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Loneliness in Digital Workplaces: Antecedents, Outcomes, and a Typology of Work Configurations

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Abstract. This study investigates loneliness in digital workplaces through a systematic literature review (SLR) followed by quantitative validation. The SLR identified four key antecedent themes: technology affordances, job design, personal characteristics, and behavior and context in digital workplaces, alongside two outcome themes: psychological and job-related. Based on these findings, a conceptual model grounded in Job Demands-Resources theory was developed and tested with survey data from 258 workers across diverse digital work arrangements. Results confirmed that technology affordances and the need for affiliation significantly reduce workplace loneliness, which in turn predicts emotional exhaustion and decreased techno-work engagement. Latent profile analysis using remote work intensity, technology-mediated interaction intensity, and digital mindset as indicators identified three distinct configurations: Hybrid ($n = 99$), Office-Based ($n = 91$), and Full-Remote workers ($n = 68$). Welch ANOVA revealed that while configurations differ in work-home integration, affiliation needs, and techno-work engagement, workplace loneliness does not differ across profiles. This configuration-invariance of loneliness indicates that technology affordances and the need for affiliation are universal antecedents that operate independently of work arrangement. This study contributes to business-IT alignment literature by demonstrating that humanistic technology investment, particularly supporting social connection and association, and attention to individual affiliation needs are equally relevant across all digital workplace configurations.

Keywords: Digital Workplace, Workplace Loneliness, Business-IT Alignment, Employee Well-Being, Latent Profile Analysis, Remote Work.

1 Introduction

The digital transformation of workplaces has led to diverse work settings in which employees work from different locations and time zones. During the COVID-19 pandemic, employees were sent to work from home, and technology was further developed to create the digital workplace

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most office workers use today [1]. This trend continued after the pandemic, motivating scholars and practitioners to understand the well-being-related implications of digital workplaces [2], [3], [4], [5]. Digital transformation is not only a technological shift but also a profound change in organizational structures, leadership roles, and workforce management practices. As organizations adapt to remote and hybrid work models, they face new challenges in maintaining employee engagement, collaboration, and well-being. One such well-being-related implication is loneliness [6], [7].

A Digital Workplace (DWP) is "an integrated technology platform that provides all the tools and services to enable employees to effectively undertake their work, both alone and with others, regardless of location" [5, p. 480]. It involves "... not only the physical space, employees and tasks, but also a set of strategically accepted procedures and rules to maximize productivity and improve collaboration, communication and knowledge management" [8, p. 10]. This approach highlights that DWPs are more than a mere bridge between different locations and working times; they require elaborate planning and consideration of multiple factors.

Given the recent developments causing a massive shift towards DWPs, workplace loneliness, defined as "the perception of relationship deficit in any organization which hampers the employee's psychological well-being, which is an essential attribute for overall organizational performance" [9, p. 1], is an important topic for organizations to explore. Loneliness has been described as a critical public health concern with almost one in six people around the world experiencing it [10]. Within the workplace, loneliness has been associated with employee dissatisfaction, burnout, and adverse effects on employee performance and commitment [11], [12], [13]. Empirical evidence shows that stress-related absenteeism, often linked to workplace loneliness, costs organizations billions each year [14].

Understanding the factors and consequences of workplace loneliness is critical for organizations seeking to manage workforce well-being and sustain employee engagement. Addressing such humanistic aspects is increasingly recognized as essential for effective business-IT alignment (BITA), as organizations aim to ensure that digital initiatives support both organizational performance and employee needs [15]. This perspective aligns with calls to prioritize human capabilities and embed employee well-being within enterprise architecture approaches [16].

BITA is typically examined across four dimensions: strategic, structural, social, and cultural [17]. Yet, the social dimension, encompassing human experiences and perceptions, remains under-researched [18] and is often described as "mechanistic and fail[ing] to capture real life" [17, p. 298]. Neglecting loneliness in digital workplaces can undermine BITA efforts, as disengaged employees are more likely to resist digital innovation or fall short of realizing intended productivity gains [19]. As organizations increasingly pursue sustainability goals that also encompass employee mental health [20], BITA plays a pivotal role. Optimal IT and strategic alignment may position organizations to meet business objectives [21], but such efforts are likely to be fruitless without sustainable working practices that enable employees to flourish.

Efforts towards BITA can be perceived as job resources when supporting goal accomplishment through sound strategic planning [22]. Conversely, they may become job demands by hindering task completion, limiting social interaction, or failing to address psychosocial hazards in the workplace [23]. Through the lens of loneliness and psychosocial risk [24], sustainable alignment practices can mitigate risks leading to workplace loneliness, such as lack of emotional support.

This study utilizes a systematic literature review (SLR) followed by quantitative validation to investigate the antecedents and outcomes of loneliness in digital workplaces from a well-being perspective. The study is a continuation of the work presented in [25]. It addresses three primary research questions: (1) "What factors influence loneliness in the digital workplace?", (2) "How does loneliness in the digital workplace impact employee well-being?", and (3) How does workplace configuration impact digital workplace loneliness?". Section 2 elaborates on the SLR process, followed by detailed findings in Section 3. We then present our conceptual model for

quantitative validation and report empirical results, including regression analyses, in Section 4. Section 5 identifies a typology of digital workplace configurations through latent profile analysis and examines the configuration-invariance of loneliness antecedents, while Section 6 discusses theoretical and practical contributions alongside study limitations. Finally, Section 7 concludes the article.

2 Methods

This study employed a mixed-methods approach combining a systematic literature review with quantitative validation. The SLR phase utilized the 2020 PRISMA Framework [26], combined with thematic analysis [27] to identify antecedents and outcomes of digital workplace loneliness. The quantitative phase tested the identified relationships through survey data and developed a typology of digital workplace configurations using latent profile analysis, examining whether loneliness antecedents operate consistently across configurations.

2.1 Systematic Literature Review

Bramer et al.'s search strategy framework guided the literature search process [28]. The following Boolean search terms were used in ProQuest Central and Scopuss:

> ("digital workplace*" OR "remote work*" OR "virtual workplace*" OR "Home Office" OR "digital work" OR "new way of work*" OR "online work*" OR "telework*" OR "telecommute") AND ("workplace loneliness" OR "social isolation at work" OR "work solitude" OR "work-induced solitude" OR "occupational loneliness" OR "work environment isolation" OR "professional solitude") AND ("manifestations of loneliness" OR "displays of loneliness" OR "signs of loneliness" OR "symptoms of loneliness" OR "appearances of loneliness" OR "antecedents of loneliness" OR "influencing factors" OR "determinants" OR "drivers" OR "contributors" OR "causes" OR "antecedents" OR "moderators" OR "alleviators" OR "mitigators" OR "relievers" OR "Well-being" OR "employee mental health" OR "job satisfaction" OR "employment satisfaction" OR "work happiness" OR "job performance" OR "work effectiveness" OR "job productivity")

ProQuest Central was chosen as an extensive multidisciplinary research database with access to the major subject areas relevant to this study, including business, health, and science and technology. According to 2022 data, Scopus is the largest existing multidisciplinary database with 40,562 peer-reviewed journals indexed compared to 24,831 for Web of Science [29]. Hence, utilizing both databases enables the researchers to access a wide range of multidisciplinary articles. Inclusion criteria were peer-reviewed English articles published between 2021and April 2024, available in full text. Thirty-five records were identified through the Boolean search. The PICO Framework [30] helped determine further eligibility criteria: (P) Population: focusing on remote and hybrid work knowledge workers; (I) Intervention/phenomenon of interest being loneliness in digital workplaces; (C) Comparison: with non-lonely employees or pre-digital workplace conditions; and (O) Outcomes related to employee well-being effects.

