

Investigating the Impact of Emerging the Technologies on Construction Safety Performance

Krishna L S¹, Dr T R Sethu Raman²

¹ PG Student, Sivaji College of Engineering & Technology, Manivila, Kanyakumari District

² Professor, Sivaji College of Engineering & Technology, Manivila, Kanyakumari District

Abstract-- Worldwide, the construction industry now prioritizes safety on construction sites above all else. Building labor is commonly viewed as hazardous, with a significant chance of illness and injury for employees. The utilization of technology is seen as a successful strategy to guarantee construction safety management overall and to enhance the health and safety conditions for site workers. The several evolving technology options for construction health and safety management are outlined in this paper. Creating a performance indicator for safety construction is the primary objective of this research. The study involved a thorough examination of the conventional literature with an emphasis on cutting-edge technological solutions for construction safety. The most significant factors influencing were determined using the relative importance index and the exploratory factor analysis. A case study was conducted to determine the key elements affecting safety. An overview of the many kinds of cutting-edge technologies available for construction health and safety management is given in this paper. This report offers a thorough and conventional overview of earlier research on the acceptance and application of technology in construction health and safety management. A case study was conducted to determine the key elements affecting safety. An overview of the many kinds of cutting-edge technologies available for construction health and safety management is given in this paper. This report offers a thorough and conventional overview of earlier research on the acceptance and application of technology in construction health and safety management.

Key words: Construction Technology, Health and Safety, Safety Practices

I. INTRODUCTION

One of the riskiest sectors of the global economy is thought to be the construction sector. The quantity of buildings constructed annually for residential, commercial, and office uses is rising daily. Because there is a growing need for houses, offices, and other types of infrastructure, the construction industry is growing daily. Given its size and complexity, the construction sector is likely to provide a number of health risks. As a result, safety is essential in the construction sector due to the absence of hazards. According to the guide to the project management

body of knowledge, safety management is a crucial component of project management.

It is required of safety management to assess all potential hazards and incidents in order to protect project personnel from harm. Finding these appropriate tactics and safety initiatives is so crucial. Safety concerns are becoming more and more important to all industries. Around the world, a large number of construction businesses are putting safety measures in place to reduce accidents, get rid of illnesses, and provide a safe working environment on their sites.

From a construction safety perspective, the number of accidents and near-misses that occurred on construction sites in the last ten years has proven that further improvements are needed in all aspects related to safety and health on construction projects. The traditional practice of safety management onsite indicates that the construction workers may not be efficiently informed of hazardous locations and safety-related issues. Communication among construction workers and project players is undeniably crucial, especially in ensuring safety information is accurately and effectively delivered and understood.

Any technology that enables and successfully improvises all areas of safety and health on sites is believed to have potential benefits in enhancing overall construction safety management, given the limitations of safety information exchange and availability. This is due to the fact that the construction sector is infamous for using information and communication technology sparingly to enhance work processes and manage construction-related safety and health.

Many studies have been conducted on ways to enhance construction safety in various aspects. Several researchers have proposed the use of state of the art, as safety and health have become one of the key responsibilities of the project management team and most of the employees dont like safety rules as they think.

II. LITERATURE REVIEW

Dishant shah, Smit Chheda, Sagar Mehta, Vedit Hirani Data gathered from several large contractors with expertise working on large-scale building projects, as well as industry-observed safety procedures, make up the report. The following highlights organisational safety policies, worker attitudes towards safety, safety equipment, safety training, and causes of dangers. After visiting many building sites and speaking with the site engineer about the safety protocols put in place to reduce or eliminate accidents, the research was completed. The construction sector, which employs the majority of people in India, must address the reasons of risks. Using the right safety procedures may prevent 98% of accidents. The safety officer should conduct safety checks on a regular basis. In India, the aforementioned technologies are still not widely utilised. The high implementation costs of these technologies might be the cause of such. Builders and construction companies should be educated about the advantages of utilising these technologies as life is a gift that shouldn't be squandered by jeopardising the safety of these employees who have dedicated their lives to a project.

Prof: Ranganathan.B.A Safety Performance in Construction Industries Since ancient times, one of the oldest and riskiest sectors in the global economy has been building. It involves a lot of unskilled labour and the mobility of equipment and materials in a small space, which raises serious safety concerns. A significant economic force and one of the riskiest sectors of the economy is the building industry. There were around 74,241 work-related accidents in total in 2014. In order to make designers and project planners more accountable for worker safety, it is necessary to promote their connection with safety specialists. Designers and planners must take workers' safety into consideration while designing and planning projects. More than sixty percent of these incidents were related to the building sector.

