

## SEEN SAFETY PERFORMANCE FROM THE PERSPECTIVE OF SAFETY PLAN, SAFETY BEHAVIOR AND SAFETY CULTURE THROUGH MANAGEMENT CONTROL AS A MODERATING VARIABLE: A CONCEPTUAL FRAMEWORK

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**Abstract** - This paper is a research design that aims to examine the factors that can affect safety performance in the chemical industry sector, several previous studies have conducted research on safety performance in the construction sector and there is still little research on safety performance in the chemical industry sector. This study uses a quantitative research design and will use hypothesis testing using PLS-SEM analysis tools as well as field studies. This study will use the entire population of the chemical industry in Banten province, which is as many as 60 companies and all of them will be sampled in this study. Practical implications: managers in the chemical industry sector companies must implement broad policies to improve safety performance to maintain business continuity by reducing the risk of work accidents. Originality/value: this researcher is one of the pioneers in research on the influence of safety planning, safety behavior, and safety culture on safety performance in the chemical industry.

**Keywords:** safety performance, safety planning, safety behavior, safety culture, management control.

### INTRODUCTION

Increasingly competitive industrial competition and the current globalization of trade have an impact on very fierce competition in all aspects (Villazón et al. 2020) this requires companies to further optimize all their resources to maintain their business continuity ((Nuryanto et al. 2020), the 4th industrial revolution is a combination of technology by integrating technological resources, human machines and, providing a major change in the sector. The use of technology, machines, and humans has risks and dangers that can cause work accidents so there is a decrease in efficiency and productivity, which has negative implications for the organization as a whole (Singh and Misra 2021).

In Banten Province in 2017 there were 6,139 work accidents with the number of claims of Rp.30,138,371,709 then in 2018 the number of accidents decreased by 30.21% to 3,847 cases with the number of claims of Rp.29,765,923,072, in 2019 there were 4,870 work accidents, an increase of 21.01% with the number of claims of Rp.39,395,277,250 and in 2020 there was an increase in the accident rate of 15.82% with an increase in the number of accidents as many as 5,785 cases and the number of claims worth Rp.36,441,611,153, then in 2021, the number of work accidents increased again by 26.14% from the previous year to 7,832 cases with claims of Rp.43,092,033,226.

Accidents large and small are events that are not desired by all industry players, the accidents referred to are like fires or explosions caused by uncontrollable processes (Ilić-Komatina, Galjak, and Belošević 2018). In addition, accidents at one installation have a domino effect (Xu, Gai, and Salhi 2021) that can spread to other installations resulting in a chain of accidents resulting in a more severe condition (Chao Chen, Reniers, and Zhang 2018) the impact of major accidents on the chemical industry can cause many losses both to company property, casualties, environmental pollution and ecological problems (Chen Chen et al. 2020)

In previous studies, it was explained that planning, design, and procurement greatly affect safety performance (Mahmoud et al. 2020), this is different from research that says that technological and human failures are the cause of accidents due to failure to predict all possibilities (Steijn et al. 2020), attitudes or commonly referred to as safety behavior have a positive effect on safety performance (Karimpour, Jahani, and Abbas 2021), but some argue that employee participation in health and safety issues, as well as safe behavior in the workplace, depends on management (Bayram, Arpat, and Ozkan 2021), a safety culture positively affects safety performance (Otitolaiye et al. 2021) this is different from the results of other researchers who stated that the role of strong safety culture moderation on the influence of the adverse impact of project complexity on safety performance by safety management (Trinh and Feng 2020).

Based on the above phenomenon, this study will test the safety performance of the chemical industry in the Banten province area influenced by safety planning, safety behavior, and safety culture through management control as a moderating variable.

This research is one of the pioneers in research on the influence of safety planning, safety behavior, safety culture, and management control on safety performance in the chemical industry, the results of this research are expected to be a reference and reference for the chemical industry business actors to make occupational safety factors an important part of the management system in realizing the goal of business continuity.