Exclusion criteria included an absence of focus on loneliness or digital workplace context. Comments and conference proceedings were also excluded. Reasons for exclusion included, but were not limited to, duplications across databases, abstracts missing a digital environment or workplace loneliness context, and a study focus not relevant to the topic, e.g., crisis management and resilience, creativity and innovation, and wellness strategies.

Following Brown and Clarke's "six steps of thematic analysis framework" [27], data were collected and coded by the third author, then revisited, quality-checked, and updated by the first two researchers. Themes were created manually around each research question with the help of a synthesis matrix in a spreadsheet guided by Ingram et al. [31]. For parsimony purposes, final themes

and sub-themes had to be supported by at least three records. Supplementary information including the PRISMA Flow Diagram, the collation of initial themes, the synthesis matrix, excluded literature with reasons, scales used in the studies, sample characteristics, and a collection of the applied theories from the included literature is available in the Online Resources (with access provided in Appendix A). The overview of PRISMA phases and steps applied is shown in Table 1.

Table 1. PRISMA Phases and Steps

PRISMA Phase	Steps (Inclusion)	Steps (Exclusion)
Identification	Records identified from databases (n = 35)	Duplicate records removed (n = 1)
Screening	Records screened (n = 34) Records sought for retrieval (n = 18) Reports assessed for eligibility (n = 18)	Records excluded (n = 16) Reports not retrieved (n = 0) Excluded: Not focused on loneliness (n = 1); Lack of focus on digital work environments (n = 2)
Included	Studies included in this review (n = 15)	

2.2 Quantitative Validation

Based on the SLR findings, a conceptual model was developed and tested using survey data. Data were collected via an online survey distributed to remote workers, resulting in 258 valid responses after data quality screening (see Section 4.1 for detailed procedures). The survey measured key constructs identified in the SLR, including technology affordances, need for affiliation, work-home integration, workplace loneliness, emotional exhaustion, and techno-work engagement. Additionally, respondents reported their remote work intensity, technology-mediated interaction intensity, and digital mindset, which together served as indicators in a latent profile analysis identifying three distinct digital workplace configurations (Hybrid, Office-Based, Full-Remote). This mixed-methods design enabled us to validate the relationships identified in the literature and to examine whether those relationships hold equally across configurations.

3 SLR Findings

The systematic literature review identified key themes related to antecedents and outcomes of workplace loneliness in digital environments. These findings informed the development of our conceptual model for quantitative validation (Section 4). Table 2 provides an overview of the papers supporting each theme.

Table 2. Papers and Themes

Category	Theme	Source Papers	N
Factors	Technology Affordances	[32], [33], [34], [35], [36], [37], [38], [39]	8
	Job Design	[32], [33], [34], [37], [38], [40], [41], [42], [43]	9
	Personal Characteristics	[32], [33], [34], [37], [38], [40], [44], [41]	8
	Behavior + Context in Digital Workplaces	[34], [36], [40], [44], [45], [46]	6
Outcomes	Psychological Outcomes	[34], [37], [38], [39], [46]	5
	Job-Related Outcomes and Performance	[32], [34], [36], [37], [39], [43], [45]	7

3.1 Factors Influencing Loneliness

Four themes were found within the included literature: (1) technology affordances, (2) job design, (3) personal characteristics, and (4) behavior and context in digital workplaces. These themes formed the basis for selecting antecedents in our empirical model.

3.1.1 Technology Affordances

Eight records mentioned the theme of technology affordances in digital workplaces, highlighting two key variables: visibility and association. Visibility, afforded through conferencing and external social media, plays a role in shaping communication experiences. The lack of face-to-face interaction, as noted by several studies [32], [33], [34], [35], [38], relates to reduced visibility in virtual environments, potentially leading to increased loneliness.

Association, which involves connecting information and people through digital means, is another critical factor. The efficacy of direct communication channels directly impacts the ability to form and maintain associations in digital workplaces [32], [35], [38]. Informal exchanges are necessary to create bonds with colleagues and establish trust and belonging in remote working conditions [36], [43]. However, these informal exchanges are reduced in remote settings due to a perceived lack of availability [43]. Optimizing the use of Information and Communication Technologies (ICTs) to enhance both visibility and association can potentially mitigate loneliness, as suggested by the Social Presence Theory[†] and Media Richness Theory[‡] [35]. Based on these findings, technology affordances were included as a key predictor in our empirical model.

3.1.2 Job Design

The theme of job design was found in nine records. This theme included factors related to (1) task interdependence and clarity, and (2) job autonomy.

In particular, task interdependence emerged as a pivotal factor in workplace loneliness. As technology enables more flexibility, many digital tasks are designed for independent execution, potentially isolating team members and damaging virtual teams [37], [42]. TTask interdependence is identified as a moderator of workplace loneliness [37], [43]. Research suggests that time constraints on tasks and the amount of high-concentration work play a relevant role in forming social connections at work [41]. Additionally, task clarity was recognized as a mitigating factor for loneliness, especially in digital workplaces with limited communication [32], [40], [43]. A lack of clarity can result in task conflicts that disrupt cooperation and thereby divide the team [32].

A further job design related factor was job autonomy. Four records observed a mitigating effect on loneliness when employees were given more control and autonomy over their situation, leading to less task interdependence. This also included the choice of their work setting and the ability to optimize their working conditions to meet their social needs [34]. A lack of autonomy and the use of controls, such as monitoring, comes with more loneliness in remote environments [37], [38], with benefits depending on segmentation preferences [33].

Given the theoretical importance of task interdependence, we initially planned to include it in our empirical model. However, as detailed in Section 4.2, task interdependence proved empirically indistinguishable from workplace loneliness and was therefore excluded from further analysis. This means that job design, a frequently cited antecedent theme in the SLR, is not represented as a distinct factor in the quantitative model, a limitation we return to in Section 6.

