The Impact of Virtual Work on Employee Adaptive Performance in IT Industry

Eryin Halmen, Hendrik Lamsali*, Rosman Iteng
School of Technology Management and Logistics, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia

*Corresponding author email: hendrik@uum.edu.my

ABSTRACT
The rapid transition to virtual work, driven by technological advancements and accelerated by the COVID-19 pandemic, has significantly impacted employee adaptive performance in many industries. This study investigates the challenges and opportunities posed by virtual work environments on employee adaptability, focusing on six dimensions: geography, collaboration, culture, work practices, organisation, and technology. The research objective is to determine how these dimensions influence adaptive performance, which is crucial for organisational resilience and effectiveness in remote work. A survey was conducted with 276 employees from the IT sector, using purposive sampling to select participants with specific work experience and roles. The study employed a Structural Equation Model (SEM) using Partial Least Squares (PLS) to analyse the data. Key findings indicate that while culture, work practices, organisation, and technology positively and significantly influence adaptive performance, the impact of geography and collaboration was positive but not significant. This suggests that certain aspects of virtual work environments are more critical than others in enhancing employee adaptability. The study's findings underscore the importance of developing targeted strategies to improve adaptive performance in virtual settings, particularly by focusing on cultural adaptation, effective work practices, and leveraging technology. These recommendations are crucial for organisations seeking to enhance their remote work effectiveness. Future research should explore the role of digital skills in enhancing adaptive performance and further investigate the effectiveness of virtual work practices across different industries.

KEYWORDS: Virtual work, Adaptive performance, Digitalization, Employee performance, IT industry

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1. INTRODUCTION

The transition from traditional work environments to virtual work has recently gained significant attention, and for good reason. Technological advancements, such as high-speed and secure internet connections, have primarily driven progress (Lamsali et al., 2023). These advancements have enabled employees to schedule meetings through video conferencing and remotely access their company computer systems utilising Virtual Private Networks (Caniëls, 2023). However, it was the unprecedented COVID-19 pandemic that significantly accelerated this transformation. Amid the pandemic, many individuals, regardless of their level of technological proficiency, were required to participate in remote employment. The widespread use of virtual work has led to changes in individual work schedules and completely transformed the typical office environment. The virtual workspace has become more common lately and has become a method that enables efficient collaboration and communication among individuals in various geographic areas (Zulwisli et al., 2024). The rise of virtual working environments has brought significant attention to their potential and benefits to companies. The virtual working environment emerged as a response to the impact of the Covid-19 outbreak on organisations. The emergence of this new norm has opened up opportunities for leveraging the benefits of remote work and adjusting one's approach to task execution. The virtual working environment has enabled companies to maintain their operations despite the pandemic. The practice of virtual work has been adopted during the pandemic, although it may require a significant adjustment period for most procedures (Diab-Bahman & Al-Enzi, 2020). The global Covid-19 pandemic has significantly disrupted the daily routines of individuals worldwide. However, the adaptability of employees to a flexible work environment can be facilitated by their leadership style and level of job autonomy (Hamid, 2023). Virtual work relies on digital technology, with most tasks being performed remotely and accomplished through digitalisation and the Internet. Employees must adapt to the changes in their work and acquire digital skills to use technology in virtual work settings effectively (Vuori et al., 2019). The proficiency of employees in acclimating to digital

technology in work-related matters can be assessed through adaptive performance (Park & Park, 2019). Despite the challenges, the potential benefits of virtual work are vast, offering a more flexible and efficient way of working.

Malaysia entered the transition phase of endemic in April 2022, and the working environment has reverted to the culture of working in the office physically (Salim, 2022). A study conducted by the United Nations Development Program (UNDP) and Talent Corporation Malaysia (TalentCorp) reveals that 80% of workers in Malaysia still go for virtual work, with half of them showing a preference to do so for at least three days a week (TalentCorp & UNDP, 2021). In line with this demand, the Malaysian government has taken some positive steps by including Flexible Working Arrangement (FWA) in the 1955 Work Act (Revised in 2022), effective September 2022. Employees in this country are allowed to apply to their respective employers and refer to them the suitable time, day, and location to work, including virtual work. Furthermore, the organisation in Malaysia must engage in meticulous planning and preparation regarding the design of work structures, infrastructure, and the mental and physical well-being of employees when utilising technology and accessing information conveniently (Molino et al., 2020). According to a study conducted by (Patulny et al., 2020), virtual work's likelihood is higher among individuals with advanced skills and education in a limited number of industries, occupations, and geographic areas. In addition, according to data provided by TalentCorp Malaysia, industries such as banking and insurance (76–86%), management (68–78%), professional, scientific, and technical services (62–75%), and IT and telecommunications (62–80%) actively embrace the virtual working environment. The transition of most organisations to virtual work necessitates that employers understand the changing nature of occupations and the significance of digital skills, which employees must acquire and apply. The subsequent section of this paper is structured in the following manner. Section 2 highlights the problem statement. Section 3 explains the research significance, followed by an analysis of the pertinent literature in Section 4, and highlights the research methodology in Section 5. Section 6 presents key research findings, and Section 7 discusses and concludes the research.

