

# Safety Risk and its Impact to the Risk Management System in the Construction Industry at National Capital Region Philippines

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## ABSTRACT

This descriptive-quantitative type of study identified how safety risks impact the risk management system of the construction industry in the National Capital Region, Philippines. A researcher-structured survey questionnaire was made to gather the needed data for this study and was distributed to different construction sites' key personnel like the project in-charge, project manager, and safety officer with either the use of Google form or by the conventional method which is a printed questionnaire directly distributed to the project sites. The collected data were analyzed utilizing frequency, percentage, weighted mean, standard deviation, and T-test. The findings indicated that the key personnel were familiar with the existing rules and laws in terms of construction safety that are being implemented in the country, however there are some common safety practices which were not properly implemented. It was also found that the rewards system will help improve the company's safety implementation even with less supervision. The study also found out that mitigating safety risks in the construction sites is still an area of concern in the project risk management system. Since there were still some lapses in implementing safety protocols, the main goal of a risk management system which is to minimize the risks cannot be attained until safety protocols are properly implemented in every project site. To control and mitigate safety risks in the workplace, a comprehensive risk management plan which contains different levels of safety controls should be developed and implemented.

**Keywords:** Construction industry, Philippines, Risk management system, Safety measures, Safety protocols and practices, Safety risks.

**JEL Classification:** H12; J28; J81; K32; L74.

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### **Highlights of this paper**

- This study aimed to determine how the construction industry at National Capital Region (NCR), Philippines employed risk management system.
- The study found out that mitigating safety in the construction sites is still an area of concern in the risk management system.
- It is recommended that in order to control and mitigate risks, a comprehensive risk management plan should be developed and implemented.

## **1. INTRODUCTION**

Risk management system in a construction industry deals with planning and evaluating the project risk, then, it must be followed by the implementation of processes, procedures, and systems to mitigate the risk. Risk management has become an essential requirement for construction projects. The risk management process includes hazard identification, risk assessment, and risk control. It is also a systematic process of identifying, analyzing, and responding to project risk, and it includes maximizing the probability and consequences of positive attributes and minimizing the probability and consequences of attributes adverse to project objectives (El-Karim, Nawawy, & Abdel-Alim, 2017).

Malsam (2022) stated that construction risk management is the process of evaluating and implementing procedures to reduce the impact of risks in construction projects. For construction projects, this means taking the time to carefully assess the risks associated with each phase of work, depending on which party you are. According to Marshall, Prusak, and Shpilberg (1996) studies of failures of risk management suggest three underlying causes: dysfunctional culture, unmanaged organizational knowledge, and ineffective controls.

A construction risk management system involves a lot of monitoring and tracking. In today's modern era of the construction industry, and it is important to understand the most common construction risk to mitigate its effect on the project site. Investigating them and taking mitigating actions to eliminate or lessen the risks, even reducing the quantum of the impacts can help the contractors to properly turn over the project. For many years, construction organizations in developing countries have approached risk management in construction projects and organizations by using a set of normally insufficient practices, producing poor results most of the time, and limiting the success of project management (Serpell, Ferrada, Rubio, & Arauzo, 2015).

There are 5 common types of risk in the construction project, but to generalize, the risk is anything that will delay the project from its agreed turnover. Below are the 5 common risks and where they will occur in the project. The first one is the safety risk. Since manpower in the construction world is the most important part of a project, nothing can be done without them. Thus, protecting the manpower is the greatest line of protection in the industry. Making them safe at all times from any unnecessary circumstances will give peace of mind. The second one is financial risk. Aside from manpower, money also plays an essential part to roll a construction business. Without money, nothing will happen to the project as one cannot buy materials, rent equipment, or pay manpower salaries. The third one is the legal risk. Managing a construction project involves more than the constraints of time, cost, and scope. Legal constraints include regulations, code violations, and contract term disputes with the client, vendors, or subcontractors. The fourth is the project risk. It is commonly associated with the mishandling of the project. It includes poor management of the resources, missing deadlines, and awareness of the difficulties that can throw the project off track. And lastly, the environmental risk. This is also known as acts of God such as floods, earthquakes, and other kinds of natural disasters (Malsam, 2022).

