Shipyard Employees' Motivation towards Safety Behavior: Factor Analysis with Social Cognitive Theory Approach

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Abstract: Ships are important transportation modes used in the logistics and maritime industry in general. Many accidents have occurred in the maritime industry, and the root cause of those accidents is the unsafe behavior done by the employees. This research aims to analyze the factors that motivate the safety behavior of shipyard employees. The model that will be used refers to Social Cognitive Theory (SCT). In SCT, the variables used to construct the model are environmental factors (FL), management commitment (KM), safety-efficacy (SE), employee involvement in safety (TK), and work safety behavior (PA). From those five variables, 11 research hypotheses are established. Data is collected by distributing offline questionnaires to field employees, supervisors, and safety management at PT. DTPS. The number of respondents involved was 173 respondents, which is then modeled by using the structural equation modeling (SEM) method. The result shows that four of the eleven hypotheses are rejected. In addition to that, TK has an important role in motivating safety behavior in the workplace, which is subsequently followed by SE. Therefore, it is needed to change the behavior and culture of an individual at the workplace to improve safety behavior.

1 INTRODUCTION

Many accidents have occurred, triggered by unsafe behavior. Many attempts have been made to reduce accidents. However, the number of accidents is not automatically decreasing. In the logistics and maritime industry, ships are one of the important transportation modes, and its quality should be a priority. Ships should be made through reliable processes as it guarantees the safety of the passenger, product, as well as, employees who operate the ships. While the safety of employees who makes the ships is also important in many shipyard companies, employees' motivation in regard to safety is still low. Factors that influence shipyard employee motivation toward safety behavior need to be identified so that the shipyard company can take corrective actions to promote safe behavior and reduce the number of accidents. Based on this, this research wants to focus on analyzing factors that influence the safety behavior of shipyard employees. This research aims to develop a model to identify factors that motivate shipyard employees' safety behavior, to identify the social cognitive variables that are most influential in motivating safety behavior towards shipyard employees, and provide recommendations to the company in improving occupational safety and health. For the case study, this research is conducted at PT. DTPS, a ship construction, and reparation company. PT. DTPS has implemented OHSAS 18001: 2007 safety management and ISO 14001:2015 environmental management system. However, there are still many employees who currently do not comply with work occupational health and safety (OHS) regulations, especially regarding the use of personal protective equipment (PPE). The field workers have the potential to experiencing work accidents related to physical hazards, falls, and scratches, slipping, or bumping. A condition where employees are not wearing PPE indicates the lack of supervision and awareness of employees towards safety behavior. Unsafe behavior is identified when employees are operating the machine. The operation is not performed based on the procedures, which might lead to work accidents. Moreover, the lack of communication between employees is also an issue that occurs in the company. The contribution of this research is to identify the factors that are most influential towards the safety behavior of shipyard employees. As a result, the company is able to take

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action to increase the safety awareness of the employees and minimize the level of work accidents. This research focuses on field employees and management related to OHS in the company.

2 RESEARCH METHODOLOGY

2.1 Modeling

The first stage of research methodology is modeling. At this stage, variables are identified, and the model is conceptualized. The identification of latent variables is carried out by using the theoretical framework of SCT (Bandura, 1986, 1997; Compeau, Higgins and Huff, 1999; Huang and Lin, 2008) and information from previous studies (Cui et al., 2013; Guo, Yiu and González, 2016; Hald, 2018). From previous studies, some latent variables that may influence the safety behavior of employees are identified. These include five latent variables, which are environmental factors (FL), commitment management (KM), safety-efficacy (SE), employee involvement (TK), and work safety behavior (PA). Indicators or variables are able to represent the latent variables for the model.

The conceptualization of the model is depicted in the form of a path diagram that shows the causality relationship between the tested variables. Subsequent to the path diagram, the hypothesis is then formulated. Figure 1 presents the conceptual model used in this research.

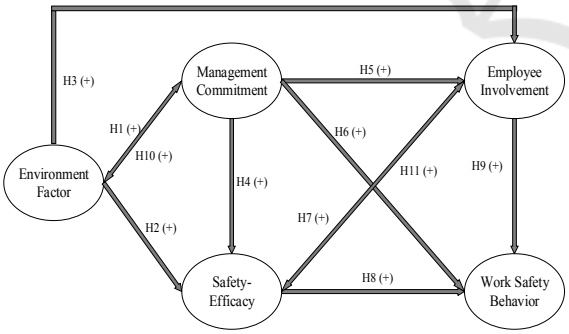

Figure 1: Conceptual Model.

