Exploring Building Information Modelling (BIM) Readiness in Islamabad Capital Territory (ICT) of Pakistan

M Abubakar Tariq[1], Usman Javed[2], Mamoon Riaz[3], Tayyab Zafar[4]

1. Corresponding Author. Lecturer, Department of Civil Engineering (DCE), International Islamic University (IIU), Islamabad, Pakistan.
   Email: abubakar.tariq@iiu.edu.pk
2. Lab Engineer, Department of Civil Engineering (DCE), International Islamic University (IIU), Islamabad, Pakistan.
   Email: usman.javed@iiu.edu.pk
3. Lecturer, Department of Civil Engineering (DCE), International Islamic University (IIU), Islamabad, Pakistan.
   Email: mamoon.riaz@iiu.edu.pk
4. Lab Engineer, Department of Civil Engineering (DCE), International Islamic University (IIU), Islamabad, Pakistan.
   Email: tayyab.zafar@iiu.edu.pk

Abstract

Building Information Modelling (BIM) is a significant development in Architecture, Engineering and Construction (AEC) industry. It is a collaborative way of working among stakeholders of a project underpinned through technology, i.e. shared data rich virtual model of a construction facility. Governments, round the world, are steering the process of BIM adoption to achieve value for public money spend on infrastructure. Different studies are carried out, throughout the world, on different focus groups to find out their readiness of BIM. The present study is the first ever study to explore an overall awareness and readiness of BIM in the construction sector operating within the vicinity of Islamabad Capital Territory (ICT), Pakistan. A survey is conducted in the study area; 190 valid responses are obtained. The results show that 59% of the respondents are aware of BIM, however, only 39% are currently utilizing BIM. Nevertheless, 62% respondents are willing to adopt BIM in the near future. Therefore, awareness and the willingness to adopt BIM is on an upward trend, while, the adoption of BIM is a bit low at present. The government should steer the process of BIM adoption, like the United Kingdom (UK) Government, to achieve value for public money in developing infrastructure.

Keywords: BIM, BIM awareness, BIM readiness, BIM adoption

1. INTRODUCTION:

BIM is documented as a 'revolutionary' development and a 'game changer' for AEC industry (UK Cabinet Office, 2011; Ullah *et al.*, 2019). There is no single universally agreed a definition of BIM as it is a huge concept to comprehend. Nevertheless, in a nutshell it is a precise data rich virtual representation of a construction facility and a collaborative way of working (Eastman *et al.*, 2011).

The significance of the BIM is evident as the government of the UK initiated a task group with the help of the UK's construction industry in 2011 for its implementation. The cut-off date to adopt BIM Level-2 for all public projects in the UK was 2016 (UK Cabinet Office, 2011) and BIM Level-3 would be implemented from 2016 to 2025. Furthermore, BIM plays a key role in achieving set targets in Construction 2025 (HM Government, 2013).

Numerous benefits of BIM have been reported in the literature. Zheng *et al.,* (2019) identified that BIM can be beneficial throughout a project's life-cycle: design, execution, operation, as well as, to improve the living environment of a facility. Additionally, it can improve safety (Li *et al.*, 2017) and productivity (Arayici *et al.*, 2011), which will reduce the delays and cost (Azhar, 2011).

However, Ullah *et al.*, (2019) state, based on the literature review, that despite the benefits of the BIM, there are many barriers to adopt it, such as: lack of awareness, the cost involved for software, hardware and training, lack of interest from clients/contractors/sub-contractors, legal and contractual issues.

Several studies in different parts of the world on BIM readiness targeted towards specific groups have been conducted in the literature to assess the awareness of the subject matter and its readiness (Zhou, 2012; Kugbeadjor, 2015; Ghaffarianhoseini *et al.*, 2016; Shen, 2016; Yusuf, 2017). However, no such study is undertaken in Pakistan, thus, for the first-time authors conducted this study for the construction industry of Pakistan keeping in view of significance and the growing demand of BIM internationally (Ismail, 2017).The present study is aimed at to explore an overall awareness of BIM among practitioners of in the construction industry within the premises of ICT, Pakistan. Furthermore, the authors are interested in to find out if the practitioners of the industry are willing to adopt it in the near future.

