Providing Collaborative Education with an International Dimension: An Ulster University and Pennsylvania State University Case Study

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ABSTRACT

The BIM process, encompassing the use of Common Data Environments (CDEs), collaborative working and the sharing of approved, up-to-the-minute information, has revolutionized the construction industry. However, this method of delivery is something which is alien to many needing a paradigm shift in communication methods (Homayouni et al, 2010), as most are more familiar with traditional approaches such as email communication and sharing communication and sharing ‘marked up’ hard copies of drawings. In the technology driven world in which we live, it is important that those entering the industry from this point forward have an appreciation of this way of working. Therefore, this paper will provide an overview of a collaborative project which has been undertaken at Ulster University to help undergraduate students become familiar with this new way of working and communicating. The paper will outline how the students worked in multidisciplinary teams on a hypothetical building project, before collaborating asynchronously with students from Pennsylvania State University.

KEYWORDS

BIM, Collaboration, Collaborative Working, Education

1. INTRODUCTION

The Belfast School of Architecture (BSA) and the School of the Built Environment (SCOBE) sit within the Faculty of Art, Design and the Built Environment at Ulster University (UU). There are a range of construction related undergraduate programmes situated within both schools, including Architectural Technology & Management (ATM) within BSA and both Civil Engineering (CE) and Quantity Surveying and Commercial Management (QSCM) within SCOBE. Within BSA the implementation of BIM ideology is most apparent on the ATM programme. Architectural Technology is a “relatively new professional discipline” (Emmitt, 2002), which is constantly evolving. It is likely to evolve further over coming years to meet the requirements of BIM and associated working methods (Morton & Thompson, 2011), and play a key role in the future delivery of BIM projects. Matthews (2013, p.191) indicates that Architectural Technologists “core education is technical design and this gives them a skill set that allows them to communicate effectively with the other design disciplines to in effect provide a central point of co-ordination for building information”. Therefore, integration of BIM concepts, principles and processes are essential within the curriculum to ensure graduates are ready to meet the challenges they will face in industry.

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In contrast, Civil Engineering is the second oldest engineering profession after military engineering. However, it also needs to move with the advances in technology as it deals with all aspects of the built environment: structural design, environmental and geotechnical aspects of construction, highways and transportation, municipal engineering including waste and clean water, materials and coastal engineering. Sacks & Barak (2010) determine that in this environment where numerous disciplines intersect and interact, communication is vital to the success of a project. They further indicate that should BIM not be included in the undergraduate curricula, graduate civil engineers will not have the ability required for expression and communication of design intent. Therefore, communication of the structural design elements through collaborative practice is a vital success factor in any project.

Within the Quantity Surveying (QS) discipline, many journal articles over the past three to four decades predicted that technological advancements such as: the development of intelligent software systems like ELSIE in the late 1980s (Brandon, 1992); widespread use of spreadsheets in accountancy and surveying and database driven Bill of Quantity description libraries in the 1990s (Saleh, 1999); two-dimensional on screen Quantity-Take-Off (QTO) in the early 2000s (CRC Construction Innovation, 2007) and now BIM (Wong et al, 2014; Wu et al, 2014), would eradicate the role of the Quantity Surveyor in building procurement. Far from this being the case, the number of registered Quantity Surveyors in the United Kingdom (UK) has risen over that period and it remains by far the largest representative group of surveyors within the Royal Institution of Chartered Surveyors (RICS). This is most likely due to employers throughout the industry recognising:

- The commercial value of obtaining the correct commercial advice and matching the correct procurement options to the client’s needs to ensure a positive impact on team performance (Forgues & Koskela, 2008).
- The benefit of setting up the contract particulars to deliver the outcomes the client demands (Ramus et al, 2006)
- The value of impartial advice on the validity of claims for variations, loss and expense, extensions of time and agreeing final accounts. (Ramus et al, 2006)
- The requirement for similar (commercially aware) advice to contractors and sub-contractors alike, regarding the preparation of tenders, their financial risk management and entitlements, maintaining positive cash flow, monitoring profitability and assisting in contingency planning to mitigate losses (Ren et al, 2001).

The requirement for such professional services is unlikely to dissipate in the near future, even if clients overcome their aversion to Integrated Project Delivery (IPD) approaches that BIM also champions (Kent & Becerik-Gerber, 2010). The profession sees BIM as an opportunity to access the geometrical data associated with intelligent models more quickly and efficiently (Cheung et al, 2012), allowing the Private Quantity Surveyor (PQS) more time to consider other important aspects including better value engineered design optimisation and enabling faster decision turnaround, thus providing a better service. The challenge is not so much whether the QS should embrace BIM or if it should be introduced within the curriculum, but how it should be taught and delivered within a collaborative approach to educational delivery.

Since the Latham report (Latham, 1994) highlighted the immense fragmentation within the construction industry design teams have started to incorporate contractors in integrated design teams (Baiden et al, 2006). Greater emphasis has been given to the communication of ideas and BIM is the ideal mechanism to deliver this. Prior to this it had been deemed a problem due to the temporary nature of the alliances between team members in design and construction due to the cross-organizational boundaries this produces (Dossick & Neff, 2010). However, BIM is promoted as the way to overcome these issues.
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