EXPLORING THE ADOPTION OF BUILDING INFORMATION MODELLING IN INDIA AND NEED FOR FURTHER IMPLEMENTATION

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Abstract: In the last decade BIM has brought a revolution in the AEC industry. Its ability to perform collaborative activities is what makes it special. Though the implementation of BIM in developed countries like USA or UK is significantly appreciable, the developing countries like India is still novice when it comes to adoption of BIM. The AEC industry in India is slowly and gradually implementing BIM but still there is a lot of scope for BIM usage. Hesitancy to adopt new technology, lack of BIM experts, heavy initial cost, lack of initiative and involvement from government are some of the factors which averts the AEC industry in India from enjoying the immense benefits which can be incurred by implementation of BIM. This paper is mainly a review of many reports and research papers which has been published so far to evaluate the implementation of BIM in India.

Key Words: *Building Information Modelling, BIM, AEC Industry, India*

INTRODUCTION

In near future BIM is expected to change the whole scenario of Architecture, Engineering and Construction (AEC) industry. The existing infrastructure at present is sufficient to cater to the needs of only two-third of India's population and the quality of this existing infrastructure is too poor to withstand natural calamities. So, there is a greater need for better and more infrastructure facilities in near future. BIM is likely to emerge as one of the most revolutionary advancements that would transform the Indian real estate and construction sector. According to a recent McGraw-Hill Construction Report (2012), BIM adoption in the USA expanded from 49% in 2009 to over 71% in 2012. In the UK, the government introduced a progressive program for mandated use of fully collaborative BIM for government projects by 2016 to reduce project delays and cost overruns as part of the overall economic development (UK Government, 2011). In Singapore, the government provides BIM funds to promote a broader usage of BIM technology (Singapore Government, 2013). In contrast, the Indian construction industry is not tapping the true potential of BIM tools. According to a report created by Kumar and Mukherjee (2009), 23% of Indian AEC professionals were exclusively using BIM for their practices; of the remaining 77%, only 9% were actively utilizing BIM applications and solutions. In the advanced countries such as the USA, the percentage of companies employing BIM increased from 49% in 2009 to 71% in 2012 [1]. In 2009, about 50% of construction players in North America have implemented BIM in their construction projects and will use it for their next projects whereas about 20% of non-user intended to adopt it within two years' time [2]. The lack of initiative from government makes the condition more miserable for Indian AEC industry.

Stanford University Center for Integrated Facilities Engineering (CIFE) figures based on 32 BIM projects indicates benefits such as (Kunz and Gilligan, 2007) the following.

- Up to 40% elimination of unbudgeted change.
- Cost estimation accuracy within 3%.
- Up to 80% reduction in time taken to generate a cost estimate
- A savings of up to 10% of the contract value through clash detections.
- Up to 7% reduction in project time.

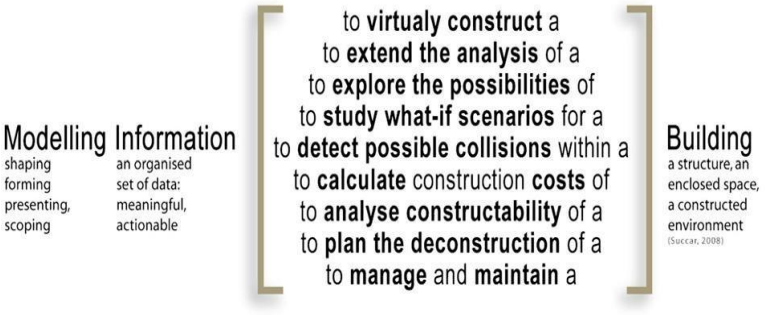

Fig 1- Building Information Modelling

BIM ON A GLOBAL LEVEL

On a global level BIM is experiencing a revolution which has transformed the AEC industry. Developed countries like USA, UK, and Australia are implementing BIM to a greater extent to make the projects time efficient and economical. In 2011, the UK government made it mandatory to implement the use of BIM in all public sector projects by 2016. According to a report by Smart Market from 2007 to 2012, the adoption of BIM in North America has jumped from 28% to 71%.