2.2 Data Collection

The next stage of the research is designing and distributing questionnaires. The questions are developed based on the variables and indicators defined from the previous stage. The questionnaire uses a Likert scale of 1-7.

Questionnaires are directly distributed to field employees who are involved in the shipyard production process. The determination of sample number is based on the model constructed by (Hair et al., 2007), which stated that the number of samples which must be obtained for SEM is 5-10 times the number of indicators. This research uses 5 variables and 25 indicators. As a result, the minimum number of samples that must be obtained is 125 data.

2.3 Statistical Testing

After the data is collected, the following step is to test the proposed model. At this stage, the structural equation modeling (SEM) is applied to test the hypotheses. SEM is a set of statistical techniques that able to test a series of relationships simultaneously. The main reason for the use of SEM is because of its ability to estimate the relationship between multiple connected variables. SEM allows a more accurate analysis compared to other methods such as multiple regression, factor analysis, and covariance analysis because it could consider interaction modeling, nonlinearity, correlated independent variables, measurement error, and correlated error (Byrne, 2010). In addition to that, Linear Structural Relationship (LISREL) software is used for testing. This test aims to determine the consistency and validity of the proposed model. SEM testing uses several goodnesses of fit criteria. If the model does not match the data, the model needs to be modified to obtain a better match.

The first step of SEM is to conduct an initial measurement test. This test is carried out by using the confirmatory factor analysis (CFA) method. The purpose of this test is to identify whether the indicators used are relevant to the variables. Initial measurements are performed by running the LISREL software to ensure that all indicators meet several sub-criteria such as error variance, t-value, standardized loading factor (SLF), and standard error. In this case, several iterations are required to declare the model as fit. If the indicator does not meet the sub-criteria, the indicator must be removed, and the next iteration is performed until the model is fit. After all, indicators are fit, and a reliability test is performed to measure the consistency of latent variable indicators. The greater the value of reliability means that the indicator has a higher consistency in measuring latent variables. The validity test is then performed, which aims to see the level of accuracy achieved by an indicator in measuring the concept.

The second step is testing the structural model. This test uses multiple regression analysis, which assesses whether there is a significant or insignificant

relationship between variables (independent) with endogenous variables (dependent).

2.4 Data Analysis and Interpretation

The data analysis and interpretation phase are carried out by analyzing latent variables that have been formulated in SEM. Data analysis is in the form of a relationship from each variable and social factor that influences the safety behavior of an employee the most. These factors are motivations for employees in implementing safety behavior in the workplace.

3 RESULT

3.1 PT DTPS and Respondent Profiles

PT. DTPS is a company involved in the shipping industry (construction of new ships and ship repairs). PT. DTPS has a vast experience in constructing new ships. Until now, the total construction that has been carried out is 97 ships of various types and sizes. As for ship repair, the company has cooperated with government agencies as well as private companies. PT. DTPS is committed to implementing all the clauses specified in the ISO 9001: 2008 Quality Management System standards, OHSAS 18001: 2007 OHS Management System, and ISO 14001: 2004 environmental management system.

In this research, the process of data collection is carried out by directly distributing questionnaires to OHS management and field employees. Respondents who fill out the questionnaire are permanent employees or contractors of PT. DTPS. The respondents involved in this study are 173 respondents.

The majority of respondents who participate in this research are between 31 and 40 years old. The age of respondents describes the behavior and action of an employee. The level of education is one of the factors that influence the level of understanding in answering questions and performing activities. Based on the collected and processed data, it showcases that the majority of respondents involved in this research are high school graduates. In other words, most of the respondents have an average level of education. Moreover, none of the respondents have a degree below the junior high. The majority of respondents have positions as permanent or field staff because the focus of this research is the safety behavior of field employees in the workplace. Work accident experience is defined as work-related accidents and health problems experienced by the employee that originate from previous work. Experiences are derived from personal injuries or work accidents, and experience with the safety and health of employees, in particular, can be related to behavioral intentions towards work safety. Zhou and Jiang (2015) stated that personal experience factors related to safety were strong predictors in shaping behavior safety. The majority of respondents involved in this research have experienced a mild category work accident.

3.2 Data Processing Result

Initial measurements were carried out using LISREL software and produce output in the form of error variance, t-value, and Standardized Loading Factor (SLF) values. The following are the results of the first iteration of LISREL running software, presented in Table 1.

Table 1: The 1st Iteration of CFA Running Result.