2. METHODOLOGY:

The methodology of this exploratory study is based on literature review and questionnaire survey data collected from stakeholders involved in construction projects within the ICT, Pakistan. A questionnaire survey was carried out to explore awareness, usability and the willingness of stakeholders to adopt BIM in the near future. The aim of the research is to explore an overall awareness of BIM in the construction industry, not just the top management of an organization, thus, a wider spectrum of the participants is targeted as unit of analysis. Awareness regarding BIM of the wider workforce of the industry i.e. individuals working in the sector, is utmost significant to find out prevailing conditions of the industry. Additionally, as the industry is comprised of different roles: clients, contractors and consultants, thus

investigating the readiness of BIM from clients, contractors and consultants is also very important for better understanding the latest scenario of overall the industry. Therefore, 190 valid responses from individual working as clients, consultants and contractors are gathered and analyzed. The results of the survey are presented graphically and critically analyzed in the results and discussion section.

3. RESULTS AND DISCUSSION:

The results of the survey conducted within the ICT, Pakistan regarding awareness of BIM and its readiness are given below. A total of 190 respondents from different stakeholders of construction industry participated in the survey.

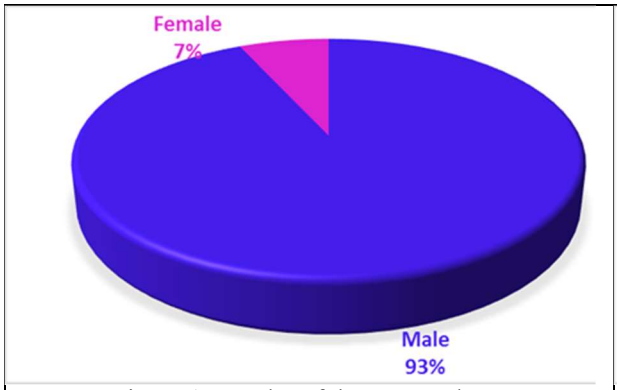

Figure 1: Gender of the Respondents

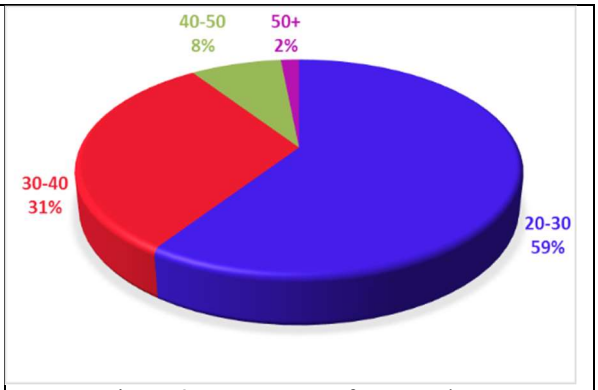

Figure 2: Age Group of Respondents

The study reveals male dominancy in the construction industry of the ICT, with the figure of 93 and 7% of male and female respondents respectively as shown in figure 1. However, youngsters between the age of 20-30 years make a simple majority of 59% in this field, whereas, 31, 8 and 2% of the respondents are between the age group of 30-40, 40-50 and 50+ years respectively.

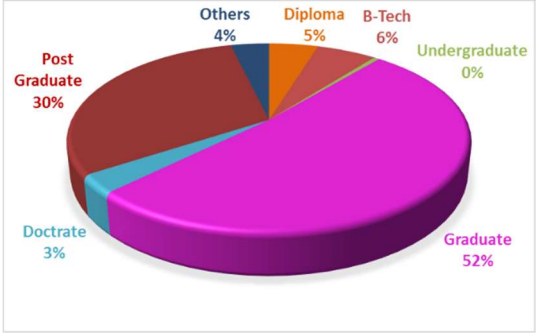

Figure 3: Qualification of the Respondents

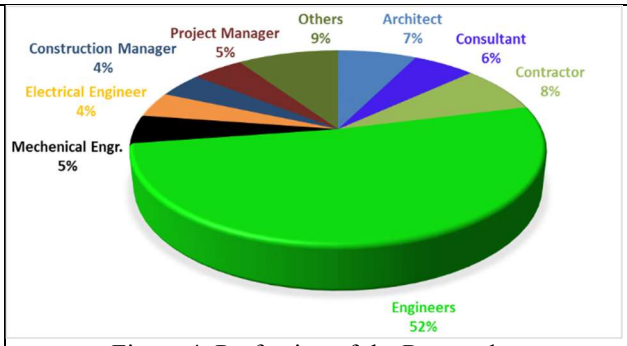

Figure 4: Profession of the Respondents

The qualification demographics of respondents are shown in figure 3; 52% are graduates and 30% are postgraduates. Additionally, 3% of the respondents hold PhD degree as well. But the majority of the respondents have a four years degree and above qualification. The current profession of the respondents is shown in figure 4. The respondents displayed an array of profession, but the majority of them are Civil Engineers, i.e. 52%.

