

Adoption and Awareness of Building Information Modelling (BIM) in Pakistan

**Umar farooq¹, Dr. Kashif ur rehman², Rafaqat shoaib³, Nasir khan⁴ and Adnan
haider⁵**

1. Corresponding Author. BS student, Department of Civil Engineering, COMSATS University Islamabad, Abbottabad campus, Abbottabad, Pakistan.
Email: umer6868@gmail.com
2. Assistant Professor, Department of Civil Engineering, COMSATS University Islamabad, Abbottabad campus, Abbottabad ,Pakistan.
Email: skashif@cuiatd.edu.pk
3. BS student, Department of Civil Engineering, COMSATS University Islamabad, Abbottabad campus, Abbottabad, Pakistan.
Email: Rafaqatshoaib157@gmail.com
4. BS student, Department of Civil Engineering, COMSATS University Islamabad, Abbottabad campus, Abbottabad, Pakistan.
Email: nasirkhansgr2@gmail.com
5. BS student, Department of Civil Engineering, COMSATS University Islamabad, Abbottabad campus, Abbottabad, Pakistan.
Email: adnanhaider470@gmail.com

Abstract

During 2016-2017, a higher growth rate of 9.05 % is achieved by Pakistan construction industry. It is observed that the construction industry has a poor reputation of accomplishing the projects in required time, cost, and quality. It is because of using the traditional management techniques that can be easily minimized with the implementation of new technologies like Building Information Modeling (BIM). In this study, a questionnaire survey is performed, which helps in finding the present state of BIM in Pakistan and also highlights the barriers in the successful adoption of BIM in Pakistan. Out of 105 responses received, 63 % of Architecture, Engineering, and Construction (AEC) professionals are aware of BIM and among them, only 17% had utilized BIM in their projects, which is a very low percentage and has to be increased. This research helps in the awareness of BIM in Pakistan as 91 % of the respondents responded that it helps us in clearing our minds about BIM.

Key Words: Building Information Modeling (BIM), 2D CAD, BIM in Pakistan, Barriers in Adopting BIM in Pakistan.

1. INTRODUCTION

Construction industry is an important economic development sector in Pakistan. It produces the largest ratio of employment and also plays a vital role in economic development (Maqsoom et al., 2013). The construction industry has an annual growth rate of 9.05% during the period of 2016-2017 (Pakistan Economic Survey 2017). The construction Industry in Pakistan, like other developing countries, has a poor history in terms of completing projects in required time, cost and quality (Gardezi et al., 2014, Maqsoom and Charoenngam, 2014). Moreover, many projects fail to accomplish their objectives due to cost and time overruns; hence, the Pakistan construction industry is unable to deliver as per government plan of progressive development (Maqsoom and Charoenngam, 2014). So through usage of modern tool like BIM to accomplish the project successfully. In this study, problems are highlighted which hinders for successful completion of a project; a communication gap within an organization, lack of government policies, lack of awareness among the stakeholders etc.

The objective of this research is to scrutinize BIM applications in designing, coordinating, managing and execution of construction projects and to evaluate the potential of BIM for its use in Pakistan construction industries.

2. Building Information Modeling (BIM)

2D computer aided design (CAD) was first introduced by the Autodesk company in December 1982. It helps in better documentation, accurate drafting and save time. Due to easiness of using AutoCAD, the architects shifted towards AutoCAD (Yan and Demian, 2008).

The concept of BIM was first introduced by Chuck Eastman and Robert Aish in 1970. For more than twenty years, this system of modeling was used under different names such as virtual building, intelligent object and product model (Ozorhon and Karahan, 2016). This edge of BIM over traditional CAD model is that the model generated by BIM can be effectively used for planning, design, construction, and operation of the facility (Azhar, 2011). Architecture, Engineering, and Construction (AEC) professionals prefer BIM for effective and efficient design and construction management (Charlesraj, 2014). BIM is not only a software but a complete process as well (Azhar, 2011). BIM as an official term was used in 1992 and later on in 2000 software called “Revit Software”. After that the same software was sold to Autodesk and they brought many new changes in 2004. Currently, that software is known as Autodesk Revit. BIM has brought revolutionary change in the field of building design to some high level of extent (Haron et al., 2009).