Latent Variable	Indicator	Error Var	SLF	t-value
Environmental Factor	FL1	0,066	0,97	17,37
	FL2	0,14	0,92	15,82
	FL3	0,098	0,95	16,82
	FL4	0,097	0,94	16,34
	FL5	0,2	0,88	14,6
Commitment Management	KM1	0,45	0,08	1,01
	KM2	0,48	0,59	7,72
	KM3	0,38	0,48	6,02
	KM4	0,96	-0,57	-7,38
	KM5	0,22	-0,66	-8,72
Safety-Efficacy	SE1	0,23	0,82	12,81
	SE2	0,23	0,82	12,84
	SE3	0,11	0,93	15,49
	SE4	0,35	0,53	7,28
	SE5	0,37	0,3	3,93
Employee Involvement in Safety	TK1	0,28	0,68	9,57
	TK2	0,39	0,56	7,47
	TK3	0,24	0,8	11,97
	TK4	0,57	0,52	6,92
	TK5	0,95	0,57	7,6
Work Safety Behavior	PA1	0,13	0,91	14,9
	PA2	0,23	0,75	11,07
	PA3	0,72	0,28	3,53
	PA4	0,83	0,26	3,3
	PA5	0,25	0,8	12,3

The second iteration result of the CFA test after the six indicators omitted is presented in Table 2. Based on Table 2, it is known that all indicators have positive error variance. A measurement model can be said to be good if it meets several requirements. A good indicator is if the error variance is positive, the SLF value ≥ 0.45, and the t-value meets the minimum

standard ≥ 1.96 (Hair et al., 2007). The result of the t-value for all indicators in this research has values ≥ 1.96, and for SLF, all indicators have values ≥ 0.45. So, from the second iteration result, it can be said that the model was valid. The test can proceed to the next stage.

The goodness of fit test is now performed on models. The goodness of fit test is performed using the results of LISREL running software. The goodness of fit test results can be seen in Table 3.

Table 2: The 2nd Iteration of CFA Running Result.

Variable	Indicator	Error Var	SLF	t-value
Environmental Factor	FL1	0,06	0,97	17,47
	FL2	0,14	0,92	15,79
	FL3	0,095	0,95	16,88
	FL4	0,1	0,93	16,25
	FL5	0,21	0,87	14,48
Commitment Management	KM2	0,091	0,93	7,86
	KM3	0,3	0,63	6,45
Safety-Efficacy	SE1	0,25	0,81	12,48
	SE2	0,22	0,83	13,03
	SE3	0,091	0,94	15,67
	SE4	0,36	0,53	7,2
Employee Involvement in Safety	TK1	0,24	0,73	10,5
	TK2	0,4	0,55	6,34
	TK3	0,3	0,75	10,82
	TK4	0,54	0,55	7,36
	TK5	0,98	0,55	7,33
Work Safety Behavior	PA1	0,11	0,92	15,22
	PA2	0,24	0,73	10,81
	PA5	0,25	0,8	12,21

Table 3: Goodness of Fit CFA Model Result.

Sub Criteria Analysis	Cut Off Value	Test Results	Information
RMSEA	≤ 0,08	0,045	Model fit
90% Conf.Interv. for RMSEA	Expected to be small	0,019-0,021	Model fit
NFI	≥ 0,90	0,82	Model less fit
NNFI	≥ 0,90	0,92	Model fit
RFI	≥ 0,90	0,97	Model fit
IFI	≥ 0,90	0,97	Model fit
CFI	≥ 0,90	0,97	Model fit
PGFI	≥ 0,60	0,66	Model fit

Test results with LISREL software in Table 3 show that all criteria meet the cut-off value, except NFI. The NFI in the model is still less than 0.90, which is 0.82. This can occur because of the possibility that the small NFI value is caused by the complexity of the model, so to eliminate the influence of the complexity of the model, a more appropriate measure is NNFI. NNFI on the model is fit where the cut off value has exceeded 0.90. The validity test aims to see the level of accuracy achieved by an indicator. An indicator can be said to be good if it has a t-value ≥ of 1.96 and has an SLF value of ≥ 0.45 (Hair et al., 2007). The result of this research found that all indicators had met the required criteria so that all indicators were declared capable of measuring the dimensions of the variables. The reliability test is a test to determine the consistency of measurement indicators of a latent variable. The greater the value of composite reliability, the better the indicator or has high consistency in measuring latent variables. Following is the formula used in the reliability test:

$$Composite\ Reliability = \frac{(\sum SLF)^2}{(\sum SLF) + \sum e_j} \quad (1)$$

SLF values obtained from the results of running LISREL software, while ej is a measurement error on each indicator. A construct has good reliability if it has a composite reliability value (CR) ≥ 0.70 (Hair et al., 2007). The reliability test results can be seen in Table 4.