BIM Initiative in Singapore
Recognizing the public sector as a catalyst for change, the Building and Construction Authority (BCA) has identified public sector procurement as an important strategy in the BIM roadmap. To prepare the private sector agencies in leading the industries use of BIM, BCA has taken three key approaches to this strategy.
Partnering Government Entities: BCA has changed major government procurement entities (GPE's), specifically the Housing and Development Board, the Ministry of Education and Land Transport Authority in partnership programs. This program includes conduction hands-on training for GPE officers, initiating new BIM pilot projects to define standard BIM requirement.
Training Public Consultants: The BCA has launched a number of BIM training program to equip public sector consultants with BIM expertise. The program will also be extended to contractors.
Joint Industry Efforts: BCA has partnered the industry on initiatives that will make it easier for businessman and professionals to apply BIM in their projects. These include – • Developing BIM requirement guidelines – led by Real Estate Developers Association of Singapore (REDAS) and major GPE's. • Developing regulatory approval e-submission guidelines and templates – led by all government regulatory agencies • Developing project collaboration and object library standards -- led by building Smart Singapore.

Table 1- ***BIM Initiative Measures by Singapore Government.***
(Source- State of BIM adoption and outlook in India, RICS, Amity University [4])

The Global Construction sector output in 2013 was about US$ 7.2 Trillion and it is poised to grow to US$ 15 Trillion by 2025. The growth is predominantly expected in developing economies such as India, China, Russia, Poland and Brazil, taking the contribution of emerging countries from about 35% of global construction output to 55% by 2020 [4].

Country	**Initiative**
USA	The General Services Administration (GSA) in the USA has pioneered the BIM adoption for public sector projects, has developed a suite for BIM guidelines and standards. It is believed by many that efforts made by GSA has resulted in over 70 per cent of projects in USA adopting BIM
United Kingdom	The UK's BIM industry working group has prepared a BIM strategy to increase BIM usage by 2016. The initiative would primarily satisfy UK Government Construction Client Group demand to reduce capital cost and the carbon burden generated from construction and operation of the built environment by 20%.
Norway	In 2010, Norwegian government stated its commitment to succeed in BIM adoption which has resulted in many organizations in Norway adopting BIM.
Denmark	BIM is to be used for all the projects executed by Danish state clients, such as the palaces and Properties Agency, the Danish University Property Agency and the Defense Construction Service
Finland	Finland's state property services agency, senate Properties has been using BIM for its project since 2007.
Hong Kong	Hong Kong's Housing Authority has set an ambitious target of using BIM in all of its new projects by the end of 2014. To support this initiative it had developed a set of modelling standards and guidelines for effective model creation, management and communication among BIM users.
South Korea	Public Procurement Service has mandated the compulsory use of BIM for all private sector projects over US$ 40 Million and for all public sector project by 2016.

Table 2—***BIM Initiatives at Global Level.***
(Source- State of BIM adoption and outlook in India, RICS, Amity University [4])

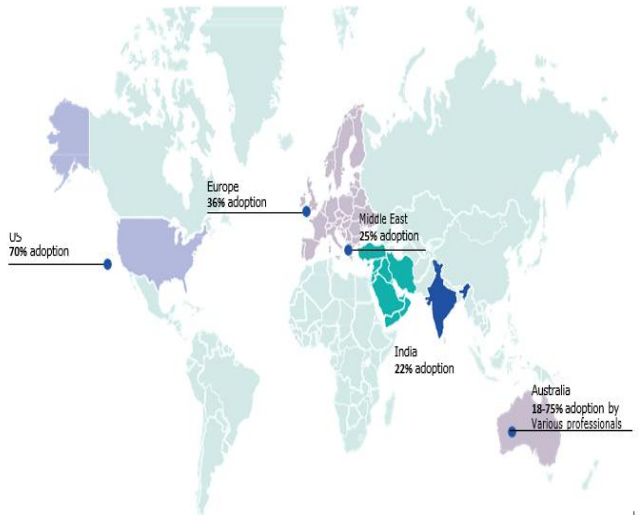

Fig2 - Global BIM Adoption.

