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Muther's Grid Analysis of the Workplace Layout of Triple V S4S & Furniture: Some Proposals

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***Abstract*: The method used are qualitative approach, observation, survey checklist and Muther's Grid Method Muther's Grid is the tool in analyzing the relationship of each process in order to come up with effective layout. The study assessed the workplace layout of Triple V S4S & Furniture. Ergonomic conditions were also analyzed in relation to workers' performance. The result revealed that the furniture in the workspace is flexible but not comfortable enough for long working hours. The physical conditions, including room temperature and noise distractions, greatly affect productivity. Disorganized storage space and the inability to display materials are also concerns. Having control over temperature and efficient lighting would improve productivity. Hence, it emphasized the significance of workplace layout optimization and the selection of appropriate conditions for an effective work environment.**

***Keywords*: employee performance, ergonomic arrangement, improvement, work environment layout, working order, work productivity.**

1. Introduction

Productivity is an employee's maximum individual potential performance at work. Production process productivity could be improved by thoroughly studying the facility's layout design. Employees spend more than half of their waking hours at work, and their surroundings have significant effects on their performance and mental health. Productive work not only requires work skills, and discoveries to improve work methods but also an enjoyable working environment that facilitates the smooth accomplishment of work (Hutagalung, 2020). Organizations must create a work environment strategy that fosters and supports efficient, satisfied, and healthy personnel. Employees must feel comfortable and at ease in their workplace to do their best work. A well-planned workspace design produces a less stressful and more productive workplace.

A workplace is defined as a location where people work alone or in groups to contribute value to their company (Heathfield, 2019). Workplace design is no longer just an aesthetic consideration; it is also a strategic one that influences employee productivity, creativity, and overall job satisfaction. Organizations are increasingly understanding the importance of creating work environments that correspond with their business goals while also supporting their workers' well-being. According to Wiles and Turner (2022), employees want to feel cared for by their surroundings and the organization for which they work. Therefore, people-centric design and fit-out are so important. Small, stuffy offices with inadequate lighting and poor facilities are increasingly considered unacceptable because they are thought to hurt employees' physical and emotional well-being and their performance in the workplace.

Employee performance is the outcome of an individual's efforts to complete duties and obligations assigned to him based on his skill, experience, honesty, and availability. Employee performance can be influence by a variety of factors, including job motivation and work environment (Alya, 2022). According to Agistiawati & Asbari (2020), paying attention to work environment circumstances involves attempting to create working conditions that are in agreement with the wishes and needs of employees as executors of work in the workplace.

An optimized workplace design can improve employee performance; alternatively, an inadequate work environment can reduce employee performance. Therefore, this study aimed to examine the workplace layout and its condition whether it is ergonomically acceptable. In this way, it can boost the company workers' performance through the proposed workplace layout at Triple V S4s & Furniture in Luyang, Carmen, Cebu.

2. Materials and Methods

The impact of the working environment at Triple V S4s & Furniture in Luyang, Carmen Cebu was investigate using a qualitative approach, direct observation, survey guidelines and Muther's Grid method. The goal was to determine how the workplace layout and its conditions affected employee performance. The study sought insights into workplace condition and employees' experiences, identified disruptions, and assessed the need for potential workplace layout adjustments.

A. Environment & Participants

The environment for this study was Triple V S4s & Furniture, located in Luyang, Carmen, Cebu. This furniture store specializes in designing customized furniture based on

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customer preferences. The researchers were interested in evaluating the existing workplace layout and its working conditions if it can affect the employee performance, thus they chose this particular organization as the study site. To accomplish this, the researchers closely studied the workplace design, through using Muther's Grid Analysis. This method enabled a thorough examination of the layout and its conditions in the furniture manufacturing process at Triple V S4s & Furniture.

