

Assessing the Aspects of BIM over Construction Industry

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ABSTRACT: Building Information Modelling (BIM) is becoming a complete collaborative process in the construction industry. Despite its short history, BIM has had an increasing growth during the last decade. This is happening mainly due to its capabilities on construction projects. BIM can create a common language between all parties and system divisions in a project and make them an integrated team. The approach of BIM strongly matches with integrated project delivery systems. The role of BIM as a coordinator of project system is quite similar to the duties of a project manager. BIM integrates different disciplines by effective communication, analyses the project systems for constructability, estimates the cost and time of projects at any time using quantity takeoffs, draws a big picture of projects using visualization and builds collaborative teams. All these are what a project manager does in a different scale during a project life cycle.

This paper aims to show the impact of BIM over construction organization and project manager's role on construction project. It emphasizes the importance of having proper BIM knowledge and experience for project managers to succeed.

KEYWORDS: Building Information Modelling (BIM), Project Management, Construction.

I. INTRODUCTION

BIM is beginning to change the way buildings look, the way they function, and the ways in which they are designed and built. Building information modelling (BIM) is a digital representation of physical and functional characteristics of a facility.

BIM is a collaborative way of working underpinned by the digital technologies which unlock more efficient methods of designing, creating and maintaining our assets. BIM service are mostly utilized as a graphical modelling tool in Engineering, Architectural firms. In India utilization of various BIM aspects on various project management knowledge areas is not fully realized. This study investigates BIM's utilization on project management knowledge areas and identifies its challenges towards project management utilization to overcome the identified challenges. Utilization of BIM tools allows effective and better plan for construction project activities, which can overcome the potential errors in design, disputes among project managers, construction cost overcome and project delay. BIM also has potential for improving communication, collaboration between construction project managers, reducing cost at every stage in construction project and reduce safety issue in construction project.

II. LITERATURE REVIEW

Aarti Nanajkar and Zhili Gao has presented the "BIM Implementation Practice at India AEC Firms". This paper describes the current state of knowledge BIM along with the online survey used to collect data regarding the problems faced by Indian AEC firms studied. The data were analysed to determine the essential changes for individuals and for discipline, solutions to overcome barriers, and effective ways to introduce BIM capabilities. In this work the

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consideration of India's AEC BIM application was evaluated and suggests strategies based on those factors. AEC industries in India there are fewer BIM users with little knowledge of BIM. The main reasons for this are the high cost of software, low customer demand and lack of qualified or trained employees. In this work the consideration of India's AEC BIM application was evaluated and suggests strategies based on those factors. AEC industries in India there are fewer BIM users with little knowledge of BIM. The main reasons for this are the high cost of software, low customer demand and lack of qualified or trained employees.

Saeed Rokooei has given an approach towards “Building Information Modelling in Project Management: Necessities, Challenges and Outcomes”. This paper aims to show the correspondence of BIM and functions of project manager in construction projects. It emphasizes the importance of having adequate BIM knowledge and experience to be successful project managers. This document also describes the requirements for BIM knowledge and experience enrichment project managers. This document shows the main aspects of BIM, including conflict detection, constructability, analysis, time and cost estimation (4D and 5D), integration, quantity takeoff, models based on elements, collaboration and teamwork and communication construction projects. These capabilities have empowered BIM to play an important role in project management as a new tool.

J. Wong and J. Yang has presented “Research and Application of Building Information Modelling (BIM) In the Architecture, Engineering and Construction (AEC) Industry: A Review and Direction for Future Research”. This study shows that first presents a review of research and achievement BIM in the AEC industry, and then made a number of suggestions for future research in BIM. This paper argues that the value of BIM during the phases of design and construction is well documented in the last decade, and new research needs to expand the level of development and analysis of design / construction stage to publish the asset management of the construction and installation. The document reveals that previous research efforts have focused mainly on design and pre-construction planning, perhaps due to reasons of greater perceived value of BIM implementation in these phases by construction professionals. Two outstanding research deficiencies were identified in this study. First, existing research is fragmented and lack of connection of BIM technology in the field of construction, particularly in the functions of planning, design, construction and facilities management in the last decade

Kym Newton and Nicholas Chileshe have given “Awareness, Usage and Benefits of Building Information Modelling (BIM) Adoption – The Case of South Australian Construction Organizations”. Research has shown that while building information modelling (BIM) is not a new concept and its absorption is becoming an increasingly important factor in the efficiency factor and the international competitiveness of the industry of the Australian construction (ACI), compared with other industries, the ACI is often regarded as being slow to implement new ideas and technologies. A field study was conducted with a randomly selected twenty-nine shows construction organization. Ten benefits of BIM were used, and the response data to the surveys were collected through structured and analysed by analysing questionnaires Media and ranking. This article has presented the perceptions of interest groups representing construction organizations in South Australia in relation to knowledge, use, challenges, and advocated benefits of adopting building information modelling (BIM).

