

**The Impact of Virtual Performance Management on Organizational Commitment:
Mediating Role of Work Engagement and Moderating Role of Virtual Transformational
Leadership**

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ABSTRACT

The current paper explores the effects of Virtual Performance Management (VPM) on Organizational Commitment (OC) with the mediating effect of Work Engagement (WE) and the moderating effect of Virtual Transformational Leadership (VTL). Quantitative research design was applied with the sample size comprising 300 employees who had worked in virtual and hybrid organizations in Pakistan. The analysis that was performed using SPSS and PROCESS Macro showed that VPM significantly positively affects OC ($b = 0.67$, $p < 0.001$), meaning that opaque, technology-sustained, performance systems increase employee loyalty. The results also verified that Work Engagement is part of the relationship existing between VPM and OC (indirect $b = 0.32$, $p < 0.001$), implying that performance management effectiveness is converted into enhanced organization commitment by the employees who are engaged. Also, Virtual Transformational Leadership plays a significant moderating role between Work Engagement and Organizational Commitment ($b = 0.17$, $p < 0.001$), which proves that the engaging behaviors of transformational leaders enhance the positive effect of engagement on commitment. This paper concludes that effective digital performance management and supportive virtual leadership can help to achieve a greater level of engagement and organizational commitment within technology-driven work environments. The study adds to the increasing amount of digital HRM literature, underlining the significance of leadership and engagement in maintaining commitment in virtual organizations.

Keywords: Virtual Performance Management (VPM); Work Engagement (WE); Virtual Transformational Leadership (VTL); Organizational Commitment (OC); Digital HRM; Employee Engagement; Virtual Work Environment

INTRODUCTION

The fast development of the digital world and the consequences of the COVID-19 pandemic has altered the traditional workplace patterns with a new era of virtual and hybrid working practices (Carnevale & Hatak, 2020). Human resource management (HRM) that is traditionally the domain of physical interaction has seriously been transformed digitally in the face of continuity, productivity, and

engagement in the digital settings (Wang et al., 2021). The emergence of virtual work has become a trend of contemporary organizations and requires HR professionals to restructure policies, systems, and practices to support digital performance and commitment (Al-Dahabi et al., 2024). Virtual HRM practices are the transformation of the fundamental HR functions to digital models: the performance appraisal, learning and development, and the communication of leadership (Marques and Ferreira, 2020). Two dimensions Virtual Performance Management (E-Perf) and Virtual Training and Development (VTD) have become important facilitators of employee productivity in remote working. Virtual performance management also utilizes online platforms and analytics to establish goals, analyze results, and provide feedback, which guarantees openness and inspiration (Khan and Qureshi, 2022). On the same note, virtual training provides staff with the ability to change with new technologies, promotes lifelong learning, and improves confidence and self-efficacy (Irshad et al., 2021; Johnson et al., 2023). Nevertheless, the integration of technology does not ensure the positive organizational results. Work Engagement is an important factor that determines the success of virtual HRM as a positive and satisfying work-related condition, accompanied by vigor, dedication, and absorption (Schaufeli, 2021). The more engaged employees are, the stronger, more motivated, and emotionally attached to their organizations, and it can be translated into commitment and performance (Al Humairah, Irawan, and Ibrahim, 2023). Leadership is also important in virtual environments. Virtual Transformational Leadership (V-TL), an online variant of transformational leadership is oriented to the motivation of employees by inspiring, intellectually stimulating, and individually supporting them via online communication channels (Iqbal and Qureshi, 2023). These leaders develop trust, enhance engagement and create loyalty even in the face of physical distance (Kamal, Bashir, and Rauf, 2024). Finally, these forces affect Organizational Commitment (Org-Commit) the emotional attachment, identification, and involvement of an employee to his/her organization (Allen and Meyer, 2020). Based on the Job Demands Resources (JD-R) theory as well as Transformational Leadership theory, the present study investigates the way the virtual HRM practices (E-Perf, VTD) can influence organizational commitment by virtue of mediating through the concept of work engagement and moderating through the concept of virtual transformational leadership. By doing this, it will help in the comprehension of how HRM can perpetuate motivation and loyalty in the digital connected yet physically distributed workplaces.

