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Cognitive and Organizational Ergonomics as Drivers of Employee Performance in Banks

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Abstract

Purpose: This study investigates how ergonomic practices (i.e., physical, environmental, cognitive, and organizational) influence employee performance in banking environments.
Design/methodology/approach: An explanatory research design was employed. Quantitative data were collected from 367 banking employees in the Kathmandu Valley and analyzed using PLS-SEM.
Findings: Cognitive and organizational ergonomics significantly predict employee performance, whereas physical and environmental ergonomics were not statistically supported.
Implications: The study provides actionable insights for banking managers and HR professionals to design ergonomically optimized work environments that foster employee focus, efficiency, and satisfaction. It emphasizes the need to prioritize cognitive and organizational ergonomics in employee performance enhancement strategies.
Originality/value: This study challenges conventional assumptions about the primacy of physical and environmental ergonomics. It extends the Job Demands-Resources (JD-R) model, fills empirical gaps in the Nepalese banking sector, and offers a theoretically grounded framework for creating supportive, user-friendly workplaces.
Keywords: Banks, employee performance, ergonomics practices

JEL Classification: J24, M12, M54, M55

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Introduction

In the contemporary competitive business environment, employee performance is a critical determinant of organizational success. A key yet often overlooked factor influencing workforce productivity and engagement is ergonomics, the science of designing work environments to suit the physical, cognitive, environmental, and organizational needs of employees (Agrawal et al., 2025). Ergonomics encompasses more than comfortable furniture; it creates a holistic workplace that promotes both well-being and performance.

Rapid technological advancements and evolving business contexts have increased occupational stress, making it a significant workplace health concern (Travers & Cooper, 2024). Insufficient attention to the interplay between work processes and technologies has adversely affected employees' health and hindered organizations from achieving optimal performance outcomes. Modern office environments function as dynamic socio-physical systems, where human behavior, social relationships, values, and corporate culture interact with technology and workspace design (Colenberg et al., 2021; Baobeid et al., 2021; Menozzi et al., 1999).

Organizations are increasingly investing in ergonomics to enhance productivity while managing costs, as ergonomic interventions have been shown to reduce absenteeism, lower medical expenses, and improve job satisfaction (Sever, 2019). In the banking sector, which plays a pivotal role in economic growth (Bhattarai et al., 2023), employees are required to provide high-quality customer service while adhering to stringent regulatory standards (Naik & Rao, 2022). Extended periods of desk work can adversely affect both health and job performance (Ali et al., 2020), highlighting the importance of ergonomics in promoting efficiency and well-being.

According to the International Ergonomics Association (2018), ergonomics studies the interactions between humans and other system elements to optimize performance and well-being. As Ahmadi (2016) explains, it applies scientific principles, data, and techniques to improve human-system interaction. Workplace ergonomics is inherently multidisciplinary, addressing factors such as illumination, noise, temperature, and workstation design to enhance employee comfort and efficiency (Bolis et al., 2023; Merino-Salazar, 2017; Deshpande, 2013). Traditional office designs have gradually shifted toward human-centric, flexible, and adaptive environments (Chandra et al., 2020), aiming to reduce work-related musculoskeletal disorders (WMSDs) and other health concerns that negatively impact productivity (Heidarimoghadam et al., 2020; Wilder & Sigurdsson, 2015; Koshy et al., 2020; Svendsen et al., 2020).

High-performing employees are essential for achieving competitive advantage and profitability, encompassing both behavioral aspects—actions undertaken by employees, and outcome aspects—tangible results of these actions (Aguinis, 2005). Maximizing productivity requires aligning work processes, tools, and environments with employee motivation and capabilities (Sekar et al., 2013). In the banking sector, where speed, accuracy, and customer satisfaction are vital, ergonomics plays a crucial role in creating supportive conditions for efficient performance.

