Image : Jurnal Riset Manajemen

E-ISSN: 2657-0688, P-ISSN: 2339-2878
Journal homepage: https://ejournal-economy.upi.edu/image

Digital Well-Being Work System Scale Development Using Content Validity and Exploratory Factor Analysis

Annisa Ciptagustia[1*], Rofi Rofaida[2], Heny Hendrayati[3], Riskeu Faldesiani[4], Murni Zarina Razali[5], M. Ikhwan Maulana Haeruddin[6]

[1,2,3] *Department of Management, Faculty of Economics and Business Education, Universitas Pendidikan Indonesia, Indonesia*
[4] *Department of Office Management Education, Faculty of Economics and Business Education, Universitas Pendidikan Indonesia, Indonesia*
[5] *Faculty of Business Management, Universiti Teknologi MARA (UiTM), Selangor, Malaysia*
[6] *Department of Management, Faculty of Economics and Business, Makassar State University, Makassar, Indonesia*

Abstract

Digitalization intensifies connectivity demands and exposes early-career Generation Z banking employees to digital overload and boundary erosion, yet organizations still lack a system-level diagnostic to assess HR practices that protect digital well-being while sustaining performance. This study develops the Digital Well-Being Work System (DWWS) scale by translating HR-systems logic into six actionable domains and testing its initial psychometric properties. Item development combined domain specification and readability checks, followed by expert–user review (six raters) using the Content Validity Index (CVI). A main survey of 294 Generation Z banking employees in West Java was then analyzed using exploratory factor analysis (Principal Axis Factoring with Varimax rotation). Scale-level CVI showed excellent relevance and clarity (S-CVI/Ave = 0.965), with minor wording refinements to a small set of non-unanimous items before constructing testing. EFA supported a stable six-factor solution (KMO = 0.852; Bartlett's $p < .001$) with moderate-to-strong loadings (≈0.555–0.751) across 24 retained items. The resulting DWWS offers a practical instrument to audit and improve organizational support for healthy digital work; future research should confirm the structure via CFA in an independent sample and test predictive validity across sectors.

Article Info

Correspondence:
Annisa Ciptagustia
(annisacipta@upi.edu)

Article History:
Submitted: 05-06-2025
Revised: 17-08-2025
Accepted: 21-10-2025
Published: 30-10-2025

JEL Classification:
I31; J24; M54

Keyword:
Content Validity Index;
Digital Well-Being;
Exploratory Factor Analysis;
Sustainable HRM;
Technostress

1. INTRODUCTION

Generation Z is a working-age group that is increasingly prominent in the dynamics of employment. In Indonesia, there are 64.22 million people in the youth category, with 51.51% of them being Generation Z (Central Statistics Agency, 2024). This generation brings a shift in preferences towards the world of work, especially the emphasis on work-life balance, sustainability values, and attention to corporate social responsibility (Choi et al., 2024). In line with that, digital transformation is accelerating changes in work design towards a more flexible, hybrid, and technology-based model (De Stefano et al., 2023; Sidik

et al., 2024), as well as encouraging a Sustainable HRM strategy that emphasizes performance sustainability through HR practices that are adaptive to the demands of the digital era (Gomes et al., 2024; Jora et al., 2023). However, despite increased flexibility and career development opportunities, salary and benefits remain a key consideration in job selection decisions At the same time, digital work also presents new psychosocial challenges, such as stress due to excessive use of technology and doom-scrolling behavior, which is the compulsive consumption of negative content as well as reduced face-to-face interactions that have the potential to trigger social isolation. These conditions are reported to be associated with decreased work performance and deterioration of mental health in Gen Z professionals in technology-intensive sectors (Bashir et al., 2024; Chand & Mishra, 2024; Jora et al., 2023; Madero-Gómez et al., 2023). The data also shows that some Gen Z in Indonesia face mental health risks and experience mental health problems in the last two years. Triggering factors include financial stress, high-achieving demands, unclear life goals, and excessive exposure to digital media. If not managed, this condition has the potential to reduce productivity, increase attendance, and reduce the quality of work which ultimately harms the organization. Therefore, sustainable human resource management, including a Sustainable HRM approach and sustainability-oriented HR practices, is seen as important to improve employee well-being while strengthening employee loyalty, commitment, and job retention (Arman et al., 2023; Buga, 2024; Gomes et al., 2024; Madero-Gómez et al., 2023), including through practices that balance performance and sustainability such as green HRM and sustainable HR strategies (Aggarwal et al., 2023; Anshima et al., 2024; Kalei, 2024).

While research on Sustainable HRM and employee well-being is growing, there are still conceptual and empirical gaps in how well-being is measured, especially in the context of digital transformation. In Sustainable HRM practice, employee well-being is often formulated in several key aspects, such as social, emotional, physical, and financial (Buga, 2024; Seabrook, 2024). However, increasingly digital work dynamics demand a more relevant measurement approach one that captures the characteristics of modern work, such as technology-based flexibility, blurred work boundaries, and the risk of overload of digital communication while remaining connected to the logic of high-performance work systems that support well-being (Robertson et al., 2023). Unfortunately, the concepts of Well-Being-Based High-Performance Work Systems (HWB-PWS) and digital well-being are still often treated as two separate entities in the literature (Chillakuri & Vanka, 2020; Shi et al., 2024). In fact, research evidence shows the urgency of integrating technology and welfare in the work system; e.g. meta-analytical findings related to the impact of ICT on individuals (Wang et al., 2022), limitations of e-mental health interventions (Hamouche & Marchand, 2021), post-pandemic gig work dynamics (Malik et al., 2022), workforce vulnerability due to smart technology (Brougham & Haar, 2021), employee support for digital transformation (Meske & Junglas, 2020), psychological factors of remote work (Grant et al., 2021), and the role of job crafting and digital resilience (Laker et al., 2022). Therefore, a more holistic framework is needed to bridge such integration through a work system that simultaneously supports performance and well-being in the context of digital work.

