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User Perception of the Operational Office Design of PT Sentul City TBK with an Ergonomic Approach to Support Work

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ABSTRACT

A comfortable work environment that meets human needs is a key factor in employee productivity. A high-quality work environment not only creates a sense of comfort but also supports work efficiency and effectiveness. In this study, a qualitative method was used through literature review and interviews with office staff to comprehensively describe the existing conditions. Anthropometric principles and user-centered design were applied to identify the gap between the design of existing tools and user needs. This research aims to design ergonomic tools that meet user requirements, minimizing the risk of injury and thereby increasing work activity efficiency. Ergonomics involves the application of knowledge about human body limitations, as well as the interaction between humans, work tools, and the work environment, to create greater efficiency and optimal productivity. The application of ergonomic principles is crucial in improving user well-being and comfort, reducing the risk of health issues such as Work-Related Musculoskeletal Disorders (WRMSDs), and ensuring sustainable performance. A case study at PT Sentul City Tbk's office showed that a non- ergonomic work environment design can lead to health complaints among workers, such as fatigue, soreness, and pain in certain body parts. Analysis revealed that employees experienced discomfort in the lower back and neck areas due to supporting tools that did not match anthropometric standards. Therefore, workspace arrangement, selection of ergonomic furniture, and adjustments to meet both the physical and psychological needs of workers are essential to improve employee productivity, health, and job satisfaction.

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1. INTRODUCTION

The office is considered a highly vital element within organizations, both in the private and government sectors. In the office, information is received, recorded or documented, processed, and distributed to the parties who need it (Dwi Pramono et al., 2022). Work productivity can be influenced by a comfortable work environment that meets the needs of employees. A sense of comfort and support for work productivity, as well as for people, will be provided by a high-quality environment (Grahara & Setiawan, 2021). (Wijanarko et al., 2024). A concept has been proposed regarding the relationship between the quality of the office environment and the productivity level of its users. If the working environment conditions are unsatisfactory, the productivity of the space users tends to decrease. In other words, the productivity of space users is influenced by their perception of the comfort of the space. From this definition, it can be concluded that ergonomics is a multidisciplinary science applied to study the interaction between humans including their abilities and capacities and work tools as well as the work environment, so that maximum work efficiency and productivity can be achieved. Share Export Rewrite (Nur Fajri Alfata et al., 2020).

An ergonomic workspace is the foundation for employee well-being and productivity within a company. In an increasingly competitive business world, a company must place the implementation of ergonomic principles at the core of its human resource management strategy. They need to understand that employees who feel comfortable and are supported by a work environment that meets their physical and psychological needs will tend to be more productive and resilient in facing work demands (Hasab Najmi Hakim et al., 2024). Currently, awareness of Occupational Health and Safety (OHS) is mandatory for all companies or businesses. Therefore, the development of OHS must be carried out to reduce potential hazards and risks that may arise due to weaknesses and working relationships (Purwo Saputro & Suryati, 2023).

Ergonomics is the study of how the work environment affects worker interactions. It includes the physical workspace, tools, materials, practices, and work structure, both individually and in teams. Its main goal is to ensure the safety and protection of workers (Atikah Rahma, 2025). Ergonomics also focuses on the prevention of musculoskeletal disorders as well as the improvement of occupational health and safety. Many laws and regulations in various countries support the implementation of ergonomics in the workplace (Ratu Chairunisa, 2024). When designing a work environment, physical aspects, job design, and social conditions must be considered. Ergonomic improvements have been proven to enhance well-being, reduce fatigue, and minimize work-related stress (Putri Nurul, 2020). Poor workplace design can decrease employee performance and happiness. Therefore, many companies are beginning to apply ergonomic principles to create a more comfortable workplace.

The main objective of implementing ergonomics is to study the physical and psychological limitations of humans when interacting with their work environment. In addition, ergonomics aims to reduce excessive fatigue and to design products that are comfortable and able to meet the physical needs of their users. The planning of work sequences including job descriptions, supporting equipment, and the work environment is utilized to achieve these goals (Alya Radhwa & Danish Al-G, 2024).

