

Technology-Enabled Remote Work and Employee Engagement: Challenges for Human Resource Management During the COVID-19 Era

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Abstract

The COVID-19 pandemic forced an abrupt and near-universal shift to technology-enabled remote work, converting an arrangement that had been gradual, voluntary, and selective into one that was sudden, mandatory, and total. This paper examines what that shift meant for employee engagement and the challenges it created for human resource management, synthesizing the pre-pandemic telework literature with the first wave of scholarship on remote work during COVID-19. It argues that pandemic remote work differed from the telework that research had previously studied in ways that limit the applicability of earlier findings: it was involuntary, comprehensive, conducted under conditions of crisis and blurred boundaries between work and home, and unaccompanied by the choice and preparation that had characterized telework as an optional benefit. Drawing on the job demands–resources and work-design perspectives, the paper analyzes how pandemic remote work affected the psychological conditions on which engagement depends—reshaping autonomy, social connection, boundary management, and the experience of meaning and support—and it identifies the mechanisms through which engagement was both sustained and eroded. The paper then examines the challenges the shift posed for HRM, including sustaining connection and culture at a distance, supporting well-being under crisis conditions, adapting performance management to unobserved work, and preserving equity across employees whose circumstances differed sharply. It develops an integrative account of remote-work engagement under crisis and draws implications for how HR functions can support engagement when work is mediated by technology and separated from a shared physical setting. Building on this account, the paper advances a proposed digital employee experience analytics framework that combines natural language processing of employee voice, process mining of HR service workflows, and machine-learning prediction—including temporal models—to detect burnout, disengagement, and productivity risk early and to compare experience across office, hybrid, and remote employees. An illustrative evaluation is reported to demonstrate the design and is clearly labeled as hypothetical pending empirical validation. It concludes that technology enabled remote work but did not by itself sustain engagement, which depended on deliberate human and managerial support that the crisis made both harder and more necessary—support that a well-governed analytics capability can inform but not replace.

Keywords: remote work, telework, employee engagement, COVID-19, human resource management, work design, well-being, digital employee experience, people analytics, natural language processing, process mining, burnout prediction

1. Introduction

When the COVID-19 pandemic spread across the world in early 2020, organizations that had debated remote work for years implemented it in a matter of days. Offices closed, and work that could be done from home moved there, mediated by video conferencing, messaging platforms, and cloud applications that carried the burden of coordination that physical proximity had previously carried. The scale and speed of the shift were without precedent: an arrangement that had grown slowly for decades, adopted selectively and usually by choice, became overnight the mandatory condition of work for a large share of the workforce (Kniffin et al., 2021). This paper

concerns what that transformation meant for one of the outcomes human resource management cares about most—employee engagement—and for the HR function tasked with sustaining it.

Employee engagement, understood as the investment of an employee's full self in their work—cognitively, emotionally, and physically (Kahn, 1990)—matters because engaged employees perform better, stay longer, and contribute more discretionary effort than those who are merely present. Sustaining engagement is a central aim of HRM, and it had long been understood to depend in part on conditions that the office environment supplied: social connection with colleagues, the visible support of managers, a sense of belonging to a shared enterprise, and the meaning that comes from work embedded in a community. Pandemic remote work disrupted many of these conditions at once, and it did so under circumstances—health anxiety, economic uncertainty, the collapse of boundaries between work and home—that were themselves inimical to engagement. The question of how engagement fared, and what HR could do to protect it, became urgent.

A tempting move is to answer that question from the existing telework literature, which had studied remote work for decades and had established a reasonably nuanced picture of its effects. But this paper argues that the move must be made with caution, because pandemic remote work differed from the telework that research had studied in several consequential ways (Wang, Liu, Qian, & Parker, 2021). Prior telework was typically voluntary, and the self-selection of those who chose it shaped its outcomes. It was usually partial, a day or two a week rather than the whole of work. It was undertaken by employees who wanted it and organizations that had prepared for it. And it took place against a normal backdrop, not during a global health and economic crisis. Pandemic remote work was involuntary, comprehensive, unprepared, and conducted amid acute stress, and each of these differences bears on engagement. The earlier literature is therefore a starting point that must be adapted rather than a template that can be applied.

This paper pursues three aims. The first is to characterize pandemic remote work and to distinguish it from the telework previously studied, so that the applicable and the inapplicable findings can be told apart. The second is to analyze how technology-enabled remote work under pandemic conditions affected employee engagement, using established theory to identify the mechanisms of both erosion and resilience. The third is to examine the challenges the shift posed for human resource management and to consider how HR functions could respond. The paper's central argument is that technology enabled remote work but did not sustain engagement; engagement depended on human and managerial support that the crisis made simultaneously more difficult and more necessary.

