

Cognitive Ergonomics on Employee Wellbeing: A Literature Review

Ranjana Koirala¹, Kiran Maharjan²

Abstract

Ergonomics is a strategy to reduce occupational disease rates and improving general working conditions for employees in order to improve productivity. Employee participation is often suggested to improve employees' relations to the organization. Research shows that ergonomics adoption on workplace to enhance the productivity level by reducing health related problem and building employee friendly work environment is milestone to enhance employee performance. However, it is less known in context of Nepal. This study aims to explore cognitive ergonomics on employee wellbeing. For this study, research papers are exhaustively selected from scientific databases like Scopus, Web of Science, Science Direct and Google Scholar by developing criteria for each component to ensure the idea goes in-depth and analyzes the roles of the importance of cognitive ergonomics in promoting employee performance. In the process of paper selection, we set a criterion that the paper should directly or indirectly comprise cognitive ergonomics on employee wellbeing. The papers available in the database from 2000 to 2022 are mostly reviewed in order to complete this study. This study concludes that cognitive ergonomics is a subset of the greater subject of human factors and ergonomic sciences; however, it is still a relatively untapped resource for enhancing employee wellbeing. If planned effectively, cognitive ergonomics may make major contributions to increasing job performance, lean operations, productivity, and, ultimately, establishing safer and healthier workplaces in the industry.

Keywords: Cognitive Ergonomics, Organizational Psychology, Employee Wellbeing, Stress Management

1. Introduction

Organizational psychology has spent years studying the relationship between worker productivity and happiness (Wright, 2010; Sabir et al., 2019). They are more productive and profitable if they are able to design a workplace that creates congruence in the line of sight between employer and employee interests which means that the workplace is designed where employees believe they will benefit financially and psychologically if the organization is profitable and successful (Gilbreath, 2004; Kossek et al., 2012). In the past two decades employers have taken major initiatives to promote workplace wellness (Keller et al., 2009; Singh et al., 2019). The performance of workload relies heavily on cognitive functioning – a mental process that involves information processing such as attention, working memory, decision making and learning in workplace (Sweller et al., 2019; Ghalenoei et al., 2022). This broad term coined for this process is cognitive ergonomics.

Cognitive ergonomics studies cognition in the workplace and operational settings, so as to augment human well-being performance and at the same time system performance too (Christy & Duraisamy,

¹ KIST Medical College and Teaching Hospital, Tribhuvan University, Lalitpur, Nepal, Email: ranjanakoira2070@gmail.com

² Quest International College, Pokhara University, Gwarko, Lalitpur, Nepal

2020). It is a subdivision of the grander field of human capital and ergonomics (Kalakoski et al., 2020). In any work system, the workers and their environment should be considered as an extremely interactive joint cognitive system (Johansson & Hollnagel, 2007). The cognitive ergonomics focuses on cognitive processes in the design of environment and technology (Young et al., 2015). Employee well-being is based on the state of individuals' mental, physical, and general health, as well as their experiences of satisfaction both at work and outside of work. In this light, employee well-being is influenced by the pleasure or displeasure derived from the job itself, as well as individuals' interactions with colleagues, teammates, and supervisors (Shrestha et al., 2021). Well-being comprises both psychological outcomes such as lack of distress, anxiety, and emotional exhaustion, and physiological outcomes such as blood pressure, heart condition, and general physical exhaustion (Danna & Griffin, 1999; Koirala & Bhattarai, 2021, 2022).

Cognitive ergonomics as being concerned with mental processes such as perception, memory, reasoning and motor response, as they affect interactions among human and others elements of a system (Zolotova & Giambattista, 2019; Gangopadhyay, 2022). Cognition and Ergonomics indicate the cognitive aspects of the interaction between the people, the work system and the artefact where the intention of designing them so that the interaction is effective (Dittmar et al., 2021). The cognitive processes such as perception, learning as well as problem solving play an important role in the interaction with artefacts and they must be considered to explain the cognitive tasks that people perform (Błaszak et al., 2019). Traditionally, cognitive analysis of interaction has been implemented by applying theoretical models of human cognitive processes proposed by cognitive psychologists (Kirshner & Whitson, 2021). Furthermore, employee well-being in terms of positive outcomes such as job satisfaction, happiness, organizational commitment, intention to remain with the organization, work engagement, sense of purpose, and affective wellbeing (Boyd & Nowell, 2020; DiPietro et al., 2020). It is based on human perception, mental processing, and memory information. As these may relate to human-system design, relevant topics include mental workload, decision-making, skilled performance, human-computer interaction, human reliability, work stress, and training (Christy & Duraisamy, 2020).

In modern digitalized work environments in global era, the performance of work tasks relies heavily on cognitive functioning (Kozyreva et al., 2020). These days, globalization has opened up different means for easy access to capital, people, technology, knowledge and opportunities, thereby resulting in a more diverse and inclusive work environment (Devkota et al., 2020, 2021). In this respect, good performance and high employee wellbeing is more concerned part to promote organization in its growth by promoting welfare among the employee (Yu et al., 2021). Employee Wellbeing is becoming a growing concern, because it has more focused on human resource and thus it has become an immense challenge focus on effects of cognitive ergonomics on wellbeing of employee and deal with stress level of employees (Di Fabio & Peiró, 2018). As MacKy and Boxall (2008) good work performance and high employee well-being are mutually connected where job satisfaction and well-being at work are associated with better workplace performance. It is therefore essential to manage cognitively straining conditions and reduce their harmful consequences for individual employees, teams, organizations, and society. The cognitive processes such as perception, learning as well as problem solving play an important role in the interaction with artefacts and they must be considered to explain the cognitive tasks that handle and performed by people (Susi & Ziemke, 2001).

