International Journal of Civil Engineering and Technology (IJCIET)
Volume 10, Issue 07, July 2019, pp. 343-348, Article ID: IJCIET_10_07_033
Available online at http://www.iaeme.com/ijciet/issues.asp?JType=IJCIET&VType=10&IType=7
ISSN Print: 0976-6308 and ISSN Online: 0976-6316

BIM ADOPTION STRATEGIES – THE CASE OF JORDAN

Mohammed A.KA. Al-Btoush
Faculty of Engineering, Isra University, Queen Alia International Airport South of the Capital Amman, Amman PO Box 33 and 22 Isra University Office 11622 Amman, Jordan.
Corresponding wardbtoush2012@yaOhoo.com

Ja'far A.Aldiabat Al Btoosh
Faculty of Engineering, Jerash University, Jerash, Jordan.
Corresponding ooonjaffar45@yahoo.com

ABSTRACT

Many case studies have been conducted on the adoption strategies of building information modelling (BIM). This paper is aimed at exploring the best strategy to implement BIM in the Jordanian construction industry. The contractors can use this strategy to assess how ready they are to adopt building information modelling. To achieve the target, a comprehensive literature was expanded in two frameworks, firstly, Jordan construction industry to understand the current conditions for the construction practice and highlight related challenges. The second framework was building information modelling, the concept, adoption conditions, and best practices to pick the best adoption strategy. To conceptualize the nominated theoretical adoption strategies, a qualitative approach was followed, and 15 semi-structured interviews were carried out with the largest construction companies in the Jordanian construction industry. Reliability and validity checks were performed at three levels; A focus group workshop consists of four construction experts who recommended adjustments inregard of culture' components in the theoretical strategies, The second level of validity where a questionnaire sent to 50 respondents work for a construction organizations, secondly the results were analysed by the structured equation modelling technique, the first hypotheses was rejected leading to a second adjustment inregard of the conceptual framework. To perform the final validity check, a discussion with three major industry players in Jordan took place in order to finalise the conceptual strategies framework. Findings showed that the best strategy to adopt BIM among construction companies in Jordan is still unclear, so many barriers and challenges are facing BIM adoption such as, but not limited to, Lack of government support , BIM unawareness, the absence of BIM training centres and specialists , resistance to change and cost.

Key words: BIM, Adoption Strategies, Jordan

Cite this Article: Mohammed A.KA. Al-Btoush and Ja'far A.Aldiabat Al btoosh, BIM Adoption Strategies – The case of Jordan. *International Journal of Civil Engineering and Technology* 10(7), 2019, pp. 343-348.
http://www.iaeme.com/IJCIET/issues.asp?JType=IJCIET&VType=10&IType=7

1. INTRODUCTION

Little support in researching ,little consistent profitability rate, the tendency of clients in choosing the minimum cost and low training level are the main issues related to the construction industry as discussed by Zakaria et al. (2013). The construction industry contributed in 2014 about 5.8% to the gross domestic product (GDP) of Jordan (Central Bank of Jordan [CBJ], 2017). On the other hand, it faces challenge such as, the low productivity as it is noticeable from repeated delays in the government project (Mattarneh, 2015). Due to the relatively low rating of the quality effect on productivity Hiyassat et al. (2016) argue that there is a need to increase the awareness of the significance of adopting advance quality management practices in Jordan. Numerous studies have been performed on the adoption strategy of building information modelling (BIM)'s in many countries including USA and UK (Bryde et al., 2013), (Khosrowshahi and Arayici, 2012), (Takim et al., 2013), (Smith, 2014). However, BIM adoption has shown the capabilities to increase information integration, productivity, and minimise fragmentations, uncertainties, conflicts, complexities , among others (Khosrowshahi and Arayici, 2012). Moreover, BIM can save costs between 3% and 5%, (Ansah et al., 2016). BIM is promising a developing procedural and technological change within the AEC sector (Azhar et al., 2015), (Abdirad, 2017).

2. LITERATURE REVIEW

The background of Jordanian construction industry

Low productivity is one of the major matters challenging the construction sector in Jordan. Ruqaishi and Bashir (2013) figured out the vital factors that minimize manpower rate in the construction projects in Jordan. large number of reasons were recognised and considered in accord to Thomas's factor model. Most of the respondents stated that, overtime work and quality specifications are the main causes of demotivation. **Cost Overrun** According to (Al-Momani, 1996), the actual cost surpassed the original contract price by 30% in the government projects.

