

The Effect of Ergonomic Workplace Design on Employee Productivity: A Study in Triple V4s and Furniture

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Abstract: This study emphasized the crucial role of workplace design featuring furniture, noise, temperature, light and spatial arrangement in enhancing employees' well-being and productivity in Triple V4s and Furniture. The research design used was qualitative approach, focusing on the qualitative aspects of an orderly workspace and the aforementioned factors to understand their effects on productivity and collaborative efficiency among employees. The result of the study, stated that comfort is the common factor that increases productivity among the workplace design. It stresses the importance of flexible and comfortable furniture, highlights noise and high temperatures as productivity hindrances, and underscores the need for efficient illumination. Thus, the company needed to have the following: strategic expenditures in high-quality, adaptable furniture, noise-canceling personal protective equipment (PPE), ideal temperature regulation, and careful lighting.

Keywords: Comfort, Employee productivity, Small-Medium Enterprise (SME), Triple V4s and Furniture, Workplace design.

1. Introduction

Triple V4s and Furniture is a thriving Small-Medium Enterprise (SME) furniture company specializing in creating unique, high-quality furniture such as doors, tables, chairs, and cabinets. Their skilled workers put in much effort to craft these marvels of woodworking, using only the finest lumber available. This attention to quality and craftsmanship has made Triple V4s and Furniture a popular choice for discerning customers who value quality and durability in their furniture.

The lean design of processes and workplaces is more critical than ever in our highly globalized world. Especially in industrialized countries, workplace design has taken on a high priority, as about work-related musculoskeletal disorders (WMSD) cause one-third of all cases of sick leave. It is generally known that good ergonomics can reduce the physical strain on the employee, thus optimizing the production flow and directly influencing the company's productivity (Beuß. et al., 2019). According to (Gani et al., 2018), environmental factors such as light, furniture, noise, temperature, and spatial arrangement should be prioritized to ensure that occupational

safety and health are not neglected. A work environment that is uncomfortable and dangerous can affect the concentration, performance, and productivity of employees.

Ergonomics is the setting of the scientific knowledge relating to man and necessary to design tools, machines, and devices that the most significant number can use with the maximum comfort, safety, and effectiveness (Tarafder, 2019). According to The World Green Building Council, organizations that provide comfortable and supportive workplace environment, good office furniture and spatial arrangements, appropriate lighting, a comfortable temperature, and minimal noise levels are thriving, stating that safe, healthy, and comfortable workplace design ensures improved productivity and quality of outcome (Hanif & Saleem, 2020).

The workplace must be well-designed, healthy, and environment-friendly to improve productivity. The indoor environment quality comes from temperature, light, noise, air quality, the workspace layout, color schemes, plants, and many other factors. Workplace design should consider ergonomics and workflow and enable the workforce to use the space efficiently. A healthy, comfortable, and safe workplace design enhances employees' motivation and satisfaction, leading to high productivity (Hanif & Saleem, 2020).

The workspace arrangement's graphical depiction shows if the production facilities are utilized effectively, if the company's production capabilities are adequate, or if this production system can manage a rise in output. Individual elements in the layout are positioned according to predetermined, place-marked positions. The purpose of this work is to provide a better understanding and orientation of the workplace (Kubr et al., 2021)

Ergonomics and balance of factors like noise reduction, furniture setting and layout of hardware, lighting, air, and room space also ensure the productivity and better performance of the employees. An employee's performance can be sustainable by providing an excellent ergonomic design. The optimized layout is essential for better performance, including ergonomics

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factors and the workflow course. Various studies have concluded that the performance of employees is greatly affected by their working conditions. Better working conditions lead to better employee performance (Riaz *et al.*, 2017).

This study aimed to emphasize the effect of well-designed workplaces and ergonomics on workers' productivity at Triple V4s. In line with this, this study is of great importance because it addresses the specific challenges carpenters face at Triple V4s and Furniture, providing actionable insights to improve workplace design and work processes and enhance overall productivity.

2. Materials and Methods

A qualitative approach was used to study the effect of the ergonomic workplace on employee productivity in the Triple V4s and Furniture in Luyang, Carmen Cebu. Two primary data collection methods, observation and a structured checklist designed for this, and adapted from Hameed & Amjad (2009), were utilized to gather comprehensive insights. The observational study was to analyze how workplace design affects employee productivity by conducting direct, real-time observations. We distributed a structured questionnaire simultaneously to collect quantitative data essential for drawing meaningful conclusions in the study.

A. Data Gathering Tools and Study Procedure

We will use varied data-gathering methodologies to obtain comprehensive data on workplace design and employee perspectives. The first stage in adequately performing the study is to write a permission letter that the research adviser, Industrial Engineering Chairman, Triple V4s, and Furniture owner must approve. We utilized a checklist and conducted direct observations in data gathering. Upon validating the checklist, the researchers went to the company. The checklist included 20 items on a checklist scale to provide qualitative information. The objective was to collect responses from all ten workers and give the participants 5-10 minutes to answer the questions.

