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Building Information Modeling in Project Management: Necessities, Challenges and Outcomes

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Abstract

Building Information Modeling (BIM) is becoming a comprehensive collaborative process in the construction industry. Despite its short history, BIM has had an increasing growth during the last decade. This is happening mainly due to its capabilities on construction projects. BIM can create a common language between all parties and system divisions in a project and make them an integrated team. The approach of BIM strongly matches with integrated project delivery systems. The role of BIM as a coordinator of project system is quite similar to the duties of a project manager. BIM integrates different disciplines by effective communication, analyzes the project systems for constructability, estimates the cost and time of projects at any time using quantity takeoffs, draws a big picture of projects using visualization and builds collaborative teams. All these are what a project manager does in a different scale during a project life cycle.

This paper aims to show the correspondence of BIM and project managers' roles on construction projects. It emphasizes the importance of having proper BIM knowledge and experience for project managers to succeed. This paper also discusses the requirements of BIM knowledge and experience enrichment of project managers.

Keywords: Building Information Modelling, Project Management, Construction

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1. Introduction

1-1. History

Building Information Modeling (BIM) can be defined as a reliable, digital, three dimensional, virtual representation of the project to be built for use in design decision-making, construction scheduling and planning, cost estimates and maintenance of construction projects (Words & Images, 2009). The BIM Handbook (2008) defined BIM as a computer-aided modeling technology for the purpose of managing the information of a construction project

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focusing on production, communication and analysis of building information models. The National Building Information Model Standard Project Committee defined the BIM as following:

“A BIM is a digital representation of physical and functional characteristics of a facility. As such it serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its lifecycle from inception onward.”

The concept of BIM theoretically emerged and was developed at Georgia Institute of Technology in the late 1970s and grew rapidly after that. The growth happened because of the increasing attention paid to construction teams and firms that found merits in using BIM in order to integrate the process of the construction projects and managing them. The term Building Information Modeling was first used in 2002 to describe virtual design, construction and facilities management (Harris, 2010).

Graphisoft in 1986 introduced its new software as a solution for virtual building. This software, Archicad, was really a drastic improvement in CAD programs of that time since Archicad allowed the creation of three dimensional (3D) models of projects (Dey, 2010). The terms Building Information Modeling and Building Information Model and the acronym of BIM were widespread when Autodesk released the "Building Information Modeling" (Autodesk, 2003).

1-2. Construction Project Management

Construction projects constitute the main part of all disciplines projects due to their amount, variety and cost. The U.S. Census Bureau News (2013) estimated that the construction industry would spend more than \$874 billion in 2013. These projects range from small residential or retail projects to mega multifunction projects. Needless to say, with any scale of a construction project, there is a necessity for managing it. The management of construction projects requires knowledge of modern management as well as an understanding of all construction processes. Along with the change in technology, organizational arrangement or procedures and new features and methods, the management of construction projects differs (Hendrickson, 2000). Construction project management is a series of activities for determining how, when and by whom the work, including all life cycle activities, will be performed.

Similar to the Project Management Body of Knowledge (PMBOK) definitions, the construction project manager handles project management planning, cost management, time management, quality management, contract administration, safety management and risk management. The project manager is also in charge of communication between all stakeholders on the project including owner, designers, engineers, professional crew and administrative staffs. Generally, construction project management shares the common and overall characteristics of general projects, therefore, the rules and methods required for general project management can be applied to this type of projects.

2. Building Information Modeling Aspects

2-1. Integrated Project Delivery System

Integrated project delivery (IPD) is a growing approach for delivering projects that unifies different disciplines' efforts and integrates all parties including project managers, designers, engineers, systems and practices into a collaborative process. IPD optimizes the value of a project by improving efficiency through all phases. IPD recruits all

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