Virtual Leadership and Digital Management Competencies: Their Impact on Employee Performance in Virtual Human Resource Management Systems

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***Abstract*—In the post-pandemic era, organizations are increasingly adopting Virtual Human Resource Management (VHRM) systems to manage distributed teams and remote employees. This study examines the influence of Virtual Leadership and Digital Management Competencies on Employee Engagement and Performance in virtual work environments. The research aims to explore how leadership styles adapted to digital platforms and technology-driven management skills affect key HRM outcomes in the virtual context. A structured questionnaire was distributed among employees working in IT and service-based firms adopting VHRM practices. The findings indicate that leaders with strong digital competencies and emotional intelligence significantly enhance employee engagement, motivation, and performance. The study concludes that the success of VHRM systems largely depends on digitally capable leaders who can foster trust, communication, and collaboration in virtual spaces.**

***Index Terms*—Virtual Leadership, Digital Management Competencies, Employee Engagement, Employee Performance, Virtual Human Resource Management (VHRM).**

I. INTRODUCTION

The transition toward digitally-mediated work environments has transformed how organizations engage with their workforce, compelling new models of human resource management that leverage technology to overcome geographic and temporal barriers. In Chennai's expanding IT industry, Virtual Human Resource Management Systems have gained traction as essential tools to coordinate, develop, and manage dispersed talent pools. Central to this transformation are two organizational capabilities: virtual leadership that guides remote teams through clear communication and trust-building, and digital management competencies enabling effective use of HR technologies to monitor and support employees remotely.

This paper investigates how these leadership and digital capabilities influence employee engagement and performance, key indicators of organizational success in virtual contexts. The focus on Chennai's IT sector provides a contextualized understanding pertinent to one of India's foremost technology hubs.

Research Objectives

1. To evaluate how virtual leadership influences employee engagement within virtual human resource management systems in Chennai's IT industry.
2. To assess digital management competencies of HR professionals and their effect on employee performance in virtual work environments.
3. To analyze the relationship between virtual leadership and digital management competencies in enhancing employee productivity.
4. To determine the combined impact of virtual leadership and digital management skills on employee engagement and performance.
5. To provide recommendations for improving virtual HR practices through leadership development and digital competency enhancement.

Scope of the Study

The study is geographically limited to the IT sector located in Chennai, Tamil Nadu, targeting professionals working in virtual or hybrid work setups within reputed IT firms. It focuses on Virtual

Human Resource Management Systems (VHRMS) as the key context through which leadership and HR digital competencies influence employee outcomes.
The research primarily investigates three constructs: Virtual Leadership (communication, trust, digital usage), Digital Management Competencies (digital literacy, tool usage, training), and Employee Performance (productivity, meeting expectations, evaluation fairness). Data is collected through structured quantitative surveys targeting employees and HR professionals, providing statistically generalizable insights relevant to virtual work in IT.
The study addresses leadership and HR competencies at the managerial and operational levels impacting individual employee engagement and performance metrics.

Limitations of the Study
The study utilizes cross-sectional survey data, which restricts causal inferences about the relationships among virtual leadership, digital competencies, and performance. Data collection is confined to Chennai's IT industry, limiting the generalizability of findings to other geographic regions or industries without further validation.
Self-reported measures for constructs like leadership behavior and performance may introduce response biases such as social desirability or common method bias. The survey focuses on select dimensions of virtual leadership and digital competencies, potentially overlooking other relevant factors impacting virtual HRM effectiveness.
Rapid technological evolution may mean that digital tools and competencies measured in this study could become outdated, necessitating periodic reassessment.

II. LITERATURE REVIEW

Evolving Leadership Dynamics in Virtual Settings
The move to digitalized workplaces necessitates leadership approaches adept at managing virtual workforces. Existing research highlights that virtual leaders must excel in articulating goals clearly across digital channels, nurturing trust without physical proximity, and employing digital tools to oversee progress and provide feedback. These leaders foster an environment conducive to innovation and adaptability amid the challenges posed by remote working arrangements (Abbasnejad & Izadi Moud, 2012).

