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Remote Work Barriers and Their Impact on IT Industry of Pakistan

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ABSTRACT

This study aims at investigating the role of technological, organizational, environmental and psychosocial barriers on the engagement and sustainability of remote work among IT professionals in Pakistan, and at the same time explore the mediation role of remote work engagement and the moderation role of digital self-efficacy. The quantitative research design with cross-sectional type was applied and data were collected using a structured questionnaire with 302 respondents. Reliability tests, correlation, regression, mediation and moderation were used in analyzing the data. The results showed that when all four categories of barriers were taken into account, there were significant and negative relationships between organizational/social barriers and remote work engagement. Positive prediction for performance sustainability was achieved from remote work engagement, and organizational barriers showed significant negative association with performance sustainability. The mediation analyses revealed partial mediation for all four barrier categories between the variables and performance sustainability. Moreover, digital self-efficacy positively moderated the relationship between remote work engagement and performance sustainability as well. The study emphasizes the need to address organizational and psychosocial factors, to enhance employee commitment, and to build up digital skills to ensure high sustainable performance in remote and hybrid jobs.

Introduction

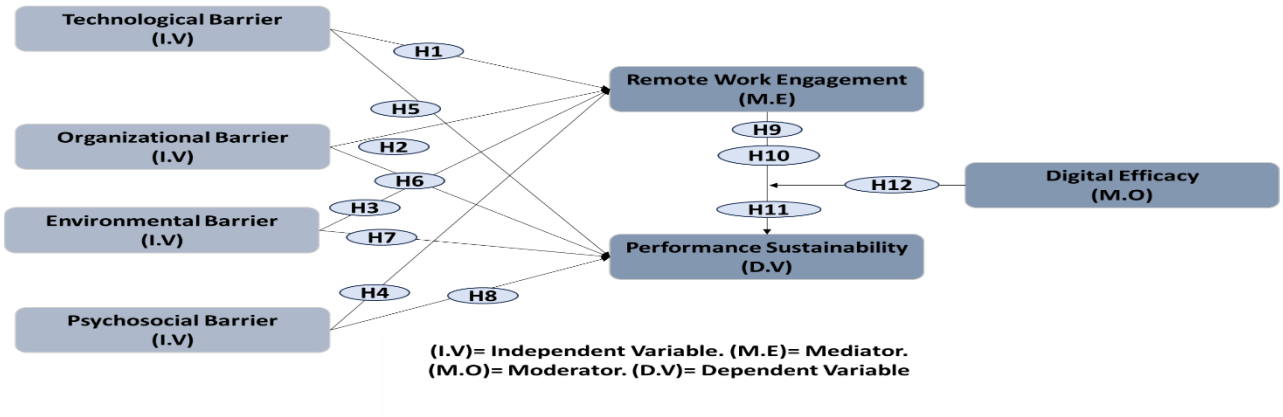
The speed of digitalization of the twenty-first century has revolutionized the way organizations conduct business, as well as their relationship with the workforce (Schildt, 2020). The innovations in information and communication technologies (ICTs), globalization, and the high penetration of digital platforms have made it possible for employees to work from dispersed locations without ever having been as easy (Raghuram et al., 2019). Remote work, which is also referred to as a niche arrangement, has become a standard practice in organizations in industries (Messenger, 2019). The move towards flexible and hybrid, as well as completely virtual work arrangements, has been mostly driven by the organizational demands to stay competitive, cut down on the operational expenses, and gain access into a wider talent pool (Froese et al., 2025).

The COVID-19 crisis enhanced a shift to the remote work on a global scale (Ng et al., 2021). The International Labor Organization (2021) indicates that over 557 million workers across the globe have been transitioned to remote work at the height of the pandemic, which is the greatest movement of workers in the modern world (Institute for U.S. and Canadian Studies at the Russian Academy of Sciences & Petrovskaya, 2024). Remote work is still being adopted in the post-pandemic era as a business continuity strategy, talent retention and employee satisfaction tool (Bayelsa State Polytechnic, Aleibiri. Bayelsa State, Nigeria et al., 2025). Studies offer evidence that firms that pursue a long-term remote or hybrid model have greater agility, can tap into global skills, and have fewer turnover expenses (Shinde, 2025). This has caused remote work to cease to be an emergency solution, but a component of modern work design.