Methodologically, the need for a more integrated measurement model is also emphasized by the development of employee well-being instrument studies. Employee well-being has been measured through a variety of conceptualizations and instruments (effective/evaluative experiences, psychosocial working conditions, and broader quality of life indicators). However, this field is still fragmented due to differences in construct definitions, domain coverage, and psychometric reporting quality, making it difficult to compare studies and translate scientific evidence into HR policies (Jarden et al., 2023). In response to these challenges, a multidimensional approach began to develop to integrate the determinants of work and non-work. One example is the NIOSH Worker Well-Being Questionnaire (WellBQ), which is designed as a multi-domain holistic assessment according to changes in the nature of work and the Total Worker Health framework, and was developed through a literature review, expert input, and large-scale pilot (Chari et al., 2022; National Institute for Occupational Safety and Health [NIOSH], 2024). However, recent scale

validation and development studies still point to crucial limitations for the digital work context and Gen Z: evidence often rests on a single industry or one location sample (limiting generalization), some subdomains show weaknesses in convergent validity and overlapping domains after cultural adaptation, and many instruments are not yet sensitive to the reality of digital work where technology-based flexibility coexists with boundary blurring and spillover work–family stress (De Stefano et al., 2023; Sampil et al., 2025; Wang et al., 2022). Accordingly, occupational well-being scales constructed in specific national contexts still require cross-cultural replication and cross-sector testing before being used as a robust measure for organizational policies (Daovisan & Intarakamhang, 2024; Jarden et al., 2023), while workplace mental health/well-being instruments tested in specific professional contexts require cross-industry and cross-age cohort validation so that construct stability in the digital-intensive young workforce can be ensured (MacKinnon et al., 2024). In addition, digital well-being instruments are also constantly evolving, but often still focus on general contexts or specific populations so that they require adaptation when brought to the context of high-performance digital work (Arslankara et al., 2022). Overall, these limitations reinforce the need to develop measurement models that are more contextually relevant and psychometrically robust, including integration between the logic of high-performance work systems that support well-being and digital well-being considerations for Gen Z (Chari et al., 2022; Jarden et al., 2023; Sampil et al., 2025).

Departing from this gap, the present study addresses conceptual and empirical limitations in integrating High Well-Being Performance Work Systems (HWB-PWS) and digital well-being within a sustainable human resource management framework (Anshima et al., 2024; Arman et al., 2023; De Stefano et al., 2023; Gomes et al., 2024). Prior research highlights the need for more contextually relevant and psychometrically robust well-being measurement models for Generation Z in digitally intensive work environments, where existing instruments often require further refinement and external validation (Ciptagustia & Faldesiani, 2024; Ciptagustia et al., 2024). Accordingly, this study introduces the Digital Well-Being Work System (DWWS) as an integrative construct that unites well-being-oriented high-performance work systems and digital well-being into a holistic measurement framework tailored to digital work contexts and Generation Z characteristics (Chillakuri & Vanka, 2020; De Stefano et al., 2023; Shi et al., 2024; Wang et al., 2022). The novelty of this research lies in bridging two strands of literature that have often been treated separately high-performance work practices that support well-being and welfare dimensions in the digital work ecosystem into a single operational construct to support the diagnosis and design of sustainable HRM interventions (Arman et al., 2023; Chari et al., 2022; Gomes et al., 2024; Jarden et al., 2023; Sampil et al., 2025). Methodologically, this study focuses on indicator development and initial instrument validation using the Content Validity Index (CVI) and Exploratory Factor Analysis (EFA) based on empirical evidence from Generation Z employees in digital work contexts (Daovisan & Intarakamhang, 2024; Jarden et al., 2023; MacKinnon et al., 2024; Sampil et al., 2025).

2. METHODS

This study uses a quantitative approach with a survey design (cross-sectional). The main objective of the study was to develop and test the initial validity of measurement instruments that integrate the constructions of High Well-Being and Performance Work System (HWB-PWS) and Digital Well-Being into the framework of the Digital Well-Being Work System (DWWS). Initial testing includes content validity through the Content Validity Index (CVI) and construct validity through Exploratory Factor Analysis (EFA).

The research population is Generation Z (aged 20–29 years) who live in West Java Province. The analysis unit is Generation Z individuals who work in the private banking sector and government financial institutions in the West Java region. The sample extraction technique used purposive sampling with inclusion criteria: (1) Generation Z aged 20–29

years; (2) working in a private bank or government financial institution in West Java; (3) have a minimum working period of 6 months so that the respondents have sufficient experience in the work system and the use of technology in the workplace. The calculation of the minimum sample needs based on G*Power shows the need for a minimum of 108 respondents. However, to obtain a stable factor structure in EFA, the study targeted 294 respondents, in line with the general practice of factor analysis that suggests moderately large sample sizes to improve the robustness of correlation matrix estimation and factor structure reliability.

The initial DWWS item pool was informed by HWB-PWS (Parent-Lamarche et al., 2023) and Digital Well-Being (Arslankara et al., 2022) as the primary conceptual sources. The six DWWS domains were derived from a narrative review and a cross-mapping procedure between HPWS practices and digital well-being protective mechanisms from 22 article. Due to space constraints, the full list of included studies is not shown; the domain derivation is summarized in Table 1. This instrument was grounded in a narrative review of HPWS, digital well-being, and sustainable HRM. Articles were retrieved from Scopus, Web of Science, Taylor & Francis, Springer, MDPI, and SAGE, using peer-reviewed publications (2015–2025) relevant to the focal themes; non-peer-reviewed papers/proceedings and non-HRM contexts were excluded. The selection yielded 22 articles, which were synthesized thematically and cross-mapped (HPWS practices × digital well-being protective mechanisms) to derive six DWWS domains as the basis for item generation.

Table 1. Variable Operations

Dimension	Indicators/Statement Items	No. Item
1. Digitalized Training & Career Development: Digital literacy and ethics embedded in training and career development to prevent digital overload and enable healthy digital work.	My organization provides regular training that covers digital literacy and technology use ethics.	1
	I got the opportunity to coach to use digital tools in a healthy and productive way.	2
	The training I attended helped prevent digital overload.	3
	I feel that my career path is clearly organized and supports readiness to face digital transformation.	4
2. Responsible Digital Flexibility: Digital-enabled flexibility supported by clear boundaries (e.g., communication norms/right to disconnect) to prevent after-hours intrusion.	I have digital work flexibility that is accompanied by communication limitations (e.g. quiet hours).	5
	My organization gives you the right to disconnect outside of business hours.	6
	Autonomy in the use of digital technology is balanced with the responsibility of maintaining occupational health.	7
	Time restrictions and digital communication rules at work help me prevent work intrusion after hours.	8
3. Empowerment with Digital Mindfulness: Autonomy and participation complemented by mindful digital practices and periodic review of digital load to reduce technostress.	I got digital mindfulness training to manage the burden of technology.	9
	Organizations routinely monitor and evaluate employees' digital stress levels.	10
	I feel more focused (flow) at work after getting a digital mindfulness intervention.	11
	I am empowered to make decisions with full awareness of the impact of digital technology on my health.	12
4. Reward for Healthy Digital Behaviour: Norms and incentives that reinforce safe, ethical, and non-intrusive digital behaviour at work**.**	Healthy digital behaviors (e.g. email etiquette, not sending excessive messages outside of business hours) are valued by organizations.	13
	I feel that there is an incentive to maintain data security and digital privacy.	14
	Organizational culture emphasizes the importance of a balance between performance and digital health.	15