According to (Seftianingsih & Astuti, 2020) ergonomics explains the relationship between employees and physiological as well as psychological aspects in their work environment. From this statement, ergonomics can be interpreted as activities carried out to create comfort and safety (non-hazardous conditions) for people working in an office. Comfort can be assessed through factors such as: Workspace arrangement, Air quality, Color, Sound, Culture, Other

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relevant factors. Meanwhile, safety is measured by how office equipment and machinery are used to ensure that users do not experience hazards, either in the short or long term, such as physical injuries (wounds, blindness, electric shocks, etc.) or mental stress. Mental stress may arise from a work culture imposed and developed by management that does not align with the conditions of the majority of employees.

According to Wignjosoebroto in (Montororing, 2020), anthropometry comes from "anthro," which means human, and "metri," which means measurement. The application of this data is for addressing design and workspace issues. Matters related to human body dimensions include conditions, frequency and difficulty, body posture, and requirements to facilitate movement. In general, humans have differences in body shape and size. There are several factors that influence the shape and size of the human body, including:

a. Age, In general, human body dimensions will grow and increase in size as age increases, starting from birth up to around 20 years old and above.
b. Sex, The body size dimensions of males are generally larger than those of females, except for certain body parts such as the hips and so on.
c. Ethnicity/Nationality, each ethnic group, nation, or ethnic community will have physical characteristics that differ from one another.
d. Body Position, posture or body position will affect body measurements; therefore, a standard body position must be applied during measurement surveys.

Observations at the PT Sentul City Tbk office indicate that the design of the work environment affects user interactions. User interaction with work support equipment does not yet meet ergonomic standards; employees often complain of discomfort such as fatigue, soreness, or pain in certain parts of the body after using furniture for extended periods. For example, chairs or desks that are too high or too low cause unnatural or slouched sitting positions, resulting in pain in the back, neck, or arms.

Digitalization has transformed the work environment, driving a shift from fixed office designs to flexible offices, which necessitates a reevaluation of workplace ergonomics. Emphasizes that an inadequate work environment and poor ergonomic design, including mismatched furniture, increase the risk of work-related musculoskeletal disorders (WRMSDs) among employees (Mayang et al., 2024).

(Putri Nurul, 2020)It is stated that a well-established work environment in a company will increase employee productivity. Therefore, to maximize employee performance, it is necessary to create a good work environment as well as provide work facilities that support the activities of employees. (Putri Andina, 2022) It is stated that room temperature, the type of furniture, and repetitive tasks are important ergonomic factors that influence a person's work performance. This implies that, to improve employee performance, cost-effective ergonomic solutions must be implemented.

The use of non-ergonomic office desks and chairs can lead to various health problems, such as back, neck, and shoulder pain, as well as other musculoskeletal disorders. In addition, improper posture over the long term can decrease concentration and work performance. Therefore, applying ergonomic principles in the design of office desks and chairs is extremely important (Atikah Rahma, 2025). If abnormal working positions are continuously ignored, it will result in discomfort and the emergence of occupational diseases, one of which is Work-Related Musculoskeletal Disorders (Purbasari, 2020) Ergonomic furniture and adjustable arrangements minimize physical strain and reduce the risk of musculoskeletal disorders (Singh & Pande Rana, 2024). Work-Related Musculoskeletal Disorders are complaints or disorders of the musculoskeletal system experienced by workers, with several risk factors present in the workers themselves, such as biomechanical, psychosocial, and individual factors(Andriyono et al., 2021).

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2. RESEARCH METHODOLOGY

The nature of this writing is qualitative, utilizing literature studies and precedent studies. The selection of this method is based on its ability to comprehensively describe existing conditions. Exploratory and applicative in nature, this research combines empirical data analysis with academic review to produce a design framework that is both operational and grounded in scientific knowledge.

