

Digitalization, Techno-Stressor, and Digital Readiness: Their Effects on Job Stress and MSMEs' Performance

Khoirul Hikmah^{1*}, Arief Subiyantoro¹, Marita¹, Rifqi Syarif Nasrulloh², Aditya Wardana³, Muhammad Ilham Fawwaz¹

¹Universitas Pembangunan Nasional "Veteran", Yogyakarta 55283, Indonesia

²Universitas Brawijaya, Malang 65145, Indonesia

³Universitas Dirgantara Adisutjipto, Yogyakarta, 55198, Indonesia

*Corresponding Email: khoirul.hikmah@upnyk.ac.id

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Digitalization in the Society 4.0 era has accelerated digital technology adoption among MSMEs, generating both operational benefits and technology-related psychological pressures. This study examines the effects of digitalization on job stress and digital performance among MSMEs in Yogyakarta, with techno-stressor as a mediator and digital readiness as a moderator. Survey data from 171 MSME owners and managers were analyzed using PLS-SEM with SmartPLS 4.1. Digitalization did not significantly affect job stress ($b = 0.124$, $p = 0.180$) or techno-stressor ($b = -0.150$, $p = 0.107$). Techno-stressor was positively associated with job stress ($b = 0.670$, $p < 0.001$), but did not mediate the digitalization–job stress relationship ($b = -0.100$, $p = 0.117$). Digital readiness did not significantly moderate the digitalization–techno-stressor relationship ($b = 0.095$, $p = 0.070$) or the digitalization–job stress relationship ($b = 0.032$, $p = 0.480$). Job stress was not associated with digital performance ($b = -0.083$, $p = 0.093$), whereas digital readiness was positively associated with digital performance ($b = 0.709$, $p < 0.001$). The findings highlight the importance of digital readiness as a resource associated with MSME digital performance and the need to manage technology-related pressure during digital transformation.

Keywords: Digital Performance; Digital Readiness; Digitalization; Job Stress; MSMEs; Techno-Stressor

JEL Classification: L26; M15; O33

INTRODUCTION

The Society 4.0 era has accelerated digital transformation among micro, small, and medium enterprises (MSMEs), with technologies such as the Internet of Things (IoT), artificial intelligence (AI), and e-commerce platforms supporting operational efficiency, productivity, and market competitiveness. Recent evidence also indicates that digital entrepreneurship is positively associated with entrepreneurial competence and business innovation, highlighting the role of digital capabilities in supporting innovation-oriented outcomes (Astini et al., 2026).

The Special Region of Yogyakarta in Indonesia has experienced increasing digital technology adoption among MSMEs, driven by the expansion of online marketplaces and government-supported digital market access programs. The growing use of e-commerce platforms, digital payment systems, and cloud-based management tools has enabled MSMEs to expand their market reach and improve the efficiency of their business operations.

However, digital transformation can also create new work-related demands and psychological pressures associated with intensive technology use. MSME operators may need to remain continuously connected, respond rapidly to customer demands, and manage multiple digital platforms simultaneously. These conditions can increase perceived workload and contribute to techno-overload, particularly when digital technologies become an integral part of daily business activities. Wang et al. (2008) demonstrate that e-commerce users face job-related stress because they need to respond rapidly while dealing with intense market competition. The lack of digital competence among users may also generate techno-uncertainty, self-doubt, and anxiety when interacting with digital applications (Mougha et al., 2023).

Techno-stressor refers to technology-related demands that can create psychological strain when individuals experience difficulties adapting to intensive or changing digital technologies (Tarafdar et al., 2019). Techno-stressor is particularly relevant to MSMEs in developing economies, where differences in infrastructure, digital skills, and organizational resources may influence responses to technological demands. Digital readiness may influence how MSMEs respond to technological demands by providing infrastructure, capabilities, and organizational support (Zheng, 2024). Higher readiness may facilitate adaptation to digitalization; however, whether it consistently functions as a protective resource remains empirically uncertain (Tarafdar et al., 2019).

Empirical findings remain inconsistent. Digitalization has been associated with both reduced stress through flexibility and organizational support (Malik et al., 2022) and increased stress through information overload and constant connectivity (Bregenzer & Jimenez, 2021; Cavicchioli et al., 2025). Similarly, its relationship with techno-stressors varies depending on available support and digital capabilities (Lanzl, 2023). Digital readiness has also shown varying effects on techno-stressors and well-being (Alfehaid et al., 2024; Becker et al., 2022), while job stress and digital readiness demonstrate inconsistent relationships with performance outcomes (Martin et al., 2022; Trischler & Li-Ying, 2022).

Taken together, inconsistencies constitute an empirical gap because previous studies have not established consistent relationships among digitalization, techno-stressor, digital readiness, job stress, and digital performance. A separate contextual gap concerns the limited understanding of how these relationships operate within MSMEs operating in Indonesia, a developing economy, particularly in Yogyakarta, where resource constraints, uneven digital capabilities, and rapid technology adoption may alter

the balance between technology-related job demands and available resources. Examining this context is therefore important because findings derived from larger organizations or more digitally mature environments may not be directly applicable to MSMEs.

This study addresses these gaps by simultaneously examining the direct relationships among digitalization, techno-stressor, job stress, digital readiness, and digital performance, while testing techno-stressor as a mediating mechanism and digital readiness as a moderating factor. The novelty of the study lies in integrating these relationships within a single MSME-focused framework within the developing-economy context of Indonesia, with a particular focus on Yogyakarta. Theoretically, the study contributes to the Job Demands–Resources (JD–R) perspective by examining whether digital readiness consistently functions as a resource that buffers digital demands or may, under certain conditions, intensify technology-related pressure. Practically, the findings provide evidence for MSME owners and relevant stakeholders to strengthen digital capabilities while simultaneously managing technology-related workload and psychological pressure during digital transformation.