B. Procedures of Data Gathering

Various kinds of data collection techniques was employ in order to collect comprehensive data on workplace design from the perspectives of employees. The first step in conducting the study appropriately is to write a permission letter that was approve by the research adviser, Industrial Engineering Chairman, and Triple V S4s & Furniture. Surveys, interviews, and on-site observations used to collect data. After the request was approve, a pre-made survey questionnaire created and designed to capture employees' perceptions of their workplace environment. Upon validation of the survey questionnaire, the researchers proceeded to the company. To acquire qualitative insights, the survey questions consisted of 14 items on a checklist scale. The goal was to gather responses from all 10 workers and let the participants answer for about 5-10 minutes. Additionally, direct observations of the workplace environment was conduct to document physical design components and evaluate workplace conditions and its effect to employee performance in the current layout. The data gathered used to build a recommended workplace arrangement that would be more beneficial to the employees.

3. Results and Discussion

In this segment, a comprehensive examination and interpretation of the study's data are undertaken, aiming to discern the demographic characteristics of the participants and explore their perspectives on the current workplace design at Triple V S4s & Furniture. The goal is to uncover nuanced insights that enhance understanding regarding the assessment of workplace environments through a meticulous exploration process.

A. Current Workplace Layout

The researchers methodically collected a thorough list of errors that were discovered during the study's thorough conduction within the organizational framework. These flaws, thoroughly documented by the research group, serve as critical foundational insights influencing the suggested layout for Triple V S4s & Furniture. The researchers' acute observations not only identify the areas that require attention, but they also play an important part in creating the strategic considerations for the best layout and structure of Triple V S4s & Furniture. The researchers' comprehensive study highlights the importance of these detected faults in informing the creation of a reliable and effective layout that matches smoothly with the company's aims and operational requirements.

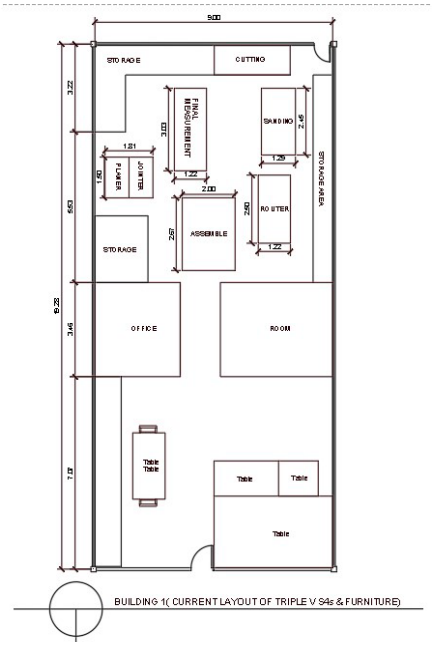

Fig. 1. Building 1 (Current Layout of Triple V S4s & Furniture)

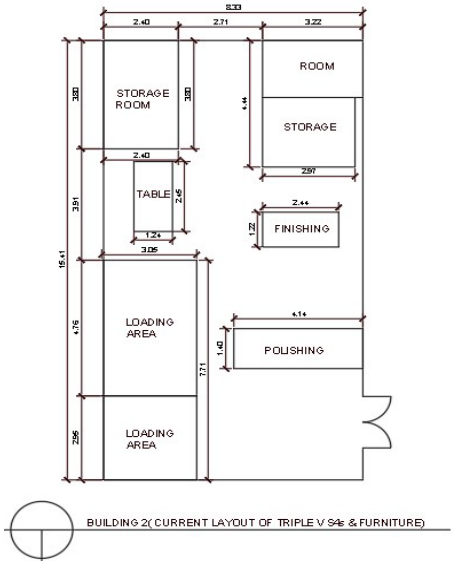

Fig. 2. Building 2 (Current Layout of Triple V S4s & Furniture)

B. The Current Muther's Grid

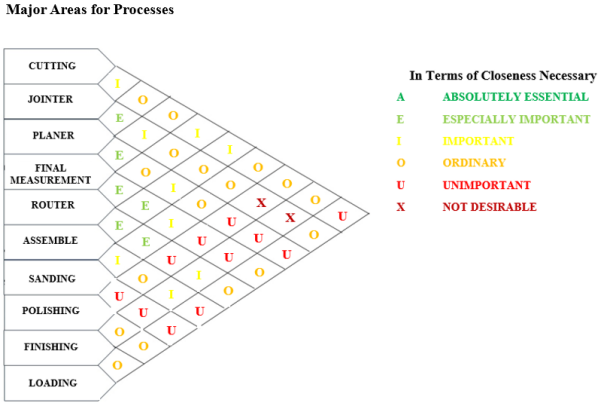

Fig. 3. Muther's Grid of the Current Workplace Layout of Triple V S4s & Furniture

