Screen Pollution in Corporate Offices: An ESG Perspective on Digital Sustainability

Aashay Raut[1], Amishka Mohite[2], Lakshya Singh[3], Vishal Solanki[4], Anusha Priya[5]
[1,2,3,4]*IIEBM Indus Business School, Pune, India*
[5]*Guide, IIEBM Indus Business School, Pune, India*

***Abstract*—Context: The rapid digitalization of corporate workplaces has resulted in employees spending extended hours in front of screens daily. This pervasive exposure to digital devices has given rise to a modern occupational health concern termed 'screen pollution'—encompassing the cumulative physical, psychological, and cognitive harms associated with excessive screen use. In India and globally, corporate employees routinely face 8–10 hours of screen exposure per workday, often compounded by additional personal screen time.**

Objective: This study investigates the relationship between Screen Exposure Time (SET), sleep quality, chronotype, and cognitive functioning among corporate office employees, framed through the Environmental, Social, and Governance (ESG) sustainability lens. Specifically, it positions digital employee wellness as a social pillar responsibility for organizations.

Methodology: A descriptive survey-based research design was employed. Primary data were collected via a structured questionnaire administered to 43 respondents, comprising corporate employees and management students. Secondary data were drawn from peer-reviewed journals, WHO occupational health guidelines, and ESG sustainability reports. Statistical analysis included frequency distribution and descriptive analysis of survey responses.

Major Findings: Survey analysis revealed that 86% of respondents use screens within one hour of bedtime. Only 7% reported sleeping more than 7 hours, with the majority (56%) sleeping 5–7 hours. A significant proportion (37%) reported moderate-to-high eye strain scores (4–5 on a 5-point scale). Cognitive symptoms such as concentration difficulties and attention decline were widely reported. Furthermore, 51% of respondents agreed or strongly agreed that excessive screen use is a workplace sustainability issue, yet 37% confirmed their organizations do not promote digital wellbeing practices. Secondary evidence from Bako-Biro et al. (2004) further establishes that screen-based devices are significant indoor pollutants capable of degrading air quality, inducing SBS symptoms, and reducing office work performance.

***Index Terms*—Screen Pollution, ESG, Digital Sustainability, Employee Well-being, Sleep Quality, Cognitive Function, Sick Building Syndrome, Indoor Air Quality, Chronotype.**

I. INTRODUCTION

1.1 Background of the Study

The corporate world is undergoing a seismic transformation driven by rapid technological advancement. Digital tools such as computers, smartphones, cloud platforms, and video conferencing applications have become indispensable to everyday office operations. Workplaces are now more connected, efficient, and globally integrated than at any prior point in history. However, this digital revolution has simultaneously generated new occupational health concerns that were absent from traditional office environments.

One such emerging concern is screen pollution—a term that captures the harmful cumulative effects of excessive screen exposure on employee health, performance, and well-being. Unlike conventional environmental pollution caused by chemicals or particulates, screen pollution represents a form of digital occupational hazard. Employees in corporate offices routinely spend 8–10 hours per day working in front of screens, with additional exposure occurring during commuting, leisure, and social media engagement.

This continuous digital engagement exerts a wide range of adverse effects: physical symptoms such as digital eye strain (Computer Vision Syndrome), musculoskeletal discomfort, and disrupted circadian rhythms; psychological symptoms such as stress, anxiety, and burnout; and cognitive symptoms including attention decline, reduced memory retention, and decision fatigue.

Paralleling this, research on indoor environmental quality has demonstrated that personal computers (PCs) themselves are significant indoor pollution sources. Bako-Biro et al. (2004) found that 3-month-old PCs placed in an office environment had a sensory pollution load of 3.4 olf—more than three times the pollution equivalent of a standard person—and increased the percentage of employees dissatisfied with perceived air quality from 13% to 41%. This physical dimension of screen pollution, often overlooked in digital wellness discourse, compounds the cognitive and psychological burdens already associated with screen overuse.

1.2 Screen Pollution as a Corporate Sustainability Issue

Traditional sustainability discussions have focused on environmental dimensions: carbon emissions, energy conservation, and waste management. Modern ESG frameworks, however, have significantly expanded this scope. The three pillars of ESG each carry specific relevance to screen pollution:

Environmental: Energy consumption of digital infrastructure, e-waste from electronic devices, and heat pollution from PC hardware.

Social: Employee wellness, mental health, work-life balance, and occupational health standards.

Governance: Ethical workplace policies, responsible technology use, and corporate accountability for digital wellness.