Significance of Digital Competency in HR Practices
Digital management competencies encapsulate the proficiency of HR professionals in utilizing digital platforms to administer workforce processes efficiently. Such skills include mastery of digital HR systems, real-time performance analytics, and the orchestration of continuous learning initiatives to boost employee digital literacy. A digitally adept HR team contributes significantly to organizational agility and enhanced employee experiences in virtual frameworks (Ahmed, 2024).

Interplay Among Leadership, Competencies, and Employee Outcomes
Empirical findings suggest that successful virtual leadership and comprehensive digital management capabilities combine to positively affect employee engagement and productivity (Chaudhary et al., 2022). Transparent use of performance management tools and equitable evaluation mechanisms within VHRMS environments are identified as key contributors to high employee satisfaction and commitment.

Virtual Leadership

Virtual leadership refers to leadership enacted across time and space through information and communication technologies (ICTs) rather than purely in face-to-face settings. It builds on classical leadership theories (e.g., transformational, transactional, leader-member exchange) but adapts to the demands of digital mediation. For example, leaders must be more explicit in setting vision, maintain regular communication, and compensate for the reduced social cues present in physical co-presence (Alfehaid & Elshafie, 2019). Empirical reviews in telework and virtual teams identify core competencies such as clear and structured digital communication, trust-building at a distance, empowerment of remote team members, and enabling virtual collaboration (Chouhan & Shukla, 2025).

For instance, one review found that task-oriented communication (clarifying goals, providing guidance,

requesting feedback) was significantly associated with performance in telework settings.
Frontiers

Another study focused on school leaders in virtual environments and found that although traditional leadership programmes addressed many domains, virtual contexts required distinctly different competencies (for example, managing relationships and instructional delivery via digital platforms) (Avolio et al., 2013).

Digital Management Competencies

Digital management competencies refer to the combination of technical skills, informational/analytical abilities, and socio-cognitive skills that managers need to effectively design, implement and oversee digital work systems. This includes tool literacy (e.g., using collaboration platforms), information-management (data literacy, knowledge sharing), strategic use of digital workflows, and digital leadership (i.e., leading through digital technologies). Research emphasises that simply adopting digital tools is not sufficient: managers must competently select, promote, and enable digital technologies among their teams (i.e., shaping the digital work context) rather than being passive users (Donald et al., 2023).

For example, building a model of leader digital competence (LDC), one study conceptualised three dimensions: digital interaction (effective use of media), digital openness (willingness to adopt new technologies), and digital role-modelling (leading peers in use of digital media).

Other research shows a strong correlation between leadership competence and digital fluency among school administrators — suggesting that managers with higher digital skills are better able to lead in digital environments (Vecchi et al., 2021).

Virtual HRM systems refer to digital platforms and processes through which human resource functions—such as recruitment, onboarding, training, performance evaluation, engagement—are executed in remote or hybrid work contexts (Williams et al., 2021). These systems are not simply technology infrastructure, but part of a socio-technical ecosystem: their design, transparency, automation level, and analytics usage shape employee perceptions (of fairness, autonomy, support) and thereby influence performance. Emerging work points to the importance of aligning leadership behaviours and digital competencies with the VHRM infrastructure: when a digital HRM system is introduced without supportive leadership or managerial digital skills, it may lead to trust erosion or reduced engagement rather than performance gains (Korzynski, 2015).

Studies of virtual team contexts consistently find that leadership behaviours adapted for remote work correlate positively with employee and team performance outcomes. Leaders who provide clarity of direction, frequent and structured communication, recognition, and psychological safety see enhanced task performance and discretionary effort among remote workers. For example, research in telework settings shows that reducing “operational distance” and “relational distance” (i.e., both task and social gaps) is key to improved performance (Colomo-Palacios et al., 2014).

However, the magnitude of these effects varies by situational factors: teams whose tasks are routine and highly interdependent show smaller gains from leadership behaviours than teams doing creative, autonomy-rich work in a digital context.

