

REMEDIES OVER BARRIERS OF AUTOMATION AND ROBOTICS FOR CONSTRUCTION INDUSTRY

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Abstract: In construction, automation and robotics technologies implementation can be fairly broad, including all stages of the construction life-cycle, from the initial design, through construction of the building on site and building maintenance or control after the building has been completed to the eventual dismantling or demolition of the building. The degree of automation and robotics systems implementation in construction varies significantly from one construction phase to another. Nowadays, unlike the use of automation systems or robots for on-site operations The most significant benefits of robotics and automation systems application in construction industry are enhancing productivity and work efficiency with reduced costs, solid quality with higher accuracy than that provided by skilled workers, occupational safety enhancement for workers and better safety for the public by deploying machines for dangerous works, work environment conditions improvement in that common manual work is reduced to a minimum, the workers are discharged from uncomfortable work positions, etc. In this paper also mention the barriers and remedies of automation and robotics in construction site.

Keywords: Automation, Robotics, Remedies, Barriers

I. INTRODUCTION

Automation is defined as a self-regulating process performed by using programmable machines to carry out series of tasks. Introducing the use of machines to a production process is called mechanization. Automation goes one step further and the process is not only supported by machines but these machines can work in accordance with a program that regulates the behavior of the machine. Construction automation has been described as the use of mechanical and electronic means in construction to achieve automatic operation or control to reduce potential exposure, time or effort while maintaining or improving quality. Construction work is labor-intensive and is conducted in dangerous situations, also the work content and materials change frequently. Robots are used widely to help human workers in construction sites. This approach demonstrates a decentralized, autonomous, flexible, simple, and adaptive approach to construction. Therefore, construction robotics has been a very hot research area in the construction industry. The main goal of this paper is to convince building designers and managers to incorporate robotic systems when managing modern buildings to save manpower and improve efficiency. In this paper, the main objective is to discuss the obstacles and remedies over the barriers while implementing automation technologies in Indian infrastructure projects.

II. OPPORTUNITIES AND CHALLENGES IN INDIA'S AUTOMOTIVE MARKET

There is a rapidly growing domestic market. Growth is also visible in automotive export markets. There are well trained, talented engineers and workers. Companies that aggressively adopt leading-edge technologies and standards will have a clear competitive advantage in the global automotive market. The importance of India and China as drivers of global growth is well documented. For instance, in 2009, India accounted for 2 % and China 4 %, which is projected to rise to 23 % for India and 18 % for China by 2030. India and China are also projected to have over 50 % of global middle class spending by 2050.

III. IMPLEMENTATION OF AUTOMATION AND ROBOTIC TECHNOLOGIES IN ON-SITE CONSTRUCTION PROCESS

Automation and robotics in construction work execution has various advantages that could help the implementation of these systems. Among the most meaningful advantages belong:

- i. Less dependency on direct labour** – fewer problems related to quality and the repetitiveness of work carried out, as well as costs may be reduced by reducing labour, whereas less operators are needed for the automated system;
- ii. Productivity increase** – besides the speed of production increasing the productivity is improved by disengaging the operation of the limitations of the human factor;
- iii. Occupational safety increase** – the automated systems may carry out their work in dangerous zones for humans, this makes it possible to reduce labour injuries;
- iv. Quality increase** – operations with automated and robotized systems are typically carried out with less variability than human workers;
- v. Greater control over the productive process** – problems may be detected in an easier way as each stage of the process is controlled in order to verify the correct functioning of the system and the result of each one;
- vi. Greater control over the final result of the process** – the final result may be controlled in a more efficient way by controlling the result of each step of the aforementioned process.

