Article title: Safety Issues In The Construction Industry
Authors: Harsha kapalavai[1]
Affiliations: School of technology UCM[1]
Orcid ids: 0000-0002-8204-9371[1]
Contact e-mail: hxl36080@ucmo.edu
License information: This work has been published open access under Creative Commons Attribution License http://creativecommons.org/licenses/by/4.0/, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. Conditions, terms of use and publishing policy can be found at https://www.scienceopen.com/.
Preprint statement: This article is a preprint and has not been peer-reviewed, under consideration and submitted to ScienceOpen Preprints for open peer review.
Funder: N/A
DOI: 10.14293/S2199-1006.1.SOR-.PPL50HA.v1
Preprint first posted online: 04 November 2022
SAFETY ISSUES IN THE CONSTRUCTION INDUSTRY

Harsha Siva Naga Sai Kapalavai

School of Technology, University of Central Missouri

INDM 5230 Seminar in Industrial Management

Author Note

This research is adapted from previous work. Kapalavai, H. (2021). Safety Issues in the construction industry [Unpublished paper]. School of Technology, University of Central Missouri.

This research was completed as part of the course work for the Current issues in the industry course.
Table of Contents

Introduction ........................................................................................................................................... 3

Body of knowledge in the field of 'safety management in the construction industry ............... 3

Characteristics of various methodologies relating to simulation and optimization modelling ...... 4

Importance of the selected topic .................................................................................................................. 6

Importance of the selected industry in this study ....................................................................................... 6

Current problem and solution ...................................................................................................................... 7

Basic concepts and motivations of business............................................................................................... 7

Key issues impacting the respective business operations .......................................................................... 8

Advantages and disadvantages of the selected system ............................................................................... 10

Ethical considerations .................................................................................................................................. 10

Safety issues in the construction industry in the USA ............................................................................. 11

Practices of green environment in the construction industry for safety management ..................... 12

The reason behind showing the importance of choosing this topic ....................................................... 14

Hope the things for accomplishing the study by investigation ................................................................. 14

Summary of the topic .................................................................................................................................. 15

Reference list ............................................................................................................................................... 16
Introduction

The safety issues that are involved in the construction sector in the USA are scaffolding formwork, working at heights, safety during excavation, housekeeping works material stacking and handling respectively. In this research topic, the knowledge regarding safety management, purpose and importance of the selected topic has been illustrated along with current problems relating to the construction industry in the USA and an innovative idea regarding practicing the green environment in the construction sector has also been addressed in detail.

Body of knowledge in the field of 'safety management in the construction industry

Safety management in the construction sector in the USA carries out a method that can be used for controlling and managing safety-related activities for ensuring a safe working environment within the segment of the construction industry. Besides, maintaining the safety of the construction project can also be influenced by a major part of making the decisions relating to the designing and the planning process of the project (Forteza et al., 2020). Hence, the knowledge of safety in this regard should be associated with the concept of several working activities including gathering, organizing, maintaining, and providing thorough information on the several processes of the safety elements. Thus, the knowledge relating to safety tends to consist of the equivalent or elements that are used in the overall construction industry in the USA.
Characteristics of various methodologies relating to simulation and optimization modelling

Different simulation methodologies are as follows:

**Discrete event simulation**

The discrete event simulation is the predetermined beginning of the ending points where the method is involved in keeping the actual track of the time that has already elapsed at the time of the beginning of the process.

**Dynamic simulation**

The dynamic simulation is the combination of the usage of the computer program for modelling the time-varying behavior of the dynamic simulation that is also critically described through the ordinary or partial differential equations (Guo et al., 2018).

**Process simulation**

The process simulation is used for designing, developing, analyzing, and optimizing the overall technical procedures that are used in the construction industry for representing the behavior of evolving in several conditions of the construction industry over time.

Different optimization modelling methodologies are as follows:

**Linear programming**

This programing methodology itself is a technique of the linear function that can be minimized or maximized at the time of describing various constructional activities. Besides, this technique can be successful in guiding quantitative decisions in business planning and industrial engineering in the construction sector in the USA (Allianz, 2021).
Mixed-integer programming

This methodology is associated with the mixed-integer quadratic programming that states a complete problem of optimizing the entire quadratic function by combining the set of various components in a continuous way for optimizing a problem (Delvinne et al., 2020).