LITERATURE REVIEW

Theoretical Review

Job Demand–Resource (JD–R) Theory

The JD–R theory distinguishes job demands, which require sustained effort and may generate psychological strain, from job resources that support goal achievement and help individuals cope with demands (Bakker et al., 2023; Demerouti et al., 2001). In this study, digitalization is positioned as a source of job demands, techno-stressor as a technology-related demand, and digital readiness as a potential organizational and personal resource (Tarafdar et al., 2019). Job stress represents psychological strain, while digital performance reflects an organizational outcome associated with the balance between demands and resources (Bakker et al., 2023; Demerouti et al., 2001; Michelotto & Joia, 2024).

Variables Review

Digitalization Society 4.0

Digitalization involves transforming business activities and processes through the adoption and integration of digital technologies to improve operational efficiency and user experience. In this study, digitalization specifically refers to the implementation and integration of digital technologies into MSME business activities and processes, rather than the preparedness to use such technologies or the outcomes generated from their use. In this study, digitalization is measured using five indicators adapted from Fonseca (2018): (1) digital technology adoption, (2) digital infrastructure, (3) digital skills, (4) digitalization impact, and (5) sustainable innovation.

Job Stress

Job stress represents psychological strain that may arise when job demands exceed individuals' capabilities or available resources (Bakker et al., 2023; Demerouti et al., 2001). In digitally intensive work environments, continuous responsiveness and technological adaptation may increase such demands. The initial measurement of job stress comprised five indicators adapted from Nasir et al. (2022): (1) workload, (2) role conflict, (3) role ambiguity, (4) social support, and (5) emotional exhaustion. After the measurement-model assessment, the social support indicator was removed because it was conceptually more consistent with a job resource than with job stress.

Techno-Stressor

Techno-stressor refers to technology-related demands that create psychological strain when individuals have difficulty adapting to intensive or changing technology use (Tarafdar et al., 2019). Within the JD–R framework, overload, invasion, complexity, insecurity, and uncertainty represent technology-related demands that require sustained cognitive and emotional effort and may generate strain when available resources are insufficient (Bakker et al., 2023; Demerouti et al., 2001). The initial measurement of techno-stressor comprised five indicators adapted from Tarafdar et al. (2019): (1) techno-overload, (2) techno-invasion, (3) techno-complexity, (4) techno-insecurity, and (5) techno-uncertainty. After the measurement-model assessment, the techno-insecurity indicator was removed because of its low loading and its comparatively limited applicability to the MSME owner and manager context.

Digital Readiness

Digital readiness refers to the degree to which an MSME is prepared to adopt and effectively utilize digital technologies (Michelotto & Joia, 2024). In this study, digital readiness represents the preparedness and enabling conditions for digital technology use, rather than the actual adoption and integration of digital technologies captured by digitalization. It encompasses preparedness in technological infrastructure, processes, capabilities, and culture that supports digital transformation. Within the JD–R framework, digital readiness can be conceptualized as a potential resource because technological capabilities and organizational preparedness may help individuals manage technology-related demands and adapt to digital change (Bakker et al., 2023; Demerouti et al., 2001). The indicators employed in this study are adapted from Tarafdar et al. (2019), which are (1) technological infrastructure, (2) capabilities and organizational support, (3) employee psychological preparedness, and (4) organizational cultural elements.

Digital Performance

Digital performance refers to the extent to which MSMEs achieve measurable outcomes from the utilization of digital technologies in their business activities (Michelotto & Joia, 2024; Sharabati et al., 2024). Unlike digitalization, which reflects the implementation and integration of digital technologies, and digital readiness, which reflects preparedness for their effective use, digital performance captures the outcomes generated from such utilization. Digital performance reflects the effectiveness of digital investments and digital channels in generating customer and marketing outcomes (Sharabati et al., 2024). Within the JD–R framework, it represents an organizational outcome associated with managing digital demands through available resources (Bakker et al., 2023). In this study, digital performance is measured using five indicators adapted from Sharabati et al. (2024): (1) digital investment success rate, (2) website visitor statistics, (3) customer retention rates, (4) social media interaction metrics, and (5) marketing campaign optimization.

Hypotheses Development

Digitalization and Job Stress

Digitalization may reduce job stress by increasing flexibility and organizational support (Malik et al., 2022; Valta et al., 2024), but may also increase stress through information overload, continuous connectivity, and greater work demands (Bregenzer & Jimenez, 2021; Cavicchioli et al., 2025; Marsh et al., 2024). Its adverse effects may be weaker when individuals possess adequate digital competence or organizational support. From the JD–R perspective, digitalization represents a potential job demand that may generate psychological strain when its demands exceed available resources (Bakker et al., 2023; Demerouti et al., 2001). These inconsistent findings provide the basis for examining its relationship with job stress among MSME actors.

H1: Digitalization in the Society 4.0 era has a significant effect on job stress.

Digitalization and Techno-Stressor

Digitalization may increase techno-stressors by introducing system complexity, communication demands, and digital security risks (Malik et al., 2022; Rademaker et al., 2025). However, these effects may be reduced when individuals possess adequate digital competence or organizational support, while supportive digital environments may improve efficiency and reduce perceived technological complexity (Lanzl, 2023). From the JD–R perspective, digitalization becomes a technology-related demand when cognitive load, connectivity, and adaptation requirements exceed available resources (Bakker et al., 2023; Demerouti et al., 2001; Tarafdar et al., 2019).

H2: Digitalization in the Society 4.0 era has a significant effect on techno-stressors.

Techno-Stressor and Job Stress

Techno-stressors, including techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty, have been associated with greater job stress and psychological strain (Kaltenegger et al., 2024). However, its adverse effects may be weakened by training, digital competence, leadership support, and other organizational resources (Malik et al., 2022). Consistent with the JD–R framework, techno-stressor represents a technology-related job demand that may increase job stress when demands exceed available personal and organizational resources (Bakker et al., 2023; Demerouti et al., 2001; Tarafdar et al., 2019).