Anand Kumar Mishra, Mr. Syed Tabish Quadri. Globally, the building industry is extremely dangerous. Globally, the construction business has experienced significant expansion, especially in the last several years. This document explains the many kinds of dangers, accidents, and their causes. The construction sector, which employs the majority of people in India, must address the reasons of risks. Using the right safety procedures may prevent 98% of accidents. The study came to the conclusion that injuries are the main reason behind construction accidents. These injuries can be studied further, as can

preventative measures that can be taken. Companies may constantly review the law and create a suitable health and safety plan and usually the cause which health and safety plan tailored to their workforce and work environment. It is possible to thoroughly research the legal requirements that employers can adhere to in order to provide a safe working environment on construction sites. Principal suggestions: Employees should get priority instruction in safety and health-related topics. Plant and equipment should be regularly inspected. The right safety professionals need to be sent to the location.

Chukkaluru Rukmunnisa Sulthana, P.Naveen Kumar One of the riskiest industry areas is construction. Every year, many industrial mishaps occur worldwide, resulting in worker harm and injuries as well as financial losses. Safety concerns are becoming more and more important to all industries. Around the world, a large number of construction businesses are putting safety measures in place to reduce accidents, get rid of illnesses, and provide a safe working environment on their sites. The purpose of this study is to identify and assess security management practices in construction projects in order to control and reduce the risks to the health and safety (H&S) of construction workers. The purpose of the questionnaire is to get a wide range of viewpoints from seasoned experts who are employed on many building projects. The first step in gathering data from earlier, relevant research is to evaluate this body of work. Workers were found to be underdeveloped, untalented, and uninformed about equipment use and security precautions. Employees were unaware of these mishaps.

Ibukun Awolusi , Eric Marks, Mathew Hallowell Workers typically confront significant safety and health concerns throughout the building process due to the hazardous working conditions at construction sites. Historically, construction safety has been monitored and controlled in a reactive manner by responding to unfavourable trends in injury rates. This paper's goal is to present a thorough analysis of wearable technology's use in individualised construction safety monitoring. We identify and analyse the features of wearable technology and safety measurements that are hypothesised to be able to forecast safety performance and management procedures. According to the analysis, a wide range of safety performance parameters may be monitored and measured in the construction industry using wearable technology now in use in other industrial sectors. The advantages of distinct wearable sensors or systems can be combined according to their characteristics for

multi parameter safety performance monitoring.

V.K.Bansal This study predicts locations and activities that have a greater risk of accidents and uses GIS-based navigable 3D animation to aid in the safety planning process. It also makes it simpler to comprehend the building sequence. This method incorporates suggestions from experts and safety code rules with elements or activities that increase the realism of safety planning. The experts who plan construction operations and create workplace safety programmes found that the speedy retrieval of information from the safety database was helpful. Research demonstrates that decisions made by project planners and designers directly affect the safety of workers. In order to increase their accountability for worker safety, designers and project planners should be encouraged to engage with safety specialists. This is because they must take workers' safety into account during the design and planning phases.

Dr. Kailash Mohapatra, Dr. Dipti Prasad Mishra.

This article's primary goal is to ascertain the relationship between construction productivity and information technology utilisation, particularly the latter's use to automate and integrate job activities for building projects. The author looked at two relationships: the first was between information technology and productivity in the construction business, and the other was between information technology and value added growth and productivity in the construction sector relative to other industries. Information technology has recently had an influence on global industries, economies, lifestyles, and even cultures. Numerous scholars have looked into the connection between productivity and information technology, with the manufacturing industry garnering a lot of attention as a significant economic indicator.

KA Shamsuddin, MNC Ani, AK Ismail, MR Ibrahim. This paper's primary goal was to educate construction workers on the many safety precautions available to them in the sector. The majority of accidents are caused by dangerous behaviours and environments. Because not all construction dangers can always be found and removed, construction accidents can be avoided by determining the primary cause of the incidents through thorough accident investigation. This research aims to investigate the issues related to worker safety, health, and environmental protection on construction sites. When compared to other businesses, the construction sector has a history of causing a great deal of harm, making it a very unsafe place to work. The project would advise

carrying out the work on environmental, health, and safety protection on building sites in more specialised areas, including at highway or tunnel construction, which involves restricted spaces, electrical work, and plumbing.