	Rewards systems in organizations encourage ethical and safe digital behavior.	16
5. Safe-by-Design Performance Management: Performance practices that consider digital workload/fatigue and protect focus and recovery while maintaining accountability.	Evaluate my performance by considering the digital load (notifications, online meetings, number of applications used)	17
	The KPIs in my organization are structured so as not to cause excessive intensification of digital work.	18
	My digital work schedule gives me enough space for deep work without the distractions of technology.	19
	The feedback I received includes suggestions to maintain my digital health.	20
6. Inclusive & Ethical Digital Climate: An ethical, civil, and inclusive digital climate supported by clear guidelines and safe reporting mechanisms.	Organizations have clear guidelines for digital politeness.	21
	I feel safe to report cases of harassment or unethical behavior in the digital space.	22
	Organizations provide fair and equal access to technology for all employees.	23
	My digital work environment supports a sense of psychological security and inclusion for all.	24

Source: Key sources: Becker & Huselid (1998); Pfeffer (1998); Boxall & Macky (2009); Lepak et al. (2006); Jiang et al. (2012); Parent-Lamarche et al. (2023); Arslankara et al. (2022); Derks et al. (2014); Derks & Bakker (2014); Mazmanian et al. (2013); Tarafdar et al. (2015); Reinecke & Basto-Fleitas (2021); Ayyagari et al. (2011); Peccei et al. (2013); Ragu-Nathan et al. (2008); Parker et al. (2017); Qureshi et al. (2020).

Data was collected using a structured questionnaire (online/offline). Prior to the main survey, items were adapted to the banking/financial context and checked for Gen Z readability. Figure 1 outlines a two-phase scale-development process: Phase 1 (Content validity) domain specification, item pool development, readability/face check, and expert CVI to retain or revise items; Phase 2 (Construct validity) main survey, data screening, sampling adequacy checks, EFA to identify the factor structure, and reliability testing to produce a preliminary scale (with CFA/SEM recommended in a future independent sample).

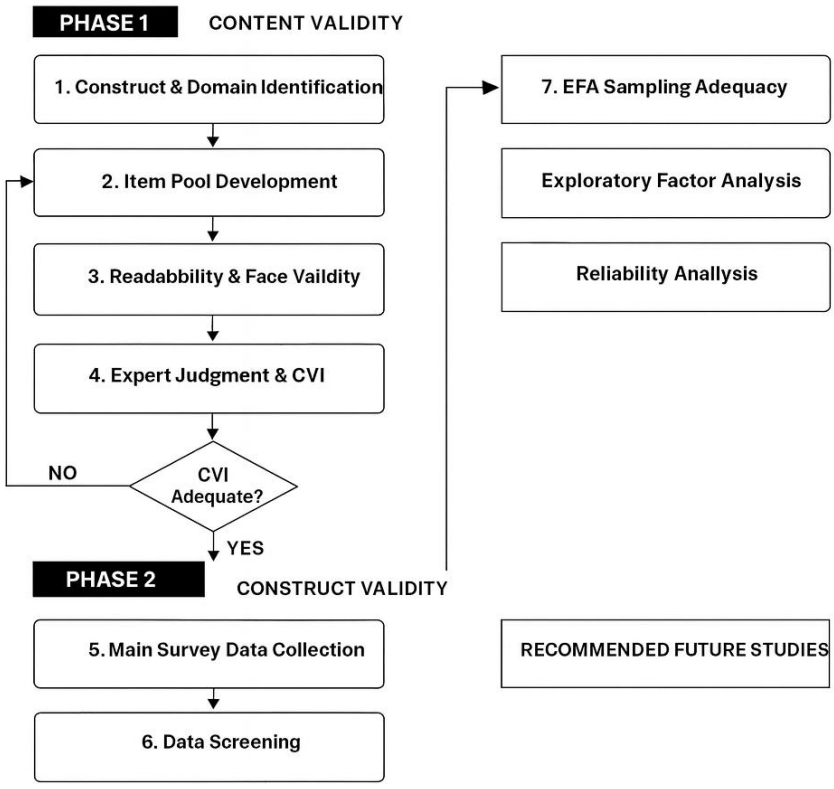

Figure 1. Research Procedure
Source: Development by Researcher (2025)

3. RESULT AND DISCUSSION

The findings of this study provide important theoretical insights into the integration of digital well-being and High Well-Being Performance Work Systems within a sustainable HRM perspective. The six-factor structure of the DWWS demonstrates that digital well-being is not merely an individual-level outcome but is systematically shaped by organizational work systems and HR practices, thereby positioning digital well-being as a collective and structural phenomenon rather than an individual responsibility. By shifting the focus from reactive, individual coping strategies to proactive, system-level interventions, this study advances digital well-being research and enriches both the sustainable HRM and digital work literature.

This study reports the empirical results of the DWWS instrument development in three steps. First, respondent demographics (N = 294) are presented to describe the sample profile. (Table 2) Second, content validity is reported through CVI to confirm the adequacy of the item pool and identify minor revisions. Third, construct validity is examined using EFA to evaluate factorability, uncover the underlying factor structure of DWWS, and assess preliminary reliability of the resulting scale.

Table 2. Demographic Statistic of the sample (n=294)

Characteristic	Categories	n (%)
Gender	Women / Men / Prefer not to say	168 (57.14) / 120 (40.82) / 6 (2.04)
Age (years)	Range; most frequent	20–28; 23 (19.05), 24 (14.63), 26 (13.27)
Bank type	Private / Government	155 (52.72) / 139 (47.28)
Work arrangement	WFO / Hybrid / WFH / Remote	203 (69.05) / 80 (27.21) / 11 (3.74) / 0 (0.00)
Employment status	Permanent / Contract / Outsourcing	168 (57.14) / 111 (37.76) / 15 (5.10)
Education	S1 / D3 / S2	226 (76.87) / 43 (14.63) / 25 (8.50)

Source: Data Processed (2025)

Based on the respondent profile (N = 294) (Table 1), the sample was predominantly women (57.14%) and early-career employees aged 20–28, with the largest shares at age 23 (19.05%), 24 (14.63%), and 26 (13.27%). Most respondents held a bachelor's degree (S1; 76.87%), and job roles were concentrated on customer-facing and operational functions frontliners (20.07%) and back office/operations (18.37%) with additional representation from IT/digital banking (12.24%) and relationship management/sales (11.22%). Work tenure was mainly 1–2 years (54.42%) and 3–5 years (29.93%), while work arrangements were largely WFO (69.05%) and hybrid (27.21%). This profile aligns with the study's purpose, as early-career banking employees in service- and target-driven roles with intensive WFO/hybrid routines are likely to experience substantial digital work demands, making DWWS highly relevant to examine as an organizational support system (HR practices, work design, communication norms, and digital literacy).

