



Beyond Burnout: Human Capital Fragility and the Limits of Adaptation in Digital Organizations

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Abstrak

This study addresses the growing vulnerability of human capital in contemporary organizations characterized by continuous pressure, rapid technological change, and escalating performance demands. While prior research has examined burnout, resilience, work engagement, and adaptive performance, these perspectives remain fragmented and insufficient to explain the systemic nature of human sustainability challenges. To bridge this gap, the study introduces the concept of human capital fragility, defined as a condition in which adaptive capacity progressively deteriorates under sustained demand exposure and insufficient resources. Drawing on job demands resources theory, conservation of resources theory, technostress literature, and adaptive performance research, the study develops a mechanism based conceptual framework. The model identifies three core processes, namely resource depletion, cognitive overload, and adaptive fatigue, which collectively explain how continuous demand exposure erodes human capacity over time. The framework further conceptualizes fragility as a higher order construct that manifests through burnout, disengagement, and reduced adaptive performance. In addition, the model highlights the moderating role of job resources, psychological capital, and human centered system design. The study contributes by integrating fragmented research streams into a unified framework and by shifting the focus from performance maximization to capacity sustainability in digital work environments.

Keywords

human capital fragility, technostress, resource depletion, cognitive overload, adaptive fatigue, job demands resources

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1. Introduction

The acceleration of digital transformation, artificial intelligence, and globally interconnected systems has fundamentally reshaped the nature of work, redefining how organizations operate, compete, and create value. Contemporary work environments are increasingly characterized by heightened complexity, continuous change, and intensified performance expectations, requiring employees to adapt at an unprecedented pace (Cascio & Montealegre, 2016; Teece *et al.*, 2016). While these transformations promise efficiency and innovation, they simultaneously impose sustained cognitive, emotional, and behavioral demands that challenge the limits of human capacity.

Emerging evidence suggests that the modern workplace is no longer defined by episodic stressors but by continuous exposure to high-intensity demands that accumulate over time. The job demands–resources (JD-R) theory has long established that excessive job demands, such as workload, time pressure, and emotional strain, lead to psychological strain and reduced well-being (Demerouti *et al.*, 2001; Bakker & Demerouti, 2007). However, recent advancements in the JD-R literature indicate that in digitally mediated environments, demands are increasingly persistent and cumulative, creating ongoing pressure rather than discrete episodes of stress (Bakker *et al.*, 2023; Demerouti & Bakker, 2023). This shift toward continuous demand exposure marks a critical transformation in how work-related strain should be conceptualized.

In parallel, the rapid diffusion of digital technologies has introduced a new category of stressors commonly referred to as technostress. Technostress arises when individuals struggle to cope with the demands associated with information and communication technologies, including information overload, constant connectivity, and system complexity (Tarafdar *et al.*, 2019). Unlike traditional stressors, technostress is inherently boundaryless, often extending beyond formal working hours and blurring the distinction between work and personal life (Molino *et al.*, 2020; Camacho & Barrios, 2022). Rather than alleviating workload, digital tools frequently intensify work demands, accelerate task execution, and increase cognitive load, thereby amplifying psychological strain (Singh *et al.*, 2022; Wang *et al.*, 2023).

This intensification of work demands has been accompanied by a global rise in burnout, a condition characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment (Maslach *et al.*, 2001). Burnout has become one of the most extensively studied phenomena in organizational research, with evidence demonstrating its detrimental impact on employee well-being, performance, and organizational outcomes (Schaufeli *et al.*, 2009; Bakker & Demerouti, 2017). However, recent studies suggest that burnout represents only one manifestation of a broader pattern of strain emerging in contemporary work environments, where multiple stressors interact and accumulate over time (Gabriel & Aguinis, 2022; Britt *et al.*, 2021).

At the same time, the concept of resilience has gained prominence as a potential counterbalance to these challenges. Employee resilience is generally defined as the capacity to adapt, recover, and maintain functioning under conditions of stress and change (Bardoel *et al.*, 2014; Näswall *et al.*, 2019). At the organizational level, resilience reflects the ability to absorb shocks, maintain operations, and adapt to dynamic environments (Lengnick-Hall *et al.*, 2011; Hartwig *et al.*, 2020). Despite its conceptual appeal, emerging research indicates that resilience is not a universally stable or sufficient capability. Instead, it is shaped by contextual and structural conditions, and its effectiveness may diminish under sustained and high-intensity pressures (Singh *et al.*, 2024; Liang & Cao, 2021).

Complementing this perspective, the literature on work engagement and thriving at work has emphasized positive human functioning in organizations. Work engagement, defined as a state of vigor, dedication, and absorption, is associated with improved performance, well-

being, and organizational effectiveness (Schaufeli & Bakker, 2004; Bakker & Demerouti, 2008). Similarly, thriving at work reflects the joint experience of vitality and learning, capturing both energy and growth in the workplace (Spreitzer *et al.*, 2005; Kleine *et al.*, 2019). However, these perspectives often assume a relatively stable balance between job demands and resources, an assumption that becomes increasingly problematic in environments characterized by continuous demand escalation and technological acceleration.

Another critical dimension of contemporary work is the growing importance of adaptive performance, defined as the ability to adjust behaviors, learn new skills, and maintain effectiveness in dynamic environments (Charbonnier-Voirin & Roussel, 2012; Park & Park, 2019). While adaptability is widely regarded as a key capability in the digital era, recent research suggests that continuous adaptation itself may become a source of strain. Repeated cycles of adjustment impose cognitive and emotional costs that accumulate over time, potentially leading to diminished motivation, fatigue, and resistance to change (Jundt & Shoss, 2023; Chouhan, 2023). This reveals a critical paradox: the very conditions that demand adaptability may simultaneously undermine the capacity to adapt.

Taken together, these developments point to a deeper structural issue that remains insufficiently theorized in the existing literature. While burnout, technostress, resilience, engagement, and adaptive performance have been extensively studied, these constructs are often examined in isolation, leading to fragmented explanations of human functioning in organizations. Current theories tend to adopt static or episodic perspectives, focusing on discrete states or events rather than capturing the cumulative and systemic nature of modern work pressures (Pandey *et al.*, 2025; Bakker *et al.*, 2023). Moreover, there is a lack of mechanism-based frameworks that explain how continuous exposure to escalating demands and technological pressures progressively erodes human capacity over time.

The conservation of resources (COR) theory provides an important foundation for understanding stress processes by emphasizing that individuals strive to acquire, maintain, and protect valuable resources, and that stress occurs when these resources are threatened or depleted (Hobfoll *et al.*, 2018). The theory further highlights the concept of resource loss spirals, where initial resource depletion increases vulnerability to further losses. However, in contemporary digital environments, these loss dynamics may become structurally embedded, as continuous demands and limited recovery opportunities accelerate resource depletion beyond individuals' capacity to recover (Demerouti & Bakker, 2023; Kumar, 2024).

In response to these limitations, this study introduces the concept of **human capital fragility**, defined as a systemic condition in which the adaptive capacity of individuals and collectives progressively deteriorates under sustained exposure to escalating demands and insufficient resources. Unlike burnout, which represents a psychological state, or resilience, which reflects a coping capability, human capital fragility captures a broader and more dynamic phenomenon that unfolds over time. It reflects the cumulative erosion of cognitive, emotional, and adaptive resources, resulting from the interaction between persistent job demands, technological pressures, and limited recovery mechanisms.