Jaimin B. Patel, Prof. Neetu B. Yadav. To better understand accident causes, safety-affecting variables, preventative measures, and the use of Safety Management Systems at construction sites, a thorough literature review was conducted. This study used a quantitative research design that used surveys and questionnaires. Utilising the questionnaire method is a dependable and efficient way to collect quantitative data. It is a crucial technique used by management researchers. Based on the themes that emerged from the study of the pertinent literature, a questionnaire was created for the purpose of gathering and analysing data. Based on a review of the literature, the health and safety of workers are the most crucial factors to take into account when building. Additionally, preserving safety on building sites depends on the establishment and enhancement of the safety management system.

Abdulkadir Ganah, Godfaurd.John. The use of BIM in the construction sector in connection to H&S communication is examined in this study. The application of building information modelling for health and safety (H&S) during construction has the potential to improve practitioners' comprehension of their sites and lower the likelihood of accidents. Data on the integration of H&S planning with the BIM environment for site practitioners was gathered through a questionnaire survey and a thorough assessment of the literature. Based on the comments, it was determined that BIM would improve the present H&S planning method used by building site workers. Employees benefit from being able to see H&S concerns as they are being worked on during the toolbox discussion onsite.

A. SUMMARY

Site, length, environment, unpredictability, complexity, deadlines, financial intensity, organisational structures, and other variables all affect construction projects. Due to its dynamic, complex, and decentralised character, the construction industry is one of the most susceptible in the world, making worker safety on construction sites an urgent priority. According to research, the primary factors influencing construction site safety mishaps include human behaviour, the particularities of the sector, challenging work site conditions, and inadequate safety management, which leads to the use of risky tools, techniques, and processes.

III. RESEARCH METHODOLOGY

The research design for this study employs a serial technique. The first stage is to obtain information about the elements influencing safety on building sites by collecting and analysing literature research. Subsequently, a questionnaire survey was carried out in order to ascertain which of the criteria gathered from the literature have the greatest impact on construction sites' safety performance. The questionnaire survey was administered by email, mail, and interviews. The relative relevance index was initially used to evaluate each factor's significance before the questionnaire was analysed.

To ascertain the key elements influencing construction projects' safety performance, a case study is conducted.

IV. CASE STUDY

Data is collected through case studies. The case studies are used to identify the safety procedures that are currently in use at the construction sites, to collect information on the issues related to these practices, and to identify the techniques used to address these issues.

The building complex that is being planned consists of three basement levels designated for parking, seven stories plus one podium level for parking, one level for amenities and a swimming pool. A 40-story condominium building is being proposed. The construction projects, which are high-rise structures with significant site safety risks, were chosen because they were suitable for this study. To safeguard the general public and other structures, the projects must also incorporate site safety.

V. DATA COLLECTION

Safety Practices at Construction Site

In accordance with the Occupational Safety and Health Act of 1994, the firm offers safety and health policies to all major stakeholders in order to execute safety procedures at construction sites. The company's policy is to operate in a way that will guarantee employees' reasonable practices for health, safety, and welfare at work. Furthermore, it guarantees that the mitigation of risks to workers and assets conforms entirely with all pertinent rules and regulations.

This organisation wants to guarantee that there are no significant mishaps for any of the workers there. The safety policy also mandates that all workers apply a safe work environment, make sure the workplace is safer, and take reasonable precautions for their own health and safety as well as the health and safety of anybody else who could be impacted by their actions.

This company's safety policy places a strong emphasis on everyone's responsibility for everyone else's health, safety, and environment. The director will approve and evaluate the safety policy every year.

Education and Training

The importance of health and safety on building sites is something the organisation continually stresses. Enlightening the important actors through training programmes is one method of fostering a safety culture. The employer will make sure that every new hire attends the weekly induction training. During the induction training, safety and health issues will be covered with all new employees. They will be shown the safety symbol signs that is normally used at the construction site by the safety officer. The safety precautions that must be followed while carrying out the jobs are reminded to the personnel.

Site Safety Inspection

To make sure the safety procedures at the building site are operating efficiently, site safety inspections are required. The respondent stated that while the majority of safety officers at construction sites do safety inspections, the efficacy of these inspections has long been questioned. The safety officer will walk the site safely each week to conduct a safety check for this project. Workers who disregard safety standards will face prompt disciplinary action from the safety officer during the safety inspection session.