Country	*Current Status of BIM*
USA	USA appears to be at forefront of global BIM usage. The McGraw-Hill Construction BIM survey conducted recently revealed that over 70% of construction projects in the USA use BIM and almost all BIM users plan to improve adoption.
Australia	The survey sponsored by Built Environment Innovation and Industry Council in 2010 revealed that the majority of organizations in Australia are using BIM in projects.
Europe	The European survey in 2010 conducted by McGraw-Hill Construction revealed that the BIM adoption in Europe is about 36%. Adoption in UK, France and Germany was 35%, 38% and 36% respectively.
The Middle East	As per Building SMART Middle East survey 2011, about 80% participants in the sector were aware of BIM technology. However, only 25% projects are executed using BIM. The key reason for low BIM adoption include low availability of skilled staff and high cost of BIM implementation.

Table 3 – Current Global Status of BIM. (Source- State of BIM adoption and outlook in India, RICS, Amity University [4])

BIM IN INDIA: PAST AND THE PRESENT

In India, the AEC industry at present is the second largest employment producing sector. This sector contributes immensely to the economic well-being of country. As per the planning commission the contribution of this sector to the GDP has increased from 6.1% in 2002 to 6.9% in 2007 and has been above 8% since 2007 despite the global slowdown [4]. At present, the Indian AEC industry is facing lots of problems. The problems associated with over shooting of budget and delay in timely completion of projects is one of the major concern which is still prevalent. Use of old technologies and lack of standards is still haunting the Indian AEC industry. Due to more complexity in design, project delivery methods, facilities management and operations there is need to have a shift of technology which could take care of arising problems. The ultimate solution to most of the problems can be solved by BIM. But, the major issue is the Indian AEC industry has not matured enough to adopt BIM, it is still at infancy stage.

Survey done by Indian built environment sector, RICS, School of Built Environment and KPMG in 2014 found that 22% of the respondent currently use BIM , 27% respondents reported that they are aware and actively considering BIM usage. Surprisingly, 43% respondent claimed to be aware of BIM but are not sure about implementing it in their organization in near future. Also, 8% of respondents are not aware of BIM [4]. The condition was even worse in 2009. According to survey done by Kumar and Mukherjee in 2009 by sending questionnaire in different parts of India, only 9% were actively using BIM. Only 23% were exclusively using BIM, 15% were testing BIM, 23% were interested but did not adopt BIM and 15% were not even aware of BIM [5].

According to the report by RICS [4], BIM is still in experimentation stage in India in comparison to developed countries like USA, UK, Singapore and Australia especially when it comes to degree of implementation and maturity of AEC industry. BIM is achieving popularity in India, but is appreciably popular in among the more experienced professionals. Even though few private sector firms have made it mandatory to use BIM on few selected projects, the large scale implementation is still non-existent.

