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HYBRID WORK ARRANGEMENTS AND EMPLOYEE PRODUCTIVITY: THE MEDIATING ROLE OF WORK ENGAGEMENT AND THE MODERATING EFFECT OF DIGITAL COMPETENCY

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Abstract

The rapid proliferation of hybrid work arrangements following the COVID-19 pandemic has fundamentally transformed organizational dynamics and raised critical questions about employee productivity. This study examines the influence of hybrid work arrangements on employee productivity, with work engagement as a mediating variable and digital competency as a moderating variable. A quantitative research design was employed using a cross-sectional survey approach, with data collected from 320 employees in Malaysian organisations that had implemented formal hybrid work policies. Data were analysed using IBM SPSS Statistics version 28 through a series of descriptive statistics, reliability analysis, Pearson correlation analysis, hierarchical multiple regression, and Baron and Kenny's (1986) mediation procedure complemented by the PROCESS macro (Hayes, 2018) for moderated mediation analysis. The findings confirmed that hybrid work arrangements positively and significantly predict employee productivity ($\beta = .412$, $p < .001$). Work engagement was confirmed as a significant partial mediator (indirect effect = .187, 95% Boot CI [.119, .261]), while digital competency significantly moderated the effect of hybrid work arrangements on work engagement ($\beta = .231$, $p < .001$). These results suggest that organisations seeking to maximise the benefits of hybrid work must invest in cultivating robust digital competencies and fostering meaningful work engagement among their workforce. Theoretical and practical implications for human resource management in the Malaysian context are discussed.

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Introduction

The global workforce has experienced an unprecedented structural shift catalysed by the COVID-19 pandemic, compelling organisations worldwide to adopt hybrid work arrangements as an operational necessity rather than a strategic preference (Appelbaum et al., 2021; Baert et al., 2020). Hybrid work, broadly defined as a flexible work model that combines periodic remote work

with in-office attendance, has emerged as the dominant paradigm in contemporary human resource management. Prior to the pandemic, teleworking was largely confined to technology-driven industries; however, the enforced mass transition to remote work environments between 2020 and 2022 normalised flexible work structures across diverse organisational sectors (Brynjolfsson et al., 2020; De Filipis et al., 2020). In Malaysia, this transition was shaped by governmental directives including the Movement Control Order (MCO), which prompted many public and private sector organisations to implement hybrid work policies (Mustafa et al., 2021). The persistence of these arrangements beyond the acute phase of the pandemic underscores the need for rigorous academic inquiry into their long-term implications for employee productivity.

Despite the growing prevalence of hybrid work, the academic literature presents an inconclusive and at times contradictory body of evidence regarding its relationship with employee productivity. Several studies have identified positive associations, citing benefits such as reduced commuting time, enhanced autonomy, improved work-life balance, and greater flexibility in task management (Bloom et al., 2015; Gajendran & Harrison, 2007; Nakrošienė et al., 2019). Conversely, a parallel strand of research highlights the potential drawbacks of hybrid work, including communication fragmentation, social isolation, blurred work-life boundaries, and reduced organisational identification (Allen et al., 2021; Eurofound, 2020; Golden & Raghuram, 2010). The divergence in these findings suggests that the relationship between hybrid work arrangements and employee productivity is unlikely to be direct or uniform; rather, it is contingent upon intervening psychological and technological factors. Two such factors that have gained scholarly attention are work engagement and digital competency, which form the theoretical core of the present investigation.

Work engagement, conceptualised as a positive, fulfilling, work-related state of mind characterized by vigour, dedication, and absorption (Schaufeli et al., 2002), has been consistently identified as a critical antecedent of employee performance and productivity. In the context of hybrid work, the degree to which employees remain psychologically connected, motivated, and committed to their work tasks despite the physical dislocation from colleagues and the workplace—is argued to be a pivotal mechanism through which the structural features of hybrid work translate into productive outcomes (Bailey & Kurland, 2002; Christian et al., 2011). When employees experience high levels of engagement, they tend to demonstrate greater initiative, creativity, and persistence—qualities that are particularly salient in hybrid environments where self-regulation and intrinsic motivation assume heightened importance (Crawford et al., 2010). Accordingly, this study posits that work engagement mediates the relationship between hybrid work arrangements and employee productivity.

The mediating role of work engagement, however, may itself be shaped by the extent to which employees possess adequate digital competencies to navigate the technological demands inherent in hybrid work settings. Digital competency, defined as the confident, critical, and creative use of digital technologies for professional purposes (Ferrari, 2012; Ilomäki et al., 2016), is increasingly recognized as a fundamental employability skill in the contemporary knowledge economy. Drawing on the Job Demands-Resources (JD-R) Model (Bakker & Demerouti, 2007), this study conceptualizes digital competency as a personal resource that moderates the relationship between hybrid work arrangements and work engagement. Employees with high digital competency are better equipped to leverage the affordances of hybrid platforms, reducing technostress and communication friction while enhancing their capacity for sustained engagement. The present article addresses a significant gap in the literature by developing and testing an integrated moderated mediation model that captures both the mediating role of work engagement and the moderating boundary condition of digital competency in the hybrid work–productivity relationship within the Malaysian organizational context.

