

BIMarabia



6th issue

July 2017

**Computational Design of Hangzhou
Tennis Center**

**How do you make the Revit program
work for you? (Second Part)**

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Introduction

READ, because writing and drawing are the first data modeling ever!

About Building Information Modelling we talk, yes and in Arabic but, to confirm what results you have achieved “Mr. Engineer”, or whatever you like to be called, we will conduct a scientific review of modeling principle away of Engineering!

History records archaeological finds of architectural drawings dating back to the fourth millennium BC, in which another “Mr. Engineer” tried back in those good old days sketching floor plans and elevations over a drawing in a wonderful manner ensuring that they are fully compatible in implementation. However, these drawings did not include the proper sufficient data to facilitate the work. The data was poor and not in any way close to the data found in the clay-colored plate the “Copper Shipment” which recorded the rejection of a copper shipment due to incompliance to specifications with reference to another agreement saved in place neutral to the parties and happened to be called “The Temple”. It is worth mentioning that the quantity was ordered for the construction of a project in what was then called “The Palace” with reference to the damage liabilities caused due to the delivery date delay, in addition to demanding refund of the amount paid, but - and with all the above - was without executive drawings!

This clay plate dates back to the second millennium BC and is still preserved till today in the British Museum.

Well, you might be aware of that, but what is next?

Historical discoveries suggest that 6000 years before the date of this issue of our beloved magazine, a group of our ancestors - here in the East – agreed to give a form to the numbers and the operative voice letters to document the different information, inventing – with or without intention - the first model for data exchange in history. The drawings however, existed way earlier due to their use in several areas of life. One of the modelling systems however could not catalyze the development of urbanization and construction work alone, rather it required both systems: Architectural drawings to draw shapes, and Alphabetic writing for filling those shapes with needed information, symbols and numbers indispensable.

Hence, Architectural or executive drawings in general would be closer to a painting if they had no recorded data.

And even you, “Mr. Engineer” if you ever admitted a discussion to make a decision on site without data, you will be just another person with a different opinion trying to prove nothing new.

The current modelling system has evolved from the union of the two above mentioned systems development and became more precise with the contributions of different knowledges, such as visual arts, physics, mathematics, sociology, and, last but not least, information technology ... influenced back and forth by these knowledge areas which helped us along history on data entry - not tangible such as time, temperature, sound, stress, loads, tension ... etc to the scope of the senses and the space of understanding in order to better manipulate them.

As examples of the effect of the concept of modelling in different sciences is Einstein's proof of his special and general Theory of Relativity using mathematical modelling of physics. Al-khwarizmi as well, has modeled mathematical equations couple of centuries before him to geometrically understand, solve, and even validate them. Not to forget the table of Ahmed bin Menem in his book «Feqh Alhesab», in which he modeled the quantities and geometries in details documenting a highly dynamic and magnificent table that's being used till today in countless fields!

Today, and after 6000 years, we are able to record shapes, colors, measurements, quantities, specifications, chronological order, date of completion, cost, written notices, and legal agreements, in a real simulation of what will actually be one central model available for reading, simultaneous editing or addition by multidisciplinary individuals allocated in different parts of the world. This technique has several calling names, of which "Building Information Modeling" is the most comprehensive and suitable. BIM flawlessly embodies the existing project data so that we can see them clearly and of the same perspective, because we -as different human beings- will agree on how to action this data once we agree on how to define, understand and imagine it. The way is to allow for an integrated vision that includes all perspectives and layers for all parties, forcing each one to look from other's perspective. This is the beginning of a mission for proper planning and a solid foundation moving towards simulating the project (The second step) and virtually building it before actually building it, or in other words; building the project twice!

Build your project twice to avoid errors at the first (virtual) one during the second (actual) construction process, in addition to the possibility of exposing the virtual building to test conditions in a realistic simulation (The third step) of the external environment, plus the clash detection between its internal systems, and then followed by the realistic implementation (The fourth step) to address any problems resulting from the design change as per Project's Operator request that may not come late after the design has finished.

This cycle summarizes the theory of Deming, «The Master of Quality» (Plan - Do - Check - Act) and the pioneer of Manufacturing Engineering, which proves the impact of BIM with Manufacturing Engineering theories and even Industrial Design in terms of high quality, time and cost savings. With all the above, we still need to develop a clear agreed plan of action to increase our utilization of all vast possibilities of Building Information Modelling. Despite the success of several ventures, we lack the optimum utilization rate compared with our ancestors who were able, with simple tools to best exploit BIM completely and built Architectural and urban monuments that we still find amazing today! Our preoccupation with the diversity, contrast and constant change of this technology has distracted us from the full exploitation of it, which will only happen through a proper plan execution and stop jogging for everything, selecting the most appropriate, specialization and cooperation with other disciplines. On behalf of the magazine team, I welcome you to this issue of your BIM Arabia magazine.



Ahmed Lutfi

Omar Salim

BIM manager

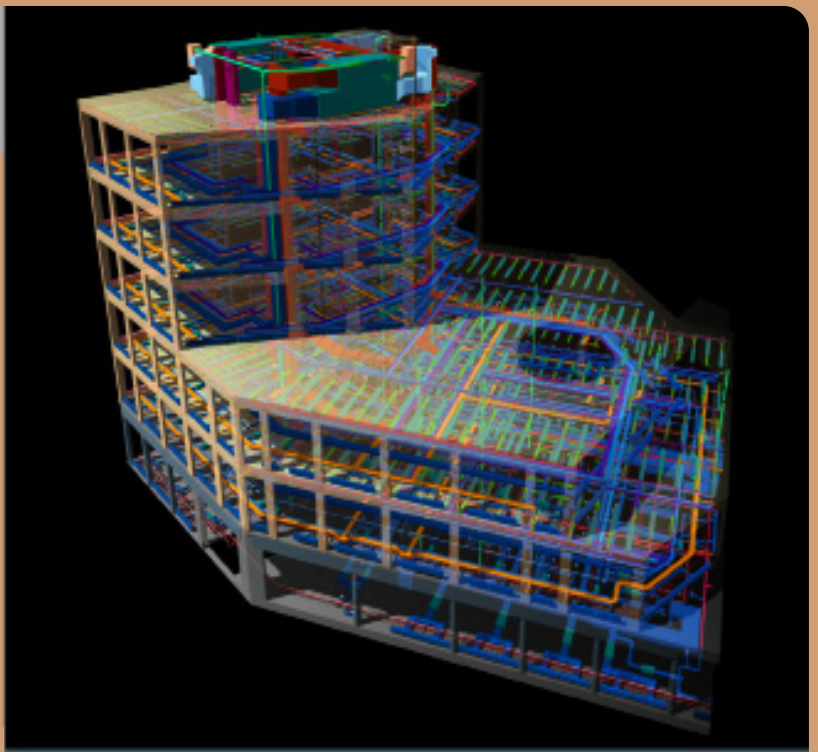
Founder of BIMarabia magazine



[/https://draftsman.wordpress.com](https://draftsman.wordpress.com)



Translator: Wessam Ahmed



ABOUT BUILDING INFORMATION MODELING WE TALK

Building Information Modelling: Making of a digital model of the building with all the Architectural, Structural and Electromechanical details that we need to make a decision for.

BIM Benefit

Helps in Maintenance Operation after Project completion



A study by the Center for Integrated Facility Engineering - Stanford University on 32 huge projects found that:

Up to 40% elimination of unbudgeted change



Cost estimation accuracy within 97%



Up to 80% reduction in time taken to generate a cost estimate



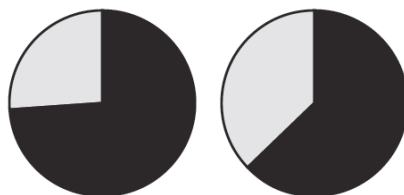
A savings of up to 10% of the contract value



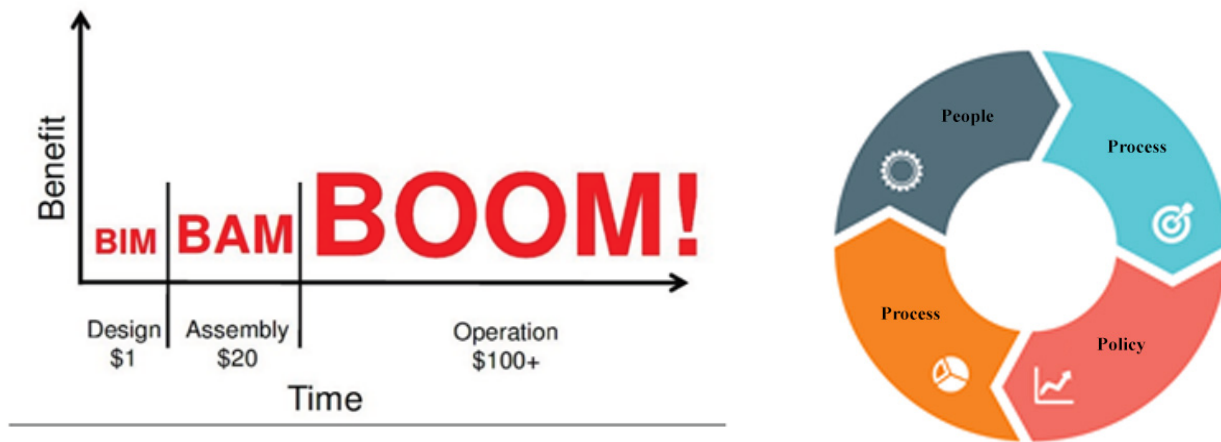
Up to 7% reduction in project time



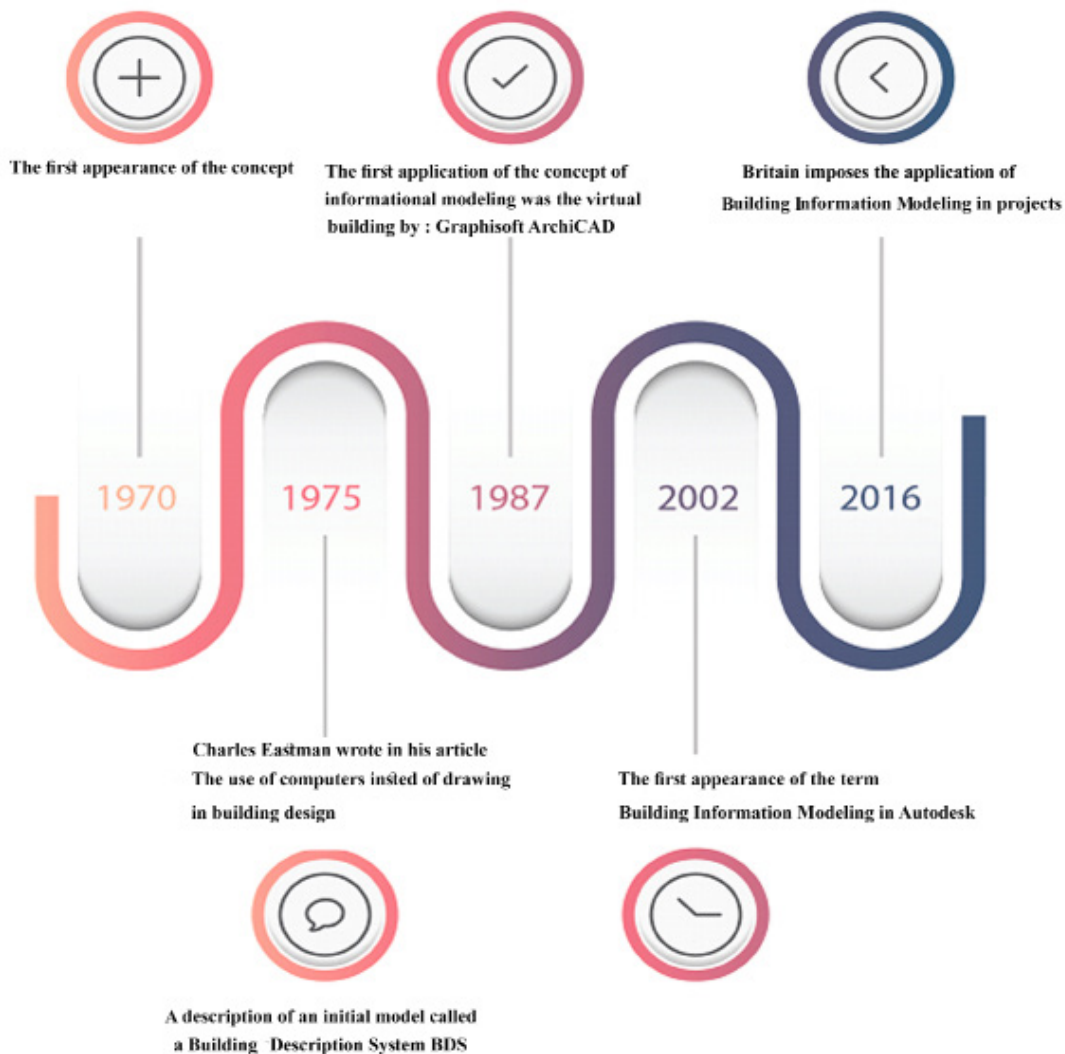
A recent survey by the McGraw-Hill Foundation found that “Three-quarters of BIM users in Western Europe (74 percent) have achieved significant positive results on their overall investments on these BIM models, compared with 63 percent of BIM users in North America”.



The primary BIM benefit does not appear during design or construction, but during management work of the facility in the so-called FM.



BIM is not a software, it is rather a technology and process carried out by people in working teams, and it is not new but is officially dated back to 1970s. Early studies have mentioned the same principle but in different names. This was a brief introduction to the Building Information Modelling:



The benefits of BIM software in calculating quantities and determining the cost of projects?



Eyad Haj Saeed

- Founder and director of Orbit Office to introduce consultancy and training in the field of project management.

It is a common knowledge that the quantification process plays an important role during the project life cycle, from project design to project execution to delivery to the owner, and has a significant role in determining the time, cost and quality standards of the project requirements.

During the study and audit of the project:

Starting with the calculation of estimated quantities (BOQ), through which project costs are estimated, the design team calculates the quantities of the drawings from the AutoCAD software, and then writes the results to Excel, but it takes time to finish them, not only a few, but in large and unique projects, and it is also possible to calculate the quantities, regardless of how correctly results were written.

Including Revit:

Where the study of modeling and the calculation of quantities

Its advantages in calculating quantities:

- The ease of visual verification in terms of reference to a particular element, and know the quantity accurately
- Adjustments are made directly to the bill of quantities when the model changes, such as changing sections or material.

