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Identification of Workplace Social Sustainability Indicators Related to Employee Ergonomics Perception in Indonesian Industry

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Abstract: Sustainability indicators have provided a breakthrough for companies to assess their performance in supporting corporate sustainability. There is no standard framework for these support-defining indicators to conduct a social sustainability performance assessment. There is a limitation of quantitative social sustainability indicators appropriate for performing ergonomic concept assessments. Ergonomics, as a field concerning people and their interactions with the environment, in particular, the workplace, can play a role in social sustainability, besides its conventional approach of workplace re-engineering. Three major areas of ergonomics were analyzed. The indicators were established based on a review of the literature and confirmed using a factor analysis that covered all major aspects of workplace ergonomics. The factor analysis aimed to reduce the complexity of workplace social sustainability indicators related to ergonomics. The final result integrated 73 indicators into 17 indicators based on three major areas of ergonomics. The findings showed that the best workplace social sustainability indicators were divided into five factors: employee well-being, safety concerns, workplace comfort, musculoskeletal health, and environmental concerns. It would be very beneficial for the industry and the government to support corporate social sustainability and the global sustainability index.

Keywords: factor analysis; indicators; workplace ergonomics; workplace social sustainability

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1. Introduction

Sustainability is a complex term that involves meeting our own demands without affecting future generations' ability to meet their own. It is seen as a continuing process of development based on the communication of values [1,2]. The implementation of sustainability is the responsibility of every company in carrying out its business processes. Sustainability encourages businesses to make decisions regarding long-term environmental, social, and human impacts through sustainable development. Sustainable development can be interpreted as a socio-economic and environmental process characterized by fulfilling human needs while preserving the environment's quality indefinitely [3]. It is commonly recognized that sustainable development attempts to strike a balance between economics, environmental integrity, and social well-being [4].

The three pillars framework is being used by systems to measure sustainability: environment, economy, and social [5,6], observing that social sustainability is not as easy as environmental and economic sustainability [7–9]. As a social dimension, social sustainability cannot be evaluated using the same methods as the other two pillars. Furthermore, all-purpose measures of social sustainability are too general to be practical, and customized indicators for specific companies must be developed. The lack of explicit measures of social sustainability in corporate organizations encourages the need to identify indicators that can be measured quantitatively. In terms of sustainability, it is a survival strategy for companies to establish systems in which people have a desire to work for a specific organization, the ability to accomplish business duties correctly, and the chance to work toward improved health, lower stress, or a work–life balance [10]. Social sustainability is a comprehensive strategy to monitor and identify the effects of business on employees.

Ergonomics and sustainability have different backgrounds, but they tend to merge in concerns since they have a similar end objective, specifically a focus on people's health and well-being [11]. Ergonomics is defined as the scientific study of how humans interact with the tools and equipment they use to conduct tasks and other activities [12]. Ergonomics increases the productivity and efficacy of work and other tasks and promotes positive human values such as enhanced protection, reduced fatigue and stress, and improved quality of life [13]. Ergonomics focuses on recognizing and defining user characteristics, understanding and managing existing skills and knowledge, designing and understanding tasks, defining and applying the appropriate level of task performance, and understanding the workplace's environmental and psychosocial conditions [14].

Based on similar objectives, which focus on health and well-being, social sustainability has a strong relationship with ergonomics. Social sustainability helps determine human factors and the social impact of products and services [15]. Based on the previous literature, the implementation of ergonomic concepts could have several benefits. The philosophy of ergonomics helps management to establish the necessary skills and knowledge about human characteristics and abilities. The previous social sustainability framework included three dimensions: worker safety, worker comfort, and environmental concerns [16]. However, the framework did not clearly include the human and physical factors as social sustainability indicators. Other frameworks considered in social sustainability include wages and benefits, health and safety, health insurance, and occupational health and safety certification [17,18]. These indicators are part of the ergonomics concept, which can contribute to accomplish social sustainability. It indicates that the concept of ergonomics has obtained limited support in the context of social sustainability. A relevant social sustainability adoption model and structure need to be developed. An appropriate assessment structure must support the successful implementation of social sustainability, supposing that the objective is to redesign existing human resources to incorporate the concept of sustainability.

According to the global indexes, Indonesia is ranked 101st in the Sustainable Development Goals 2020 [19]. Although Indonesia has implemented various policies to improve each indicator, this index remains a severe problem and continues to grow. In terms of ergonomics, Indonesia is an Industrially Developing Country (IDC), in which work-related musculoskeletal disorders are common [20]. Workers in Indonesia also experience musculoskeletal problems related to their work. According to research, workplace interventions must address physical limitations, including limiting vibration exposure and lifting tasks, and psychosocial factors, including reducing effort, enhancing appreciation, increasing job satisfaction, and controlling job stress [21]. Without a good understanding of these ideas, employee productivity can be affected due to the influence of non-ergonomic activities. Thus, companies in Indonesia need to identify any indicators that can support increased company productivity through workplace social sustainability.

The purpose of the research is to identify any ergonomic indicators that can support workplace social ergonomics based on employee perceptions. Based on indicators established for each particular work domain to assess social sustainability, the approach should increase productivity by improving each company's sustainability in that particular work domain. It is therefore interesting to adopt an ergonomics approach, since it deals with what the employee may feel and perceive more directly than others. The findings are expected to complement the traditional approach of workplace re-engineering.

This is a critical advantage of this framework. Since it focuses on the business at the employee level, internal management and external benchmarking can apply the result of the framework. This study was conducted to analyze the indicators based on the point of view of Indonesian employees. From the employees' point of view, it is hoped that the results will be considered by the government, especially the Indonesian government, in the provision of supportive policies. The Indonesian government's efforts in applying ergonomic principles in the workplace through regulations of the Ministry of Health and the Ministry of Manpower are expected to be in line with the perceptions held by each employee.

This study provides a set of quantitative indicators appropriate for assessing workplace social sustainability. The paper begins with a review of the literature on social sustainability from the perspective of ergonomics. The paper then presents an investigation of the relationship between ergonomics and workplace social sustainability, accompanied by a section on the research methodology. Finally, a review of the findings and their implications is provided.

2. Literature Review

This section describes social sustainability for the workplace and ergonomic factors, and the relationship between the two definitions. The concept of ergonomics and sustainability is essential to the improvement of the company. It allows the company to adjust more appropriate tasks to the employees. Based on the literature, the specific sociotechnical framework pathways in their study organizations impact business survival and show how the ergonomics approach can contribute to identifying and evaluating possible improvements [22].

To better understand how workplace sustainability related to the ergonomics concept can be assessed, its scope must be explained. Sustainability is described as meeting the human needs of current and future generations [23]. As a part of sustainability, social sustainability represents the moral and ethical reasoning of what is appropriate in a specific scenario, whereas social exchange offers the framework of individual activities for long-term collaboration [24]. There appears to be no agreement on the perspectives and criteria that should be used for conceptualizing and measuring this concept. Researchers from diverse disciplines appear to have formulated social sustainability in a variety of ways. This concept demonstrates that the character of social sustainability is multidimensional [25] and may be appropriate to the needs of the stakeholders concerned. Eizenber et al. [26], on either perspective, divide social sustainability into four dimensions: urban forms, safety, equity, and eco-prosumption. In general, many studies consider safety to be an important factor in social sustainability.

