

# **BIM BUILDING INFORMATION MODELLING.**

Understanding its functions in the future of the Architectural profession.

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## **SYNOPSIS**

Recently there have been many discussions both in open forums and on social media chats about BIM and how it will affect the future architectural profession. What do architects need to do? Do they need to upgrade to the BIM or do they stay with their 2D Autocad and wait until the construction industry is ready? Do they invest in expensive BIM software only to have it lying wasted in their expensive computers? Are there enough BIM technicians in the local industry? What do we do if our clients such as 1PRIMA insist that we must be BIM proficient before they will appoint us? Fake it by sub-letting the modelling to an outsource firm? How do we advise our clients when they ask if they need to appoint a BIM Manager for their project? Do we adopt BIM if our clients are not willing to pay us for the technology? I am a one Architect firm doing bungalows. Is BIM right for me? Is BIM not for the mega firms doing mega projects only?

These and many other questions will be considered in this paper. A brief outline of the fundamental concepts of BIM from an Architects point of view will be discussed. What are the basic BIM authoring tools available and their advantages and disadvantages will also be discussed. What steps do Architects need to take to adopt BIM if they wish to be among the early adopters of this technology? These and other questions will be discussed from a practicing architect's point of view.

## **CONTENT**

- 1.What is bim?
- 2.Benefits of BIM for Architects
- 3.Over coming common BIM barriers
- 4.BIM software
- 5.Working with others

## **WHAT IS BIM?**

NBS BIM Definition:

*A Building Information Model is a rich information model, consisting of potentially multiple data sources, elements of which can be shared across all stakeholders and be maintained across the life of a building from inception to recycling (cradle to cradle). The information model can include contract and specification properties, personnel, programming, quantities, cost, spaces and geometry.*

A more down to earth definition would be as follows.

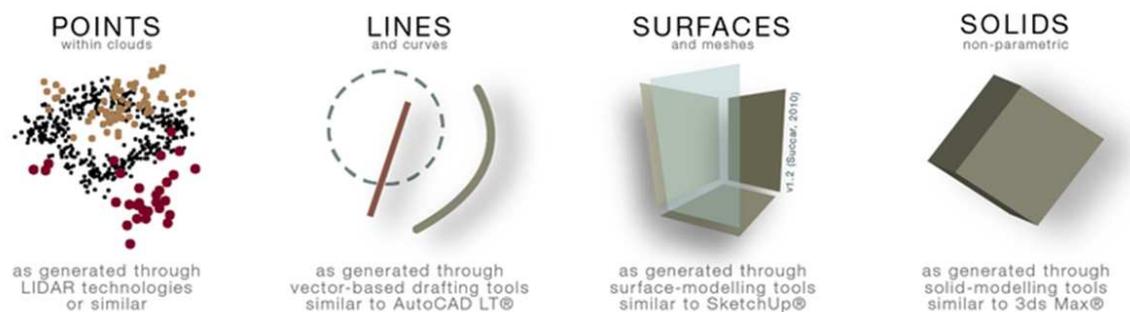
*Building*: a structure, an enclosed space, a constructed environment...

