

RISK AND SAFETY MANAGEMENT IN THE CONSTRUCTION INDUSTRY: A CASE OF TAMAWE METROPOLIS, NORTHERN REGION

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ABSTRACT: *The paper examines the key factors that influence risk and safety performance of construction sites, the effects of accidents on construction site and the measures that will improve risk and safety performance on construction sites in the Tamale Metropolis in the Northern Region of Ghana. Three research questions were formulated. The study adopted descriptive research that is mixed methodology approach. The research instruments employed were self-administered questionnaires, interviews and observations which were used in collecting primary data from the selected construction firms. The population of the study was two hundred and thirty (230) selected individuals. They consist of site supervisors (60), site engineers (60), architect (30), consultants (20) and general foremen (60) in the Tamale Metropolis of Northern Region of Ghana. Interview guide were also sent out to reach thirty (30) Project Managers of the registered Ghanaian contractors and an observations were made in six (6) different project sites to get the right information about risk and safety management in the construction industry. Stratified random and non-proportional probability sampling techniques were employed for the study. The findings of the study on factors that influence risk and safety performance revealed some important factors which include; lack of implementation of mandatory PPE policy on site, inadequate and safe means of access to and from at workplaces, difficulties in accessing risk and safety records due to restricted working conditions, and less or no lighting in confine areas on site to ensure risk and safety management. The findings of the study also gave the effects of construction sites accidents and their consequences; on fatal accidents, day's work is suspended, construction companies pay huge sums of compensation, some accidents lead to loss of lives. The study made some recommendations which, if adopted, will lead to significant improvements in the risk and safety performance of construction companies in Ghana.*

KEYWORDS: construction, safety management, project performance, construction risk, construction companies

INTRODUCTION

Research has shown that more than 600 million people in the urban areas of the world are homeless and are living in life and health-threatening situations, (United Nations Centre for Human Settlement, UNCHS, 1996). To meet these requirements of the economics and basic needs for these peoples, there will be severe pressure on the resources of the countries as well as the globe. It is for these reasons that the construction industry is deliberately made to improve the capacity and effectiveness of the industry in order to meet the demand of the situation through building and

civil engineering products, and to support sustainable national economic and social development objectives (International Council for Research and Innovation in Building and Construction, CIB, 1999). It is true that the construction industry is doing a lot of developmental projects beside it has its own problems when it comes to risk and safety management to cost and efficiency in Ghana especially the Tamale Metropolis. The Construction industry is where craftsmen and other workers can easily get hurt in the process of carrying out their duties. For that matter, it is important to have control on risk and safety of projects to ensure the construction cost and efficiency is within the budget. Risks arise from uncertainty and are generally interpreted as factors which have an adverse effect on the achievement of the project objectives (Smith, 2002). Cook and Williams (2004) noted that construction is undeniably a risky business for many reasons; one of which include poor record of cost and time certainty.

The construction industry is found in different places where the conditions there can change due to the complex nature of each project (Sanvido et al., 1992). At this stage, if the aim of each construction industry is to be successful then risk and safety management can facilitate this aim. It should be understood that risk and safety management is not a tool which ensures the project success but rather a tool which helps to increase the probability of achieving success. Risk and safety management is therefore a proactive rather than a reactive concept in the construction industry. Past studies (Lyons and Skitmore, 2002; Klemetti, 2006; Zou et al., 2006) have been conducted within the field of risk management but each presents a different approach to this concept. Despite all these, the pertinent questions to address, therefore, are to examines the key factors that influence risk and safety performance of construction sites, the effects of accidents on construction site and the measures that will improve risk and safety performance on construction sites in the Tamale Metropolis in the Northern Region of Ghana

Statement of problem

Accident is one of the major problem facing the construction industry in Ghana more especially in the Tamale Metropolis. Many construction site workers are killed and some get injured as a result of their work; some of them suffer from ill health, such as dermatitis, musculoskeletal disorders, etc. The danger in construction site, however, does not only restricted to those working on site but children and other members of the public are also killed or get injured due to inadequate control of construction activities. The construction industry's performance has shown a steady long-term improvement, which is welcome, however there is no room for complacency, (Internal Labour Organization, ILO, 1992).

As a result of bad decisions made with regards to risk and safety management, construction workers and their families will continue to witness the unnecessary injuries, pain and suffering that so tragically afflict them. In addition, accidents and ill health have a financial cost on the project and also affect the efficiency of the work schedule. Accidents continue to happen in the world's occupational setting particularly in the developing countries, experience more accidents per thousand workers than in the developed countries. Risk and safety arise from uncertainty and are generally interpreted as factors which have an adverse effect on the achievement of the project objectives (Smith, 2002). This paper therefore seeks to fill this gap by examining critical factors

that influence risk and safety performance of construction sites, the effects of accidents on construction site and the measures that will improve risk and safety performance on construction sites in the Tamale Metropolis in the Northern Region of Ghana

Research questions

For the purpose of this study, the following research questions were formulated;

1. What are the key factors that influence risk and safety performance of construction sites?
2. What are the effects of accidents on construction site?
3. What measures will improve risk and safety performance on construction sites?

LITERATURE REVIEW

Theoretical Framework

The theoretical framework of this research hinges on Cooper et al., 2005. They opined that risk and safety management process involves the systematic application of management policies, processes and procedures to the tasks of establishing the context, identifying, and analysing, assessing, treating, monitoring and communicating risks. Risk and safety management process is the basic principle of understanding and managing risks in a project.

