Ergonomic Approach on Rail Industry Workers Using Rail Ergonomics Questionnaire

Dian Palupi Restuputri, Angelie Rekha Elvera, Adhi Nugraha, and Ilyas Masudin
Industrial Engineering
University of Muhammadiyah Malang
Malang, East Java, Indonesia
restuputri@umm.ac.id, rekhaelvera@gmail.com, adhinugraha@umm.ac.id ,
masudin@umm.ac.id

Abstract

The goal of this study is to use the Rail Ergonomics Questionnaire to determine the relationship between the human factor scale and worker performance, as well as to identify the most dominant factors on the human factor scale that can affect worker performance. The Rail Ergonomics Questionnaire (REQUEST) method was used in this study. This is a descriptive cross-sectional study and an analytic observational study. To collect data, the researchers used observation, questionnaires, and a literature review. To determine the number of samples, the Random Sampling technique and the Slovin method were used in this study. According to the findings of this study, the exogenous variables with a significant influence on performance are job satisfaction and safety culture. Other exogenous variables, such as usability, communication, work environment, working hours, workload, and work stress, have no effect on performance.

Keywords
Rail Ergonomics Questionnaire, Job Satisfaction, Safety Culture, and Workload.

1. Introduction
Shen et al. (2006) stated that shifted-work has a significant effect on the severity of physical and mental fatigue of workers (Van Drongelen et al. 2017). Occupational Health and Safety in Indonesia is often ignored, proven by the high number of work accidents that occurred in companies. It is indicated by data from BPJS Employment (Fuad 2019) showing that the number of work accidents continues to increase from year to year. In 2017, there were 123,041 cases reported, while in 2018, there were 173,105. The high number of work accidents is constrained by various things, for example, the mindset that considers work accidents as a disaster that leads people to be resigned (Ramli 2010). According to Kodrat (2012) and (Härmä et al. 2019), occupational accidents and occupational health are related to fatigue, shifts, and working hours. Too much workload will cause tension in workers and lead to stress (Bhui et al. 2016, Sunyoto 2012). A study states that there is an effect of stress on job satisfaction in an organization (Hoboubi et al. 2017, Sullivan and Bhagat 1992).

Praptini (2000) and (Singh et al. 2019) states that one of the factors that influence job satisfaction is job stress. The positive relationship between the work environment and job satisfaction and the work environment affects the performance of an organization. The work environment that affects human performance is influenced by physical, chemical, physiological, biological, mental, and socio-economic factors (Feldman 2003, Li et al. 2020). The workload is a determinant of work productivity (Inegbedion et al. 2020). If the workload is below the eating standard, it can lead workers to do unproductive activities. Meanwhile, if the workload is above the standard, there will be a tendency for workers to experience fatigue (Inegbedion et al. 2020). The relationship between the performance of the railroad industry employees and the factors that affect performance can be a reference to ensure safety and the system as a whole (Sinha et al. 2011). In the railway industry, it is necessary to carry out routine checks of data from workers to be used as performance indicators on various human factors from several possibilities that can affect the worker's performance.

The Rail Ergonomics Questionnaire (REQUEST) has been designed to measure workers' perceptions and opinions about various human factors scales that have been assigned to rail industry workers, and have a role in various human

factors, such as job satisfaction, workplace, occupational safety and health culture and stress (Ryan et al. 2016). PT X one of the State-Owned Enterprises engaged in transportation, which produce the first integrated train in Southeast Asia. Various kinds of products are issued, namely locomotives, passenger trains, motorized trains, freight cars, special trains, as well as developing products to meet customer needs. Based on the above background, the researcher intends to research "Analysis of Ergonomic Approach on Railway Industry Workers using Rail Ergonomics Questionnaire". The purpose of this study is to measure the worker's objective perception of various human factors in the rail industry workers. So that the results of measurements and data collection can be processed with an ergonomic approach, which is expected that the results of this research can lead to a recommendation for workers and companies. So the problem in this research is "How to analyze the perception of rail industry workers with different roles based on the human factor scales using the Rail Ergonomics Questionnaire?"

1.1 Objectives

The purpose of this study is to determine the relationship between the human factor scale with the worker performance by using the Rail Ergonomics Questionnaire and find out the most dominant factors on the human factor scale that can affect worker performance.

2. Literature Review

Ergonomics is a systematic science that provides information about the nature and capabilities of a working system in order for people to work effectively, efficiently, safely, and comfortably at work (Ginting 2010, Kroemer and Kroemer 2016). According to (Sharma et al. 2016), the term "ergonomic" is derived from the Greek words "ergon" (work) and "nomos" (natural law) and can be defined as the science of various human aspects in the workplace that are reviewed based on physiology, anatomy, psychology, management, engineering, and design. The overarching goal of ergonomics is to improve physical and mental comfort by preventing work-related diseases and disorders, reducing physical and mental workload, and increasing job satisfaction, to improve social welfare by improving the quality of social contacts, managing work effectively, and increasing social security during productive age or after being unproductive, and to create. The work system contains the elements environment, task, technology, organization, and individual. Noise, lighting, temperature, air quality, and workplace layout have all been identified as potential triggers for work by ergonomic experts. The most well-known environmental stressor that can cause increased arousal, blood pressure, and a negative psychological mood is noise(Cohen and Spacapan 1984, Leijssen et al. 2019). Environmental factors such as air quality and layout have been shown to influence energy expenditure, heat exchange, stress response, and sensory disturbances, making tasks more difficult to complete and increasing worker stress and emotional disturbances. Many so-called psychosocial work factors are related to task elements such as job demands (e.g., perceived quantitative workload, work pressure, cognitive demands), job context (e.g., challenge, repetition), machine movement, and job control (Carayon and Smith 2000, Padula et al. 2017). According to (Levecque et al. 2017) the combination of high job demands and low decision making is the most concerning and can lead to a variety of health issues. These two task elements are just two of many that can have an impact on worker performance, health, and safety. Another aspect of the task is that repetition can be physically and psychologically taxing. Physical repetition is the most important predictor of musculoskeletal disorders (Antwi-Afari et al. 2017, Silverstein et al. 1987).

Psychological repetition, such as a lack of challenge, variety, and skills, can also lead to a variety of physical and mental health issues (Cox 1985, Gruber et al. 2020). A lack of technological skills leads to low motivation, stress, and poor performance. Fear of job loss due to technological replacement reduces motivation and increases stress. On the other hand, when new technology is used correctly, it can improve job and skill utilization, leading to increased motivation and performance while reducing stress. Employees may experience physiological strain as a result of the physical characteristics of tools and technology. Poor workstation design, for example, can result in unhealthy posture and movement, as well as decreased performance (Berlin and Adams 2017, Grandjean 1980). The organizational context in which work tasks are performed frequently has an impact on worker motivation, stress, and performance. The manner in which employees are introduced to new technology or other changes, as well as the organizational support they receive, such as training and adjustment time, are related to stress and performance (Driskell et al. 2018, Smith and Carayon 1995). The ability to advance and advance on the job (career development) has an impact on motivation and stress. Other organizational considerations, such as shift work and overtime, have been linked to negative mental and physical health outcomes (Sparks et al. 2018, Williams et al. 1985).

