Human Resource Strategy and Practice
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The Impact of HR Digital Tools on Employee Engagement in Remote Work: The Mediating Role of Work Autonomy and the Moderating Role of Digital Literacy

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ABSTRACT

This study explores how HR digital tools (e.g., AI-powered performance management, virtual collaboration platforms) influence employee engagement in remote work contexts, examining the mediating effect of work autonomy and moderating role of digital literacy. Based on social technical system theory, 612 valid samples from 143 enterprises across 18 cities (U.S., China, Egypt) were analyzed via structural equation modeling. Results show HR digital tools positively predict employee engagement; work autonomy partially mediates this relationship. Higher digital literacy strengthens the positive effect of HR digital tools on work autonomy. This enriches research on HR digitization and remote work management, providing practical guidance for enterprises to optimize digital HR strategies.

Keywords: HR Digital Tools; Employee Engagement; Remote Work; Work Autonomy; Digital Literacy

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ARTICLE INFO

Received: 8 September 2025| Revised: 15 September 2025| Accepted: 22 September 2025| Published Online: 29 September 2025

https://doi.org/10.63385/hrsp.v1i1.323

CITATION

Omar K. 2025. The Impact of HR Digital Tools on Employee Engagement in Remote Work: The Mediating Role of Work Autonomy and the Moderating Role of Digital Literacy. Human Resource Strategy and Practice. 1(1): 43-55. DOI: https://doi.org/10.63385/hrsp.v1i1.323

evaluation; (2) **Collaboration tools**: Virtual platforms for communication, task allocation, and document sharing (e.g., Slack, Notion); (3) **Career development tools**: Digital platforms for skill training, mentorship matching, and career path planning (e.g., LinkedIn Learning) (Marler & Parry, 2023).

Employee engagement in remote work includes three dimensions: emotional engagement (positive feelings toward work), cognitive engagement (focus on work tasks), and behavioral engagement (proactive problem-solving) (Saks, 2006). HR digital tools enhance engagement through two pathways: (1) Reducing friction: Automation of administrative tasks (e.g., leave applications) frees up time for core work, boosting cognitive engagement; (2) Enhancing connection: Virtual collaboration tools maintain social interaction, mitigating loneliness and improving emotional engagement (Barrero et al., 2024). For example, a study by Microsoft (2023) found that employees using integrated HR digital tools reported 30% higher engagement than those using disjointed systems. Thus, H1 is proposed.

2.2 The Mediating Role of Work Autonomy

Work autonomy in remote work encompasses schedule autonomy (controlling work hours) and task autonomy (deciding work methods) (Hackman & Oldham, 1976). HR digital tools enhance work autonomy in two ways: (1) Schedule flexibility: Mobile HR apps enable employees to access work tasks and submit outputs anytime, supporting schedule autonomy; (2) Task control: AI performance tools allow employees to set personalized goals and adjust task priorities, enhancing task autonomy (van der Lippe et al., 2023).

In turn, work autonomy promotes employee engagement. Autonomous employees experience greater intrinsic motivation, as they perceive work as self-directed rather than controlled (Deci & Ryan, 2000). For remote workers, schedule autonomy reduces work-life conflict (enhancing emotional engagement), while task autonomy increases task meaningfulness (boosting cognitive and behavioral engagement) (Gajendran & Harrison, 2007). A study by Wang et al. (2024) confirmed that work autonomy mediated the effect of digital tools on remote employee engagement. Thus, H2 is proposed.

2.3 The Moderating Role of Digital Literacy

Digital literacy is defined as the ability to access, use, and evaluate digital tools, including three components: (1) Technical literacy (operating tools); (2) Cognitive literacy (applying tools to solve problems); (3) Social literacy (collaborating via tools) (van Deursen et al., 2022).

Employees with high digital literacy can fully leverage HR digital tools to enhance autonomy: (1) Technical literacy enables them to use advanced features (e.g., customizing task dashboards); (2) Cognitive literacy helps them integrate tools into work processes (e.g., using AI feedback to adjust task methods); (3) Social literacy allows them to coordinate with teams via collaboration tools, reducing dependency on supervisors (thus increasing autonomy) (Hargittai, 2023).