## LITERATURE REVIEW

### Chemical Industry Accidents

The chemical industry is one of the industries that have a high risk (Wang, Li, and Wu 2020), several accidents in the chemical industry that occurred in China such as in Hebei Province in 2018 and Jiangsu Province in 2019 caused casualties, property damage and the surrounding environment (Xiaoming 2020). Apart from china, there was also a chemical industry accident in Dhaka Lama Bangladesh on February 19, 2019, which caused 71 deaths, 37 people were injured and the fire could only be matched for 15 hours (Syeda 2020). From 2008 to 2018 6 chemical industry accidents in South Korea resulted in 5 deaths (Jung, Woo, and Kang 2020) major accidents in Russia and the world on average occurred in companies that produce or store chlorine, ammonia, mineral fertilizers, organic synthesis products and petrochemicals (Pavlenko, Pavlenko, and Dolzhikova 2020), The effects of accidents due to thermal radiation, toxic gas clouds, explosions and exposure to toxic chemicals cause enormous impacts both on humans, property and the environment (Hosseinnia, Khakzad, and Reniers 2018).

### Safety Performance

Safety issues in an organization are placed as a very big problem, this happens along with capacity building, accountability, and changes to regulations and environmental norms. companies face stricter legal challenges so they need to adjust concrete measures to improve safety performance (Eyer 2018).

The increase in company performance is of course influenced by safety performance, because according to research that there is an established relationship between the company's work culture in terms of company performance and safety performance (Musonda, Lusenga, and Okoro 2021), in addition to that there is a close relationship between injuries and work accidents that result in the loss of human life which negatively affects organizational productivity, profit and brand image (Nielsen 2014). So to reduce work injuries, companies need to develop a safety management system and integrate it into policies, strategies, and processes (Kim et al. 2019) so that the system built is in line with the company's vision and mission and can be run by the goals of developing the system.

An established relationship was found between the company's work-related culture in terms of company performance or safety performance (Musonda, Lusenga, and Okoro 2021), then (Nielsen 2014) suggested that there is a close relationship between work injuries and accidents that result in the loss of human life which negatively affects organizational productivity, profit, and brand image.

To reduce work injuries, the company has developed a safety management system and integrated it into policies, strategies, and processes (Kim et al. 2019).

Safety performance is an illustration of the quality of work related to safety (Mohammed et al. 2020), besides that safety performance is an important indicator of organizational transparency and brand values (Sharma and Mishra 2021) because safety is part of the occupational and environmental safety management system (Sarkheil 2021)

### **Management Control**

In realizing all the goals that an organization wants to achieve, control from management is needed, this is done to ensure that employees have consistent behavior with the organization's strategy (Feder and Weißenberger 2021). In addition, the purpose of management control is to motivate employees to have behaviors that are in line with the goals set by the organization (Kenneth A. Merchant 2003).

Management can assess the effectiveness of safety performance through control over the implementation of safety regulations, leadership, safety planning, safety compliance, performance measurement, risk assessment, safety inspection, and Safety Culture (Khalid, Sagoo, and Benachir 2021). The control function in a company can be carried out starting from the management level to the top management level as stakeholders in the company (Nishitani et al. 2021) using a management control system (Bellora-Bienengräber, Radtke, and Widener 2021).

Internal and external factors must be controlled to influence safety performance therefore requires an effective safety management strategy to reduce accident rates through optimization of resources, practices, and structures (Le Coze 2019). Safety management systems can affect organizational systems, working groups, and individual behavior (Newaz et al. 2021).

### **Safety Plan**

Safety planning is a good start coming from project development, minimizing costs, and reducing time (Thor Myklebust, Tor Stålhane 2016). Occupational safety and health planning is a basic instrument for the management of an identification activity and if appropriate, then risk assessment and preventive step planning are the practices that can reduce the potential for accidents and increase worker productivity (Gurmu 2019).

The occupational safety plan should be considered as a real instrument in the workplace to carry out work safely and all information contained in this document should contain about planning, organizing, and controlling each of the activities from the point of view of safety and health in the workplace (Martínez-Rojas et al. 2020). Therefore, we face an alarming reality and point out that the lack of effectiveness of safety planning can be a decisive factor in the realization of a worker safety risk (Weinstein, Kroska, and Walser 2021).