The dimensions for social sustainability to construction criteria also provide different studies. Site considerations and equipment, comfort and health considerations, safety and security, and architectural aspects are the main dimensions for these variables [16]. When compared to the prior reference, the similarity of dimensions also leads to factors of safety and security, although architectural dimensions are not recognized in the results of other studies. This occurs because the characteristics of social sustainability are applied to each object. It is necessary to make adjustments based on the needs of the users.

It was previously stated that social sustainability has a similar objective as ergonomics. This brings new possibilities for the development of social sustainability indicators based on ergonomic principles. Ergonomics emphasizes domains of specialization that include the physical, cognitive, and organizational contexts [14]. Each of these ergonomics components has its own set of considerations. The study of human anatomical, anthropometric, physiological, and biomechanical characteristics as they relate to physical activity is the focus of physical ergonomics [27]. Physical ergonomics are becoming more important as workforces age and more women take on occupations formerly controlled by men [14]. Cognitive ergonomics is concerned with how mental processes such as perception, memory, information processing, reasoning, and motor response affect interactions between humans and other system elements, and organizational ergonomics is concerned with the optimization of sociotechnical systems, such as organizational structures, policies, and processes [27].

Ergonomics is a field that focuses on the knowledge of interactions between people and systems, with the objectives of increasing worker health, safety, comfort, pleasure, commitment, and well-being through better working circumstances [28]. As a result, combining the ergonomics approach with organizational strategy could be a powerful and very useful approach for organizations. These three domains will support the aspects of human capabilities and limitations that can help the design of compatible solutions, including workplace, product, and work system design [27]. In terms of sustainability, ergonomics is a key strategy that encourages interaction in corporate culture [29]. Corporate culture improvement is enabled by the understanding of the user's requirements and preferences while performing their tasks, as well as continuous involvement in all work and life activities. The three ergonomic domains serve as a basis for the development of a social sustainability framework. The main indicator for development is the concept of social sustainability.

Ergonomics contributes to the fulfillment of social sustainability in the workplace. Stakeholders are critical to achieving social sustainability, which is oriented towards human well-being. As a result, employees' roles become critical in identifying indicators and dimensions of social sustainability in the workplace. In this way, sustainability has been analyzed exclusively according to its contractual aspects that bind the various stakeholders to the company operations [30]. A more active role from employers and employees in dealing with some ergonomic issues is needed. The practice of applying ergonomics can be realized with a multidisciplinary approach, employing several solutions that can increase productivity. However, only a few ergonomics studies have looked at this issue [31]. The application of ergonomic principles to companies in Indonesia needs to be considered. Previous research explained that many workers use the existing facilities, and the workers still show poor occupational safety and health knowledge on hazards, and sources of hazards, risk, and injury [31,32]. It is necessary to adopt a participatory approach as part of solving ergonomic problems in the workplace [33].

Stakeholder participation is crucial for any assessment framework [34]. Individual interviewees' understandings of the context are the best to be interpreted; subject of the study surveys, participant observation, or other approaches can help to provide more entire facts of the context and the level to which social sustainability is actively applied [6]. The majority of these tools generate sustainability scores using a set of indicators or ratings [5]. Although such types of sustainability evaluation systems are more comprehensive in assessing sustainability, they are less useful for developing effective strategies to improve many companies' sustainability, and a more integrative approach should be used [5].

Because companies have developed certain cultures and norms over time, it is essential to consider management practices and social dynamics among employees when studying workplace strategies. Therefore, the employees' role is essential in implementing the company's strategy, especially in realizing corporate sustainability [35]. Employees play an important role. In social exchange, employees tend to show reciprocal behavior by exchanging solutions and technical advice. They will be more likely to better integrate environmental problems in their workplace [24]. Thus, the workplace can be used as a reference indicator in the realization of corporate sustainability. This support leads to social sustainability in the workplace [36]. It is essential to investigate the underlying challenges faced by the company for successful implementation.

Meanwhile, The Ministry of Health Regulation of the Republic of Indonesia Number 48 of 2016, concerning Office Occupational Safety and Health, requires that the safety and health of workers be ensured through standards for implementing safety, health, work environment, sanitation, and office ergonomics required in office buildings. The Ministry of Manpower of the Republic of Indonesia has also strengthened regulations issued by the Ministry of Health. The Ministry of Manpower regulation Number 5 of 2018 stated that the work environment must include physics, chemistry, biology, ergonomics, and psychology. Ergonomic factors can affect workforce activities caused by mismatches between work facilities, including working methods, work positions, work tools, and lifting loads on workers. Based on the two regulations, it is clear that the ergonomic aspect is a factor that must be considered in creating a pleasant working environment by the preferences of Indonesian employees.

3. Materials and Methods

In this section, several dimensions are described in more detail to support the framework. This model identification establishes a structural model for the workplace social sustainability indicator related to the ergonomics factors.

3.1. Model Identification

Ergonomics supports global sustainability through more humane, safer, more comfortable, healthier, and more efficient business, and pays attention to welfare as a corporate goal in the sustainability discourse [37]. In applying ergonomic principles to achieve corporate sustainability, it is necessary to support company stakeholders. The concept of ergonomics supports the application of sustainable work, which is supported by employees. Employees have a critical role in achieving business sustainability and sustainable development in their workplaces and communities [38]. Although satisfying all of the criteria mentioned is difficult, the indicators must be accomplished as much as feasible.

When the amount of information is adequate, indicators are determined based on the literature. The indicators are chosen with social elements related to ergonomics that can apply to any company and holistic approach. In the beginning, indicators are divided into three levels: levels 0–3. Level 0 is the variable of the research, workplace social sustainability. Meanwhile, level 1 is the three domains of specialization of ergonomics, physical, cognitive, and organization. Levels 2 and 3 are the dimensions and indicators that break down further.

Identifying indicators based on level 2 of domain specialization refers to the existing literature, such as cognitive ergonomics. The most important dimensions include mental demand, human–machine interaction, work stress, training, and education [14,39,40]. Each dimension is further identified to determine indicators that can be used as a basis for assessment. Thirteen indicators are determined based on existing references and then evaluated by the expert by considering the suitability in the aspect of social sustainability. There are eleven indicators for the final results in the mental demand dimension. The same steps are also carried out on the entire domain and dimensions of the entire framework. The evaluation of indicators is carried out by experts based on a sustainability point of view. The selection of indicators based on the experts' points of view ensures that these indicators are included in the scope of the research. If the indicator is not feasible, the indicator is eliminated, and an additional literature search is carried out if necessary.

As a result, we eliminated indicators that were not appropriate for the conceptual model. Finally, 73 basis indicators were determined and classified based on the ergonomic factors (cognitive, physical, and organizational) (Table 1). Thresholds, also known as reference values, are minimum and maximum sustainability levels that are used to assess indicators and vary depending on the nature of the indicators. We recommend a reflection on the metrics to be used to identify and monitor social sustainability by combining a literature analysis on the sustainability assessment model, ergonomic aspects, and a real-world example of a defined set of indicators.

Table 1. Indicator identification based on three dimensions of ergonomics for social sustainability.