H3: Techno-stressor has a significant effect on job stress.

The Mediating Role of Techno-Stressor

Techno-stressor may mediate the relationship between digitalization and job stress because digitalization can introduce technological demands, unpredictability, and cognitive workload that generate technology-specific pressure, which may subsequently contribute to psychological strain (Kaltenegger et al., 2024). However, this indirect pathway may be weakened by digital competence, leadership, social support, and other organizational resources (Gimpel et al., 2025). Within the JD–R framework, techno-stressor therefore represents a potential mechanism through which digital demands are associated with broader job stress (Demerouti et al., 2001; Tarafdar et al., 2019).

H4: Techno-stressor mediates the relationship between digitalization in the Society 4.0 era and job stress.

The Moderating Role of Digital Readiness on Digitalization–Techno-Stressor Relationship

Digital readiness may shape the relationship between digitalization and techno-stressor. Higher readiness can support adaptation to digital change and reduce technology-related pressure (Alfehaid et al., 2024), although other evidence shows that readiness does not consistently reduce stress across organizational contexts (Becker et al., 2022; Scheepers et al., 2022). From the JD–R perspective, digital readiness represents a potential resource that may alter how digital demands are experienced and managed. Its role may therefore depend on the balance between technological demands and available resources (Bakker et al., 2023; Demerouti et al., 2001).

H5: Digital readiness moderates the relationship between digitalization in the Society 4.0 era and techno-stressors.

The Moderating Role of Digital Readiness on Digitalization–Job Stress Relationship

Digital readiness may influence how digitalization-related demands are associated with job stress. Higher digital competence and adaptive capacity may help individuals manage technological pressure (Bregenzer & Jimenez, 2021), although prior studies also report inconsistent or non-significant moderating effects (Cavicchioli et al., 2025; Han, 2024). From the JD–R perspective, digital readiness represents a potential resource that may weaken the translation of digital demands into psychological strain when sufficient capabilities and support are available (Bakker et al., 2023; Demerouti et al., 2001).

H6: Digital readiness moderates the relationship between digitalization in the Society 4.0 era and job stress.

Job Stress and Digital Performance

Previous studies provide mixed evidence regarding job stress and performance. Excessive stress may reduce productivity and performance effectiveness (Martin et al., 2022), whereas moderate stress may support focus and adaptive effort (Ghafoor & Haar, 2022). Other studies report no significant relationship when adequate organizational resources help individuals manage work demands (Cavicchioli et al., 2025). Within the JD–R framework, job stress represents psychological strain that may deplete resources needed for digital tasks, although its performance consequences may depend on the resources available to cope with such demands (Bakker et al., 2023; Demerouti et al., 2001).

H7: Job stress has a significant effect on digital performance.

Digital Readiness and Digital Performance

Digital readiness supports an organization's ability to use digital technologies and translate digital capabilities into performance outcomes. Higher technological and organizational preparedness has been associated with stronger operational and innovation outcomes (Trischler & Li-Ying, 2022), whereas insufficient readiness may constrain performance through inadequate infrastructure, capabilities, or organizational support (Pingali et al., 2023). From the JD–R perspective, digital readiness represents a resource that may support goal achievement by helping MSMEs manage digital demands and convert technology use into stronger performance outcomes (Bakker et al., 2023; Demerouti et al., 2001).

H8: Digital readiness has a significant effect on digital performance.

Conceptual Framework

Figure 1. Conceptual Framework

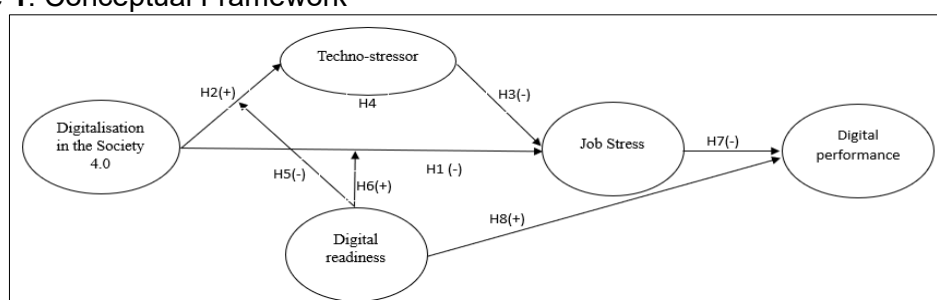


Figure 1 illustrates the conceptual framework developed based on the JD–R theory to examine the relationships among digitalization, techno-stressor, job stress, digital readiness, and digital performance among MSME actors in Yogyakarta. The framework

proposes that digitalization may be associated with job stress both directly and indirectly through techno-stressor, with techno-stressor serving as a mediating mechanism. In addition, digital readiness is proposed to moderate the relationships between digitalization and techno-stressor and between digitalization and job stress. Finally, job stress and digital readiness are proposed to influence digital performance. These relationships form the basis for the eight hypotheses tested in this study.

RESEARCH METHOD

Research Design

This study employed a quantitative, cross-sectional survey design to examine the relationships among digitalization, techno-stressor, digital readiness, job stress, and digital performance among MSME actors in the Special Region of Yogyakarta.

Population and Sampling

The population consisted of MSME owners and managers in the Special Region of Yogyakarta who used digital technologies in their business activities. Purposive sampling was applied using three criteria: (1) being an MSME owner or manager in Yogyakarta; (2) using digital technologies in business operations; and (3) being directly involved in digital-based business activities. An a priori power analysis based on three predictors, a medium effect size ($f^2 = 0.15$), a 0.05 significance level, and 0.80 statistical power indicated a minimum sample of 77 respondents. The final sample of 171 therefore exceeded this requirement.

Measurement of Variables

The instrument measured five latent constructs: digitalization, job stress, techno-stressor, digital readiness, and digital performance, using indicators adapted from prior studies as described in the Literature Review. All items used a five-point Likert scale. Content validity was assessed through expert judgment by digital-management academics and MSME practitioners who evaluated item wording, conceptual consistency, and contextual relevance.