2. PROBLEM STATEMENT

At the outset, companies and employees encountered numerous obstacles and difficulties during the transition to virtual work, as the framework of virtual work diverged from that of working in a physical office. Examples of factors that can contribute to ambiguity in separating work and non-work activities, the consequences for individuals and society when physical presence in the workplace is not required, and the potential benefits and drawbacks of flexible work arrangements have been discussed by Contreras et al. (2020). Furthermore, the staff's social isolation leads to disengagement from their usual work setting, leading to subpar performance and a persistent lack of motivation to work (Wojcak et al., 2016). Hence, employees must adapt to utilising a novel digitalised working environment, considering factors such as time management and the overall work environment (Nguyen et al., 2020). The personnel are facing difficulties in adjusting and acclimating to new systems or automated equipment that introduce changes to the workplace (Wang et al., 2021). Pulakos et al. (2000) argue that employees must adapt to fast-paced technological advancements, organisational affiliations, and restructuring. Recognising the significance of adaptability and the employees' capacity to adjust to changes in the work environment, researchers examined the topic of employees' adaptive performance in their studies (Hongden, 2021).

As organisations increasingly transition to virtual work environments, a significant challenge emerges in maintaining and enhancing adaptive work performance. While offering flexibility and broader access to talent, virtual work introduces several issues that hinder employees' ability to adapt and perform effectively. The absence of in-person interactions impairs spontaneous collaboration and real-time problem-solving, potentially slowing response times to unforeseen challenges. Additionally, virtual work can strain employee engagement and cohesion, affecting overall morale and productivity. These factors collectively hinder an organisation's ability to swiftly adapt to changing market conditions and evolving project requirements, potentially affecting its competitive edge and operational effectiveness. Addressing these issues is essential for optimising adaptive performance and ensuring organisational resilience in the virtual work era. Recent transitions to virtual work environments have sparked a need for a deeper understanding of their impact on adaptive work performance. Despite the widespread adoption of remote work, a notable gap exists in empirical research examining how virtual settings influence employees' ability to adapt and perform effectively. Recent studies, such as those by Al-Habaibeh et al. (2023), highlight this research void, emphasising that while virtual work offers flexibility and cost benefits, it also poses unique challenges that have not been thoroughly explored. These studies indicate that the rapid shift to remote work has outpaced research on its effects on adaptive behaviours, such as real-time problem-solving, team collaboration, and innovation. As organisations increasingly rely on virtual teams, understanding these dynamics is crucial for developing strategies that enhance adaptive performance and ensure continued organisational effectiveness in a remote work landscape.

As organisations increasingly adopt virtual work arrangements, understanding how these environments impact adaptive performance becomes crucial. Virtual work comprises six dimensions—geographical, cultural, organisational, work practices, technological, and collaboration—that collectively influence employees' ability to adapt and perform effectively. The geographical dimension introduces challenges related to time zone differences and remote locations, while the cultural dimension affects communication and collaboration styles across diverse backgrounds. The organisational dimension involves structure and management practices changes, impacting how employees navigate new workflows and hierarchies. Work practices are transformed through altered routines and expectations, technological advancements necessitate new skills and tools, and the absence of face-to-face interactions challenges collaboration. These dimensions may uniquely affect adaptive work performance, potentially leading to productivity, communication, and team dynamics disruptions. Investigating how these dimensions interact and influence adaptive work performance is essential for developing strategies to optimise performance and resilience in virtual work environments. Hence, this study aims to determine the impact of a virtual working environment towards adaptive performance.

