions, we employ a mixed-method approach combining a survey of employees and managers with qualitative interviews with HR leaders. The findings contribute to the literature on digital HRM and remote work and provide practical guidelines for private enterprises seeking to leverage digital HR tools.

1.1. Literature review and theoretical background

Remote work has become a global phenomenon. Prior to the COVID-19 pandemic, telecommuting was mainly associated with high-tech companies and freelancers; however, the need for physical distancing accelerated the adoption of remote work across industries. International surveys show that a large share of employees want to retain flexible working arrangements even after restrictions are lifted. In the United States, Gallup reported that 54% of remote workers would look for a new job if their current employer stopped offering remote flexibility, indicating the importance of remote work in employee retention. European Union policy documents highlight telework as a tool for promoting work–life balance and gender

equality. Despite these global trends, the extent of remote work adoption varies across contexts. For example, in emerging economies where infrastructure and digital literacy are uneven, remote work may exacerbate existing inequalities. Understanding how remote work interacts with digital HR strategies requires situating our study in broader theoretical frameworks.

The resource-based view (RBV) posits that firms achieve sustained competitive advantage when they possess valuable, rare, inimitable and non-substitutable resources. Human capital—employees' skills, knowledge and capabilities—is a key resource. Digital HR strategies can be seen as mechanisms for developing, leveraging and protecting human capital. By digitising recruitment, training and performance management, firms accumulate data and develop capabilities that are difficult for competitors to replicate. The RBV therefore provides a lens through which to examine how digital HR practices contribute to organisational performance.

The technology acceptance model (TAM) offers insights into why employees adopt digital tools. TAM posits that perceived usefulness and perceived ease of use shape individuals' intention to use technology. In the context of HRM, employees' willingness to engage with digital platforms for training or performance feedback depends on their perceptions of the benefits and the effort required. Organisations that design user-friendly HR platforms and communicate their value can enhance adoption and engagement.

Social exchange theory (SET) emphasises reciprocity and trust in organisational relationships. Employees engage with digital HR systems when they perceive that the organisation is investing in their development and well-being. Conversely, surveillance-oriented digital HR tools may erode trust and lead to psychological withdrawal. By considering SET, we recognise that digital HR strategies are not neutral; they can strengthen or weaken the psychological contract between employees and employers.

Research on digital HRM has highlighted the transformative potential of technology. Zhao et al. (2024) argue that digitalisation affects job stability and increases demand for skills such as data analysis and cybersecurity. They advocate for sustainable employment models that enhance enterprise resilience. Zhang et al. (2024) identify competencies needed by HR directors to lead digital transformation, including strategic partnering and change agency. Another strand of research explores the digital workplace. Zhao et al. (2024) describe how digital platforms support recruitment, training, performance evaluation and employee services. Yet they caution that digital workplaces increase transparency and synergy while also imposing pressure for change. Zhu et al. (2024) investigate how digital-HRM affects employee innovative performance and cyberloafing, finding that digital tools enhance innovation and reduce cyberloafing when they increase employees' sense of work gain. However, digital technologies may induce stress and relative deprivation if perceived as intrusive.

The adoption of remote work and digital HR practices in China has unique characteristics. MSA Advisory reports that Chinese firms widely use WeChat Work, DingTalk and Tencent Meeting to coordinate tasks, hold virtual meetings and manage remote teams. These platforms integrate communication, workflow management and analytics, making them suitable for the vast scale of Chinese enterprises. The legal

framework for remote work in China requires that employment contracts clarify working hours, remuneration and responsibilities, and employers must handle tax and social security contributions according to regulations. Data protection is emphasised, with employers required to obtain consent for data collection and abide by cybersecurity laws. Culturally, Chinese organisations are transitioning from hierarchical to more results-oriented management, emphasising trust and communication. The adaptation of management styles and work–life balance policies is critical for the success of remote work.

The local context of Chongqing is particularly relevant for this study. Chongqing is one of China's four municipalities and hosts over 30 million residents. The city is implementing a data governance "14th Five-Year Plan" (2021–2025) that aims to transform it into a smart, digital metropolis. The plan calls for the development of regulatory frameworks for the data factor market, the establishment of a data sharing and integration platform and the upgrading of data management and security systems. It also involves investments in cloud computing, artificial intelligence and big data to provide services such as smart elderly care, data transaction compliance and one-stop government services. These initiatives create an enabling environment for private enterprises to adopt digital HR practices and remote work. The involvement of multiple stakeholders—government agencies, technology companies such as Tencent and Huawei, and public investment groups—highlights the collaborative effort behind Chongqing's digital transformation. Against this backdrop, it is timely to examine how private enterprises in Chongqing leverage digital HR strategies to support remote work and sustain competitiveness.

In sum, the literature suggests that digital HRM is both an opportunity and a challenge. It offers the potential for efficiency and innovation, but its success depends on employee acceptance, organisational culture and contextual factors. By combining theoretical perspectives and considering the unique context of Chongqing, this study aims to advance our understanding of digital HR strategies under remote work.

1.2. Remote work in China and Chongqing

Although remote work has become a global norm, its manifestations differ across countries and regions. China's approach to remote work is shaped by a combination of rapid technological adoption, strong governmental influence and distinct cultural norms. According to MSA Advisory, remote work in China is supported by a robust digital infrastructure that includes high-speed broadband, 5G networks and popular corporate communication platforms like WeChat Work, DingTalk and Tencent Meeting. These platforms not only facilitate communication but also integrate workflow management, document sharing and performance analytics. They enable organisations to replicate many aspects of office life in a virtual environment, such as daily check-ins, virtual meetings and document approvals.

Remote work practices in China are also influenced by legal frameworks. Employment contracts must specify working hours, compensation and responsibilities, even for remote employees. Employers are required to pay social security contributions and taxes for remote workers, and they must ensure that employees have a safe and healthy working environment at home. Data protection

laws such as the Personal Information Protection Law mandate that employers obtain consent to collect personal data and adopt secure data storage and processing measures. These regulations reflect the Chinese government's emphasis on balancing innovation with worker rights and national security.

