

# Building Information Modeling (BIM)

ITS IMPACTS AND BENEFITS ON  
ARCHITECTURE, CONSTRUCTION AND  
ENGINEERING INDUSTRIES (A.C.E)

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# WHAT IS BIM ?

BIM is a process of generating and managing building data during its complete lifecycle, from conceptual design through operation of the building. Building information modeling (BIM) is an integrated workflow that enables architects, engineers, and builders to explore a project digitally before it is built.

## BIM is Evolution not Revolution

The creation and use of coordinated, internally consistent, computable information about a building project in

BIM is a modern technology and associated set of processes to produce, communicate, and analyze

'building models' .....

- 'Digital representations' of the building components that follow parametric rules, which can be manipulated in an intelligent fashion
- Carry 'computable graphic and non-redundant data attributes' which are consistent, coordinated which can be viewed



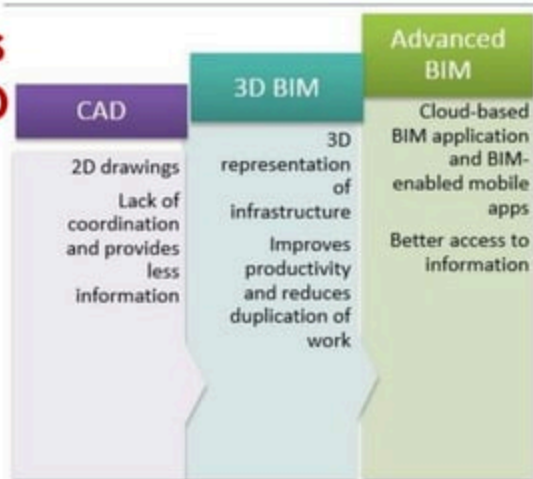
- BIM is a digital representation of the complete physical and functional characteristics of a built asset.
- A BIM model can contain information on design, construction, logistics, operation, maintenance, budgets, schedules

# Building Information Modelling

## Workshop **USERS**



# Drawings AutoCAD BIM



What differentiates the two technologies? = Computer Aided Design or Drafting, both 2D and 3D, with emphasis on "computer-aided"

## Graphic Information

BIM = Building Information Modeling or Management, only 3D, with emphasis on "Information"

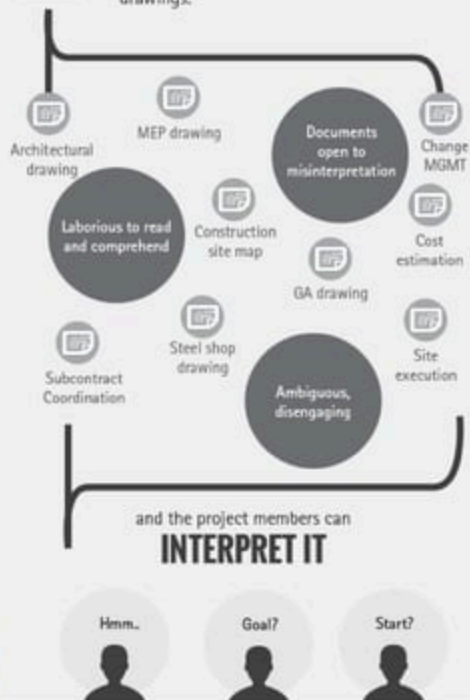
## Need of BIM?

- Depth of information contained within BIM enables a richer analysis than traditional processes and it has the potential to integrate large quantities of data across several disciplines throughout the building's lifecycle.



## DRAWING BASED PROCESS

The building is human-only readable drawings.



## BIM PROCESS

The building is Data-based information model



Drawing based process vs. BIM process





This is CAD



This is BIM



CAD

BIM

Task	CAD (hours)	BIM (hours)	Hours saved	Time savings
Schematic	190	90	100	53%
Design developmen t	436	220	216	50%
Constructio n documents	1023	815	208	20%
Checking and coordination	175	16	159	91%

**CAD VS BIM**

## **1 CONTROLLING RISK BY ENHANCING AGILITY**

Virtually all construction projects encounter unforeseen circumstances with the potential to delay the project schedule and rapidly increase project cost

## **2 ENHANCED DECISION MAKING**

Customers must make any decision during the design and construction phase of their project and effective communication is necessary for success. Reliably presenting customers with accurate information is critical to ensure those decisions are well informed and timely.

