Evaluating safety management practices in construction industry by using SPSS software

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Abstract— The construction industry is currently recognized as a major economic force and one of the most hazardous industries. Accidents not only result in considerable pain and suffering but have impact on productivity, quality, time, and negatively affect the environment and consequently add to the cost of construction. An effective safety program may prevent many accidents on construction sites. In this study a questionnaire was developed and distributed to 30 construction companies to evaluate the factors influencing safety management on construction projects. The data collected will be analyzed by using Statistical Package for the Social Sciences (SPSS version 22) software. The study initiates that the benefits of S&H improvements include: reduced accident costs, increased productivity, improved human relations and enhanced firm’s image. S&H should be considered as a prerequisite for productivity and quality.

Keywords: safety management, SPSS, safety &health

I. INTRODUCTION
The construction industry is one of the major industries in the world. The achievement of this industry in rebuilding areas that devastated by both natural and man-made disasters, and in providing power, has conferred great benefits on the human race. There has, however, been a price to pay for this continuous growth and activity. Although it is difficult to obtain accurate statistics in an industry in which many accidents are undetected and unreported, in many countries fatal accidents, and those accidents involving loss of working time, frequently exceed those in any other manufacturing industry. The Contribution to the high rate of accidents are those the characteristics of the industry which distinguish it from the rest of manufacturing industry.

The improvement of safety, health and working conditions depends ultimately upon people working together, whether governments, employers or workers. Safety management involves the functions of planning, identifying problem areas, coordinating, controlling and directing the safety activities at the work site, all aimed at the prevention of accidents and ill health. Accident prevention is often misunderstood, for most people believe wrongly that the word “accident” is synonymous with “injury”. This assumes that no accident is of importance unless it results in an injury. On a construction site there are many more “incidents” than injuries. They cannot afford to wait for human or material damage before doing anything. Safety management means applying safety measures before accidents happen.

1.1 Safety management
Safety, an economic as well as humanitarian concern requires proper management control. The Benefits of safety and health may include: reduced injuries, reduced property damage, reduced down time, improvement in morale, enhancing industrial relations, high productivity, reduced cost and enhanced quality. The Other benefits include: less compensation insurance, less hidden costs, improved supervisor morale, increased efficiency, and improved marketability. Most of the accidents on
construction sites are preventable through implementation of effective safety programs. Although effective safety programs can prevent or reduce injuries, not all contracting organizations implement safety programs. Good safety performance is also related to the management and that applying excessive pressure by any means to the workers resulted in increased injuries.

1.2 The cost of accidents

The cost of accidents can be categorized as direct or indirect costs. Direct costs of injuries are those that are most visible and are typically referred as insurable costs. Direct costs may include: medical cost, cost for compensation benefits, liability cost, and property losses. Indirect costs of accidents are difficult to measure. The indirect costs are those which are hidden and no historical record is kept. Indirect costs include: less productivity for both the returned workers and the crew or workforce, clean-up costs, replacement costs, stand-by costs, overtime costs, administrative costs, replacement worker orientation, costs resulting from delays, supervision costs, costs that related to rescheduling, transportation, and wages paid while the injured is idle. Indirect costs associated with accidents as:
- Cost of lost time of the injured employee.
- Cost of stoppage of work of other employees.
- Cost of time spent by first-aid attendant on the case.
- Cost of damage to machinery tools, or other property.

1.3 Types of the accidents and its causes

The accidents are classified as 2 types - major and minor, in major cases death, fatal, permanent body part injury etc. and in minor cases, first aid cases, temporary body part injury etc. are recorded. Based on the number of accidents, causes are classified into three categories with percentage as follows.

Unsafe act (67%) - the following activities are considered as an unsafe act
1. Operating without permission
2. Avoiding instruction procedure
3. Using unsafe tools/equipment

Unsafe condition (26%) - the following activities are considered as an unsafe condition.
1. Poor housekeeping.
2. Improper barricading
3. Improper electric connection.

1.4 Safety policies

As Safe and healthy working conditions do not happen by chance, employers need to have a written safety policy for their enterprise to set out the safety and health standards which is their objective to achieve. The safety policy should deal with the following:
- Arrangements for training at all levels. Particular attention needs to be given to key workers such as scaffolders and crane operators whose mistakes can be dangerous to other workers.
- Safe systems or methods of work for hazardous operations: the workers carrying out these operations should be involved in their preparation.
- Duties and responsibilities of supervisors and key workers.
- Arrangements by which information on safety and health is made to be known.
- Arrangements for setting up safety committee.
- Selection and control of subcontractors.

