

Effect of Safety System Implementation And Occupational Health on Work Productivity with Job Satisfaction as an Intervening Variable

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Abstract—This research focuses on finding out the extent of the influence of occupational safety and occupational health on employee work productivity where job satisfaction is an intervening variable. This research is a type of quantitative research with hypothesis testing. The population taken in this research were employees who worked on the construction of the South Cikampek toll road. The research sample will be taken from employees who are actively working on several different projects so that a sample of 120 respondents is obtained. The indicator measurement scale used is the Likert Scale and data analysis uses Structural Equation Modeling - Partial Least Square (SEM-PLS). Based on the test results, it can be concluded that work safety has a positive effect on job satisfaction, meaning that the better the work safety program, the higher the employee's job satisfaction. Occupational health has a positive effect on job satisfaction, meaning that the better the management and the more attention paid to employee work health, the higher the value of job satisfaction. employees also increase. Work safety has a positive effect on work productivity, meaning that the higher the value of work safety, the greater the employee's productivity. Work health has a positive effect on work productivity, meaning that if employee health services are guaranteed, the value of employee work productivity will also increase.

Index Terms-Work Safety, Work Health, Work Productivity, PT Jasa Marga, SEM-PLS

I. INTRODUCTION

Human resources are one of the important components for the success and success of an organization or company. Humans need special attention because they are living assets owned by companies. The fact that people are a major asset for a company and organization therefore requires serious attention and is managed as well as possible. The purpose of this is intended so that human resources owned by a company or organization can have a good lead impact and can contribute maximally to the company. According to Simanjuntak (2017), humans play an active and dominant role in every organizational activity, because humans become planners, actors and inventors of the realization of organizational goals. The responsibility of occupational safety and occupational health is not only on the government as a provider of employee health insurance, but the responsibility for occupational safety and occupational health is also the responsibility of the company and the employees themselves. The impact of work safety (work accidents) and occupational health (occupational diseases) is

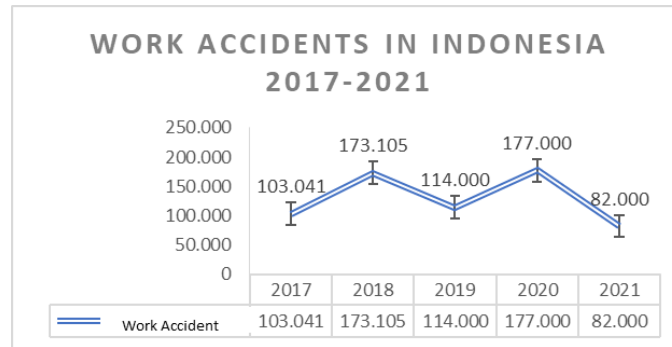
very influential for the company and is an important element that needs to be considered because it can harm employees and the company itself. This impact can be seen from the loss of time in working and the increased costs that must be incurred due to the accident.

Abu Nandir (2018) revealed that work safety is safety related to work tools, materials and processing processes, workplaces, and the environment, as well as the ways employees do their jobs. Labor protection includes several aspects and one of them is safety protection, the protection intends that the workforce safely carry out their daily work to increase production and productivity. Occupational health is a specialization in health sciences and its practices which aim for every worker / working community to obtain the highest degree of health, both physical and mental, as well as social preventive and curative efforts against diseases/health problems caused by worker factors in the work environment and against diseases (Suma'mur, 2019). According to Kussrianto (2017), suggesting that productivity is a comparison between the results achieved with the participation of the time union workforce. The participation of labor here is the use of resources and is effective and efficient.

