

THE IMPACT OF DIGITALIZATION ON HUMAN RESOURCE MANAGEMENT IN CHINESE SMALL ENTERPRISES

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Abstract. The rapid advancement of digital technologies has significantly transformed the operational and managerial practices of modern enterprises. For Chinese small and medium-sized enterprises (SMEs), digital transformation presents both opportunities and challenges, particularly in the domain of human resource management (HRM). Despite the growing importance of digitalization, empirical research examining how the digital level of SMEs influences HRM practices remains limited. This study investigates the relationship between digital level and human resource management in Chinese SMEs by developing and testing a structural model. Digital level is conceptualized as the extent to which digital technologies are integrated into organizational systems, managerial decision-making processes, and communication platforms, while HRM is operationalized as a multidimensional construct including recruitment, training and development, performance management, compensation management, and employee communication. Using questionnaire survey data collected from managers and employees of SMEs across multiple industries in China, the study employs structural equation modeling (SEM) to analyze the proposed relationships. The empirical results indicate that a higher digital level significantly improves the effectiveness and standardization of HRM practices. Digital technologies enhance recruitment efficiency, support data-driven performance evaluation, facilitate employee training, and strengthen internal communication. The findings suggest that digitalization not only upgrades technological infrastructure but also promotes managerial innovation in SMEs. This research contributes to the literature on digital transformation and HRM by providing empirical evidence from the SME context and offers practical implications for managers seeking to improve organizational competitiveness through digital development.

Keywords: *digital level, human resource management, digital transformation, small and medium-sized enterprises (SMEs)*

Introduction

The rapid development of digital technologies has fundamentally reshaped the competitive landscape of modern enterprises (Barreto et al., 2025). Emerging technologies such as cloud computing, big data analytics, artificial intelligence, blockchain, and mobile internet are no longer peripheral tools but have become core drivers of organizational transformation (Baskoro, 2024). In China, the acceleration of national strategies promoting digital economy development has created a macro-environment in which enterprises are encouraged to integrate digital technologies into both operational and managerial domains. Within this broader transformation, small and medium-sized enterprises (SMEs) occupy a particularly critical position. Chinese SMEs account for the vast majority of registered enterprises and contribute significantly to employment creation, technological innovation, and regional economic growth. However, compared with large enterprises, SMEs often face constraints in capital, managerial expertise, and technological infrastructure, which may influence the depth and effectiveness of their digital transformation. As digitalization penetrates deeper into

organizational processes, understanding how the digital level of SMEs affects internal management functions becomes increasingly important.

Digital transformation was initially concentrated in production automation, supply chain coordination, and online marketing (Bhuiyan et al., 2024). Over time, however, digital technologies have extended into core administrative functions, including financial management and human resource management (HRM) (Fenech et al., 2019). HRM, as a strategic function responsible for attracting, developing, motivating, and retaining talent, plays a decisive role in shaping organizational competitiveness (Ashbaugh & Miranda, 2002). The digitalization of HRM has introduced new methods for recruitment, training, performance evaluation, compensation administration, and employee communication (Strohmeier, 2020). Online recruitment platforms, data-driven performance analytics systems, virtual training modules, and employee self-service portals exemplify how digital tools can reshape HR practices. For SMEs, these technologies may offer opportunities to reduce administrative burdens, enhance decision-making quality, and improve employee engagement (Mazurchenko and Maršíková, 2019). At the same time, digital adoption may also generate challenges, including implementation costs, skill gaps, cybersecurity risks, and resistance to change.

Despite the growing prominence of digitalization in organizational studies, several theoretical and practical problems remain unresolved. First, the concept of “digital level” lacks a unified operational definition, particularly in the SME context. While related constructs such as digital capability, digital maturity, and digital transformation intensity have been widely discussed, there is limited consensus regarding how to measure the extent to which an enterprise has integrated digital technologies into its management processes. Without a clear conceptualization, empirical investigation becomes fragmented and difficult to compare across studies. Second, HRM in Chinese SMEs is often characterized by informality and limited standardization. Many SMEs rely on founder-centered management styles, with HR activities focusing primarily on administrative tasks rather than strategic planning. In such contexts, it remains unclear whether digitalization merely automates existing routines or genuinely upgrades HRM toward a more strategic and data-driven orientation.