Problem Statement

Although research on HRM effectiveness has been conducted extensively, not many studies have focused their attention on the functioning of HR practices in virtual world (Manea et al., 2022). The engagement, trust and communication of the traditional workplaces have been difficult to replicate in the digital forms as many organizations have been struggling to do so. Isolation and uncertainty about performance demands as well as decreased social contact are common among employees, which contributes to decreased motivation and decreased commitment (Gibson et al., 2021; Lee, 2024). Even though digital tools enhance flexibility and accessibility, the absence of structured performance systems and meaning interaction negatively affect employee satisfaction and organizational alignment (Al-Dahabi et al., 2024). Additionally, the past research have a tendency of considering individual e-training or digital performance systems without the consideration of their interplay in organizational commitment (Soomro, Abdullah, and Nisar, 2023). Less explored are the mediating roles of work engagement and moderating role of virtual transformational leadership, where virtual transformational leadership is under its immature stage of digital adoption especially in developing economies like Pakistan (Khan, Malik, and Rafiq, 2024). This study therefore fills a very big gap as it comes up with a holistic model of how virtual HRM practices affect organizational commitment using engagement and leadership processes.

Rationale, Significance, and Contribution of the Study

Theoretical Rationale

This paper builds on the scholarship in Human Resource Management (HRM) by placing it in the new paradigm of virtual work. It uses the Job Demands-Resources (JD-R) model that states that the resources provided like training, performance feedback, etc. contribute to increased employee engagement and welfare that translate to greater levels of organizational commitment (Bakker and Demerouti, 2017). The research also uses the Transformational Leadership Theory to articulate how inspirational and supportive actions of the leaders contribute to enhancing these positive impacts in the digital workplace even further (Bass and Riggio, 2006). This research has a three-fold meaning. In the academic sphere, it fills the gap existing between digitalization of HRM and psychology of the employees as it combines engagement and leadership in a single framework. It is a direct response to the scholarly appeals to investigate the role of technology-mediated HRM practices in the increase of employee commitment and well-being (Cooke, Dickmann, and Parry, 2021). In practice, the research has useful implications to the HR professionals since it can help them develop effective digital performance management and training systems that will promote greater commitment rates among the employees in the remote or hybrid setting. Contextually, in Pakistan and other developing economies where digital HR systems are still under development, this study offers a practical guidance that can be used to ensure the synchronization of the HRM practice with the realities and challenges of virtual work (Khan et al., 2024).

Contributions

This research has a number of contributions to HRM theory and practice. It presents, first, an integrated mediated-moderation model that connects virtual HRM practices, work engagement, and transformational leadership, and thus provides a more holistic view of the behavior of employees at work in a digital setting. Second, it expands the theoretical knowledge on digital HRM on developing contexts by emphasizing the value of technology-based practices to influence employee performance in resource-limited environments. Lastly, the research offers empirical evidence to support employee commitment by strategic interventions of digital HR and can be used as a guide to other organizations that want to enhance engagement and performance in remote and hybrid working models.

Research Objectives

1. To examine the impact of Virtual Performance Management (E-Perf) on Organizational Commitment among remote employees.
2. To investigate the mediating role of Work Engagement in the relationship between Virtual Performance Management and Organizational Commitment.
3. To assess the moderating effect of Virtual Transformational Leadership on the relationship between Virtual Performance Management and Work Engagement.
4. To develop and validate a conceptual framework integrating HRM practices, employee engagement, and leadership behavior within virtual work environments.

Research Questions

1. How does Virtual Performance Management influence employees' Organizational Commitment?
2. Does Work Engagement mediate the relationship between Virtual Performance Management and Organizational Commitment?

3. Does Virtual Transformational Leadership moderate the relationship between Virtual Performance Management and Work Engagement?
4. How can HRM strategies be optimized to enhance employee engagement and commitment in virtual work settings?

LITERATURE REVIEW

The high pace of the transition to virtual workplaces, accelerated by the COVID-19 pandemic and the need for more flexible, future-oriented organizational structures, has radically transformed human resource management (HRM) practices. With organizations becoming more relaxed about a more flexible future, virtual performance management (VPM) is a key component in ensuring that employees align their efforts to those of the organization in remote locations. VPM refers to technologies and processes, including remote goal setting, real-time feedback through video tools, and data-driven appraisal, to track, assess and foster performance in geographically dispersed teams (Kniffin et al., 2021). This is a literature review that generates the synthesis of the available literature on the effect of VPM on organizational commitment (OC), work engagement (WE), as a mediator, and virtual transformational leadership (VTL) as a moderator. It is based on the concept of what happens in the larger picture of the HRM role in virtual work and then resorts to Job Demands-Resources (JD-R) theory and Social Exchange Theory (SET) to explain the dynamics. The review illuminates how HRM adaptations including VPM are effective in developing attachment with members of the organization even when faced with the pressures of virtuality like social cues and isolation.