The paper proceeds as follows. Section 2 describes the approach. Section 3 provides conceptual background on engagement and on the relevant work-design and job demands-resources perspectives. Section 4 characterizes pandemic remote work and its differences from prior telework. Section 5 analyzes the effects on engagement, and Section 6 examines the challenges for HRM. Section 7 develops an integrative framework. Section 8 proposes a digital employee experience analytics framework that operationalizes the paper's account and reports an illustrative evaluation. Section 9 draws implications for practice, and Section 10 addresses limitations and future research before Section 11 concludes.

2. Approach

This is a conceptual, narrative review. It synthesizes two bodies of work: the substantial pre-pandemic literature on telework and its effects, and the rapidly produced first wave of scholarship on remote work during COVID-19. The review was assembled around anchor works from each. From the telework tradition it draws on the meta-analytic and review literature on telecommuting and its consequences (Gajendran & Harrison, 2007; Allen, Golden, & Shockley, 2015; Bailey & Kurland, 2002) and on the foundational treatments of engagement (Kahn, 1990; Saks, 2006) and its motivational basis (Bakker & Demerouti, 2007). From the pandemic literature it draws on early analyses of remote work and the workplace under COVID-19 (Wang et al., 2021; Kniffin et al., 2021; Carnevale & Hatak, 2020; Rudolph et al., 2021; Vyas & Butakhieo, 2021; Kramer & Kramer, 2020).

The scope is bound to the period of the pandemic's onset and its immediate aftermath, capturing the shift to remote work and its consequences for engagement as they were understood in 2020 and 2021. Because much of the pandemic scholarship was produced quickly and under unusual conditions, the paper treats its findings as an

important but preliminary account rather than a settled one, and it is attentive throughout to the distinction between what was established and what was conjectured in the urgency of the moment.

3. Conceptual Background

3.1 Employee engagement

Engagement, in the influential formulation, is the harnessing of an organization's members to their work roles such that they employ and express themselves physically, cognitively, and emotionally in their performance (Kahn, 1990). Kahn identified three psychological conditions that foster engagement: meaningfulness, the sense that one's work matters; safety, the sense that one can bring oneself to work without fear of negative consequences; and availability, the sense that one has the physical and psychological resources to engage. Later work situated engagement within a broader nexus of antecedents and consequences, linking it to job and organizational resources on the antecedent side and to performance, commitment, and retention on the outcome side (Saks, 2006). This framing is useful for the present paper because it locates engagement in conditions that remote work under the pandemic directly disturbed—meaningfulness, safety, and the availability of resources were all affected by the shift, and analyzing engagement means analyzing what happened to these conditions.

3.2 Job demands–resources and work design

The job demands–resources model provides a complementary lens. It holds that every job comprises demands, which cost effort and deplete energy, and resources, which help achieve goals, reduce demands, and stimulate growth; engagement arises when resources are ample relative to demands, and burnout when demands overwhelm resources (Bakker & Demerouti, 2007). Pandemic remote work altered both sides of this balance simultaneously, adding demands—technological difficulty, isolation, the intrusion of domestic responsibilities—while changing the availability of resources such as social support and managerial feedback. The work-design perspective, applied specifically to pandemic remote work by Wang and colleagues (2021), extends this analysis by identifying the particular characteristics of remote work—autonomy, social support, monitoring, and workload—that shaped outcomes, and by showing that these characteristics could either support or undermine effectiveness and well-being depending on how remote work was configured and managed. Together these perspectives frame engagement as the product of a balance that the shift to remote work unsettled, and they direct attention to the specific job characteristics through which the effect operated.

3.3 Engagement as a measurable state and the telework evidence that preceded the pandemic

The conception of engagement used here connects to a substantial tradition of measurement and to a body of telework research that, though it predates the pandemic, supplies much of what could be anticipated about remote work's effects on engagement. In the measurement tradition, engagement has been operationalized as a positive, fulfilling, work-related state characterized by vigor, dedication, and absorption, distinct from but related to its negative counterpart, burnout (Schaufeli, Salanova, González-Romá, & Bakker, 2002). Subsequent work established that engagement and burnout are shaped by the same underlying balance of demands and resources, so that conditions which deplete resources or intensify demands move employees away from engagement and toward exhaustion (Maslach & Leiter, 2008), and that engagement, so understood, predicts task and contextual performance, giving the construct its practical significance for organizations (Rich, LePine, & Crawford, 2010). This measurement tradition matters for the present analysis because it specifies what it is that remote work under the pandemic could enhance or erode: not a vague sense of morale but a definable psychological state with known antecedents and consequences.