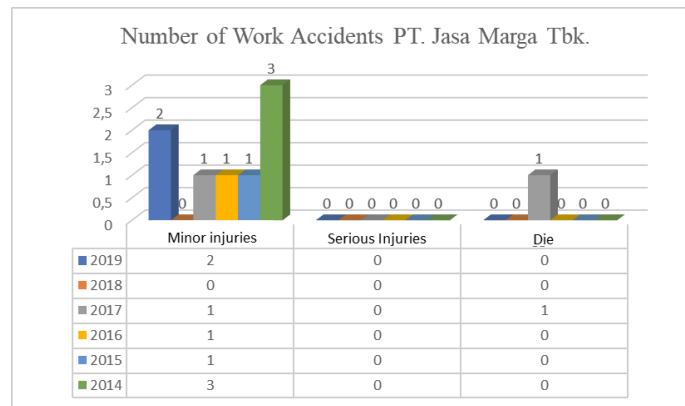
Job satisfaction is an emotional attitude that pleases and loves his job. This attitude is reflected by work morale, discipline, and work performance (Hasibuan 2017). Through Government Regulation No. 04 of 1978, on March 1, 1978 the Government established PT Jasa Marga (Persero) Tbk. Jasa Marga's main task is to plan, build, operate and maintain toll roads and their equipment so that toll roads can function as highways that provide higher benefits than non-toll roads. PT Jasa Marga (Persero) Tbk through its subsidiary PT Jasamarga Japek Selatan (JJS) recorded the construction progress of Jakarta-Cikampek Toll Road or Japek II Selatan Section 3 (Taman Mekar-Sadang) reaching 60.82 percent until the end of January 2022. Jakarta-Sadang Toll Road or Jakarta-Cikampek II Selatan Toll Road or Jaksa/Japek II Selatan is an ongoing toll road that connects the Jakarta Outer Ring Road in Jati Asih, Bekasi with Purbaleunyi Toll Road in Sadang, Purwakarta. This toll road is planned to reduce the burden on the Jakarta Cikampek I Toll Road, especially for motorists originating/going to the Jagorawi Toll Road and break down congestion in the Transyogi Mega Housing Area, Jonggol (Bogor Regency, Depok City, Bekasi City and Bekasi Regency). The plan is that this toll road will be connected to the Trans Java Toll Road (PT. Jasa Marga, 2018).

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Source : BPJS Employment Statistics Data 2022
Figure 1. Accident Data in Indonesia for the Last 5 Years



Source : Annual Report 2019 PT. Jasa Marga Tbk
Figure 2. Employee Work Accident Year 2014-2019 PT. Jasa Marga Tbk.

PT. Jasa Marga in the construction and improvement of toll road projects certainly implements the Occupational Health and Safety Management System (SMK3). Where the implementation of k3 refers to the regulations of the Government of the Republic of Indonesia, namely Law Number 1 of 1970 concerning Work Safety; Government Regulation Number 50 of 2012 concerning the Implementation of Occupational Safety and Health Management System; Regulation of the Minister of Manpower Number PER.04 / MEN / 1987 concerning the Supervisory Committee for Occupational Safety and Health and Procedures for Appointing Occupational Safety Experts; Regulation of the Minister of Manpower Number PER-02 / MEN / 1992 concerning Procedures for Appointment of Obligations and Authorities of Occupational Safety and Health Experts; and ISO 45001:2018 International Standard on Occupational Safety and Health. Occupational safety and health is very influential on employee productivity and job satisfaction, therefore the implementation of an occupational safety and health management system is an important element that cannot be underestimated by the company. This study focuses on the implementation of an occupational safety and health management system on employee productivity with job satisfaction as an intervening variable. Therefore, this research is expected to be a proposal or recommendation in strategies to increase employee productivity and job satisfaction.

II. LITERATURE REVIEW

A. Definition of Toll Road

Based on UU No. 13 of 1980, Road is a land transportation infrastructure in any form including parts of the road including auxiliary buildings and equipment intended for traffic. The road sections in question are Road Benefit Areas (DAMAJA), Road Owned Areas (DAMIJA), Road Supervision Areas (DAWASJA). Based on PP No. 15 of 2005 concerning toll roads, it is explained that the definition of toll roads is a public road that is part of the road network system and as a national road whose use is required to pay tolls. A toll is a certain amount of money paid for the use of toll roads. The amount of toll rates is different for each class of vehicle and these provisions have been determined based on a presidential decree. Meanwhile, toll road sections are parts or sections of certain toll roads whose business can be carried out by certain business entities. Based on the Indonesian Road Capacity Manual (MKJI: 1997), it is explained about the definition of toll roads as roads for continuous traffic with full control of the entrance road, whether it is a divided or undivided road. The types of toll roads are two-lane two-way undivided (2/2 UD), four-lane two-way divided (4/2 D) and toll roads divided by more than four lanes.