3. RESEARCH SIGNIFICANCE

The significance of virtual work lies in its capacity to offer unprecedented flexibility and access to a global talent pool and reshape traditional work environments. Adaptive performance is crucial in a virtual work setting, as it directly influences an organisation's ability to respond to rapidly changing conditions and unforeseen challenges. By leveraging digital tools and remote communication platforms, organisations can operate across different time zones and geographic locations, allowing diverse perspectives and expertise to be integrated into projects. This flexibility supports work-life balance and enables organisations to quickly scale their workforce according to project needs, potentially reducing overhead costs associated with physical office spaces. However, this shift also necessitates re-evaluating how work processes are managed and performance is assessed in a virtual context. Studying the impact of virtual work on adaptive performance holds substantial theoretical importance as it advances our understanding of how remote work environments influence vital aspects of organisational behaviour and performance. Traditional work performance and adaptation theories were primarily developed with in-office settings in mind. By examining adaptive work performance in virtual contexts, researchers can refine existing theoretical frameworks to account for the unique dynamics of remote work, such as altered communication channels and dispersed team structures. This research can contribute to developing new theoretical models that better reflect the realities of virtual work, offering more profound insights into how adaptive behaviours manifest and evolve in remote settings. Such theoretical advancements are crucial for expanding our knowledge of organisational behaviour and improving the robustness of performance and adaptation theories in the digital age.

From a practical perspective, understanding the impact of virtual work on adaptive work performance is essential for optimising organisational effectiveness and employee satisfaction in remote environments. As businesses increasingly adopt remote and hybrid work models, there is a pressing need to develop strategies that support employees adapting to these new work settings. This study can inform the design of more effective remote work policies, training programs, and technology solutions tailored to enhance adaptive performance. For instance, insights gained from this study can help organisations implement better virtual collaboration tools, improve communication protocols, and foster a supportive remote work culture. This practical knowledge is vital for addressing challenges related to productivity, team cohesion, and employee engagement in virtual settings, ultimately leading to more successful and sustainable remote work practices.

4. LITERATURE REVIEW

4.1 Adaptive Performance

During times of crisis and rapid change, adaptive performance becomes significant as the organisation's survival depends on employees' capacity to learn and innovate rapidly. It is essential to prioritise the measurement of adaptive performance as it enables enterprises to evaluate employees' capacity to learn and innovate rapidly, which is crucial for the organisation's survival. Fluctuations in the external environment can challenge employees' abilities and expertise, compelling them to respond and adapt promptly. Researchers have considered adaptive performance a concept that includes adapting to task, team, and organisational changes (Van Den Heuvel et al. 2020). Adaptive performance is task-performance-focused actions people take in response to or anticipating job changes (Juyumaya, 2022). Park & Park (2019) defined adaptive performance as flexible work behaviours that help employees adapt to change by showing excellence in problem-solving, uncertainty/stress/crisis, new learning, and adaptability related to people, culture, and environment" (Park & Park, 2019). They also said that individual traits and personalities, job and group characteristics, and organisational factors affected adaptive performance. Studies of adaptive performance based on real-world data show that supportive behaviours, such as advice or feedback from a supervisor, help adaptive performance. At

the same time, awards and more responsibility can motivate employees and help them perform better. So, it is essential to look at individual and environmental factors that affect adaptive performance, which needs to be investigated more (Park & Park, 2019). Adaptive performance will help organisations measure and show the level of skills of their employees in terms of how well they can deal with changes. A mix of formal and informal learning practices and ongoing employee development would create a learning culture. It would give formal training to held teams to help them manage themselves better and develop performance measures that consider the situation's complexity and the opportunities and barriers that come with it. It would also help the organisation adapt to change, encourage organisational learning, keep up with changing customer expectations, and do an excellent job of doing its tasks. Adaptive performance involves solving problems, being flexible, and getting used to new ways of doing things. Where adaptive performance has a mixed effect on task performance, research shows that it positively affects managing change and reaching organisational goals (Jundt et al., 2015).

4.2 Theory Related to Adaptive Performance

Lewin's field theory is related to the transformation of traditional working places to virtual work (Akkaya et al., 2021). Lewin's field theory suggests that individuals' behaviour is influenced by the interaction between their characteristics and the environment in which they operate. Furthermore, this theory describes individual behaviour as fundamentally driven by individual and environmental factors. Regarding virtual work adoption, which is a behaviour that has received very little scholarly attention, we selected this broad theoretical approach to form a foundational understanding of it. In virtual work, this theory emphasises that organisations can positively influence employee behaviour by creating a supportive and conducive virtual working environment (Kozako et al., 2022). This means that organisations must provide the tools and resources for virtual teams to communicate and collaborate effectively. In addition to providing the necessary technology, organisations should also focus on fostering a sense of trust and camaraderie among virtual team members (Digap & Quines, 2022).