The telework research conducted before the pandemic applied this logic to remote work specifically and reached conclusions that framed the questions the pandemic would later force. Studies grounded in the job demands–resources model found that telework altered both sides of the demands–resources balance, and that its effect on engagement and exhaustion depended on which side moved more—remote work could enhance engagement by increasing autonomy and reducing interruption, or erode it by increasing isolation and blurring boundaries (Sardeshmukh, Sharma, & Golden, 2012). The isolation mechanism in particular was well documented: professional isolation was found to diminish the performance of employees who teleworked more extensively, identifying precisely the risk that comprehensive pandemic remote work would later realize at scale (Golden,

Veiga, & Dino, 2008). This pre-pandemic evidence establishes that the effects of remote work on engagement were never simple or uniform even under favorable conditions, and that the balance of mechanisms—autonomy and focus on one side, isolation and boundary erosion on the other—was understood in outline before the pandemic made it universal.

4. Pandemic Remote Work and Its Differences from Prior Telework

Understanding the engagement consequences of pandemic remote work requires first understanding how it differed from the telework that research had previously studied, because those differences determine which earlier findings apply. The pre-pandemic literature had reached a broadly reassuring conclusion: telework, in moderation and by choice, tended to have small positive effects on outcomes such as job satisfaction and performance, and its risks—professional isolation, reduced visibility—grew with its intensity (Gajendran & Harrison, 2007; Allen et al., 2015). But this conclusion was drawn from a form of remote work that differed from the pandemic version on at least four dimensions.

The first difference is volition. Prior telework was overwhelmingly voluntary, chosen by employees who wanted it, and the self-selection of those employees shaped the favorable findings; people who thrive working remotely were the ones who elected to do so (Bailey & Kurland, 2002). Pandemic remote work was mandatory, imposed on employees regardless of their preference or suitability, which means the favorable outcomes associated with voluntary telework cannot be assumed to carry over. The second difference is intensity. Prior telework was typically partial, preserving the office as a site of connection and the remote day as a respite; pandemic remote work was total, removing the office entirely and with it the periodic reconnection that had limited telework's isolating effects (Allen et al., 2015). The third difference is preparation. Voluntary telework was generally undertaken by employees and organizations that had prepared for it, with suitable arrangements and established norms; the pandemic shift was abrupt and unprepared, conducted with whatever technology and space employees happened to have. The fourth difference is context. Prior telework occurred against a normal backdrop, whereas pandemic remote work took place during a health and economic crisis that generated fear, grief, and uncertainty, and that collapsed the boundary between work and a home now shared with family, schooling, and the anxieties of the moment (Kniffin et al., 2021; Kramer & Kramer, 2020).

The significance of these differences is thrown into relief by the most rigorous pre-pandemic evidence on working from home. A well-known field experiment, conducted before the pandemic, found that home working could raise performance and satisfaction—but the conditions of that study were the mirror image of the pandemic's: participation was voluntary, the employees had suitable home conditions, the arrangement was chosen and managed, and it took place under normal circumstances (Bloom, Liang, Roberts, & Ying, 2015). The favorable result, in other words, was obtained under precisely the conditions the pandemic removed, which cautions strongly against reading such findings as reassurance about mandatory, universal, unprepared remote work under crisis. The earliest telework scholarship had already catalogued this double-edged character, noting that remote work offered real advantages of flexibility and autonomy alongside real challenges of isolation, visibility, and boundary management, and that which predominated depended on how the arrangement was designed and supported (Kurland & Bailey, 1999). The pandemic did not resolve this tension; it universalized it while stripping away the conditions that had let the advantages predominate.

These differences matter because they run in the direction of engagement risk. Each of the features that made pandemic remote work distinctive—its compulsion, its totality, its unpreparedness, its crisis context—works against the psychological conditions that engagement requires. The reassuring findings of the telework literature were premised on the very features that the pandemic removed, and applying them uncritically to pandemic conditions would understate the challenge. The pandemic did not simply scale up telework; it created a different phenomenon, and engagement had to be sustained under conditions the earlier research had not examined.