BIM can effectively help in minimizing these problems. BIM may be defined as the process of creation and implementation of a computer based model to integrate the planning stage, design stage, the execution phase and operation of a project (Masood et al., 2014). Autodesk360 cloud (A360) provides a central workspace in the cloud for project content and the people working on a project (members of a project). A360 cloud is a collaborative tool through which all the team members are connected and they share their designs etc. to A360 drive as shown in figure 1 . Members of the project team can easily access and view all the data formats (DWG, PDF, DWT, RVT etc.) shared in the drive from any device.

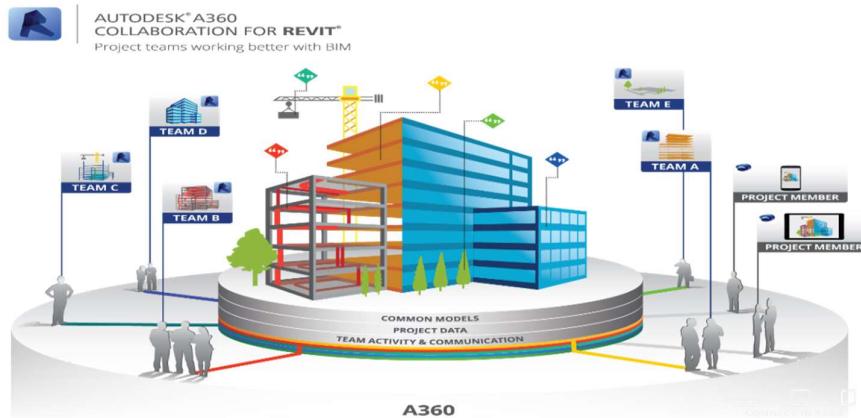


Figure 1:A360 Cloud
(<https://bimandbeam.typepad.com/.a/6a00d83453439169e201b7c73706ed970b-pi>)

3. Difference between BIM and 2D CAD

BIM and 2D CAD differ from each other in such a way that 2D CAD explains a building by isolated 2D views such as plans, sections and elevations. If changes are to be made, changes in all views must be done, a tedious process which is more prone to errors and leads to improper documentation. Moreover, 2D drawings show data as graphical entities only, such as lines, arcs and circles, as compare to the intelligent background semantic of BIM models, in which objects are defined in terms of building elements and systems such as spaces, walls, beams and columns. A BIM model include all data needed, which is related to the structure, including its aesthetics, functional properties and information related to project life cycle, in addition of “smart objects”. For example, in BIM any heating unit also store information related to its supplier, operation and maintenance procedures, flow rates and clearance requirements (Innovation, 2007). The processes of BIM helps in development and use of the computer generated n-dimensional (n-D) models to simulate the planning, design, construction and operation of a facility. It helps AEC professionals to overlook what is to be built on the site and to identify effective design, construction or operational clashes and any issues which would disturb the project execution as planned (Azhar, 2011).

4. BIM implementation globally

A wide research is ongoing to realize the issues for the implementation of BIM in the construction industry and to communicate the benefits of BIM implementation to the construction industry. It is reported that globally BIM implementation was 26% in 2007 and over doubled in less than a decade, reaching 57% in 2016 (Bhatti et al., 2018).

The governments of the US, UK, Germany, Canada and other developed countries have made the BIM implementation compulsory for their industries (Wang, 2014). A research shows that the lower percentage of BIM adoption in Malaysia is due to the lack of national BIM policy, poor holistic readiness , software integration, competition and unwillingness to share knowledge amongst industries (Bin Zakaria et al., 2013).

BIM implementation in the top ten largest international construction markets (working on level 2 of BIM) are as shown in Table 1.

