

BIM-based facility management: A critical appraisal of benefits and challenges

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Abstract: For the past few decades, construction industry has seen slow and steady growth with respect to innovation and productivity. This debate was finally renewed with the introduction of building information modeling (BIM), which has emerged as a probable solution for facility managers to counter the challenges of poor interoperability and information handling during project handover stage. Also, in the Indian context, with the increasing development, use of new and latest technology becomes an integral part, which instigates a need of using BIM along with other technologies. However, despite the advantages like automation in data entry and ease of accessing the data, BIM in facility management (FM) is being adopted very slowly. A comprehensive literature review reveals that there is an improvement related to the accuracy of facility management data which increases the efficiency of executing work orders. It also reveals that using BIM in FM for existing buildings is a challenging task with very few real world case studies. This paper aims to analyze the values added by BIM in FM and the challenges that obstruct the exploitation of the same. In particular, this paper contains a qualitative study of the state-of-art literature scrutinizing the interactions of BIM and FM.

Keywords: Building information modeling, efficiency, facility management, facility managers, interoperability.

1. Introduction

Construction industry in India forms the second largest industry after Agriculture, contributing a huge share to national economy and in generating employment. It attributes to almost 8-11% in India’s GDP, on an average. GDP from Construction industry has increased to 2754.48 INR Billion in the fourth quarter of 2018 as against 1861.37 INR Billion in the third quarter of 2012.



SOURCE: TRADINGECONOMICS.COM | CENTRAL STATISTICAL ORGANISATION, INDIA

This shows that a major growth is taking place in the construction industry. However, this growth will only continue if the industry grows with the latest technologies and trends and adopt it wisely. Before coming down to these technologies like BIM, let us first understand the operational and maintenance industry or the Facility Management industry which constitutes more than half the total life cycle cost.

FM broadly covers 2 domains: 'Space & Infrastructure' and 'People & Organization' where the former refers to the physical built environment with focus on (work-) space and (building-) infrastructure and the latter refers to work psychology and occupational physiology. The total life cycle cost of a project depends majorly on the operations and maintenance cost. Research shows that the overall life cycle cost of a project is usually 5 to 7 times greater than the initial investment [1]. Hence optimization of resources in the second half of the project life cycle becomes a necessary task. This instigates a need for managing both existing and new facilities in an economically and environmentally efficient way [2]. Countries around the

world have understood this need to adopt BIM in construction industry. Although developed countries have adopted BIM efficiently, developing countries are still struggling at the same [3].

Paper based documents is usually the source to building information. According to National Institute of Standards and Technology (NIST), a considerable time is spent on locating and verifying project and facility information from past activities, and most of the valuable data regarding design and operation is lost during its life cycle. Thus, humungous amount of information is required and it becomes the most necessary part for FM [4]. Construction industry has noticed legit reasons to use BIM for facility management for consistent and coordinated exchange of knowledge and information through different stages of a project [5].

In the Indian construction industry, BIM is still trying to catch up to the rest of the developed countries. Only a few companies are using BIM for their projects. On the other hand, Facility Management is yet to be developed into a formal sector completely. There is a scarcity of professional people required to handle BIM and for the interoperability between BIM and the FM software.

2. State-of-Art

A rapid urban transformation has been recorded in the last decade in India. The recent Smart Cities initiative by the Central Government has added new thrust to this rapid change. The application of technology is expected to transform the policies, governance and the process of providing water, sanitation and power. This vision of building smart buildings and smart cities can only be converted into reality with the help of latest technology. One such technology is BIM or Building information modelling which will save both time and money for the Construction industry. But a sustainable construction process always includes future in its methodology, which in turn instigates a need for including Operation and Maintenance in the design stage. The present scenario of adopting BIM for Facility Management is not very satisfying. Both BIM and FM are struggling in their own sector. However, a growth has been recorded in the last few years which suggests that the construction industry in India is no more reluctant about accepting new technologies.

