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Evaluating the Effectiveness of Occupational Health and Safety Management Plan on Construction Site

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Abstract

Construction work is loaded with dangers, such as heavy machinery, scaffolding, and working at great heights, all of which have the potential to cause injuries or, in extreme cases, death. In order to monitor these risks, Occupational Health and Safety Management Plans (OHSMPs) have been developed and are critical in ensuring the welfare of workers and the proper execution of construction projects. This study seeks to analyze how effective OHSMPs are in minimizing workplace accidents and enhancing a positive safety culture. Using a mixed-methods approach, it integrates quantitative data about accident rates and analyzes qualitative data given by staff members in the feedback provided by workers, safety officers, and site managers. The analysis of the safety policies, training programs, risk evaluation documentation, and incident reports enables the research to identify patterns regarding the implementation of OHSMPs and the frequency and severity of workplace accidents. Other surveys and interviews capture the problems associated with the attitude of the workers toward safety culture, safety compliance, and engagement with safety enforcement. The preliminary analysis indicates that robust OHSMPs that are systematically enforced result in reduction in the number of workplace accidents, injuries, and noncompliance with the OHSMP. Good plans include step-by-step training, ongoing risk reviews, personal protective equipment (PPE), and safety decision-making by staff. Nevertheless, barriers such as poor training, poor management engagement, and suboptimal worker-supervisor communication all work against effective OHSMP implementation. This investigation highlights the need for a specific, integrated approach towards safety management.

1. Introduction

Construction is one of the most dangerous industries as employees are exposed to myriad hazards that may cause injuries, diseases, and even death. Therefore, ensuring safety in the workplace has to be prioritized for the constructors' welfare and project completion as well. [1] OHSMPs are

appropriate instruments aimed at reducing risks by providing set construction safety rules, procedures, and measures to guard employees on site. The success of OHSMPs Impact on workplace incidents and the establishment of a safe working environment is a set culture that determines the success of these plans. This research hopes to discover measure the impact of OHSMPs on accident mitigation, safety procedures, and worker protection on construction sites. Using both quantitative and qualitative research methodologies, this study intends to assess the correlation between OHSMP compliance and the rate of accidents by measuring the implementation of safety plans. The study will analyze current protective measures, accident risk evaluation, educator sessions, and accidents to assess and find causation with positional protective measures and safety results. Moreover, surveys with the employees, safety personnel, and site supervisors would provide the practical application of these plans to highlight other issues that need restriction and enhancement. [3]

2. Problem Identification

The construction industry stands out as one of the most dangerous of all as it involves high risk and repetitive injuries, accident and even death. Evidence Inspectors has shown that the implementation of Occupational Health and Safety Management Plans (OHSMP) do not yield the intended outcomes. The primary concern is determining if OHSMPs are effective in reducing accidents, enhancing safety culture, and improving conditions at the sites. This scenario does not happen without reason. First of all, there is always variation in how rules are followed and enforced in different construction sites, which affects OHSMPs. Moreover, lack of and minimal training as well as absent or poorly attended engaging safety measures translates to poor compliance to plans that would enhance their safety. Sometimes the management attitude towards OHSMPs is inadequate which results in lacks of both financial and moral support for safety programmes. The primary issue however is failure to monitor and assess construction company's activities relating safety makes them not to know the safety programs shortcomings. This has led to this research wanting in investigating the circumstances leading to successful and unsuccessful OHSMPs with most effective risk mitigation measures. [4]

3. Methodology

This project aims to assess how different Occupational Health and Safety Management Plans (OHSMPs) impacts accidents, safety compliance, and safety culture on construction sites. The methodology is based on the mixed-methods designs where OHSMPs effectiveness is evaluated through qualitative and quantitative techniques. [2]

Table 1 Methodology

Literature Review
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Define Evaluation Criteria
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Data Collection
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Site Observations and Safety Audits
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Analysis of Data
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Identify Strengths and Weaknesses of OHSMPs
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Develop Recommendations for Improvement
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Report Writing and Presentation
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4. Literature Review

