

Assess the Effectiveness of Safety Management System in Constructing Four-Storey School Buildings in Cabanatuan City

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Abstract- *To assess the status of the construction safety management system for the 4-Storey School Building in Cabanatuan City, Philippines, a survey questionnaire was conducted. This survey aimed to evaluate the effectiveness of the safety management system in terms of safety perception, training and awareness, safety practices, and communication within the organization. The researcher employed a quantitative research method, using the survey questionnaire as the primary tool for data collection. The respondents included architects, engineers, safety officers, and foremen. The collected data were statistically analyzed using range, mean, standard deviation, and variance to describe and assess the effectiveness of the Safety Management System. The results of this study are beneficial to the industry as they enhance the understanding of SMS among professionals and support better SMS implementation in the workplace.*

Index Terms- *accidents, hazards, risks, safety.*

I. INTRODUCTION

effective safety management system enables the identification of risks, evaluation of hazards, and application of control measures to minimize accidents and injuries. Throughout its life cycle, a safety management system (SMS) helps detect and eliminate risks and improve safety. Proper implementation of safety management must be a top priority, especially as the modern workplace presents new health challenges for both employees and those responsible for their safety. By properly implementing safety management, incidents or accidents involving employees can be avoided. Learning and implementing construction safety measures will reduce risks and accidents, save time during construction, and minimize unexpected, accidental expenses.

According to the Philippines Statistical Authority, the construction sector is the most hazardous industry in the country. The three most prevalent causes of fatal injuries are workers being struck by moving objects, being hit by moving vehicles, and falling from heights. These incidents are often attributed to a lack of training, insufficient awareness of safety protocols, and poor safety management.

The research study focuses on the effectiveness of the safety management system. It examines how safety management practices are implemented to ensure that risks are identified and controlled from the conceptual stage through to the end-of-life cycle. The significance of the research lies in the crucial role that safety management systems play in understanding and identifying risks, allowing them to be addressed and corrected at the earliest stage to minimize adverse effects.

II. THEORETICAL FRAMEWORK

The study is anchored on the following theories: The Probability theory, Attribution theory, and Decision theory. The theory of probability has developed overages since Galileo was first introduced as part of his experiments on the dice game (Maistrov, 1974). The objective of probability theory is to analyze and illustrate the sequence of randomized trials. The concept of risk could have a specific meaning under the condition of known probabilities which are classified into two distinctions, the subjective and objective interpretations. According to objective probability, the estimation of the likelihood that something will happen by using observations. Subjective probability, on the other hand, is a guess which is based on personal experience.

Decision theory is concerned with calculating the consequences of uncertain decisions (Peterson, 2013). Risk management is concerned with making decisions to manage uncertainties and their consequences. Decision theory is about evaluating choices people make. When information on the decision maker's risk-taking behavior is available, decision theory can prioritize risks and prescribe how to react to them numerically

III. METHODOLOGY

3.1 Research Design

This study will utilize mixed approaches:

- Quantitative Method of Research: This method minimizes bias and relies on numerical data. This data is typically collected through surveys, questionnaires, and experiments.
- Qualitative Method of Research: This research produces rich, detailed description of participants' perspectives. Qualitative methods are vital for gaining in-depth knowledge in situations or phenomena. This data can typically be obtained through interviews.

These approaches complement each other, enriching the overall understanding of the research.

3.2 Population and Sample of the Study

The researchers used accidental and purposive sampling techniques in determining the number of respondents. This was to obtain the validity and acceptability measures of the study. To apply and guarantee the performance of the study, the researchers selected 3 site engineer/architects, 3 safety officers and 3 foremen in the 3 school building sites to evaluate the proposed system.

3.3 Research Instruments

The proponents utilized researcher-made questionnaires and interviews validated by experts. A pilot test was also conducted. The questionnaires are to describe the effectiveness of a safety management system in mitigating risk. Interviews help the researcher to systematically and accurately grasp and describe the phenomena in the study. The researcher personally interviewed the respondents and facilitated the giving-out the survey questionnaires, to ensure the validity and truthfulness of the responses of the

respondents. The Likert scale was used to interpret answers, 1 being the lowest and 5 being the highest Criteria for Evaluation.

Table 3.1

General Safety Perception	The level of Perception of workers regarding safety in construction.
Training and Awareness	Evaluate the effectiveness of training and awareness programs in the construction.
Safety Practices and Compliance	Assess the safety practices and compliance in construction.
Management and Communication	Assess the effectiveness of management and communication within Safety Management System (SMS) in construction.