Table 1
Survey checklist

No.	Workplace Design	YES	NO
1	My furniture is flexible to adjust, rearrange or reorganize my workspace per my needs.	R3, R4, R5, R6, R7, R8, R9, R10	R1, R2
2	My furniture is comfortable enough that I can work without getting tired for 7-8 working hours a day.	R1, R2, R6, R7,	R3, R4, R5, R8, R9, R10
3	The physical conditions at work does not influence my productivity.	R2, R6, R7,	R1, R3, R4, R5, R8, R9, R10
4	Adequate and comfortable furniture will affect my productivity positively.	R1, R2, R3, R4, R5, R8, R9, R10	R6, R7,
5	I am satisfied with the amount of space for storage and displaying important materials.	R1,	R2, R3, R4, R5, R6, R7, R8, R9, R10
6	The equipment are sufficient to carry out necessary daily tasks.	R1, R2, R3, R4, R5, R6, R8, R9, R10	R7
7	Current workplace helps in effective communication and collaboration with others.	R1, R2, R3, R6, R10	R4, R5, R7, R8, R9
8	The room temperature does not affect my normal level of productivity.	R7	R1, R2, R3, R4, R5, R6, R8, R9, R10
9	My workspace is provided with efficient lighting so that I can work easily without strain on my eyes.	R1, R2, R3, R4, R6, R7, R9, R10	R5, R8
10	I have the access to lighting controls.	R3, R4, R5, R6, R7, R8, R9	R1, R2, R10
11	My workspace has many noise distractions.	R4, R5, R7, R8,	R1, R2, R3, R6, R9, R10
12	My work environment is quiet.	R6, R7,	R1, R2, R3, R4, R5, R8, R9, R10
13	Unfavorable environmental conditions (noise distractions, unsuitable temperature etc.) in the office will increase my productivity at work.	R1	R2, R3, R4, R5, R6, R7, R8, R9, R10
14	I have access to control the temperature or airflow in my workplace.	R9, R10	R1, R2, R3, R5, R6, R7, R8

Figure 3 shows the formulated Muther's Grid in accordance with the current layout of the company. Seeing the grid can be a form of verification that the current layout is disorganized because the areas designated for each process are not aligned based on the sequence of the entire process upon producing the final product.

As seen in the current layout, the arrangement of all areas designated for each process in making the products is disorganized as to what the process would be next. The processes mentioned are the major ones—merely the exclusion of the small details in making a specific product. The disorganization caused traffic in the transportation of the product, depending on what the next process would be. Moreover, it is observable that there are no clear pathways; thus, the workers in the workplace would only be passing through any space or path, even if it were an inadequate space or the wrong pathway. The dimensions of all areas for each major process are over sufficient because it is noticeable that the workers could still work freely. Added to that, the workers in every process is as much as is necessary.

C. Ergonomic Survey Checklist of the Workplace Condition

The assembled dataset illustrates the findings of all 14-guide questions.

D. The Proposed Muther's Grid

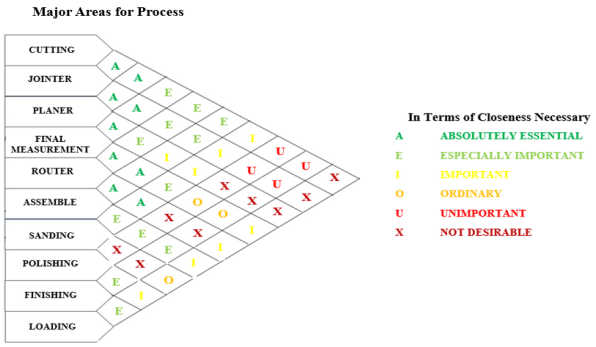

Fig. 4. Muther's Grid of the Proposed Workplace Layout of Triple V S4s & Furniture

The proposed Muther's Grid is based on the current layout. Since the placement of all areas for all major processes is in order based on the process of making the product areas: cutting, jointer, planer, final measurement, router, assemble, mostly rated A, because they are all absolutely essential to be next to one another. Additionally, sanding and polishing is not desirable to be close to one another because of the dust debris to potentially stick again to the furniture to be polished. Moreover, it is especially important for polishing, finishing and loading in terms of closeness.