Organizations worldwide have increasingly embraced innovative workplace designs to meet diverse employee needs, incorporating flexible schedules, inspiring interiors, and learning opportunities to enhance productivity and reduce health-related issues (Adhikari et al., 2021; Harris, 2016; Nielsen et al., 2017; Sabir et al., 2019). Ergonomic practices not only improve employee well-being but also foster engagement, creativity, and organizational value (Agrawal et al., 2025; Sabir et al., 2019). Governments have also established regulations to ensure safe and healthy work conditions, reinforcing the alignment between job demands and workers' capabilities (Akinbola & Popoola, 2019; Kamala et al., 2024; Jaffar et al., 2011; Neumann & Dul, 2005).

Despite the demonstrated benefits, inconsistencies remain in the prioritization of ergonomic factors, and debates persist regarding the cost-effectiveness of ergonomic interventions. While some perceive them as unnecessary expenses (Ranabhat, 2015), empirical evidence shows clear returns through improved employee health, satisfaction, and performance (Sohrabi & Babamiri, 2021; Asmare & Hailemariam, 2025). Education on ergonomic benefits is vital for both employers and employees to optimize workplace conditions (Ranabhat, 2015).

Although the literature on workplace ergonomics is extensive, most studies focus on physical aspects, often employing solely quantitative or qualitative approaches. Consequently, empirical gaps remain regarding comprehensive, mixed-methods investigations, particularly in the context of developing economies such as Nepal. A mixed-methods design allows for a deeper exploration of complex relationships between ergonomic practices and employee performance, yielding robust and actionable insights (Creswell, 2003; Tashakkori & Teddlie, 1998). In Nepal's banking sector, where ergonomic implementation is still emerging, rigorous studies integrating both quantitative and qualitative approaches are scarce.

Addressing these gaps, the present study examines the impact of ergonomic practices on employee performance in Kathmandu Valley's banking sector, combining quantitative analysis with qualitative exploration. By contextualizing ergonomic frameworks within Nepalese banking environments, this research aims to advance understanding of how ergonomics influences employee efficiency, well-being, and overall organizational success.

Literature Review

Ergonomics and Workplace Performance: Global Trends and Nepalese Perspectives

Ergonomics, also known as human factors engineering, involves designing systems, tools, and environments that align with human capabilities and needs to enhance safety, comfort, and productivity. The field has its roots in the Industrial Revolution, with pioneers such as Bernardino Ramazzini and Frederick Winslow Taylor emphasizing workplace efficiency and the mitigation of occupational hazards (Koirala & Nepal, 2022). The mid-20th century marked the formalization of ergonomics as a discipline, with the establishment of the International Ergonomics Association (IEA) and the adoption of principles such as work physiology, biomechanics, and anthropometry in European industries (Sarri-Chalkidou, 2024; Keyserling & Chaffin, 1986). World War II further

accelerated the development of ergonomics, as human-centered design became essential in military equipment and soldier training. The term “ergonomics” was coined by Hywel Murrell in 1949, consolidating the discipline’s focus on optimizing human-system interaction (Stack & Ostrom, 2023; Wilson, 2000). In recent decades, the rise of computers and digital technologies has introduced new challenges in office ergonomics, addressing issues such as repetitive strain, musculoskeletal disorders, and interface usability. The field has since expanded into cognitive, organizational, and emotional ergonomics, encompassing mental workload, organizational support systems, and overall well-being (Mokdad & Moniem, 2017).

Globally, ergonomic practices vary by region and industry. Scandinavian countries such as Sweden, Denmark, and Norway emphasize employee well-being through office designs that incorporate sit-stand desks, ergonomic seating, and natural lighting (Hanson et al., 2009). In the UK, spatial layout and workflow optimization are central to improving employee efficiency (Hignett et al., 2015). In the United States, workplace safety and digital ergonomics are prioritized, with organizations like OSHA establishing guidelines to prevent musculoskeletal injuries and support healthy interactions with technology (Zerguine et al., 2023). South American countries, including Brazil, implement ergonomic interventions to reduce exposure to workplace hazards and enhance job fit, while Asian manufacturing industries increasingly adopt “people-oriented” designs to align with global standards of sustainable and user-friendly workplaces (Soares, 2006; Merino-Salazar et al., 2017; Cheng, 2011). Despite this growth, small businesses and certain industrial sectors in Asia and Africa often lack resources or awareness to implement ergonomics effectively (Sout et al., 2015; Chowdhury & Chakraborty, 2017; Mokdad et al., 2019).