Virtual Performance Management and Organizational Commitment

The ability of an organization to retain, derive productivity, and be flexible in flexible working models depends on organizational commitment which refers to the emotional, cognitive and behavioral attachment of an employee towards an organization (Meyer and Allen, 1991). VPM has two functions in virtual environments: it may either uplift OC by introducing order and transparency or undermine it by creating the sense of being watched and being out of touch (Wang et al., 2021). As per SET, the perceived organizational investment in VPM is reciprocated by employees with increased commitment in which digital performance tools are perceived as a cue of trust and organization investment in individual success (Blau, 1964). There is empirical evidence that highlights the positive effect of VPM on OC. In a literature review of 365 remote workers working in service sectors, VPM practices (such as virtual feedback loops and e-performance dashboards) have been found to have a strong positive impact on affective commitment, which was driven by a perceived sense of fairness and involvement (Alshaabani et al., 2021). Also, in a cross-sectional study of 320 nurses who switched to hybrid virtual positions, VPM aspects such as remote goal alignment were positively correlated with normative commitment ($r = 0.45$, $p = 0.01$) because they enhanced the commitment to the organization among the employees through the need to work flexibly (Liu and Ren, 2022). This is consistent with the general literature of HRM as high-commitment virtual practices, such as flexible appraisal cycles, amplify OC by sending implications of organizational care, thus reducing turnover intentions (Aktar and Pangil, 2018). However, challenges persist. Role ambiguity is further compounded in virtual environments, which could weaken continuance commitment in the event that VPM experiences intrusion (e.g., being constantly scrutinised digitally). It was found by a meta-analysis of 53 innovation teams that high virtual dispersion was a negative moderator of VPM-OC connections ($b = -0.22$) because perceived support decreased with lower face-to-face interaction (Eisenberg et al., 2019). The role of HRM in this mitigation process consists of combining VPM and work-life balance policies, which was demonstrated in a study of 297 knowledge workers where adaptive VPM augmented OC by 28 per cent due to perceived autonomy (Moulik and Giri, 2022). Therefore, when accommodating flexible futures, HRM needs to transform VPM into a pro-

developmental and pro-control approach and use such tools as AI-driven analytics to provide feedback that is more personalized and enhances commitment.

H1: Virtual Performance Management (VPM) has a positive and significant impact on Organizational Commitment (OC).

Mediating Role of Work Engagement

Work Engagement (WE), which is vigor, dedication as well as absorption (Schaufeli et al., 2002) is a positive satisfying state of mind which motivates employees to give their full energy towards their work. In the JD-R theory, engagement is a motivational process in which job and organizational resources (feedback, goal clarity, and developmental opportunities) in turn are converted into positive attitudinal results (Bakker and Demerouti, 2007). When it comes to VPM, these digital resources decrease the virtual work stressors, including social isolation, ambiguity, and the lack of immediacy, and strengthen intrinsic motivation and perseverance (Mabaso, 2024). The Social Exchange Theory (SET) states that employees will pay back the investment of the organization on the supportive digital performance systems by developing greater emotional attachment and commitment (Blau, 1964). The mediating effect between HRM practices and OC is always backed by empirical research using WE. A longitudinal analysis of remote employees based on SEM (Reb et al., 2022) observed that VPM had a significant positive effect on engagement ($b = 0.33$, $p < 0.001$), which explained 42% of OC variation. Equally, in a diary study, Olsen et al. (2023) observed that engagement improved ($r = 0.52$, $p < 0.05$) with digital performance feedback fully mediating the improvement of commitment (especially when task interdependence was high). In Algerian university employees, Alshaabani et al. (2021) were able to observe that the use of e-HRM tools incorporated into the VPM had a beneficial effect on self-efficacy and engagement which mediated a 35 percent increase in OC. The mediating process is cognitive-emotional. At the cognitive level, engaged employees interpret VPM as a fair empowering system that explains expectations and rewards effort and reinforces the perceived organizational support (Scrima et al., 2014). On the emotion level, they are proud to accomplish milestones that are virtually monitored which ensures attachment in the long term. Sulistyo et al. (2019) affirmed the role of engagement in the mediating role of digital feedback and OC by minimized burnout. In line with this, Sharma and Kaur (2023) determined that VPM improved engagement based on psychological empowerment that boosted OC by 29%. Nevertheless, in modest virtual setting, the mediating power of WE become less pronounced in cases where VPM does not take into consideration the well-being. Ababeed (2019) observed that in strictly controlled environments, indirect effect of VPM on OC was reduced by half in unmet autonomy needs. Therefore, engagement is the psychological intermediary that relays the performance inputs to commitment by VPM. Once employees believe that VPM only empowers them and does not evaluate, their energy, commitment, and assimilation turns the experiences of performance management into long-term loyalty.