But in addition to the previous features , NAVISWORKS software comes to give us the best features, including:

- With a click of a button the project quantities will be fully calculated according to the classification of the items, all of which takes only a few minutes, and is one of the most important features of the software

During the executing of the project:

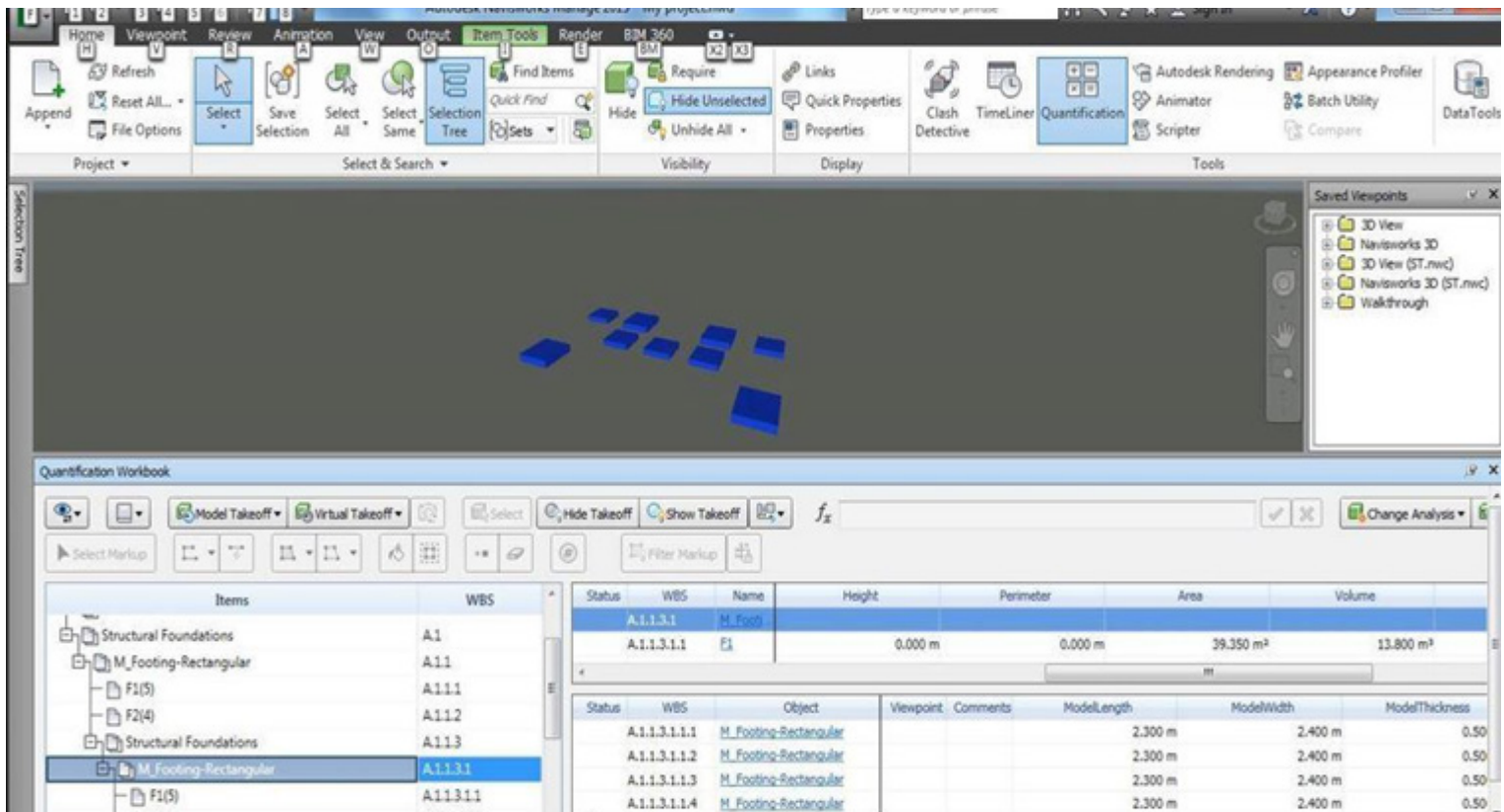
In large projects, there are specialists to calculate quantities in each engineering field to follow up on the accounting of subcontractors.

There are also accountants of quantities to deal with the supervising entity according to the items of the BOQ's estimated disclosure, the accounts may be inaccurate and the project manager may request material that are premature or redundant due to lack of accuracy in the quantity calculation.

All of this will overload the main contractor with the burden of financial expenses that will adversely affect the progress of the project. It is also possible that the quantities issued by the supervisor are different from the quantities of the main contractor, resulting in ongoing disputes between the parties

The benefit was from NAVISWORKS

- Any modification during the implementation of the project at the request of the owner, will be adjusted in the model, which is reflected on the BOQ and becomes directly modified, and then exported to Excel for coordination in order to approve the financial statements of subcontractors and the claim of the owner.
- The benefits reflected on the supervisor are to raise the financial statements of the main contractor, based on the quantities resulting from the modified models, agreed upon by the parties. This will reduce disputes and accelerate the work of the project.



The screenshot displays the Navisworks software interface. The top ribbon includes tabs for Home, Viewpoint, Review, Animation, View, Output, Item Tools, Render, and BIM 360. The 'Item Tools' tab is active, showing options like Select, Save Selection, Select All, Select Same, Selection Tree, Find Items, Require, Hide, Hide Unselected, Unhide All, Links, Quick Properties, Properties, Clash Detective, TimeLiner, Quantification, Autodesk Rendering, Appearance Profiler, Animator, Batch Utility, and DataTools. The main workspace shows a 3D model of a building foundation with several blue rectangular blocks. A 'Saved Viewpoints' panel on the right lists views such as 3D View, Navisworks 3D, 3D View (ST.mvc), Navisworks 3D (ST.mvc), and Walkthrough. Below the 3D view is the 'Quantification Workbook' window, which contains a table of items and their properties.

Status	WBS	Name	Height	Perimeter	Area	Volume
	A.1.1.3.1	M_Footing				
	A.1.1.3.1.1	E1	0.000 m	0.000 m	39.350 m ²	13.800 m ³

Status	WBS	Object	Viewpoint	Comments	ModelLength	ModelWidth	ModelThickness
	A.1.1.3.1.1.1	M_Footing-Rectangular			2.300 m	2.400 m	0.50
	A.1.1.3.1.1.2	M_Footing-Rectangular			2.300 m	2.400 m	0.50
	A.1.1.3.1.1.3	M_Footing-Rectangular			2.300 m	2.400 m	0.50
	A.1.1.3.1.1.4	M_Footing-Rectangular			2.300 m	2.400 m	0.50

We can find a precise organization of the material supply chain, by taking advantage of the software in determining when to store material, and when to order new material from suppliers.

We conclude the article:

Today we have an urgent need to spread the culture of BIM and its applications, and to do the work of Arab research to study the benefits when used in projects through most important of which is the effective and positive impact to the accuracy of project quantities on the life cycle of the project.



QUALITY MANAGEMENT IN BUILDING INFORMATION MODELING

Quality refers to the high degree of value, which is a term that expresses the status of the product or the level of performance of the work. The good product is the one which achieves reaching the needs of the consumer or the customer and sometimes exceeds its expectations. It also means the ability of the product to fulfill its function and the conformity of the product to the specifications set during design, And the degree to which the agreed requirements are met by the customer. The standard definition of quality is “the set of characteristics and attributes that must be met in the product or service so that it performs its function to the fullest and satisfies the consumer.”

Customer Satisfaction

The satisfaction of the customer or the client with the service or products obtained. This satisfaction is the basic quality objective in all its principles, since the project can't be considered successful unless it satisfies consumers or users of the final product of the project.

Quality Management

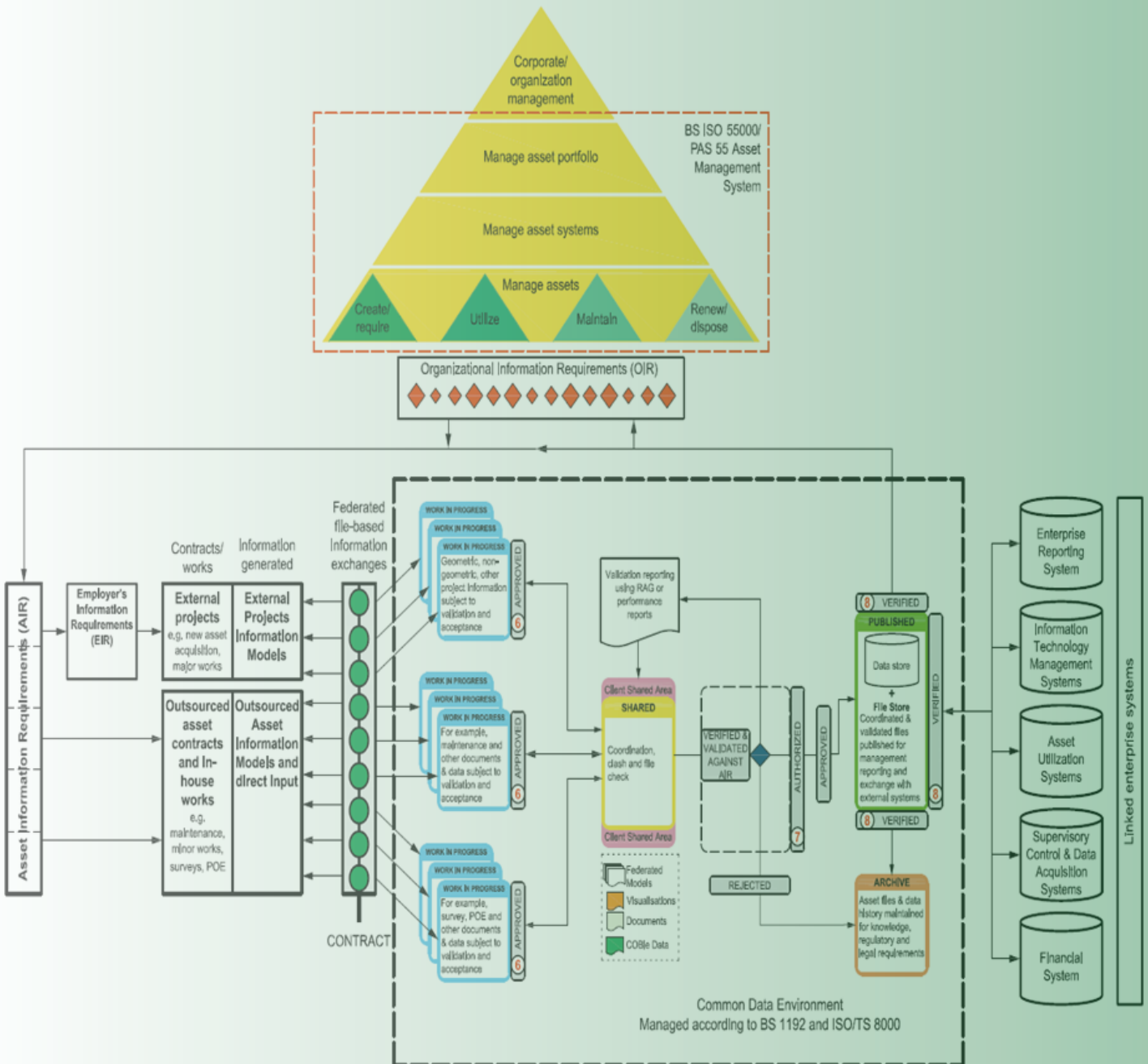
Is the process of managing the techniques and practical activities that are used and aimed to improve the quality level and achieving the highest possible efficiency.

In the process of Building Information Modeling, monitoring and evaluating the data of the building information model, processes and activities associated with this model is crucial to ensure following-up of best practices for the process of building the model from the beginning of the project and through its development stages until the end of the project to become a usable product.

The quality of the model must be reviewed and tested before it's delivered to any stakeholder in the project during the project development stages. This is to ensure optimal exchange of data between the project team. All beneficiaries must perform the required quality measurement tests before delivering the BIM or related content of the project. Each section or discipline should prepare an evidence of their review of the BIM model which is required and approved in accordance with the BIM guidelines.

Quality Management plan

Is the plan to achieve the objectives of upgrading the quality by identifying the necessary requirements to achieve quality and appropriate standards to measure the quality of the project and its outputs, and document the description of the final product of the project. The key features of this process are that they provide instruction and guidance on how to manage and validate quality throughout the project development.



Ensuring data and information governance and assurance

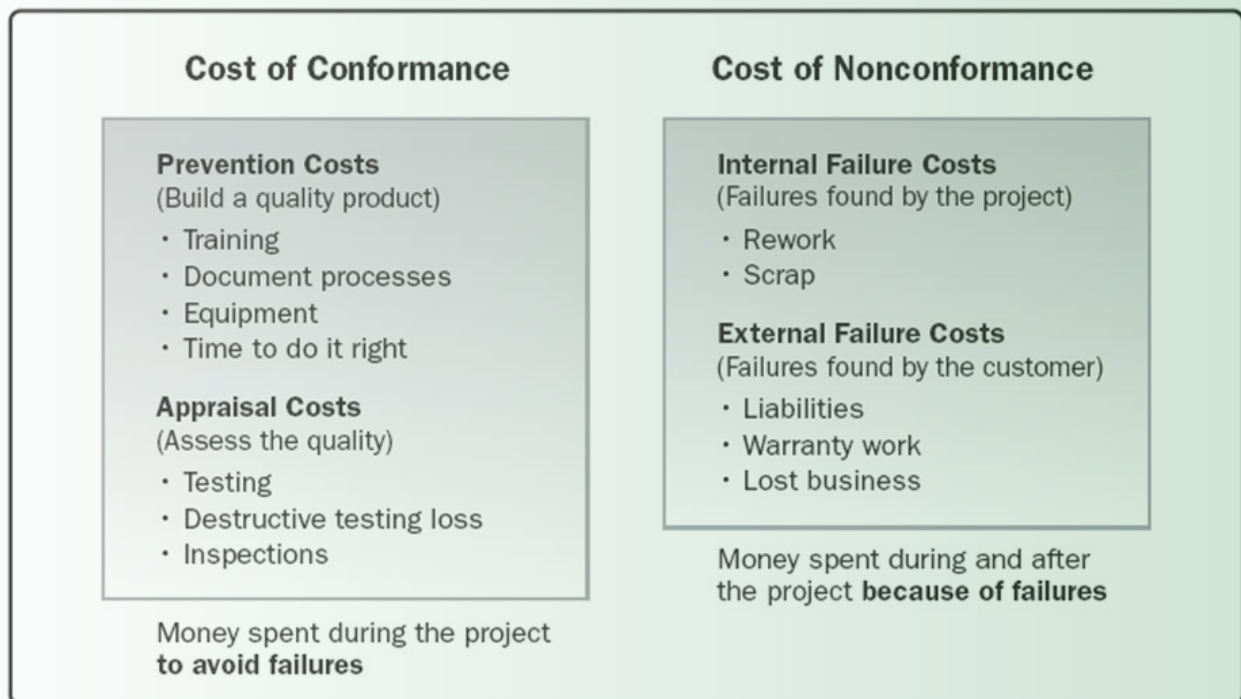
Quality planning must be done in parallel with other planning processes at the beginning of the project. For example, the proposed changes in the final product to meet specific quality standards may require cost adjustments or a project schedule and a detailed analysis of the risks affecting other project plans.

Corrective Action

The act that corrects the faults in the work and the discovered during the process of inspection and review.

Prevention over Inspection

Is the process of planning, design, and construction of the quality of the product or the activity that matches the specifications before the need to corrective action, the cost of precautions for general faults is much less expensive than the cost of breakdown maintenance after the inspection during the development of the project as shown in the following figure :



**Example of the Seven Basic Quality Tools
Reference (PMBOK® Guide) – Fifth Edition**

Quality Assurance

It is an activity and a way to ensure that the requirements and standards required for the project resulting from quality control reports to reach outputs satisfy the client's needs are met, the basic feature of this process is facilitating processes to improve quality, and the implementation of a set of actions planned and processes specific methodology within the quality management plan of the project

Quality Improvement

The operational procedures and activities taken by project personnel to increase the effectiveness of activities and processes in the project and the end product to avail or benefit all the beneficiaries of the project, the main objective of quality management in the BIM projects, which must be considered at the beginning of any project

Finally, After explaining the importance of quality management in the BIM, the following are some points to consider when developing a BIM Quality Management Plan:

- Correct distribution of the roles and responsibilities of all employees of the BIM project and ensure that these tasks are included and the timing of their implementation.
- Definition of content, tools used, file formats, methods of data exchange and information.
- Requirements for processing of information and data, including exporting control, audit methods and quality assurance.
- Monitoring and evaluating data and information continuously and improve the quality of information and data to fulfill the needs of the project.
- Identify the standards to be applied in the BIM model construction process.
- Identify requirements for storing information and data in secure ways that take into account privacy in data transfer.
- Identify the requirements for the backup process, determine where these copies are stored and the timing of activation of this process.
- Identify schedules and requirements for the exchange, distribution and availability of information and data from all parties involved in the project.
- Determining requirements for data archiving.
- Define the requirements for erasing undocumented or undesirable data, in accordance with security and privacy standards.

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Translator: Muhammad Etman



Computational Design of Hangzhou Tennis Center

One of the most significant parametric buildings in the world is the Hangzhou Tennis Center. The building has been selected for this article due to its unique and distinctive parametric design method. The designers of this building used parametric design to model the envelope of the center for two rational reasons: first, to find suitable innovative skin and second, to reduce the steel consumption for the structure .