Table 4: Reliability Test Result.

Latent Variable	CR	Information
Environmental Factor	0,97267	Reliable
Commitment Management	0,86157	Reliable
Safety-Efficacy	0,91306	Reliable
Employee Involvement in Safety	0,7993	Reliable
Work Safety Behavior	0,90913	Reliable

It was found that the composite reliability (CR) value of all variables showed ≥ 0.70. This indicates that the indicators attached to the latent variable already have the expected reliability.

The second test is a structural model test. Before starting the structural model test, a goodness of fit test of the overall model is required. The purpose of the goodness of fit test is to ensure that the structural model can accurately explain the direction of the relationship and influence. If the test value meets the cut off value of each criterion, then the whole model considered as fit.

It was found that the test results with LISREL software showed that all criteria met the cut off value. After testing the goodness of fit, a structural model test is performed using the LISREL running software. The criteria used are the t-value. The t-value is useful to see the significance between latent variables. The

following are the t-value results obtained from running the LISREL software, presented in Figure 2.

Based on Figure 2, it can be seen that from the eleven research hypotheses, four hypotheses did not meet the t-value ≥ of 1.96 (error value of 5%). Therefore, the four hypotheses, which are H2, H3, H5, and H6, were rejected. So, the path diagram used after the hypothesis test is as presented in Figure 3.

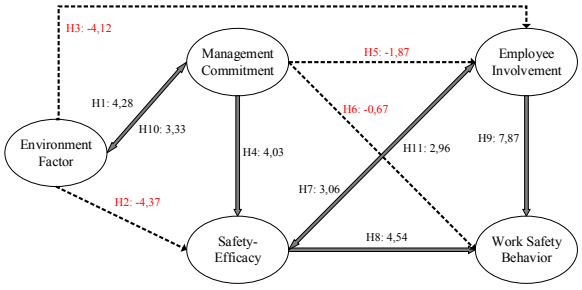

Figure 2: The t-value Structural Model Result.

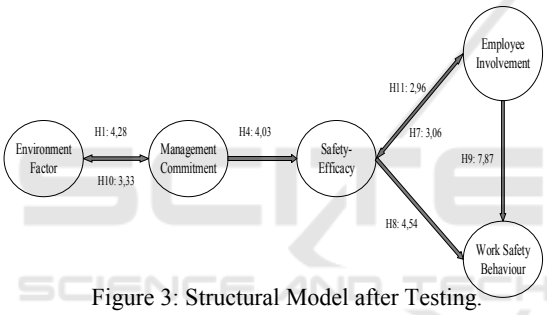

Figure 3: Structural Model after Testing.

Then the composition of the influence of each variable is determined. The composition of the effects of each variable is used to determine which latent variables are most influential in the model. The total effect is the sum of the direct and indirect effects obtained from the LISREL software output. The following are the results of the composition of the effects of each variable that can be seen in Table 5.

It was found that employee involvement in safety (TK) had the greatest total effect on all variables. This indicates that employee involvement has the most influence in producing work safety behavior in the workplace.

Table 5: Influence Composition of Each Variable.

Hypothesis	Path	Total Effect
H1	FL-KM	0,34
H2	FL-SE	-0,04
H3	FL-TK	-0,53
H4	KM-SE	0,1
H5	KM-TK	-0,2
H6	KM-PA	-0,21
H7	SE-TK	0,26
H8	SE-PA	0,48
H9	TK-PA	0,7
H10	KM-FL	0,35
H11	TK-SE	0,65

4 DISCUSSION

4.1 Hypothesis Analysis

H1 states that environmental factors (FL) have a positive influence on commitment management (KM). After structural test models, the results of H1 is accepted. This shows that the hazardous environment encourages management to carry out and make a policy, procedure, and safety practice, which the management seeks to continue in reducing the dangerous environment that occurs in the company. This finding supports the argument of Nielsen et al. (2006) that commitment management in work safety is usually considered the most important dimension of the safety climate. Organizational support and supervision are needed because employees' perceptions about commitment management to safety can be related to safety-related behavior. Commitment management that has been made by PT. DTPS for work safety is OHSAS 18001:2007 standardization. The standardization is a regulation regarding the obligation to use PPE in the field, the existence of periodic inspections by supervision, the existence of education and training programs on OHS, and so on. However, PT. DTPS has not implemented a penalty program or punishment for employees who do not follow the procedures and regulations regarding OHS.