Screen pollution aligns most directly with the social pillar of ESG. Organizations that neglect screen-related occupational hazards risk reduced productivity, higher absenteeism, increased employee turnover, and reputational damage in sustainability reporting. Conversely, companies embedding digital wellness into ESG strategy demonstrate leadership in sustainable human capital management.

1.3 Need for the Study

With hybrid work models and escalating digital dependency, screen pollution has become an unavoidable feature of modern corporate life. Despite its growing prevalence and documented adverse effects, the topic remains significantly underexplored in corporate ESG reporting frameworks. This study addresses the gap by empirically connecting screen exposure data with employee wellness outcomes, and by situating the findings within a structured ESG sustainability argument. It provides organizations with both evidence and a framework for adopting responsible digital workplace practices.

II. LITERATURE REVIEW

2.1 Screen Exposure and Digital Eye Strain

Research consistently demonstrates that prolonged screen use leads to Computer Vision Syndrome (CVS), characterized by dry eyes, blurred vision, headaches, and neck pain (American Optometric Association, 2019). Office employees are particularly susceptible owing to sustained exposure without adequate rest intervals. The 20-20-20 rule—looking at an object 20 feet away for 20 seconds every 20 minutes—has been widely recommended but rarely institutionalized in corporate settings.

2.2 Screen Time, Blue Light, and Sleep Disruption

Blue light emitted from LCD and LED screens suppresses the production of melatonin, a hormone essential for initiating sleep. Chang et al. (2015) demonstrated in a controlled study that evening use of light-emitting electronic devices significantly reduced melatonin levels and next-morning alertness. Cain and Gradisar (2010) found robust associations between pre-sleep electronic media use and delayed sleep onset, shorter total sleep duration, and diminished sleep quality among young adults—findings highly applicable to the corporate population.

2.3 Chronotype and Corporate Workplace Misalignment

Chronotype refers to an individual's biologically determined preference for activity timing. Morning chronotypes exhibit peak alertness early in the day, while evening chronotypes perform best in the afternoon or night. Corporate schedules, which predominantly favour fixed 9–5 structures, systematically disadvantage evening-type employees, contributing to social jetlag, chronic sleep deficits, and reduced cognitive performance (Roenneberg et al., 2012). Recognizing and accommodating chronotype diversity is therefore both a wellness and a productivity imperative.

2.4 Cognitive Fatigue and Productivity Decline

Excessive screen exposure is associated with cognitive overload resulting from continuous digital multitasking. Constant context-switching between emails, video calls, messaging platforms, and work applications depletes attentional resources and reduces executive functioning. Bako-Biro et al. (2004) provided direct experimental evidence: the presence of operating PCs in an office increased the time required for text processing tasks by 9%, and subjects reported increased sleepiness and lower self-estimated work ability.

2.5 ESG Frameworks and Employee Digital Wellness

Contemporary ESG frameworks increasingly recognize employee health and digital wellness as material sustainability risks. Deloitte (2023) documented that organizations integrating wellness programs into ESG governance saw measurable improvements in employee productivity and retention. The World Economic Forum (2022) identified responsible technology management as a growing dimension of corporate social responsibility, encouraging companies to develop explicit digital wellness policies.

2.6 Indoor Air Quality and PC Pollution

Bako-Biro et al. (2004) conducted a landmark controlled study exposing 30 female subjects to conditions with and without operating PCs in a low-polluting office environment. Their key findings established that PCs are underappreciated indoor pollution sources: the sensory pollution load of a single PC was 3.4 olf; dissatisfaction with perceived air quality nearly tripled (from 13% to 41%) in the PC-present condition; and text processing time increased by 9%. The most significant chemical compounds detected from PC emissions included phenol, toluene, 2-ethylhexanol, formaldehyde, and styrene. The study concluded that so-called 'stealth chemicals'—undetectable by standard analytical methods—may contribute significantly to adverse effects, highlighting the limitations of routine indoor air quality assessments.

2.7 Research Gap

While existing literature extensively documents individual health impacts of screen exposure—eye strain, sleep disruption, cognitive decline—limited scholarly work integrates these effects into a unified ESG sustainability framework for corporations. Furthermore, the physical pollution dimension of PCs (VOC emissions, indoor air quality degradation) is rarely linked to digital wellness discourse. This study addresses both gaps by synthesising occupational health evidence with corporate ESG responsibility frameworks and primary survey data.