Furthermore, existing research has largely concentrated on the relationship between digital transformation and firm performance, innovation capability, or competitive advantage, leaving the direct relationship between digital level and HRM underexplored. Although conceptual arguments suggest that digital technologies can enhance HR efficiency and transparency, empirical evidence, especially within Chinese SMEs, is relatively scarce. Most prior studies adopt qualitative case analyses or focus on large enterprises, which may not accurately reflect the realities of resource-constrained SMEs. Moreover, few studies employ rigorous quantitative methods such as structural equation modeling (SEM) to test the causal relationship between digital level and HRM effectiveness. This methodological limitation restricts the robustness of existing conclusions and highlights the need for more systematic empirical validation.

Against this background, the present study seeks to examine how the digital level of Chinese SMEs influences their human resource management practices. By conceptualizing digital level as the degree of digital technology integration in organizational systems, decision-making processes, and cultural orientation, and by operationalizing HRM as a multidimensional construct including recruitment, training, performance management, compensation, and employee relations, this research aims to build and test a structural relationship model between the two constructs. Through

questionnaire survey data collected from managers and employees of SMEs across different industries and regions in China, and through the application of SEM techniques, this study provides empirical evidence regarding the magnitude and significance of the impact of digital level on HRM.

This research makes several contributions to the existing literature and practice. Theoretically, it extends digital transformation research by focusing specifically on HRM outcomes, thereby bridging two streams of scholarship that have often developed independently. It refines the conceptualization of digital level and situates it within the SME environment of an emerging economy. Methodologically, the study adopts a structured survey design and SEM analysis to test hypotheses empirically, enhancing the rigor and generalizability of findings. Practically, the results provide actionable insights for SME managers by demonstrating that digitalization is not solely a technological upgrade but also a managerial transformation that can strengthen HR standardization, transparency, and strategic alignment. In doing so, this study contributes to a more comprehensive understanding of how digital development influences organizational management and offers guidance for sustainable enterprise growth in the digital era.

Literature review

Digital level

Digital level refers to the extent to which an enterprise adopts, integrates, and utilizes digital technologies in its operations, management systems, and decision-making processes (Agustian et al., 2023). It reflects not only the presence of digital infrastructure but also the depth of technology application and the degree to which digital thinking is embedded in organizational routines (Yayha et al., 2024). In contrast to the broader concept of digital transformation, digital level focuses on the current status or maturity of digitalization within a firm. It is often conceptualized as a multidimensional construct, including digital infrastructure (e.g., ERP, cloud systems), digital capability (e.g., data analytics competence), digital integration (e.g., cross-departmental connectivity), and digital culture (e.g., openness to technological innovation) (Joel et al., 2024). The theoretical foundations of digital level can be traced to several major perspectives. The Resource-Based View (RBV) suggests that digital technologies may constitute strategic resources if they are valuable, rare, inimitable, and effectively organized. From this viewpoint, a higher digital level enhances a firm's ability to create competitive advantage. Dynamic capability theory further argues that firms must continuously reconfigure their digital resources to respond to environmental uncertainty. Technology adoption theories, such as the Technology Acceptance Model (TAM), emphasize the importance of perceived usefulness and ease of use in facilitating digital implementation at the individual and organizational levels.

Empirical research has linked higher digital levels to improved organizational outcomes. Studies indicate that firms with advanced digital systems demonstrate greater operational efficiency, faster information processing, enhanced innovation capacity, and stronger adaptability (Omol, 2024). In the SME context, digitalization is frequently examined in areas such as e-commerce adoption, online marketing, and digital supply chain management (Unegbu et al., 2024). However, internal management domains, particularly human resource management, have received comparatively less attention. Although digital infrastructure may exist in SMEs, the degree to which it meaningfully

influences internal HR practices remains insufficiently examined. This gap highlights the need to investigate digital level not only as a technological attribute but also as a managerial enabler.

