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Risk Safety Management Practices of the Department of Public Works and Highways (DPWH) – Isabela for Construction Site Accident Prevention

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***Abstract*: Construction work is still the most hazardous job in the world accounting for the highest accidents and fatalities related to work. This scenario motivated the researcher to find out the risk safety management practices of the construction workers hired by the Department of Public Works and Highways of Isabela for construction site accident prevention. The study would also like to find out their concept of risk safety management and identify hazards existing in their workplace. The study was conducted in a construction site being managed by the DPWH among 50 workers of different job descriptions who voluntarily participated in the study. Results showed that the construction workers have very good concept and practice of risk safety management. There was no difference in the concept and practice of risk safety management of the construction workers when they are grouped according to age, civil status, highest educational attainment and job description, but status of employment is a factor that affects their concept and practice of risk safety management. Full-time workers have better concept and better practice of risk safety management than their part-time counterparts. This finding led to the conclusion that construction work is hazardous based on the existing risks which are inherent to the work in spite of the government efforts to mitigate such work conditions in the workplace. It is thus recommended that responsible government agencies and organizations must conduct regular and random assessment of construction sites to evaluate the level of compliance to safety standards for construction industries. Further studies are also recommended to find out the types and rates of injuries in construction works.**

***Keywords*: Construction Site Accident, DPWH, Management Practices, Risk Safety.**

1. Introduction

Safety in the workplace has been emphasized by the International Labor Organization since 1964. In all areas of work, safety of the workers are recognized to be the most important factor that defines the success of the company and satisfaction of the workforce. Occupational health and safety is a principle to prevent job related injuries and diseases, as well as the protection of workers from hazards posed by inherent risks existing in their workplace and to improve working conditions for optimum performance of the workers (Technical and Ethical Guidelines, ILO, 2006). In 2006, the ILO convened to promote a framework for occupational safety and health to provide systematic and coherent policies on safety and health of workers that aimed to dialogue with government, employers and employees through their organization to promote a safe and healthy workplace culture (ILO Related Standards, 2018).

Construction industry is considered the largest single sector that influences the growth and development of a country because of its contribution to the economic progress (Mosiye & Asokan 2019). This industry employs about 7-8% of the global workforce and about 15-20% in some countries (Bhatuk & Patel, 2021). The jobs within a construction project is diverse but are all related to physical and manual labor even with the help of equipment making the job of a construction worker very risky and hazardous (Thanaraj & Priya, 2019). For this reason, a framework of occupational and safety system is much needed along these lines of work.

A. Background of the Study

The Philippine construction industry was forecasted to grow by an average of 10.8% per year from 2022 to 50% by 2040 (Research and Markets, 2023). With this expansion, the country is faced with occupational and safety of the workforce serving in this industry. According to the records of ILO, Philippines in their Manila office, 17-18 persons in the country's workforce are not doing their job at acceptable conditions. The main reason – there is still inadequate or the lack of occupational safety culture among the employers and workers. Although most observations seem to point that the safety of workers in the construction industry is commonly neglected or disregarded not only in the country, but most of the developing nations, the ILO has always promoted the framework of occupational safety and health across all types of work.

In response to the mandate from the ILO, the Department of Labor and Employment came up with guidelines to govern occupational safety and health of workers especially among the construction workers. This effort from the Philippine government is still to be tested as accidents in construction sites

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are still increasing (Toyado, 2021). Researches conducted in the country have commonly resulted in findings that the cause of poor occupational safety and health management is the lack of trained people on the issue and concern of occupational safety and health, as well as most construction firms ignore the DOLE guidelines or simply do not implement them (Cabahug, 2014). In view hereof, this study will be conducted to find out the risk and safety management practices of the Department of Public.

Works and Highways Isabela among the employees of their construction projects to mitigate the accidents occurrence.

B. Research Questions

The study aims to answer the following research questions:

1. What is the demographic profile of the respondents in terms of:
    1. age
    2. civil status
    3. educational attainment
    4. status of employment
    5. work/job description
2. What are the concepts of the respondents on risk safety management in the construction site?
3. What are the risk safety management practices by the respondents in the construction site?
4. What are the risks hazards existing in the construction sites?
5. Is there a significant difference in the concepts on risk safety management in the construction site among the respondents when they are grouped according to their profile?
6. Is there a significant difference in risk safety management practices of the respondents in construction site when they are grouped according to their profile?
7. What are the proposed measurable actions based on the studies?

C. Significance of the Study

The results of the study will benefit the following individuals and institutions:

Construction Workers. The construction workers will be enlightened on the importance of observing and practicing the appropriate risk and safety management to reduce any accidents and incidents that may affect their health and capacity to work.

Foreman/supervisors. This study will give insights to these people of their role in keeping their workers healthy and thus will ensure the success and completion of the project without incidents nor accidents.

To the construction company administration. The study will open frontiers for strategies and intervention on implementing risk and safety management at the most profitable way. Cost of keeping workers healthy and productive would mean better performance and return of investments for the company.

DOLE. The results of the study will be a prototype for the department to improve the current guidelines on construction safety which is updated according to the trends and needs of the times.

Future Researchers. This study will open another area for research in terms of the physical and mental health of the construction workers who are stressed physically and its effects on their mental health.

D. Theoretical Background

1) Theoretical Framework

The theoretical framework of the study is the Department of Labor and Employment Guidelines Governing Occupational Safety and Health in the Construction Industry. The guidelines were formulated to ensure the protection and welfare of the workers of the industry, as well as the community where the construction is being done and promotion of good relationship of both employees and employers of the industry. This guideline is DOLE Department Order NO. 13 series of 1998. This guideline is embodied in Article 165, Chapter 2, Title I of Book Four of the Labor Code of the Philippines stating that the DOLE is solely responsible for the administration and enforcement of occupational safety and health laws, regulations and standards in all establishments and workplaces wherever they may be located.