Risk and Safety in the Project Life Cycle

Project life cycle could be explained as the developmental stages or phases that a project has to undergo from the beginning (inception) to the end (completion) which allows managers and executives to maintain control of the project more efficiently. The term project life cycle is used as a management tool to improve a project's performance. According to El-Reedy (2010), stages of construction projects start with a feasibility study, followed by preliminary studies of the project, following detailed studies with detailed drawings and thereafter, operation crew will receive the project to run. All these stages or phases of the project have to pass through, the risk and safety measures should also be observed to enable the project life cycle to come to an end successfully. He further stated that in all these stages or phase , there are many types of quality control that are required to obtain a successful project that can return benefits and appropriately return money to the owner and all departments and professionals in that project.

A characteristic of the project life cycle is that it changes from time to time. At each stage of the project, there is a role for the owner, the contractor, and the consulting engineer. Each system has its own method of project management, and every stage of these methods has its own characteristics and circumstances, which follow a change in the area of employment Scope of Work (SOW) that clarifies each stage for each of the three parties (El-Reedy, 2010). All these activities provide easier and more accurate potential risk and safety identification and makes risk and safety management processes more effective (Chapman and Ward, 2003). Due to the variety of project types, project life cycle requires adjustments and an individual approach. A number of further stages within each phase should be adjusted to a particular project depending on its scope and structure. Since each project is unique, a framework used in one project can turn out to be

completely different from another. Chapman and Ward (2003) proposed a different method of project life cycle as shown in Table 1.

Table 1 Phases, stages, and steps in the PLC.

Phases	Stages	Steps
Conceptualization	Conceive	Trigger event Concept capture Clarification of purpose Concept elaboration Concept evaluation
Planning	Design The product strategically	Basic design Development of performance criteria Design development Design evaluation
	Plan The execution strategically	Basic activities and resources basic plan Development of targets and milestones Plan development Plan evaluation
	Allocate Resources tactically	Basic design and activity-based plan detail Development of resource allocation criteria Allocation development Allocation evaluation
Execution	Execute Production	Co-ordinate and control monitor progress Modification of target and milestones Allocation modification Control evaluation
Termination	Deliver The product	Basic deliverable verification Deliverable modification Modification of performance criteria Deliver evaluation
	Review The process	Basic review Review development Review evaluation
	Support The product	Basic maintenance and liability perception Development of support criteria Support perception development

Table1. Phases, Stages and Steps in the Project Life Cycle (Chapman and Ward, 2003)

From Bennett (2003) project life cycle can be divided in to six phases of different lengths and start with; Pre-project phase, Planning and Design phase, Contractor selection phase, Project

mobilization phase, Operations phase, and Close- out and Termination phase. Due to the complexity of projects in the construction industry the method to use for any project must be carefully selected.

Decision Making Process from Risk and Safety Management Perspective

When a single course of action is clear, due to having all the requisite information, an automatic decision can be made. Unfortunately, due to many variables that often occur this is not usually the case, especially in the construction industry (Butler, 1991). The completion of each phase there is a decision making point where risk and safety assessment takes place in order for the various teams work safe on site. Based on the risk assessment, an appropriate decision is made regarding further actions or proceeding to the next phase (Smith et al., 2006). To effectively manage project, an evaluation should be made across all the phases of project life cycle. Ward and Chapman (1995) use 'go', 'maybe' and 'no go' options in a decision making process. A 'go' status will constitute a green light for proceeding on to the next phase while 'no go' will stop the project. Evaluation resulting in a 'maybe' decision will lead to return to a previous phase or even phases for further improvements and minimizing risk and safety (Ward and Chapman, 1995). When careful decisions are made at the end of every study of the phases is likely to prevent or minimise risks and safety hindrances in the construction industry.

The Concept of Risk and Safety Management

Smith et al. (2006) gives a comprehensive description of the concept of Risk and Safety Management and the process involve in practicing it. Risk and safety management is a tool used to facilitate the project in order to make better decisions based on the information from the investment. These decisions taken will help to achieve better performance in the construction industry. Even though, the definition of risk and safety management differs from author to authors, they all carry the same information. According to (Cooper et al., 2005), risk and safety management process involves the systematic application of management policies, processes and procedures to the tasks of establishing the context, identifying, analysing, assessing, treating, monitoring and communicating risks. Risk and safety management process is the basic principle of understanding and managing risks in a project. It consists of the main phases: identification, review, analysis, and response (Smith et al. 2006). Considering this study Smith et al. (2006) and other views will be used for further analysis.

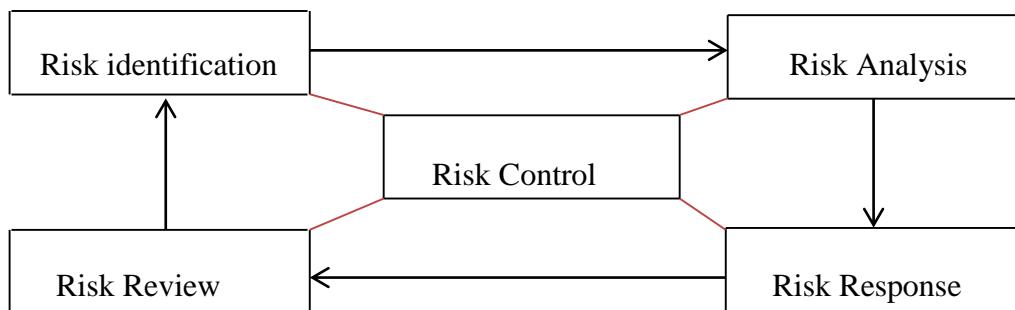


Figure 2.The Process of managing risks (Smith et al. 2006).