Information Technology utilization According to El-Mashaleh (2007) the main difficulties for IT usage are investment costs and the lack of experience.

Building Information Modelling

Building Information Modelling (BIM) is a digital representation of physical and functional characteristics of a facility (NBIMS,2018). According to (Atazadeh et al., 2017) BIM is collaboration by different parties at different phases of the life cycle of a facility to insert, extract, update or modify information.

Building information modelling concept

Software can compose models distributed in various design packages and into a single file, to be seen as one composite model (Zhang et al., 2013).see Figure 1

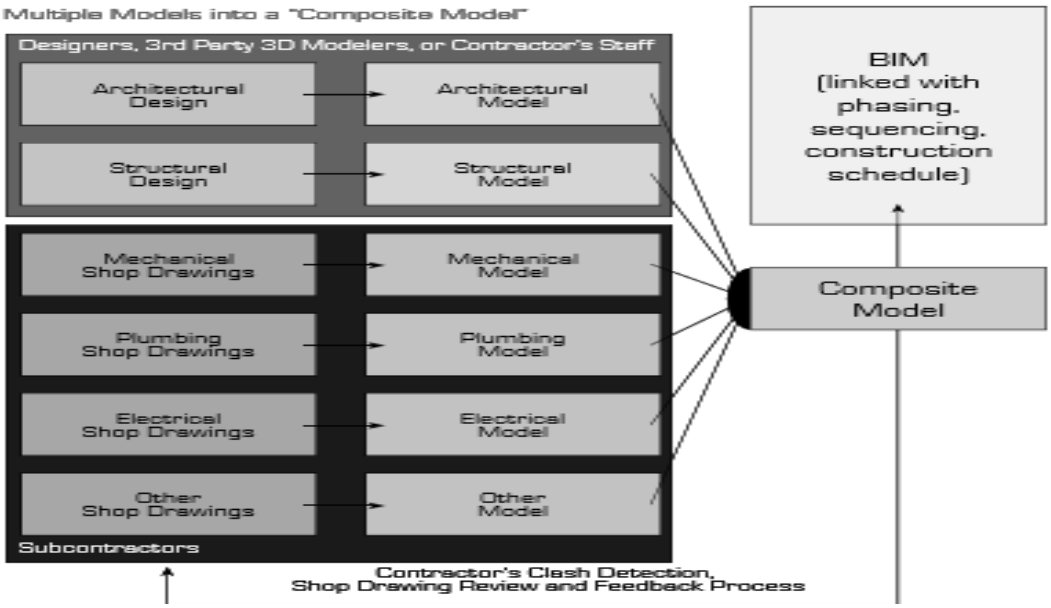

Figure 1 Building Information Modelling in construction lifecycle

Before selecting the adoption strategy, reviewing the adoption of BIM through the project lifecycle is required (Zakaria et al., 2013). The usage of supportive project delivery can be helpful where it increases the efficiency of BIM operation through creating the project (Zhang et al., 2015).

The Evolution of BIM

There are four methods to integrate the various functionality needed in BIM tools: One single model is created to contain all the functions which could be parallel to nD modelling tool. A set of connected process progressive strategy that is equally useful to various firms. Impartial public typical exchange interface is adopted by the application. BIM support tools to improve their own capabilities Eastman et al. (2011). Figure 2 presents more details