Mental Demand [14,39,40]—11 indicators
Mental workload (mind)
Tasks classified based on skill, rule, knowledge
Tasks needing special requirements such as attention or memory
Information that is usually processed first before a response is made
External memory aids, predictor display decision support system, navigation aids, etc.
Workers carrying out more than one task at a time (multitasking)
Physical layout of the workplaces compatible with the sequences of mental operations
Information integrated from different departments
Feedback for each task
Controls, displays, task demand, and proper support in the working area
Individual judgments (based on own opinions) involved when working
Human–Machine Interaction [14,41]—7 indicators
Available information is suitable and satisfies worker's job requirement
Flow of information in the company (e.g., SOP)
Many sources of information used by the worker (e.g., email, reports)
Variety of distractions during work (e.g., noise)
Controls on display of devices (e.g., buttons, switches, levers, mouse, keyboard)
Multiple methods in monitoring process (e.g., direct observation, checklist, survey, statistic report)
Warnings, instructions, and others displayed in the workplace
Work Stress [14]—5 indicators
Facilities to help workers during the work (e.g., printer, AC, snacks, and drinks)
Employee's work role (job description)
Performance standards
Specific work system (in details)
Support from peers and supervisor
Training and Education [42,43]—3 indicators
Training and education documentation (e.g., skills management and competence development)
Audits and monitoring, preventive safety actions in the company
Competency consideration as part of work allocation decision
Physical Demand [14,39]—7 indicators
Manual handling controlled and measured in the workplace
Large forces during the work
Work involving lifting, twisting, bending, stooping, or reaching
Static work in the workplace
Resting time
Lifting aids, power tools, and other job aids in the workplace (e.g., crane, forklift, lift)
Cycle time data
Workspace Design [14,44]—9 indicators
Space for the worker to work
Seats for workers
Adjustable seat height
Chair backrest, footrests, armrests, and/or lumbar pads in the workplace
Visual and any ergonomic requirements appropriate for the work surface
Foot controls and/or hand tools (e.g., screwdriver, pliers, hammer, stationery) for the workers
Pressure on body parts of the workers during work
Personal protective clothing for the workers
Hot or cold surfaces in the workplace (on equipment, tools, desk, etc.)

Table 1. *Cont.*

Work Environment [14,45]—3 indicators
Temperature, noise, lighting, and vibration in the work environment Humidity control and ventilation Toxic or radioactive chemicals or other hazards in the work environment
Workforce Characteristics [14]—3 indicators
Anthropometry data of the workers (e.g., body dimensions). Data of workers (gender, name, age, education, health, skill, work durations, reason for departure, etc.) Worker categories (mainly full time, part time, or seasonal)
Workplace Safety [46,47]—4 indicators
Accident data for every year Documentation on accident history of the workers (e.g., type of accident, frequency, cause, etc.) Expenditure on illness and accident prevention Documentation on absence of the workers (e.g., cause, frequency)
Organizational Structure [46]—2 indicators
Data of workers working alone or with others Structure organization
Organizational Policies [47,48]—19 indicators
Overtime payment Code of conduct signed by all employees Employment contracts and accident insurance, paid periodic vacations, etc. Study leave for the worker Documentation on Company Social Responsibility (CSR) and related topics Social investments and principles (e.g., coffee makers, sports, and activities) Career development Well-being of the local community (e.g., employment, taxes, etc.) Documentation on employment safety and decent work Rights and benefits of the workers Social sustainability programs for employees Supplier's and contractor's responsibility related to material purchasing Customer satisfaction Stay in touch with corresponding stakeholders Maintaining contact with corresponding stakeholders Overtime work data Free meal breaks and refreshments for the workers Pressure due to deadlines, meeting targets (KPI), etc. Employee satisfaction data

This stage describes how data collection and assessment are carried out in the study. Relevant statistical analysis methods are also provided supporting this study.

3.2. Assessment and Data Collection

The data was analyzed using factor analysis, including exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Exploratory factor analysis is used to determine a measure's factor structure and to assess its internal reliability. When researchers have no theories about the nature of their measure's underlying factor structure, EFA is recommended. Confirmatory factor analysis is a statistical approach that is used to confirm the factor structure of a set of observed data. CFA enables researchers to test the hypothesis that there is a link between observed factors and their underlying latent constructs.

A questionnaire was created as the primary research tool to answer the research question. The results were analyzed using MS Excel and IBM SPSS Amos 23 software. Surveys were completed online by employees with a minimum of one year of experience. Each item was rated on a five-point Likert scale, which required the participant to choose the indicator's priority level.

This study uses a non-probability sampling technique. Since our research method is non-probability sampling, we assume Indonesian workforce characteristics based on our findings. Because the study was performed online utilizing survey links, it was not possible to set a sample size prior to data collection. Furthermore, the number of employees fluctuated during the early stages of the epidemic due to layoffs [49,50]. In this analysis, purposive sampling was chosen. It is an appropriate sampling technique for particular circumstances. Purposive sampling is most commonly used when a population that is difficult to access needs to be measured.

For this research, there should be at least 365 participants before EFA is implemented. Based on the literature, the required minimum sample size has to be at least five times the total indicators (items), 73 items. After EFA is run, the result is confirmed with confirmatory factor analysis (CFA). For EFA, the duration of data collection is the first two months, the next one month is for EFA data processing, and the next two months are for the second data collection for CFA. When the duration is over, data collection is stopped. The duration of data collection for EFA is the first two months, followed by one month for EFA data processing, and another two months for CFA data collection. When the limit is exceeded, more than 365 participants, data collection terminates.

The overall number of participants was 505, with a 22.4% sample loss expected in the study. The online survey was distributed through social media platforms. The finalized questionnaire was distributed, and 392 Indonesian employee participants responded. Descriptive statistical methods were used to analyze the findings through EFA. For CFA, there were 303 participants, with a 17% sample loss. The sample size was 251, which exceeds the required minimum sample size of around 150. The data were gathered using a different questionnaire from respondents not part of the exploratory factor analysis. Figure 1 shows the step of collecting data for EFA and CFA.

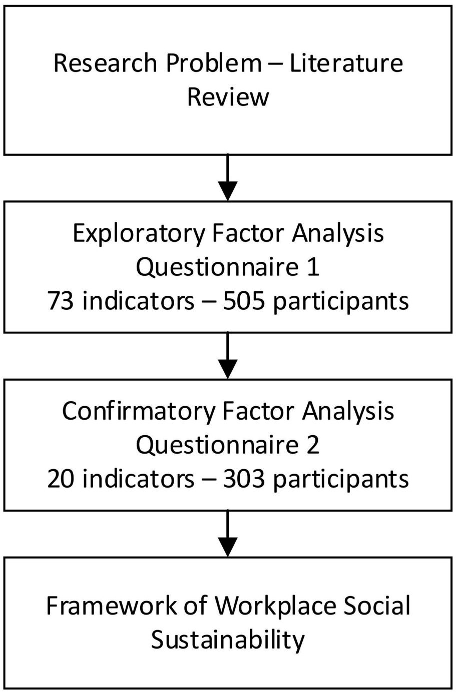

Figure 1. Collecting data for EFA and CFA.

Data were collected from June 2020 to October 2020 using a structured questionnaire. The instrument was self-developed based on the literature review, and the three steps of instrument development guided the process. First, the concept was identified through the literature. Second, the indicators were constructed by determining the framework, format, items, readability, and scoring. Finally, the validity and reliability of the instrument were checked through factor analysis.

3.3. Statistical Analysis

A descriptive analysis of the demographic profile was conducted, including industry area, gender, age, education, and work duration. Sample adequacy and correlation analysis were used to test the appropriateness indicator for performing factor analysis by KMO and Bartlett's test with a value limit >1 [51]. From the result of the test, a significant Bartlett's test excluded random correlation between the characteristics.

