Critical Succes Factor (CSF's) Identification that Affect Safety Performance in Construction Projects at Palm Oil Sector in Gabon, West Africa

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Abstract- One of the most disturbing causes of project work is the risk of an accident that occurs on a construction project. Safety performance can be an indication of how well a construction project works in implementing the safety program in the field, as well as can be used to evaluate previously carried out work safety management. The study will further examine the factors affecting the safety performance of construction projects in the palm coconut plantation area in Gabon. The study used a meta-analysis model to investigate factors that influenced the safety performance of 25 previous researchers. The process of identifying key success factors (CSF's) is carried out with literature study and analysis of the company, PT XYZ archive. The identified influence factors are then validated by an expert. The collected data is then processed and analyzed to obtain factors that affect safety performance. The results of the study show validation by the experts obtained a framework formulation consisting of 4 groups and 24 variables and has an impact on improved safety performance in PT. XYZ. Furthermore, the Group and the already validated variables will be used to know the performance of the implementation of the safety management system ISO 45001:2018 in PT. XYZ so that the application of safety management system in PT XYZ can reach maximum results.

Index Terms- Safety performance, Construction Project, CSF's, Meta analysis.

I. INTRODUCTION

The risk of accidents at work in the construction sector is one of the industrial sectors with a fairly high risk of work accidents. One of the most disturbing or discontinued causes of project work is the risk of an accident that occurs on a construction project. (Sepang et al, 2013). According to the International Labour Organization (ILO), 2018, more than 2.78 million people worldwide die each year from work accidents. Approximately 374 million injuries and work-related diseases occur annually, followed by more than 1.8 million deaths in the Asia-Pacific region due to work each year, and two-thirds of the world's deaths occur in Asia. (ILO, 2018).

Similarly, what happened in the country of Gabon as one of the developing countries in West Africa, showed that there were several serious and fatal accidents on some construction projects in Gabon. The rate of work accidents (AT) in the construction industry sector in Gabon (CTN B) in 2021 slightly increased from 2019, representing 752 more accidents than in 2019 (recorded approximately 89,000 work-related accidents/AT), which is almost 1% of the additional job accidents. (www.gabonreview.com).

As one of the leading sectors that has been growing rapidly for the last 10 years, the palm oil plantation in Gabon has been around since 1980 and is still on a small scale through local companies. In last decade, company PT XYZ, began to enter and develop a palm plantation area in Gabon. Based on the data reporting of work accidents in PT XYZ can be known work accident cases in 2022 show that was not fatal accidents occurred (zero fatality); loss time injury about 47 cases and accidents resulting in minor injuries occurred 262 cases. Despite a decrease in the number of accidents, the data can explain that the accident case data is still higher than the expectation of achieving the zero-accident target. It can be illustrated that the occurrence of 47 work accidents which some of them were in the project area, that result in serious injuries will affect the loss time and increase the cost of care and compensation which is not cheap. In addition, the loss time will affect the delayed completion of project work according to the target which ultimately results in a decline in customer satisfaction. This fact also explains that, although the management of PT XYZ has already tried to implement the safety management system procedures based on OHSAS 18001 and ISO 45001 in all its work practices, however, projects in the palm oil plantation area in Gabon still occur work accidents.

Still high cases of work accidents occurring in PT XYZ, indicating that there were accidents of work along with numerous

findings of unsafe behavior from workers. Preliminary observations were carried out on 35 employees as of December 3rd, 2022 regarding safety compliance that was still considered to be low. Overall of the three divisions, the remaining low level of compliance was only 41.1% and only 43.3% of the level of employee participation in safety activities in the company environment. This fact leads to the question of how efficient and effective the safety program has been run by the management of PT XYZ. Therefore, in an effort to reduce work accidents in companies engaged in the construction field, each company is obliged to implement a work safety management system in accordance with government rules to ensure the protection of the workforce in a project. (Abdullah, 2018).

On the side of government regulation in the field of safety and health, there are a number of general regulations that are adopted from some labor regulations adopted by previous French colonial regulations, such as *Loi n° 3/94 du 21 novembre 1994 portant Code du travail*, *Loi n° 6/75 du 25 novembre 1975 portant code de sécurité sociale*, and some common rules about safety and health, such as *Ordonnance n° 018/PR/2010 du 25 février 2010 portant modification de certaines dispositions du Code du Travail de la République gabonaise* dan *Décret n°01494/PR/MTEPS du 29 décembre 2011 déterminant les règles générales d'hygiène et de sécurité sur les lieux de travail*; However, detailed rules are not yet available. There is a gap from the regulatory side when compared with OSHA 18000 management system or ISO 45001.