The methodology used in this study aimed to explore the concept of cognitive ergonomics and its impact on employee wellbeing, specifically in Nepalese organizations compared to other SAARC countries. To achieve this, a comprehensive review of existing literature on cognitive ergonomics, using scientific databases such as Scopus, Web of Science, Science Direct, and Google Scholar are conducted. The selection of papers for review was done by developing specific criteria for each component, ensuring that the study goes in-depth and analyzes the importance of cognitive ergonomics in enhancing employee performance. The criteria for paper selection stipulated that the papers should directly or indirectly address cognitive ergonomics and employee wellbeing, thereby ensuring that the selected papers would be relevant to the study. The review process covered papers that were available in the database from 2000 to 2022. This research aimed to cover the most recent developments in this field to provide the most up-to-date insights into the concept of cognitive ergonomics and its impact on employee wellbeing. In a nutshell, this study provides valuable insights into the concept of cognitive ergonomics and its role in promoting employee performance and wellbeing in Nepalese organizations. By selecting and reviewing research papers from various scientific databases, this study enhances the existing literature on cognitive ergonomics, highlighting the importance of further research in this area. The findings of this study can benefit organizations in Nepal and other countries where labor employment is a significant source of production ecosystem.

2. Cognitive Ergonomics on Employee Well-being

As the global environment becomes more dynamic, organizations and businesses are compelled to constantly seek the most appropriate systems to maximize their innovation planning and management through new methods and paradigms that efficiently serve new and existing markets with new and/or modified products and services. The operation of organizations establishes a link between macro- and micro-level data, ergonomic thinking in relation to radical innovation, value creation, and their processes, where various communities and stakeholders are involved. As ergonomic knowledge and research has advanced, as well as new human concerns have developed across the world, ergonomic applications have evolved (Liem & Brangier, 2012).

Human well-being, including the avoidance of musculoskeletal disorders and other workplace health and safety goals, is the major emphasis of ergonomics study and advice. Furthermore, in many countries, ergonomics is closely linked to occupational health and safety laws. In terms of health and safety, the current trend in western government policies, which is to reduce command-control legislation while increasing support for voluntary initiatives, is a threat to ergonomics since organizations will not start ergonomic initiatives on their own (Wilder & Sigurdsson, 2015). Occupational or workplace injury has been acknowledged in the office environment for decades. Occupational safety practices are used in developed nation organizations, while occupational safety, cognitive ergonomics, and organizational ergonomics practices are yet untapped in most developing country organizations (Inyang et al., 2012). In the United Kingdom, ergonomic interventions such as changing chair height to relieve knee flexion, moving armrests to allow forearms to be parallel to the floor, and adjusting head position are used. In recent years, research into the creation of ergonomic solutions to lower the risk factors for musculoskeletal disorders among workers has increased. Despite this, the use of ergonomic treatments in the workplace is still in its early stages (Dul et al., 2012).

According to a study done in Denmark, employees and occupational health and safety experts have a poor awareness of workplace OHS practices linked to the prevention and treatment of MSDs. OHS specialists have asked for recommendations for preventing and treating work-related MSDs, stating that the standards should focus on a variety of OHS concerns as well as human ergonomics to decrease workplace harm. Organizations are working on a guideline on ergonomics and safety practices for preventing and treating MSDs in the workplace (Dunn et al., 2011). The subject of increasing workplace quality of life has been disregarded in Argentina due to problems such as industrial reconversion procedures, privatization, and inflation management. The risk of health hazards has grown as these places have been overlooked.

Various workplace safety measures are used to reduce health risks. Job fit for the employee has received greater attention in recent years. Workplaces are constructed based on an employee's aptitude or compatibility to optimize their job performance (Chan et al., 2020). Repetitive movements were the most common exposures for men and women in terms of physical, chemical, biological, and ergonomic working conditions in South America, ranging from 50.8 percent in Argentina to 84.4 percent in Colombia for women and 58.6 percent in Uruguay to 77.3 percent in Central America for men (Merino-Salazar et al., 2017). In line with worldwide trends (Mokdad et al., 2019) ergonomics principles are being used in a variety of industries. Ergonomics design is being adopted by the health sector, industry, agriculture, service sector, and manufacturing to combat health-related issues. Ergonomics is more common in industrialized countries than in poor countries.

