International Journal of Advance Research in Science and Engineering
Vol. No.6, Issue No. 04, April 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

AWARENESS ON IMPLEMENTATION OF BUILDING INFORMATION MANAGEMENT (BIM) IN INDIAN CONSTRUCTION INDUSTRY

[1]R.Arjun , [2]Dr.S.Kamal, [3]K.Gunasekaran

[1]Post Graduate, [2]Assistant Professor, [3]Research Scholar

Department of Structural Engineering, Annamalai University, Tamilnadu, (India)

ABSTRACT

In Indian construction industries has faced a lot of issues during construction, such as planning, estimation and scheduling. In generally the most of a construction sectors not used Building Information Management (BIM) based constructions. Building Information Management (BIM) is the process of performing and managing Building Information in an interoperable and reusable way. BIM is the advanced construction method it generates various dimensional (n-D) models to simulate the planning, design and construction operations. It encourages integration of the roles of all stakeholders on a project allowing the architects, engineers and constructors to visualize. BIM provides to build in a simulated environment and to identify potential design, construction or operational issues. This study is mainly focused on identify the awareness level on implementation of BIM in Indian construction industries. The questionnaire survey was conducted to determine the level of awareness about BIM across India. The questionnaires was developed using 3 point likert scale, to rank the awareness of BIM. The questionnaires was distributed among the architects, engineers and consultants to rate the opinion of BIM, on their ongoing and past projects. The questionnaire consists of two major groups i) demographic details and ii) factors of BIM. The collected data were approached significant analysis to rank the awareness level implementation of BIM in Indian construction firms. This study concludes awareness is in moderate level in Indian construction.

Keywords: BIM, Estimation, Planning, Scheduling, Visualize.

I. INTRODUCTION

Construction sector in India will play a significant role in the nation's infrastructure and economic growth. In a modern world, construction industry plays a major role in development of our nation. India is a developing country, it have poor infrastructure facilities and construction methods. Current construction technique in India is not fare and results in delays, cost overruns and quality issues. Overcome these issues, Building Information Management (BIM) based construction to be implemented. Building Information Management (BIM) is a model-based design concept, in which buildings will be built virtually before they get built out in the field. BIM is an advanced mode of construction in all over the world. In India BIM based construction is in moderate level. Need to improve construction quality in India.

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

II. BUILDING INFORMATION MANAGEMENT (BIM)

Building Information Management (BIM) is the word that itself serves many meanings and in common understanding "A design approach that can maximize the creativity and economic benefits using computing power". Building Information Management (BIM) is a digital representation of physical and functional characteristics of materials. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle.BIM is primarily a three dimensional digital representation of a building and its intrinsic characteristics. It is made of intelligent building components which includes data attributes and parametric rules for each object. It also manages the information exchange between the AEC (Architects, Engineers and Contractors) professionals, to strengthen the interaction between the design team. BIM is a shared knowledge about the information for decisions making during its lifecycle. BIM technology provides users with accurate and consistent building/project data and information, accommodating the functions needed to model the building and provides a virtual view of it. BIM revolutionize the AEC industry, being not only a change between 3D and parametric modelling with 4D capabilities, but a change in workflows, methodologies and process of constructions.