In Nepal, ergonomics remains an emerging concept, with many businesses unaware of the need for workplace design aligned with ergonomic standards. Although terms like “healthy workplace” and “occupational health and safety” are commonly cited, practical adoption is limited, especially among small enterprises and labor-intensive industries such as construction and transportation (Ranabhat, 2015; Nepal & Koirala, 2024; Prajapati et al., 2023). While large private companies have made incremental improvements, short-term cost considerations often outweigh long-term health and productivity benefits. The implementation of lean practices in Nepali organizations also tends to focus solely on technical efficiency, neglecting human factors and ergonomics, which negatively affects employees’ quality of work life and overall performance (Gedara & Madusanka, 2024; Biondo et al., 2024).

Empirical research highlights the positive relationship between ergonomic practices and employee performance. Human factors and ergonomics (HFE) encompass physical aspects such as posture, repetitive movements, lifting, and vibration, as well as organizational aspects like job rotation, coworker support, and supervisor guidance (Nagaraj & Jeyapaul, 2021). Studies across various sectors, including banking, healthcare, and government organizations, demonstrate that appropriate lighting, workstation design, noise control, and ergonomic training improve employee well-being, reduce discomfort, and enhance productivity (Rahman et al., 2022; Sharma et al., 2021; Muhammad et al., 2020; Motlagh et al., 2020; Hamidi et al., 2020). Furthermore, environmental factors such as temperature and lighting affect cognitive function and motivation, influencing overall work performance (Luo et al., 2021). Research consistently

supports the notion that ergonomically designed workplaces promote physical comfort, mental health, and organizational efficiency (Makhbul et al., 2022; Ndubuisi, 2022; Akbar, 2022; Ajmair et al., 2022).

Physical Ergonomics and Employee Performance

Physical ergonomics focuses on designing workplaces, tools, and equipment to enhance employee comfort, safety, and efficiency while reducing the risk of injury or strain (Rahman et al., 2022). Proper workstation setups, adjustable chairs, and desk arrangements improve focus, reduce fatigue, and support overall well-being, leading to higher productivity and accuracy (Boadi-Kusi et al., 2021; Burke, 2000). Research across industries—from manufacturing to offices- demonstrates that ergonomic interventions reduce absenteeism, prevent musculoskeletal disorders, and improve operational outcomes (Robertson, 2008; Hoe et al., 2018; Koirala & Nepal, 2022).

H1: Physical ergonomics positively influences employee performance.

Cognitive Ergonomics and Employee Performance

Cognitive ergonomics examines how work systems interact with employees' mental processes, including perception, memory, attention, and decision-making (Colovic, 2011). By reducing cognitive overload, role ambiguity, and work-related stress, organizations can improve focus, decision-making, and overall performance (Nazir & Amin Beig, 2022). Training, feedback, and user-friendly systems enhance skills and task efficiency, as evidenced in banking, healthcare, and manufacturing contexts (Sharma et al., 2021; Park et al., 2019; Pallas et al., 2016). Cognitive ergonomics thus facilitates better accuracy, productivity, and well-being.

H2: Cognitive ergonomics positively influences employee performance.

Organizational Ergonomics and Employee Performance

Organizational ergonomics addresses sociotechnical aspects such as structures, policies, communication systems, and work schedules to improve employee satisfaction and efficiency (White, 2008). Job rotation, supportive supervision, coworker collaboration, and flexible scheduling enhance social support, reduce stress, and optimize performance (Bouville & Alis, 2014; Nagaraj & Jeyapaul, 2021; Song et al., 2016). Efficient organizational processes also improve compliance, workflow, and resource management, which are critical in sectors like banking, healthcare, and manufacturing (Lee et al., 2018; International Ergonomics Association, 2018).

H3: Organizational ergonomics positively influences employee performance.