Building on this conceptualization, this study develops a mechanism-based framework that explains how human capital fragility emerges through three interrelated processes: resource depletion, cognitive overload, and adaptive fatigue. These mechanisms provide a deeper understanding of how continuous exposure to high-intensity demands undermines adaptive capacity and leads to a range of behavioral and psychological outcomes, including burnout, disengagement, and reduced adaptive performance. Furthermore, the framework highlights the moderating role of job resources, psychological capital, and human-centered system design in shaping the intensity of fragility.

This study makes three key contributions to the literature. First, it advances theory by introducing human capital fragility as a novel construct that captures the systemic vulnerability of employees in contemporary organizations. Second, it provides a mechanism-

based explanation that integrates previously fragmented research streams, including burnout, technostress, resilience, and adaptive performance. Third, it shifts the analytical focus from performance maximization to capacity sustainability, offering a new perspective on how organizations can sustain human functioning in an era of continuous transformation.

Ultimately, as organizations continue to invest in digital technologies and pursue higher levels of performance, the critical challenge is no longer how to increase efficiency alone, but how to sustain human capacity under conditions of continuous pressure. Understanding human capital fragility is therefore essential for developing more sustainable, human-centered approaches to organizational design and performance management in the digital age.

2. Literature Review and Research Gap

2.1 Burnout and the Intensification of Job Demands

Burnout has long been recognized as a central construct in understanding employee strain in organizational settings. Defined as a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment, burnout emerges as a prolonged response to chronic job stressors (Maslach *et al.*, 2001). Over the past decades, extensive empirical research has confirmed the strong relationship between excessive job demands—such as workload, time pressure, and emotional labor—and burnout outcomes (Demerouti *et al.*, 2001; Bakker & Demerouti, 2007; Alarcon, 2011).

The job demands–resources (JD-R) model has been particularly influential in explaining this relationship, positing that job demands lead to strain while job resources buffer negative effects and foster engagement (Schaufeli & Bakker, 2004; Bakker & Demerouti, 2008). However, recent developments in the JD-R literature suggest that the nature of job demands has evolved significantly in contemporary work environments. Rather than being episodic or situational, job demands are increasingly persistent, multidimensional, and cumulative (Bakker *et al.*, 2023; Demerouti & Bakker, 2023).

This transformation is further reinforced by organizational expectations of continuous performance and responsiveness, which extend work demands beyond traditional boundaries (Cascio & Montealegre, 2016). As a result, burnout can no longer be fully understood as a response to isolated stressors but must be viewed as an outcome of sustained exposure to escalating demands embedded within modern work systems (Schaufeli *et al.*, 2009; Bakker & Sanz-Vergel, 2014).

Moreover, recent research highlights that burnout is not only a psychological condition but also a process shaped by dynamic interactions between demands and resources over time (Sonnentag *et al.*, 2012; Britt *et al.*, 2021). This temporal dimension suggests that burnout represents a cumulative phenomenon, reflecting the progressive erosion of employee capacity rather than a static state.

2.2 Technostress and the Emergence of Digital Work Pressures

The rapid diffusion of digital technologies has introduced a new layer of complexity into organizational life, giving rise to technostress as a critical area of inquiry. Technostress refers to the stress experienced by individuals due to their inability to cope effectively with information and communication technologies (Tarafdar *et al.*, 2019). Core dimensions of technostress include information overload, constant connectivity, system complexity, and technological uncertainty (Tarafdar *et al.*, 2010; Tarafdar *et al.*, 2019).

Unlike traditional stressors, technostress is inherently pervasive and boundaryless, often extending beyond formal working hours and eroding the separation between work and personal life (Molino *et al.*, 2020; Camacho & Barrios, 2022). This constant connectivity

creates a state of persistent cognitive engagement, where employees remain mentally tied to work even during non-working hours.

Empirical studies consistently demonstrate that technostress is associated with negative outcomes such as emotional exhaustion, reduced job satisfaction, and impaired performance (Wang *et al.*, 2023; Consiglio *et al.*, 2023). Furthermore, meta-analytic evidence indicates that technostress interacts with traditional job demands to amplify psychological strain, suggesting a compounding rather than additive effect (Kotek & Vranjes, 2025; Kumar, 2024).

Importantly, recent research emphasizes that technostress is no longer a peripheral phenomenon but has become structurally embedded within digital work environments (Mansuroğlu & Smith, 2026). Digital systems continuously generate demands through notifications, data flows, and communication expectations, thereby creating a persistent pressure system that intensifies cognitive and emotional strain (Singh *et al.*, 2022; Holland *et al.*, 2022).

This structural embedding of technostress challenges traditional stress models, which assume clear boundaries between stress exposure and recovery. In digital contexts, such boundaries are increasingly blurred, making recovery more difficult and contributing to chronic strain accumulation (Sommovigo *et al.*, 2023).

2.3 Resilience as Adaptive Capacity in Dynamic Environments

In response to escalating work demands, resilience has emerged as a key construct in organizational research. Employee resilience is commonly defined as the capacity to adapt, recover, and maintain functioning under conditions of stress and change (Bardeel *et al.*, 2014; Näswall *et al.*, 2019). At the organizational level, resilience reflects the ability to absorb shocks, sustain operations, and adapt to dynamic environments (Lengnick-Hall *et al.*, 2011; Hartwig *et al.*, 2020).

Research has consistently linked resilience to positive outcomes, including enhanced well-being, sustained performance, and improved coping with adversity (Paterson *et al.*, 2014; Liang & Cao, 2021). Moreover, resilience has been conceptualized as a dynamic capability that enables organizations to navigate uncertainty and maintain competitiveness (Teece *et al.*, 2016).

However, despite its widespread adoption, resilience research presents several limitations. First, resilience is often treated as an individual-level trait or capability, overlooking the structural and systemic conditions that shape adaptive capacity (Cooke *et al.*, 2019). Second, resilience is frequently examined as a reactive construct, focusing on recovery after disruption rather than explaining the gradual erosion of capacity under sustained pressure.

Recent multilevel research further suggests that resilience emerges from interactions across individual, team, and organizational levels, rather than residing solely within individuals (Singh *et al.*, 2024). This highlights the importance of examining resilience within broader systemic contexts.

Additionally, there is growing recognition that resilience may have limits, particularly in environments characterized by continuous and high-intensity demands. Under such conditions, resilience may become insufficient or unsustainable, leading to diminishing returns in coping capacity (Goh *et al.*, 2022). This raises critical questions about the extent to which resilience alone can address the challenges of modern work environments.

2.4 Work Engagement and Thriving as Positive Functioning

Complementing the focus on stress and resilience, the literature on work engagement and thriving at work provides insights into positive human functioning. Work engagement, characterized by vigor, dedication, and absorption, has been associated with higher

performance, well-being, and organizational outcomes (Schaufeli & Bakker, 2004; Bakker *et al.*, 2008).

Similarly, thriving at work reflects a psychological state combining vitality and learning, emphasizing both energy and growth (Spreitzer *et al.*, 2005; Porath *et al.*, 2012). Meta-analytic evidence confirms that thriving is positively associated with performance, innovation, and well-being (Kleine *et al.*, 2019).

The JD-R model provides a theoretical foundation for understanding these positive states by highlighting the role of job resources in fostering engagement and buffering the effects of demands (Bakker & Demerouti, 2007; Xanthopoulou *et al.*, 2009). However, this framework implicitly assumes that resources can effectively offset demands.

In highly dynamic and digitally mediated environments, this assumption becomes increasingly problematic. The escalation of demands may outpace the availability and effectiveness of resources, thereby weakening the buffering mechanisms proposed by existing models (Bakker *et al.*, 2023).