III. STATEMENT OF THE PROBLEM

Corporate employees are experiencing an unprecedented volume of compulsory screen exposure, yet organizations have largely failed to treat this exposure as a measurable, reportable occupational health and sustainability risk. Screen pollution—encompassing the digital, chemical, and cognitive burdens of extended screen engagement—is escalating with each successive generation of workplace technology. Despite clear evidence linking screen overuse to impaired sleep, reduced cognitive performance, increased physical symptoms, and degraded indoor air quality, the majority of organizations do not include digital wellness metrics in their ESG reporting, do not enforce structured screen break policies, and do not measure screen-related health outcomes systematically.

The problem, therefore, is twofold: first, a widespread underappreciation of the occupational health risks posed by screen pollution; and second, an absence of institutional ESG governance frameworks that would require organizations to monitor, report on, and mitigate these risks. This study seeks to empirically document the prevalence and impact of screen pollution among a sample of corporate employees and students, and to articulate the case for integrating digital wellness into ESG sustainability governance.

IV. OBJECTIVES OF THE STUDY

To examine the prevalence and distribution of screen pollution symptoms among corporate office employees.

To assess the relationship between Screen Exposure Time (SET) and sleep quality parameters (sleep duration, sleep onset difficulty, sleep quality rating).

To analyze the influence of chronotype on cognitive functioning and workplace productivity.

To evaluate the physical dimension of screen pollution—including indoor air quality degradation from PC emissions—as documented in the literature.

To position screen pollution as an ESG-linked corporate sustainability issue under the social pillar.
To recommend evidence-based strategies for corporate digital sustainability governance.

V. RESEARCH QUESTIONS

What is the average daily screen exposure time among corporate employees, and how does it compare across work and non-work contexts?
Is there a significant association between high Screen Exposure Time (SET) and poor sleep quality among respondents?
Does chronotype moderate the relationship between screen exposure and cognitive performance outcomes?
To what extent do corporate organizations currently incorporate digital wellness practices and metrics into their ESG governance frameworks?
What policy interventions are most effective in reducing screen pollution-related occupational health risks?

Research Hypotheses:
H1: Higher screen exposure time significantly reduces sleep quality among employees.
H2: Screen exposure time negatively impacts cognitive functions such as attention, concentration, and memory.
H3: Chronotype significantly influences sleep patterns and workplace performance among office employees.
H4: Sleep quality mediates the relationship between screen exposure and cognitive performance.
H0: There is no significant relationship between SET, chronotype, sleep parameters, and cognitive functions.

VI. SIGNIFICANCE OF THE STUDY

This study makes several important contributions to the intersecting domains of occupational health, corporate sustainability, and ESG governance:
Academic Contribution: It bridges two bodies of literature—digital wellness research and ESG sustainability frameworks—that have hitherto developed largely independently. It provides an integrative model for understanding screen pollution as both an occupational health and a corporate governance issue.
Organizational Relevance: The findings and recommendations provide corporate HR departments, ESG officers, and senior management with actionable evidence for developing digital wellness policies. Organizations increasingly face stakeholder pressure to demonstrate social pillar leadership; this study provides a concrete area for programmatic intervention.
Public Health Dimension: By documenting the indoor air quality degradation caused by PC emissions—building on the experimental evidence of Bako-Biro et al. (2004)—the study highlights a physical dimension of screen pollution that extends beyond individual device use habits to shared office environments.
Policy Development: The study contributes to the growing body of evidence that should inform occupational health regulations, ergonomic standards, and mandatory ESG disclosure requirements related to employee digital wellness.
Employee Empowerment: By quantifying the relationship between screen exposure habits and health outcomes using primary survey data, the study provides employees with evidence to advocate for institutional wellness support.

VII. SCOPE AND LIMITATIONS

7.1 Scope
The study covers corporate office employees and management students, reflecting typical digital work patterns.
It examines screen exposure across work hours and personal time to capture total daily SET.
The ESG analysis focuses on the social pillar, with secondary reference to Environmental and Governance implications.
Secondary evidence from indoor air quality research (Bako-Biro et al., 2004) extends the analysis to the physical pollution dimension of screen-based devices.
The study period is the academic year 2025-26, reflecting current post-pandemic hybrid work norms.

7.2 Limitations
Sample Size: The primary survey comprised 43 respondents. While sufficient for descriptive and correlational analysis, findings should be interpreted with caution regarding broader generalizability.
Self-Reported Data: Screen time, sleep duration, and symptom severity rely on self-report, which is subject to recall bias and social desirability effects.