Table 1: Cognitive Ergonomics on Employee Well-being in Global Context

Author Country	Findings	Conclusion and Recommendations
Nabirye et al. (2011) Kampala, Uganda	In nursing experience, family responsibility influence hospital nurses' perception of occupational stress, job satisfaction and job performance	Research to identify organizational, family or social factors which contribute to reduction of perceived occupational stress and increase job satisfaction and job performance was recommended.
Kwon et al. (2021) United States of America	Older age groups using the JD-R model that suggest that although job demands can lead to burnout and stress, job resources help reduce their effects, and in turn, may result in better teacher engagement in their work	Most of the studies on early childhood teacher well-being conducted to date have examined one or two aspects of well-being or the role of working conditions for those limited aspects of well-being
Ajmal et al. (2021)	Safety improvement is a continuous process. It improves when organizations take serious initiatives which included safety training and its implications of learned skills and knowledge.	The validated model will help the top management, safety leaders, and strategists maintain occupational health and safety performance to reduce accident rates, injuries, and near misses
Olabode et al. (2017) Nigeria	Employee/human element into ergonomics design process by getting detailed anthropomorphic data, which may bridge the communication disconnect between employees and ergonomic designers	Organizations should orientate and train employees on ergonomics so that they will be aware of the benefits derivable from it and be able to fit into the organization's designs.
Hamrol et al. (2011) Poland	The study found that only a small number of work conditions have a significant	Work monotonous raised the probability of quality failures, and the

	effect on the quality of the assembly process. The study also confirmed the hypothesis that the interaction between two critical work factors, noise level, and work monotony, has a significant impact on the quality of the assembly process.	combination of work monotony and noise level increased the chance of quality failures by a factor of three and ten, respectively, although noise level alone had no effect on quality.
Eklund (1995) Sweden	Six stages of the study were carried out in eight departments. Physical demands, psychological demands, and difficult to assemble task categories were applied to 58 tasks. Inspectors were questioned and quality statistics were acquired.	In the final adjustment department, the relative risk of quality issues for high-risk activities was 2.95 (P .05), and in the random disassembly inspection department, the relative risk was 1.94.
Christy and Duraisamy (2020) Portugal	High scores are derived from a good interaction between lean, ergonomics and safety	To be up-to-date on lean thinking implementation progress, a repetitive evaluation of leanness by frequent assessments becomes a necessity, as it helps in assessing the contribution of the lean practices implemented by the firm toward improving its performance
Kalakoski et al. (2020) Finland	(i) The response accuracy in data-based decision-making decreases when the amount of information increases and (ii) irrelevant information affects judgement.	A cognitive bias in data-based decision-making Good cognitive ergonomics of design should support the encoding of the reality of the situation with shortening the sequences when presenting information;

3. Cognitive Ergonomics Practices in Asian Countries

Recently ergonomics has attracted widespread attention in the Asian context too. The understanding of ergonomics, a suitable work environment, and acceptable postures is severely poor among India's small enterprises and unorganized sector. Musculoskeletal diseases (MSDs) are common in small companies due to the manual motions performed (Dded & Uide, 2014). Because of the poorly built workplace in India, the number of persons suffering from occupational ailments is increasing at an alarming rate.

People who are totally aware of ergonomic workplace principles do not always execute ergonomics specified at a workstation, according to the current study (Das, 2020). The ergonomics idea has been used to groundwater conservation study in Denpasar, Bali, Indonesia. Ergonomics are critical for the long-term effectiveness of groundwater conservation projects, which have been widely embraced in Indonesia. Human activities were the focus of ergonomics application. The ergonomics method is paired with the hydrogeological approach to develop designs that are appropriate for the socio-cultural local community's capabilities, limits, and conditions, allowing the program to be continued indefinitely (Sudijajeng et al., 2020). Traditionally, cognitive analysis of interaction has been implemented by applying theoretical models of human cognitive processes proposed by cognitive psychologists. However, this approach is now facing a serious dilemma, predictions made from these models developed in laboratory settings with particular materials, tasks and people are not confirmed when we have to predict how a person interacts with an artefact. Cognitive Ergonomics studies how people can understand the concepts and principles used in support systems, to solve a problem or to elaborate a decision (Jung et al., 2020). For example, the heuristic of search used by the computer can be different from that used by the human user.

It is possible to wonder then, if it would be necessary for the device to be transparent such that the human user will be able to understand the heuristic of search that it uses, or that it is enough that it carries out some algorithms correctly without revealing them. In Asian industrial design, the relevance of merging user-friendly design concepts with ergonomic ideas in sustainable design is continuously increasing (Yang & Cheng, 2017). Because of budgetary restrictions, small businesses in Asia do not practice ergonomics at work. For a decade, the international ergonomics community has been attracted by the fast expansion of ergonomics disciplines and the rising Asian economy. Despite the fact that Asia has progressed from a traditional agrarian to a sophisticated industrial culture, ergonomics knowledge and practice are still in their infancy (Srivilai & Sorod, 2019).