Data Collection

Data were collected from August to December 2025 through a Google Forms questionnaire distributed to MSME owners and managers in Yogyakarta. Responses were screened using the three inclusion criteria, and only eligible responses were retained. Respondents were informed about the study purpose, voluntary participation, and confidentiality, and informed consent was obtained before questionnaire completion.

Data Analysis

Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.1. The measurement model was evaluated using outer loadings, average variance extracted (AVE), Cronbach's alpha, and composite reliability (CR), with thresholds of 0.70, 0.50, and 0.70, respectively. The structural model was assessed using path coefficients, t-statistics, p-values, and R^2 . Hypotheses were tested using bootstrapping, including the proposed mediation and moderation effects. A two-tailed significance test at the 5% level was applied consistently. Given the self-reported cross-sectional data, potential common method bias (CMB) was assessed using full-collinearity VIF.

RESULTS

Descriptive Analysis

Based on 171 MSME respondents, the final sample exceeded the minimum sample size requirement established through the statistical power assessment described in the Research Method. To provide a clearer overview of the sample, the demographic and business characteristics of the respondents are summarized in Table 1.

Table 1. Descriptive Analysis

Characteristic		Frequency (n)	Percentage (%)
Gender	Female	139	81.29
	Male	32	18.71
Generation	Millennial	66	38.60
	Generation X	59	34.50
	Gen Z	46	26.90
Education	Senior secondary education	78	45.61
	Diploma/Bachelor's degree	65	38.02
	Junior Secondary Education	18	10.53
	Master's/Doctoral Degree	10	5.85
Business Sector	Culinary & food processing	116	67.83
	Services & related industries	20	11.70
	Retail & Trading	19	11.11
	Other Business Sectors	16	9.36
Business age	Less than 1 year	51	29.82
	1 – 3 years	60	35.09
	3 – 5 years	42	24.56
	More than 5 years	18	10.53
Monthly Business Revenue	Below IDR 3 million	83	48.54
	IDR 3 – 10 million	50	29.24
	Above IDR 10 million	38	22.22

As shown in Table 1, respondents were predominantly female (81.29%), with Millennials as the largest generational group (38.60%). Most had senior secondary education (45.61%), and the sample was dominated by culinary and food-processing MSMEs (67.83%). Businesses aged 1–3 years represented the largest business-age group (35.09%), while 48.54% reported monthly business revenue below IDR 3 million. Construct means were interpreted using a five-point scale with an interval width of 0.8, ranging from very low (1.00–1.80) to very high (4.21–5.00) (Bougie & Sekaran, 2025). Digitalization, techno-stressor, job stress, digital readiness, and digital performance recorded mean scores of 3.66, 2.98, 3.11, 3.68, and 3.85, respectively

Data Analysis

Outer Model

The measurement model was evaluated using outer loadings, AVE, Cronbach's alpha, and CR. The indicator-loading results are presented in Table 2.

Table 2. Validity test (First and Second Test)

Indicator	First test					Second test				
	DP	DR	DS	JS	TS	DP	DR	DS	JS	TS
DP_1	0.834					0.834				
DP_2	0.760					0.760				
DP_3	0.830					0.830				
DP_4	0.834					0.833				
DP_5	0.883					0.883				
DR_1		0.796					0.798			

DR_2		0.817				0.817			
DR_3		0.849				0.848			
DR_4		0.867				0.867			
DS_1			0.780				0.779		
DS_2			0.827				0.828		
DS_3			0.876				0.878		
DS_4			0.850				0.850		
DS_5			0.819				0.816		
JS_1				0.756				0.787	
JS_2				0.858				0.876	
JS_3				0.808				0.816	
JS_4				-0.408*				-	
JS_5				0.735				0.747	
TS_1					0.718				0.726
TS_2					0.690*				0.707
TS_3					0.845				0.850
TS_4					0.526*				-
TS_5					0.762				0.758

Note: DP = Digital Performance; DR = Digital Readiness; DS = Digitalization Society 4.0; JS = Job Stress; TS = Techno-Stressor.

The convergent validity results in Table 2 show that most indicators achieved outer loading values above the recommended threshold of 0.70. However, JS_4 (-0.408) and TS_4 (0.526) exhibited persistently low loadings in the initial model and were therefore removed in accordance with Hair et al. (2022). The removal was supported not only by the statistical results but also by theoretical considerations. JS_4 represents social support, which is conceptually more consistent with a job resource in the JD–R framework than with the experience of job stress itself. Its negative loading further indicated that it did not reflect the same underlying stress construct as the remaining job-stress indicators. TS_4 represents techno-insecurity, which reflects concerns about technology-related job insecurity. This dimension may be less applicable to MSME owners and managers, whose technology-related pressures are more directly associated with overload, invasion, complexity, and uncertainty. Accordingly, the removal of JS_4 and TS_4 improved the empirical and conceptual consistency of the respective constructs. By contrast, TS_2 was retained because its loading increased from 0.690 to 0.707 after re-estimation.

Table 3. Validity and Reliability test

Variables Researched	Cronbach's alpha	(rho_a)	(rho_c)	AVE
DP	0.886	0.888	0.917	0.688
DR	0.852	0.854	0.900	0.694
DS	0.888	0.902	0.918	0.690
JS	0.823	0.843	0.882	0.652
TS	0.758	0.764	0.847	0.581

Notes: DP = Digital Performance; DR = Digital Readiness; DS = Digitalization Society 4.0; JS = Job Stress; TS = Techno-stressor.

Table 3 presents the convergent validity and reliability results. All constructs had AVE values above 0.50 and reliability coefficients above 0.70, supporting convergent validity and internal consistency.