III. USE OF BIM IN CONSTRUCTION MANAGEMENT

There are many uses of Building Information Modelling for each project participant. The figure number 1 depicts these uses for planning, design (pre-construction), construction, and operation (post-construction) phases:

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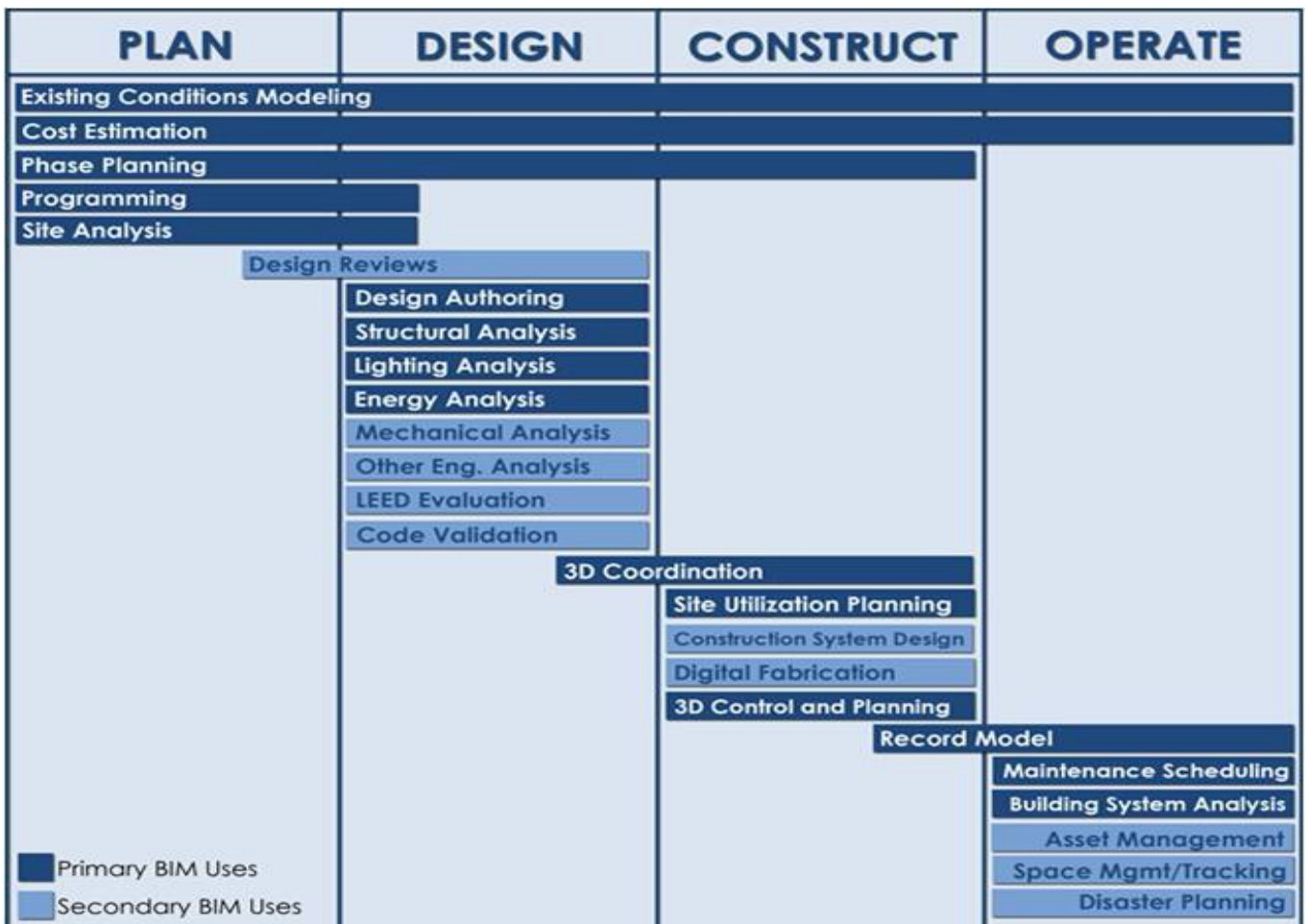
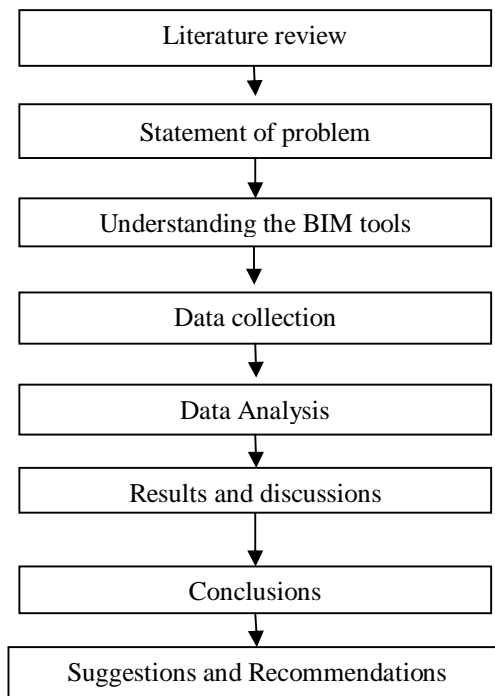