The productivity of employees is still at the heart of performance, innovation and competitive advantage of an organization. Various structural and psychological factors that influence productivity are identified in remote and hybrid environments, among them being the effectiveness of communication, digital competence, autonomy, collaboration processes, and organizational culture (Waizenegger et al., 2020). Although remote work allows employees to have more flexibility in their time and less stress related to commuting, it needs a high degree of self-discipline, digital literacy, and coordination.

Empirical research results have mixed findings on productivity in remote environments. Other studies indicate productivity improvements, as fewer people interfere with one another in the workplace, people have more autonomy, and work-life integration (Bloom et al., 2015; Choudhury et al., 2020). Conversely, other studies can show that distance working can reduce productivity if the workers suffer from communication delays, failures of the technology or from not receiving any support from the management (Sull et al., 2022). The results seem contradictory and suggest that the productivity of remote working largely relies on contextual factors, such as the preparedness of the organization, information technologies, job designation and the psychological comfort of the workers.

Theoretical Framework



Literature review

In the past few years, the IT industry in Pakistan had been booming and became a big exporter and provider of digital jobs in recent years (Mujahid, 2002). With the COVID-19 pandemic, the remote working trend has increased even more, particularly for software developers, freelancers, and IT service providers (Ng et al., 2021). This shift helped organizations to continue with operations and reach foreign markets. But Pakistan was not experiencing the same structural issues as the developed economies. Poor infrastructure, including the unreliability of internet access and power outages posed barriers to successful remote work (PTA, 2022). Organizational preparedness was also unbalanced with most companies not having formal remote work policies, digital management systems, and training systems. Despite these restrictions, the remote work had its benefits, such as savings, more people could work, and the expansion of freelancing globally (Lisnawati et al., 2025).

Remote Work Barriers

The idea of barriers to working remotely emerged as a multi-dimensional barrier, one that renders one's job performance in the virtual environment inefficient (Prodanova & Kocarev, 2021). Technological barriers included poor Internet connection, a lack of digital tools and cybersecurity threats, and affected working process and efficiency (Venkatesh, Thong, and Xu 2012). A lack of face-to-face interaction caused communication barriers and misunderstandings, delays, and coordination problems in teams. A few

organizational factors were identified that facilitated the process: lack of clarity in expectations and ineffective monitoring systems that led to ambiguity, and reduced motivation of employees (Bartsch et al. 2020). Psychological obstacles (stress, isolation, burnout) had adverse impacts on engagement and well-being, especially in extended remote environments (Oakman et al., 2020). Other environmental factors that interfered with employees' focus and productivity were home distractions and poor working environment (Niebuhr et al. 2022).

Employee Performance

Employee performance was established as how much the individuals were able to perform their job roles and the contribution they made towards the organizational goals (Campbell, 1990). It included several dimensions; task performance that entailed core job responsibilities, and contextual performance that included extra-role actions like collaboration and flexibility (Oniță et al., 2026). In remote employment, the effectiveness of communication, access to technology, self-discipline, and support by a manager were some factors to determine performance. Empirical research suggested remote work had the potential to improve performance due to the presence of more autonomy and a decreased work-related disruption. But other research found that performance had decreased because of challenges in coordination, absence of supervision and mental pressure (Sull et al., 2022).

Sustainability of Performance

Performance sustainability was defined as a capacity of the employees to perform consistently and of high quality during a long period without burnout or exhaustion of the resources (Bakker, Demerouti, and Sanz-Vergel 2023). Sustainability focused on long-term performance, durability and health, unlike short-term productivity. Sustainability was especially relevant in the context of remote work with the heightened use of self-management and digital interactions (Sull et al., 2022). Empirical studies indicated that remote work may produce positive productivity effects at first, but after a long time and without proper support, it would cause fatigue and deteriorating performance (Oakman et al., 2020).

Effect of Remote Work Barriers and Employee Performance

Empirical research had found that there was a strong correlation between worker performance and barriers to remote work. The technological barriers were identified to have a direct negative impact on productivity through distortion of workflow and wasting time on completing tasks (Venkatesh, Thong, and Xu 2012). Communication barriers had an adverse impact on collaborating and decision-making, which resulted in team performance inefficiencies. The factors within organizations related to the lack of motivation and job satisfaction were linked to organizational barriers, especially the absence of managerial support and expectations (Bartsch et al. 2020). The effects of stress and isolation resulted in psychological barriers that further reduced cognitive functioning and engagement, leading to poor performance outcomes (Oakman et al., 2020).