Safety Auditing

Twice a year, the firm audits for safety. Usually, representatives of the International Organisation of Standardisation will handle it. It consists of document checks, safety inspections, and interviews with the responsible safety officer. To gauge the degree of safety at the building site, safety audits are crucial. The safety officer may ascertain whether or not the construction site's level of safety satisfies the requirements of the safety standard following the auditing session.

Safety Meeting

The speaker emphasised that thousands of people were occasionally engaged in these initiatives on the building site. As a result, there is a greater chance of danger than with other projects. In order to monitor and supervise the safety of workers at the building site, it is crucial to have monthly safety meetings. The safety committee will create tactics to consistently maintain the site safety level throughout the meetings, as well as examine current safety concerns at the construction site.

Site Safety Organization

The respondent stated that safety is the most crucial aspect of this project, which is why the organisation has designated safety officers and supervisors to oversee safety on the job site. This organisation formed a safety and health committee made up of all the important project participants because it recognises the importance of health and safety on building sites.

According to the respondent, the presence of a safety and health committee is crucial as it will oversee and manage safety and health matters at the construction site. To maintain the safety and health at the building site, each member of the committee will carry out their assigned duties. Therefore, the company's goal of having no significant incidents involving any of the site staff can be accomplished.

Personal Protective Equipment (PPE)

The interviewee firmly advises all workers at the construction site to wear and utilise basic personal protection equipment, such as safety boots and helmets, in her capacity as the project's safety officer. Additionally, he will see to it that all staff members, including team managers, authorities, and outside guests, are wearing safety boots and helmets. .

Additionally, by keeping a PPE record, the safety officer uses a methodical approach to document the issue of PPE to the workers. Every time the safety officer inspects PPE on site, he also gives out a PPE checklist.

Emergency Support and Safety Measuring Devices

It's crucial to have measurement tools and emergency assistance available, particularly for high-rise construction projects. Typically, this organisation has set up an assembly area where all employees may congregate in the event of an emergency, such as a short circuit or firefighting. Additionally, there is first aid supplies on the premises. In addition, they offer emergency entry and egress to the location in the event of a crisis.

Fall Protection Systems

According to the respondent, taking part in a high-rise building project carries greater danger than taking part in other projects. The firm equips all personnel who operate at a height of 2.5-29 metres with safety harnesses in order to lower the danger of falls during project works. In addition, they offer safety ladders, handrails, guardrails, and safety nets to stop falls.

Safety Promotions

This business offers warning and safety signs at building sites as part of its safety promotion efforts. Considering that the majority of the employees are from Myanmar, their safety signs are printed in that language.

Other Safety Practices

The contractor offers access in both directions. Those entering the passenger lift should use the left side, while those leaving should use the right side.

Problems in Safety Practices at Construction Site

Regarding the second goal, the respondent was requested to provide his opinions about issues with safety procedures at building sites in light of this project. According to his perspective, one of the issues is that employees and the management team are not aware of safety issues. Some employees were uncomfortable wearing safety helmets, therefore they chose not to wear them while doing their jobs. The interviewee continues by saying that occasionally the team management does nothing to discipline employees who disobey safety regulations. This indicates that the team management has a poor awareness level.

The respondent further emphasises that in order to provide workers with safety knowledge, they want management commitment. In this initiative, the supervisors would get instructions from the safety officer, and it is the supervisors' responsibility to relay them to their employees. However, a majority of the supervisors failed to do as instructed.

Also, in an effort to complete their task more quickly, the personnel frequently utilise faulty tools or equipment. They'll use any tools at hand to do the assignment if they can finish it in time. In actuality, there are instances where personnel misuse the equipment as well. According to the respondent, some employees disregard the work procedures mandated by the guidelines. This is risky and likely to result in an accident.

Strategies to Reduce Problems at Construction Site

The respondent also offers recommendations on ways to lessen the issues with safety procedures at building sites that have been encountered the interviewee recommends holding an efficient training session for the employees, including visual aids like photos, graphs, and animations to raise awareness among the staff and the management team. Indeed, he underscores the necessity of revising and enhancing the present training course's content.

Second, he recommends having safety books, safety

warning signs, and a bilingual safety handbook in order to address language problems that may arise between employees and supervisors. The respondent concludes by restating the need for a significant financial budget to be set aside for safety management as well as the requirement that this budget be distributed in accordance with a set percentage. To help the safety officer or safety committee enhance the safety and health culture at construction sites, it is crucial to have a set budget for safety management.