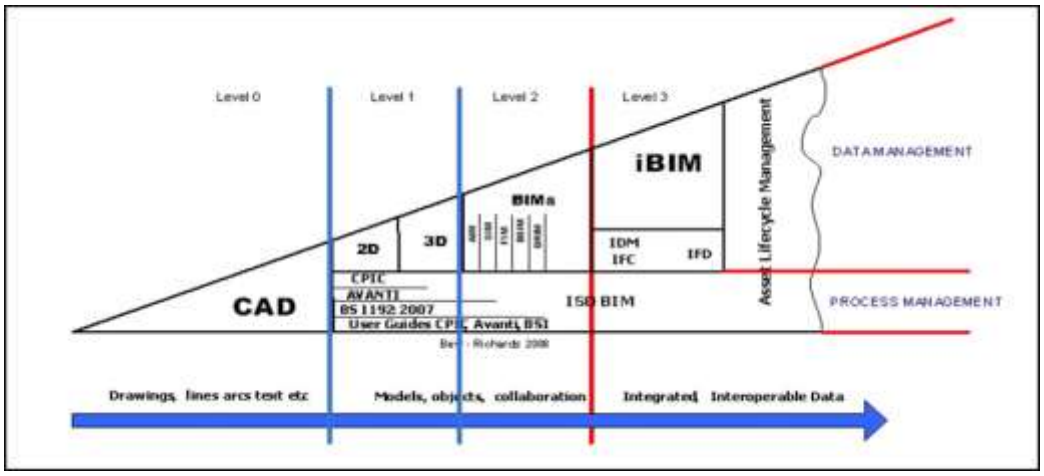

Figure 2 BIM evolutionary ramp from construction perspective (Bew et al., 2008)

BIM adoption – Global Strategies

As stated by Lu et al. (2012) the **United States** is leading the world in BIM adoption and implementation in the construction industry. The US (GSA) General Services Administration has established the implementation of BIM on public projects and federal services In the

United States. As stated by Khctnlani (2012), they established a national (3D-4l)-BIM program through its Public Buildings Service (PBS) Office In 2003. BIM utilization was instructed for spatial program validation in 2007. A series of strategies and instructions that contain a National BlM Standard that is internationally predictable has also recognized. The **United Kingdom** has presented a BIM adoption strategy for the UK construction industry that is assumed by many to be the greatest BlM implementation program in the world Smith (2014). The Strategy of the UK Construction industry in 2011 was a 5-year staged implementation plan with the intention to include BIM on all of government projects by 2016.

Scandinavian Region

The Finnish Government has invested intensely in IT research in the construction industry since the 1970s. They recently launched a Universal BIM instructors for the contractors which is being heavily supported the Finnish construction industry Sulankivi et al. (2013). The Danish government is deeply support BIM and invests strongly in research and development as stated by Smith (2014). Denmark is leading the expansion of new BIM classification standards for productivity in construction, the target for establishing this standard for not only Denmark but for the European Union area. Shao et al. (2013) stated that, this new BIM classification standard is very imperative for the European Union and there has been worldwide interest in its progress. Statsbygg in Norway is an organization responsible for management, progress and construction in government services. They have implemented BIM for their projects since 2007 (Smith, 2014).

3. RESEARCH METHODOLOGY

The aim of this study was to select the best strategy to adopt BIM technology in the Jordanian construction industry. Qualitative and quantitative approaches were applied in this study. BIM is a new technology in the Jordanian construction industry, the circumstantial analyses and qualitative approaches seem proper as they describe why and how. The study established a survey to measure the different levels of BIM strategies. Firstly, an interview was directed to a fifteen respondents as a representatives for the major construction organizations in Jordan, the core of the interview was about the best strategy to adopt BIM technology in Jordan , the interview results lead to develop a conceptional model (Figure 3)

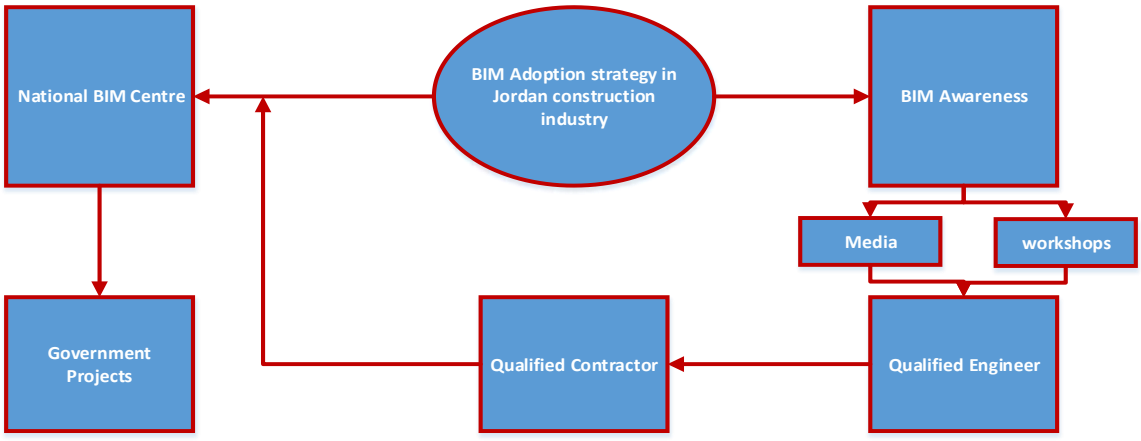

Figure 3 Conceptual Model for BIM adoption strategy in Jordan Construction Industry.

