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## Building Information Modeling (BIM): A new paradigm for quality of life within Architectural, Engineering and Construction (AEC) industry

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### Abstract

The adoption of Building Information Modeling (BIM) constitutes a paradigm shift in the architectural, engineering and construction (AEC) industry. Broader BIM adoption will transform construction processes to achieve greater efficiency to improve the quality of life (QOL) of construction stakeholders. This paper seeks to identify determinant factors and implementation gaps of BIM in the AEC industry. A case study was conducted through a preliminary workshop organised by CIDB among the five potential stakeholders: Public Private Partnership (PPP) Unit (UKAS), JARING, eMOST/ UMP, Greenwave Synergy (GWS) and CIDB eConstruct (EC) of the AEC industry in Malaysia. The findings suggest various determining factors and gaps existed at the national and organisational levels. Finally, the workshop suggested an *'affordable BIM concept'* with *'pay-per-use or periodical license'* method to be adopted for SMEs contractors.

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*Keywords:* Building Information Modeling (BIM); BIM influencing model; construction; technology

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### 1. Introduction

Technology is changing and developing around the world at a rate and pace never experienced before. The contribution of new technology to economic growth can only be realized when and if the new technology is widely adopted and used. Adoption itself results from a series of individual decisions to begin using the new technology, decisions which are often the result of a comparison between the uncertain benefits of the new invention and the uncertain costs of adopting it (Parente

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and Prescott, 1994). The architecture, engineering and construction (AEC) industry is often perceived as being slow in adopting technology, and was claimed to cling on to old business models and processes for decades. Nevertheless, the AEC industry has several practical applications that facilitate the technology, outsourcing and exchange of information within the industry, the roles of technology adopted are important to sustain the quality of life (QOL) to mankind. For instance Computer aided design (CAD) or drafting is a technology widely used by the AEC industry. CAD is a form of computer-aided building modulation that architects, engineers and contractors use to create and view two-and three-dimensional models. The AEC industry also uses building information modeling (BIM), a newer computerized modeling system that can create up to six-dimensional models; this software can greatly increase productivity in the AEC industry. Hence, the task of AEC industry is to be able to adopt and apply technologies in order to improve the quality and productivity of the industry (Hassan, 2012).

Much attention in the AEC industry today is focusing on Building Information Modeling (BIM). CIDB (2013) defines *BIM as a process supported by technology of computer generated model used in collaboration to populate information and simulate the planning, design, construction and operation of a facility*. BIM is now being increasingly used as an emerging technology to assist in conceiving, designing, construction and operating the building in many countries (Wong et. al., 2009). It is recognized as a new management technology that provides an integrated solution to operate businesses while improving the client satisfaction to time, cost, safety, quality and functionality of construction projects. Meanwhile, there is a great diversity in ideas about definitions on Quality of Life (QOL). Some perceive it as *the environment we live, the house and the air we breathe*, while others describe it as *safety and security, health, wealth (employment), transport infrastructures, adequate building for housing, schooling and recreation* (Mercer, 2007). In general, QOL is a subjective matter that involves a person's emotional state and personal life. To achieve any of the perceive QOL, adoption of new technology is inevitable.

This paper seeks to identify the key determinant factors and implementation gaps of BIM in the AEC industry. A Technology Acceptance Model (TAM) developed by Davis (1989) posits that human feelings, behavior and attitude are the trigger to begin adopting new technology. The study accesses the impact of *perceive usefulness* and *ease-of-use* to the broader adoption of BIM which will ultimately contribute to the improvement of QOL in the AEC industry.

## 2. Background

One of the Malaysian government agenda in the 12 National Key Economic Areas (NKEAs) is to enhance business growth in the AEC industry (Pemandu, 2011). For this matter, the AEC organizations have aggressively embraced new technology in order to remain competitive in the current market (Alshawi et.al. 2010). Building Information Modeling (BIM) is one of the new emerging technologies to be deployed in the design, construction, and facility management in which a digital representation of the building process is being created to facilitate the exchange and interoperability of information in digital format. Despite the advantages derived from this paradigm, local construction industry is reluctant to deploy the technology in its service delivery (Shuratman, 2012).

BIM has existed for over 20 years; it is only over the last few years that the construction industry is aware that BIM promises to make the industry much more streamlined and efficient (Arayici, et. al., 2012). BIM applications has grown tremendously, from a tool to design in three dimensions and use of components, to a tool that is used for model analysis, clash detection, product selection, and whole project conceptualization (Weygant, 2011). BIM is now being increasingly used as an emerging technology to assist in conceiving, designing, construction and operating the building in many countries (Wong et.al. 2009). It is providing itself as a very powerful tool that allows users to

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