3.1.3 Personal Characteristics

Personal characteristics, including demographics and individual traits affecting loneliness in the digital workplace, were drawn from eight records. The most considered socio-demographic characteristics predicting loneliness in the digital workplace were age and gender [38], [40]. However, studies included in the review that, for these variables, did not report significant differences [32], [33], [34], [37], [38], [40]. [44], highlight that workplace loneliness is impacted by the individual need to belong or need for affiliation.It is argued that telecommuters with a high

[†] Social Presence Theory at https://cornerstone.lib.mnsu.edu/cgi/viewcontent.cgi?article=1001&context=isalt_resources

[‡] https://www.ebsco.com/research-starters/social-sciences-and-humanities/media-richness-theory

need for belonging and affiliation are more likely to feel that these needs are unfulfilled in the digital workplace. As noted in [41], loneliness at work cannot be blamed on the individual alone, as the concept is a product of the interplay between individual and contextual factors. Based on the consistent evidence across studies, the need for affiliation was included as a personal characteristic predictor in our model, while age and gender were included as control variables.

3.1.4 Behavior and Context

Identified in six records, the theme includes (1) the separation of work and home and (2) leadership behavior and organizational culture. The separation of work and home emerges as a critical factor in digital workplace loneliness. High job and home demands significantly increase workplace loneliness by causing interference between work and private life, leading to reduced social contact and emotional exhaustion [40], [45]. The lack of physical separation between work and home in remote work makes it challenging to manage the demands of both domains, leading to spillover effects that contribute to emotional exhaustion and workplace loneliness [36]. The difficulty in separating work and home life can lead to individuals restricting their communication in digital settings to conserve mental resources, as explained by the Conservation of Resources (COR) theory [44], [45].

Leadership and culture also impact loneliness in digital environments. Servant, supportive, transformational, and ethical leadership styles are identified as positive influences [45], [46]. Servant leadership is noted for its positive influence on social capital, facilitating adaptation and reducing depression; transformational leadership helps prevent role conflict and reduces stressors such as anxiety and isolation effects. Emotional leadership is known to preserve mental well-being in times of crisis, thereby preserving emotional resources [46]. As for organizational culture, a collaborative team climate is negatively associated, while a competitive climate is positively associated with digital workplace loneliness [44]. Finally, the perception of remote work stigma is another factor. Remote workers may be perceived to receive ‘special treatment’ and be resented by in-office coworkers [34], leading to loneliness. Work-home integration was selected as the behavioral/contextual factor for our empirical model due to its relevance across different workplace configurations.

3.2 Impact of Loneliness

The second research question regarding the impact of loneliness in the digital workplace on well-being focuses on two topics of interest: (1) psychological outcomes and (2) job satisfaction and performance (see Table 2). These outcomes informed the dependent variables in our quantitative validation.

3.2.1 Psychological Outcomes

Five records suggest an impact of workplace loneliness on emotional exhaustion. Interestingly, it emerges as both an antecedent and outcome of workplace loneliness in digital environments. Studies highlight this bidirectional relationship, noting that loneliness depletes emotional resources, hindering quality social interactions and creating a vicious cycle [37], [39]. Several studies mention depression as a direct or indirect outcome of workplace loneliness. The authors of [33] found indirect effects of loneliness through emotional exhaustion, while others identified direct links [34], [37]. Loneliness also predicts related issues such as technostress and psychological distress [38]. Digital diseases such as nomophobia and fear of missing out are significantly explained by loneliness [42], addressing the interplay between loneliness, emotional exhaustion and related psychological outcomes in digital workplaces. Emotional exhaustion was included as a psychological outcome in our empirical model.

3.2.2 Job-Related Outcomes and Performance

Job satisfaction and performance are significantly impacted by loneliness in digital workplaces, as mentioned in eight studies. The authors of [43] found a negative relationship between social isolation and adjustment to remote work, indicating lower job satisfaction. Similarly, [34] and [36] reported negative associations between loneliness and work engagement as well as job satisfaction, respectively. Performance is also affected, with studies reporting reduced productivity [34] and creativity [32], [45] due to loneliness. Factors contributing to this include lower organizational commitment, lower quality feedback, and lack of role clarity [34], [43]. Counterproductive behaviors such as cyberloafing [39], knowledge hoarding [37], [44], and reduced organizational citizenship behavior [34] further impact performance negatively in digital workplaces. Given the central role of technology in digital workplaces, we operationalized this outcome as techno-work engagement in our empirical model to better capture engagement specifically in technology-mediated work contexts.

4 Research Model for Quantitative Validation

Building on the findings of this SLR, a conceptual model for quantitative validation has been developed (see Figure 1), which aims to empirically test the relationships between key variables we identified in the literature on digital workplace loneliness. The model illustrates how workplace loneliness operates within the Job Demands-Resources (JD-R) theoretical framework in digital workplace contexts [47].

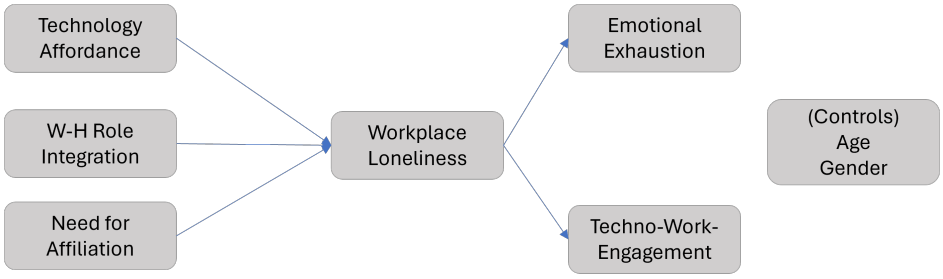

Figure 1. Empirical model

The proposed model includes three key antecedents of digital workplace loneliness: technology affordances that can serve as digital job resources when optimized (cf. Section 3.1.1), the need for affiliation (cf. Section 3.1.3) functioning as a personal resource or demand depending on fulfillment, and work-home integration (cf. Section 3.1.4) representing job demands from boundary blurring in digital work environments. Workplace loneliness, in turn, is hypothesized to predict two outcomes: emotional exhaustion (cf. Section 3.2.1), following the health impairment process of the JD-R model, and reduced techno-work engagement (cf. Section 3.2.2) representing diminished motivational outcomes. While emotional exhaustion is well-supported by the SLR as an outcome, we extend the concept of work engagement to encompass techno-work engagement, given the central role of technology in digital workplaces. In doing so, we aim to demonstrate how inadequate digital job resources and heightened digital job demands can create conditions for workplace loneliness, which then triggers both the stress and motivational processes outlined in JD-R theory.

4.1 Data Collection

Data were collected through an online survey distributed to full-time workers who communicate and collaborate using online tools and work at least one day remotely in a given week. A total of 278 responses were received. To ensure data quality, we implemented a multi-stage screening process. First, 13 responses were eliminated because participants completed the survey in less

than three minutes, indicating insufficient engagement with the questionnaire. Second, we applied a careless responding detection procedure in which responses showing evidence of systematic non-differentiation across survey items were identified through manual review and excluded from analysis. This procedure resulted in the removal of 7 additional responses. After this systematic screening process, the final sample comprised 258 valid responses (148 males; 110 females). Participants had a mean age of 33.05 years (SD = 9.40) and worked remotely an average of 2.28 days per week (SD = 1.79). In addition to the main research model constructs, we measured *digital mindset* as a supplementary variable for profiling purposes. Workplace loneliness is shaped not only by structural work conditions, i.e., physical location and technology-mediated interaction intensity, but also by individuals' orientation toward technology itself. Digital mindset captures individuals' propensity to recognize alternative use cases of digital technologies and to see potential for technology-driven transformation [4]. Therefore, the digital mindset was included as a third indicator in the latent profile analysis alongside remote work intensity and technology-mediated interaction intensity (see Section 5).