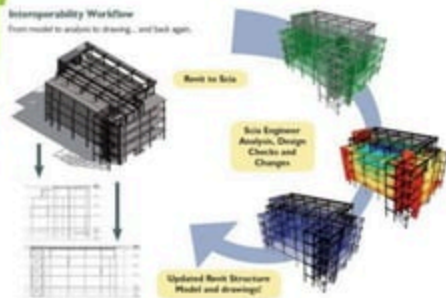
## **3 IMPROVING QUALITY WITH DIGITAL PROTOTYPING**

Because each construction project is unique problem with constructability and detailing are common.

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## Interoperability workflow Model

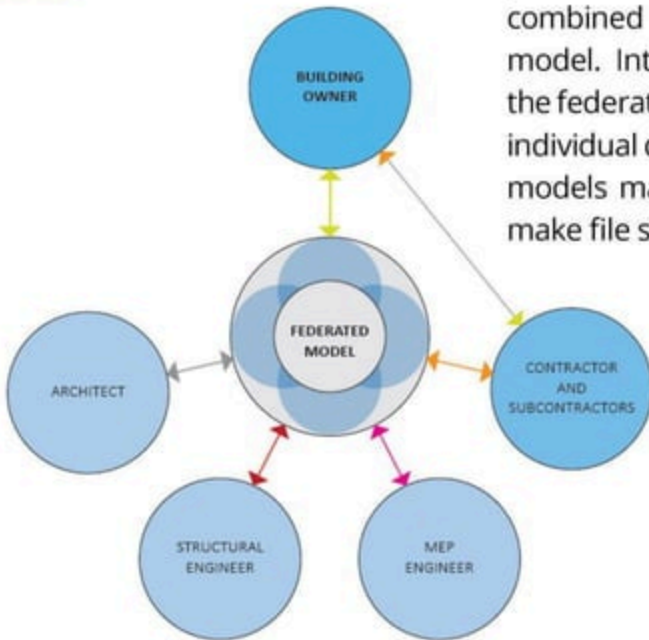


The fundamental principle that brought the concept of BIM into existence is "Interoperability". Interoperability is the ability of making systems and organizations work together (inter-operate). It is term defined basically for information technology or systems engineering services to allow for information exchange. Idea being that multiple vendors would be able to access a building model to supply data to the architects and engineers in a 3D space. Interoperability is the dynamic exchange of information among all applications and platforms serving the entire building community throughout the life cycle of facilities. Therefore, no matter what programs were being used across the broad spectrum of vendors, there would be a medium to transfer data to something that others in the industry could access, this medium being the 3D model.

## Principles of BIM

## Federation Model

This principle is further defined as Model federation, for the majority of projects, each designer or sub-trade will produce their own model. These models can be then combined or “federated” to create a single shared model. Interdisciplinary coordination is confirmed in the federated model. Required changes are made in the individual discipline models. On large projects discipline models may be split into multiple, smaller models to make file sizes more manageable.