4.3 Fundamentals of Virtual Work

Virtual work is a digital workplace that does not have to be in one place and accessed by anyone, no matter where they are (Vallo Hult & Bystrom, 2022). A virtual working environment encourages virtual or flexible work by letting employees do routine tasks from anywhere and anytime (Fayard et al., 2021). The virtual work comprises hardware, people, and digital processes that must operate together (Launer et al., 2022) at different times and locations (Liu & Geertshuis, 2021). The differences allow the employees to access all the software, hardware, and other resources needed to accomplish daily tasks. For example, email, instant messaging, word processing, spreadsheets, intranet software, productivity and social tools, customer relationship management, human resource management, and enterprise resource planning can be done instantly as communication co-occurs (Launer et al., 2022). Virtual work has been described in different ways, but all of them have understood in common that employees are spread out geographically and rely on technology to communicate about work (Esha et al., 2023). Moreover, virtual work also refers to an activity where individuals work at a distance from their employer, using ICT to overcome the gap (Hoeffling, 2001). In addition, virtual working is a flexible work arrangement in which employees operate in locations virtually from their central offices and have no actual contact with their co-workers. However, they can still connect with them via technology (Van Zoonen et al., 2021). As a result, virtual work promotes productivity, creativity, and growth.

4.4 Variables of Virtual Work and Development of Research Hypotheses

4.4.1 Geography and Adaptive Performance

Geography and virtual working studies focus on the role of hybrid sensing and adaptive environments and digital platforms that connect local Internet networks to architectures for storing and processing data in main data centres. Studying how virtual working environments sense and change over time opens the door to new kinds of technology that depend on flexible, interactive workplaces. For example, by putting technology in places and habits that people use daily, people can collect data, make better predictions, and change how people act. Several studies on so-called connected or intelligent houses (Dammann et al., 2022) have critically examined how digital technologies make their way into everyday life. Adapting environments positively affects routine tasks and day-to-day behaviours while opening new ways to interact and communicate. The resulting regions open more ways for behaviour to affect adaptive performance in a good way. Nonetheless, the extent to which geographical factors significantly influence adaptive performance needs further investigation. Therefore, the hypothesis is developed as follows:

Hypothesis 1: Geography contributes positively to adaptive performance.

4.4.2 Collaboration and Adaptive Performance

Empirical studies from the literature on collaboration contribution refer to collaboration in virtual work that teams working together can do to improve their ability to change. The fact that virtual collaboration tools are so popular explains many benefits to organisations,

teams, and individuals. These benefits, along with the constant improvement of technology, have led to a considerable rise in virtual teamwork. The way the team does its work is vital to temporal. Teamwork design is the nature and organisation of tasks, activities, and responsibilities at the team level (Parker et al., 2014). The collaboration includes things like how independent the team is and how much its members rely on each other (Newman & Ford, 2021). However, further examination of collaboration's impact on adaptive performance is needed. Therefore, the hypothesis is formulated as follows:

Hypothesis 2: Collaboration contributes positively to adaptive performance.

4.4.3 Cultural and Adaptive Performance

Even though leadership, organisational trust, and human capital investments have all been looked at in the past to see how they affect adaptive performance (Parray, 2020), this study focuses on culture, which includes the organisational climate and the environment's changeability. Cherian et al. (2021) found that organisational culture affects how workers act and think and how well they do their jobs. Owen (2020) found a link between organisational climate and adaptability. Zhang and Chen (2023) also mentioned that a training mindset improves employees' knowledge and skills to deal with new challenges and do a better job overall. In addition, Adamovic (2022) also found that training culture is linked to job autonomy and agreed that the ability of employees to adapt is affected by their changing surroundings. Therefore, the following hypothesis is developed to determine the impact of cultural factors on adaptive performance:

Hypothesis 3: Culture contributes positively to adaptive performance.

4.4.4 Work Practices and Adaptive Performance

Many work practice factors, such as organisational fairness and job control studies, have been examined to see how they affect adaptive performance. Thus, this study focuses on job communication, job autonomy, and job environment, which are defined as work practices due to strong justification and evidence in the literature. Yunus and Mostafa (2022) assert that job autonomy is how much the job gives the worker the freedom to decide how to do his work. They also mentioned that job autonomy is linked to adaptable success in a good way. Vohra et al. (2023) mentioned that job autonomy measures how free and independent workers are in making decisions about how they do their jobs. So, workers with more job autonomy have more freedom at work because they can choose how to do their jobs better, which increases their performance (Khoshnaw & Alavi, 2020). Furthermore, Kopelman and Augugliaro (2022) proposed that the work setting affects how productive and well employees do their jobs. To further examine the impact of work practices towards adaptive performance, the following hypothesis is proposed:

Hypothesis 4: Work Practices contribute positively to adaptive performance.