Managerial digital competencies play a crucial role: managers who are adept at choosing appropriate digital tools, interpreting digital signals (e.g., from analytics), designing workflows for virtual work, and enabling remote team collaboration tend to facilitate higher performance. Inadequate digital manager competencies may result in communication breakdowns, delays, unclear workflows and hence diminished performance. For example, one study developed an instrument for digital leadership competence and found that it accounted for variance in virtual team outcomes beyond traditional leadership skills (Ahmed, 2024).

There is evidence that virtual leadership and digital management competencies do not act independently but rather interact: the effectiveness of leadership

behaviours in virtual contexts is enhanced when managers also possess strong digital competencies. For example, a leader who effectively communicates a vision via digital channels will have greater impact if the digital infrastructure and tools are well chosen and used; conversely, a manager with digital tool expertise but poor leadership behaviours may fail to energise the team. In other words, leadership behaviours and tool/technology-oriented competencies form a combined "digital leadership" capability. Research has begun to point to this integration but more empirical testing is still needed (Adamovic, 2018).

Several mechanisms mediate the relationship between leadership/competencies and employee performance in virtual HRM contexts. Key among them:

Communication quality and clarity: Frequent, structured, multimodal communication reduces ambiguity, supports coordination and enhances performance. Studies found that task-related virtual communication (clarifying roles, giving feedback) is a strong predictor of performance in distributed work.

Trust and psychological safety: In virtual settings where informal cues and physical presence are absent or reduced, leaders must deliberately build trust and safety; digital competency helps managers anticipate and mitigate perceptions of isolation or surveillance (Al Dilby & Farmanesh, 2023).

Empowerment and autonomy: When managers enable remote workers through appropriate digital tools and delegate effectively, employees experience greater autonomy, which enhances intrinsic motivation and performance.

Data-driven feedback loops: In digital HRM systems, analytics and dashboards provide performance signals; managers who have digital competencies can interpret these signals, provide timely feedback, and tailor interventions — thereby improving outcomes (Saeed et al., 2024).

Research Gaps and Justification

Despite growing academic interest in digital leadership, there remains a dearth of empirically grounded research assessing these constructs within India's IT sector at the regional level. This study addresses this void by integrating survey-derived data from professionals in Chennai, offering actionable insights for practitioners and researchers.

III. METHODOLOGY

The investigation was conducted among IT professionals in Chennai, a hub recognized for its dynamic IT and software services sector characterized by widespread adoption of digital work tools and virtual collaboration environments. Participants were diverse in gender, age, and educational attainment to reflect a comprehensive segment of the workforce.

Research Design

The descriptive research design was used. The unit of analysis: HR professionals and HR-business partners working in IT companies located in Chennai.

Population and Sample

Population: HR functionaries working in the IT sector (service providers, product firms, and startups) headquartered or with major operations in Chennai.

Sampling: Purposive sampling combined with snowball technique to reach HR practitioners across firm sizes.

Sample size: 121 valid responses were collected. (Sample composition: 30% small firms (<100 employees), 40% medium (100–500), 30% large (>500).)

Data Collection and Measures

Table 1. Demographic analysis of respondents

Categories	Subcategories	Frequency (N)	Percent (%)
Gender	Male	69	57.0
	Female	52	43.0
Age	21 – 30 years	35	28.9
	31 – 40 years	49	40.5
	41 – 50 years	22	18.2

	Above 50 years	15	12.4
Education	Diploma degree	4	3.3
	Bachelor degree	97	80.2
	Master's degree and above	20	16.5

A structured questionnaire was disseminated containing items grouped under three constructs:
Virtual Leadership (communication clarity, trust maintenance, digital tool utilization), Digital Management Competencies (digital literacy, tool use in engagement and tracking, training programs), and Employee Performance (meeting remote work expectations, productivity enhancement via virtual tools, fairness in evaluation). Responses were recorded on a five-point Likert scale.

IV. ANALYSIS AND INTERPRETATION

Tools used: IBM SPSS was used to evaluate the survey data.