Environmental Ergonomics and Employee Performance

Environmental ergonomics focuses on the physical conditions of the workplace, such as lighting, temperature, noise, ventilation, and workspace layout, to support employees'

physical and cognitive well-being (Jayathilaka & Karunarathne, 2021). Proper lighting, comfortable temperatures, and low noise levels reduce fatigue, prevent errors, and increase overall productivity (Idkhan & Baharuddin, 2019; Sun & Han, 2021). Empirical studies show that optimizing environmental factors can enhance worker focus, accuracy, and efficiency across industries (Roelofsen, 2002; Nazir & Amin Beig, 2022; Park et al., 2019).

H4: Environmental ergonomics positively influences employee performance.

Research Methods

This study employed a quantitative explanatory research design to examine the relationship between ergonomics practices and employee performance among banking employees in Kathmandu Valley. A survey was administered to 367 employees, achieving a response rate of 76.29%, using convenience sampling through both personal visits and electronic communication via Kobo Toolbox. The study measured four dimensions of ergonomics—physical, cognitive, environmental, and organizational—using validated scales adapted from prior research, while employee performance served as the dependent variable. All survey items were rated on a five-point Likert scale ranging from "strongly disagree" to "strongly agree." Content validity was ensured through face validation by seven experts in organizational psychology, ergonomics, and human resource management, while a pilot study with 30 respondents confirmed reliability and construct validity. Demographic data indicated that 56% of respondents were male, 87% were under 40 years of age, and the majority held assistant-level positions with 1–6 years of experience. The collected data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess the relationships between the ergonomics dimensions and employee performance. Ethical considerations included informed consent, anonymity, and voluntary participation of all respondents. The study's design ensured methodological rigor through standardized measurement instruments, pretesting, and adherence to statistical validation criteria. Thus, this approach provides robust quantitative evidence on how different ergonomic practices influence employee performance in the Nepalese banking sector.

Results

Descriptive and inferential analyses were performed using Smart-PLS 4.0 and SPSS Version 23. The study first assessed the normality of the scale items, with descriptive statistics revealing mean values ranging from 2.933 to 4.131 and standard deviations between 0.730 and 1.077, indicating low variability in the data. Normality was further confirmed as skewness and kurtosis values fell within the recommended thresholds of ±2 and ±7, respectively (Curran et al., 1996), demonstrating that the data were suitable for advanced statistical analysis. To address potential common method bias (CMB), a full collinearity assessment using variance inflation factor (VIF) values was conducted following Kock's (2015) approach, with all VIF values remaining below 3.3, indicating that CMB was not a concern. The research model employed reflective constructs, as variations in the latent variables influence the measurement of their corresponding

observed indicators. Following Hair et al. (2019), the model was evaluated using a two-stage approach, encompassing both measurement and structural model assessments. This procedure ensured the reliability, validity, and robustness of the constructs before testing the hypothesized relationships. Thus, these analyses confirm the suitability of the data and the methodological rigor of the study.

Measurement Model Results

The reliability and validity of the constructs were examined using the measurement model assessment approach outlined by Hair et al. (2017). Reliability was evaluated through indicator reliability, Cronbach's alpha, and composite reliability (CR), with all remaining values exceeding the recommended threshold of 0.70 (Cohen, 2013; Hair et al., 2017), indicating strong internal consistency. Three items—PE_6, EE_6, and EP_3—were removed due to low factor loadings. Convergent validity was confirmed as all constructs met the standard criteria: average variance extracted (AVE) greater than 0.50, CR exceeding 0.70, and CR values higher than the corresponding AVE. Detailed results of these assessments are presented in Table 2.

Table 2

Reliability and validity

Constructs	Observed Items and Coding	Standardized Factor Loading (SFL)	Average Variance Extracted (AVE)	Composite Reliability (CR)	Cronbach's Alpha
Physical Ergonomics (PE)	PE_1	0.747	0.618	0.889	0.845
	PE_2	0.83			
	PE_3	0.875			
	PE_4	0.723			
	PE_5	0.742			
Environmental Ergonomics (EE)	EE_1	0.77	0.563	0.865	0.815
	EE_2	0.769			
	EE_3	0.769			
	EE_4	0.733			
	EE_5	0.709			
	CE_1	0.748	0.613	0.905	0.873