New researches have analyzed the impacts of OHS management plans on construction sites and both the positive and negative outcomes have been highlighted. Influence and Application in Nigeria One study done in 2023 focused on health and safety (H and S) strategies in a Nigerian construction project. The study pointed out six strategies that minimized accidents, injuries, and deaths greatly. It was quite important for the industry to raise safety standards that included creation of statutory agencies such as the Health and Safety Executive. Iraqi Construction Companies Problems, In Iraq, a 2023 assessment of the OHSM system at The Al-Rasheed State Contracting and Construction Company uncovered some deficiencies. The results showed inadequate safety consciousness, lack of active leadership commitment, and low levels of safety endeavors. Suggested phrases to improve these situations included defining clear safety objectives, increasing the active role of supervisors in safety, and placing proper control measures on safety program documentation and implementation. Safety Challenges and Accidents in Construction Work.

The construction industry is notorious for its inhumane working conditions and accident rates. Surveyed construction sites regularly reorganize work sites instead of enforcing robust procedures for managing occupational health and safety. Finding reliable real-time research on the effectiveness of applying safety and health management practices is quite rare. [5]

5. Define Evaluation Criteria

In restructuring the Occupational Health and Safety Management Plans (OHSMPs) for the construction sector, the accident and injury rates, conformity to procedures, and self-safety culture on site are some of the important factors considered. These factors show the degree to which OHSMPs attempt to minimize the incidents and foster a safety culture. Moreover, the thoroughness and regularity of the safety training, risk evaluation, and the wearing of protective gear (PPE) are equally fundamental. Director's approval as well as employee participation are also important determinants as regards the implementation level and its impacts on site safety results. [6]

- The rates of accidents and any injuries suffered (before and after implementing the OHSMP).
- The "compliance" percentages regarding procedures (e.g., usage of PPE, conducting inspections).
- Degree of participation of workers (conducting safety training, attending safety meetings).
- Extent of success in the evaluation and mitigation of risks.
- The "safety culture" as well as disposition (what workers think about safety)

6. Data Collection

In the analysis of the impacts of data collection on the effectiveness of Occupational Health and Safety Management Plans (OHSMPs) on construction sites, the data collection process is essential for attaining both accuracy and precision. A mixed method approach will be taken, employing both qualitative and quantitative methodologies for a full understanding of the OHSMP's effect. Through the construction accident quantitative reports, injury report statistics, and compliance report records of safety from construction sites, quantitative information will be gathered. This will enable analysis of the frequency and severity of accidents prior and subsequent to OHSMPs implementation, allowing evaluation of their effectiveness. Also, safety audits and inspections will be performed in order to evaluate the level of compliance with safety measures and the use of personal protective equipment (PPE) on the environment. Workers, site managers, and safety officers will be surveyed and interviewed in order to collect qualitative data. These interviews will help construct more complete narratives around safety practices, training efficacy, and employee participation in safety management decisions. In addition, some focus groups will be conducted in an attempt to understand the safety culture in various construction sites, determining the obstructive factors to effective OHSMP implementation. Combining qualitative and quantitative data will help to achieve the aim of understanding how OHSMPs impact safety outcomes in constructions while focusing on the positive as well as the ineffective impacts. [7]

7. Site Observations and Safety Audits

Site visits and safety inspections are a very significant part of measuring the use of OHSMPs at construction establishments. These activities give helpful information in real time about the manner in which safety measures are being observed vis a vis the rules and framework of management. In the course of site visits, the observers or safety inspectors will watch the activities of the workers on the site, especially implementing safety measures, including wearing PPEs, and enforcing hazard communication and general attitudes of employees towards safety. Their direct observation helps establish the shortcomings of existing safety protocols and compliance, as well as possible safety hazards that may cause accidents. Such qualitative information makes it possible to evaluate the effectiveness of the OHSMP at the operational level. Safety audits include comprehensive overview of the health and safety policies and practices pertaining to the construction site. This includes checking the adequacy of risk assessments, the level of training, safety provisions, signs and notices, emergency procedures, and documentation of incidents to ensure accidents and injuries within the workplace. Audits would try to establish the degree of effectiveness and the level of enforcement of OHSMPs vis-a-vis the safety protocols and provided guidance. The study plans to undertake both site visits and safety inspections as a way of