Table 4. Fornell–Larcker Criterion

Construct	DP	DR	DS	JS	TS
DP	0.829				
DR	0.734	0.833			
DS	0.689	0.769	0.831		
JS	-0.296	-0.301	-0.243	0.808	
TS	-0.359	-0.406	-0.394	0.672	0.717

Notes: DP = Digital Performance; DR = Digital Readiness; DS = Digitalization Society 4.0; JS = Job Stress; TS = Techno-stressor.

Discriminant validity was subsequently assessed using the Fornell–Larcker criterion. As shown in Table 4, the square root of AVE for each construct exceeded its correlations with other constructs, supporting discriminant validity based on the Fornell–Larcker criterion.

Table 5. Collinearity Variance Inflation Factor (VIF)

Variables	VIF
DS → JS	2.622
DS → TS	2.594
TS → JS	1.247
DS x DR → TS	1.191
DS x DR → JS	1.216
JS → DP	1.099
DR → DP	1.099

Notes: DS = Digitalization Society 4.0; JS = Job Stress; TS = Techno-stressor; DR = Digital Readiness; DP = Digital Performance

Potential CMB was subsequently assessed using the full-collinearity VIF approach. The results in Table 5 show that all full-collinearity variance inflation factor (VIF) values range from 1.099 to 2.622, which are below the conservative threshold of 3.3. According to Kock (2015), VIF values below this threshold indicate that serious collinearity and CMB concerns are unlikely. Accordingly, the full-collinearity VIF results do not indicate serious CMB concerns; however, they should not be interpreted as definitive evidence that CMB is entirely absent.

Inner Model

The structural model was evaluated using R^2 , model-fit indices, and path coefficients. Figure 2 presents the structural model.

Figure 2. Path Model – Inner Model

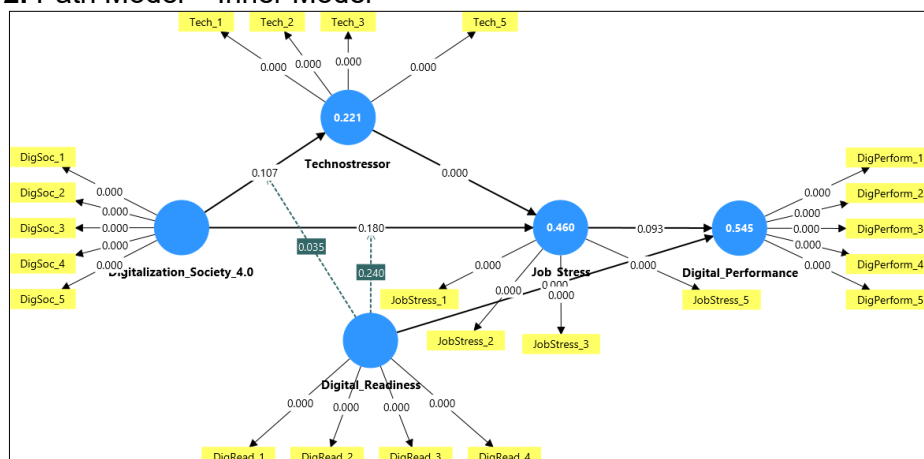


Table 6. R-Square test

Variables	R-square	R-square adjusted
DP	0.545	0.540
JS	0.460	0.447
TS	0.221	0.207

Notes: DS = Digitalization Society 4.0; JS = Job Stress; TS = Techno-stressor; DR = Digital Readiness; DP = Digital Performance.

Table 6 reports both R^2 and adjusted R^2 values. The adjusted R^2 values were used to interpret the explanatory power of the structural model because they account for the number of predictors included in each endogenous construct. Following [Hair et al. \(2022\)](#), values below 0.33 were considered weak, values between 0.33 and 0.66 moderate, and values of 0.67 or above strong. The adjusted R^2 value for digital performance was 0.540, indicating that the predictors explained 54.0% of its variance and reflecting moderate explanatory power. Job stress had an adjusted R^2 value of 0.447, also indicating moderate explanatory power, whereas techno-stressor had an adjusted R^2 value of 0.207, indicating weak explanatory power.

Table 7. Model Fit Assessment

Model	Estimated	95% CI Limit	Interpretation	Model
SRMR	0.081	0.070	Slightly above the suggested threshold	Moderate fit
d_ULS	1.647	1.224	Exceeds the 95% CI limit	Exact fit not established
d_G	0.628	0.508	Exceeds the 95% CI limit	Exact fit not established

As a supplementary assessment, model-fit indices were examined to provide additional information regarding model fit. The model fit assessment in **Table 7** shows that the SRMR value was 0.081, which is slightly above the conservative threshold of 0.08 but remains close to the recommended range. Meanwhile, the d_ULS value of 1.647 exceeded its 95% confidence interval limit of 1.224, and the d_G value of 0.628 also exceeded its 95% confidence interval limit of 0.508. Therefore, exact model fit based on d_ULS and d_G was not established. These indices should be interpreted cautiously and should not be used as the sole basis for determining the suitability of a PLS-SEM model. Accordingly, the subsequent model evaluation focused primarily on the measurement model and structural model criteria ([Hair et al., 2022](#)). Given these results, model evaluation was based primarily on the measurement-model and structural-model assessments rather than on exact-fit indices.

Table 8. Path Coefficients (P-Values)

Variables	β	t-statistic	p-values
DS → JS	0.124	0.916	0.180
DS → TS	-0.150	1.243	0.107
TS → JS	0.670	10.667	< 0.001
DS → TS → JS	-0.100	1.190	0.117
DS x DR → TS	0.095	1.809	0.070
DS x DR → JS	0.032	0.706	0.240
JS → DP	-0.083	1.321	0.093
DR → DP	0.709	13.103	< 0.001

Notes: DS = Digitalization Society 4.0; JS = Job Stress; TS = Techno-stressor; DR = Digital Readiness; DP = Digital Performance. The reported p-values are based on two-tailed significance tests at the 5% significance level.