Furthermore, recent research suggests that positive states such as engagement and thriving are not stable but fluctuate over time, influenced by daily and contextual factors (Niessen *et al.*, 2012; Chiotis & Michaelides, 2022). This temporal variability underscores the importance of examining human functioning as a dynamic process rather than a static condition.

2.5 Adaptive Performance and the Cost of Continuous Adaptation

Adaptive performance has become increasingly important as organizations operate in rapidly changing environments. It refers to the ability to adjust behaviors, acquire new skills, and maintain effectiveness in response to changing conditions (Charbonnier-Voirin & Roussel, 2012; Park & Park, 2019).

While adaptability is widely regarded as a critical capability, emerging research highlights its associated costs. Continuous adaptation requires sustained cognitive effort, emotional regulation, and behavioral flexibility, which may lead to fatigue over time (Sonnentag *et al.*, 2012; Jundt & Shoss, 2023).

This phenomenon gives rise to what can be conceptualized as adaptive fatigue, where repeated adaptation efforts diminish individuals' capacity to respond effectively to ongoing change. Empirical studies indicate that excessive work intensification and continuous change demands can negatively impact psychological health and engagement (Chouhan, 2023).

Moreover, adaptive performance is influenced by resource availability and cognitive capacity. When individuals experience cognitive overload or resource depletion, their ability to adapt is significantly impaired (Park *et al.*, 2020). This highlights a critical paradox: while organizations increasingly demand adaptability, the conditions that necessitate adaptation may simultaneously undermine the capacity to adapt.

2.6 Toward an Integrative Perspective: Fragmentation and Limitations

Despite the richness of existing literature, research on burnout, technostress, resilience, engagement, and adaptive performance remains largely fragmented. Each stream provides valuable insights but focuses on specific aspects of human functioning, resulting in partial and disconnected explanations (Pandey *et al.*, 2025).

A key limitation lies in the tendency to examine these constructs in isolation, without considering their interdependencies and cumulative effects. For instance, burnout research focuses on strain outcomes, resilience research emphasizes coping, and engagement research highlights positive functioning. However, these perspectives rarely converge into a unified framework.

Additionally, most existing models adopt static or episodic perspectives, focusing on discrete events or states rather than capturing the continuous and cumulative nature of modern work pressures (Bakker *et al.*, 2023). This limits their ability to explain long-term patterns of capacity erosion and performance decline.

Furthermore, there is insufficient attention to underlying mechanisms. While theories such as JD-R and conservation of resources (COR) provide important foundations, they do not fully explain how escalating demands, technological pressures, and limited recovery opportunities interact to shape human functioning over time (Hobfoll *et al.*, 2018).

Table 1 is designed to eliminate conceptual ambiguity by clearly distinguishing the core constructs used in the framework. This is particularly important for a theory-building paper to prevent reviewer concerns about construct overlap, re-labeling, or unclear levels of analysis.

Table 1. Conceptual Definitions and Construct Distinctions

Construct	Definition	Level of Analysis	Distinction from Related Constructs
Escalating Job Demands	Persistent and cumulative work requirements that require sustained cognitive, emotional, or physical effort	Job / Organizational	Differs from episodic stressors by being continuous and compounding over time
Technological Pressure	Structurally embedded digital demands such as constant connectivity, information overload, and system complexity	Technological / Organizational	Unlike traditional demands, it is boundaryless and technology-driven
Resource Depletion	Progressive exhaustion of cognitive, emotional, and physical resources due to sustained demand exposure	Individual (process)	Represents underlying mechanism rather than outcome (e.g., burnout)
Cognitive Overload	Condition in which information-processing demands exceed individual cognitive capacity	Individual (process)	Focuses on processing limits rather than emotional exhaustion
Adaptive Fatigue	Decline in motivation and capacity to adapt due to repeated and sustained adaptation demands	Individual (process)	Distinct from burnout; specifically tied to adaptation demands
Human Capital Fragility	Systemic condition in which adaptive capacity progressively deteriorates due to interacting mechanisms under sustained pressure	Multilevel / Systemic	Higher-order construct integrating multiple mechanisms, not a single psychological state
Burnout	Syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment	Individual (outcome)	Outcome manifestation, not underlying process
Disengagement	Withdrawal of cognitive and emotional investment in work	Individual (behavioral outcome)	Behavioral response distinct from psychological exhaustion
Reduced Adaptive Performance	Decline in the ability to adjust behavior and respond effectively to change	Individual (performance outcome)	Performance-based outcome, not psychological condition

Construct	Definition	Level of Analysis	Distinction from Related Constructs
Job Resources	Work-related assets (e.g., autonomy, support) that help individuals cope with demands	Job / Organizational	Function as buffers rather than direct determinants
Psychological Capital	Positive psychological resources including self-efficacy, optimism, hope, and resilience	Individual	Internal capacity that moderates strain processes
Human-Centered System Design	Design of technological systems that prioritize usability, reduce complexity, and support human functioning	Organizational / Technological	Structural moderator shaping technological pressure effects

Source: Developed by the authors

Table 1 strengthens the conceptual clarity of the manuscript by explicitly distinguishing between antecedents, mechanisms, outcomes, moderators, and the higher-order construct. By clarifying definitions and levels of analysis, Table 1 reduces the risk of construct overlap and reinforces the paper’s mechanism-based theoretical contribution.

2.7 Research Gap: Toward Human Capital Fragility

In light of these limitations, there is a need for a more integrative and mechanism-based conceptualization that captures the systemic vulnerability of human capital in contemporary organizations. Such a framework should address three critical gaps.

First, it should integrate multiple research streams into a coherent perspective that explains how burnout, technostress, resilience, engagement, and adaptation interact. Second, it should adopt a dynamic and cumulative perspective that captures how continuous exposure to demands affects human capacity over time. Third, it should identify the mechanisms through which these processes unfold.

To address these gaps, this study introduces the concept of human capital fragility, which conceptualizes the gradual erosion of adaptive capacity as a function of sustained demand escalation, resource imbalance, and limited recovery mechanisms. By integrating insights from JD-R theory, COR theory, technostress literature, and adaptive performance research, the study develops a mechanism-based framework that provides a more comprehensive understanding of human vulnerability in modern work environments.

3. Conceptual Framework Development

3.1 Reframing Human Capital: From Capability to Fragility

The dominant perspective in organizational research conceptualizes human capital as a source of competitive advantage, emphasizing skills, competencies, and performance outcomes. This view is deeply rooted in strategic management and human resource literature, where capability development is assumed to lead to sustained organizational success (Teece *et al.*, 2016). However, such an assumption implicitly treats human capacity as stable, expandable, and resilient under increasing demands.

This study challenges that assumption by arguing that in contemporary digital work environments, human capital should be understood not only as a productive resource but also as a fragile system of adaptive capacity. Unlike traditional models that emphasize accumulation and enhancement, this perspective recognizes that human capacity is inherently limited, depletable, and susceptible to erosion under sustained pressure.

Drawing on conservation of resources (COR) theory, individuals strive to acquire, maintain, and protect valuable resources, including cognitive, emotional, and physical capacities

(Hobfoll *et al.*, 2018). When these resources are continuously threatened or depleted without sufficient recovery, individuals become increasingly vulnerable to stress and dysfunction. Extending this logic, the present study conceptualizes human capital fragility as a systemic condition in which the adaptive capacity of individuals and collectives progressively deteriorates under sustained exposure to escalating demands and insufficient resources.

This conceptualization moves beyond the dichotomy of burnout and resilience by positioning fragility as a dynamic and cumulative phenomenon. Rather than representing a temporary state or a lack of coping ability, fragility reflects the gradual weakening of the system itself—where the capacity to sustain performance, well-being, and adaptation becomes increasingly compromised over time.