The analysis was carried out by examining the existing interior of the planning and design division's workspace, accompanied by photographic documentation. The results of this field study serve as a reference for the design process. The purpose of the field study conducted at the PT Sentul City Tbk office was to determine whether the actual conditions of the office environment specifically the dimensions of the furniture used by office users comply with office standards according to relevant literature or applicable regulations**.**

2.1 Research Stage

The stages of the data collection method used to analyze User Perceptions of the Operational Office Design of PT Sentul City Tbk with an Ergonomic Approach to Support Work are as follows:

2.1.1 Observation

A field survey was conducted to document the layout, material conditions, and circulation patterns at the PT Sentul City Tbk office, located at Jl. Surya Kencana No.1, Citaringgul, Babakan Madang, Bogor Regency, West Java 16810. In addition, comparative studies were carried out at the following three sites:

1. PT MNC Land
   Location: Jl. Kebon Sirih No. 17-19, RT.15/RW.7, Kab. Sirih, Kec. Menteng, Central Jakarta City, Special Capital Region of Jakarta 10340.
2. Plaza Summarecon Serpong
   Location: Jl. Gading Serpong Boulevard Blok M5 No.3, Pakulonan Barat, Kelapa Dua.
3. Kantor Sinar Mas Land Plaza BSD City
   Location: Jl. BSD Grand Boulevard, Sampora, Kec. Cisauk, Tangerang Regency, Banten 15345.

2.1.2 Interview

Conducting a structured interview to understand the needs and preferences of users regarding space and daily activities was carried out with an employee at the office, namely Mr. Desha, who serves as the Manager of the Planning and Design division.

2.1.3 Documentation

The materials obtained consist of photos and videos of the building, which were taken directly by the author using personal equipment. The documentation focuses on the floors, walls, ceilings, furniture, and the overall atmosphere of the space.

2.1.4 Analysis

1. Data Analysis Stage
   a. Conducting a SWOT analysis to identify strengths, weaknesses, opportunities, and threats in space design.
   b. Grouping requirements based on room function, ergonomics, aesthetics, and sustainability
   c. Creating a spatial pattern analysis map, such as for natural and artificial lighting, air circulation, and acoustics

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d. Comparing survey findings with applicable standards to ensure the design complies with regulations.

2. Data Synthesis Stage
   a. Arranging room zoning based on the hierarchy of functions and circulation needs.
   b. Creating a moodboard to determine the visual theme, materials, and color palette.
   c. Developing an initial layout scheme that organizes work areas, support spaces, and circulation efficiently.
   d. Designing ergonomic concepts and integrating smart technology to support productivity and sustainability.

3. Design Development Stage
   a. Producing detailed technical drawings covering layout, lighting, ventilation, and material specifications.
   b. Creating 3D visualizations to realistically depict the final design outcome.
   c. Conducting lighting and ventilation simulations to ensure spatial efficiency and comfort.
   d. Preparing a work schedule and technical specifications for materials, furniture, and technology.
   e. Holding discussions with stakeholders to ensure the design meets needs and expectations.

4. Design Evaluation and Finalization
   a. Refining and perfecting technical drawings and visualizations based on feedback.
   b. Compiling the final design documentation, including working drawings, 3D renders, and technical specifications.
   c. Creating an implementation guide to support project execution in the field.

3. RESULT AND DISCUSSION

Results of the field study, employee interviews, and questionnaires distributed to understand user perceptions of the supporting work facilities for employees at the Sentul City office. Observation was conducted by interviewing Mr. Desha, the Manager of Planning and Design, by asking several questions related to the comfort of work support equipment. It was found that employees often experience health complaints such as neck and lower back pain caused by work support equipment, which in turn disrupts their concentration while working. Below are the questions posed to Mr. Desha:

Table 1. Interview Results

Question	Answer
Do you often experience discomfort while working during office hours?	All the time, because I frequently have to change my sitting position.
What do you usually do when taking a short break?	Stretch my body and usually go to the pantry or another room.
What makes you feel uncomfortable while working?	The chair cannot be adjusted in height because it is broken, and during overtime, the lighting is inadequate, which causes my eyes to quickly feel strained or sore.