B. Work Safety

According to Sinambela (2017: 365) Occupational Health and Safety is a field related to the health, safety, and welfare of humans working in an institution or project location. Another similar opinion also emerged from Leon C. Megginson in Hamali (2018: 164) Occupational Safety and

Health (K3) which includes the terms safety risk and health risk. Work safety indicates a condition that is safe or safe from suffering, damage or loss in the workplace. The definition of work safety according to Abu Nandir (2018: 13) is related to work tools, materials and processing processes, workplaces, and the environment, as well as the ways employees do their jobs. Stopiah and Etta (2018: 324) work safety is a state that is safe and secure from sufferers and damage and losses at work, both in the form of using tools, materials, machines, in processing processes, packing techniques, storage, as well as maintaining and securing the place and work environment.

C. Work Accidents

According to the Regulation of the Minister of Manpower R.I NUMBER: PER.04 / MEN / 1993 Work Accidents are accidents that occur in connection with employment relations, including diseases arising from employment relations, as well as accidents that occur on the way to depart from the manuju home of work, and return home through a road that can or is reasonably passed. Wijayanti (2019: 27) stated that work accidents are accidents related to activities in the company, which means that accidents that occur are caused by work and when doing work and accidents that occur on the way to and from work. Rolan (2022: 14) added that a work accident is an event that is clearly undesirable and often unexpected initially which can cause losses of both time, property or property as well as casualties that occur in the industrial work process or related to it.

D. Occupational Health

Health is a very expensive thing, because we know what it feels like or feels pain. Therefore, maintaining health is a very mandatory thing for you to do. Occupational health according to the Joint ILO / WHO Committee (1995) is the implementation and maintenance of the highest physical, mental and social health of workers in all occupations, prevention of labor health problems caused by working conditions, protection of workers against the risk of factors

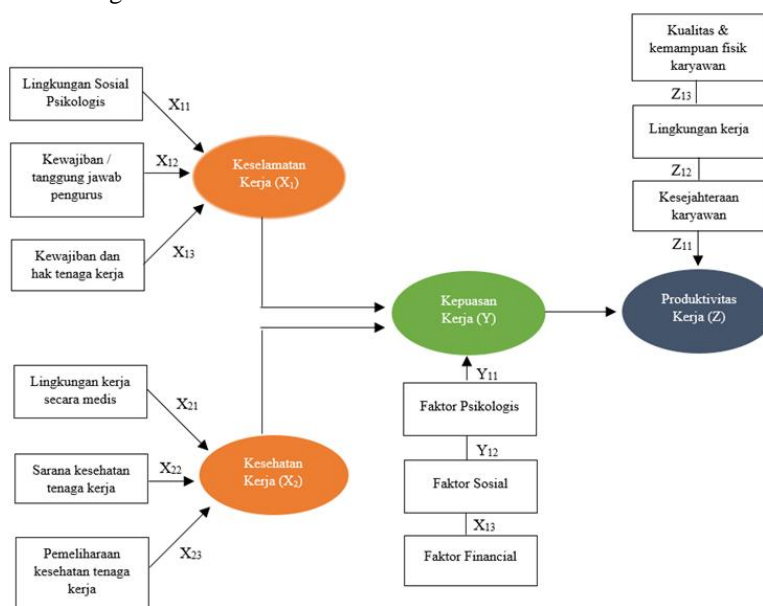
that interfere with health, placement and maintenance of workers in the work environment according to their physical and psychological abilities and in conclusion is the adjustment of work to man and man to his work. The same thing was also conveyed by Sholihah & Kuncoro (2019: 29) that occupational health is a condition that is free from physical, mental, emotional or pain disorders caused by the work environment. Marwansyah (2019: 3) explained that occupational health is a state of well-being of the body, soul and social that allows everyone to live a productive life socially and economically, besides that occupational health is also a relief of workers from physical or economic diseases.