Risk and Safety Management in Construction Projects

Risk and safety management is an integrated collection of processes, procedures, policies, and programs that are used to assess, define and manage the risk and safety used in the provision of construction services. The industry is of the biggest investment area and a careful measures must be put on place to cattail any losses or failure of the project. To make sure that the project objectives are met, the portfolio of risk and safety associated with all the parties in the project life cycle (PLC) should be considered (Cleland & Gareis, 2006). Risk and safety measures should be taken in to consideration during the planning stage, the preliminary budget stage and the construction of work of the project. Risk and safety Management when applied systemically will helps to control those critical elements which can negatively impact project performance. When there is difference in the design, the scope and the time frame of completion of projects it will characterises with risk and safety in the construction industry. Due to this it is important to keep a balance in the concept of time-cost-quality trade-off and efficiency, which are more widely used and is becoming an important issue for the construction industry (Zhang and Xing, 2010).

Risk and Safety Identification

The purpose of identifying risks is to obtain a list with potential risks to be managed in a project by Project Management Institute (PMI, 2004). Risk Identification can be done by the following methods:

- **Brainstorming:** This is one of the most popular techniques. Generally, it is used for idea generation; it is also very useful for risk identification. All relevant persons associated with project gather at one place. There is one facilitator who is briefing about various aspects with the participants and then after note down the factors. Before closing it the facilitator review the factors eliminate the unnecessary ones.
- **Delphi Technique:** This technique is similar to brainstorming but the participants in this do not know each other and they are not at the same place. They will identify the factors without consulting other participants. The facilitator like in brainstorming sums up the identified factors.
- **Interview/Expert Opinion:** Experts or personnel with sufficient experience in a project can be a great help in avoiding/solving similar problems over and over again. All the participants or the relevant persons in the project can be interviewed for the identification of factors affecting risk.
- **Past Experience:** Past experience from the same kind of project, the analogy can be formed for identification of the factors. When comparing the characteristics of projects will provide insight about the common factors.
- **Checklists:** These are simple but very useful predetermined lists of factors that are possible for the project. The check list which contains a list of the risks identified in projects undertaken in the past and the responses to those risks provides a head start in risk identification.

Avoidance / Prevention of Risk and Safety

There are many potential risks that a project can be exposed to, and which can impact its success (Potts, 2008). This is why risk and safety management is required in the early stages of a project instead of dealing with the damage after the occurrence of the risk (PMI, 2004). The avoidance means that by looking at alternatives in the project, many risks can be eliminated. If major changes

are required in the project in order to avoid risks, Darnall and Preston (2010) suggest applying known and well developed strategies instead of new ones, even if the new ones may appear to be more cost efficient. In this way, the risks can be avoided and work can proceed smoothly because strategy is less stressful to the users.

RESEARCH METHODOLOGY

The research design employed for the study is descriptive survey (mixed method) which involves observing and describing the behaviour of a subject without influencing it in anyway. Both qualitative and quantitative were used in analysing the data. A research design sets out guidelines that linkup the elements of methodology adopted for a study namely; relating the paradigm to the research strategy and then the strategy to methods for collecting empirical data (Denzin and Lincoln 2006:22). This study adopted a multi paradigmatic position argued to follow from the study's context and the diversity of information needed to shed light on risk and safety management. A multi-paradigm view essentially underscores the adoption of multi- methodology. Employing a single method in the study would be analogous to observing the physical world using a particular instrument. This method made used of combining; observations, interviews, and questionnaire. As such self- administered questionnaires, interviews and observations were used in collecting primary data. Two main types of data were used in this study. These are primary and secondary data. The primary data included those that came from the questionnaire which formed the basis for the analysis. The secondary data involved data that were collected from the review of relevant books, journals magazines, newspapers and websites. Data was collected using questionnaire as major instrument.

ANALYSIS AND PRESENTATION OF RESULTS

Results of the questionnaires were received from; site supervisors, site engineers, general foremen, project managers, and consultants. Two hundred and three (230) questionnaires were received representing 88.3% of the total respondents of the two hundred and thirty (230). The figure 1 below shows the results from the questionnaires.

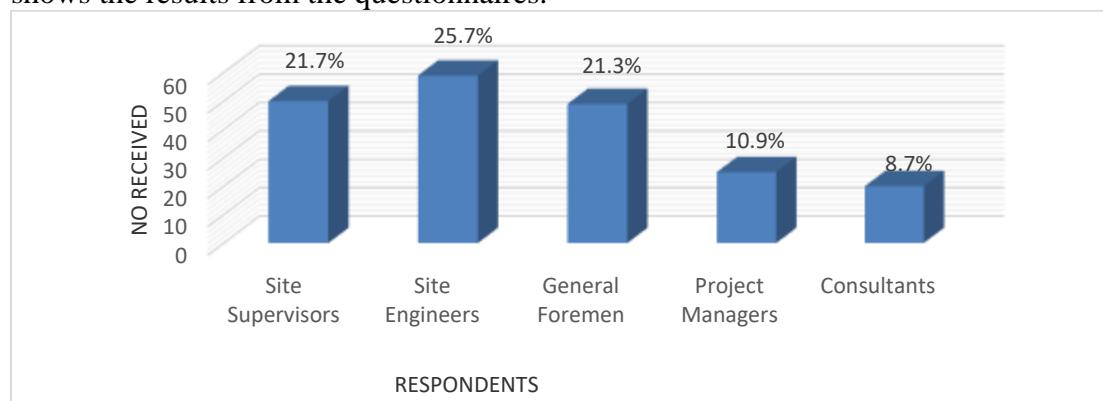


Fig 1 Questionnaires Received from Respondents

(Source: Researcher's field data; 2015)