3.4 Data Gathering Procedure

The researchers provide informed consent to interview together with the survey questionnaires to the site engineers/architects, safety officers and foremen to get their approval to participate in the study. After getting their permission to participate in the study, the researchers gave them the survey questionnaire to answer before the development of the study. A maximum of one (1) day was allotted to the participants to complete the survey questionnaires.

3.5 Statistical Treatment

This study used some statistical treatment to evaluate and analyze the results of the study. Range, Mean, Standard Deviation, and Variance are used to describe and assess the level of effectiveness of Safety Management System based on the data gathered in the study.

Table 3.2

Excellent	4.21 – 5.00
Very Good	3.41 – 4.20
Satisfactory	2.61 – 3.40
Fair	1.81 – 2.60
Poor	– 1.80

IV. RESULTS AND DISCUSSION

This portion of the study shows the analysis and interpretation of the data gathered from the respondents.

A. Evaluation Results for Site Architects/Engineers

Table 3.3 shows the evaluation result of Site Architects/Engineers on the effectiveness of Safety Management System in Constructing a Four-Storey School Building in Cabanatuan City. Based on evaluation of three Site Architects and one Site Engineer, the general safety perception, training and awareness, safety practices and compliance, and management and Communication were excellent with a grand mean of 4.583 and standard deviation of 0.526.

Table 3.3

Criteria	Mean	SD
General Safety Perception – refers to the level of perception of workers regarding safety protocols in construction	4.500	0.333
Training and Awareness – refers to how effective the training and awareness program in construction	4.417	0.744
Safety Practices and Compliance – assessment on safety practices and compliance of the construction project	4.667	0.526
Management and Communication – assessment on the effectiveness of management and communication in construction	4.750	0.500

Legend:

Excellent	4.21	–	5.00
Very Good	3.41	–	4.20
Satisfactory	2.61	–	3.40
Fair	1.81	–	2.60
Poor	1.00 – 1.80		

B. Evaluation Result of Safety Officers

Table 3.4 shows the evaluation result of Safety Officers on the effectiveness of Safety Management System in Constructing a Four-Storey School

Building in Cabanatuan City. Based on evaluation of three Safety Officers, the general safety perception, training and awareness, safety practices and compliance and management and Communication were excellent with a grand mean of 4.528 and standard deviation of 0.468.

Table 3.4

Criteria	Mean	SD
General Safety Perception – refers to the level of perception of workers regarding safety protocols in construction	4.778	0.192
Training and Awareness – refers to how effective the training and awareness program in construction	4.222	0.718
Safety Practices and Compliance – assessment on safety practices and compliance of the construction project	4.667	0.577
Management and Communication – assessment on the effectiveness of management and communication in construction	4.444	0.385

Legend:

Excellent	4.21	–	5.00
Very Good	3.41	–	4.20
Satisfactory	2.61	–	3.40
Fair	1.81	–	2.60
Poor	1.00 – 1.80		

C. Evaluation Result for Foreman

Table 3.5 shows the evaluation result of foremen on the effectiveness of Safety Management System in Constructing a Four-Storey School Building in Cabanatuan City. Based on evaluation of three foreman, the general safety perception, training and awareness, safety practices and compliance and management and Communication were excellent with a grand mean of 4.500 and standard deviation of 0.481.

Table 3.5

Criteria	Mean	SD
General Safety Perception – refers to the level of perception of workers regarding safety protocols in	4.555	0.577

construction		
Training and Awareness – refers to how effective the training and awareness program in construction	4.444	0.577
Safety Practices and Compliance – assessment on safety practices and compliance of the construction project	4.667	0.385
Management and Communication – assessment on the effectiveness of management and communication in construction	4.333	0.385

Legend:

Excellent	4.21	–	5.00
Very Good	3.41	–	4.20
Satisfactory	2.61	–	3.40
Fair	1.81	–	2.60
Poor	1.00 – 1.80		

V. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSION

This study finds that the overall safety perception of each worker, along with training and awareness programs on construction sites, safety practices and compliance execution, and effective communication from engineers to workers, are all effective in mitigating risk. Consequently, safety management has thoroughly evaluated and implemented the appropriate system approach in constructing a 4-storey school building.

RECOMMENDATIONS

1. The study requires continuous performance monitoring of the construction workers.
2. It must provide up-to-date training and awareness of safety and health protocols to all the workers.

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