All items used in the study are detailed in Table B1 in Appendix B. Items were measured on different scales depending on the construct. Technology affordances [48], [6], work-home integration [49], and workplace loneliness [50] items were rated on a five-point Likert scale (1 = *Strongly Disagree*, 5 = *Strongly Agree*). Exhaustion [51] items used a seven-point frequency scale (1 = *Never*, 2 = *A few times a year or less*, 3 = *Once a month or less*, 4 = *A few times a month*, 5 = *Once a week*, 6 = *A few times a week*, 7 = *Every day*). Techno-work engagement [52] items used a six-point frequency scale (1 = *Never*, 2 = *Very rarely*, 3 = *Rarely*, 4 = *Occasionally*, 5 = *Very frequently*, 6 = *Always*). Need for affiliation [53] items were rated on a three-point scale (1 = *No*, 2 = *More or less*, 3 = *Yes*). The technology-mediated interaction intensity item used a five-point frequency scale (1 = *Never*, 5 = *Always*), and the remote work intensity item ranged from 0 (*Do not work remotely*) to 5 (*Five days per week*). All statistical analyses were conducted in R. Confirmatory factor analysis used *lavaan* (v0.6-20) [54], robust correlations used the *WRS2* package [55], regression standardized coefficients were obtained via *lm.beta*, robust regression via *MASS*, and latent profile analysis via *tidyLPA* [56].

4.2 Measurement Model Assessment

The measurement model demonstrated good overall fit to the data (CFI = 0.954, TLI = 0.943, RMSEA = 0.052, SRMR = 0.052), meeting the recommended thresholds (CFI/TLI $\geq$ 0.90, RMSEA $\leq$ 0.08, SRMR $\leq$ 0.08) [57].

Workplace loneliness (WPL) was operationalized using six items covering workplace collaboration and communication (reverse-coded), reflecting the degree to which employees feel socially disconnected at work. This operationalization follows established approaches that treat perceived social disconnectedness as a core measurable dimension of workplace loneliness [50]. Task interdependence (TIDP) was initially modeled as a separate construct [58]. However, CFA results revealed severe multicollinearity between TIDP and WPL, with an inter-construct correlation of -0.977 and HTMT values approaching 1.0, indicating that these constructs were empirically indistinguishable. As task interdependence and workplace loneliness appear to represent opposite poles of the same underlying dimension, TIDP was excluded from further analysis. The exclusion of TIDP means that job design is absent from the quantitative model as a distinct predictor, a measurement limitation that restricts the empirical coverage of the SLR-identified antecedent themes (see Section 6).

Table 3[‡] presents the reliability and validity indicators for all constructs. Reliability was assessed using Cronbach's alpha (α) and composite reliability (CR), with both measures exceeding the threshold of 0.70 for all constructs.Convergent validity was evaluated using average variance

[‡] TAF: Technology Affordances; NFA: Need for Affiliation; WHI: Work-Home Integration; WPL: Workplace Loneliness; EXH: Exhaustion; TWE: Techno Work-Engagement

extracted (AVE), with the recommended threshold of 0.50. Five of the six constructs met all recommended thresholds. WPL fell slightly below the AVE threshold (AVE = 0.437), though its composite reliability (CR = 0.818) and Cronbach's alpha (α = 0.811) substantially exceeded accepted standards. Fornell and Larcker (1981, p. 46) characterize such cases as merely *questionable*, not invalid, noting that composite reliability alone is sufficient to establish convergent validity. As an AVE above 0.40 is considered acceptable when CR exceeds 0.60 [59], [60], and all HTMT values remained well below the 0.85 threshold [61], the construct was retained. All factor loadings exceeded the minimum threshold of 0.50 [62].

Discriminant validity was assessed using the Heterotrait-Monotrait (HTMT) ratio of correlations, with all values well below the conservative threshold of 0.85 (highest = 0.506, see Table B2 in Appendix B), confirming that the constructs are sufficiently distinct from one another [61]. Composite scores were computed as the mean of their respective indicators for subsequent regression analyses.

Table 3. Measurement Model Assessment

Model Fit Indices				
CFI	TLI	RMSEA	SRMR	χ^2/df
0.954	0.943	0.052	0.052	1.700

Construct Reliability and Validity				
Construct	**α**	**CR**	**AVE**	**Loadings**
TAF	0.727	0.773	0.643	0.627–0.918
WHI	0.776	0.786	0.651	0.795–0.815
NFA	0.814	0.819	0.604	0.696–0.821
WPL	0.811	0.818	0.437	0.525–0.742
EXH	0.892	0.894	0.737	0.799–0.922
TWE	0.869	0.871	0.693	0.743–0.931

Thresholds: α ≥ 0.70, CR ≥ 0.70, AVE ≥ 0.50, Loadings ≥ 0.50

TAF: Technology Affordances; WHI: Work-Home Integration; NFA: Need for Affiliation; WPL: Workplace Loneliness; EXH: Exhaustion; TWE: Techno-Work Engagement

4.3 Model Testing: Correlation and Regression Results

Table 4 presents robust correlations among the study variables based on the percentage bend correlation with 2000 bootstrap samples [55]. Workplace loneliness showed significant negative correlations with technology affordances ($r = -0.401$, $p < 0.001$) and need for affiliation ($r = -0.370$, $p < 0.001$), indicating that better technological support and higher affiliation needs were associated with lower loneliness. A weaker but significant negative correlation was observed with technology-mediated interaction intensity ($r = -0.137$, $p < 0.05$). Techno-work engagement was negatively correlated with workplace loneliness ($r = -0.451$, $p < 0.001$) and with exhaustion ($r = -0.176$, $p < 0.01$). Work-home integration showed significant positive associations with exhaustion ($r = 0.200$, $p < 0.01$) and techno-work engagement ($r = 0.143$, $p < 0.05$).

Notably, remote work intensity showed positive associations with technology-mediated interaction intensity ($r = 0.280$, $p < 0.001$) and techno-work engagement ($r = 0.157$, $p < 0.05$). This pattern reflects the inherently digital nature of remote work arrangements, where location flexibility co-occurs with technology-mediated interaction. These two dimensions, supplemented by the digital mindset, provided the empirical basis for our subsequent latent profile analysis (see Section 5).