Several personal factors influence the physiological and psychological responses elicited by the previous elements of the work system model. Personality, physical health status, skills and abilities, physical condition, anthropometry,

experience, motivation, goals, and needs are a few examples (Carayon and Smith 2000). Despite the elements' potential negative effects on motivation, performance, and work stress, there are also positive aspects that can counteract or minimize negative influences. For example, the negative impact of insufficient skills to use new technology can be mitigated by increased worker training. The negative effects of low-level work can be offset by an organizational supervisory structure that encourages employee engagement and task control. Jobs with a lot of negative elements have the most negative impact on employees, whereas jobs with a better balance are less stressful and may produce positive outcomes, such as a higher quality of work-life balance and improved performance. Work fatigue is a process in which the body's physical endurance to continue doing the activities decreases (BláfOSS et al. 2019, Wignjosoebroto 2000). Work fatigue can also be defined as a tired feeling and a decrease in alertness (Fang et al. 2019, Setyawati 2010). Fatigue is a condition in which a person's ability to carry out activities is impaired (Setyawati 2010). Fatigue, according to (Yılmaz and Üstün 2018) is a process that can result in a decrease in welfare or performance as a result of work activity. When the body's performance suffers, so do its power, work capacity, and concentration to complete a task. The workload is a task assigned to the workforce that must be completed in a set amount of time using the worker's skills and potential. Workloads are classified into two types: qualitative workloads and quantitative workloads (Munandar 2001). Workload is said to affect work stress in a study (Erat et al. 2017, Nurmalasari 2012). Workload, according to Shah et al. (2011), has a significant negative impact on worker performance.

3. Methods

This is an analytic observational study and descriptive cross-sectional research that uses hypothesis testing to explain the differences between variables. The human factor scale was used in this study, which includes job satisfaction, work environment, communication, system usability, workload, occupational health and safety culture, working hours, workload, and work-related stress. To collect data, the researchers used observation, questionnaires, and a literature review. To determine the number of samples, the Random Sampling technique and the Slovin method were used in this study. The SmartPLS software was used to assess the validity and reliability of each variable indicator in this study. The measurement model was used in the validity testing, specifically by looking at the loading factor value. If the loading factor value is greater than 0.6, the variable indicator in this study is valid. In terms of reliability, testing is done by examining the results of the value of composite reliability. If the composite reliability value is greater than 0.7, the variable indicators in this study are considered reliable (Hair et al. 2017). In this study, the structural model was tested using the Structural Equation Model (SEM), which is a type of multivariate analysis in the field of social science. Multivariate analysis is a statistical method for analyzing multiple research variables at the same time (Hair et al. 2016). Partial Least Squares is a method for determining the complexity of a relationship between constructs as well as seeing the relationship between constructs and their indicators. PLS has two evaluation models: the measurement model and the structural model. In this study, the structural model was evaluated to determine the relationship between latent constructs. R-square and path coefficients are two of the tests run on the structural model. Following data processing, the next step is to analyze the results of the REQUEST questionnaire data processing. The final stage is to summarize the results of the data processing analysis. It also makes recommendations for businesses and additional researchers.

As shown in Figure 1, this research model consists of eight latent variables, including job satisfaction, usability, communication, work environment, safety culture, working hours, workload and work stress, as well as performance. Evaluation of the measurement model is a stage to test the validity and reliability of a latent variable. In this study, the researcher wanted to see the relationship between variable X and variable Y. Determination of the conceptual model is a model used to describe the relationship of various scales of human factors with worker performance. From the conceptual model, it is also possible to see the factors which one is the most dominant to worker performance. The next conceptual model makes hypotheses for this study.

The hypotheses are:

H1 : Job satisfaction has a significant effect on worker performance
H2 : Usability has a significant effect on worker performance
H3 : The communication factor has a significant effect on worker performance
H4 : Environment has a significant effect on worker performance
H5 : Workload and work stress have a significant effect on worker performance

H6 : The safety culture factor has a significant effect on worker performance
H7 : The factor of working hours has a significant effect on worker performance

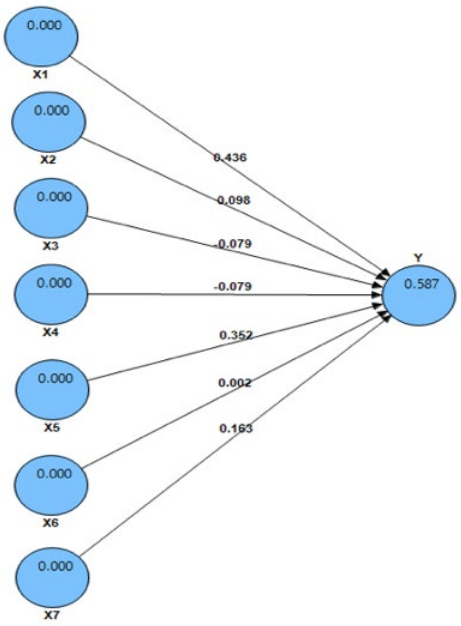

Figure 1. Path diagram

4. Data Collection

4.1 Respondent Profiles

Based on the Table 1, it is known that from the 272 workers involved in this study, at most 14.3% of the respondents were part of the research and development division, and at least 11.4% of the respondents were part of the Human Resource and General Affair divisions. It shows that most of the workers involved in this research were part of the research and development division.

Table 1. Respondent frequency distribution

Division	Frequency	Percentage
Research & Development	39	14.3%
Human Resource & General Affair	31	11.4%
Finance & Accounting	33	12.1%
Organizational Design	33	12.1%
Technology	32	11.8%
Internal Audit Unit	33	12.1%
Marketing	37	13.6%
Corporate Secretary	34	12.5%
Total	**272**	**100%**

Based on the Table 2, it is known that from 272 workers involved in this study, 50.7% of respondents had positions as Certain Period Employment Contract (PKWT), then 45.2% of respondents positioned as staff, then 2.6% of respondents were managers, and 1.5% of respondents were specialists. It shows that most of the workers involved in this research had a position as PKWT.

Table 2. Position frequency distribution

Position	Frequency	Percentage
Certain Period Employment Contract (PKWT)	138	50.7%
Staff	123	45.2%
Manager	7	2.6%
Specialist	4	1.5%
Total	**272**	**100%**

Based on the Table 3, it is known that from 272 workers involved in this study, 51.1% of respondents were male, and 48.9% of respondents were female. It shows that most of the workers involved in this study were male.

Table 3. Gender frequency distribution

Gender	Frequency	Percentage
Male	139	51.1%
Female	133	48.9%
Total	**272**	**100%**

Based on Table 4, it can be seen that from 272 workers involved in this study, 23.9% of respondents aged under 25 years, then 58.1% of respondents aged between 25 to 34 years, 14.3% of respondents aged between 35 to 44 years, and 3.7% of respondents aged between 45 to 56 years. It shows that most of the workers involved in this study were between 25 and 34 years old.

Table 4. Age frequency distribution

Age	Frequency	Percentage
Under 25 Years Old	65	23.9%
25 – 34 Years Old	158	58.1%
35 – 44 Years Old	39	14.3%
45 – 56 Years Old	10	3.7%
Total	**272**	**100%**

Based on Table 5, it can be seen that from 272 workers involved in this research, 10.3% of respondents had a working period of less than 1 year, then 72.1% of respondents had a working period of 1 to 5 years, 9.6% of respondents had a working period of 6 to 10 years, 4.4% of respondents had 11 to 19 years of service, and 3.7% of respondents had more than 20 years of service. It shows that most of the workers involved in this research had a working period of 1 to 5 years.