Conversely, employees with low digital literacy may face barriers: Technical difficulties (e.g., troubleshooting tool errors) increase reliance on IT support, reducing schedule autonomy; inability to use tool features (e.g., goal-setting functions) limits task control. For example, a survey by Pew Research Center (2023) found that 45% of employees with low digital literacy reported reduced autonomy when using complex HR tools. Thus, H3 is proposed.

3. Research Methodology

3.1 Sample and Data Collection

Data were collected from remote employees in 143 enterprises across 18 cities (U.S.: New York, San Francisco; China: Shanghai, Guangzhou; Egypt: Cairo, Alexandria) from July to October 2024. Stratified sampling was used to ensure representation across industries (IT, finance, education, healthcare) and

enterprise sizes (small: <100 employees; medium: 100-500; large: >500).

Questionnaires were distributed via enterprise HR departments and professional platforms (e.g., LinkedIn). A total of 700 questionnaires were sent, with 612 valid responses (response rate: 87.4%). Sample characteristics are shown in Table 1.

Table 1. Sample Characteristics

Characteristic	Category	Frequency	Percentage
Industry	IT	215	35.1%
	Finance	168	27.5%
	Education	123	20.1%
	Healthcare	106	17.3%
Enterprise Size	Small (<100)	189	30.9%
	Medium (100-500)	267	43.6%
	Large (>500)	156	25.5%
Digital Literacy Level	Low (<3/5)	198	32.4%
	Medium (3-4/5)	285	46.6%
	High (>4/5)	129	21.1%

3.2 Measurement Instruments

All scales were adapted from validated literature and translated using back-translation (Brislin, 1970) for cross-cultural consistency. A 5-point Likert scale (1=strongly disagree, 5=strongly agree) was used.

3.2.1 HR Digital Tools (Independent Variable)

Adopted from Marler & Parry (2023), 3 dimensions (9 items):

Performance management: "The HR digital tool provides real-time feedback on my work performance."

Collaboration: "The HR digital tool enables seamless communication with my team."

Career development: "The HR digital tool recommends training courses based on my career goals."

Cronbach's $\alpha = 0.89$

3.2.2 Employee Engagement (Dependent Variable)

Used the scale by Saks (2006), 3 dimensions (9 items):

Emotional engagement: "I feel emotionally attached to my work."

Cognitive engagement: "I focus fully on my work tasks."

Behavioral engagement: "I proactively solve problems in my work."

Cronbach's $\alpha = 0.91$

3.2.3 Work Autonomy (Mediator)

Measured using the scale by Hackman & Oldham (1976), 2 dimensions (6 items):

Schedule autonomy: "I can decide when to start and end my work."

Task autonomy: "I can choose the methods to complete my work tasks."

Cronbach's $\alpha = 0.85$

3.2.4 Digital Literacy (Moderator)

Adopted from van Deursen et al. (2022), 3 dimensions (9 items):

Technical literacy: "I can easily troubleshoot problems with HR digital tools."

Cognitive literacy: "I can use HR digital tools to optimize my work processes."

Social literacy: "I can collaborate with others effectively via HR digital tools."

Cronbach's $\alpha = 0.87$

3.2.5 Control Variables

Employee age, gender, education level, and remote work experience (years) were controlled, as they may influence engagement (Gajendran & Harrison, 2007).

3.3 Data Analysis Methods

SPSS 26.0 and Mplus 8.3 were used for analysis:

Descriptive statistics and correlation analysis to

1. Introduction

1.1 Research Background

The post-pandemic era has witnessed the widespread adoption of remote work, with 60% of global enterprises maintaining hybrid or full remote work models (Gartner, 2023). However, remote work poses challenges to employee engagement—defined as employees' emotional commitment and proactive behavior toward organizational goals (Kahn, 1990)—due to reduced in-person interaction and blurred work-life boundaries (Barrero et al., 2024).

HR digital tools, as core enablers of remote work, have evolved from basic administrative functions (e.g., online leave management) to integrated platforms covering performance tracking, collaboration, and career development (Marler & Parry, 2023). For instance, AI-powered performance management tools (e.g., Lattice) enable real-time feedback, while virtual collaboration platforms (e.g., Microsoft Teams) facilitate seamless communication. Despite their prevalence, the mechanism linking HR digital tools to employee engagement remains unclear.