Remote Work Effects on Sustainability in Performance

Remote work was linked to sustainability in performance in a complex way with both facilitating and inhibiting factors. On the other hand, remote working was associated with flexibility, autonomy, integration of work and life, thus resulting in long-term productivity (Choudhury et al., 2020). Conversely, long-term working remotely without proper support resulted in burnout, lack of engagement, and decreasing performance (Oakman et al., 2020). Support to the organization was essential in the sustainability outcomes achieved because good communication structures, managerial instructions and technological assets neutralized the adverse impacts. Research has shown that employees with sufficient support tended to show a stable performance as time went by (Bakker, Demerouti, and Sanz-Vergel 2023). Yet, issues of sustainability continued to exist in the surroundings that had poor infrastructure and organizational practices. Most importantly, the available studies were more concerned with short term productivity and not on long term sustainability. This left a knowledge gap on the relationship between the effects of remote work on performance trajectories in the long term. In the IT organizations where sustained performance was a must, mitigating sustainability issues was important. Thus, the investigation of the long-term effects of remote work was fruitful as it offered insights into how organizations could implement effective remote work systems that were able to sustain employee performance.

Methodology

The methodology of this study is quantitative, positivist and deductive approach to investigate the relationship between remote work challenges and performance sustainability of IT professionals in Pakistan. A cross-sectional, correlational research design is used to explore relationships between remote work barriers, namely communication barriers, technological barriers and work–life balance barriers and sustainable performance. Work engagement and organizational support are also addressed to explore its

possible mediating and/or moderating role. Target population includes IT professionals working in remote/hybrid scenarios in Pakistan including Lahore, Karachi and Islamabad. The sampling method is a non-probability sampling which is a mixture of purposive and convenience sampling to target participants who have relevant experience in remote working. A sample of 300 IT professionals with various job role, educational background and job experience levels are included in the study. Primary data are gathered in a fixed format questionnaire online. It consists of five-point Likert scales for challenges with remote work, performance sustainability, work engagement, and organizational support. Previous studies are used as a basis to create adapted measurement scales to ensure relevance to the research context. Content and face validity are taken into account in the development of the instrument, and a pilot test is carried out to determine the clarity, relevance and reliability of the instrument. Reliability test (Cronbach's-alpha), validity test and screening of missing values, outliers and inconsistencies are used to assess data quality. Frequencies, percentages, means and standard deviations are used to describe the demographic characteristics and study variables. Pearson correlation and multiple regression analysis (where applicable) are used to investigate relationships between the independent and dependent variables and to determine the predictive power of the identified variables on performance sustainability. Further mediation or moderation analyses are suggested to explore the mediating and moderating role of work engagement and organizational support. Appropriate statistical assumptions are checked prior to inferential testing. Ethical principles are upheld during the research process. The participants are given information on the purpose of the study, informed consent is obtained, and participation is voluntary. Confidentiality and anonymity is maintained, data is kept securely and participants are reminded of their right to withdraw without penalty. This methodological approach offers a structured foundation to explore the issues of remote work and sustainable performance of IT professionals in Pakistan.

Results and analysis

Table 01 Response Rate

Questionnaire distributed	Questionnaire received	Excluded Responses	Correct Responses	Response rate (%)
385	308	6	302	80%

Table 2 Respondent profile

Variable	Category	Count	Column N%
Gender	Male	148	49.0
	Female	154	51.0
Age Group	20 or less	6	2.0
	21–30 Years	104	34.4
	31–40 Years	139	46.0
	41–50 Years	40	13.2
	50 Plus	13	4.3
Qualification	Bachelor's Degree	152	50.3
	Master's Degree	97	32.1
	MS/MPhil	41	13.6

	PhD	12	4.0
Job Position	Junior Level	100	33.1
	Mid-Level	129	42.7
	Senior Level	59	19.5
	Top Management	14	4.6
Work Experience	Less than 5 Years	169	56.0
	5–10 Years	104	34.4
	11–15 Years	24	7.9
	More than 15 Years	5	1.7
Working Type	Fully Remote	124	41.1
	Hybrid (Mostly Remote)	82	27.2
	Hybrid (Mostly Office)	62	20.5
	Office-Based	34	11.3
Remote Work Experience	Less than 1 Year	115	38.1
	1–3 Years	142	47.0
	4–6 Years	38	12.6
	More than 6 Years	7	2.3

Table 03 Reliability of Data

Variables	***Cronbach's Alpha***	***N of Items***
TB	0.859	6
OB	0.865	7
EB	0.880	5
PB	0.919	6
RE	0.918	6
DSE	0.873	5
PS	0.932	7

Table 03 show the results of reliability Since every construct achieved a Cronbach's Alpha value well above 0.80, the measurement instrument can be considered highly reliable. Consequently, the questionnaire was deemed appropriate for conducting further statistical analyses, including descriptive statistics, correlation analysis, regression analysis, and moderation analysis.