Based on Figure 1 and 2, the workspace size is the main issue that employees have with the current arrangement. There are many storage areas in the workplace and it is disorganized that is space consuming. In order to ensure that workers are able to do their duties effectively, while designing a new layout, consideration should give the amount of space available for storage and the display of important materials. Most answers seem to indicate that there was a barrier to interpersonal communication and teamwork in the current office design. Additionally, it affects their productivity when carrying out essential tasks, so consideration must be given to it when creating a new layout.

Figure 5, suggested that the proposed layout by the researchers should be applied based on the proposed Muther Grid. By creating a workplace environment that is free from noise and distractions, the performance and productivity of employees can be maximize. Additionally, equalizing the space and ensuring smooth transfer of materials and processes from one stage to another will greatly enhance efficiency. It is worth noting that collaborative workspaces have shown to be successful in developing employee collaboration. According to research conducted by Gensler, a leading global design and architecture firm, workplace layout can have a significant impact on employee performance, well-being, and satisfaction (Gensler, 2019). The study found that workplace layout can affect several key factors related to employee performance, including collaboration, communication, and concentration.

There is, nevertheless, potential for improvement in terms of offering separate spaces and other facilities to facilitate both privacy and collaboration. This can result in a more conducive work atmosphere in which employees can focus on their responsibilities while still having opportunity for productive communication and collaboration with their co-workers. Businesses who follow these suggestions can expect to see faster growth and development. A well-designed workplace enhances not only employee morale and happiness, but also overall corporate performance. It fosters an environment in which employees feel valued, motivated, and encouraged, resulting in higher production and success.

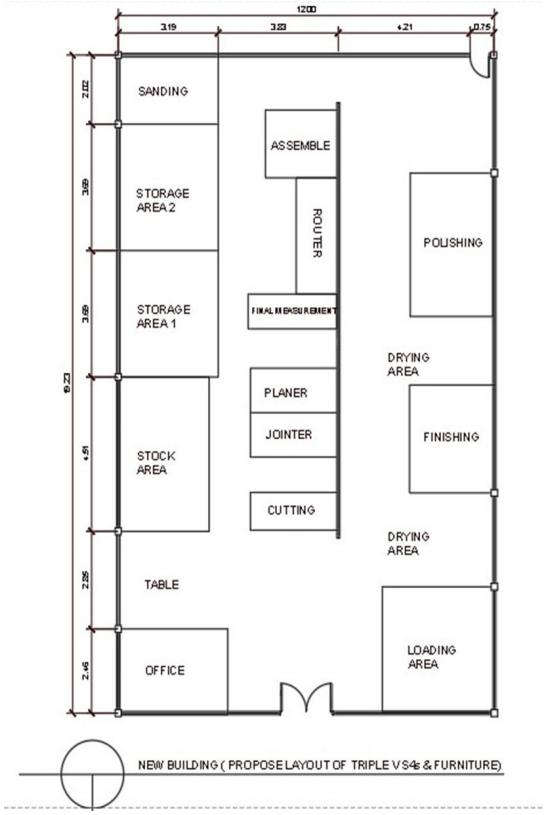

Fig. 5. Proposed Workplace Layout of Triple V S4s & Furniture

Table 2
Distances of processes

Processes	Current	Proposed
Cutting to Jointer	7. 99 m	3.71 m
Jointer to Planer	3.44 m	1 m
Planer to Final Measurement	6.2 m	2.79 m
Final Measurement to Router	1. 71 m	1.37 m
Router to Assemble	4.13 m	2.13 m
Assemble to Sanding	80. 55 m	5.47 m
Sanding to Polishing	1. 55 m	8.60 m
Polishing to Finishing	9.7 m	6.10 m
Finishing to Loading	3.5 m	3.40 m
TOTAL	118.77 m	34.58 m