Causal Inference: The cross-sectional survey design precludes definitive causal claims; associations identified suggest hypotheses for future longitudinal investigation.
Demographic Homogeneity: The majority of respondents were aged 20–25, limiting applicability to older employee demographics who may exhibit different patterns.
Laboratory vs. Field Conditions: The indoor air quality findings of Bako-Biro et al. (2004) derive from controlled laboratory conditions which may not perfectly reflect all real-world office configurations.

VIII. THEORETICAL FRAMEWORK

This study is grounded in three theoretical frameworks that together provide a comprehensive model for understanding screen pollution as a multi-dimensional corporate sustainability issue:

8.1 ESG Sustainability Framework

The ESG framework, developed by institutional investors and codified by organizations including the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB), provides the overarching structure for this study. Screen pollution is mapped across all three ESG dimensions:

Environmental (E):
PC hardware emits volatile organic compounds (VOCs) including phenol, toluene, and formaldehyde, degrading indoor air quality. E-waste from end-of-life devices represents a further environmental burden.

Social (S):
Screen pollution directly impacts employee health, sleep quality, cognitive performance, and psychological well-being—all material social pillar concerns.

Governance (G):
The absence of digital wellness policies and failure to disclose screen-related occupational health risks in ESG reports represents a governance deficit.

8.2 Demand-Resources Model (JD-R)

The Job Demands-Resources (JD-R) Model (Bakker & Demerouti, 2007) posits that occupational health outcomes result from the interaction between job demands (stressors that require sustained effort) and job resources (supports that facilitate work). In the context of screen pollution, excessive screen exposure represents a chronic job demand that, in the absence of adequate resources—such as digital wellness policies, ergonomic equipment, and screen break protocols—depletes cognitive and emotional reserves, leading to burnout, reduced performance, and disengagement.

8.3 Circadian Rhythm and Chronobiology Framework

The circadian rhythm framework (Roenneberg et al., 2012) explains how the biological timing of sleep and activity is governed by endogenous clocks modulated by environmental cues, principally light. Artificial blue light from screens disrupts these cues, delaying circadian phase and suppressing melatonin. The social jetlag concept—the misalignment between biological chronotype and social schedules imposed by corporate work hours—provides the theoretical basis for understanding chronotype-related productivity differences among employees.

IX. EXTENDED LITERATURE REVIEW: KEY STUDIES

Author(s) & Year	Key Finding	Relevance
Bako-Biro et al. (2004)	PCs increased dissatisfied employees from 13% to 41%; sensory load 3.4 olf per PC; text processing time increased 9%	Core evidence for physical PC pollution impacting productivity
Chang et al. (2015)	Evening device use reduced melatonin by 55% and delayed sleep onset by ~10 minutes	Establishes biological mechanism of screen-sleep disruption
Cain & Gradisar (2010)	Electronic media use before sleep associated with shorter, lower quality sleep in young adults	Directly applicable to corporate employee sleep patterns

Author(s) & Year	Key Finding	Relevance
Roenneberg et al. (2012)	Social jetlag linked to poor academic/work performance and increased health risks	Basis for chronotype accommodation policy recommendation
Deloitte (2023)	ESG-integrated wellness programs show measurable ROI in retention and productivity	Business case for digital wellness as ESG investment
WHO (2021)	Occupational screen-based work guidelines recommend structured breaks and ergonomic standards	Regulatory/policy authority supporting study recommendations
World Economic Forum (2022)	Responsible technology management identified as growing ESG Social pillar priority	ESG framework validation for screen pollution positioning

X. RESEARCH METHODOLOGY

10.1 Research Design
A descriptive and analytical research design was employed. The study integrates primary quantitative data from a structured survey with secondary data synthesis from peer-reviewed literature, WHO guidelines, and ESG reports. This mixed-evidence approach enables both empirical documentation of screen pollution prevalence and theoretical positioning within sustainability frameworks.

10.2 Data Collection
Primary Data: A structured 16-question questionnaire was developed covering demographic information, daily screen exposure time (work and personal), pre-sleep screen habits, physical symptoms (eye strain, headaches), sleep duration and quality, chronotype assessment, cognitive functioning self-report, and ESG awareness about digital wellness.
Secondary Data: Peer-reviewed journals (Indoor Air, Sleep Medicine, PNAS), WHO occupational health guidelines, ESG sustainability reports (Deloitte 2023, WEF 2022), and laboratory experimental data from Bako-Biro et al. (2004).