Table 04 Descriptive Statistic and Correlation

S. #.	Variables	N	Mean	SD	1	2	3	4	5	6	7
1	TB	302	3.198	1.143	1						
2	OB	302	3.276	1.070	0.321**	1					
3	EB	302	3.266	1.174	0.454**	0.423**	1				
4	PB	302	3.322	1.219	0.361**	0.396**	0.210**	1			
5	RE	302	3.283	1.165	-0.636**	-0.795**	-0.688**	-0.748**	1		
6	DSE	302	3.311	1.155	0.739**	0.812**	0.682**	0.669**	-0.643**	1	
7	PS	302	2.482	1.174	-0.682**	-0.790**	-0.713**	-0.709**	0.782**	0.672**	1

**** the Coefficient is highly significant at 0.001 level**

Table 04 show the results of descriptive statistics and correlation analysis of 302 respondents showed that all the study variables are significantly related to each other. There is some variation in the responses given as mean values range from 2.482 (PS) to 3.322 (PB) and standard deviations range from 1.070 to 1.219. Analysis of the correlation shows that TB, OB, EB and PB are found to be positively correlated with DSE while RE and PS are found to be negatively correlated with the above-mentioned variables. The highest positive correlation is found between OB and DSE (r = 0.812), and the highest negative correlation is between OB and RE (r = −0.795). Further, there is positive correlation (r = 0.782) between RE and PS. All values of the correlation reported are significant at the 0.001 level. The results indicate significant correlations between the study variables, but do not imply causality between them, and multicollinearity between the variables needs to be investigated.

Table 05 Simple Regression Coefficients of Predictors on Remote Work Engagement (Outcome)

Variable	Constant	B	Adj.R^2	F	Sig	T	sig
TB	4.746	-.653	.405	204.306	<.001	-14.294	<.001
OB	5.513	-.872	.632	514.217	<.001	-22.676	<.001
EB	4.904	-.688	.474	270.031	<.001	-16.433	<.001
PB	5.047	-.719	.559	380.341	<.001	-19.502	<.001

N=302, ***p<.001, Outcome: Remote Work Engagement

Table 05 show the simple regression analysis is based on the impact of TB, OB, EB and PB on remote work engagement among 302 respondents. The findings show that all four predictors were negatively related to remote work engagement and statistically significant ($p < .001$). TB (B = −0.653, Adj. R^2 = .405), OB (B = −0.872, Adj. R^2 = .632), EB (B = −0.688, Adj. R^2 = .474), and PB (B

= −0.719, Adj. Both of these (R^2 = .559) are significant predictors of outcome. Of these factors, OB explains the highest variance in work engagement on remote work, which is 63.2%, followed by PB (55.9%), EB (47.4%) and TB (40.5%). The regression models are statistically significant (p < .001) indicating that each of the predictors is associated with remote work engagement at a level of significance. These results confirm that there are substantial negative relationships between the predictors and outcome variable.

Table 06 Simple Regression Coefficients of Predictors on Performance Sustainability

Variable	Constant	B	Adj.R^2	F	Sig	T	sig
TB	4.721	-.700	.465	261.262	<.001	-16.164	<.001
OB	5.320	-.867	.624	497.280	<.001	-22.300	<.001
EB	4.811	-.713	.509	310.989	<.001	-17.635	<.001
PB	4.748	-.682	.502	302.958	<.001	-17.406	<.001
RE	.402	.782	. 612	472.848	<.001	21.745	<.001

N=302, *** p<.001, Outcome: Performance Sustainability

Table 06 show the simple regression analysis is used to analyze the correlations between TB, OB, EB, PB and RE with 302 respondents meeting the criteria in terms of performance sustainability. It is suggested that TB (B = −0.700, Adj. = −0.694), the linear model, is the best fit for this data set. R^2 = .465), OB (B = −0.867, Adj. R^2 = .624), EB (B = −0.713, Adj. R^2 = .509), and PB (B = −0.682, Adj. There are statistically significant negative relationships between R^2 (p < .001) and performance sustainability. By contrast, RE is significantly positively related to performance sustainability (B = 0.782, Adj. R^2 = .612, p < .001). The negative predictors are the most powerful, accounting for 62.4% of the variance for OB and 61.2% of the variance for RE. The results of all 5 regression models are statistically significant (p < .001). The results indicate that TB, OB, EB and PB have negative correlation with performance sustainability while RE has positive correlation with it.