Table 1: BIM Adoption percentages in the world (Bin Zakaria et al., 2013).

Countries	Adoption percentages	Countries	Adoption percentages
Germany	90%	France	65%
United States	72%	United Kingdom	54%
Canada	67%	India	22%

5. BIM in Pakistan

When it comes to development in infrastructure, Pakistan lags far behind due to illicit practices in the construction sector (Maqsoom et al., 2013). The critical risks in Pakistan's construction industry include poor quality, lack of planning, alteration in scope and design of a project, corruption, claims and disputes, inadequate design, and quantity changes (Shabbar et al., 2017). Similarly, one the main reason for major delays and cost overruns have been reported as mistakes and error in design, variations, delays in preparation and approval of drawings, conflicts between drawings and specifications, unrealistic time and cost estimate, improper planning, poor coordination between project stakeholders, and poor contract management (Gardezi et al., 2014). In Pakistan only 11% of related industry has implemented BIM and only to generate 3D models which is very limited part of BIM (Bhatti et al., 2018) and has to be increased. Measurements should be done for the adoption of BIM in Pakistan also national policies should be made to control the problems facing by the construction industry in Pakistan (Ali et al.).

6. Results and Discussions

6.1. Survey

A questionnaire document is any written set of questions, while a survey is both the set of questions and the process of gathering, combining, and examining the responses from those questions.

After going through the literature review, an online questionnaire was developed through google documents and shared for collecting information regarding the BIM implementation in Pakistan's construction industry. It consists of three sections, section A is a demographic section and includes the demographic profile of respondents. Section B consists of certain questions about the implementation of BIM. Whereas in section C questions about the barriers in the successful implementation of BIM was asked.

The questionnaire was distributed via email amongst the contracting companies, consultants, architectural firms and engineers. The email addresses of the firms was acquired from the Pakistan Engineering Council (PEC) website and through personal contacts.

6.1.1 Demographic section

Figure 2a shows the respondent profiles and Figure 2b shows their awareness about BIM. From the survey performed, 105 responses were received and analysis were done which shows that 63% of the professionals in the construction industry of Pakistan are aware of BIM and the remaining 37 % are still unaware of BIM and its applications.