Figure 1: BIM Uses throughout a Building Lifecycle

The utilization of BIM can capitalize on its impact during the design phase, on a project because the capability to influence cost is the maximum. Earlier than problems become high cost influence to the project, the team can ingeniously come up with ideas, and present resolution to issues. This can comprehend throughout the cooperation and coordination of the whole project employees. Consequently, it is exceptionally significant to have a superior association. The mutual efforts of the team can be enhanced by the use of BIM. The architect and engineer can experiment their design ideas including energy analysis. The constructability, sequencing, value and engineering reports can be provided by construction manager.

IV. METHODOLOGY

The methodology contains the Input, Process, Output methodology. In input literature, qualitative data from researchers and employees will be collected. In process assessment and analysis of acquired data through qualitative coding is done. In output conclusion and result on the objectives of the dissertation. Following chart shows the adopted methodology for research.



Methodology adopted for research

V. BUILDING INFORMATION MODELLING ASPECTS

a) Clash Detection

The geometrical design inconsistencies are solitary of the pervasive problems of different disciplines plans for a construction project. When there is superimpose between the plans of different disciplines this issue happens. It would be achievable to fetch the plans together using BIM. And detect the clashes also become easy. Another option of this visual checking is modifying the aesthetic problems. In the figure number 2 the clashes is identified between mechanical and sprinkler designs during design phase (preconstruction). Which saves rework n reduces time cost as well as wastage.

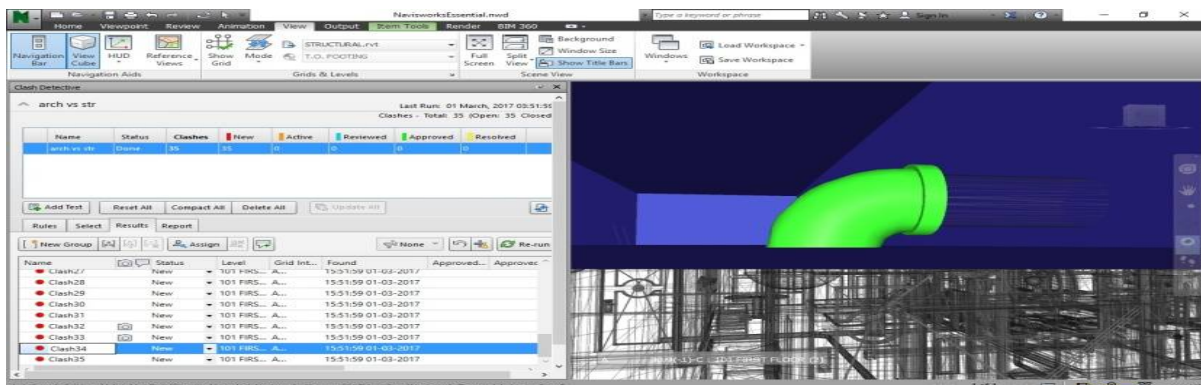


Figure2: Clash detection between Mechanical and Sprinkler

b) Constructability

It would be potential for team mates in a project to analyse and switch constructability subject and (if needed) support issues into RFIs using BIM. The illustration information can be provided from a vantage point to show the problems. This visual information supplementary mark-up allows further investigation for finding solutions and, thus, mitigates the risks.