The guideline shall be applied to all operations and undertakings of the construction industry and all its subdivisions based on the classification code of the Philippines Construction Accreditation Board (PCAB) of the Construction Industry Authority of the Philippines (CIAP), as well as companies or entities responsible for demolition works and enterprises which the DOLE determined to be within construction industry.

The following are the pertinent provisions of Guidelines:

1. Every construction project must have a suitable Construction Safety and Health Program (CSHP) which must be in accordance with the rules, orders and issuances of the DOLE via: a.) formation of a Construction Safety and Health Committee before each construction project is started to implement specific safety policies, impose penalties and sanctions for violation of the CSHP and responsible for orienting, instructing and training all workers at the site with regards to CSHP and accountable for disposing waste arising from the construction;
2. Provision of personal protective equipment to all workers depending on the type of work they do in the construction project. PPEs must be furnished on the expense of the company in accordance with RULE 1080 of the OSHS. PPEs provided by be adequate and approved and must be required to all workers, including those persons who are authorized or allowed to be at the construction site.
3. Designating a Safety Personnel to be assigned as the general construction safety and health officer to oversee full time the overall management of the CSHP through monitoring and inspecting all aspects of the construction work being undertaken. He shall be responsible for assisting government inspectors in the conduct of safety and health surveillance any time especially during accident investigation. One (1)

CSHO must be appointed/designated for every 10 units of heavy equipment, additional officer can be designated depending on the size of the construction site and number of workers.

4. Provision of Occupational Health Personnel and Facilities within the worksite. Personnel must be competent to handle emergency cases and facilities must be complemented with adequate medical supplies, equipment and facilities based on the number of workers in the site. There must be one (1) certified first- aider for 50 or less number of workers. A full-time nurse must be employed for construction project hiring more than 50 workers but less than 200. A part-time physician, a dentist and an emergency clinic when the workforce exceed 200 but not more than 300. A transportation vehicle must be provided for transporting cases to the nearest medical/dental facility of 5 km radius and can be reached within 25 minutes of travel. If there is no available facility within the construction site, a MOA or MOU to the nearest hospital must be engaged in.
5. Construction safety signages must be provided to warn the workers and the public of existing hazards in the construction site and must be posted in prominent and strategic positions and locations and written in language understandable to all workers and the general public. Periodic monitoring and inspection be done to be able to update and refurbished worn-out signages.
6. Maintaining safety use of heavy equipment in the construction site through appropriate certification of types and functions. All equipment must be tested and certified according to the standards prescribed by the DOLE or recognized organization before, during and after the construction.
7. Must require all workers in the construction project skills certificates and any other trainings undergone to ensure competence and safety during their job performance. This includes certificates on safety and health protocols.
8. Submit monthly construction safety and health report to the DOLE regional office to include the monthly summary of all safety and health committee meetings, accidents that occurred and investigations done and periodic hazard assessments with corresponding remedial measures and actions.
9. The employer/owner of construction project must provide worker welfare facilities such as clean water, sanitary and washing facilities to ensure humane working conditions.
10. Violations shall have corresponding penalties depending on the degree of commission or omission of violations of labor standards, safety rules and regulations and other pertinent policies.

2) Conceptual Framework

The study will use the Input-Process-Output framework to show the relationships of the variables and how the study will be conducted as well as the expected outcome of the study.

The input of the study will include the demographic profile of the respondents, the concept of risk and safety management, their practice of risk and safety management and the identified hazards of their work in the construction project.

The process of the study includes the data collection through survey questionnaire, the interpretation and treatment of the data through analysis of information gathered by the research instrument.

The output of the study will be the improved practice of risk and safety management and formulation of programs depending on the degree of practice and existing hazards in the construction site where the respondents work.

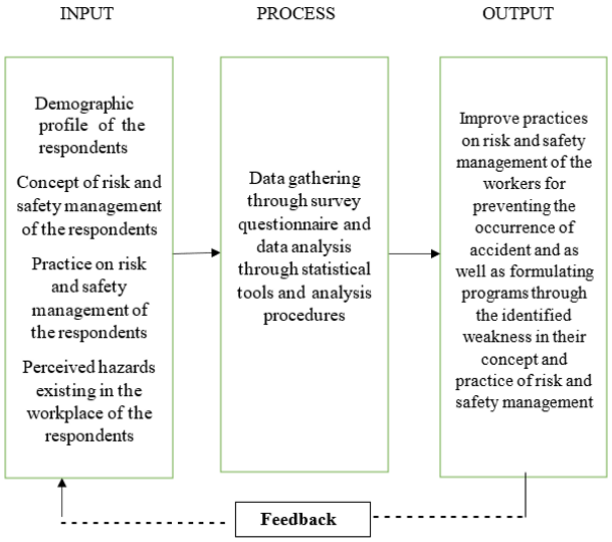

Fig. 1. Paradigm of the study

2. Methods

A. Literature Review

1) Construction Industry

Construction industry refers to the component of manufacturing that deals with building, repairing, renovating and maintaining infrastructures (Hussain et al., 2022). This industry includes all building of infrastructure not limited to erection, alteration, demolition or improvement in part or as whole includes plumbing and electricals. This industry is commonly under civil engineering works performed by both public and private agencies (Law Insider, 2024). Because of the nature of work done in this industry, there is high probability of injuries and accidents thus considered to be the most hazardous job (Demirkesen & Arditi, 2015; Holte & Kjestveit, 2012). The inherent nature of work such as working at heights, working with dusts and particles, noise exposure, vibrations from tools and machineries predispose the workers to falls and accidents, lung diseases and ailments, hearing problems and musculoskeletal disorders (LetsBuild, 2023).