Tabel 5. Working period frequency distribution

Working Period	Frequency	Percentage
Less than 1 Years	28	10.3%
1 – 5 Years	196	72.1%
6 – 10 Years	26	9.6%
11 – 19 Years	12	4.4%
Over 20 Years	10	3.7
Total	**272**	**100%**

According to Table 6, 17.3 percent of the 272 workers in this study had a term of less than one year service, 75.7 percent had a term of one to five years service, 5.9 percent had a term of six to ten years service, and 1.1 percent had a term of more than twenty years service. It demonstrates that the majority of the workers in this study had a term of 1 to 5 years. According to the analysis, the job satisfaction variable is measured by three dimensions, with four dimensions (X1.1 to X1.3) having a loading factor value greater than 0.6. As a result, the four dimensions have been declared valid for measuring the job satisfaction variable. The usability variable is measured by ten indicators, each

of which has a loading factor value greater than 0.6. As a result, the indicators are declared to be valid for measuring the usability variable. The communication variable is measured by two dimensions, each of which has a loading factor greater than 0.6. As a result, the dimensions are declared to be valid for measuring the communication variable. The work environment variable is measured on two dimensions, each of which has a loading factor value greater than 0.6. As a result, these dimensions have been declared valid for measuring work environment variables.

Tabel 6. Term frequency distribution

Term of Office	Frequency	Percentage
Less than 1 Years	47	17.3%
1 – 5 Years	206	75.7%
6 – 10 Years	16	5.9%
11 – 19 Years	3	1.1%
Total	**272**	**100%**

The variable of safety culture is measured by fifteen indicators, with all indicators (X5.1 to X5.15) having a loading factor value greater than 0.6. As a result, the indicators are declared to be valid for measuring the safety culture variable. The working hours variable is represented by seven indicators, each of which has a loading factor value greater than 0.6. As a result, the indicator is declared to be accurate in measuring the working hours variable. The work stress variable is measured by twenty indicators, all of which have a loading factor value greater than 0.6 (X7.1 to X7.20). As a result, the indicators are declared to be valid for measuring the work stress variable. The performance variable is measured by ten indicators, with each indicator (Y1.1 to Y1.10) having a loading factor value greater than 0.6. As a result, the indicators are declared to be valid for measuring the performance variable.

Based on Table 7, it can be seen that the composite reliability values on the job satisfaction, usability, communication, work environment, safety culture, working hours, work stress, and performance variables are greater than 0.7. Thus, based on the calculation of composite reliability, all indicators that measure job satisfaction, usability, communication, work environment, safety culture, working hours, work stress, and performance variables are declared reliable.

Tabel 7. Validity test results

Variable	Composite Reliability
Job Satisfaction	0.768
Usability	0.736
Communication	0.727
Work Environment	0.814
Safety Culture	0.747
Working Hours	0.771
Work Stress	0.775
Performance	0.793

4.2 Job Satisfaction Variable Measurement Model

Based on the measurement model in the Table 8, it is known that the loading factor value of the X1.1 dimension is 0.903. It means that the job satisfaction variable diversity can be represented by the X1.1 dimension of 90.3%. In other words, the contribution of the X1.1 dimension in measuring the job satisfaction variable is 90.3%. The loading factor value of the X1.2 dimension is 0.696. It means that the job satisfaction variable diversity can be represented by the X1.2 dimension of 69.6%. In other words, the contribution of the X1.2 dimension in measuring the job satisfaction variable is 69.6%. The loading factor value of the X1.3 dimension is 0.642. It means that the job satisfaction variable diversity can be represented by the X1.3 dimension of 64.2%. In other words, the contribution of the X1.3 dimension in measuring the job satisfaction variable is 64.2%. The job satisfaction variable measurement model also informs that the X1.1 dimension has the highest loading value of 0.903. It means that the X1.1 dimension is the dominant indicator in measuring the job satisfaction variable.

Table 8. Measurement of job satisfaction variables

Variable	Dimension	Loading Factor
Job Satisfaction	X1.1	0.903
	X1.2	0.696
	X1.3	0.642

4.3 Usability Variable Measurement Model

The loading factor value of the X2.1 indicator is 0.657, according to the measurement model in the Table 9. This means that the X2.1 indicator of 65.7 percent can represent the usability variable diversity. In other words, the X2.1 indicator contributes 65.7 percent to measuring the usability variable. The indicator X2.2 has a loading factor of 0.653. This means that the X2.2 indicator of 65.3 percent can represent the usability variable diversity. In other words, the X2.2 indicator contributes 65.3 percent to the measurement of the usability variable. The X2.3 indicator has a loading factor of 0.752. This means that the X2.3 indicator of 75.2 percent can represent the usability variable diversity. In other words, the X2.3 indicator contributes 75.2 percent to measuring the usability variable. The X2.4 indicator has a loading factor of 0.661. This means that the X2.4 indicator of 66.1 percent can represent the usability variable diversity. In other words, the X2.4 indicator contributes 66.1 percent to measuring the usability variable. The X2.5 indicator has a loading factor of 0.767. This means that the X2.5 indicator of 76.7 percent can represent the usability variable diversity. In other words, the X2.5 indicator contributes 76.7 percent to measuring the usability variable.

Table 9. Measurement of usability variables

Variable	Indicator	Loading Factor
Usability	X2.1	0.657
	X2.2	0.653
	X2.3	0.752
	X2.4	0.661
	X2.5	0.767

Variable	Indicator	Loading Factor
Usability	X2.6	0.660
	X2.7	0.623
	X2.8	0.663
	X2.9	0.694
	X2.10	0.608

The X2.6 indicator has a loading factor of 0.660. This means that the X2.6 indicator of 66 percent can represent the usability variable diversity. In other words, the X2.6 indicator contributes 66% of the time to measuring the usability variable. The X2.7 indicator has a loading factor of 0.623. This means that the X2.7 indicator of 62.3 percent can represent the usability variable diversity. In other words, the X2.7 indicator contributes 62.3 percent to measuring the usability variable. The X2.8 indicator has a loading factor of 0.663. This means that the X2.8 indicator of 66.3 percent can represent the usability variable diversity. In other words, the X2.8 indicator contributes 66.3 percent to measuring the usability variable. The X2.9 indicator has a loading factor of 0.694. This means that the X2.9 indicator of 69.4 percent can represent the usability variable diversity. In other words, the X2.9 indicator contributes 69.4 percent to measuring the usability variable. The X2.10 indicator has a loading factor of 0.608. This means that the X2.10 indicator of 60.8 percent can represent the usability variable diversity. In other words, the X2.10 indicator contributes 60.8 percent of the time to measuring the usability variable. According to the usability variable measurement model, the X2.5 indicator has the highest loading value of 0.767. It means that the X2.5 indicator is the most important in determining usability variables.

4.4 Communication Variable Measurement Model

Based on the measurement model in the Table 10, it is known that the loading factor value of the X3.1 dimension is 0.709. It means that the communication variable diversity can be represented by the X3.1 dimension of 70.9%. In other words, the contribution of the X3.1 dimension in measuring the communication variable is 70.9%. The loading factor value of the X3.2 dimension is 0.800. It means that the communication variable diversity can be represented by the X3.2 dimension of 80.0%. In other words, the contribution of the X3.2 dimension in measuring the communication variable is 80.0%. The communication variable measurement model also informs that the X3.2 dimension has the highest loading value of 0.800. It means that the X3.2 dimension is the dominant indicator in measuring the communication variable.