Secondly, a questionnaire has distributed to 50 construction engineers work as a project manager in different construction organizations to test validity of the interview results and finalise the adoption strategy model, the new model shown below in Figure 4.

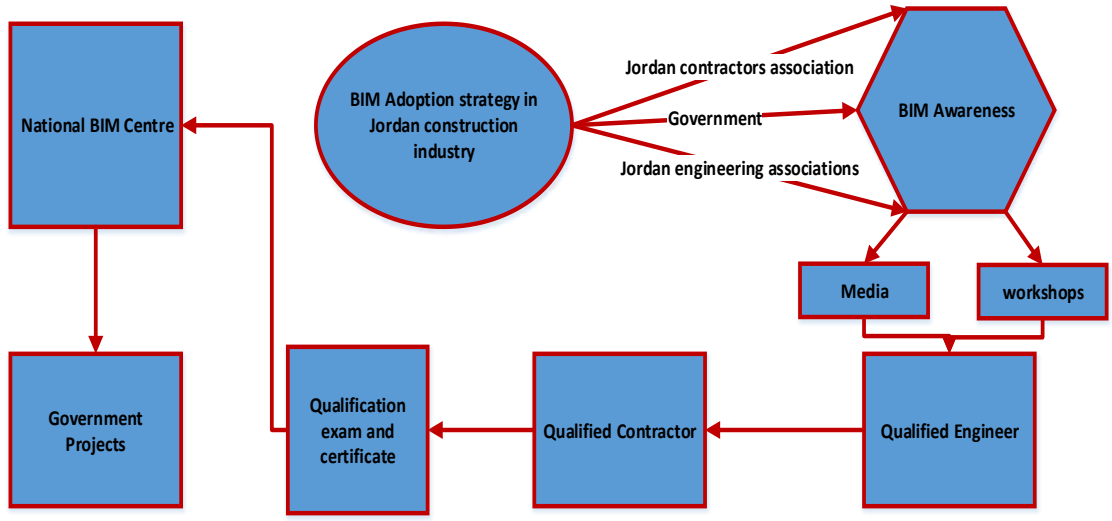

Figure 4 Finalised Model for BIM adoption strategy in Jordan Construction Industry.

4. RESULTS AND DISCUSSION

The analysis of the data was based on the individual knowledges and contextual of the respondents, their considerate, and awareness of BIM. The respondents showed a variation in terms of BIM concept. While 10 (20%) individuals considered BIM as a Model-Based Collaboration, 20 (40%) understand BIM as "*an interactive set of processes, policies, and technologies producing an approach to manage essential building designs and project data in a digital format all through the building's life-cycle*." Likewise,20(40%) supposed that BIM technology is a Network-Based Integration. In regard of BIM adoption strategy, 40% (20 respondents) was not sure about BIM implementation strategy in Jordan. 50% (25 respondents) believed that no strategy is sufficient to adopt BIM in Jordan, 10% (5 respondents) indicated that BIM will take place in Jordan if the government adopt the new technology.

5. CONCLUSION

BIM implementation is progressively becoming essential for the AEC industry to improve the construction development and address problems in the project lifecycles. The results confirmed that specialists have a better understanding and are familiar of BIM technology but the capital to initialise the technology is not available beside the lack of training staff and resistance to culture change, among others.

REFERENCES

[1] ABDIRAD, H. 2017. Metric-based BIM implementation assessment: a review of research and practice. *Architectural Engineering and Design Management,* 13**,** 52-78.

[2] AL-MOMANI, A. H. 1996. Construction cost prediction for public school buildings in Jordan. *Construction Management & Economics,* 14**,** 311-317.

[3] ANSAH, R. H., SOROOSHIAN, S., MUSTAFA, S. B. & DUVVURU, G. 2016. Advancing Towards Delay-Free Construction Project: A.