H2 and H3 stated that environmental factors (FL) have a positive effect on safety-efficacy (SE) and employee involvement on safety (TK). After structural model testing, it was found that H2 and H3 were rejected. The test results indicate that environmental factors do not have a positive effect on self-efficacy and employee involvement. This is in accordance with the results of previous studies conducted by Cui et al. (2013). Several possibilities cause environmental factors does not have a positive influence on self-efficacy and employee involvement; for example, employees continue to feel confident even though working in a dangerous work environment.

H4 shows that commitment management (KM) has a positive effect on safety-efficacy (SE). Management's commitment to safety is a major factor

influencing the success of an organization's safety program. This indicates that commitment management influences on the internal aspects of individual attitudes and beliefs about safety. It is noteworthy that no direct relationship was found between hazardous environments and safety-efficacy. Instead, the results show that the relationship between the two is mediated by management's commitment to safety. This shows that the disconnect between the environment that is considered dangerous and the internal beliefs of employees in shaping the safety climate can be caused by deficiencies in the role of leaders and authority in handling safety potential. Although employees are required to follow safety procedures and are given channels to communicate with their managers regarding safety issues, the manager is less responsive and passive to safety threats when observing the lack of commitment from supervision, especially senior company managers. Given that field employees have limitations in safety measures, it is unlikely that they can respond individually towards the hazardous environment and handle the case immediately.

H5 and H6 state that commitment management (KM) has a positive influence on employee involvement in safety (TK) and work safety behavior (PA). After structural model testing, it was found that H5 and H6 were rejected. The test results indicate that commitment management does not have a positive effect on involvement and work safety behavior. This is following the research of Cheyne et al. (2002), which stated that a person's attitude or behavior tends to be obtained through observations from others and then duplicate it. Several possibilities cause commitment management do not have a positive influence on employee involvement in workplace safety behavior. For example, management is less committed to implementing OHS programs that make employees underestimate the importance of safety for themselves and others.

H7 shows that safety-efficacy (SE) has a positive effect on employee involvement in safety (TK), while H11 shows that employee involvement (TK) has a positive effect on safety-efficacy (SE). Employees' perceptions of safety affect work safety behavior. Safety-efficacy and employee involvement are one unity because both are individual cognitive behaviors. SCT (Bandura, 1986) asserted that an individual acquires behavior through observations from others, then mimics what they have observed, which shows that people's behavior is influenced by their cognitive processes. Employee involvement, in this case, is to show the relationship of employees related to safety and their acceptance of personal responsibility for achieving safety, such as helping colleagues in dangerous conditions. Thus, it can be seen as the extent to which the role of self-efficacy is reflected in safety behavior. It is noteworthy that no direct relationship was found between management commitment and employee involvement in safety. On the contrary, the results show that the relationship between the two is mediated by safety-efficacy. These results provide empirical evidence about the role of employee self-efficacy in safety management. This is in line with the argument of SCT Bandura (1986). The findings show that self-efficacy is not directly affected by management aspects but rather is controlled by their beliefs and observations of others that lead them to take similar actions. An individual's behavior will affect the behavior of other individuals. This finding is in line with the statement of Cui et al. (2013) that the normative aspects of an organization, through the influence of management attitudes, determined the behavior and expected the involvement of its employees. If organizational norms are affected by a low managerial commitment to safety, employees will also exhibit negative safety attitudes and accept risks related to the work received. This hypothesis is also similar to previous studies conducted by Guo, Yiu, and González (2016), where the results of the research showed that SE has a positive influence on employee involvement in safety.

H8 and H9 show that safety-efficacy (SE) and employee involvement in safety (TK) have a positive effect on work safety behavior (PA) in the workplace. After structural test models have been obtained, the results that hypotheses 8 and 9 are accepted. This indicates that employee confidence and involvement has a positive influence on the occurrence of work safety behavior.

H10 states that commitment management (KM) has a positive influence on environmental factors (FL). After the structural model tested, it was found that H10 was accepted. This shows that commitment management encourages or seeks to reduce the presence of hazardous environments in the workplace by establishing policies, procedures, and other regulations. The higher the level of management's safety commitment, the lower the level of perceived production pressure. The commitment to safety management has an indirect influence on safety behavior (participation and safety compliance). Social support from management to employees is very important to do.