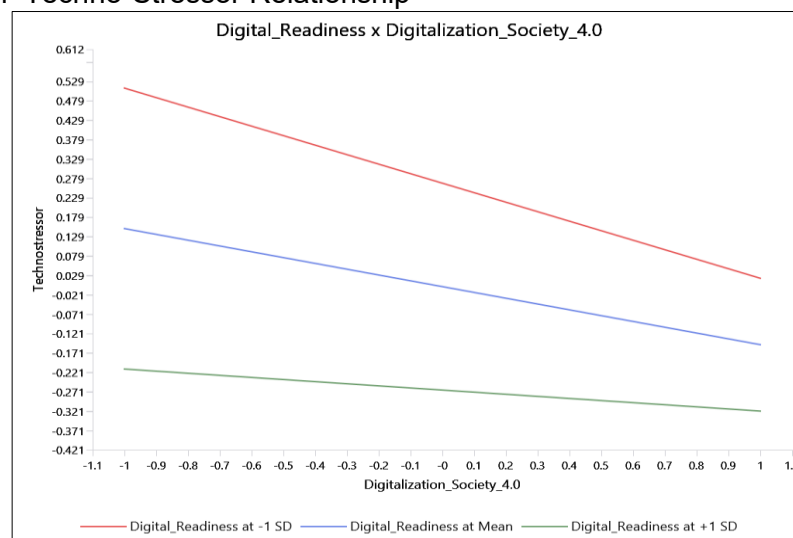
The path coefficients and their statistical significance were subsequently examined to evaluate the proposed hypotheses. The hypothesis testing results in Table 8 show that two of the eight hypotheses were supported. Techno-stressor had a significant positive association with job stress ($\beta = 0.670$, $t = 10.667$, $p < 0.001$), supporting H3. Digital readiness was also positively associated with digital performance ($\beta = 0.709$, $t = 13.103$, $p < 0.001$), supporting H8. In contrast, digitalization was not significantly associated with job stress ($\beta = 0.124$, $t = 0.916$, $p = 0.360$) or techno-stressor ($\beta = -0.150$, $t = 1.243$, $p = 0.214$), while the indirect effect of digitalization on job stress through techno-stressor was also not significant ($\beta = -0.100$, $t = 1.190$, $p = 0.234$). The interaction between digitalization and digital readiness was not significant for techno-stressor ($\beta = 0.095$, $t = 1.809$, $p = 0.070$) or job stress ($\beta = 0.032$, $t = 0.706$, $p = 0.480$). Job stress was also not significantly associated with digital performance ($\beta = -0.083$, $t = 1.321$, $p = 0.186$). Accordingly, H1, H2, H4, H5, H6, and H7 were not supported, whereas H3 and H8 were supported.

Table 9. Conditional Effects of Digitalization on Techno-Stressor at Different Levels of Digital Readiness

Level of Digital Readiness	Digitalization → Techno-stressor
+1 SD	-0.060
Mean	-0.151
-1 SD	-0.242

The simple-slope analysis in Table 9 further illustrates the pattern of the relationship between digitalization and techno-stressor at different levels of digital readiness. At a low level of digital readiness (-1 SD), the conditional relationship between digitalization and techno-stressor was more negative ($\beta = -0.242$). At the mean level of digital readiness, the conditional effect was $\beta = -0.151$, while at a high level of digital readiness ($+1$ SD), the relationship became weaker and approached zero ($\beta = -0.060$). These results indicate that higher digital readiness attenuates the negative relationship between digitalization and techno-stressor. Figure 3 visually confirms this pattern, showing a progressively flatter negative slope as digital readiness increases.

Figure 3. Simple-Slope Plot of the Moderating Effect of Digital Readiness on the Digitalization–Techno-Stressor Relationship



DISCUSSION

H1: The Influence of Digitalization in the Society 4.0 Era on Job Stress

The results showed that digitalization in the context of Society 4.0 was not significantly associated with job stress among MSME actors in Yogyakarta. Empirically, variations in digital technology adoption were not accompanied by statistically significant differences in perceived job stress. This finding differs from previous studies by [Bregenzer & Jimenez \(2021\)](#) and [Cavicchioli et al. \(2025\)](#), which indicated that digitalization may be associated with increased workload and responsiveness demands. One possible explanation is that digital technologies may already have become part of routine business activities among MSME actors, thereby reducing the additional psychological demands associated with their use. This interpretation is consistent with [Wrede et al. \(2023\)](#), who emphasized the role of adequate digital competence in managing technology-related stress. From the JD–R perspective, digitalization may simultaneously introduce additional job demands while also providing resources such as flexibility and operational efficiency. These competing mechanisms may help explain why no significant overall association between digitalization and job stress was observed in this study.

H2: The Influence of Digitalization in the Society 4.0 Era on Techno-Stressor

The results showed that digitalization in the Society 4.0 era was not significantly associated with techno-stressors. Empirically, greater digital technology adoption was not accompanied by significantly higher levels of technology-related pressure among the MSME respondents. This finding differs from [Lee \(2021\)](#), which emphasized that increased digitalization may be associated with technological overload, complexity, and other technology-related stressors. One possible explanation is that the consequences of digitalization may depend on the extent to which technological demands are accompanied by adequate capabilities and organizational support. This interpretation is consistent with [Lanzl \(2023\)](#), who highlighted the importance of resources in managing technology-related demands. From the JD–R perspective, digitalization may represent a potential job demand, but its association with techno-stressor may remain limited when available resources are sufficient to manage those demands. Thus, the non-significant finding suggests that digitalization does not necessarily correspond to greater techno-stressor across all MSME settings.

H3: The Influence of Techno-stressor on Job Stress

The results showed a positive and significant association between techno-stressor and job stress. Empirically, higher levels of techno-stressor were associated with higher levels of job stress among MSME actors. This finding is consistent with [Kaltenegger et al. \(2024\)](#), which emphasized the association of technology-related pressure with psychological strain and burnout in digital work environments. From the JD–R perspective, techno-stressor represents a technology-related job demand that requires continuous cognitive and psychological effort. When these demands are experienced at higher levels, they are associated with greater psychological strain, which is reflected in the significant positive relationship with job stress observed in this study.