Cognitive Ergonomics (CE)	CE_2	0.78			
	CE_3	0.791			
	CE_4	0.833			
	CE_5	0.835			
	CE_6	0.704			
Organizational Ergonomics (OE)	OE_1	0.738	0.557	0.898	0.867
	OE_2	0.753			
	OE_3	0.716			
	OE_4	0.744			
	OE_5	0.761			
	OE_6	0.778			
	OE_7	0.732			
Employees Performance	EP_1	0.798	0.655	0.919	0.894
	EP_2	0.755			
	EP_4	0.869			
	EP_5	0.854			
	EP_6	0.779			
	EP_7	0.794			

Note. Researcher's calculation from field data (2025)

Discriminant validity was assessed using the Fornell–Larcker criterion, Heterotrait–Monotrait ratio (HTMT), and cross-loadings. The Fornell–Larcker test confirmed that the square root of each construct's AVE exceeded its correlations with other constructs (Fornell & Larcker, 1981; see Table 3). HTMT values were all below the 0.85 threshold, supporting discriminant validity (Henseler et al., 2015; see Table 4). Cross-loading analysis further showed that each indicator loaded highest on its respective construct, indicating no discriminant validity issues in the study.

Table 3

Discriminant validity - Fornell and Larcker test

Fornell and Larcker test					
	CE	**EE**	**EP**	**OE**	**PE**
CE	**0.783**				
EE	0.453	**0.75**			
EP	0.611	0.429	**0.809**		
OE	0.635	0.428	0.726	**0.746**	
PE	0.397	0.383	0.47	0.541	**0.786**

Note. Researcher's calculation from field data. (2025)

Table 4

Discriminant validity - HTMT test

HTMT TEST					
	CE	**EE**	**EP**	**OE**	**PE**
CE					
EE	0.516				
EP	0.678	0.468			
OE	0.727	0.485	0.814		
PE	0.456	0.432	0.526	0.618	

Note. Researcher's calculation from field data. (2025)

Structural Model Analysis

After confirming the measurement model, the structural model was assessed to test the hypothesized relationships between exogenous and endogenous variables (Hair et al., 2017). A bootstrapping procedure with 10,000 resamples was applied to estimate path coefficients, including beta values, standard errors, t-values, p-values, and confidence intervals. The model's explanatory power, indicated by an R^2 of 0.576 for employee performance, reflects moderate predictive strength based on the four independent variables (Hair et al., 2011). Multicollinearity was examined using inner VIF values, all below 5, confirming no collinearity issues (Sarstedt et al., 2017). Model fit was also acceptable, with an SRMR value of 0.081, well within the 0.10 threshold (Henseler, 2014).

Furthermore, the study examined the causal relationship by analyzing the direct effects of economic practices on employee performance. The findings of the bootstrapping approach are detailed in Table 5. An analysis of the direct relationships clearly reveals that the relationship between physical ergonomic and employee performance was statistically insignificant (β = 0.075, t = 1.443, p-value = 0.149). Hence, H1 was rejected. By H2's findings, environmental ergonomics and employee performance exhibit a statistically insignificant relationship (β = 0.082, t = 1.78, p-value = 0.075), which means that H2 is rejected. Similarly, cognitive ergonomics significantly improves employees' performance (β = 0.22, t = 4.068, p-value = 0.000), confirming H3. Furthermore, organizational ergonomics has a significant effect on employee performance (β = 0.051, t = 8.867, p-value = 0.000). Thus, hypothesis 4 is accepted.

Table 6
Empirical Results of the Structural Path

Structural Path	Beta Coefficient	SE	t-values	P-values	Empirical Decision
H1: PE -> EP	0.075	0.052	1.443	0.149	Not Supported
H2: EE-> EP	0.082	0.046	1.78	0.075	Not Supported
H3: CE-> EP	0.22	0.054	4.068	0.000	Supported
H4: OE-> EP	0.51	0.058	8.867	0.000	Supported

Note. Researcher's Calculation from Field Data (2025)

Discussion

The results indicate that cognitive and organizational ergonomics significantly enhance employee performance, whereas physical and environmental ergonomics do not show statistically significant effects. Cognitive ergonomics—such as clear procedures, user-friendly systems, and effective training—reduce mental workload and improve efficiency (Hu, 2017; Navimipour, 2015; Schaule, 2018). Organizational ergonomics—including managerial support, recognition, and adequate resource allocation—positively influence morale and productivity (Welsh, 2015; Barmore & H. R., 2019; Nyamekye & F., 2012). The qualitative findings corroborate these results, with participants emphasizing streamlined processes and supportive leadership as critical for performance in cognitively intensive and customer-oriented environments like banking.