3. Results and Discussion

This section provides an in-depth overview of the data collection, analysis, and interpretation during the study on employees' perceptions of productivity and workplace design. The study examined how workplace design affects people and how it can be improved to increase productivity and well-being.

A. Workplace Design and Productivity

The five features of workplace design, namely, furniture, noise, temperature, light, and spatial arrangement, were analyzed in each area of the furniture company. Table 1. shows the checklist of Workplace Design Features.

Based on Figure 1, the adaptability of furniture is crucial in ensuring that workers' physical conditions are maintained at optimal levels without inducing discomfort or fatigue. Research indicates that adequate and comfortable furniture positively affects worker productivity. Additionally, selecting suitable furniture that focuses on ergonomic and functional designs can

significantly contribute to employee comfort and support optimal performance. However, noise pollution is a prevalent challenge in the furniture industry that hinders workers from having a quiet and focused work environment. The high levels of noise emanating from machinery, cuttings, and other sources of noise pollution often disrupt the work patterns of workers.

Low temperatures in a workspace typically do good things for productivity. However, high temperatures can significantly affect their ability to perform their duties effectively. In particular, the heat generated by machinery and other equipment can compromise workers' ability to concentrate, decreasing overall efficiency and productivity. This is especially true during sanding procedures requiring high attention and focus.

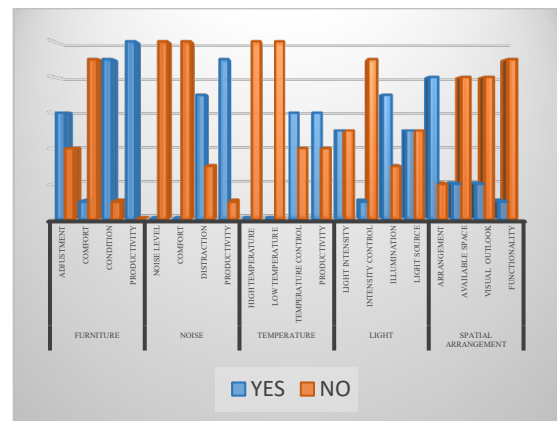


Fig. 1. Respondents' perception in workplace design feature

Regarding lighting, the workplace benefits from efficient illumination that covers the entire area without causing eye strain. However, the light intensity on the worktable is not regulated, and the establishment does not provide a specialized close-up lighting desk. Instead, the establishment relies on a ceiling bulb light that provides good visibility but may need to be more suitable for intricate or detailed work that requires precise visual acuity. The workspace also benefits from adequate natural light, thanks to the windows that permit fresh air and natural light to enter the enclosed environment. This can have a positive effect on worker well-being and productivity.

Within the confines of the workspace, it has been observed that all workers are actively engaged in carrying out their assigned tasks. However, a crucial issue regarding storing essential and non-essential items has been identified. In particular, furniture wood and unneeded woodcuts are intermingled, potentially leading to a reduction in productivity. The storage area appears disorganized and chaotic, which can lead to the misplacement of significant materials. Furthermore, the current utilization of the workspace for the production of unfinished furniture may need to be more conducive for hosting informal or spontaneous meetings.

4. Recommendation

Employers should invest in high-quality, ergonomic furniture that is adjustable, comfortable, and durable, as it plays a vital role in ensuring the well-being and productivity of

employees in the workplace. This can help prevent physical strain, discomfort, and fatigue that negatively effects worker productivity and well-being. In selecting furniture, employers should consider its practicality and functionality by considering several factors such as weight, ease of movement, and ease of cleaning.

It is essential to minimize noise levels to create a quieter and more focused environment. To address this issue, workers can

be provided noise-canceling personal protective equipment (PPE), which would help create a more peaceful and productive work environment, improving overall productivity.

Employers should ensure their workers are comfortable and productive by maintaining optimal workspace temperature. This can be achieved by providing proper ventilation and air conditioning to prevent excessive heat buildup. Employers should also provide protective gear and clothing to protect