3.2 Escalating Demands and Technological Pressure as Structural Antecedents

The emergence of human capital fragility is rooted in the structural transformation of work. Contemporary organizations are characterized by escalating job demands and pervasive technological pressures, which together create a continuous and compounding strain environment.

Within the job demands–resources (JD-R) framework, job demands are defined as aspects of work that require sustained physical, cognitive, or emotional effort (Demerouti *et al.*, 2001; Bakker & Demerouti, 2007). While traditionally conceptualized as discrete stressors, recent research indicates that job demands have become increasingly persistent and intensified, driven by organizational expectations of continuous performance and responsiveness (Bakker *et al.*, 2023; Demerouti & Bakker, 2023).

Parallel to this development, technological pressure has emerged as a defining feature of modern work systems. Technostress literature highlights how digital technologies introduce new forms of demands, including constant connectivity, information overload, and system complexity (Tarafdar *et al.*, 2019). These demands are not merely additional but are structurally embedded within work processes, continuously generating cognitive and behavioral pressures (Kumar, 2024; Mansuroğlu & Smith, 2026).

Importantly, job demands and technological pressures do not operate independently. Instead, they interact to create a compound demand environment, where traditional workload pressures are amplified by digital intensity. This interaction leads to a shift from episodic stress exposure to a state of continuous demand saturation, where individuals are persistently engaged in high-intensity work without sufficient opportunities for recovery.

In such environments, the balance between demands and resources—central to the JD-R model—becomes structurally skewed. Rather than a dynamic equilibrium, organizations increasingly operate under conditions of **chronic imbalance**, where demands systematically outpace available resources. This imbalance forms the foundational condition from which human capital fragility emerges.

3.3 Core Mechanisms: From Demand Exposure to Capacity Erosion

To explain how structural pressures translate into fragility, this study proposes three interrelated mechanisms: resource depletion, cognitive overload, and adaptive fatigue. These mechanisms represent the processes through which continuous exposure to escalating demands erodes human capacity over time.

Resource depletion constitutes the foundational mechanism. According to COR theory, stress occurs when individuals experience actual or threatened loss of resources (Hobfoll *et al.*, 2018). In high-demand environments, continuous task execution, emotional labor, and digital interruptions gradually exhaust cognitive and emotional resources. Importantly, this process is self-reinforcing: as resources are depleted, individuals' capacity to cope with

subsequent demands diminishes, increasing vulnerability to further depletion (Demerouti & Bakker, 2023). This creates a loss spiral, where initial strain accelerates subsequent deterioration.

Cognitive overload represents a second mechanism, reflecting the limits of human information-processing capacity. Digital work environments are characterized by rapid information flows, multitasking, and constant decision-making, all of which increase cognitive demands (Cascio & Montealegre, 2016). When these demands exceed processing capacity, individuals experience overload, leading to impaired attention, reduced decision quality, and diminished learning ability (Wang *et al.*, 2023; Kumar, 2024). Beyond immediate performance effects, cognitive overload undermines the ability to acquire new knowledge and adapt to changing conditions, thereby directly constraining adaptive capacity.

The third mechanism, adaptive fatigue, captures the paradoxical cost of continuous adaptation. While adaptability is widely regarded as a desirable capability, sustained and repeated adaptation efforts require significant cognitive and emotional investment (Jundt & Shoss, 2023). Over time, this leads to fatigue, characterized by reduced motivation to engage with change, increased resistance, and diminished responsiveness. Adaptive fatigue highlights a critical insight: adaptation is not costless, and excessive demands for adaptability can ultimately undermine the very capacity they seek to enhance (Chouhan, 2023).

These three mechanisms are not independent but interact dynamically. Resource depletion reduces cognitive capacity, increasing susceptibility to overload. Cognitive overload, in turn, accelerates fatigue by making adaptation more effortful. Adaptive fatigue further limits the ability to mobilize resources, reinforcing depletion. Together, these processes form a self-reinforcing cycle of capacity erosion, transforming demand exposure into systemic fragility.

Figure 1 isolates the internal mechanism through which sustained demands become cumulative capacity erosion. Its purpose is to show that resource depletion, cognitive overload, and adaptive fatigue do not operate as separate mediators but as mutually reinforcing processes.

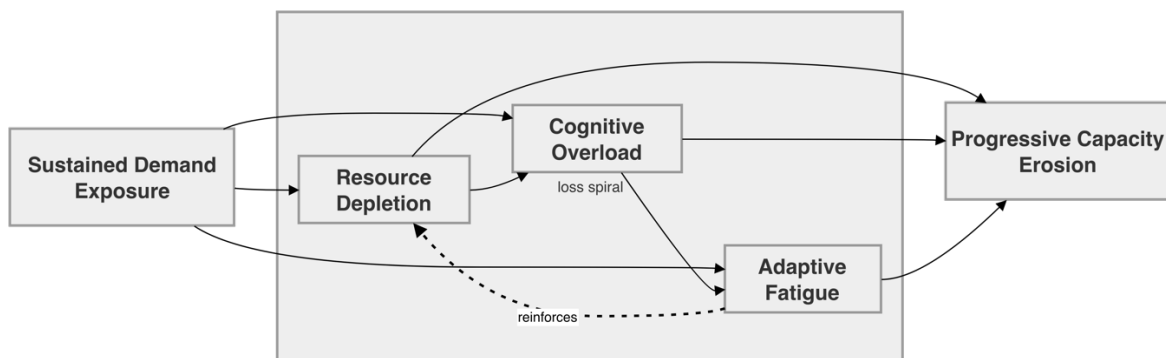


Figure 1. Dynamic Mechanisms of Capacity Erosion
Source: Author's conceptualization

As illustrated in Figure 1, sustained demand exposure activates a reinforcing mechanism system in which resource depletion increases susceptibility to cognitive overload, cognitive overload intensifies adaptive fatigue, and adaptive fatigue feeds back into further depletion. Figure 1 supports the article's argument by clarifying that human capital fragility emerges from cumulative mechanism interaction rather than from isolated strain pathways.

3.4 From Mechanisms to Outcomes: Manifestations of Fragility

The interaction of resource depletion, cognitive overload, and adaptive fatigue gives rise to a range of behavioral and psychological outcomes that are widely documented in the literature. These outcomes should be understood not as isolated phenomena but as manifestations of underlying fragility.

Burnout represents the most direct outcome of sustained resource depletion. As emotional and cognitive resources are exhausted, individuals experience chronic fatigue, detachment, and reduced effectiveness (Maslach *et al.*, 2001; Schaufeli *et al.*, 2009). In parallel, work engagement declines as individuals struggle to maintain energy and involvement in their tasks (Bakker & Demerouti, 2008).

Cognitive overload and adaptive fatigue further contribute to reduced adaptive performance, limiting individuals' ability to respond effectively to changing demands (Charbonnier-Voirin & Roussel, 2012; Park & Park, 2019). Over time, these conditions also lead to withdrawal behaviors, such as disengagement and reduced effort, as individuals seek to conserve remaining resources (Morrison, 2023).

Importantly, these outcomes are interconnected. Burnout reduces engagement, disengagement limits performance, and reduced performance increases pressure, reinforcing the cycle of strain. This interdependence underscores the need to view these outcomes as part of a broader system rather than as independent constructs.

3.5 Human Capital Fragility as a Higher-Order Construct

Building on the mechanisms and outcomes described above, this study conceptualizes human capital fragility as a higher-order construct emerging from the interaction of resource depletion, cognitive overload, and adaptive fatigue.