*Information*: an organised set of data: meaningful, actionable

*Modelling*: shaping, forming, presenting, scoping

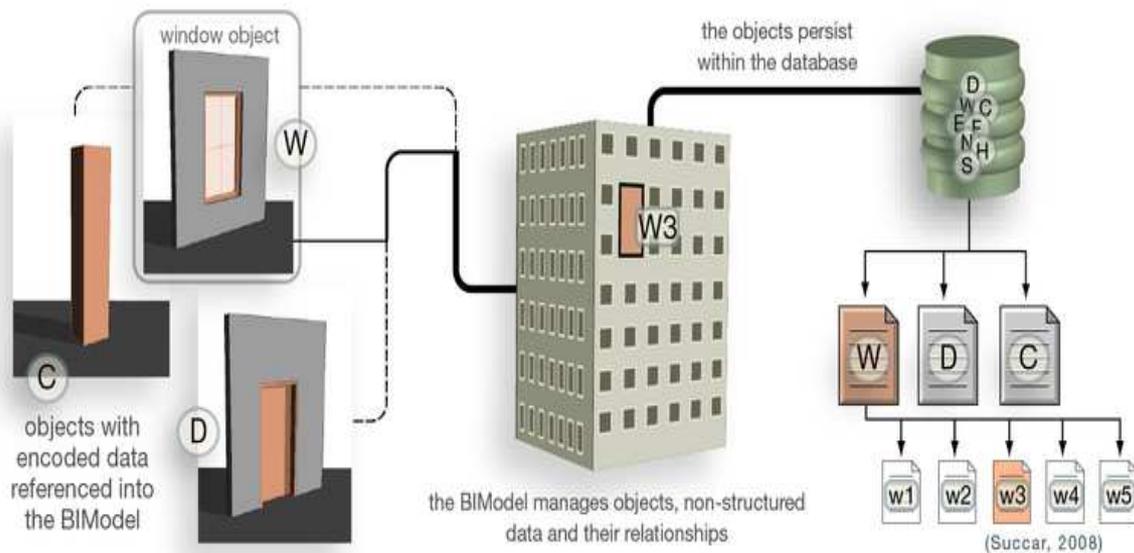
In order to qualify as a BIM model it must have the following properties:

1. must be Three Dimensional,
2. built from Objects (solid modelling - object oriented technology),
3. have encoded and embedded discipline-specific information (more than a mere database)
4. have interwoven relationships & hierarchies between their objects (rules and/or constraints: similar to a relationship between a wall and a door where a door creates an opening in a wall),
5. describes a Building of some sort.



Surface Modellers (like SketchUp® for example), Entity-Based Modellers (like 3D AutoCAD®) and Geometric Modellers (like Autodesk® VIZ) do not qualify as a BIM modellers. The exclusion is also passed onto 3D object-based platforms that are outside the Architectural Engineering and Construction domain (like SolidWorks®, Solid Edge® and Inventor®).

A BIM model is typically able to output from its built up data base an array of information typically required in 2D format such as plans, elevations, sections, door and window schedules and schedule of all components of the construction such as columns and beams, staircases, fixtures and fittings among others that have been created in the BIM model. In most BIM programs (usually called BIM Architectural authoring tools), these outputs can be saved in several formats such as dwg, dxf, pdf and xls.



## BENEFITS OF BIM FOR ARCHITECTS

Some of the key benefits for Architects of upgrading to BIM are as follows:

1. Improved skills and faster delivery resulting in improvements in productivity.
2. Less mistakes. Automating building plan production
3. Lower dependency on low skill staff
4. Allows for better teamwork and collaboration within the project team

Typically, a 3D bim model once developed in a BIM program can output the following scaled 2D drawings:

North, South, East, West elevations or more if required.

Two typical sections or more if required

Floor plans of all floors.

Schedules of all components.

Say the production of the model takes twice as long as drawing two 2D drawings. The model can automatically output up to 12 drawings for a four story building and up to 20 drawings for a 12 story building. This is a six to ten fold increase in production drawings as far as the Design Development part of the Architect's work is concerned. If we add in the 3D model which the Architect has to also draw up if he is developing his design in the traditional 2D format, we are looking at an eight to twelve fold increase in productivity.

Furthermore there is no longer the requirement for checking if all the above mentioned drawings are coordinated as they come from the single model and will have no mistakes as far as physical description as concerned. When we go into changes in the design again there is a single change in the model that is reflected in all the 2D drawings. In effect one architect supported by five CAD draughts men can be replaced by one draughts man to one Architect.

So far we have only considered a situation where the Architect alone is working in BIM and outputting his work in 2D CAD drawings to his fellow professionals in his team who are not BIM capable and we are already able to see huge productivity improvements for himself. If his entire project team is BIM capable, the productivity improvements we can forecast will be many folds more. This will be considered in the last part of this paper under “Working with Others”

## **OVERCOMING COMMON BIM BARRIERS**

One of the greatest barriers faced by Architects to adopt BIM is their misunderstanding of what BIM is and its benefits. Among the common myths going around are:

1. Other Consultants have not started to use BIM so no benefit to me to start
2. BIM software is very expensive & NOT worth the cost
3. BIM training is very expensive
4. Local Authorities DO NOT require BIM so why the extra cost for no benefit
5. Clients are NOT willing to pay for BIM which cost me more than CAD

Myth number one has already been countered in the above paragraph about the benefits for architects to go for BIM. If they further develop their and develop proper templates, a single model can produce all the Local Authority Building Plan submissions @D drawings at the “push of a button” when the model is fully developed.