III . BACKGROUND OF THE STUDY

Kumar and Mukherjee, **(2009)** states that the Building Information Management (BIM) is the documentation process. Consisting of various information's about different phases of any project like design and planning. BIM is used to major construction applications. Such as estimating, scheduling, design coordination and operational visualization. Visualize the works like mechanical, electrical and plumbing (MEP) in the building systems may possible. In India by conducting the various survey and analysis reports the BIM is gaining acceptance by the owners, architects, engineers, and builders.Barlish and Sullivan, **(2012)** this research was carried out to establish metrics and benchmarks to assess overall performance and benefits derived from BIM. By evaluating resultant information to quantify benefits and costs with BIM utilization, through established return and investment metrics (Design and Contractor cost). In a project trying to determine if BIM will benefit for construction industry. This research results present a valid framework methodology and baseline. The metrics for collection presented in the study provide a starting point for the stakeholders to begin their analysis in BIM based constructions.Konig*et al*, **(2012)** this paper revivals simulation approaches to support construction scheduling by Building Information Modelling (BIM). Different kinds of planning data have to be analyzed and integrated. To perform the realistic and suitable simulation, like building information models, bill of quantities, framework schedules, delivery dates, or available resources. Major challenge in specification process is error-prone and often small variations of the input data lead to extensive modifications. BIM makes an intelligent concept to store interdependencies between activities in order to reuse them for handling modifications and different alternatives.Finally the correctness of the interdependencies can be checked and visually highlighted. Saini*et al*, **(2013)** this paper states that, the Architecture, Engineering and Construction (AEC) industries have long sought techniques to decrease project cost, increase productivity and quality, and reduce project delivery time. So AEC makes effective planning is one of the most important aspects of a construction project and influences the success of a project.Utilization of 4D modelling is the integration of a 3D model with a construction schedule in

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

order to visualize the sequence of activities. Through the various analyses, finding the BIM based construction is an effective method. BIM based schedule promotes interaction and collaboration among the project team members from different fields of construction.Elbeltagi*et al*, **(2014)** in this paper, a comprehensive cost estimating and monitoring model is presented and integrated using BIM. To provide the user with the capability of visualizing actual cost expended in different building elements and compare it with that budgeted at different time intervals.BIM depends on using commercial software packages such as Microsoft Project and Microsoft Excel. Microsoft Excel provides the capabilities needed to reduce and analyze of the input data and output results. So the proposed system will be able to perform the estimate and monitor at different levels.A visualized cost estimate/cost control model provides reliable features to architects, owners, engineers and contractors in the construction industry.Smith, **(2014)** the main objective of this study is focus on the implementation strategies that are being successfully used by countries leading in the construction field. BIM evolves and construction process increasingly become automated the role of construction professionals will need to adapt accordingly to provide more sophisticated services that incorporate 3D, 4D time, 5D cost modelling and 6D facilities management and sharing cost information data with the project team as part of the BIM integrated delivery approach. Investigation was to determine best practices and innovative approaches being used around the globe. BIM has better position in capabilities and initiatives to evolve. Franco et al, **(2015)** the study is to identify the major barriers to using BIM for a project's estimating and scheduling. By the various comparisons, accuracy and efficiency of traditional method of estimating. Using On Screen Takeoff and BIM Light Gauge Framing Software. BIM is limited use for estimating and scheduling, especially for small to mid-sized projects. Because the subcontractor did not have the proper structure to adopt. This research provides recommendations on the benefits of BIM for estimating multi-family projects by addressing the obstacles to embracing the concept of automated estimating, and scheduling.Shaikh et al, **(2016)** studied the adoption of Building Information Modelling (BIM) in the construction industry by increasing quality of project, improved planning, scheduling, and visualization, time and cost. It also involves finding the awareness and adoption of BIM in the city of Mumbai among the construction professionals like Builders, Contractors, Site Engineers and Design Engineers among the professors and students. The quantitative and qualitative questionnaire survey was conducted to found the total awareness among the respondent who are aware of BIM. Survey results, awareness of BIM is high among the professors but low among the construction professionals in the city of Mumbai.

IV. METHODOLOGY

The study was conducted through a questionnaire survey and personally interviewed among the construction peoples in various locations and various projects in India. Study is based on a sample size of 100 respondents.Data's are collected in the form of questionnaires. Twenty three no's of open and twenty seven no's of closed type questions was prepared and distributed. Depend on the survey; number of samples to be collected from various professionals was working in the reputed construction industries among various cities in India.

Respondents were requested to indicate the condition of BIM in Indian construction industries. The questionnaire contained two sections: The first section have collected the demographic details of the

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

respondents. In the second section The study is based on the following criteria i) Awareness of BIM, ii) Knowledge of BIM, iii) Benefits of BIM, iv) Implementation of BIM and v) Causes of BIM.

The data was collected through primary source data collection method using three point likert scale of each group. Statistical approach was used for the data analysis.