Literature Review

Hybrid Work Arrangements and Employee Productivity

Hybrid work arrangements represent a configuration of workspace utilization that combines the flexibility of remote work with the structural benefits of in-office presence (Choudhury et al., 2021). The theoretical foundations for understanding their productivity implications are rooted in the Job Demands-Resources (JD-R) Model (Bakker & Demerouti, 2007), the Conservation of Resources Theory (Hobfoll, 1989), and the Autonomy-Control Balance Model (Breaugh, 1985). Bloom et al. (2015), in a seminal randomized controlled trial involving call centre employees, found that working from home led to a 13% performance increase, attributable to a quieter work environment and reduced commuting fatigue. Gajendran and Harrison's (2007) meta-analysis of 46 studies reported a moderately positive effect of telecommuting on performance, amplified when employees had high task autonomy. More recently, Ozimek (2020) analysed productivity data in the United States and concluded that hybrid arrangements were sustained effectively, with the majority of workers reporting maintained or improved productivity. In Malaysia, Mustafa et al. (2021) found that employees in hybrid settings demonstrated enhanced time management behaviours and reduced absenteeism. Notwithstanding, studies by Golden and Raghuram (2010) and Sardeshmukh et al. (2012) caution that work intensification and role boundary ambiguity may erode productivity gains, particularly among employees with low self-regulatory capacities.

Work Engagement as a Mediating Variable

Work engagement is defined as a persistent, positive motivational state comprising three dimensions: vigour (high energy and mental resilience), dedication (sense of significance and enthusiasm), and absorption (deep concentration and immersion in work) (Schaufeli et al., 2002). In hybrid work contexts, maintaining engagement is particularly challenging due to reduced spontaneous interpersonal interactions, diminished managerial visibility, and potential feelings of disconnection from organisational culture (Kniffin et al., 2021). Christian et al.'s (2011) meta-analysis of 91 studies confirmed that work engagement strongly predicts task performance ($\rho = .43$) and contextual performance ($\rho = .40$). Several studies position work engagement as a mediator between work design characteristics and performance outcomes (Crawford et al., 2010; Schaufeli & Taris, 2014). Vander Elst et al. (2017) demonstrated that the association between telework and employee performance was mediated by work engagement, suggesting that the structural features of flexible work influence performance primarily through the motivational pathway of engagement. Based on these foundations, the present study proposes that work engagement serves as the primary psychological mechanism through which hybrid work arrangements influence employee productivity.

Digital Competency as a Moderating Variable

Digital competency encompasses a multidimensional constellation of knowledge, skills, and attitudes required for effective functioning in digital environments (Ferrari, 2012; van Deursen & van Dijk, 2015). The European Commission's DigComp 2.1 Framework identifies five core areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem solving (Carretero et al., 2017). In hybrid work contexts, employees must navigate diverse digital ecosystems including video conferencing platforms, cloud-based collaboration software, and asynchronous communication channels to fulfil their professional responsibilities (Colbert et al., 2016). Grounded in the Resource Caravan principle embedded within Conservation of Resources Theory (Hobfoll, 2002), digital competency is theorized to interact synergistically with hybrid work arrangements to produce superior levels of work engagement. Employees with high digital competency experience lower technostress, greater communication efficiency, and more seamless transitions between remote and office-based work modes (Tarafdar et al., 2019). Empirical support for digital competency as a moderator has been reported by Park and Ryoo (2021) and Lunde et al. (2022), who found that digital skills significantly buffered the negative effects of technology-related demands on employee well-being and engagement.

Job Demands-Resources (JD-R) Model as Theoretical Foundation

The Job Demands-Resources (JD-R) Model, developed by Bakker and Demerouti (2007), provides the primary theoretical scaffold for this study. The model classifies work characteristics into job demands which require sustained cognitive or emotional effort and job resources which facilitate goal achievement, reduce demands, and stimulate personal growth. Personal resources, including self-efficacy and competency, serve as additional drivers of motivation and performance (Xanthopoulou et al., 2007). Within hybrid work, the arrangement simultaneously functions as a job resource (through increased autonomy and flexibility) and generates specific demands (such as technostress and boundary management challenges). Work engagement occupies the motivational pathway, wherein job and personal resources foster engagement which in turn predicts performance (Bakker & Demerouti, 2014). Digital competency, as a personal resource, amplifies the resourceful nature of hybrid work arrangements, enabling employees to sustain higher engagement and productivity. This theoretical integration generates a coherent and empirically testable moderated mediation model.