Based on the description above, it is clear that safety performance is a very important thing in the construction services industry, however, the issue of work safety is often out of the attention of the parties involved in the process of construction. From the study of existing literature (Mohammadi et al., 2018) collected the factors that can affect safety performance are motivation, rules and regulations, financial and productivity aspects, resources and equipment, working conditions, culture and climate safety, attitudes and behaviors, lessons from accidents, organizations, as well as safety programs and management systems.

Some studies in developed countries show that the implementation of work safety program should pay attention to the legal constitution and inspection issues of work safety, so that, training, socialization, and introduction of technical devices related to work safety is needed (Andersen et al., 2019), (Zhou et al., 2019). The construction industry in developing countries is more focused on working methods in the implementation of construction projects as an effort to face serious risks in work safety (Åsgård, 2018). Studies in other developing countries also suggested that construction stakeholders focus more on recruitment processes, education programs, training, and workers' productivity (Karimi and Taghaddos, 2019). (Korkmaz and Park, 2018).

To ensure the workers welfare and the quality of products, the company must be willing to spend the cost to form an integrated management system. At present, this can be helped with one of the management tools using ISO standards. (International Organization for Standardization). In March 2018, ISO published ISO 45001 on Occupational Health Safety Management System (OHSMS) as a replacement for OHSAS 18001. This standard is intended to enable organizations or industries to manage work safety risks and improve work safety performance. This becomes the challenge of the management of PT XYZ in ensuring the safety program runs properly and efficiently not only limited to the effort to maintain the integrity of the company but also there are requirements to qualify in the ISO 45001: 2018 certification.

One way to know the accuracy and efficiency of a safety program is to identify critical success factors. (CSF's). According to Aksorn and Hadikusumo (2008), there are several CSF's that can influence the implementation of safety programs. Therefore, the final result of this study is a safety program recommendation based on the principles of smart safety.

Depending on the facts already described, the researchers want to know the key success factors of the safety program that PT XYZ can implement on the project in the palm oil plantation area in Gabon. This is becoming increasingly important given the impact caused by work accidents that can harm the organization and employees involved. The results of the evaluation of customer satisfaction with respect to the accuracy of the timing of execution at large contractors are at a level of dissatisfaction, as there are frequent delays in the completion of the project, which is accused due to the problem of work accidents (Madeppungeng, Intari and Fauziah, 2020). The aim of this study is to identify CSF's on a construction project at a palm oil plantation in Gabon.

II. RESEARCH METHODOLOGY

The study used a meta-analysis model to investigate factors that influenced the safety performance of 25 previous researchers. A meta-analysis model is an analysis of a previously existing research. Research data is obtained using secondary data through literature review and archive research to identify factors that affect safety performance in PT. XYZ and then validate the influence factors from experts. In this study, the variables used are variables that are based on the results of literature studies related to several Critical Success Factors development of safety performance that have been carried out according to the research of experts and based on regulations, i.e. as shown in the following Table 1.

Table 1: Determinant Variable of Safety Performance

Group 1 factors - worker participation		
No	**Variable**	References
1	Personal Attitude	Levitt and Samelson (1993), Stranks (1994), Tam et al. (2001), Johnson (2003), Schultz (2004), Fang et al. (2006).
2	Personal Motivation	Petersen (1984), Levitt and Samelson (1993), Stranks (1994), Neal and Griffin (2002), Johnson (2003).