The indicators were developed from a literature review that supported social sustainability. Then, EFA using total variance explained was used to determine the number of new factors by varimax rotation. The consideration of varimax rotation depends on the eigenvalue >1. This step also removed the indicators with cross-loadings. The Kaiser criterion was used to assess the quality of the factor analysis. Cronbach's alpha was also calculated to determine internal consistency and the degree to which the questions were related to each other.

4. Result and Discussion

This section presents the exploratory factor analysis and the confirmatory factor analysis, which began with data collection to support the suitable indicators of workplace social sustainability related to ergonomics.

4.1. Sample Structure

Based on the questionnaire distribution of phase 1, 60% of the respondents were male; 57% were aged 25–34 years, 19% were aged 18–24 years, and 18% were aged 35–44 years. A total of 5% registered their age as 45–54 years old, and 1% were elderly (55 years and over). Almost 59% of the participants had 1–5 years of experience, while 29% had more than five years of experience. Regarding education level, 79% had undergraduate degrees and 17% had graduate degrees. In terms of the industrial sector, 43% worked in the tertiary sector, 36% in the secondary sector, and 10%, in the quaternary sector. The demographic data of phases 1 and 2 are presented in Table 2.

Table 2. Demographic data.

Type	Percentage	
	Phase 1 (EFA)	Phase 2 (CFA)
Gender		
Male	60%	45%
Female	40%	55%
Age		
18–24	19%	12%
25–34	57%	65%
35–44	18%	16%
45–54	5%	6%
55–64	1%	1%
Work Duration		
<1 years	12%	11%
1–5 years	59%	66%
6–10 years	15%	11%
>10 years	14%	12%
Industry Sector		
Tertiary	43%	45%
Secondary	36%	26%
Quaternary	19%	16%
Quinary	6%	10%
Primary	5%	3%

Table 2. *Cont.*

Type	Percentage	
	Phase 1 (EFA)	Phase 2 (CFA)
Education Level		
Senior High School	1%	1%
Diploma	3%	3%
Undergraduate	79%	73%
Master	16%	20%
Doctoral	1%	3%

The education level data showed that the majority of respondents (79%) had Bachelor's degrees, 16% had Master's degrees, 3% had diplomas, 1% had doctoral degrees, and another 1% had senior high school diplomas. Based on the demographic data of the participants, the average worker was aged 25–34 years, had a working duration of 1–5 years, worked in the quaternary industrial sector, and had an undergraduate education level (Table 2).

4.2. Feasibility Check of Exploratory Factor Analysis

Principal axis factoring was used to summarize the original information into a minimum number of factors to predict a company/institution's social sustainability score, where latent factors are identified. Exploratory factor analysis was performed on each subscale to investigate the underlying structures within the adoption and integration constructs. Varimax was chosen as the rotation method since it is an orthogonal rotation that allows for factor correlation [52,53]. Employees' point of view was used to identify the suitability of characteristics based on the literature, describing various factors of social sustainability related to ergonomic dimensions.

This stage was the initial stage before factor analysis could be carried out. In this stage, two aspects needed to be examined. The first was Barlett's test of sphericity value, which was used to check if there was a significant correlation between indicators. The Keizer–Meyers–Oklin (KMO) measure of sampling adequacy (MSA) value was the second. The KMO value was used to measure the sample's adequacy by comparing the observed correlation coefficient with the partial correlation coefficient. The Barlett's test of sphericity value was 11831.018 with a significance level of 0.000, which is less than 0.005, so the null hypothesis can be rejected and we can accept the alternative hypothesis. It indicates a significant correlation between the observed indicators. The KMO result of 0.899 showed that the sample had high adequacy.

Factor extraction for all indicators yielded 73 social sustainability factors related to ergonomics. Next, the indicators were reduced based on individual MSA. The individual MSA values had to be greater than or equal to 0.5 to be accepted. The next step in the factor analysis was factor rotation to maximize the clustering of indicators. The rotation factor used was the varimax method. Varimax was chosen because this method maximizes the amount of variance in the factor load. A factor may have a high or low average load factor or loading factors on each of its indicators. The varimax method tries to make the factor load high or close to 1 or -1 on one factor. The test results show that all indicators were acceptable. Communalities were also checked on each indicator, and each value of the extracted communalities had to be greater than or equal to 0.5. The results reveal indicators with values of less than 0.5. For this reason, 44 indicators were excluded from the total of 73 indicators. Based on the examination of Barlett's test of sphericity and the Keizer–Meyers–Oklin (KMO) measure of sampling adequacy value for the 44 selected indicators, the KMO value was 0.892 with a Bartlett's test of sphericity less than 0.05. At least two questions were highly correlated. For the correlation matrix, there was an indicator correlation higher than or equal to 0.3 and no multicollinearity. This means no values were in the very high range of 0.8–0.9. The determinant was not above 0.00001.

4.3. Determining the Number of New Factors

One of the hardest things to determine when conducting a factor analysis is the number of factors to settle on. Based on the total variance explained in the method results, recommendations for six factors could be developed. The cumulative % of the variance was 57.421. The condition is not highly acceptable at first because the minimum acceptance percentage of explanation is around 60%. The threshold of cumulative % is 60% [51]. The number of new factors was calculated using a scree plot that displayed the eigenvalues on the y-axis and the number of factors on the x-axis. A scree plot will always show a descending curve. The number of new factors was determined by the scree test, which was used to calculate the eigenvalue of data variance. Based on the scree plot results, six or seven factors were recommended, based on the elimination of the previous indicators. The eigenvalue limit had to be greater than or equal to 1. Figure 2 shows the results of the scree plot. It is essential to keep in mind that running a factor analysis reduces the large number of factors that describe a complex concept.

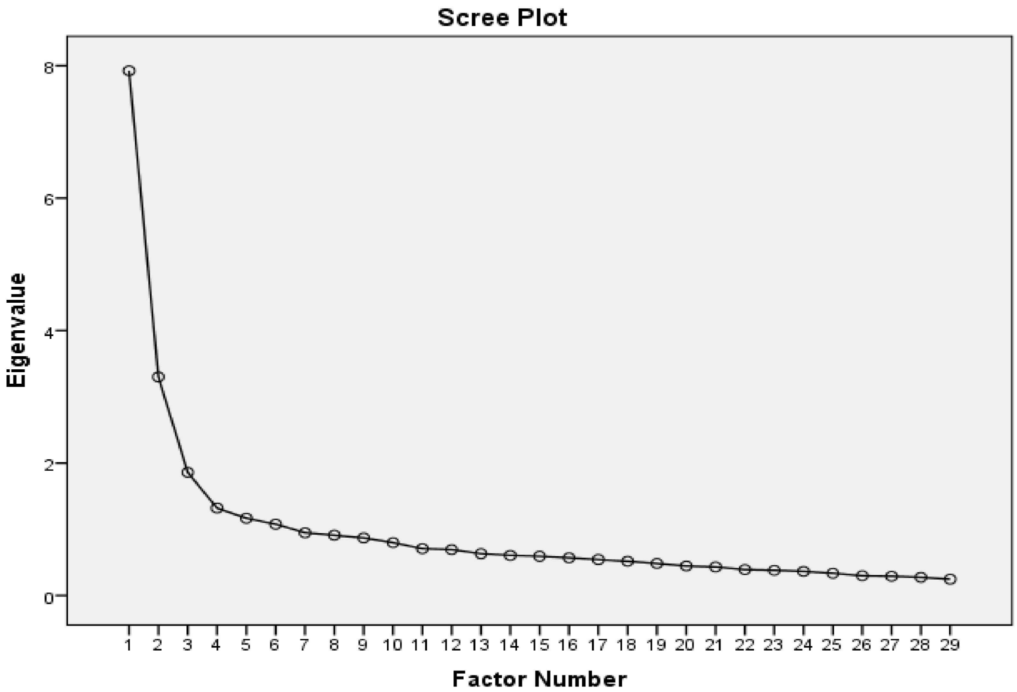

Figure 2. Scree plot.