### **Safety Behavior**

Safety behavior is classified into two main categories: safety compliance and safety participation. The degree of compliance with safety is closely related to measures regarding safety, such as compliance with safety regulations and compliance with safety instructions. Safety participation is a safety-related behavior that is voluntary, such as a willingness to support colleagues, be regularly involved in safety training programs, and make safety recommendations (Amponsah-Tawaih and Adu 2016).

Behavior is the actual activity that a person shows about other individuals and the world around them based on corporate policy. Safety behavior is an activity carried out by individuals as a form related to protection (He et al. 2019). Safety behavior is an important factor in safety performance that has many benefits over other factors, such as injury and death (Xue, Fan, and Xie 2020).

Safety behavior is inseparable from safety performance and is influenced by various processes (Huang and Chiu 2020). Safety behavior refers to the safety activities of employees in the workplace expressed by the actions of employees to establish and improve safety in the work environment (Adi, Eliyana, and Hamidah 2021).

Workers who have safety behaviors are workers who voluntarily pay attention to their safety, and the safety of colleagues, comply with safety regulations in the workplace, provide advice to

reduce potential risks in the workplace, and always wear safety equipment (Winda Widyanty and Puspa 2021).

### **Safety Culture**

Since the Chornobyl accident in 1986, the concept of safety culture has been a tremendous concern, in any investigation into work accidents safety culture has become a very concerning issue. The safety culture in an organization not only affects the productivity of the organization but also affects business competition with competitors (Kartikawati and Djunaidi 2018).

(Y. Chen, McCabe, and Hyatt 2018), Defining the safety culture into common values, commitments, beliefs, communication, behaviors, and habits of the members of the organization, has a very strong impact on safety behavior and safety performance. Top management's commitment to safety and their support of safety systems can help companies achieve greater safety benchmarks (Ghahramani and Salminen 2019).

Physical condition, behavior. procedures, management, competence, and collaboration are important components of the occupational safety culture (Almazrouei et al. 2020). (Zwetsloot, van Middelaar, and van der Beek 2020), defines safety culture as the attitudes, values, assumptions of perceptions, and habits of relevant members of the organization to deal with safety risks, and to measure the occupational safety culture it is necessary to analyze the policies made. In addition to leadership style, participation in the implementation of occupational safety and communication are characteristics of the safety culture (Widyanty et al. 2020).

### **The relationship between safety plan and safety performance**

The results of the study (Sarkheil 2021), that to achieve good safety performance, it must be carried out through safety planning by designing and using preventive indicators to monitor the effectiveness of the controls implemented, planning solutions to build an occupational safety culture, implementing an effective management system, paying attention to and considering special practical training according to needs and conditions.

Proactive occupational safety planning can improve the prevention of work accidents, meaning that occupational safety planning has a significant effect on safety performance (Im and Park 2020). The chemical industry is a high-risk industry with a large investment scale and has a long process and complex technology, so to maintain the continuity of its business requires good safety and health planning through a strict occupational safety and health management system (Min et al. 2020).

Planning has evolved from a progressive force for economic and social development to one that places the need for capital through regional economic development (Holdsworth, Sandri, and Hayes 2020).

H<sub>1</sub>: safety plan has a positive and significant effect on safety performance

### **The Relationship Between Safety Behavior And Safety Performance**

Employee safety behavior complies with organizational security measures and directly improves safety performance (Sharma and Mishra 2021). pay attention to one's safety, and the safety of colleagues, comply with safety regulations in the workplace, provide advice to reduce potential risks in the workplace, and always wear safety equipment affect improve high safety performance in the workplace (Winda Widyanty and Puspa 2021).

(Adi, Eliyana, and Hamidah 2021), his research describes that several research variables such as safety leadership, safety communication, safety commitment, and safety climate can help managerial teams make effective approaches to improving safety behaviors in the workplace. Compliance with safety procedures and safety participation does not always change safe behavior, because work fatigue also affects the process of work accidents (Tong et al. 2020).