This conceptualization advances existing theory in several ways. First, it integrates multiple dimensions of strain into a unified construct, capturing the systemic nature of human vulnerability. Second, it introduces a temporal perspective, recognizing that fragility develops progressively through cumulative processes rather than appearing suddenly. Third, it shifts the focus from outcomes (e.g., burnout) to underlying conditions, providing a more fundamental explanation of human functioning in organizations.

By conceptualizing fragility as a higher-order construct, the framework aligns with recent calls for multilevel and integrative approaches to understanding work-related phenomena (Goh *et al.*, 2022). It also enables empirical operationalization through second-order measurement models, facilitating future quantitative validation.

3.6 Moderating Factors: Buffering and Amplifying Dynamics

While fragility emerges from structural pressures and underlying mechanisms, its intensity is shaped by several moderating factors that influence how individuals respond to demands.

Job resources, including autonomy, feedback, and social support, play a critical buffering role by enhancing individuals' capacity to cope with demands (Bakker & Demerouti, 2007; Cooke *et al.*, 2019). In high-resource environments, the negative effects of demands on resource depletion may be mitigated, slowing the progression toward fragility.

Psychological capital, encompassing self-efficacy, optimism, hope, and resilience, represents an internal resource that supports adaptive functioning (Luthans & Youssef-Morgan, 2017). Individuals with higher psychological capital are better equipped to manage cognitive overload and sustain performance under pressure. However, as previously noted, these resources may have limits under sustained stress.

Human-centered system design constitutes a structural moderator that shapes the nature of technological pressure. Systems that prioritize usability, reduce complexity, and support recovery can alleviate cognitive demands and reduce technostress (Tarafdar *et al.*, 2019; Holland *et al.*, 2022). Conversely, poorly designed systems may amplify overload and accelerate fragility.

These moderating factors highlight that fragility is not solely determined by individual characteristics but is deeply influenced by organizational and technological contexts.

3.7 Integrative Model: A Systemic Perspective on Human Capital Fragility

Synthesizing the above arguments, this study proposes an integrative conceptual model in which escalating job demands and technological pressures act as structural antecedents that trigger resource depletion, cognitive overload, and adaptive fatigue as core mechanisms. These mechanisms interact dynamically, leading to the emergence of human capital fragility as a higher-order condition.

Fragility, in turn, manifests through behavioral and psychological outcomes, including burnout, disengagement, and reduced adaptive performance. The strength of these relationships is influenced by moderating factors such as job resources, psychological capital, and system design.

This model represents a shift from traditional equilibrium-based frameworks toward a dynamic imbalance perspective, where sustained misalignment between demands and capacity leads to progressive system deterioration. By integrating multiple theoretical streams into a unified mechanism-based framework, the model provides a comprehensive explanation of how human vulnerability develops in contemporary work environments.

In doing so, it offers a foundation for future empirical research and practical interventions aimed at sustaining human capacity in the face of continuous organizational and technological change.

3.8 Conceptual Model Specification

Building upon the preceding theoretical development, this study proposes an integrative conceptual model that captures the systemic processes underlying human capital fragility. The model positions escalating job demands and technological pressures as structural antecedents that operate through three core mechanisms—resource depletion, cognitive overload, and adaptive fatigue—to influence key behavioral and psychological outcomes.

The logic of the model is inherently processual and dynamic. Rather than assuming a static balance between demands and resources, the framework conceptualizes organizational life as a system characterized by continuous demand exposure and cumulative capacity erosion. In this context, human capital fragility emerges not as an isolated construct but as a higher-order condition resulting from the interaction of underlying mechanisms.

Furthermore, the model incorporates moderating factors that shape the strength and direction of these relationships. Job resources, psychological capital, and human-centered system design function as buffering or amplifying forces, influencing how individuals experience and respond to sustained demands. This reflects a shift from purely individual-level explanations toward a multilevel and system-oriented perspective (Hobfoll *et al.*, 2018; Goh *et al.*, 2022).

Importantly, the model adopts a mechanism-based structure, where mediating processes play a central role in linking antecedents to outcomes. This approach aligns with recent calls in organizational research to move beyond direct-effect models and toward deeper explanations of how and why relationships occur (Bakker *et al.*, 2023; Demerouti & Bakker, 2023).

By integrating these elements, the proposed model provides a comprehensive representation of how sustained exposure to escalating demands and technological pressures leads to progressive erosion of human capacity, ultimately resulting in burnout, disengagement, and reduced adaptive performance.

This figure establishes the full mechanism-based architecture linking structural pressures to systemic human outcomes. It clarifies how escalating demands and technological pressures translate into human capital fragility through interdependent psychological processes, while also incorporating boundary conditions.

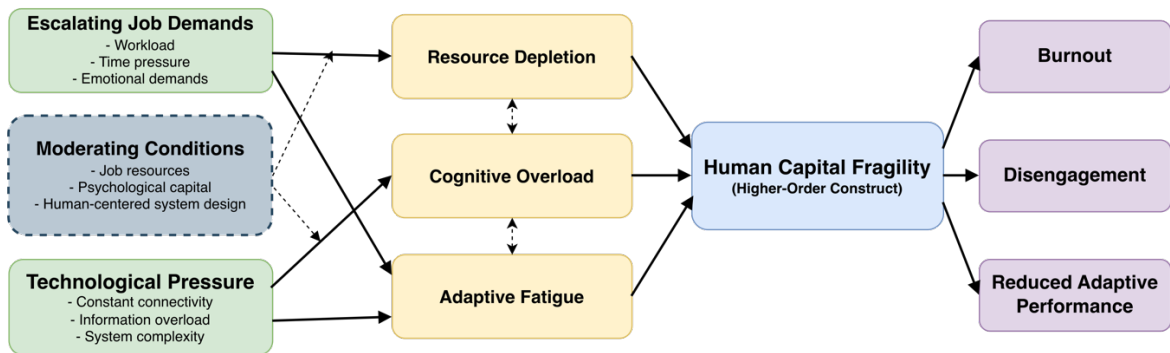


Figure 2. Conceptual Model of Human Capital Fragility
Source: Developed by the author

The framework articulated in Figure 2 clarifies how escalating job demands and technological pressures operate as structural antecedents that activate three interrelated mechanisms—resource depletion, cognitive overload, and adaptive fatigue—which jointly give rise to human capital fragility as a higher-order condition. This fragility then manifests in burnout, disengagement, and reduced adaptive performance. By structuring the model around mechanisms rather than direct effects, Figure 2 strengthens the article’s central argument that human vulnerability emerges from cumulative and interacting processes rather than isolated stressors.

3.9 Conceptual Propositions

To formalize the theoretical relationships described above, this study advances a set of propositions grounded in established theories, including the job demands–resources (JD-R) model, conservation of resources (COR) theory, technostress literature, and adaptive performance research.

Table 2 organizes the propositions into a compact analytical structure so that the theoretical logic can be reviewed without rereading the full proposition section. It clarifies which relationships are antecedent-based, mechanism-based, mediating, moderating, or higher-order.

