

CHAPTER

5

BIM IMPLEMENTATION IN HANDLING DESIGN CHANGES

*Farah Azwanee Aminuddin, Aina Qistina Khazli,
Aimi Sara Ismail, and Nurshikin Mohamad Shukery*

5.1 INTRODUCTION

Due to the complex characteristics of construction projects, changes are inevitable and have become common to the project participants. Various issues and errors, incomplete information, defects, and mistakes, or related issues have emerged throughout the design phase day by day which may cause progressive revisions of the project scopes (Rajendran, 2015). These changes are often triggered by inexperienced clients in hopes of incorporating new ideas, minimising project expenses without providing a proper design to envision the project at the design stage before it is actually observed into realities (Shourangiz et al., 2011).

These changes have significant impacts on the construction phase as such: Effect to the project timeline, cost, performance and productivity. Many clients do not realise the implications of the changes and may blame the contractors if the project faced any disputes or claims (Sun & Meng, 2009). This creates problems for construction parties and raises the risk of mutual conflicts.

Changes in design may occur from getting new ideas from the clients in which, they may not have a realistic visualisation of the project in design stages not until they have experienced it in reality. These changes

may impact the lifecycle of the project which may cause delay in time, cost overruns, and other negative impacts (Shourangiz et al., 2011). Delays in the construction project can affect the cost of the construction project to be overrun and one of the factors is due to the changes of designs throughout the process. The failure to operate effective design change management in the project teams (Sun & Meng, 2009) in design change cases can have a detrimental impact on project drivers, such as time, cost and output (Hwang & Low, 2012).

Building information modelling's growth and progression impacts the construction industry in all fields and stages. One such paper proposes an ontology of design changes (Pilehchianlangroodi, 2012). The ontology specifically describes a BIM-based framework to coordinate the changes. They supplement the notion with the concept of an integrated system aimed at allowing database updating on a BIM model, and promoting information sharing and exchanging for energy-efficient architecture. The effectiveness of BIM technology is a great help in design, especially at the early stage of the construction phase.

Building information modelling processes spend an ample amount of time during the design phase due to a higher level of detail and consideration compared to traditional methods. Any changes of the design after this stage, can wholly impact the effectiveness of BIM in the overall project duration because of the last-minute design changes (Kong et al., 2020). In addition, each design change that is applied in BIM is automatically seen in each view and database, making it easy for the project team to handle this design change (Autodesk Building Solution, 2002). To ensure the reliability of BIM tools, their strengths must first be recognised. This chapter presents the application of BIM tools and the degree of their versatility to incorporate changes throughout the design process of the projects. The purposes of this research are to briefly address the application of BIM in handling design changes and present the challenges faced in implying BIM to handle design changes.

5.2 BUILDING INFORMATION MODELLING AND DESIGN CHANGES

Change orders have long been an inherent feature of the construction, where projects are afflicted by variation orders. Even with BIM, change of orders are inevitable but with fast response at an early stage of the construction process, they can be managed effectively. Construction, as opposed to manufacturing, has generally segregated planning and design from construction processes that had resulted in certain shifts in scope and design during construction (Sunday & Clinton, 2017). The division of design and construction has contributed to significant problems in which designs are made without much consideration. Buildability or efficient markets have a detrimental effect on project efficiency (Love, 2002). The consequence of these adjustments has resulted in problems such as cost overrun, scheduling of delays and lack of productivity. This shows that design changes have a significant effect on the efficiency of the construction project.

According to Choy and Sidwell (1991) design change defined as any adjustment in the nature of the job as outlined in the contract documents following the establishment of significant obligations between the principal and the contractor. A design is any change in the facility or development of the project. These modifications apply not only to matters in compliance with the terms of the contract, but also to adjustments in the working conditions (Burati et al., 1992) which led to an alteration of the contract price or time of the contract (Ibbs & Asce, 2012). There are various members that respond to the alteration in design. The following are players who have affected design changes during the construction process of the building projects: The contractor (main contractor or subcontractor), the design team (including the architect, service engineers, structural engineers, etc.) and the client or employer (McGraw Hill, 2014).