(Source: Author's Analysis, 2025)

Based on the results of the employee interviews in Table 1 and several questions posed, it can be concluded that employees feel uncomfortable while working due to chairs and desks that do not adequately support work activities over long periods. Employees frequently

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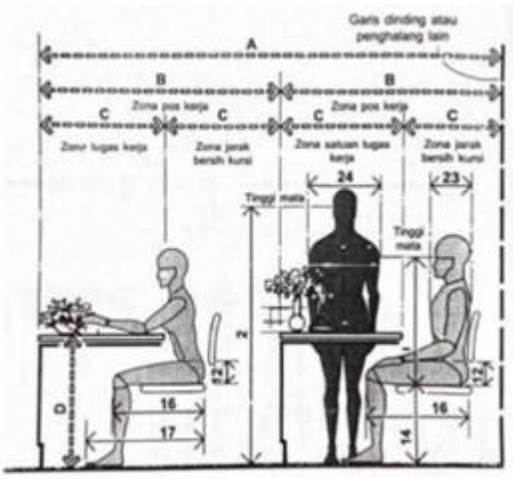
experience pain while working, which leads them to often take breaks to stand or stretch during work and to change their sitting positions. This, in turn, disrupts their concentration while working.

3.1 Analysis of Furniture in the Planning and Design Division Room

The results of the existing condition analysis indicate that the work support equipment, namely chairs and desks, do not comply with the established ergonomic standards. Ergonomic discrepancies can be identified by comparing them to anthropometric standards, as shown in the following figures.

Figure 1. Existing Work Desk
(Source: Author's Analysis, 2025)

Based on the condition of the work desk in figure 1, the height tends to be standard, but it may not be ideal for all users. An ergonomic desk height should allow the arms to form an angle of about 90 degrees while working. Although the width is sufficient, the placement of computer equipment appears suboptimal, with some monitors positioned too far from the sitting position. The ideal desk height for adults ranges from 70 to 80 cm; if it exceeds this standard, it can cause the shoulders and arms to be raised unnaturally, leading to tension in the neck and shoulder muscles.



	in	cm
A	120–144	304,8–365,8
B	60–72	152,4–182,9
C	30–36	76,2–91,4
D	29–30	73,7–76,2
E	120–168	304,8–426,7
F	60–96	152,4–243,8
G	18–24	45,7–61,0
H	24–48	61,0–121,9
I	30–48	76,2–121,9
J	18–22	45,7–55,9
K	42–50	106,7–127,0
L	60–72	152,4–182,9

Figure 2. Antropometry of the Workspace
(Source: Author's Analysis, 2025)

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A chair with a width of 45 cm is considered too narrow and does not provide adequate comfort. Pain in the back, neck, and shoulders can be experienced when sitting for long periods due to this condition. In addition, armrests that are not wide enough cause parts of the arms to hang, especially for workers with larger arm sizes. Armrests that are too short and insufficient chair height also result in the arms not being aligned with the keyboard, so workers often feel pain in the left and right forearms.

3.2 Design of Furniture in the Planning and Design Division Room

Figure 3. Redesign of Work Support Furniture
(Source: Author's Analisis, 2025)

When designing an ergonomic chair, it is important to ensure that the backrest is curved to follow the natural contour of the spine, so that the back remains upright and is protected from health issues. In addition, the armrests should be designed wider than previous models, allowing workers with larger forearms to comfortably support their arms, preventing them from hanging and reducing the risk of forearm muscle strain.

The seat of the chair uses cushioning designed without sharp edges, so users do not easily feel sore or uncomfortable when sitting to work. The chair height can also be adjusted between 44 cm and 53 cm to suit the average height of Indonesians, allowing the feet to rest flat on the floor without having to tiptoe. In addition, the chair is equipped with swivel casters to provide safe and comfortable mobility for workers.

The use of adjustable employee desks with a height of 70 cm is already in accordance with ergonomic standards for work desks. Additionally, the presence of a partition panel with a height of 100 cm provides sufficient privacy without obstructing light circulation or communication between employees.