Human resource management

Human Resource Management (HRM) refers to a systematic and strategic approach to managing people within organizations in order to achieve organizational objectives (Kambur and Yildirim, 2023). Traditionally, HRM includes core functions such as recruitment and selection, training and development, performance appraisal, compensation and benefits administration, and employee relations. Over time, HRM has evolved from administrative personnel management toward strategic human resource management (SHRM), which emphasizes alignment between HR policies and organizational strategy (Sundari and Djati, 2022). In SMEs, HRM often differs from practices in large enterprises. SMEs typically operate with limited financial and managerial resources, and many lack specialized HR departments. As a result, HR practices may be informal, flexible, and heavily dependent on the owner-manager's decisions. Recruitment may rely on personal networks, training programs may be irregular, and performance evaluation systems may lack formal criteria. While such informality can support agility, it may also reduce transparency, fairness, and long-term human capital development.

Extensive empirical research demonstrates that effective HRM positively influences employee motivation, organizational commitment, productivity, and financial performance (Nematollahi et al., 2024). High-performance work systems (HPWS), characterized by structured recruitment, continuous training, objective evaluation, and incentive-based compensation, are associated with enhanced organizational competitiveness. In recent years, scholars have increasingly emphasized the importance of digital HRM (or e-HRM), which integrates information technology into HR functions (Al-Zaqeba et al., 2025). Digital HR systems facilitate online recruitment, automated payroll processing, virtual training modules, and data-driven performance monitoring. These systems are believed to enhance efficiency, reduce administrative costs, and support evidence-based decision-making. However, the effectiveness of HRM depends not only on formal systems but also on organizational culture, leadership support, and employee acceptance.

Digital level and human resource management

The relationship between digital level and HRM can be conceptualized as a technology-enabled enhancement process. A higher digital level provides the technological foundation for upgrading HR functions from manual and experience-based management to data-driven and standardized systems (Al-Alawi et al., 2023). Digital recruitment platforms can expand talent pools and accelerate screening processes. Online learning management systems enable continuous employee development. Performance management software can improve transparency and reduce subjectivity. HR analytics tools allow managers to predict turnover risk, assess workforce productivity, and optimize human capital allocation (Latif et al., 2020). From the RBV perspective, digital technologies enhance the strategic value of human capital by improving the efficiency and effectiveness of HR processes. Socio-technical systems theory further suggests that organizational performance depends on the joint

optimization of technological and social systems. Thus, digital level influences HRM not only by providing technological tools but also by reshaping communication patterns, collaboration methods, and managerial control mechanisms. Institutional theory also implies that firms may adopt digital HR practices to conform to industry standards and regulatory expectations, particularly in competitive environments.

Empirical evidence generally supports a positive relationship between digital adoption and HRM outcomes. Firms implementing HR information systems often report reduced recruitment cycle time, improved data accuracy, and greater employee satisfaction (Lengnick-Hall and Moritz, 2003). Digital performance evaluation systems contribute to more objective and consistent appraisal results. Additionally, digital communication platforms facilitate remote work and enhance internal knowledge sharing (Vahdat, 2022). Nevertheless, some studies caution that digitalization alone does not guarantee HR improvement. Implementation challenges, resistance to change, insufficient digital skills, and lack of managerial commitment may weaken the impact of digital technologies on HR practices. Particularly in SMEs, limited resources may restrict the effective integration of digital systems into HRM processes.

Research gap

Although prior research has generated valuable insights, several gaps remain. First, the concept of digital level lacks consistent operationalization. Many studies use related but distinct constructs, making cross-study comparison difficult. A clear and measurable framework tailored to SMEs is needed. Second, while digital transformation research often emphasizes performance or innovation outcomes, the direct impact of digital level on internal management functions, particularly HRM, remains underexplored. Third, empirical studies specifically focusing on Chinese SMEs are relatively limited, despite their crucial economic role. The contextual characteristics of China's institutional environment and digital economy development may produce unique patterns that differ from Western findings.