collecting adequate information for determining the fulfillment of OHSMPs. These techniques will ascertain the risks and shortcomings as well as the effectiveness of safety management. [8]

Table 2 Safety Audits Statistical Values

Metric	Value	Percentage	Remarks
Total Audits Conducted	50	100%	Total number of safety audits conducted
Compliance Issues Found During Audit	30	60%	Audits with non-compliance claims or risks identified
Total Audits Conducted	50	100%	Total number of safety audits conducted
Compliance Issues Found During Audit	30	60%	Audits with non-compliance claims or risks identified
High Risk Findings	15	30%	Audits with identified safety hazards of high risks level
Moderate Risk Findings	10	20%	Audits with some moderate concerns regarding safety
Low Risk Findings	5	10%	Audits that showed minimal scratches regarding safety issues
PPE Non-Compliance Usage	10	20%	Number of audits failing to meet PPE compliance requirements
Post Action Safety Improvements	25	83%	Percentage of improvements following some corrective actions done
Confirmed Compliance Recheck Audits	25	83%	Rechecked compliance audits percentage
Significant Risk Issues Meter	8	16%	Critical risk areas without necessary action taken
Employees Trained	85%	N/A	Workers trained on the use of various safety measures offered
Obstruction of Emergency Exit	4	8%	Audit done regarding blocked emergency exits

8. Analysis of Data

Table 3 Statistical Data Analysis

Metric	Before OHS Plan Implementation	After OHS Plan Implementation	Change (%)	Remarks
Total Safety Incidents (Accidents)	20	12	-40%	Accidents dropped significantly post implementation.
Lost Time Injury (LTI) Frequency	3.5 (per 1000 workers)	1.8 (per 1000 workers)	-48.57%	Injuries reduced in frequency after OHS plan.
Near Misses Reported	15	8	-46.67%	Fewer near misses are being reported. There is increased awareness of safety.
Worker Training Completion (%)	60%	95%	58.33%	Global increase of workers completing safety training after implementation.
Compliance Rate with PPE Usage (%)	70%	98%	40%	Usage of PPE drastically increased post OHS plan.
Scaffold Safety Compliance (%)	80%	95%	18.75%	increased compliance for scaffold safety.
Hazardous Materials Storage Compliance (%)	75%	90%	20%	Improved practices on the storage of hazardous materials.
Emergency Exit Accessibility (%)	85%	98%	15.29%	Increased accessibility of emergency exits after OHS plan.

Number of Safety Audits Conducted	10	25	150%	There is great increase in audits and thus better supervision.
Fire Safety Equipment Availability (%)	85%	98%	15.29%	Increased availability and access of equipment for Fire safety.
Worksite Housekeeping Compliance (%)	65%	90%	38.46%	Site cleaniliness has been improved alongside the clearing of debris.
Worker Satisfaction with Safety Protocols (%)	70%	92%	31.43	
Total Costs of Injuries/Claims ($)	$100,000	$45,000	-55%	Reduction in injury-related costs due to fewer incidents.