A safe work arrangement is known as the "six-foot office," where the distance between individuals in the workspace is at least 2 meters or 6 feet. This concept brings changes to office furniture layouts; for example, employees no longer sit facing each other but instead sit back-to-back. Desks are arranged in a grid or zigzag pattern. The size of office desks has also decreased, from the original 1.8 meters to 1.6 meters, then 1.4 meters, and can even be smaller. In addition, partition panels may be installed between desks to protect each employee. Before the pandemic, offices generally implemented an open-plan workspace concept without partitions, which encouraged collaboration and communication between divisions. This open space made interaction easier and reduced communication distance between workers, which had a positive impact on the company (Nediari et al., 2021).

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3.3 Distance Between Furniture in the Planning and Design Division Room

Figure 4. Existing Distance Between Furniture
(Source: Auhor's Analisis, 2025)

Placing a chair too close to a wall or other furniture makes it difficult for users to pull the chair back or stand up freely. Ergonomic standards recommend a minimum of 60–75 cm of free space behind the chair so that users can move comfortably. Some desks are positioned very close to the wall, resulting in very limited space behind the chair. This can make it difficult for users to stand up or move around freely.

Figure 5. Redesign Distance Between Furniture
(Source: Author's Analisis, 2025)

Thus, the distance between furniture can be managed if the space between rows of desks on the left and right sides of the main aisle is sufficiently wide, allowing two people to comfortably pass each other in the central corridor. This aligns with office ergonomic standards, which recommend that the main aisle should have a minimum width of 100–120 cm. The parallel and straight arrangement of desks facilitates easy access to each workstation without significant obstacles. The work chairs are spaced adequately apart, enabling users to pull their chairs back and stand up without disturbing one another. The distance between chairs in the same row also appears sufficient for arm and body movement.

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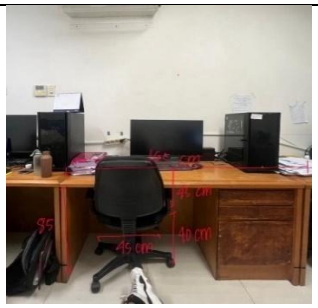
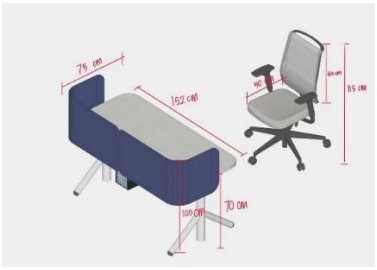
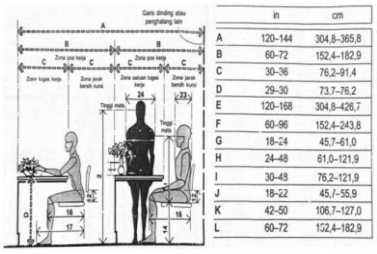
Table 1 Redesign of Work Support Furniture

Re-Design and After Design		
Existing	**Furniture**	**Ergonomic**
		
The work support equipment, namely chairs and desks, does not comply with established ergonomic standards. The chair, with a width of 45 cm, is too narrow and suboptimal for comfort. This can cause pain in the back, neck, and shoulders when sitting for long periods.	The chair seat uses cushioning without sharp edges to prevent soreness, and the chair height can be adjusted between 44–53 cm so that feet can rest perfectly on the floor. The chair is also equipped with swivel casters for comfortable mobility. Meanwhile, the adjustable work desk with a height of 70 cm meets ergonomic standards, and a partition panel with a height of 100 cm provides privacy without blocking light and communication between employees.	The size of a shared workspace or work area for 50 users, with a standard allocation of 4 m² per person, will result in an optimal area of 200 m². Public offices, as currently known in both conventional and open-plan arrangements, consist of similar work environments organized in a general row layout. The dimensions shown in the diagram below are determined using basic anthropometric requirements that were originally established for individual work environments.
Summary		
In the existing condition, the desks and chairs do not meet ergonomic standards, so chairs that are too narrow and uncomfortable can cause pain in the back, neck, and shoulders if used for long periods. The furniture redesign addresses this issue by providing chairs with adjustable height, cushioning without sharp edges, and swivel casters for mobility. The work desks are also height-adjustable to meet ergonomic standards. Additionally, a 100 cm high panel on the desk provides privacy without blocking light and communication between employees. Ergonomic standards are based on space requirements and dimensions that match user anthropometric data, making the work environment more comfortable and productive.		