Myth number two can be analyzed as below.

2D AutoCAD LT cost RM 5,000  
Autodesk Revit cost RM15,000  
Cost Difference 3x

LT Productivity 1  
BIM (Revit) Productivity 5 to 10 times  
Cost Difference 8x typically

Say you have a typical bungalow project with about 20 basic drawings and say production costs of RM1,000 per drawing. So total production cost for 2D is RM20,000 (Not including the 3D image yet). Production cost for BIM model say RM 5,000. If you include the BIM software rental cost of say RM2,000, total cost is RM7,000. This is almost three times lower in real dollar terms than doing it in 2D format. The benefits of faster delivery, no mistakes in drawing coordination, multiple 3D images and even walk through and walk around in video clips is still not included yet.

## Take your BIM Journey with **LOWEST investment COST, NOW THAN EVER!**

It's time to move to BIM and understand BIM methodologies and processes. With Autodesk® Revit LT you can take a soft approach and start transitioning your traditional 2D process into an easy to use BIM tool at your own pace while learning BIM along the way.

Autodesk® Revit LT uses the Revit Native RVT file format which is the same as Revit, Revit Architecture, Revit Structure and Revit MEP and allows exchange and sharing of model files with other Revit users with the extended project teams.

AUTODESK® REVIT LT	Promo Price
1 Seat With 2 Years Desktop Subscription	RM 2,950 + 1 Day Jump-start Training ( <b>FREE</b> )
1 Seat With 3 Years Desktop Subscription	RM 4,450 + 1 Day Jump-start Training ( <b>FREE</b> )

Myth three. BIM training is expensive. The reality is that it is not much more expensive than CAD training. The problem really is one of inadequate capable trainers for Architects from BIM vendors who typically offer the BIM basic training as part of the sale of the software. This is where the Architect Institutes have to supplement the training to overcome the problem.

Myth five. This is only a matter of time. Many advanced countries such as Singapore already require BIM submissions for building plan approvals as below.

### PHASED MANDATORY BIM E-SUBMISSION

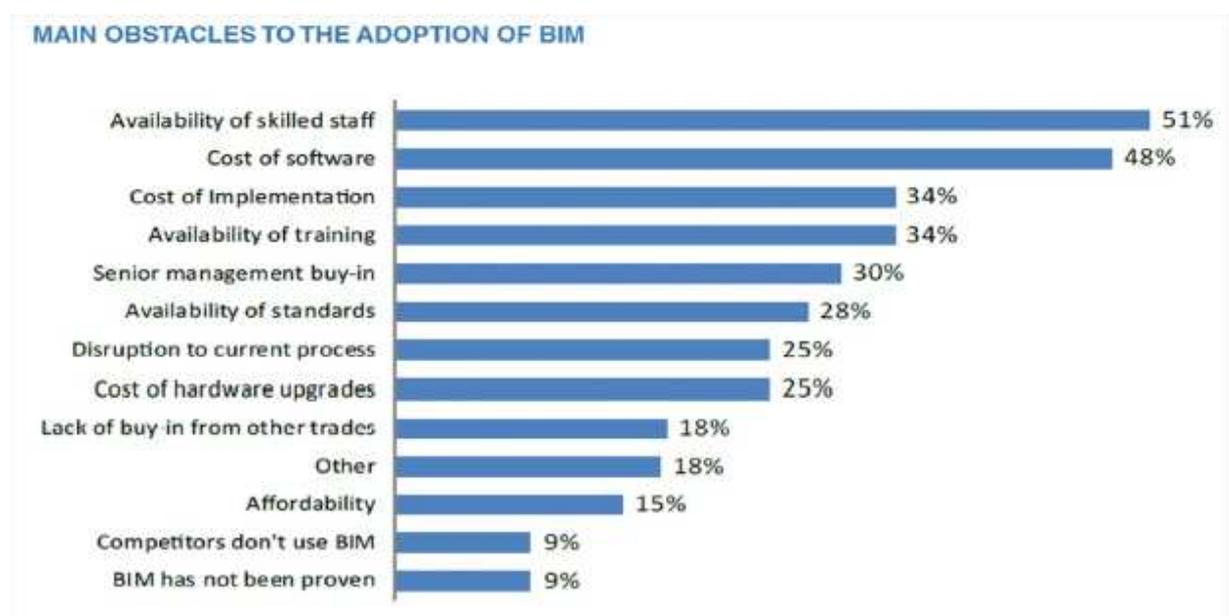
<b>2013</b>	Mandatory Architecture BIM e-Submissions for all new building projects > 20,000 m <sup>2</sup>
<b>2014</b>	Mandatory Engineering BIM e-Submissions for all new building projects > 20,000 m <sup>2</sup>
<b>2015</b>	Mandatory Architecture & Engineering BIM e-Submissions for all new building projects > 5,000 m <sup>2</sup>