We tested three regression models to examine the antecedents and outcomes of workplace loneliness, controlling for age and gender in all models (see Table 5). Task interdependence

was excluded due to multicollinearity concerns as discussed in Section 4.2. Model 1 examined predictors of workplace loneliness and explained 24.6% of the variance. Technology affordance ($b = -0.312$, $\beta = -0.353$, $p < 0.001$) and need for affiliation ($b = -0.255$, $\beta = -0.272$, $p < 0.001$) were both significant negative predictors of workplace loneliness. Work-home integration showed no significant relationship with loneliness ($b = 0.043$, $\beta = 0.066$, $p = 0.231$). Model 2 tested workplace loneliness as a predictor of exhaustion, explaining 8.1% of variance. Workplace loneliness showed a significant positive relationship with exhaustion ($b = 0.707$, $\beta = 0.279$, $p < 0.001$). Model 3 examined workplace loneliness as a predictor of techno-work engagement, explaining 20.3% of variance. Workplace loneliness showed a strong negative relationship with techno-work engagement ($b = -0.689$, $\beta = -0.434$, $p < 0.001$). Control variables (age and gender) showed no significant relationships in any of the three models. These patterns are consistent with our theoretical framework and are further examined through latent profile analysis in Section 5.

Table 4. Robust Correlations

Variable	1	2	3	4	5	6	7	8	9
1. TAF	–								
2. WHI	−0.050	–							
3. NFA	0.222 ∗ ∗	−0.002	–						
4. WPL	−0.401 ∗ ∗	0.079	−0.370 ∗ ∗	–					
5. EXH	−0.127∗	0.200 ∗ ∗	−0.123∗	0.233 ∗ ∗	–				
6. TWE	0.248 ∗ ∗	0.143∗	0.197 ∗ ∗	−0.451 ∗ ∗	−0.176 ∗ ∗	–			
7. Age	0.115	0.049	0.016	0.009	0.022	−0.064	–		
8. RMW	0.127∗	0.210 ∗ ∗	0.116	0.037	0.038	0.157∗	0.031	–	
9. TMI	0.234 ∗ ∗	−0.096	0.042	−0.137∗	−0.024	0.169 ∗ ∗	0.084	0.280 ∗ ∗	–

$*p < 0.05$, $**p < 0.01$, $***p < 0.001$ (two-tailed)

Note: Robust correlations based on percentage bend correlation (2000 bootstrap samples)

TAF = Technology Affordances; WHI = Work-Home Integration; NFA = Need for Affiliation;

WPL = Workplace Loneliness; EXH = Exhaustion; TWE = Techno-Work Engagement;

RMW = Remote Work Intensity; TMI = Technology-mediated interaction intensity

5 Latent Profile Analysis: Digital Workplace Configurations

5.1 Profile Derivation

To identify distinct digital workplace configurations, we conducted a latent profile analysis (LPA) using three indicators: remote work intensity (RMW), technology-mediated interaction intensity (TMI), and digital mindset (DM). LPA is a person-centered analytical approach that classifies individuals into latent subgroups based on their patterns across observed variables [63]. The three indicators were selected to capture complementary dimensions of digital work: *where* employees work (RMW), *how much* they rely on technology for interaction (TMI), and *how they orient themselves* toward digital technology (DM). Together, these dimensions characterize qualitatively distinct configurations of digital work rather than a single continuum.

Although digital mindset was not identified as a direct antecedent of workplace loneliness in the systematic review, it serves as a dispositional indicator within the latent profile analysis rather than a substantive predictor in the regression model. The three profile indicators together operationalize and extend Becker et al.'s definition of digital workplaces [64]: remote work intensity captures the location dimension, technology-mediated interaction intensity captures whether tasks are performed alone or collaboratively via digital tools, and digital mindset contributes to this definition by adding a dispositional dimension. Theoretically, the digital mindset determines which social

affordances of workplace technology individuals perceive. Two employees with identical remote work intensity and interaction frequency may experience different levels of social connection depending on their orientation toward digital tools [65], [66]. Moreover, including a dispositional indicator alongside structural ones is moreover a methodological requirement for producing substantively meaningful profile differentiation: without it, profiles risk collapsing into trivial level differences on structurally similar variables [63].

Table 5. Regression Results

	Dependent variable:		
Variable	**WPL (1)**	**EXH (2)**	**TWE (3)**
TAF	-0.312^{***}		
	(0.050)		
NFA	-0.255^{***}		
	(0.054)		
WHI	0.043		
	(0.036)		
WPL		0.707^{***}	-0.689^{***}
		(0.153)	(0.089)
Age	0.004	-0.008	-0.010
	(0.004)	(0.010)	(0.006)
Gender (Female)	0.035	-0.097	-0.058
	(0.068)	(0.185)	(0.108)
Constant	3.627^{***}	2.451^{***}	6.241^{***}
	(0.251)	(0.453)	(0.264)
Observations	258	258	258
R^2	0.246	0.081	0.203
Adjusted R^2	0.231	0.070	0.194
F Statistic	16.438^{***}	7.424^{***}	21.580^{***}

*p<0.05; **p<0.01; ***p<0.001

Standard errors are in parentheses. N = 258 for all models

TAF: Technology Affordances; NFA: Need for Affiliation; WHI: Work-Home Integration; WPL: Workplace Loneliness; EXH: Exhaustion; TWE: Techno-Work Engagement

Models were estimated using the `tidyLPA` package in R [56], assuming equal variances and zero covariances across profiles. We compared 2 to 4 profile solutions using AIC, BIC, and entropy (a standardized index of classification certainty, with values closer to 1.0 indicating sharper profile separation). The 3-profile solution was selected on the basis of superior entropy (0.970), adequate minimum class size ($n_{\text{min}} = 68$), and theoretical interpretability (see Table B3 in Appendix B). A 4-profile solution offered a marginal improvement in AIC (1910.9 vs. 1919.8) but produced a class of only $n = 8$, rendering subsequent validation analyses unreliable.

5.2 Profile Characteristics

Three substantively distinct configurations emerged, as shown in Table 6.

Office-Based Workers ($n = 91$, 35.3%): This profile works almost entirely in person (approximately 0.3 remote days per week) with somewhat lower technology-mediated interaction ($M_{\text{TMI}} = 3.79$) and the lowest digital mindset ($M_{\text{DM}} = 3.84$). Office-Based workers represent a predominantly traditional configuration in which physical co-location remains the primary mode of work.

Hybrid Workers ($n = 99$, 38.4%): This profile is characterized by moderate remote working (approximately 2.4 days per week), frequent technology-mediated interaction ($M_{\text{TMI}} = 4.14$), and

a high digital mindset ($M_{\text{DM}} = 4.00$). Hybrid workers balance physical co-presence with substantial digital work, relying on both face-to-face and technology-mediated channels.

Full-Remote Workers ($n = 68$, 26.4%): This profile is distinguished by nearly full remote working (approximately 4.7 days per week), the highest technology-mediated interaction ($M_{\text{TMI}} = 4.40$, close to "Always"), and a high digital mindset ($M_{\text{DM}} = 4.07$). Full-Remote workers conduct virtually all of their work outside traditional office settings, relying heavily on digital platforms for interaction and exhibiting a strong disposition toward digital technology.