3	Safety Meeting	El-Mashaleh, et al. (2009)
Group 2 factors - safety prevention and control system		
No	**Variable**	References
4	Efficient Enforcement System	Fang, et al. (2004)
5	Suitable Supervision	Fang, et al. (2004)
6	Safety Training	Toole (2002), Tam, et al. (2004)
7	Equipment and Maintenance	Toole (2002), Tam, et al. (2004)
8	Personal Competency	Top (1991), Mohamed (2002), Tam et al. (2004), Fang et al. (2006), Mohamed (2002).
9	Program Evaluation	Peyton and Rubio (1991), Pierce (1995b), Oklahoma Department of Labor (1998), Stranks (2000), Abudayyeh et al. (2006)
10	Continuing participation of employees	Peyton and Rubio (1991), Harper and Koehn (1998), Ariss (2003), Smith (2003), Abudayyeh et al. (2006)
Group 3 factors - safety arrangement		
No	**Variable**	References
11	Good Communication	Peyton and Rubio (1991), Stranks (1994), Vredenburgh (2002), Fang et al. (2004), Abudayyeh et al. (2006)
12	Allocation of Authority and Responsibility	Abudayyeh, et al. (2006)
13	Delegation of authority and responsibility	Anton (1989), Oklahoma Department of Labor (1998), Rue and Byars (2001), Abudayyeh et al. (2006)
14	Adequate Resource Allocation	Erikson (1997), Oklahoma Department of Labor (1998), Rollenhagen and Kahlbom (2001), Rechenthin (2004), Abudayyeh et al. (2006)
Group 4 factors - safety commitment		
No	**Variable**	References
15	Management Support	Pierce (1995b), Blake (1997), Stranks (2000), Rowlinson (2003), Rechenthin (2004), Abudayyeh et al. (2006), Herrero et al. (2006)
16	Teamwork	McGowan and Norton (1989), Krause (1997), Ulloa and Adams (2004), Abudayyeh, et al. (2006).
17	Clear and Reasonable Objective	Abudayyeh, et al. (2006)
18	Clear and realistic goals	Weber (1992a), Cooper (1993), Pierce (1995a), Blake (1997)
19	Positive group norms	Petersen (1984), Sarkus (1997), Stranks (2000), Johnson (2003)
20	Effective enforcement scheme	Pierce (1995b), and Michaud (1995), Construction Safety Association of Ontario (2002), Fang et al. (2004)
21	Safety equipment acquisition and maintenance	Toole (2002), Tam et al. (2004)
22	Appropriate safety education and training	Cooper and Cotton (2000), Toole (2002), Tam et al. (2004), Fang et al. (2004), Fang et al. (2006)

Source: Made by Author

III. DATA COLLECTION AND ANALYSIS

Data collection through questionnaires is aimed at answering research questions. At this stage, primary data collection is carried out through observations, interviews, and questionnaires with experts. To gather some of the data needed in the research, the following are the steps carried out by the researchers: 1. Identify and Verify lists of CSF's adopted from some previous research

from several international journals. Through the adoption, the researchers obtain references about CSF's. Subsequently, the CSF's will be communicated with some managers and staff of the company to obtain CSF's that truly fit the company's conditions and strategy. So that, in this phase, the CSF's final approval has been obtained for evaluation in the next phase.

The first stage questionnaire contains the identification of the dimensions and indicators that influence the development of safety performance which in this study are obtained from the study of literature. These questionnaires are given to experts for verification, clarification, and validation for content and construction. Experts are asked if they agree or disagree with the dimensions and indicators and fill in the information column for input on each dimension and indicator. In addition, the experts are also asked to fill in an additional dimension column or indicator if there are additional dimensions or indicators. The number of proposed experts is 5 (five) people shown in the following Table 2:

Tabel 2. Expert for Questionnaire Validation

Experts	Gender	Age	Department	Work Experience	Nationality	Level of Education
Expert 1	Male	38	Civil Engineer	12	Cameroonian	Bac + 5 Master Niveau 7
Expert 2	Mâle	33	Head of H&S Department	11	Emiratis	Bac + 5 Master Niveau 7
Expert 3	Male	41	Civil Engineer Manager	12	Gabonese	Bac + 5 Master Niveau 7
Expert 4	Male	37	Civil Engineer	15	Indian	Bac + 3 Licence Niveau 6
Expert 5	Male	42	General Manager	16	Indonesia	Bac + 3 Licence Niveau 6

Source: Made by Author

From the results of validation and verification of several experts above obtained the validation results as seen in Table 3. In general, indicators can be accepted by experts, although there are also indicators that do not get the approval of experts. In addition, there are several recommendations of dimensions and indicators from experts as these factors are believed to significantly affect safety performance.