4.4.5 Organization and Adaptive Performance

Organisational factors refer to workers' perceptions of whether an organisation cares about their well-being and contributions (Park et al., 2020). It also encompasses employees' assessments of whether the organisation helps them achieve professional and personal goals. Employees who perceive good organisational support feel safer and more engaged (Kose & Şencan, 2016). Research demonstrates that perceived organisational factors strongly correlate with progressive workplace characteristics and behaviours, such as positive adaptation performance (Park et al., 2020). Organisational factors may positively affect adaptation performance, which predicts more helping behaviours within a corporation. Hence, the hypothesis is developed as follows:

Hypothesis 5: Organization contributes positively to adaptive performance.

4.4.6 Technology and Adaptive Performance

To achieve digital transformation, companies have spent much money on improving their technology infrastructure and training employees with technical skills in handling technology and applications (Al-Shoura et al., 2023). Aside from that, organisations have taken steps to prepare their employees for digital transformation by telling them about technological changes (Vrchota et al., 2020). Examining workers' technology readiness is a common way to determine how ready they are to use the Technology. Technology readiness comprises four parts: optimism, innovativeness, discomfort, and insecurity. People may be motivated when they feel optimistic and creative in the technology company. To further examine the impact of technology towards adaptive performance, the following hypothesis is established:

Hypothesis 6: Technology contributes positively to adaptive performance.

Figure 1 depicts the conceptual framework of this study. The independent variable presents virtual work's characteristics, including geography, collaboration, culture, work practice, organisation, and technology. Meanwhile, the dependent variable presents adaptive performance. Six hypotheses test the direct relationship with adaptive performance.

5. METHODOLOGY

In this study, a total of 276 employees participated. Since the population in this study is too large, the approach uses a purposive sampling technique, which stated three criteria: first, categories in the Information and Technology (IT) sectors; second, skilled workers who have experienced between 1- 5 years and in the position of operation and top level of management in an organisation were setting to limit the sample. The calculation of sample size applied the calculation from G-Power, and the result stated that the minimum sample size was 103. This study employs a reflective measurement model. It measures constructs, namely adaptive performance, including subdimensions like solving problems, handling uncertainty and learning work tasks, and virtual working environment (geography, collaboration, culture, etc.). These constructs are being measured by multiple items, where the latent variable (construct) causes the indicators. As shown in **Table 1**, the items of virtual working characteristics adapted from Chudoba et al. (2005), as cited by Whillans et al. (2021), consisting of four items of geography, five items of collaboration, seven items of culture, six items of work practices, six items of organisation and eight items of technology. In addition to adaptive performance, there are a few dimensions adopted from Pulakos et al. (2000), who mentioned there are six items for solving problems creatively, six items for dealing with uncertain and unpredictable work, seven items for learning work, tasks, technologies, and procedures and six items of handling stress. The data collected from a survey, this study employed the Structural Equation Model using Partial Least Square (PLS) to predict the significant virtual work characteristics and adaptive performance by the selected employees in private companies in Malaysia. In data analysis, measurement and structural models were applied to test the hypotheses.