The computational design criteria of this building are based on five main tasks:

1- Translation

The design concept, the design problem or the initial design model (according to the type of design project) is translated parametrically by programming or scripting to a parametric model. This task can be operated by the architect of the project, a parametric design expert, or an external specialized firm. In the case of collaborating with an expert or an external firm, the design team should provide the parametric team with full description of the concept and detailed objectives of the design to accomplish a successful parametric model.

2- Rationalization

In this task, the parametric designer converts the basic concept, the sketch, or non-rational geometry into a rational logical model. This task is necessary only if the design team did not supply the parametric team with rational 3D model that presents the concept or the design problem.

3- Control

The lead parametric designer has to find an appropriate mechanism to control the parametric model. At first, the designer should figure out the fundamental geometry, which usually called the "Design Surface". Afterwards, he/she has to assign the pre-defined parameters on his surface as the generator of the alternatives.

4- Generate and Test

This is the main task in the parametric design process. Design alternatives are generated through the pre-defined parameters that were assigned on the design surface. These alternatives are evaluated carefully and accurately by the designers throughout a criteria that depends on specified factors that differ from project to another. However, the factors are typically related to four areas: structure, construction, aesthetics, and environment.

5- Sharing Information

In the sharing information task, the final design model will be translated to a clear language for construction phase. Scripting can be used to convert the model to data, drawings, schedules, or files for other applications that are suitable for contractors.



Building Background

The Hangzhou Tennis Center is located in the city of Hangzhou in China. The center is one of the the Olympic Park project consists. The Olympic Park occupies 400,000 square meters on the west bank of Qiantang River, whereas the building utilizes 220,000 square meters to accommodate 10,000 seats. The Park and the Center were designed both by the same company NBBJ in collaboration with CCDI firm for structural design. The construction of the center was launched in 2011 and it was completed in 2015.

1. West Riverfront Plaza
2. Parking
3. South Entry Plaza
4. Tennis Practice Fields
5. East Riverfront Plaza
6. Parking
7. Cultural Center Plaza
8. Retail Boulevard
9. Rolling Landform Park
10. Gingko Bosque
11. Retail Connection Spine
12. Retail Connection Spine
13. Water Feature
14. East Entry Plaza
15. Extreme Sports Area
16. Community Playfields

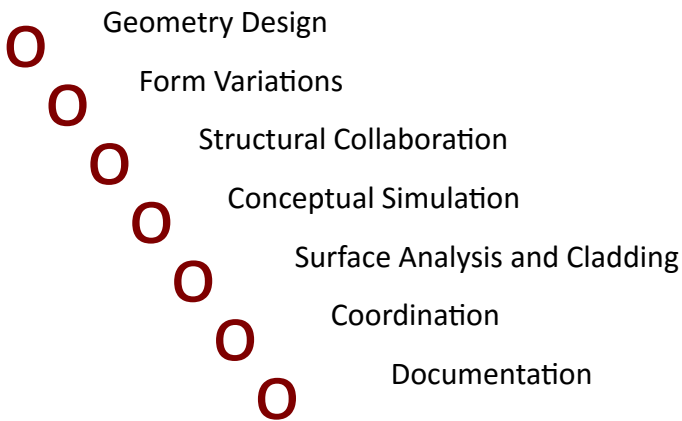


The parametric design process of the Hangzhou Center started immediately after determining the geometry of the envelope. NBBJ intends to reduce the amount of steel that will be used for the envelope structure in order to model an efficient shell that provides the spectators with clear field of vision. Consequently, the resultant shell successfully achieves the previous goals with 24 steel trusses that bond with the concrete bowl, and reduces the steel consumption by 67% of the intended amount. This achievement truly demonstrates successful parametric design.



Overview of Parametric Design

NBBJ Company supervised the parametric modeling process of the Center during the schematic design phase. The main goal of this process was to produce a model that is economical in steel quantity and sufficient in energy consumption. Grasshopper application was first used to generate an accurate logarithmic design for the shell and then it was used to generate the transfer of the design information to other disciplines and achieve efficient collaboration. Furthermore, the parametric design was also applied on other tasks in this project for the first time:



The Parametric Design

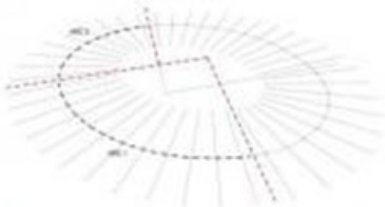
Envelope Geometry

The main design concept of the envelope was based on a double curve surface that was developed from a circular arc. The objective of the concept was to model an envelope that provides enough shadow on the bowl, protects spectators from the rain, and affords covered space for mechanical equipments and lighting devices. The surface was transformed parametrically to a point cloud of NURBS control points. These points were generated to produce repetitive double curve surfaces that were arrayed along the circular arc. The generated double curve surfaces took a form of petal.

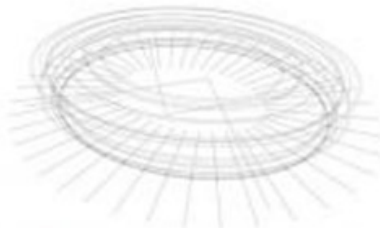


Generate Architectural Alternatives

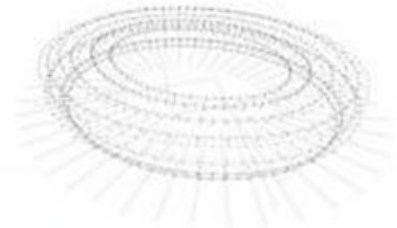
After defining the envelope geometry, the resultant petals were parametrically generated to gain a number of alternatives for their design and arrangement. The process depended on two operations: sorting and transforming. The design alternatives were evaluated and compared by the design team according to pre-defined factors: aesthetic judgment, parameters for shade, drainage, structural performance, and sports technical systems.



1. Circular axes are established as the driving geometry for the bowl and the exterior steel petals.



2. Axis geometry is translated in 3D space to define the interior and exterior limits of the stadium shell.



3. Axes are divided into lists of control points.



4. The list of points is organized to define B-spline curves and surfaces.



5. The B-spline geometry is subdivided to create primary truss geometry.



6. Secondary structural elements for truss tracing and roof systems are linked to the primary truss system.

nbbj

HANGZHOU STADIUM

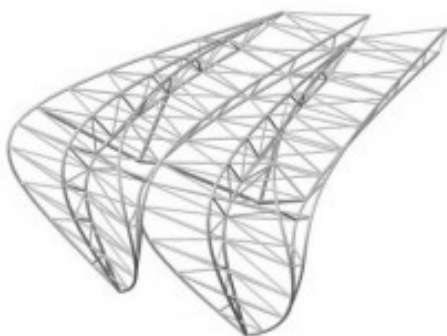


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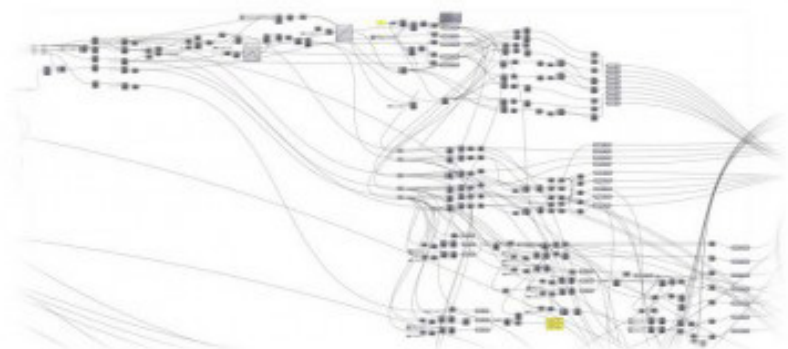
HANGZHOU STADIUM

Generate Structural Elements

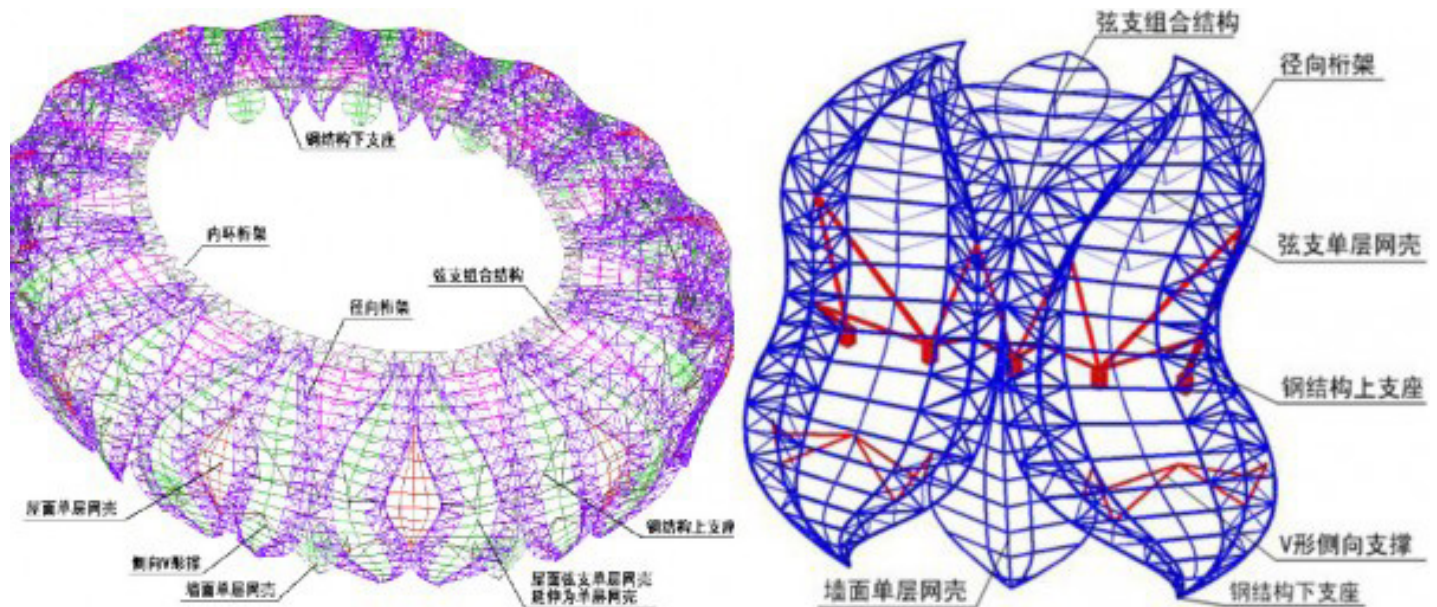
To convert the petals to structural elements, NBBJ collaborated with CCDI Company to transform the double curve surfaces of the petals to typical truss centerline model. This model was produced by Grasshopper and is applicable for structural design softwares. Hence, the efficient collaboration between NBBJ and CCDI had designed a convenient sufficient truss for the envelope.



3. TRUSS MEMBER SIZE COORDINATION



The parametric design was also used for the structural analysis of the project. Kangaroo Physics plug-In for Grasshopper was employed to simulate the effect of the gravity force on the truss elements. This simulation illustrates the tensile and compression forces, which made it easy for the designers to make the appropriate structural adjustments on the trusses. This process contributed effectively in identifying the structural problems at early phases in the design process. This has great benefits for the time schedule of the project.

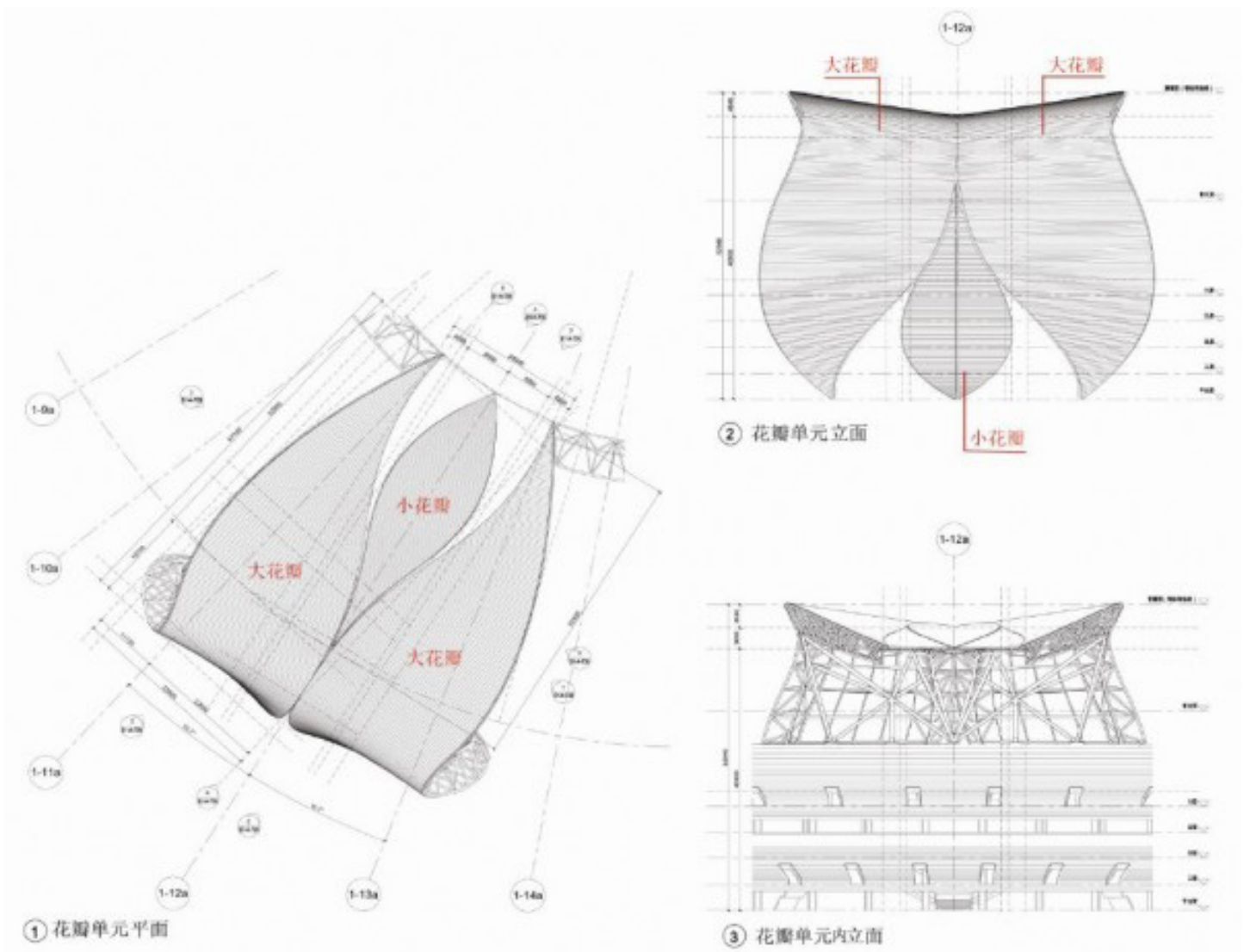


Cladding Design

The parametric design was employed to facilitate the calculation process of the quantity of aluminum panels. Rhinoceros and Grasshopper have the tools to determine the areas of the double curve surfaces and to panelize the aluminum on these surfaces accurately. In addition, these softwares helped in the manufacturing of the panels by unrolling the ruled surfaces to flatten plates and cutting them by CNC machines.

Construction Documentation

It is outstanding that the documents of Hangzhou Center were also algorithmically prepared. Grasshopper has the ability to make the export process of the parametric model to other applications within reach. Custom scripts were developed for automatic export of the data as 3D DWGs files. The files were used in Autodesk Revit to generate the orthographical drawings, whereas a special Grasshopper script was used to unroll the ruled surfaces and to document the details of aluminum plates in special drawings with quantity spreadsheets.



