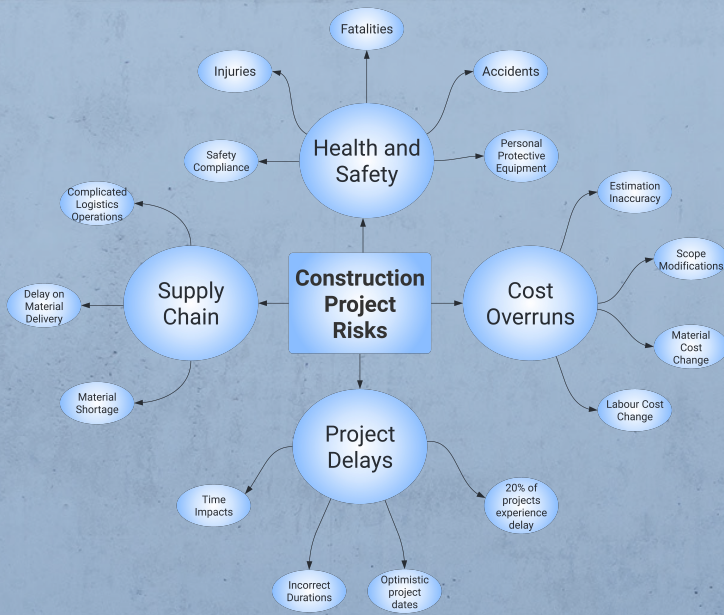


AI IN CONSTRUCTION RISK MANAGEMENT

Context



Abstract

This study is about the effectiveness of artificial intelligence applications in managing risks in construction industry. The aim is to explore the capabilities of artificial intelligence and automation for a better risk management. Secondary research using Science Direct is conducted to assess the capabilities of artificial intelligence in risk management. Risks faced in the construction sector such as safety incidents, schedule setbacks, cost overruns, and delays in the delivery of materials. To address these issues effectively, a thorough analysis and implementation of mitigation strategies are essential. Adopting a data-driven strategy, facilitated by artificial intelligence (AI), machine learning, and sophisticated data collection technologies, can significantly enhance risk management. These tools allow for real-time analysis, offering a substantial benefit in proactively managing risks. Given that construction projects often differ greatly in terms of location, weather, and other factors, risk management must be tailored to each project's specific needs, relying heavily on data analysis and forecasting. AI excels at sifting through large volumes of data to identify trends and make accurate predictions, thereby playing a pivotal role in enhancing risk management strategies through proactive analysis. However, the major finding is that despite the success of the advancements in artificial intelligence, the construction industry faces challenges in prompt adoption of advanced technologies. These challenges are mostly caused by the cost and time needs to be invested as well as the lack of knowledge about advanced technologies. This requires further studies to find appropriate methods for implementation of advanced technologies for construction industry.

Method

The study investigates how artificial intelligence (AI) can enhance risk management in construction. It focuses on the practical application of AI to mitigate risks and gain insights into its potential in risk management. Using search terms like 'construction', 'artificial intelligence', and 'risk management', case studies from the past decade were collected from database Science Direct. Data analysis involved comparing these case studies to identify factors influencing AI integration and uncover complexities in implementation. While providing valuable insights, limitations were encountered in obtaining a diverse range of case studies, constraining the scope for comprehensive findings on AI's contrast with traditional methods.

Explore the capabilities of artificial intelligence on the path of a better risk management in construction projects.

Investigate the potential enhancements in risk management facilitated by artificial intelligence and advanced technologies.

Aims

Utilizing on and off-site real-time data analytics, along with recent technologies like drones, Building Information Modeling (BIM), and prefabricated building approaches, can enhance hazard detection and assessment in construction. These advancements help mitigate common hazards such as poor time management, safety risks, and adverse weather conditions. Automation and advanced data collection techniques enable organizations to foresee trends and minimize threats, offering a competitive edge.



OpenAI DALL-E (2024)

Research



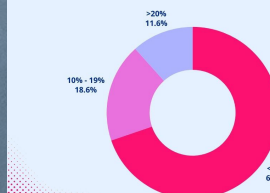
OpenAI DALL-E (2024)

The analysis reveals that significant capital projects often face substantial delays and budget overruns. When considering artificial intelligence adoption, it's crucial to weigh both cost and time implications. Implementing AI requires significant financial and time investments, including acquiring technology, hiring experts, and training staff. Integrating AI into workflows can be complex and time-consuming. McKinsey & Company (2022) suggests ROI from AI adoption can be challenging, emphasizing the need for careful assessment. Nonetheless, some companies have successfully reduced costs, while others have seen revenue increase after implementing AI in risk management.

AI tools are crucial for constructing reliable risk assessment models, particularly for cost overrun mitigation in construction projects. These methods address complex uncertainties in project outcomes, employing various independent and combined approaches. However, inherent limitations necessitate hybrid methods integrating AI techniques, popular for effectively managing uncertainties. Simulation, especially Monte Carlo Simulation (MCS), aids decision-making by generating multiple potential outcomes based on historical data. AI-integrated risk management methods are adaptable to project needs, dynamically handling schedule risks and streamlining complex computations.

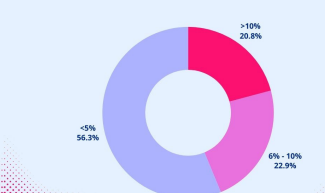
Companies Decreased Cost

AI-Related cost decrease in 2021 related to risk



Companies Increased Revenue

AI-Related revenue increase in 2021 related to risk



Number of companies adopted AI in risk management which decreased costs and increased revenue (McKinsey & Company, 2022)

Conclusion

The study highlights the success of artificial intelligence in risk management but notes the construction industry's slow adoption of technological advancements compared to other sectors. To stay competitive, construction firms must embrace digitalization. While AI applications have progressed, their implementation in construction lags. The study underscores the need for further research addressing challenges in AI adoption, proposing solutions to drive development in the industry forward.

OpenAI DALL-E (2024) DALL-E response to Erhan Isik, 10 April.

McKinsey & Company (2022). The state of AI in 2022--and a half decade in review | McKinsey. [online] [www.mckinsey.com](https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-in-2022-and-a-half-decade-in-revi-ew). Available at: <https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-in-2022-and-a-half-decade-in-revi-ew>

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