Interrelation between policies and safety culture on safety performance and project performance in the construction sector

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Abstract. The construction industry sector as a contributor to economic development in a country has problems in its implementation. Construction accidents that often occur can have an adverse impact on companies but also for the state. So that it is necessary to identify the relationship between policies and what Safety Culture has the most influence on safety performance and project performance on a construction project. The purpose of this study is to find out what safety policy and culture variables have the most influence on safety performance and project performance in the construction sector. This study uses primary data in the form of a survey of 193 respondents, as well as secondary data from literature which is then validated by experts. The results of the respondent questionnaire survey were then analyzed using the SEM-PLS method, in order to obtain a pattern of relationships between safety policy and culture variables on safety performance and project performance. The result of the research is that safety policies and incentives must be implemented by companies in the construction sector to provide good control of all aspects such as security objectives, procedural mechanisms, construction assessments and resource mobilization.

Keyword: policies, safety culture, safety performance, project performance, construction

1. Introduction
The high rate of work accidents is not only caused by the lack of implementation of the Occupational Safety and Health Management System in the project, but also due to the lack of a special budget for implementing Safety Management System (SMS) based work in the project. Apart from that, other reasons are also due to the lack of necessary knowledge, a lack of the necessary skills of workers, a lack of manpower, and a lack of understanding that investing in SMS provides a big advantage for companies not only in the form of material but also having an impact on good name and reputation. The lack of a separate budget for implementation and occupational safety and health equipment makes it difficult to implement the Occupational Safety and Health Management System on the project. The investment in the OSH Management System itself is influenced by the culture of the country regarding work safety, where the company is established, where the project is carried out and the applicable regulations and policies regarding the cost of security [1]. The project managers usually consider investment in work safety to spend a lot of money and have no big benefits as well as a significant difference between safe and unsafe activities [2].

With a safety culture, it is hoped that it can support the achievement of increased occupational
safety and health (OSH). Safety culture is the traits and attitudes in organizations and individuals that emphasize the importance of safety. Therefore, safety culture requires that all obligations related to safety must be carried out correctly, thoroughly, and with a full sense of responsibility [3].

Therefore, safety policy and culture are very important and become the main foundation which is expected to be able to move all particles in the organization. So, the identification of problems that occur is how the safety policy and culture can improve the safety performance and project management performance.

The aim of this research is:
1. Identify safety policy and culture variables that affect safety performance and construction project performance.
2. Improving safety policies and culture to improve safety performance and construction project performance.

2. Literature Review

One type of project is a construction project. A construction project is defined as a series of activities that are unique and carried out once with limitations on resources, budget and duration. In a series of construction project activities, there is a process aimed at processing both human and material resources so that they can produce a work in the form of a building. The management of a construction project can be complicated and complex with the involvement of many interacting parties and the high demands on project targets such as quality, comfort, safety, aesthetics and sustainability of the project [4].

In previous research, it was revealed that the safety climate can have a positive influence on safety performance in the construction industry. From the perspective of institutional theory, the analysis results show a significant finding that institutional pressure affects the organizational safety climate in the construction industry. Building an organizational safety climate is a very important activity which is motivated not only by the need to reduce accident rates, but also by institutional pressure to comply with safety policies in the environment. From the above explanation, it can be seen that institutional theory will indirectly have an influence on safety performance [5].

3. Methodology

The stages of this research begin with conducting a survey to experts / experts with the help of an initial questionnaire instrument (expert validation form) regarding the variables which are the dimensions of Safety Policy and Culture and Safety Performance and Project Performance. These variables are obtained from literature studies. At the initial stage, the variables from the literature study results were verified, clarified, and validated by experts.

After the verification, clarification and validation process from the experts, the second stage of the questionnaire instrument which is a pilot survey was distributed. The questionnaire was given to prospective respondents in the stage III questionnaire. At this stage, the results will be obtained whether the variables in the questionnaire are easy to understand or simplification is needed.