2) Hazards in Construction Works

According to the review of literature done by Saibabu et al. (2022), because of the complexity of the type of work done in this industry, there is diversity in the hazards and risks to the workers making the initiatives of keeping the working

conditions of this type of work environment be given priority in terms of safety. There is high levels of risks and presence of hazards for the workers because safety is often placed in the sidelines by both the workers and the management (Sermolo, 2014). In the Philippines, according to the International Labor Organization (2023) the boom in the construction industry brought about by growth and development have no acceptable working conditions for about 17 to 18 construction workers.

There are many hazards and risks to life and limb among the workers in construction sites. The causes of these hazards were identified by Lubega et al. (2001) as lack of knowledge on safety protocols and policies, inexperienced workers and managers' inadequate knowledge on safety and inadequate funding for safety trainings and facilities. Hazards were classified under acute when there is direct effects on their physical health such as falls, trips, slips and injuries while

chronic hazards were those which is caused by exposures to extreme temperature, noise, vibration, or chemicals. There are also three dependent levels of injury: near miss, incident and actual accidents (Vitharana et al., 2015). Mitigating hazards through reduction of risks is the most important action a construction company can do through operating under the guidelines of risk and safety management system. The most common hazards in construction industry are due to carelessness as a result of ignorance, lack of awareness as well as knowledge of the type of work being performed. Unskilled workers with limited educational background leads to accidents and injuries (Thanaraj & Priya, 2019). Safety and quality management is critical in ensuring a safe workplace. Even if labor organizations and government agencies have standards for safe work environment are in place when construction companies have inadequate nor lack of safety programs, the hazardous conditions in construction sites are not prevented. It is very important for each construction company to develop a performance-based safety program based on safety policies in terms of trainings, medical and first aid facilities and competent personnel in charge of such eventualities (Saibabu et al., 2022).

3) Current Status of Risk Safety Management

The present-day status of work-related injuries is still highest in the construction industry. According to the Building and Wood Workers' International (BWI) in 2017 and of Pegula (2017), deaths and injuries from construction industry is 30-40% internationally in all constructions. The Philippines, as one of the developing countries, have the problem of occupational injuries especially in the construction industry resulting from lack or inadequate regulatory standards in addition to the inadequacy of the national surveillance systems needed to monitor the status of the workforce in the construction industry (Lu, 2021). The global construction safety statistics of 2024 showed that there is increase in the fatalities in construction by 11% from 2021 to 2022 with falls, struck by equipment, compression injuries and electrocutions accounting for the 65% all construction- related deaths (BigRenz, 2024). The World Health Organization through the International Labor Organization has estimated that there is a high economic loss from the construction industry which is the highest contributor to the economic gains of a country (Lu, 2021). The current safety culture in the construction industry is poor due to old cultural orientations, personal values and priorities of the owners of the construction company. This scenario is also being complicated by the type of trainings and orientations being given in terms of safety in the workplace (Holte & Kjestveit, 2012). According to Hasle and Limborg (2006) and the study of Chin et al. (2010), the implementation of safety and health protocols depends on the size and financial status of the construction company. There must be specific standards to be followed by companies, large or small, for the inclusion of all necessary education and training of workers.

4) Problems of Construction

According to Gorecki & Bizon-Gorecki (2024), safety management cannot be put in place without risk management. Risk management includes the identification of risks, its estimation, its control, the financing and monitoring. Along these lines, financial aspects speak for all the other areas of risk management. All entails costing which, most of the time, the construction management is not willing to take. All engineering works entails management of risk and safety of all stakeholders. Problems were identified both from the workers and the other from the point of the construction management. Those identified problems emanating from the workers are poor safety practices due to lack of awareness, ignoring the safety protocols, or total lack of care.

Those pointed out emanating from the management are inadequate and inefficient implementation of safety rules and regulation standard such as non- designation of safety officer, lack of emergency and health facilities, poor orientation and training of workers. All these will lead to poor practices in risk and safety management in the construction sites (Joble & Briones, 2022; Patel & Pitroda, 2018; Vitharana et al., 2015).

In spite of the Philippine Government efforts to implement the safety guidelines on construction projects, there is much to be done. All stakeholders must cooperate through strict implementation of the rules and regulations of the DOLE for safer working environment (Joble & Briones, 2022). The most critical factors identified by Rakul & Ramadhasan (2020) that affects the quality of safety management are commitment of the management on safety to implement necessary reviews and monitoring to be able to address safety issues effectively.

3. Methods

A. Research Design

The study used the descriptive survey design to find out the practices on risk and safety management of the Department of Public Highways Isabela. The use of a descriptive study is appropriate when attempting to summarize the characteristics, preferences, behaviors of individuals or groups for better understanding (Fraenkel & Wallen, 2010). It is also the best method to be used when data about conditions, trends and status to establish what is prevailing (Adanza et al., 2009).

B. Site and Participants

The study was conducted in selected construction projects of the DPWH Isabela. Most of the projects were the re-blocking of the national roads traversing the province of Isabela which

employs numerous workers. The construction workers, hired both part-time and full time, were the respondents targeted by the researcher.

C. Population, Sample Size, Sampling Procedure

The researcher chose the construction projects dealing with the re-blocking of the national highway traversing the province of Isabela. The DPWH Isabela usually hires more than 50 construction workers which includes the heavy equipment operators, masons, and the general construction workers. The researcher used purposive and stratified sampling in order to get the most participants. There were 50 construction workers currently present in the construction site of the DPWH who were willing to participate in the study.