From figure 1 clearly shows the received questionnaires from the respondents as follows; site supervisors out of sixty (60) questionnaires fifty (50) were retrieved from the respondents representing 83.3%, the total number given to the site engineers were sixty (60) but fifty-nine (59) were received from the respondents representing 98.3%, also sixty (60) questionnaires were distributed among the general foremen and out of that forty-nine (49) representing 81.7% of the questionnaires were collected, then thirty (30) questionnaires were also given to project managers and twenty-five (25) were collected representing 83.3%, and the consultants were given twenty (20) questionnaires and all the twenty (20) were retrieved representing 100%.

Results and Discussions of Questionnaires from Site Supervisors.

The results from the study revealed that out of the numerous factors of risk and safety awareness, the issues of construction workers wearing Personal Protective Equipment (PPE) on site and other dangerous areas on construction site being protected both ranked first with their mean mark of 4.3 representing 12.3% of the respondents, it is clear that this could improve risk and safety performance in construction sites, since most accidents are attributed to personal protective equipment (PPE) and other dangerous areas on construction site not being protected. The issues of contractors ensuring site tidiness was ranked third with the mean of 4.1 representing 11.7% of the respondents. Whether work on the construction sites were carried out by skilled trained personnel and whether there were mechanisms for ensuring basic hygiene on site also had mean mark of 3.9 representing 11.1% by the respondents and was rank forth. The mean mark of 3.5 representing 10.0% by the respondents said construction workers should get risk and safety induction on site hazards and rules first, before they are allowed to start work on the site and it was ranked sixth.

Table 1 Results of Risk and Safety Awareness

Risk and Safety Awareness	Mean	Rank
Construction workers wear Personal Protective Equipment (PPE) on site.	4.3	1
Holes and other dangerous areas on construction site protected.	4.3	1
Contractors ensure site tidiness.	4.1	3
Work on construction sites is carried out by skilled trained personnel.	3.9	4
There mechanisms for ensuring basic hygiene on site.	3.9	4
Construction workers get risk and safety induction on site hazards and rules.	3.5	6
There is adequate first aid.	3.0	7
Standard site rules and hazard signs displayed on construction sites.	2.9	8
Familiar with the concept of risk and safety management.	2.6	9
Regulatory bodies go round to ensure compliance with risk and safety rules.	2.5	10

Source: Researcher's field data; 2015

With the issue of providing adequate first aid on the construction sites, a had mean mark of 3.0 (8.6%) representing the respondents' views agreed to that and was ranked seventh, this means that few of the companies provide first aid to their workers in case of accident or ill-health. The issue of standard site rules and hazard signs being displayed on construction sites, the respondents representing 8.3% of the mean mark of 2.9 and this was ranked eighth agreed to the issue, that is rules and signs post should be display at the construction sites, the figure 7.4% of the mean mark

of 2.6 which ranked ninth representing the respondents said that workers need to be familiar with the concept of risk and safety management. Last but not least the respondents representing 7.2% of the mean of 2.5 agreed that regulatory bodies should go round to ensure compliance of risk and safety rules in the various construction sites and it was ranked tenth. Table 1 shows the result of the field study.

Results and Discussions of Questionnaires from Site Engineers.

The Table 2 gives the results from the field study and it revealed the factors leading to accidents on construction sites. One of the most leading factor that was first identified are companies who do not provide save working environment for their workers and this was represented by 12% of the mean mark of 3.0 from the respondents and it was ranked first, this means that the factor of save environment was considered very important to the respondents because the result indicated shows that factor to be leading the rest of the factors that could cause accidents on sites. The respondents representing 11.6% of the mean mark of 2.9 and was ranked second in position agreed that workers should wear protective clothes, and must be provided with clear direction on manual handling of tools and equipment, also companies should do regular servicing of plants and machines thus these will help in reducing risk and safety in the construction industry. Another area of the study revealed by the respondents of 11.2% of the mean mark of 2.8 also agreed that some companies do not employ qualified personnel at their work site and this was ranked fifth, hence lack of qualified personnel and other factors can lead to accident on site to the workers as well as the company. The study shows that 10.8% of the mean of 2.7 by the respondents said clearly that working-at-height safety precautions were given to workers before the start of work especially high rise buildings. The respondents being 10.0% of the mean mark of 2.5 said there is no problem in ensuring site tidiness, proper storage of plants and materials and this was ranked seventh,

Table 2 Results of Factors Influencing Construction Site Risk and Safety Performance