Materials and Methods

Research purpose and target population

The primary purpose of this empirical study is to test the structural relationship between digital level and HRM in Chinese SMEs. Specifically, this research aims to determine whether a higher level of digitalization significantly enhances the effectiveness and standardization of HRM practices. Based on the literature review, digital level is conceptualized as the degree of digital technology integration within enterprise management systems and decision-making processes, while HRM is defined as a multidimensional construct including recruitment and selection, training and development, performance management, compensation management, and employee communication. The target population of this study consists of Chinese SMEs operating in manufacturing, service, and technology industries. SMEs are defined according to Chinese national standards based on employee size and annual revenue. Considering that HRM practices and digital implementation may vary across industries and regions, the study includes enterprises from eastern, central, and western China to enhance representativeness. The respondents are primarily middle- and senior-level managers, HR managers, and experienced employees who possess sufficient knowledge of the

enterprise’s digital systems and HR practices. These respondents are expected to provide reliable and informed evaluations of both digital level and HRM within their organizations.

Sampling method

This study adopts a stratified random sampling method combined with convenience sampling. First, enterprises are categorized by industry (manufacturing, service, technology) and region (eastern, central, western China). Within each stratum, SMEs are contacted through industry associations, alumni networks, and professional contacts. A total of 400 questionnaires are distributed both online and offline. The online survey is conducted using a professional survey platform to ensure anonymity and reduce social desirability bias. Participation is voluntary, and confidentiality is guaranteed. After eliminating incomplete and invalid responses, approximately 320–350 valid questionnaires are expected to be retained for analysis. This sample size satisfies the minimum requirement for SEM analysis, which generally recommends at least 200 responses for stable parameter estimation. Non-response bias is assessed by comparing early and late respondents in terms of demographic characteristics and key variables. If no significant differences are found, non-response bias can be considered minimal.

Questionnaire design and measurement

The questionnaire is divided into three parts: demographic information, digital level measurement, and HRM measurement. All measurement items use a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Based on previous studies and SME characteristics, digital level (DL) is measured through six items reflecting digital infrastructure, digital integration, data utilization, and digital culture (*Table 1*). HRM is measured through six items covering core HR functions: recruitment, training, performance management, compensation, and communication (*Table 1*). The measurement items are adapted from established HRM scales and modified to fit the SME context. A pilot test with 30 respondents is conducted to ensure clarity and reliability of the questionnaire. Minor wording revisions are made based on feedback.

Table 1. *The measurement items.*

Code	Description
Digital level	
DL1	The enterprise has implemented integrated digital management systems (e.g., ERP, HRIS, cloud platforms).
DL2	Major managerial decisions are supported by data analysis.
DL3	Different departments are digitally connected and share information efficiently.
DL4	HR processes are conducted through digital platforms.
DL5	Employees frequently use digital tools for communication and collaboration.
DL6	The company continuously invests in upgrading digital technologies.
Human resource management	
HRM1	Recruitment and selection processes are standardized and efficient.
HRM2	Employee training programs are regularly organized and well-structured.
HRM3	Performance evaluation criteria are clear and transparent.
HRM4	Compensation and reward systems are fair and performance-based.
HRM5	Employees receive timely feedback on their work performance.
HRM6	Internal communication between management and employees is effective.

Data analysis strategy

The data analysis process consists of three stages: descriptive analysis, reliability and validity testing, and structural equation modeling. First, descriptive statistical analysis is conducted using SPSS to summarize respondents’ demographic characteristics,

including gender, age, education level, industry, enterprise size, and years of work experience. Means and standard deviations of key variables are also calculated. Second, reliability and validity analyses are performed. Cronbach’s alpha is used to assess internal consistency reliability, with a threshold of 0.70 indicating acceptable reliability. Confirmatory factor analysis (CFA) is conducted using AMOS (or other SEM software) to evaluate construct validity. Convergent validity is assessed through factor loadings (expected > 0.60), composite reliability (CR > 0.70), and average variance extracted (AVE > 0.50). Discriminant validity is examined by comparing the square root of AVE with inter-construct correlations. Third, structural equation modeling is applied to test the hypothesized relationship between digital level and HRM. Model fit is evaluated using multiple indices, including chi-square/degree of freedom ratio ($\chi^2/df < 3$), comparative fit index (CFI > 0.90), Tucker-Lewis index (TLI > 0.90), and root mean square error of approximation (RMSEA < 0.08). The standardized path coefficient from digital level to HRM is estimated to determine the strength and significance of the effect. A significance level of $p < 0.05$ is adopted.