Table 07 Multiple Regression Coefficients of Predictors on Remote Work Engagement

Variable	*B*	β	*SE*	*t*	*p*
Constant	5.595		.129	43.359	.000
TB	.048	.047	.062	.768	.443
OB	-.661	-.603	.083	-7.989	.000
EB	.043	.043	.068	.625	.532
PB	-.320	-.333	.060	-5.355	.000

R^2 = .669, F = 150.080, N=302, P<0.05

Table 07 show the multiple regression analyses analyze the effect of TB, OB, EB and PB on the remote work engagement on 302 respondents. The findings showed that OB (β = −0.603, p < .001) and PB (β = −0.333, p < .001) are statistically significant and negatively related to remote work engagement. In contrast, TB (β = 0.047, p = .443) and EB (β = 0.043, p = .532) do not have statistically significant effects. The overall regression model is significant (F = 150.080, p < .001), and accounts for 66.9% of the variance in remote work engagement (R^2 = .669). The predictors that are significantly related to remote work engagement are OB, followed by PB. The results underscore the significance of OB and PB for the disclosure of variations in engagement with remote work, when all four predictors are taken into account.

Table 08 Multiple Regression Coefficients of Predictors on Performance Sustainability

Variable	*B*	β	*SE*	*t*	*p*
Constant	3.196		.334	9.577	.000
TB	-.099	-.096	.059	-1.660	.098
OB	-.293	-.267	.087	-3.366	.001
EB	-.109	-.109	.065	-1.675	.095
PB	-.043	-.045	.060	-.726	.469
RE	.400	.400	.055	7.213	.000

R^2 = .699, F = 137.620, N=302, P<0.05

Table 08 show the multiple regression analysis is conducted on the 302 respondents, to investigate the effect of TB, OB, EB, PB and RE on the performance sustainability (PS). The results suggest that OB is significant at p = .001 at a β of −0.267, RE is significant at p < .001 at a β of 0.400. However, TB (β = −0.096, p = .098), EB (β = −0.109, p = .095), and PB (β = −0.045, p = .469) do not have statistically significant effects on PS at the 0.05 level. The overall regression model is statistically significant (F = 137.620, p < .001) and explains 69.9% of the variance in performance sustainability (R^2 = .699). Of the predictors, RE is the most significant positive predictor, and OB is a significant negative predictor. The results indicate that RE and OB are significant variables in predicting performance sustainability in the context of the five variables being taken together.

Table 09 Mediation Analysis of RE between TB and PS

Effect / Path	B	SE	t	p	95% CI
TB → RE (Path a)	−0.6532	0.0457	−14.2936	< .001	[−0.7431, −0.5633]
RE → PS (Path b)	0.5851	0.0432	13.5581	< .001	[0.5002, 0.6700]
Direct effect (TB → PS)	−0.3182	0.0443	−7.1859	< .001	[−0.4054, −0.2311]
Indirect effect (TB → RE → PS)	−0.3822	0.0540*	—	—	[−0.4919, −0.2803]

Table 09 show the Hayes' PROCESS Macro Model 4 was used to analyse the mediation process, and the results indicated that the mediation model was a partial mediation that significantly reduced the effect of technological barriers on remote work engagement (B = -0.6532, p < .001), and that the mediation model had a significant positive effect on performance sustainability (B = 0.5851, p < .001). The indirect effect of technological barriers on performance sustainability through remote work engagement was negative and statistically significant (B = -0.3822), BootSE = 0.0540, 95% bootstrap CI [−0.4919, −0.2803]), as the confidence interval did not include zero. Moreover, technical barriers had a direct effect on the sustainability of performance which remained significant (B = -0.3182), (p < .001)). These results indicate that the technological barriers have an indirect effect on performance sustainability on top of the direct effect, since a portion of the technological barriers has been identified as being mediated by decreased engagement in remote work.