Factors Influencing Construction Site Risk and Safety Performance.	Mean	Rank
Companies provide safety environment for worker.	3.0	1
Workers wear protective clothes at construction site.	2.9	2
Construction workers provided with clear direction on manual handling	2.9	2
The company do regular servicing of plants and machines.	2.9	2
The company employ qualified personnel.	2.8	5
Clear working-at-height precautions are provided to the workers.	2.7	6
There is no problem in ensuring site tidiness and proper storage of plants and materials.	2.5	7
There is no difficulty in ensuring proper arrangement and collection of waste materials on-site	2.2	8
The company prepare and served food for workers.	1.8	9
<u>The department permit alcohol to be served at its premises.</u>	1.2	10

Source: Researcher's field data; 2015

The table 2 further revealed the factors that influence risk and safety in the construction industry. Some of the factors were; having difficulty in ensuring proper arrangement and collection of waste

materials on-site which had 8.8% of the respondents and a mean mark of 2.2 and was ranked eighth agreed to the fact, the respondents of 7.2% of the mean mark of 1.8 said their companies prepare and served food for their workers. Finally, respondents of 4.8% agreed that their department permit alcohol to be served at its premises and this was ranked tenth with the mean mark of 1.2.

Results and Discussions of Questionnaires from General Foremen.

The consequences from construction sites accidents are uncountable. It causes human tragedies, adversely affecting other workers and breaking the goals of the project such as cost overrun, efficiency, project delay and low productivity. Figure 2 shows the effects of accidents on construction sites.

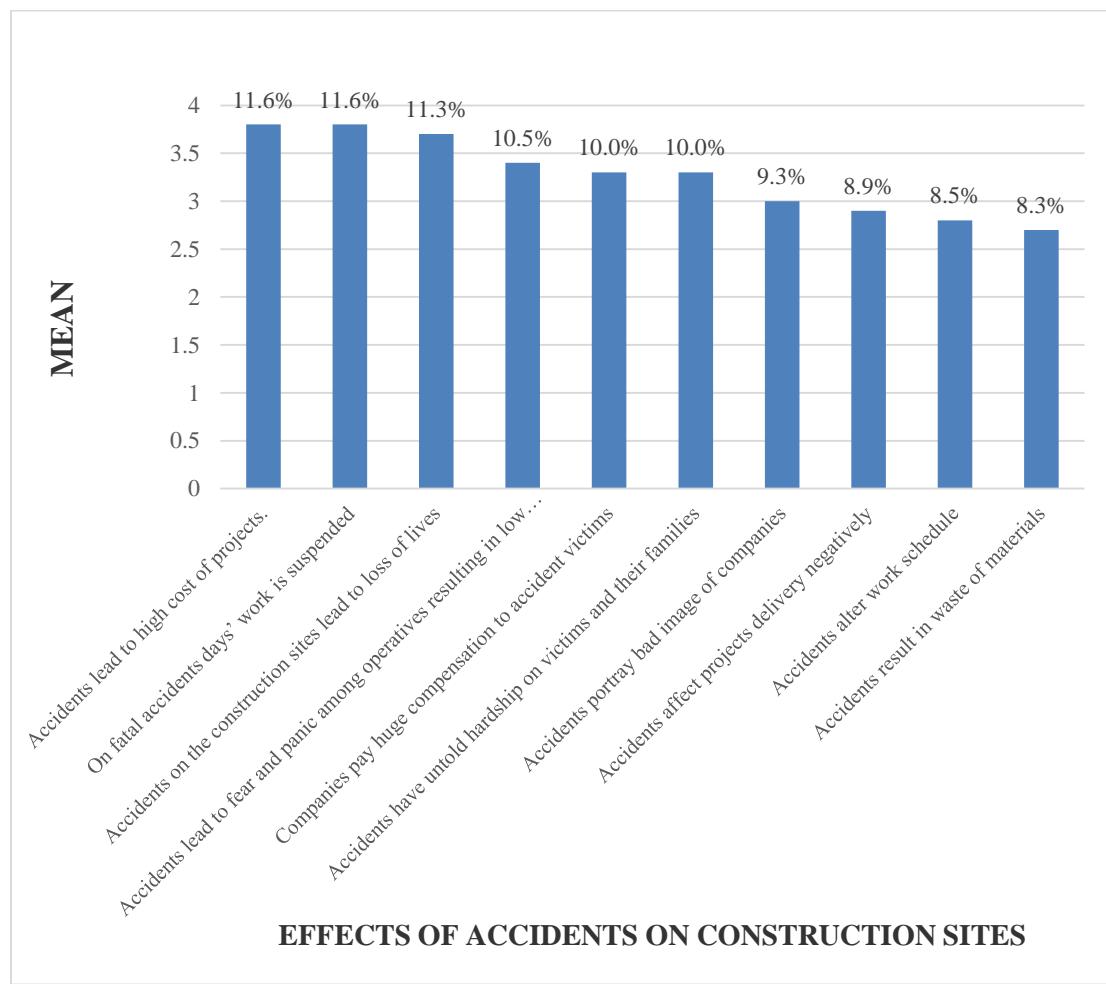


Fig. 2
Results of Questionnaires from General Foremen
(Source: Researcher's field data; 2015)

