UNIVERSITY OF CAMBRIDGE
Department of Engineering

CONSTRUCTION ENGINEERING MASTERS DISSERTATION ABSTRACT

Elementary Digital Twin Construction

Sustainable construction project delivery is more relevant today than ever before. Poor productivity is a prominent contributor to the unsustainable trajectory the industry is currently on. This trajectory is becoming increasingly intolerable in the light of technological developments in digital information systems which are now providing novel solutions to improve current productivity. The notion of digital twin or data centric construction is showing potential to shift the industry from re-active to more pro-active project delivery. In spite of the optimism surrounding data centric construction there is no clear evidence of it being coherently implemented during the construction phase of project delivery. Addressing and solving unacceptably low productivity is becoming increasingly urgent from a sustainability perspective, which necessitates the rapid implementation of technologies which can improve things in the short term. A conceptual analysis of “Digital Twin Construction” investigates whether this data centric approach to project delivery can deliver value now or whether it remains a future aspiration. The research findings indicate value can be generated in the short term if contractors invest in three key areas:

1. A radically different approach to BIM is required. In contrast to current industry practice, this research suggests that the contractor produces full construction detail building information models, from scratch, during the project delivery phase. Designer authored models were found to lack the schema and geometric detail to allow it to be leveraged with site collected data.
2. Sensor generated data already in use by the industry can be extended to collect key productivity **output data**. Increasing the install frequency of sensors establishes the live connection between the virtual and physical construction site.
3. Ubiquitous smart phones on project sites are already collecting key labour productivity **input data**, which needs to be leveraged against output data and BIM data to drive productivity insights. This rich data source completes the productivity closed loop digital nervous system on the project.

Digital Twin Construction (DTC) as a concept is new and exciting because it is the first attempt to provide a considered and inclusive trellis for digital twin information systems to grow into a coherent and value adding whole. This area of research is still in its infancy with interest in the subject growing rapidly.

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October 2021