(Source: Author's Analisis, 2025)

3.4 Discussion Results

The results and findings of this study conclude that the ergonomic dimensions of work support equipment in the workspace do not yet meet the specified standards, which can impact user comfort. If this issue is not addressed, over time it may lead to conditions such as repetitive strain injuries in the wrists and tendonitis (Widodo Tri, 2021). In complex production and human systems, including those in the informal industrial sector, ergonomic principles can be implemented. The application of ergonomics aims to match the type of work with the worker's capacity, thereby minimizing physical complaints and increasing work efficiency. To achieve this, there are two main strategies that can be used: the preventive approach (prevention) and the curative approach (treatment) (Rasyid Prakoso, 2023):

1. In ongoing processes, the curative approach is applied through interventions or modifications to the conditions, work environment, and ongoing work processes.
2. On the other hand, the conceptual approach, known as the systems approach, is considered effective when implemented at the planning stage. From the selection

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and transfer of technology, ergonomic principles must be implemented alongside other assessments, such as technical, economic, socio-cultural, and environmental aspects. This holistic approach is referred to as appropriate technology.

When designing a set of furniture to achieve ergonomic aspects for supporting facilities such as chairs and desks, it is essential to refer to anthropometric standards (Rasyid Prakoso, 2023).

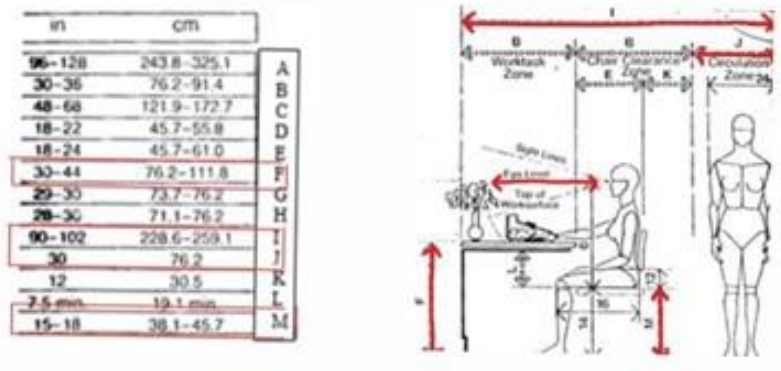

Figure 6. Antropometry of Work Desk
(Source: Human Dimension)

Figure 7. Antropometry of Work Desk
(Source: https://www.physica.com.au/workstation/)

From both figures, it can be seen that the optimal distance for movement between work areas is 30 inches (76.2 cm), in accordance with ergonomic standards (Appendix J). Meanwhile, the minimum dimensions for an office chair include a height of 38.1–45.7 cm and a tilt angle of 90–120 degrees, while the minimum desk height is 76.2 cm (as stated in Appendix F). To reduce eye fatigue, the minimum viewing distance between the eyes and the monitor should be 45 cm. In addition, the total circulation space for the work area (Appendix I) requires a minimum width of 90 inches (228.6 cm) to create an ergonomic work environment.

4. CONCLUSION

Overall, the results of this study indicate that the work support equipment in the workspace does not yet meet the standards set by existing regulations, as all supporting tools such as desks and chairs not only fail to comply with standards but also vary in form for each user. However, the changes that have been implemented can be adapted to the needs of users according to the activities performed in the workspace. It is expected that these adjustments will help reduce workers' physical complaints and increase productivity.

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Various aspects must be considered in designing a good chair, such as the physical, mental, and social conditions of workers, physical capabilities, work environment, physical workload, and working posture, in order to create a safe, comfortable, and productive work environment.

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