The results from respondents of the field study in figure 2 shows that accidents lead to high cost of projects, and on fatal accidents days' work is suspended which results in cost overrun of the project this was agreed by the respondents who represent 11.6% of the mean of 3.8 and was ranked first, that shows the high level of consequences accidents can cause in the construction industry. The results shown indicate that 11.3% of the mean 3.7 of the respondents also revealed that accidents on the construction sites lead to loss of lives of workers, the respondents representing 10.5% of the mean mark of 3.4 also agreed that accidents can lead to fear and panic among operatives resulting in low productivity and was ranked fourth. The study also indicate that companies who do not take risk and safety seriously end up paying huge compensation to accident victim and this could have untold hardship on victims and their families as well as contractors by the respondent who represent 10.0% of the mean of 3.3 and was ranked fifth. The issue of accidents being portraying bad images of companies was represented by 9.3% of the mean of 3.0 with the ranking of seventh, also with the issue of accident affecting projects delivery negatively, it was agreed by the respondents being 8.9% of the mean mark of 2.9 with the ranking of eighth in position, the respondents out of the total 8.5% of the mean mark of 2.8 agreed that accidents alter work schedule and was ranked ninth, and on the issue of accidents result in waste of materials 8.3% of the mean 2.7 with ranking of tenth agreed to that fact by the respondents.

Results and Discussions of Questionnaires from Project Managers.

The result from the study suggest that appropriate measures should be put in place by the employer to ensure the safety of the employees as stipulated in the labour Act (2003) of Ghana. However, the Labour Act 2003, Act 651, Part XV, sections 118 to 120 apparently directs employers and employees in their roles and responsibilities in managing Occupational Health and safety. Table 3 shows the results from the respondents from the field study.

Table 3 Results of Managing risk and safety in the construction industry

Managing Risk and Safety in the Construction Industry.	Mean	Rank
Challenge unsafe behaviour in a timely way.	2.9	1
Ensuring that workers use protective clothes (PPE).	2.8	2
Maintain attention on the significant of risks and implementation of adequate controls.	2.6	3
Maintaining inter and intra personal relationship	2.5	4
Demonstrating personnel cleanliness to workers.	2.4	5
Encouraging site tidiness.	2.4	5
Accepting all manner of workers views and ideas.	2.2	7
Talking to workers with acceptable tone.	2.1	8
Demonstrate their commitment by their actions; they are aware of the key risk and safety issues.	2.0	9
Ensure consultation with the workforce on risk and safety.	1.9	10

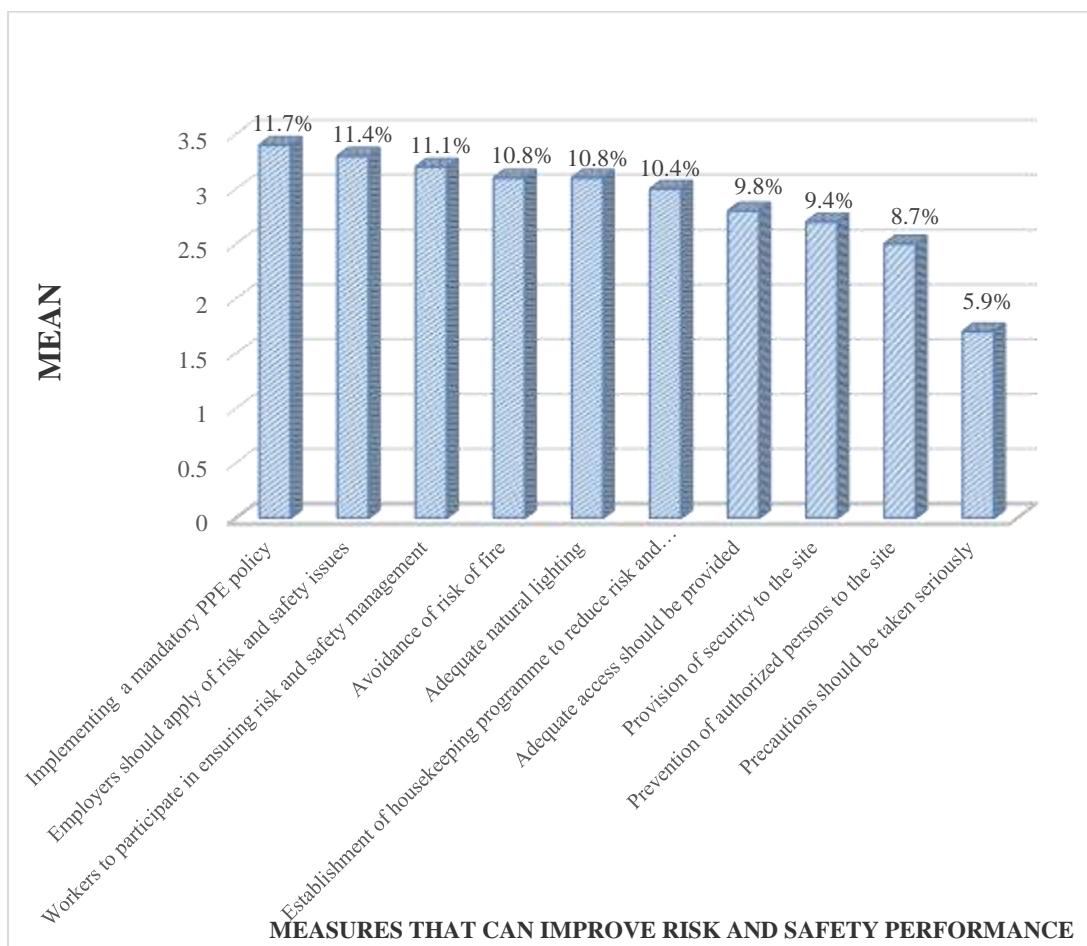
Source: Researcher's field data; 2015

Some of the measures the study uncover were challenging unsafe behaviour in a timely way was represented by the respondents of 12.2% of the mean of 2.9 who gave their backing to the issue since it could lead to risk and safety problem on site, the results indicate that 11.8% of the