5. Effects on Employee Engagement

How did engagement fare under these conditions? The evidence and the theory point to a mixed and uneven picture, in which the same shift eroded engagement through some mechanisms while, for some employees and in some organizations, sustaining or even enhancing it through others. This section analyzes both directions.

5.1 Mechanisms of erosion

Several mechanisms worked against engagement. The most prominent was the loss of social connection. The office had supplied the informal interaction, the sense of belonging, and the relational safety on which engagement partly depends, and its removal isolated employees from colleagues and from the shared enterprise, weakening the connection that sustains discretionary effort (Wang et al., 2021). Video-mediated interaction substituted imperfectly for physical presence, supporting scheduled coordination but not the spontaneous connection that builds relationships, and prolonged reliance on it produced its own fatigue.

A second mechanism was the collapse of boundaries between work and home. Remote work conducted from a home that was also a site of family life, childcare, and schooling blurred the separation between roles, producing interference in both directions and a difficulty in disengaging that eroded the recovery on which sustained engagement depends (Kramer & Kramer, 2020; Vyas & Butakhieo, 2021). The demand of managing this boundary, absent for those who had previously left work at the office, added to the load employees carried.

A third mechanism operated through well-being. The pandemic itself imposed stress—health anxiety, economic insecurity, isolation, grief—that depleted the psychological resources employees had available to invest in work, reducing the availability that engagement requires (Carnevale & Hatak, 2020). Engagement is difficult to sustain when the self that would be engaged is preoccupied with survival and safety, and the crisis conditions surrounding remote work weighed directly on the resources engagement draws upon.

5.2 Mechanisms of resilience and enhancement

Yet engagement did not collapse uniformly, and some mechanisms worked in its favor. Autonomy, a powerful driver of engagement, increased for many remote workers, who gained control over their time, their environment, and the pace and manner of their work (Wang et al., 2021). Where this autonomy was genuine and supported, it could enhance engagement, and some employees reported greater focus and satisfaction working away from the interruptions and commute of office life. The removal of commuting returned time and energy that could be reinvested in work or recovery.

Meaningfulness, too, could be heightened rather than diminished. For employees whose work contributed visibly to responding to the crisis, or who found in a disrupted world a renewed sense of purpose, the meaningfulness condition of engagement was reinforced (Kahn, 1990). And the shared adversity of the pandemic, where organizations handled it well, could strengthen rather than weaken the bond between employee and organization, as employees who felt genuinely supported through a frightening period responded with loyalty and effort. These resilient and enhancing mechanisms explain why the engagement effects of pandemic remote work were not uniformly negative, and why outcomes varied so widely across employees and organizations.

5.3 The role of variation

The mixed picture is, on closer inspection, a picture of variation, and the sources of variation are themselves important findings. Engagement outcomes depended heavily on individual circumstances—whether an employee had adequate space and equipment, whether they shared their home with children needing care, whether their role suited remote performance—so that the same organizational shift produced very different experiences across employees (Wang et al., 2021; Vyas & Butakhieo, 2021). They depended on managerial behavior, with supportive, communicative managers buffering the erosion mechanisms and absent or controlling ones amplifying them. And they depended on organizational response, with organizations that invested in connection, well-being, and support sustaining engagement that others allowed to erode. The variation is the key to the practical question, because it locates the difference between good and poor engagement outcomes not in the technology, which was broadly common, but in the human and managerial support that surrounded it—which is precisely the domain of HRM.

5.4 The technology of remote work and its own effects

Because the arrangement this paper examines is technology-enabled remote work, the properties of the technology itself deserve direct attention, for the tools that made remote work possible also shaped engagement in ways that were neither neutral nor uniformly benign. Video conferencing sustained coordination and preserved a degree of face-to-face contact, but it imposed its own demands. The cognitive effort of sustained video interaction, the

unnatural experience of watching oneself, and the loss of the informal cues that ease in-person communication produced a distinctive fatigue that accumulated over long days of back-to-back calls, depleting the very energy that engagement requires (Wang et al., 2021). Messaging and collaboration platforms kept work flowing but multiplied the channels demanding attention and blurred the line between availability and overload, contributing to an always-on expectation that eroded recovery. The telework literature had already established that virtual work, pursued intensively, could deplete workers and weaken their commitment through exhaustion (Golden, 2006), and pandemic conditions intensified precisely the intensity that this earlier finding identified as the danger.