Safety in the construction industry is commonly neglected and most of the time disregarded, thus making the said industry as of one of the most dangerous sectors in terms of health and safety. The Philippine government, thru the efforts of the Department of Labor and Employment (DOLE), is addressing the problem by providing safety and

health trainings to the company personnel of the industry sector. However, such effort can be considered far from satisfactory, as construction accidents still continue to increase. Despite the programs implemented by the government, thru its attached agency, and also the measures made by the construction firms, the number of construction accidents is still high (Toyado, 2021). Similarly, Cabahug (2014) pointed out that the construction industry is still one of the most dangerous land-based work sectors in the country. He further indicated that fatal accidents such as falls from height, accidents involving construction equipment, electrocution, and being hit by objects are the common causes of accidents in the construction industry.

Fatal and serious injuries happened in the construction industry because most of the companies in the Philippines do not have enough trained people to oversee the safety procedures at the project sites (Cabahug, 2014). Most contractors choose to ignore standard safety protocols in their workplace. To date, there is no evidence of the same study to determine the impact of safety risk in the risk management system in the construction industry at National Capital Region (NCR), Philippines. Thus, the need to conduct this study to determine if safety risk is a factor of concern in the risk management system.

This research focused on how different construction sites around NCR, Philippines implemented their safety plans to mitigate safety risks and what are their other counter measures to improve their current safety plans. The first objective determined the familiarity of project/site personnel with the existing laws that are being implemented by the DOLE with regards to construction safety. Second, this study assessed the different safety protocols and practices that are being implemented in the different construction sites. Then lastly, this study evaluated other safety measures that are being implemented at the project sites that may help improve their current safety plans.

## **2. METHODOLOGY**

The study used a quantitative approach to collect the data which is gathered from a survey questionnaire. The survey questionnaire was distributed at the job sites to mostly ranking officers including project-in-charge, project manager, and safety officer. Some respondents were reached out with the aid of Google form. Since NCR was identified as the center of the construction industry in the country, the researchers chose this area to conduct the study. As per the latest record from the Philippine Contractors Accreditation Board (PCAB), there are total of almost 42,000 registered contractors which fall to either of the following categories: General Contractor; Mechanical, Electrical, Plumbing & Fire Protection (MEPF) Contractor; and Specialty Contractor. The target sample population for the survey was 150 personnel but only 118 respondents answered the questionnaire, of which 50% of are General Contractors while the remaining 50% are MEPF and Specialty Contractors. The collected data were tallied, tabulated, and analyzed utilizing frequency, percentage, weighted mean, standard deviation, and T-test. A confidentiality note was indicated in the researcher-structured survey questionnaire to assure the privacy of the respondents and to ensure them that the obtained data will only be used for the purpose of the study.

To satisfy the objectives of the study, construction companies were randomly selected to answer the survey questionnaire. Some respondents were visited in their actual project sites to distribute the questionnaire while some of them were reached via online platforms like social media and emails with the use of the Google form questionnaire. No particular category of the project being handled by the respondents is considered in the selection of the respondents. For the first objective, in order to determine the familiarity of the respondents with the existing laws and regulations regarding construction safety, the researchers used a Likert scale of 1-4 with 1 being not familiar and 4 being very familiar with the existing safety laws and regulations.

As to the second objective, the researchers stated in the questionnaire all the basic safety protocols that must be implemented in each construction site to determine how their key personnel implemented their safety standards.

For the last objective, the researchers tried to find other mitigating factors that are being used by construction companies to further increase the mitigating efficiency of their safety protocols. Some options on how to mitigate the risks are stated in the latter part of the questionnaire to determine the activities of the company in mitigating construction safety risks.