2.1 Benefits

Most of the contracts today require documents that contain various lists like that of spare parts, equipment, warranties, maintenance schedules, etc. which is pivotal for both owners and facility managers to support and maintain the facilities [2]. The construction industry in general spends in millions and several hours of manpower in recollecting and assembling this information [6]. Facility managers, various book authors and researchers have suggested that BIM be used to assist with operations and maintenance management [7].

BIM plays a vital role in contributing towards a well-designed FM system through the supply of 3D data that can streamline facility management over the long term [7]. It is expected of BIM to capture data and use it across the entire life cycle of the project. Although BIM, so far, has been used for designing and construction purposes due to the coordination and imaging capabilities, there is an increasing demand amongst the professionals to use BIM in facility management activities as well [8]. Whatever data, be it graphical or non-graphical, is stored in BIM can be used for FM activities such as quality control, energy management, commissioning and repair maintenance [5].

BIM facilitates interoperability and exchange of information in digital format by representing the building process digitally [9]. Moreover, it increases the workforce efficiencies by improving the quality and reliability of data. As more and more people get accustomed to BIM, utilization of improved data will eventually increase manifold [9]. BIM will supply a rich data that can be set into the CAFM systems which will eventually help us in obtaining optimum performance at a faster rate and hence reduce cost [10].

The benefits of BIM in Facility Management begins from improvement in information handover, improvement in accessing the accurate FM data and the increase in efficiency in work order execution [2].

An updated building information can also help in deconstruction or decontamination process through minimizing errors and reducing financial risks by deconstruction scheduling, cost estimation or optimizing the tracking of deconstruction progress [11].

In a nutshell, BIM can help the FM personnel in saving time lost in obtaining the documents, make FM process easier giving a more clear direction to fulfil the objective.

2.2 Challenges

The key to efficient and effective operation and maintenance management is information [4]. Although this is vital for FM, this particular sector struggles with proper information management owing to the fragmented layers in the collection of information [9]. This basic factor contributes in the major loss of knowledge within the AECO sector [12]. Although computerization helps in the retrieval and capturing of information, the automated data analysis is still limited to Computer Aided Facility Management (CAFM) systems [4] [5]. Commonly used CAFM tools are Computer Aided Design (CAD); Integrated Workplace Management System (IWMS) [13]; Computerized Maintenance Management Systems (CMMS) [13]; Enterprise Asset Management [14]. All these software have different functions and behave differently, but the common prerequisite for all the CAFM systems is that they consider data as their most invaluable asset for their organization [15].

The other challenge which is usually faced by professionals is a missing system in place for matching the designed model with the available information [16]. At the same time, it is quite ambiguous as to who should provide the data and at what stage [5]. Facility Managers have usually been included in the later stage of the building lifecycle and that too in a very limited way [17]. Designs are hardly challenged for their impact on maintenance and operational life cycle [18]. The key challenge for FM industry is their approach in adopting new technologies and systems. The FM industry is usually reluctant in adopting new technologies and processes. Moreover, the advantages of BIM in FM has to be clearly conveyed to the FM industry or else the adoption rate will hardly show a progress [5]. The other challenge lie within the clients and the lack of demand from their sides [19]. A very few professionals available for BIM handling also hinders its adoption and use [10].

A platform for information exchange was developed called COBie (Construction Operation Building information exchange), which could capture the lifecycle operation and deliver the necessary information required by the FM industry [20]. However COBie fails to address the issue that who should provide the data, when should they provide it and how [21]. There is a lack of legal and contractual agreement for the implementation of BIM in FIM in particular [5], which forms another key challenge. Governments of individual countries need to take up a step in this regard.