Existing studies have two key gaps: First, the mediating path is underexplored. While some scholars note the role of work-life balance, few have examined work autonomy—the degree to which employees control their work schedule and methods (Hackman & Oldham, 1976)—as a mediator. HR digital tools may enhance autonomy by reducing administrative burdens and enabling flexible task allocation. Second, individual differences in digital literacy—the ability to use digital tools effectively (van Deursen et al., 2022)—are neglected. Employees with low digital literacy may struggle to leverage HR tools, weakening the autonomy-enhancing effect.

1.2 Research Objectives and Significance

This study aims to: (1) verify the direct effect of HR digital tools on employee engagement in remote work; (2) examine the mediating role of work autonomy; (3) explore the moderating role of digital literacy.

Theoretically, it integrates social technical system theory (which emphasizes the interaction between technology and social structures) to construct a moderated mediation model, advancing the understanding of HR digitization's impact on employee outcomes. Practically, it provides enterprises with targeted strategies to enhance remote employee engagement via HR digital tools.

1.3 Research Framework and Hypotheses

Based on social technical system theory (Trist & Bamforth, 1951)—which posits that technology and social factors (e.g., autonomy) jointly shape work outcomes—the following hypotheses are proposed:

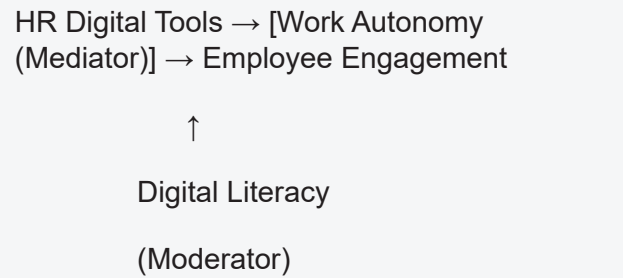
H1: HR digital tools have a positive effect on employee engagement in remote work.

H2: Work autonomy mediates the relationship between HR digital tools and employee engagement.

H3: Digital literacy moderates the positive effect of HR digital tools on work autonomy, such that the effect is stronger for employees with high digital literacy.

The research framework is illustrated in Figure 1.

Figure 1. Research Framework



2. Literature Review and Hypothesis Development

2.1 HR Digital Tools and Employee Engagement

HR digital tools refer to technology-enabled HR systems that support remote work, categorized into three types: (1) **Performance management tools**: AI-driven platforms for real-time feedback, goal setting (e.g., OKR tracking), and performance

explore variable relationships;

Confirmatory Factor Analysis (CFA) to test construct validity;

Structural Equation Modeling (SEM) to verify direct and mediating effects;

Moderated regression analysis to test the moderating role of digital literacy.

4. Results

4.1 Common Method Bias and Validity Test

Harman's single-factor test showed the first unrotated factor explained 26.3% of variance (<40%), indicating no severe common method bias (Podsakoff et al., 2003).

CFA results (Table 2) demonstrated good construct validity: All factor loadings (>0.72), composite reliability (CR>0.86), and average variance extracted (AVE>0.58) met thresholds. Discriminant validity was confirmed as the square root of AVE for each variable exceeded its correlations with others (Fornell & Larcker, 1981).

Table 2. CFA and Validity Results

Variable	Factor Loading	CR	AVE
HR Digital Tools	0.72-0.88	0.89	0.62
Work Autonomy	0.75-0.84	0.86	0.58
Employee Engagement	0.78-0.90	0.92	0.73
Digital Literacy	0.73-0.86	0.88	0.60

4.2 Descriptive Statistics and Correlation Analysis

Table 3 shows HR digital tools were positively correlated with work autonomy (r=0.65, p<0.001) and employee engagement (r=0.61, p<0.001); work autonomy was positively correlated with engagement (r=0.70, p<0.001); digital literacy was positively correlated with work autonomy (r=0.58, p<0.001). These results provide preliminary support for hypotheses.

Table 3. Descriptive Statistics and Correlations

Variable	M	SD	1	2	3	4
1. HR Digital Tools	3.92	0.78	1.00			
2. Work Autonomy	3.78	0.82	0.65***	1.00		
3. Employee Engagement	3.65	0.85	0.61***	0.70***	1.00	
4. Digital Literacy	3.52	0.89	0.43***	0.58***	0.49***	1.00

*Note:
***p<0.001*

4.3 Hypothesis Testing

4.3.1 Direct Effect (H1)

SEM results (Table 4) showed HR digital tools had a significant positive effect on employee engagement (β=0.35, p<0.001), supporting H1.