### 3. RESULTS AND DISCUSSION

This part of the study presents the interpretation of data obtained from the questionnaire. A detailed discussion of the tabulated responses are presented and analyzed based on the objectives of the study.

#### 3.1. Respondents' Profile

This is composed of respondents' personal information like gender, age, position in the company, and years of service in the company.

Table 1 shows that out of 118 respondents, there are more male employees than female employees in the sample. A total of 92 (77.97%) are male respondents. Furthermore, 41 of them (34.75%) have age between 31-40 years. This represented a working class of mature adults who are in a good position to provide relevant information to this study because they had enough knowledge and job related experiences in the construction industry. Moreover, in this age group, these people are assumed to have high motives for work. Also, majority of them are in the supervisory position (53.39%) and have been working in their respective company for about 4-9 years (50%).

Table 1. Respondents' demographic characteristics.

Characteristics	Category	Frequency	Percentage (%)
Gender	Male	92	77.97
	Female	26	22.03
	Total	118	100.00
Age	20-30	35	29.66
	31-40	41	34.75
	41-50	36	30.51
	51-60	6	5.08
	Total	118	100.00
Position	Rank and File	23	19.49
	Supervisory	63	53.39
	Managerial	32	27.12
	Total	118	100.00
Years of service in the company	1-3 Years	37	31.36
	4-9 Years	59	50.00
	10-19 Years	20	16.95
	20 Years and above	2	1.69
	Total	118	100.00

#### 3.2. Respondents' Company Profile

In this study, company profile includes company information like the types and details of their ongoing projects. Table 2 shows that majority of the sampled construction firms (83.05%) have on-going projects dealing with the private sector particularly in building commercial establishments (55.08%).

**Table 2.** Respondents' company profile.

Company profile	Category	Frequency	Percentage (%)
Types of the ongoing project			
	Private	98	83.05
	Government	2	1.69
	Mixed	18	15.25
	Total	118	100.00
On-going project details			
	Residential	29	24.58
	Commercial	65	55.08
	Industrial	11	9.32
	High rise	10	8.47
	Land development	3	2.54
	Total	118	100.00

### 3.3. Familiarity of Project/Site Personnel with the Existing Laws that Are Being Implemented by the DOLE Concerning Construction Safety

This section discusses the familiarity of the project key personnel in the construction industry with the rules and regulations on construction safety that are being implemented by DOLE. Table 3 shows how familiar the project key personnel are with the existing safety laws implemented by the DOLE.

**Table 3.** Respondents' responses on how they are aware of government mandated laws on safety.

Statement	Weighted mean	Standard deviation	Verbal interpretation
1. D.O No.13 (series of 1998)...	3.441	0.723	Familiar
2. R.A No. 11058...	3.314	0.636	Familiar
3. Mandatory 8 Hours...	3.110	0.737	Familiar
4. Revise the OSH checklist...	3.013	0.086	Familiar
Overall weighted mean	3.220	0.550	Familiar

Note: 1-1.49 (Not Familiar), 1.50-2.49 (Less Familiar), 2.50-3.49(Familiar), and 3.50-4.00 (Very Familiar).

Based on Table 3, the respondents rated all government mandated laws on safety as familiar with an overall weighted mean of 3.22 and with a standard deviation of 0.55. However, there is still a need to improve their awareness of the existing safety laws for them to be very familiar with it for them to confidently implement the laws at all times in every project site. The safety personnel in the project site must be confident with their knowledge for them to fully address how to appropriately mitigate the magnitude of risks and foster safe behaviors in the workplace (Karakhan & Gambatese, 2018).

### 3.4. Assessing the Different Safety Protocols and Practices that are Being Implemented in Different Construction Sites

Common safety protocols should be implemented in each project site. Table 4 presents the common safety practices being implemented in each project site.