D. Research Instrument

The research instrument is the survey questionnaire was formulated using the following works: 1) Joble JC & Briones JP, 2022, Safety Risk and its Impact to the Risk Management System in the Construction Industry at the National Capital Region, Philippines. International Journal of Economics, Business and Management Studies vol. 9 no. 2, 148-156 2.) Employee Health and Safety Culture Survey from HealthLinksCertified.org; 3) Priya MM, Kothai PS & Kohilambal E (2021). Study on Safety Practices and their Performance in the Construction Industries. International Journal of Modern Trends in Engineering and Research [ResearchGate] retrieved 4) Vitharana VHP, Subashi DE Silva GHMJ & De Silva S (2015). Health Hazards, Risk and Safety Practices in Construction sites – a review study. Engineer vol XLVIII no 3 pp. 35-44 The Institution of Engineers, Sri Lanka. The survey questionnaire made was pilot tested to be able to determine the validity and reliability score of the instrument. The questionnaire garnered a reliability score of 0.930 using Cronbach Alpha, which means that the questionnaire is a very good data gathering tool on concepts and practices on risk safety management of construction workers.

The survey questionnaire will have the following components: Part 1 – demographic profile of the respondents; part 2 – risk and safety management concept; part 3 – practices on risk and safety management; part 4 – perceived hazards in the construction project they worked in.

E. Data Gathering Procedure

The study was conducted following the steps given below:

1. A letter requesting permission to conduct the study was given personally to the Head of the DPWH Isabela for approval;
2. Upon approval, the construction sites were identified and participants chosen for the orientation and information dissemination of what and how the research will be conducted;
3. After the orientation, the researcher personally administered the survey questionnaire to ensure that all questions and queries of the participants will be entertained to their satisfaction, and to ensure 100% retrieval of the survey questionnaire.
4. After all questionnaires were retrieved, tallying, treatment and interpretation were done.
5. Drafting of the final manuscript commenced afterwards.

F. Data Analysis

The data were analyzed after statistical treatment of the numerical data gathered. Descriptive analysis used the frequency, percentage, standard deviation and weighted mean. Inferential analysis used the t-test, ANOVA and chi-square for differences.

The 4-point scale was used in the interpretation of data in the questionnaire as shown in the table below:

Table 1

For the concept of risk safety management

Scale	Numerical range (mean scores)	Qualitative Answers	Interpretation
4	3.25 – 4.00	Strongly agree	Very good concept
3	2.50 – 3.24	Agree	Good concept
2	1.75 – 2.49	Disagree	Satisfactory concept
1	1.00 – 1.74	Strongly disagree	Poor concept

For Practice of Risk Safety Management

Scale	Numerical range (mean scores)	Qualitative answers	Interpretation
4	3.25 – 4.00	Always	Very good practice
3	2.50 – 3.24	Often	Good practice
2	1.75 – 2.49	Sometimes	Satisfactory practice
1	1.00 – 1.74	Never	Poor practice

For Identification of Hazards in the Workplace

Scale	Numerical range (mean score)	Qualitative answers	Interpretation
4	3.25 - 400	Always	Most common hazard
3	2.50 – 3.24	Often	Common hazard
2	1.75 – 2.49	Sometimes	Uncommon hazard
1	1.00 – 1.74	Never	Not a hazard

G. Ethical Consideration

Foremost to be considered in this study is the informed consent for the participants to make better decisions on their participation in the study. The principle of volunteerism was strictly followed. Data privacy was strictly observed for the protection of the respondents. Any request for copy of the results shall be granted to the participants for their perusal. The participants were given the liberty to drop-out or withdraw from the study anytime along the conduct without duress or intimidations.

4. Results

The results and findings of the study are presented in tables for better understanding. It is presented in parts following the sequence of the research questions.

Part 1. Demographic Profile of the Respondents

From Table 2, it can be gleaned that majority of the construction workers were 20 to 29 years old (40.0%) followed by the 30 to 39 years old (36.0%). The least number of construction workers belong to the 50 years and above. Most of the workers are married at 62.0%, while the single ones comprised of 38.0%. In terms of highest educational attainment, majority of the construction workers are high school graduates comprising of 30% of the whole population, followed by

college graduates at 28%. The least number of workers are elementary graduates at 6%. In terms of status of employment, there are more part-time construction workers (60%) than full-time ones (40%). Majority of the construction workers are doing carpentry work (28%), while the least are electrician at 12%.

Table 2
Distribution of the respondents according to their demographic profile

Profile Variable	Categories	Frequency	Percent
Age	20 – 29 years	20	40.0
	30 – 39 years	18	36.0
	40 – 49 years	8	16.0
	50 years & above	4	8.0
Civil Status	Single	19	38.0
	Married	31	62.0
Educational Attainment	Elem Graduate	3	6.0
	High school level	12	24.0
	HS graduate	15	30.0
	College level	6	12.0
	College graduate	14	28.0
Status of Employment	Full-time	20	40.0
	Part-time	30	60.0
Work Description	Foreman	7	14.0
	Mason	8	16.0
	Carpentry	14	28.0
	Electrician	6	12.0
	Plumber	7	14.0
	Machine operator	8	16.0

Part 2. Concepts of Risk Safety Management of the Construction Workers

Table 3
Mean scores of the construction workers on their concepts of risk safety management

Indicators	Mean	SD	Interpretation
1. Working in construction is a hazardous job	3.30	0.71	Very good concept
2. Work safety means there is a system which prevents workers from being injured or hurt during the performance of their job	3.46	0.61	Very good concept
3. Worksite wellness is a responsibility of both employees and employers alike	3.52	0.58	Very good concept
4. Observance of proper work protocols is important to keep workers from injury resulting from work	3.50	0.51	Very good concept
5. There is a need for the company to orient and train workers on workplace safety and limit the risks of injury	3.46	0.54	Very good concept
6. Workplace safety means using specific equipment according to specifications	3.24	0.62	Good concept
7. It is important for the organization to require workers to undergo annual medical check-ups to determine any predisposing ailments that may hampers work and increase risk of injury	3.26	0.66	Very good concept
8. There must be a manual of safety procedures to follow	3.38	0.67	Very good concept
9. There are different risks and hazards in the workplace depending on the type of work being performed by the worker	3.34	0.72	Very good concept
10. Hazards are part and parcel of construction work	3.22	0.74	Good concept
Overall Mean	**3.38**	**0.11**	**Very good concept**