10.3 Sampling
Target Population: Corporate office employees and management student’s representative of digital workforce.
Sample Size Achieved: 43 respondents.
Sampling Technique: Convenience sampling via online questionnaire (Google Forms).
Data Collection Period: March–April 2026.
Gender Composition: 26 male (60.5%), 17 female (39.5%).
Age Composition: 37 respondents aged 20–25 (86%), 6 respondents aged 25–30 (14%).

10.4 Analytical Tools
Descriptive statistics: Frequency distributions and percentage analysis for all survey variables.
Cross-tabulation: To identify associations between SET categories and sleep/cognitive outcomes.
Comparative analysis: Primary survey findings benchmarked against published literature data.
ESG mapping: Survey findings mapped to ESG Social pillar indicators.

XI. DATA ANALYSIS AND INTERPRETATION

11.1 Screen Exposure Time During Work Hours

Daily Work Screen Hours	Number of Respondents	Percentage (%)
Less than 4 hours	12	27.9%
4–6 hours	12	27.9%
6–8 hours	11	25.6%
8–10 hours	6	14.0%
More than 10 hours	2	4.7%
Total	43	100%

Interpretation: Approximately 44.3% of respondents reported working on screens for 6 or more hours daily during work alone. When combined with personal screen time, total daily SET is substantially higher for the majority of respondents.

11.2 After-Work Screen Exposure

Additional Screen Hours (Post-Work)	Number of Respondents	Percentage (%)
Less than 1 hour	9	20.9%
1–2 hours	23	53.5%
2–4 hours	10	23.3%
More than 4 hours	1	2.3%
Total	43	100%

Interpretation: 79.1% of respondents spend at least 1 additional hour on screens after work hours, substantially increasing total daily SET beyond what is measured during work alone.

11.3 Screen Use Before Sleep

86% of respondents (37 out of 43) reported using screens within one hour before sleeping. Only 6 respondents (14%) avoid screens in the hour before bedtime. This finding is highly significant: screen use in the pre-sleep window directly suppresses melatonin production and delays sleep onset, as established by Chang et al. (2015).

11.4 Eye Strain and Physical Symptoms

Eye Strain Score (1-5 Scale)	Number of Respondents	Percentage (%)
1 (No strain)	8	18.6%
2 (Mild)	6	14.0%
3 (Moderate)	14	32.6%
4 (Significant)	12	27.9%
5 (Severe)	3	7.0%
Total	43	100%

Interpretation: 67.4% of respondents reported eye strain at moderate or higher levels (scores 3–5). Only 18.6% reported no eye strain. This prevalence rate is consistent with published figures on Computer Vision Syndrome in office settings.

11.5 Sleep Duration

Sleep Duration Per Night	Number of Respondents	Percentage (%)
Less than 5 hours	8	18.6%
5–6 hours	16	37.2%
6–7 hours	16	37.2%
7–8 hours	2	4.7%
More than 8 hours	1	2.3%
Total	43	100%

Interpretation: 93% of respondents sleep fewer than 7 hours per night. The WHO and National Sleep Foundation recommend 7–9 hours of sleep for adults. This near-universal sleep deficit among surveyed employees is consistent with the established link between high screen exposure and reduced sleep duration.

11.6 Sleep Quality Rating

Sleep Quality Rating (1-5 Scale)	Number of Respondents	Percentage (%)
1 (Very Poor)	3	7.0%
2 (Poor)	12	27.9%
3 (Average)	17	39.5%
4 (Good)	7	16.3%
5 (Excellent)	4	9.3%
Total	43	100%

Interpretation: 74.4% of respondents rated their sleep quality as average or below (scores 1–3). Only 25.6% reported good or excellent sleep quality. This pattern supports H1—that high screen exposure time is associated with reduced sleep quality.

11.7 Tiredness During Work Hours

Tiredness During Work (1-5 Scale)	Number of Respondents	Percentage (%)
1 (Never tired)	3	7.0%
2 (Rarely)	6	14.0%
3 (Sometimes)	18	41.9%
4 (Often)	13	30.2%
5 (Very Often)	3	7.0%
Total	43	100%

Interpretation: 79.1% of respondents experienced daytime tiredness sometimes or more frequently. This is consistent with reduced sleep quality and duration attributable to high screen exposure.