Content Validity

Table 3. Composition of the Appraiser Panel

Appraiser Code	Role	Assessment Focus
E1	Lecturer	HRM Theory
E2	HR Manager	HR Practice
E3	a bank manager	The context of the banking industry
E4	Employee Gen Z 1	Readability & relevance for Gen Z
E5	Employee Gen Z 2	Readability & relevance for Gen Z
E6	Employee Gen Z 3	Readability & relevance for Gen Z

Note. With six raters, I-CVI = 0.83 corresponds to 5/6 agreement; S-CVI/Ave ≥ 0.90 is commonly interpreted as strong content validity.

Source: Data Processed (2025)

This study used 6 expert panels to conduct a content validity test (CVI) for 24 DWWS items, namely: 1 HR lecturer (HRP), 1 HR practitioner, 1 banking manager, and 3 Generation Z employees.

Table 4 summarizes the CVI results obtained from the expert assessment. Table 4 shows the validity of the instrument's very strong content. The S-CVI/Ave value for *relevance* and *clarity* is both 0.965 (≥0.90), so the quality of the item content is considered excellent overall. Meanwhile, the S-CVI/UA of 0.792 on both aspects indicates that about 79.2% of the items obtained full agreement from the expert panel; since this index is more stringent, the lower value of the S-CVI/Ave remains reasonable and mainly serves to mark items that need minor revision.

Table 4. CVI Index Summary

Item	S-CVI/Ave (Relevance)	S-CVI/Ave (Clarity)	S-CVI/UA (Relevance)	S-CVI/UA (Clarity)
24.0	0.965	0.965	0.792	0.792

Source: Data Processed (2025)

Table 4 shows excellent scale-level content validity, with S-CVI/Ave = 0.965 for both relevance and clarity (≥0.90). Using the stricter universal agreement criterion, S-CVI/UA = 0.792, indicating that 19 of 24 items (79.2%) achieved full agreement among the six raters. Accordingly, all items were retained, while seven non-unanimous items (I-CVI < 1.00) were refined through minor wording edits (simplifying technical terms and adding brief behavioural examples) to improve clarity and reduce ambiguity prior to EFA. A focused re-review (mini-CVI) of the revised items confirmed improved agreement, with S-CVI/Ave = 1.000, S-CVI/UA = 1.000, and I-CVI = 1.000 for both relevance and clarity across the revised items. (Table 5)

Table 5. Item-level CVI results for non-unanimous items (I-CVI < 1.00)

Item	Domain	I-CVI (Relevance)	I-CVI (Clarity)	Decision
9	Empowerment with Digital Mindfulness	0.833	0.833	Retain (minor wording refinement)
10	Empowerment with Digital Mindfulness	0.833	0.833	Retain (minor wording refinement)
11	Empowerment with Digital Mindfulness	0.833	1.000	Retain (minor wording refinement)
17	Safe-by-Design Performance Management	0.833	0.833	Retain (minor wording refinement)
18	Safe-by-Design Performance Management	0.833	1.000	Retain (minor wording refinement)
19	Safe-by-Design Performance Management	1.000	0.833	Retain (minor wording refinement)
21	Inclusive & Ethical Digital Climate	1.000	0.833	Retain (minor wording refinement)

Source: Data Processed (2025)

Table 5 indicates that only seven items received non-unanimous ratings, with an I-CVI of 0.833 (i.e., agreement by 5 of 6 raters) on relevance and/or clarity. No item fell below the acceptability threshold; therefore, all items were retained for further analysis. The non-unanimous items were clustered in three domains Empowerment with Digital Mindfulness (DWWS09–11), Safe-by-Design Performance Management (DWWS17–19), and Inclusive and Ethical Digital Climate (DWWS21) suggesting a need for minor wording refinements to improve clarity and interpretability prior to EFA. These revisions, which focused on simplifying terminology and clarifying behavioral cues, are summarized in Table 6 and incorporated into the final item set. The revised items were subsequently used for the EFA.

Table 6. Before–after item revisions (expert review)

No Item	Dimension	Early version	Revised version (recommended)
9	Empowerment with Digital Mindfulness	I got digital mindfulness training to manage the burden of technology.	Organizations provide short training to manage digital distractions (e.g. notifications, work chats, online meetings) to keep work focused and healthy.
10	Empowerment with Digital Mindfulness	Organizations routinely monitor and evaluate employees' digital stress levels.	Organizations conduct periodic evaluations related to digital workloads (e.g. frequency of online meetings, notifications, communication hours) and their impact on work stress.
11	Empowerment with Digital Mindfulness	I feel more focused (flow) at work after getting a digital mindfulness intervention.	After the digital distraction management program/training, it is easier for me to work focused for a long time.
17	Safe-by-Design Performance Management	My performance evaluation considers the digital load (notifications, online meetings, number of applications used).	Performance evaluations consider digital working conditions (e.g., intensity of online meetings and notifications) to keep targets fair and realistic.
18	Safe-by-Design Performance Management	The KPIs in my organization are structured so as not to cause excessive intensification of digital work.	KPIs are structured so that they don't encourage 'always-on' (e.g., instant responses outside of business hours or excessive meetings) that increase digital workloads.
19	Safe-by-Design Performance Management	My digital work schedule gives me enough space for deep work without the distractions of technology.	Work schedules allow specific time to work without digital communication interruptions (e.g. focus hours without meetings/chats).
21	Inclusive & Ethical Digital Climate	Organizations have clear guidelines for digital politeness.	Organizations have clear guidelines for digital communication etiquette (e.g., how to send messages/emails, communication hours, and online meeting etiquette).