Constraint programming

The constraint programming methodology includes a paradigm for solving the combinatorial problems by drawing a wide range of techniques from the domain of the artificial intelligence by stating the constructions based on some possible solutions for some decision variables respectively.

Nonlinear programming

This effective programming methodology shows the proposed methods of showing better performances for optimizing the computation cost and optimization of the buildings. Besides, it also carries out the advantages for solving various issues in terms of obtaining the well-defined solutions accordingly (Lyu et al., 2018).

Purpose of the chosen topic

The purpose of this chosen topic regarding 'safety issues in the construction industry is important to address the issues relating to this sector as stated above. The safety issues that also have been described above in the introduction section must be solved by saving lives and preventing lots of injuries and harm and so on from the workplace. Thus, proper safety training is needed along with compliance for showing the success and survival of the organization relating to this industry. Additionally, the workers' safety in the construction industry needs adequate training and education that needs to be added to reduce the rate or possibility of injury.
Importance of the selected topic

The importance or significance of this selected topic is to address the issues relating to the entire construction sector in the USA where safety management is necessary for making the workplace safe and healthy for protecting all the workers of the construction industry from illness and injury. Additionally, as it is inclined to lower or reduce the cost of injury, thus, the rate of employee turnover and absenteeism also needs to be reduced in a strategic way (Pan & Hon, 2020). Hence, increasing the overall productivity and quality are required for raising the morale of the employees accelerating the required business growth along with protecting the associated workers of those respective sectors in the USA.

Importance of the selected industry in this study

The importance of the construction industry that is mentioned in this study is to contribute to the entire economic growth of the nation, the USA where it is also known as the investment-led sector for showing a high interest to the government. Thus, the entire construction industry tends to develop the infrastructure that is associated with health and transport which also plays an important role for the workers making extreme struggles for the construction industry. Besides, this industry also plays values for the workers and robust the sources of the well-played jobs for creating the products that are highly and genuinely valued in this renowned industry in the USA domain.
Current problem and solution in the construction industry

Problem
The current problem associated with the safety issues of the construction industry is several work-related diseases such as asbestosis, repeated stress conditions and silicosis that may affect the hazardous situation. Hence, the consideration of making the management of safety in the respective industrial domain leads the people to the safety hazards that are being struck by several injuries, and the deaths of the construction sites (Mohammadi et al., 2018).

Solutions
The solutions relating to the safety issues in the construction sector in the USA are trying to make them the less risky option, preventing the access to the hazards, organizing the work for reducing the exposures to the hazards and issues the overall protective equipment. Besides, providing the welfare facilities and involving and consulting with the associated workers are essential for strengthening the culture of safety, implementing the identification and assessment plan of hazards, and measuring the impacts of that plan over time. The solutions regarding mitigating or overcoming the issues of safety in the construction industry can also be assessed by delivering the desired training to the workers, getting the workers involved and making them accountable and rewarding them for showing good activities if possible and construction site inspections and the safety meeting daily (Wang & Cheng, 2021).

Basic concepts and motivations of construction business

Basic concepts
The basic or the initial concepts relating to the topic as mentioned above are to create an influx in the overall material costs and improve the safety of the employees of the construction sector in the
USA. Moreover, reducing the investment within the domain of the real-estate sector can be performed by preserving the whole construction environment by preventing the effects and possibilities of several natural disasters and also involving the skilled manpower with stating the needs or requirements of the multiple clearances.

**Business motivations**

The business motivations in the entire construction industry in the USA are making associations of several incentive measures that need to be applied for bringing the workplace motivation for achieving the satisfaction of the workers and maintaining a proper balance among the interrelated motivational factors for bringing the higher production and performance as the strategic outputs for this industry. In addition to this, an adequate amount of mitigation needs to be developed among the respective industrial workers for solving the urgent issues for managing several projects relating to this industry and the overall engineering projects in the same industry (Tehrani et al., 2019). As the appropriate motivation, quality and productivity of the works are needed for increasing the growth and profits of the construction business, the contractors and several organizations must rely on the strategic human resources.