Table 10. Measurement of communication variable

Variable	Indicator	Loading Factor
Communication	X3.1	0.709
	X3.2	0.800

4.5 Work Environment Variable Measurement Model

Based on the measurement model in the Table 11, it is known that the loading factor value on the X4.1 dimension is 0.660. It means that the work environment variable diversity can be represented by the X4.1 dimension of 66.0%. In other words, the contribution of the X4.1 dimension in measuring the work environment variable is 66.0%. The loading factor value of the X4.2 dimension is 0.976. It means that the work environment variable diversity can be represented by the X4.2 dimension of 97.6%. In other words, the contribution of the X4.2 dimension in measuring the work environment variable is 97.6%. The work environment variable measurement model also informs that the X4.2 dimension has the highest loading value of 0.976. It means that the X4.2 dimension is the dominant indicator in measuring the work environment variable.

Table 11. Measurement of work environment variable

Variable	Indicator	Loading Factor
Work Environment	X4.1	0.660
	X4.2	0.976

4.6 Safety Culture Variable Measurement Model

Based on the measurement model in the Table 12, it is known that the loading factor value of the indicator X5.1 is 0.657. It means that the safety culture variable diversity can be represented by the X5.1 indicator of 65.7%. In other words, the contribution of the X5.1 indicator in measuring the safety culture variable is 65.7%. The loading factor value of the X5.2 indicator is 0.619. It means that the safety culture variable diversity can be represented by the X5.2 indicator of 61.9%. In other words, the contribution of the X5.2 indicator in measuring the safety culture variable is 61.9%. The loading factor value of the X5.3 indicator is 0.615. It means that the safety culture variable diversity can be represented by the X5.3 indicator of 61.5%. In other words, the contribution of the X5.3 indicator in measuring the safety culture variable is 61.5%. The loading factor value of the X5.4 indicator is 0.675. It means that the safety culture variable diversity can be represented by the X5.4 indicator of 67.5%. In other words, the contribution of the X5.4 indicator in measuring the safety culture variable is 67.5%.

Table 12. Measurement of safety culture variable

Variable	Indicator	Loading Factor
Safety Culture	X5.1	0.657
	X5.2	0.619
	X5.3	0.615
	X5.4	0.675
	X5.5	0.670
	X5.6	0.614
	X5.7	0.698
	X5.8	0.624

Variable	Indicator	Loading Factor
Safety Culture	X5.9	0.616
	X5.10	0.625
	X5.11	0.687
	X5.12	0.668
	X5.13	0.762
	X5.14	0.758
	X5.15	0.644

The loading factor value of the X5.5 indicator is 0.670. It means that the safety culture variable diversity can be represented by the X5.5 indicator of 67%. In other words, the contribution of the X5.5 indicator in measuring the safety culture variable is 67%. The loading factor value of the X5.6 indicator is 0.614. It means that the safety culture variable diversity can be represented by the X5.6 indicator of 61.4%. In other words, the contribution of the X5.6 indicator in measuring the safety culture variable is 61.4%. The loading factor value of the X5.7 indicator is 0.698. It means that the safety culture variable diversity can be represented by the X5.7 indicator of 69.8%. In other words, the contribution of the X5.7 indicator in measuring the safety culture variable is 19.8%. The loading factor value of the X5.8 indicator is 0.614. It means that the safety culture variable diversity can be represented by the X5.8 indicator of 61.4%. In other words, the contribution of the X5.8 indicator in measuring the safety culture variable is 61.4%.

The loading factor value of the X5.9 indicator is 0.616. It means that the safety culture variable diversity can be represented by the X5.9 indicator of 61.6%. In other words, the contribution of the X5.9 indicator in measuring the safety culture variable is 61.6%. The loading factor value of the X5.10 indicator is 0.625. It means that the safety culture variable diversity can be represented by the X5.10 indicator of 62.5%. In other words, the contribution of the X5.10 indicator in measuring the safety culture variable is 62.5%. The loading factor value of the X5.11 indicator is 0.687. It means that the safety culture variable diversity can be represented by the X5.11 indicator of 68.7%. In other words, the contribution of the X5.11 indicator in measuring the safety culture variable is 68.7%. The loading factor value of the X5.12 indicator is 0.668. It means that the safety culture variable diversity can be represented by the X5.12 indicator of 66.8%. In other words, the contribution of the X5.12 indicator in measuring the safety culture variable is 66.8%.

The loading factor value of the X5.13 indicator is 0.762. It means that the safety culture variable diversity can be represented by the X5.13 indicator of 76.2%. In other words, the contribution of the X5.13 indicator in measuring the safety culture variable is 76.2%. The loading factor value of the X5.14 indicator is 0.658. It means that the safety culture variable diversity can be represented by the X5.14 indicator of 65.8%. In other words, the contribution of the X5.14 indicator in measuring the safety culture variable is 65.8%. The loading factor value of the X5.15 indicator is 0.644. It means that the safety culture variable diversity can be represented by the X5.15 indicator of 64.4%. In other words, the contribution of the X5.15 indicator in measuring the safety culture variable is 64.4%. The safety culture variable measurement model also informs that the X5.13 indicator has the highest loading value of 0.762. It means that the X5.13 indicator is the dominant indicator in measuring the safety culture variable.

4.7 Working Hours Variable Measurement Model

Based on the measurement model in the Table 13, it is known that the loading factor value of the X6.1 indicator is 0.755. It means that the working hours variable diversity can be represented by the X6.1 indicator of 75.5%. In other words, the contribution of the X6.1 indicator in measuring the working hours variable is 75.5%. The loading factor value of the X6.2 indicator is 0.662. It means that the working hours variable diversity can be represented by the X6.2 indicator of 66.2%. In other words, the contribution of the X6.2 indicator in measuring the working hours variable is 66.2%. The loading factor value of the X6.3 indicator is 0.628. It means that the working hours variable diversity can be represented by the X6.3 indicator of 62.8%. In other words, the contribution of the X6.3 indicator in measuring the working hours variable is 62.8%.

Table 13. Measurement of working hours variable

Variable	Indicator	Loading Factor
Working Hours	X6.1	0.755
	X6.2	0.662
	X6.3	0.628
	X6.4	0.666
	X6.5	0.683
	X6.6	0.825
	X6.7	0.613

The loading factor value of the X6.4 indicator is 0.666. It means that the working hours variable diversity can be represented by the X6.4 indicator of 66.6%. In other words, the contribution of the X6.4 indicator in measuring the working hours variable is 66.6%. The loading factor value of the X6.5 indicator is 0.683. It means that the working hours variable diversity can be represented by the X6.5 indicator of 68.3%. In other words, the contribution of the X6.5 indicator in measuring the working hours variable is 68.3%. The loading factor value of the X6.6 indicator is 0.825. It means that the working hours variable diversity can be represented by the X6.6 indicator of 82.5%. In other words, the contribution of the X6.6 indicator in measuring the working hours variable is 82.5%. The loading factor value of the X6.7 indicator is 0.613. It means that the working hours variable diversity can be represented by the X6.7 indicator of 61.3%. In other words, the contribution of the X6.7 indicator in measuring the working hours variable is 61.3%. The working hours variable measurement model also informs that the X6.6 indicator has the highest loading value of 0.825. It means that the X6.6 indicator is the dominant indicator in measuring the working hours variable.

4.8 Work Stress Variable Measurement Model

Table 14 shows the measurement results of the work stress variable, where the loading factor value starts from 0.600 to 0.750. The work stress variable measurement model also informs that the X7.6 indicator has the highest loading value of 0.737. It means that the X7.10 indicator is the dominant indicator in measuring the work stress variable.