**Principles of BIM**

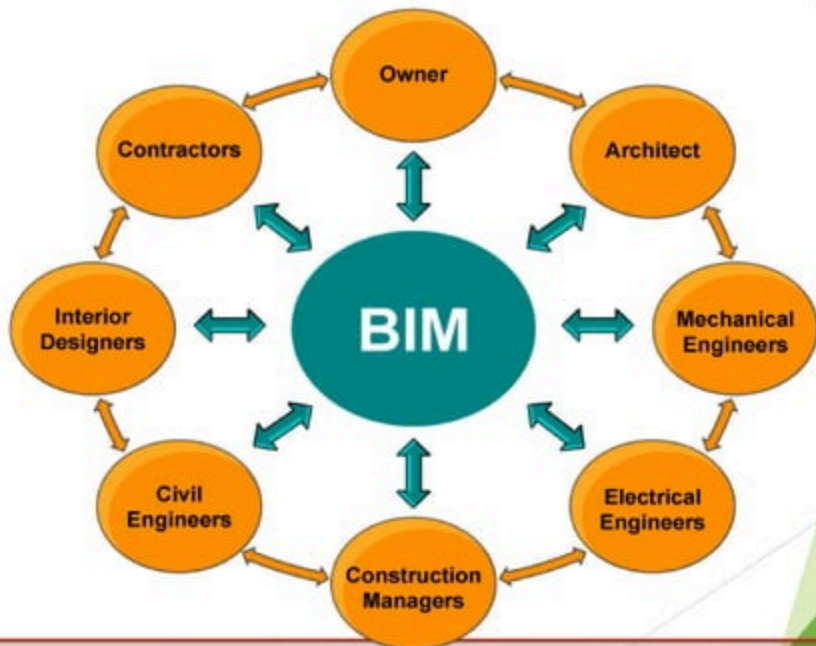


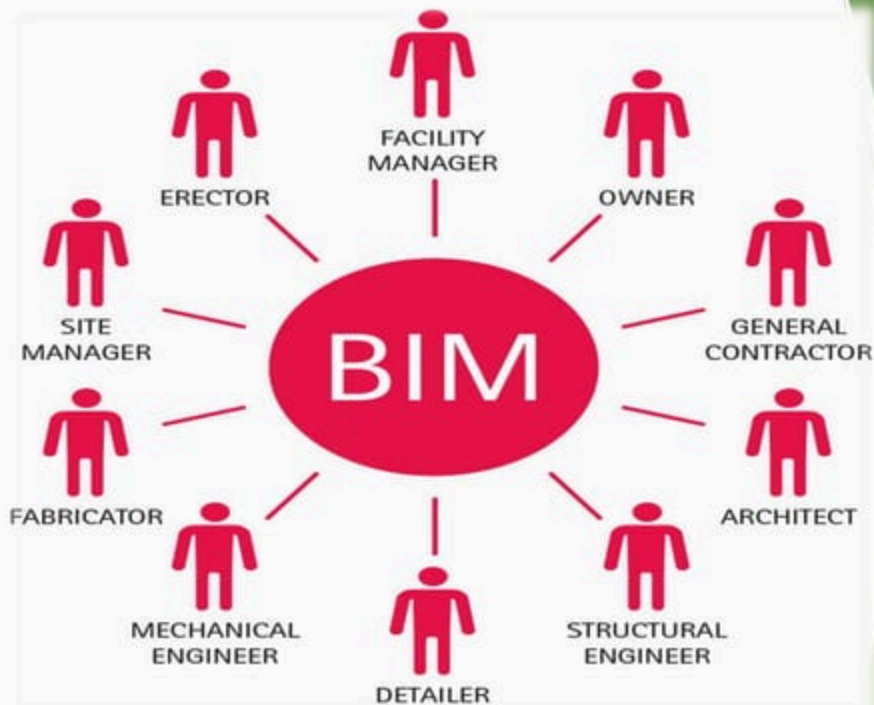
"Cloud" allows different members of cross-functional team to work on the project in one place

**BIM cloud?**

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## Interaction among the AEC professionals due to BIM without any conflict





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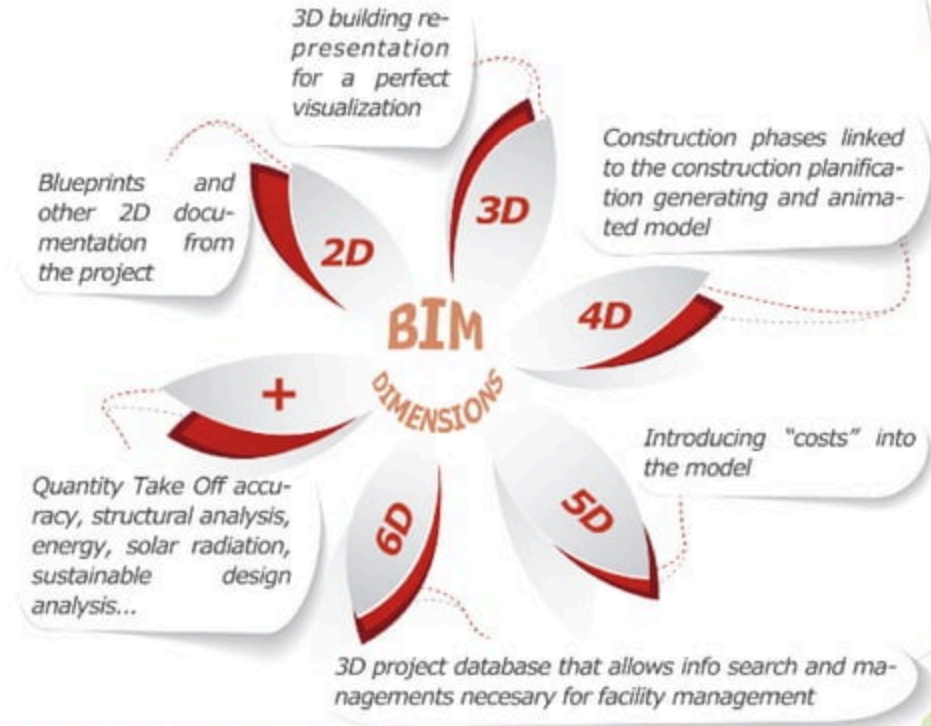
**Who can take advantage of BIM**

