Building Information Modelling
Design Ecologies:
A New Model?

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ABSTRACT

This paper considers the barriers to BIM adoption and demonstrates they are symptoms of existing problems in the Architecture, Engineering, Construction, and Operations (AECO) industry. When current external pressures are considered, a varied and complex set of problems emerge that require a significant paradigm change if they are to be resolved sustainably. It is argued that Building Information Modelling (BIM) does not represent a paradigm change on its own and the concept of the design ecology is presented as a framework within which BIM can act as a catalyst for change. Specific affordances of this model are presented in terms of responding to the challenges presented in the Low Carbon Construction report (Innovation and Growth Team, 2010) and to the general characteristics of the original problems identified. Examples are presented to demonstrate that this is already emerging in practice and some suggested areas of further investigation are suggested.

Keywords: Building Information Modelling, Collaboration, Design Ecology, Design Process, Low Carbon Construction, Paradigm Change, Sustainability

1. INTRODUCTION

In Autumn 2010, the Innovation and Growth Team of the Government Construction Advisory Committee published its final report, Low Carbon Construction (Innovation and Growth Team, 2010). In this report, the transition of the AECO industry to a low carbon economy is questioned and the potential for Building Information Modelling (BIM) is specifically noted:

Its particular significance in the context of carbon is not just that the importance of integration to a new, more reliable and less costly proposition that the industry needs to bring to the carbon reduction programme, but also as an instrument of systems engineering, with the potential to model different scenarios.

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This single quotation is aspirational in terms of the scale and complexity of the goals it seeks to address. Responding to low carbon design and construction will be difficult enough but a systems engineering approach will require a significant paradigm shift in the way the AECO industry operates.

The industry faces an immediate challenge. BIM offers the opportunity to change the way it works but it also offers the chance to simply continue existing processes more efficiently. The challenge then is to whether the industry will continue with existing practices or engage in real change to meet the complex challenges we face today.

2. PROBLEMS

2.1. Old Problems

BIM is potentially a new and different way of designing, constructing and operating buildings and the built environment. As such, it arguably joins a list of ‘ideas’ that have attempted to improve the Architecture, Engineering, Construction and Operations (AECO) industry over the years. The Low Carbon Construction report referred to in the introduction acknowledges the need to still work on problems previously identified, citing both Egan and Latham. The reports Rethinking Construction (Egan, 1998) and Constructing the Team (Latham, 1994) both identify critical and wide-ranging issues and proposed a range of institutional and process changes. Latham identifies specifically the fact that “Previous reports on the construction industry have either been implemented incompletely, or the problems have persisted.” (Latham, 1994, p vii).

Yet significant change has yet to occur beyond individual exemplar projects and these reports have not resulted in transformation to where good practice might be said to have become normal practice. Change, it seems, is something that the AECO industry finds particularly difficult and this is not because the problems cannot be solved – they can. For example, trust and cooperation in project teams (Kadefors, 2004) or genuine partnering approaches (Thompson & Sanders, 1998). But there seems to be a need to retain existing paradigms of practice as if there were no alternatives.

2.2. New Problems

The adoption of Building Information Modeling (BIM) software applications in the AECO industry accelerated in 2011 yet uptake still remains slow in certain disciplines (NBS, 2012). More importantly, the use of BIM, beyond that of an efficient software solution, to genuinely foster collaborative BIM Level 2 maturity processes (as defined in (BIM Working Party, 2011)), has yet to be achieved in the commercial environment (Rawlinson, 2012). This is all despite the growing body of experience and research demonstrating the benefits of BIM as a process, for example, Malleson in (NBS, 2012), International Alliance for Interoperability (2010), or Chevin & Crotty (2012).

As the awareness spreads, so too do the barriers and objections to its mainstream adoption. As noted by the UK Government’s BIM Working Party, “Whenever change is identified barriers are cited…” (BIM Working Party, 2011), and this could be seen as a truism for any institution facing change. But the sheer range of barriers to BIM adoption is interesting and a few brief examples are presented below:

- **Fragmented processes**: These occur at all levels of practice, from separating specialist designers right through to fragmented procurement. At each stage of the process there is a limit to what can be achieved and it is rare to find a project that doesn’t stop and start in some way and this is now a specific problem with BIM processes, where the most effective methods depend on continuity, not disjunction;
- **‘Lonely’ and ‘Selfish’ BIM**: The AECO industry is generally poor at collaborating
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