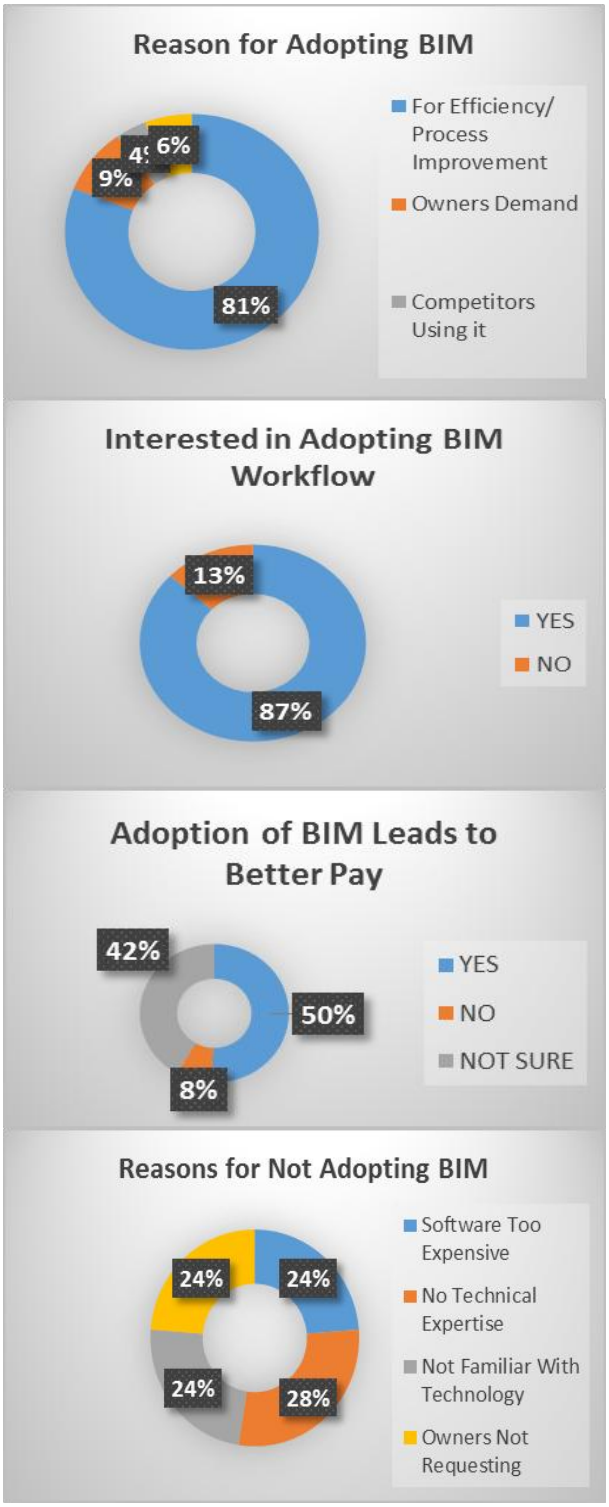

Fig 3- BIM Adoption in India.

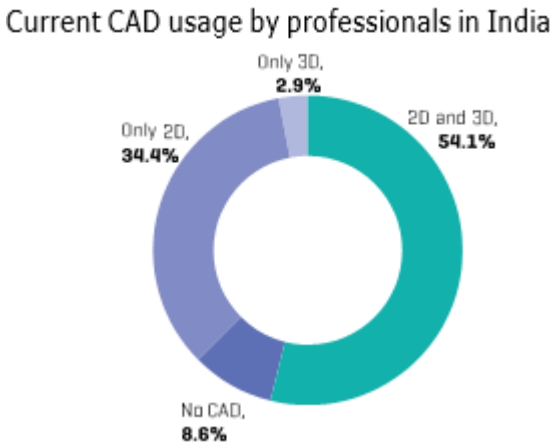

Fig 4– Current CAD Usage in India.

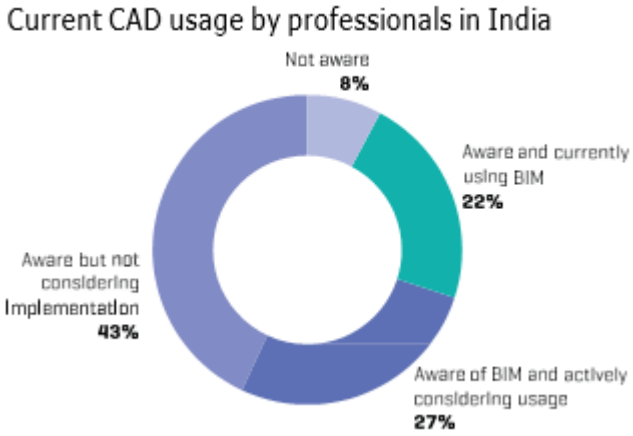

Fig 5 – BIM Awareness in India.