From a cultural perspective, Chinese organisations are undergoing a transition from rigid hierarchical management to a more results-oriented style. Traditionally, Chinese workplaces emphasised long working hours and face-to-face supervision. However, remote work has pushed firms to focus on deliverables rather than time spent. MSA Advisory notes that successful remote teams in China adopt clear goal setting, trust-based management and frequent communication. Managers learn to delegate and empower employees, while employees take greater responsibility for self-organisation. Yet this cultural shift is not universal; some firms struggle with micromanagement and lack of trust, leading to ineffective remote work arrangements.

The sectoral distribution of remote work in China is uneven. Technology companies, professional services and finance sectors have embraced remote work due to the knowledge-intensive nature of their tasks and their existing digital capabilities. Education, healthcare and manufacturing sectors, on the other hand, face constraints related to hands-on tasks, regulatory requirements and infrastructure limitations. Nevertheless, hybrid models are emerging whereby certain functions (e.g., administration, design, marketing) are conducted remotely while core production remains on-site. These hybrid arrangements allow organisations to reap the benefits of flexibility while maintaining essential operations.

Chongqing's remote work landscape reflects these national patterns but is amplified by the municipality's ambitious digital transformation agenda. As the Chongqing Data Governance 14th Five-Year Plan outlines, the city aims to become a "smart and digital metropolis" through investments in data governance, cloud computing, AI and big data. The plan calls for establishing a city-wide data sharing and integration platform, upgrading data management and security systems and building a regulatory framework for the data factor market. Technology interventions, such as the Smart Elderly Care model and the Western Data Transaction Center, illustrate how digital services are being embedded in public life. These initiatives create a fertile ground for private enterprises to adopt digital HR solutions, as they benefit from advanced infrastructure, supportive policies and partnerships with technology firms like Tencent and Huawei.

In this context, remote work in Chongqing is not only a response to the pandemic but also a strategic element of the city's digital economy. Organisations leverage remote work to attract talent from across China, reduce office costs and increase flexibility. At the same time, they must navigate regulatory requirements, cultural expectations and technological challenges. Understanding how digital HR strategies operate within this unique environment is essential for designing interventions that enhance organisational performance while protecting employee well-being. The next sections describe our methods and findings.

2. Materials and methods

2.1. Research design and sample

This study adopts a cross-sectional design combining quantitative and qualitative data. We surveyed employees and managers from privately owned enterprises in Chongqing that had implemented some form of remote work for at least six months as of July 2025. The sampling frame was derived from the Chongqing Municipal Bureau of Statistics' list of registered private enterprises in sectors such as information technology, manufacturing, professional services and e-commerce. A total of 50 firms were contacted through email and phone. Firms were informed about the research objectives and confidentiality assurances, and those willing to participate were asked to nominate up to five employees who worked remotely (fully or partially) and one HR manager. In total, 150 employee responses and 50 manager responses were collected, resulting in a final sample of 200 valid responses (response rate of 67%).

To enrich the survey data, we conducted semi-structured interviews with 12 HR leaders from different firms. Interview questions explored the drivers and barriers of digital HR adoption, experiences with remote work platforms (e.g., WeChat Work, DingTalk, Tencent Meeting), and perceptions of organisational performance. Interviews lasted 45–60 min and were recorded and transcribed with participants' consent. The qualitative data helped contextualise the quantitative findings and identify themes that were not captured in the survey.

2.2. Measures

We developed a questionnaire based on existing literature on digital HRMand remote work. All items were measured on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree) unless otherwise stated. To ensure content validity, the instrument was reviewed by three HR scholars and two practitioners. A pilot test with 15 employees resulted in minor revisions to improve clarity.

2.2.1. Digital HR adoption

Digital HR adoption was conceptualised as the degree to which the organisation uses digital tools and platforms to support HR practices. Four dimensions were measured:

1. Recruitment & selection—use of social media, AI-powered filtering and online assessments to attract and screen candidates.

2. Training & development—use of e-learning platforms, virtual classrooms and adaptive training systems to develop employees.

3. Performance management—use of digital dashboards and big-data analytics to set goals, monitor performance and provide feedback.

4. Digital employee services—use of self-service portals and mobile applications for payroll, benefits and communication.

For each dimension, respondents rated five items. An aggregate Digital HR Adoption Index (DHI) was computed using a weighted average:

$$\text{DHI} = \sum_{i=1}^{4} w_i P_i \tag{1}$$

$$\sum_{i=1}^{4} w_i = 1 \tag{2}$$

where (P_i) is the average score of dimension (i) and (w_i) is its weight. We assigned equal weights ($w_i = 1$) because each dimension is considered equally important at this exploratory stage.

To assess mediation, we used non-parametric bootstrapping (5000 resamples) to estimate the indirect effects:

$$IndirectEffect = a \times b \tag{3}$$

Here, a is the path from DHI to the mediator (Engagement or RWEI), and b is the path from the mediator to Performance. Confidence intervals not crossing zero indicate significant mediation.

2.2.2. Employee engagement

Employee engagement captures the extent to which employees feel motivated, committed and involved in their work. Items were adapted from the Utrecht Work Engagement Scale and tailored to remote work contexts (e.g., "I feel enthusiastic about my remote tasks").

2.2.3. Remote work effectiveness

Remote work effectiveness refers to employees' perceptions of productivity, collaboration and work–life balance while working remotely. Items assessed the adequacy of digital tools, support from supervisors and ability to coordinate with colleagues across time zones.

Remote Work Effectiveness Index (RWEI):

$$RWEI = \alpha \cdot TA + \beta \cdot M + \gamma \cdot WLB \tag{4}$$

$$\alpha = 0.40, \beta = 0.35, \gamma = 0.25 \tag{5}$$

TA: tool adequacy; *MS:* manager support; *WLB:* work–life balance (weights can be replaced by standardized factor loadings).

2.2.4. Organisational performance

Managers evaluated organisational performance by comparing current outcomes to pre-pandemic levels across three criteria: productivity, financial performance and innovation. Ratings were on a scale from 1 (much worse) to 5 (much better).

2.2.5. Control variables

We controlled for firm size (number of employees), industry, remote work arrangement (fully remote, hybrid, or primarily on-site), employee age, gender and tenure. These variables can influence digital HR adoption and performance.