Who should provide BIM to the Owner?



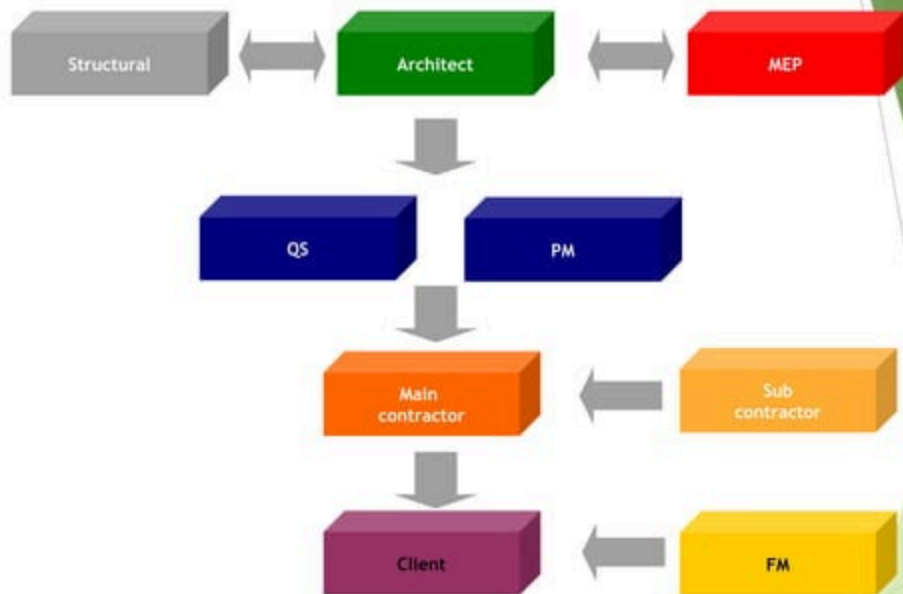


# What is 3D, 4D, 5D, 6D and 7D in BIM?



**BIM Wash** or *BIM Washing* is a term describing the inflated, and/or deceptive, claim of using or delivering Building Information Modeling services or products.

3D	A	<b>Architecture</b>
	S	Structural
	ME	Mechanical Electrical & Plumbing
4D	W	+TIME planning and construction simulation
5D	Q	+COST (Capital, life cycle & FM)



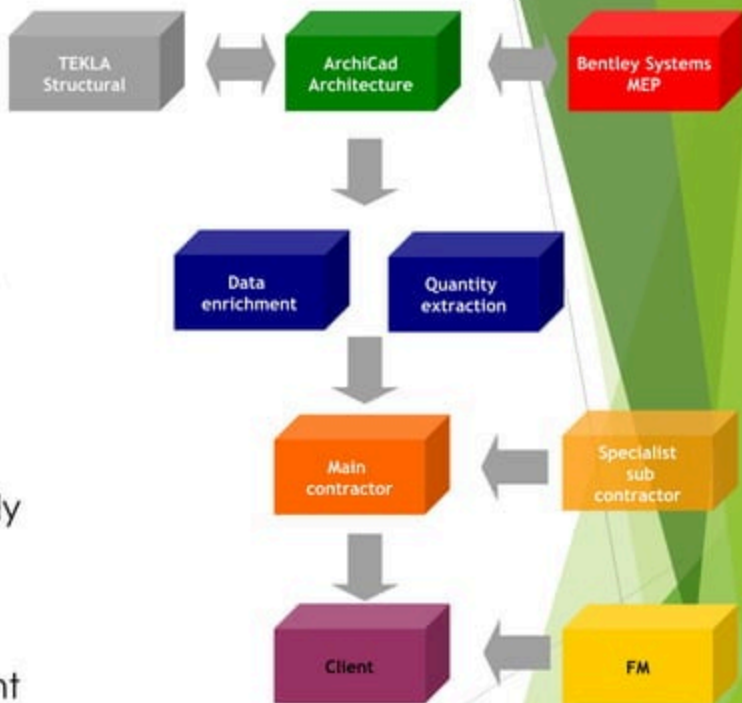
**Working Collaboration**

Information is added to the same model as the design progresses.