H4: The Mediating Role of Techno-stressor in the Relationship Between Digitalization and Job Stress

The results showed that the indirect relationship between digitalization and job stress through techno-stressor was not statistically significant. Empirically, the proposed mediating role of techno-stressor was therefore not supported. This pattern is consistent with the non-significant relationship between digitalization and techno-stressor found in the structural model, indicating limited support for the proposed indirect mechanism. Previous studies suggest that technology-related stress responses may vary depending

on individual preparedness, social support, digital competence, and organizational resources (Gimpel et al., 2025). From the JD–R perspective, these resources may influence how digital demands are perceived and managed, which may help explain why digitalization was not significantly associated with job stress through techno-stressors in the present MSME context. Thus, the findings do not support a uniform indirect pathway from digitalization to job stress through techno-stressors.

H5: The Moderating Role of Digital Readiness in the Relationship Between Digitalization and Techno-Stressor

The results did not provide statistically significant evidence that digital readiness moderated the relationship between digitalization and techno-stressor ($\beta = 0.095$, $p = 0.070$). Although the interaction coefficient was positive, its magnitude did not reach the 5% significance level under the two-tailed test. The simple-slope analysis nevertheless indicates a descriptive pattern in which the negative association between digitalization and techno-stressor was stronger at a low level of digital readiness ($\beta = -0.242$), weaker at the mean level of digital readiness ($\beta = -0.151$), and closer to zero at a high level of digital readiness ($\beta = -0.060$). Because the interaction effect was not statistically significant, this pattern should be interpreted as descriptive rather than as evidence of a reliable moderating effect.

From the JD-R perspective, digital readiness was conceptualized as a potential resource that may help MSME actors manage technology-related demands through greater capabilities and organizational support. However, the present findings do not provide sufficient statistical evidence that digital readiness systematically changes the relationship between digitalization and techno-stressors. This result suggests that the role of digital readiness may depend on contextual factors that were not directly examined in this study. Previous research has similarly indicated that the relationship between digital readiness and technology-related stress may vary across organizational and contextual conditions (Becker et al., 2022; Scheepers et al., 2022). Further research is therefore needed to examine whether organizational support, digital competence, or the nature of technological demands explains variations in this relationship.

H6: The Moderating Role of Digital Readiness in the Relationship between Digitalization and Job Stress

The results showed that digital readiness did not significantly moderate the relationship between digitalization and job stress. Empirically, there was no evidence that different levels of digital readiness changed the strength of the association between digitalization and general job stress. This finding is consistent with Cavicchioli et al. (2025), who suggested that the psychological consequences associated with digitalization may also depend on organizational conditions and individual coping mechanisms. One possible explanation is that general job stress among MSME actors may reflect a broader combination of digital and non-digital job demands, making the moderating role of digital readiness less pronounced. From the JD–R perspective, digital readiness may represent a resource that is more directly relevant to technology-specific demands than to broader job stress. This may help explain why the descriptive pattern observed for techno-stressor in H5 was more apparent than the corresponding moderation pattern for job stress in H6, although neither interaction effect reached statistical significance at the 5% level.

H7: The Influence of Job Stress on Digital Performance

The results showed that job stress was not significantly associated with digital performance. Empirically, variations in job stress were not accompanied by statistically significant differences in the digital performance of the MSME respondents. This finding differs from studies suggesting that elevated work-related stress may impair

performance, but is consistent with Cavicchioli et al. (2025), who emphasized that supportive environments and effective work-management practices may limit the performance consequences associated with stress. One possible contextual explanation is that MSME owners and managers may have greater flexibility in organizing their work and responding to business demands; however, this explanation was not directly tested in the present study and should therefore be interpreted cautiously. From the JD–R perspective, available job resources may compensate for psychological demands and help maintain performance even when job stress is present. Accordingly, the non-significant finding indicates that job stress was not directly associated with digital performance in the present sample. Related evidence from Indonesian MSMEs shows that work–life balance and resilience are positively associated with MSME performance (Suwandi et al., 2026), further indicating the relevance of psychological resources to performance outcomes.

H8: The Influence of Digital Readiness on Digital Performance

The results showed that digital readiness was positively and significantly associated with digital performance. Empirically, higher levels of digital readiness corresponded to higher digital performance among the MSME respondents. This finding is consistent with Trischler and Ying (2022), who identified digital readiness as an important factor associated with organizational efficiency, innovation, and competitiveness. Supporting evidence from Indonesian MSMEs also shows that technology adoption is positively and significantly associated with business performance (Tikawati et al., 2026). From the JD–R perspective, digital readiness can be viewed as a resource that provides individuals and organizations with the capabilities needed to manage digital requirements and perform digital activities effectively. The finding therefore supports the role of digital readiness as an important resource associated with stronger digital performance. Practically, the result suggests that strengthening digital capabilities and preparedness may support MSMEs in obtaining better outcomes from their digital activities.

CONCLUSION

This study examined the relationships among digitalization, techno-stressor, digital readiness, job stress, and digital performance among MSMEs in Yogyakarta. The results showed that digitalization was not significantly associated with job stress ($\beta = 0.124$, $p = 0.360$) or techno-stressor ($\beta = -0.150$, $p = 0.214$). Techno-stressor was positively and significantly associated with job stress ($\beta = 0.670$, $p < 0.001$), supporting H3, while its mediating role in the relationship between digitalization and job stress was not supported ($\beta = -0.100$, $p = 0.234$). Digital readiness did not significantly moderate the relationship between digitalization and techno-stressor ($\beta = 0.095$, $p = 0.070$) or the relationship between digitalization and job stress ($\beta = 0.032$, $p = 0.480$). Job stress was not significantly associated with digital performance ($\beta = -0.083$, $p = 0.186$), whereas digital readiness showed a strong positive association with digital performance ($\beta = 0.709$, $p < 0.001$), supporting H8. Thus, H3 and H8 were supported, while H1, H2, H4, H5, H6, and H7 were not supported.