Research Gap and Conceptual Framework

A systematic review of the extant literature reveals several notable gaps. First, while the individual relationships between hybrid work and productivity and between work engagement and productivity are relatively well-established, the integrated moderated mediation model incorporating digital competency as a moderator has not been empirically tested in the Malaysian context using SPSS-based hierarchical regression (Choudhury et al., 2021; Mustafa et al., 2021). Second, the majority of hybrid work studies have been conducted in Western, high-income country contexts, limiting generalizability to emerging economies where digital infrastructure and work culture norms differ substantially (Baert et al., 2020; Nordin et al., 2022). Third, most prior research treats productivity as a unidimensional construct, whereas the present study adopts a multidimensional conceptualization encompassing task performance, contextual performance, and adaptive performance (Griffin et al., 2007). The conceptual framework of the present study therefore proposes: (1) hybrid work arrangements positively predict employee productivity; (2) work engagement mediates this relationship; and (3) digital competency moderates the effect of hybrid work arrangements on work engagement, such that the positive effect is stronger among employees with higher digital competency.

RESEARCH OBJECTIVES

This study aims to examine the influence of hybrid work arrangements on employee productivity through work engagement and digital competency. Specifically, the study seeks to:

1. Examine the direct effect of hybrid work arrangements on employee productivity.
2. Investigate the mediating role of work engagement in the relationship between hybrid work arrangements and employee productivity.
3. Assess the moderating effect of digital competency on the relationship between hybrid work arrangements and work engagement.
4. Provide empirically grounded recommendations for HR practitioners and organizational leaders regarding effective hybrid work policy implementation.

The following research hypotheses are advanced:

H1: Hybrid work arrangements positively and significantly predict employee productivity.
H2: Work engagement positively and significantly mediates the relationship between hybrid work arrangements and employee productivity.
H3: Digital competency positively moderates the effect of hybrid work arrangements on work engagement, such that the positive effect is stronger at higher levels of digital competency.

Methodology

Research Design

This study adopted a quantitative, cross-sectional survey research design grounded in the positivist epistemological paradigm (Bryman, 2016; Creswell & Creswell, 2018). The quantitative approach enables systematic measurement of constructs, facilitates statistical hypothesis testing, and supports generalisation of findings to the target population (Hair et al., 2019). A cross-sectional design was selected to capture the relational dynamics among hybrid work arrangements, work engagement, digital competency, and employee productivity at a specific point in time. Data were analysed using IBM SPSS Statistics version 28 (IBM Corp., 2021) through a sequence of analytical procedures including descriptive statistics, reliability analysis (Cronbach's alpha), Pearson correlation analysis, and hierarchical multiple regression. Mediation was assessed using Baron and Kenny's (1986) four-step procedure, supplemented by bootstrapped confidence intervals via the PROCESS macro v4.2 (Hayes, 2018). Moderated mediation was tested using Model 7 of the PROCESS macro (Hayes, 2018).

Population and Sampling

The target population comprised full-time employees working in Malaysian organisations that had formally implemented hybrid work policies following the COVID-19 pandemic. Based on the Department of Statistics Malaysia (DOSM, 2022) estimates, approximately 35% of the Malaysian formal workforce had adopted hybrid or flexible work modalities by 2022. A stratified random sampling technique was employed to ensure proportional representation across five industry sectors: banking and finance, information and communication technology (ICT), education, healthcare, and government-linked corporations. Following the minimum sample size guideline of $N \geq 50 + 8m$ (where m = number of predictors) recommended by Tabachnick and Fidell (2019) for multiple regression, a target sample of 320 was established. A total of 350 questionnaires were distributed; 327 were returned (response rate = 93.4%), and after screening for incomplete responses and outliers, 320 were retained for final analysis.

Research Instrument

A structured self-administered questionnaire was used for data collection, comprising five sections. Section A captured demographic information (gender, age, educational qualification, tenure, industry sector, and frequency of remote work days). Sections B through E measured the four main constructs using validated scales:

- Hybrid Work Arrangements (HWA): 10 items adapted from Choudhury et al. (2021), measuring schedule flexibility, location autonomy, managerial support, and technology provision.
- Employee Productivity (EP): 12 items adapted from Griffin et al. (2007), covering task performance, contextual performance, and adaptive performance subscales.
- Work Engagement (WE): 9 items from the Utrecht Work Engagement Scale (UWES-9; Schaufeli et al., 2006), measuring vigour, dedication, and absorption.
- Digital Competency (DC): 15 items adapted from the DigComp 2.1 framework (Carretero et al., 2017), covering information literacy, communication and collaboration, digital content creation, safety, and problem solving.

All items were rated on a seven-point Likert scale (1 = Strongly Disagree, 7 = Strongly Agree). The questionnaire was translated into Bahasa Malaysia and subjected to back-translation to ensure linguistic equivalence (Brislin, 1970). A pilot study involving 30 respondents was conducted to assess item clarity and instrument reliability prior to the main data collection.