The coordinator can merge the separate files by converting to IFC "common" file format

The Design & Build contractor can add supply chain information

The client owns the completed BIM and amends with refurbishment and adaption

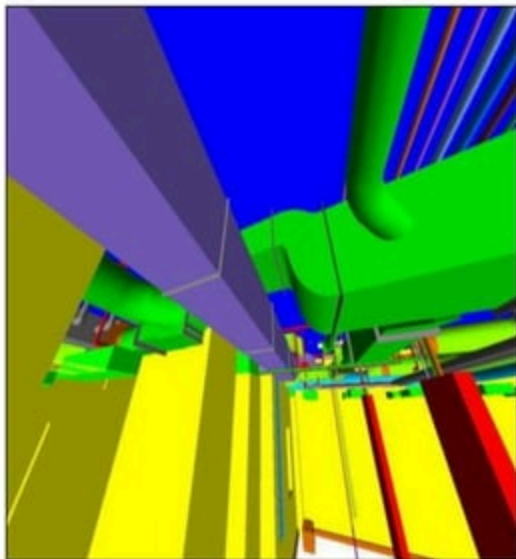


**Flow of work**

## USES OF BIM 360

Collaboration and Access	Simulation	Visualization
<ul style="list-style-type: none"><li>• Clash detection and coordination</li><li>• Conceptual design and feasibility evaluation</li><li>• Field management</li></ul>	<ul style="list-style-type: none"><li>• Mechanical simulation</li><li>• Air, fluid, flow, and thermal comfort</li><li>• Energy analysis</li><li>• Structural analysis</li></ul>	<ul style="list-style-type: none"><li>• Rendering</li></ul>

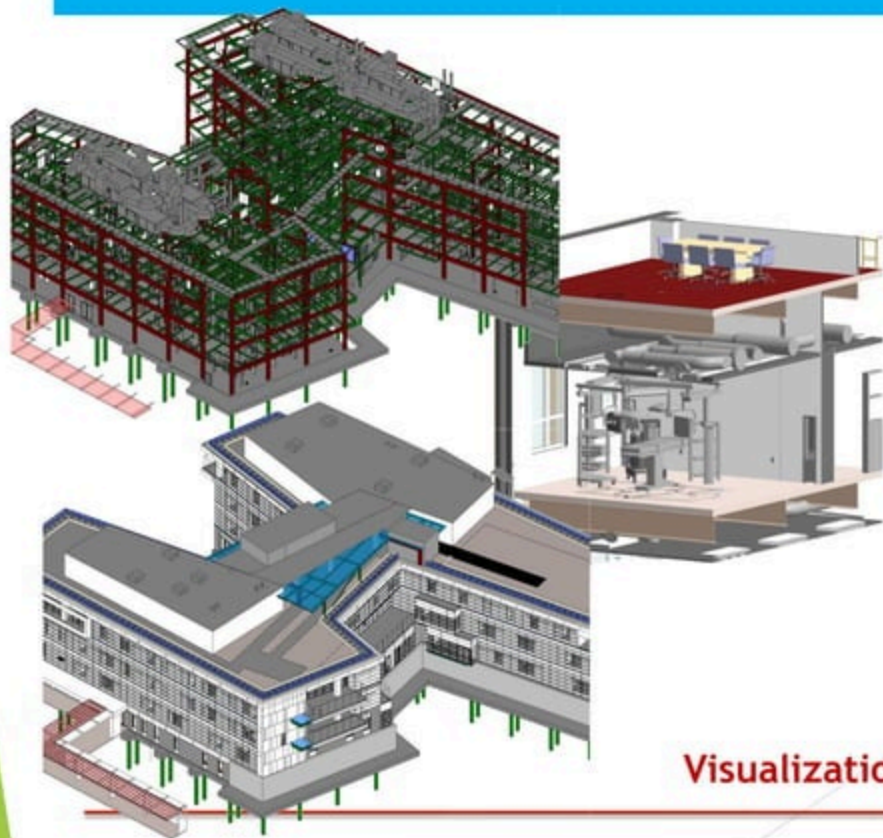
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**Clash Detection**