11.8 Chronotype and Productivity Patterns

Peak Productivity Time	Number of Respondents	Percentage (%)
Early Morning	20	46.5%
Late Night	8	18.6%
Afternoon	6	14.0%
Evening	6	14.0%
Late Morning	3	7.0%
Total	43	100%

Interpretation: While 46.5% of respondents identify as morning types—aligned with conventional corporate schedules—53.5% report peak productivity at times misaligned with typical 9–5 structures. This chronotype diversity supports the case for flexible work scheduling based on individual biological rhythms.

11.9 ESG Awareness: Screen Pollution as Sustainability Issue

Response	Number of Respondents	Percentage (%)
Strongly Agree	3	7.0%
Agree	19	44.2%
Neutral	18	41.9%
Disagree	2	4.7%
Strongly Disagree	1	2.3%
Total	43	100%

Interpretation: 51.2% of respondents agreed or strongly agreed that excessive screen usage is a workplace sustainability issue. A further 41.9% were neutral, suggesting significant scope for awareness-building. Only 7% disagreed or strongly disagreed.

11.10 Organizational Digital Wellbeing Promotion

Does Your Organization Promote Digital Wellbeing?	Number of Respondents	Percentage (%)
Yes	15	34.9%
No	16	37.2%
Not Sure	12	27.9%
Total	43	100%

Interpretation: Only 34.9% of respondents confirmed their organizations promote digital wellbeing. 37.2% reported no such practices, and 27.9% were unsure. Combined, approximately 65% of respondents cannot confirm their organization actively promotes digital wellness—a significant governance gap.

XII. FINDINGS

The following key findings emerge from the integrated analysis of primary survey data and secondary literature:

Screen exposure is widespread and substantial: 44.3% of respondents work on screens for 6+ hours daily; 79.1% engage in additional personal screen time of 1+ hours post-work, indicating high total daily SET for the majority of respondents.

Pre-sleep screen use is nearly universal: 86% of respondents use screens within one hour of bedtime—a habit with well-documented adverse effects on melatonin production and sleep onset (Chang et al., 2015).

Sleep deficit is pervasive: 93% sleep fewer than 7 hours per night; 74.4% report average or below-average sleep quality. These figures are substantially below recommended sleep thresholds for adults.

Physical symptoms are prevalent: 67.4% of respondents reported moderate-to-severe eye strain (scores 3–5 on a 5-point scale), consistent with Computer Vision Syndrome literature.

Daytime tiredness is common: 79.1% experience tiredness during work hours sometimes or more, reducing productivity and attentiveness.

Chronotype diversity is underserved: 53.5% of respondents identify as non-morning types, yet corporate schedules predominantly favour morning structures, creating performance-suppressing chronotype misalignment.

ESG awareness of screen pollution is growing but limited: 51.2% agree screen use is a sustainability issue, yet 65% cannot confirm their organization actively promotes digital wellbeing.

Physical PC pollution is documented in literature: Bako-Biro et al. (2004) established that PCs are significant indoor pollution sources whose emissions degrade perceived air quality, increase SBS symptoms, and reduce work performance by measurable margins—a dimension of screen pollution absent from most corporate ESG assessments.

Governance gap exists: The majority of organizations in the survey sample have not institutionalized digital wellness practices, representing a material gap in ESG Social pillar governance.

XIII. DISCUSSION

The findings of this study converge across primary and secondary data sources to present a coherent and concerning picture of screen pollution as an undermanaged corporate health and sustainability risk. The near-universal prevalence of pre-sleep screen use (86%) and resulting sleep deficits (93% sleeping below 7 hours) among respondents indicates that screen pollution's disruption of circadian biology has become a normalized feature of modern working life. This normalization is problematic because, as established by Chang et al. (2015) and Cain and Gradisar (2010), the physiological consequences—reduced melatonin, delayed sleep onset, and diminished sleep quality—are not merely subjective but objectively measurable and accumulate over time.

The cognitive burden is compounded by the physical pollution dimension of PC hardware. Bako-Biro et al. (2004) demonstrated experimentally that operating PCs degrade indoor air quality, elevate sensory pollution loads, and directly reduce office work performance even at standard ventilation rates. Their finding that text processing time increased 9% in the PC-present condition parallels the cognitive decline that current respondents attribute to screen fatigue—suggesting the two mechanisms (chemical emissions and digital overexposure) may interact cumulatively in real-world offices.

From an ESG perspective, the governance data are particularly notable. While over half of respondents recognise screen pollution as a sustainability concern, only one-third can confirm their organization promotes digital wellbeing. This disconnects between awareness and institutional action represents a governance failure with measurable human capital consequences: reduced productivity, elevated absenteeism, and diminished employee engagement.

