UNIVERSITY OF CAMBRIDGE
Department of Engineering

CONSTRUCTION ENGINEERING MASTERS DISSERTATION ABSTRACT

The comparison of learning curves in different methods of construction

The issue of productivity is critical to the future of the construction industry as we know it, with numerous reports, most recently Modernise or die: The Farmer Review of the UK construction labour model (Farmer, 2016) identifying low productivity as the first critical symptom to address within the industry. 'Productivity, when assessed against other industries, especially manufacturing led ones, the differential is stark, not only in current absolute terms but also in how the gap has widened over time. Other industries have harnessed wholesale process improvement by embracing and commercialising the role of technology and have effectively reinvented themselves by driving a paradigm shift in their end-to-end delivery.'

However there have been areas of change within construction with shifts towards digital engineering and BIM as well as modern methods of construction such as Design for Manufacture and Assembly (DfMA) and modularisation. These changes are often fuelled by academic research, however as these changes become widely adopted within industry it is time to update existing academic knowledge with further research and examine their impact.

The manufacturing industry first identified definite learning curves in productivity analysis as early as 1936. Theodore Wright came up with a mathematical model that can be used to predict the reduction in labour input over time (Wright, 1936). This reduction came as a result of the development of efficiency and skills which were developed because of practice and experience (Wright, 1936).

This research compares and contrasts the productivity data for five high rise structures, constructed in central London in the last two years, which were constructed using varying degrees of modularisation, from traditional in-situ construction to fully modular construction. The findings suggest that improvements to productivity or learning are greater for modular construction compared to that of traditional in-situ construction. Despite much noise in the data from other factors there is some correlation to the mathematical models observed by Wright and others within manufacturing environments, learning is clearly present. There are limitations to the research which suggest that productivity is significantly affected by other factors which have an impact to the overall productivity than the degree of modularisation. Nonetheless, the research has demonstrated that improvements are quicker with modern methods of construction and as such further research could show how this could be taken forward to subsequent projects.

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