E. Job Satisfaction

Job satisfaction is an individual thing because each individual has a level of satisfaction that varies with the value system that applies to him. This is due to the differences of each individual. The higher the assessment of activities that are felt by individual desires, the higher the satisfaction with these activities. The high and low satisfaction can have an unequal impact. It depends on the mental attitude of the individual concerned as stated by Roe and Byars in Priansa (2017: 291), that high job satisfaction will encourage the realization of organizational goals effectively. While a low level of satisfaction is a threat that will bring destruction or setbacks to the organization, quickly or slowly. Donni (2017: 291) suggests that job satisfaction is the general attitude of an individual toward his job.

F. Hypothesis Development

Hypotheses contain brief statements collected from theoretical foundations, literature reviews, research and are temporary answers to the research problems at hand. Referring to empirical research on the effect of occupational safety and health on work productivity with job satisfaction as an intervening variable, the hypothesis proposed in this study is as follows:



Source: Author Process (2023)
Figure 3. Hypothesis Flow

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So several hypotheses were set, namely:

- Hypothesis 1: Job safety influences job satisfaction
- Hypothesis 2: Occupational health influences job satisfaction
- Hypothesis 3: Job satisfaction influences work productivity
- Hypothesis 4: Work safety influences work productivity
- Hypothesis 5: Occupational health influences work productivity

III. RESEARCH METHODS

This study focuses on determining the extent of the effect of occupational safety and occupational health on employee work productivity where job satisfaction is an intervening variable, so based on this, this study is a type of quantitative research with hypothesis testing. Data is obtained by survey, namely by giving questionnaires to the construction actors involved. The questions given are fixed (static) or standard. The population taken in this study is employees who work in the construction of the South Cikampek Toll road. Research samples will be taken from employees who are actively working on several different projects in such a way that they are considered representative of the population studied. The sample in question uses simple random sampling statistical techniques so a sample of 120 respondents was obtained which was then used the SEM-PLS Method for data analysis.

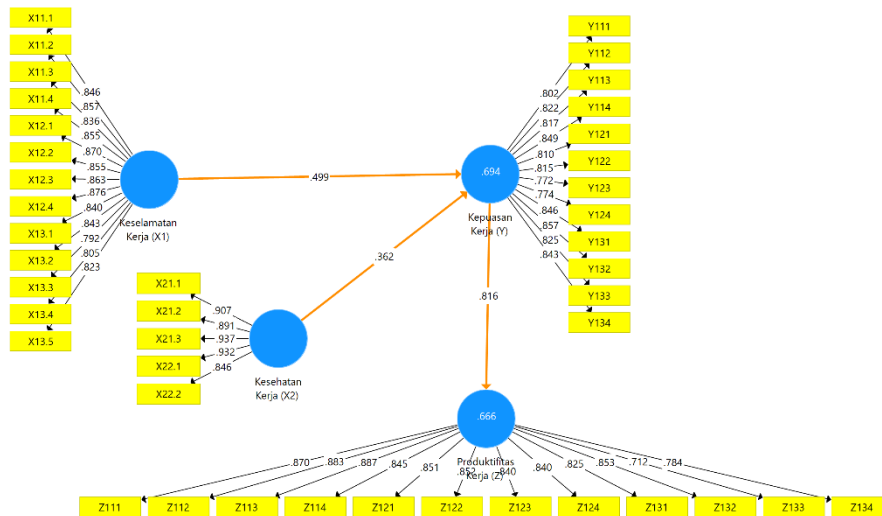
The primary data in the study was obtained directly from the answers of the employee participants in charge of the construction of the South Cikampek Toll Road based on the

results of existing questionnaires. Secondary data is obtained from literature studies and existing references as well as the history of company data PT Jasa Marga Tbk. The measurement scale of the indicator used is the Likert Scale. With the Likert scale, the variables to be measured are described into variable indicators. Then, the indicator is used as a starting point for compiling instrument items that can be statements or questions. This study used Structural Equation Modeling – Partial Least Square (SEM-PLS) data analysis. Data analysis to be processed using Smart PLS 4 software. PLS model evaluation is used to determine how much influence between the independent latent variable (exogenous) and the dependent variable (endogenous).