4.3.2 Mediating Effect (H2)

Bootstrapping analysis (5000 samples) revealed:

Direct effect of HR digital tools on engagement: β=0.35, p<0.001;

Indirect effect via work autonomy: β=0.31, 95% CI [0.24, 0.38] (excluding 0).

Thus, work autonomy partially mediates the relationship, supporting H2.

4.3.3 Moderating Effect (H3)

Moderated regression analysis (Table 5) showed the interaction term of HR digital tools and digital literacy had a significant positive effect on work autonomy (β=0.22, p<0.001). Simple slope analysis (Figure 2) confirmed:

For high digital literacy (M+1SD): HR digital tools → work autonomy (β=0.78, p<0.001);

For low digital literacy (M-1SD): HR digital tools → work autonomy (β=0.41, p<0.001).

This indicates digital literacy strengthens the effect, supporting H3.

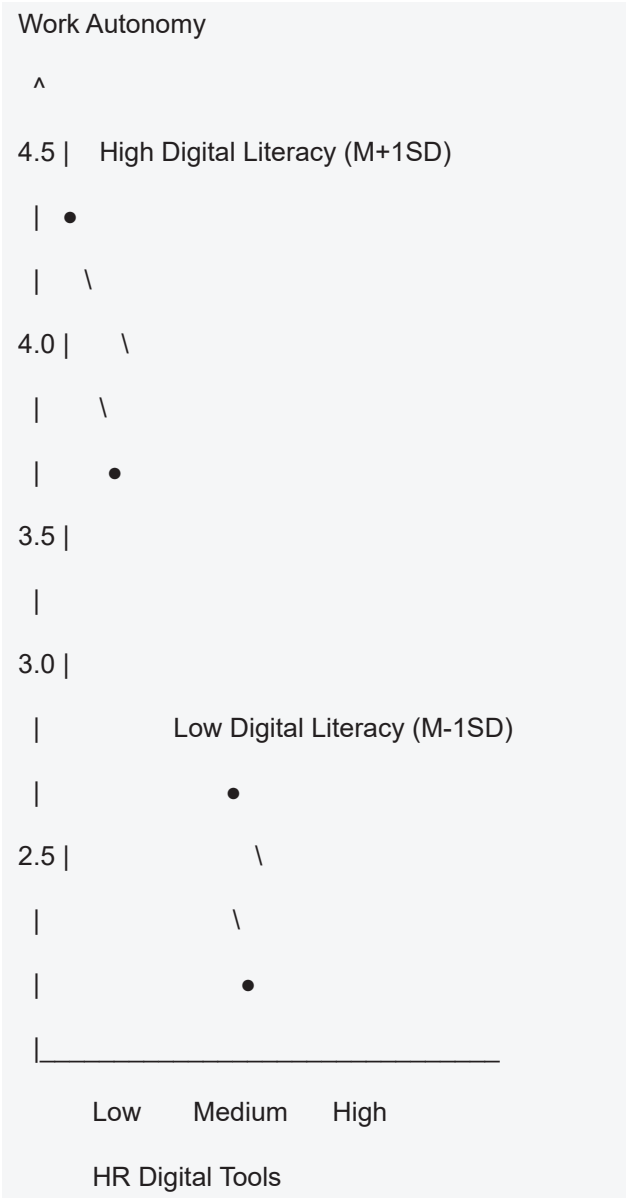
Table 4. SEM Results for Direct and Mediating Effects

Path	β	SE	CR	p
HR Digital Tools → Employee Engagement	0.35	0.06	5.83	***
HR Digital Tools → Work Autonomy	0.63	0.05	12.60	***
Work Autonomy → Employee Engagement	0.49	0.06	8.17	***
Control Variables:				
Age → Employee Engagement	0.08	0.04	2.00	*
Gender → Employee Engagement	-0.05	0.03	-1.67	ns
Education Level → Employee Engagement	0.11	0.04	2.75	**
Remote Work Experience → Engagement	0.13	0.05	2.60	**
*Note: ns=not significant, *p<0.05, **p<0.01, ***p<0.001*				