Table 2. Summary of Conceptual Propositions

	Proposition & Relationship	Mechanism Type	Theoretical Basis
P1	Escalating job demands → Resource depletion	Antecedent– mechanism	JD-R; COR
P2	Technological pressure → Cognitive overload	Antecedent– mechanism	Technostress
P3	Job demands × Technological pressure → Adaptive fatigue	Compounding demand effect	JD-R; Technostress; Adaptive performance
P4	Resource depletion → Burnout	Mechanism–outcome	COR; Burnout literature
P5	Cognitive overload → Reduced adaptive performance	Mechanism–outcome	Cognitive capacity; Adaptive performance
P6	Adaptive fatigue → Work disengagement	Mechanism–outcome	Engagement; Adaptive performance
P7	Resource depletion, cognitive overload, and adaptive fatigue → Human capital fragility	Integrative mechanism	COR; Withdrawal behavior
P8	Job demands → Resource depletion → Burnout	Mediation	JD-R; COR
P9	Technological pressure → Cognitive overload	Mediation	Technostress

	Proposition & Relationship	Mechanism Type	Theoretical Basis
	→ Reduced adaptive performance		
P10	Continuous adaptation demands → Adaptive fatigue → Work disengagement	Mediation	Adaptive performance
P11	Job resources weaken job demands → resource depletion	Moderation	JD-R
P12	Psychological capital weakens cognitive overload → reduced adaptive performance	Moderation	Psychological capital
P13	Human-centered system design weakens technological pressure → cognitive overload	Moderation	Technostress; System design
P14	Human capital fragility emerges from resource depletion, cognitive overload, and adaptive fatigue	Higher-order construct	Integrative multilevel theorizing

Source: Developed by the author

Table 2 supports the article’s analytical logic by translating the conceptual framework into a structured set of testable theoretical claims. It helps distinguish antecedent effects, mediating mechanisms, moderating conditions, and the higher-order status of human capital fragility, thereby reducing construct ambiguity and strengthening the paper’s mechanism-based contribution.

Antecedents and Core Mechanisms

P1. *Escalating job demands are positively associated with resource depletion over time.*

This proposition is grounded in COR theory, which posits that individuals experience stress when resources are threatened or depleted (Hobfoll *et al.*, 2018). Within the JD-R framework, excessive job demands require sustained effort, leading to the gradual exhaustion of cognitive and emotional resources (Demerouti *et al.*, 2001; Bakker & Demerouti, 2007). Recent extensions further emphasize that continuous and cumulative demands accelerate resource loss over time (Bakker *et al.*, 2023).

P2. *Technological pressure is positively associated with cognitive overload in digital work environments.*

Technostress research demonstrates that information overload, constant connectivity, and system complexity increase cognitive demands beyond individuals’ processing capacity (Tarafdar *et al.*, 2019; Kumar, 2024). When technological demands exceed cognitive limits, individuals experience overload, impairing attention, decision-making, and learning processes (Wang *et al.*, 2023).

P3. *The interaction between job demands and technological pressure amplifies adaptive fatigue.*

This proposition integrates JD-R and technostress perspectives by recognizing that combined demands create compounding strain effects. Continuous exposure to both workload pressure and digital intensity increases the cognitive and emotional costs of adaptation, leading to fatigue over time (Jundt & Shoss, 2023; Chouhan, 2023).

Mechanisms and Outcomes

P4. *Resource depletion is positively associated with burnout.*

Extensive burnout research shows that prolonged resource exhaustion leads to emotional exhaustion, depersonalization, and reduced effectiveness (Maslach *et al.*, 2001; Schaufeli *et al.*, 2009). COR theory further explains that sustained resource loss creates vulnerability to chronic stress outcomes (Hobfoll *et al.*, 2018).

P5. *Cognitive overload is negatively associated with adaptive performance.*

Cognitive overload reduces individuals' ability to process information, learn new skills, and respond effectively to changing demands (Cascio & Montealegre, 2016; Park & Park, 2019). As adaptive performance relies on cognitive flexibility, overload directly constrains adaptability (Charbonnier-Voirin & Roussel, 2012).

P6. *Adaptive fatigue is negatively associated with work engagement.*

Work engagement requires sustained energy and motivation (Schaufeli & Bakker, 2004). When individuals experience fatigue from continuous adaptation, their willingness to invest effort declines, leading to disengagement (Bakker & Demerouti, 2008; Chouhan, 2023).

P7. *The combined effect of resource depletion, cognitive overload, and adaptive fatigue leads to human capital fragility, reflected in increased withdrawal behaviors.*

This proposition synthesizes COR theory and behavioral withdrawal literature. As multiple mechanisms interact, individuals adopt withdrawal strategies to conserve remaining resources (Morrison, 2023), signaling systemic fragility rather than isolated strain.

Mediating Relationships

P8. *Resource depletion mediates the relationship between job demands and burnout.*

The JD-R model and COR theory jointly support this mediation, where job demands increase strain indirectly through resource exhaustion (Demerouti *et al.*, 2001; Hobfoll *et al.*, 2018).

P9. *Cognitive overload mediates the relationship between technological pressure and reduced adaptive performance.*

Technostress literature suggests that technological demands impair performance primarily through cognitive strain mechanisms (Tarafdar *et al.*, 2019; Wang *et al.*, 2023).

P10. *Adaptive fatigue mediates the relationship between continuous adaptation demands and work disengagement.*

Process-based research on adaptive performance highlights that repeated adaptation leads to fatigue, which reduces motivation and engagement over time (Jundt & Shoss, 2023).

Moderating Effects

P11. *Job resources weaken the positive relationship between job demands and resource depletion.*

Within the JD-R model, job resources such as autonomy and support buffer the negative effects of demands (Bakker & Demerouti, 2007; Cooke *et al.*, 2019).

P12. *Psychological capital mitigates the negative effects of cognitive overload on adaptive performance.*

Psychological capital enhances coping capacity and cognitive resilience, enabling individuals to better manage overload (Luthans & Youssef-Morgan, 2017).

P13. *Human-centered system design reduces the impact of technological pressure on cognitive overload.*

Technology design literature suggests that user-friendly and intuitive systems can significantly reduce cognitive strain and technostress (Tarafdar *et al.*, 2019; Holland *et al.*, 2022).

Higher-Order Construct

P14. *Human capital fragility functions as a higher-order construct emerging from the interaction of resource depletion, cognitive overload, and adaptive fatigue.*

This proposition is grounded in integrative and multilevel perspectives, which emphasize the need to conceptualize complex organizational phenomena as higher-order constructs capturing systemic interactions (Goh *et al.*, 2022; Bakker *et al.*, 2023).

4. Discussion

4.1 Reframing Human Capital in the Era of Continuous Pressure

The present study advances a fundamental shift in how human capital is conceptualized in contemporary organizations. Traditional perspectives have largely framed human capital as a repository of skills, competencies, and capabilities that can be developed and leveraged for competitive advantage (Teece *et al.*, 2016). While this view remains influential, it implicitly assumes that human capacity is expandable and resilient under increasing demands.

The findings of this conceptual development challenge this assumption by demonstrating that human capital must also be understood as a fragile system of adaptive capacity, subject to deterioration under sustained pressure. In digitally mediated environments characterized by continuous demand escalation, the critical issue is no longer whether employees can perform, but whether they can sustain performance over time without degradation in cognitive and psychological functioning.

This reframing aligns with emerging perspectives that emphasize the limits of human adaptability in high-intensity work systems (Hakanen & Kaltainen, 2026). It shifts the analytical focus from performance maximization toward capacity sustainability, positioning human capital not only as a source of value creation but also as a potential constraint on organizational performance.

4.2 Extending the Job Demands–Resources (JD-R) Theory

This study contributes to the JD-R literature by introducing a temporal and systemic dimension that has been underdeveloped in prior research. The JD-R model posits that job demands lead to strain while job resources foster engagement (Demerouti *et al.*, 2001; Bakker & Demerouti, 2007). Although widely validated, this framework is largely based on the assumption of a manageable and dynamic balance between demands and resources.