IV. RESULTS AND DISCUSSION

A. Measurement Model Test Results (Outer Model)

Testing a construct model can begin by determining the form of evaluation to be performed. PLS construct testing begins with the fullness of the loading value of the indicator/proxy for each latent variable. The determination of threshold values varies in various previously published studies such as Hair et al. (2017) which argue that the value of 0.7 is assumed to correspond to the communality of a proxy with a minimum of a proxy (yellow) can be explained by 50% (0.72) of a latent variable (blue) with the designation of the average variance extracted from the item, so that the value of 0.7 is used as a threshold.



Source: Data processed (2023)
Figure 4. Construct Model After Elimination Process

In Figure 4, there has been an elimination of the occupational health construct (X2) in items X22.3 (part of the medical environment domain) and X23.1 – X23.3 (the entire domain of health facilities) because these four items do not have a loading value > 0.70 or at least capture 50% variance in a construct. The elimination is based on the general rule that at least an item can capture 25% or with an outer loading value of 0.50 to generally use at 50% as mentioned above (Hair et al., 2020). In SmartPLS, construct reliability can be measured using measures such as Cronbach's Alpha, Rho_A, and Composite Reliability (CR). These steps indicate the internal consistency of the construct by checking the correlation between items.

Table 1. Construct Reliability Test

Variable	Cronbach Alpha	ρ _a	CR
Work Safety (X1)	.966	.967	.970
Occupational Health (X2)	.943	.945	.957
Job Satisfaction (M)	.956	.956	.961
Work Productivity (Y)	.961	.963	.966

Source: Data processed (2023)

The construct convergent validity was assessed using Average Variance Extracted (AVE). The AVE value indicates the percentage of variance in the observed indicator recorded by the underlying construct, indicating strong convergent validity, as the per-item construct is

calculated based on the outer loading power (Sarstedt et al., 2017).

Table 2. Construct Validity Test

	Average Variance Extracted (AVE)
Work Safety (X1)	.711
Occupational Health (X2)	.816
Job Satisfaction (M)	.672
Work Productivity (Y)	.702

Source: Data processed (2023)

Table 3. Fornell-Larcker Criterion Value

	Job Satisfaction (Y)	Occupational Health (X2)	Work Safety (X1)	Work Productivity (Z)
Work Productivity (Y)	.820			
Occupational Health (X2)	.796	.903		
Work Safety (X1)	.814	.871	.843	
Work Productivity (Z)	.816	.876	.973	.838

Source: Data processed (2023)

Another value to test the validity of the discriminant is the HTMT ratio. This ratio uses a standard value of 1, where the closer the value of the construct ratio, the less discriminant validity will be. There is an HTMT value below the threshold (marked in green) in the construct of occupational health, namely health facilities. This value can be used as an important note that there is unidimensionality of the indicator.

Table 4. Discriminant Test using HTMT Ratio

	Job Satisfaction (Y)	Occupational Health (X2)	Work Safety (X1)
Occupational Health (X2)	.835		
Work Safety (X1)	.840	.909	
Work Productivity (Z)	.846	.918	1.007

Source: Data processed (2023)

In the Fornell-Larcker and HTMT criteria test, it was found that between variables X1 and Z there is

All latents and indicators have met the requirements for reliability and construct validity because the AVE value has met the requirements for a value of 0.05. Furthermore, to assess the discriminant validity of the construct, the Fornell-Larcker criterion is used. The results of the PLS test for constructs in this study revealed that the discriminant value that met the standard was only on the motivational variable. However, this criterion is not an absolute prerequisite for rejecting constructs (Henseler et al., 2015). Individual testing of each construct is performed to see discriminant patterns between indicators on a latent variable.

multidimensionality or autocorrelation in both variables. By looking in more detail at the correlation test between items, it was found that items X12.2 – X12.4 and Z12.3 – Z12.4 and Z13.1 – Z13.2 did not meet the correlation standard and correlated with items in other constructs. Therefore, all seven indicators can be eliminated before proceeding with testing.

Testing the value of the variance inflation factor is important in showing the multicollinearity of each construct. VIF measures the regression magnitude of one independent variable against another. The maximum VIF value is 10 or 5 (Hair et al., 2017, 2020). The corresponding VIF test in Appendix 2 shows that items X21.3 and X22.1 have an inflative factor value of >10, so both items are eliminated.