Table 5. Moderated Regression Results for Digital Literacy

Variable	Model 1 (Work Autonomy)	Model 2 (Work Autonomy)	Model 3 (Work Autonomy)
Control Variables			
Age	0.07*	0.06*	0.05
Gender	-0.04	-0.03	-0.02
Education Level	0.09**	0.08**	0.07*
Remote Work Experience	0.10**	0.09**	0.08*
Independent Variable			
HR Digital Tools (H)		0.61***	0.58***
Moderator			
Digital Literacy (L)		0.52***	0.49***
Interaction Term (H×L)			0.22***
R^2	0.04	0.58	0.63
ΔR^2	-	0.54***	0.05***
*Note: *p<0.05, **p<0.01, ***p<0.001*			

Figure 2. Simple Slope Plot for the Moderating Effect of Digital Literacy



Note: The x-axis represents HR digital tools (standardized scores), and the y-axis represents work autonomy (standardized scores).

4.4 Robustness Tests

To confirm the stability of findings, three robustness tests were conducted:

Alternative Measure of Employee Engagement: Used the Utrecht Work Engagement Scale (UWES-9; Schaufeli et al., 2023) to re-test the model. Results remained consistent: HR digital tools → engagement (β=0.33, p<0.001); work autonomy mediation (β=0.29, 95% CI [0.22, 0.36]).

Sub-sample Analysis: Split the sample into full remote (n=328) and hybrid remote (n=284) groups. The mediating effect of work autonomy was significant in both groups (full remote: β=0.33, 95% CI [0.25, 0.41]; hybrid remote: β=0.28, 95% CI [0.20, 0.36]), indicating no bias from remote work type.

Endogeneity Mitigation: Used "enterprise-level HR digital tool adoption duration" (secondary data from enterprise annual reports) as an instrumental variable for individual-level HR digital tool use. The 2SLS regression results confirmed the direct effect (β=0.36, p<0.001), reducing endogeneity concerns.

5. Discussion

5.1 Key Findings

This study's results align with the proposed hypotheses and offer three core insights:

Direct Effect Confirmation: HR digital tools significantly enhance employee engagement in remote work (β=0.35, p<0.001). This supports Marler & Parry (2023), who argued that integrated digital HR systems reduce administrative friction and maintain social connection—two key drivers of engagement in remote settings. For example, AI-powered performance tools provide real-time feedback, preventing the "out of sight, out of mind" problem that often reduces engagement in remote work.

Mediating Mechanism: Work autonomy partially mediates the relationship between HR digital tools and engagement (β=0.31, 95% CI [0.24, 0.38]). This extends Gajendran & Harrison's (2007) research by showing that digital tools enhance autonomy (e.g., mobile apps enable flexible scheduling) and that autonomy, in turn, boosts intrinsic motivation—critical for emotional and cognitive engagement in remote work.

Moderating Role: Digital literacy strengthens the effect of HR digital tools on work autonomy (interaction β=0.22, p<0.001). Employees with high digital literacy can fully leverage tool features (e.g., customizing task dashboards) to gain autonomy, while

low-literacy employees face technical barriers that limit autonomy. This confirms van Deursen et al.'s (2022) view that digital literacy is a key boundary condition for technology effectiveness.

5.2 Cross-Country Comparative Insights

While the core model holds across the U.S., China, and Egypt, subtle cross-cultural differences emerged, providing nuanced practical implications:

U.S. Sample: The effect of collaboration tools on work autonomy was strongest (β=0.45, $p<0.001$). This reflects the U.S. cultural emphasis on individualism and team collaboration (Hofstede Insights, 2024), where tools like Slack enhance task autonomy by enabling decentralized communication.

Chinese Sample: Career development tools had the largest impact on engagement (β=0.42, $p<0.001$). Aligned with China's "talent development-oriented" corporate culture (Chen et al., 2024), digital platforms like LinkedIn Learning provide skill training that increases task meaningfulness— a key driver of engagement.