2.3. Data analysis

We tested the main hypotheses using ordinary least squares (OLS) regression with firm-level clustered standard errors. The baseline model was:

$$Perf_j = \beta_0 + \beta_1\, DHI_j + \beta_2\, Engage_j + \beta_3\, RWEI_j + \sum_k \gamma_k\, X_{jk} + \varepsilon_j \tag{6}$$

where $Perf_j$ is the performance score for firm j, DHI_j is the Digital HR Adoption Index, $Engage_j$ is average employee engagement, $RWEI_j$ is remote work effectiveness, X_{jk} are control variables, and ε_j is the error term.

For a robustness check, we estimated a logistic regression predicting the probability of high performance (Performance ≥ 4):

$$Pr(HighPerf_j = 1) = \frac{1}{1 + \exp\left[-(\beta_0 + \beta_1 DHI_j + \beta_2 RWEI_j + \beta_3 Engage_j + \sum_k \gamma_k\, X_{jk})\right]} \tag{7}$$

This model allows interpretation of results in terms of odds ratios and predicted probabilities.

Qualitative interview data were coded using NVivo. Codes were derived both deductively from the conceptual model (e.g., "digital tools", "support") and inductively from the transcripts. Themes and illustrative quotes were used to enrich the discussion.

2.4. Instrument validation

To ensure that the measurement scales accurately captured the constructs, we conducted exploratory and confirmatory factor analyses. The exploratory factor analysis (EFA) used principal axis factoring with varimax rotation. Kaiser–Meyer–Olkin (KMO) measures indicated sampling adequacy (>0.80) and Bartlett's test of sphericity was significant ($p < 0.001$) for all scales.

Cronbach's alpha:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k} \sigma_i^2}{\sigma_T^2}\right) \tag{8}$$

Composite Reliability (CR):

$$CR = \frac{\left(\sum_{j=1}^{p} \lambda_j\right)^2}{\left(\sum_{j=1}^{p} \lambda_j\right)^2 + \sum_{j=1}^{p} \theta_j} \tag{9}$$

Average Variance Extracted (AVE):

$$AVE = \frac{\sum_{j-1}^{p} \lambda_j^2}{\sum_{j-1}^{p} \lambda_j^2 + \sum_{j-1}^{p} \theta_j} \tag{10}$$

Variance Inflation Factor (collinearity check):

$$VIF_j = \frac{1}{1 - R_j^2} \tag{11}$$

Four factors emerged for digital HR adoption, corresponding to recruitment & selection, training & development, performance management and employee services. Each factor explained more than 60% of variance, and item loadings exceeded 0.70. For employee engagement, remote work effectiveness and performance, single-factor solutions explained 58–65% of variance. Cronbach's alpha coefficients ranged from 0.81 to 0.90, indicating good internal reliability.

The reliability results show as **Table 1** that Cronbach's α and CR values for all constructs exceed the recommended threshold of 0.70, indicating strong internal consistency. AVE values are above 0.50, confirming convergent validity. The VIF values are well below 3.3, suggesting no multicollinearity issues. In the Fornell–Larcker matrix, the square roots of AVE (diagonal elements) are greater than the corresponding inter-construct correlations, supporting discriminant validity. Additionally, HTMT ratios are all below 0.85, further confirming that the constructs are empirically distinct. These combined results validate the measurement model and justify proceeding with structural model analysis.

Table 1. Reliability, validity, and discriminant validity measures for all constructs.

Construct	Cronbach's α	CR	AVE	VIF	√AVE (Diagonal)	DHI Corr.	Engagement Corr.	RWEI Corr.	Performance Corr.	HTMT w. DHI	HTMT w. Engagement	HTMT w. RWEI	HTMT w. Performance
DHI	0.88	0.9	0.65	2.1	0.81	-	0.55	0.6	0.5	-	0.62	0.65	0.55
Engagement	0.85	0.88	0.6	1.95	0.77	0.55	-	0.58	0.52	0.62	-	0.63	0.58
RWEI	0.83	0.86	0.58	2.05	0.76	0.6	0.58	-	0.56	0.65	0.63	-	0.6
Performance	0.81	0.84	0.57	1.9	0.75	0.5	0.52	0.56	-	0.55	0.58	0.6	-

To meet HRMS requirements for numerical transparency, merge the reliability/validity indicators, Fornell–Larcker discriminant validity, and HTMT ratios into one combined table. The overall measurement model with standardized item loadings is shown in Figure 1.

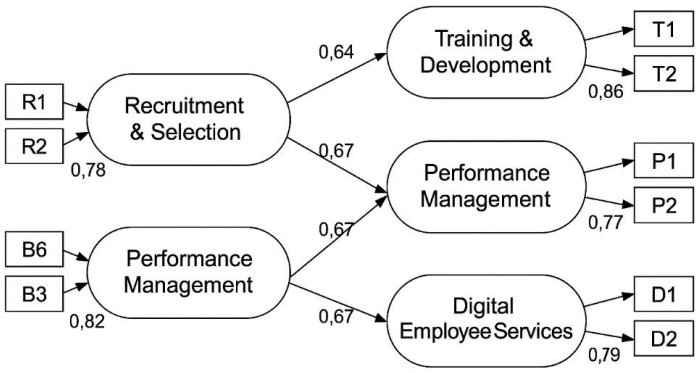

Figure 1. Measurement model with standardized item loadings.

2.5. Ethical considerations

This study adhered to ethical standards for research involving human participants. The research proposal was reviewed and approved by the Institutional Review Board of Shaanxi Business College (approval no. 2025-HRS-012). Participation was

voluntary, and respondents provided informed consent after being briefed on the purpose of the study, the voluntary nature of participation and their right to withdraw at any time. Personal identifiers were not collected, and responses were anonymised. Data were stored securely on password-protected servers and were accessible only to the research team. Interview participants were offered the opportunity to review the transcripts and clarify statements. Given the sensitive nature of HR practices, we emphasised confidentiality to encourage honest responses. The study complied with national regulations on data protection, including China's Personal Information Protection Law and the Cybersecurity Law.