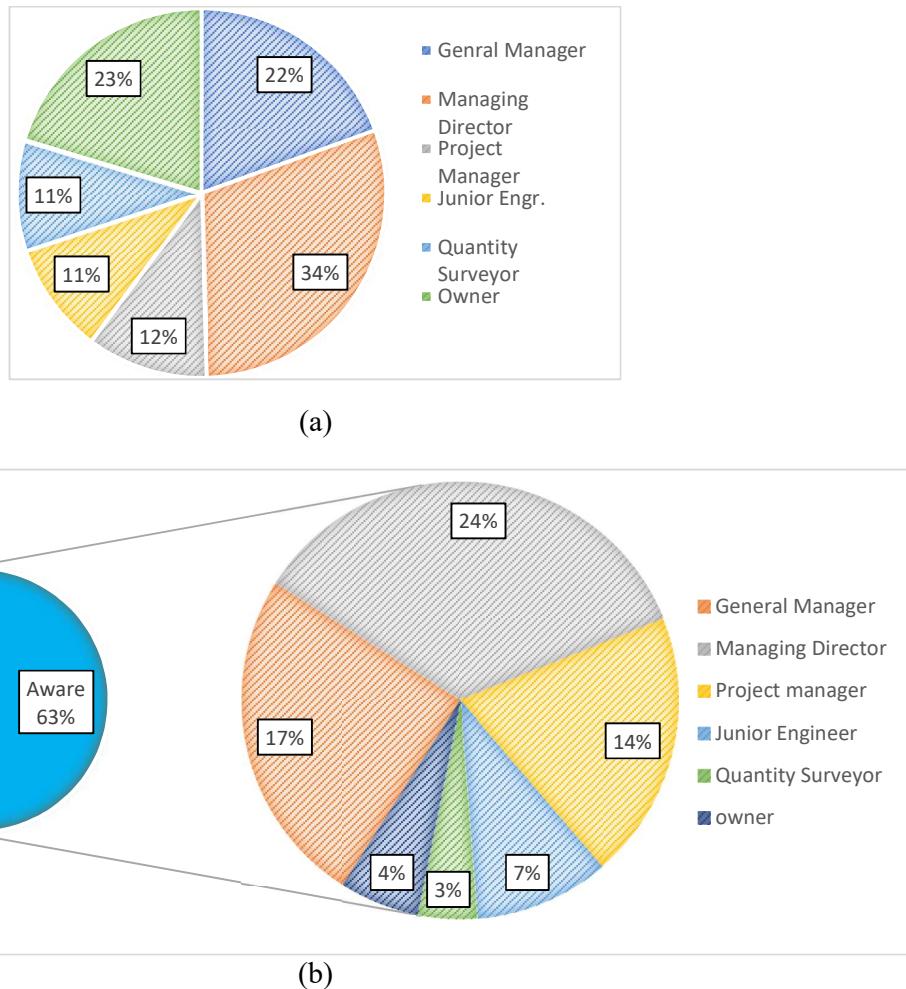


Figure2: Demographic profile of Respondents; a) Job Position, b) Awareness about BIM

6.1.2. BIM Implementation:

In Figure 3a it is shown that among 63 % of the respondents who were aware of BIM only 17% of them had utilized BIM in their projects, which is a very low percentage. Whereas in Figure 3b, it is shown that only 25% of organizations have BIM policies and protocols. A question was asked “Do you forecast companies will be left behind if they don’t adopt BIM quickly enough” in which 82 % of the respondents thinks that companies will be left behind if they do not adopt BIM in their projects quickly. So, according to this survey results, the companies should adopt BIM quickly for their survival in the upcoming decades.