The present framework extends this perspective in three significant ways. First, it conceptualizes job demands as continuously escalating rather than episodic, reflecting the realities of digital work environments where demands are persistent and cumulative (Bakker *et al.*, 2023; Demerouti & Bakker, 2023). Second, it introduces the concept of cumulative resource depletion, emphasizing that repeated exposure to demands leads to progressive erosion rather than immediate strain. Third, it identifies adaptive fatigue as a distinct mechanism, highlighting that continuous adaptation itself can become a source of strain.

Together, these extensions move the JD-R model beyond a static equilibrium perspective toward a dynamic imbalance framework, where sustained misalignment between demands and resources leads to long-term capacity deterioration. This perspective provides a more accurate representation of contemporary work environments, where recovery opportunities are limited and demand intensity remains consistently high.

4.3 Advancing Conservation of Resources (COR) Theory

The proposed framework also advances COR theory by emphasizing the structural conditions under which resource loss becomes chronic and self-reinforcing. COR theory suggests that individuals strive to protect and accumulate resources, and that stress occurs when these resources are threatened or lost (Hobfoll *et al.*, 2018). It also highlights the concept of resource loss spirals, where initial losses increase vulnerability to further losses.

Building on this foundation, the present study argues that modern organizational environments—particularly those shaped by digital transformation—can create structural loss spirals, where resource depletion is embedded within the design of work itself. Continuous demands, constant connectivity, and limited recovery opportunities accelerate resource loss beyond individuals' capacity to recover (Kumar, 2024; Demerouti & Bakker, 2023).

Furthermore, this study extends COR theory by incorporating cognitive processing capacity as a critical dimension of resources. While traditional applications focus on the quantity of resources, the inclusion of cognitive overload highlights that the ability to utilize resources effectively can also deteriorate under pressure (Wang *et al.*, 2023). This expansion provides a more nuanced understanding of how resource dynamics operate in complex and information-intensive environments.

4.4 Rethinking Resilience in High-Pressure Systems

Resilience has often been positioned as a solution to workplace challenges, emphasizing individuals' ability to recover from stress and maintain functioning (Bardoel *et al.*, 2014; Näswall *et al.*, 2019). However, the present framework offers a more nuanced perspective by situating resilience within a broader fragility context.

Rather than viewing resilience as a universally effective capability, this study suggests that resilience operates as a buffering mechanism whose effectiveness is contingent on systemic conditions. In environments characterized by continuous demand escalation, resilience may become insufficient or unsustainable, particularly when recovery opportunities are limited and pressures remain persistent (Goh *et al.*, 2022).

This perspective aligns with multilevel research showing that resilience is not solely an individual trait but is shaped by organizational and contextual factors (Singh *et al.*, 2024). Consequently, the responsibility for managing strain cannot be placed solely on individuals. Instead, organizations must address the structural drivers of fragility, shifting the focus from “building resilient employees” to designing resilient systems.

4.5 The Adaptive Performance Paradox

One of the most significant theoretical insights emerging from this study is the identification of an adaptive performance paradox. While adaptability is widely recognized as a critical capability in dynamic environments (Park & Park, 2019), the present framework demonstrates that continuous adaptation imposes cumulative cognitive and emotional costs that can ultimately undermine adaptive capacity.

This paradox is particularly salient in digital work contexts, where employees are expected to continuously learn, adjust, and respond to technological changes. Empirical research suggests that repeated adaptation cycles can lead to fatigue, reduced motivation, and resistance to change (Jundt & Shoss, 2023; Chouhan, 2023).

By introducing the concept of adaptive fatigue, this study provides a mechanism-based explanation for this paradox, showing how the very processes that enable adaptability can also contribute to its decline. This insight extends existing adaptive performance literature by integrating resource dynamics and cognitive constraints into the understanding of adaptability over time.

4.6 Toward a Human-Centered Theory of Organizational Sustainability

The findings of this study contribute to the emerging discourse on human-centered organizational design by emphasizing the central role of human sustainability in achieving long-term performance. While organizations have traditionally focused on technological

innovation and efficiency, the proposed framework highlights that human capacity represents a fundamental constraint on system performance.

This perspective aligns with calls for more human-centered approaches to digital transformation, which prioritize well-being, meaningful engagement, and sustainable performance alongside productivity (Cascio & Montealegre, 2016). By conceptualizing human capital fragility as a systemic condition, the study provides a theoretical foundation for integrating human considerations into organizational design.

Moreover, the framework suggests that sustainable performance cannot be achieved solely through technological advancement or capability development. Instead, it requires balancing demand intensity with recovery opportunities and aligning organizational systems with human limitations. This represents a shift from efficiency-driven models toward sustainability-oriented organizational theories.

4.7 Summary of Theoretical Contributions

This study makes several key contributions to the literature.

First, it introduces human capital fragility as a novel construct that captures the systemic vulnerability of employees in contemporary work environments. Unlike existing constructs, fragility reflects a dynamic and cumulative condition that emerges from sustained exposure to escalating demands.

Second, it develops a mechanism-based framework that explains how structural pressures translate into behavioral and psychological outcomes through resource depletion, cognitive overload, and adaptive fatigue. This approach responds to calls for deeper theoretical explanations that go beyond direct-effect models (Bakker *et al.*, 2023).

Third, the study extends existing theories, including JD-R and COR, by incorporating temporal, cumulative, and systemic dimensions, providing a more comprehensive understanding of human functioning under continuous pressure.

Finally, it integrates previously fragmented research streams into a coherent and unified framework, advancing the theoretical understanding of human sustainability in modern organizations.

5. Implications and Future Research Directions

5.1 Managerial Implications: From Performance Maximization to Capacity Sustainability

The proposed framework suggests a fundamental shift in managerial orientation from performance maximization toward capacity sustainability. Traditional management practices often emphasize efficiency, productivity targets, and continuous performance improvement. While these approaches may generate short-term gains, they can unintentionally accelerate resource depletion and contribute to long-term fragility.

Managers should therefore adopt a capacity-aware approach, recognizing that human cognitive, emotional, and adaptive resources are finite and require continuous replenishment. This involves redesigning work processes to prevent chronic overload, ensuring adequate recovery opportunities, and aligning performance expectations with sustainable levels of effort (Bakker & Demerouti, 2007; Hobfoll *et al.*, 2018).

Importantly, managerial decision-making should incorporate early warning indicators of fragility, such as signs of cognitive overload, declining engagement, and adaptive fatigue. By shifting attention from output alone to the conditions that sustain performance, organizations can mitigate long-term risks associated with capacity erosion.

5.2 Organizational Design Implications: Building Human-Centered Systems

At the organizational level, the findings underscore the importance of human-centered system design. Digital transformation initiatives are often driven by technological efficiency without sufficient consideration of human limitations. However, the present framework demonstrates that poorly designed systems can amplify technostress and accelerate fragility.

Organizations should therefore prioritize the design of systems that reduce unnecessary complexity, minimize cognitive load, and support recovery. This includes simplifying workflows, limiting excessive notifications, and structuring communication processes to avoid constant interruption (Tarafdar *et al.*, 2019; Holland *et al.*, 2022).

Additionally, organizations should move toward what can be termed “fragility-aware systems”, where monitoring mechanisms are embedded to track resource depletion, workload intensity, and employee well-being. Such systems enable proactive interventions rather than reactive responses to burnout or disengagement.

5.3 Human Resource Management Implications: Beyond Skills to Psychological Capacity

The findings extend the role of human resource management (HRM) beyond traditional focus areas such as skill development and competency building. While these remain important, the concept of human capital fragility highlights the need to prioritize psychological capacity and resource sustainability.