Parallel analysis was also carried out at this stage, with 13 new factors that could be formed. Parallel analysis is a technique for assessing the number of components or factors to retain from factor analysis. The program essentially works by generating a random dataset with the same number of observations and factors as the original data. The randomly generated dataset is used to construct a correlation matrix, and the eigenvalues of the correlation matrix are determined. The findings of the parallel analysis are shown in Table 3.

Table 3. Parallel analysis results.

PARALLEL ANALYSIS.			
PAF/Common Factor Analysis and Raw Data Permutation			
Specifications for this Run:			
Ncases	392		
Nvars	73		
Ndatsets	392		
Percent	95		
Raw Data Eigenvalues, and Mean and Percentile Random Data Eigenvalues			
Root	Raw Data	Means	Percentile
1.000000	14.974612	1.170566	1.246272
2.000000	4.003787	1.089816	1.151345
3.000000	2.526635	1.030422	1.092583
4.000000	1.970033	0.979409	1.034474
5.000000	1.742454	0.933841	0.979512
6.000000	1.314191	0.893129	0.938435
7.000000	1.203260	0.853897	0.892394
8.000000	1.059863	0.818403	0.857783
9.000000	0.946328	0.783186	0.820252
10.000000	0.845538	0.749363	0.786300
11.000000	0.792749	0.717044	0.751862
12.000000	0.766780	0.686499	0.716592
13.000000	0.690711	0.657252	0.689602
14.000000	0.650818	0.629656	0.658719
15.000000	0.608408	0.601183	0.632318
16.000000	0.543959	0.574082	0.603767

4.4. Implementation of the Rotation Method

After the extraction stage, the rotation method was carried out to identify each latent factor’s indicators. This stage still referred to the extraction stage results by testing a combination of 6, 7, and 13 latent factors. The rotation method chosen was oblique with oblimin and orthogonal with varimax. The rotation of the components or factors was carried out through the varimax orthogonal rotation method to simplify the data’s interpretation to minimize the number of factors with high loads in each factor.

The rotation method was performed on the three extraction stages. First, it was applied for the results of the parallel analysis. Using the oblique with oblimin method, several factors only consist of one indicator. It is not recommended if there is a stand-alone indicator for each factor. Similar results also occur in the application of the orthogonal with varimax method. Thus, the use of 13 factors is not recommended. Second, it was applied for the rotation of the seven-factor scree plot results. The results show that one factor does not have an indicator, so the rotation method switches to six factors resulting from the total variance explained. In the first phase, two indicators were eliminated due to cross-loading and low loading factors. The iteration was repeated until there was no cross-loading between factors; each factor consisted of three indicators. With this final EFA structure, the model can explain around 61.508% of the variance; in other words, the model is acceptable. The data show that 20 indicators could be represented in up to five latent factors of social sustainability (Table 4).

Table 4. Result of rotation method by varimax with Kaiser normalization.

	Factor				
	1	2	3	4	5
Rights and benefits of the workers	0.729				
Employment contracts and accident insurance, paid periodic vacations, etc.	0.655				
Career development	0.593				
Code of conduct signed by all employees	0.564				
Employee satisfaction data	0.541				
Overtime work data	0.506				
Documentation on employment safety and decent work	0.479				
Personal protective clothing for the workers		0.740			
Lifting aids, power tools and other job aids in the workplace (e.g., crane, forklift, lift)		0.598			
Hot or cold surfaces in workplace (on equipment, tools, desk, etc.)		0.592			
Foot controls and/or hand tools (e.g., screwdriver, pliers, hammer, stationery)		0.528			
Chair backrest, footrest, armrests, and/or lumbar pads in the workplace			0.788		
Adjustable seat height			0.747		
Visual and ergonomics requirements appropriate to the work surface			0.625		
Work involving lifting or twisting, bending, stooping, or reaching				0.780	
Large forces during the work				0.704	
Manual handling controlled and measured in the workplace				0.471	
Toxic or radioactive chemicals or other hazards in the work environment					0.728
Accident data for every year					0.656
Temperature, noise, lighting, and vibration in the work environment					0.454

The rotation method with varimax generated five latent factors. The varimax result eliminated nine indicators from the extraction stage. Each latent factor was given a name according to the relationship of each indicator. Based on the reliability test results, the Cronbach's alpha values of the five latent factors were 0.808, 0.773, 0.808, 0.736, and 0.710, respectively. The overall indicators indicated no multicollinearity in each indicator. This model offered a fit result with a loading factor greater than 0.5 [51]. Table 5 showed that the % cumulative variance was 61.508. It is acceptable because the minimum acceptance percentage of explanation is 60%. It was concluded that, since multicollinearity did not occur, the factors did not have strong correlations with other factors in the model, so the prediction power was reliable and stable.

Table 5. Total variance explained.

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	5.617	28.087	28.087	5.115	25.575	25.575	2.891	14.457	14.457
2	2.805	14.023	42.110	2.371	11.855	37.430	1.936	9.682	24.139
3	1.522	7.610	49.720	1.056	5.280	42.709	1.906	9.529	33.668
4	1.257	6.283	56.003	0.779	3.893	46.603	1.671	8.353	42.022
5	1.101	5.505	61.508	0.642	3.208	49.811	1.558	7.789	49.811
6	0.755	3.776	65.284						
7	0.740	3.549	68.984						
8	0.710	3.166	72.533						
9	0.633	3.111	75.633						
10	0.622	2.857	78.810						
11	0.571	2.698	81.667						
12	0.540	2.584	84.365						
13	0.517	2.343	86.949						
14	0.469	2.131	89.292						
15	0.426	2.022	91.423						
16	0.404	2.022	93.445						
17	0.384	1.920	95.365						
18	0.328	1.638	97.002						
19	0.307	1.533	98.535						
20	0.293	1.465	100.000						

4.5. Conceptual Category

This study aimed to identify indicators that can support workplace social sustainability with the support of the ergonomic concept. Based on the literature, 73 indicators can be used to build social sustainability. The exploratory factor analysis results reduced these indicators to 20 indicators of social sustainability, grouped into five main latent factors. The five latent factors needed to be further analyzed to obtain the closeness of the meaning of each indicator.

Based on the rotation method results, the first factor contains several indicators, including rights and benefits, contract and insurance, career development, code of conduct, employee satisfaction, and safety documents. These indicators are related to aspects that can provide employee satisfaction. Employees will be more motivated to contribute to organizational objectives if they feel that the organization respects them and tries to meet their requirements, significantly influencing corporate performance [54]. In addition, equity, well-being, and employee development are the main dimensions in designing sustainable human resource management [55,56]. The safety and health conditions of the work environment, as well as the workers' views about their working environment, work atmosphere, and work organization, are all factors in well-being [57]. Employee well-being is an essential determinant of the long-term effectiveness of an organization. Therefore, these seven indicators can be called the employee well-being (EW) factor, which supports the realization of workplace social sustainability.