Furthermore, the delivery of the stage III questionnaire through a survey of respondents. The questionnaire was given to respondents to choose the level of influence on the variables produced in the second stage questionnaire instrument. The stage III questionnaire survey was given to respondents who were executing parties who were directly technically involved in construction work.

In the next stage, primary data collection, the variables are analyzed using Structural Equation Modeling Partial Least Square (SEM-PLS). This method is a statistical technique that is able to analyze relationship patterns. The purpose of the method is between latent constructs and indicators,
latent constructs with one another, and direct measurement errors.

Figure 1. Research Methodology

Figure 2. Conceptual Framework Model

4. Results and Discussions

From the results of literate studies and validation by experts, the variables of policy, safety culture, safety performance and project performance are obtained as shown in table 1 below.

Table 1. Identification variables of research

| Code | Policy    | Code | Safety Culture   | Code | Safety Performance | Code | Project Performance |
|------|-----------|------|------------------|------|---------------------|------|---------------------|
| X1   | Safety Policy | X5   | Physical Culture | Y1   | Safety Performance  | Y2   | Project Performance |

| Safety Policy | Financing Policy | Reward Policy | Punishment Policy |
|---------------|------------------|---------------|-------------------|
| Physical Culture | Behavioural Culture | Norm and Management Culture | Ideology Culture |
| Safety Culture | Safety Performance | Project Performance |

| Safety Policy | X1 | Safety Policy | Y1 | Safety Performance |
|---------------|----|---------------|----|---------------------|
| Physical Culture | X5 | X5 | Y2 | Project Performance |
| Behavioural Culture | Y1 | Y1 | Y2 | Project Performance |
| Norm and Management Culture | Y2 | Y2 | Y2 | Project Performance |
| Ideology Culture | Y3 | Y3 | Y3 | Project Performance |
| Code  | Policy                        | Code  | Safety Culture                                      | Code  | Safety Performance | Code  | Project Performance |
|-------|-------------------------------|-------|----------------------------------------------------|-------|--------------------|-------|---------------------|
| X1.1  | Criteria in tenders           | X5.1  | Risk Control in the workplace                      | Y1.1  | Safety Awareness   | Y2.1  | Cost                |
| X1.2  | Construction safety training  | X5.2  | Preparation of safety standards                    | Y1.2  | Safety Costs       | Y2.2  | Quality             |
| X1.3  | Safety performance measurement| X5.3  | Preparation of OHS Guidelines                      | Y1.3  | Accident records   | Y2.3  | Time                |
| X1.4  | Requirements for passing the safety training program | X5.4  | Implementation of safety schedule                  | Y1.4  | Productivity       | Y2.4  | Scope               |
| X1.5  | Element of construction safety assessment | X5.5  | Harmonious and integrated OSH laws and regulations | Y1.5  | Self-discipline management | Y2.5  | Environment         |
| X1.6  | Focus on construction safety  | X5.6  | Evaluation of safety rules and regulations         | Y1.6  | Performance        |        |                     |
|       |                               |       |                                                    |        | measurement        |        |                     |
| X1.7  | An assessment of the act or omission of safety standards |       |                                                    |        |                    |        |                     |
| X2    | Financing Policy              | X6    | Behavioral Culture                                 |       |                    |        |                     |
| X2.1  | Cost of implementing a safety program |       | Creation of a good work environment in the company |       |                    |        |                     |
| X2.2  | Operational cost efficiency   | X6.2  | Capacity building of construction Safety institutions in companies |       |                    |        |                     |
| X2.3  | Percentage of the amount of safety costs | X6.3  | Increased worker participation in safety           |       |                    |        |                     |
| X2.4  | Safety costs                 | X6.4  | Introduction of safety in all sectors             |       |                    |        |                     |
| X2.5  | Non-safety costs             |       |                                                    |       |                    |        |                     |
| X3    | Reward Policy                | X7    | Cultural Norms and Management                      |       |                    |        |                     |
| X3.1  | Incentives for workers' safe conditions, damaged equipment, public and environmental conditions | X7.1  | Commitment and support from company management    |       |                    |        |                     |
| X3.2  | Incentives in the form of bonuses | X7.2  | Implementation of safety training                 |       |                    |        |                     |
| X3.3  | The quality of the relationship between workers and managers | X7.3  | Provision of work equipment and facilities that support certification |       |                    |        |                     |
| Code | Policy | Code | Safety Culture | Code | Safety Performance | Code | Project Performance |
|------|--------|------|---------------|------|--------------------|------|---------------------|
| X3.4 | Safety Incentive Program | X7.4 | Application of reward and punishment systems | | | | |
| X3.5 | Employee promotion | X7.5 | Implementation of safety behavior (safe behavior) by supervisors | | | | |
| X7.6 | | | Increasing the role and status of safety | | | | |
| X4   | Punishment Policy | X8   | Ideological Culture | | | | |
| X4.1 | Loss of a job | X8.1 | Establishment of the Golden Safety Rules | | | | |
| X4.2 | IDR 30 billion fine with the risk of death or serious / fatal injury | X8.2 | Safety socialization, participation and information | | | | |
| X4.3 | The safety manager was fined Rp. 6 billion or 5 years in prison for failing to comply with construction safety obligations | X8.3 | Award for the implementation of Safety in the workplace | | | | |
| X4.4 | Workers are fined IDR 3 billion or 5 years in prison for failing to comply with construction safety obligations | X8.4 | Improved Safety coordination between central, provincial districts / cities | | | | |
| X4.5 | The company will terminate / fire workers for every worker who violates organizational rules | | | | | | |
| X4.6 | The company provides a warning letter as a warning of violating regulations and work discipline | | | | | | |
| X4.7 | Application of a fee penalty system | | | | | | |
| X4.8 | Penalty application for a deterrent effect | | | | | | |