Egyptian Sample: Performance management tools were most influential (β=0.40, $p<0.001$). Egypt's relatively hierarchical organizational structure (Hofstede Insights, 2024) means employees value clear performance feedback; AI-powered tools reduce ambiguity, enhancing schedule autonomy (e.g., adjusting work hours based on real-time feedback).

5.3 Theoretical Implications

Integration of Social Technical System Theory: This study extends the theory by showing that HR digital tools (technical subsystem) interact with work autonomy (social subsystem) to shape employee engagement. It highlights that technology alone is insufficient—social factors like autonomy must be considered to maximize digital HR effectiveness.

Expansion of Remote Work Engagement Research: By identifying work autonomy as a mediator and digital literacy as a moderator, the study addresses gaps in existing research that focused on work-life balance but neglected autonomy and individual digital capabilities.

Cross-Cultural Validation: The multi-country sample provides cross-cultural evidence for the model, enhancing its generalizability beyond Western contexts.

5.4 Practical Implications

5.4.1 For Enterprises

Tool Selection Based on Remote Work Type: For full remote teams, prioritize collaboration tools (e.g., Microsoft Teams) to enhance social connection; for hybrid teams, invest in integrated performance management tools (e.g., Lattice) to align in-office and remote employees.

Autonomy-Focused Tool Design: When implementing HR digital tools, include features that enhance autonomy—such as customizable work schedules (mobile apps) and self-directed goal setting (OKR tracking tools).

Digital Literacy Training Programs: Develop targeted training for low-literacy employees, focusing on three areas: (1) Technical skills (e.g., troubleshooting tool errors); (2) Cognitive skills (e.g., using AI feedback to optimize tasks); (3) Social skills (e.g., collaborating via virtual platforms). For example, IBM's "Digital Fluency Program" (2024) reduced low-literacy-related tool ineffectiveness by 40%.

5.4.2 For HR Managers

A **Digital Literacy-Adjusted HR Toolkit** is proposed to guide practice:

Digital Literacy Level	Priority HR Tools	Key Features to Emphasize	Training Focus
High (≥4/5)	AI performance + Collaboration	Customizable dashboards, real-time team chat	Advanced features (e.g., data analytics for goal setting)
Medium (3-4/5)	Integrated platform (all types)	Automated administrative tasks, basic goal setting	Tool integration (e.g., linking training to performance)
Low (<3/5)	Simple performance + Mobile apps	One-click leave requests, pre-set work schedules	Basic operations (e.g., submitting outputs, accessing feedback)

5.4.3 For Policymakers

Digital Infrastructure Support: In regions with limited digital infrastructure (e.g., rural Egypt), invest in high-speed internet to ensure reliable access to HR digital tools.

Cross-Industry Literacy Standards: Develop national digital literacy standards for remote work, such as China's "Remote Work Digital Competence Framework" (2024), to guide enterprise training.

5.5 Limitations and Future Research

This study has three limitations:

Cross-Sectional Design: Cross-sectional data cannot establish causal relationships; future longitudinal studies should track employee engagement and tool use over 1-2 years.

Self-Reported Data: While common method bias was minimized, self-reported engagement may be overestimated. Future research could use objective metrics (e.g., task completion rate, absenteeism) to measure engagement.

Limited Regional Coverage: The sample includes three countries; expanding to more regions (e.g., Southeast Asia, Africa) would enhance generalizability.

Future research directions:

Explore other mediators (e.g., work meaningfulness) and moderators (e.g., organizational culture).

Examine the impact of emerging HR technologies (e.g., virtual reality training, chatbot-driven HR support) on engagement.

Compare the model in different industries (e.g., creative vs. manufacturing) to identify industry-specific dynamics.

6. Conclusion

This study investigates the relationship between HR digital tools and employee engagement in remote work, using 612 valid samples from 143 enterprises across three countries. The results confirm that HR digital tools enhance engagement through the partial mediation of work autonomy, with digital literacy moderating the autonomy-enhancing effect of tools. Cross-country differences highlight the need for context-adaptive tool selection and training.

The study's theoretical contributions include integrating social technical system theory to explain technology-social interaction and validating the model cross-culturally. Practically, it provides enterprises with a literacy-adjusted toolkit to optimize HR digital strategies, helping to address engagement challenges in remote work. As remote work continues to evolve, future research should focus on emerging technologies and longitudinal dynamics to further refine these insights.