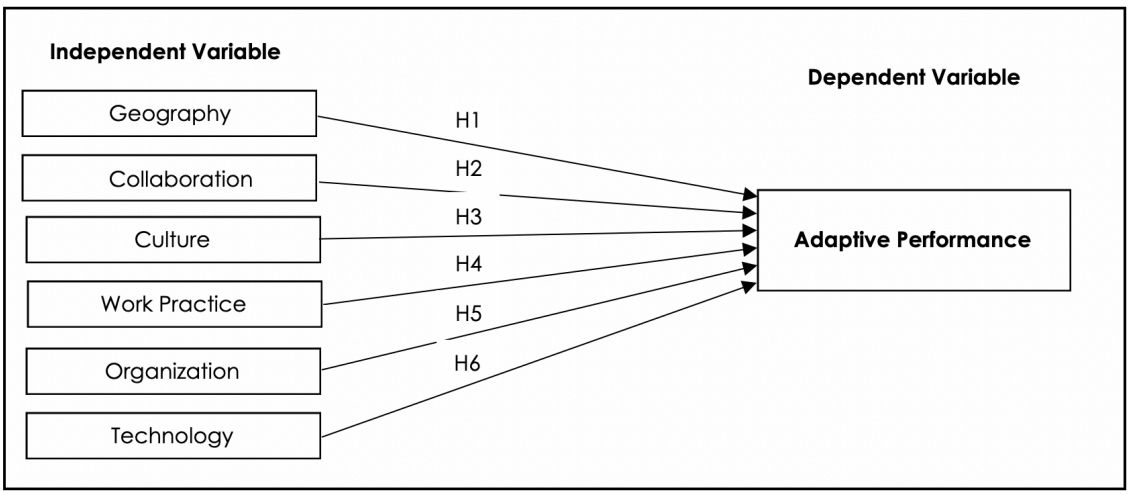


Figure 1: *Conceptual Framework*

Table 1: *Items Measurement*

Variables	No of Items	Sources
Virtual Works		
Geography	4	Chudoba et al. (2005)
Collaboration	5	
Cultural	7	
Work Practices	6	
Organisation	6	
Technology	5	
Adaptive Performance		
Solving Problem	6	Pulakos et al. (2000)
Uncertainty	6	
Learning Work	7	
Handling Work	5	

6. FINDINGS

6.1 Demographic Factor

From the demographic data in **Table 2**, the results obtained information on employees' gender, age, employment status, working experience and position. Among the respondents, there were 141 males and 135 female respondents. Respondents mostly had an age range from 20-30 (110), 86 were aged 31 to 40, and 55 respondents were above 41 to 50, so the results show the age was balanced for young and senior employees in organisations. Most of the respondents were 170 employees in positions of the employees in contract; 31 of them were freelancers, and 40 of the rest of the respondents were in part-transitions. There were 87 employees with working experience of more than five years, 24 employees with working experience of 4-5 years, and 88 employees with working experience of 1-3 years. For the position, there were 27 employees from the operation, and 12 of them were technicians. In addition, there were 66 executive managers and 49 assistant managers, and 39 of them were managers for middle-level positions. In addition to top-level management, 32 of them were in the position of head of the department, 16 of them were at the professional level, and 35 of the respondents were in top management. Based on the analysis above, the demographic factors are adequate to fulfil the requirements of this study.

6.2 Measurement Model

Table 3 shows the convergent validity test of the sub-dimensions of virtual work characteristics and adaptive performance. In convergent validity, the composite reliability values for all constructs also exceeded 0.8, which proves reliability (Hair et al., 2019). In addition, all the items' Dillon–Goldstein rho values were above 0.8, supporting the reliability of the items. Cronbach's alpha reliability analysis revealed that all variables had values exceeding 0.85, indicating that all were reliable. **Table 3**'s projected loading and cross-loading values show that all indicator loadings exceeded 0.6 except for one item (financial literacy). Hence, based on the above, all indicators of this study have been deemed reliable (Hair et al., 2013). In the subsequent analysis, the Heterotrait-monotrait ratio of correlations was conducted to test the discriminant validity of virtual work and adaptive performance. Based on Ahmad et al. (2015), there are two ways of using the HTMT to assess discriminant validity: (1) as a criterion or (2) as a statistical test. For the first one, if the HTMT value is more significant than HTMT.85 value of 0.85 (Kline, 2011), or HTMT.90 value of 0.90 (Gold et al., 2001), then there is a problem of discriminant validity. The second criterion, according to Henseler et al. (2015), is to test the null hypothesis (H0: HTMT ≥ 1) against the alternative hypothesis (H1: HTMT < 1) and if the confidence interval contains the value one (i.e., H0 holds) this indicates a lack of discriminant validity.In this study, the first approach assumes that the values of HTMT are between 0.85 and 0.9; the result indicates that the construct indicated no issues with discriminant validity.

Table 2: *Demographic analysis*

Demographic Factors		Frequency	Per cent
Gender	Female	135	48.91
	Male	141	51.09
Age	20-30 years	110	39.86
	31-40 years old	86	31.16
	41- 50 years	55	19.93
	51 years old and above	25	9.06
Employment Status	Permanent	170	61.59
	Contract	35	12.68
	Freelancer	31	11.23
	Part-time	40	14.49
Working Experience	less than six months	31	11.23
	Six months - 1 year	46	16.67
	1-3 years	88	31.88
	4-5 years	24	8.70
	Five years and above	87	31.52
Position	Top management	35	12.68
	Professional	16	5.80
	Head of Department	32	11.59
	Manager	39	14.13
	Assistant Manager	49	17.75
	Executive Manager	66	23.91
	Technician	12	4.35
	Operation	27	9.78
Total		276	100.00

Table 3: *Convergent validity of dimension's virtual work*

Variables	Cronbach's alpha	Composite Reliability	Average Variance Extracted
Virtual Work	0.976	0.978	0.551
Collaboration	0.858	0.899	0.641
Cultural	0.919	0.937	0.681
Geography	0.778	0.856	0.601
Organisation	0.919	0.937	0.711
Technology	0.954	0.961	0.758
Work Practice	0.891	0.917	0.649
Adaptive Performance	0.978	0.979	0.663
Handling Work	0.91	0.933	0.738
Learning	0.965	0.971	0.828
Solving Problem	0.931	0.946	0.743
Uncertainty	0.928	0.943	0.736

In this study, the first approach assumes that the values of HTMT are between 0.85 and 0.9; the result indicates that the construct indicated no issues with discriminant validity. Therefore, the results of the measurement model exceeded the recommended values, thus indicating sufficient convergence validity.