In contrast, although prior studies highlight the importance of physical ergonomics in preventing discomfort and improving performance (Singh & J, 2000; Ramlall & J, 2008) and environmental factors such as lighting and noise in shaping well-being and

productivity (Attaianese & E., 2017; Ari et al., 2016; Altomonte et al., 2020), this study did not find significant statistical effects. This may be due to the relatively low physical demands of banking tasks and variations in ergonomic implementation across branches. However, qualitative insights suggest that discomfort and environmental stressors can still influence concentration and comfort, indicating the need for context-specific interventions.

Thus, the integrated findings demonstrate that managing cognitive load and strengthening organizational support are central to improving performance in knowledge-intensive sectors. While physical and environmental ergonomics may play a secondary role statistically, a holistic ergonomic strategy remains important for sustaining employee well-being and productivity.

Based on these findings, the study proposes the Cognitive Organizational Ergonomics Synergy (COES) model, which conceptualizes the interaction between cognitive and organizational ergonomics as a key driver of employee performance and job satisfaction in cognitively demanding industries. This model extends existing ergonomics and performance literature by emphasizing mental workload management and structured organizational support as strategic resources for enhancing employee outcomes.

Conclusion and Implications

This study advances understanding of ergonomics in the banking sector, particularly within developing economies such as Nepal. The findings underscore the dominant influence of cognitive and organizational ergonomics on employee performance, challenging conventional perspectives that prioritize physical and environmental dimensions. Consistent with the Job Demands–Resources (JD–R) framework, ergonomic practices operate as critical job resources by easing mental workload and strengthening engagement. By situating the analysis within Nepal's banking context, the study contributes empirical evidence from a setting that remains underrepresented in ergonomics research. Its mixed-method rigor further deepens theoretical clarity by distinguishing the differential effects of ergonomic dimensions and demonstrating that performance in cognitively intensive industries depends largely on mental workload management and structured organizational support.

Beyond theoretical contributions, the findings hold practical significance. Bank management can enhance productivity and employee well-being by prioritizing intuitive technologies, streamlined workflows, and supportive leadership practices. Such targeted ergonomic interventions can foster greater efficiency, satisfaction, and sustained performance.

The study also carries interdisciplinary relevance. Insights regarding cognitive and organizational ergonomics can inform practices in STEM-oriented environments—including laboratories, academic institutions, and technology-driven workplaces—where mental demands and decision complexity are high. Applying similar ergonomic principles in these contexts may improve workflow coordination, reduce cognitive strain, and enhance decision quality. Although physical and environmental ergonomics were not statistically significant, qualitative evidence highlights their role in employee comfort and concentration, suggesting that interventions such as optimized lighting, noise control, and adjustable workstations remain valuable across knowledge-intensive sectors.

For policymakers and industry bodies, the results support the development of ergonomic standards that extend beyond physical design to incorporate cognitive and organizational considerations. Even where statistical effects are limited, context-sensitive adjustments—such as quiet workspaces and adaptable furniture—can complement broader strategies centered on organizational support. These findings may guide occupational health frameworks and encourage standardized ergonomic policies across the financial and service sectors.

Despite its contributions, the study has limitations that open avenues for future research. The sample was confined to Class A commercial banks; subsequent studies could include Class B and C institutions to enhance generalizability. Expanding the model to test mediating and moderating variables—such as job satisfaction, stress, age, or personality—would clarify underlying mechanisms and boundary conditions. Further research could also examine ergonomics in other service industries, including call centers and insurance firms, where task structures and customer interactions differ. Additionally, exploring how emerging technologies such as automation, artificial intelligence, and virtual reality reshape ergonomic demands would provide timely insights into optimizing performance and well-being in evolving work environments.

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Conflict of Interest

The Authors declare that there is no conflict of interest.

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