\*\* will be calibrated in a gradual manner by taking into consideration the readiness of the industry practitioners and technology

Singapore Building and Construction Authority

Myth six. When have our clients ever been required to pay for our basic tools? Have Architects ever been paid for using ACAD 2D? Paying extra for BIM may happen in the early years but in time to come it is more likely that Architectural firms without BIM will be excluded from the list of accepted consultants for major Developer firms. This is already happening in Malaysia, where Sime Darby, Sunway and Brunfield have started to dropped Architects who are not BIM capable. In summary, Architects who do not change with the time will become obsolete business entities within a decade or so.

The real barriers are best outlined from the results of BIM surveys as below



The biggest secret to BIM adoption is **“GET STARTED NOW”**

Another common question is which software should I use? When you really look at that question, the answer is insanely simple.

**The one you will enjoy using most.**

Here is a piece of advice from a BIM guru with more than 20 years user experience:

All BIM programs (Revit, ArchiCAD, Vectorworks, Bentley Systems, Allplan...) have their pros and cons. Some do more than others. Each has its strengths when working with others (ie, collaboration and interoperability). Each program handles all the levels of BIM differently. But none of that really matters. If you don't enjoy using the software, it is irrelevant if the program is the best thing ever. You won't take advantage of it. Who cares if the program can exchange data with everyone under the sun or can model the craziest things you can image. If you hate working in the program, you won't do any of that. If during your commute home you just mope about missing the joys of hand drafting, then you've made a huge mistake. You either need to find the joy in the software you've chosen or pick another.

Both ArchiCAD and Revit are easy programs to learn, but hard to master. HOWEVER... if you know one, learning the other will be easy IF you don't try to make Program A act like Program B.. Support OPEN BIM though as the future interoperability is vital for group collaboration.

## **BIM SOFTWARE AVAILABLE**

### **ARCHITECTURAL BIM SOFTWARE**

- 1. Autodesk Revit Architecture**
- 2. Graphisoft ArchiCAD**
- 3. Bentley Ecosim Architecture**
4. Nemetschek Vectorworks Architecture
5. Nemetschek Allplan Architecture
6. RhinoBIM
7. Sketchup PlusSpec
8. MSA IDEA Architectural Design from IntelliCAD
9. Gehry Technologies – Digital project designer
10. CADsoft Envisioneer
11. Softech spirit
12. ACCA Edificus

### **STRUCTURAL BIM SOFTWARE**

1. Autodesk Revit Structure
2. Bentley Structural Modeler
3. Bentley RAM, STAAD and ProSteel
4. Tekla Structures
5. CypeCAD
6. Graytec Advance Design
7. StructureSoft Metal Wood Framer
8. Nemetschek Scia
9. MSA Strad and Steel
10. Autodesk Robot Structural Analysis

### **MEP BIM SOFTWARE**

1. Autodesk Revit MEP
2. Bentley Hevacomp Mechanical Designer
3. MSA FineHVAC + FineLIFT + FineELEC + FineSANI
4. Gehry Technologies - Digital Project MEP Systems Routing
5. CADMEP (CADduct / CADmech)