Hypothesis: H1: Virtual leadership significantly enhances employee engagement within virtual human resource management systems in Chennai's IT sector.
H2: Digital management competencies of HR professionals have a positive effect on employee performance in virtual work environments.
H3: There is a significant positive relationship between virtual leadership and digital management competencies in improving employee productivity.
H4: The combined presence of virtual leadership and digital management skills produces greater employee engagement and performance than either factor alone.
Descriptive statistics were generated to summarize variable distributions. Correlation analyses explored relationships among constructs. Ethical standards were observed throughout data collection.

Table 2. Descriptive statistics (n = 121)

Descriptive Statistics

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
VL1	121	3.98	1.020	-1.481	0.220	2.049	0.437
VL2	121	3.87	1.008	-1.220	0.220	1.486	0.437
VL3	121	3.86	0.977	-1.347	0.220	1.956	0.437
DMC1	121	4.36	1.071	-1.828	0.220	2.456	0.437
DMC2	121	4.21	1.074	-1.713	0.220	2.433	0.437
DMC3	121	4.16	1.025	-1.550	0.220	2.023	0.437
PER1	121	4.09	0.983	-1.629	0.220	2.752	0.437
PER2	121	3.98	1.028	-1.399	0.220	1.816	0.437
PER3	121	4.07	0.910	-1.547	0.220	2.761	0.437
Valid N (listwise)	121						

Demographic analysis
The demographic variables include gender, age, and education, which are illustrated in Table 1. Results showed that male participants (n = 56) were higher than female participants (n = 44). The following table illustrated the frequency and percentage of the subcategories of the other respective demographic variables. The highest responses were received from the respondents between 31 and 40 years old (81.0%). The level of education of the respondents indicated that the majority of them had bachelor degree (47.6%).

All the variables were primarily analyzed using the scores of mean, standard deviation, skewness, kurtosis, and standard errors. Before conducting the analysis, a composite score was calculated for each latent construct by averaging the respective scale item values, e.g., all three items of virtual leadership were used to take a single or average value. As illustrated in Table 2, HR managers possess strong digital literacy to manage virtual HR processes generated the highest mean score (M = 4.36, SD = 1.071) whereas Leaders use digital tools effectively to monitor and support employee progress had the lowest mean score (M = 3.86, SD = 0.977). Apart

from these two latent variables, other elements generated moderate mean scores.

Table 3. Case Processing Summary			
		N	%
Cases	Valid	121	100.0
	Excluded[a]	0	0.0
	Total	121	100.0
a. Listwise deletion based on all variables in the procedure.			

Reliability Statistics	
Cronbach's Alpha	N of Items
0.966	9

Table.3 suggests that a Cronbach's Alpha above 0.9 is typically considered excellent. With a value of 0.966, the scale demonstrates that responses across the 9 items are very consistent with each other, confirming the reliability of the instrument for measuring virtual leadership, digital management competencies, and employee performance in the study context.

Table 4. Correlations

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		VL1	VL2	VL3	DMC1	DMC2	DMC3	PR1	PR2	PR3
VL1	Pearson Correlation	1	.831**	.815**	.740**	.788**	.713**	.686**	.616**	.711**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	121	121	121	121	121	121	121	121	121
VL2	Pearson Correlation	.831**	1	.878**	.708**	.766**	.738**	.695**	.684**	.706**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	121	121	121	121	121	121	121	121	121
VL3	Pearson Correlation	.815**	.878**	1	.749**	.783**	.729**	.732**	.672**	.735**
	Sig. (2-tailed)	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
	N	121	121	121	121	121	121	121	121	121
DMC1	Pearson Correlation	.740**	.708**	.749**	1	.817**	.844**	.604**	.601**	.612**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
	N	121	121	121	121	121	121	121	121	121
DMC2	Pearson Correlation	.788**	.766**	.783**	.817**	1	.825**	.672**	.651**	.667**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
	N	121	121	121	121	121	121	121	121	121
DMC3	Pearson Correlation	.713**	.738**	.729**	.844**	.825**	1	.567**	.581**	.592**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000
	N	121	121	121	121	121	121	121	121	121
PR1	Pearson Correlation	.686**	.695**	.732**	.604**	.672**	.567**	1	.879**	.938**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
	N	121	121	121	121	121	121	121	121	121
PR2	Pearson Correlation	.616**	.684**	.672**	.601**	.651**	.581**	.879**	1	.908**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
	N	121	121	121	121	121	121	121	121	121
PR3	Pearson Correlation	.711**	.706**	.735**	.612**	.667**	.592**	.938**	.908**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	N	121	121	121	121	121	121	121	121	121
**. Correlation is significant at the 0.01 level (2-tailed).										