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Visualization -Rendering



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**3D Software used in BIM**

## Design analysis software used in BIM



Bentley



STAAD.Pro V8i  
Release 2017.04

TEKLA Structures®



ORACLE®  
PRIMAVERA

Microsoft®  
Project 2010

## Scheduling software used in BIM

## Estimation software used in BIM

Autodesk  
Quantity Takeoff

Do more costing and less counting. Keep everything digital and up-to-date with fast, accurate, and detailed materials reports.



innovaya

Google  
SketchUp



Non - BIM software

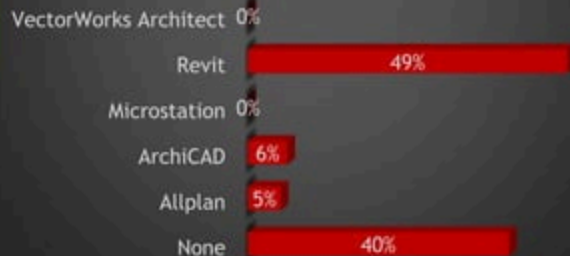


CINEMA 4D  
by MAXON

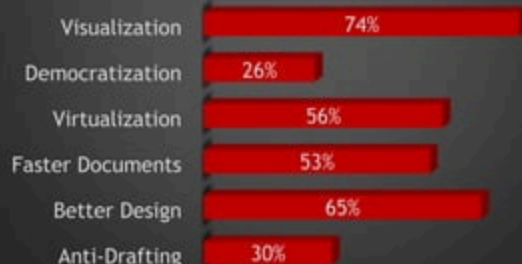
## Countries making BIM compulsory for big projects/government projects

United Kingdom, Norway, Denmark, Finland, Hong Kong, South Korea, Netherlands

### BIM Application used in India



### Aspect of BIM that appeals the most



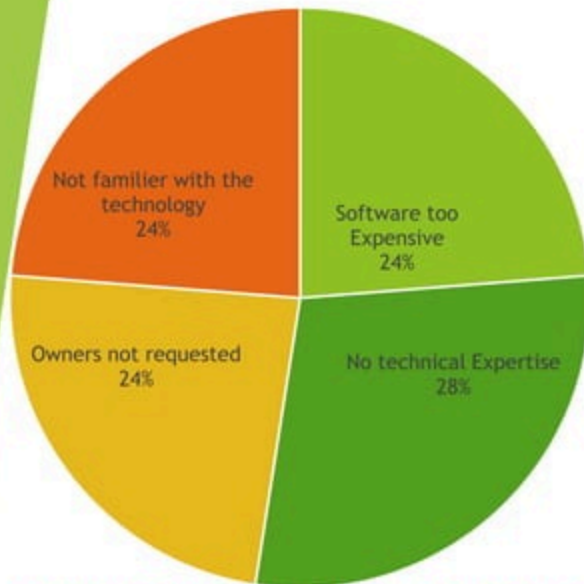
***BIM in India***

*BIM is gaining popularity amongst professionals within the Indian built environment sector*

*BIM enjoys maximum popularity among experienced professionals since they have a better appreciation of the value proposition of BIM.*

*BIM is more popular in large organisations, with a large strength of technical staff, hinting that BIM implementation is more beneficial in large and complex projects*





**Reasons for not using BIM in India**

*BIM is still in its infancy stage in India*

*Still has not reached a stage where users can boast about the cost savings for a project due to BIM implementation because a majority of BIM users in India have not seen a full cycle of BIM implementation for their projects*

