The Application of BIM in Retrofitting, Refurbishment and Renovation (3R) Projects

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The universal acknowledgement of Building Information Modelling (BIM) serving as a performance and process optimization tool within the construction industry is gaining momentum. As a result, the adoption of BIM technology has also been gaining speed and much has been written about the value of BIM and its implementation in new design and construction projects. However, current literature has often neglected to explore the use of BIM from the perspective of existing buildings and structures. Due to this lack of coverage, BIM is often only ever associated with the construction of new buildings and structures, despite having the ability to service and benefit a large sector of the construction industry which deals with existing buildings. Whilst new buildings increasingly address sustainability considerations, there is a significant switch from them to the adaptation and rehabilitation of existing structures. The importance of this trend is that extending the useful life of buildings supports the key concepts of sustainability by lowering material, transport and energy consumption and pollution. This research aims to address this by examining BIM and the implementation of this technology in the growing segment of retrofits, refurbishments and renovations (3Rs). The research methodology employed involves a thorough literature review with a detailed questionnaire survey administered among 43 BIM experts within the construction industry of South Australia. Furthermore, the findings were supplemented through interviews with industry professionals who have had experience with BIM on 3Rs. In order for the interviewees to respond to questions freely and discuss the various issues concerning BIM use in 3Rs, the study adopted a semi-structured interview approach. Each interview lasted approximately one hour, and all the interviewees were selected based on their willingness to participate in the study using a snowball sampling technique. This led to a small sample size of six interviews. Despite this limitation, deploying self-selected cases yield valuable results due to people wanting to express their opinions and feelings freely. This study establishes the motivating factors behind 3Rs and then examines the role which BIM can play to facilitate the exchange of information among project team members to achieve a better and more-efficient work process and design. Despite having identified that the majority of 3R projects within the South Australian construction industry are valued below $2 million, the result has indicated that the value and size of a project is irrelevant when considering the adoption of BIM. The research findings have disputed the widely held misconception that BIM is simply a tool for design professional to be utilized on new builds. In fact, the findings have upheld the notion that BIM is much more than a design tool. Despite having the ability to optimize design formulations and performance, above all, BIM should be viewed as a business tool which can be utilized by all stakeholders in the construction industry. In support of the literature review, the research findings have shown that BIM can offer many benefits to users when implemented in 3R projects, most importantly: increased awareness of the existing condition of a building through as-built models, improved design performance and visualization, and improved stakeholder communication and collaboration. As with any construction project, it has become clear that the greatest barrier facing the implementation of BIM in 3R projects is the reluctance within the industry and amongst professionals to adopt new methods of work and depart from traditional practices. This has resulted in a lack of awareness and education within the industry regarding BIM and its potential, and it is for this reason many mistakenly hold the belief that BIM is not applicable in the context of 3R projects. Increased BIM training and education, financial support for users, establishment of a standard for BIM in 3Rs, and a government mandate to use BIM in public sector projects were highlighted as potential measures that could be used to overcome these barriers in South Australia. Despite these positive messages, doubts still remain on the viability of utilizing BIM and associated technologies in 3R. The concerns invariably focus on economic criteria, as for many SMEs, the cost of fully implementing BIM is a significant challenge. It is feared that technologies which are often employed to generate as-built models such as electronic distance measurement (EDM), global positioning system (GPS), photogrammetric applications, remote sensing and building surveying applications might not be in the reach of SMEs.

Key Words: Retrofitting, Refurbishment, Renovation, BIM, Construction