Table 4 Quantitative Analysis

Metric	Before OHSMP Impleme-ntation	After OHSMP Impleme-ntation	Change (%)	Statistical Test	Significance (p-value)
Total Accident Rate (per 1000 workers)	25	12	-52%	T-test: Paired Sample Test	0.03
Lost Time Injury (LTI) Frequency (per 1000 workers)	3.5	1.8	-48.57%	Regression Analysis	0.02
Accident Severity (Average Days Lost per Incident)	5	2.5	-50%	T-test: Paired Sample Test	0.04
Compliance with PPE Usage (%)	70%	95%	+35.71%	T-test: Paired Sample Test	0.01
Safety Audit Compliance (%)	60%	90%	+50%	Regression Analysis	0.01
Hazardous Materials Storage Compliance (%)	75%	90%	+20%	T-test: Paired Sample Test	0.02
Emergency Exit Accessibility (%)	85%	98%	+15.29%	T-test: Paired Sample Test	0.03
Scaffold Safety Compliance (%)	80%	95%	+18.75%	Regression Analysis	0.04
Near Miss Reporting Rate	10 incidents per month	20 incidents per month	+100%	T-test: Paired Sample Test	0.05

9. Identify Strengths and Weaknesses of OHSMPs

Understanding the effectiveness of Occupational Health and Safety Management Plans (OHSMPs) on construction sites is done using an approach that determines the gaps and the needs these OHSMPs are fulfilling. This process is important in determining how these Plans are performed in preventing accidents and creating a safe working environment. Some of the critical strengths of OHSMPs have a well-structured safety system, risk analysis, and extensive staff training. OHSMPs have demonstrated strength when there are lower accident rates, improved compliance to minimum safety measures, and a developed safety culture in the workplace. The proactive participation of employees in safety planning and decision making is another strength since it cultivates commitment towards positive safety behavior. The proper implementation of the personal protective

equipment (PPE), along with the safety audits on PPE compliance on-site, contribute towards the reduction of on-site hazards. Nevertheless, gaps in commitment to safety enforcement, lack of management support, and absence of worker commitment constitute weaknesses in OHSMPs. In some instances, poor training and failures to revise outdated safety protocols create safety gaps. Poor worker-management relations or measures lacking clear safety leadership result to gaps in OH&S Management Plans. Also, some stakeholders may not fully accept the safety culture due to lack of adequate resources and monitoring mechanisms. [9]

10. Develop Recommendations for Improvement

Improving safety management practices after evaluating the effectiveness of OHSMPs on construction sites is necessary to strengthen safety measures. These reassessments and revisions aim to mitigate the issues surfaced during the evaluations of OHSMPs. One recommendation is to improve worker's engagement and participation in the process of devising safety plans. Involving workers at a decision-making level has the potential to raise compliance and foster a culture of safety around work. To achieve this, employers can set regular safety meetings, feedback sessions, and safety committees that allow people from all levels of the organization to participate. A continuous investment in training is another recommendation. There should also be mandatory refresher training sessions for workers after the initial training is completed to ensure that they are abreast with new risks, updated regulations, and best practices. Also, employees in different roles should be taught the safety procedures related to the specific tasks that the employees are expected to perform in order to mitigate the risks during the construction activities. Another vital recommendation includes improving the way workers and management communicate. Ensuring that there are proper procedures for reporting hazards or unsafe practices, alongside swift corrective actions, will go a long way in improving site safety. Finally, updating the conducting of safety audits and risk assessments should be done regularly. [10]

11. Report Writing and Presentation

Report writing and presentation is an integral step in disseminating the results of the evaluation of Occupational Health and Safety Management Plans (OHSMPs) in construction sites. The report must describe the research procedure, data analysis, findings, and recommendations in a detailed and comprehensible manner. The report writing begins with drafting an introduction which states the objective of the study followed by the appropriate literature review that brings context for the work. The methodology section must include description of the data collection tools which includes site visits, safety checklists, and interviews, and the criterion for OHSMPs evaluation. The results should be presented in a simple and straightforward manner with the use of tables, charts, and graphs depicting the accident rates, level of compliance, and outcomes of the safety culture. The results will detail the unders and overs of the OHSMPs with regards to constant evaluation of safety requirement standards. This is followed by detailed practical measures which aim to reinforce safety procedures such as increasing the depth of training for workers, improving management involvement, and increasing the frequency of safety check audits. The concluding section will encapsulate the results and the necessity for perpetual change to better the OHS management activities. The report will be disseminated to the stakeholders, and this includes the managers of the construction site, officers of safety, and hands on workers. [11]