respondents representing the mean of 2.8 said ensuring that workers use personal protective equipment (PPE) is the way forward in managing risk and safety on site, the respondents of 10.9% of the mean 2.6 also agreed that maintaining attention on the significant of risk and safety and implementing adequate controls could go a long way in managing risk and safety on site, also the results display the mean of 2.5 representing 10.5% of the respondents who show interest of maintaining inter and intra personal relationship that it could help in the risk and safety management, the study revealed that 10.0% of 2.4 mean mark of the respondents also agreed that demonstrating personnel cleanliness and encouraging site tidiness to workers will let others to copy the life style and that will improve good health among the workers. From the results, 9.7% of the mean mark of 2.2 by the respondents said accepting all manner of workers views/ideas is also a good sign of all-inclusive management of risk and safety in the construction industry. The respondents being 8.9% of the mean mark of 2.1 also agreed that when management will talk to workers with acceptable tone it will show a good relationship between management and workers. The result also indicates that 8.4% of the mean mark of 2.0 by the respondents shows that workers demonstrating their commitment by their actions that indicate that they are aware of risk and safety issues on site. The mean mark of 1.9 representing 7.9% by the respondents said that ensuring consultation with the workforce about risk and safety could bring out some hit on risk and safety and that will help management to be able to control or minimise risk and safety in the construction industry.

Results and Discussions of Questionnaires from Consultants.

Figure 3 shows the results of the study, which unveil that 11.7% of the mean mark of 3.4 of the respondents agreed to implementing a mandatory PPE policy that will improve risk and safety performance on site, from the results it is realised that employers should be responsible for the application of risk and safety issues in respect of workers placed under their authority this was agreed by the respondents being 11.4% of the mean mark of 3.3 and was ranked second. Also the study unveil that 11.1% of the mean mark of 3.2 which ranked third by the respondents accepted the fact that workers should participate in ensuring risk and safety management in the construction industry so as to improve risk and safety performance. The study also disclose that all appropriate measures should be taken by the employer to avoid the risk of fire from the project and where natural lighting is not adequate to ensure safe working conditions, adequate and suitable lighting including portable lighting where appropriate should be provided at every workplace and any other place on the construction site agreed by 10.8% of 3.1 mean by the respondents. From the results of the study it was unfold that the respondents being 10.4% of the mean mark of 3.0 agreed to suitable housekeeping programme should be established and continuously implement on each construction site to minimize accidents on the construction sites.

**Figure 3 Results of Questionnaires from Consultants**

(Source: Researcher's field data; 2015)

Figure 3 shows that 9.8% of the respondents representing the mean mark of 2.8 said adequate and safe means of access to and egress from all workplaces should be provided, indicating where appropriate and maintaining a safe condition. Also the results display that adequate precautions should be taken such as the provision of fencing, look-out men or barriers to protect any person who might be injured by a falling object or materials, agreed by 9.4% of the respondents of the mean marked of 2.7 and ranked eighth in position. Construction sites in built-up areas and alongside vehicular and pedestrian traffic routes should be fenced to prevent the entry of unauthorized persons and that was agreed by 8.7% of the mean of 2.5 by the respondents, and 5.9% of the mean of 1.7 by the respondents' results indicate that all appropriate precautions should be taken seriously in order to improving risk and safety performance in the construction industry. The figure 3 shows the results of the respondents from the field study.

Results and Discussions of Interviews from Project Managers

The researcher interviews were successfully conducted throughout the thirty (30) project managers representing 100% of the respondents which were the target group of the researcher and their views were as follows:

Risk and Safety Awareness (Identification) on the Construction Site

Within the construction industry, Risk and Safety is a concept which is very rarely used in the structured form as mentioned in the literature. Managers within the studied project perceived Risk and Safety in various ways. When the researcher asked them what risk and Safety meant to them, they defined risk as a difficulty, uncertainty, threat, unpredictable event or danger, but also more descriptive as challenging the project success, obstacles on the way to achieve the set goal or not meeting the project objectives, this justify Cleden (2009)definition in the Literature Review. They also explained Safety as the condition of being from any harm. With the issue of risks in a project, the respondents said risk in a project can causes so many problems such as; death, injury/accident, change of programme, damages to machines and plants. Effect of Risk on Time, the respondents said it delays timing of the project and delivery of the project is also delays. Effects of Risk on Cost, The researcher through the interview was told that risk increases the cost of the project due to accidents to workers and damaged plants on site. When asked the respondents how? They replied saying that the work may be in progress and if an accident happened to a worker, work has to be halted for some time and that is cost to the company.

Effects of Risk on Efficiency, the respondents reported that efficiency consists of technical features that can be altering the project by risk. They say normally, when the technical expertise involved in a risk problem the efficiency of the work keep reducing.

From this the researcher observed that everyone saw risk as something negative which should be avoided and not to distort the schedule of work and increase the cost of the project.