Table 2: Cognitive ergonomics on Employee Well-being in Asian Countries

Author/Country	Findings	Conclusion & Recommendations
Sakthi Nagaraj and Jeyapaul (2021) Tiruchirappalli, India	Physical ergonomics has more influence on the enhancement of lean performance than organizational ergonomics. Cognitive ergonomics have the least influence on lean performance enhancement	Operational managers, lean consultants and policy makers alike should explore ways to improve the usability of human-centered lean practices in organizations. Comfortable working conditions for workers who are involved in lean practices ensures the adoptability of lean practices and enhanced lean performance.
Qaiser Suleman et al. (2018) Khyber Pakhtunkhwa, Pakistan	Negative correlation between perceived occupational stress and psychological well-being, moderate negative correlation was found between all the sub- scales of perceived occupational stress and psychological well-being	Collaboration with policy makers to formulate a comprehensive strategy for stress reduction management for secondary school heads that develop good psychological well-being.
Buddhacharya (2022) Kathmandu, Nepal	There was a moderate level of stress in the IT sector of the Kathmandu valley which has contributed to negative effect on the performance of the employees.	Employee performance can be affected by occupational stress in both positive and negative ways. Employees in any firm can also be benefited from stress, but it depends on how the person manages it. When an employee's capacity for handling stress exceeds the limit, the stress may have a detrimental effect on their performance.
Makhbul et al. (2013) Malaysia	Components of ergonomic workstation reveals that 38.4% of the changes in workplace stress outcomes are due to the relationship between stress and ergonomic factors, which include human; machine; work area; and environmental factors. Among	A thorough evaluation must be performed in relation to employees' health factors; work area design; shiftwork; humidity; and working hours, particularly since all variables have a significant relationship with workplace stress outcomes.
Vimalanathan and Babu (2017) Chennai, India	The temperature and illumination are independently significant on the productivity of the office workers have been understood.	Ergonomic factors have a significant and positive impact on computer operators' work productivity. The results revealed that the environmental ergonomic factors, cognitive ergonomic factors, and organizational ergonomic factors have more influence on productivity.

4. Cognitive Ergonomics on Employee Wellbeing: Key Observation and Lesson Learned

Cognitive strain related to work demands and target setting with working conditions is a notable risk factor for work performance (Then et al., 2013). As it directly affects the employee ability to master cognitively demanding work tasks. Disruptions in the work environment, such as speech and office noise disrupt office-related tasks and interruptions have harmful consequences for task performance (Banbury & Berry, 2005). Furthermore, information overload manifested as multitasking or through new interaction technologies hinder task performance. Not only do cognitively straining working conditions directly impair cognitive functioning and task performance; they can also lead to cognitive failures that affect overall performance of organization. Cognitively straining conditions can have direct effects on task performance, as well as indirect, extensive effects on work performance and productivity if they expose employees to cognitive failure and impair occupational safety and health (Crawford, 2010).

Organizations, nowadays, seem to have diverse environments from where the employees can work from the convenience of their home environment or from the cubicle of their office This has led to a distinct separation of the work environments into two main settings at the home or office structure(Lin et al., 2022). They have also enforced different work practices accordingly, and are continuously improving them to improve their overall working culture and environment, which serves as an important factor for retention and acquisition of highly capable workforce environment. As various companies accommodate and bring in these changes in work schedules and patterns, the conventional idea of "working around the clock" has undergone a paradigm shift. Nowadays, workplace has become more "outcome oriented" than "people orientated". Highly performing workforce has become the main focal point for any organization. Employees are exposed to an increasing level of stress in their job, resulting in various health issues in their effort to present oneself as suitable for the job (Jossy & Kumar, 2018). As the focus of the company and the nature of the work demands for high-performing and efficient employees, people have been stimulated to work beyond their capabilities and pay grade.

Employees also face tremendous pressure to keep themselves updated to the latest trends and technologies required for their professions (Burke, 2006). This gap between the requirement for a well performing and efficient workforce and the limited skills and capabilities of the employees has pushed them to put extra efforts on their work, resulting in stress, namely occupational stress (Aarabi et al., 2013). Nowadays, stress is a significant issue in many corporations. In many firms today, the cost of workplace stress seems to be on the higher side which is highly affected on employee discontent, job mobility, burnout, poor work performance, and less effective interpersonal connections at work (Danna & Griffin, 1999).

Most of their work is project based and time bound. Employees are taken a number of stressors due to the extreme difficulty of their line of work and the high level skilled required work and set target to meet. Workload, time restraints, demands, role ambiguity, skill diversity, role conflict, strained workplace relationships, accountability to the organization, keeping up with new technological advancements, job instability, and an unfair incentive system are some of these stressors (Skinner et al., 2021).

From the review of cognitive ergonomics on Employee Well-being, it is observed that organizational ergonomics are less effective than physical ergonomics at improving lean performance where the least

amount of impact cognitive ergonomics has on improving lean performance (Sakthi Nagaraj & Jeyapaul, 2021). To determine organizational, familial, or societal factors that help reduce perceived occupational stress and improve job performance and job satisfaction (Nabirye et al., 2011), a negative association between psychological well-being and felt workplace stress, and a moderate negative correlation was discovered between each of the subscales of perceived workplace stress (Suleman et al., (2018). On the other hand, burnout and stress are caused by job expectations, which can be reduced by workplace resources. As a consequence, staff may be more engaged in their work (Kwon et al., 2021). Determinants of safety performance, the process of safety improvement is ongoing when businesses take real actions, including safety training and the consequences of acquired knowledge and skills, things go better (Ajmal et al., 2021) .