**Key issues impacting the respective business operations**

The key issues relating to making an impact on the business operations in the construction industry in the US are as follows:

**poor productivity**

As the construction industry is made up of small-scale and large-scale organizations, the small-scale companies tend to have low margins for deterring the upfront cost of the investment in technology that helps in improving productivity in the long run.
the rising cost of the building materials

Because of rising the cost of the building materials in 2020 where the steel prices are up to 45%-47% and copper has risen its cost by 70%-75% per metric ton and the prices of the aluminum also have risen by 50%-55% and the fuel prices also have risen by 43%-47% per liter (United States Department of Labor, 2020).

shortages of the skilled labor

The low number of qualified workers with the acquisition of the specialized skills were the new or innovative technology changes to the economic structure that leads to the rapid changes that may create the sudden oversupply and shortfall of the qualified individuals (Jaafar et al., 2018).

Lack of sustainability and efficiency

The lack of eco-friendliness generates more strategic values with the help of the process changes and the technology during reducing the usage and showing the environmental impacts. The application of eco-friendliness is inclined to add to all aspects of the business from producing and purchasing the marketing and distribution in the construction industry.

poor project performance

The poor performance of the construction project tends to be associated with improper planning, site management, decision-making, construction methods, shortage of labor, and technical personnel. Shortage of materials and the lack of quality and the improper design so far (Tabanfar & Pourbabaki, 2021).

Electrical Equipment

A significant area of concern for building site safety is electrical equipment. The presence of unsecured wires, sparks, or cables close to water sources are possible electrocution hazards that supervisors must be aware of.
All construction sites need to have the appropriate lockout/tagout system in place to manage dangerous electricity. To prevent these safety risks, team leaders and staff members in charge of handling any type of energy source should get the necessary training.

**Advantages and disadvantages of the selected system**

**Advantages**
As per the selected system, the advantages are addressing the effective safety programs that must be helpful in reducing the possibility of injuries and accidents where according to OSHA (occupational safety and health administration) do not perform the training programs associated with maintaining the regular-based safety that may also have the fatality rate that is five times bigger than that if the regular safety-oriented programs.

**Disadvantages**
The disadvantages of the selected system are the instability in the respective working surfaces, massive failure while using or applying the equipment of the 'fall protection and accessories along with several human errors so far.

**Ethical considerations**
The ethical considerations are the requirements of maintaining the ethical conduct with the building constructions in the construction sector while uncovering the prices, unbid cutting, and the improved documentation. Besides, making quick and long payments is needed for involving the subcontractors for overcoming the lack of the safety issues and delivering the fair treatment of the contractors in tender while negotiating the accounts and addressing the mini-statement of the
capacities and qualifications of the competitors for securing the environment at all. The ethical considerations of the construction industry must be related to the professional competence, improved work delivery, professional conduct and progressing the relationships between the contracting parties that carry out the developed relationships that must be considered for showing the less suffering of the individual in the construction industry (American society of safety professionals, 2019).

**Safety issues in the construction industry in the USA**

The safety issues in the construction industry or sector in the USA are as follows:

**Safety during excavation**

The excavations in case of the hazardous work are related to the trench in public areas, guards and barricades, fences that need to be provided for preventing the accidents and the excavation areas must be lighted for the night work adequately.

**Scaffolding**

Scaffolding, in the construction industry, uses a temporary platform for elevating and supporting the workers and the materials at the time of making construction, repairing, and cleaning of consisting of the convenient size of the heights with several methods for supporting and depending on the form of the appropriate usage and application too.

**Formwork**

The formwork, where the mold is used to form the concrete into the structural shapes including columns, slabs, shells, and beams for building works. Additionally, the formwork can be of fiberglass, steel, plastic, or timber where the inside surface is coated with the bond breaker for keeping the concrete from sticking to the mold.
Working at heights

The working at heights of the buildings rates the high-risk activities that refer to the works that are being undertaken in any place and in case no safety precautions or measurements are present, hence, as a result, the personal injury can happen to fall accidentally from a fragile roof or heightened building (Mahmoud et al., 2020).

Stacking and material handling

The stacking and handling of the materials need to be reduced for avoiding the sharp edges or the comparatively heavier loads. This can be controlled by staking the materials in the authorized areas and stacking the materials on a level surface that never makes the stacks within the segment of the width of the minimum base of the buildings.