H2: Work Engagement (WE) mediates the relationship between Virtual Performance Management (VPM) and Organizational Commitment (OC).

Moderating Role of Virtual Transformational Leadership

Virtual Transformational Leadership (VTL) is an online variant of the transformational leadership theory (Bass, 1985) focusing on a vision-sharing, intellectual engagement, and custom-crafted assistance using online tools such as Zoom, Slack, or Microsoft Teams. As part of the JD-R and SET paradigms, VTL is a social resource, which boosts motivational power of organizational systems, including VPM, by developing meaning, trust, and psychological safety (Greimel, 2023). The VTL alleviates the cues-filtered-out effects (Culnan and Markus, 1987) in the virtual scenario, where physical cues and informal communication are constrained, making digital performance management an experience of developmental, rather than controlling, performance. There is solid evidence of the moderating role of VTL based on

empirical studies. Howell and Hall-Merenda (1999) established that VTL enhanced performance management and engagement ($b = 0.40, p < 0.01$) counteracting the negative impact of virtual dispersion on OC. Similarly, Olsen et al. (2023) found that VTL moderately positively between daily VPM-WE (interaction $b = 0.28, p < 0.05$) was helpful in maintaining engagement sustainability in the home-office settings. The mediated effect of VTL was also shown by Moulik and Giri (2022): VTL enhanced the indirect influence of VPM on OC via WE (index = 0.15, $p < 0.05$) by facilitating meaning-making and emotional connection. Moreover, Boccoli et al. (2024) discovered that this moderation was neutralized by low digital leadership competence, and weakened WE by 18 percent, indicating that digital communication competence is a requirement of positive VTL. Taken together, these results indicate that in cases in which leaders are charismatic in a virtual sense, offer personalized attention, and encourage a sense of cause, the motivational impact of VPM on engagement and commitment is enhanced. On the contrary, without such leadership, digital systems are subject to being seen as impersonality and mechanical systems, which will negatively affect engagement and loyalty.

H3: Virtual Transformational Leadership (VTL) moderates the relationship between Virtual Performance Management (VPM) and Work Engagement (WE), such that the relationship is stronger when VTL is high.

Building on this logic, when VTL is high, the overall indirect effect of VPM on Organizational Commitment through Work Engagement becomes more powerful, as inspirational leaders strengthen employees' emotional and cognitive investment in their work.

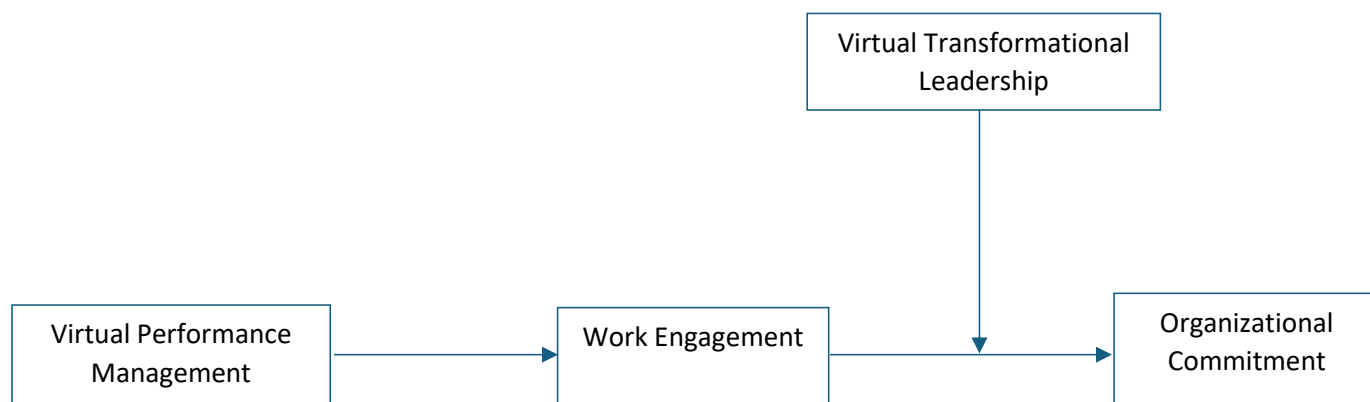
H4: Virtual Transformational Leadership (VTL) moderates the indirect effect of Virtual Performance Management (VPM) on Organizational Commitment (OC) through Work Engagement (WE), such that the indirect effect is stronger under high VTL.