As can be gleaned in Table 4, the data implies that the respondents have a lot of common safety practices that are being implemented in the construction sites to help mitigate safety risks. However, there are still some areas needing improvements to ensure the complete safety of workers in the construction sites. For item 1, it was found out that majority of the construction sites were implementing the pre-employment procedures on safety awareness and orientation (92.37%) and personal protective equipment (PPE) distribution (94.92%). However, It must be noted that construction companies' pre-deployment procedures should also include workplace and job responsibility familiarization. With a result of 37 respondents out of 118 (31.35%) who were only implementing familiarization of workplace and job responsibility, then it might be difficult to achieve zero accident in the project site. Workplace and

job responsibility familiarization gives the workforce more confidence towards productivity and helps reduce the workers committing an error which in turn may result in zero accident in the project site. For item 2 which considers the important tools in mitigating safety, it was observed that only safety helmets and safety shoes were the most common PPE being distributed before the start of construction works. Some important items intended for eye protection and ear protection were not commonly given to the jobsite workers.

**Table 4.** Respondents' responses on common safety practices.

Statement	Category	Frequency	Percentage(%)
1. Which pre-deployment procedures are being implemented?	Safety awareness & orientation	109	92.37
	Personal protective equipment (PPE) distribution	112	94.92
	Workplace and job responsibility familiarization	37	31.35
2. Which of the ffg. personal protective equipment (PPE) are being used in the jobsite?	Safety helmet/Hardhat	118	100.00
	Eye protection/Safety goggles	63	53.39
	Ear protection	35	29.66
	Safety harness	29	24.58
	Safety shoes	118	100.00
	Gloves	9	7.63
3. What are the different safety signages that are being found in the jobsite?	Warning signs	114	96.61
	Mandatory signs	96	81.35
	Prohibition signs	102	86.44
	Safe condition signs	83	70.34
	Fire equipment signs	62	52.54
4. Are your heavy equipment operators have proper qualifications like NC2?	Yes	109	92.37
	No	9	7.63
	Total	118	100.00
5. Do you have a safe evacuation plan in your project site?	Yes	102	86.44
	No	16	13.56
	If yes;		
	Location of designated safe areas and assembly point	74	62.71
	Exit routes	81	68.64
	Exit strategy common to everyone during emergency	3	2.54
	Contact details of local emergency services	32	27.19
	None at all	2	1.69
	Total	118	100.00

**Note:** Respondents were allowed to have multiple responses to the above questions.

It should be noted that these items may also help in boosting the line of protection of the workers during their working hours. Cases of injuries can be avoided if workers would be allowed only to work with proper PPEs. This finding confirmed that some contractors have a lax attitude in dealing with worker safety precautions and the proper use of PPEs. In the study of Cabahug (2014) he found out that the highest cause of injury recorded in the jobsites is puncturing by nails. He further noted that this could have been prevented by simply wearing a pair of steel-toe shoes. For item 3, the findings indicated that majority of the construction firms practiced the use of different signages at jobsites. For item 4, it was found out that majority of heavy equipment operators have the proper qualifications. However, as mandated by law, all heavy equipment operators need to have a proper qualification like an NC2 certification or license before they can operate the equipment. It can be noted that there are still few operators (7.63%) who are not yet licensed to operate the heavy equipment and if this will not be handled properly in the project, this may lead to a serious accident at the workplace. For item 5, majority of the construction sites have safe evacuation

plans. However, there are still 16 project sites or 13.56% of the sampled construction firms with no safe evacuation plans in case emergency happens.

3.5. Evaluating other Safety Measures being Implemented at the Project Sites that may Help Improve their Current Safety Plans

Providing other safety measures will help to enhance the risk mitigation practices in the project sites. Table 5 shows the responses of the different construction companies on what they think will help improve their safety plans.

It can be noted that reduction of loss of life and property can be addressed by minimizing the impact of disasters when they are planning about the hazard. The local governments must first determine the common natural catastrophe risks and vulnerabilities in their region. The activities can cover the evaluation and reduction of safety risks. Assessment of the risks connected to recognized hazards is the goal of safety risk management, together with the creation and use of appropriate and effective mitigations.