Autodesk Material Description	Promo Price (RM)	Normal Price (RM)
<b>Building Design Suite 2016</b>		
Autodesk Building Design Suite Premium	27,820.00	31,827.00
Autodesk Building Design Suite Standard	21,750.00	23,615.00
Autodesk Building Design Suite Ultimate	43,740.00	49,957.00
<b>Revit 2016</b>		
Autodesk Revit Architecture	23,540.00	26,934.00
Autodesk Revit Structure	23,540.00	26,934.00
Autodesk Revit MEP	23,540.00	26,934.00
<b>Infrastructure Design Suite 2016</b>		
Autodesk Infrastructure Design Suite Premium	27,820.00	31,827.00
Autodesk Infrastructure Design Suite Standard	22,320.00	24,185.00
Autodesk Infrastructure Design Suite Ultimate	43,740.00	49,957.00
<b>Civil 3D 2016</b>		
Autodesk AutoCAD Civil 3D	25,508.00	29,193.00

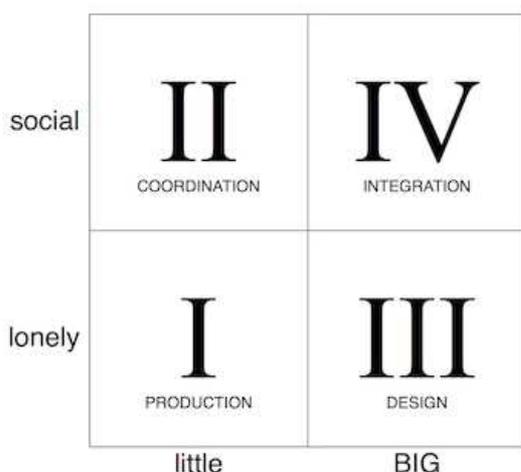
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**All the product c/w 3 Years Maintenance Subs**  
**NO PROMO for 1 Year Maintenance Subs**

Find out more, email your enquiry to [cheonglip@progressive.com.my](mailto:cheonglip@progressive.com.my) & [cyndichan@progressive.com.my](mailto:cyndichan@progressive.com.my)

## WORKING WITH OTHERS

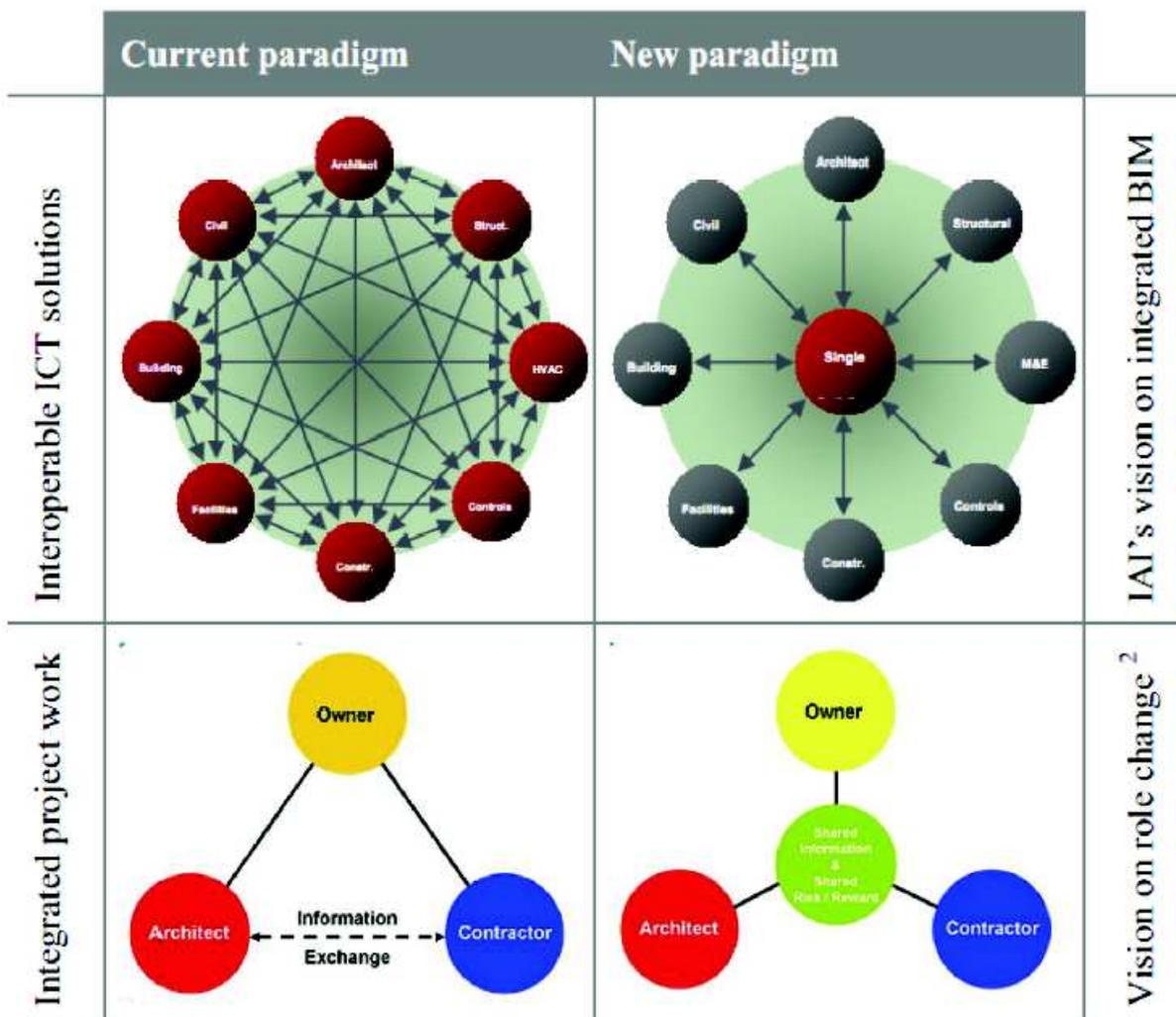
Many leaders in the construction industry believe that we have not yet reaped the real benefits of BIM. As in the diagram below.