IV. BARRIERS

The study revealed numerous barriers to the consideration of construction automation in the design phase. As with the recommended design practices, the barriers can be separated into those that exist at the project level and those are present industry-wide. Project-level barriers are as follows:

1. Automated technology capabilities are limited and create tremendous costs when contractors attempt to match project variability with automated equipment variability.
2. Frequent changes/advances in the technologies. Technological advancement and improved design occur rapidly and many users cannot keep up with the changes.
3. The cost of owning and operating automated technologies.
4. A lack of standard design elements. Repetitious elements are likely to lead to greater utilization of automated technologies.
5. “No two sites present the same problems, and a layout suitable for one site maybe quite unsuitable for another.”

A lack of consideration of the construction phase by the designer, due to the means and methods residing with the constructor. Other barriers exist that are not necessarily applicable

to a specific project, but are representative of the nature and structure of the construction industry. These industry-wide barriers are as follows:

1. Designers typically have limited construction experience. There should be pre-construction consulting between the designer and constructor concerning cost saving construction methods.
2. Designers typically have limited knowledge of automated technologies. There should exist consulting between designers and constructors concerning automated technology availability and potential implementation.
3. Designers typically have limited knowledge of the design practices, which facilitate the use of the automated construction technologies.
4. A general lack of designer interest in considering automated technologies in their designs.
5. The structure of, and the roles associated with, the traditional design-bid-build contracting method. Barriers exist which limit the amount of preconstruction consulting and communication that can occur.
6. The traditional roles and responsibilities of the designer. Traditionally the means and methods of construction have been the responsibility of the constructor. Consequently, a designer's ability to influence the implementation of construction methods has gone unused or unrecognized.
7. Resistance to change from the commonly used design practices.
8. Some designers view change as high risk, because there exists a level of uncertainty and untested consequences. Particularly risk associated with implementing automation.
9. Conflict of interest on public projects when contractors are brought in during design. Publicly funded projects are required to be competitively bid, limiting the pre-construction communication between constructors and designers.
10. Lack of reference material available for designers to use for consulting.

V. REMEDIES

Remedies over the obstacles while implementing automation technologies in Indian infrastructure projects are as follows

Remedies over High Cost: The high cost is main obstacles in implementing automation. The automation technology is so expensive. The infrastructure construction company should apply the automation technology for greater productivity and good quality of work. The company should take loan from World Bank at low interest to implement the automation technology. Indian Infrastructure Company should take loan from World Bank and Reserve Bank of India at low interest to proper implementation of automation technology. Government incentives should be given to contractors, builders and infrastructure companies for using innovative approaches to construction.

Remedies over Limited Resource Available to Small and Medium Size Firms: For small and medium size firms the resource should be available for using automation technology is less? The funds available for implementing automation technology are less as compared to big construction companies. To overcome from improper funding companies should tie up to other companies to implement automation technology. They should form joint ventures to purchase the automated technologies and use this automated technology together.

Remedies over Automation Technologies are Expensive to Update and Maintain: The remedies over automation technologies to update and maintain are getting loan from World Bank and the automation should be properly used and maintained. The automation technology should be updated and maintained tie to time for proper working operation. It should increases the productivity of machines or project.

Remedies over Automation Technologies are Unavailable Locally or Difficult to Acquire: The automation technologies are unavailable locally or difficult to acquire, the company should get in joint ventures with company uses this automated technologies and get the technology from somewhere else.

Remedies over low technological knowledge to workers: The technologies are not as easily accepted by worker. They have no knowledge about automation technologies. Considering the re-training of construction workers, to supervise maintain and programmed the technologies are not seen as a way to replace the worker. The training can be incorporated through a set of necessary upgrading skills for semi-skilled worker or through seminars and workshops. Change in education and training of construction professionals, this is relevant if there is to be increased understanding of the technologies in the industry and on the worksites.

CONCLUSION

Robots are increasingly involved in construction operations to maintain highly accurate actions and to reduce hazardous risks achieving improved control and safety. Automated construction can be further developed to include: design, engineering, maintenance of existing and planned structures. As the main objective of this paper is to state remedies over the barriers in implementing automation technologies in Indian Infrastructure Projects and Construction Firms.

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