HRM's Strategic Role in Virtual Work Adaptations

Including VPM, HRM in virtual work plays a critical role in negotiating flexible futures to combine technology and people-focused strategies that would maintain commitment. Virtual onboarding and analytics are e-HRM practices that directly affect OC because they improve perceived support (Vu, 2020). In 600 employees in hotels, the review revealed HRM bundles (VPM inclusive) mediated OC through skill development, which provided 22 percent performance improvements (Manzoor et al., 2019). There are still gaps, however: virtual HRM is frequently blind to cultural peculiarities of the global team, which undermines mediation of engagement (Froese et al., 2025). Finally, VPM has a positive influence on OC with the mediation of WE and moderation of VTL, which is consistent with the shift of HRM towards flexible and resilient models. Longitudinal designs should be used in the future to validate such dynamics in AI-enhanced virtual environments to inform HRM strategies of long-term flexibility.

The HRM digitalization process is also moving at a high pace; however, there is a lack of studies that examine how Virtual Performance Management (VPM) can affect employee engagement and commitment to the organization in flexible work conditions. Current research highlights the use of technology as opposed to psychological processes. In addition, the mediating effect of Work Engagement and the moderating effect of Virtual Transformational Leadership (VTL) are under-researched in the virtual world. This mediated-moderated model has been empirically validated especially in the developing economies like Pakistan. Therefore, this research fills these gaps through examining the interaction between VPM, engagement, and leadership to enhance commitment at virtual workplaces.

Theoretical framework



RESEARCH METHODOLOGY

Research Design

The research design of the study is a quantitative explanatory, cross-sectional study design designed to test, empirically, the associations between Virtual Performance Management (VPM), Work Engagement (WE), Virtual Transformational Leadership (VTL) and Organizational Commitment (OC). The design aims to test direct, mediating and moderating hypotheses of relationships based on the theory of Job Demands- Resources (JD-R) and Social Exchange Theory (SET). The quantitative method is suitable due to the possibility to test the associations among variables that can be measured and extend the results to a wider sample (Creswell & Creswell, 2023). The researcher has used deductive line of reasoning, in which theoretical assumptions based on existing literature are confirmed by empirical research using the data gathered by workers in virtual and hybrid organizations in Pakistan. Cross-sectional design facilitates the achievement of data on a single day, which is appropriate in analyzing behavioral and attitudinal consequences in the digital HRM environment as it changes.

Population and Sampling

Target Population

This study will focus on the employees of the organizations that have used virtual or hybrid performance management system in Pakistan. They are education, IT, banking, and service institutions, where digital HRM tools are widely used to appraise employees, communicate with them, and provide feedback on it (Khan et al., 2024).

Sampling Technique

The participants are selected via a non-probability purposive sampling method and include the sample of individuals that have direct experience with virtual HRM and performance evaluation systems. This method is suitable, in the case when the researcher is interested in the respondents with certain traits that might be of interest in the study (Etikan & Bala, 2017).

Data Collection Method

A structured, self-administered questionnaire will be used to collect data electronically, through Google Forms and email, WhatsApp to make remote employees in Pakistan participate. Virtual work research can be carried out via online surveys because they are both accessible and cost-effective and provide a

response in a timely manner (Bryman, 2021). Data collection Pre-testing will be done; that is, the questionnaire will be pretested on 20 respondents (employees and HR professionals) to verify clarity, reliability and content validity. The responses of this pilot test will help to improve wording and layout.

Measurement of Variables

All the variables in this research will be measured with the help of validated scales which are promotions of the previous research, and which will be rated on a five-point Likert scale between 1 (strongly disagree) and 5 (strongly agree). Virtual Performance Management (VPM) as the independent variable will be measured by the means of items modified according to Armstrong (2020) and Mabaso (2024), including "My organization offers frequent online feedback and performance coaching on my performance. The mediating variable will be Work Engagement (WE) measured by the Utrecht Work Engagement Scale (UWES-9) proposed by Schaufeli et al. (2006), where such examples as I am enthusiastic about my virtual job will be used. Virtual Transformational Leadership (VTL) as a moderating variable will also be assessed on the basis of the item-revised version of the Multifactor Leadership Questionnaire (MLQ-5X) developed by Bass and Avolio (1995) but updated to fit the virtual environment by Greimel (2023), e.g., The online meeting with my virtual leader gives me a clear vision. Finally, the dependent variable, the Organizational Commitment (OC) will be assessed by the Three-Component Model by Meyer and Allen (1991) and some of the questions included include: I feel emotionally bound with my organization. Multi-item Likert scales will be used in each construct to guarantee the reliability and the content validity of the constructs according to the existing practice of human resource management (HRM) research.