The technology also mediated engagement unequally, because access to it was unequal. Employees differed in the quality of their home connectivity, the adequacy of their equipment, and their fluency with the tools, so that the same technological enablement produced smoother work for some and persistent friction for others (Vyas & Butakhieo, 2021). This digital divide compounded the other sources of variation the paper has emphasized, and it meant that the technology which enabled remote work in the aggregate could disadvantage particular employees in ways that bore directly on their capacity to engage. A final property of the technology deserves note: its capacity for monitoring. The same systems that mediated remote work generated detailed records of activity, and the temptation to use them for surveillance—to substitute electronic monitoring for the visibility the office had provided—threatened the autonomy and trust that the analysis identified as engagement's most valuable remaining resource (Wang et al., 2021). The technology, in other words, did not merely enable remote work neutrally; it introduced fatigue, mediated access unequally, and offered a surveillance capability whose use could undermine the engagement the arrangement was meant to preserve.

6. Challenges for Human Resource Management

The shift to pandemic remote work posed a set of connected challenges for the HR function, each corresponding to a condition of engagement that the shift disturbed. This section sets them out.

The first challenge was sustaining connection and culture at a distance. With the office removed, the informal interaction and shared experience that had transmitted culture and built belonging had to be recreated deliberately through other means, a task for which few organizations had established practices and which technology facilitated only partially (Kniffin et al., 2021). HR functions had to find ways to preserve the relational fabric of the organization without the setting that had produced it, and to do so for a workforce that was newly dispersed and, for many, newly isolated.

The second challenge was supporting well-being under crisis conditions. Because the depletion of psychological resources threatened engagement directly, and because the pandemic imposed stresses well beyond the workplace, HR functions faced an expanded responsibility for employee well-being that reached into health, isolation, and the management of work-home boundaries (Carnevale & Hatak, 2020). Meeting it required moving beyond conventional wellness offerings to a more active and empathetic support of employees navigating a frightening period, and doing so at a distance.

The third challenge was adapting performance management to unobserved work. Remote work removed the visibility on which conventional performance management had partly relied, and it created a temptation toward intrusive electronic monitoring that risked undermining the autonomy and trust on which engagement depended (Wang et al., 2021). HR functions had to shift the basis of performance management from presence and observation toward outcomes and trust, a change many had contemplated but few had implemented, and to resist the surveillance response that the loss of visibility invited.

The fourth challenge was preserving equity. Because remote work affected employees so differently according to their circumstances, an undifferentiated response risked deepening inequity—between those with suitable home conditions and those without, between those with caregiving burdens and those without, between roles that could be performed remotely and those that could not (Vyas & Butakhieo, 2021; Rudolph et al., 2021). HR functions had to attend to this variation, tailoring support to circumstances rather than assuming a common experience, and to guard against a remote-work regime that advantaged some employees while disadvantaging others.

The fifth challenge was managing the boundary between work and life on behalf of a workforce that had lost the physical separation the commute and the office once provided. Because the collapse of that boundary threatened

the recovery on which sustained engagement depends, HR functions confronted a novel responsibility to protect employees' capacity to disconnect—through norms about availability, expectations around response times, and a culture that did not equate constant reachability with commitment (Kramer & Kramer, 2020). This challenge was made harder by the same technology that enabled remote work, since the tools that kept employees connected also made it difficult to be unreachable, and it was complicated by the pandemic's compression of work and home into a single space shared with family and, for many, with caregiving and schooling. The challenge extended, too, to the careers and security of employees whose working lives had been destabilized, since the crisis unsettled not only where people worked but the stability and trajectory of their employment, adding a layer of uncertainty that weighed on engagement (Spurk & Straub, 2020). Managing the work–life boundary, in these conditions, became part of the HR function's contribution to sustaining engagement rather than a matter left to individual employees to negotiate alone.

7. An Integrative Framework

The analysis can be drawn together into an integrative account of remote-work engagement under crisis. The framework begins from the recognition that pandemic remote work altered the conditions of engagement—meaningfulness, safety, and the availability of resources—simultaneously and in both directions, and that the net effect for any employee depended on the balance of erosion and resilience mechanisms as they played out in that employee's particular situation. Technology enabled the arrangement by making remote work possible, but technology was common across employees and organizations and therefore cannot explain the wide variation in engagement outcomes. What explained the variation was the human and managerial support surrounding the technology: the extent to which managers connected with and supported their people, the extent to which organizations invested in belonging and well-being, and the extent to which the response was tailored to the differing circumstances of employees.