Table 10 Mediation Analysis of RWE between OB and PS

Effect / Path	B	SE	t	p	95% CI
OB → RE (Path a)	−0.8716	0.0384	−22.6764	< .001	[−0.9473, −0.7960]
RE → PS (Path b)	0.4197	0.0532	7.8902	< .001	[0.3150, 0.5243]
Direct effect (OB → PS)	−0.5008	0.0583	−8.5834	< .001	[−0.6156, −0.3859]

Indirect effect (OB → RE → PS)	−0.3658	0.0733*	—	—	[−0.5132, −0.2234]

Table 10 show the results of Hayes' PROCESS Macro Model 4 indicated that organizational barriers had a significant negative association with remote work engagement (B = -0.8716, p < .001), and that performance sustainability had a significant positive association with remote work engagement (B = 0.4197, p < .001). The mean effect of organizational barriers on performance sustainability via remote work engagement was negative and statistically significant (B = −0.3658, BootSE = 0.0733; 95% bootstrap CI: −0.5132, −0.2234). Beyond the above factors, organizational barriers remained directly related to performance sustainability after the above factors were controlled for (B = -0.5008, p < .001). These results suggest that organizational barriers may also work indirectly on performance sustainability through the effect on remote work engagement, in addition to having a direct effect, as evidenced by partial mediation results.

Table 11 Mediation Analysis of RWE between EB and PS

Effect / Path	B	SE	t	p	95% CI
EB → RE (Path a)	−0.6879	0.0419	−16.4326	< .001	[−0.7703, −0.6055]
RE → PS (Path b)	0.5534	0.0458	12.0820	< .001	[0.4633, 0.6436]
Direct effect (EB → PS)	−0.3326	0.0458	−7.2652	< .001	[−0.4227, −0.2425]
Indirect effect (EB → RE → PS)	−0.3807	0.0518*	—	—	[−0.4865, −0.2859]

Table 11show the results of the mediation analysis using the PROCESS Macro Model 4 revealed that environmental barriers had a significant and negative impact on remote work engagement (B = -0.6879) (p< .001), and that remote work engagement had a significant and positive impact on performance sustainability (B = 0.5534) (p< .001). The 95% bootstrap confidence interval of the BootSE for the indirect effect of the environmental barriers on the performance sustainability through the remote work involvement was significant from zero (95% bootstrap CI for the indirect effect = [−0.4865, −0.2859]). Additionally, performance sustainability was still significantly impacted by the direct effect of environmental barriers (B = -0.3326, p < .001). This study indicated that the environmental barriers were indirectly related to performance sustainability through the environmental barriers' impact on reduced remote work engagement and directly related to performance sustainability, suggesting partial mediation.

Table 12 Mediation Analysis of RWE between PB and PS

Effect / Path	B	SE	t	p	95% CI
PB → RE (Path a)	−0.7193	0.0369	−19.5023	< .001	[−0.7919, −0.6467]
RE → PS (Path b)	0.5722	0.0518	11.0486	< .001	[0.4702, 0.6741]
Direct effect (PB → PS)	−0.2706	0.0498	−5.4323	< .001	[−0.3687, −0.1726]
Indirect effect (PB → RE → PS)	−0.4116	0.0546*	—	—	[−0.5204, −0.3077]

Table 12 show the mediation analysis conducted with the Hayes' PROCESS Macro Model 4 showed that the psychosocial barriers had a significant negative impact on remote work engagement (B = -0.7193, p < .001), while the remote work engagement had a significant positive impact on performance sustainability (B = 0.5722, p < .001). The CI for the indirect effect of psychosocial barriers on performance sustainability via remote work engagement did not include 0, and the effect of psychosocial barriers on performance sustainability was negative and statistically significant (B = -0.4116, BootSE = 0.0546, 95% bootstrap CI [−0.5204, −0.3077]). In addition, the immediate impact of psychosocial barriers on performance sustainability was still present (B = -0.2706), (p < .001). These results suggest partial mediation, as psychosocial barriers are found to be directly linked to lower performance sustainability as well as indirectly, via reduced engagement in remote work.