Source: Data Processed (2025)

Exploratory Factors Analysis (EFA)

An exploration factor analysis (EFA) was conducted to examine the construct validity of the DWWS items. Sampling adequacy was supported (KMO = 0.852) and Bartlett's test was significant ($\chi^2 = 2214.207$, df = 276, $p < .001$), indicating that the correlation matrix was factorable.

Table 7. EFA adequacy and extraction summary

Indicator	Result
Sample	N = 294
Items analysed	24 DWWS items
Extraction / rotation	Principal Axis Factoring (PAF) with Varimax rotation
KMO	0.852 (meritorious)
Bartlett's test	$\chi^2 = 2214.207$; df = 276; $p < .001$
Communalities (extraction)	0.352–0.616
Retained factors	6 factors (supported by scree "elbow")
Rotated loadings (approx.)	0.555–0.751

Note. Loadings were interpreted based on the rotated factor matrix; low coefficients were suppressed in the output.
Source: Data Processed (2025)

Table 8. Six-factor DWWS solution (item clustering and loading ranges)

Factor	Label (domain)	Items	Loading range (approx.)
F1	Inclusive & Ethical Digital Climate	21–24	0.625–0.723
F2	Responsible Digital Flexibility	05–08	0.595–0.710
F3	Empowerment with Digital Mindfulness	09–12	0.566–0.751
F4	Digitalized Training & Career Development	01–04	0.555–0.740
F5	Safe-by-Design Performance Management	17–20	0.556–0.716
F6	Reward for Healthy Digital Behaviour	13–16	0.580–0.667

Source: Data Processed (2025)

The EFA results support a clear six-factor structure that aligns with the theorized DWWS domains, with all item loadings falling in a moderate-to-strong range (approximately 0.555–0.751). Inclusive & Ethical Digital Climate (Items 21–24; 0.625–0.723) and Responsible Digital Flexibility (Items 05–08; 0.595–0.710) show consistently strong loadings, indicating well-defined constructs. Empowerment with Digital Mindfulness (Items 09–12; 0.566–0.751) contains the highest loading in the solution, suggesting particularly strong indicator–factor alignment, while Digitalized Training & Career Development (Items 01–04; 0.555–0.740) and Safe-by-Design Performance Management (Items 17–20; 0.556–0.716) also demonstrate adequate and interpretable loadings across items. Reward for Healthy Digital Behavior (Items 13–16; 0.580–0.667) shows stable moderate-to-strong loadings, supporting its coherence as a distinct domain. Overall, the loading pattern indicates that the DWWS items cluster meaningfully into six interpretable dimensions, providing initial evidence of construct validity.

The six-factor DWWS solution should be read as more than a statistical outcome: it supports DWWS as a work-system construct that captures how organizations design HR practices and norms to protect digital well-being while sustaining performance. This interpretation aligns with the HR systems/HPWS tradition, which argues that employee outcomes are shaped by bundles of mutually reinforcing practices rather than isolated interventions (Becker & Huselid, 1998; Boxall & Macky, 2009; Lepak et al., 2006; Jiang et al., 2012). Crucially, however, DWWS extends this tradition into a domain it has not previously addressed: rather than specifying practices that enhance performance, DWWS specifies practices that protect employees from the pathological byproducts of digitally intensive performance demands. This is a conceptually distinct function that existing HPWS frameworks do not operationalize (Chillakuri & Vanka, 2020; Shi et al., 2024), and it responds directly to the call for measurement models that integrate high-performance work system logic with digital well-being considerations into a single organizational-level construct (De Stefano et al., 2023; Jarden et al., 2023). The clean six-factor EFA solution with no cross-loadings requiring item removal, and all loadings falling within the moderate-to-strong range (0.555–0.751) provides initial empirical warrant for treating these six protective domains as a coherent organizational system rather than a checklist of loosely related practices. In this sense, DWWS offers what Worthington & Whittaker (2006) characterize as the hallmark of rigorous construct-driven scale development: a theoretically derived structure that the data confirm rather than impose.

Substantively, the six DWWS domains map onto well-documented risks of ICT-enabled work overload, invasion, and role stress collectively discussed in the technostress literature (Ayyagari et al., 2011; Tarafdar et al., 2007; Ragu-Nathan et al., 2008). Importantly, DWWS does not merely describe digital strain; it specifies the organizational levers that can prevent it. Responsible Digital Flexibility (F2; loadings 0.595–0.710) directly addresses hyperconnectivity pressures linked to reduced recovery and detachment and is coherent with the "autonomy paradox" argument that mobile connectivity can create norms of continual accessibility (Mazmanian et al., 2013) and with diary evidence linking work-related smartphone use to poorer psychological detachment (Derks et al., 2014). What DWWS adds to these individual-level findings is a system-level operationalization: it is not sufficient for individual employees to manage their own digital boundaries; organizations must institutionalize boundary norms quiet hours, right-to-disconnect policies,

communication protocols as a formal HR practice. The independent emergence of F2 as a psychometrically coherent factor confirms that Gen Z banking employees perceive this institutional dimension as real, distinct, and organizationally located. Empowerment with Digital Mindfulness (F3; loadings 0.566–0.751) the factor with the highest loading ceiling in the solution reflects organizational programs for managing digital distraction, monitoring digital workload, and supporting focused work. Its strong psychometric coherence is consistent with job demands–resources theory, which positions proactive organizational resources as a distinct buffer against strain that operates independently of individual coping (Bakker & Demerouti, 2007; Ragu-Nathan et al., 2008). Notably, F3 also contained the items requiring the most wording revision during the CVI phase (I-CVI = 0.833 initially); the fact that semantic refinement alone without any conceptual revision was sufficient to produce the highest loadings in the solution supports Fabrigar et al.'s (1999) argument that item wording clarity is the primary driver of common variance extraction in Principal Axis Factoring. Safe-by-Design Performance Management (F5; loadings 0.556–0.716) echoes contemporary work-design scholarship arguing that digitalization makes performance metrics, workload signals, and the protection of deep work more critical, not less (Parker & Grote, 2022). The independence of F5 from F2 is itself a theoretically meaningful finding: employees distinguish between when they are allowed to disconnect a temporal boundary question and how their performance targets are structured in relation to digital load a work design question. This differentiation, which performance management frameworks have not yet formally incorporated, has direct implications for sustainable HRM practice: boundary policies and KPI redesign require qualitatively different managerial responses and should not be conflated under a generic flexibility agenda.