Table 14. Measurement of work stress variable

Variable	Indicator	Loading Factor
Work Stress	X7.1	0.711
	X7.2	0.712
	X7.3	0.737
	X7.4	0.611
	X7.5	0.614
	X7.6	0.737
	X7.7	0.632
	X7.8	0.617
	X7.9	0.645
	X7.10	0.652

Variable	Indicator	Loading Factor
Work Stress	X7.11	0.727
	X7.12	0.689
	X7.13	0.623
	X7.14	0.634
	X7.15	0.696
	X7.16	0.615
	X7.17	0.610
	X7.18	0.624
	X7.19	0.620
	X7.20	0.691

4.9 Performance Variable Measurement Model

Table 15 shows the measurement results of the performance variable, where the loading factor value starts from 0.600 to 0.770. 11. The performance variable measurement model also informs that the Y1.5 indicator has the highest loading value of 0.774. It means that the Y1.5 indicator is the dominant indicator in measuring the performance variable.

Table 15. Measurement of *performance* variable

Variable	Indicator	Loading Factor
Performance	Y1.1	0.681
	Y1.2	0.757
	Y1.3	0.654
	Y1.4	0.717
	Y1.5	0.774

Variable	Indicator	Loading Factor
Performance	Y1.6	0.756
	Y1.7	0.651
	Y1.8	0.665
	Y1.9	0.716
	Y1.10	0.626

According to Table 16, the results obtained for hypothesis testing are as follows: The effect of job satisfaction on performance yields a path coefficient of 0.436 and a T statistic of 3.144. The test results show that the value of T statistics is greater than the value of T table (1.96). It means that job satisfaction has a significant impact on performance. The impact of usability on performance results in a path coefficient of 0.098 and a T statistics value of 1.181. The test results show that the value of T statistics T table is significant (1.96). It means that usability has a negligible effect on performance. The impact of communication on performance results in a path coefficient of -0.079 and a T statistics value of 0.962. The test results show that the value of T statistics T table is significant (1.96). It means that communication has a negligible effect on performance.

Table 16. Hypothesis testing results

Exogenous	Endogenous	Path Coefficient	Standard Error	T Statistics
Job Satisfaction	Performance	0.436	0.139	3.144
Usability	Performance	0.098	0.083	1.181
Communication	Performance	-0.079	0.082	0.962
Work Environment	Performance	-0.079	0.170	0.463
Safety Culture	Performance	0.352	0.117	3.017
Working Hours	Performance	0.002	0.086	0.024
Workload and Work Stress	Performance	0.163	0.168	0.968

The impact of the work environment on performance results in a path coefficient of -0.079 and a T statistics value of 0.463. The test results show that the value of T statistics T table is significant (1.96). It means that the work environment has a negligible impact on performance. The impact of safety culture on performance results in a path coefficient of 0.352 and a T statistics value of 3,017. The test results show that the value of T statistics is greater than the value of T table (1.96). It means that safety culture has a significant impact on performance. Working hours have a path coefficient of 0.002 and a T statistics value of 0.024. The test results show that the value of T statistics T table is significant (1.96). It means that working hours have a negligible effect on performance. The impact of workload and work stress on performance results in a path coefficient of 0.163 and a T statistics value of 0.968. The test results show that the value of T statistics T table is significant (1.96). It means that workload and work stress have a negligible effect on performance.

As shown in Table 17, the analysis results inform that the variable with the highest coefficient on performance is job satisfaction, with a total effect of 0.436. Thus job satisfaction is a variable that has the most dominant effect on performance. The analysis result of usability shows the number of 0.098 so that it is known that this variable affects performance. The analysis result of communication and work environment is -0.079 so that it can be concluded that there is no effect between these two variables on performance. The results obtained in the safety culture is 0.325 while for work stress is 0.163; it is concluded that the two variables affect the performance variable. On the working hours variable, the results obtained are 0.002; it is concluded that these variables do not affect performance.

Table 17. Dominant effect

Exogenous	Endogenous	Path Coefficient
Job Satisfaction	Performance	0.436
Usability	Performance	0.098
Communication	Performance	-0.079
Work Environment	Performance	-0.079
Safety Culture	Performance	0.352
Working Hours	Performance	0.002
Work Stress	Performance	0.163

5. Results and Discussion

Based on the results of data processing carried out in this study, the coefficient of job satisfaction on the performance of 0.436 states that job satisfaction has a positive and significant effect on worker performance. So it can be interpreted that the higher the job satisfaction felt by employees, the more likely they can improve performance. Testing the effect by looking at the path coefficient value is positive and if the value of T statistics $\geq$ T table (1.96), then it can be interpreted that there is a positive and significant effect of exogenous variables on endogenous variables. Another study also stated that there is an influence between job satisfaction on work performance (Eliyana and Ma'arif 2019, Nitisemito 1996). In addition, (Pang and Lu 2018)state that job satisfaction is one of the factors that can improve worker performance which will contribute to performance improvement in a company.

The potential relationship between employee attitudes and employee performance was rigorously investigated since the 1930s, coinciding with the study of Hawthorne and the relationship to people and movement. Following the human relations movement, the most influential narrative review of job satisfaction with job performance relationships was investigated by (Porter et al. 1995). In the study, the authors reviewed studies relating job satisfaction to job performance as well as several other behavioral outcomes (accidents, absenteeism, and turnover). Expectancy-based motivation theories generally define job satisfaction as something following rewards generated by performance (Van Eerde and Thierry 1996). LAWLER III and Porter (1967), (Van Eerde and Thierry 1996) argue that sincerity will lead to job satisfaction through the provision of intrinsic and extrinsic rewards. From four studies, it is stated that job performance has a significant causal effect on job satisfaction (Smayling and Miller 2012) However, in the six other studies, it was stated that there was no significant effect. So, as in job satisfaction. The results of the research on the relationship between job satisfaction and performance are inconsistent.

In this study, the coefficient of the work environment on the performance of 0.079 states that the work environment has a negative but not significant effect on worker performance. So it can be interpreted that the better the work environment felt by employees, the more likely they are to reduce performance. Although not significant, testing the

effect by looking at the path coefficient value is positive, and if the value of T statistics ≥ T table (1.96), then it can be interpreted that there is a negative and insignificant effect of exogenous variables on endogenous variables. However, in other studies, it is stated that everything that is around workers when doing a job can affect workers when carrying out their duties (Nitisemito 1996, Wang et al. 2018).

Job performance is the main function of knowledge, skills, abilities, and personal characteristics of an employee that may contribute to or can reduce the function of effectiveness in the workplace (Rismawati and Mattalata 2018) and the work environment can affect or can limit or increase worker performance (Al-Omari and Okasheh 2017, Peters and O'Connor 1980). Work environment and organizational variables are known to affect performance in two ways. First, the work environment can affect performance through constraints (Agbozo et al. 2017, Peters et al. 1980, Ramli 2019). The work environment can impede, interfere, or limit the range of skilled work behaviors, potentially affecting workers' performance while working on their duties and impeding the relationship between ability and performance. Second, the work environment can have an impact on performance through the effectiveness of workers when doing work on work arrangements (Pawirosumarto et al. 2017, Peters and O'Connor 1980, Ramli 2019). For example, the work environment provides information about the organization's reward system, which can further provide motives, effective reactions, and expectations of particular consequences of specified behavior. Concerning the influence of the work environment on performance Peters and O'Connor (1980) initiated a crucial research program to identify possible national constraint situations that may, first, have a direct and negative impact on workers and worker performance, and the second, on the relationship between moderate ability performance. In a series of laboratory experiments, these researchers demonstrated that performance constraints may influence task performance and employee active reactions such as frustration and dissatisfaction (Peters and O'Connor 1980). A more substantial relationship between work environment and performance was evident in a field study conducted by (Kartal 2018, Steel and Mento 1986).They found a significant effect of high and low situational constraint environments. The relationship between work environment and performance also depends on the performance measures used (Pawirosumarto et al. 2017).