H<sub>2</sub>: safety behavior has a positive and significant effect on safety performance

### **The relationship between Safety culture and safety performance**

The results of the study (Qayoom and H.W. Hadikusumo 2019), explained that the safety culture at the operational and middle management levels is much more effective than the strategic level (top management) in improving safety performance in an organization.

(Zwetsloot, van Middelaar, and van der Beek 2020), defining a safety culture is an attitude, value, assumption, perception, and habit that is relevant to dealing with safety risks, and to measure the culture of occupational safety it is necessary to analyze the policies made. In addition to leadership style, participation in the implementation of occupational safety and communication are characteristics of the safety culture ((Widyanty et al. 2020).

According to (Musonda, Lusenga, and Okoro 2021) the improvement of safety performance in organizations is impossible if the culture is not improved, although there has been no recognition that cultural improvement results in better performance or occupational safety behavior, and there has been no definitive statement about how to improve the safety culture and how it is measured.

H<sub>3</sub>: safety culture has a positive and significant effect on safety performance

#### Relationship between Management Control and Safety Plan

The role of management is very important in controlling safety planning, using risk management starting from identification to risk assessment and countermeasures (Miao et al. 2021) control of planning is the goal in developing future and long-term planning standards or actions (Traxler, Schrack, and Greiling 2020). The management committee is instrumental in the prevention of very large accidents hammering the analysis and management process of a risk (Chao Chen and Reniers 2020)

H<sub>4</sub>: Management Control has a positive and significant effect on the Safety Plan

#### Relationship between Management Control and Safety Behavior

Control management can influence individual behavior by increasing safety knowledge, motivation, and involvement in helping to comply with safety rules (Newaz et al. 2021), the role of management's commitment is enormous to changes in labor safety attitudes and behaviors (Chao Chen and Reniers 2020) and often when an accident occurs the blame is employee behavior factors while management factors are rarely investigated (Kee et al. 2017).

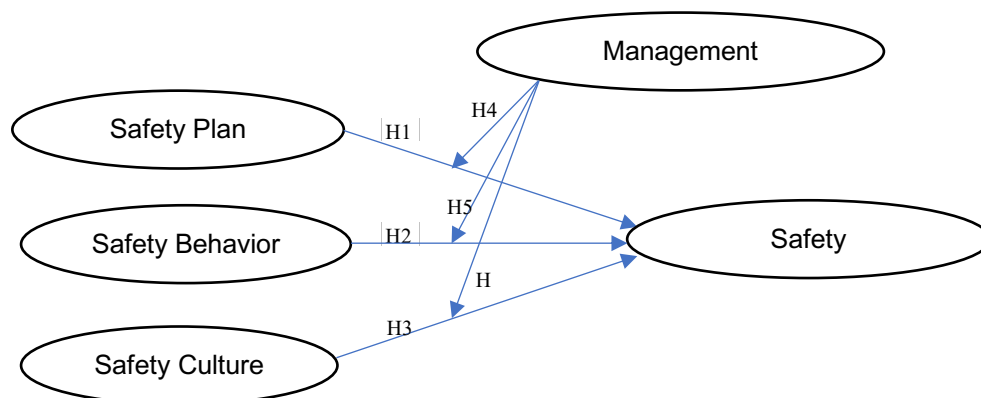
H<sub>5</sub>: Management Control has a positive and significant effect on Safety Behavior

#### The Relationship between Management Control and Safety Culture

Culture with a background in ethnicity, religion, and language as well as the value of perilous attitudes cannot be separated from work activities so that between culture and control management are two things that have interdependence (Malmi et al. 2020) control management factors through organizations can affect the safety climate, safety culture, and safety practices (Newaz et al. 2021), the investment of occupational safety culture can be increased through management's commitment to the safety of the workforce to be provided with continuous organizational training, seminars, and learning (Chao Chen and Reniers 2020)

H<sub>6</sub>: Management Control has a positive and significant effect on Safety Culture

Based on the description above, the research framework is compiled as follows:



## METHODS

This study uses a quantitative research design and will use hypothesis testing using PLS-SEM analysis tools, this study will use the entire chemical industry population in Banten Province, which is as many as 60 companies, and all of them will be sampled in this study. this industry was chosen because it satisfies the expected context in a study to test hypotheses. The literature criteria used in this study include:

1. Literature on safety performance in the chemical industry sector.
2. The keywords used are the chemical industry, work accidents, safety performance, safety plan, safety behavior, safety culture, and management control
3. The literature chosen is literature published from 2014 to 2021.