c) Analysis

Helping the project managers, designers and engineers in doing more analyses and enabling better decision making is another aspect of BIM. By linking the building information models to appropriate tools, it would be possible to analyse the energy consumption of a construction project and then find better solutions such as changing materials and orientation, mass and space, etc. furthermore, light, mechanical and acoustics explores are also accessible to be performed by BIM.

c.1 Lighting Analysis

Daylight is the oldest source of illumination and has been leveraged by the earliest civilizations from around the world. Whether it was the ancient Greek, Roman, Egyptian or Mayan civilizations the sun has played an important role in shaping the architecture of their time. As an essential element of life, these civilizations were planned around the direct light from sun, moon and stars and indirect natural light generated from these sources.

c.2 Value of Day lighting

In addition to lighting accounting for approximately 28% of the total electricity used in a building, there is also an impact on the space cooling percentages. Roughly 07% of the electricity required for air conditioning results from heat generated by lamps. This combined impact illustrated that nearly 60% of the electricity used in commercial building is directly and indirectly related to its lighting systems.

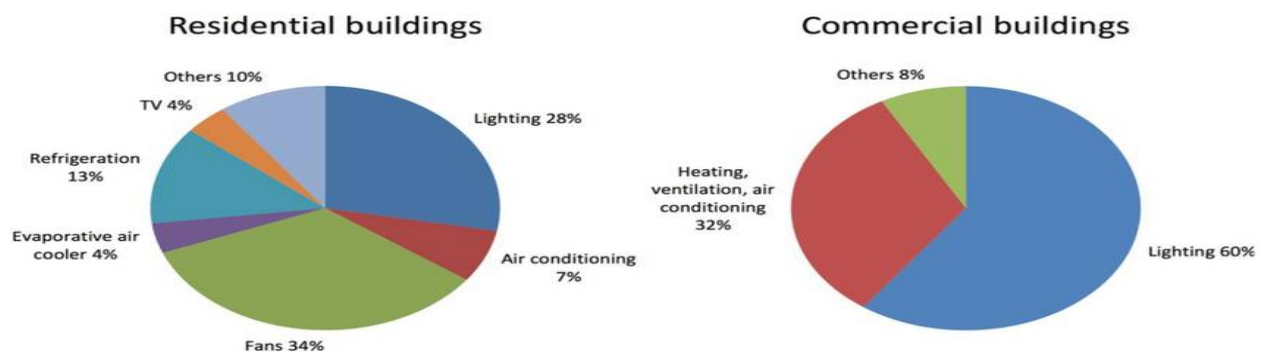


Figure3: Electricity usage in commercial and residential building in India

When designing buildings, all the way through the day and also throughout the year the vibrant nature of daylight, poses various challenges. This designing of buildings exploit this plentiful natural supply to meet the luminance requirements of architectural spaces.

This part of the Delighting Primer addresses the intricacies of what constitutes good day lighting design, and sketches a general design methodology that considers the many factors involved in good day lighting design.

c.3 The Benefits of Day lighting

The psychological benefits and the energy savings benefits are the two major causes for using daylight to meet up the illumination desires of an architectural space. Good day lighting has been shown to improve the overall attitude, satisfaction and well being of building occupants.

A variety of benefits of day lighting in different building types and functions are listed below. Amongst them enhanced trade sales in big box stores, enhanced worker efficiency and abridged absenteeism in office buildings, superior student educational presentation in K-12 schools also enhanced patient revival times in hospitals. To improve general health and circadian rhythm exposure to daylight has also been shown. These psychosomatic benefits can effortlessly validate every extra design effort and additional expenditure connected with introducing controlled daylight into buildings.

With suitable electric lighting controls, Day lighting can result in considerable energy savings. This energy saving dropping electric lighting loads and related cooling loads. Along with this with appropriate solar control, solar gains through cooling load periods can be diminished. And solar gains for the period of heating load periods can be made to use reducing the energy desires of both cooling and heating a space.

In figure number 4 shows the result of day light analysis of a particular plan in which lux is unit of luminance. It shows the sunlight analysis which we can use and convert the building into green building by using more and more natural light into building to reduce artificial lighting sources.