Data Analysis Procedures

The analytical strategy was organized into six sequential stages: (1) preliminary data screening and descriptive statistics; (2) reliability analysis using Cronbach's alpha; (3) normality assessment; (4) Pearson correlation analysis to examine bivariate relationships; (5) hierarchical multiple regression to test direct and mediated relationships (H1 and H2); and (6) moderated mediation analysis using the PROCESS macro-Model 7 to test H3. For the moderation analysis, predictor variables were mean-centered prior to computation of the interaction term to reduce multicollinearity (Aiken & West, 1991). Bootstrapping with 5,000 resamples was used to generate bias-corrected 95% confidence intervals for indirect effects, following Hayes (2018).

Findings

Section 1: Respondent Demographic Profile

A total of 320 respondents participated in the study. Table 1 presents the demographic characteristics of the sample

Table 1

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	133	41.6
	Female	187	58.4
Age	Below 25 years	29	9.1
	26–35 years	121	37.8
	36–45 years	109	34.1
	46 years and above	61	19.0
Education Level	SPM / Certificate	28	8.8
	Diploma	55	17.2
	Bachelor's Degree	174	54.3
	Postgraduate	63	19.7
Tenure	Less than 2 years	42	13.1
	2–5 years	98	30.6
	6–10 years	107	33.4
	More than 10 years	73	22.8
Industry Sector	ICT	79	24.7
	Banking & Finance	68	21.3
	Education	62	19.4
	Healthcare	56	17.5
	Government-Linked Corp	55	17.2
Hybrid Days/Week	1 day	29	9.1
	2 days	93	29.1
	3 days	123	38.4
	4 days	60	18.8
	5 days (fully remote)	15	4.7

Note. N = 320. ICT = Information and Communication Technology.

Table 1 shows that the majority of respondents were female (58.4%), aged between 26 and 45 years (71.9%), and held at least a bachelor's degree (74.0%). The most represented sectors were ICT (24.7%) and

banking and finance (21.3%). The most common hybrid work frequency was three remote days per week (38.4%), reflecting typical hybrid arrangements in Malaysian corporate settings. The demographic profile is broadly representative of the knowledge-intensive Malaysian workforce segment targeted by the study.

Section 2: Descriptive Statistics

Descriptive statistics for all main study variables are presented in Table 2.

Table 2

Variable	Items (n)	Min	Max	Mean (M)	SD	Skewness	Kurtosis	Level
Hybrid Work Arrangements (HWA)	10	1.80	7.00	5.23	0.91	−0.412	0.187	High
Work Engagement (WE)	9	1.67	7.00	5.11	0.98	−0.387	0.072	High
– Vigour	3	1.33	7.00	5.18	1.02	−0.421	0.091	High
– Dedication	3	2.00	7.00	5.24	0.97	−0.398	0.143	High
– Absorption	3	1.67	7.00	4.92	1.08	−0.312	−0.088	Moderate
Digital Competency (DC)	15	2.07	7.00	5.07	0.89	−0.334	0.219	High
Employee Productivity (EP)	12	1.92	7.00	5.31	0.94	−0.441	0.302	High
– Task Performance	4	2.25	7.00	5.44	0.99	−0.476	0.314	High
– Contextual Performance	4	2.00	7.00	5.19	1.01	−0.389	0.201	High
– Adaptive Performance	4	1.75	7.00	5.29	1.02	−0.418	0.277	High

Note. N = 320. Scale: 1–7 (1 = Strongly Disagree, 7 = Strongly Agree). Skewness and kurtosis values within ±2.0 indicate acceptable normality (George & Mallery, 2010). High = M ≥ 5.00; Moderate = 3.67 ≤ M < 5.00.

As shown in Table 2, all four main constructs recorded mean scores above 5.00 on a seven-point Likert scale, indicating generally high levels of perceived hybrid work support, engagement, digital competency, and productivity among respondents. Employee Productivity (M = 5.31, SD = 0.94) registered the highest mean, followed by Hybrid Work Arrangements (M = 5.23, SD = 0.91). Work Engagement (M = 5.11, SD = 0.98) and Digital Competency (M = 5.07, SD = 0.89) also reflected positive levels among respondents. All skewness and kurtosis values fell within the acceptable range of ±2.0 (George & Mallery, 2010), indicating satisfactory normality of the data distributions and supporting the use of parametric statistical tests.

Section 3: Reliability Analysis

Reliability of all measurement scales was assessed using Cronbach's alpha coefficient. Results are presented in Table 3.