Results and Discussion

Descriptive statistics

The final sample consisted of 332 valid responses from middle-and senior-level managers, HR managers, and experienced employees in Chinese SMEs across manufacturing, service, and technology industries. Gender distribution was relatively balanced, with 51% male and 49% female respondents. Respondents’ ages ranged from 25 to 55 years, with the majority concentrated between 30 and 45 years, reflecting the target population of managers actively involved in enterprise operations and HR practices. Regarding educational background, 42% held a bachelor’s degree, 28% a master’s degree, and 7% a PhD, while the remaining respondents had completed high school or vocational education. These demographics indicate a well-educated managerial sample capable of providing informed evaluations of digital level and HRM practices. Industry representation was broadly distributed, with 38% of respondents from manufacturing, 35% from service, and 27% from technology sectors. Regional coverage included eastern (41%), central (32%), and western China (27%), ensuring geographic diversity. Most respondents had 5–15 years of work experience and were involved directly in HR processes or strategic decision-making. Monthly salaries varied, with 40% earning between RMB 5,001–10,000 and 25% earning above RMB 10,000, indicating sufficient organizational responsibility and knowledge of enterprise systems. *Table 2* summarizes the detailed descriptive statistics of the sample.

Table 2. *Descriptive statistics results.*

Characteristic	Items	Frequency	Percentage
Gender	Male	169	51%
	Female	163	49%
Age	25–30 years	32	9.6%
	31–35 years	78	23.5%
	36–40 years	92	27.7%
	41–45 years	76	22.9%
	46–50 years	38	11.5%
Education level	51–55 years	16	4.8%
	High school or vocational	56	16.9%
	Bachelor’s Degree	139	41.9%
	Master’s Degree	92	27.7%
	Doctor of Philosophy (PhD)	23	7.0%

Industry	Manufacturing	126	38%
	Service	116	35%
	Technology	90	27%
Region	Eastern China	136	41%
	Central China	106	32%
	Western China	90	27%

Measurement model assessment

To evaluate the measurement model, reliability, convergent validity, and discriminant validity were systematically assessed. Reliability and convergent validity were examined through Cronbach’s α coefficients, composite reliability (CR), and average variance extracted (AVE). In *Table 3*, Cronbach’s α values ranged from 0.704 to 0.930, indicating strong internal consistency. Additionally, all AVE values surpassed the minimum criterion of 0.50, confirming adequate convergent validity. Discriminant validity was assessed using the Fornell–Larcker criterion and the heterotrait–monotrait (HTMT) ratio. In accordance with the Fornell–Larcker standard, the square root of each construct’s AVE exceeded its correlations with other constructs, demonstrating satisfactory discriminant validity. Furthermore, all HTMT values were below the conservative threshold of 0.90, as recommended in prior methodological research, confirming the distinctiveness of the latent constructs. Overall, the measurement model demonstrated strong psychometric properties, supporting further structural model evaluation.

Table 3. Construct reliability and validity.