By consolidating the production area into a single, larger building than the current layout can significantly enhance operational efficiency. The current layout, which involves two separate buildings with a travel distance of 70 meter from first building to second, which leads to increased travel time for workers of the furniture-making process with a total of 118.77-meter distance. Study by Kuo and Wu (2019) found that reducing the distance between workstations in a furniture factory led to a significant increase in productivity. A proposed workspace promotes better communication and streamlines the workflow, ultimately reducing the time travel required to complete each piece of furniture with a total of 34.58-meter distance. In addition to the timesaving benefits, the proposed layout offers cost advantages for businesses. Operating and maintaining a single building tends to be more economical with an estimated total of Php 30, 000 than managing two separate structures with an estimated cost of Php 41, 500. Consolidating resources in one location allows for better utilization of space and utilities, potentially leading to lower operating cost. The recommended proposal to a single, larger building for furniture production aligns with the goals of creating a better work environment. This change not only addresses logistical challenges and reduces travel time but also brings about financial benefits to the business. Hence, investing in a workplace design that prioritizes employee comfort, collaboration, and communication is crucial for achieving long-term success.

Table 3
Estimates expenses

Expenses	Current estimated value	Proposed estimated value
Utility cost	Php 25, 000	Php 20, 000
Transportation cost	Php 500	Php 0
Rent expense	Php 16, 000	Php 10, 000
TOTAL	Php 41, 500	Php 30, 000

4. Recommendation

Based on the results from the guide questions given to the workers of Triple V S4S & Furniture, some recommendations and assessments were made to address the problem of the worker's to their working environment.

The furniture that the workers worked on are uncomfortable, where in they are getting tired of working 7-8 hours a day and it can affect their productivity negatively. According to Singh (2020), work breaks are known for positively influencing employees' psychologically and physiologically. Considering the discomfort caused by the current furniture, implementing regular breaks could significantly improve the workers' well-being. It is recommended to take breaks between every 25 and 90 minutes (Harris, 2022). Creating a more ergonomic workspace could contribute to increased productivity and job satisfaction. Organizations should prioritize the holistic health of their employees by fostering a supportive environment that encourages regular breaks and comfortable furniture that addresses the ergonomic aspects of the workspace.

Moreover, the worker's environment is noisy, and adverse working conditions such as noise and insufficient warmth reduce their productivity. Because of the machineries used to make the furniture, the working environment in the furniture business is definitely noisy. As a result, furniture manufacturers should reduce the noise levels of this equipment so that workers can focus and their productivity does not suffer. In this case, researchers will advise the company to use adequate noise-

cancelling equipment such as earmuffs or earplugs to prevent noise-induced hearing loss. Hearing protection devices minimize the amount of noise energy that reaches and damages the inner ear. Earmuffs and earplugs are the most prevalent types of PPE that workers must wear. Engaging in safety practices that can mitigate the risk of hearing loss and other detrimental consequences requires the participation of individuals, physicians, and administrators. Employers are administratively obligated to provide hearing protection devices to prevent hearing loss or impairment. According to the Olubwa (2021), the usage of personal hearing, protective devices should be enforced through education and built-in administrative measures. Only persistent long-term preventive use has a positive benefit. It is also suggested that via conscious administrative effort, the use of safety methods like as shift rotations, leave scheduling, acoustic sound proofing of offices, quiet machinery, and other strategies be increased. It is recommended that employers furnish personal protective equipment (PPE) to mitigate noise levels. Moreover, employers ought to afford every employee the option to choose from a variety of hearing protection options, including canal caps, earplugs, complete head enclosures, and ear mugs.

Additionally, workers are dissatisfied with the amount of space for storage and displaying of important materials. According to Iconic Office Furniture (2023), an organized environment reduces stress, improves mental well-being, enhances productivity, and saves precious time. Effective space planning is crucial and its interior. When planning the layout, consider the specific needs and functions of the space. One effective strategy is to incorporate open-concept layouts that allow for seamless movement between different areas (Comet Architects, 2023). Thus, the researchers proposed a layout in aiding this problem.