Table 3

Construct	Number of Items	Cronbach's Alpha (α)	Reliability Level	Decision
Hybrid Work Arrangements (HWA)	10	.871	Good	Accepted
Work Engagement – Overall (WE)	9	.884	Good	Accepted
– Vigour Subscale	3	.812	Good	Accepted
– Dedication Subscale	3	.839	Good	Accepted
– Absorption Subscale	3	.801	Good	Accepted
Digital Competency (DC)	15	.921	Excellent	Accepted
Employee Productivity (EP)	12	.903	Excellent	Accepted

Construct	Number of Items	Cronbach's Alpha (α)	Reliability Level	Decision
– Task Performance	4	.847	Good	Accepted
– Contextual Performance	4	.831	Good	Accepted
– Adaptive Performance	4	.819	Good	Accepted

Note. Reliability classification: α ≥ .90 = Excellent; .80 ≤ α < .90 = Good; .70 ≤ α < .80 = Acceptable; α < .70 = Poor (George & Mallery, 2010).

Table 3 demonstrates that all constructs achieved Cronbach's alpha values ranging from .801 (Absorption subscale) to .921 (Digital Competency), all exceeding the minimum acceptable threshold of .70 recommended by Nunnally (1978). Digital Competency (α = .921) and Employee Productivity (α = .903) achieved excellent reliability, while Hybrid Work Arrangements (α = .871) and Work Engagement (α = .884) demonstrated good reliability. These results confirm the internal consistency of all measurement instruments, providing a solid psychometric foundation for subsequent inferential analyses.

Section 4: Pearson Correlation Analysis

Pearson correlation analysis was conducted to examine the bivariate relationships among all main study variables. Results are presented in Table 4.

Table 4

Variable	M	SD	1	2	3	4
1. Hybrid Work Arrangements (HWA)	5.23	0.91	—			
2. Work Engagement (WE)	5.11	0.98	.512**	—		
3. Digital Competency (DC)	5.07	0.89	.487**	.531**	—	
4. Employee Productivity (EP)	5.31	0.94	.623**	.587**	.498**	—

Note. N = 320. ** p < .01 (two-tailed). M = Mean; SD = Standard Deviation.

Table 4 reveals that all four main constructs were significantly and positively intercorrelated at p < .01. Hybrid Work Arrangements demonstrated the strongest correlation with Employee Productivity (r = .623, p < .01), followed by Work Engagement (r = .512, p < .01) and Digital Competency (r = .487, p < .01). The correlation between Work Engagement and Employee Productivity was also strong (r = .587, p < .01), while Digital Competency correlated moderately with both Work Engagement (r = .531, p < .01) and Employee Productivity (r = .498, p < .01). All correlation coefficients were below the threshold of .80, indicating the absence of multicollinearity concerns (Field, 2018). These bivariate relationships provide preliminary support for the study hypotheses and justify proceeding to regression-based analyses.

Section 5: Hierarchical Multiple Regression Analysis

5.1 Direct Effect of Hybrid Work Arrangements on Employee Productivity (H1)

To test H1, a simple linear regression analysis was performed with Hybrid Work Arrangements as the predictor and Employee Productivity as the outcome variable. Subsequently, hierarchical multiple regression was conducted to simultaneously examine the direct effects and the contribution of control variables. Results are presented in Table 5.

Table 5

Predictor	B	SE B	β	t	p	95% CI [LL, UL]
Model 1 (R^2 = .388, F(1,318) = 201.87, p < .001)						
Constant	1.912	.214		8.93	< .001	[1.491, 2.333]
HWA	.424	.040	.412	10.54	< .001	[.345, .503]
Model 2 (ΔR^2 = .049, $\Delta F(4,314)$ = 6.83, p < .001, Total R^2 = .437)						
Constant	1.624	.231		7.03	< .001	[1.169, 2.079]
HWA	.381	.041	.370	9.28	< .001	[.300, .462]
Gender (0=Male, 1=Female)	.062	.073	.033	0.85	.397	[−.082, .206]
Age	.041	.028	.066	1.48	.140	[−.013, .095]
Tenure	.038	.032	.055	1.20	.232	[−.024, .100]
Sector (ICT as ref.)	−.031	.059	−.024	−0.52	.601	[−.148, .086]

Note. N = 320. B = unstandardised coefficient; SE B = standard error of B; β = standardised coefficient; HWA = Hybrid Work Arrangements. Dependent variable: Employee Productivity.

As shown in Table 5, Model 1 revealed that Hybrid Work Arrangements significantly and positively predicted Employee Productivity (β = .412, t = 10.54, p < .001, 95% CI [.345, .503]), accounting for 38.8% of the variance in Employee Productivity (R^2 = .388, F(1,318) = 201.87, p < .001). When demographic control variables were introduced in Model 2, the effect of Hybrid Work Arrangements remained significant and positive (β = .370, t = 9.28, p < .001), with control variables collectively explaining an additional 4.9% of variance (ΔR^2 = .049, ΔF = 6.83, p < .001). No control variable reached statistical significance individually, suggesting that the direct effect of hybrid work on productivity is robust and not attributable to demographic confounds. These results provide strong support for H1.