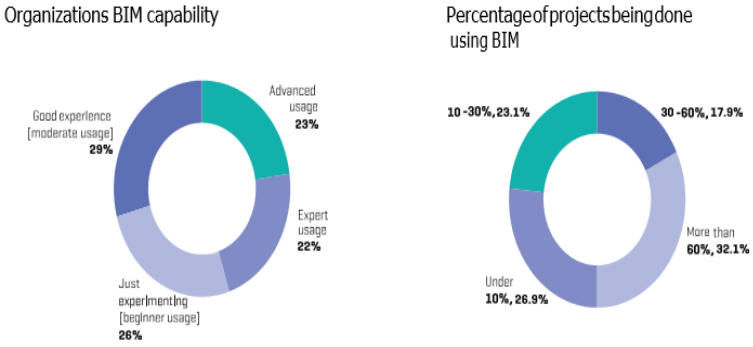

Fig6 – Level of BIM Usage among users and BIM projects amongst users.

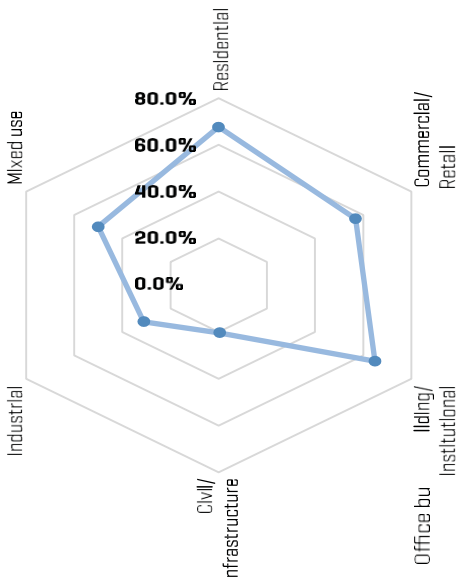

Fig7- Usage of BIM in various sub-sector of built environment.

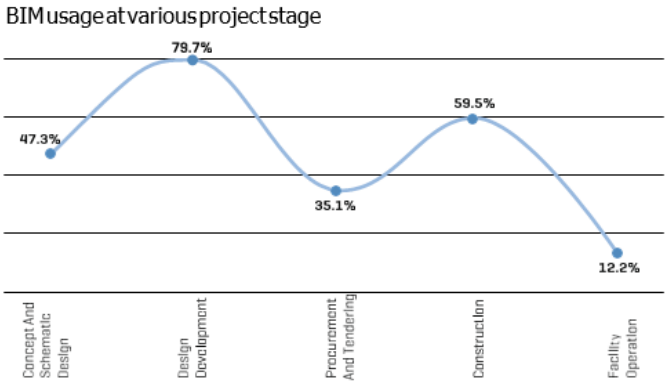

Fig 8- BIM usage in various project phases.

There are many issues which are not allowing to successfully implement BIM in India. The mind set of stakeholders to hesitate to adopt new technology is a big challenge. Traditional methods like 2-D drawings and CAD are still used in major number of projects. The high initial cost of implementing BIM is also a hurdle and the lack of initiation from government to mandate the use of BIM in large scale projects adds to the plight. There is also a scarcity of professional who are proficient with BIM. The educational institutions are also failing to play their part. Even though there are short-term courses available but the lack of proper curriculum and training is not allowing future professionals to be equipped with BIM Knowledge. There are not many clients who insist the use of BIM in their projects. Also, Return on Investment (ROI) is a major concern with BIM. If used for low budget projects, the high initial cost associated with using BIM makes the project overall uneconomical.

CONCLUSION

BIM has proved to be a boon for AEC industry globally. Developed countries have already benefitted themselves and are taking further measures to adopt BIM to a greater extent. Whereas India is still not at par with developed countries. For this India must establish centers which would work on promoting BIM on a large scale. The Government must tie up private sector firms to encourage the use of BIM and it should take the initiative as done by Government in many countries. India must bring in action its worldwide recognized Information and Communication Technology (ICT) Leadership to reinforce the large scale implementation of BIM. If taken, a collaborative approach by Government and private sector firms, then BIM can do wonders for AEC industry as well as for Indian economy.

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