After doing a small survey for the Indian subcontinent, it is revealed that BIM is in a growing stage and will work in its full potential in the coming years. However, clients around the country are not very optimistic with the idea of BIM, they are still assumed to be unaware of all the benefits of BIM. At the same time, Facility Management sector has seen a rapid growth in the last few years. There is still a gap between on-site service providers, and the FM designing team. Apart from the metropolitan cities, most of the places identify the facility service providers as individual vendors who provide a door to door service, without being included in the formal sector. For instance, if an owner wants to get the HVAC system checked and also get a gas pipe repaired, they will ask for two different vendors rather than approaching a single facility team which can look after both of them. In short, a One-Step solution is still not in place completely. The major challenges faced by the FM industry to incorporate BIM are summarized in Figure 1.

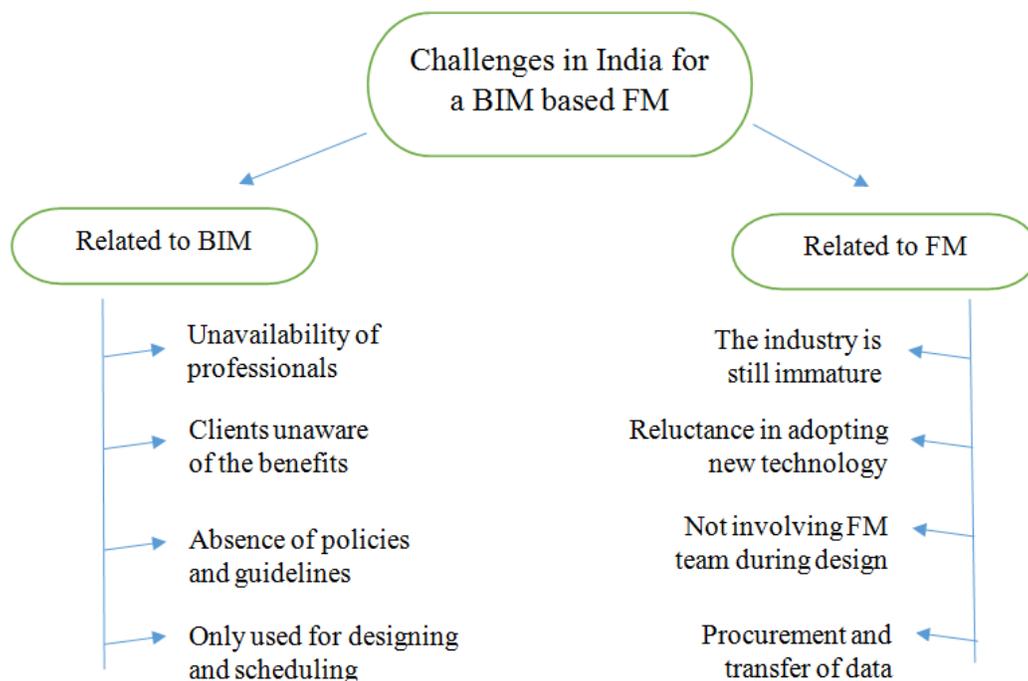


Figure 1: Challenges in India for a BIM based FM

3. Conclusion

The literature review reveals that Building Information Modelling can add great value to the Facility Management industry if implemented properly. There is no second thought about the fact that BIM will eventually save time and cost, bring in easier and relaxed ways of handling and transferring information and knowledge for both FM team and the client. Although there are a lot of evidences for the same, the integration of BIM and FM is still in emerging field. The findings also reveal that for a country like India, FM needs to take a major shift to be categorized into a formal sector completely. Only then will the FM industry be able to incorporate a platform like BIM. Today, there are significant challenges faced by the FM industry in the adoption of BIM. A lack of systematic handover and exchange of information, the missing demand from clients, a missing

legal and contractual framework which can help in the growth of this industry. At the same time, the developed platforms for the exchange of information should be polished wisely to answer all the doubts of a FM team as to who, when and how should the data be provided. Once these issues are resolved, BIM can be successfully incorporated in the FM industry and help the construction industry as a whole.

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