II. OBJECTIVE OF THE PROJECT

- To reduce loss in cost due to accidents.
- To analyze the various safety practices in varying projects.
- To identify the various risk factors associated from the literature review.
- To assess the employee perception regarding the existing safety management.
- To evaluate the safety culture of the employees with reference to occupational health and safety issues.
- Improving the studies on safety management, evaluating the collected data using SPSS software for various constructions.
- Suggesting appropriate safety practices in unsafe construction environment.
III. METHODOLOGY

The methodology adopted in this project is given below:

- Study on safety management in construction site.
- Study of literatures related to safety management.
- Consider various project environment and work loads of projects.
- Preparation of questionnaire.
- Site visit to major construction project.
- Questionnaire survey and personal interviews with Site-Engineers, Supervisor and managers.
- Analyzing and evaluating the data collected by using spss software.
- Remedial measures are to be suggested and the present data is to be recorded for future reference.
- Conclusions, recommendations and suggestions for future study.

IV. LITERATURE REVIEW

2.1 Historical data

This study theoretically and empirically developed the ideas around safety management practices. Data were collected using safety manager, supervisor, employee surveys designed to access link safety management system practices, employee perceptions resulting from existing practices and safety performance outcomes. The author identified the relationship between the level of safety focused worker emotional and cognitive engagement with accident rates.

2.2 Tools and software

Natalie C. Skeepers, Charles Mbohwa (2015), studied a cross sectional study, over 348 questionnaires were e-mailed to construction companies in Gauteng, with 155 valid responses received and 44.5% valid response rate achieved. Through the analysis of SPSS, the results showed that leadership visibility and behavior affects safety culture and safety performance in the construction industry. The study suggested improving safety performance by providing well-entrenched safety management systems with the foundation being, safety leadership, communication, commitment and employee training.

2.3 Case based approach

M.N. Vinodhkumar, M. Bhasi (2010) measured employees’ perceptions on six safety management practices and self-reported safety knowledge, safety motivation, safety compliance and safety participation. Survey was carried out using questionnaire among 1566 employees belonging to eight major accident hazard process industrial units in Kerala, a state in southern part of India. Analysis were made using AMOS-4 software. The author highlighted the need of safety training of the workforce.

V. FACTORS ON SAFETY MANAGEMENT

Safety training

- In construction, training to the workers is an essential factor for safety.
- Training components:
  - New hire orientation
  - Job specific training
  - Safety meetings

Worker involvement

- The workers in the construction should be involved in learning safety techniques
- Quality of work will be reduced due to the absence of involvement of the worker in safety construction

Safety communication and feedback

- To improve a safety culture and prevent injuries is to optimize safety related communication throughout an organization
- Employees often fail to “speak up” when they observe risky behaviors even when they know they should.

Safety rules and procedures

- Enforce the rules and working procedures to the workers
- Conduct inspections to review work safety
Safety promotion policies

- Policies to maintain standard level of safety construction
- Promotes safety practices

Safety knowledge

- Poor knowledge of safety may result in hazards.
- Enforce workers knowledge of safety in work.

Safety compliance

- Rectify worker complaints for safety work.
- Ensure the necessities available for safe working.

VI. ANALYSIS AND RESULTS

The questionnaire was distributed over 30 construction firms asking their contribution in identifying map for the factors. The construction companies were randomly selected from available list.

Statistical Package for the Social Sciences

SPSS is widely used software for statistical analysis in social science. It is also used by health researchers, market researchers, government, survey companies, education researchers, marketing organizations, data miners, and others. SPSS Statistics places constraints on internal file structure, data processing, data types, and matching files, which together considerably simplify programming. SPSS datasets have two-dimensional table structure, where the rows typically represent cases (such as individuals or households) and the columns represent measurements (such as sex, age, or household income). The files can be matched one-to-one and one-to-many, but not many-to-many.

The figure below shows the example for analysis of results, the analysis was done using SPSS software in which the Response Percentage for factors were obtained.

VII. CONCLUSION

The results of this analysis provide strong empirical support that components of safety performance are closely associated. The study demonstrated the validity and reliability of the perceived safety management practices of safety performance. The results of this study also highlight the need of safety training of the workforce and the involvement of the management in safety. Safety, rules and regulations in construction site should fully be maintained from the initial to final stage of construction. It can be concluded that the top management has the most significant role in supporting the successful implementation of safety program in construction projects.
REFERENCES


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