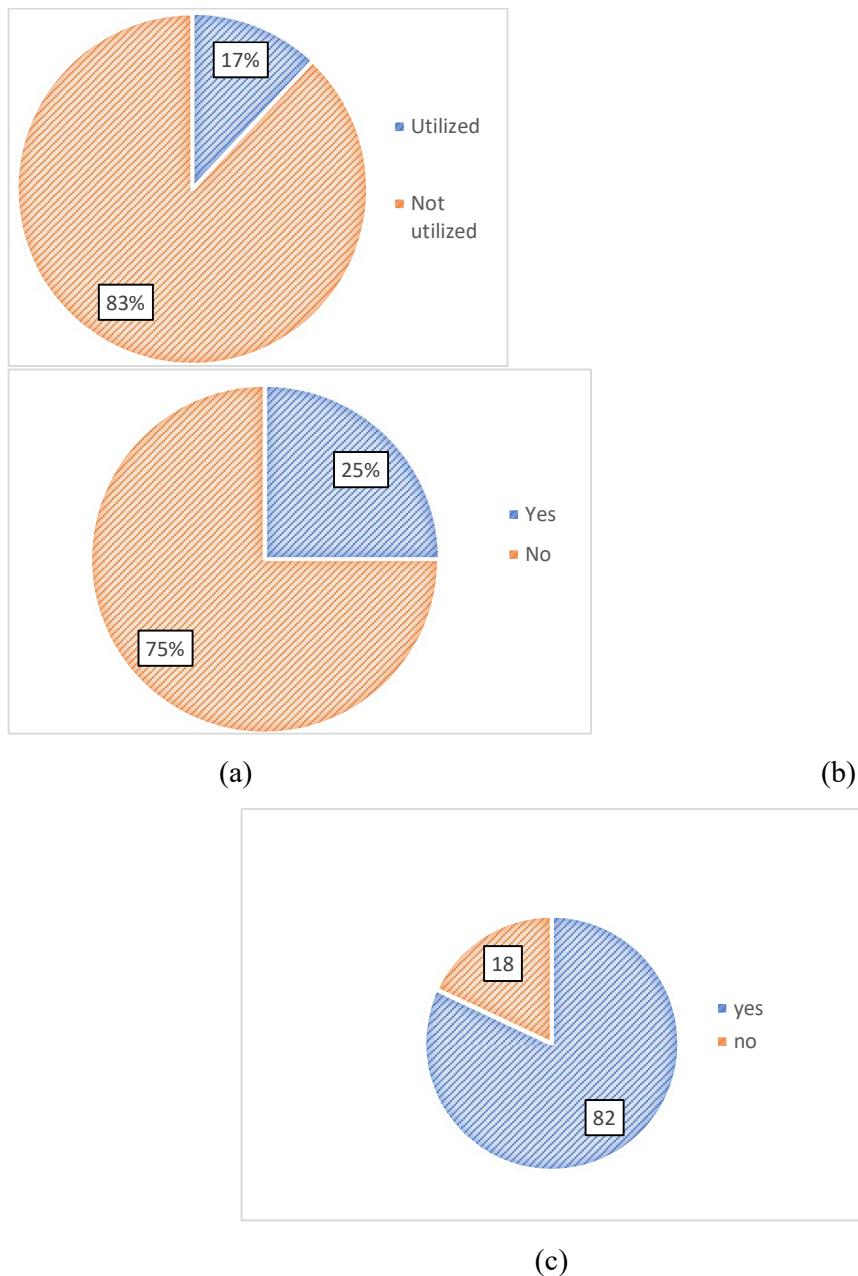


Figure 3: BIM Implementation, a) Utilization of BIM in projects, b) The availability of BIM Policies in organization, c) Prediction about BIM adoption in near future.

7. Barriers/Issues Related to Adopting BIM in Pakistan

Table 2 shows the barriers and their ratings in the successful adoption of BIM in Pakistan's construction industry. Respondents are asked about different barriers of BIM adoption to rate it on a Likert scale from 0-5. The responses are then analyzed and the average ratings for each barrier is obtained.

Table 2: Barriers in adoption of BIM

Barriers	Rating
Lack of Government regulation about BIM	78%

Lack of seminars on new technologies like BIM by firms	77%
BIM adoption requires organizational restructure	72%
Lack of BIM professionals	70%
Lack of ability to manage projects through BIM	64%
Searches of firm for a better consultant coordination process	62%
Initiatives encouragements of firm in developing new solutions	62%
Top management don't support change	62%
Communication gap in an organization	60 %
High initial cost of BIM	52%
Current practices are serving good	35 %
Firms provides software training to their employees	55%

8. Awareness of BIM:

For the awareness of BIM amongst the AEC professionals, a video about BIM and its applications was shared and a question was asked whether the video is helpful in clearing their minds about BIM or not. 91% of the respondents responded that the video was helpful in clearing their minds about BIM.

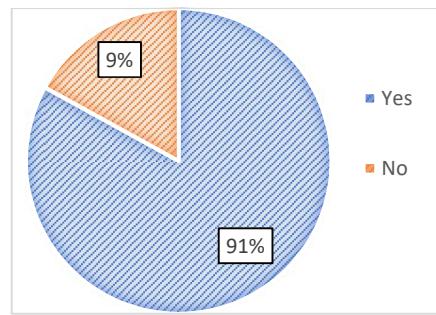


Figure 4: Was this video helpful or not?

9. Conclusion:

Construction industry of Pakistan is facing problems of delays and miscommunications in all stages of the project. The construction industry are not yet convinced to adopt the modern management approaches such as BIM. Through this case study, the present state and barriers of BIM implementation are highlighted. The study recommends BIM to be beneficial for the construction sector. The topmost barriers of BIM adoption in Pakistan construction industry are identified as the present structure of organizations and lack of government regulation about BIM. For the awareness of BIM in Pakistan's construction industry a video was shared with the AEC professionals and in the near future seminars will be arranged to show the advantages of BIM with the help of practical work.

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