6.3 Structural Model

To evaluate the structural models, the R square (R^2) indicates the amount of variance in the exogenous variables explained by the endogenous. Using a bootstrapping technique with a re-sampling of 500 path estimates and t-statistics calculated for the hypotheses testing, the result revealed that R Square (R^2) indicates that 59.3 percent of adaptive performance was explained by virtual work. As shown in **Table 4**, the second-order analysis for virtual work and the sub-dimension found that collaboration (β = 0.952, t-value > 1.96, p < 0.05), cultural (β = 0.952, t-value > 1.96, p < 0.05), geography (β = 0.896, t-value > 1.96, p < 0.05), organisation (β= 0.908, t-value>1.96, p<0.05), technology (β= 0.954, t-value>1.96, p<0.05) and work practice (β= 0.896, t-value > 1.96, p < 0.05) have significant with virtual work. Hence, virtual work was associated with collaboration, culture, geography, organisation, technology, and work practices. Furthermore, the result in **Table 5** shows a similar finding that the sub-dimension of handling work (β = 0.926, t-value > 1.96, p < 0.05), learning (β = 0.956, t-value > 1.96, p < 0.05), solving problem (β = 0.8937, t-value > 1.96, p < 0.05) and uncertainty (β = 0.923, t-value > 1.96, p < 0.05) were associated with adaptive performance. Moreover, **Table 6** shows the result of hypothesis testing, which indicates that geography ((β = 0.035, t-value < 1.96, p> 0.05) and collaboration (β = 0.077, t-value < 1.96, p > 0.05) were positive but not significant with adaptive performance. In contrast to cultural (β = 0.155, t-value > 1.96, p < 0.05), work practice (β = 0.0.192, t-value > 1.96, p < 0.05), organisation (β = 0.121, t-value > 1.96, p < 0.05) and technology (β = 0.416, t-value > 1.96, p < 0.05) were positive and significant influence with adaptive performance. Following Hair et al. (2013) suggestions, this study also assessed the predictive relevance (Q2) using the blindfolding procedure with a distance value of 10. Blindfolding is a measure that builds on a sample reuse technique, omitting a part of the data matrix, estimating the model parameters, and predicting the omitted part using the estimates (Hair et al., 2013). Due to the Q2 value of 0.160 with only one endogenous construct, the intention is more significant than 0 (Fornell & Larcker, 1981), and the result accepts the model as having sufficient predictive power between virtual work and adaptive performance.

Table 4: *First-Order Analysis for Virtual Work*

Path Coefficient	Beta Value	Standard Error	T-Value	P-Value
Virtual work -> Collaboration	0.952	0.008	115.796	<0.05
Virtual Work -> Cultural	0.952	0.01	100.037	<0.05
Virtual work -> Geography	0.896	0.018	50.855	<0.05
Virtual work -> Organization	0.908	0.017	53.091	<0.05
Virtual Work -> Technology	0.954	0.008	119.068	<0.05
Virtual work -> Work practice	0.896	0.019	47.743	<0.05

Table 5: *First-order Analysis for Adaptive Performance*

Path Coefficient	Beta Value	Standard Error	T-Value	P-Value
Adaptive performance -> Handling Work	0.926	0.016	59.221	<0.05
Adaptive Performance -> Learning	0.956	0.008	112.451	<0.05
Adaptive performance -> Solving Problem	0.937	0.012	79.501	<0.05
Adaptive Performance -> Uncertain	0.923	0.015	62.06	<0.05

Table 6: *Structural Model Analysis*

Path Coefficient	Beta	SE	T-Value	P-Value	Result
Geography -> Adaptive _Performance	0.035	0.046	0.759	0.448	H1: Not Supported
Collaboration -> Adaptive _Performance	0.077	0.054	1.436	0.151	H2: Not Supported
Cultural -> Adaptive _Performance	0.155	0.046	3.377	0.001	H3: Supported
Workpractice -> Adaptive _Performance	0.192	0.049	3.914	0.000	H4: Supported
Organization -> Adaptive _Performance	0.121	0.042	2.885	0.004	H5: Supported
Technology -> Adaptive _Performance	0.416	0.051	8.123	0.000	H6: Supported

