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Adopting BIM in the Jordanian Private Construction Industry Case Study

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Abstract: Jordan construction industry experience challenges that reduce the number of construction industry organizations to121organization in 2016 compared to 148 in 2015 based on the Central Bank of Jordan annual report. According to the literature the main causes identified by researchers include poor design, poor scheduling and planning and the fragmental nature of the industry. To address these challenges, the adopting of Building Information Modelling (BIM) is proposed. This study presents a strategic plan to adopt BIM by the private sector of the Jordan construction industry. Through wide and comprehensive survey (quantitative approach) the findings shows that the adoption of BIM in the Jordanian private construction section is subjected to many factors such as the top management support, spreading awareness by the construction associations and governmental national BIM training centres.

Key words: Construction, fragmental nature, quantitative approach, BIM, comprehensive, scheduling

INTRODUCTION

Gross Domestic Product (GDP) in Jordan is effected significantly by the construction industry sector (Sweis *et al*., 2008). However, many industry players including contractors, consultants and owners in Jordan reported that the industry is experiencing time and cost overrun which lead to financial issues. The major reasons stand behind these issues considered by the researchers include but not limited to-poor design, weak planning, fragmental nature of the industry, site conditions, lack of competent technical staff, among others (AL-Moumani, 2000; Sweis *et al*., 2008). To address these challenges, the adopting of Building Information Modelling (BIM) is proposed (Mihindu and Arayici 2008; Aranda-Mena *et al*., 2009). According to Mehran (2016); Gerges *et al*. (2017) the use BIM in Jordan is very scarce. Nonetheless, BIM is considered a new tool in building construction according to the researchers who demonstrated that BIM is capable to improve approaches and process to control the industry. Moreover, BIM acts as a catalyst for construction operations. It enhances design improve quality increase the integration of disjointed process (Ansah and Sorooshian, 2017).

Many researchers demonstrated that BIM has the potential to increase productivity and smoothing the business process flow and decrease uncertainties, difficulties, disintegrations, clashes, among others (Mihindu and Arayici, 2008; Aranda-Mena *et al*., 2009; Khosrowshahi and Arayici, 2012).

However, there is a gap in literature in regard of BIM impact on the Jordanian construction industry, a few researchers tried to explore the potential and effectiveness of BIM on the Jordanian construction industry.

This study explores the private sector thoughts about the best strategies to adopt BIM in the Jordanian private construction sector. Thus, this will push the industry towards more extensive BIM adoption to address challenges and other issues in the Jordanian construction sector.

Literature review

Jordan construction industry challenges: Construction industry becomes more complex, since, it now involves many stakeholders from different disciplines. Controlling cost and time of construction projects is the most important issues in construction industry. A project should meet not quality output standards and time, budget objectives (Tahir *et al*., 2018). Globally, the construction industry is faced with noteworthy time and cost overrun (Smith, 2014). In Saudi Arabia, for example, it was found out that only 30% of construction projects were finished within the scheduled dates and that the average time

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overrun was between 10 and 30% (Assaf and Al-Hejji, 2006). In Jordan the cost of variation orders is a major challenge. Many studies have examined the reasons behind the variation orders and a set of solutions have been introduced as a way of decreasing their effects, yet the cost of variation orders still maximize (Alshdiefat, 2018). The major reasons stand behind these variation orders considered by the researchers include but not limited to-poor design, weak planning, fragmental nature of the industry, site conditions, lack of competent technical staff, among others (AL-Moumani, 2000; Sweis *et al*., 2008).

BIM adoption strategies: BIM demands more than just installing a new software, it also entails a total overhaul of the methods the industry runs and that the AEC firms relate with the owners and their supply chain. Thus, a clear set of procedures delineating an operational plan and methodology for BIM adoption needs to be established (Arayici *et al*., 2011). To meet that require, a set of BIM standards, structures, procedures and best practice strategies have been developed. Autodesk suggested a BIM placement strategy, though it appears quite inclusive, it has some disadvantages such as the risk management involved in BIM adoption (Almuntaser *et al*., 2018). Arayici *et al*. (2012) suggested a BIM Model imitating the lean principle of plan, however, the model does not fully discussed a practical steps.

This research uses questionnaire structure. The main focus of this study was to figure out the best strategies to adopt BIM based on the Architecture, Engineering and Construction (AEC) industry in Jordan construction private sector.

MATERIALS AND METHODS

This study aims at exploring the best strategy to adopt BIM by the private sector in the construction industry in Jordan. To meet this aim, the study commenced by conducting a comprehensive literature reviews on the adoption strategies of BIM in worldwide followed by a wide range quantitative survey using a 300 questionnaire that designed based on the literature review.

RESULTS AND DISCUSSION

The sample for this study consists of owners, consultants and contractors operating in the Jordanian AEC private construction sector.