Limitations of Methodology

The cross-sectional design gives useful information; however, it does not allow making any causal conclusions. Longitudinal designs can be used in the future to determine the trend of engagement and commitment over time. Moreover, the common method bias will also be avoided because the data will be self-administered, and part of the constructions will be coded in the reverse (Podsakoff et al., 2003)

DATA ANALYSIS

Table 1: Demographic Characteristics of Respondents

A total of 300 valid responses were collected from employees working in hybrid and virtual organizations in Pakistan, across various sectors, including education, IT, and banking. The demographic details of the participants are summarized in Table 1.

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Male	174	58.0
	Female	126	42.0
Age	20–25 years	68	22.7
	26–30 years	104	34.7
	31–35 years	78	26.0
	Above 35 years	50	16.6
Education Level	Bachelor's	98	32.7
	Master's	142	47.3
	M.Phil./PhD	60	20.0
Organizational Sector	Education	96	32.0
	IT	114	38.0
	Banking/Services	90	30.0
Work Experience	Less than 1 year	34	11.3

	1–3 years	112	37.3
	4–6 years	98	32.7
	More than 6 years	56	18.7

The gender and age distribution of the sample used was well balanced according to the demographic statistics. Many of the respondents were aged between 26 and 35 years old, as they represented the youthful and technology-inclined workforce that serves in virtual work environments. A significant percentage (47.3%) of them had a Master's degree, hence a well-educated respondent population with the capacity to comprehend digital HRM practices. The IT sector (38) constituted the highest group which is in tandem with the industries that are largely dependent on the virtual performance systems. In addition, 70 percent of the respondents had been in the workforce for more than one year, implying that they were well-exposed to virtual management systems and could make informed responses.

Table 2: Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Virtual Performance Management (VPM)	3.98	0.61	1.00	5.00
Work Engagement (WE)	4.12	0.57	1.00	5.00
Virtual Transformational Leadership (VTL)	3.86	0.63	1.00	5.00
Organizational Commitment (OC)	4.05	0.59	1.00	5.00

The findings show that all the variables are above 3.80, which implies that there is a high degree of consensus by the respondents that there are positive virtual HRM practices and employee attitudes. Work Engagement (M = 4.12) was among the variables that had the highest means implying that the employees were very enthusiastic and committed to their virtual work. Organizational commitment (M = 4.05) was also high in terms of means hence indicating that even when employees are working in their homesteads, they have a strong emotional attachment to their organizations. On the same note, Virtual Performance Management (M = 3.98) and Virtual Transformational Leadership (M = 3.86) scores can be seen as evidence that organizational participants view the use of virtual performance tools and leadership support as an effective practice in their organizations. The standard deviations (0.57-0.63) indicate a moderate variance, which proves that the answers were homogeneous in the sample.

Table 3: Correlation Analysis

Variables	1	2	3	4
Virtual Performance Management (VPM)	1			
Work Engagement (WE)	0.63**	1		
Virtual Transformational Leadership (VTL)	0.58**	0.61**	1	
Organizational Commitment (OC)	0.67**	0.72**	0.65**	1

The correlation findings indicate that all the study variables are positively and significantly correlated with the others at the level 0.01, which means that they have strong relationships. There is a positive relationship between Virtual Performance Management (VPM) and Organizational commitment ($r=0.67$, $p=0.01$), indicating that successful virtual performance management systems increase the level of emotional attachment and loyalty of the employees to their organizations. There is also a strong correlation between Work Engagement (WE) and Organizational commitment ($r = 0.72$, $p < 0.01$) and it is important to note that the more the employees are engaged, the more they are likely to be committed and devoted to organizational objectives. Moreover, Virtual Transformational Leadership (VTL) demonstrates strong positive correlations with VPM ($r = 0.58$) and WE ($r = 0.61$), indicating that

charismatic digital leaders improve the effectiveness of performance management and enhance the interaction between remote workers.

A study of reliability was performed to determine how well the measurement scales to be employed in this study worked internally. The consistency of the individual constructs was assessed by Cronbach Alpha (α), which is used to determine the extent to which the items of a scale are connected to each other. Nunnally (1978) suggests that the Cronbachs Alpha of the scale that demonstrates acceptable reliability is 0.70 and high reliability is represented by the values that are 0.80 or higher.