HR practices should incorporate interventions aimed at enhancing psychological capital, including self-efficacy, optimism, and resilience (Luthans & Youssef-Morgan, 2017). At the same time, HR systems must ensure that learning and development processes do not contribute to cognitive overload by imposing excessive training demands without adequate integration into work routines.

Performance management systems should also be re-evaluated to balance productivity expectations with well-being considerations. Instead of reinforcing “always-on” cultures, organizations should promote sustainable engagement models that allow employees to maintain high performance without continuous strain.

5.4 Leadership Implications: From Control to Supportive Capacity Building

Leadership plays a critical role in shaping how employees experience demands and resources. Traditional leadership approaches that emphasize control, monitoring, and performance pressure may inadvertently intensify resource depletion and cognitive overload.

The proposed framework suggests that effective leadership in contemporary organizations requires a shift toward supportive capacity building. Leaders should foster psychological safety, provide clarity in high-change environments, and actively support recovery and well-being (Edmondson & Lei, 2014; Morrison, 2023).

Furthermore, leaders must develop the ability to recognize early signs of adaptive fatigue and disengagement, adjusting expectations accordingly. This involves balancing performance demands with an understanding of human limitations, ensuring that employees are not pushed beyond sustainable thresholds.

5.5 Policy Implications: Regulating Sustainable Work in the Digital Era

The implications of human capital fragility extend beyond organizational boundaries to the level of public and institutional policy. The rise of digital work and constant connectivity has fundamentally altered the structure of work, often blurring the boundaries between professional and personal life.

Policy interventions such as the “right to disconnect” have been proposed as mechanisms to protect employees from continuous digital exposure and to restore work–life balance (Camacho & Barrios, 2022). Such policies can play a crucial role in preventing chronic resource depletion and supporting long-term well-being.

Additionally, organizations and policymakers should consider establishing standards for sustainable work practices, including limits on working hours, guidelines for digital communication, and requirements for employee well-being initiatives. These measures can help create environments that support both productivity and human sustainability.

5.6 Measurement Implications: Toward a Human Capital Fragility Index

The conceptualization of human capital fragility opens new opportunities for measurement and empirical assessment. Future research can develop multi-dimensional measurement instruments that capture the core components of fragility, including resource depletion, cognitive overload, and adaptive fatigue.

Such measures can be integrated into a Human Capital Fragility Index, enabling organizations to monitor vulnerability levels and identify areas requiring intervention. This approach aligns with the growing emphasis on data-driven decision-making in human resource management and organizational design.

Moreover, measurement development can benefit from advances in psychometric modeling, including second-order constructs and structural equation modeling (SEM), to capture the hierarchical nature of fragility.

5.7 Strategic Implications: Human Sustainability as Competitive Advantage

Beyond operational and managerial considerations, the findings of this study have important strategic implications. In knowledge-intensive and digitally driven economies, human capital remains a critical source of innovation and competitive advantage. However, this advantage can only be sustained if organizations effectively manage the risks associated with fragility.

Organizations that successfully balance demand intensity with capacity sustainability are likely to achieve more stable performance, higher employee engagement, and greater adaptability in uncertain environments (Bakker *et al.*, 2023). In this sense, human sustainability should be viewed as a core strategic capability, rather than a peripheral concern.

This perspective reframes human capital management as a long-term investment in organizational resilience and performance, rather than a short-term focus on productivity metrics.

5.8 Future Research Directions

While the present study provides a comprehensive conceptual framework, it also opens several avenues for future research.

First, empirical validation of the proposed model is essential. Future studies should employ longitudinal research designs to capture the cumulative and dynamic nature of human capital fragility. Such designs would enable researchers to examine how resource depletion, cognitive overload, and adaptive fatigue evolve over time and interact with each other.

Second, the framework can be tested using structural equation modeling (SEM) to examine the mediating and moderating relationships proposed in this study. This would provide empirical evidence for the mechanism-based structure of the model and its explanatory power.

Third, future research should explore multi-level dynamics, examining how individual-level fragility interacts with team-level and organizational-level factors. For example, team resilience and leadership practices may influence how fragility develops and manifests across different contexts (Goh *et al.*, 2022; Singh *et al.*, 2024).

Fourth, there is a need to investigate the role of emerging technologies, such as artificial intelligence and algorithmic management, in shaping human capital fragility. These technologies may introduce new forms of pressure and complexity, further intensifying demand environments (Valtonen *et al.*, 2025).

Fifth, cross-cultural studies can provide insights into how fragility dynamics vary across different institutional and cultural contexts. Differences in work norms, social support systems, and organizational practices may influence the extent to which fragility emerges and its impact on outcomes.

Finally, future research should focus on the development and validation of intervention strategies aimed at mitigating fragility. This includes examining the effectiveness of human-centered system design, recovery practices, and psychological interventions in sustaining human capacity.

6. Conclusion

This study set out to address a growing yet insufficiently theorized phenomenon in contemporary organizations: the increasing vulnerability of human capital under conditions of continuous pressure, rapid technological change, and escalating performance demands. By introducing the concept of human capital fragility, the study provides a new lens for understanding how and why employees and organizations struggle to sustain performance in modern work environments.

Departing from traditional perspectives that treat burnout, resilience, engagement, and adaptive performance as separate constructs, this research integrates these streams into a unified, mechanism-based framework. The model demonstrates that human capital fragility emerges through the interaction of escalating job demands and technological pressures, mediated by three core processes: resource depletion, cognitive overload, and adaptive fatigue. These mechanisms collectively explain how continuous exposure to high-intensity demands leads to the progressive erosion of adaptive capacity, ultimately manifesting in outcomes such as burnout, disengagement, and reduced adaptive performance.

Theoretically, this study contributes in several important ways. First, it advances the literature by conceptualizing human capital fragility as a higher-order construct that captures the systemic and cumulative nature of human vulnerability. Second, it develops a mechanism-based explanation that moves beyond direct-effect models, providing deeper insight into the processes linking structural pressures to behavioral and psychological outcomes. Third, it extends established theories, including the job demands–resources (JD-R) model and conservation of resources (COR) theory, by incorporating temporal, cumulative, and system-level dimensions. In doing so, the study responds to calls for more integrative and dynamic approaches in organizational research.

From a practical perspective, the findings underscore the urgent need for organizations to rethink their approach to managing human capital. The prevailing emphasis on performance maximization and continuous acceleration must be balanced with strategies that preserve and regenerate human capacity. Without such a shift, organizations risk undermining the very foundation of their performance—namely, the cognitive, emotional, and adaptive resources of their workforce. The concept of fragility highlights that sustainable performance is not achieved through increasing demands alone, but through aligning those demands with the limits and recovery needs of human systems.

Looking forward, this study opens multiple avenues for future inquiry. Empirical validation of the proposed framework is essential, particularly through longitudinal and multi-level research designs that capture the dynamic and cumulative nature of fragility. Further exploration of measurement approaches, including the development of a Human Capital Fragility Index, can enhance both theoretical and practical understanding. Additionally, the role of emerging technologies, hybrid work arrangements, and cultural contexts in shaping fragility dynamics remains an important area for future research.

Ultimately, the central argument of this study is that in an era defined by digital acceleration and continuous change, the true boundary of organizational performance lies not in technological capability, but in the limits of human adaptive capacity. Organizations that recognize and address human capital fragility will be better positioned to sustain performance, foster resilience, and navigate uncertainty. In contrast, those that ignore these dynamics may achieve short-term gains at the cost of long-term viability.

In this sense, the future of organizational success depends not only on how efficiently systems operate, but on how effectively they sustain the people who operate within them.

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