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Open Source Software: are programs with Codes
(ABBREVIATION of Why) which are available, accessible and developed,
often free or cheap. As (Stallman) says «free software is software that respects your freedom»
The first who creates this concept is the programmer
(Richard Matthew Stallman),



BIM and Open Source Software

 Translator: Sonia Ahmed

Who says «I could make money from this, I might pleased myself by writing the source code. But I knew by the end of my practical life, I will remember the years of building walls to disperse people, and I will feel that I spent my life to make the World a worse place»



Omar Selim

BIM MANAGER

<https://draftsman.wordpress.com>

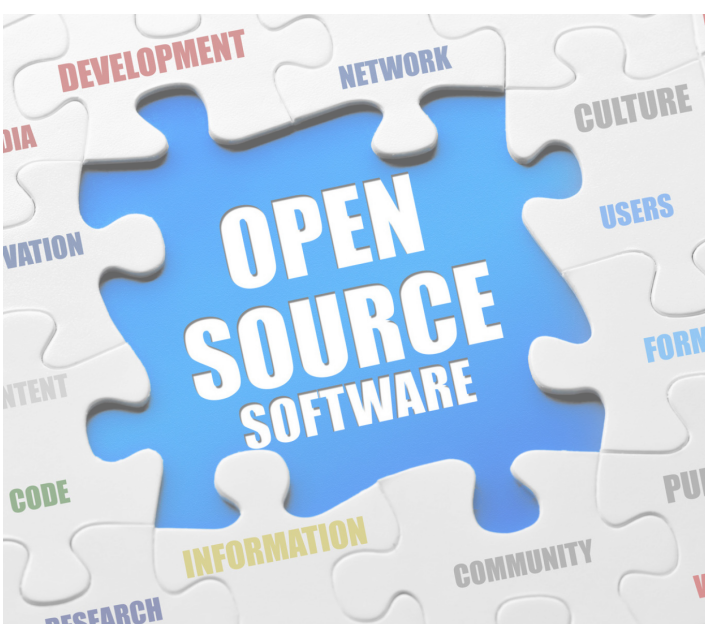
In order to make the source program open, four freedoms must be there:

- The first freedom: the freedom to use the software for any purpose. There are companies require specific purposes to work by their programs

- The second freedom: the freedom to study and modify the source code of the program. Most of the other programs are closed and its decode is secret, such as the way of making (Kentucky meal)

- The Third Freedom: The freedom to distribute copies of the original program to be able to help your neighbor or your friend.

- The fourth freedom: the freedom to distribute copies of the modified program and sharing your modification with community participation



The popular browser **(Firefox)** is one of the best free web browsers in the world.



(Free Download Manager) is an excellent and free program to download from the internet.



(Virtual Box) Computer simulator to create a model of a computer within the operating system to install another Operating System



VirtualBox

The most famous **open** source programs

(their number in thousands)

(GIMP) is a free Program which competes to A PHOTOSHOP.



(Blender) is a 3D graphics competitor to (3ds Max), despite its small size - almost 70 MB - but it functions more than the (3ds Max) of 7 GB hard drive, such as the existence of its own games (Games Engine), and films have been made by it and the same films are open source you can modify it freely such as Sintel film.



(Inkscape) drawing program.



(Sweet Home 3D) is a fantastic and simple program to design the decor of your apartment easily and place the furniture, even if you are not a specialist.

Sweet Home 3D



(Pdf Creator) to print pdf files.



We come now to **(BIM)**

Unfortunately there is not a lot of open source software for modeling operations and this might not be changed soon, but there are many programs that allow to deal with BIM models to review it such as (Free BIM Viewer) or to get reports of information or verification of data quality. Here comes the importance of relying on formulas or systematic coordination that doesn't belong to any commercial company for exchanging of data, such as (IFC) (Industry Foundation Classes)

Examples of the programs:

- If we server the site to browse (IFC) files and exported to any formula you want (XML & IFC & CSV & JSON)

www.ifcwebserver.org

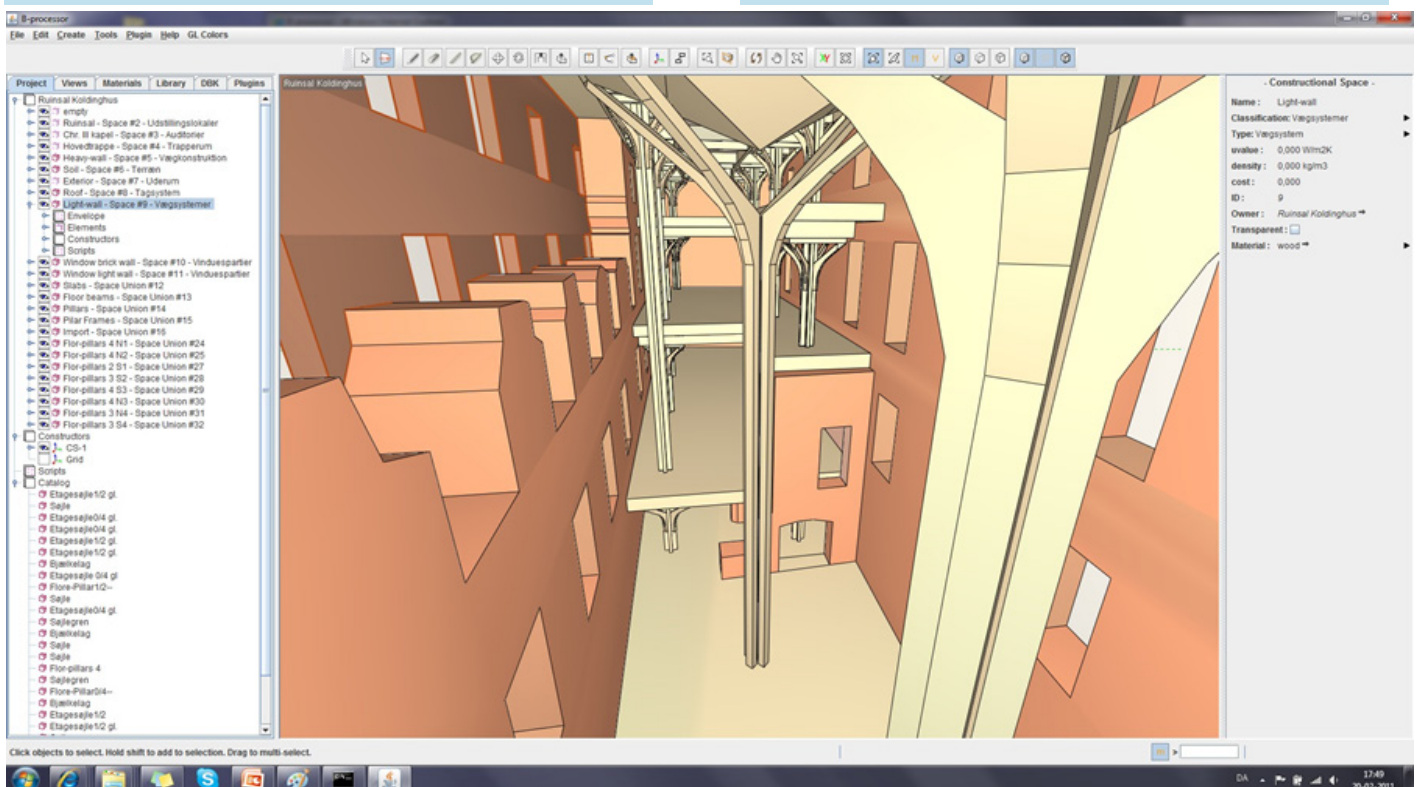
- www.bimviewer.com You can download IFC files and thus become available for everyone on the Internet

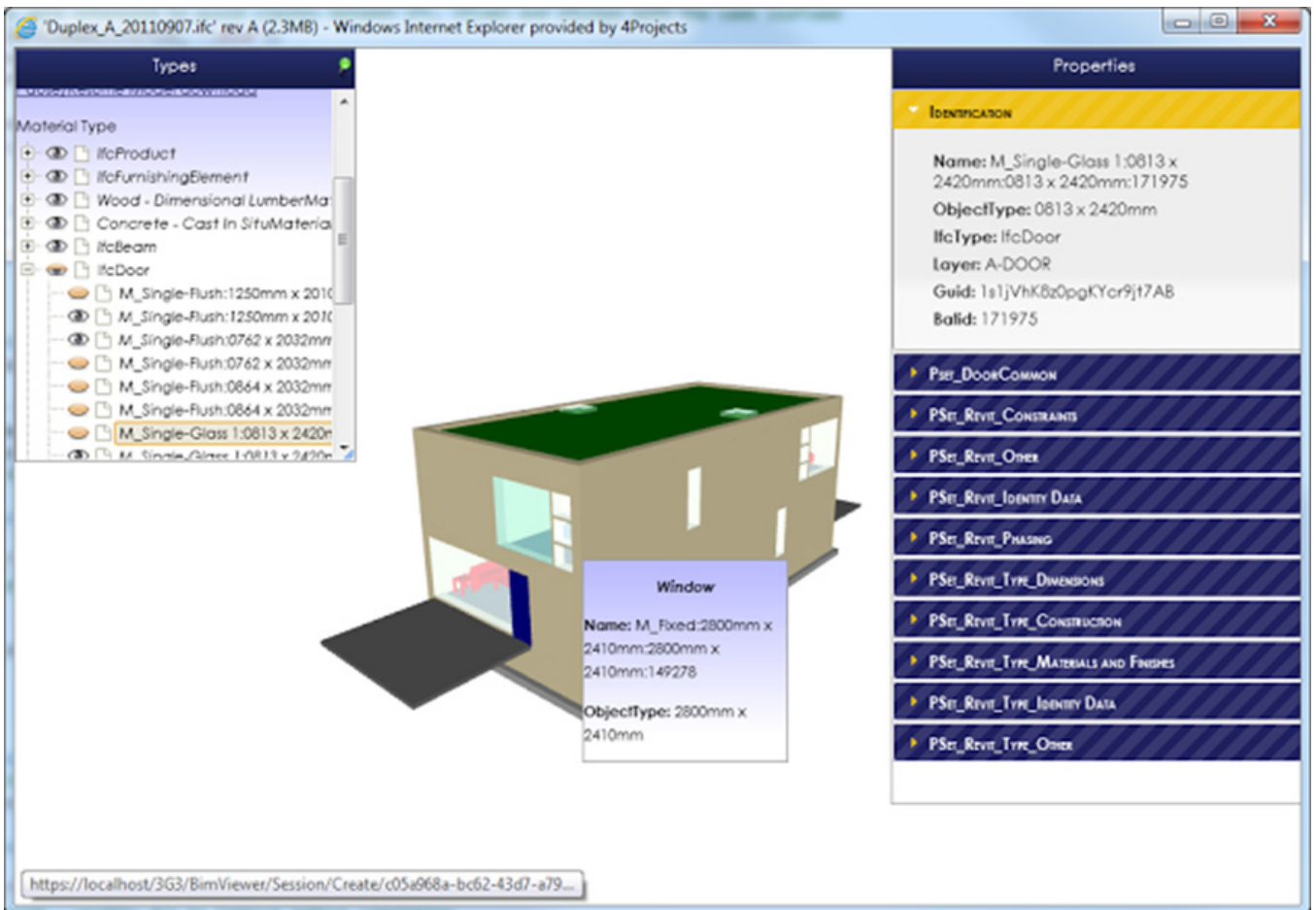
- Windsurfer to display IFC files

- <http://freecadweb.org/> Cad program lists have been added to it to join the list of BIM programs

- B-processor The BIM program coded and developed by (Arhus School of Architecture in cooperation) with (the Alexandra institute.) to be competitive to Revit program and Archicad. The program follows the basic BIM concepts and it was developed from the ground up.

- (4BIM) is an on-line available tool, based on IFC. <http://www.4projects.com/OurProduct/4BIM.aspx>





Gestion Revit

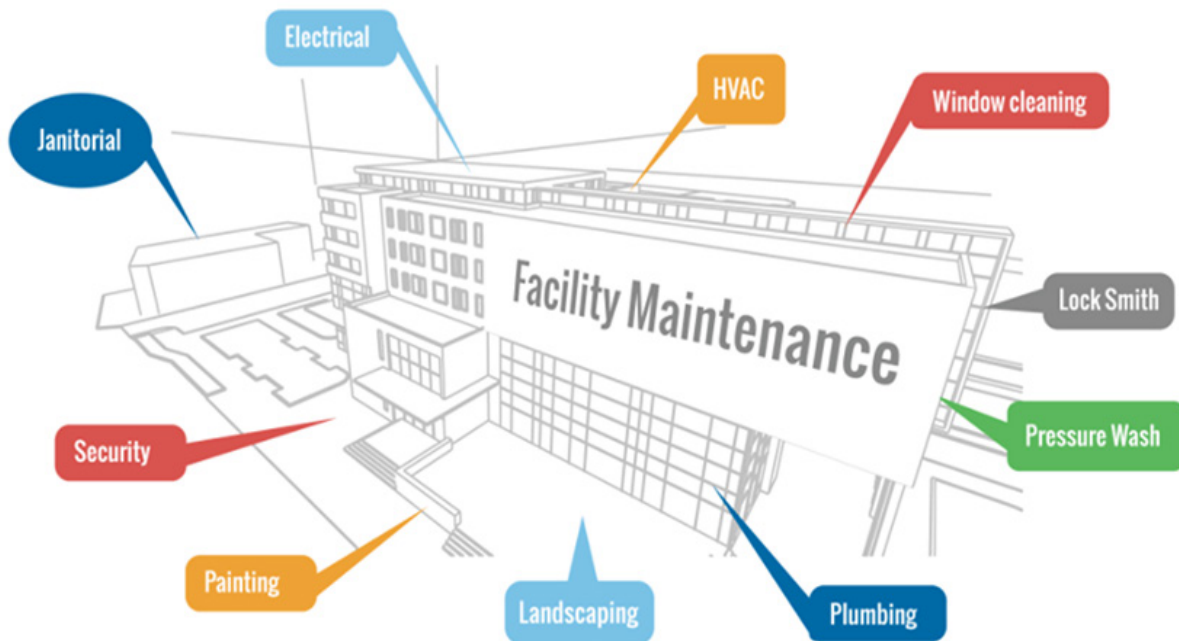
Free program to manage Revit database access. <http://sourceforge.net/projects/gestionrevit/?source=directory>



OpenMaint

is a free and open source program to manage facilities which helps in decision-making and supports BIM

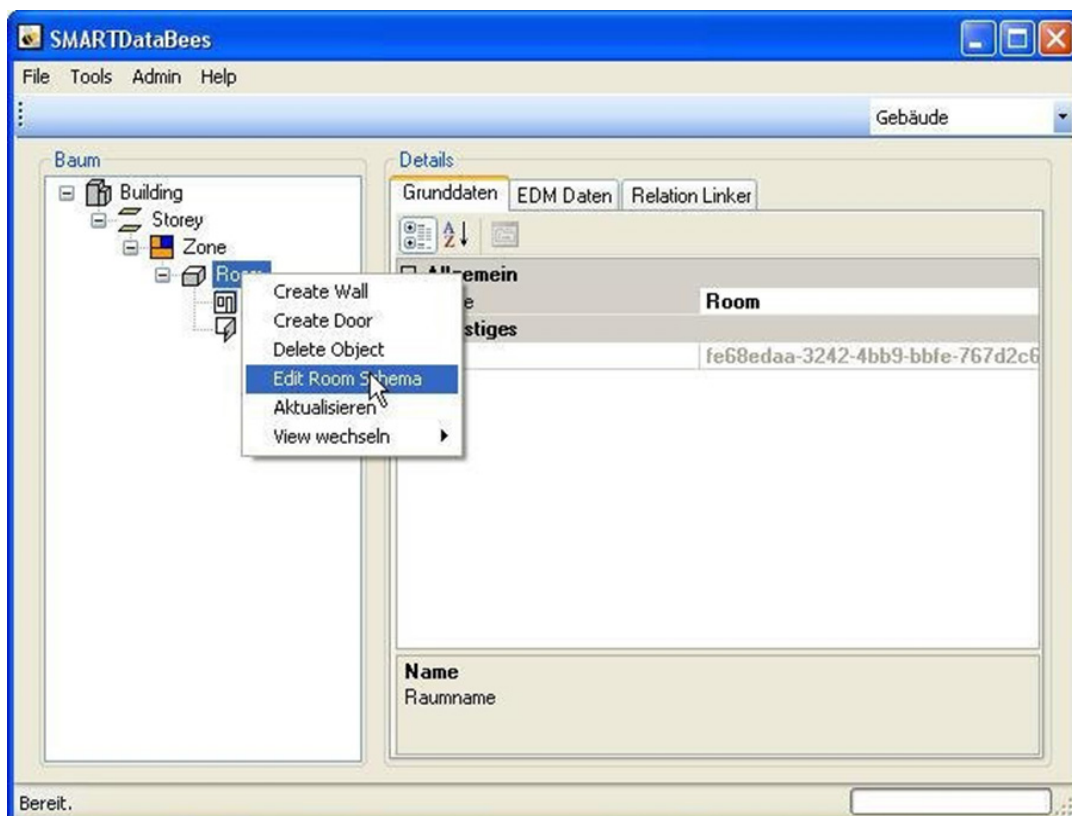
<http://www.openmaint.org/en>



SMARTDataBees

is a program to manage Database (facility management), (CAFM/FM) Open Source and supports MySQL versions, MS-SQL, SQLite.