Table 6. Digital Workplace Profiles: Indicator Means and Criterion Validity

	Office-Based ($n = 91$)	**Hybrid** ($n = 99$)	**Full-Remote** ($n = 68$)	**Welch** F	p
LPA Indicators (class-level means)					
Remote Work Intensity (RMW)	0.29	2.44	4.72	—	—
Tech.-mediated Interaction (TMI)	3.79	4.14	4.40	—	—
Digital Mindset (DM)	3.84	4.00	4.07	—	—
Criterion Variables (M)					
Technology Affordances (TAF)	4.08	4.27	4.26	2.180	0.116
Work–Home Integration (WHI)	1.97	2.29	2.45	6.004	0.003**
Need for Affiliation (NFA)	2.04	2.31	2.14	4.368	0.014*
Workplace Loneliness (WPL)	2.01	1.91	2.11	2.033	0.134
Exhaustion (EXH)	3.51	3.50	3.67	0.259	0.772
Techno-Work Engagement (TWE)	4.29	4.62	4.58	3.242	0.042*

*$p < 0.05$; **$p < 0.01$. Welch F tests were used throughout due to unequal group variances (Levene's test: WHI $p = 0.017$). LPA indicators report class-level means from the fitted model; significance testing is not applicable. Pairwise comparisons were conducted via Games-Howell post-hoc tests.

5.3 Profile Validation: Configuration-Invariance of Loneliness

To assess the criterion validity of the profiles and examine the role of workplace configuration, we tested whether the three configurations differed on the main study variables. Because Levene's test indicated unequal variances for work-home integration ($F(2, 255) = 4.115$, $p = .017$), we applied Welch ANOVA throughout. Pairwise comparisons used Games-Howell post-hoc tests.

The three profiles differed significantly on work-home integration ($F(2, 153.56) = 6.004$, $p = 0.003$, $\eta^2 = 0.045$), need for affiliation ($F(2, 156.13) = 4.368$, $p = 0.014$, $\eta^2 = 0.032$), and techno-work engagement ($F(2, 157.66) = 3.242$, $p = 0.042$, $\eta^2 = 0.025$). Post-hoc tests showed that Full-Remote workers reported significantly higher work-home integration than both Hybrid ($p = 0.027$) and Office-Based workers ($p = 0.006$), consistent with greater boundary permeability in fully remote arrangements. Hybrid workers reported significantly higher need for affiliation than Office-Based workers ($p = 0.012$), suggesting that individuals who choose hybrid arrangements may have stronger social needs that motivate them to maintain physical co-presence. Hybrid workers also exhibited higher techno-work engagement than Office-Based workers ($p = 0.042$), reflecting more positive employee well-being experiences when using technology for work purposes.

Figure 2 visualizes the standardized profile means for the four key criterion variables. Solid lines (WHI, NFA, TWE) reflect variables that differ significantly across configurations; the dashed line (WPL) illustrates the flat pattern that constitutes the invariance finding. Full pairwise comparisons from Games-Howell post-hoc tests are provided in Table B4 in the Appendix B. Critically, the three profiles did not differ on workplace loneliness ($F(2, 155.13) = 2.033$, $p = 0.134$), technology affordances ($F(2, 160.60) = 2.180$, $p = 0.116$), or exhaustion ($F(2, 155.23) = 0.259$, $p = 0.772$).

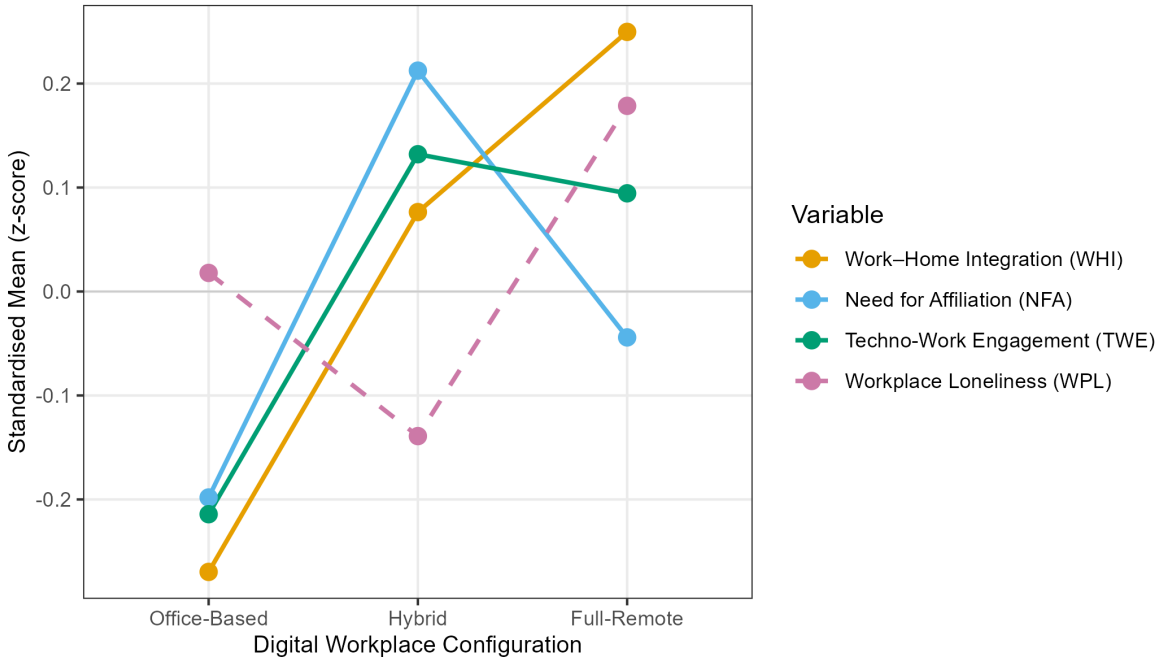

Figure 2. Standardized profile means for key criterion variables across the three digital workplace configurations. The dashed line (Workplace Loneliness) highlights the configuration-invariance finding: WPL remains flat across profiles while WHI, NFA, and TWE vary meaningfully. Full pairwise comparisons are reported in Table B4 in Appendix B.

The non-significant difference in loneliness was the central finding of the LPA. Despite substantive differences in the structural conditions of work (RMW), the intensity of digital interaction (TMI), and the disposition toward digital technology (DM), employees across all three configurations reported comparable levels of workplace loneliness. We term this the *configuration-invariance of loneliness*: the antecedents identified in the regression analysis appear to drive loneliness equally across all configurations rather than being conditional on how employees work. The practical implication is that organizations cannot rely on workplace configuration alone to address loneliness; targeted investment in technology quality and attention to individual affiliation needs are required regardless of work arrangement.