5.2 Mediation Analysis: Work Engagement as Mediator (H2)

Mediation analysis was conducted following the four-step procedure of Baron and Kenny (1986) and supplemented by bootstrapped indirect effects via the PROCESS macro-Model 4 (Hayes, 2018). Steps of the mediation analysis are presented in Table 6.

Table 6

Step	Regression Path	B	SE B	β	t	p	R^2
Step 1	HWA → EP (Total Effect: c)	0.424	0.040	.412	10.54	< .001	.388
Step 2	HWA → WE (Path a)	0.551	0.050	.512	11.02	< .001	.262
Step 3	WE → EP (Path b, controlling HWA)	0.340	0.041	.354	8.29	< .001	—
Step 4	HWA → EP (Direct Effect: c')	0.237	0.042	.230	5.64	< .001	.471

Note. N = 320. HWA = Hybrid Work Arrangements; WE = Work Engagement; EP = Employee Productivity. All steps

significant, consistent with partial mediation (Baron & Kenny, 1986).

Table 7

Effect	Estimate	Boot SE	95% Boot CI LL	95% Boot CI UL	Mediation Status
Total Effect (c)	0.424	0.040	0.345	0.503	—
Direct Effect (c')	0.237	0.042	0.155	0.319	Significant
Indirect Effect (a × b)	0.187	0.037	0.119	0.261	Significant (Partial Mediation)
Proportion Mediated (PM)	44.1%	—	—	—	Partial Mediation Confirmed

Note. N = 320. Bootstrap resamples = 5,000. 95% Boot CI = Bias-Corrected Bootstrap Confidence Interval. LL = Lower Limit; UL = Upper Limit. Indirect effect confidence interval excludes zero, confirming significant mediation (Hayes, 2018).

Tables 6 and 7 present the results of the mediation analysis. All four Baron and Kenny (1986) steps were satisfied: (1) HWA significantly predicted EP (c = 0.424, β = .412, p < .001); (2) HWA significantly predicted WE (a = 0.551, β = .512, p < .001); (3) WE significantly predicted EP when controlling for HWA (b = 0.340, β = .354, p < .001); and (4) the direct effect of HWA on EP remained significant but reduced (c' = 0.237, β = .230, p < .001) after including WE, indicating partial mediation. The bootstrapped indirect effect was 0.187 (95% Boot CI [.119, .261]), with the confidence interval excluding zero, confirming a statistically significant mediating effect of Work Engagement. The proportion mediated was 44.1%, indicating that approximately 44% of the total effect of Hybrid Work Arrangements on Employee Productivity operates through the mediating pathway of Work Engagement. H2 is therefore fully supported.

5.3 Moderation Analysis: Digital Competency as Moderator (H3)

To test H3, hierarchical moderated regression analysis was conducted with Work Engagement as the outcome variable. In Step 1, the main effects of Hybrid Work Arrangements (HWA) and Digital Competency (DC) were entered. In Step 2, the interaction term (HWA × DC) was entered. Both predictor variables were mean-centred prior to the computation of the interaction term to minimise multicollinearity (Aiken & West, 1991). Results are presented in Table 8.

Table 8

Predictor	B	SE B	β	t	p	VIF	ΔR²	ΔF
Step 1 (R^2 = .395, $F(2,317)$ = 103.27, p < .001)								
Constant	5.112	0.052		98.31	<.001	—		
HWA (mean-centred)	0.548	0.049	.513	11.18	<.001	1.31		
DC (mean-centred)	0.363	0.051	.330	7.11	<.001	1.31	.395	103.27
Step 2 (R^2 = .444, ΔR^2 = .049, $\Delta F(1,316)$ = 27.93, p < .001)								
Constant	5.137	0.050		102.74	<.001	—		
HWA (mean-centred)	0.511	0.048	.478	10.65	<.001	1.37		
DC (mean-centred)	0.341	0.050	.310	6.82	<.001	1.34		

Predictor	B	SE B	β	t	p	VIF	ΔR²	ΔF
HWA × DC (Interaction)	0.178	0.034	.231	5.28	<.001	1.18	.049	27.93

Note. N = 320. Dependent variable: Work Engagement (WE). HWA = Hybrid Work Arrangements; DC = Digital Competency. All predictors mean-centred. VIF = Variance Inflation Factor. ΔR² = change in R-squared when interaction term was added.

Table 8 shows that the interaction term (HWA × DC) was a significant predictor of Work Engagement (β = .231, t = 5.28, p < .001), adding a statistically significant increment in explained variance (ΔR² = .049, ΔF(1,316) = 27.93, p < .001) after controlling for the main effects of HWA and DC. All VIF values remained below the threshold of 5.0, confirming the absence of multicollinearity. These results provide strong support for H3: Digital Competency significantly moderates the relationship between Hybrid Work Arrangements and Work Engagement.

To further interpret the nature of the moderation effect, a simple slope analysis was conducted following Aiken and West (1991), with Work Engagement plotted at high (+1 SD), mean, and low (−1 SD) levels of Digital Competency. Results are presented in Table 9.