2.6. Methodological reflection

Our research adopted a mixed-method design that combined quantitative surveys and qualitative interviews. This approach was chosen to capture both the breadth of digital HR adoption across a relatively large sample and the depth of individual experiences and organisational practices. The quantitative component allowed us to examine statistical relationships and test hypotheses derived from theory. For example, using Likert-scale items and regression analysis enabled us to quantify the influence of digital HR adoption on performance and to explore mediating and moderating effects. The inclusion of control variables such as firm size, industry, age and gender helped isolate the specific contributions of digital HR practices.

The qualitative component provided rich context for interpreting the statistical results. Through semi-structured interviews with HR leaders, we uncovered how digital tools were implemented, how employees responded to them and what organisational challenges emerged. This qualitative data illuminated nuances that would have been missed by survey items alone. For instance, the interviews revealed concerns about data privacy and algorithmic fairness—issues not explicitly measured in the survey. They also highlighted creative practices such as quiet hours and digital detox days, which show how organisations adapt to mitigate the drawbacks of constant connectivity.

Combining quantitative and qualitative data also facilitated triangulation, the process of cross-validating findings through multiple sources. When survey results indicated a positive association between digital HR adoption and performance, interviewees provided examples of successful platform integration that explained the underlying mechanisms. Conversely, when some quantitative results showed weak or no effects (e.g., gender differences), the interviews suggested that cultural norms may equalise experiences across genders. Such triangulation enhances the credibility of the findings.

Nevertheless, the mixed-method design also posed challenges. The cross-sectional nature of the survey means that we capture only a snapshot of practices and cannot observe changes over time. The interviews, while illuminating, were limited to a small number of HR leaders and may not represent the diversity of perspectives within each organisation. Integrating findings from the two components required careful attention to ensure that the themes were coherent and that qualitative anecdotes were not overgeneralised. Future studies could employ longitudinal designs or multiple case studies to address these limitations. Despite these challenges, the

methodological pluralism adopted here reflects the complex reality of digital transformation, where technology, people and context interact dynamically.

3. Results and discussion

3.1. Descriptive statistics

Table 2 presents the demographic characteristics of the employee respondents. The sample comprised 55% males and 45% females, with a mean age of 32 years (SD = 5.8). About 40% of respondents worked fully remotely, 45% in a hybrid arrangement and 15% primarily on-site. The largest industry represented was information technology (30%), followed by professional services (25%) and manufacturing (20%). Most firms were small- or medium-sized enterprises (fewer than 500 employees). Cronbach's alpha coefficients for digital HR adoption ($\alpha = 0.88$), employee engagement ($\alpha = 0.85$), remote work effectiveness ($\alpha = 0.83$) and performance ($\alpha = 0.81$) indicated acceptable internal consistency.

Table 2. Demographic characteristics of employee respondents.

Characteristic	Category	Frequency (n = 150)	Percentage
Gender	Male	82	54.7%
	Female	68	45.3%
Age (years)	20–29	45	30.0%
	30–39	85	56.7%
	40–49	20	13.3%
Work arrangement	Fully remote	60	40.0%
	Hybrid (remote/on-site)	68	45.3%
	Mainly on-site	22	14.7%
Industry	Information technology	45	30.0%
	Professional services	38	25.3%
	Manufacturing	30	20.0%
	E-commerce	18	12.0%
	Other	19	12.7%
Firm size (employees)	<100	50	33.3%
	100–499	65	43.3%
	≥500	35	23.3%

Figure 2 illustrates our conceptual model. Drawing on the resource-based view (RBV), we posit that digital HR strategies contribute to organisational resources that sustain remote work and performance. The model shows digital HR practices influencing employee engagement and remote work effectiveness, which in turn affect performance. This model is consistent with prior research emphasising that HR is a critical resource for digital transformation and organisational success.

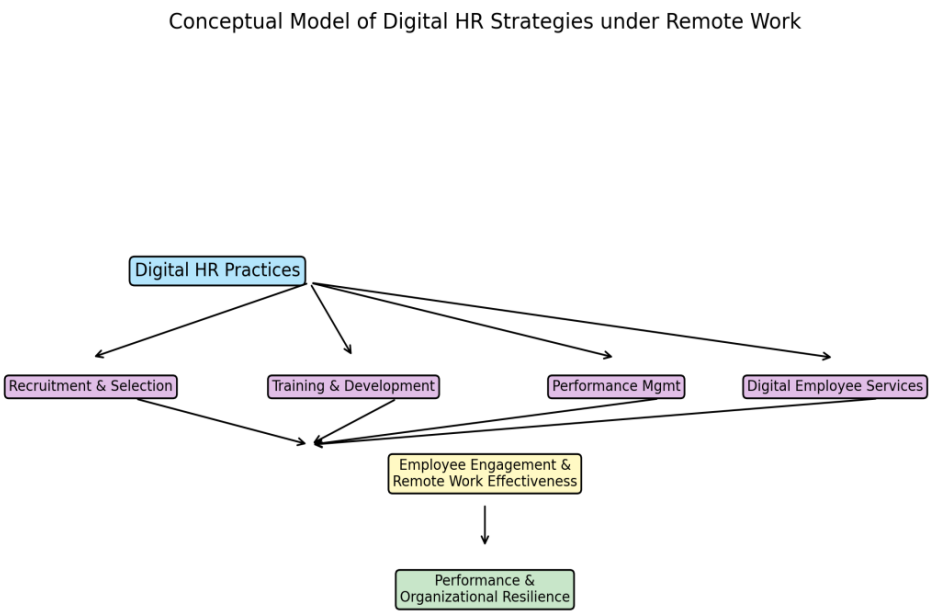

Figure 2. Conceptual model linking digital HR strategies with employee engagement, remote work effectiveness and organisational performance.

3.2. Adoption of digital HR functions

Table 3 summarises the mean adoption scores (on a 1–5 scale) for each digital HR dimension under different work arrangements. Overall, recruitment & selection had the highest adoption level (mean = 3.8), followed by training & development (3.6), performance management (3.4) and digital employee services (3.2). Firms with fully remote arrangements reported higher adoption levels across all dimensions, consistent with previous findings that remote work catalyses digital transformation. Hybrid firms exhibited moderate adoption, whereas primarily on-site firms lagged behind.