VI. DISCUSSION

The research findings on existing safety procedures at building sites are displayed in Table 2. Both projects have adopted safety procedures, based on the case studies that were done. Table 1 demonstrates that both businesses offer workers at construction sites education and training in addition to having safety regulations for the job being done there. They also routinely conduct safety audits and site safety inspections.

Additionally, safety meetings are held on building sites to talk about safety-related issues with the management group and employees. Apart from that, both corporations have set up safety organisations to oversee and regulate the security of the building sites. Both businesses supply personal protection equipment, such as safety helmets, safety boots, gloves, and other items, to employees in order to guarantee their safety. They offer fall prevention solutions including handrails, guardrails, safety nets, and catch nets, as well as emergency support and safety measuring tools like first aid and medical attention for common accidents.

Additionally, both businesses encourage safety on building sites to guarantee that the area is always safe. Every firm promotes safety in a different way. With the exception of defining the borders between red and green zones and the pink ticket system, both contractors generally execute the most of the safety procedures mentioned above. Other safety precautions included in both case studies include offering safety access, labelling scaffolding with distinct colours, and designating certain locations for dangerous chemicals. Consequently, it can be said that both contractors have implemented safety policies, education and training, site safety inspections, safety audits, safety meetings, safety organisations, PPE, emergency support and safety measuring devices, fall protection systems and safety promotions at construction sites. These practices are in line with the literature reviewed.

VII. CONCLUSION

According to the research findings, construction sites typically have well-organized and good safety practices, including safety policies, training programmes, safety audits, inspections, meetings, personal protective equipment, emergency support, safety measuring devices, fall protection systems, and safety promotions. However, a number of significant issues with safety practices exist.

These issues include workers' lack of knowledge about work procedures, the absence of funding for safety management, workers' lack of awareness, and the language barrier that separates supervisors and employees. However, a number of significant issues with safety practices exist. These issues include workers' lack of knowledge about work procedures, the absence of funding for safety management, workers' lack of awareness, and the language barrier that separates supervisors and employees.

Many approaches have been put forth to address the issues, including the provision of 35 efficient safety training, the budgetary allotment for safety management, the unwavering support of upper management, and the distribution of safety pamphlets in multiple languages as a means of mitigating issues with safety procedures. The recommendations address three key areas for putting safety procedures into effect: resource allocation, top management commitment, and worker awareness.

VIII. REFERENCE

1. W. Zhou, J. Whyte, R. Sacks. 2012. "Construction safety and digital design: A review, Automation in Construction," vol. 22, pp. 102–111.
2. G. E. Aguilar and K. N. Hewage. 2013. "IT based system for construction safety management and monitoring: C- RTICS2," Autom. Constr., vol. 35, pp. 217–228
3. "Department of Occupational Safety and Health Malaysia." [Online]. [Accessed: 20-Apr-2015].
4. S.J. Cox, T.R. Cox, The structure of employee attitude to safety: a European example Work Stress, 5 (1991), pp. 93- 106.
5. J.M. Tomas, A. Oliver, The perceived effect of safety climate on occupational accidents Proceedings of Work and Well-being: An Agenda for Europe Conference University of Nottingham (1995).
6. S.J. Cox, A.J.T. Cheyne, Assessing safety culture in offshore environments, Saf Sci, 34 (2000), pp. 111-129.
7. M. Alshawi, J. Underwood, The application of information technology in the management of construction. RICS Research, London (1999).

8. T. Howarth, D.P. Watson, Construction safety management Wiley-Blackwell, Chichester (2009), pp. 55-81.
9. G.D. Larsen, J. Whyte, Safe construction through design: perspectives from the site team. Constr Manage Econ, 31 (2013), pp. 675-690.
10. W. Zhou, J. Whyte, R. Sacks, Construction safety and digital design: a review. Automat Constr, 22 (2012), pp. 102-111.
11. S. Zhang, J. Teizer, J.K. Lee, C.M. Eastman, M. Venugopal, Building information modeling (BIM) and safety: automatic safety checking of construction models and schedules Automat Constr, 29 (2013), pp. 183-195.
12. V. Benjaoran, S. Bhokha, An integrated safety management with construction management using 4D CAD model, Saf Sci, 48 (2010), pp. 395-403.
13. Hudson, P. (2007). Implementing a safety culture in a major multinational. Safety Science, 45(6), 697-722
14. Levitt, R. E. and Samelson, N. M. (1987). Construction Safety Management. New York: McGraw-Hill.
15. Lingard, H and Rowlinson, S M. (2005). Occupational Health and Safety in construction project management; UK Taylor & Francis.