Building Information Model for Existing Buildings for Facilities Management: RetroBIM Framework

Giulia Carbonari, University of Greenwich, London, UK
Spyridon Stravoravdis, University of Greenwich, London, UK
Christine Gausden, University of Greenwich, London, UK

ABSTRACT

The use of Building information modelling for the design and construction phase of a building has been thoroughly looked into by researchers and practitioners and there is evidence to support that it is beneficial for reducing cost, time and improving communication. Yet the potential use of BIM for the operational and management phase (Facilities management), besides maintenance schedules and equipment information and location, is still not clearly identified. The UK Government, institutional clients and major private owners are now demanding for BIM for new construction and major refurbishment but given that 70-75% of the current UK building stock will still be in use in 2050, a significant part of the existing facilities will not have an information model till the next major refurbishment, creating a major gap in the built environment. This paper presents a new framework aimed at creating information models for facilities management requiring minimal BIM skills and discusses the impact that models created for the operational stage would have on the whole life cycle of a building.

KEYWORDS

BIM, Existing Buildings, Facilities Management, Information Management

1. INTRODUCTION

The number of companies using BIM for the design and construction of new buildings is constantly growing (Bryde, Broquetas, & Volm, 2013; Underwood & Isikdag, 2011): this technology is developing fast and it is used to accommodate the growing complexity of new construction projects (Bryde et al., 2013). BIM is an information management process (Underwood & Isikdag, 2011) that can be used at all stages of a building’s life-cycle: from understanding the project needs of the owner, to evaluate designs, manage the construction process and operate the building until decommissioning (Grilo & Jardim-Goncalves, 2010). A building information model can reduce costs, provide support to a more efficient project delivery process (IFMA, 2013) and enhance collaboration and knowledge sharing (Ho, Tserng, & Jan, 2013; Kivits & Furneau, 2013). The many benefits of BIM during design, planning and construction (Eastman, Sacks, Sacks, & Liston, 2011; Gray, Gray, Teo, Chi, & Cheung, n. d.) have been studied both by practitioners and academics but for building operations and facilities managers, BIM is still a relatively new topic: its potential is still not fully understood and there is little interest regarding what happens once the building model is completed and handed over, and how BIM will be used to manage the facility beside the possible use for enhanced building maintenance (SmartMarket Report, 2008). BIM awareness and adoption growth has been significantly influenced
by the UK Government strategy for the construction industry (SmartMarket Report, 2014). BIM Level 2 mandate for all Government projects by 2016, is based on a collaborative digital environment and focuses mainly on design and construction, while BIM Level 3, now Digital Built Britain, “will extend BIM into the operation of assets over their lifetimes” (Digital Built Britain, n. d.). The full collaboration between all disciplines involved in a construction project aimed for BIM Level 3 will get facilities managers more involved with the modelling technology. Only recently, researchers have started looking at the possible integration of BIM and FM but the main focus is on new constructions rather than existing buildings (Gray, Gray, Teo, Chi, & Cheung, n. d.). However, given the number of existing buildings in the UK estimated to be in use by 2050 (70-75%) (Ravetz, 2008) there is the need to address the problem of creating building information models for existing estates. Facility managers are constantly challenged to improve and standardize all available information to address day-to-day operations and life-cycle management (IFMA, 2013). Nowadays, building information is often incomplete or obsolete (Becerik-Gerber, Jazizadeh, Li, & Calis, 2012; Gursel, Sariyildiz, Akin, & Stouffs, 2009) hence during operation “an inordinate amount of time is spent locating and verifying specific facility and project information” (O’Connor, Dettbarn, & Gilday, 2004). BIM provides integration of data systems during the building’s life cycle (IFMA, 2013), therefore there is an opportunity for facilities managers to improve the current practice and use BIM as a decision making tool. There are several potential benefits of using BIM during operation and maintenance that confirm the importance of extending BIM to facilities management practices and create models for existing buildings: the availability of as-built information (Eastman et al., 2011), the development of maintenance schedules, the opportunity to track and maintain lifecycle information about the building structure (Carbonari & Jones, 2014) together with the opportunity to improve various aspects of performance (IFMA, 2013).

The purpose of this paper is to present the initial stages of the development of a new framework aimed at creating building information models for existing buildings. Section 2 discusses how the information model should be developed according to the Publicly Available Specification (PAS) 1192. Section 3 focuses on the technologies currently available to create models for existing buildings. Section 4 presents the research methodology and the two buildings used as case studies for the research. Section 5 outlines the RetroBIM framework and the future developments of the study and Section 6 concludes with the research findings.

2. INFORMATION MODELS THROUGH PAS1192

Over the building life cycle the amount of graphics and data required varies from stage to stage (Figure 1): the volume of graphical information, fundamental during the design stage, decreases once the design is complete, while attribute data become more important during the construction and operation phases (IFMA, 2013).

By combining both “physical and functional characteristics of a facility” (BuildingSMARTalliance, 2007) BIM can easily accommodate the different users’ needs during the building’s life cycle. In order to create a data-rich model, bespoke to each organisation’s needs, the British Standards Institution published in 2013, the Publicly Available Specification (PAS) 1192 Part 2 “Specification for information for the capital/delivery phase of construction projects using building information modelling” (The British Standards Institution, 2013). PAS 1192-2 determines a set of standards needed to meet the BIM Level 2 requirements for new constructions or refurbishments and ensure a collaborative digital environment. Through the various stages of the Information Delivery Cycle (IDC), the PAS 1192-2 provides a framework for the creation and development of an information model that results, after the project hand over, in the delivery of the as-constructed asset information model (AIM). Information within the model grows as the project moves from stage 1 (brief) to stage 6 (handover & closeout), and is based on the Employer’s Information Requirements (EIR) identified at the beginning of the process. During the operational phase, analysed in the PAS 1192 Part 3 (The British Standards Institution, 2014) the AIM will evolve accordingly to the events (e.g. major and
Using GIS Technology to Define and Assess a Rurality Scheme Suitable for Decision Support in Health and Patient Services

A Comparative Analysis of the Complexities of Building Information Model(ing) Guides to Support Standardization
www.igi-global.com/article/a-comparative-analysis-of-the-complexities-of-building-information-modelling-guides-to-support-standardization/177238?camid=4v1a