The International Standards Organization (ISO) standard for usability (Bevan et al. 2015) covers three usability dimensions that should be used to fully assess the usability construct. ISO defines these three dimensions as effectiveness (whether the user is successful in performing the task), efficiency (whether the user can perform the task quickly), and satisfaction (whether the user is satisfied when performing the task). In other words, for a given system, if users can complete a task, but they take a lot of time to do it, or if they are not happy with the way they have to do it, the usability of the system is rated low because only one of the three usability dimensions has been met. If the usability level is high, the user performance will increase or help the performance level in completing the task. According to (Lewis and Sauro 2009) the strength of the relationship between system usability and employee performance seems to depend on the nature of the task used to establish the relationship. So the other assessment states that there is no significant relationship. It may be due to the increasing number of tasks, as well as the user's reluctance to rank all interfaces poorly in the ratings. It can be that one task is clear and easy but the others give some not-very-successful effects in carrying out the task. Or maybe, Users do only some sort of weighted integrated average of their entire experience so that positive experiences carry more weight even when it's hard to understand. There have been several studies on measuring and reporting user satisfaction (Alessa et al. 2018, Dianat et al. 2019, Giese and Cote 2000) and because of the complexity of satisfaction constructs, many of these measures may not report accurate assessments of all these constructs (Peterson and Wilson 1992).

Many factors, such as interface aesthetics (Sonderegger and Sauer 2010) are functional or lack thereof (Goodwin 1987) implied or explicit social factors associated with interface use (Venkatesh and Morris 2000), and cultural factors for different users (Vatrapu and Pérez-Quiñones 2006) may run in satisfaction. Users may include some or all of these elements in their usability assessment, introducing variants when tasks are varied and numerous. Research relating system usability scores to the most popular number of user satisfaction metrics, and careful analysis of potential overlapping measurement dimensions, may provide additional insight into the relationship between subjective usability and ISO metrics. The type of task and the way the practitioner presents the data can also have an impact on the strength of the correlation. In this study, the effect of usability on performance resulted in a path coefficient of 0.098 with a T statistics value of 1.181. The test results show that the value of tT statistics < T table (1.96). It means that there is an insignificant effect of usability on performance. Meanwhile, according to the path diagram coefficients into the structural model, it states that usability has a positive and insignificant effect on performance. It means that the higher the usability, the more likely it is to improve performance, although the increase is not significant.

The effect of communication on performance produced a path coefficient of -0.079 with a T statistics value of 0.962 in this study. The test results show that the value of T statistics T table is significant (1.96). It means that communication has a negligible effect on performance. The path diagram convention results in a communication coefficient on performance of 0.079, indicating that communication has a negative and insignificant effect on performance. It means that improved communication has a negative impact on performance. Despite the fact that the decrease is not significant. The effect of workload and work stress on performance was found to have a path coefficient of 0.163 and a T-statistics value of 0.968 in this study. The test results show that the value of T statistics T table is significant (1.96). It means that workload and work stress have a negligible effect on performance. The path diagram convention results into the structural model of the workload and work stress coefficient on performance is 0.163, indicating that work stress has a positive but insignificant effect on performance. It means that the greater the workload and work stress, the better the performance. Despite the fact that the increase is minor. We also looked at the relationship between occupational health and safety culture and performance, and the influence of safety culture on performance yielded a path coefficient of 0.352 and a T statistic value of 3.017. The test results show that the value of T statistics is greater than the value of T table (1.96). It means that safety culture has a significant impact on performance. The path diagram convention results into the structural model of the safety culture coefficient on performance of 0.352 indicate that safety culture has a positive and significant effect on performance. It means that the better the safety culture, the more likely it is that performance will improve.

Working hours have a path coefficient of 0.002 and a T statistics value of 0.024. The test results show that the value of T statistics T table is significant (1.96). It means that working hours have a negligible effect on performance. Working hours have a positive and insignificant effect on performance, according to the results of the path diagram convention into the structural model of the working hours coefficient on performance of 0.002. It means that the more efficient the working hours, the more likely it is that performance will improve. Despite the fact that the increase is minor.

6. Conclusion

The comparison between the human factor scale and perceptions of rail industry workers with different roles can be seen in the processing results of the questionnaire distributed to the workers. The internal control unit division, the company secretary division, the finance and accounting division, the HR and GA division, the technology division, the research and development division, the marketing division, the operations planning division, and the service providers division are the eight divisions. The results of hypothesis testing using the SmartPLS software program show that several exogenous variables, namely job satisfaction and safety culture, have a significant effect on performance. Other exogenous variables, such as usability, communication, work environment, working hours, workload, and work stress, have no effect on performance. Exogenous variables that have a dominant influence on endogenous variables can be identified using the largest coefficient value, regardless of whether the coefficient is positive or negative. According to the analysis results, the variable with the highest coefficient on performance is job satisfaction, which has a total effect of 0.436. As a result, job satisfaction is the most influential variable on performance. Based on the findings of the research, the proposed solution is for companies to use the REQUEST questionnaire as a reference to evaluate worker performance. Companies should focus more on employee job satisfaction and safety culture because, according to this study, job satisfaction has a significant impact on employee performance. Finally, the company strengthens its safety culture by conducting periodic employee socialization and implementing a sanctions system for employees who violate company regulations related to occupational health and safety.

References

Agbozo, G. K., Owusu, I. S., Hoedoafia, M. A., and Atakorah, Y. B., The effect of work environment on job satisfaction: Evidence from the banking sector in Ghana, *Journal of Human Resource Management,* vol. 5, no. 1, pp. 12-18, 2017.

Al-Omari, K., and Okasheh, H., The influence of work environment on job performance: A case study of engineering company in Jordan, *International Journal of Applied Engineering Research,* vol. 12, no. 24, pp. 15544-15550, 2017.

Alessa, T., Abdi, S., Hawley, M. S., and de Witte, L., Mobile apps to support the self-management of hypertension: systematic review of effectiveness, usability, and user satisfaction, *JMIR mHealth and uHealth,* vol. 6, no. 7, pp. e10723, 2018.

Antwi-Afari, M., Li, H., Edwards, D., Pärn, E., Seo, J., and Wong, A., Biomechanical analysis of risk factors for work-related musculoskeletal disorders during repetitive lifting task in construction workers, *Automation in Construction,* vol. 83, pp. 41-47, 2017.

Berlin, C., and Adams, C, *Production ergonomics: Designing work systems to support optimal human performance*, Ubiquity press, London, 2017.

Bevan, N., Carter, J., and Harker, S., ISO 9241-11 revised: What have we learnt about usability since 1998?, *Proceedings of the International Conference on Human-Computer Interaction*, Los Angeles, USA, August 2-7, 2015.