Respondent's profiles: The survey was carried out through a questionnaire survey of private industry key players. It had 300 respondents; 60 owners (20%), 90 consultants (30%), 150 contractors (50%). Table 1 shows distribution among respondents based on their age, education field and experience. The education level was varied from Bachelor's degree to Master's degree and PhD degree holders.

Table 1: Respondent's profile

Respondent/interval	Frequency	Percentage
Age		
18-25	5	1.7
26-35	85	28.3
36-45	91	30.3
46-55	75	25.0
≤56	44	14.7
Education		
Bachelor's	276	92.0
Master's	22	7.3
PhD	2	0.7
Field		
Contractor	136	45.3
Consultant	110	36.7
Owner	54	18.0
Experience		
<5	25	8.3
5-10	65	21.7
11-15	74	24.7
16-20	70	23.3
21-25	45	15.0
26-30	15	5.0
>30	6	2.0

Questionnaire's structure: Questionnaire was divided into three main categories; BIM benefits awareness, BIM adoption barriers and BIM best adoption strategies.

Respondents required answering 10 questions about their level of BIM benefits awareness. The findings stated that 30% of the respondents were aware of BIM benefits where most of the respondents that (70%) are not aware of BIM technology. About 156 respondents, more than (50%) indicated that the major barriers against BIM adoption is the absent of awareness in regard of this new management system while (20%) believe the change resistance is the most important challenges and finally, (10%) of the respondents indicated that cost is the main obstacle in adopting BIM. The third category answers; the best strategy to adopt BIM was as follows, 180 respondent (60%) stated that it is a government action in the first place through establishing a BIM national training centre and initiating a BIM national standards while 60 respondents (20%) thinks it is the construction associations responsibility to spread BIM in the industry through forcing BIM courses in their memberships rules. About 30 respondents (10%) stated that it is the private sector organizations responsibility to develop this technology while the rest of respondents convinced that it is the society responsibility to stop fighting against any new technology and accept the required change. Figure 1 summarise these findings.

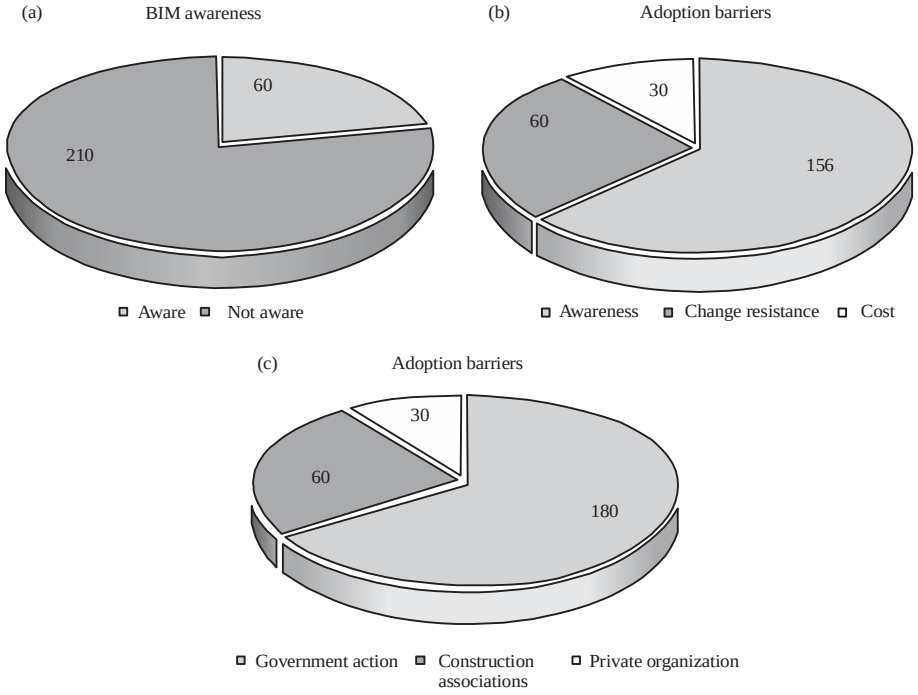

Fig. 1a: BIM benifits awareness, (b) BIM adoptation barriers and (c) BIM best adoptation strategies

CONCLUSION

Building Information Modelling (BIM) is a new and powerful technology implemented by many countries. It is the use of modelling computer software to document a building design and to simulate the construction.

It can be stated that the best BIM adoption in the Jordanian private construction industry is subjected to a government action such as lunching a national BIM training centre; national BIM standard institute, BIM national specifications ranked first, secondly the Jordanian construction associations can force BIM courses as a pre-condition for memberships like Jordanian construction contractors and Jordan engineer association. This study considered a first step towards the adoption of BIM in Jordan. Yet, it provides a benchmark for future researches that should tackle several other avenues further.

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