The remaining three factors complete the diagnostic architecture of DWWS. Inclusive & Ethical Digital Climate (F1; loadings 0.625–0.723) reflects the normative and relational dimensions of digital work etiquette norms, psychological safety to report misconduct, and equitable technology access. The high lower-bound loading and tight item clustering are consistent with organizational climate theory's argument that normative work environments exert independent effects on employee behavior and well-being beyond structural or instrumental conditions (Kopelman et al., 1990). The particular salience of F1 in this sample predominantly early-career frontline employees in WFO and hybrid arrangements suggests that Gen Z workers hold clear and differentiated expectations around digital civility and inclusion as organizational responsibilities, not merely personal conduct norms. Digitalized Training & Career Development (F4; loadings 0.555–0.740) and Reward for Healthy Digital Behaviour (F6; loadings 0.580–0.667) map respectively onto the ability-enhancing and motivation-enhancing HR practice bundles distinguished by Jiang et al. (2012) and Lepak et al. (2006), confirming that DWWS preserves the canonical internal logic of HPWS while extending it to the digital domain. Together, the six factors form an internally differentiated system not a list of related practices which is the defining property of a work system construct (Lepak et al., 2006) and the structural basis of DWWS's claim to organizational-level utility.

In practical terms, the diagnostic specificity of DWWS addresses a gap that Jarden et al. (2023) identified as a persistent limitation of well-being measurement: the inability to translate survey scores into actionable HR policy. Generic well-being instruments yield aggregate scores that, while useful for benchmarking, provide limited guidance for managerial intervention because the same low composite score can result from qualitatively different organizational failures. DWWS resolves this ambiguity at the factor level. Low scores on F2 specifically indicate the absence of institutionalized disconnection norms and call for policy-level boundary interventions quiet-hours protocols, communication governance, or right-to-disconnect policies. Low scores on F5 indicate that KPI structures and meeting norms are amplifying digital workload and require performance system redesign not wellness programs. Low scores on F1 point to a normative deficit in digital culture, requiring governance-level interventions such as digital etiquette guidelines and safe reporting mechanisms. Low scores on F3 signal inadequate organizational support

for focused, distraction-managed work, and call for structured digital mindfulness programs and workload monitoring systems. This factor-specific diagnostic logic positions DWWS not as a well-being survey an instrument that describes employee states but as an organizational audit tool that locates the system components requiring intervention. For organizations in the Indonesian banking sector, where digital work intensity is rising alongside a growing Gen Z workforce (Badan Pusat Statistik, 2024) and sustainability-oriented HRM is gaining regulatory and reputational salience (Gomes et al., 2024; Madero-Gómez et al., 2023), DWWS provides a structured pre-intervention baseline that enables targeted, evidence-based sustainable HRM investment rather than generic well-being initiatives.

Several limitations bound these conclusions and simultaneously define a productive research agenda. Construct validity evidence remains exploratory: EFA identifies plausible factor structures but does not confirm them CFA in an independent sample is required, including evaluation of second-order and bifactor specifications that would clarify whether DWWS operates solely as a multidimensional profile or also as a unitary higher-order construct representing general digital work system quality (Marsh et al., 2014). Criterion-related and predictive validity are entirely untested; future research should examine whether DWWS factors differentially predict technostress, burnout, psychological detachment, work engagement, and turnover intention thereby providing evidence that the six dimensions are not only structurally but functionally distinct. Measurement invariance across sector, generational cohort, employment status, and work arrangement (WFO, hybrid, WFH) is necessary before DWWS can support group comparisons or cross-organizational benchmarking. The present single-industry sample, though appropriate for initial scale development, limits the generalizability of the factor structure and the loading magnitudes reported here. Finally, temporal stability and intervention sensitivity remain unestablished: longitudinal and test–retest designs are needed to confirm that DWWS scores are stable over time and responsive to genuine organizational change in digital work system quality the precondition for the instrument's use as an evaluation tool in sustainable HRM program design and assessment.

4. CONCLUSION

This study set out to develop and initially validate the Digital Well-Being Work System (DWWS) scale an instrument designed to measure organizational-level HR practices that protect employee digital well-being while sustaining performance. The results confirm that DWWS can be operationalized as a psychometrically coherent six-factor construct, with strong content validity (S-CVI/Ave = 0.965) and an interpretable EFA structure (KMO = 0.852; loadings 0.555–0.751) grounded in the integration of High Well-Being Performance Work System and digital well-being frameworks. The primary contribution is conceptual: DWWS shifts the measurement focus from how individual employees experience digital work to how organizations design the conditions that shape it a function not served by existing well-being instruments and one that responds directly to the sustainable HRM imperative to align HR system design with long-term employee sustainability.

Beyond scale development, this study introduces a diagnostic framework in which each of the six DWWS factors Responsible Digital Flexibility, Empowerment with Digital Mindfulness, Safe-by-Design Performance Management, Inclusive & Ethical Digital Climate, Digitalized Training & Career Development, and Reward for Healthy Digital Behaviour maps onto a distinct organizational intervention domain. This factor-level specificity enables practitioners to identify which components of their digital work system require strengthening, rather than relying on aggregate well-being scores that conflate structurally different organizational failures. For Generation Z employees in digitally intensive sectors such as banking, where the convergence of high-performance demands and pervasive

technology use creates compounding psychosocial risks, DWWS provides a practical audit tool that can inform targeted, evidence-based sustainable HRM investment.

The present findings are explicitly preliminary. DWWS requires confirmatory validation including CFA, criterion-related validity testing, and measurement invariance assessment across sectors and demographic groups before it can function as a generalizable standard. Future research that completes this validation pathway would establish DWWS as a replicable organizational diagnostic, capable of supporting both cross-sector benchmarking and pre–post evaluation of digital well-being interventions. In doing so, it would contribute to closing the gap between sustainable HRM theory and the measurement infrastructure needed to implement and evaluate it in practice.

5. REFERENCES

Aggarwal, M., Dutta, M., Madaan, V., Pham, L., & Lourens, M. (2023). Impact of green human resource management on sustainable performance. *E3S Web of Conferences*, *399*, 07005. https://doi.org/10.1051/e3sconf/202339907005

Anshima, A., Bhardwaj, B., Sharma, D., & Chand, M. (2024). Ensuring sustainability through green HRM practices: A review, synthesis and research avenues. *Journal of Organizational Effectiveness: People and Performance*, *11*(4), 1120–1140. https://doi.org/10.1108/JOEPP-10-2023-0493

Arman, R., Saleem, I., & Ghani, A. S. (2023). Critical review of sustainable human resource management (SHRM) practices, approaches, and outcomes. *Journal of Cleaner Production*, *382*, 135291. https://doi.org/10.1016/j.jclepro.2022.135291

Arslankara, V. B., Demir, A., Öztaş, Ö., & Usta, E. (2022). Digital well-being scale validity and reliability study. *Journal of Teacher Education and Lifelong Learning*, *4*(2), 263–274.