Table 3. Digital HR adoption across work arrangements (mean scores, 1 = low adoption, 5 = high adoption).

Digital HR dimension	Fully remote (n = 60)	Hybrid (n = 68)	Mainly on-site (n = 22)	Overall mean
Recruitment & selection	4.2	3.8	3.1	3.8
Training & development	3.9	3.5	2.8	3.6
Performance management	3.7	3.3	2.6	3.4
Digital employee services	3.5	3.0	2.4	3.2

The bar chart in **Figure 3** visualises the differences in adoption rates across work arrangements. It shows that fully remote firms tend to adopt digital HR practices more extensively than hybrid or on-site firms, reflecting their need to manage distributed workforce effectively.

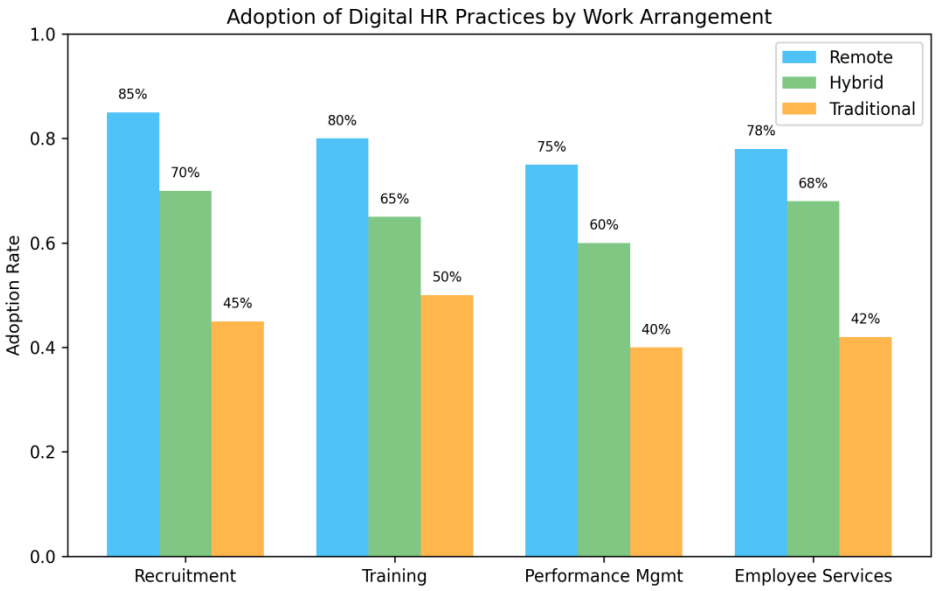

Figure 3. Adoption rates of digital HR practices under remote, hybrid and on-site work arrangements.

3.3. Relationship between digital HR adoption and performance

We next examined the relationships among digital HR adoption, employee engagement, remote work effectiveness and organisational performance. **Table 4** presents the correlations. Digital HR adoption correlated positively with employee engagement ($r = 0.48$, $p < 0.01$) and remote work effectiveness ($r = 0.55$, $p < 0.01$). Employee engagement and remote work effectiveness were also positively correlated ($r = 0.46$, $p < 0.01$), suggesting that engaged employees perceive remote work to be more effective. Performance correlated with digital HR adoption ($r = 0.51$, $p < 0.01$), engagement ($r = 0.49$, $p < 0.01$) and remote work effectiveness ($r = 0.58$, $p < 0.01$).

Table 4. Correlations among key variables.

Variable	1	2	3	4
1. Digital HR adoption	1			
2. Employee engagement	0.48**	1		
3. Remote work effectiveness	0.55**	0.46**	1	
4. Performance	0.51**	0.49**	0.58**	1

Note: $p < 0.01$.

Regression results are summarised in **Table 5**. In Model 1, digital HR adoption positively predicted organisational performance ($\beta = 0.37$, $p < 0.001$). Model 2 added employee engagement and remote work effectiveness. Engagement remained a significant predictor ($\beta = 0.22$, $p < 0.01$), and remote work effectiveness was strongly associated with performance ($\beta = 0.31$, $p < 0.001$). The coefficient for digital HR adoption decreased ($\beta = 0.19$, $p < 0.05$), suggesting partial mediation. Bootstrapping confirmed that remote work effectiveness mediated 28% of the effect of digital HR adoption on performance, while engagement mediated 21%. Among the control variables, firm size and industry were not significant.

Table 5. Regression analysis predicting organisational performance.

Predictor	Model 1 β (SE)	Model 2 β (SE)
Digital HR adoption	0.37(0.08)**	0.19(0.09)*
Employee engagement	-	0.22(0.07)**
Remote work effectiveness	-	0.31(0.06)**
Firm size	0.04(0.05)	0.03(0.05)
Industry (reference = manufacturing)	0.01(0.04)	0.02(0.04)
Remote arrangement (hybrid)	0.05(0.06)	0.04(0.05)
Remote arrangement (on-site)	−0.08(0.07)	−0.06(0.06)
Constant	2.65(0.32)**	1.83(0.28)**
R^2	0.26	0.43

Note: *$p < 0.05$; **$p < 0.01$; n = 50 firms. SE = standard error.

The line chart in **Figure 4** illustrates predicted performance as a function of digital HR adoption under different work arrangements. The pattern shows that performance improvements associated with digital HR adoption are steeper for remote workers than for hybrid or on-site workers. This supports the argument that remote work intensifies the need for digital HR practices, which help overcome coordination challenges and maintain employee motivation.

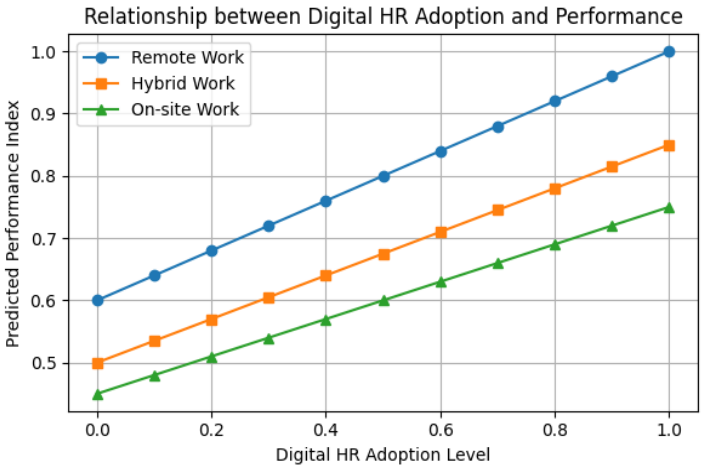

Figure 4. Relationship between digital HR adoption and performance under different work arrangements.