Table 3 presents the concepts of the construction workers on risk safety management. The overall concept of the construction workers on risk safety management are "very good." All indicators were rated "very good" by the respondents except for indicator no. 6 and no.10 which state that workplace safety means using specific equipment according to its specifications (mean of 3.24) and hazards are part and parcel of construction work (mean of 3.22), respectively. This implies that the concept on these areas is not fully understood by the construction workers which could affect their practice of safety protocols in the construction site.

Part 3. Risk Safety Management Practices of the Construction Workers in the Workplace

Table 4
Mean scores of the construction workers risk safety management practices in the workplace

Indicators	Mean	SD	Interpretation
1. Before a worker is deployed to a construction area, there is orientation on risk and safety awareness	3.46	0.58	Very good practice
2. On deployment, the worker is given the appropriate personal protective equipment, such a goggles, gloves or helmets	3.34	0.72	Very good practice
3. On deployment, there is a job familiarization briefing given	3.34	0.75	Very good practice
4. In the construction site, which of the following safety signages are found:	3.26	0.10	Very good practice* VG
4.1 warning signs	3.40	0.67	practice
4.2 mandatory signs	3.14	0.73	Good practice
4.3 prohibition signs	3.22	0.68	Good practice
4.4 safe conditions	3.36	0.75	VG practice
4.5 fire equipment signs	3.18	0.77	Good practice
4.6 Exit routes	3.26	0.69	VG practice
5. A safe evacuation plan is in place at the construction site	3.20	0.57	Good practice
6. Provision of a designated location for assembly and evacuation site	3.30	0.58	VG practice
7. Provision of contact details for local emergency services	3.40	0.64	VG practice
8. There is a designated rescue and emergency officer	3.38	0.67	VG practice
9. There is a regular training for safety procedures and emergency first aids	3.28	0.78	VG practice
10. There is a regular inspection and audit of the construction site risks and safety status	3.22	0.68	Good practice
Overall Mean	**3.30**	**0.68**	**Very Good Practice**

Table 4 presents the practices on risk safety management of the construction workers. It can be gleaned from the table that the overall practice on risk safety management of the construction workers is "very good." However, indicators 5 and 10 were rated as "good practice." There is good practice on risk safety management in terms of safe evacuation plan is in place at the construction site (mean of 3.20) and there is regular inspection and audit of the construction site risks and safety status (mean of 3.22) respectively. Indicator number 4 (in the construction site, which safety signages are found, although the indicator mean score of 3.26 means very good practice, there are signages which garnered only "good" rating. The signages which are only given "good" ratings are mandatory signages (mean of 3.14), prohibition signs (mean of 3.22) and fire equipment signs (mean of 3.18). This means that not all areas have these signages to warn or inform the construction workers of the existence of these signs and places in the workplace.

Part 4. Risk Hazards Existing in the Construction Site Table 4

Table 5
Mean scores of hazards existing in the construction site

Hazards	Mean	SD	Interpretation
1. Slips and trips due to uneven or wet surfaces	2.90	0.79	Common hazards
2. Working at heights with the danger of falls	2.86	0.73	Common hazards
3. Moving parts of machinery (grinders/mixers)	2.82	0.83	Common hazards
4. Vehicle hazards, medium and heavy equipment	2.84	0.82	Common hazards
5. Electricity, systems and equipment	2.92	0.85	Common hazards
6. Dust and particles posed risks to lung/eyes	3.02	0.82	Common hazards
7. Musculoskeletal hazards from manual handling of operations	3.00	0.67	Common hazards
8. Noise pollution	3.06	0.82	Common hazards
9. Vibrations from equipment and operations	3.04	0.75	Common hazards
10. Extreme temperatures both hot and cold	2.96	0.81	Common hazards
11. Fire hazards	3.02	0.80	Common hazards
12. Infectious diseases	2.86	0.83	Common hazards
Overall Mean	**2.94**	**0.09**	**Common hazards**

From Table 5, it can be noted that hazards are common in construction sites. With the highest 5 hazards commonly existing in construction sites are noise pollution (mean of 3.06), vibrations from equipment and operations (mean of 3.04), fire hazards (mean of 3.02), dusts and particles that poses risks to eyes and lungs (3.02), musculoskeletal hazards from manual handling of operations (mean of 3.00) and extreme temperatures from furnaces and cold storage areas (mean of 2.96). To elucidate, the hazards were ranked in Table 6.

Table 6
Mean scores and rank of hazards existing in the construction site

Hazards	Mean	Rank	Interpretation
1. Slips and trips due to uneven or wet surfaces	2.90	7	musculoskeletal hazards
2. Working at heights with the danger of falls	2.86	8	musculoskeletal hazards
3. Moving parts of machinery (grinders/mixers)	2.82	10	Common hazards
4. Vehicle hazards, medium and heavy equipment	2.84	9	Common hazards
5. Electricity, systems and equipment	2.92	6	musculoskeletal hazards
6. Dust and particles posed risks to lung/eyes	3.02	3*	extreme hazards
7. Musculoskeletal hazards from manual handling of operations	3.00	4*	extreme hazards
8. Noise pollution	3.06	1*	extreme hazards
9. Vibrations from equipment and operations	3.04	2*	extreme hazards
10. Extreme temperatures both hot and cold	2.96	5*	musculoskeletal hazards
11. Fire hazards	3.02	3*	extreme hazards
12. Infectious diseases	2.86	8	musculoskeletal hazards