Another indicator that can assess workplace social sustainability is related to support for comfort at work, as supported by three indicators with loading factors of 0.625–0.788. Comfort is a priority that falls just below employee well-being and safety concerns. Employees place a high level of importance on a chair's comfort, which can be affected by the presence of a backrest, footrest, armrests, and lumbar pads. The preference is that the chairs at work can also be adjustable in height. Another requirement that must be met in the workplace is the visual consideration of ergonomics. According to several studies, there is a relationship between self-reported discomfort and musculoskeletal injuries, with these troubles influencing perceived comfort. Workplace comfort (WC) is one aspect that must be considered in the realization of workplace social sustainability [58–60].

Indicators related to personal safety and equipment are factors that have a high level of importance. Based on the survey result, the safety domain should include personal protective clothing, lifting tools and equipment, workplace environment, and hand tools. Four indicators can be proven by the loading factors of this indicator, which ranged from 0.548–0.740. The importance of using this equipment shows that the employee has reasonable concerns about safety. Employee awareness of potential hazard, as well as the employer's safety policies and procedures, are critical to personal safety in the workplace. However, a preventive solution is to consider the safety concerns (SC) related to the company's working environment as early as in the design stage of the facility's layout [61].

The human musculoskeletal system of the body enables people to move by using their muscles and bones. The musculoskeletal system is a crucial system because it gives the body form, support, stability, and movement. Abnormalities in this system can disrupt people's daily lives because they cause specific complaints. This consideration is the fourth latent factor of concern in social sustainability based on the ergonomic concept. Participants stated that work involving lifting or twisting, bending, stooping, or reaching should receive attention. Based on the principle of ergonomics, workplaces must be designed to be flexible in order to avoid postural fixation, which leads to static loads of the musculoskeletal system. Flexibility implies that the worker can perform the activity in more than one working posture at least a portion of the time, with a workplace designed to accommodate both postures [14]. The aspects of forces also need to be considered by controlling the potential for musculoskeletal health (MH) activities in the workplace. These three indicators are essential considerations that can affect musculoskeletal health and have loading factors of 0.471–0.780. A focus on preventing musculoskeletal injuries in the industry is a necessary component of ergonomics [62].

Environmental concerns (EC) are an essential consideration for employees in realizing social sustainability with three indicators. Considering the work environment by paying attention to hazards, temperature, noise, lighting, and vibration supports workplace indicators. A proper working environment is one factor that increases employee productivity, which results from increasing employee performance levels. An appropriate physical work environment can prevent employee work accidents. The physical working environment includes the nature and arrangement of all the material objects. These elements are the stimuli that individuals experience at work, and they include elements such as the building's architecture, the size and shape of the space, the furniture and equipment, and environmental conditions such as noise, lighting, or air circulation [63]. The physical work environment can have a direct effect on social perception and cognition, which not only supports the concept that both affective and cognitive processes are essential determinants of social outcomes but also complements the image of a more inclusive context for understanding the complex dynamics between an expansive list of physical work environments and a diverse collection of organizationally re-engineered work environments [64].

4.6. Confirmatory Factor Analysis

The latent factors of workplace social sustainability indicators were successfully developed in the exploratory factor analysis. The next phase was to confirm the indicators with confirmatory factor analysis to ensure that the framework fit and represented the population. Measured factors and the construct were chosen based on the EFA results. The sample size was 251, which exceeded the minimum sample size requirement of around 150. The data were collected with a different questionnaire from respondents different from those in the exploratory factor analysis.

Confirmatory factor analysis can be performed by utilizing structural equation modeling (SEM). The first step is to develop a path diagram by adding a measurement model. A path diagram is drawn, and elements of the path diagram are assigned accordingly. Initially, the elements drawn to the diagram are exogenous indicators (uncorrelated with other factors). Other elements included are the relationships of indicators, the loading (L) from construct to each measured item, and the error of every measured factor. Covariance of constructs is not included the first time, since it is assumed that latent constructs are independent (have no correlation) or, in other words, are orthogonal with the EFA output. Figure 3 shows that each latent construct contains at least three items, which present unidentified issues when SEM is run. The latent construct of employee well-being uniquely includes seven indicators. The rest of the latent construct contains only 3–4 indicators on average. There were five latent factors in the measurement models.

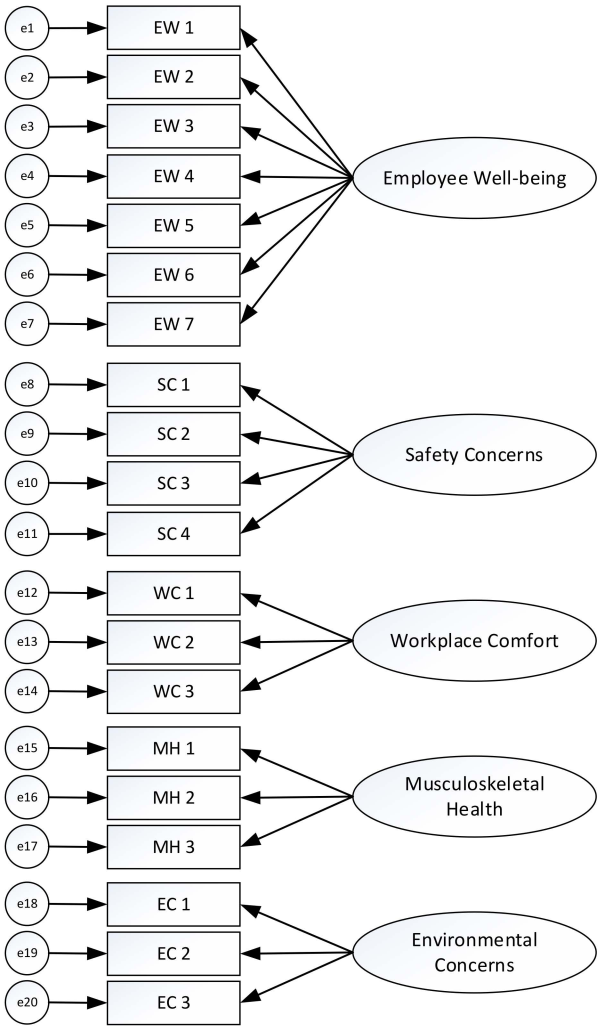

Figure 3. Measurement model of CFA path diagram.

According to the findings of exploratory factor analysis, the five latent factors supported workplace social sustainability. The measurement model was validated with a path diagram comprising two parts, which indicated the fitness of the model through the goodness of fit and construct validity. It identified employee well-being, workplace comfort, safety concerns, musculoskeletal health, and environmental concerns as priority factors of workplace social sustainability related to ergonomic practices in manufacturing and services companies. The model was validated by considering the goodness of fit acceptance. Several models were tested by starting with the initial model and adding one covariant to the initial model to add covariance between factors. The measurement results showed that the goodness of fit acceptance was still not fulfilled. The indicators used in measuring the model's validity were chi-square, normed chi-square, GFI, RMSEA, RMR, SRMR, TLI, CFI, and PNFI. Table 6 shows the result of the test. Indicators were eliminated to obtain the validity of the model according to predetermined criteria. Elimination of criteria in this CFA is performed based on the goodness of fit acceptance. Because the addition of covariance in each dimension does not obtain results that meet the limits, then the indicator is removed based on the lowest loading factor, starting with EW 6 (0.389), EW 2 (0.440), and EW 7 (0.498), respectively. After eliminating EW 7, the initial model was revised until it had good goodness of fit (GOF), which is presented in Table 6.