It was found out in item 1 that the respondents believed that regular seminars and trainings for safety practitioners (92.37%) will help to reduce the safety risks in jobsites since this can equip them with the right knowledge on how to deal with the different safety issues which can probably happen in jobsites. For item 2, majority of the construction companies gave their safety practitioners the privilege to attend the safety seminars and trainings (60.17%) for them to be more aware of the latest safety practices in the country. This means that are adhering to the requirements outlined in the Occupational Safety and Health (OSH) Act's standards, rules, and regulations on providing a workplace free from significant recognized hazards. Lastly, for item 3, giving rewards to motivate the workers to practice safety in the project site even without or with less supervision was answered on the affirmative at 88.98% which means one strategy to increase employee motivation and participation is by rewarding hard work. Karakhan and Gambatese (2018) stated that incentives are frequently used in the construction industry to influence human behavior and improve worker performance concerning safety and quality.

Table 5. Other safety plans that will help to improve and mitigate the safety risk.

Statement	Category	Frequency	Percentage (%)
1. Which of the ffg. you think will help in mitigating the risk in the jobsite?	Internal auditing by 3rd party safety practitioner	78	66.10
	Regular seminar & training for safety practitioner	109	92.37
	Revision of safety plan at least once a year	41	34.75
2. Does your company gives you the privilege to attend the latest seminar?	Yes	71	60.17
	No	47	39.83
	Total	118	100.00
3. In your own opinion, do you think giving rewards will motivate the worker to practice safety at the site even without or with less supervision?	Yes	105	88.98
	No	13	11.02
	Total	118	100

Note: Respondents were allowed to have multiple responses to item 1.

Table 6 shows the data in Table 5 when subjected to further analysis using T-test. As can be gleaned in the table, the computed p-values resulted to 3.71, 1.58, and 1.58 for items 1, 2, and 3, respectively. All p-values were greater than the 0.05 level of significance, therefore the results imply that there is no significant difference for other risk mitigating plans in the jobsites.

Table 6. T-test for other risks mitigating plans in the job sites.

Statement	Category	Expected	T-Test	P-Value
1. Which of the ffg. you think will help in mitigating the risk in the jobsite?	Internal auditing by 3rd party safety practitioner	15.6		
	Regular seminar & training for safety practitioner	21.80		
	Revision of safety plan at least once a year	8.20	0.0470	3.71
2. Does your company gives you the privilege to attend the latest seminar?	Yes	35.50		
	No	23.50		
			0.0639	1.58
3. In your own opinion, do you think giving rewards will motivate the worker to practice safety at the site even without or with less supervision?	Yes	52.60		
	No	6.50		
			0.2108	1.58

#### 4. CONCLUSIONS AND RECOMMENDATIONS

The findings in this study indicate that mitigating safety risks in the construction sites is still an area of concern in the project risk management system. Since there were still some lapses in implementing safety protocols, the main goal of the risk management system which is to mitigate the risk cannot be attained until safety protocols are properly implemented in every project site. It must also be cleared that in all project sites, all project key personnel must be responsible for securing safety risk management at all times. They must be fully aware on all the safety laws within the Philippines so that all safety practices would be properly implemented in every aspect of the project. However, though it indicated in the result that regular seminars and trainings of the project key personnel will help to mitigate the safety risks by updating their safety knowledge, there are still some companies which do not allow or give their employees the privileges to attend. Their attendance to these activities will make them very familiar too with government-mandated laws on safety.

To control and mitigate safety risks in the workplace, a comprehensive risk management plan which contains different levels of safety controls should be developed and implemented. A safety management plan must always be followed and implemented strictly in every project site by a duly competent safety practitioner who is very familiar with the existing safety laws. A high level of priority should be given to the implementation of risk controls that are high in the hierarchy of controls to eliminate the risk management system plan of the project. In addition, each company should allow or require all their project key personnel and safety personnel to regularly attend the latest safety seminars and workshops to update their knowledge with the existing safety protocols that are being implemented in the Philippines.

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