*Five common hazards in construction sites

Part 5. Difference in the Concept of Risk and Safety Management among the Construction Workers

Table 7
Differences in the concept of risk safety management of the construction workers according to their age

Age Concept of Risk Safety Management	N	Mean Rank	H test	df	p-value
20-29 years old	20	29.10	6.770	3	0.080
30-39 years old	18	27.78			
40-49 years old	8	15.63			
50 years old and above	4	17.00			

*At 0.05 level of significance

To determine the differences in the concept of risk safety management among the construction workers when they are grouped according to the age, the Kruskal-Wallis H Test was used. The test results revealed that the workers were not significantly different in their concept of risk safety management in the workplace. The null hypothesis was accepted at p-value of 0.08, which implied that the concepts of the construction workers are similar for younger or older construction workers.

Table 8
Differences in the concept of risk safety management of the construction workers according to their civil status

Civil Status Concept of Risk Safety Management	N	Mean Rank	U	p-value
Single	19	27.13	263.500	0.533
Married	31	24.50		

*At 0.05 level of significance

To find out the differences on the concept of risk safety management of the construction workers with their civil status, the Mann-Whitney U test was utilized. The results showed that there is no significant differences in the concept on risk and safety management among the construction workers when they are grouped in terms of their civil status at p-value of 0.533 since the computed U is greater (U=263.50). The null hypothesis is thus accepted. This implied that there is no difference in the concept of risk and safety management among single or married construction workers.

The differences on the concept on risk safety management of the construction workers when they are grouped according to their highest educational attainment were determined through the Kruskal-Wallis H test. Results showed that there is no significant difference in their concept of risk safety management when they are grouped according to their highest educational attainment at p-value of 0.505 since the computed value of H = 2.341 which is higher than 0.505, thus, the null hypothesis is accepted. This implies that highest educational attainment has no effect on their concept of risk safety management, thus are similar among the respondents.

Table 9
Differences in the concept of risk safety management of the construction workers according to their highest educational attainment

Highest Educational Attainment Concept of Risk Safety Management	N	Mean Rank	H test	df	p-value
Elementary graduate	3	20.17	2.341	4	0.505
High school level	12	17.96			
High school graduate	15	19.33			
College level	6	27.33			
College graduate	14	38.93			

*At 0.05 level of significance

Table 10
Differences in the concept of risk safety management of the construction workers according to their employment status

Employment Status Concept of Risk Safety Management	N	Mean Rank	U	p-value
Full-time	20	35.68	96.50	<0.001
Part-time	30	18.72		

*At 0.05 level of significance

The difference in the concept of risk safety management among construction workers in terms of employment status was determined using the Mann-Whitney U test. Results showed that there is a significant difference between the full-time and part-time workers. This means that the null hypothesis was rejected that implied that the concept on the risk safety management is different between the full-time and the part-time (U=96.500, p=<0.001).

Table 11
Differences in the concept of risk safety management of the construction workers according to their work description

Work Description Concept of Risk Safety Management	N	Mean Rank	H test	df	p-value
Foreman	7	37.00	8.984	5	0.110
Mason	8	21.63			
Carpentry	14	28.43			
Electrician	6	27.25			
Plumber	7	20.07			
Machinery operator	8	17.63			

*At 0.05 level of significance

The Kruskal-Wallis H test was utilized to determine the difference in the concept of risk safety management among the construction workers based on their work description. Results showed that there is no significant difference in the concept of the workers when they are grouped according to their work description. At H=18.984 and p=0.110, the null hypothesis is accepted since computed p-value is greater than 0.05 level of significance. This implies that the concept of risk safety management is similar across all work descriptions of the workers.

Part 6. Difference in the Risk Safety Management Practices among the Construction Workers

To determine if there is any significant difference in the risk safety management practices of the construction workers based

on their age, the Kruskal-Wallis H test was used. Results showed that the workers were not significantly different in their risk safety management practices in terms of their age at H=1.515 and p=0.679, requiring the acceptance of the null hypothesis at 0.05 level of significance. This implies that the workers have the same risk safety management practices.

Table 12
Differences in the risk safety management practices of the construction workers according to their age

Age	N	Mean Rank	H test	df	p-value
Risk Safety Management Practices of the Construction Workers					
20-29 years old	20	28.00	1.515	3	0.679
30-39 years old	18	24.83			
40-49 years old	8	24.00			
50 years old & above	4	19.00			

Table 13
Differences in the risk safety management practices of the construction workers according to their civil status

Civil Status	N	Mean Rank	U	p-value
Concept of Risk Safety Management				
Single	19	22.68	241.00	0.284
Married	31	27.23		

*At 0.05 level of significance

Comparing the practices of the construction workers on risk safety management based on their civil status, the Mann-Whitney U test was used to compute for significant differences. Results revealed that there is no significant difference between the practices on risk safety management among the single or married workers. This makes it imperative to accept the null hypothesis at 0.05 level of significance (U=241.00, p=0.284). It implies that both single and married workers have similar risk safety management practices.

Table 14
Differences in the risk safety management practices of the construction workers according to their highest educational attainment

Highest Educational Attainment	N	Mean Rank	H	df	p-value
Concept of Risk Safety Management					
Elementary graduate	3	24.17	2.672	4	0.614
High school level	12	21.79			
High school graduate	15	23.37			
College level	6	30.00			
College graduate	14	29.32			

The statistical difference in the risk safety management practices of the construction workers according to their highest educational attainment was determined using the Kruskal-Wallis H test. It can be noted from Table 9 above that at H (4) = 2.672 and p-value of 0.614, the null hypothesis is accepted because the computed p-value is greater than 0.05 level of significance. The implication of this finding is that there is no significant difference in the practice of risk safety management among the construction workers in terms of their educational attainment. It means that there are similar practices on risk safety management among the construction workers regardless of the highest educational attainment.