Table 6. Goodness of fit acceptance.

Goodness of Fit Acceptance	Value
Chi square	240.928
Normed chi-square (1–5)	2.210
GFI (≥0.9)	0.901
RMSEA (≤0.1)	0.070
RMR (≤0.08)	0.045
SRMR (≤0.08)	0.0725
TLI (≥0.8)	0.905
CFI (≥0.9)	0.924
PNFI (≥0.5)	0.698

Previously, based on Figure 4, the confirmatory factor analysis output's goodness of fit result was acceptable, which showed the framework could represent the population. To support and strengthen the study, construct validity was used as a benchmark to show that the model was robust. First, passing construct validity would prove that the model contained measurement models that represented the latent constructs. Evaluating convergent validity can be achieved by analyzing the standardized loading estimate on every item, item significance, average variance extracted (AVE), and construct reliability (CR) calculation. All items must have factor loadings above 0.5 to meet convergent validity. The factor loadings of each item in the final path diagram are shown in Table 7. In terms of the significance of the items, every indicator belonged to its construct. Every item also had a *p*-value less than the value marked with an asterisk (***), as shown in Table 8 below.

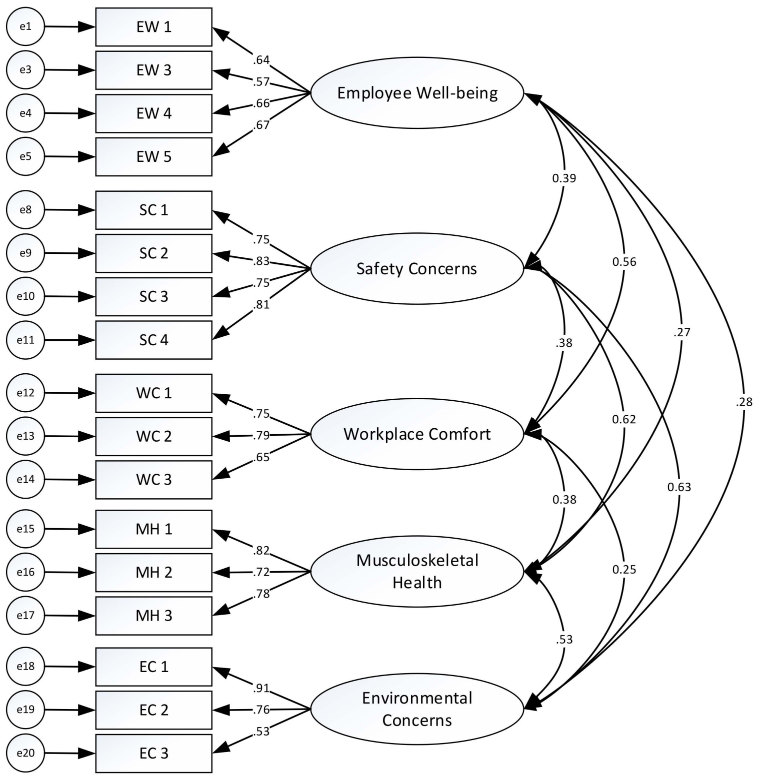

Figure 4. Comprehensive version of GOF.

Table 7. Factor loading.

	Estimate
WC3 <— WC	0.651
WC2 <— WC	0.789
WC1 <— WC	0.749
SC4 <— SC	0.808
SC3 <— SC	0.754
SC2 <— SC	0.825
SC1 <— SC	0.747
EC3 <— EC	0.534
EC2 <— EC	0.759
EC1 <— EC	0.914
MH3 <— MH	0.781
MH2 <— MH	0.724
MH1 <— MH	0.819
EW3 <— EW	0.570
EW4 <— EW	0.658
EW1 <— EW	0.644
EW5 <— EW	0.665

Table 8. Significance of CFA measurement model.

	Estimate	S.E.	C.R.	P	Label
WC3 <— WC	0.790	0.088	9.028	***	par_1
WC2 <— WC	1.000				
WC1 <— WC	1.073	0.109	9.861	***	par_2
SC4 <— SC	0.888	0.064	13.976	***	par_3
SC3 <— SC	0.795	0.062	12.841	***	par_4
SC2 <— SC	1.000				
SC1 <— SC	0.892	0.070	12.681	***	par_5
EC3 <— EC	0.464	0.056	8.303	***	par_6
EC2 <— EC	0.790	0.067	11.834	***	par_7
EC1 <— EC	1.000				
MH3 <— MH	0.910	0.076	11.915	***	par_8
MH2 <— MH	0.927	0.083	11.156	***	par_9
MH1 <— MH	1.000				
EW3 <— EW	0.756	0.108	6.980	***	par_10
EW4 <— EW	1.000				
EW1 <— EW	0.844	0.111	7.597	***	par_11
EW5 <— EW	0.937	0.121	7.740	***	par_12

The *p*-value means of its significance impact ($p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)

In order to attain convergent validity, the average variance extracted (AVE) for each latent construct must be greater than 0.5 (50%). The measurement models, in total, had five latent constructs. The AVE and CR values are listed in Table 9.

Table 9. AVE and CR of latent constructs of path diagram.

Latent Factor	AVE (Acceptance Value is $\geq$0.5)	CR (Acceptance Value is $\geq$0.7)
EW	0.40370625	0.749087437
EC	0.565544333	0.788901619
WC	0.535774333	0.774807993
MH	0.601632667	0.818816272
SC	0.6150035	0.564461023

This table shows that the employee well-being latent construct had an AVE value below the threshold, indicating that the construct items did not 100% represent the construct, or that another item needed to be included. Despite the AVE violation, the rest of the latent construct had good CR and AVE. Therefore, convergent validity was confirmed. The second phase was to check the discriminant validity of the construct. The discriminant value for every latent construct was compared with the correlation estimate. All of the latent construct's discriminant values had to be greater than the value of correlations between constructs to indicate that each latent construct could explain its items better than could other constructs. In other words, each latent construct had to be distinct from the others. The comparison results are shown in Table 10 below.

Table 10. AVE and CR of latent construct.

Latent Factor	Square Root AVE/Discriminant Value		Correlations	Estimate
EW	0.635		SC <–> EC	0.628
EC	0.752		WC <–> EW	0.557
WC	0.732		SC <–> MH	0.625
MH	0.776		EC <–> MH	0.529
SC	0.784		SC <–> EW	0.386
			EC <–> EW	0.279
			WC <–> SC	0.378
			WC <–> MH	0.381
			MH <–> EW	0.270
			WC <–> EC	0.247

Based on the discriminant validity results of the CFA measurement model, the five valid latent constructs supported workplace social sustainability. Table 10 lists the thresholds used in CFA discriminant validity. These results are used as a measure of the relationships between factors that support workplace social sustainability. For example, in the table, the relationship between safety concerns and employee well-being is 0.628. The threshold of the latent factor for employee well-being is 0.635. Given that the relationship between the safety concerns value and employee well-being is lower than the threshold (0.628 < 0.635), the latent factor is valid. The measured factors and their latent constructs are associated with the theoretical concept. The belonging of items makes sense and describes their latent construct in a meaningful way (face validity).

