Impact of Smart Technologies on Construction Projects: Improvements in Project Performance

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Introduction
Smart Technologies

• Key technologies associated with 4IR include Cyber-Physical System (CPS), Internet-of-Things (IoT), Big Data (BD), Additive Manufacturing (AM), Augmented Reality (AR), Virtual Reality (VR), robotics, Autonomous Vehicles (AV), laser scanning and blockchain.

• Can self-organise and self-execute work tasks.

• Enable the integration, digitalisation, and automation of entire value chains.
Research Motivation

- Potential to improve performance of industries
- Lack of awareness of the benefits increases the perceived risk of technology adoption, resulting in resistance towards adoption
Research Objectives

This study aims to investigate:

i. the smart technologies perceived to be most useful in construction projects;

ii. the improvements in the performance of construction projects that can be achieved from the implementation of smart technologies; and

iii. the correlations among the smart technologies and the perceived improvements to project performances
Research Significance

• Better understanding of feasibility of adopting smart technologies and improvements in project performance

• Serve as foundation to develop a data-driven roadmap to drive the adoption of smart technologies in the construction industry
Background
Applications in Construction Projects

- Real-time monitoring and control on site and along the supply chain
- Integrated data platform for decision-making and optimised planning
- Real-time communication
Research Approach
Research Approach

- **Literature review**
  - Establish foundation for the study and development of the survey questionnaire

- **Expert panel discussion and interviews**
  - Validate the survey questionnaire prior to distribution

- **Distribution of survey questionnaire**
  - Administered to 600 target respondents
  - 73 valid responses received

- **Data analysis and post-survey interviews**
  - Analyse collected data
  - Validate the findings from the survey questionnaire
Data presentation
Profile of Respondents

Respondent Role
- Project managers: 69.86%
- Architect: 23.29%
- Director: 6.85%

Years of Experience in the Industry
- Ten years and below: 58.90%
- More than ten years: 41.10%
Data analysis and discussion
Top Smart Technologies that Improve Construction Projects Performance

- Autonomous vehicles and robotics
  - Automate dangerous and routine works
  - Improve productivity and quality
  - Increased consistency of works

- Additive manufacturing
  - Typically conducted off-site in controlled environment
  - Improves productivity and quality

- Cyber-physical system and Internet-of-Things
  - Improve collaboration among stakeholders

Productivity = output/ on-site manpower
Top Improvements in Construction Projects

• Improved productivity
• Improved quality
• Improved collaboration
# Rank of Benefits of Smart Technologies in Construction Projects

<table>
<thead>
<tr>
<th></th>
<th>AV and robotics</th>
<th>AM</th>
<th>CPS and IoT</th>
<th>Big data</th>
<th>Laser scanning</th>
<th>AR and VR</th>
<th>Blockchain</th>
<th>Overall</th>
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*RT = rank by technology, RB = rank by benefit*
# Rank Correlation between Smart Technologies

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<tr>
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<th>AV and Robotics</th>
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<th>Laser scanning</th>
<th>AR and VR</th>
<th>Blockchain</th>
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*Correlation is significant at the 0.05 level (2-tailed)
### Rank Correlation between Perceived Benefits

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<tr>
<th></th>
<th>Improve productivity</th>
<th>Improve quality</th>
<th>Improve collaboration</th>
<th>Cost saving</th>
<th>Time saving</th>
<th>Improve safety</th>
<th>Reduce labour</th>
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*Correlation is significant at the 0.05 level (2-tailed)
Conclusion
Summary of Findings

- Autonomous vehicles and robotics
- Additive manufacturing
- Cyber-physical system and Internet-of-Things

- Improved productivity
- Improved quality
- Improved collaboration
Drive the digital transformation of the construction industry
THANK YOU
Bibliography