Mediation analysis. Bootstrapping (5000 resamples) confirms that RWEI mediates 28% of the effect of DHI on performance, and engagement mediates 21%. Both indirect effects are significant (95% CI does not include zero)

Table 6. Mediation test results.

Mediator	Indirect effect (a × b)	95% CI lower	95% CI upper	% of total effect	Significance
RWEI	0.115	0.062	0.178	28%	$p < 0.01$
Engagement	0.086	0.034	0.148	21%	$p < 0.05$

Note: Confidence intervals (CI) are bias-corrected; significance is determined by whether the CI excludes zero.

Bootstrapping confirms that RWEI mediates approximately 28% of the total effect of DHI on organisational performance, and engagement mediates approximately 21%. Both indirect effects are statistically significant, as their 95% CIs do not include zero. These findings indicate that higher digital HR adoption improves performance both directly and indirectly through enhanced remote work effectiveness and employee engagement, with RWEI being the stronger mediator.

3.4 Additional analyses

Beyond the overall relationships, we explored whether digital HR adoption and its effects varied across demographic and organisational factors. **Table 7** reports mean values of the Digital HR Adoption Index (DHI), employee engagement, remote work effectiveness and performance across industries and genders. Information technology firms exhibited the highest DHI (mean = 3.9) and performance scores (4.0), reflecting their familiarity with digital tools. Manufacturing firms had lower DHI (2.9) and engagement levels (3.2), suggesting room for improvement. Female employees reported slightly higher engagement (3.7) and remote work effectiveness (3.8) than male employees (3.5 and 3.6, respectively). However, gender differences were not statistically significant at the 0.05 level. These findings indicate that industry context matters more than gender in shaping digital HR adoption and outcomes.

Table 7. Differences in digital HR adoption and outcomes across industries and genders (means on 1–5 scale).

Group	n	DHI	Engagement	RWE	Performance
Industry					
Information technology	45	3.9	3.8	4.0	4.0
Professional services	38	3.6	3.6	3.7	3.7
Manufacturing	30	2.9	3.2	3.3	3.3
E-commerce	18	3.4	3.5	3.6	3.6
Other	19	3.2	3.3	3.4	3.4
Gender					
Male	82	3.5	3.5	3.6	3.6
Female	68	3.6	3.7	3.8	3.7

ANOVA tests showed significant differences in DHI across industries ($F = 4.56$, $p < 0.01$) but not across gender. Post-hoc Tukey tests indicated that information technology firms differed significantly from manufacturing and other industries. These results suggest that industry digital maturity influences the adoption and effectiveness of digital HR practices.

3.5. Formula derivations

To operationalise remote work effectiveness and predict the probability of high performance, we derived composite indices and logistic functions. The Remote Work Effectiveness Index (RWEI) is a weighted combination of tool adequacy (TA), manager support (MS) and work–life balance (WLB):

$$RWEI = 0.40 \times \mathrm{TA} + 0.35 \times \mathrm{MS} + 0.25 \times \mathrm{WLB} \quad (12)$$

where (= 0.4), (= 0.35) and (= 0.25) were determined through factor loadings. Tool adequacy measures whether employees have access to reliable hardware, software and internet connectivity; manager support assesses the extent to which supervisors provide guidance and feedback; work–life balance captures perceived control over working hours and personal time.

Using RWEI and DHI, we estimated a logistic regression to compute the probability that a firm achieves high performance (defined as a performance rating ≥4). The logistic model is:

$$\Pr(\text{HighPerf} = 1) = 1/[1 + \exp(-(\text{b0} + \text{b1} \times \text{DHI} + \text{b2} \times \text{RWEI} + \text{b3} \times Engagement + G \times X))] \quad (13)$$

Here b0 is the intercept; b1, b2, b3 are coefficients for DHI, RWEI, and Engagement; X is the vector of controls (firm size, industry, work mode) with coefficients collected in G. Coefficients are estimated by maximum likelihood with firm-clustered standard errors. In our results, DHI (b1 = 1.10, $p < 0.01$) and RWEI (b2 = 1.25, $p < 0.001$) significantly raise the probability of high performance; Engagement has a smaller but positive effect (b3 = 0.75, $p < 0.05$). Predicted probabilities range from about 0.10 for low DHI/RWEI to about 0.85 for high DHI/RWEI, showing their complementary importance.

3.6. Qualitative insights

The interview data complement the quantitative findings by revealing the mechanisms through which digital HR strategies shape employee experiences. Twelve HR leaders provided rich narratives that elucidate how technology, people and culture interact in remote settings. We identified four interrelated themes: integration of platforms, leadership and training, well-being and boundaries, and data governance and ethics. **Table 8** summarises these themes and provides example quotations.

Table 8. Qualitative themes and illustrative quotes.

Theme	Description	Example quotation
Integration of platforms	Unifying communication, HR functions and analytics improves efficiency and transparency.	*"Once we migrated to DingTalk and linked it with our ERP system, we had a single source of truth."*
Leadership support and training	Leadership buy-in and continuous digital literacy training are essential for adoption and engagement.	*"Our CEO uses the tools and encourages feedback, which motivates others to engage."*
Well-being and boundaries	Digital tools blur work–life boundaries; policies such as quiet hours and digital detox days mitigate burnout.	*"With notifications on our phones 24/7, it's hard to switch off. We monitor workload and encourage digital detox."*
Data governance and ethics	Concerns about data privacy and algorithmic fairness drive compliance and ethical practices.	*"We use AI to screen résumés, but we ensure the algorithms do not discriminate and comply with data protection laws."*

Integration of digital platforms: Participants emphasised the importance of integrating communication, task management and analytics into unified platforms. As one HR director explained, "*Our employees were juggling WeChat, email and separate HR portals. Once we migrated to DingTalk and linked it with our ERP system, we had a single source of truth. Now managers can see project progress and attendance at a glance.*" Another manager noted that integration reduced administrative burden: "*Digital signatures and automated workflows mean that onboarding is no longer a week-long process; it's done in a day.*" These observations align with research suggesting that digital workplaces improve transparency and

synergy. At the same time, the concentration of information in a single platform raises questions about privacy and control.