Theoretically, these findings extend the JD–R perspective by showing that technology-related demands and resources do not operate uniformly in the MSME context. Techno-stressor was associated with greater psychological strain, consistent with its role as a job demand, whereas digital readiness was positively associated with digital performance, supporting its role as an important digital resource. Although the interaction analysis did not provide statistically significant evidence of a moderating effect, the descriptive simple-slope pattern suggests that the relationship between digitalization and techno-stressor may vary across levels of digital readiness. This pattern indicates that

the role of digital readiness may depend on the level of digital demands experienced by MSME actors.

Practically, the findings suggest that MSMEs should strengthen digital readiness through appropriate training, technological support, and capability development while simultaneously managing technology-related demands and workload pressures. Attention to balanced workload distribution, social support, and work flexibility may also help MSME actors manage psychological pressure during digital transformation. Given the cross-sectional design, these findings should be interpreted as statistical associations rather than causal relationships.

Future studies should employ longitudinal designs to examine changes in digitalization pressures, techno-stressors, and job stress over time. Comparative studies across different regions and industrial sectors may also provide a clearer understanding of variations in digital readiness and technology-related psychological demands. Future research may further incorporate organizational support, digital leadership, resilience, and work-life balance as additional moderating or explanatory variables. Mixed-methods approaches could provide deeper insights into the behavioral and psychological mechanisms underlying digital stress, while multi-group analysis may be used to examine whether the structural relationships differ across demographic characteristics, levels of digital competence, or firm characteristics.

LIMITATION

This study acknowledges several limitations that should be considered when interpreting the findings. First, the use of a cross-sectional research design constrains the ability to capture temporal variations in digitalization pressures, techno-stressors, and job stress (in particular, stress-related responses may fluctuate over time, and cross-sectional data may not fully reflect these dynamic psychological states). Second, the sample predominantly consisted of micro-scale MSMEs operating within the culinary sector in Yogyakarta, which restricts the generalizability of the results to other industries or regions with different levels of digital maturity. Third, the reliance on self-reported measures may introduce the risk of common method bias, especially for constructs related to psychological perceptions such as techno-stressor and job stress. Fourth, the relatively low variance observed in certain digitalization indicators may have reduced the statistical power to detect significant structural relationships, thereby contributing to several non-significant findings within the model.

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ABOUT THE AUTHOR(S)

1st Author

Khoirul Hikmah is a lecturer in the Department of Management, Faculty of Economics and Business, Universitas Pembangunan Nasional "Veteran" Yogyakarta, Indonesia. She holds a Bachelor's degree in Management from Universitas Pembangunan Nasional "Veteran" Yogyakarta, a Master of Science degree from Universitas Gadjah Mada, and a Doctoral degree in Economics from Universitas Sebelas Maret Surakarta. She currently holds the academic position of Lecturer in the Department of Management. Her research interests include human resource management and financial management.

Email: khoirul.hikmah@upnyk.ac.id

ORCID ID: <https://orcid.org/0000-0002-6646-9552>

2nd Author

Arief Subiyantoro is a Professor of Management at the Department of Management, Faculty of Economics and Business, Universitas Pembangunan Nasional "Veteran" Yogyakarta, Indonesia. He obtained his Bachelor's degree from Universitas Pembangunan Nasional "Veteran" Yogyakarta in 1982, a Master's degree from Universitas Padjadjaran in 1989, and a Doctoral degree in Management from Universitas Padjadjaran in 1993. He was born in Yogyakarta in 1957 and has been actively involved in teaching, research, and academic publications. His research interests include cooperative management, organizational management, and business development. He has also authored several academic books and published research articles in national and international journals.

Email: arief.subyantoro@upnyk.ac.id.

3rd Author

Marita is a lecturer in the Department of Accounting, Faculty of Economics and Business, Universitas Pembangunan Nasional "Veteran" Yogyakarta, Indonesia. She obtained her Bachelor's degree in Accounting from Universitas Islam Indonesia in 1997 and a Master of Science degree in Accounting from Universitas Gadjah Mada in 2003. She currently holds the academic position of Lecturer (Lektor). Her research interests focus on strategic management accounting and financial management.

Email: marita@upnyk.ac.id.

4th Author

Rifqi Syarif Nasrulloh is a lecturer in the Department of Management, Brawijaya University, Indonesia. He received his Bachelor's degree in Management from Universitas Pembangunan Nasional "Veteran" Yogyakarta and a Master's degree in Management from the same university. His research interests include human resource management, intellectual property management, and MSME development.

Email: rifqisyarif@student.ub.ac.id

ORCID ID: <https://orcid.org/0000-0002-6198-1493>

5th Author

Aditya Wardana is a lecturer at Universitas Dirgantara Adisutjipto, Faculty of Law and Business, Indonesia, and also serves as a tutor at Universitas Terbuka. He obtained his Bachelor's degree from Universitas Sebelas Maret and completed his Master's degree

in Management at Universitas Pembangunan Nasional “Veteran” Yogyakarta, Indonesia. He actively conducts research in the field of financial management. His research interests include retail investment behavior, corporate bankruptcy, and financial distress.
Email: adityawardana0506@gmail.com
ORCID ID: <https://orcid.org/0009-0009-5325-6441>

6th Author

Muhammad Ilham Fawwaz is a student at Universitas Pembangunan Nasional “Veteran” Yogyakarta, Indonesia. He is currently pursuing his undergraduate degree in Management at the Faculty of Economics and Business. His academic interests include business management, digital business, and entrepreneurship.
Email: 141240596@student.upnyk.ac.id