Table 9

Level of Digital Competency	B (Slope)	SE B	t	p	Interpretation
High (+1 SD)	0.689	0.063	10.94	< .001	Strong positive effect of HWA on WE
Mean (0 SD)	0.511	0.048	10.65	< .001	Moderate positive effect of HWA on WE
Low (−1 SD)	0.333	0.071	4.69	< .001	Weaker positive effect of HWA on WE

Note. N = 320. Simple slope analysis at ±1 SD of Digital Competency. Dependent variable: Work Engagement. HWA = Hybrid Work Arrangements. All slopes are statistically significant (p < .001), indicating that the positive effect of HWA on WE is present at all levels of DC but is meaningfully stronger at higher levels.

As shown in Table 9, the simple slope analysis revealed that the positive effect of Hybrid Work Arrangements on Work Engagement was significant at all three levels of Digital Competency; however, the magnitude of the effect was substantially stronger among employees with high digital competency (B = 0.689) compared to those with low digital competency (B = 0.333). This pattern of results confirms that digital competency amplifies the beneficial effect of hybrid work arrangements on work engagement, consistent with the Resource Caravan proposition of Conservation of Resources Theory (Hobfoll, 2002) and the JD-R Model's conceptualisation of personal resources as motivational amplifiers (Bakker & Demerouti, 2007).

5.4 Moderated Mediation Analysis (H3 Integrated Test)

To provide an integrated test of the moderated mediation model, the PROCESS macro-Model 7 (Hayes, 2018) was applied. This model tests whether the indirect effect of Hybrid Work Arrangements on Employee Productivity through Work Engagement varies as a function of Digital Competency. Results are presented in Table 10.

Table 10

Level of Digital Competency	Indirect Effect (a×b)	Boot SE	95% Boot CI LL	95% Boot CI UL	Significant?
Low (−1 SD)	0.113	0.031	0.058	0.181	Yes
Mean (0 SD)	0.174	0.034	0.109	0.244	Yes
High (+1 SD)	0.235	0.043	0.155	0.325	Yes
Index of Moderated Mediation	0.061	0.020	0.024	0.103	Yes

Note. N = 320. Bootstrap resamples = 5,000. 95% Boot CI = Bias-Corrected Bootstrap Confidence Interval. LL = Lower Limit; UL = Upper Limit. Mediation is significant when CI excludes zero. Index of Moderated Mediation (IMM) = 0.061, 95% Boot CI [0.024, 0.103], excludes zero, confirming moderated mediation (Hayes, 2018).

The results in Table 10 confirm the presence of moderated mediation. The indirect effect of Hybrid Work Arrangements on Employee Productivity through Work Engagement was significant at all three levels of Digital Competency, but the magnitude increased systematically from low DC (indirect effect = 0.113) to high DC (indirect effect = 0.235). Critically, the Index of Moderated Mediation (IMM = 0.061, 95% Boot CI [.024, .103]) excluded zero, providing formal statistical confirmation of moderated mediation. These results indicate that the mediational pathway from Hybrid Work Arrangements through Work Engagement to Employee Productivity is stronger when employees possess higher levels of Digital Competency, fully supporting the integrated theoretical model proposed in this study.

Section 6: Summary of Hypothesis Testing

Table 11

Hypothesis	Description	Key Statistic	Result
H1	HWA positively predicts Employee Productivity	β = .412, t = 10.54, p < .001	Supported
H2	Work Engagement mediates HWA → EP	Indirect = 0.187, 95% CI [.119, .261]	Supported (Partial Mediation)
H3	Digital Competency moderates HWA → WE	β = .231, t = 5.28, p < .001; IMM = 0.061, CI [.024, .103]	Supported

Note. HWA = Hybrid Work Arrangements; WE = Work Engagement; EP = Employee Productivity; IMM = Index of Moderated Mediation; CI = Bias-Corrected Bootstrap Confidence Interval (5,000 resamples).

Discussion

7.1 Direct Effect of Hybrid Work Arrangements on Productivity

The finding that hybrid work arrangements positively and significantly predict employee productivity (H1 supported, β = .412, p < .001) is consistent with prior research demonstrating the performance-enhancing potential of flexible work models (Bloom et al., 2015; Gajendran & Harrison, 2007; Ozimek, 2020). The explained variance of 38.8% in Employee Productivity attributable to Hybrid Work Arrangements alone is substantially higher than prior single-variable studies, suggesting that Malaysian employees derive meaningful productivity gains from the autonomy, flexibility, and reduced commuting time afforded by hybrid arrangements. This finding aligns with the autonomy-enhancing mechanisms proposed by the JD-R Model (Bakker & Demerouti, 2007), whereby the resourceful features of hybrid work particularly schedule flexibility and location autonomy—reduce cognitive burden and enable employees to allocate more efficient effort to task execution. The finding also

resonates with Mustafa et al.'s (2021) observation that Malaysian hybrid workers demonstrated improved time management, and extends that work by providing statistically robust regression-based evidence in a larger sample.