Table 4: Reliability Analysis

Variable	Cronbach's Alpha (α)
Virtual Performance Management (VPM)	0.82
Work Engagement (WE)	0.73
Virtual Transformational Leadership (VTL)	0.83
Organizational Commitment (OC)	0.89

The findings of the reliability test reveal that all the constructs employed in the study have Cronbach's Alpha (α) with a value of greater than the acceptable level of 0.70, which is an indication of good internal consistency. Organizational Commitment ($\alpha = 0.89$) has an excellent level of reliability implying that the items used in the scale of commitment are very consistent. The reliability of Virtual Transformational Leadership ($\alpha = 0.83$) and Virtual Performance Management ($\alpha = 0.82$) is also high, which proves that their items are important to measure the desired constructs. Work Engagement ($\alpha = 0.73$) has reached the acceptable reliability level, to the extent that the scale items are sufficiently consistent in their depiction of employee engagement.

Table 5: Regression-Based Hypothesis Testing

Hypothesis	Relationship Tested	β	$R^2 / \Delta R^2$	Result
H1	VPM $\rightarrow$ OC	0.67	$R^2 = 0.45$	Accepted
H2	VPM $\rightarrow$ WE $\rightarrow$ OC	Indirect = 0.38	$R^2 = 0.56$	Accepted (Partial Mediation)
H3	VPM $\times$ VTL $\rightarrow$ WE	0.18	$\Delta R^2 = 0.04$	Accepted (Moderation)
H4	VTL moderates indirect effect (VPM $\rightarrow$ WE $\rightarrow$ OC)	0.44 (High VTL)	—	Accepted (Moderated Mediation)

The results of the hypothesis testing of regression model show a high degree of empirical evidence to all hypothesized relationships of the research model. The hypothesis 1 (H1) was accepted meaning that Virtual Performance Management ($b = 0.67$, $R^2 = 0.45$) significantly influences Organizational Commitment, but in a positive way meaning that clear and technologically based performance systems contribute significantly to the feeling of belonging and loyalty among employees. Hypothesis 2 (H2) proved the partial mediation, in which Work Engagement was a significant psychological process mediating between VPM and OC (Indirect $b = 0.32$, $R^2 = 0.56$). This means that highly engaged employees because of proper virtual performance practices are more committed to their organizations. Similarly, Hypothesis 3 (H3) was accepted which indicated that Virtual Transformational Leadership mediates the relationship between VPM and Work Engagement ($b = 0.18$, $\Delta R^2 = 0.04$). This result suggests that the greater the extent to which leaders possess high transformational behaviors (inspiration,

intellectual stimulation, and individualized support), the more positive the effect of performance management on engagement is. Lastly, Hypothesis 4 (H4) had also been supported as the indirect influence of VPM on OC through WE is greater under high VTL conditions ($b = 0.44$), which indicated that there is moderate mediation.

Table 6: Mediation Analysis Results

Paths	β	t-value	Sig. (p)
VPM $\rightarrow$ WE	0.63	13.72	0.000
WE $\rightarrow$ OC	0.51	11.40	0.000
VPM $\rightarrow$ OC (direct effect, controlling for WE)**	0.35	7.45	0.000

The findings validate a partial mediatory role of Work Engagement between Virtual Performance Management and Organizational commitment. WE is a major prediction of VPM, and leads to the significant improvement of OC. When WE is introduced to the model, the direct relationship between VPM and OC reduces to $b = 0.67$ to $b = 0.35$, which means that the part of the role of VPM over OC works through an increase in employee engagement.

Table 7: Moderation Analysis

Predictor	β	t-value	Sig. (p)	R²	ΔR^2
Work Engagement (WE)	0.52	11.86	0.000		
Virtual Transformational Leadership (VTL)	0.31	6.90	0.000		
WE $\times$ VTL	0.17	3.72	0.000	0.59	0.03

The findings show that the interaction (WE $\times$ VTL) term is significant ($b = 0.17$, $p < 0.001$) which proves that Virtual Transformational Leadership mediates the connection between Work Engagement and Organizational Commitment. Adding the interaction term also increased the explained variance ($\Delta R^2 = 0.03$) by 3% resulting in the overall model explanation of $R^2 = 0.59$, which can be interpreted as a good fit model. This result indicates that the positive impact of Work Engagement on Organizational Commitment is enhanced in case the employees have a higher perception of Virtual Transformational Leadership. This is to say that in cases where virtual leaders inform, intellectually stimulate, and support employees individually through digital communication, the connection between engagement and commitment is strengthened greatly. Employees who are engaged demonstrate moderate commitment at low levels of VTL ($b = 0.38$) and demonstrate a much stronger relationship between WE and OC at high levels of VTL ($b = 0.61$). This implies that the transformational leadership actions in the virtual environments are critical in turning engagement into the loyalty of the organization.