To create human resource policies that will reduce presenteeism-related productivity loss and define evidence-based intervention objectives for wellness programs. It helps in locating and calculating organizational or individual exposures that are strongly linked to presenteeism and its associated productivity(Rasool et al., 2021). The opinions of employees' well-being and productivity are influenced by five teleworking effect variables: personal and societal factors, organizational and job-related factors, technology considerations, social aspects at home, and social factors at work (Catană et al., 2022). Occupational stress has the potential to have both beneficial and negative effects on employee performance. Any company's employees can profit from stress, but it depends on how they handle it. When a worker's ability to handle stress goes beyond what is reasonable, the stress may have a negative impact on their performance. (Buddhacharya, 2022).

Restuputri et al. (2021) mentioned that usability, communication, work environment, working hours, workload, and work stress have little impact on performance, however exogenous variables such as job satisfaction and safety culture significantly affect performance (Restuputri et al., 2021). By including the employee/human factor into the ergonomics design process, it may be possible to close the communication gap between employees and ergonomic designers. (Olabode et al., 2017). Work that was repetitive increased the likelihood of quality failures, and when monotony was combined with noise level, the likelihood of quality failures rose by a factor of three and ten, respectively. Noise level alone had no impact on quality(Hamrol et al., 2011). The study of Eklund (1995) has shown challenges were subjected to physical difficulties, psychological demands, and challenging to put together task categories. Quality statistics were gathered, and inspectors were questioned. Furthermore, a recurrent examination of leanness through periodic evaluations is required to stay up to date on the success of the adoption of lean thinking since it helps determine how much the firm's adopted lean practices have improved performance (Christy & Duraisamy, 2020).

A dynamic link between HRM, ergonomics, and work psychodynamics produces significant theoretical hypotheses that should be investigated in further study (Brito et al., 2020). Employee health issues, work environment design, shift work, humidity, and working hours all require careful consideration, especially given their strong associations with the effects of workplace stress (Makhbul et al.,2013).The productivity of computer operators is significantly and favorably impacted by ergonomic considerations. Organizational ergonomics, cognitive ergonomics, and environmental ergonomics all have a greater impact on productivity (Vimalanathan & Babu, 2017). Furthermore, now, as Kalakoski et al. (2020)

rightly mentioned how to enhance performance at work and how cognitive ergonomic practices assist job performance in knowledge work is crucial question.

5. Conclusion

A survey of the current literature reveals that various research investigations have been undertaken on the Cognitive Ergonomics all throughout the world. In cognitively demanding activities, there is a need to enhance research into cognitive strain, which poses a significant danger to work performance and employee well-being. This study concludes that good working conditions, high work performance, and high employee well-being support each other. Cognitively straining conditions such as disruptions, interruptions, and information overload are related to impaired task performance and diminished well-being at work. Therefore, it is essential to reduce harmful consequences to individual employees and organizations. On the other hand, stress is a physiological state which has a prevailing effect on how a person reacts, adapts and responses to the circumstances, surroundings and objects by particular work environment. This factor has affected human life, wellbeing, health and behaviour having both positive and negative consequences. Most significantly, the findings have focused on evidence-based cognitive ergonomic strategies that improve knowledge work performance. At the same time, poor cognitive equipment designs have serious safety implications, such as a lack of consistent controls and imprecise instructions. Thus, making things clearer and creating user-friendly designs would help to reduce mistakes, improve reaction speeds, and shorten learning curves. In a nutshell, cognitive ergonomics is a subset of the greater subject of human factors and ergonomic sciences, however, it is still a relatively untapped resource for enhancing employee wellbeing. If planned effectively, cognitive ergonomics may make major contributions to increasing job performance, lean operations, productivity, and, ultimately, establishing safer and healthier workplaces in the industry. To harness the mentioned potentialities and promoting employee wellbeing, good evidence based research is much needed. Countries like Nepal can utilize the concept of cognitive ergonomics in order to provide better job environment.

References

- Aarabi, Subramaniam & Akeel,(2013). Relationship between motivational factors and job performance of employees in Malaysian service industry. *Asian Social Science*, 9(9), 301–310. <https://doi.org/10.5539/ass.v9n9p301>.
- Ajmal, Shahrul, Nordin, S. M. D., Sabir, A. A., Al-mekhlafi, A. A., Mohammed, G., & Naji, A. (2021). Safety management paradigms : COVID-19 employee well-being impact on occupational health and safety performance. *Journal of Hunan University*, 48(3),1-15 . <http://jonuns.com/index.php/journal/article/view/556>.
- Banbury, S. P., & Berry, D. C. (2005). Office noise and employee concentration: Identifying causes of disruption and potential improvements. *Ergonomics*, 48(1), 25–37. <https://doi.org/10.1080/00140130412331311390>.
- Błaszak, M., Rybska, E., Tsivitanidou, O., & Constantinou, C. P. (2019). Botanical gardens for productive interplay between emotions and cognition. *Sustainability*, 11(24), 7160.