Primary Benefits of BIM



Looking in greater detail, we can see the following benefits in BIM collaboration:

1. Transfer of full model to C&S and M&E Engineers who are BIM capable to input their parts of the overall documentation
2. Transfer of model to other analysis programs such as Energy, Sunlight, Lighting and without having to re-build the model
3. Feed back from post analysis back to improve the original model.
4. Additional inputs into the model to enable Construction Management use
5. Post constructions use of the model in Facilities Management in terms called 4D, 5D, etc



## CONSTRUCTION MANAGEMENT BIM SOFTWARE

1. Autodesk Navisworks
2. Solibri Model Checker
3. Vico Office Suite
4. Vela Field BIM
5. Bentley ConstrucSim
6. Tekla BIMSight
7. Glue (by Horizontal Systems)
8. Synchro Professional
9. Innovaya

## FM FACILITIES MANAGEMENT BIM SOFTWARE

1. Bentley Facilities
2. FM:Systems FM:Interact
3. Vintocon ArchiFM (For ArchiCAD)
4. Onuma System
5. EcoDomus

In BIM collaboration between all parties in the construction team, inter operability of the software becomes vital. The model must be able to be transferred between different software with minimum loss of information or data. This is where compatibility to the IFC protocol becomes vital. Currently, IFC 4x3 is the most widely accepted and its development history and structure is as shown below.