6 Discussion

6.1 A Typology of Digital Work Configurations

The latent profile analysis identified three empirically distinct digital workplace configurations that differ meaningfully in work-home integration, affiliation needs, and techno-work engagement. This typology extends technology-profile taxonomies [64] and personality-based configurations [67] by grounding configurations in the structural and dispositional dimensions of where, how intensively, and with what orientation employees engage with digital work. Critically, the three profiles differ not only in work arrangements (remote days, interaction frequency) but also in experiential characteristics: Full-Remote workers reported the highest work-home integration, reflecting inherently permeable boundaries in fully location-flexible work; Hybrid workers reported the highest need for affiliation, suggesting that the voluntary maintenance of physical co-presence may be driven precisely by stronger social needs. Hybrid workers also reported higher techno-work engagement than Office-Based workers, suggesting that regularly bridging physical and virtual work environments fosters a more active and absorbed orientation toward digital tools.

A further empirical finding concerns what does *not* differ across configurations: workplace loneliness. Despite the structural and experiential contrasts described above, employees in

all three configurations reported statistically equivalent levels of loneliness. We term this the *configuration-invariance of loneliness*. The invariance finding indicates that technology affordances and the need for affiliation are universal antecedents of loneliness: the same psychological mechanisms operate regardless of whether employees work from home, in an office, or in a hybrid of both. This helps generalize the core model beyond the specific sample context and provides a more robust foundation for the theory: loneliness in digital workplaces is primarily a function of technology quality and individual affiliation needs, not of where or how work is organized.

This finding also reframes the contribution of workplace configuration. Configuration does not determine loneliness, but it does shape the broader work experience in ways that matter. The different levels of work-home integration and affiliation needs across profiles suggest that configurations create distinct psychosocial contexts, even when loneliness outcomes converge.

6.2 Business-IT Alignment: From Instrumental to Humanistic Objectives

Our findings speak directly to a fundamental tension in BITA research: the predominant focus on instrumental objectives, such as work efficiency, productivity gains, and profitability at the expense of humanistic objectives concerning employee well-being. IS research has historically privileged the "techno" over the "social," measuring alignment success primarily through operational metrics while neglecting the human experience of technology-mediated work [68]. The strong negative relationship between technology affordances and workplace loneliness positions technology as foundational social infrastructure, not merely an operational tool. These findings map onto the four core BITA dimensions.

At the *strategic alignment* level [69], IT strategy should explicitly include social connection as an objective alongside productivity and efficiency; a reorientation from purely instrumental goals [70]. At the *cultural alignment* level [71], investment decisions should incorporate humanistic assessment criteria: asking not only "Does this technology improve task efficiency?" but also "Does it support association and informal connection?" At the *social alignment* level [17], the dual outcome pathway illustrates the cost of neglecting this dimension: workplace loneliness modestly increases exhaustion but strongly reduces techno-work engagement. Digital transformation success depends on employees' willingness to engage with new systems [72], and lonely employees may technically use digital tools while lacking the vigor and absorption needed to realize their potential.

The three-profile typology informs the *structural alignment* dimension of BITA [17], which concerns how an organization's IT infrastructure, processes, and roles are configured to enable strategic objectives. Organizations are not managing a single "digital workplace" but a portfolio of configurations with different psychosocial profiles. Effective alignment requires understanding which configurations predominate in a given workforce, what experiential conditions each creates (particularly regarding work-home integration and affiliation needs), and how technology investments can support connections across all of them.

6.3 Practical Implications for Organizations

The configuration-invariance finding provides a clear organizing principle for practice: investments in collaborative technology and social infrastructure are universally beneficial and should not be deferred until an organization has characterized its workforce configuration. Several concrete implications follow.

First, technology investments should be evaluated for both instrumental and humanistic objectives [70]. When business and IT leaders plan digital workplace investments, they should explicitly ask: Does this technology enable informal connection, or only formal task collaboration? Does it support association, i.e. the ability to reach out and connect? Concretely, this means ensuring digital environments include low-friction social channels alongside task channels. Dedicated spaces

for non-work conversation (virtual watercoolers), asynchronous social features (reactions, social feeds, status updates), and tools such as virtual coffee break schedulers or ambient presence indicators all support the kind of informal contact that reduces loneliness.

Second, organizations should address individual differences in affiliation needs proactively. The finding that the need for affiliation consistently reduces loneliness across all configurations suggests that employees with low affiliation needs are at elevated risk regardless of their work arrangement. They are less inclined to initiate social contact and thus less likely to benefit from available opportunities without proactive organizational support. Practical measures include integrating a brief affiliation-need assessment into onboarding, using results to guide decisions about team assignment, collaboration load, and social program recommendations. Office-Based workers, who exhibit lower average affiliation needs in our sample, might benefit most from low-friction connection opportunities embedded in existing routines. Full-Remote workers, who cannot rely on incidental physical contact regardless of affiliation orientation, benefit from intentional social rituals such as virtual team lunches, peer buddy systems, or voluntary non-task check-ins.

Third, while the core antecedents of loneliness are configuration-invariant, the experiential context is not. Organizations should consider the different psychosocial profiles of their configurations when designing support programs. Full-Remote workers face the highest risks around boundary management and disconnection. Clear right-to-disconnect policies and explicit guidance on work scheduling might protect this group. Hybrid workers exhibit the highest affiliation needs and techno-work engagement, suggesting that this group combines strong social motivation with a particularly absorbed and dedicated orientation toward technology-mediated work. Office-Based workers, while benefiting from physical co-presence, are not immune to loneliness. Their lower technology-mediated interaction may limit connections with distributed colleagues, and inclusive digital practices ensure they are not left out of informal networks that increasingly operate online.

Fourth, organizations should adopt a transdisciplinary approach to digital workplace design. Enterprise architects, HR professionals, learning and development specialists, and occupational health practitioners should collaborate to conduct psychosocial risk assessments of digital workplace designs, treating social connection as an architectural concern on par with security, scalability, and interoperability. Loneliness should be monitored as a key well-being metric alongside traditional engagement and productivity indicators, with results disaggregated by workplace configuration to enable targeted responses.

6.4 Limitations and Future Directions

Several limitations contextualize the contributions of this research. While we argue that technology affordances and affiliation needs reduce loneliness, which in turn increases exhaustion and reduces engagement, the cross-sectional design prevents causal inference. Longitudinal designs would provide causal evidence and reveal whether loneliness antecedents remain invariant when the same individuals transition between configurations.

A notable gap between the SLR and the quantitative model is the absence of job design as a predictor. The SLR identified job design, particularly task interdependence, as the most frequently cited antecedent theme across the included literature. However, task interdependence proved empirically indistinguishable from workplace loneliness in the CFA (HTMT approaching 1.0), precluding its inclusion as a separate predictor. Future research should develop measurement approaches that can disentangle task interdependence from loneliness or examine job autonomy as an alternative job design variable that is not subject to this measurement confound.

Measurement challenges more broadly, including the slightly below-threshold AVE for workplace loneliness suggest that digital workplace constructs may benefit from scale development work specifically tailored to the diverse work arrangements now prevalent. The SLR's relatively

narrow database scope (ProQuest and Scopus only) represents a further limitation; inclusion of Web of Science may surface additional relevant literature.