The framework's central proposition is thus that engagement under pandemic remote work was determined not by the technology of remote work but by the quality of human support layered upon it—and that this support was made simultaneously more difficult, because it had to be delivered at a distance and under crisis, and more necessary, because the conditions of engagement were under greater threat than before. This proposition locates the pandemic's lesson for HRM precisely. The function's contribution was decisive not because it controlled the technology but because it shaped the support, and the organizations whose employees remained engaged were those whose HR functions and managers rose to a support task that the crisis had made harder and more important at once.

The framework carries a broader implication for how the relationship between technology and engagement should be understood, one that extends beyond the pandemic to technology-mediated work in general. It is tempting, when work moves onto digital platforms, to treat the resulting outcomes as effects of the technology—to ask whether video conferencing or remote collaboration tools are good or bad for engagement. The pandemic experience suggests this framing misplaces the causal weight. The technology set the conditions within which engagement was contested, expanding some resources such as autonomy while adding some demands such as virtual-communication fatigue, but it did not determine the outcome, which turned on how the technology was used and, above all, on the human support that accompanied it. Two teams using identical tools could diverge sharply in engagement depending on whether their managers connected with and supported them, whether their organizations invested in belonging and well-being, and whether the response was attuned to their differing circumstances. This is why the paper locates the decisive factor in the human and managerial layer rather than in the technological one, and why it treats the pandemic less as a story about remote-work technology than as a story about the human work of sustaining engagement under conditions that technology had transformed. The lesson generalizes: as more work becomes technologically mediated and physically distributed, the engagement of a workforce will depend less on the sophistication of the tools it is given than on the deliberateness of the human support built around them, and the responsibility for that support falls squarely on managers and on the human resource function that develops and enables them.

8. A Proposed Digital Employee Experience Analytics Framework

The integrative account developed above locates the decisive factor in remote-work engagement in the human and managerial support surrounding the technology, and it identifies a practical difficulty: at a distance, the signals of strain that a manager would once have read in a corridor or across a desk are far harder to perceive. This section proposes a digital employee experience analytics framework designed to help HR and managers perceive those signals earlier and act on them, by combining natural language processing, process mining, and predictive machine learning over the data that distributed work generates. As throughout, the framework is a design contribution and a research agenda rather than a validated system, and the results reported below are explicitly illustrative. It is offered in the spirit of the paper's caution rather than against it: analytics can inform the human support that sustains engagement, but it cannot substitute for it, and a framework of this kind is defensible only if it is governed with unusual care for privacy and trust.

8.1 Motivation and positioning

Remote and hybrid work both intensify the risk to engagement and generate, as a byproduct, a rich digital record of how work actually happens. The framework's premise is that this record, used responsibly, can make the invisible visible—surfacing the accumulation of workload, the erosion of boundaries, the fraying of connection, and the early signs of burnout that a dispersed setting hides from managerial view. Its purpose is proactive rather than punitive: to detect problems while they can still be addressed, and to do so in a way that respects the autonomy and trust the paper has repeatedly identified as engagement's most valuable resources. The framework thus operationalizes the paper's argument by giving HR an instrument for the early, differentiated, and evidence-informed support that distributed work requires.

8.2 Data sources and privacy

The framework draws on data an organization already generates in the course of digital work: engagement-survey responses and other forms of employee voice, HR help-desk tickets, training-attendance logs, absence and leave requests, meeting load, task activity, and collaboration-platform activity. Because much of this data is sensitive, the framework is explicit that it must be anonymized or aggregated to protect individual privacy, minimized to what is necessary, and used to support employees rather than to surveil them—conditions that are not optional refinements but preconditions of the framework's legitimacy. The tension is real and the paper does not minimize it: the same data that can reveal burnout can enable monitoring that itself causes burnout, and the framework's value depends entirely on staying on the right side of that line.

8.3 Natural language processing of employee voice

The first analytical component applies natural language processing to the textual traces of employee experience—survey comments, help-desk tickets, and other voice channels. Topic modeling identifies the themes employees raise, using established generative methods for discovering latent topics in text (Blei, Ng, & Jordan, 2003), while sentiment and opinion analysis gauges the emotional tone of feedback and tracks its movement over time (Pang & Lee, 2008). Distributed word representations allow the system to capture meaning beyond surface keywords, relating expressions of stress, workload, or managerial concern even when they are worded differently (Mikolov, Sutskever, Chen, Corrado, & Dean, 2013). Applied over time, these methods can detect rising complaints about workload, souring sentiment toward management, or emerging signals of stress—early indicators of disengagement that would otherwise be lost in the volume of unstructured text.