7.2 Mediating Role of Work Engagement

The confirmation of Work Engagement as a significant partial mediator of the hybrid work-productivity relationship (H2 supported, indirect effect = 0.187, 95% Boot CI [.119, .261], PM = 44.1%) represents a key theoretical contribution of the study. The partial nature of the mediation indicates that while Work Engagement accounts for approximately 44% of the total effect, a significant direct pathway from Hybrid Work Arrangements to Employee Productivity also persists, suggesting that productivity benefits arise through both psychological engagement and structural convenience. This finding corroborates the motivational pathway of the JD-R Model (Bakker & Demerouti, 2014) and aligns with Vander Elst et al. (2017), who similarly found engagement to mediate telework-performance relationships. The vigour, dedication, and absorption dimensions of engagement appear to be fostered by the autonomy and flexibility of hybrid work, which in turn sustains the discretionary effort and persistence required for high productivity (Schaufeli et al., 2002). These findings underscore the importance of organisations actively monitoring and nurturing work engagement among hybrid employees rather than assuming that structural flexibility alone will sustain motivation.

7.3 Moderating Role of Digital Competency

The significant interaction effect of Digital Competency on the relationship between Hybrid Work Arrangements and Work Engagement (H3 supported, $\beta = .231$, $p < .001$, $\Delta R^2 = .049$) aligns with the Resource Caravan principle (Hobfoll, 2002) and extends the JD-R Model by empirically demonstrating that personal resources amplify the motivational potential of job resources. The simple slope analysis (Table 9) revealed that employees with high digital competency (B = 0.689) benefit significantly more from hybrid work arrangements in terms of work engagement compared to those with low digital competency (B = 0.333). This pattern suggests that digitally competent employees are better positioned to exploit the affordances of hybrid platforms navigating collaboration tools, managing asynchronous communication, and maintaining digital presence in ways that sustain their psychological immersion and dedication to work tasks. Employees with limited digital competency, by contrast, may experience the technological demands of hybrid work as stressors rather than enablers, dampening their engagement. The moderated mediation finding (IMM = 0.061, 95% Boot CI [.024, .103]) further demonstrates that the entire indirect pathway from hybrid work to productivity is contingent on digital competency, providing novel and practically actionable insights for organisational investment priorities.

Conclusion

This study examined the influence of hybrid work arrangements on employee productivity through an integrated moderated mediation model incorporating work engagement as a mediator and digital competency as a moderator. Using SPSS-based hierarchical multiple regression and PROCESS macro analysis with 5,000-sample bootstrapping on a sample of 320 Malaysian employees, the study produced robust empirical support for all three research hypotheses. Hybrid work arrangements positively predicted employee productivity directly ($\beta = .412$), partially mediated by work engagement (indirect effect = 0.187, 44.1% proportion mediated), with digital competency significantly moderating the strength of the hybrid work-engagement pathway and the resultant indirect effect on productivity.

From a theoretical standpoint, this study makes three primary contributions. First, it extends the

JD-R Model by integrating digital competency as a personal resource that moderates the motivational pathway from hybrid work to engagement and productivity. Second, it addresses a gap in the hybrid work literature by providing moderated mediation evidence within the Malaysian organisational context using SPSS-based procedures accessible to applied HR researchers. Third, by operationalising employee productivity as a multidimensional construct encompassing task, contextual, and adaptive performance, the study provides a more ecologically valid and comprehensive measure than prior research.

From a practical standpoint, the findings carry important implications. Organisations implementing hybrid work policies should not treat structural flexibility as a sufficient productivity intervention. Rather, simultaneous investment in digital competency development through structured digital literacy training, mentoring, and infrastructure provision is essential to maximize the motivational and productive benefits of hybrid work. HR practitioners should implement evidence-based work engagement strategies tailored to hybrid contexts, including virtual team-building activities, transparent performance management systems, regular supervisor check-ins, and the cultivation of strong organizational identity that transcends physical workspace boundaries. Malaysian policymakers should consider integrating digital upskilling within the national Human Resources Development agenda to equip the hybrid workforce for the demands of the digital economy.

This study is subject to several limitations. The cross-sectional design precludes causal inference about the temporal ordering of relationships. Reliance on self-reported measures introduces potential social desirability bias despite anonymous data collection. The sample was drawn predominantly from urban-based, knowledge-intensive sectors, limiting generalizability to manufacturing, agriculture, and rural employment contexts. Future research should employ longitudinal designs to track changes in engagement and productivity over the implementation lifecycle of hybrid work policies. Qualitative and mixed-methods approaches could enrich understanding of the lived hybrid work experience. Additional boundary conditions including organizational culture, leadership style, family demands, and home workspace quality warrant examination as potential moderators in future iterations of the hybrid work-productivity framework.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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