Table 13 Moderation of SE on the relationship between RE and PS

Predictor	B	SE	t	p	95% CI
Remote Work Engagement (RE)	0.8485	0.0889	9.5447	< .001	[0.6736, 1.0235]
Digital Self-Efficacy (DSE)	0.0704	0.0816	0.8629	.389	[−0.2311, 0.0902]
RE × DSE	0.0799	0.0247	3.2380	.001	[0.0284, 0.0313]

Table 13 show the Moderation analysis was performed to find out whether the relationship between Remote Work Engagement (RE) and Performance Sustainability (PS) is moderated by Digital Self-Efficacy (DSE). The results indicate that remote work engagement positively and significantly affects performance sustainability (B = 0.8485) (SE = 0.0889) (t = 9.5447) (p < .001), in that, as remote work engagement is higher, the performance sustainability is also higher. The main effect for digital self-efficacy is not statistically significant when other model factors are included at the level of reference work engagement with remote working, B = 0.0704, SE = 0.0816, t = 0.8629, p = .389. However, the relationship between remote work engagement and digital self-efficacy is positive and statistically significant (B = 0.0799, SE = 0.0247, t = 3.2380, p = .001), which shows that digital self-efficacy has a positive influence on remote work engagement and the sustainability of work performance. From a practical perspective, workers who feel more self-confident about their digital skills might be more likely to be able to leverage their digital presence in the remote setting into sustainable performance results.

Discussion

The results of the present study will be beneficial in gaining deeper understanding of the relationships between remote work barriers, remote work engagement, digital self-efficacy, and performance sustainability of employees in the IT industry of Pakistan. The results obtained from the 302 respondents show that remote-work barriers are significantly related to decreased employee engagement and employee performance sustainability. The reliability analysis results showed that Cronbach's alpha of the study constructs ranged from 0.859 to 0.932 indicating the constructs had good-to-excellent internal consistency. The correlation analysis and regression analysis have found that technological, organizational, environmental and psychosocial barriers had negative relationships with the engagement to work remotely and the sustainability of work performance. Organizational barriers had the strongest negative associations to both outcomes. In multiple regression analysis, organizational barriers (β = −0.603, p < .001) and psychosocial barriers (β = −0.333, p < .001) were significant predictors of remote work engagement, while technological and environmental barriers were not significant predictors when the four barriers were introduced as a whole. This indicates that organizational support, communication and employees' psychological health might be especially significant for retaining engagement in remote working environments. The finding of positive associations was that remote work engagement is a significant positive predictor of performance sustainability (β = 0.400, p < .001). The multiple regression model accounted for 69.9% of the variance in the sustainability of performance, which shows that employee engagement is an important factor in addition to the factors associated with remote work barriers. After adjusting for the other factors, organizational barriers also were a strong negative predictor (β = −0.267, p = .001); technological, environmental, and psychosocial barriers were not statistically significant. The mediation analysis also showed that the relationship of all four barrier categories to performance sustainability was partially mediated by remote work engagement. There was statistical significance for the indirect effects when the 95% bootstrapped CIs for the indirect effects did not contain zero. The results indicate that the barriers to teleworking could be indirectly related to lower performance sustainability through employee engagement as well as directly. Lastly, the interaction between digital self-efficacy and remote work engagement and its impact on performance sustainability was positively strengthened by digital self-efficacy, as revealed in the moderation analysis (B = 0.0799, p = .001). This revelation indicates that workers who are more confident in their ability to work digitally could be more likely to turn virtual engagement into long-term productivity. In conclusion, the results highlight the need to address organizational challenges, foster employee involvement, and enhance digital skills to ensure sustainable performance among IT professionals in Pakistan. Effective communication, managerial support, and the right digital tools and employee well-being should be key considerations in formulating remote and hybrid work policies.

Conclusion

Based on the above conclusion, it can be said that technological, organizational, environmental and psychosocial barriers are significant determinants of remote work engagement and sustained performance among the employees of IT industry in Pakistan. The results show that the remote work engagement is positively correlated with the sustainability of performance and partially

mediates the relationship between all four barriers and the sustainability of performance. Organizational barriers are an important negative predictor of engagement and performance sustainability when other factors are taken into account among the barriers. Additionally, the results indicated that digital self-efficacy positively moderates the relationship between remote work engagement and performance sustainability, indicating that higher digital self-efficacy level may help employees to better convert engagement to performance sustainability. Hence, IT should prioritize minimizing organizational and psychosocial issues, enhancing remote working environments, increasing digital competencies in employees and promoting engagement. These measures can help companies boost staff efficiency and maintain productivity in the workplace while allowing them to work remotely and in hybrid arrangements.

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