The three-profile solution, while well-supported statistically, reflects the configuration diversity of this particular sample. More diverse or sector-specific samples spanning customer-facing roles, manufacturing, or healthcare, may reveal additional configurations or different profile characteristics. Cultural context also warrants attention: norms around work-life boundaries, communication directness, and collectivism-individualism may produce different loneliness dynamics across national contexts. Future research should examine whether the configuration-invariance of loneliness antecedents replicates across cultures and sectors, test interventions designed to reduce loneliness through technology affordances and affiliation-need pathways, and explore whether the same invariance holds for other well-being outcomes beyond exhaustion and techno-work engagement.

7 Conclusion

This study set out to understand the antecedents and outcomes of loneliness in digital workplaces and to examine the role of workplace configuration in that context. A systematic literature review identified four antecedent themes and two outcome themes: psychological and job-related. The quantitative validation confirmed that technology affordances and the need for affiliation are the key drivers of workplace loneliness, which in turn reduces techno-work engagement and increases exhaustion. These relationships hold across three empirically distinct configurations (Hybrid, Office-Based, and Full-Remote workers) identified through latent profile analysis.

The central conclusion is one of universality rather than conditionality: loneliness antecedents do not depend on how or where employees work. Technology affordances and need for affiliation are equally protective regardless of configuration; a finding we term the *configuration-invariance of loneliness*. For organizations, this means that investments in social connection technology and attention to affiliation needs apply equally across all workforce configurations, rather than being limited to specific work arrangements. For researchers, this means that the core psychological mechanisms driving loneliness in digital workplaces are robust and generalizable, providing a foundation for theory-building across the rapidly evolving landscape of digital work.

At the same time, configurations are not irrelevant: they shape the broader work experience in ways that matter for well-being policy. Full-Remote workers face heightened work-home integration and boundary permeability; Hybrid workers exhibit the strongest affiliation needs; and Office-Based workers risk exclusion from the informal digital networks that increasingly define organizational social life. Effective business-IT alignment must account for this diversity by ensuring that a universal social connection infrastructure is implemented thoughtfully across all arrangements. The path forward requires enterprise architects, IT leaders, HR professionals, and occupational health practitioners to treat loneliness not as a personal problem but as a systemic design challenge, and to address it with the same rigor applied to any other dimension of organizational performance.

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Appendix A: Online Resources

The online resources related to the SLR phase can be downloaded here: https://docs.google.com/spreadsheets/d/e/2PACX-1vTLi6URT7_RKbsmq2PKerGEO9nocNhn8VQissemQe5OsiTtUIi2uG4cDPpHc-UU2bqBuSLUa5z52HQa/pub?output=pdf

Appendix B

Table B1. Measurement Constructs and Final Items

Construct	Items	Source
Technology Affordance	The technologies at work allow me to connect with other members of the organization. The technologies at work allow me to keep close contact with my colleagues.	[48] and [6]
Work–Home Role Integration	It is often difficult to tell where my work life ends and my family life begins. In my life, there is a clear boundary between my career and my role as a parent or family member (reverse coded).	[49]
Need for Affiliation	When I am in trouble, I need help and support from others. When something bothers me, I like to go to others for advice. Particularly when I am experiencing difficulties, I like to lean on someone.	[53]
Workplace Loneliness	I have friends available to me at work. I have co-workers available whom I can depend on when I have a problem. I have enough people available at work with whom I can talk about my job. I have people around me at work. I am well integrated with the department or company where I work. I am part of the company network.	[50]
Exhaustion	I feel emotionally drained by my work. I feel burnt out from my work. I feel tired when I get up in the morning and have to face another day on the job.	[51]
Techno-Work Engagement	When I utilize technology in my work, I feel that I am bursting with energy. I am enthusiastic about utilizing technology in my job. I am completely immersed in using technology in my work.	[52]
Technology-mediated interaction intensity	To what extent do you interact with customers and colleagues online for work purposes? (Never - Always)	Own formulation
Remote work intensity	In a given week, how often do you work remotely? (0-5 days)	Own formulation
Digital Mindset	When using technologies, I always think about what else I could use it for besides its intended functions. I always recognize how technologies could replace established solutions. If I developed technologies, I would always provide possibilities for alternative use cases. I always see potential for digital products or services to transform entire markets. I enjoy using technologies that are generic and versatile.	[4]

Diagnostic analyses revealed no multicollinearity concerns (all VIF < 1.11). Shapiro-Wilk tests indicated departures from normality for all three models ($W = 0.976$, 0.978, and 0.964, all $p < 0.001$). To assess robustness, we compared OLS with robust regression (MM-estimation). Results were substantively identical across methods, with the same predictors achieving significance at similar magnitudes, confirming the findings were not unduly influenced by outlying observations or assumption violations. We report OLS estimates for ease of interpretation.

Table B2. Discriminant Validity: HTMT Ratio

Construct	TAF	WHI	NFA	WPL	EXH
WHI	0.003				
NFA	0.280	0.007			
WPL	0.506	0.104	0.394		
EXH	0.174	0.289	0.113	0.316	
TWE	0.330	0.145	0.185	0.485	0.178

Note: All HTMT values < 0.85 threshold
confirming discriminant validity

Table B3. Fit Indices for Latent Profile Analysis Models

Profiles	AIC	BIC	Entropy	Min. Class Size (%)	Max. Prob.
2	2020	2055	0.679	43.0	0.919
3	**1920**	**1970**	**0.970**	**26.4**	**0.999**
4	1911	1975	0.945	3.1	0.999
5	1887	1966	0.910	3.1	0.996

AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.
Lower AIC/BIC indicates better fit. Entropy values closer to 1.0 indicate clearer classification.
Max. Prob. = maximum posterior probability of profile membership.

Table B4. Games-Howell Post-Hoc Pairwise Comparisons for Significant ANOVA Variables

Variable	Group 1	Group 2	Estimate	95% CI	p_{adj}	Sig.
Work–Home Integration (WHI)	Hybrid	Office-Based	-0.321	$[-0.612, -0.030]$	0.027	*
	Hybrid	Full-Remote	0.161	$[-0.209, 0.530]$	0.559	n.s.
	Office-Based	Full-Remote	0.481	$[0.116, 0.847]$	0.006	**
Need for Affiliation (NFA)	Hybrid	Office-Based	-0.263	$[-0.478, -0.049]$	0.012	*
	Hybrid	Full-Remote	-0.164	$[-0.399, 0.071]$	0.225	n.s.
	Office-Based	Full-Remote	0.099	$[-0.155, 0.352]$	0.627	n.s.
Techno-Work Engagement (TWE)	Hybrid	Office-Based	-0.330	$[-0.651, -0.009]$	0.042	*
	Hybrid	Full-Remote	-0.036	$[-0.389, 0.317]$	0.969	n.s.
	Office-Based	Full-Remote	0.294	$[-0.078, 0.667]$	0.150	n.s.

Estimates are mean differences (Group 1 − Group 2). p_{adj} = Games-Howell adjusted p-value.
$^{*}p < 0.05$; $^{**}p < 0.01$. n.s. = not significant.