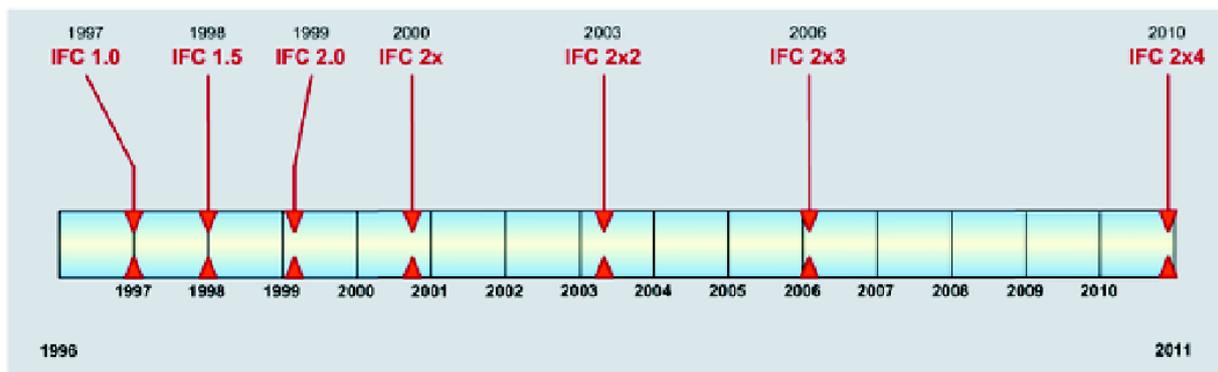
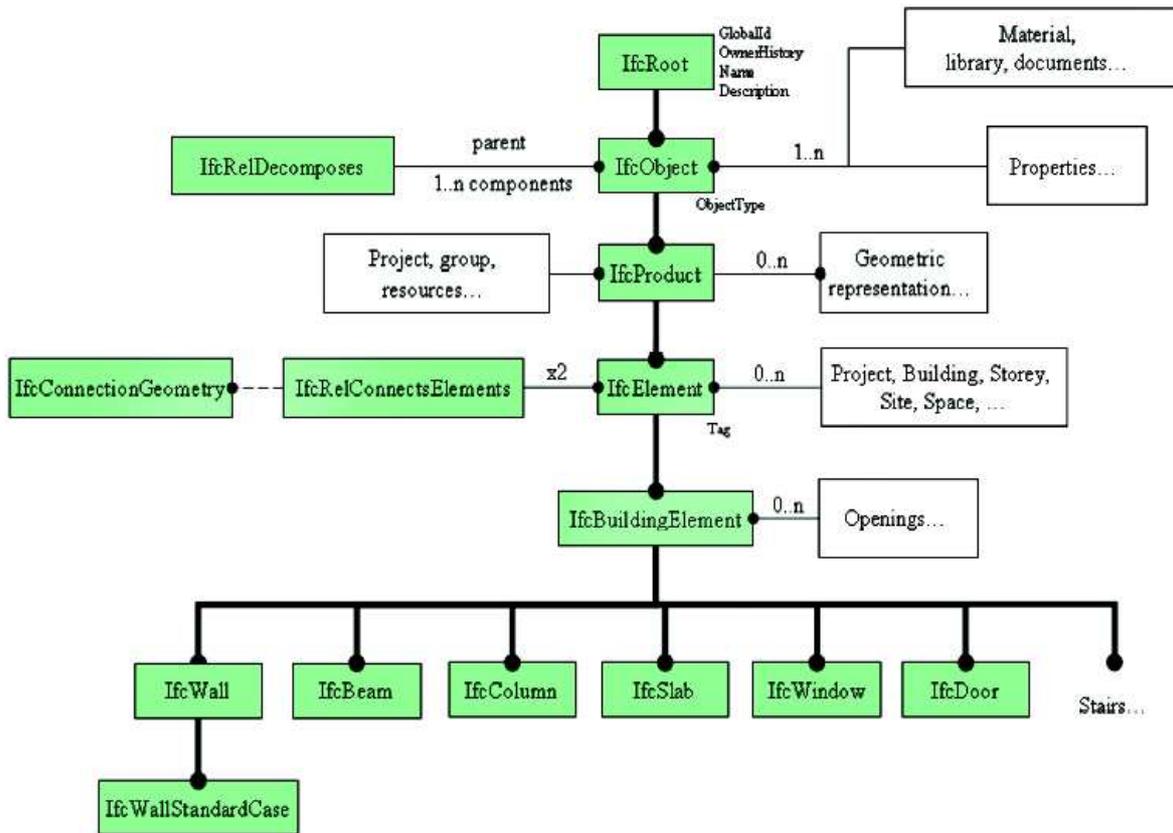


FIGURE 4 IFC RELEASE HISTORY (EXTRACTED FROM [HTTP://WWW.IAI-TECH.ORG](http://www.iai-tech.org))



For Green Building analysis, the IFC compliance protocols are shown below.

Indicator	Before use stage					Use Stage				End of Life Stage		
	Product Stage			Constructi on Stage		Operation of building- incorporated services	Operation of non-building- incorporated appliances	Maintenance, repair and refurbishment	Transport (of people)	Deconstruction	Disposal Stage	
	Raw Material Process	Transport	Manufacturing	Transport	Construction Installation Process						Transport	Recycling, reuse and energy recovery
GWP												
Energy												
Water												
Waste						*	*					
IEQ												
Stages included for each indicator						Required in 2009 version				Optional in 2009 version		
						Not included in 2009 version				Not relevant		