Furthermore, the temperature can have a significant impact on workers' productivity. The current workplace temperature affects the normal level of productivity, and workers do not have access to control the temperature or airflow in their workplace. According to the study by Wolkoff (2021), ventilation is critical in enhancing work performance and lowering health consequences. While workers may not be able to adjust the temperature or airflow, combining ventilation with indoor air humidity and room temperature control can improve perceived indoor air quality, health, and job performance. This can help to create a more pleasant and productive work environment for employees while reducing the risk of illness. The “health-based ventilation rate” in a building should meet WHO's air quality guidelines to reach an acceptable perceived indoor air quality (Wolkoff, 2021). Employers should prioritize providing adequate ventilation and maintaining good indoor air quality to support the well-being and productivity of their employees. Good ventilation helps remove pollutants, control humidity, supply fresh air, reduce health issues, and improve productivity. Creating a conducive work environment involves regular inspections, cleaning air filters, and addressing any air quality issues promptly.

Through these recommendations, the overall performance of the employee will have a positive impact of the workplace and workers will be satisfied with the proposed working environment.

5. Conclusion

Therefore, the current organizational structure, as identified through guide questions and the Muther’s Grid Analysis underlines flaws. The proposed solution for the layout addresses these concerns by significantly improving space usage, removing communication barriers, and increasing workers performance, resulting in a more efficient and desirable work environment.

References

[1] Agistiawati, E., & Asbari, M. (2020). “Pengaruh Persepsi Siswa atas Lingkungan Belajar dan Penguasaan Kosakata terhadap Kemampuan Berbicara Bahasa Inggris Siswa Sekolah Menengah Atas Swasta Balaraja. EduPsyCouns”. Journal of Education, Psychology and Counseling, 2(1), 513–523.

[2] Alya, Nur, Febriyantoro, Mohamad Trio, Zulkifli, Zulkifli, Suleman, Dede, Saputra, Fendi, & Suyoto, Yohanes Totok. (2022). “The influence of motivation, work discipline, and work environment on employee performance at PT. Cipta Rasa Multindo.” *Priviet Social Sciences Journal*, 2(4), 5–11.

[3] Comet Architect + Interior (2023, July 10). “7 strategies for maximizing small spaces in corporate and retail design: Functionality, comfort, and Aesthetic appeal.” *LinkedIn.*

[4] Gensler. (2019). Workplace survey 2019. Retrieved from https://www.gensler.com/research-insight/blog/workplace-survey-2019

[5] Hanif, Ayaz Muhammad & Saleem, Zohra. (2020). “The Impact of Workplace Design on Employee Productivity: A Comparative Study of University Libraries in China and Pakistan.” *International Journal of Professional Management.* 15. 1-14.

[6] Harris, H. (2022). The Top Benefits of Taking Breaks at Work. *Nivati.*

[7] Hutagalung, D., Sopa, A., Asbari, M., Cahyono, Y., Maesaroh, S., & Chidir, G. (2020). “Influence of Soft Skills, Hard Skills and Organization Learning on Teachers’ Performance through Innovation Capability as Mediator”. *Journal of Critical Reviews*, 7(19), 54–66.

[8] Heathfield, S.M. (2019). The Pros and Cons of a Flexible Work Schedule. *The Balance.*

[9] Iconic office furniture Dubai, (2023).” 7 Strategies for Maximizing Small Spaces in Corporate and Retail Design: Functionality, Comfort, and Aesthetic Appeal.”.

[10] Kuo, R. J., & Wu, C. M. (2019). “The impact of workstation layout on productivity: A case study of furniture manufacturers.” *International Journal of Industrial Ergonomics*, 69, 1-8.

[11] Olubwa, James (2021). “Impact Of Environmental Noise on Individual Hearing Problems. A Critical Literature Review,” *Journal of Environment* 1 (1), 61-72.

[12] Singh Usha, Ghadiri Argang, Weimar Daniel, Prinz Joachim (2020). "Let's Take a Break!": “An Experimental Comparison of Work-Break Interventions and Their Impact on Performance.” *Journal of Business Research*, Volume 112, 2020, pp. 128-135.

[13] Wiles, Jackie and Turner Jordan (2022). “Build a Sense of Belonging in the Workplace” *Gartner.com*

[14] Wolkoff Peder, Kenichi Azuma, Paolo Carrer, (2021). “Health, work performance, and risk of infection in office-like environments: The role of indoor temperature, air humidity, and ventilation.”