Table 15
Differences in the risk safety management practices of the construction workers according to their employment status

Employment Status	N	Mean Rank	U	p-value
Concept of Risk Safety Management				
Full-time	20	32.40	162.00	0.006
Part-time	30	20.90		

*At 0.05 level of significance

The Mann-Whitney U test was used to compute for the significant difference in the practice of risk safety management among the construction workers in terms of their employment status. The test revealed that there is significant difference between the practices on risk safety management of the full-time and part-time construction workers at 0.05 level of significance (U = 162.00, p = 0.006). This means that the full-time workers have better practice of risk safety management than the part-time workers, thus the null hypothesis was rejected.

Table 16
Differences in the risk safety management practices of the construction workers according to their work description

Work Description	N	Mean Rank	H	df	p-value
Concept of Risk Safety Management					
Foreman	7	31.79	4.089	5	0.537
Mason	8	25.25			
Carpentry	14	20.57			
Electrician	6	30.83			
Plumber	7	22.79			
Machinery Operator	8	27.25			

*At 0.05 level of significance

To find out the difference in the risk safety management practices of the construction workers, the Kruskal-Wallis H test was utilized to compute for the significant difference of the practices based on their work description. The test revealed that there was no significant difference in the practice on risk safety management of the construction workers across all work descriptions at 0.05 level of significance and H = 4.089 and p = 0.537, thus the null hypothesis was accepted. This implies that the construction workers have similar risk safety management practices regardless of their work description.

Part 7. Proposed Measurable Action to Mitigate the Hazards of Construction Sites according to Studies

Based on the literature reviewed the following table presents the hazards and problems with the proposed measurable actions that could mitigate the hazards existing in construction sites:

Most proposed measurable actions are related to the construction company efforts. It can be noted that actions pertaining to the workers are often of demographic characteristics such as educational attainment which influenced the degree of understanding of the protocols and significance of following these guidelines to ensure the safety condition of the workplace.

Although it is the responsibility of the construction company to provide budget and financial support for safety and risk management, the company oftentimes ignore the facts of injuries happening in inherently dangerous workplace until accidents and injuries occurred. Because of this reality, the government and its enforcing agencies must be vigilant in monitoring the safety and risk issues to maintain safe working environment for all the workers in construction institutions.

Financial backing enables the company to buy ear mufflers, equipment and tools that lessen the degree of exposures to damaging elements such as vibrations, extreme temperatures as well as put in place signages that could help everyone in the construction site locate or avoid areas which are dangerous. Budget could also address the needs of the workers in terms of injury compensation and medical requirements to be able to perform their job safely and optimally.

Table 17
Proposed measurable action to mitigate the hazards

Existing Hazards	Proposed Measurable Actions	Expected outcomes
Lack of knowledge on safety protocols and policies (Lubega et al., 2001)	Regular safety trainings and seminars both for new and old workers	Adequate knowledge on safety protocols and policies as well as the consequences of injuries from these hazards; post test must be given from time to time to measure their knowledge and skills on maintaining and monitoring of safety
Inadequate funding and budget (Chin et al., 2010)	Provision of adequate funds from the company for trainings and seminars as well as for injuries sustained during duty hours	Very difficult to measure but licensing of construction company but require financial provision for this part of operations
Lack of safety programs (Saibabu et al., 2022)	Putting in place a safety program for all the employees and workers by the human resource management of the company	Licensing agencies must require a manual of safety program of the construction company
Inadequate or lack of regulatory standards (LU, 2021)	Enacting a law dealing with regulatory standards on safety in construction sites which is a problem in most developing countries like the Philippines	There are existing standards through the WHO, ILO and DOLE must is of limited implementation because of no mandate to enforce the standards from these agencies
Poor of limited skills and experiences of hired workers (Thanaraj & Priya, 2019)	Health and safety promotion must be undertaken to deal with ignorance and lack of awareness of hazards in the workplace for both old and new workers	Return demonstrations or drills must be conducted for the management to measure the degree of preparedness of the workers for any injuries that maybe encountered
Inefficient and inadequate implementation of safety rules and regulation standards by the construction management (Joble & Briones, 2022; Patel & Pitroda, 2018)	Regular and random inspection and visit of licensing agencies on the level of implementations of safety programs and protocols of construction companies	Licensing agencies must require a manual of safety program of the construction company which must be followed during the daily operations of the company

5. Discussion

The salient findings of the study are the following:

1. Majority of the construction workers are ages 20-29, married, high school graduate, work part-time in the construction and do carpentry work.
2. The construction workers have very good concept about risk safety management;
3. The construction workers have very good practice of risk safety management;
4. Risk hazards are common in the construction workplace with noise pollution, vibrations from equipment and operations, dust and particles exposure, fire hazards and exposure to extreme temperatures are ranked the highest respectively;
5. There were no significant differences in the concept of risk and safety management among the construction workers in terms of age, civil status, educational attainment and work description but there is significant difference in the concept of risk safety management in terms of employment status wherein there is better concept of risk and safety management among the full-time workers;
6. There were no significant differences in the risk safety management practices among the construction workers in terms of age, civil status, educational attainment and work description but there is significant difference in the risk safety management practices in terms of employment status wherein there is better practice of risk and safety management among the full-time workers.