[4] ATAZADEH, B., KALANTARI, M., RAJABIFARD, A. & HO, S. 2017. Modelling building ownership boundaries within BIM environment: A case study in Victoria, Australia. *Computers, Environment and Urban Systems,* 61**,** 24-38.

[5] AZHAR, S., KHALFAN, M. & MAQSOOD, T. 2015. Building information modelling (BIM): now and beyond. *Construction Economics and Building,* 12**,** 15-28.

[6] BEW, M., UNDERWOOD, J., WIX, J. & STORER, G. Going BIM in a commercial world. Editors, Zarli, A. and Scherer, R., eWork and eBusiness in Architecture, Engineering and Construction, ECPPM 7 th European Conference on Product and Process Modelling, CRC Press, Taylor and Francis Group, Sophia Antipolis, France, 2008. 139-150.

[7] BRYDE, D., BROQUETAS, M. & VOLM, J. M. 2013. The project benefits of building information modelling (BIM). *International journal of project management,* 31**,** 971-980.

[8] EASTMAN, C. M., EASTMAN, C., TEICHOLZ, P. & SACKS, R. 2011. *BIM handbook: A guide to building information modeling for owners, managers, designers, engineers and contractors*, John Wiley & Sons.

[9] EL-MASHALEH, M. S. 2007. Benchmarking information technology utilization in the construction industry in Jordan. *Journal of Information Technology in Construction (ITcon),* 12**,** 279-291.

[10] HIYASSAT, M. A., HIYARI, M. A. & SWEIS, G. J. 2016. Factors affecting construction labour productivity: a case study of Jordan. *International Journal of Construction Management,* 16**,** 138-149.

[11] KHOSROWSHAHI, F. & ARAYICI, Y. 2012. Roadmap for implementation of BIM in the UK construction industry. *Engineering, Construction and Architectural Management,* 19**,** 610-635.

[12] LU, W., PENG, Y., SHEN, Q. & LI, H. 2012. Generic model for measuring benefits of BIM as a learning tool in construction tasks. *Journal of Construction Engineering and Management,* 139**,** 195-203.

[13] MATTARNEH, S. 2015. A study of factors causing cost overruns in Jordanian construction industry [dissertation]. *Al-Isra University, Amman, Jordan*.

[14] RUQAISHI, M. & BASHIR, H. A. 2013. Causes of delay in construction projects in the oil and gas industry in the gulf cooperation council countries: a case study. *Journal of Management in Engineering,* 31**,** 05014017.

[15] SHAO, Y.-Y., CHANG, Y.-L., HUANG, C.-Y., HSU, C.-H. & CHENG, A.-L. 2013. The germline BIM deletion polymorphism is not associated with the treatment efficacy of sorafenib in patients with advanced hepatocellular carcinoma. *Oncology,* 85**,** 312-316.

[16] SMITH, P. 2014. BIM implementation–global strategies. *Procedia Engineering,* 85**,** 482-492.

[17] SULANKIVI, K., ZHANG, S., TEIZER, J., EASTMAN, C. M., KIVINIEMI, M., ROMO, I. & GRANHOLM, L. Utilization of BIM-based automated safety checking in construction planning. Proceedings of the 19th International CIB World Building Congress, Brisbane Australia, 2013. 5-9.

[18] TAKIM, R., HARRIS, M. & NAWAWI, A. H. 2013. Building Information Modeling (BIM): A new paradigm for quality of life within Architectural, Engineering and Construction (AEC) industry. *Procedia-Social and Behavioral Sciences,* 101**,** 23-32.

[19] ZAKARIA, Z., MOHAMED ALI, N., TARMIZI HARON, A., MARSHALL-PONTING, A. & ABD HAMID, Z. 2013. Exploring the adoption of Building Information Modelling (BIM) in the Malaysian construction industry: A qualitative approach. *International Journal of Research in Engineering and Technology,* 2**,** 384-395.

[20] ZHANG, S., TEIZER, J., LEE, J.-K., EASTMAN, C. M. & VENUGOPAL, M. 2013. Building information modeling (BIM) and safety: Automatic safety checking of construction models and schedules. *Automation in Construction,* 29**,** 183-195.