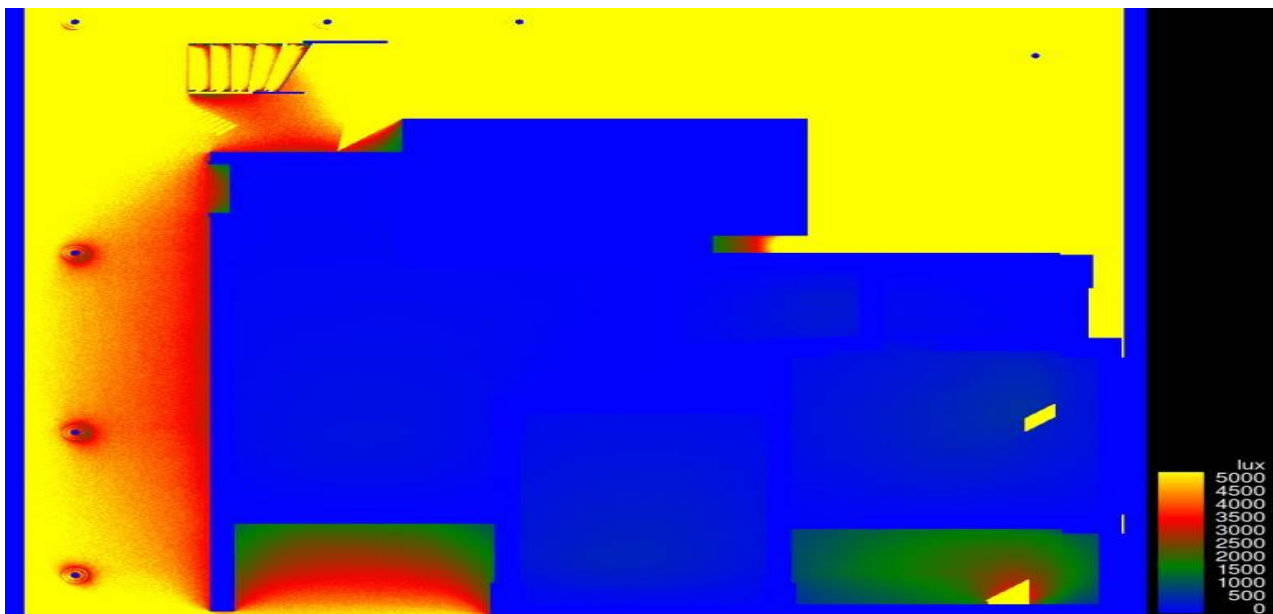


Figure4: Day Light Analysis

d) Time & Cost Estimation (4D & 5D)

Time and cost estimation are other features of BIM which enable project managers to visualize the construction project at any point in time and have a clear understanding of project phases. The generally used 4D and 5D which are known as time and cost estimation can be appropriately utilized in the initial stages of a project. This also makes possible the decision building procedure with least cost and time needed. Furthermore, BIM has the potential to imitate the various substitutes for a construction project. Hence it helps project managers and executives to unfailingly envisage the consequences of their decisions.

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appropriate practice and knowledge in BIM should be set as a decisive factor for admittance of a construction project manager.

VII. CONCLUSION

The main aspects of BIM together with clash detection, constructability, analysis, time and cost estimation (4D and 5D), and quantity take-off on construction projects is discussed in this paper. These capabilities have empowered BIM to play a significant role in project management as a new tool. Obviously, BIM, like any other tool in a system, should be utilized by a user, and one of the best persons for filling this role is the project manager.

A BIM is, in its most basic form, the move from analog to digital design and construction. A BIM is designed to be the mediating program between the specific programs used by architects, engineers, contractors and suppliers/vendors. It moves towards a completely universal and interoperable program working with computer based models in 3D, 4D and 5D. From the 3D model, plans and sections can be developed. The 3D capabilities of the program will visually solve any questions about material and spatial relationships. This makes conflict resolution easier to detect as well. Engineers can devise their individual systems (i.e. plumbing, HVAC and fire sprinkler) and coordinate with each other. Once the model is composed, installers can follow the BIM to prevent any conflicts in future construction (Figure 2). Models can then be created in 4D so contractors can both visualize construction before it actually takes place, and predict the best locations for construction equipment and lay down areas.

VIII. FUTURE WORK

Future studies about encouraging the project owners to exploit the powerful BIM benefits and services may be performed. In a country where there is a huge need and demand for infrastructure, BIM makes sure that more of the investor's capital goes to the proper utilization of costs. The studies should be performed for finding the benefits of BIM for Facilities Management and to find out the use of BIM for post construction phase. The current state of the Indian construction industry demands a massive marketing and promotion campaign to encourage BIM usage. The Indian government, with its substantial resources, could help promote BIM usage for the construction industry.

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