Risk and safety assessment in the construction industry

From the interview conducted, the respondents gave the following points as serious measures to be able to assess risk and safety in the construction sites.

- Maintain attention on the significant of risks and implementation of adequate controls,
- implement a mandatory PPE policy,
- compliers of risk and safety rules and regulations,
- Adequate and safe means of access to and from all workplaces are provided,
- Maintaining inter and intra personal relationship,
- Encouraging site tidiness,
- Challenge unsafe behaviour in a timely way

According to the respondents these were they used to control risk and safety management in their construction sites. Through the investigation, the researcher understood that risk and safety were primarily managed within the companies concerning the scope of worked assigned. They also consult with other members of the project team to manage the situation. The respondents told the researcher that they have been calling meetings with the workers of the companies where risk and

safety issues are raised and discuss as to how to be cautious about risk and safety on site. Another method is experts trying to solve those identified issues by educating workers on risk and safety management. Also the respondents being the project managements said they use Systemizing and Mapping as techniques of handling risk and safety issues in their various companies.

Also, the interviews revealed that respondents were using a several of methods to rank already identified risks. The common way was to set criteria in order to rank the most critical risks. Based on the created pattern, all potential risks were then listed and put in order. Economy related problems were ranked higher in the hierarchy than the time related problems. One respondent identified resources, economy and technical aspects as the set of criteria used in all projects undertaken by his organization.

Another way to rank risks within the project was through discussion which involves more than two personnel. The respondents said that they use experience from previous projects to facilitate discussions of risk and safety issues. In addition, such discussions were used as a tool to inform other workers about potential risks so that they will be aware and protect themselves and the project. In addition, the one of the respondents said; "They would like to see methods like a tool or device to have control over the situation. In other words, the methods should facilitate improvements and help to avoid surprises in the construction sites. All the respondents believed in better results and project performance as a result of implementing good structured methods of risk and safety management".

When the researcher asked the respondents if there have been an incident of risk in their companies, it was a difficult question to them and declined to answer it. Due to this the followed up question was not attempted.

Risk and Safety Response on Construction Site

As emerged from the interviews, dealing with risk and safety was performed in structured ways. Whereas some organizations had procedures or used checklists to minimize risks, others felt more comfortable with transferring it to experts in the relevant area for redress. Another tool mentioned here again was the use of discussion to mitigate the problem. Awareness of potential risks and being active helped to deliver a project with a minimum number of errors.

The researcher through the interview had the understanding from the respondents that depending on the nature of the identified risk will call for appropriate measure for it, and part from that educating and cautioning the workers about the risk will also help in the avoidance of any bad thing to happen.

What Benefit to get when Risk and Safety is Managed well in the Construction Industry

The most expected incentive to benefit from a project work was to deliver the project without any risk and safety problems in it. All the respondents agree that they don't want anything like risk in their projects at the same time they believed that delivering absolute problem free project in the construction sector was not possible. Thus, the aim for most respondents was to avoid any bigger defects in the project.

According to the respondents, when risk and safety is managed very well in the construction industry, the following benefits are expected;

- Reduced administrative costs
- The potential for reduced insurance and liability costs
- Positive employee impacts and protection of worker health
- Enhanced image within your company for employees, the community, clients and customers, and stakeholders
- Improve regulatory compliance
- Improved employee performance
- Reduced costs from injuries and illnesses
- Improved relations with OSHA and other associated agencies
- Better employee relations within the company. Everyone is on the same page with regard to safety
- Other businesses similar to yours may learn how they can do better, too
- Improving Safety is usually a competitive advantage, because of reduced costs.

All the respondents agree that there is a potentially significant cost savings in implementing Risk and Safety Management System. The long term savings include improvements and reducing hazards of processes and systems, the potential improvement in employee and equipment performance, and the savings of avoiding fines associated with non-compliance and compensations.

Though, contractors and managers claimed they provided their staff with safety apparatus at the various construction sites visited, observed by the researcher. However what was seen in the various sites the contrary.

Risk and Safety Sign in/on Construction Site

Throughout the observations in the six (6) different project sites it was realized that most of the risk and safety signs were absent and the few which were seen were only found in the project manager's offices making it difficult for the workers to see, since the offices area are a bit away from the work. All these challenges make the workers not to have much knowledge about risk and safety management in the construction industries.

Compliance with risk and safety rules and regulations

During the observation the researcher found out that while some personnel were obeying risk and safety rules and regulations in their line of duty, some other personnel were doing the opposite of their colleagues. The illustrations in the figures below shows the level of compliance of risk and safety rules and regulations on some construction sites in the Tamale Metropolis summarized the researcher's field observations.

RECOMMENDATIONS

The following recommendations are made to address the findings:

- Risk and safety experts should be contacted to assist in implementing some of the personal

protective equipment (PPE) policy at the various construction site.

- Clients, contractors and consultants of the construction sector should ensure that every construction contract takes comprehensive account of risk and safety requirements for the project.
- Workers and statutory bodies should ensure and demand the provision of adequate health and safety measures on site.
- Education and training of every new employee should be an integral part of the company's operations to avoid accidents on site.
- Where natural lighting is not adequate to ensure safe working conditions, adequate and suitable lighting, including portable lighting where appropriate, should be provided at every workplace and any other place on the construction site where a worker may have to pass.
- The risk and safety practices require the managerial seminar to be organized regularly to educate workers on this subject so that all the workers would ensure a safe working place.

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