The chronotype distribution data add a further dimension: over half the respondents report peak performance at times structurally excluded by standard corporate schedules. Research on social jetlag (Roenneberg et al., 2012) suggests this misalignment generates ongoing cognitive impairment analogous to mild chronic sleep deprivation. Organizations that ignore chronotype diversity are therefore forfeiting productivity and well-being gains that could be captured through flexible scheduling—a low-cost, high-impact governance intervention.

In aggregate, these findings support Hypotheses H1 and H2: high screen exposure is associated with both reduced sleep quality and diminished cognitive functioning. H3 (chronotype influence on sleep) is supported by the distribution of peak productivity times and their misalignment with standard schedules. H4 (sleep quality as mediator between screen exposure and cognition) is consistent with the data pattern, though causal mediation testing awaits longitudinal investigation.

XIV. CONCLUSION

Screen pollution has emerged as one of the defining occupational health challenges of the digitalized corporate workplace. This study has documented its prevalence through primary survey data showing near-universal sleep deficits, high rates of physical eye strain symptoms, chronic daytime tiredness, and widespread cognitive difficulties among corporate employees and management students—all attributable in significant part to excessive and poorly managed screen exposure.

The study has further demonstrated, drawing on the landmark experimental research of Bako-Biro et al. (2004), that the physical pollution generated by operating PC hardware represents an additional, underappreciated layer of the screen pollution problem. Volatile organic compound emissions from PCs measurably degrade indoor air quality, increase Sick Building Syndrome symptoms, and reduce measurable work output—effects that persist even in PCs that have been in service for three months.

Positioned within the ESG sustainability framework, screen pollution is most naturally located in the social pillar as a material employee health risk. However, its environmental dimensions—energy consumption, e-waste, and indoor VOC pollution—and its governance dimensions—the current absence of mandatory digital wellness disclosure and policy standards—span all three pillars. Organizations that address screen pollution comprehensively therefore strengthen their entire ESG posture.

The most urgent institutional response required is the transition from individual awareness of screen pollution harms to systematic organizational governance: structured screen break enforcement, chronotype-accommodating scheduling, ergonomic workspace standards, digital wellness metrics in ESG reporting, and executive accountability for employee digital health outcomes.

XV. RECOMMENDATIONS

15.1 For Organizations

Implement the 20-20-20 Rule: Enforce a policy requiring employees to look at an object 20 feet away for 20 seconds every 20 minutes. This should be embedded in corporate wellness guidelines and supported by reminder technology.

Establish Digital Wellness Metrics in ESG Reporting: Include screen-related occupational health data—average daily SET, prevalence of CVS symptoms, sleep quality indices, and digital wellness program participation rates—in annual ESG/sustainability reports.

Adopt Chronotype-Flexible Scheduling: Conduct chronotype assessments during onboarding and where operationally feasible, allow employees to structure core working hours around their biological peak performance windows.

Improve Office Ventilation Standards: Given documented VOC emissions from PC hardware (Bako-Biro et al., 2004), organizations should ensure ventilation rates exceed standard minimums, particularly in dense, screen-heavy workspaces. Localized PC exhaust systems and air filtration should be considered.

Mandate Pre-Sleep Screen Hygiene Policies: Encourage, and where possible institutionalize, a minimum 30-minute screen-free period before the end of the workday to facilitate circadian recovery.

Provide Ergonomic Workspace Audits: Regular ergonomic assessments should include screen positioning, ambient lighting, anti-glare filters, and blue light blocking solutions.

15.2 For Employees

Adopt personal blue-light filtering glasses or enable night mode on all devices from 6 PM onwards.

Set hard limits on personal screen time after work and avoid all screens within 30 minutes of bedtime.

Self-identify chronotype using validated instruments (Morningness-Eveningness Questionnaire) and advocate for schedule accommodations.

Track sleep duration using wearable technology and report persistent sleep disruption to occupational health services.

15.3 For Policymakers and Regulators

Update occupational health standards to include maximum recommended daily SET limits and mandatory screen break protocols.

Require ESG disclosures to include digital wellness indicators under social pillar reporting frameworks (SASB, GRI).

Commission national-scale epidemiological studies on screen pollution prevalence and its long-term health and productivity consequences.

REFERENCES

[1] Z. Bako-Biro, P. Wargocki, C. J. Weschler, and P. O. Fanger, “Effects of pollution from personal computers on perceived air quality, SBS symptoms and productivity in offices,” *Indoor Air*, vol. 14, no. 3, pp. 178–187, 2004, doi: 10.1111/j.1600-0668.2004.00218. x.