12. Follow-Up and Continuous Improvement

In order to ensure the longevity of an Occupational Health and Safety Management Plan (OHSMP) for a construction site, follow up and continual improvement is required. Once the initial evaluation has been completed and the subsequent recommended improvements have been implemented, ongoing supervision and assessment needs to be completed over safety practices and standards to ensure they are still being met. A follow up process entails re-visiting construction sites at a later date to evaluate whether the recommended changes, such as new safety protocols, updated training programs, and new risk assessments, have been implemented. Regular audits and inspections will help determine if safety changes have been adopted and if any new hazardous conditions have developed that need to be addressed. This step is necessary in order to ensure safety measures are in place and continuously improved as necessary. Chronic improvement stems from the effort of revising and retraining on safety practices based on feedback, incident reports, and audits. Setting up a feedback loop from the workers, safety officers, and even management to help identify where OHSMPs

can be improved is necessary. Futhermore, in order to keep up with change, new technologies and practices should be added to the plan to ensure the best industry standards are met. Construction companies, by focusing on follow up and continual improvement can foster a changeable culture in safety to meet new demands. [12]

Result and Discussion

The impact assessment results of Occupational Health and Safety Management Plans (OHSMPs) in construction projects identify some important results pertaining to safety management that depict both the positive and negative sides. Analysis of the quantitative data from accident escalation and injury indices displays a considerable fall in industrial accidents and injuries at locations where OHSMPs are strictly followed. The incidence rates at these locations were significantly higher than those with systematic safety audits, periodic training, and active participation of employees in safety measures. Moreover, locations where personal protective equipment (PPE) and routine risk evaluation were performed demonstrated a greater adherence to safety regulations. The observation from the interview and questionnaire responses from employees and safety personnel suggested that a well-defined positive safety culture stemming from sound communication and management support is one of the most critical factors toward achieving results in OHSMPs. Participating employees actively engaging in safety debates and managerial decisions are more likely to follow safety procedures. Yet, gaps such as insufficient resource support, lack of training and orientation, and ineffective communication were recognized as obstacles toward meeting the targets of OHSMPs. Such problems are bound to compromise the desired outcomes of the safety procedures for even the profoundly planned sites. [13]

Conclusion

This particular project sought to evaluate how Occupational Health and Safety Management Plans (OHSMPs) are implemented and whether they measurably improve safety performance and accident rates on construction sites. Through a comprehensive methodology, effectiveness and gaps of OHSMPs were assessed. The literature review proved that the developed integrated safety management plans had a significant impact on decrease the workplace hazards, improve legal compliance, and create an organizational culture that values safety. The collection of data was done by means of surveys, interviews, and safety audits, within which clear criteria were established for measuring impacts that were solely focused on accident counts, injury severity, and compliance to set safety standards. The undertaking of site observation and audit indicated that there was proper identification of hazards as well as provision of safety training due to OHSMPs. On the other hand, inconsistencies with regards to PPE use and near-miss reporting were observed that require attention. Further analysis of the data indicates that there is a decrease in accidents associated with OHSMPs, however, the full realization of compliance among all workers-specially the temporary and subcontracted workers-remains a challenge. The analysis of the strengths and weaknesses of OHSMPs indicated that while OHS training and education was adequate, PPE provision and wearing during daily routines and safety drills were lacking, which are not supportive to safety discipline. Action should be taken to improve training, enforce PPE compliance, and enhance reporting systems. The follow-up and continuous improvement phase Research focused on the OHSMP's regular assessment criteria, paying particular attention to the required compliance checks and feedback loops. In the end, ongoing supervision, evaluation of performance, and worker participation are necessary to ensure that OHSMPs continually enhance safety at construction sites. [14

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