Furthermore, there are only two measures of fit to ensure model fitness in the PLS-SEM software: SRMR and NFI. The SRMR is an absolute fit measure defined as the standardised difference between the observed and predicted correlations. A value less than 0.08 is generally considered a good fit (Hu et al.,1992). The finding calculated the SRMR value for our model, and the SRMR was 0.087, indicating that the model is a considerably good fit. Another measure, the normed-fit index (NFI), is an incremental measure of fit with values greater than 0.90 indicating a good fit. The results showed an NFI value of 0.95, which suggests the model has achieved a good fit. Overall, the result summarised the result of the hypotheses testing and found that all sub-dimensions for variables have a significant relationship and apply to the recent study.

7. CONCLUSION

In summary, this study examines the effect of sub-dimensions of virtual work, such as geography, collaboration, culture, work practice, organisation, and technology, on adaptive performance among 276 employees working in the IT industry. The results stated that hypothesis 3 to hypothesis 6 were supported. This explained that culture, work practice, organisation, and technology with adaptive performance have a positive and significant relationship with adaptive performance. While geography and collaboration were favourable but insignificant, hypothesis 1 and Hypothesis 2 were not supported in this study. The possibility that this happened is that globalisation has led to an increase in the number of individuals taking on duties and responsibilities outside their local work environment. The COVID-19 pandemic has accelerated the adoption of global work arrangements. These arrangements have grown prevalent during the COVID-19 pandemic. Kaushik and Guleria (2020) and other researchers have documented the growing trend of corporations using virtual work to deal with the disruptions caused by the pandemic. In the past, virtual labour was limited to being a commonly accepted corporate practice only in IT and technology. Nevertheless, due to the pandemic, some organisations have been compelled to adopt remote work for their staff, leading to substantial advantages. Commonly chosen organisational techniques encompass flexibility, utilisation of cyberspace for work-related tasks, and prioritising the safety of workers and employees while ensuring sufficient support for productive virtual work. In addition, organisations must address the working conditions by actively engaging employees in participation, development, and motivation. This can be achieved through consistent communication, innovative approaches, and training programmes (Abdullah et al., 2023). Organisations should also prioritise employees' well-being and health by implementing creative support methods. Organisations should foster commitment among managers and involve employees in decision-making processes to enhance internal efficiency and attract talented individuals. This can be achieved by promoting cohesion, sharing experiences, and making necessary changes based on organisational assessments and data. Virtual work fosters increased productivity, enhanced creativity, and facilitates growth and expansion. It enhances coordination and occasionally triggers a shift in organisational culture, establishing the foundation for transitioning to a data-first or digital-first approach (The Asia Foundation, 2020). Additionally, it serves as an incentive to attract fresh talent and enhance productivity, employee contentment, and staff retention. Most employees would willingly accept a reduction in salary in exchange for the opportunity to work remotely on some occasions. The digital workspace is essential for hybrid employment. Employees may effortlessly collaborate, communicate, and interact with colleagues and clients, regardless of location, whether at the office or residence.

In conclusion, many businesses and organisations have benefited throughout the epidemic from the increased use of virtual workers made possible by communication and computing technology advances. Generally, virtual practice before the COVID-19 pandemic (Delfino & Van Der Kolk, 2021). However, after the COVID pandemic, the physical layout, operational procedures, and general work structure have been rapidly transformed into a virtual working environment (Handke et al., 2020). The result supports the previous finding that the characteristics of collaboration, culture, geography, organisation, technology, and work practices are associated with virtual work and found that all sub-dimensions are associated with virtual work. In addition, the subdimension of adaptive performance, such as handling work, learning, solving problems and uncertainty, is associated with adaptive performance. Overall, virtual work has a significant influence on adaptive performance. Considering the changing of digitalisation, which increases usage of the internet,

information and communication technologies without digital skills, skilled workers in IT industries are challenged to retain the talent and skills of their employees (Tavoletti et al., 2021). The need for digital skills has become a priority in many workplaces. The degree of digitalisation changes and the possibility of a skilled worker working virtually in developed countries may increase the brain drain by creating another brain gain. Hence, virtual work remains relevant as the new norms make employees flexible and willing to learn new things based on their knowledge, skill, and ability. In future studies, this study recommends exploring and investigating the roles of digital skills in improving adaptive performance and the effectiveness of virtual work practices in IT industries.

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