<http://sourceforge.net/projects/osfm/?source=directory>



Konsol

is an open source program (not completed yet) to create 3D buildings (architecturally, constitutive, mechanically and electrically). Hopes held on Arabs and Muslims programmers to unite in this project in order to gain invaluable experience

<http://sourceforge.net/projects/konsol>



1- For the (Revit Structure) program, does it have the same importance in the Gulf within operating companies in accordance to BIM concept with the same widespread use of Revit Arch or Revit MEP?

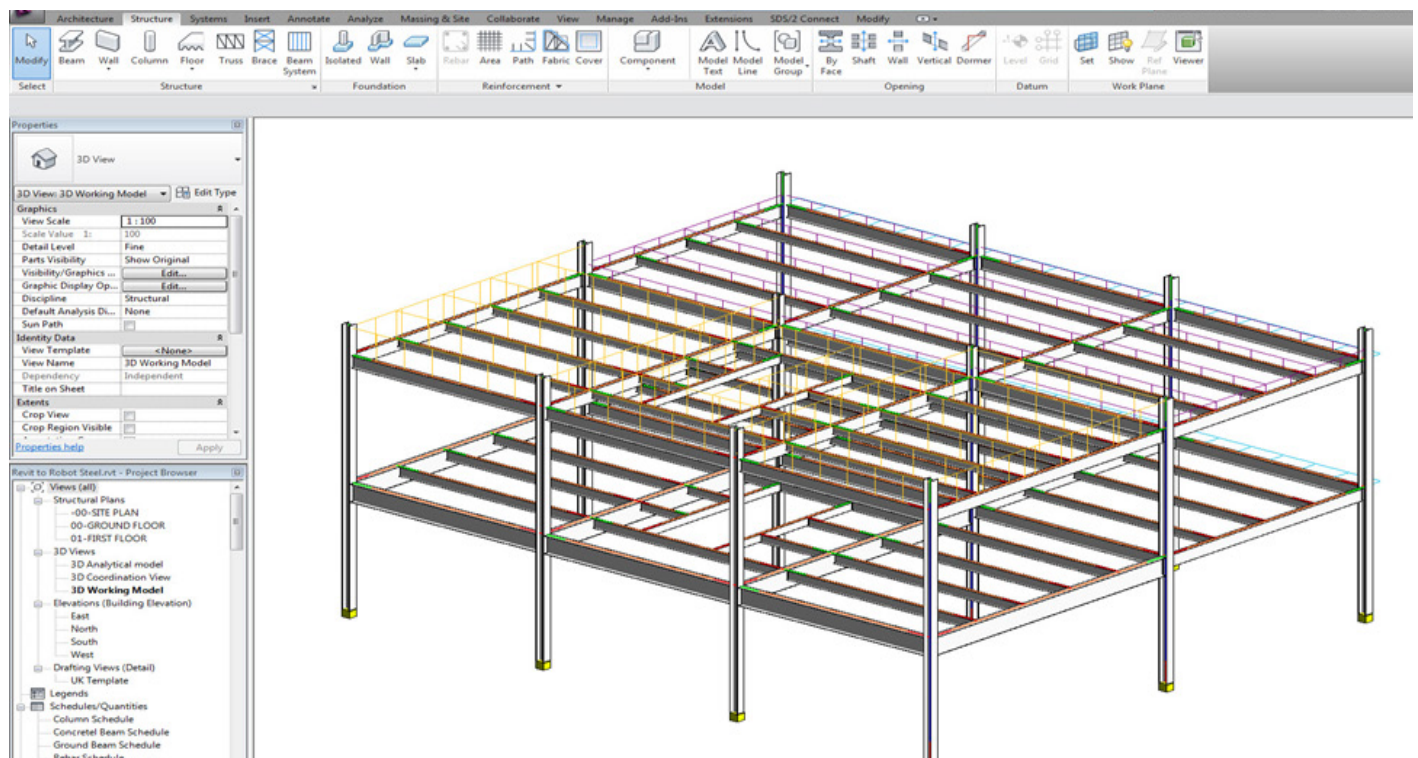
Yes, they are certainly corroborating each other, here comes the power of Revit platform, for example the capacity of ArchiCad software is distinctive in the field of Architecture but on constitutive and electromechanical is not at the same degree until now, but Tekla program is a strong on construction field and weak in terms of architecture, especially in the case of communication with other programs and export and import. The power of BIM programs comes from the integration between all sections.



2- Does the professional civil engineer in the Revit Str. program need to master the Revit Arch.? Can a construction engineer understand the architectural study, such as the Vray settings, without studying it in college?

No, not necessarily, “I know something about everything and I know everything about something”, the skillful engineer must know something about everything outside his specialization.

It is not required from the engineer to be super and learn everything (construction accounts and the accounts of the air conditioning ...), the focus should be in the area of specialization and there is no objection to know something of other jurisdictions, through work and communication he will learn shared skills between architecture and construction, Yes, you can learn VRAY without studying in college, you can learn online.



3- What is the best and quickest method to put the COLUMN in Revit program when all the columns removed 12 or 6 cm from the axis, what if Autodesk Company adds an option to select the Insertion Point to the column?

The best way to include the columns in Revit through the grid, as long as all columns have the same distance from the axis, this can be done through the Center of Gravity then all the columns are selected together next the order to move is given to them.

For the characteristics of determining the point of column inclusion is in ArchiCad and may be located in one of the program supplements or what hears (PLUGINS)

5. What is the difference between the two programs of Revit Str. & Autodesk Advance Concrete, whether it is possible to link between them, and export elements of armature through Revit to an Advance Concrete?

A big difference:

Revit Structure focuses on modeling.

While the Advance Concrete focuses on shop drawing

Yes you can export.

4. What is the best in case of linkage to AutoCAD program, is it import to construction scheme or architect?

May be it is better to import the architectural scheme in Revit, then to complete the construction and designing work directly inside the Revit.

Is it wrong to draw construction schemes in AutoCAD then import them to Revit, after that make modeling only?

According to the project; Architectural may start working in Revit directly and does not use AutoCAD. And he may move from construction scheme of AutoCAD to complete the work by Revit.

6. Can you explain the Dynamo, what is it? And how to use it?

Even with the latest types of technology, we still need to plan to save time and effort. Abraham Lincoln says: "Give me six hours to cut a tree I will spend the first four hours sharpening the axe!"

The original quote «Give me six hours to chop down a tree and I will spend the first four sharpening the axe »

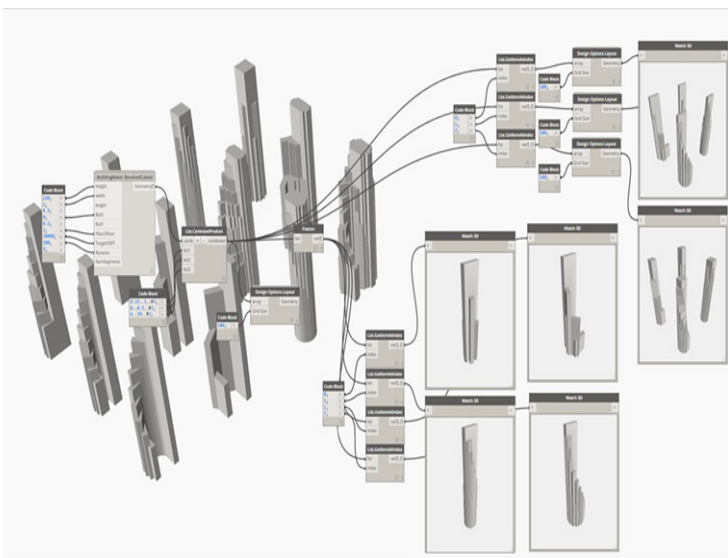
In brief: DYNAMO is used to facilitate action without programming, for example, you want to organize thousand items with proportional sizes so that you start with small at corners and grow with a certain percentage whenever it moved away from the starting point, without programming DYNAMO you would take a longer time.

It is possible to change all the material for once or to change all room numbers or numbers of doors. If God wills we will explain in the next magazine issues, you can find part of it here

<https://draftsman.wordpress.com/?s=Dynamo>

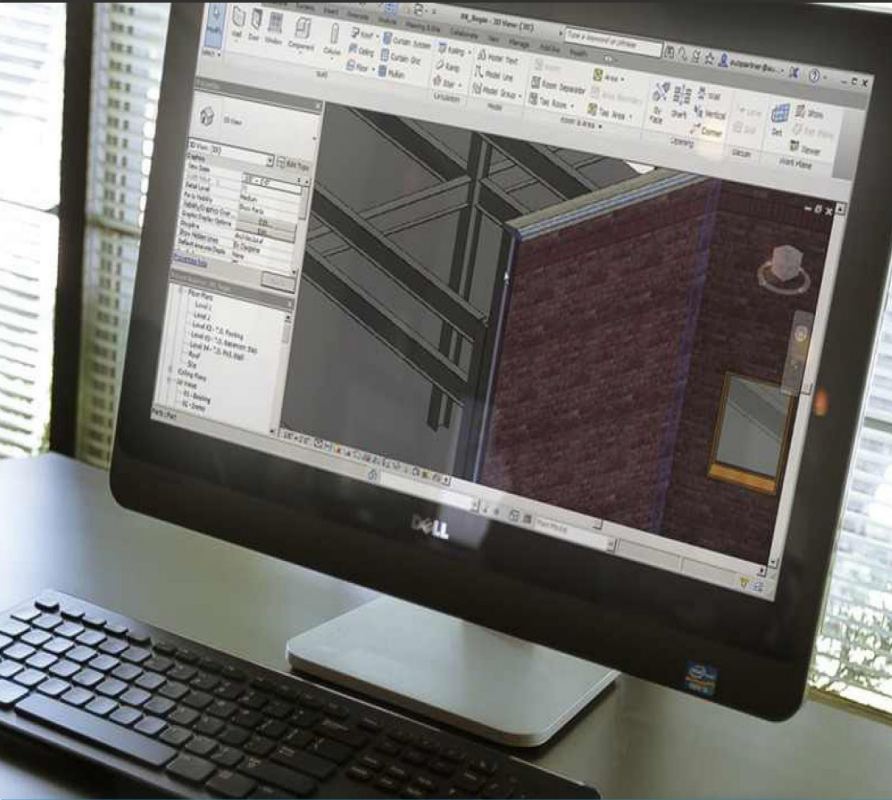
There is a version for Autodesk dynamo-studio

<http://www.autodesk.com/products/dynamo-studio/overview>



Answered By: Omar Selim

Translator: Sonia Ahmed



Eng. Amar Al-tom

S.ARCHITECT / BIM MANAGER

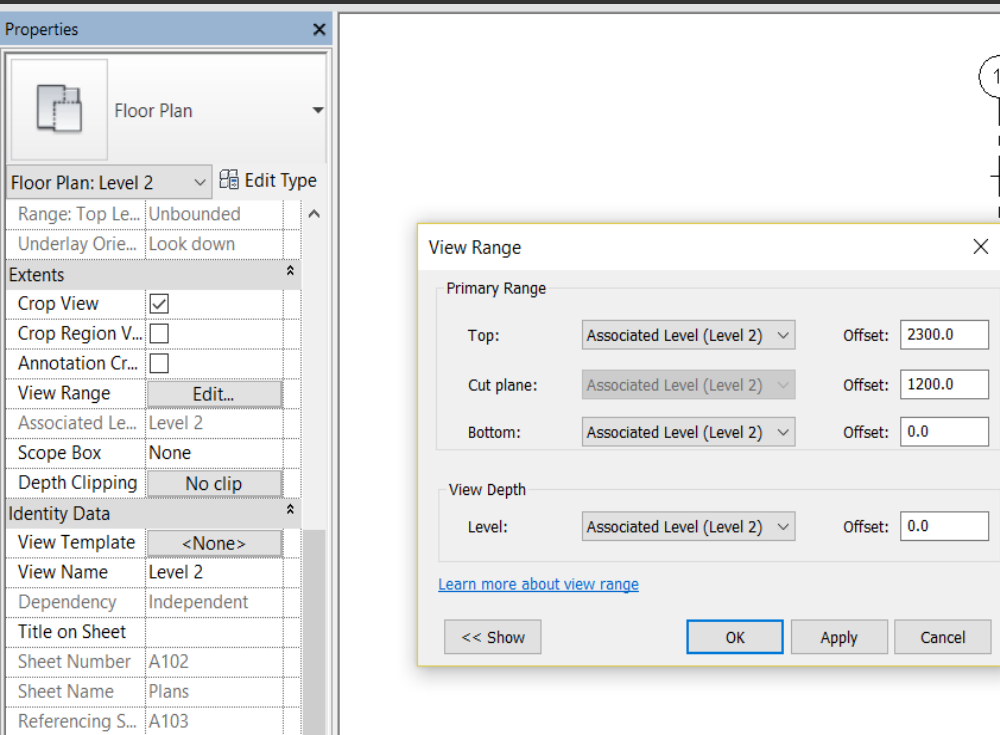
AITorath International Consulting

How do you make Revit program work for you?

The second part

Within^{the} realm of the BIM world and In the midst of its wanderings and strange worlds, it will be a pleasure for us to complete our long journey in that world and to learn together (how do we make Rivet work for us and willing us?) ...

Sometimes some parts are not visible in the project at different levels. To solve this problem, we can go to project properties and adjust the view or to a wider range.