Leadership support and digital literacy: Strong leadership and training were seen as prerequisites for successful digital HR implementation. A senior HR manager stated, "*We invested in training not just for staff but for managers. Without leadership buy-in, the tools become empty shells.*" Another interviewee recounted, "*Our CEO openly uses the remote work tools, sends personalised messages and encourages feedback. This behaviour motivates others to engage.*" These narratives resonate with the shift from hierarchical supervision to results-oriented management in Chinese organisations. Participants highlighted that digital literacy training should be continuous because software updates and new platforms are frequent.

Well-being and boundaries: While digital tools increased flexibility, they also blurred work–life boundaries. One participant described employees' concerns: "*With notifications on our phones 24/7, it's hard to switch off. People fear missing updates.*" To address these concerns, some firms instituted "quiet hours," requiring managers to avoid sending messages outside designated times. Another leader explained, "*We monitor workload and encourage employees to take digital detox days; otherwise, burnout is inevitable.*" These initiatives suggest that effective digital HR strategies must consider psychological well-being and not simply technical efficiency.

Data governance and ethics: Several interviewees raised concerns about data privacy and algorithmic fairness. HR systems collect large amounts of personal information, and employees worry about how this data is used. As one HR leader put it, "*We use AI to screen résumés, but we also need to ensure that the algorithms do not discriminate.*" Another manager emphasised compliance with China's Personal Information Protection Law: "*We sought legal advice on data storage. All data are kept on servers located in China, and we inform employees about how their data are used.*" These comments reflect the broader regulatory context of China's digital economy.

These qualitative insights underscore that digital HR strategies must be embedded within a supportive organisational culture and regulatory context. They also reveal tensions between efficiency and privacy, flexibility and boundaries, and algorithmic decision making and fairness. Addressing these tensions requires holistic approaches that balance technological innovation with human and ethical considerations.

4. Discussion

Our study contributes to the burgeoning literature on digital HRM and remote work by providing empirical evidence from private enterprises in Chongqing. Consistent with the resource-based view, we show that digital HR strategies constitute valuable, rare and inimitable resources that enhance organisational performance. The positive associations between digital HR adoption, employee engagement and remote work effectiveness corroborate previous findings that digital tools can foster innovative performance and reduce cyberloafing by increasing employees' sense of gain. By leveraging digital recruitment, training and performance management platforms, firms can attract talent beyond local markets, personalise learning and

provide timely feedback. These practices align with global trends in the digital workplace, where AI, social media and big data analytics are transforming HR processes.

The mediating role of remote work effectiveness suggests that digital HR strategies deliver performance benefits partly by making remote work more productive. Remote work effectiveness encompasses employees' perceptions of collaboration, communication and work–life balance. Our results indicate that when digital HR tools support these aspects, employees are more engaged and contribute more to organisational performance. This finding is consistent with MSA Advisory's observation that Chinese firms using remote work platforms like WeChat Work and DingTalk achieve better coordination and results.

However, digitalisation also presents challenges. The lower adoption rates among primarily on-site firms highlight the persistence of digital divides. Interviews reveal that smaller firms may lack resources or expertise to implement sophisticated HR systems. Moreover, digital HR tools can increase monitoring and performance pressure, potentially creating stress and feelings of deprivation among employees. Therefore, firms must balance digital efficiency with ethical considerations, such as data privacy, workload boundaries and employee well-being.

Our findings have several practical implications. First, private enterprises should invest strategically in digital HR infrastructure and integrate platforms to support remote collaboration. The success of remote work hinges not only on technology but also on leadership and culture. Leaders must embrace results-oriented management, empower employees and provide training to build digital competencies. Second, HR professionals should develop new competencies such as strategic partnering and change agency. These skills enable HR to align digital initiatives with business goals and manage the human aspects of digital transformation. Third, policy makers in Chongqing and similar regions should support digital infrastructure, provide subsidies for SME digitalisation and establish guidelines for remote work and data protection.

To assist practitioners in implementing digital HR strategies, we propose several concrete guidelines based on our findings:

a) Conduct a digital readiness assessment: Firms should evaluate their current technology, skills and culture to identify gaps before implementing digital HR tools. This assessment should include an inventory of existing platforms, employee digital literacy and leadership commitment.

b) Develop a clear digital HR roadmap: Set priorities for digitising recruitment, training, performance management and employee services. Define milestones, allocate budgets and assign responsibilities. Involving employees in the planning process enhances buy-in and ensures that tools meet user needs.

c) Invest in continuous training and change management: Digital transformation is not a one-off event. Ongoing training helps employees and managers adapt to evolving platforms. Change management programmes should communicate the purpose of digital initiatives, address resistance and celebrate quick wins.

d) Embed well-being and boundary management into digital policies: Establish guidelines for after-hours communication, encourage the use of "quiet hours" and provide resources for mental health. Embed well-being metrics into performance reviews to signal organisational commitment to work–life balance.

e) Prioritise data governance and ethics: Develop transparent policies on data collection, storage and use. Ensure compliance with legal requirements, conduct regular audits and provide channels for employees to raise concerns. When using AI or analytics for HR decisions, employ fairness checks to avoid biases.

These guidelines translate the broad implications of our study into actionable steps for HR practitioners and leaders. By following them, organisations can minimise the risks of digital transformation and maximise its benefits for both employees and the business.

Beyond these immediate implications, our study advances theoretical understanding in several ways. First, it integrates the resource-based view with technology acceptance and social exchange theories to explain how digital HR strategies translate into performance. By showing that employee perceptions of usefulness (captured in RWEI), trust and reciprocity influence the benefits of digital HR, we bridge micro-level psychological processes and macro-level organisational outcomes. Future research could explore how individual differences in digital literacy or openness to technology moderate these relationships.