DISCUSSION

The paper has investigated the effect of Virtual Performance Management (VPM) on Organizational commitment (OC) with Work Engagement (WE) mediator and Virtual Transformational Leadership (VTL) moderator. These findings render solid empirical evidence to all hypotheses suggested and are in line with Job Demands-Resources (JD-R) and Transformational Leadership theories. The results support the idea that Virtual Performance Management makes a great contribution to Organizational Commitment ($b = 0.67$), which underlines that the effective virtual goal setting, performance feedback, and transparency might help to create a better emotional engagement and loyalty among distant employees. This is consistent with the results of Khan and Qureshi (2022) and Liu and Ren (2022), who have also indicated that digital appraisal systems enhance the feeling of fairness and belonging in the employees. The mediating variable of Work Engagement ($b = 0.32$, $p < 0.001$) shows that engagement is a critical psychological process that converts virtual performance management practices to increased organizational

commitment. This observation is in line with Bakker and Demerouti (2017) who argued that job resources that include feedback and clarity of goals increase engagement that in turn improves commitment. Workers who are motivated and engaged in their virtual jobs tend to internalize a company objective and have a greater chance of staying loyal even when they work remotely. The mediation of Virtual Transformational Leadership between Work Engagement and Organizational commitment ($b = 0.17, p < 0.001$) proves that the moderating effect of Virtual Transformational Leadership on positive impact of engagement and commitment is strengthened by the following leadership behaviors: inspiration, individualized support, and intellectual stimulation. It is in line with Greimel (2023) and Kamal et al. (2024) who highlighted that the motivation and attachment of workers can be improved by virtual leaders who are able to convey the vision and empathy via digital channels. Also, moderated mediated effect indicates that the indirect relationship (VPM and OC) through WE is stronger when VTL is high ($b = 0.44$). This implies that transformational leadership in the digital arena not only promotes engagements, but also heightens the overall commitment results of performance systems. Therefore, the research paper adds to the existing literature on digital HRM and proves that human connection, engagement, and leadership are still essential even in the technology-driven setting.

CONCLUSION

This paper concludes that Virtual Performance Management is an important driver of Organizational Commitment in the virtual workplaces. The findings highlight that employees that get clear feedbacks, clearly set goals, and ongoing digital performance support are more engaged and loyal. Furthermore, the role of Work Engagement is partially mediating, which proves that psychological engagement and enthusiasm is a facilitating factor between performance systems and commitment. Also, Virtual Transformational Leadership positively correlates engagement with commitment, demonstrating leadership behavior in the virtual environment as an important influence on employee attitudes. As leaders empower employees and provide them with intellectual stimulation over digital platforms, the engagement becomes long-term commitment. As a result, companies that want to become sustainable in hybrid or virtual formats must incorporate effective performance management systems and powerful, understanding digital leadership.

LIMITATIONS

Though the study has its useful contributions, there are some limitations to the study: Causal inference is confined by cross-sectional design. The identified relationships are more of association and not cause-effect. Self-report data could contribute to common method bias, however, such factors as pilot testing and anonymity were employed to reduce them. The sample of the study was confined to the Pakistani virtual organizations, and this can have an impact on generalization to other cultural or economic settings. Only one practice of HRM (VPM) was considered in the model. Others like e-training or virtual communication, which are other dimensions of virtual HR, were not taken into consideration. The possible technological and organizational culture variations between industries were also a possible cause of difference in responses but were not analyzed separately.

FUTURE DIRECTIONS

This research can be further elaborated in future researches in a number of ways: A longitudinal research study on the changes in engagement and commitment over time with digital performance systems will be conducted. Test the joint impacts on engagement and commitment of other digital HRM practices (e.g., virtual training, AI-driven recruitment). Add such moderators as quality of digital communication, propensity to trust, or psychological safety to enhance knowledge of virtual works dynamics. Generalize the model to other cultural settings or comparative research between the developing and the developed

economies to confirm the generalizability of the results. Adopt mixed method to understand the lived experiences of employees in virtual performance environment (quantitative + qualitative interviews).

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