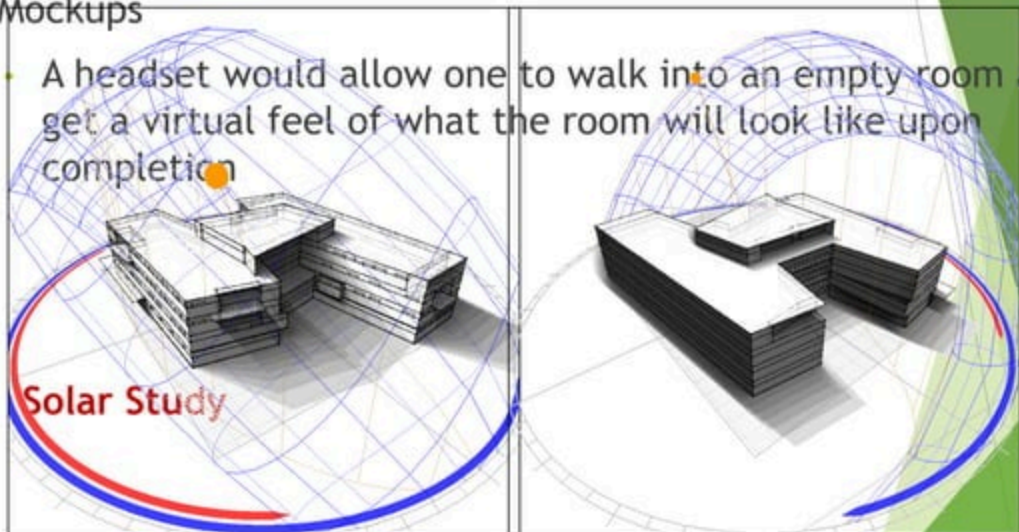
*Organizations remain sceptical about BIM implementation and its perceived benefits*

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- Green BIM
  - Utilization of BIM helps make buildings more sustainable
  - Example: sunlight and temperature control

- Mockups

- A headset would allow one to walk into an empty room and get a virtual feel of what the room will look like upon completion



***FUTURE POSSIBILITIES OF BIM***

# BIM and Sustainable Design

*BIM technologies provide immediate insight in how design decisions impact building performance, while BIM processes encourage an integrated design approach – a critical strategy for making projects greener.*

*Also green design and construction rely on improving building performance.*

*BIM models can also give more information to product manufacturers, which can eliminate waste.*

*Using BIM, extended design teams can visualize design changes and simulate how various scenarios will affect building performance.*

*With this direct feedback, designers can analyze alternatives that will improve energy efficiency, optimize for natural light and ventilation, evaluate viability and placement of solar panels, and more*

## PRODUCTIVITY GAINS

Productivity gain is one of the major benefits of using BIM and is the top metric organizations expect to improve when they adopt the technology. Primarily, BIM realizes this gain through its ability to:

**minimize project management**

**foster communication and co-ordination**

**identify errors early**

**reduce rework**

**reduce costs**

**improve quality.**

## DESIGN

As a lifecycle model, BIM begins in the early stages of a project. Designers are likely to benefit from fundamental changes to the design process and the greater certainty between design intent and the final construction and operation of the building.

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***Benefits of BIM***

- Flow of data
- Improper schedule of work
- Cost estimate is tedious and not accurate
- Digitalization of data is less
- Clash detection becomes very difficult to notice
- Reinforcement details in junctions
- Energy analysis
- Complexity of software used for BIM
- Cost of software
- Lack of BIM knowledge in India
- BIM course is only available abroad
- The computer system running these software needs high end specifications

**Drawbacks/Problems faced when BIM is not used**

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# Projects in India using BIM



Project : Power Plant  
Category : Industrial - Plant  
Location : Vidharbha(India)  
Area : 1,85,600 sq mtr



Project : Personal Rapid Transit  
Category : Transportation  
Location : Amritsar, India  
Length : 4 km track & 7 stations



The socio-economic and environmental aspects can both be addressed by simply re-thinking the construction process including the sourcing of recycled and reclaimed materials where possible

However, BIM provides a better platform to address the technical issues. The benefits such as increased communication, design integration, lean construction, reduced waste, paperless documentation, clash detection, costing, programming, simulation and modelling are far superior to that of CAD.

BIM will then enable the most efficient delivery of a sustainable development

## CONCLUSION

- BIM is promising and more advantageous compared to the traditional process, but still it has several setbacks as the technology is still in primitive stage.

- A significant amount of development is to be done in information flow and interoperability of the software.

- Additional training material is to be provided with software to learn the complicated features

- In India, universities should start teaching BIM as an academic course to make the people perfect in this field.

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THANK YOU