Potential of Using BIM for Improving Hong Kong’s Construction Industry

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ABSTRACT

Given sizable capital projects in Hong Kong are using BIM from January 2018 on and site safety continues to be a concern for the local construction stakeholders. It is timely to investigate the potential of using BIM for construction safety. This research reveals the potential of using BIM for site safety is strong (85% supported), indicating Hong Kong should engage specific projects to test effectiveness of using BIM for safety, including implementation of safety management system and/or process of risk assessment.

KEYWORDS

Architectural, BIM for Safety, Building Information Modelling, Engineering and Construction, Risk Assessment, Safety Management System

INTRODUCTION

In the past, the AEC sector considered the triangle of time, cost and quality as the key performance indicators (KPIs) to measure the success of projects. Over time, others have proposed to expand these KPIs. Nicholas (1989) identified that the multiple criteria for success are time, cost, quality and safety. Chua, Kog, and Loh (1999) considered that the critical success factors refer to the nature of the project and the company, and can also include safety consideration and market entry. In addition, Albert and Ada (2004) considered that the KPIs to reflect successful construction projects should cover eight different factors including quality specification, commercial value, environmental impact, user expectation, participant’s satisfaction, health and safety performance, time, and cost. Gould and Joyce (2009) pointed out that in the US; workers expect site safety management in workplaces including construction sites. Construction is a relatively hazardous industry, requiring all stakeholders to be involved. More importantly, enforcement of the Occupational Safety and Health (OSH) Act in the US since 1970s sets the legal basis for construction companies on how to manage site safety.

The construction industry is a milestone sector of Hong Kong, representing 5.6% of gross domestic product and 9.2% workforce in 1999 (Construction Industry Review Committee Hong Kong Government, 2001). Unfortunately, and despite all effects, Hong Kong still has a relatively high number of accidents. During 2010-2014, accidents in the construction industry accounted for 25% of the total number of industrial accidents in Hong Kong. In fact, the construction industry accounted for 74% of all industry fatalities in Hong Kong over the same period (Labour Department Hong Kong Government, 2015). To “build a better 2030”, the Construction Industry Council in Hong Kong issued the challenge of the construction industry for manpower, productivity, safer, greener and

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collaboration including consideration of adopting Building Information Modelling (BIM) for safety McKinsey & Company (2015) which is the focus of this paper.

IMPROVING HONG KONG’S CONSTRUCTION SAFETY

The European Union (2010) reported that the construction industry remains one of the most vulnerable sectors for accidents. There are many different tools to improve OSH including a combination of mandatory and voluntary measures. Ju (2014) listed the tools to include a mix of prescriptive, performance-based and general duties legislation or administrative measures. The OSH issues in Hong Kong are multi-folded and there are different approaches to manage site safety.

Traditionally, the approach was to impose legal controls following occurring of serious accidents, which is or often referred as “command and control” (Zhou, Irizarry, & Li, 2013). More recently, use of risk assessment (RA) is becoming more widespread and evident in human safety, security, environmental protection, product quality, planning and change management processes. This led to the publication of an international standard, the ISO31000 series, with a cycle loop similar to BS8800 involving “mandate and commitment”, “design of framework for managing risks”, “implementation of risk management”, “monitoring and review” and “continual improvement” (International Organization for Standardization, 2009). Many of Hong Kong’s legislation or management practices refer to the process of risk management and RA, suggesting that combining RA and other safety initiatives will help improve OSH performances and lower accident injuries (European Union, 2010; Labour Department, 2014).

In parallel, different countries are adopting “safety management” as the strategy to reduce accidents. Safety management systems (SMS) have been adopted for the UK and Hong Kong as the way to manage and reduce site safety risks. Houssin and Coulibalı (2011) pointed out that the root cause of up to 60% of accidents was “design-related”. Before ISO45001 – occupational health and safety management system, Hong Kong enacted Safety Management Regulation in 1997 which is now regarded as the key approach for managing construction safety in Hong Kong. Tam and Fung (1998) found the best safety management practices to reduce safety risks for Hong Kong’s construction industries can include safety training, employment of direct work force, accident investigation and safety incentive scheme. Cheng, Ryan, and Kelly (2012) revealed three effective elements of SMS are safe inspection, safety training and safe work practices for Hong Kong.

However, the safety performance in Hong Kong’s construction industry remains a concern and to “build a better 2030”, the Construction Industry Council in Hong Kong issued the challenge of the construction industry for manpower, productivity, safer, greener and collaboration. In terms of safer construction environment, McKinsey & Company (2015) recommended to initiatives to:

- Promote “design for safety” via consideration of the Construction Design Management regulation in UK and safety award for stakeholders;
- Promote safety ownership by extending the Pay for Safety scheme to include subcontractors and even frontline workers, and to highlight the different safety responsibilities among multi-tier contractors; and
- Adoption of new safety-improving new tools such as Building Information Modelling (BIM) safety from Finland or new construction methods from US into safety performance scheme.

It is beyond the scope of this paper to investigate all safety initiatives. The focus is to investigate the potential of using BIM for improving Hong Kong’s construction safety. Since the approach to manage OSH in Hong Kong is mostly associated to RA and SMS, these will be targeted to gauge the potential of using BIM for construction safety.
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