B. Inner Model Evaluation

The R-squared value (R²) is calculated to assess the number of variances described by endogenous constructions in structural models. The R² value indicates the predictive power of the model. It can be known at the value of R² job satisfaction and productivity > 60%. It is important to note that R² values can range from 0 to 1, with higher values indicating a greater number of variances described by independent constructions in the model (Gelman et al., 2019).

Table 5. R Square Value

Variable	R Square	R Square Adjusted
Job Satisfaction (Y)	0.678	0.673
Work Productivity (Z)	0.676	0.673

Source: Data processed (2023)

Meanwhile, this F-square test is carried out to find out the goodness of the model. F-square values of 0.02, 0.15 and 0.35 can be interpreted as whether the predictor of the latent variable has a weak, medium, or large influence at the structural level. Based on the F-square test, it can be seen that the work productivity construct has an F square value that is very far below the mark which indicates the small good value of the construct model.

Table 6. F Square Test

	Job Satisfaction (Y)	Work Productivity (Z)
Job Satisfaction (Y)		2.083
Occupational Health (X2)	.121	
Work Safety (X1)	.189	

Source: Data processed (2023)

C. Path Coefficient

The next test is to see the significance of the influence between variables by looking at the value of the parameter coefficient and the statistical significance value of T, namely through the bootstrapping method. It can be noted that all items have positive associations with their latent variables and with significance that meets the standard ($p < 0.05$).

Table 7. Linear Regression Value

Direct Path Value	Regression Coefficients (β)	CI 95%	Standard Deviation	T Statistics	P Values
Job Satisfaction (Y) \rightarrow Work Productivity	.822	.872	.034	24.371	.000
Occupational Health \rightarrow Job Satisfaction (Y)	.380	.540	.112	3.388	.000
Work Safety \rightarrow Job Satisfaction (Y)	.475	.655	.109	4.338	.000
Mediation Path Value	Original Sample (O)	CI 95%	Standard Deviation	T Statistics	P Values
Occupational Health \rightarrow Job Satisfaction \rightarrow Work Productivity	.312	.447	.095	3.301	.001
Work Safety \rightarrow Job Satisfaction \rightarrow Work Productivity	.390	.537	.092	4.235	.000

Source: Data processed (2023)

- H1: The T-test shows a calculated T of 4.338 which is greater than the table T at a 95% significance of 1.96, as well as a p-value of 0.000 which means that the positive association of the two variables is statistically significant.
- H2: The T-test shows a T count of 3.388 which is greater than the table T at 95% significance, as well as a p-value of 0.000 which means that the positive association of the two variables is statistically significant.
- H3: The T-test shows a calculated T of 24.371 which is greater than the table T at a 95% significance of 1.96, as well as a p-value of 0.000 which means that the positive association of the two variables is statistically significant.
- H4: The T-test shows a calculated T of 4.235 which is greater than the table T at a 95% significance of 1.96, as well as a p-value of 0.000 which means that the positive association of the two variables is statistically significant.
- H5: The T-test shows a calculated T of 3.301 which is greater than the table T at a 95% significance of 1.96, as well as a p-value of 0.001 which means that the positive association of the two variables is statistically significant.

V. DISCUSSION

A. The Effect of Work Safety on Employee Job Satisfaction

As is known, based on the results of the analysis using the SmartPLS tool, PV values were found for the influence of work safety on job satisfaction with a value of 0.000. This value interprets that work safety has a significant effect on job satisfaction. These results are commonplace and can be explained in real terms, that agencies or industries provide security facilities that are ideal for what workers or employees need. Kurniawan et al. (2013) state that guaranteeing occupational safety and health is the company's effort to provide support for every activity carried out by employees. Rio, (2014) in his research

findings also revealed that the job satisfaction of an employee or worker from an agency and company is obtained based on their trust in the company or agency which is always responsive and reactive to the safety of its workers, starting from the existence of a program from the government in the form of BPJS employment to the existence of safety guarantees borne by the agency or company if a work accident occurs for workers or employees who carry out their work during operational work hours. The satisfaction that arises ultimately influences other variables such as motivation at work.