Table 1
Workplace design features checklists

Workplace Design Features	Factors	Statements in Questionnaire	YES	NO
Furniture	Adjustment	My furniture is flexible to adjust, rearrange or reorganize my workspace.	R1, R2, R3, R4, R8, R9	R5, R6, R7, R10
	Comfort	My furniture is comfortable enough so that I can work without getting tired till 5pm.	R5	R1, R2, R3, R4, R6, R7, R8, R9, R10
	Condition	The physical conditions at work influence my productivity	R1, R2, R4, R5, R6, R7, R8, R9, R10	R3
	Productivity	Adequate and comfortable furniture will affect my productivity positively.	R1, R2, R3, R4, R5, R6, R7, R8, R9, R10	
Noise	Noise level	My work environment is quiet.		R1, R2, R3, R4, R5, R6, R7, R8, R9, R10
	Comfort	I am able to have quiet and undisturbed time alone.		R1, R2, R3, R4, R5, R6, R7, R8, R9, R10
	Distraction	My workspace has many noise distractions.	R1, R2, R4, R5, R6, R8	R7, R9, R10
	Productivity	Noise free environment will increase my productivity	R1, R2, R3, R4, R5, R6, R8, R9, R10	R7
Temperature	Temperature level (low)	The overall temperature of my workspace in raining season is cold enough that I can't work		R1, R2, R3, R4, R5, R6, R7, R8, R9, R10
	Temperature level (high)	The overall temperature of my workspace in summers is not hot enough that I can work		R1, R2, R3, R4, R5, R6, R7, R8, R9, R10
	Temperature control	I am able to control temperature or airflow in my office.	R1, R2, R3, R4, R5, R7	R6, R8, R9, R10
	Productivity	To what extent your room temperature affects your normal level of productivity.	R1, R2, R3, R5, R6, R7	R4, R8, R9, R10
Light	Light intensity	My workspace is provided with efficient lighting so that I can work easily without strain on my eyes.	R2, R4, R8, R9, R10	R1, R3, R5, R6, R7
	Intensity control	Do you have control over the lighting on your desk (i.e. adjustable desk light on desk)?	R3	R1, R2, R4, R5, R6, R7, R8, R9, R10
	Illumination	Ample amount of natural light comes into my office.	R1, R2, R3, R4, R6, R7, R10	R5, R8, R9
	Light source	Number of windows in my work area complete my fresh air and light need.	R1, R2, R3, R4, R5	R6, R7, R8, R9, R10
Spatial Arrangement	Arrangement	My office/branch is open enough to see my colleagues working.	R1, R2, R4, R5, R6, R8, R9, R10	R3, R7
	Available Space	My work area is sufficiently equipped for my typical needs (normal storage, movements, etc.).	R3, R4,	R1, R2, R5, R6, R7, R8, R9, R10
	Visual outlook	I am satisfied with the amount of space for storage and displaying important materials.	R3, R9	R1, R2, R4, R5, R6, R7, R8, R10
	Functionality	My workspace serves multi-purpose functions for informal and instant meetings.	R3	R1, R2, R4, R5, R6, R7, R8, R9, R10

workers from high temperatures. A comfortable and safe work environment is essential, and businesses especially in furniture industry should prioritize creating such an environment for their employees. Thoughtful illumination is necessary to provide well-balanced lighting that creates a comfortable workspace, minimizes glare, and ensures adequate illumination for various tasks.

Efficiently arranging the workplace and fostering employee collaboration is recommended to optimize its spatial layout. Implementing proper storage solutions for necessary items and removing unnecessary items causing clutter would also improve workplace productivity.

5. Conclusion

In conclusion, the effect of ergonomic workplace design on employee productivity in the context of Triple V4s and Furniture. The study identified that the adaptability of furniture is crucial in ensuring that workers' physical conditions are maintained at optimal levels, adequate and comfortable furniture has been shown to have a positive effect on the productivity of workers. However, noise pollution is a prevalent challenge that hinders workers from having a quiet, focused work environment. Minimizing noise disruptions in the workplace can significantly enhance concentration and task focus, directly contributing to improved productivity among employees.

The study also identified that low temperatures in a workspace typically do not hinder workers' productivity. Still, high temperatures can significantly affect their ability to perform their duties effectively. Regarding lighting, the study found that the workspace benefits from efficient illumination

that covers the entire area without causing eye strain and the importance of adequate natural light in enclosed work environments as it can positively affect worker well-being and productivity. The study also identified that the storage of essential and non-essential items is a crucial issue that can potentially reduce productivity. The study proposes that employers should consider the temperature of the workspace, implement measures to maintain optimal conditions, optimize workplace design, and take specific actions to reduce noise levels, all contributing to improving productivity and employee satisfaction.

References

- [1] Beu, Florian & Sender, Jan & Flügge, Wilko. (2019). Ergonomics Simulation in Aircraft Manufacturing – Methods and Potentials. *Procedia CIRP*, 81, 742-746.
- [2] Gani, A.Z. & Zamberi, M.M. & Teni, M.H.M., (2018). A review of ergonomics towards productivity. *International Journal of Supply Chain Management*, 7, 306-311.
- [3] Hameed, A. and Amjad, S. (2009) Impact of Office Design on Employee Productivity: A Case Study of Banking Organizations of Abbottabad, Pakistan. *Journal of Public Affairs Administration and Management*, 3, 1-13.
- [4] Hanif, Ayaz Muhammad & Saleem, Zohra. (2020). The Impact of Workplace Design on Employee Productivity: A Comparative Study of University Libraries in China and Pakistan, 15, 1-14.
- [5] Kubr, J. Novikov, K. Hořejší, P. Kleinová, J. Krákora, D. Connecting a virtual production and a PLC. *MM Science Journal*, pp. 4452-4462, June 2021.
- [6] Nemailal Tarafder. (2019). Study of Ergonomics in Textile Industry. *Journal of Mechanical Robotics*, 4(3), 32–34.
- [7] Riaz, Amna & Shoaib, Umar & Shahzad, Muhammad. (2017). Workplace Design and Employee's Performance and Health in Software Industry of Pakistan. *International Journal of Advanced Computer Science and Applications*.