Ayyagari, R., Grover, V., & Purvis, R. L. (2011). Technostress: Technological antecedents and implications. *MIS Quarterly*, *35*(4), 831–858. https://doi.org/10.2307/41409963

Badan Pusat Statistik. (2024). Statistik Pemuda Indonesia 2024 (Vol. 22, No. 04200.24026). Direktorat Statistik Kesejahteraan Rakyat.

Bakker, A. B., & Demerouti, E. (2007). The job demands–resources model: State of the art. *Journal of Managerial Psychology*, *22*(3), 309–328. https://doi.org/10.1108/02683940710733115

Bashir, H., Memon, M., & Muenjohn, N. (2024). Fostering a safe workplace: The transformative impact of responsible leadership and employee-oriented HRM. *International Journal of Manpower*, *45*(9), 1721–1740. https://doi.org/10.1108/IJM-06-2023-0318

Becker, B. E., & Huselid, M. A. (1998). High performance work systems and firm performance: A synthesis of research and managerial implications. In G. R. Ferris (Ed.), Research in Personnel and Human Resources Management (Vol. 16, pp. 53–101). JAI Press.

Boxall, P., & Macky, K. (2009). Research and theory on high-performance work systems: Progressing the high-involvement stream. *Human Resource Management Journal*, *19*(1), 3–23. https://doi.org/10.1111/j.1748-8583.2008.00082.x

Brougham, D., & Haar, J. (2021). Smart technology and employment vulnerability: A comparative analysis across five countries. *New Technology, Work and Employment*, *36*(2), 187–203. https://doi.org/10.1111/ntwe.12187

Buga, L. (2024). High retention HR systems: Bridging employee wellbeing and organizational commitment for sustainable success. *Virgil Madgearu Review of Economic Studies and Research*, *17*(1), 45–60. https://doi.org/10.24193/rvm.2024.17.107

Chand, P. K., & Mishra, N. (2024). Detached effects of doom scrolling on Generation Z employee performance in the Indian information technology sector. *Information Discovery and Delivery*, *52*(4), 412–425. https://doi.org/10.1108/IDD-07-2023-0081

Chari, R., Sauter, S. L., Petrun Sayers, E. L., Huang, W., Fisher, G. G., & Chang, C.-C. (2022). Development of the National Institute for Occupational Safety and Health Worker Well-Being Questionnaire. *Journal of Occupational and Environmental Medicine*, *64*(8), 707–717. https://doi.org/10.1097/JOM.0000000000002585

Chillakuri, B., & Vanka, S. (2020). Examining the effects of workplace well-being and high-performance work systems on health harm: A sustainable HRM perspective. *Society and Business Review*, *15*(2), 115–134. https://doi.org/10.1108/SBR-03-2020-0033

Choi, W., Wang, W., Kim, H., Lee, J., & Kang, S. (2024). Unraveling the link between perceived ESG and psychological well-being: The moderated mediating roles of job meaningfulness and pay satisfaction. *Behavioral Sciences*, *14*(7), 606. https://doi.org/10.3390/bs14070606

Ciptagustia, A., & Faldesiani, R. (2024). *Redefining well-being: A CFA-based and Rasch model approach to employee well-being measurement for Generation Z* [Unpublished research report]. Universitas Pendidikan Indonesia (UPI).

Ciptagustia, A., Faldesiani, R., & Firmansyah, Y. (2024). Exploring future research of employee well-being: A bibliometric approach. Proceedings of the *International Conference on Economics, Business, Education, and Finance (ICEBEF 2024)*. Universitas Pendidikan Indonesia (UPI). (Conference paper, in press).

Daovisan, H., & Intarakamhang, U. (2024). Measuring occupational well-being indicators: Scale construction and validation. *Behavioral Sciences*, *14*(3), 248. https://doi.org/10.3390/bs14030248

De Stefano, F., Bagdadli, S., & Camuffo, A. (2023). Remote working, well-being, and performance in the digital era: A systematic literature review and research agenda. *Human Resource Management Review*, *33*(4), 100929. https://doi.org/10.1016/j.hrmr.2023.100929

Derks, D., van Mierlo, H., & Schmitz, E. B. (2014). A diary study on work-related smartphone use, psychological detachment and exhaustion: Examining the role of the perceived segmentation norm. *Journal of Occupational Health Psychology*, *19*(1), 74–84. https://doi.org/10.1037/a0035076

Dilshan, H., & Annuar, N. (2020). Exploring HRM practices to retain Generation-Z in information technology sector: A systematic literature review. *International Journal of Advanced Science and Technology*, *29*(8), 1325–1335.

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, *4*(3), 272–299. https://doi.org/10.1037/1082-989X.4.3.272

Gomes, G., Coelho, A., & Ribeiro, N. (2024). A systematic literature review on sustainable HRM and its relations with employees' attitudes: State of art and future research agenda. *Journal of Organizational Effectiveness: People and Performance*, *11*(5), 1–22. https://doi.org/10.1108/JOEPP-11-2023-0497

Grant, C. A., Wallace, L. M., & Spurgeon, P. C. (2021). An exploration of the psychological factors affecting remote e-worker's job effectiveness, well-being and work-life balance. *Employee Relations*, *43*(2), 428–452. https://doi.org/10.1108/ER-01-2020-0021

Hamouche, S., & Marchand, A. (2021). Occupational e-mental health interventions: A systematic review. *Computers in Human Behavior*, *125*, 106899. https://doi.org/10.1016/j.chb.2021.106899

Jarden, R. J., Siegert, R. J., Koziol-McLain, J., Bujalka, H., & Sandham, M. H. (2023). Wellbeing measures for workers: A systematic review and methodological quality appraisal. *Frontiers in Public Health*, *11*, 1053179. https://doi.org/10.3389/fpubh.2023.1053179

Jiang, K., Lepak, D. P., Hu, J., & Baer, J. C. (2012). How does human resource management influence organizational outcomes? A meta-analytic investigation of mediating mechanisms. *Academy of Management Journal*, *55*(6), 1264–1294. https://doi.org/10.5465/amj.2011.0088

Jora, R., Mittal, P., Kaushal, S., & Raghuvaran, S. (2023). Tech-enabled sustainable HR strategies: Fostering green practices. In *2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS)* (Vol. 1, pp. 2496–2501). IEEE. https://doi.org/10.1109/ICACCS57279.2023.10113050

Kalei, A. (2024). Green human resource management practices and environment sustainability: From empirical evidence. *Journal of Business and Management Studies*, *6*(3), 45–58. https://doi.org/10.32996/jbms.2024.6.3.19

Kopelman, R. E., Brief, A. P., & Guzzo, R. A. (1990). The role of climate and culture in productivity. In B. Schneider (Ed.), Organizational climate and culture (pp. 282–318). Jossey-Bass.