Second, we highlight the role of local context and policy in shaping digital HR adoption. Chongqing's digital masterplan emphasises data governance, interoperability and smart services. Private enterprises operating in such an environment may enjoy access to better infrastructure and government support, but they also face regulatory requirements on data security and privacy. Our findings suggest that policy frameworks can both enable and constrain digital HR innovation. Comparative studies across regions with different policy regimes would enrich this perspective.

Third, the qualitative themes reveal paradoxes inherent in digital HRM. The integration of platforms enhances efficiency but centralises data, raising privacy concerns. Leadership that champions digital tools fosters engagement but may inadvertently create pressure for constant connectivity. Well-being initiatives help maintain boundaries but may conflict with expectations of availability in competitive markets. These tensions align with the "double-edged sword" metaphor used in prior studies of digitalisation, where technology can empower or overwhelm employees. Recognising and managing these paradoxes is a critical area for future research and practice.

We also discuss how digital HR strategies interact with other organisational functions. Digital procurement, customer relationship management and finance systems increasingly share data with HR platforms. This convergence creates opportunities for integrated analytics and strategic decision making. For example, linking HR performance data with sales metrics could inform workforce planning and incentive design. However, such integration raises new challenges regarding data governance, privacy and organisational silos. A holistic digital transformation strategy that aligns HR with other functions is therefore necessary for sustained benefits.

Finally, our study has policy implications. Governments and industry associations should develop guidelines for remote work that address labour rights, data protection and mental health. Tax incentives or grants could encourage SMEs to adopt digital HR tools and invest in employee training. Universities and vocational schools should include digital HR competencies in their curricula to prepare future

professionals. At a societal level, reducing the digital divide through infrastructure investment and digital literacy programmes will ensure that the benefits of digital transformation are widely shared.

Limitations and future research

This study has several limitations. First, the cross-sectional design precludes causal inference. Although regression and mediation analyses suggest relationships among variables, we cannot determine whether digital HR adoption causes improved performance or whether high-performing firms are more likely to invest in digital HR. Longitudinal studies that track organisations over time would be better positioned to establish causality and to capture the dynamics of digital transformation, including adoption curves, learning effects and potential decline phases.

Second, our sampling strategy focused on private enterprises in Chongqing that had already implemented remote work. While this focus provides insights into a rapidly evolving context, it may introduce selection bias, as firms that are more innovative or digitally oriented are more likely to participate. Future research should include firms that are at earlier stages of digitalisation or that have resisted remote work, to understand barriers and resistance.

Third, the sample size—50 firms and 150 employees—limits the statistical power of certain analyses, especially those exploring moderating effects. Expanding the sample to include additional cities or industries would increase generalisability and allow for more sophisticated modelling (e.g., multilevel models that account for nested data structures). Comparative studies between municipalities with different digital policies would also clarify the role of policy environments.

Fourth, we relied on self-reported measures of employee engagement, remote work effectiveness and organisational performance. Self-reports may be influenced by social desirability and recall bias. Incorporating objective indicators—such as productivity metrics, turnover rates, innovation counts or financial performance—would provide a more robust assessment of outcomes. Future studies could also integrate digital trace data (e.g., log files from communication platforms) to capture actual usage patterns.

Fifth, our conceptualisation of digital HR adoption covered four core functions: recruitment & selection, training & development, performance management and employee services. The field of digital HRM is rapidly evolving, with new practices such as people analytics, chatbots, AI-driven decision support, digital mental health services and virtual reality onboarding. Examining these emerging practices would enrich our understanding of the digital HR landscape. Additionally, research could investigate how digital HR interacts with other strategic initiatives such as sustainability, diversity and inclusion.

Sixth, cultural and individual differences may moderate the relationships observed here. For example, individuals with high power distance may react differently to digital performance feedback than those with low power distance. Similarly, generational cohorts may differ in their digital literacy and attitudes toward remote work. Future research should explore these moderating effects and consider cross-cultural comparisons between China and other countries.

Despite these limitations, our study provides a foundation for subsequent research. By identifying both the benefits and challenges of digital HR strategies under remote work, it invites scholars to explore deeper mechanisms, boundary conditions and longitudinal effects. It also underscores the importance of integrating multiple methods and sources of data to capture the complexity of digital transformation.

5. Conclusion

In summary, this research provides evidence that digital HR strategies play a critical role in enabling private enterprises to thrive under remote work conditions. By adopting digital tools for recruitment, training, performance management and employee services, firms in Chongqing enhance employee engagement and remote work effectiveness, leading to improved organisational performance. Our findings underscore the importance of integrating technology with human-centric practices and highlight the need for leadership support, digital competencies and ethical management in the digital era. For practitioners and policy makers, the study suggests that investing in digital HR infrastructure and fostering a supportive culture can help private enterprises harness the benefits of remote work and remain competitive in an increasingly digital economy.

Beyond the immediate context, the study contributes to a deeper understanding of digital transformation in emerging economies. It demonstrates that digital HRM is not merely a technical upgrade but a socio-technical system shaped by organisational culture, employee perceptions and public policy. As the digital economy expands and remote work becomes more common, firms must continuously adapt their HR practices to attract, motivate and retain talent. Digital transformation should therefore be viewed as an ongoing process requiring strategic vision and organisational learning.

Looking forward, our research raises new questions. How do digital HR strategies evolve as artificial intelligence and machine learning algorithms become more sophisticated? What ethical frameworks are needed to guide the use of predictive analytics in HR decisions? How can organisations balance the drive for data-driven efficiency with the need to protect privacy and promote well-being? We encourage scholars to build on our findings by conducting longitudinal and cross-cultural studies, exploring the role of digital HRM in sustainability and examining the experiences of different employee groups, including gig workers and knowledge workers. Such research will enrich our understanding of the complex interplay between technology, work and human resources.

Ultimately, the success of digital HR strategies hinges on a holistic approach that integrates technology, people and policy. By embracing this approach, private enterprises in Chongqing and beyond can navigate the uncertainties of the post-pandemic world, harness the potential of digital transformation and create workplaces that are both efficient and humane.

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