V. RESULT & DISCUSSION

The demographical profile details of the respondents are discussed in table 1. The respondent's of gender, 88% of respondent belonging to male and 12% of respondent belonging to female. The respondent's age, 14 no's of respondent are belongs to 19-25, 7 no's of respondent are belongs to 26-35, 39 no's of respondent are belongs to 36-45, 6 no's of respondent are belongs to 45-60 and less than 2 no's of respondent are belongs to 60 above. The majority of the respondent's age belongs to 36-45.

The respondent's of Project Manager 10%, 3% of Project Engineer, 19% of Project Consultant, 15% of Architect, 19% of division manager and 34% of others. The majority of the respondent's designation belongs to others 34%. The respondent's experience, 47% of respondent belongs to 1-3 years, 17% of respondent belong to 3-5 years, 13% of respondent belong to 5-8 years, 10% of respondent belong to 8-15 years and 13% of respondent belong to 15 years above. The majority of the respondent's experience belongs to project engineer 47% and least one belongs to project consultant 10%. The respondent's education, 2% of diploma, 87% of engineering, 10% of master degree and 1% of others. The majority of the respondent's education belongs to engineering 87%. The demographic details are shown in below table1.

TABLE.1 DEMOGRAPHIC DETAILS

S. no	DEMOGRAPHIC DETAILS	PERCENTAGE (%)
I	**Gender**	
1.	Male	88%
2.	Female	12%
II	**Age**	
1.	19-25	20.6%
2.	26-35	10.3%
3.	36-45	57.4%
4.	45-60	9%
5.	60 Above	3%
III	**Designation**	
1.	Project Manager	10%
2.	Project Engineer	3%
3.	Project Consultant	19%
4.	Architect	15%

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

5.	Division Manager	19%
6.	Others	34%
IV	**Experience**	
1.	1-3	47%
2.	3-5	17%
3.	5-8	13%
4.	8-15	10%
5.	15 Above	13%
V	**Education**	
1.	Diploma	2%
2.	Engineering	87%
3.	Master Degree	10%
4.	Others	1%

RESPONSES TO FACTORS INFLUENCING AWARENESS ON IMPLEMENTATION OF BUILDING INFORMATION MANAGEMENT (BIM)

Twenty seven factors, identified as the critical factors for awareness on implementation of BIM in Indian construction industry, were given to the respondents and they were asked to rank the factors in a three point likert scale as per their opinion. The responses of all the 100 respondents are collected, collated, and the Mean and Mode were calculated to identify the opinion of the architects, engineers and consultants etc are presented in below Tables 2,3,4,5 and 6.

TABLE.2 AWARENESS OF BIM

S. No	CONDITION OF BIM IN CONSTRUCTION INDUSTRY	MEAN	STANDARD DEVIATION
1.	Are you aware of BIM and its benefits?	1.64	0.760
2.	Are you aware of intends to start implementing BIM in constructions?	1.69	.0701
3.	Are you aware of any current construction methods?	1.71	0.767
4.	Are you aware of the national 3D-4D BIM programs to increase efficiency throughout building life cycles on government projects?	1.86	0.706
5.	Are you aware that General Service Administration (GSA) would like to move from a document based to a model based delivery of designs?	2.17	0.562
6.	Are you aware of the national BIM standard was established as a project of the National Institute for Building Sciences?	2.20	0.637

From the Table 2, the awareness on BIM is requested to rank like aware, not sure and unaware from the respondents. The responses of the respondent's shows that the maximum mean value (2.20) was the national BIM standard were established as a project of the National Institute for Building Sciences.

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

Hence all the respondents have a moderate knowledge knowing the national BIM standard. However the respondents have least mean value (1.64) was aware of BIM and its benefits.