Housekeeping works

The housekeeping work is not related to cleanliness at all where it includes the work areas neat and clean and in an orderly manner. Besides, sometimes, hall maintenance and floors come under the part of a slip and the trip hazards where the removal of the waste materials including cardboard and paper and the other fire hazards come from the working areas in the construction sector.

Practices of green environment in the construction industry for safety management

The practices of the 'green environment' in the whole construction industry include the reduction of the insects in the surrounding areas of the construction and sourcing the local materials relating to it. Besides, protecting the wells of the open holes safely, that opts or suitable for the non-toxic substances and are also used for getting reused for the building materials in the construction sector.
Additionally, avoiding the burying wastes and reusing the building materials come under the green environment practices in the respective industrial areas.  

_The practices of the 'green environment' also create and materials the management of safety in the construction industry. Those are as follows:_  

**Taking the initiatives relating to reducing and recycling wastes**  
Recycling the waste prevents the emissions of greenhouse gasses and the water pollutants that use the recovered materials and that generate the less sold assets comparatively. Recycling assists in reducing pollution because of the extraction of the processing of the materials of buildings.  

**Using sustainable suppliers and the production chains**  
The usage of the production chains and the sustainable supplier's association is required for putting the efforts of the organization for considering the human and the environmental impacts on the journey of the products through the supply chain from the domain of the raw materials that also source to production, delivery, storage and also creating the transportation link.  

**Enhancement of the usage of the renewable and the sustainable energy**  
Increasing the usage and application of the sustainable and renewable energy sources are necessary for improving the overall energy security, environment, and economy, involving construction transportation and industry may help in creating new jobs for meeting the local energy demands for assisting in improving the overall environmental protection so far.  

**Taking green initiatives for offsetting the carbon footprints**  
Taking the green initiation for practicing the 'green environment' is required for choosing the local and the organic food and buying the foodstuffs in bulk for using the possible reusable container and also reducing the wastage of food is needed for planning meals before the time (Sanni-Anibiree
et al., 2020). If necessary, composting the food waste needs to be done and eating lower in the food chain is also essential.

The reason behind showing the importance of choosing this topic

The actual importance of choosing this topic as mentioned and described above in detail just for managing the efficient health and safety at the respective workplace domain for ensuring the associated employees and also making them productive and happy. It is also entirely helpful or beneficial for deciding the costs of the human as well as the business relating to the injuries and the unnecessary lawsuits accordingly.

Hope the things for accomplishing the study by investigation

It can be expected by accomplishing my thorough investigation of this research topic that is taking proper health and safety measures for reducing the severity or intensity of the illness and injuries that are more likely to have occurred as well. Besides, reducing the amount of time where the employees can work on the construction site premises, thus, lowering the productivity and profitability of the construction business cannot be followed in case those safety precautions cannot be acquired timely (Ni et al., 2022). Besides, enduring a safety culture tends to make the safe workers and the safe jobsite in the construction domain and also adopting as well as enforcing the safety practices tend to eliminate the disruptions of the project where the required commitment must be developed for improving the zone of safety and improving the staff retention capacity that may attract the new or the innovative talents.
Summary of the topic

Based on the above-all discussions, it can be summarized that the leading hazards related to safety in the overall construction sites include falling, being caught between the objectives, and being struck by the objectives and the electrocutions respectively. Hence, all these hazards have caused the deaths and injuries associated with construction sites in the USA. In addition, safety concern is defined as the condition, practice and violation that may cause a substantial probability of the loss of property, physical terms, and several harmful impacts such as losing the railing on a stairwell. The tripping hazards that may be felt as the potential harm or cause of making harm to the people, environment, and the property. Several safety issues also are related to the construction industry along with the above-stated safety issues, those are the low-bid processes, transient workforce, hazardous environmental conditions due to the outdoor working situations and the multi-employer worksites and the always-changing job sites too.
Reference list


https://www.tandfonline.com/doi/abs/10.1080/10803548.2017.1366129

https://www.mdpi.com/271270


https://www.icevirtuallibrary.com/doi/abs/10.1680/jmuen.18.00028


https://aoh.ssu.ac.ir/browse.php?a_id=253&slc_lang=en&sid=1&ftxt=1&html=1

https://pdfs.semanticscholar.org/6335/51728c2f2144c1677d2eb1b9c52626807885.pdf


Architectural Management, 29(4), 1678-1714.