- Boyd, N. M., & Nowell, B. (2020). Sense of community, sense of community responsibility, organizational commitment and identification, and public service motivation: A simultaneous test of affective states on employee well-being and engagement in a public service work context. *Public Management Review*, 22(7), 1024-1050.
- Brito, M. F., Ramos, A. L., Carneiro, P., & Gonçalves, M. A. (2020). A continuous improvement assessment tool, considering lean, safety and ergonomics. *International Journal of Lean Six Sigma*, 11(5), 893–916. <https://doi.org/10.1108/IJLSS-12-2017-0144>.
- Buddhacharya, S. (2022). Occupational stress and its impacts on employee performance : a study in it sector in.
- Burke, R. J., & Ng, E. (2006). The changing nature of work and organizations: Implications for human resource management. *Human Resource Management Review*, 16(2), 86–94. <https://doi.org/10.1016/j.hrmr.2006.03.006>.
- Catană, Ș. A., Toma, S. G., Imbrișcă, C., & Burcea, M. (2022). Teleworking impact on wellbeing and productivity: A cluster analysis of the Romanian graduate employees. *Frontiers in Psychology*, 13(1). <https://doi.org/10.3389/fpsyg.2022.856196>.
- Chan, J., Kim, D. J., Kassira-Carley, S., Rotunda, A. M., & Lee, P. K. (2020). Ergonomics in dermatologic surgery: Lessons learned across related specialties and opportunities for improvement. *Dermatologic Surgery: Official Publication for American Society for Dermatologic Surgery*, 46(6), 763–772. <https://doi.org/10.1097/DSS.0000000000002295>.
- Christy, D., & Duraisamy, D. S. (2020). Ergonomics and employee psychological well-being. *International Journal of Management*, 11(3), 435-438.
- Crawford, E. R. (2010). *Rich và cộng sự (2010). .pdf*. 53(3), 617–635.
- Danna, K., & Griffin, R. W. (1999). Health and well-being in the workplace: A review and synthesis of the literature. *Journal of Management*, 25(3), 357–384. <https://doi.org/10.1016/j.jom.1999.03.006>.
- Das, B. (2020). Prevalence of work-related occupational injuries and its risk factors among brickfield workers in West Bengal, India. *International Journal of Industrial Ergonomics*, 80(2), 103052. <https://doi.org/10.1016/j.ergon.2020.103052>.
- Dded, V. A., & Uide, P. R. G. (2014). Occupational health and ergonomic intervention in indian small scale industries. *International Journal of Recent Advances in Mechanical Engineering (IJMECH)*, 5(2), 1–2. <https://doi.org/10.14810/ijmech.2016.5102>.
- Devkota, N., Paudel, U. R., & Bhandari, U. (2020). Does westernization influence the business culture of a touristic city?. *Economics & Sociology*, 13(4), 154-172.
- Devkota, N., Paudel, UR, Hamarneh, I., Bhandari, U.(2021). Rethinking westernization in destination: Tourists' perception of a touristic city. *Journal of Tourism and Services*, 23 (12), 1-25.
- Di Fabio, A., & Peiró, J. M. (2018). Human capital sustainability leadership to promote sustainable development and healthy organizations: A new scale. *Sustainability*, 10(7), 2413.

- DiPietro, R. B., Moreo, A., & Cain, L. (2020). Well-being, affective commitment and job satisfaction: influences on turnover intentions in casual dining employees. *Journal of Hospitality Marketing & Management*, 29(2), 139-163.
- Dittmar, A., Murray, D. M., van der Veer, G. C., & Witchel, H. J. (2021). Cognitive ergonomics: A European take on HCI. *Interactions*, 28(2), 88-92.
- Dul, J., Bruder, R., Buckle, P., Carayon, P., Falzon, P., Marras, W. S., Wilson, J. R., & van der Doelen, B. (2012). A strategy for human factors/ergonomics: Developing the discipline and profession. *Ergonomics*, 55(4), 377–395. <https://doi.org/10.1080/00140139.2012.661087>.
- Dunn, A. M., Hofmann, O. S., Waters, B., & Witchel, E. (2011). Cloaking malware with the trusted platform module. In *Proceedings of the 20th USENIX Security Symposium* (pp. 395–410).
- Eklund, J. A. E. (1995). Relationships between ergonomics and quality in assembly work. *Applied Ergonomics*, 26(1), 15–20. [https://doi.org/10.1016/0003-6870\(95\)95747-N](https://doi.org/10.1016/0003-6870(95)95747-N).
- Gangopadhyay, S. (2022). Application of cognitive ergonomics in communication: a social perspective. In *The History and Philosophy of Science* (pp. 277-281). Routledge India.
- Ghalenoiei, M., Mortazavi, S. B., Mazloumi, A., & Pakpour, A. H. (2022). Impact of workload on cognitive performance of control room operators. *Cognition, Technology & Work*, 24(1), 195-207.
- Gilbreath, B. (2004). Creating healthy workplaces: The supervisor's role. *International review of industrial and organizational psychology*, 19, 93-118.
- Hamrol, A., Kowalik, D., & Kujawiński, A. (2011). Impact of selected work condition factors on quality of manual assembly process. *Human Factors and Ergonomics In Manufacturing*, 21(2), 156–163. <https://doi.org/10.1002/hfm.20233>.
- Inyang, N., Al-Hussein, M., El-Rich, M., & Al-Jibouri, S. (2012). Ergonomic analysis and the need for its integration for planning and assessing construction tasks. *Journal of Construction Engineering and Management*, 138(12), 1370–1376. [https://doi.org/10.1061/\(asce\)co.1943-7862.0000556](https://doi.org/10.1061/(asce)co.1943-7862.0000556).
- Johansson, B., & Hollnagel, E. (2007). Pre-requisites for large scale coordination. *Cognition, Technology and Work*, 9(1), 5–13. <https://doi.org/10.1007/s10111-006-0050-z>.
- Jossy, A., & Kumar, G. S. G. (2018). Impact of job stress on employee performance: A study of software professionals in Kerala. *International Journal of Research and Analytical Reviews*, 5(4), 694–715.
- Jung, D., Tuan, V. T., Tran, D. Q., Park, M., & Park, S. (2020). Conceptual framework of an intelligent decision support system for smart city disaster management. *Applied Sciences*, 10(2). <https://doi.org/10.3390/app10020666>.
- Kalakoski, V., Selinheimo, S., Valtonen, T., Turunen, J., Käpykangas, S., Ylisassi, H., ... & Paajanen, T. (2020). Effects of a cognitive ergonomics workplace intervention (CogErg) on cognitive strain and well-being: a cluster-randomized controlled trial. A study protocol. *BMC psychology*, 8(1), 1-16.

