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Automation in Construction Industry it's Application and Barriers to Implementation on Construction Site

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Abstract: *Automation is transforming the construction sector, providing benefits such as better productivity, improved safety, and lower prices. Automation is used in a wide range of construction applications, from heavy equipment to off-site construction approaches such as prefabrication and modular construction. In front of this, the focus of this research is to determine the extent to which the use of automation, if entirely applied in construction sector, it also has a negative impact on the delivery of building projects. Modern equipment has helped the development of the construction industry. Several disadvantages of automated constructions are causing worker displacement, creating emotional stress for the workers, higher level of maintenance, high capital expenditures, causing geographical displacement of workers, lower degree of flexibility, employee dissatisfaction, decrease in productivity and the enslavement of labor by automated machinery.*

Keywords: Construction sector, building projects, geographical displacement, automated machinery

I. INTRODUCTION

Automation has become a crucial aspect of various industries, and the construction industry had no exception. The application of automation in construction offers numerous benefits, including increased efficiency, improved safety, and reduced costs. However, despite its potential advantages, there are several barriers to the implementation of automation on construction sites. More people are currently migrating from villages and certain other rural areas to the cities because of rapid urbanization, so that the infrastructure must also be reevaluated to manage the increase in Population growth. The construction sector is very important for developing country's economy.To meet the increased demand from the population, urge for the introduction of modern technologies. Using one of the methods are now promoted by those involved in the construction robotics and automation for building tasks in the business. The construction industry requires a lot of workers. In robotic systems and automation have proven to be very successful in reducing labor costs while boosting productivity and quality. Robotic systems can also decrease injuries and relieve workers from executing high - risk activities make the case that robotics and automation technologies have the capacity to solve the productivity issues that face the building sector because construction techniques have reached their limits.

II. LITERATURE REVIEW

Automation in the construction industry has gained significant attention in recent years due to its potential to improve productivity, safety, and cost-effectiveness. This literature review aims to provide an overview of the application of automation in the construction industry and identify the barriers to its implementation on construction sites. The review will explore various studies, research papers, and industry reports that discuss the different applications of automation in construction, such as the use of robotics, drones, and advanced machinery. It will also examine the benefits that automation brings to the industry, including increased efficiency, improved safety, and reduced costs. Furthermore, the review will analyze the barriers that hinder the implementation of automation on construction sites. These barriers can include high initial investment costs, resistance to change, and the complexity and variability of construction projects.

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Prof. PravinSahare et.al (2022)learned that automation technology is a good way to increase the manufacturing technology and reduce the manpower, its use will give good speed to the construction work and speed up the development. This will reduce the wastage of material in the construction work and will also reduce the time taken in the construction work, every work will be completed with its completeness. This research it can be summarize that barrier will Minimized by developing of technologies that are easier to use and understood and training program for workers.

Amit Srivastava et.al(2022) analyzed the importance of automation in the construction industry in this paper. They have divided the technologies like IoT, RFID, AI, edge and fog computing, big data and cloud computing, and AR, MR, and VR into distinct categories to address the technologies that drive automation. Automation in the construction sector is becoming more likely thanks to the integration of many developing technologies including edge and fog computing, AI, and IoT.

Li Yunze et.al (2021) studied that the advance of productive forces and environmental protection are greatly affected by the automation of industrial machinery. China's construction equipment automation industry continues to experience the qualities of rapid expansion, performance in terms of energy usage, resource consumption, waste production, and other key areas. We must include the idea of energy saving and environmental protection in the field of automation for construction equipment as an outcome of the policy of resource conservation and environmental protection.

W. Poppy et.al (2021) analyzed that the status of automation and robotics in construction in Europe. The existing recession has hampered European progress in all areas of automation and robotics in building. Even though there are many positive examples of automation and robotics in the construction firm, there's also a time lag when compared to other relevant sectors of the sector. To ensure its safety and working conditions in the construction industry, improve quality and output and save costs, that delay must be made up. Some of the barriers in the construction industry are due to a lack of interest in the industry. The absence of electronic systems and components, as well as a lack of trust in their lifetime, was a difficulty in earlier years that has been resolved.