Construction work is a kind of job that requires physical and manual work that predisposes the individual to job related injuries and disease because of the inherent hazards in the workplace (Technical and Ethical Guidelines, ILO, 2006; Thanaraj & Priya, 2019). The type of worker in the construction company must be young and strong to be able to provide the necessary force and energy to perform the type of job to be done in the erection or demolition of buildings and edifices. In the Philippines, workers in the construction company ranges from age 15 years old who are able to provide the needed services of the constructions company. Although, in the country, labor force is relatively young in comparison to other countries, in 2020, the census is 26.6% are ages 25 to 34 years old, followed by 35 to 44 years old and 45 to 54 years old at 22.9% and 18.4% respectively (Lu, 2021). This finding is in congruence with the results of the present study. According to Phillips (2023), there is an aging population in the construction industry with resulting detrimental impacts. Demand for construction workers is high but like the health sector is experiencing current shortage of younger workforce. The study of Holte & Kjestveit (2012) has emphasized that many of the workforce are in the secondary or high school graduates some are of vocational training. The senior high school had provided some degree of apprenticeship for meeting the real-life work. Although older construction workers seem to show better concept and practice of risk safety management, the rate of accidents do not differ across age groups (Siu et al., 2003). Construction workers in developing and poor nations are mostly unskilled and undereducated if not uneducated, a situation that puts these individuals the inadequate comprehension of the existing laws, as well as safety management protocols being implemented by their company. This condition puts them at risk of hazards inherent to construction work (Jha et al., 2015). As confirmed by the findings of this present study where the construction workers are mostly high school graduates.

The concept of risk safety management is very important for the observance of safety culture in the workplace. The safety focus is low in construction industry because of culture, demographics and regulations resulting in inadequate implementation of safety management standards (Idress & Hafeez and Kim, 2017). According to the study of Joble & Briones (2022), there is a need for construction workers to be aware of existing safety law to be confident enough to practice safety protocols in the workplace. The workers are not confident with their knowledge on risk safety management to be able to properly deal with risky circumstances and practice safe behaviors (Karakhan & Gambatese, 2018). The concept of the construction worker respondents of this study is very good.

It does not however have any relationship with the demographic profile of age, civil status, highest educational attainment and work description but the type of employment showed difference. Being undereducated is not a deterrent to the prevention of risks and hazards in the workplace if the necessary training and orientation of the risks and hazards existing in the workplace are given beforehand prior to the deployment of the workers (Saibabu et al., 2022).

The concept of risk safety management is also affected by the level of engagement of the worker during training and orientation on safety. The type of work done by the worker also affects their concepts because of the performance of different tasks thereby there is varying degrees of risks or hazards exposure (Holte & Kjestveir, 2012; Robson et al., 2010). Concepts of risk safety management affects the practice of it. There is a need for a well-established risk safety management system to improve safety behaviors of the workers and of course, the administration (Hasle & Limborg, 2006). Older construction workers seem to show better concept and practice of risk safety management, the rate of accidents does not differ across age groups (Siu et al., 2003). It also emphasized that older workers have better confidence levels in terms of performance of work because of the gained experience with age. There is also a more negative attitude towards safety management among younger workforce than older ones (Idress et al., 2017). In this study, age does not affect the concept and practice of risk safety management of the workers but most research results showed that age more positive perceptions of safety, more flexible in complying with the safety protocols which is often pointed out as a measure of their working skills, engagement in organizational strategies to maintain safety in the workplace as well as higher confidence in the performance of their work (Cigularov et al., 2013; Fang & Wu, 2013; Gyekye & Salminen., 2009).

There is no difference in the concept and practice of risk safety management among the construction workers based on their age, civil status, educational attainment and work descriptions. It can be noted though that those full-time workers have better concepts and practice of risk and safety management than the part-time ones. This implies that workers' behavior is an important component of risk safety management as it manifests the interactions between the worker and the organizational climate. Full-time workers definitely have better inter-relational conditions with the company because of their status. Full-time employees are often given responsibilities to oversee their system of risk safety management, thus must exhibit behaviors which are advantageous to all the employees and the company (Idress et al., 2017).

There are many identified hazards existing in the construction site according to the respondents of this study. Common hazards identified are noise pollution, vibrations from equipment and operations, dust and particles exposure, fire hazards and exposure to extreme temperatures. These were ranked the highest to lowest, respectively. It is same globally, in varying degrees of exposure depending on the type of work being done by the workers. Work analysis to identify the hazards most common in the construction site (Youli et al., 2018). The type of hazards and incidences of injuries, as well as fatalities must be recorded and analyzed to be able to make concrete interventional programs in addition to the existing mandates of law to ease out the increasing number of injuries and deaths in an industry that contribute much to the economic growth of the country (Lu, 2021). For a construction company to be able to address the safety needs of their workers, the organization must comply with the standards set by the government, as well as international agencies for the optimum physical well-being of their workforce.

A. Conclusions

In view of the salient findings of the study, it can be concluded that the concept and practice of risk and safety management of the construction workers under study are very good but still worksite hazards are still common in the construction site similar to the global hazard incidence of those risks. There is no difference in the concept and practice of risk safety management among the construction workers based on their age, civil status, educational attainment and work descriptions. It can be noted though that those full-time workers have better concepts and practice of risk and safety management than the part-time ones. It can also be concluded that the risk safety management of the construction company under study is no different from other parts of the Philippines where there is still high occupational injuries and fatalities even as of today.

B. Recommendations

From the conclusion drawn, the following recommendations are given:

1. Since most of the workers are young and are on part-time basis, the same orientation and training must be accorded to these group of workers because they are part and parcel of the construction company. Any work-related injuries nor fatalities among these groups of workers is reflective of the risk safety system of the company.
2. The government agencies responsible for the monitoring and evaluation of construction companies must have regular and random monitoring and evaluation of construction sites to assess the compliance of the company to the provisions of the Labor Code not only during incidents and fatalities occurred.
3. Further studies must be conducted on the satisfaction of the workers in the risk safety management system existing in their workplace to find out how the safety protocols are implemented and enforced in the company.

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