- Keller, A. P., Lehmann, D. R., & Milligan, K. J. (2009). Effectiveness of corporate well-being programs: A meta-analysis. *Journal of Macromarketing*, 29(3), 279-302.
- Kirshner, D., & Whitson, J. A. (2021). Editors' introduction to situated cognition: Social, semiotic, and psychological perspectives. In *Situated Cognition* (pp. 1-16). Routledge.
- Koirala, R., & Bhattarai, T. (2021). What determines indigenous peoples' mental health awareness? A descriptive cross-sectional study from Nawalpur District. *Quest Journal of Management and Social Sciences*, 3(1), 76-85.
- Koirala, R., & Bhattarai, T. (2022). Awareness on mental illness among adults of Tharu community in Nepal: evidence from a cross-sectional study. *International Journal of Indian Culture and Business Management*, 26(1), 19-39.
- Kosseck, E. E., Kalliath, T., & Kalliath, P. (2012). Achieving employee wellbeing in a changing work environment: An expert commentary on current scholarship. *International Journal of Manpower*, 33(7), 738-753.
- Kozyreva, A., Lewandowsky, S., & Hertwig, R. (2020). Citizens versus the internet: Confronting digital challenges with cognitive tools. *Psychological Science in the Public Interest*, 21(3), 103-156.
- Kwon, K. A., Ford, T. G., Jeon, L., Malek-Lasater, A., Ellis, N., Randall, K., Kile, M., & Salvatore, A. L. (2021). Testing a holistic conceptual framework for early childhood teacher well-being. *Journal of School Psychology*, 86(2), 178–197. <https://doi.org/10.1016/j.jsp.2021.03.006>.
- Liem, A., & Brangier, E. (2012). Innovation and design approaches within prospective ergonomics. *Work*, 41(1), 5243–5250. <https://doi.org/10.3233/WOR-2012-0013-5243>.
- Lin, S., Döngül, E. S., Uygun, S. V., Öztürk, M. B., Huy, D. T. N., & Tuan, P. Van. (2022). Exploring the relationship between abusive management, self-efficacy and organizational performance in the context of human–machine interaction technology and artificial intelligence with the effect of ergonomics. *Sustainability*, 14(4), 1–22. <https://doi.org/10.3390/su14041949>.
- MacKy, K., & Boxall, P. (2008). High-involvement work processes, work intensification and employee well-being: A study of New Zealand worker experiences. *Asia Pacific Journal of Human Resources*, 46(1), 38–55. <https://doi.org/10.1177/1038411107086542>.
- Makhbul, Z., Abdullah, N. L., & Senik, Z. C. (2013). Ergonomics and stress at workplace: Engineering contributions to social sciences. *Jurnal Pengurusan*, 37(1), 125–131. <https://doi.org/10.3233/WOR-192898>.
- Merino-Salazar, P., Artazcoz, L., Cornelio, C., Iñiguez, M. J. I., Rojas, M., Martínez-Iñigo, D., ... & Benavides, F. G. (2017). Work and health in Latin America: results from the working conditions surveys of Colombia, Argentina, Chile, Central America and Uruguay. *Occupational and environmental medicine*, 74(6), 432-439.
- Mokdad, M., Bouhaf, M., Lahcene, B., & Mokdad, I. (2019). Ergonomic practices in Africa: Date palm work in Algeria as an example. *Work*, 62(4), 657–665. <https://doi.org/10.3233/WOR-192898>.
- Nabirye, R. C., Brown, K. C., Pryor, E. R., & Maples, E. H. (2011). Occupational stress, job satisfaction and job performance among hospital nurses in Kampala, Uganda. *Journal of Nursing Management*, 19(6), 760–768. <https://doi.org/10.1111/j.1365-2834.2011.01240>.