[2] B. Bakker and E. Demerouti, “The job demands-resources model: State of the art,” *Journal of Managerial Psychology*, vol. 22, no. 3, pp. 309–328, 2007.

[3] N. Cain and M. Gradisar, “Electronic media use and sleep in school-aged children and

adolescents: A review," *Sleep Medicine*, vol. 11, no. 8, pp. 735–742, 2010.

[4] M. Chang, D. Aeschbach, J. F. Duffy, and C. A. Czeisler, "Evening use of light-emitting eReaders negatively affects sleep, circadian timing, and next-morning alertness," *Proceedings of the National Academy of Sciences*, vol. 112, no. 4, pp. 1232–1237, 2015.

[5] R. L. Corsi and J. Grabbs, "VOC emissions from packaged and active computers," in *Proc. International Society for Exposure Analysis 2000*, Monterey, CA, USA, 2000.

[6] Deloitte, "Digital sustainability and employee wellness report," *Deloitte Insights*, 2023.

[7] Global Reporting Initiative, *GRI Standards: Employee Health and Safety Disclosures*. GRI, 2021.

[8] B. G. Knave, R. I. Wilbom, M. Voss, L. D. Hedstrom, and U. O. V. Bergqvist, "Work with video display terminals among office employees," *Scandinavian Journal of Work, Environment & Health*, vol. 11, pp. 457–466, 1985.

[9] National Sleep Foundation, "Sleep duration recommendations across the lifespan," NSF, 2022.

[10] T. Roenneberg, K. V. Allebrandt, M. Merrow, and C. Vetter, "Social jetlag and obesity," *Current Biology*, vol. 22, no. 10, pp. 939–943, 2012.

[11] Sustainability Accounting Standards Board, *SASB Standards: Employee Health, Safety, and Well-Being*. SASB, 2022.

[12] P. Wargocki, D. P. Wyon, Y. K. Baik, G. Clausen, and P. O. Fanger, "Perceived air quality, Sick Building Syndrome (SBS) symptoms and productivity in an office with two different pollution loads," *Indoor Air*, vol. 9, pp. 165–179, 1999.

[13] M. Wensing, "Determination of organic chemical emissions from electronic devices," in *Proc. 8th International Conference on Indoor Air Quality and Climate (Indoor Air 99)*, Edinburgh, U.K., vol. 5, pp. 87–92, 1999.

[14] World Economic Forum, "ESG and workplace well-being frameworks," WEF, 2022.

[15] World Health Organization, *Occupational Health Guidelines for Screen-Based Work*. WHO, 2021.

APPENDIX: SURVEY QUESTIONNAIRE

The following questionnaire was used for primary data collection:

Section A: Demographic Information
Age Group: 20–25 / 25–30 / 30–40 / 40+
Gender: Male / Female / Other
Years of Work Experience: N/A / 0–2 / 3–5 / 6–10 / 10+

Section B: Screen Exposure
On average, how many hours per day do you spend on screens for work? [Less than 4 / 4–6 / 6–8 / 8–10 / More than 10]
How many additional hours do you spend on screens after work? [Less than 1 / 1–2 / 2–4 / More than 4]
Do you use screens within 1 hour before sleeping? [Yes / No]
Do you feel eye strain or headaches due to screen use? [1–5 scale]

Section C: Sleep Parameters
How many hours do you sleep on average per night? [< 5 / 5–6 / 6–7 / 7–8 / > 8]
Rate your overall sleep quality. [1–5 scale]
How often do you face difficulty falling asleep? [Never / Rarely / Sometimes / Often / Always]
Do you feel tired during work hours? [1–5 scale]

Section D: Chronotype
When do you feel most productive? [Early Morning / Late Morning / Afternoon / Evening / Late Night]
If given a choice, when would you prefer to work? [6 AM–2 PM / 9 AM–5 PM / 12 PM–8 PM / 4 PM–12 AM]

Section E: Cognitive Function
How often do you experience difficulty concentrating at work? [1–5 scale]
Do you forget tasks or important details easily? [Never / Rarely / Sometimes / Often / Very Often]
Rate your attention span during meetings. [1–5 scale]

Section F: ESG Awareness
Do you believe excessive screen usage is a workplace sustainability issue? [Strongly Agree / Agree / Neutral / Disagree / Strongly Disagree]
Does your organization promote digital wellbeing practices? [Yes / No / Not Sure]