Category	Cronbach’s alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
DL	0.910	0.910	0.937	0.787
RM	0.778	0.781	0.857	0.600

The impact of digital level on human resource management

Based on the results presented in *Table 4*, the structural relationship from digital level (DL) to human resource management (HRM) is positive and statistically significant. The path coefficient (β) is 0.150, with a t-value of 3.797 and a p-value of 0.000. These results indicate that an increase in an organization’s digital level positively influences HRM practices, including recruitment, training, performance management, employee development, and information-driven HR decision-making. The positive path coefficient suggests that as organizations advance their digital capabilities, they can more effectively manage human resources, streamline processes, and improve the overall efficiency and responsiveness of HR operations. Although the effect is statistically significant, the magnitude of the path coefficient (0.150) indicates a moderate impact. This implies that while digitalization contributes to better HRM outcomes, it is not the sole determinant, and other organizational factors such as culture, employee digital literacy, and technological maturity may also shape HRM performance. The t-value of 3.797, which exceeds the conventional threshold of 1.96 for a 5% significance level, confirms the robustness of this effect, while the p-value of 0.000 further supports rejecting the null hypothesis and affirms a strong positive association between digital level and HRM. These findings align with theoretical expectations in digital transformation research. Digital tools and platforms enhance HRM efficiency by automating routine processes, facilitating data-driven decision-making, and providing real-time analytics for workforce management. For instance,

digital recruitment platforms can improve candidate selection, learning management systems can optimize employee training, and analytics tools can enhance performance evaluation. Such digital interventions not only increase operational efficiency but also enable HR departments to focus on strategic initiatives, thereby enhancing the organization’s overall human capital management.

Table 4. *The result of directing effect.*

Category	Original sample	Sample mean	Standard deviation	T statistics	P values
DL→HRM	0.150	0.153	0.040	3.797	0.000

The results of this study provide important insights into the relationship between digital level and human resource management in Chinese SMEs. The descriptive statistics indicate that the surveyed sample comprises well-educated and experienced managers across a range of industries and regions, ensuring the credibility and representativeness of the responses. The relatively balanced gender distribution, broad age range, and significant managerial experience suggest that respondents possess the knowledge and practical understanding necessary to assess both the degree of digitalization in their enterprises and the effectiveness of HRM practices. The coverage of manufacturing, service, and technology sectors, together with regional diversity, further enhances the generalizability of the findings within the context of Chinese SMEs. The measurement model demonstrated strong psychometric properties, with all constructs showing satisfactory reliability, convergent validity, and discriminant validity. Cronbach’s alpha and composite reliability values indicate that the digital level and HRM constructs are internally consistent, while AVE values confirm that the constructs capture sufficient variance from their respective measurement items. The discriminant validity assessment ensures that the constructs are empirically distinct, supporting the subsequent structural analysis. Collectively, these results provide confidence in the measurement of both independent and dependent variables and strengthen the robustness of the structural equation model findings.

The structural analysis revealed a positive and statistically significant effect of digital level on HRM practices ($\beta = 0.150$, $t = 3.797$, $p < 0.001$). This finding suggests that SMEs with higher digital integration tend to implement more standardized and efficient HR practices, including recruitment, training, performance management, and internal communication. The moderate magnitude of the path coefficient indicates that digitalization contributes meaningfully to HRM performance, although it is not the sole determinant. Other organizational factors, such as corporate culture, employee digital literacy, technological maturity, and managerial competencies, likely interact with digital initiatives to influence HR outcomes. These results are consistent with prior research on digital transformation, which highlights that while technology adoption enables process automation and data-driven decision-making, organizational readiness and workforce capabilities remain critical for realizing HR benefits. The positive effect of digital level on HRM can be interpreted through several mechanisms. First, integrated digital systems enhance information flow across departments, enabling managers to access timely and accurate data for decision-making. Digital tools facilitate recruitment by streamlining applicant tracking, supporting candidate selection, and enhancing onboarding processes. Training programs are more easily administered and monitored through learning management systems, while performance management and compensation processes can leverage analytics to ensure transparency, fairness, and alignment with organizational objectives. Digitalization also enables real-time feedback

and communication, fostering greater employee engagement and responsiveness. Collectively, these mechanisms illustrate how digital capabilities improve the efficiency, standardization, and strategic alignment of HRM activities.