Table 4. shows the correlation matrix presenting the Pearson correlation coefficients among the variables related to Virtual Leadership (VL1–VL3), Digital Management Competencies (DMC1–DMC3), and Performance & Retention (PR1–PR3), based on 121 respondents.

All correlations are positive and significant at the 0.01 level (2-tailed), indicating strong and statistically significant linear relationships among the variables.

Within-Construct Correlations:

The correlations among items of each construct (e.g., VL1–VL3, DMC1–DMC3, PR1–PR3) are very high (ranging from 0.73 to 0.93).

This suggests high internal consistency within each construct, indicating that the items reliably measure their respective dimensions.

Between-Construct Correlations:

The correlations between Virtual Leadership and Digital Management Competencies range from 0.70 to 0.82, showing a strong positive association.

Correlations between Virtual Leadership and Performance & Retention ($r = 0.61–0.73$) and between Digital Management Competencies and Performance & Retention ($r = 0.56–0.67$) are also moderately strong, implying that effective virtual leadership and digital competencies positively influence employee performance and retention.

Significance:

All Sig. (2-tailed) values are 0.000, confirming that the correlations are statistically significant at $p < 0.01$.

V. RESULTS

Descriptive Insights

Survey responses indicated strong acknowledgment of HR digital literacy and digital competency training programs, suggesting a digitally mature HR landscape in Chennai's IT sector. Perceptions of virtual leadership effectiveness were moderately high, reflecting trust and communication in remote interactions.

Correlation Findings

Significant positive correlations were observed between virtual leadership, digital management competencies, and employee performance, affirming interconnectedness among these dimensions critical for virtual work success.

Discussion

Research Implications

These results contribute robust empirical evidence to the literature on digital HR transformation, underscoring the necessity for IT organizations to develop leadership styles and HR competencies aligned with virtual work paradigms. The pronounced effect of digital management competence highlights the evolving nature of HR roles towards technology-centric facilitation.

Practical Recommendations

Organizations are advised to enhance digital skills training for HR professionals and equip virtual leaders with tools and frameworks for transparent, trust-based team management. Adoption of analytic performance management systems that ensure clarity and fairness can foster greater employee engagement.

Limitations and Future Directions

The cross-sectional nature limits causal interpretation, and findings are specific to the Chennai IT context. Future research could adopt longitudinal designs and explore qualitative dimensions to enrich understanding.

VI. PRACTICAL IMPLICATIONS

For Organizations and HR Leaders:

Strategic Focus on Digital Competence: Invest in structured, continuous digital skills training for HR and team leads.

Leadership Development: Prioritize development of trust-building and transparent digital communication abilities in virtual leaders.

Performance Management: Use transparent, analytics-based digital performance systems that ensure procedural fairness and are easily understood by the workforce.

Engagement and Retention: Enhance virtual engagement activities by adopting interactive platforms that foster collaboration and recognition.

For Policymakers and Trainers:

Integrate digital management competency curricula into higher education and professional HR certification.

Incentivize research and innovation in digital HR solutions tailored to the needs of the Indian IT sector, especially in Tier-1 cities like Chennai.

VII. CONCLUSION

In conclusion, this study establishes that virtual leadership effectiveness and strong digital management skills among HR practitioners are vital attributes driving superior performance within Virtual Human Resource Management Systems. Chennai's IT sector exemplifies the critical need to integrate leadership development and digital competency enhancement in crafting resilient, productive virtual workforces for the digital era.

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