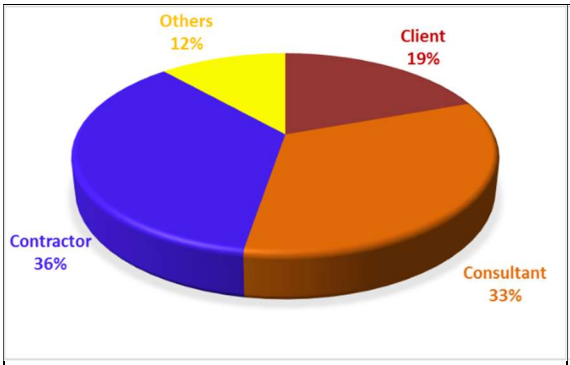

Figure 5: Role Assumed by the Organization

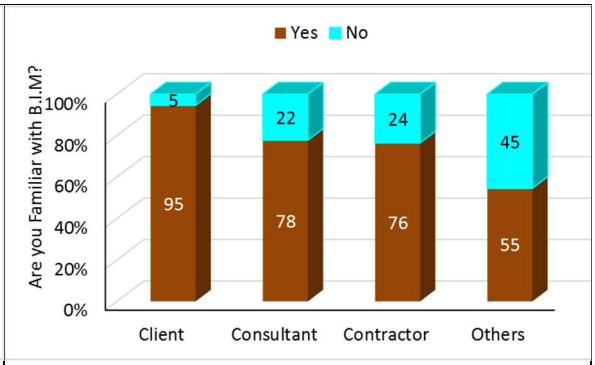

Figure 6: Familiarity with BIM

The statistics of the respondents working as a client, consultant or contractor are shown in figure 5. The majority of the respondents taken this survey are contractors and consultants with the values of 44 and 32% respectively, whereas, 15% respondents of the survey categorized their organization as a client. In response to a question about BIM awareness the percentage of the respondents who are aware of the BIM is 59% while 41% are ignorant of this development. Furthermore, the results show in figure6 that maximum of 95% clients are aware of BIM as compared to consultants and contractors. Keeping in view that Pakistan is a developing country and challenges faced by the construction industry, 59% respondents are aware of BIM, which seems appropriate to begin with. Nevertheless, to keep up with the pace of the global construction sector, BIM awareness of the construction industry of Pakistan should be increased through workshops, seminars, and conferences. Furthermore, awareness regarding different levels of BIM should be imparted, which was out of the scope of the present study.

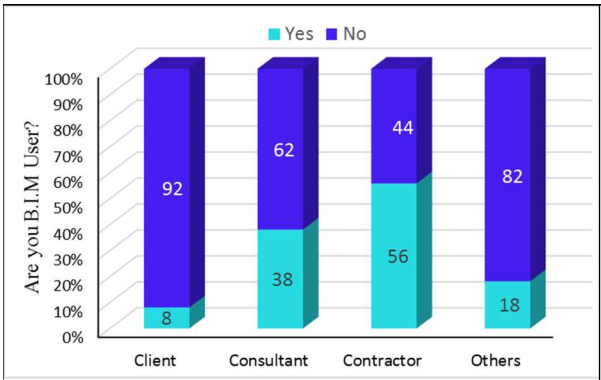

Figure 7: BIM Users in ICT Pakistan

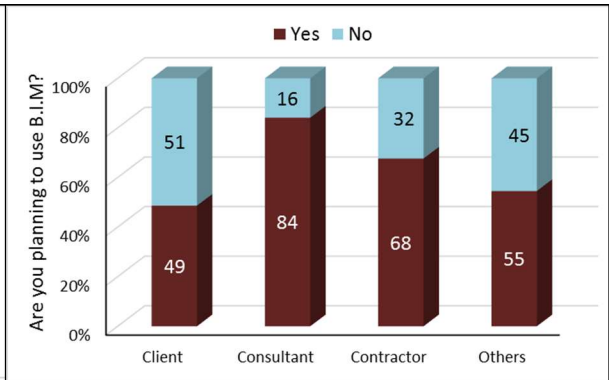

Figure 8: Planning to Use BIM

The overall percentage of the respondent currently using BIM is 39%, whereas, 64% aren't currently using it. Figure 7 shows that currently a maximum of 56% of contractors are using BIM, whereas, a minimum of 8% of clients are utilizing BIM. Again, the levels of BIM usage, i.e., level 0-3, isn't the scope of the present study. Nevertheless, the examination results clearly show that the awareness is at a higher end as compared to adoption of BIM in the study area. Thus, the adoption of BIM is at an inception stage. The barriers to adopt BIM are cost of training, software and equipment, lack of expertise and training (Shen *et al.*, 2016). Nevertheless, the respondents are asked if they are planning to use BIM in the future; 62% of the respondents gave positive response to adopt BIM as compared to 38% respondents who aren't yet planning to adopt it. Figure 8 shows that the maximum and minimum values observed are for consultants

(84%) and contractors (49%) respectively. But the level of BIM adoption is yet to be investigated.