Bhui, K., Dinos, S., Galant-Miecznikowska, M., de Jongh, B., and Stansfeld, S., Perceptions of work stress causes and effective interventions in employees working in public, private and non-governmental organisations: a qualitative study, *BJPsych bulletin,* vol. 40, no. 6, pp. 318-325, 2016.

BláfOSS, R., MIChElETTI, J. K., Sundstrup, E., Jakobsen, M. D., Bay, H., and Andersen, L. L., Is fatigue after work a barrier for leisure-time physical activity? Cross-sectional study among 10,000 adults from the general working population, *Scandinavian journal of public health,* vol. 47, no. 3, pp. 383-391, 2019.

Carayon, P., and Smith, M. J., Work organization and ergonomics, *Applied ergonomics,* vol. 31, no. 6, pp. 649-662, 2000.

Cohen, S., and Spacapan, S., *The social psychology of noise*, 1st Edition, Wiley, New York, 1984.

Cox, T., *Repetitive work: occupational stress and health*, C. L. Cooper & M. J. Smith Edition, Jhon Wiley & Sons, Chichester, 1985.

Dianat, I., Adeli, P., Jafarabadi, M. A., and Karimi, M. A., User-centred web design, usability and user satisfaction: The case of online banking websites in Iran, *Applied ergonomics,* vol. 81, pp. 102892, 2019.

Driskell, J. E., Salas, E., Johnston, J. H., and Wollert, T. N., *Stress exposure training: An event-based approach (Performance under stress)*, CRC Press, US, 2018.

Eliyana, A., and Ma'arif, S., Job satisfaction and organizational commitment effect in the transformational leadership towards employee performance, *European Research on Management and Business Economics,* vol. 25, no. 3, pp. 144-150, 2019.

Erat, S., Kitapci, H., and ÇÖMEZ, P., The effect of organizational loads on work stress, emotional commitment, and turnover intention, *International Journal of Organizational Leadership,* vol. 6, pp. 221-231, 2017.

Fang, Y.-Y., Huang, C.-Y., and Hsu, M.-C., Effectiveness of a physical activity program on weight, physical fitness, occupational stress, job satisfaction and quality of life of overweight employees in high-tech industries: a randomized controlled study, *International Journal of Occupational Safety and Ergonomics,* vol. 25, no. 4, pp. 621-629, 2019.

Feldman, M., The locational dynamics of the US biotech industry: knowledge externalities and the anchor hypothesis, *Industry and innovation,* vol. 10, no. 3, pp. 311-329, 2003.

Fuad, A., Indonesian social health insurance sample data are now available and accessible for research, *PharmacoEconomics-open,* vol. 3, no. 4, pp. 643-645, 2019.

Giese, J. L., and Cote, J. A., Defining consumer satisfaction, *Academy of marketing science review,* vol. 1, no. 1, pp. 1-22, 2020.

Ginting, G. E., *Rekayasa ruang latihan paduan suara ditinjau dari aspek ergonomi (studi kasus di Universitas Kristen Maranatha, Bandung),* Universitas Kristen Maranatha, Bandung, 2010.

Goodwin, N. C., Functionality and usability, *Communications of the ACM,* vol. 30, no. 3, pp. 229-233, 1987.

Grandjean, E., *Fitting the task to the man: an ergonomic approach*, Taylor & Francis, Britannia, 1980.

Gruber, J., Prinstein, M. J., Clark, L. A., Rottenberg, J., Abramowitz, J. S., Albano, A. M., et al., Mental health and clinical psychological science in the time of COVID-19: Challenges, opportunities, and a call to action, *American Psychologist*, vol. 76, no. 3, pp. 409-426, 2021.

Hair, J., Hollingsworth, C. L., Randolph, A. B., and Chong, A. Y. L., An updated and expanded assessment of PLS-SEM in information systems research, *Industrial Management & Data Systems*, vol. 117, no. 3, pp. 442-458, 2017.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., and Sarstedt, M., *A primer on partial least squares structural equation modeling (PLS-SEM)*, Sage publications, US 2016.

Härmä, M., et al., Shift work with and without night work as a risk factor for fatigue and changes in sleep length: A cohort study with linkage to records on daily working hours, *Journal of sleep research,* vol. 28, no. 3, 2019.

Hoboubi, N., Choobineh, A., Ghanavati, F. K., Keshavarzi, S., and Hosseini, A. A., The impact of job stress and job satisfaction on workforce productivity in an Iranian petrochemical industry, *Safety and health at work,* vol. 8, no. 1, pp. 67-71, 2017.

Inegbedion, H., Inegbedion, E., Peter, A., and Harry, L., Perception of workload balance and employee job satisfaction in work organisations, *Heliyon,* vol. 6, no. 1, 2020.

Kartal, N., Evaluating the relationship between work engagement, work alienation and work performance of healthcare professionals, *International Journal of Healthcare Management,* vol. 11, no. 3, pp. 251-259, 2018.

Kodrat, K. F., Pengaruh shift kerja terhadap kelelahan pekerja pabrik kelapa sawit di pt. x labuhan batu, *Jurnal Teknik Industri,* vol. 12, no. 2, pp. 110-117, 2012.

Kroemer, A. D., and Kroemer, K. H., *Office ergonomics: ease and efficiency at work*, CRC Press, US, 2016.

LAWLER III, E. E., and Porter, L. W., The effect of performance on job satisfaction, *Industrial relations: A journal of Economy and Society,* vol. 7, no. 1, pp. 20-28, 1976.

Leijssen, J. B., Snijder, M. B., Timmermans, E. J., Generaal, E., Stronks, K., and Kunst, A. E., The association between road traffic noise and depressed mood among different ethnic and socioeconomic groups (The HELIUS study), *International journal of hygiene and environmental health,* vol. 222, no. 2, pp. 221-229, 2019.

Levecque, K., Anseel, F., De Beuckelaer, A., Van der Heyden, J., and Gisle, L., Work organization and mental health problems in PhD students, *Research Policy,* vol. 46, no. 4, pp. 868-879, 2017.

Lewis, J. R., and Sauro, J., The factor structure of the system usability scale*, Proceedings of the International conference on human centered design*, California, USA, July 19-24, 2009.

Li, H., et al., Influence of mental stress and environmental toxins on circadian clocks: Implications for redox regulation of the heart and cardioprotection, *British journal of pharmacology,* vol. 177, no. 23, pp. 5393-5412, 2020.

Munandar, A. S., *Psikologi industri dan organisasi*, 1st Edition, Universitas Indonesia (UI-Press), Jakarta, 2001.

Nitisemito, A. S., *Manajemen personalia,* Ghalia Indonesia, Jakarta, 1996.

Nurmalasari, W., Pengaruh lingkungan kerja dan beban kerja terhadap stres kerja perawat pada rumah sakit umum daerah Arifin Achmad Pekanbaru, *Jurnal Institutional Repository UPN Veteran Yogyakarta*., vol. 1, no. 2, pp. 01-11, 2012.

Padula, R. S., Comper, M. L. C., Sparer, E. H., and Dennerlein, J. T., Job rotation designed to prevent musculoskeletal disorders and control risk in manufacturing industries: A systematic review, *Applied ergonomics,* vol. 58, pp. 386-397, 2017.

Pang, K., and Lu, C.-S., Organizational motivation, employee job satisfaction and organizational performance, *Maritime Business Review*, vol. 3, no. 1, pp. 36-52, 2018.

Pawirosumarto, S., Sarjana, P. K., and Gunawan, R., The effect of work environment, leadership style, and organizational culture towards job satisfaction and its implication towards employee performance in Parador Hotels and Resorts, Indonesia, *International Journal of Law and Management*, vol 59, no. 6, pp. 1337-1358, 2017.