Aleksandra Anna Apolinarska et.al (2021) studied that robotic assembly of timber joints using reinforcement. In many manufacturing sectors, automated assembly utilising robotic technology is widespread, but it is still in its infancy in the building industry. The work that is currently being presented only touches on a small portion of an automated assembly process for timber production. They discussed automation-related issues that define architectural building from other industrial sectors: the presence of errors and limited series, when using wood elements at this size, the control strategy can accommodate the tolerances, errors, and deformations that naturally occur.

A V Kulikov et.al (2021)investigated that the field of robotic technologies for concrete building construction is still in its beginning phases, making them difficult to apply and under development. According to literature, traditional building construction methods have been found to be unsuccessful, and the construction sector may innovate to promote health and safety and save down on time and costs. According to the systematic study, the USA had the most researchers working on robots in concrete building construction, followed by Germany and Switzerland. Low-rise constructions were the main target of the on-site robot application and technology.

Ayodeji Okeet.al (2019)investigated that over the past 20 years, the construction industry in South Africa has seen major transformation. To satisfy the increasing need of the population, there has been a demand for the adoption of recent technologies. This research aimed to investigate the harmful impacts of construction automation on the South African building industry. Over the past 20 years, the South African construction industry has seen major transformation. To satisfy the population's increasing need, there has been a call for the adoption of contemporary technologies. This research was designed to look into the negative effects of automation in the construction industry on South Africa.

Soomin Lee et.al (2019) analyzed that compaction quality in construction site. The compaction of heavy machinery cannot be updated in real time using traditional techniques, which are still in use. In order to manage compaction operations, this study set out to create an intelligent compaction system and improve the quality of existing. In order to determine the direction of future study, further experiments in various soil or aggregate types must be conducted.

Juan Manuel Davila Delgado et.al (2019) studied the primary objective should be to reduce project risk while considering contractor-side economic concerns. The main issue that stakeholders should consider when it comes to technical and professional factors is the challenges that come with having humans and robots working together.

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Robotics and other technologies' effects on the construction sector must be considered, as well as their potential to increase efficiency and reduce prices. Robots are expected to replace workers in many areas of the construction industry, but they must also offer comparative benefits over humans in these areas.

Opeoluwa Akinradewo et.al (2018) concluded that construction automation and robots will increase supervision, working conditions, cost effectiveness, and product quality as well as have a favourable effect on the project delivery. According to the survey, the South African construction sector is ready to use robots and construction automation. This indicates that industry experts are prepared to use robotic and construction automation in order to increase working conditions, boost worker productivity, enhance health and safety, enhance scheduling, and enhance the general efficiency of building projects.

K. Asadi et.al (2018) studied that hourly peak were impacted by the daily pattern of temperatures, but wind speed changed this consistent pattern and may even have been the cause of two peaks occurring in some instances. In higher elevations, the number of airborne pollen may be higher depending on the kind of building, the time of day, and the wind. The findings of this study contribute to the definition of environmental factors (airborne pollen) that should be taken into account when developing structures and the subsequent integration of its modelling in urban planning.

Robert Bogue et.al (2018) investigated that construction has been mostly unchanged for decades, that has resulted in an industry with such a flat rate of productivity, a poor safety record, rising costs, excessive material waste, and a labor crisis. Robotics is anticipated to be a critical part of the technological innovation required to get past these limitations. This essay has proven that the numerous robots currently being produced or in advanced stages of development may certainly go further than many of these restrictions. This vision is quickly becoming a reality**.**

G V Mikheev et.al (2017) studied that significant reduction in construction time, and the special combination of compactness and power of robots finds their use within the most tough situations and remote areas on the building site. The advancement of robotic technology is related to builders' aim to reduce labor cost and increase revenues. The automation of construction machinery has an important impact on the development of productive forces and environmental protection. China's construction machinery automation field still has the characteristics of extensive development, and performance in the fuel consumption, resource consumption, waste generation and other main aspects.

Vahid Faghihi et.al (2015) analyzed that scheduling is one of the most significant issues in the world of construction management, and this paper provides an overview of the current solutions. They have employed a number of other techniques to improve project scheduling. The genetic algorithm has already said, been employed most frequently to address every area of scheduling. Project scheduling is one of the most significant issues in the world of construction management, and this paper provides a summary of the current solutions. Researchers have tested with a variety of methods to improve project scheduling.