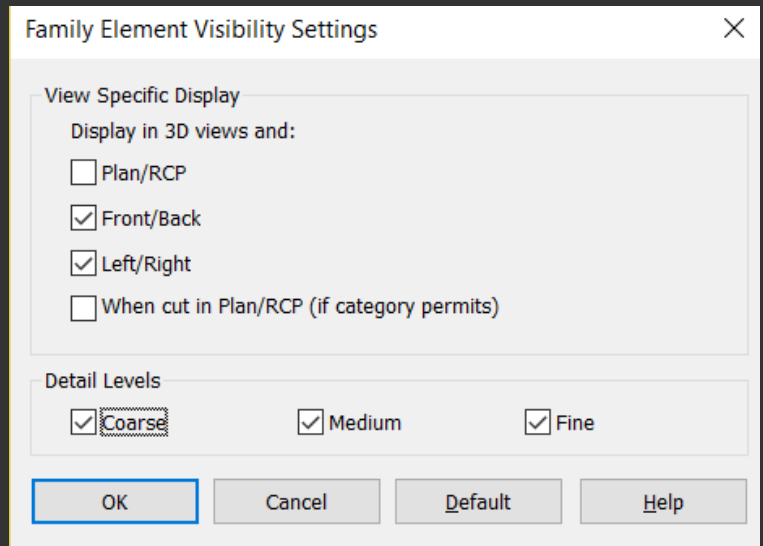
Detail Levels to optimize Workability

When building families in Revit, it provides us with a valuable window to determine the Detail Levels to be worked on by the element or the family. For example, we can choose which plots we want and the level of detail in each of them

Among the three options: either coarse fine medium

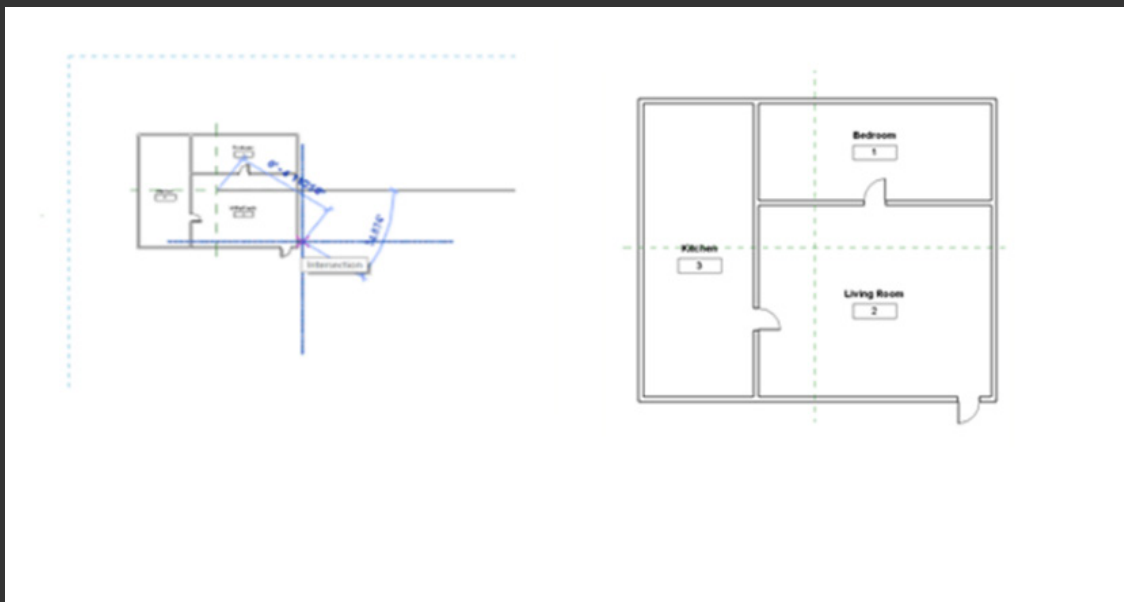
For example, you can choose the details of your hardware account, and you can choose fewer details if you work on items that do not require it.

Under the Properties window, click "Edit..." for Visibility and Graphics Overrides. Uncheck Coarse and Medium and click OK

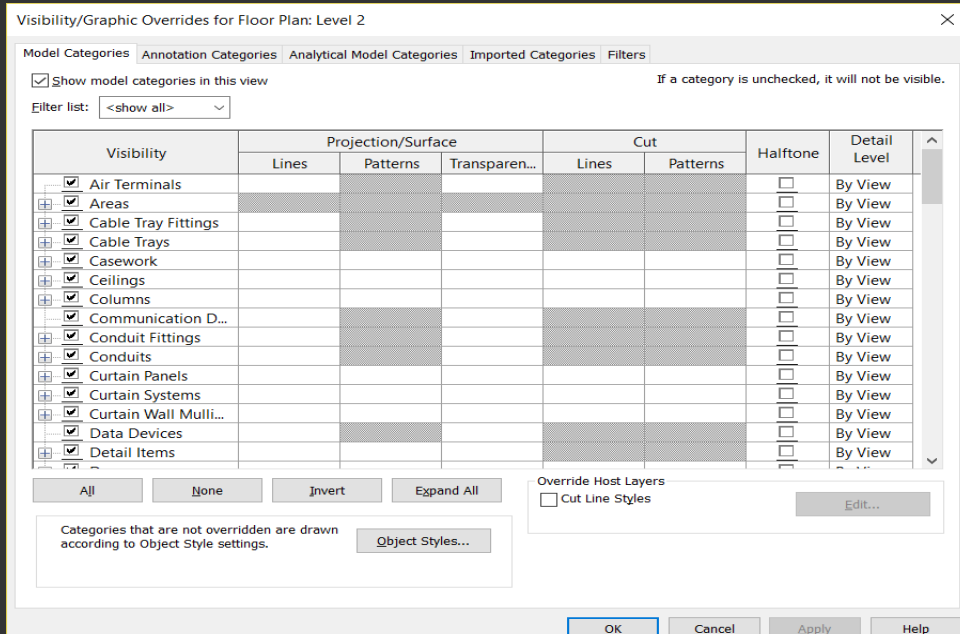


Aligning Plans on Revit Sheets

To make a reference point when setting the reference lines in the grid, add two reference lines in the sheet to arrange the projections better. Note that Detail Lines can draw lines of detail. Copy these lines and paste them between the sheets



The representational colors of your models can be categorized categorically within the visibility settings window where we simply define the necessary category and change fonts and patterns to desired color or style can be accessed by more specific parts by opening the element tree. The difference will be only in the chosen scene excluding the other projections.



Working between Views

Often we open more windows to understand the geometric shape clearer, Rivet provided a tool to help us

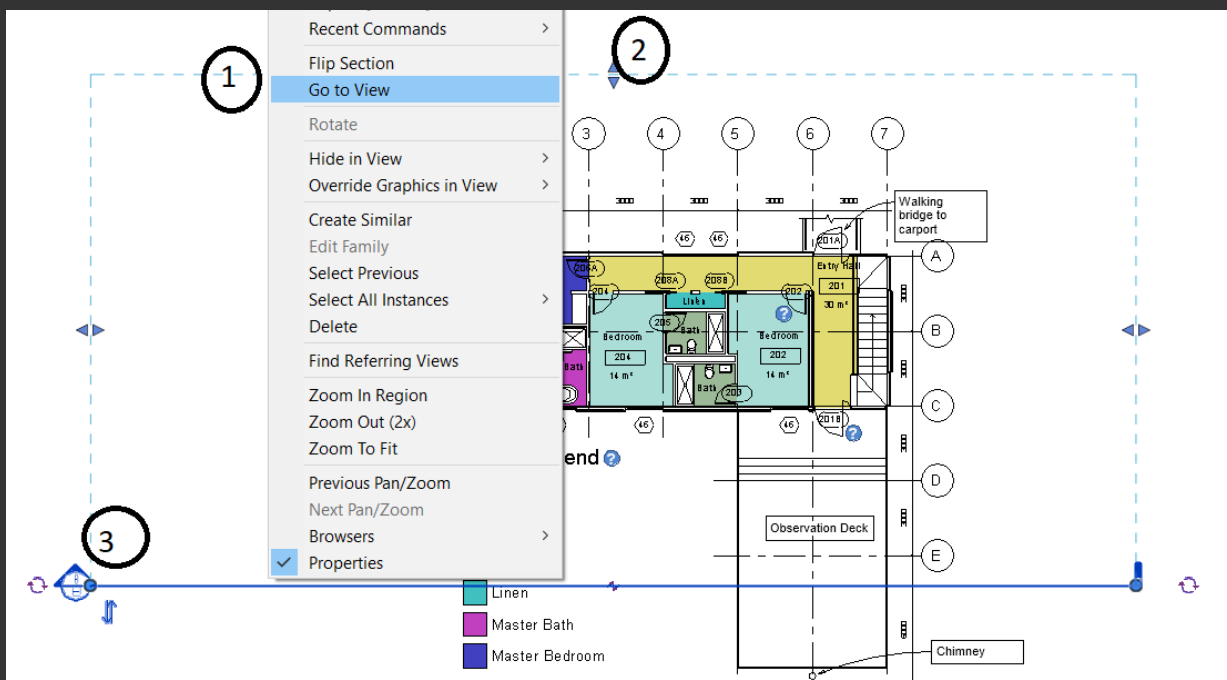
Lock unused hidden windows

View tab >> Close Hidden Views

Generally, here are the following:

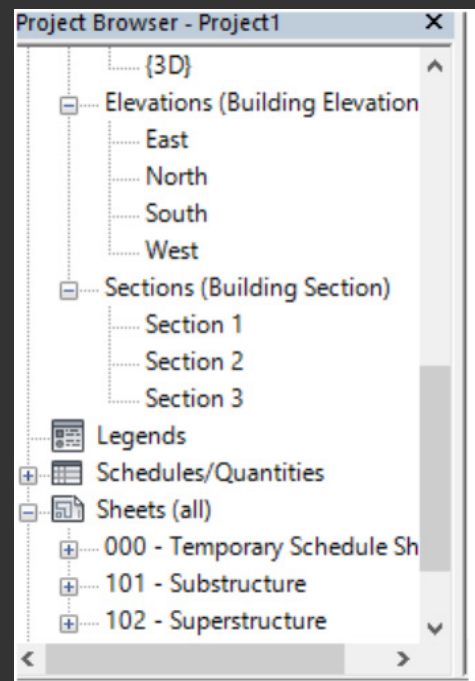
-When you have an existing section line, you can right-click on it and choose

Go to View from the shortcut menu

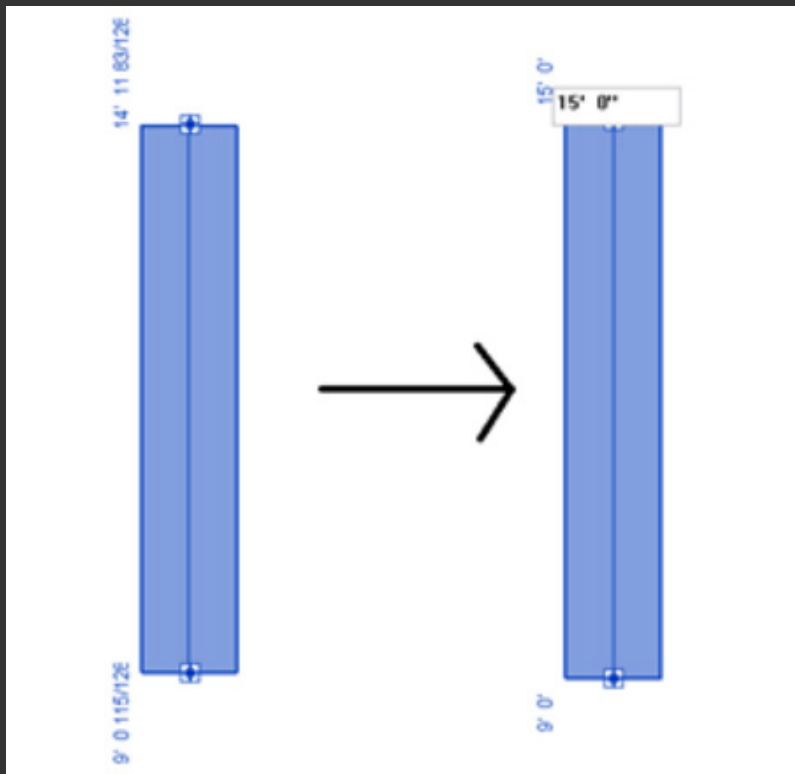


Ensure that the View Range is set to see hidden and visible items

- Make sure to delete any view not appearing in the Project Browser window



Input a Number , Don't Drag or Estimate

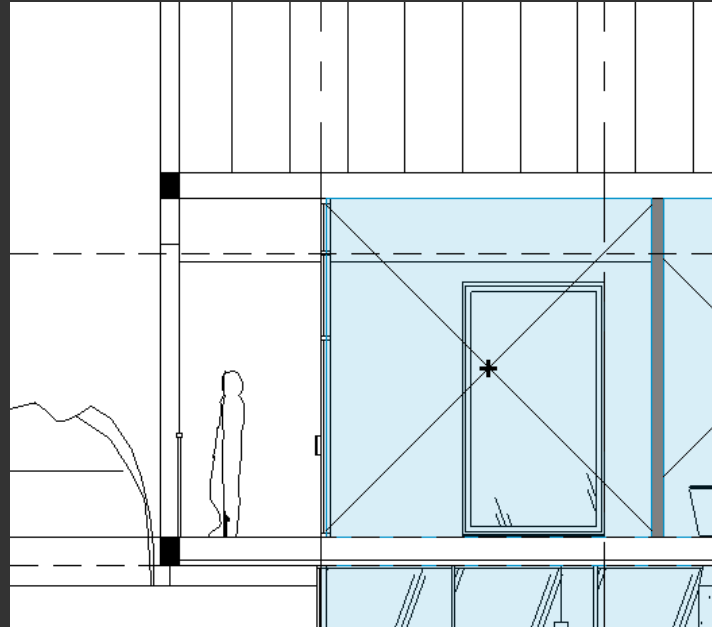


When working on the Revit try as much as possible to set values when moving the elements so that the work is accurate and move away

Items by mouse and drag

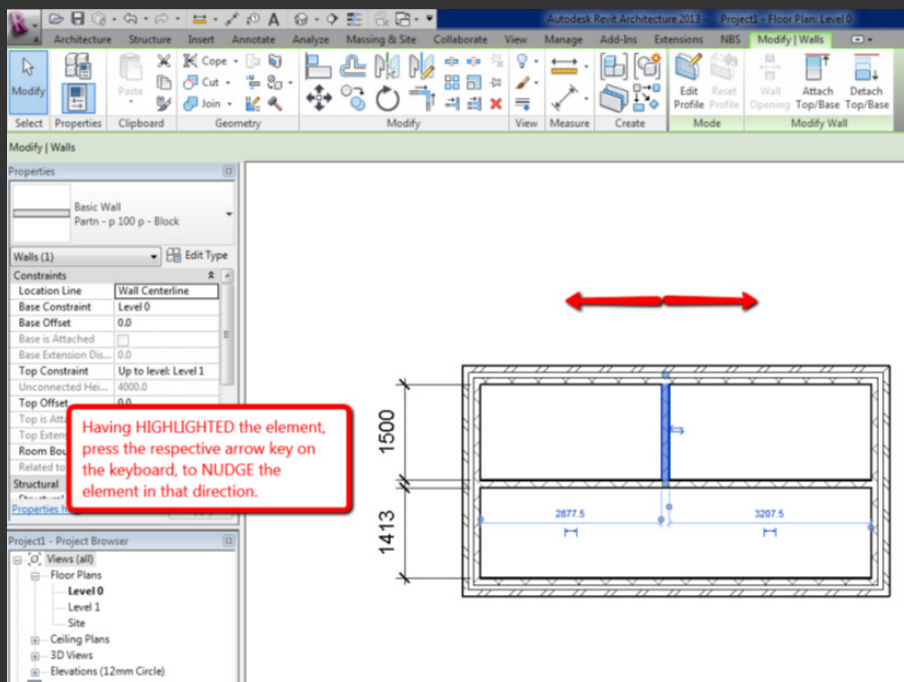
Check your Room Heights

In Revit, unfortunately, the room rises are not at the full height of the section, so in order to solve this problem we have to go to the section and adjust the height from the Properties panel or manually in the drawing. This procedure is useful for electromechanical engineers, especially for room volume calculations such as reservoirs or refrigeration.