B. The Effect of Occupational Health on Employee Job Satisfaction

The results of the research analysis show that based on the results of the analysis using the SmartPLS tool, a regression coefficient was found for the influence of occupational health on job satisfaction with a value of 0.380 with a PV value of 0.000. This value interprets that occupational health has a significant effect on the job satisfaction variable. Likewise, with work safety, workers or employees whose work health is guaranteed by an agency or company will have their satisfaction at work. Job satisfaction is closely related to working conditions and job characteristics. Unsafe and unhealthy work characteristics in the workplace will have a negative impact on employee job satisfaction (Thoresen et al., 2003). According to the theoretical framework of the job demands-resources model, each type of job characteristic is divided into job demands and job resources (Bakker & Demerouti, 2007). Empirical research shows that there is a negative correlation between job demands and job satisfaction. Job demands such as job hazards and job risks are closely related to damaged job satisfaction (Nielsen et al., 2011).

C. The Effect of Job Satisfaction on Work Productivity

From several research results collected, it was found that there is indeed an increase in the work performance of workers or employees from agencies or companies when they are satisfied with doing their work. The results of this research also show that the regression value found based on SmartPLS analysis is at 0.822, which means that increasing work productivity is influenced by job satisfaction of 82.2%.

This value interprets that high job satisfaction has a significant effect on the productivity variable of workers or employees of an agency or company.

D. Influence of Occupational Safety and Health on Work Productivity

The results of this research also show that the correlation found based on SmartPLS analysis is at a value of 0.390 for the occupational safety variable and 0.312 for the occupational health variable (p-value < 0.05). This value interprets that guaranteed occupational health and safety will have a significant effect on the productivity variable of workers or employees of an agency or company, mediated by the variable of job satisfaction. Occupational health and safety (K3) practices have a direct and significant impact on work productivity. In short, occupational health and safety practices have a major impact on work productivity by creating a safer, healthier, and more conducive work environment (Shan et al., 2022). Organizations that invest in OSH not only fulfill their moral and legal responsibilities but also reap real benefits in terms of increased productivity, reduced costs, and a more engaged and satisfied workforce (Veronica et al., 2022). According to Sinollah & Zaki (2022) when workplaces prioritize and implement K3 measures effectively, it can produce several positive outcomes that increase productivity.

E. Managerial Implications

This research has more or less had a positive impact on the company. This is also supported by Organizational Structuring which implements all coordination directly controlled by the Center (one place) making it easier to control the implementation of K3 in the Project. The following are the implications and comparisons of implementation after the research.

Table 8. Implications and Comparison of Implementation

Variable	Observations in Research	Recommendations After Research
Work safety	Work Accident Reporting is only limited to moderate-to-severe work accidents and is accumulated in quarters of a month	Reporting of work accidents should be reported starting from minor to serious injuries and reporting should be reported every month the number accumulated in a year can also be used as a comparison with previous years
Occupational Health	Adequate health facilities and regular health checks	Adequate health facilities and regular health checks need to be maintained so that workers can continue to monitor the health of workers and so that workers receive appropriate first aid if there is a work accident
Job satisfaction	There are still	Several employees

	several employees who are not placed or do not work according to their skills	who have potential that matches their skills have been seconded to fields that match their skills
Work productivity	There are opportunities for employees to develop knowledge	This facility must be maintained because it can help increase employee work productivity due to increased employee knowledge about the field of work they are involved in

Source: Processed data (2023)

VI. CONCLUSION

Safety and Health are two variables that tend to have a good relationship with each other. Guaranteeing these two variables can increase employee job satisfaction. These two aspects have been included in the K3 guidelines which are used as a reference base for developing research instruments. Furthermore, increased job satisfaction is positively correlated with increased employee work productivity. Employees who are in top condition can work more effectively and efficiently. Based on the results of the research and discussion, several conclusions can be put forward including; Occupational safety and occupational health have a positive effect on job satisfaction. Furthermore, occupational safety and occupational health have a positive effect on work productivity.

Based on the research and conclusions that researchers have obtained, there are still several research indicators whose values are still relatively low even though they all have a positive effect on each other, therefore the researchers suggest that companies can consider and improve the quality of service and application of these indicators. This research can be used as a reference in evaluating the workplace, or as a form of strategy in improving employee performance in a company or organization.

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