Furthermore, each latent construct has a relationship with each other one towards social sustainability performance (nomological validity). Therefore, the workplace sustainability framework consists of five latent factors: employee well-being, safety concerns, workplace comfort, musculoskeletal health, and environmental concerns, as presented in Figure 5. The five latent factors are supported by 17 indicators based on the ergonomic concept.

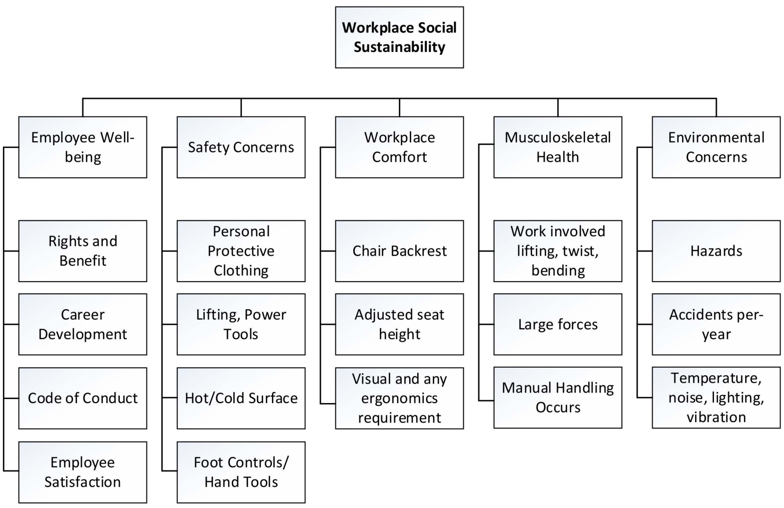

Figure 5. Framework of workplace social sustainability.

Thus, in realizing workplace social sustainability, companies must fulfill several aspects: employee well-being, safety, workplace comfort, minimization of manual handling activities, and environmental safety. Employee well-being is a significant factor that must be considered because this latent factor has the most significant importance as compared to the other latent factors in the exploratory factor analysis. Employee well-being is strongly influenced by several important factors: the fulfillment of the rights and benefits of employees, career development opportunities, clarity of code of conduct, and employee satisfaction while working at the company. If these four indicators are appropriately fulfilled, it is hoped that employee well-being can be realized in supporting workplace social sustainability.

The next latent factor that must be considered is safety concerns. This aspect also plays an essential role in realizing social sustainability in the work environment through support from the company by providing personal protective clothing, lifting and power tools, and foot controls/hand tools. In addition, in supporting the realization of safety concerns, exposure to cold and heat at workstations must be considered to provide a sense of security for employees.

Workplace comfort is a third latent factor that supports social sustainability in the workplace. Workplace comfort refers to providing a comfortable work chair with a backrest. An adjustable seat position is also an essential factor in creating workplace comfort. Workplace comfort increases when the workstation is designed with ergonomic space management by considering the visual aspects of ergonomics as well.

Musculoskeletal health and environmental concerns are the last two factors that must be considered to realize workplace social sustainability. Potential manual work activities such as lifting, twisting, and bending must be evaluated by the company. Large forces in these activities also need attention to provide comfort to workers through minimizing excessive manual handling activities. Hazard prevention and evaluation of work accidents are also activities that affect the work environment. This aspect is supported by paying attention to the work environment, such as temperature, noise, lighting, and vibration. If the company can fulfill all these requirements, employees can be healthier, have lower stress, and find a work–life balance. The company should be concerned about the quality of life in a community of employees.

The results of this framework are used to measure the workplace social sustainability. The company can then follow up to determine new policies based on the measurement results to support social sustainability in the workplace. Workplace measurement and company policy making have a continuous phase. The five factors of the framework consist of several indicators, each of which is measured independently. The measurement of each indicator can use a Likert scale, but this is only used for initial management justification. The results will be more accurate if the company implements several methods in the field of ergonomics.

Suppose that management will measure the factor of workplace comfort based on chair backrest indicators. One of the measurement methods that can be used is the NIOSH (National Institute of Occupational Safety and Health) Lifting Equation. The NIOSH Lifting Equation is a common approach used by occupational ergonomics to evaluate lifting tasks [65,66]. The NIOSH has created a mathematical model that can help forecast the risk of lifting-related injuries. For specific lifting jobs, the lifting equation specifies a recommended weight limit (RWL). Ergonomics must play a part in measuring workplace social sustainability.

There have already been a large number of studies on the scope of social sustainability. However, the majority of them focused on issues that do not include human–machine systems, including the application of ergonomic concepts. One of the social sustainability frameworks leads to construction criteria for residential buildings. This research generates a number of indicators, such as site considerations and equipment, comfort and health considerations, safety and security issues, practitioner interactions, and architectural aspects [16]. Workplace social sustainability, in comparison to the preceding framework, is a development of the previously developed social sustainability model.

The prior social sustainability framework included three factors: workplace safety, worker comfort, and environmental issues. However, earlier studies did not explicitly incorporate the human and physical elements as social sustainability indicators. In a human–machine system, indicators only apply to the physical aspects that are intended for humans. Regarding workplace social sustainability, this paradigm places an emphasis on employee well-being, which was previously not directly involved in the framework. Support for the concept of ergonomics is reinforced in the resulting workplace social sustainability by considering the factor of musculoskeletal health.

The five factors generated from the confirmatory analysis fully support current government regulations. Ministry of Health regulations emphasize office ergonomics by considering the standard of the workspace, layout, chairs, tables, work posture, corridors, work duration, and manual handling. The Ministry of Manpower has almost the same concerns: working methods, work position, work posture, design of work tools and workplaces, and restrictions on appointment, including regulating working hours and rest. All ministerial regulations explain the five employee preference factors based on the ergonomic aspects of the workplace social sustainability framework. This alignment of preferences proves that employees can have positive implications for increasing the company's sustainability index. Indirectly, this also supports the government in the sustainable development program.

The limitations of this research can be seen in the application of measurement, where the company must customize the measuring method for each dimension and indicator in workplace social sustainability. The Department of Occupational Health and Safety is required to coordinate which indicators are applicable to each department of the workplace. Based on these constraints, the application of measurements that refer to the framework must be created based on the suitability of each department in the company, which will subsequently be merged as a whole as part of the corporate level. New policies can be developed to sustain high-performing indicators and improve low-performing indicators.

5. Conclusions

This study presents five dimensions generated through confirmatory factor analysis: employee well-being, safety concerns, workplace comfort, musculoskeletal health, and environmental concerns. This study's criteria and sub-criteria are all necessary. Seventeen indicators support the five latent factors with large loading factors. The five factors may help the identification of workplace social sustainability relevant to ergonomics. However, although paying the same amount of attention to all sustainability criteria is possible, it can be impractical. Therefore, decision makers need to meet the sustainability objectives in the design. Employee preferences in various fields are aligned with the regulations on applying ergonomic principles set by the Indonesian government through the Ministry of Health and the Ministry of Manpower. This alignment supports companies in carrying out government programs to realize corporate sustainability, which can increase the global sustainability index. An integrated hierarchy, in general, will lead to a more organized and comprehensive workplace social sustainability framework. However, there is potential for further research. Different groups of participants may have different employment characteristics. This difference is interesting, because each group of workers has different potential interests in determining workplace social sustainability indicators.

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