Nudging Objects

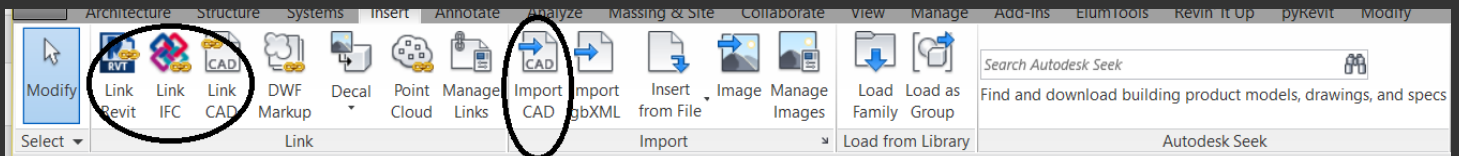
In Revit you can move objects and elements of a slight movement using the arrow-keys in the keyboard and can speed up the movement by holding the Shift key and then you will notice an increase in the movement frequency of the element



Importing CAD & Revit files to the right location

When you import CAD or Revit files into the program, you must first check the coordinates correctly and always prefer choosing Link CAD / Revit command because it links two files together. If an update is made to the original file, the linked file will be updated

There is also an Import CAD command for the same purpose which will not update the imported file



You may want to consider the following while importing::

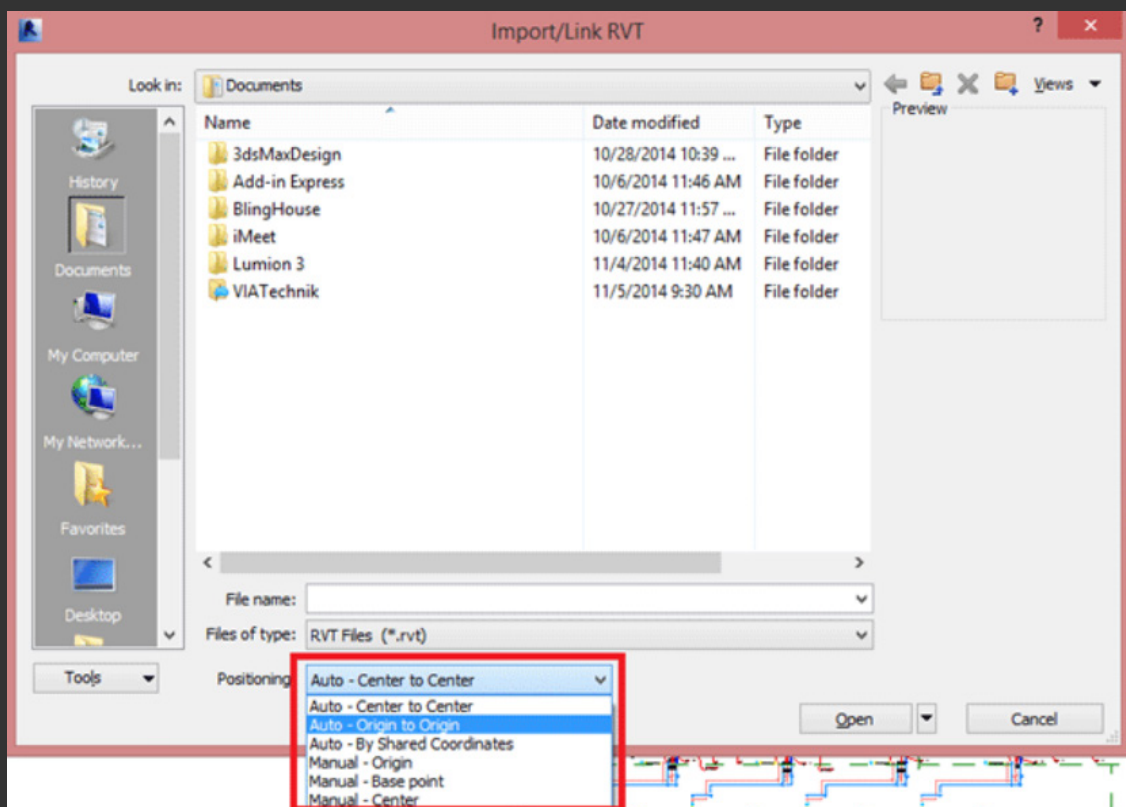
- Auto Center to Center puts the model in the middle of the drawing board

The Auto Origin to Origin option puts the model exactly in the same place as the original file

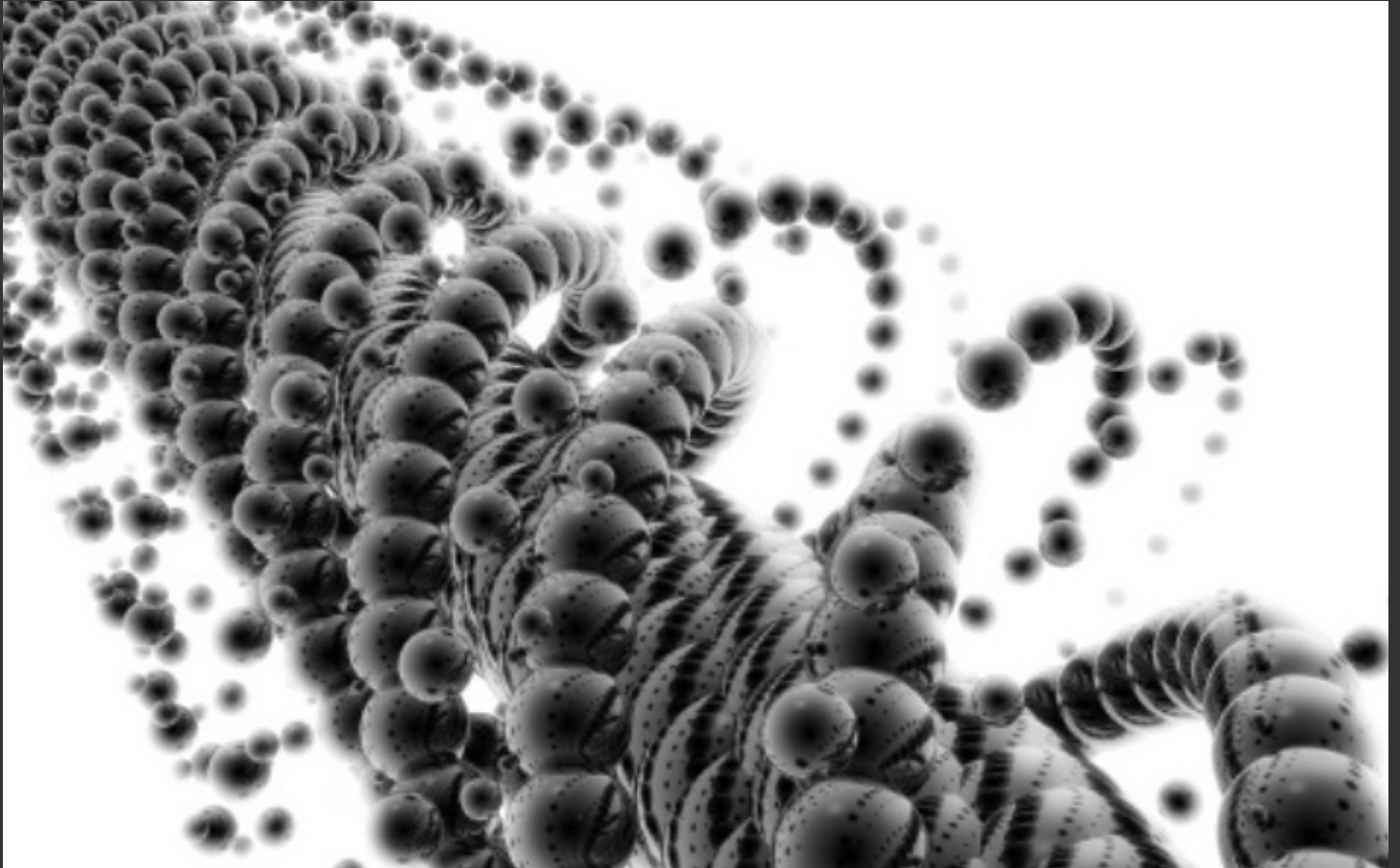
- Auto by Shared Coordinates if we set each model for its own coordinates and import it

It will be imported as positioned in the original file

- Manual option puts the model according to the movement of the mouse and the place we define



In short, Revit is full of tricks and important processes that make it easy to deal with and make it smooth in your hands so you can accomplish your work in a short time and without troubles



The difference between Coordination and Clashes Detection



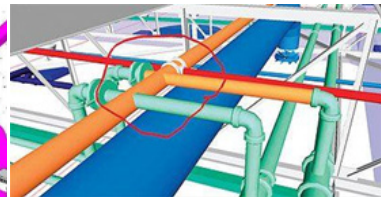
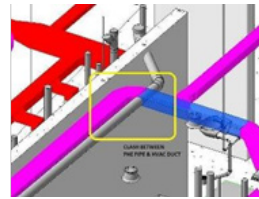
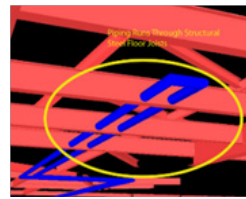
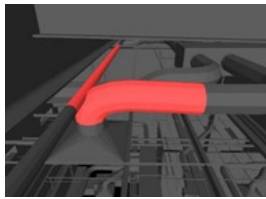
Mohammed Abdulazeez Abdulkareem

Mhmdeg1970@gmail.com



Dunya A. Aldhaher

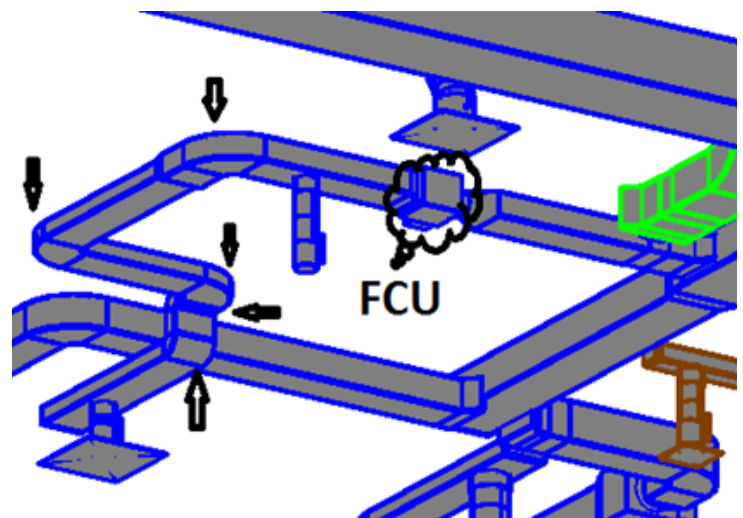
Some users of BIM technologies think that Coordination is same as Clashes Detection and solve them, and I don't think that is true. The Clashes Detection is kind of Coordination's work, but it has a greater meaning and a more important function, in addition to knowledge that the coordinators should get it.



As stated in the fifth issue of our magazine BIMArabia, the article about «the work's team and its tasks», what was meant by coordination is delivering the required service to its designated location safely and achieved the expected result of the design and avoiding conflicts that may occur between the different services.

The meaning behind that, for example, is when we have a reception room for customers in a building that offers a service, such as a hospital, and we want to provide this room or the mentioned space with different services, like, air conditioning, lighting, electricity, water supply and sanitation services for the cafeteria and supply it with a fire alarm system and firefighting system and other services depends on the design of the place and its uses.

The coordination work here is to resolve the clashes, for example, between the paths of conditioning ducts and both the sewage pipes and the cable tray without considering the increase in the number of elbows and increase the path of duct from the original design? Because it must be taken into consideration that these increases will cause friction between the sheet and the air that passes through it, as well as, increases the static pressure due to the increased elbows and rotation angles.

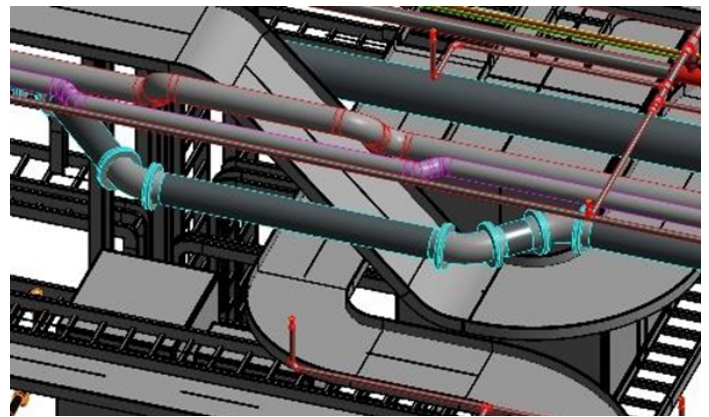


If we neglect these effects, we will be surprised that the amount of conditioned air to the mentioned space is less than the amount in the design. So, it's required a modification in the design, such as, increase in the size of the duct and the size of the air-conditioning machine and therefore increases in the cost of the project. Perhaps the best solution to this problem is a smart distribution of services that avoids clashes between the paths of those services from the beginning «and here is the job of coordinator» to achieve an appropriate solution before starting the work.

The intention here is that coordination is a process which is concerned with achieving the intended result of the design of the various services safely without any risk.

For instance, the exit path of water from fire-fighting sprinklers cannot be conflicted with lighting lamps those have no protection against water. Or the path of a sewer pipe is parallel to a cable tray below it because it is a source of danger and in these previous examples and others, must be solved by the coordinator and deliver services to the places safely.

These examples are showed the difference between coordination and clashes detection. The clashes detection means resolving the clashes of different service paths with each other, as well as, with the structural, architectural and interior design works, but coordination means checking the safe results of various services



In summary, coordinating works start from the first moment of work on the model and not the last stage to avoid distortion of service paths due to frequent clashes, the coordination's team should start by determining the best way to extend and deliver each service from the beginning. This can be done in different ways, such as doing sections in different places of the proposed tracks and the visualization of one or more of these tracks to reach to best secure solution on the users life and lower costs.

One of the goals of using clashes detection feature, that is available in various BIM programmes, is to save the costs of the project by saving the time and materials that are wasted during the execution in the site when the clashes are detected, it is easy to detect them through computers and solve them first.

Using the coordination process helps us to detect various errors and resolve them before starting the execution phase. Therefore, the coordination positively affects the schedules of the delivery dates of the different phases of the project.

Another problem to show the difference between coordination and clashes detection, when a Modeler looks for clashes between disciplines, he should not care about solving technical problems in other disciplines and may not tell others about the existence of these problems because it's not within his specialization, and perhaps it occurs to be blamed because it's not his duty. The coordinator is required to resolve all technical problems or move the problem to a higher authority or request an amendment to the original design (whatever the appropriate solution).

And finally, dear reader, remember this phrase «Coordination» starts from the beginning of work on the Model.

BIM DEPLOYMENT PLAN (BDP)

Mohammed Malik Munir

It is the implementation plan of BIM in the organization and it can have a large impact on the operations. In this section you'll define your organizational BIM vision, including goals, objectives, and alignment with your overall organizational vision

The steps for the plan are:

Alignment with organizational vision

Organization's vision statement and specify how you believe the implementation of BIM enhances and alters that vision.

Organization vision statement

To be the premier general contractor for complex construction projects, in which meeting challenges through technology sets us apart from our c

BIM enhances vision

BIM practices help us differentiate our company by offering expanded services to our clients.

BIM alters vision

BIM will enable us to compete for more projects.

Goals for BIM

Goals and objectives for adopting BIM . Also note how you would like to measure the achievement of these objectives and their targeted time-frames.

BIM goal	Measurable objective	Achieved if	Projected timeframe
Improve operations management on all new facilities	Obtain an as-built model on all new construction showing mechanical systems information	A model is collected or updated by the project team after each project or WO	April 2015

Current authoring tools

Outline the authoring tools that your organization uses in a typical project. Check your industry focus area, and then specify which authoring tool you currently use in each phase of your project.

Industry focus	Project phase	Authoring tool
Architecture	1 – Schematic design 2 – Design development 3 – Construction documentation 4 – Bid 5 – Construction administration/Build	1 – Revit, AutoCAD 2 – Revit 3 – Revit, AutoCAD 4 – Other (Fill in Name) 5 – NA
<input type="checkbox"/> Architecture	1 – Schematic design 2 – Design development 3 – Construction documentation 4 – Bid 5 – Construction administration/Build	

Planned models

Outline the models that your organization may create in a typical project. List model name, model content, the project phase when the model is typically delivered, and the model authoring tool currently used.

Model name	Model content	Project phase	Authoring tool
Coordination model	Architectural, structural, components of main building and parking garage structure	Design development and construction documents	Autodesk Revit
Civil model			<input type="checkbox"/> Civil 3D <input type="checkbox"/> InfraWorks <input type="checkbox"/> Other: _____ _____
Architectural model			<input type="checkbox"/> Autodesk Revit <input type="checkbox"/> Other: _____ _____
Structural model			<input type="checkbox"/> Autodesk Revit <input type="checkbox"/> Other: _____ _____

Planned analysis tasks

Select Types of analysis tools that your organization plans on implementing and the type and the name of the desired tool.