- Olabode, S. O., Adesanya, A. R., & Bakare, A. A. (2017). Ergonomics awareness and employee performance: An exploratory study. *Economic and Environmental Studies*, 17(44), 813-829.
- Qaiser Suleman, Ishtiaq Hussain, Saqib Shehzad, Makhdoom Ali Syed, & Sadaf Ayub Raja. (2018). Relationship between perceived occupational stress and psychological well-being among secondary school heads in Khyber Pakhtunkhwa, Pakistan. *13*(12), 1–22.
- Rasool, S. F., Wang, M., Tang, M., Saeed, A., & Iqbal, J. (2021). How toxic workplace environment effects the employee engagement: The mediating role of organizational support and employee wellbeing. *International Journal of Environmental Research and Public Health*, 18(5), 1–17. <https://doi.org/10.3390/ijerph18052294>.
- Restuputri, D. P., Elvera, A. R., Nugraha, A., & Masudin, I. (2021). *Ergonomic Approach on Rail Industry Workers Using Rail Ergonomics Questionnaire*. 3797–3812.
- Sabir, F. S., Maqsood, Z., Tariq, W., & Devkota, N. (2019). Does happiness at work lead to organisation citizenship behaviour with mediating role of organisation learning capacity? A gender perspective study of educational institutes in Sialkot, Pakistan. *International Journal of Work Organisation and Emotion*, 10(4), 281-296.
- Sakthi Nagaraj, T., & Jeyapaul, R. (2021). An empirical investigation on association between human factors, ergonomics and lean manufacturing. *Production Planning and Control*, 32(16), 1337–1351. <https://doi.org/10.1080/09537287.2020.1810815>.
- Shrestha, E., Devkota, N., Paudel, U. R., & Parajuli, S. (2021). Post-merger employee satisfaction in commercial banks of Nepal: Findings from employee satisfaction index. *Journal of Business and Social Sciences Research*, 6(1), 45-62.
- Singh, S. K., Pradhan, R. K., Panigrahy, N. P., & Jena, L. K. (2019). Self-efficacy and workplace well-being: moderating role of sustainability practices. *Benchmarking: An International Journal*, 26(6), 1692-1708.
- Skinner, B., Leavey, G., & Rothi, D. (2021). Managerialism and teacher professional identity: impact on well-being among teachers in the UK. *Educational Review*, 73(1), 1–16. <https://doi.org/10.1080/00131911.2018.1556205>.
- Srivilai, P., & Sorod, B. (2019). *Victimization of Workplace Bullying : A Prior Study of a Development of a Tool to Measure Victimization of Bullying and Its Validation with Neuroticism Trait*. 12(4), 11–24.
- Sudrajeng, L., Wiraga, I., Mudhina, M., Waisnawa, I. G. N. S., & Sudiarsa, I. M. (2020). Assessment of the effectiveness on domestic rainwater-harvesting wells (SPAHUDO) in the Northern area of denpasar city-Bali Indonesia Through ergo-hydrogeology approach. *Journal of Physics: Conference Series*, 1569(4). <https://doi.org/10.1088/1742-6596/1569/4/042098>.
- Susi, T., & Ziemke, T. (2001). Social cognition, artefacts, and stigmergy: A comparative analysis of theoretical frameworks for the understanding of artefact-mediated collaborative activity. *Cognitive Systems Research*, 2(4), 273–290. [https://doi.org/10.1016/S1389-0417\(01\)00053-5](https://doi.org/10.1016/S1389-0417(01)00053-5).
- Sweller, J., van Merriënboer, J. J., & Paas, F. (2019). Cognitive architecture and instructional design: 20 years later. *Educational Psychology Review*, 31(2), 261-292.

- Then, F., Luck, T., Luppá, M., Thinschmidt, M., Deckert, S., Nieuwenhuijsen, K., Seidler, A., & Riedel-Heller, S. (2013). Effect of the psychosocial working environment on cognition and dementia - A systematic review. *Das Gesundheitswesen*, 75(08/09). <https://doi.org/10.1055/s-0033-1354027>.
- Vimalanathan, & Babu T, R. (2017). A Study on the effect of ergonomics on computer operating office workers in India. *Journal of Ergonomics*, 07(05), 8–11. <https://doi.org/10.4172/2165-7556.1000211>.
- Wilder, D. A., & Sigurdsson, S. O. (2015). Applications of behavior analysis to improve safety in organizations and community settings. In *Clinical and Organizational Applications of Applied Behavior Analysis*. Elsevier Inc. <https://doi.org/10.1016/b978-0-12-420249-8.00023-x>.
- Wright, T. A. (2010). A sense of identity does matter in achieving relevance and meaning in our work. *Industrial and Organizational Psychology*, 3(3), 289-292.
- Yang, X., & Cheng, K. (2017). Investigation on the industrial design approach for cnc machine tools and its implementation and application perspectives. *Procedia Manufacturing*, 11(June), 1454–1462. <https://doi.org/10.1016/j.promfg.2017.07.276>.
- Young, M. S., Brookhuis, K. A., Wickens, C. D., & Hancock, P. A. (2015). State of science: mental workload in ergonomics. In *Ergonomics*, 58(1), 1–17. Taylor & Francis. <https://doi.org/10.1080/00140139.2014.956151>.
- Yu, J., Park, J., & Hyun, S. S. (2021). Impacts of the COVID-19 pandemic on employees' work stress, well-being, mental health, organizational citizenship behavior, and employee-customer identification. *Journal of Hospitality Marketing & Management*, 30(5), 529-548.
- Zolotova, M., & Giambattista, A. (2019). Designing cognitive ergonomics features of medical devices. Aspects of cognitive interaction. *The Design Journal*, 22(1), 463-474.