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Building information modeling in the architecture-engineering construction project in Surabaya

Herry Pintardi Chandra[a,]*, Paulus Nugraha[a], Evan Sutanto Putra[a]

[a]*Department of Civil Engineering, Petra Christian University, Surabaya, Indonesia*

Abstract

In current practice, many digital models do not contain sufficient information from designers to contractors and operators. A great deal of literature has pointed to the importance of understanding the Building Information Modeling (BIM). BIM is a digital representation of the physical and functional characteristics of a building. In Architecture-Engineering-Construction, BIM is the development and use a computer software model to stimulate the construction and operation of a facility, to make decisions and to improve the process of delivering the facility. The aims of this paper are to explore the need of technological support to implement the site-linked of BIM, the benefits of BIM, and the challenges of BIM. The research was conducted through literature review of BIM. The data was collected from the questionnaire survey carried out to 26 valid responses within the main stakeholders of construction work in Surabaya. A questionnaire is prepared by incorporating the technological support, benefits, and challenges of BIM. The data was analyzed by using descriptive analysis including mean analysis with 5 Likert scale. The results of the research shows that the need of technological support to implement the BIM is parametric components (mean value of 4.46), the need of software package majority is prepared by contractor and construction management consultant, and the benefit of BIM is to reduce the construction cost (mean value of 4.6). In addition, the main challenge of BIM is different brand with the mean value of 4.27, in which of incompatibility of different brand (mean value of 4.31.

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* Corresponding author. Tel.: +62811310335.
E-mail address: herpin@petra.ac.id

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1. Introduction

Building Information Modeling (BIM) has recently attained widespread attention and development in the Architectural-Engineering Construction. BIM is a digital representation of physical and functional characteristics of a facility that has transformed the way building are conceived, designed, constructed, and operated [1]. This model is a data-rich, object oriented, intelligent, and parametric digital representation of the facility to generated information that can be used to make decisions and to improve the process of delivering the facility [2]. BIM suggests the concept of Integrated Project Delivery including people, systems, business structures and practices into a collaborative process to reduce waste and optimize efficiency through all phases of the project life cycle [3]. BIM supports the continuous and immediate availability of project design scope, schedule, and cost information that is high quality, reliable, integrated, and fully coordinated [4]. BIM as a design and construction term was introduced about 15 years ago to set the emerging, information- rich, architectural computer-3-D modeling apart from traditional, mainly paper-based, 2D design and drawing. The focus of BIM is to create and reuse consistent digital information by the stakeholders throughout the lifecycle, to provide a more streamlined business process, associated project and site management methodologies including complete facilitation of construction knowledge [5]. This method is to integrate digital descriptions of all the building objects and their relationships to others in a precise manner where stakeholders can query, simulate, and estimate activities and their effects of the building process during the project life-cycle [5]. The aims of this paper are to explore the need of technological support to implement the site-linked of BIM, the benefits of BIM, and the challenges of BIM.

2. Literature review

There are many definitions of Building Information Modeling (BIM). BIM is the sharing of structured information that can be explained as a digital representation of the physical and functional characteristics of a building. A BIM model can contain information or data on design, construction, logistics, operation, maintenance, budgets, schedules and much more. The principal difference between BIM and 2D CAD is that the latter describes a building by independent 2D views such as plans, sections, and elevations. Data in 2D drawings are graphical entities only, such as lines, arcs and circles, in contrast to the intelligent contextual semantic of BIM model, where objects are defined in terms of building elements and systems such as spaces, walls, beams and columns [6]. By using BIM in construction work, drawings, procurement details, submittal processes, and other specification can be easily interrelated. In addition, systems, assemblies, sequences can be shown in a relative scale with the entire facility [7]. Technologies that can be used to implement BIM are CAD, Object CAD, and Parametric Building Modeling [4]. CAD is software that its technology supports drafting automation very effectively. Object CAD seeks to simulate building components in a CAD-based environment, focusing on the 3D geometry of the building, the generation of 2D documentation from that 3 D geometry, and the extraction of object data from the building components to provide information about quantities and object properties. Parametric Building Modeling Technology is analogous to the decision support systems used in the financial community. These systems combine a data model (geometry and data} with a behavioral model (change management) that gives meaning to the data through relationships.

2.1. The benefits of BIM

According CRC Construction Innovation [6], BIM benefits are: faster and more effective processes, better design, controlled whole-life costs and environmental data, better production quality, automated assembly, better customer service, and life-cycle data. BIM enable better decisions, faster BIM reduces the abstraction and integrates the multiple disciplines, including design and documentation, reduces the time to the market, reduces the cost of design [7]. BIM also can accelerate the adaptation of standard building prototypes to site conditions for business, and reduces human resource during the entire operation phase [4].BIM affords the design team a high degree of certainty, minimize errors and omissions, and last but not least to minimize conflict [8]. In addition, BIM model under a well managed information database can provide information on the number and types of furniture, if and when they are do for change [8]. Moreover, Arayici et al. [5] suggested that some key benefits of BIM are accurate geometrical representation of the part of the building, faster and more effective information sharing, more