Analysis	Description	Recommended tool(s)
Visualization	Visualization tools enable the project team to view the design or construction of the project in 3D, giving a more accurate perspective on the end product. These tools are highly useful in submitting proposals to help win more business.	<input type="checkbox"/> Autodesk 360 Rendering <input type="checkbox"/> 3ds Max Design <input type="checkbox"/> InfraWorks <input type="checkbox"/> Navisworks <input type="checkbox"/> Other: _____ _____ _____
Structural	Structural analysis tools use the model to analyze the building's structural properties. Structural analysis programs typically use the finite element method (FEM) to measure the stresses on all structural elements of the design. For structural analysis to work smoothly, the original structural modeling tool must be compatible with the structural analysis tool, and the original structural model property data must include information about the structural elements.	<input type="checkbox"/> Structural Analysis for Revit <input type="checkbox"/> Robot Structural Analysis <input type="checkbox"/> Other: _____ _____ _____
Clash detection	Clash detection analysis is done to check for interferences between the designs of one or many models. To help reduce change orders during construction, clash detection should be performed early and continue throughout the design process. For clash detection to work properly, your project's models must have a common reference point and must be compatible with the clash detection tool.	<input type="checkbox"/> Autodesk Revit <input type="checkbox"/> Navisworks Manage <input type="checkbox"/> BIM 360 Glue <input type="checkbox"/> Other: _____ _____

Current skills

In this part you have to fill in your organization's current skills by listing personnel type, number of employees of each type, and average skill level.

Skill	Personnel type / Number / Desired skill level / Number with skill level
2D CAD design	Administrative assistant / 5 / Novice / 0 Associate architect / 37 / Expert / 10 Project manager / 8 / Intermediate / 2 Executive / 3 / Novice / 0
<input type="checkbox"/> 2D CAD design	
<input type="checkbox"/> 3D BIM design	

Required skills

In this part you have to fill in desired skills by listing personnel type, number of total employees, the desired average skill level, and the number of employees with the desired skill level. (In other words, when it comes to skills, where are you targeting to improve?) .

Existing Training plan and requirements

If you have an existing training process for your personnel, you have to describe the types of training your employees have received as well as the forms it is typically delivered.

Support plan

This part is about what types of support do you currently have in place, and also the support that you use for the software that currently in use, as well as the software that you interesting in learning more about.

System	Support type	Contact information	Support hours
Autodesk Revit	Autodesk Premium Support	1-800-555-5555	8 a.m.–6 p.m. EST





How can **TECHNOLOGY** affect business processes and innovation?

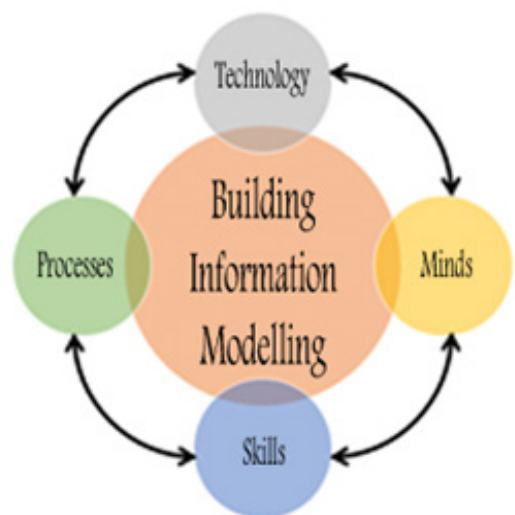


Hamza Faisal Moshref



Dunya A. Aldhaher

Digital technologies and the Internet have contributed in changing the business model in organizations in unprecedented ways. Thus, it has led to the accelerated rate of innovation and convenience between mobile devices and social media, cloud storage and information. Building information modeling, although it mainly depends on technology; it is an innovated business model depends on generating a central model full of information that contributes in optimizing the process of delivering and project's value during the life-cycle of the project, planning, designing, constructing and facilities management. Therefore, building information modeling can be considered as a knowledge repository for all things that happen during the project, whether in terms of technology, processes or others. The development of technology is one of the main pillars that support building information modeling in making radical transformations in the architecture, engineering and construction sector. For example, technology contributes to create and use of intelligent 3D models and also connects all project's participants and stakeholders. Also, technology allows collaboration and exchange of building's information whether in design or construction in an unprecedented manner. Then, the question could be, how can the available technology contribute to identifying the challenges and opportunities associated with building information modeling?

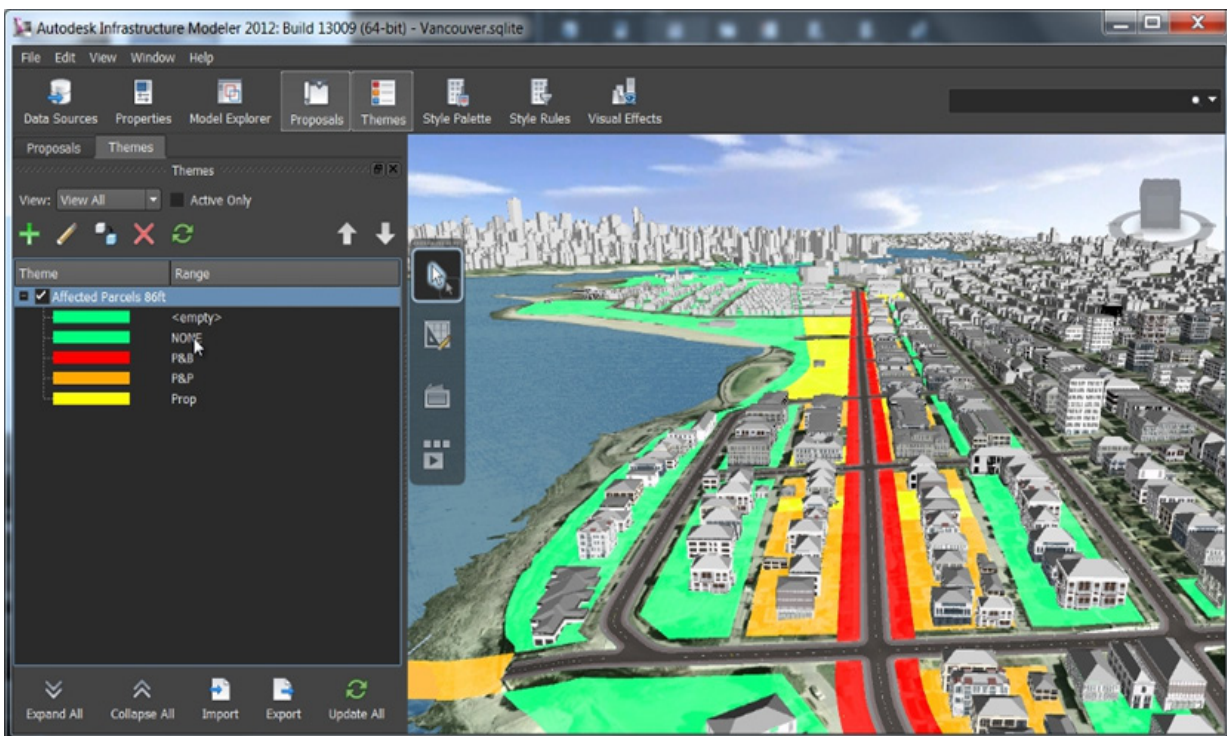


1- The benefit from large data

There is no project without infrastructure. Building Information Modeling applications help to gather, analyze, and collect large amounts of needed data to link projects to the environment context. Substantial progress in infrastructural information modeling contributed to the processing of vast amounts of data on the project environment. Advanced applications for building information modeling rely on dynamic, object-oriented engines to reduce the differences between visual design and real design, which helps in speed and accuracy of decision making. Although GIS data are necessary for a centralized model approach, these data alone are inconclusive in decision-making and communication. The inclusion of such data in the central model with the ability to obtain location and management data enhances the use of that information in real time. Planners and civil engineers have immediate access to geographical data directly in the infrastructure model. Therefore, geographic information systems -as a system of storage and analysis of geographic information- becomes a part of building information modeling process

2. Approaching to realism

Capturing current physical conditions is critical at every point in the life cycle of the infrastructure. Traditional scanning may help to approach realism, but the combination between laser scanning and digital images helps to approach realism by creating reality based on 3D point cloud data. Sensors that capture real data and ground-penetrating radar are recent examples of developed technology to capture reality that will revolutionize the type, accuracy and amount of data available for existing or proposed infrastructure. This approach to reality relies on rich data that can be accessed, analyzed, and modified over time. For example, contractors construct and update a temporary building block model during construction, and the owner monitors performance through current designs, such as, traffic ways or load on bridges and roads.



3- The imaginary reality

When it comes to visualizing the proposed imaginary reality, the industry moves away from the so-called “Hollywood building information modeling” to the concept that created directly from the model containing all the basic data. Animation can also be equally contributed in visual illustration which helps to more effectively communicate with users to speed up the approval process. Emerging technology now provides the ability to interact with, manipulate, and scale data in reality. So, planners can draw multiple scenarios (even during their meeting with clients or end-users) and understand the potential effects of design options well before moving on to the design stage.



4- Integrated reality

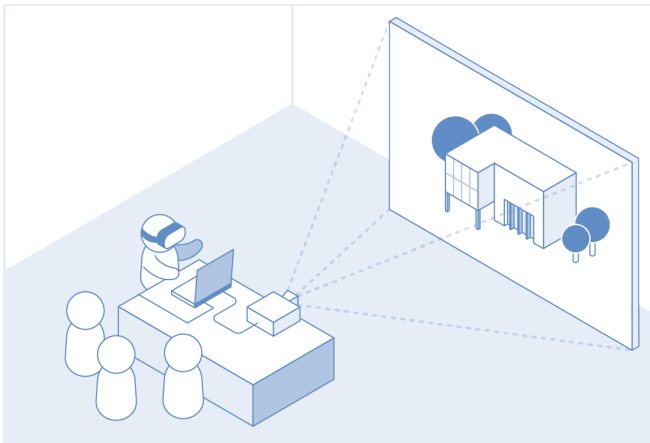
The goal here is to make the future an expected truth. Using augmented reality, stakeholders can access a complex set of information in the context of what is real. Also, the spatial reference in mobile devices can take the model from desktop to field. Therefore, modern technology has useful applications for asset construction management that allowing real-time visibility to the existing infrastructure location.

5- Cloud-based optimization

Cloud cooperation has shown that technological developments can provide new possibilities which open to designers, contractors, suppliers and construction operators. The development of cloud platforms, coupled with increased power and accessibility of mobile devices, has contributed to the extended use of data and project across the supply chain. For example, engineering analysis that links design with data is critical to achieving success but it can also be the most widely used for resources and more error-prone during the process. Through cloud computing, multiple repetitions of complex analysis can be done in a short time. This capability provides greater project visibility earlier in the design phase which leads to reduce the need for expert’s cost analysis. The application of dynamic computing analysis in the project is no longer a decision based on affordability. Designers can now analyze many conditions and elements during the conceptual design phase by using information to select alternatives to ensure the best results that are subsequently confirmed in the detailed design phase. Through processes based on cloud collaboration, one-time analysis of multiple factors can be carried out in a common model environment. This multivariate optimization results lead to higher quality and more cost-effective design solutions.

6- Mobility and cooperation

Linking diverse teams in a project requires data continuity: accurate data can be accessed at any time, by anyone, anywhere. By using Building Information Modeling, the information in the shared model provides the foundation for online-based tools and collaboration tools for better coordination of work between large and diverse teams, and to keep projects on track. In addition, the use of mobile devices in the field is greatly increased the efficiency of project during construction. For example, using a portable tablet (such as an iPad), the details of the current model can be checked more quickly and more efficiently than the traditional paper-based method at the project site.



8- Bridging the technological gap

By 2020, a full generation will have grown up in the digital explosion era. Although the use of technology is not a goal, yet the culture of the new millennium generation can help drive the transformation of technology-based businesses. Some studies indicate that this digital generation (Generation Z) represents 40% of the workforce over the next decade, which will solve many problems. Attracting and retaining young and skilled labors has become increasingly important, especially in the engineering and construction sector, where the majority of experienced workers are approaching retirement age. Likewise, the successful use of technology entails changing the culture and skill of the workforce. Technological development opens up new functional horizons that may not have existed for years and are likely to be attractive to a generation more interested and skilled in technology than previous generations. The architecture, engineering and construction sector needs to adopt new technology and modern work practices that are prevalent in other industries to attract young people to the industry. Therefore, building information modeling technology can help engage young people and attract them to the design and construction sector. Recent applications used in the gaming industry may provide a more attractive and stimulating environment for the new millennium generation of 2D graphics that resulting from 2D CAD applications. Cloud computing and collaboration platforms make the process of designing and planning of infrastructure easier and more social with immediate results. Also, the use of building information modeling can help capture the knowledge of experienced workers and transfer them to the next generation while maintaining high rates of productivity.

7- Controlling the project

Reliable vision in all aspects of the project is necessary to oversee and report on the implementation of project objectives. With the central model, all data is consistent throughout the project, linking schedules and assumed cost with reality to risk assessment. Scheduling tools are used in large project sites that reflect the four-dimensional visualization of project plans. For example, if a lever must be in a specific place on a particular date, the 4D visualization helps to see if the required work area is empty or occupied with other equipment .this procedure is extension to detect clashes which continues in developing. In addition, photograms can help calculate the associated cost implications (5D) of real-time design options, as well as, analyze and validate the impact on sustainability (6D). Therefore, there are strong efforts in the industry, especially in large companies, to link all operations from resource management, procurement and cost estimation to the participatory model. Despite considerable progress in this area, some problems still need to be resolved. These solutions help landlords and managers of operation and maintenance to connect this process with work management systems where greater value can be obtained during the facilities management phase.

Conclusion

There will be a need for smart models and second-level delivery data of BIM maturity in public sector projects which are governmental funded in England by mid-April 2016. This level varies from one company to another, but this level remains the risk zone for many organizations in the UK. The technology currently available helps to address the challenges and opportunities brought about by the use of building information modeling.



6th Issue Conclusion

BIMARABIA IS AN ARABIC MAGAZINE WITH WORLD VOLUNTEERING TO ENRICH ARABIC CONTENT OF THE ARAB TEACHER AND EQUIP THEM TO IMPROVE LOCAL CAPABILITIES AND CAPACITIES ALONG WITH SUPPORTING STUDIES AND TRANSLATION MOVEMENTS FROM/TO THE ARABIC LANGUAGE, IN ADDITION TO FORMING A UNIFIED ARABIC REFERENCE TO STORE AND SHARE EXPERIENCES.

MISSION: BUILDING THE HUMAN, THINKER, ENGINEER AND ARAB TEACHER AND EQUIP THEM TO IMPROVE LOCAL CAPABILITIES AND CAPACITIES ALONG WITH SUPPORTING STUDIES AND TRANSLATION MOVEMENTS FROM/TO THE ARABIC LANGUAGE, IN ADDITION TO FORMING A UNIFIED ARABIC REFERENCE TO STORE AND SHARE EXPERIENCES.

VISION: KEEP ABREAST AND COPE UP WITH ARTS AND ENGINEERING SCIENCES IN ARABIC AND PROVIDE CLEAR INFORMATION TO ARABIC GRADUATE AND PARTITIONING STUDENT, AND PROVIDING THE CURRENT ENGINEERING STUDENTS WITH THE EXPERTISE OF THE SPECIALISTS AND PRACTICAL EXPERIENCE.

ONE OF OUR OBJECTIVES: IS TO DEVELOP AN ARABIC CODE FOR BIM
FOR THIS, THERE ARE MANY STEPS, AND THE FIRST IS TO GET TO KNOW EACH OTHER AND HAVE REAL GATHERINGS AND MEETINGS.

Team Work

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To learn about people in your area and to increase opportunities for learning, practice and work in BIM field, use the hashtag #BIMarabia_area in your publications or tweets about Building Information Modelling on Facebook and Twitter where “area “ in the hashtag is the name of your city (of living or work). This is in preparation for the creation of working groups to exchange experiences on social networks.

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