4.2 Recommendations

This research uses an integrated model and underlines psychological perspectives in safety management that focus on the cognitive processes of an employee. This perspective enables the management and company to comprehend the understanding of human error and the sociological environment as the cause of accidents in the workplace. The causal chain from a psychological point of view begins with the employee's perception of a dangerous environment, which is an initial trigger for potential accidents. This is the cognitive process of an individual, which includes the external safety climate perception and the formation of an individual's trust (internal) in shaping behavior safety.

The first variable is the hazardous environmental factors. The most dominant indicator in this variable is the presence of safety threats related to lighting levels. A proper lighting level can be increased by providing an additional flashlight on the employee's helmet.

In the commitment management variable, the most dominant indicator in this variable is the management does not allow shortcuts when a threat occurs. Management's commitment has been demonstrated by the company through PPE regulations. But, in practice, there are employees who still do not wear PPE. The management, therefore, must consistently show leadership in safety. Continuous and consistent efforts must be made to ensure safety becomes the priority.

Punishment and reward systems are options to be applied, which aims to improve the discipline of employees. An example of this system is by creating a violation control sheet of PPE usage and procedures in the work area. OHS supervisor and management are required to fill out forms/control sheets that contain any violations committed by employees. The results of the violation will be announced in front of all the employees per each department. Safety talk is a meeting that is routinely held between supervision and employees to discuss issues regarding OHS. The purpose of this program is to inform the risks of this particular job and how to anticipate any unexpected incidents. Safety talk is recommended to be held regularly at least once a month in the morning before work starts The delivery of safety talk does not require much time, which is enough to last between 5-15 minutes with a concise and clear message. Topics covered in this program are related to hazardous conditions during work, types of work accidents or near misses that often happen, work guidelines related to work, types of PPE that should be used, and the latest issues or information about OHS.

In the safety-efficacy and employee involvement variables, recommendations that can be given are by conducting morning briefing, delivering periodic aspiration, and displaying posters related to work injuries. Morning briefings are face-to-face communications that unite leaders with their staff. This program is carried out every day in the morning with a duration of around 5-10 minutes. Morning briefings are conducted in each department and led by each head of department and employees. The company is suggested to apply the rules of leadership where each employee will take turns speaking in the morning briefing. This aims to increase the involvement of employees and encourage leadership in every employee. In briefings, leaders provide the latest information, advise employees to be more careful and comply with the existing regulations. The leaders should also discuss OHS implementation in the company, work procedures, conditions of work equipment as well as punishment and reward. Delivering regular aspirations or feedback provides employees with various information, which results in two-way communication between the leader and employees. This aspiration program is carried out by providing suggestion boxes for employees and requiring them to fill in the boxes at least once a month. This suggestion box is placed near the entrance gate of PT. DTPS. Contents within the suggestion or feedback box shall be in the form of complaints, recommendations, and findings regarding the violations committed by colleagues. The purpose of the suggestion box is to improve the communication and aspirations of all employees. Other than that, the suggestion box is also able to represent employees who are timid and keep their suggestions anonymous.

Designing a poster related to work injuries will give information on how to prevent accidents. The poster designs refer to minor, moderate, and severe injuries, such as fracture, finger cuts, and other injuries. These posters will be posted on each production process walls. The purpose of this poster is to increase the awareness of employees about injuries that may occur. Employees are expected to be more attentive and aware in order to avoid similar injuries shown in the poster.

5 CONCLUSION

The conclusions that can be obtained from this research are as follows:

1. Based on the social cognitive theory approach from Bandura (1986), factors that motivate shipyard employees of PT. DTPS consists of five variables, which are environmental factors (FL), commitment management (KM), safety-efficacy (SE), employee involvement in safety (TK), and work safety behavior (PA). Those five variables are used to analyze how variables can affect the safety behavior of employees.
2. The eleven research hypothesis is defined and tested. Based on the hypothesis test, there are four hypotheses that are rejected.
3. Employee involvement is the most influential factor that motivates employees towards safety behavior. This is in line with social cognitive theory (SCT), where people tend to mimics other people's behavior. Besides employee involvement, another factor that has significant influence is self-efficacy.
4. Some recommendations are proposed for PT. DTPS Shipyards Surabaya to increase employee motivation towards safety. These include implementing good punishment and praising programs, organizing open talks about safety awareness, and implementation of the OHS management system. Moreover, providing a flashlight or additional lighting on the employee's helmet, aspiration delivery programs, daily morning briefings, and designing posters related to safety are other options of solutions to change employee safety behavior.

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