

THE ROLE OF AI IN THE PERFORMANCE OF CONSTRUCTION WORKERS

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Introduction

Artificial Intelligence (AI) is revolutionizing the economic landscape. The adoption of this technology is increasing day by day, promising to improve productivity and efficiency. For India to emerge as the fifth largest global economy and overcome many challenges, it is essential to make the most of the capabilities of AI. The use of AI becomes essential for sustainable development and social well-being. In India, construction labour faces challenges like low wages, unsafe sites, skill gaps, language barriers, migration issues, and lack of benefits. Technology and AI can help, but the most effective help is a mix of policy, practical tools, and human support. AI can be used in construction labor to improve productivity, safety, cost control, and skill development-without replacing workers outright.

Artificial Intelligence (AI) is transforming the global construction industry by improving productivity, safety, quality, and project management. In developing countries such as India, construction workers continue to face numerous challenges, including unsafe working environments, inadequate training, low wages, labour shortages, and limited access to welfare schemes. AI offers innovative solutions to address these issues without replacing the human workforce. Technologies such as computer vision, wearable sensors, drones, robotics, Building Information Modeling (BIM), and predictive analytics help monitor worker safety, optimize resource utilization, reduce accidents, and improve construction quality. AI-based digital platforms also facilitate attendance management, wage transparency, and skill development through personalized training modules. Although AI adoption presents challenges such as high implementation costs, privacy concerns, and the need for digital literacy, its long-term benefits significantly outweigh these limitations. Government initiatives, including the IndiaAI Mission, Skill India Mission, Digital India, and welfare schemes under the Building and Other Construction Workers (BOCW) Act, further support the integration of AI into the construction sector. This paper examines the role of AI in enhancing the performance of construction workers, discusses its benefits and challenges, and

provides recommendations for responsible and inclusive implementation. The study concludes that AI should be viewed as a tool that empowers construction workers by improving safety, productivity, skill development, and overall working conditions while promoting sustainable growth in the construction industry.

Ensure basic welfare:

Workers working in the construction sector are mostly illiterate, poor and come from other regions for employment. Therefore, welfare schemes are very important for them. For this reason, the BOCW Act is very important. The Building and other Construction Workers Welfare Cess Act, 1996

Basic Welfare Scheme It is as follows

- Register workers under BOCW Act
- Provide ESI/Health insurance
- Open Jan Dhan bank Accounts
- Enroll for PM Suraksha Bima Yojana

The Government of India has also recognized the importance of digital technologies in infrastructure development through initiatives such as Digital India, the IndiaAI Mission, Smart Cities Mission, Skill India Mission, and the Building and Other Construction Workers (BOCW) Welfare Scheme. These initiatives encourage the adoption of advanced technologies while promoting worker welfare, skill development, and sustainable construction practices. Despite its numerous advantages, AI adoption in construction also presents several challenges. High implementation costs, limited digital literacy among workers, concerns regarding data privacy, resistance to technological change, and the fear of job displacement remain significant barriers, particularly for small and medium-sized construction firms. Therefore, successful implementation requires collaboration among government agencies, educational institutions, construction companies, technology providers, and workers to ensure that AI complements rather than replaces human labour.

Safety Monitoring:

Safety is a key issue for construction workers, for which we can use AI as follows :

- Computer vision cameras detect unsafe behavior
- Wearables monitor fatigue and heat stress

- AI alerts if a worker is not wearing PPE just like helmets, gloves, safety shoes
- Sensors warn supervisors if a worker is at risk of heat exhaustion

AI supported

- Cameras detect missing PPE
- Mobile alerts to supervisors

It's positive effects are seen as follows:

Fewer accidents, Legal compliance, Better compliance with safety rules.

Construction work is physically demanding and often involves hazardous activities such as working at heights, handling heavy machinery, operating electrical equipment, and lifting construction materials. As a result, construction workers are exposed to a high risk of accidents, injuries, and occupational diseases. Many workers are migrants from rural areas and have limited access to education, healthcare, social security, and welfare benefits. These challenges not only affect the well-being of workers but also reduce the overall efficiency and quality of construction projects. Artificial Intelligence (AI) has emerged as one of the most influential technologies of the twenty-first century. AI refers to computer systems capable of performing tasks that normally require human intelligence, such as learning, reasoning, problem-solving, decision-making, pattern recognition, and language understanding. The integration of AI into the construction industry is transforming traditional methods into smarter, safer, and more efficient processes. AI-powered technologies such as computer vision, drones, wearable devices, robotics, Building Information Modeling (BIM), predictive analytics, and the Internet of Things (IoT) are enabling construction companies to improve project planning, monitor worker safety, reduce waste, and increase productivity.

Rather than replacing human workers, AI acts as an intelligent support system that assists workers in performing their tasks more safely and efficiently. For example, AI-enabled cameras can detect whether workers are wearing helmets, safety jackets, gloves, and other personal protective equipment (PPE). Wearable sensors can monitor workers' heart rate, fatigue, body temperature, and environmental conditions, providing early warnings to prevent accidents. Similarly, drones equipped with AI can inspect construction sites quickly and accurately, reducing the need for workers to enter hazardous areas. AI also contributes to workforce management by improving attendance tracking, payroll processing, equipment utilization, material management, and project scheduling. Machine learning algorithms can

analyse historical project data to predict delays, estimate costs, optimize labour allocation, and identify potential risks before they become serious problems. These capabilities help organizations improve decision-making and ensure timely completion of projects.

