UNIVERSITY OF CAMBRIDGE
Department of Engineering

CONSTRUCTION ENGINEERING MASTERS DISSERTATION ABSTRACT

Understanding the perceived barriers to BIM use for the measurement of embodied carbon. A mixed-methods approach.

The measurement of embodied carbon in the construction industry is an important problem that must be solved. It is important because buildings are a major contributor to the planet's carbon footprint with the greenhouse gasses produced to building these buildings being 11% of the world's emissions yearly (World GBC, 2019). Current frameworks for measuring embodied carbon are inconsistent with one another. Currently, BIM is proposed as a method by industry and academic literature to improve how embodied carbon is measured for buildings. Current BIM tools for the measurement of embodied carbon produce inconsistent calculations. Using BIM to measure the embodied carbon will allow embodied carbon of buildings to be captured at scale and accurately too. BIM is not being widely used in industry for measuring embodied carbon. Thus, the problem is why is BIM not widely used to measure embodied carbon.

Using a mixed-methods research design BIM software tools were used to calculate the embodied carbon of a structural design BIM model. Based on the results of the comparison and a literature review a set of exploratory interview questions was prepared to get an understanding of BIM and sustainability experts' experiences in using BIM to calculate the embodied carbon of a building. Using the data collected from these initial steps a set of survey questions was prepared to understand from industry what the barriers to using BIM to measure embodied carbon are. Each survey question had a Likert scale to gauge how strongly respondents agreed or disagreed with the survey questions.

The results of the interviews were analysed using a qualitative thematic analysis technique and Pearson's correlation coefficient was used to understand which survey questions responses correlated with one another to add another layer of analysis and understand the important barriers and perceived reasons in the industry for why BIM is not more widely used to measure the embodied carbon of a building.

The key results were that BIM should be used to measure the embodied carbon of buildings. Clients need to include clear unambiguous project requirements on how it should be used. The workforce should be upskilled on how to use BIM to measure embodied carbon. That more time should be spent in the early stages of construction projects on structuring model data so that BIM can be leveraged to measure embodied carbon.

BIM should be used for the measurement of embodied carbon. Currently, there are several barriers to its use widely across industries. Upskilling the workforce in how it can be used, improving model data structures so BIM can be used to measure the embodied carbon of buildings and crucially having clear client and project requirements for how it can be used will help overcome these barriers.

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