F. Mondad et.al (2015) analyzed the most research findings on automated mobile robot building. Today's space research institutions aim to develop infrastructure away from human involvement, while building contractors regard robots as having the ability to increase construction quality, efficiency, and safety, as well as provide more flexibility in architectural design. This study discusses and categorises pertinent studies in terms of robotic systems, materials, and applications. We also explore future robotic requirements for automated building while identifying current difficulties.

Piyush M. Kale et.al (2014) focused this article for designing and developing Low-cost Automatic wall plastering machine. Building managers must carefully consider if automating traditional construction processes will be possible given the continuously growing field of construction automation. This decision requires a thorough analysis of both concrete and abstract elements, involving need-based, economic, technological, project-specific, and safety/risk criteria. On using this Can plaster between 500 and 750 square meters per day whereas masons require more time and costs, increasing output, free, and simple to move about, superior performance. Reduce project costs and critical time.

Jongwon Seo et.al (2011) presented the excavation task planner's structure is in this paper, along with some of the system's essential elements, such as work environment partitioning and excavation path generation for platform locations. Extra features, such as path planning between platform locations, are currently being developed and will be protected elsewhere. Although being a part of the Intelligent Excavating System, the excavation task planner can also be used to create comprehensive plans for ongoing traditional excavation projects.

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ShiyaoCaia et.al (2010) investigated that this paper provides a valuable aid in future research and application of automation and robotics technology for high-rise buildings focus on three construction sub-phases—earth and foundation, superstructure erection, and exterior construction study will give a comprehensive assessment of recent research and developments in the region. Based on the literature, the report also examined potential future paths for each construction subphase.

Ehsan Rezazadeh Azar et.al (2008) studied about the automation level of earthmoving equipment operation and control, this article offers a thorough analysis of current achievements in academic and industrial areas. The three main steps of this background investigation were a review of current industry developments in the sector, a thorough literature assessment in six top construction engineering and automation publications, and a review of following research papers in additional academic resources. The applicable techniques, presumptions, and limits of the four types of identified innovations were reviewed.

Rohana Mahbub et.al (2008) studied that several barriers are stops the implementation of automation in construction industry. There is strong evidence from the literature and analytical data findings that the characteristics of the construction industry and the attributes of individual companies, along with consideration of their barrier variables, have an impact on the implementation of automation and robotics in the industry.

Auton. Robots et.al (2007) analyzed according to his research, development, and industrialization in the construction industry over the past three decades, we can produce customized building products at reasonable construction costs with constant quality and human-oriented working conditions by using robotic technologies in prefabrication, on-site construction, and services.

Judith Watson et.al (2007) investigated according to the literature on the construction industry, barriers to skill development are produced by the way labor markets are organised there. It is sometimes advocated that the solution to these obstacles is "employer involvement," which results in higher "buy-in" towards skills development and investment by companies. This case demonstrates that employer engagement alone is insufficient to get beyond the obstacles the labor market structure has put in place.

Taehoon Kim et.al (2007) looked into the structure of keyword networks as well as big problems and relations in the field of robotics and construction automation research. The methodology used in this study can successfully support in obtaining useful information at various levels and views based on quantitative indicators for determining the current trends and relational patterns in a huge sector. As a result, the findings of this study can offer not only helpful understandings of the knowledge structure and research trends, but also information on future possible directions of R&D in the field of construction automation and robotics.

III. CONCLUSION

The above reviews shows that the advantages and barriers in implementing automation in Construction industry. Robotics has a lot to offer the construction sector, but adoption rates are quite low. The barriers to the use of robotics in the construction industry were studied quantitatively and qualitatively in this paper. The primary adoption-limiting problems were identified, identified, and evaluated in this study using a mixed research methodology. In order of priority, the four key difficulties that were found were classified into the following categories: Economic factors on the contractor side, client side, technical and work culture, and weak business case are listed in that order. The identified factors' internal consistency was tested using a reliability analysis, which revealed that the data that was gathered had adequate internal consistency.

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