TABLE.3 KNOWLEDGE OF BIM

S. No	CONDITION OF BIM IN CONSTRUCTION INDUSTRY	MEAN	STANDARD DEVIATION
1.	Do you believe that the construction industry is not clear enough of what BIM actually is?	1.78	0.559
2.	Have you had any previous experiences with BIM?	2.24	0.727
3.	With the implementation of BIM did your company have occurred any loss of productivity?	2.17	0.497
4.	Do you consider the implementation costs associated with BIM, to outweigh the financial gains from BIM?	2.07	0.553
5.	Do you think the implementation of BIM will helpful to the preparation of tender and contract documents?	1.86	0.540

From the Table 3, the knowledge of BIM is requested to rank like yes, no idea and no from the respondents. The responses of the respondent's shows that the maximum mean value (2.24) was the firm have any previous experiences with BIM.

Hence the maximum number of respondents doesn't have an experience with BIM. However the respondents have least mean value (1.78) that the construction industry is not clear enough knowledge of BIM.

TABLE.4 BENEFITS OF BIM

S. No	CONDITION OF BIM IN CONSTRUCTION INDUSTRY	MEAN	STANDARD DEVIATION
1.	Do you agree clients will increasingly insist on BIM adoption?	1.81	0.629
2.	With the successful adoption of BIM, a new collaborative way of working and sharing of information is expected?	1.75	0.604
3.	Full implementation of BIM by fully trained, knowledgeable and experienced construction professionals deliver reduction in costs and errors?	1.68	0.507
4.	Implementation of BIM would be easier for smaller or larger companies in terms of costs and efficiency?	1.68	0.507
5.	Did you agree with Indian government will need to lead the next evolution in design standards with the help of BIM technology requirements?	1.75	0.575

From the Table 4, the benefit of BIM is requested to rank like agree, not sureand disagree from the respondents. The responses of the respondent's shows that the maximum mean value (1.81) was the clients will increasingly insist on BIM adoption.

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

Hence, most of the respondents have disagreed the client support for the implementation of BIM in constructions. However the respondents have agree (1.68) was full implementation of BIM with fully training, knowledgeable and experienced construction professionals deliver reduction in costs and errors and Implementation of BIM would be easier for smaller or larger companies in terms of costs and efficiency.

TABLE.5 IMPLEMENTATION OF BIM

S. No	CONDITION OF BIM IN CONSTRUCTION INDUSTRY	MEAN	STANDARD DEVIATION
1.	Do you feel the implementation of BIM will be easy for the construction projects?	2.03	0.556
2.	Do you need additional training necessary to use BIM tools for implementation purpose?	1.85	0.582
3.	Has a BIM manager been introduced at your company to aid and advice during the transition?	2.25	0.439
4.	Do you currently use 3D modelling in your projects?	2.34	0.685
5.	Implementation of BIM will affect the role of the quantity surveyor?	2.29	0.527
6.	Did you notice performance of BIM being advantageous to yourself or your current construction projects?	2.02	0.601

From the Table 5, the implementation of BIM is requested to rank like yes, maybe and no from the respondents. The responses of the respondent's shows that the maximum mean value (2.34) was currently use 3D modelling in their projects.

Hence all the respondents have less working with BIM. However the respondents have least mean value (1.85) need additional training necessary to use BIM tools for implementation purpose.

TABLE.6 CAUSES OF BIM

S.no	CONDITION OF BIM IN CONSTRUCTION INDUSTRY	MEAN	STANDARD DEVIATION
1.	Do you know forecast companies will be left behind and or struggle to advise if they do not adopt BIM quickly enough?	2.29	0.966
2.	Do you feel working with BIM make your job more difficult?	2.39	0.929
3.	Do you think, there is a need to offer 3D modelling or BIM software to interior design?	2.36	0.943
4.	In your opinion the implementation of BIM will affect the cost analysis and lifecycle costing?	2.36	0.943
5.	Do you feel working with BIM helps to identifying, analysing and developing responses to risks?	2.28	0.970

From the Table 6, the causes of BIM are requested to rank like no effect, redefined and extinct the respondents. The responses of the respondent's for all the causes of BIM are extinct.

Hence all the respondents don't willing to known/implement the BIM for the construction firms.

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

V. CONCLUSION

The study was carried out to identify the awareness on implementation of Building Information Management (BIM) in Indian construction industries. The survey was carried around 100 no's Engineers in various construction industries in India. The retrieved data were analysed and found the top critical factor based on mean and standard deviation.

