

Role of Engineers on Sustainability of Structures

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ABSTRACT

Construction has been among the factors used to determine the development in a particular area or era. Nevertheless, there are multiple factors, apart from the aesthetic needs, there is a need to have management, and the primary need of management is to ensure that the projected outcome has been attained. In construction, the results are usually released before the actual construction through architectural drawings. Nevertheless, the realization does not guarantee that the structure will be of the required standards. Thus, there is a need to involve management to oversee and govern all the activities in construction as per the established standards. One of the goals that the management ought to focus on is the sustainability of the structure. Sustainability is a product of many considerations including the choice of materials used, the design applied, and overall engineering concepts considered. In all these factors, there is a need for engineering knowledge since most of the drawings are more theoretical than real. With engineers of varying knowledge from electrical, civil, structural, and others, it may be possible to establish a structure that is sustainable and that meets the set standards. Thus, engineers have an upper hand in the establishment of a sustainable and standard structure. This research is based on literature reviewing various authors who have in different dimensions highlighted the sustainability of a structure and the role of the engineers in the same. This research is significant because it will help justify why management is necessary for construction, and engineering knowledge in the same measure.

KEYWORDS: Sustainability, Engineering, Management, Standards, and Process.

I. INTRODUCTION

When setting up a structure, various regulations and statutory measures are used to

ensure that safety and quality have been attained. This is why involving construction project management is a good idea. The construction project manager must bear skills that will acknowledge the need for engineering consideration during the construction. While the project manager may pose some benefits to the structure owner, they also help attain the qualities and standards set by the relevant authorities. For that reason, most countries have a requirement to use certified engineers to oversee and direct the construction process. Among the factors that have been considered in terms of sustenance is the impact that a structure will have on the environment. Thus, consideration of the materials used, the kind of structure set, durability and safety of the design used, and overall life of the structure. Therefore, engineers have the greatest role in guaranteeing sustainable, high-quality structures.

II. LITERATURE REVIEW

In most cases, construction management is applied in large-scale projects. Nevertheless, any construction may require engineering consideration to ensure it does not turn out to be hazardous. This is because the construction managers ensure that the standards set to ensure that the structure is safe are considered. For instance, it is crucial when setting a structure factor, such as the setting of the foundation. Thus, the role of engineers in setting up a structure is crucial. Thus, in project management, the team should comprise engineers, and the construction activities should also be spearheaded by them, regardless of the scale of the project. This can help ensure that the structures are environmental-friendly, safe, and sustainable.

Why Engineers?

Firstly, the engineers are involved in the planning of the structure prior to its establishment. During the planning, multiple factors are

considered per the survey conducted (Zavadskas et al., 2018). For instance, most nations have regulations where establishing industrial structures such as manufacturing plants are dedicated to particular areas. These regulations are as per the need to ensure that such structures do not impose any hazards on the environment and the inhabitants. Thus, one factor that affirms the need to involve the engineers is the assessment of the structural purpose. With a proper understanding of the purpose, sustenance will be guaranteed.

Secondly, in the consideration process, there is consideration of time. For instance, different types of foundations would like different times of failure to which the structures may be compromised (Zavadskas et al., 2018). For instance, if the chosen method during the excavation phase would be the anchored excavation, the time must be checked to ensure that the walls do not collapse. This means that if more than the needed time is taken when setting, such a foundation would be weak, and that structure will be of low quality and its sustainability compromised.

Thirdly, safety and quality management will be guaranteed with engineers on site. The issue of safety is a collection of procedures that add up to make the structure termed safe (Zavadskas et al., 2018). Using laymen to establish a structure may end up having a structure that may serve its purpose but be hazardous to the environment and people in the area. Taking an instance where a story building being established in a city, its collapse would mean affecting many activities in the area, endangering many lives, and possibly leading to the destruction of some infrastructure. In terms of quality and the attainment of a 'high-quality' status, many factors ought to be considered, including the materials of choice, the foundation, and construction practices. Thus, to have a reliable structure, the establishment should be done by engineers.

Role of Engineers on Sustainability of Structures

There has been an increase in social issues associated with the degradation of the environment. Similarly, there is an increase in society's awareness of how human efforts contribute to this degradation. According to Carvajal-Arango et al. (2019), this issue of sustainability in construction has entered the heart of major research as more measures are being sought to ensure that the rate at which global warming is increasing will be lowered. Carvajal-Arango et al. (2019) assert that this is a call for the construction agencies and stakeholders to respond to the call to be socially

responsible. In any business operation, there is a commitment that each makes in the bid to be of benefit to society. Among the common commitments that most of companies have made is to participate in caring for the environment by embracing environmentally friendly practices. This means that the management of the construction agencies should be considerate of having corporate social responsibilities that will show their concerns for the well-being of society. This means that the engineering practices in any construction should prioritize practices that will not endanger the environment.