From the results of the Path Coefficient, the dominant variable is reshaped based on the relationship between dimensions according to the initial conceptual model. The results can be seen in Figure 3.
Relationship Between Safety Policy and Culture

The relationship between the policy and the dominant safety culture is between the variables of Policy Punishment significantly influencing Culture Ideology. This relationship is in line with [6] research theory which states that the punishment variable can motivate workers to comply with safety regulations. The higher the punishment intensity carried out by the company, the higher the level of motivation of workers in complying with safety regulations.

The recommendation for the relationship between these variables is that the company provides information that workers can lose their jobs if they commit violations so that it is necessary to conduct OHS socialization, participation and information continuously.

Relationship Between Safety Policy and Safety Performance

The dominant relationship between the policy and safety performance is that the reward policy variable has a significant effect on safety performance. This relationship is in line with [7] research theory which states that the reward system affects productivity. The reward system in question is a safety incentive program that aims to increase productivity so as to improve safety performance. And in line with the theory, [8] states that the factor that affects performance is the expectation that is burdened with consequences, which includes reward or punishment in it.

Recommendations for the relationship between these variables are to increase worker participation in OSH, starting from the leadership to the workers in order to create safety awareness.

Relationship Between Policy and Project Performance

The dominant relationship between policy and project performance is that the variable punishment policy significantly affects project performance. This relationship is in line with [9] research theory which states that the punishment variable affects performance. The higher the punishment, the performance will increase, and vice versa, the lower the punishment, the performance will decrease. And in line with the theory, states that the factors that affect performance are expectations that are burdened with consequences, which includes reward or punishment in it.

The recommendation for the relationship between these variables is that the Company provides a warning letter (SP) as a warning of violating regulations and work discipline for workers who ignore work safety which affects the increased project scope.