## RESULTS and DISCUSSION

Based on the results of the literature review obtained in this study, there is a paradigm that is developing today that it seems as if work safety is only for the protection of labor safety alone, while the occupational safety factor is also very much needed by companies to maintain investment sustainability.

Materially, losses due to work accidents that affect workers are only a small part of business losses, but when viewed from the business operational side, losses due to work accidents are very large, ranging from the cessation of the production process to damage to high-value property, not even a few work accidents that cause the company to close and cause environmental or natural damage.

The characteristics of the chemical industry that have a high risk of danger to potential accidents require the existence of serious safety planning, therefore the involvement of management in carrying out control certainly determines a safety plan prepared by a company, the good and bad of a plan is very dependent on the seriousness of management in achieving the goal of improving safety performance which in the end good safety performance will impact on the overall performance of the company.

Occupational safety planning is an inseparable part of occupational safety management which will ultimately improve safety performance in the business itself, in other words, that work safety planning has a very positive effect on safety performance in a company. Therefore, work safety must be carried out from the planning, manufacturing, installation, discharging, and at the time of change. If this has been done by the company, the target of work harmony will be achieved by expectations.

In addition to equipment, environmental and cultural factors, there are very important factors in the assessment of safety performance, namely employee behavior factors, so that employee behavior can reflect a safe action in carrying out work, of course, there must be strict involvement and control from management. management's uniqueness in shaping the behavior of employees who have a caring attitude towards safety is certainly a very important factor, without control from management, usually, employees tend to have behaviors that are less concerned about the safety of themselves and others who are in the workplace and if this happens, it will certainly greatly affect the safety performance of a company.

A company that has a high risk of work accidents due to the use of dangerous equipment and raw materials such as the chemical industry must certainly have a good workplace safety culture, creating a culture of workplace safety can not only be done by workers but also a commitment from management to create this culture. The management control function must be estimated to realize a culture of safety in the workplace, creating a culture of safety in the workplace, of course, will greatly affect the safety performance of a company organization which of course the end of all its goals is the continuity of efforts for the welfare of all parties, both workers and employers.

To realize a workplace that is free from work accidents and occupational diseases, it is necessary to have a safety culture that is rooted in every workplace, to create a culture of workplace safety requires the involvement of all parties, both workers and management. A work safety culture that has been embedded in a business activity can certainly have a very positive impact on safety performance and good safety performance will have a good impact on the sustainability of a business.

One of the safety performance indicators is a decrease or decrease in the number of work accidents, with a decrease in the number of work accidents, of course, can increase work productivity and can increase the efficiency of costs incurred due to work accidents.

In application, the role and function of planning, behavior, and safety culture are very necessary to realize the achievement of safety performance, and theoretically, the results of this research show that safety planning, safety behavior, and safety culture affect safety performance in a company.

## CONCLUSION

Based on the literature review obtained that safety behavior and a culture of safety affect safety performance in a company, therefore chemical industry business actors need to improve safety performance through planning efforts, forming safety behavior for workers, and creating a culture of safety in the workplace.

Still, at least previous research on measuring safety performance in the chemical industry is one of the limitations in this study, it is difficult for researchers in developing theories and hypotheses. So far, there have been many studies conducted by previous researchers on safety performance in the construction sector and still a little in the chemical industry sector.

To improve safety performance, this study proposes several suggestions, including:

1. Practically speaking, the role and function of management are very necessary to realize the achievement of safety performance through good safety planning efforts, efforts to change employee behavior to prioritize safety, and create a resilience resource in the workplace.
2. Theoretically, it is still necessary to conduct a lot of research that tests the factors that can affect safety performance in achieving business continuity goals.
3. The next study is that this study will be tested empirically to prove that safety planning, safety behavior, and safety culture affect safety performance through control management as moderating variables.

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