Peters, L. H., O'Connor, E. J., and Rudolf, C. J., The behavioral and affective consequences of performance-relevant situational variables, *Organizational Behavior and Human Performance,* vol. 25, no. 1, pp. 79-96, 1980.

Peters, L. H., and O'Connor, E. J., Situational constraints and work outcomes: The influences of a frequently overlooked construct, *Academy of management review,* vol. 5, no. 3, pp. 391-397, 1980.

Peterson, R. A., and Wilson, W. R., Measuring customer satisfaction: fact and artifact, *Journal of the academy of marketing science,* vol. 20, no. 1, pp. 61-71, 1992.

Porter, L. W., Brayfield, E. E., and Crockett, W., EImployee attitude and employee performance, *PSychological bulletm,* vol. 52, 1995.

Praptini, Y., Pengaruh sumber-sumber stress kerja terhadap kepuasan kerja tenaga edukatif tetap: Lembaga Perguruan Tinggi Surabaya, *Thesis*, Department of Social Science, Faculty of Social Science, University of Airlangga, 2000.

Ramli, A. H., Work environment, job satisfaction and employee performance in health services. *Business and Entrepreneurial Review,* vol. 19, no. 1, pp. 29-42, 2019.

Ramli, S., *Sistem manajemen keselamatan dan kesehatan kerja OHSAS 18001*, Dian Rakyat, Jakarta, 2010.

Rismawati, S., and Mattalata, S., *Evaluasi kinerja: penilaian kinerja atas dasar prestasi kerja berorientasi kedepan*, 1st Edition, Celebes Media Perkasa, Makassar, 2018.

Ryan, B., Wilson, J. R., Sharples, S., and Marshall, E., *Collecting human factors attitudes and opinions from signallers: Development and use of REQUEST (the Railway Ergonomics Questionnaire) People and Rail Systems*, CRC Press, USA, 2016.

Setyawati, L., *Selintas tentang kelelahan kerja*, 1st Edition, Amara Books, Yogyakarta, 2010.

Shah, S. I. H., Khan, A. Z., Bokhari, R. H., and Raza, M. A., Exploring the impediments of successful ERP implementation: A case study in a public organization, *International Journal of Business and Social Science,* vol. 2, no. 22, 2011.

Sharma, A., Bansal, P., and Kaur, M., Ergonomics in dental practice: musculoskeletal disorders, approaches and interventions, *Pakistan Oral & Dental Journal,* vol. 36, no. 2, 2016.

Shen, J., Botly, L. C., Chung, S. A., Gibbs, A. L., Sabanadzovic, S., and Shapiro, C. M., Fatigue and shift work, *Journal of sleep research,* vol. 15, no. 1, pp. 1-5, 2006.

Silverstein, B. A., Fine, L. J., and Armstrong, T. J., Occupational factors and carpal tunnel syndrome, *American journal of industrial medicine,* vol. 11, no. 3, pp. 343-358, 1987.

Singh, M. M., Amiri, M., and Sabbarwal, S., Role of job stress on job satisfaction, *International Journal of Management Studies,* vol. 6, no. 4, pp. 57-60, 2019.

Sinha, I. P., Smyth, R. L., and Williamson, P. R., Using the Delphi technique to determine which outcomes to measure in clinical trials: recommendations for the future based on a systematic review of existing studies, *PLoS Med,* vol. 8, no. 1, 2011.

Smayling, M., and Miller, H., Job satisfaction and job performance at the internship level, *Journal of Leadership, Accountability and Ethics,* vol. 9, no. 1, pp. 27, 2012.

Smith, M. J., and Carayon, P., New technology, automation, and work organization: stress problems and improved technology implementation strategies, *International Journal of Human Factors in Manufacturing,* vol. 5, no. 1, pp. 99-116, 1995.

Sonderegger, A., and Sauer, J., The influence of design aesthetics in usability testing: effects on user performance and perceived usability, *Applied ergonomics,* vol. 41, no. 3, pp. 403-410, 2010.

Sparks, K., Cooper, C., Fried, Y., and Shirom, A., *The effects of hours of work on health: A meta-analytic review Managerial, Occupational and Organizational Stress Research),* 1st Edition, Routledge, Britannia, 2018.

Steel, R. P., and Mento, A. J., Impact of situational constraints on subjective and objective criteria of managerial job performance, *Organizational behavior and human decision processes,* vol. 37, no. 2, pp. 254-265, 1986.

Sullivan, S. E., and Bhagat, R. S., Organizational stress, job satisfaction and job performance: where do we go from here?, *Journal of management,* vol. 18, no. 2, pp. 353-374, 1992.

Sunyoto, D., *Manajemen Sumber Daya Manusia*, CAPS (Center for Academic Publishing Service), Yogyakarta, 2012.

Van Drongelen, A., Boot, C. R., Hlobil, H., Smid, T., and Van der Beek, A. J., Risk factors for fatigue among airline pilots, *International archives of occupational and environmental health,* vol. 90, no. 1, pp. 39-47, 2017.

Van Eerde, W., and Thierry, H., Vroom's expectancy models and work-related criteria: A meta-analysis, *Journal of applied psychology,*vol. 81, no. 5, pp. 575, 1996.

Vatrapu, R., and Pérez-Quiñones, M. A., Culture and usability evaluation: The effects of culture in structured interviews, *Journal of usability studies,* vol. 1, no. 4, pp. 156-170, 2006.

Venkatesh, V., and Morris, M. G., Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior, *MIS quarterly*, vol. 24, no. 1, pp. 115-139, 2000.

Wang, D., Wang, X., and Xia, N., How safety-related stress affects workers' safety behavior: The moderating role of psychological capital, *Safety science,* vol. 103, pp. 247-259, 2018.

Wignjosoebroto, S., *Ergonomi studi gerak dan waktu: teknik analisis untuk peningkatan produktivitas kerja*, Guna, Surabaya, 2000.

Williams, D., House, J., Cooper, C., and Smith, M., *Job stress and blue collar work*, Cary L. Cooper and Michael J. Smith Edition, Wiley, Chichester, 1985.

Yılmaz, G., and Üstün, B., Professional quality of life in nurses: compassion satisfaction and compassion fatigue, *Journal of Psychiatric Nursing/Psikiyatri Hemsireleri Dernegi,* vol. 9, no. 3, 2018.

Biographies

Dian Palupi Restuputri is a lecturer at Industrial Engineering department at the University of Muhammadiyah Malang. Her research interests are ergonomics and human factor engineering. (Email: restuputri@umm.ac.id, tel: +62-341 464 318 ext. 166).

Angelie Rekha Elvera is a researcher in Industrial Engineering department, University of Muhammadiyah Malang, Indonesia. Her research interests are ergonomic and operations management (E-mail: rekhaelvera@gmail.com, tel: +62-341 464 318 ext. 166).

Adhi Nugraha is a lecturer at Industrial Engineering department, University of Muhammadiyah Malang, Indonesia. His research interests are system optimization and operations management (E-mail: adhinugraha@umm.ac.id, tel: +62-341 464 318 ext. 166).

Ilyas Masudin is a Professor of logistics and supply chain at Industrial Engineering Department, University of Muhammadiyah Malang, Indonesia. His research interests include logistics optimization and supply chain management (E-mail: masudin@umm.ac.id, tel: +62-341 464 318, ext.166).