The result found for maximum and minimum mean values. (i) The national BIM standard was established as a project of the National Institute for Building Sciences (2.20) and aware of BIM and its benefits (1.64). (ii) The firm have any previous experiences with BIM (2.24) and the construction industry is not clear enough knowledge of BIM (1.78). (iii) The clients will increasingly insist on BIM adoption (1.81) and full implementation of BIM with fully training, knowledgeable and experienced construction professionals deliver reduction in costs and errors and Implementation of BIM would be easier for smaller or larger companies in terms of costs and efficiency (1.68). (iv) Currently use 3D modelling in their projects (2.34) and need additional training necessary to use BIM tools for implementation purpose (1.85). (v) Feel working with BIM make your job more difficult (2.39) and working with BIM helps to identifying, analysing and developing responses to risks (2.28). Later, the studies were carried out the difference of opinion among engineers based on demographic such as gender, age, designation, experience and education. The result obtained in analysis was no difference of opinion based on any demographic profile. The study concluded that the awareness of BIM in India, obtained similar opinion among demographic profile. The factors are founded by mean and standard deviation to be enhanced to determine the awareness on implementation of Building Information Management (BIM) in Indian construction industries. The survey results, awareness of BIM is in moderate level due to lack of software knowledge and construction systems in India. The survey results, awareness of BIM is in moderate level due to lack of software knowledge and construction systems in India.

VI. RECOMMENDATION

The recommendation of this paper suggests BIM is a new and promising approach in India which is gradually gaining acceptance by the owners, architects, engineers, and builders. The survey explores the BIM potentials when used in the field to better communicate and integrate construction information across different trades, allowing for efficient work processes and better decisions. So try to aware about BIM and start implementing BIM based constructions in India for better and efficient handling of cost, materials and time.

The following are the recommendation and suggestions as follows.

i) The standard of BIM was promoted through various conferences and workshop programs.

ii)Studying the software's in college level for easy to work in BIM based construction.

iii) To create awareness and interactions with clients to adopt the BIM based constructions.

iv) Studying the 3D based software's to be learned for designing purposes.

v)To develop knowledge of software's and training to be needed for working with BIM based constructions.

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

REFERENCES

1. Barlish Kristen and Sullivan Kenneth (2012), How to measure the benefits of BIM, Journal of Automation in Construction, Vol. 24, pp. 149-159.
2. ElbeltagiEmad, OssamaHosny, Mahmoud Dawood and Ahmed Elhakeem (2014), BIM-Based Cost Estimation/ Monitoring For Building Construction, International Journal of Engineering Research and Applications, Vol. 04(07), pp. 56-66.
3. Franco Juan, Faiza Mahdi and Hussein Abaza (2015), Using Building Information Modeling (BIM for Estimating and Scheduling, Adoption Barriers, Universal Journal of Management, Vol. 03(09), pp. 376-384.
4. Konig Markus, Ilka Habenicht, Christian Koch, Sven Spieckermann, RuhrUniversität Bochum and SimPlan AG (2012), Intelligent BIM-Based Construction Scheduling Using Discrete Event Simulation, Winter Simulation Conference, Germany, pp. 662-673.
5. Kumar. J. Vinoth and Mukherjee Mahua (2009), Scope of Building Information Modeling (BIM) in India, Journal of Engineering Science and Technology Review, Vol. 02(01), pp. 165-169.
6. Saini, Vijay Kumar and MhaskeSumedh (2013), BIM based Project Scheduling and Progress Monitoring in AEC Industry, International Journal of Scientific Engineering and Research (IJSER), Vol. 01(01), pp. 94-96.
7. Smith Peter (2014), BIM Implementation-global strategies, Creative Construction Conference, Australia, pp. 482-492.
8. ShaikhAftabAbuzar, RamyaRaju, Nida L. Malim and Dr. (Mrs.) Geetha K. Jayaraj (2016), Awareness and Adoption of BIM in Construction Industry, International Journal on Recent and Innovation Trends in Computing and Communication, Vol. 04(04), pp. 204-208.