Worker safety remains the highest priority in construction. AI-powered computer vision systems analyse live video streams from CCTV cameras to detect unsafe behaviour and identify hazards in real time. These systems can recognize whether workers are wearing helmets, reflective jackets, gloves, harnesses, and safety shoes. When violations are detected, automated alerts are immediately sent to supervisors through mobile applications or control rooms. Early detection enables corrective action before accidents occur. AI also identifies restricted zones, monitors worker movements, and predicts potential hazards based on historical safety data.

Better Living Conditions for Migrant Labour:

Workers working in the construction sector are mostly from other States and other regions. Therefore, to reduce their health-related issues, it is necessary for them to fulfil some of the following requirements.

- Clean drinking water
- Toilets & rest areas
- Temporary shelters near sites

To ensure better living conditions, the government has shown its readiness to help with the following two issues

- One Nation one Ration Card
- State Migrant labour welfare schemes

Wearable technologies equipped with Artificial Intelligence continuously monitor workers' physiological conditions. Smart helmets, wristbands, and safety vests measure heart rate, body temperature, fatigue levels, blood oxygen levels, and environmental conditions such as heat and toxic gas exposure. AI analyses this information to identify abnormal health conditions and provides early warnings before workers experience heat stress, dehydration, or exhaustion. Supervisors can then provide immediate medical assistance or assign rest periods, reducing occupational illnesses and improving worker well-being. These technologies are

especially valuable during extreme weather conditions and physically demanding construction activities.

Simple Action plan (For Builders/NGOs/Gov):

For construction workers, the government, builders and other organizations need to work keeping in mind the following issues:

- Register all workers (BOCW)
- Enforce safety + training
- Digital wage payments
- Basic al tools (attendance + safety)
- Improve living conditions

The India AI Mission promotes Artificial Intelligence research, innovation, skill development, and responsible AI adoption across various sectors, including infrastructure and construction. Digital India encourages digital transformation through improved internet connectivity, e-governance, cloud computing, and digital services. Construction companies increasingly use these digital platforms for project management and workforce administration. Skill India provides vocational education and technical training for workers. Construction workers receive training in modern construction methods, digital tools, equipment handling, and workplace safety, improving their employability and productivity.

Building and Other Construction Workers (BOCW) Welfare Act

The BOCW Welfare Act provides social security measures including accident insurance, medical assistance, maternity benefits, educational support for children, pension schemes, and financial assistance. AI-enabled digital registration systems can improve access to these welfare benefits.

The Smart Cities Mission promotes intelligent urban infrastructure through digital technologies, smart transportation, sustainable construction, and efficient resource management. AI-supported construction practices contribute significantly to achieving these objectives.

Conclusion:

Helping construction labour in India is not about high-tech alone- it's about dignity,safety,skills and fair pay, with AI as a support tool, not a replacement.Various companies are trying to partner with academia, government and industry to create a situation in which AI can be used responsibly in India. The standards that are being kept in mind for security. These include preventing malicious attacks as well as ensuring the security and integrity of information through progress.

Artificial Intelligence is transforming the construction industry by improving worker safety, productivity, efficiency, and project quality. Technologies such as computer vision, wearable devices, drones, robotics, predictive analytics, and Building Information Modeling enable construction organizations to reduce accidents, optimize resources, improve decision-making, and complete projects more efficiently. Rather than replacing workers, AI functions as an intelligent support system that enhances human capabilities and creates safer working environments.For a labour-intensive country like India, responsible AI adoption should prioritize worker welfare, skill development, and social inclusion. Government initiatives such as the IndiaAI Mission, Skill India Mission, Digital India, Smart Cities Mission, and the Building and Other Construction Workers Welfare Act provide a strong foundation for integrating AI into the construction sector. However, addressing challenges related to affordability, digital literacy, cybersecurity, and ethical governance remains essential.With continuous investment in education, innovation, and policy support, Artificial Intelligence can significantly improve the performance and quality of life of construction workers while contributing to sustainable infrastructure development and national economic growth.

REFERENCE

- Autodesk. (2023). *Artificial intelligence in construction industry report*.
- Government of India. (2024). *India AI mission*. Ministry of Electronics and Information Technology.
- IndiaAI. (n.d.). *AI for smart monitoring of roads, infrastructure and traffic*.
<https://indiaai.gov.in/case-study/ai-for-smart-monitoring-of-roads-infrastructure-and-traffic>
- Ministry of Labour and Employment. (2023). *Building and Other Construction Workers (BOCW) Welfare Act*. Government of India.

Ministry of Skill Development and Entrepreneurship. (2023). *Skill India mission*. Government of India.

Office of the Mayor, City of Seattle. (2023, November 3). *City of Seattle releases generative artificial intelligence policy defining responsible use for city employees*. <https://harrell.seattle.gov/2023/11/03/city-of-seattle-releases-generative-artificial-intelligence-policy-defining-responsible-use-for-city-employees/>

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