8.4 Process mining of HR service workflows

The second component applies process mining to the event logs of HR systems, reconstructing how HR processes actually unfold rather than how they are assumed to unfold (van der Aalst, 2016; van der Aalst et al., 2012). By mapping the real paths of service requests, onboarding, or approvals, process mining exposes delays, redundancies, and bottlenecks in the HR services that shape the employee experience, and it reveals the unintended consequences of process changes. Its inclusion reflects a specific insight: the experience of work is shaped not only by the job but by the friction of the systems that surround it, and a slow, opaque, or broken HR process is itself a demand that depletes engagement. Process mining brings this normally invisible layer of experience into view.

8.5 Predictive and temporal modeling

The third component predicts the outcomes that matter—burnout, disengagement, absenteeism, and productivity risk—from the assembled features, using ensemble methods suited to complex tabular data (Breiman, 2001; Chen & Guestrin, 2016). Because employee experience is inherently temporal, unfolding and changing over weeks and months, the framework incorporates sequence models able to learn from that temporal structure: long short-term memory networks, designed to capture dependencies over time (Hochreiter & Schmidhuber, 1997), and attention-based temporal models that relate events across longer spans (Vaswani et al., 2017). Modeling the trajectory rather than the snapshot is essential, because burnout and disengagement are processes with histories, and the value of the framework lies in detecting an adverse trajectory before it reaches its destination. As in the other frameworks proposed in this collection, predictions are made interpretable through Shapley-value attribution, so that HR can see not only that risk is rising for a group but which factors are driving it (Lundberg & Lee, 2017).

8.6 Comparing office, hybrid, and remote experience

A distinctive capability of the framework, and the one that connects it most directly to this paper, is its ability to compare experience across working arrangements. By segmenting its analyses across office, hybrid, and remote employees, the framework can reveal how burnout, engagement, and productivity risk differ by arrangement, and how the drivers of each differ—whether isolation weighs more heavily on the fully remote, whether meeting load falls unevenly, whether the erosion of boundaries is concentrated among particular groups. This addresses directly the paper’s finding that remote work affected employees unequally and that an equitable response must be a differentiated one: the framework supplies the differentiated evidence on which such a response depends. Grounded in the job demands–resources understanding of burnout as the product of demands overwhelming resources (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001), it can help locate where, and for whom, that balance has tipped.

8.7 Evaluation and illustrative results

The framework is evaluated on the predictive quality of its outcome models, the coherence and stability of the topics and sentiment it extracts, the validity of the process-mining findings against known process realities, and—critically—on whether its use is perceived by employees as supportive rather than surveillant, a criterion as important as any technical metric. Table 1 reports an illustrative comparison of experience indicators across working arrangements; the values are hypothetical, constructed to demonstrate the analytical output, and must not be cited as empirical findings.

Table 1. *Illustrative (hypothetical) digital employee experience indicators by working arrangement. Values demonstrate the framework’s output and are not empirical results.*

Indicator	Office	Hybrid	Remote
Predicted burnout risk (share flagged elevated)	14%	12%	19%
Negative-sentiment share in employee voice	21%	18%	26%
Average after-hours collaboration activity (index)	100	108	121
Predicted disengagement risk (share flagged)	11%	10%	17%
HR service-process delay (median, days)	2.1	2.4	3.0

The illustrative pattern mirrors the paper's substantive argument: fully remote employees show the highest modeled burnout and disengagement risk and the greatest after-hours activity and negative sentiment, while hybrid arrangements appear, in this hypothetical rendering, to moderate some of these risks. Whatever the true values prove to be, the point of the framework is to make such differences visible and their drivers legible, so that support can be directed where the evidence shows it is most needed rather than distributed as though every employee's experience were the same.

8.8 Contribution and integration

The framework's contribution is to integrate natural language processing, process mining, and predictive analytics into a single system for monitoring the digital employee experience—an integration that lets HR move from reacting to problems after they surface to identifying them while they can still be addressed. Situated within this paper, it is an instrument for the differentiated, early, and evidence-informed support that sustaining engagement in distributed work requires. But it is only an instrument, and the paper's central claim governs it: the analytics can tell HR where connection is fraying and where strain is accumulating, yet the work of restoring connection and relieving strain remains human, and a framework that forgot this—that substituted measurement for support, or monitoring for trust—would erode the very engagement it was built to protect.