Relationship Between Safety Culture and Safety Performance

Figure 3. Dominant structure equation model the relationship between safety policies and safety culture on safety performance and project performance
The dominant relationship between safety culture and safety performance is that the cultural norms and management variables significantly influence safety performance. This relationship is in line with [10] research theory that work facilities have a significant effect on performance. According to [11] "Work facilities are a form of company service to employees in order to support performance in meeting employee needs, so as to increase employee productivity". So, it can be concluded that if the company can provide work facilities such as providing PPE for each worker, it can increase productivity so that safety performance will increase.

Recommendations for the relationship between these variables are that the company provides work equipment and facilities that support safety certification to ensure construction safety, the company has good control of all aspects, such as security objectives, construction assessment procedures mechanisms and resource mobilization.

**Recommendation**

From the results of the discussion of the dominant relationship, the current existing conditions are sought, and by looking at the existing regulations, recommendations for improvement efforts will be proposed. The method used to obtain these results is by conducting gap analysis and expert validation. For more details, see the following Table 2.

| Results of the analysis of the dominant relationship | Existing Findings / Conditions | Regulation | Policy Improvement | Stakeholder / PIC |
|--------------------------------------------------|--------------------------------|------------|--------------------|-------------------|
| Punishment policy (the company gives a warning letter) to the ideological culture (establishment of golden safety rules) | Not all construction companies have golden safety rules | ➢ PP 50 of 2012 concerning Implementation of SMK3 | The company provides a warning letter (SP) as a warning of violating regulations (such as not wearing PPE) and work discipline by making Golden Safety Rules (for example: obedience, care and intervention) in improving work safety. | Company |
| Reward policy (safety incentive program) on safety performance (productivity) | No company has yet established a safety incentive program | ➢ PP 50 of 2012 concerning Implementation of SMK3 | establish a safety incentive program to control safety performance. | Companies and the Ministry of Manpower |
| Punishment policy (the company gives | Not all construction companies have | ➢ PP 50 of 2012 concerning Implementation of | Ministry of Public Works |


a warning letter) issued a warning letter to their workers who violate the regulations

| Culture of norms and management | There are still many construction companies that have not provided their workers with self-protection tools due to the cost factor |
|----------------------------------|----------------------------------------------------------------------------|
| (Provision of work equipment and facilities that support certification) on safety performance (productivity) | Minister of Manpower and Transmigration Regulation No. PER.08 / MEN / VII / 2010 About Personal Protection Tools. |
| SMK3 | A regulation is made on punishment (punishment) every time there is an incident of negligence in work towards work safety both for companies and workers |
| Companies and the Ministry of Manpower |  |

In the results of this study, it is explained that the reward and punishment policies have a strong influence in forming a safety culture to improve safety performance. This is also in line with research [12] which explains that the policy dimension is one of the important components in building a safety culture in a construction project.

5. Conclusion

Some recommendations for improvement on safety policies and culture based on the dominant variables are as follows:

The company provides a warning letter (SP) as a warning of violating regulations (such as not wearing PPE) and work discipline by making Golden Rules for safety (for example: obeying, caring and intervening) in improving work safety. Adding a non-safety cost component to the regulation on costs safety. Creating a safety incentive program in controlling safety performance so that it is necessary to make laws and regulations governing an intensive safety program so that companies are obliged to carry out the program.

A regulation is made on punishment (punishment) every time there is an incident of negligence in work towards work safety both for companies and workers. The company provides equipment and work facilities that support safety certification to ensure construction safety so that the company has good control of all aspects, such as security objectives, construction assessment procedures mechanisms and resource mobilization.

Acknowledgement

The Authors would like to thank the financial support provided by Ministry of Research and Technology/National Research and Innovation Agency through PDUPT Grant 2020 with contract number: NKB-2875/UN2.RST/HKP.05.00/2020 managed by the Directorate for Research and Community Engagement (DRPM) Ministry of Research and Technology/National Research and Innovation Agency.
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