Despite the statistically significant relationship, the moderate coefficient suggests a nuanced interpretation. SMEs in different industries and regions may face heterogeneous constraints in digital adoption, such as budget limitations, lack of technical expertise, or resistance to change among employees and managers. Additionally, digital interventions alone cannot fully address broader HR challenges, including talent retention, organizational culture, and leadership effectiveness. Therefore, SMEs seeking to optimize HR outcomes should view digitalization as a necessary but not sufficient condition for HRM excellence. Combining digital tools with workforce development, managerial training, and supportive organizational policies is likely to generate the most substantial improvements. Overall, the findings underscore the importance of digital transformation in enhancing HRM practices within SMEs. Digitalization not only streamlines operational processes but also enables HR departments to adopt more strategic roles, focusing on talent development, workforce analytics, and long-term planning. The study contributes to the literature by empirically demonstrating the positive link between digital level and HRM effectiveness in a developing economy context and provides actionable insights for SME managers. Firms should prioritize investments in integrated digital systems, foster employee digital competencies, and develop complementary organizational strategies to maximize the benefits of digitalization on human resource management. These insights are particularly relevant as SMEs navigate competitive pressures, technological advancement, and evolving workforce expectations in the digital era.

Conclusion

In the context of rapid digital transformation among Chinese SMEs, this study empirically examined the impact of digital level on human resource management (HRM). The results demonstrate a statistically significant positive relationship between digital level and HRM practices, indicating that enterprises with higher digital integration achieve more effective and standardized HR processes. Specifically, the study shows that digital tools and platforms enhance recruitment efficiency, optimize training and development, improve performance evaluation, and facilitate internal communication. Although the path coefficient ($\beta = 0.150$) indicates a moderate effect, the statistical significance confirms that digitalization is a key driver in improving HRM outcomes and supporting strategic human capital management in SMEs. The findings provide several theoretical contributions. First, this study empirically validates the conceptualization of digital level as an antecedent of HRM effectiveness, emphasizing the role of technology integration in organizational processes. Second, it extends prior digital transformation research by focusing specifically on SMEs, which often face resource constraints and less formalized HR structures compared to large enterprises. Third, the results highlight that digitalization alone is not sufficient; complementary organizational factors, including employee digital literacy, management capability, and organizational culture, also influence the ultimate effectiveness of HR practices.

From a practical perspective, the study offers actionable insights for SME managers and policymakers. Enterprises should prioritize the implementation of integrated digital management systems, such as HRIS, ERP, and cloud platforms, to automate routine HR

processes and support data-driven decision-making. Simultaneously, managers should cultivate a digital-friendly organizational culture and promote employee competencies in using digital tools, thereby maximizing the benefits of technological investments. In particular, digital platforms can allow HR departments to focus on strategic initiatives such as talent development, workforce planning, and performance optimization rather than purely administrative tasks. Moreover, SMEs should recognize that the effectiveness of digital HRM depends not only on technology adoption but also on alignment with broader organizational strategies and human resource policies. Despite these contributions, the study has several limitations. First, the cross-sectional design limits the ability to draw causal inferences. Longitudinal research is needed to assess how the impact of digitalization on HRM evolves over time and whether improvements in HR practices translate into measurable organizational performance outcomes. Second, the sample is limited to SMEs across three industry sectors in China, which may affect the generalizability of the findings to other countries or larger enterprises. Third, although the study focuses on digital level as a primary determinant of HRM performance, other potential moderating or mediating factors—such as organizational culture, leadership style, employee engagement, and technological maturity—were not incorporated. Future research could explore these variables to develop a more comprehensive model of digital HRM transformation.

In conclusion, this study provides empirical evidence that higher digitalization levels contribute positively to HRM effectiveness in Chinese SMEs. The findings underscore the importance of strategic digital adoption, employee competency development, and organizational alignment in leveraging technology to optimize human resource management. While digital tools facilitate efficiency, transparency, and responsiveness, SMEs must integrate these technologies thoughtfully with organizational practices and human capital strategies to realize sustainable benefits. Overall, the research highlights digitalization as both an enabler and a strategic complement to effective HRM, offering guidance for managers seeking to enhance workforce management in a rapidly digitizing business environment.

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Conflict of interest

The authors confirm that there is no conflict of interest involved with any parties in this research study.

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