4. CONCLUSION and RECOMMENDATION:

The first ever study to explore awareness of BIM and readiness to adopt it is undertaken in ICT, Pakistan. Questionnaire survey is conducted and 190 respondents participated in the surveys having different gender, age group, qualification, and roles in the construction industry. Overall, it is explicit from the results that practitioners of the construction industry, clients, consultants and contractors, of the study area are aware of BIM i.e. 59%, however, only 32% has adopted BIM at present. On the other hand, 62% respondents stated that they are planning to use BIM in the future, which shows a positive attitude towards BIM adoption. Therefore, willingness and readiness to adopt BIM is on an upward trend even though the adoption is low currently.

It is recommended that awareness, readiness and adoption based on different levels of BIM can be further explored in the near future.

ACKNOWLEDGEMENT:

The authors would like to thank BSCE students of DCE, FET, IIUI, namely: M Zaman, Furqan Ahmed and Nasir Zaid in conducting a survey for this research study.

REFERENCES:

Arayici, Y., Coates, P., Koskela, L., Kagioglou, M., Usher, C. and O'reilly, K., (2011). Technology adoption in the BIM implementation for lean architectural practice. Automation in construction, 20(2), pp.189-195.

Azhar, S., 2011. Building information modeling (BIM): Trends, benefits, risks, and challenges for the AEC industry. Leadership and management in engineering, 11(3), pp.241-252.

Eastman, C., Teicholz, P., Sacks, R. and Liston, K., (2011). BIM handbook: A guide to building information modeling for owners, managers, designers, engineers and contractors. John Wiley & Sons.

Ghaffarianhoseini, A., Doan, D. T., Zhang, T., Ghaffarianhoseini, A., Naismith, N., & Tookey, J. (2016). A BIM readiness and implementation strategy for SME construction companies in the UK. In Proceedings of the 33rd CIB W78 Conference.

HM Government (2013). Industrial Strategy: government and industry in partnership. [online] Assets.publishing.service.gov.uk. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/210099/bis-13-955-construction-2025-industrial-strategy.pdf [Accessed 22 May 2019].

Ismail, N.A.A., Chiozzi, M. and Drogemuller, R., (2017), November. An overview of BIM uptake in Asian developing countries. In AIP Conference Proceedings (Vol. 1903, No. 1, p. 080008). AIP Publishing.

Kugbeadjor, W., Suresh, S., & Renukappa, S. (2015). BIM awareness and readiness of postgraduate built environment students in West Midlands universities, UK. In CIB International Conference Proceedings. Going north for sustainability: leveraging knowledge and innovation for sustainable construction and development (pp. 531-543).

Li, H., Lu, M., Hsu, S.C., Gray, M. and Huang, T., 2015. Proactive behavior-based safety management for construction safety improvement. Safety science, 75, pp.107-117.

Shen, L., Edirisinghe, R., & Yang, M. G. (2016). An investigation of BIM readiness of owners and facility managers in Singapore: institutional case study. In CIB World Building Congress.

UK Cabinet Office. (2011). Government Construction Strategy. Retrieved May 16, 2019, from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/61152/Government-Construction-Strategy_0.pdf

Ullah, K., Lill, I. and Witt, E., (2019), May. An Overview of BIM Adoption in the Construction Industry: Benefits and Barriers. In 10th Nordic Conference on Construction Economics and Organization (pp. 297-303). Emerald Publishing Limited.

Yusuf, B. Y., Embi, M. R., & Ali, K. N. (2017). Academic readiness for building information modelling (BIM) integration to Higher Education Institutions (HEIs) in Malaysia. In 2017 International Conference on Research and Innovation in Information Systems (ICRIIS) (pp. 1-6). IEEE.

Zhou, L., Perera, S., Udeaja, C., & Paul, C. (2012). Readiness of BIM: a case study of a quantity surveying organisation.

Zheng, X., Lu, Y., Li, Y., Le, Y. and Xiao, J., (2019). Quantifying and visualizing value exchanges in building information modeling (BIM) projects. Automation in Construction, 99, pp.91-108.