9. Implications for Practice

Several implications for HR practice follow, and while they arose from the pandemic they extend to technology-enabled remote work more generally. The first is to make connections deliberately. Because the informal connection the office supplied does not arise spontaneously in a dispersed workforce, HR functions and managers must create it intentionally—through structured opportunities for interaction, through communication that sustains a sense of shared enterprise, and through attention to the relationships that engagement depends on (Kniffin et al., 2021). What was once a byproduct of physical proximity becomes, in remote work, a responsibility to be discharged.

The second is to treat well-being as central rather than peripheral. Since the depletion of psychological resources threatens engagement directly, supporting well-being—helping employees manage boundaries, reducing isolation, responding with empathy to the stresses employees carry—is not a soft adjunct to engagement work but a core part of it, particularly under crisis conditions (Carnevale & Hatak, 2020). HR functions should equip managers to notice and respond to strain that is harder to see at a distance.

The third is to shift performance management toward trust and outcomes. Rather than responding to the loss of visibility with surveillance, which corrodes the autonomy and trust that sustain engagement, HR functions should base performance management on clear outcomes and on trust in employees to manage their own work, using the shift to remote work as an occasion to complete a transition many organizations had long intended (Wang et al., 2021). Autonomy supported by trust is among the strongest resources engagement has, and the temptation to monitor should be resisted.

The fourth is to tailor support to circumstance. Because remote work affects employees so unequally, an equitable response must be a differentiated one, attentive to the varying conditions—home environment, caregiving responsibilities, role suitability—under which employees work, and designed to prevent remote work from widening the gaps between them (Vyas & Butakhieo, 2021; Rudolph et al., 2021). Equity in remote work is achieved not by treating everyone identically but by responding to real differences in what employees need.

10. Limitations and Future Research

The conclusions here are bound by the nature of the evidence. Much of the pandemic scholarship on which the paper draws was produced quickly, often without the longitudinal or comparative designs that would allow firm causal conclusions, and it captured a situation still unfolding; its findings should be treated as an important early account rather than a settled one (Rudolph et al., 2021). As a narrative synthesis, the paper also reflects interpretive choices in bringing the telework and pandemic literatures together, and the mapping between them is itself a matter of judgment given the differences the paper has emphasized.

The framework proposed in Section 8 carries distinct limitations that its promise should not obscure. It is a design that has not been implemented or validated, and the indicators in Table 1 are illustrative constructions rather than

measurements. Beyond the technical challenges of building it, the framework raises ethical hazards more acute than those of the other analytics designs in this collection, because monitoring the digital traces of work can shade into surveillance that erodes the autonomy and trust the paper identifies as engagement's core resources—so that a poorly governed version of the framework could cause the very harm it aims to detect. Its legitimacy is therefore conditional on privacy protection, data minimization, transparency toward employees, and a genuinely supportive rather than punitive purpose, and these are not incidental caveats but constitutive requirements. The framework's claims—that its signals predict burnout and disengagement, that its process-mining findings identify real sources of friction, and above all that its use supports rather than undermines engagement—are hypotheses for careful, ethically governed empirical work.

The gaps define the research agenda. Longitudinal research is needed to establish how engagement evolved over the course of extended remote work, distinguishing the initial disruption from longer-run adaptation. Comparative research is needed to identify why engagement outcomes varied so widely across employees and organizations, isolating the managerial and organizational practices that made the difference. Research on the specific mechanisms of remote engagement—how connection, autonomy, and support operate when work is mediated by technology and separated from a shared setting—would strengthen the theoretical account the paper has sketched. And as organizations settle into arrangements that retain remote work beyond the crisis that occasioned it, research on sustaining engagement in enduring hybrid and remote models, under normal rather than emergency conditions, will be of lasting value.

11. Conclusion

The COVID-19 pandemic conducted an unplanned experiment in technology-enabled remote work at a scale and speed no organization would have chosen, and it revealed both the capacity of technology to keep work going and the limits of technology to keep people engaged. This paper has argued that pandemic remote work differed from the telework research had studied in ways that heightened the risk to engagement, that it affected the conditions of engagement in both directions through competing mechanisms, and that the wide variation in outcomes is best explained not by the technology, which was common, but by the human and managerial support surrounding it, which was not. The pandemic made that support harder to provide and more necessary to provide at the same time, and it fell to human resource management to meet the challenge. The enduring lesson is that technology enables remote work but does not sustain engagement; engagement in a dispersed and technologically mediated workforce depends on deliberate connection, genuine support for well-being, performance management built on trust, and attention to the unequal circumstances of employees—on the human work of engagement that no technology performs on its own.

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