Table 3. Validation and Inputs from Expert

Expert	Response and Input
Expert I	Explanatory correction of factor 20 & 22 and input of one of the important factors is the availability of signs, signals and barricades.
Expert II	Explanatory correction of factor 12 and input of one of the important factors is emergency preparation
Expert III	Explanatory correction of factor 13 and 19.
Expert IV	Explanation of Factor 22
Expert V	There is no correction to factors and additional factors

Source: Made by Author

Results of expert validation of safety performance indicators identified from literature studies are shown in Table 4 below:

Table 4. Recapitulation of Indicator Validation by Expert

No	*Critical Success Factors*	Experts				
		1	2	3	4	5
Group 1 factors - worker participation						
1	Personal Attitude	V	V	V	V	V
2	Personal Motivation	V	V	V	V	V
3	Safety Meeting	V	V	V	V	V
Group 2 factors - safety prevention and control system						
4	Efficient Enforcement System	V	V	V	V	V
5	Suitable Supervision	V	V	V	V	V
6	Safety Training	V	V	V	V	V
7	Equipment and Maintenance	x	V	V	V	V
8	Personal Competency	V	V	V	V	V
9	Program Evaluation	V	V	V	V	V
10	Continuing participation of employees	V	V	V	V	V
11	Sign, signal and barricade					
12	Emergency situations					
Group 3 factors - safety arrangement						
13	Good Communication	V	V	V	V	V
14	Allocation of Authority and Responsibility	V	X	V	V	V
15	Delegation of authority and responsibility	V	V	X	V	V
16	Adequate Resource Allocation	V	V	X	V	V
Group 4 factors - safety commitment						
17	Management Support	V	V	V	V	V
18	Teamwork	V	V	V	V	V
19	Clear and Reasonable Objective	V	V	V	V	V
20	Clear and realistic goals	V	V	V	V	V
21	Positive group norms	V	V	X	V	V
22	Effective enforcement scheme	X	V	V	V	V
23	Safety equipment acquisition and maintenance	V	V	V	V	V
24	Appropriate safety education and training	x	V	V	x	V

Source: Made by Author

The first validation was carried out by Expert 1 and according to his opinion, there are 4 Groups and 23 variables that influence safety performance in accordance with the ISO 45001:2018 standard in PT. XYZ and he added to Group 2 it should be added to the eleventh variable, which is the variable of availability of sign, signal and barricade. This is considered important because the occurrence of several work-related accidents often occurs unexpectedly. The second validation was carried out by Expert 2 and according to his opinion, there are 2 Groups and 24 variables that influence safety performance in line with the implementation of ISO 45001: 2018 in PT. XYZ. He revised by adding a variable for Group 2 to be added to the 12th variable, the emergency preparation variable. This is considered important because of the importance of rapid and accurate identification actions when facing an emergency situations. The third and subsequent validation was carried out by Experts 3, Experts 4 and Experts 5, which in his opinion, there are 4 Groups and 24 variables that influence safety performance that support the implementation of ISO 45001: 2018 in PT. XYZ.

After passing through the validation stage, we obtained a formulation of the research framework of the management system related to the improvement of safety performance that leads to the smooth implementation of work safety with the ISO 45001:2018 standard that can be used to investigate clauses and sub clauses that need to be taken into account against the application of the ISO 45001 management system in PT. XYZ. From the results of the validation by the informant, 4 groups and 24 potentially influential

variables are obtained and the variables will be used to study the performance of the implementation of the ISO 45001:2018 standard management system in PT.XYZ.

IV. CONCLUSION

Framework formulating to improve safety performance in the safety management system that refers to the validation results of five expert informant in the construction field to see the Group and any variables that influence the safety performance referring to the ISO 45001:2018 standard in PT. XYZ. From the results of validation by experts as an informant, a framework formulation consisting of 4 groups and 24 variables has been validated and has an impact on the improvement of safety performance in PT. XYZ. Furthermore, the Group and the already validated variables will be used to know the performance of the implementation of the management system K3 SNI ISO 45001:2018 in PT.XYZ in order to implement SMK3 at PT. XYZ can reach maximum results.

V. RECOMMENDATION

The results of this research need to be deepened, especially in relation to the sufficient number of respondents to be considered research subjects with professional backgrounds and practitioners of construction project management. Furthermore, future research can also conduct empirical research using both quantitative, qualitative, and mix methods to investigate safety performance practices in construction companies in order to get a more detailed picture of work accidents and their causes.

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