The issue of sustainability has been in the public domain for a long. Thus, the stakeholders in construction should have proactive measures to ensure that they put in place measures that will contribute to environmental care. According to Bamgbade et al. (2019), it is much necessary for the construction firm, like any other business, to engage in practices that will boost its competitive advantages. There have been instances where people boycott services and products from particular companies due to the allegations of taking part in the pollution of the environment. This means that in construction management, there is a need to ensure that sustainable practices have been embraced. This can be done through research work that can help develop effective and environmentally friendly approaches. Argue that this can be attained by reviewing the mechanism used in the construction processes.

The issue of sustainability is based on the performance alongside the impact it has on the surrounding. While sustainability can be associated with the durability of the structure, the impact of the structure on the environment is also considered. According to Zavadskas et al. (2018), engineers have the primary role of designing, planning, constructing, and managing infrastructures. This means that their participation in the bid to ensure that sustainability is attained in the construction docket is significant. Thus, in the management of the construction, there is a need to ensure that engineers with innovative minds are involved before, during, and after the construction. This is to guarantee that safety measures, standards, and regulatory provisions are met.

Technology is among the advantages that have been used to create changes. Through technology, there have been various mechanization and overall easing of construction activities. In construction, there may be a need to involve engineers from different disciplines, including mechanical, electrical, and civil engineers. However, in construction, the management can

ensure that the involved engineers consolidate their minds to develop approaches that will help establish sustainable structures. According to Liu et al. (2019), building information modeling (BIM) is an example of the technological approaches that have been under scrutiny to assess their effectiveness. Nevertheless, technology has been used to have a three-dimensional picture of the structures, an advancement that gives the engineers a prior insight into the structure they are setting up. Xiao et al. (2018) opine that artificial intelligence has been implemented in construction activities, thus easing the construction's evaluation and progress. This is attained through applications that assess the projected construction, give recommendations, and give the engineers insight into the factors they ought to note before starting or actualizing the construction.

Research Methodology and Data Analysis

This research is based on the literature review where consideration of the already done research works was made. The chosen sources are those that fall under the engineering discipline or cover the topic of interest with respect to the sustainability of the structures. The chosen studies had to meet the criterion of not being more than ten years old to ensure that they present the most recent information.

This research is based on literature reviews, implying that there was no quantitative data that would require technical analysis. The analysis was majorly done by comparing how various authors have discussed the sustainability of structure and the role of engineers in the same. The qualitative approach of this study gave room for a broader view of the topic, unlike when the reliance is on a specific experiment. Also, it was much easier to pinpoint any issue of inconsistency and bias and avoid such sources. This helped in coming up with a paper that was precise and insightful.

III. RESULTS AND DISCUSSION

The issue of sustainability touches on many aspects, including energy and the environment. There have been calls to ensure that the structures set out do not contribute to the already predominant issue of global warming. Zavadskas et al. (2018) opine that sustainability, as a concern in construction, has gained attention 7.6 times in the last decade. The issue of global warming connects with construction and engineering through the impact that the structure will have on the environment. There are various ways through which the construction can prioritize the issue of sustainability in terms of energy usage

and waste materials. According to Talukhaba et al. (2013), the construction sector consumes a significant percentage of energy from the level of transport, hoisting, and concreting. This means that, as the engineers strategize how the building will be, they should also engage in research activities to ensure that they settle on the approaches that will help save energy. This can be through opting for non-motorized means, a move that can help lower the overall consumption of energy. Additionally, the choice of materials can also help since the labor needed for each kind differs. These considerations require technical knowledge to ensure that the choice made to reduce energy consumption does not compromise the quality of the structure.

There are some standard requirements in terms of the materials used which have been set to guide the construction. However, the standard requirements do not imply that there cannot be some adjustments. This is because different engineers are innovating different styles and structural designs, which may require some adjustment. An instance where a construction uses more steel than required means that the foundation set would likely be overweighted, increasing the risks of sinking. Similarly, using less of the same would mean that the structure will be weak. This means that the engineers would need to do a prior analysis of the construction through an evaluation of its intended use and the available or preferable construction materials. This will help foresee the possible defect that can affect the sustainability of the structure in terms of safety.

The role of engineers in establishing sustainable structures may be futile if innovativeness is not involved. Multiple innovations have been established in the bid to ensure that structure is sustainable. According to Berry (2021), construction has been associated with 24% of carbon emissions. However, some measures can help lower this rate through innovation, such as using waste material to model building bricks and materials to help conserve the environment. With such measures, engineers can ensure that the developed structures are sustainable and constructed with respect to the well-being of the ecosystem.

IV. CONCLUSION

In conclusion, construction activities are immense in both developing and developed countries. While in developed countries, the major activities are upgrades and renovations, there is still a need to ensure that the structure meets the standards that will help conserve the environment.

This can be attained through innovations where the engineers can engage in innovative technologies to help establish sustainable structures. The engineers should also take the challenge of lowering the high energy consumption rate to practice sustainable measures. Through innovations, the engineers can challenge the current practices as per their effectiveness. Thus, the management can consolidate the ideas from the engineers of different disciplines, including civil, mechanical, and electrical, to develop sustainable approaches that will guarantee the realization of high-quality and sustainable structures. Similarly, technological advances use artificial intelligence, which helps create efficiency in realizing competency.

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