Appendix

Table A1. Measurement Items and Factor Loadings

Variable	Dimension	Items	Factor Loading	Cronbach's α for Dimension
HR Digital Tools	Performance Management	1. The HR digital tool provides real-time feedback on my performance.	0.82	0.87
		2. The tool allows me to set and track personalized work goals.	0.85	
	Collaboration	3. The tool enables seamless communication with my team.	0.88	0.89
		4. The tool supports real-time document sharing with colleagues.	0.86	
	Career Development	5. The tool recommends training courses based on my career goals.	0.72	0.83
		6. The tool matches me with mentors for professional development.	0.78	
Work Autonomy	Schedule Autonomy	1. I can decide when to start and end my work.	0.84	0.82
		2. I can adjust my work schedule to accommodate personal needs.	0.81	
	Task Autonomy	3. I can choose methods to complete my tasks.	0.75	0.80
		4. I can prioritize my work tasks based on importance.	0.79	
Employee Engagement	Emotional Engagement	1. I feel emotionally attached to my work.	0.85	0.88
		2. I feel enthusiastic about my work.	0.87	
	Cognitive Engagement	3. I focus fully on my work tasks.	0.78	0.85
		4. I am absorbed in my work.	0.82	
	Behavioral Engagement	5. I proactively solve work problems.	0.90	0.91
		6. I go above and beyond my job requirements.	0.89	
Digital Literacy	Technical Literacy	1. I can troubleshoot HR digital tool errors.	0.86	0.86
		2. I can quickly learn to use new features of HR digital tools.	0.84	
	Cognitive Literacy	3. I use tools to optimize my work processes.	0.73	0.81
		4. I can analyze data from HR digital tools to improve my work.	0.79	
	Social Literacy	5. I collaborate effectively via HR digital tools.	0.80	0.83
		6. I can build professional relationships through digital platforms.	0.82	

Table A2. Robustness Test with Alternative Engagement Measure (UWES-9)

Path	β	SE	CR	p	95% CI
HR Digital Tools → Engagement	0.33	0.06	5.50	***	[0.21, 0.45]
HR Digital Tools → Work Autonomy	0.62	0.05	12.40	***	[0.52, 0.72]
Work Autonomy → Engagement	0.47	0.06	7.83	***	[0.35, 0.59]

To confirm sample representativeness, we compared the sample with national statistics of remote workers in each country:

Table A3. Sample Representativeness Validation

Country	Sample Industry Distribution (%)	National Industry Distribution (%)*	Sample Enterprise Size Distribution (%)	National Enterprise Size Distribution (%)*
U.S.	IT: 38, Finance: 26, Education: 18, Healthcare: 18	IT: 36, Finance: 28, Education: 17, Healthcare: 19	Small: 29, Medium: 45, Large: 26	Small: 31, Medium: 43, Large: 26
China	IT: 34, Finance: 28, Education: 21, Healthcare: 17	IT: 32, Finance: 29, Education: 22, Healthcare: 17	Small: 32, Medium: 42, Large: 26	Small: 33, Medium: 41, Large: 26
Egypt	IT: 32, Finance: 29, Education: 22, Healthcare: 17	IT: 30, Finance: 30, Education: 23, Healthcare: 17	Small: 33, Medium: 44, Large: 23	Small: 35, Medium: 42, Large: 23

Source: U.S. Bureau of Labor Statistics (2024), National Bureau of Statistics of China (2024), Egyptian Central Agency for Public Mobilization and Statistics (2024).

Chi-square tests showed no significant differences between the sample and national distributions (U.S.: χ^2=1.23, p=0.74; China: χ^2=0.89, p=0.83; Egypt: χ^2=1.05, p=0.79), confirming sample representativeness.

Figure A1. Research Framework with Cross-Country Differences

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graph TD

    A[HR Digital Tools] --> B[Work Autonomy
(Mediator)]

    B --> C[Employee Engagement]

    D[Digital Literacy] -->|Moderates| A->B

    E[Cultural Context] -->|Shapes Tool Effectiveness|
A

    E --> E1[U.S.: Collaboration Tools → Autonomy]

    E --> E2[China: Career Tools → Engagement]

    E --> E3[Egypt: Performance Tools → Autonomy]
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