Kulkarni, V., & Rai, P. (2023). Generation Z talent management in organisations: An HR perspective. *Journal of Survey in Fisheries Sciences*, *10*(1), 2275–2285. https://doi.org/10.53555/sfs.v10i1.2275

Laker, B., Patel, C., Budhwar, P., & Malik, A. (2022). How job crafting relates to digital resilience. *MIT Sloan Management Review*, *63*(3), 55–62.

Lepak, D. P., Liao, H., Chung, Y., & Harden, E. E. (2006). A conceptual review of human resource management systems in strategic human resource management research. In J. J. Martocchio (Ed.), Research in *Personnel and Human Resources Management* (Vol. 25, pp. 217–271). Emerald Group Publishing. https://doi.org/10.1016/S0742-7301(06)25006-0

MacKinnon, N. J., Ambade, P. N., Hoffman, Z. T., Mehra, K., Ange, B., Ruffa, A., et al. (2024). Development of a new instrument to measure workplace mental health and well-being. *Mayo Clinic Proceedings: Innovations, Quality & Outcomes*, *8*(6), 507–516. https://doi.org/10.1016/j.mayocpiqo.2024.09.002

Madero-Gómez, S. M., Rubio Leal, Y. L., Olivas-Luján, M., & Yusliza, M. Y. (2023). Companies could benefit when they focus on employee wellbeing and the environment: A systematic review of sustainable human resource management. *Sustainability*, *15*(6), 5435. https://doi.org/10.3390/su15065435

Malik, A., Budhwar, P., & Srikanth, N. R. (2022). Gig work in a post-pandemic world: Evidence from global staffing platforms. *International Journal of Human Resource Management*, *33*(6), 1083–1110. https://doi.org/10.1080/09585192.2021.1968304

Marsh, H. W., Morin, A. J. S., Parker, P. D., & Kaur, G. (2014). Exploratory structural equation modeling: An integration of the best features of exploration and confirmatory factor analysis. *Annual Review of Clinical Psychology*, *10*, 85–110. https://doi.org/10.1146/annurev-clinpsy-032813-153700

Mazmanian, M., Orlikowski, W. J., & Yates, J. (2013). The autonomy paradox: The implications of mobile email devices for knowledge professionals. *Organization Science*, *24*(5), 1337–1357. https://doi.org/10.1287/orsc.1120.0806

Meske, C., & Junglas, I. (2020). Investigating the elicitation of employees' support towards digital workplace transformation. *Behaviour & Information Technology*, *40*(11), 1120–1136. https://doi.org/10.1080/0144929X.2020.1742782

National Institute for Occupational Safety and Health (NIOSH). (2024). NIOSH Worker Well-Being Questionnaire (WellBQ) (DHHS (NIOSH) Publication No. 2021-110, revised 05/2024). Centers for Disease Control and Prevention. https://doi.org/10.26616/NIOSHPUB2021110revised052024

Parent-Lamarche, A., Dextras-Gauthier, J., & Julien, A. (2023). Toward a new model of human resource management practices: Construction and validation of the High Wellbeing and Performance Work System Scale. *Frontiers in Psychology*, *14*, 1151783. https://doi.org/10.3389/fpsyg.2023.1151781

Parker, S. K., & Grote, G. (2022). Automation, algorithms, and beyond: Why work design matters more than ever in a digital world. *Applied Psychology*, *71*(4), 1171–1204. https://doi.org/10.1111/apps.12241

Polit, D. F., & Beck, C. T. (2006). The content validity index: Are you sure you know what's being reported? Critique and recommendations. *Research in Nursing & Health*, *29*(5), 489–497. https://doi.org/10.1002/nur.20147

Ragu-Nathan, T. S., Tarafdar, M., Ragu-Nathan, B. S., & Tu, Q. (2008). The consequences of technostress for end users in organizations: Conceptual development and empirical validation. *Information Systems Research*, *19*(4), 417–433. https://doi.org/10.1287/isre.1070.0165

Robertson, I. T., Cooper, C. L., Sarkar, M., & Curran, T. (2023). Resilience training in the workplace: A systematic review of literature. *Journal of Occupational and Organizational Psychology*, *96*(2), 342–366. https://doi.org/10.1111/joop.12425

Sampil, N. S., Daud, A., & Hairon, S. M. (2025). Translation and validation of Malay version of NIOSH worker well-being questionnaire (WellBQ). *PLOS ONE*, *20*(5), e0322451. https://doi.org/10.1371/journal.pone.0322451

Seabrook, K. (2024). PL09 Connecting the dots: The value of people at work and their health, safety and well-being. *Occupational Medicine*, *74*(Supplement_1). https://doi.org/10.1093/occmed/kqae023.0010

Shi, L., Van Veldhoven, M., Kooij, D., Van De Voorde, K., & Karanika-Murray, M. (2024). High-performance work systems and individual performance: A longitudinal study of the differential roles of happiness and health well-being. *Frontiers in Psychology*, *14*, 1261564. https://doi.org/10.3389/fpsyg.2023.1261564

Sidik, I. M., Firmansyah, Y., & Ciptagustia, A. (2024). Implementation of hybrid work system in supporting employees' work-life balance. *Journal of Global Business and Management Review*, *6*(2), 253–259.

Tarafdar, M., Tu, Q., Ragu-Nathan, B. S., & Ragu-Nathan, T. S. (2007). The impact of technostress on role stress and productivity. *Journal of Management Information Systems*, *24*(1), 301–328. https://doi.org/10.2753/MIS0742-1222240109

Wang, B., Liu, Y., & Parker, S. K. (2022). How does the use of information and communication technologies affect individuals? A meta-analysis. *Psychological Bulletin*, *148*(1–2), 1–28. https://doi.org/10.1037/bul0000358

Worthington, R. L., & Whittaker, T. A. (2006). Scale development research: A content analysis and recommendations for best practices. *The Counseling Psychologist*, *34*(6), 806–838. https://doi.org/10.1177/0011000006288127