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The Effect of Using Building Information Modeling System at Design Phase to Create High-Efficiency Projects

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KEYWORDS:
building information modeling system, projects analysis, information flow, team work, Coordination between engineering disciplines

***Abstract*— Coinciding with the advancement of building systems, traditional methods are no longer the best option for producing high-efficiency projects in less time. The main challenge that traditional methods face is developing a strategy for information flow between all project workers (stakeholders, owners, engineers, contractors, etc.) in a flexible manner, which has an impact on project efficiency.**

Modern building systems are regarded as one of the most essential practices for determining project efficiency. The Building Information Modeling system has been offered as a successful alternative in delivering successful projects through the continuous information flow between project disciplines at all stages of the project, which benefits (Architect, Civil, Structural, Contractor, etc.) In the project design, construction, and implementation phases, research confines in the design phase which is related by the architect, based on a study of the added value.

The research aims to demonstrate the value of adopting and using Building Information Modeling to increase the efficiency of architectural projects through effective strategies Specifically in the architectural design phase. The methodology of the research is based on analysis two case studies: 1) Shanghai Tower in China; 2) Qatar National Museum in Qatar, all of which rely on building information modelling technology to demonstrate the system's effectiveness in extracting successful global projects, according to the research. Subtract proposals that propose a mechanism for more widely utilizing the building information modeling system in engineering circles to improve the efficiency of architectural projects.

I. INTRODUCTION

ARCHITECTURE is a field that is always evolving and is influenced by technological advances. It is always looking for ways to improve its procedures and techniques in order to improve quality and efficiency. As a result, the amount of data that can be entered and processed is increased.

The relevance of using BIM in architectural projects is described in a simplified manner to demonstrate how to generate a successful architecture project without causing conflict between disciplines, which can damage the project's

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ultimate output. BIM (Building Information Modeling) is a complex system that provides for a detailed representation of a building. It helps development, construction, manufacturing, and procurement processes, resulting in highly efficient projects. (1)

Research method:

Architectural systems development is offered to investigate the usefulness of BIM technology by elaborating on the following points:

1- The impact of architectural systems development on engineering projects.

2- The significance of building information modeling (BIM) in architectural projects.

3- Case studies demonstrate the value of BIM in delivering high-quality international architecture projects.

II. ARCHITECTURE SYSTEMS DEVELOPMENT:

Architecture is one of the oldest sciences discovered on the earth, and its progress is measured by the progress of countries and societies.

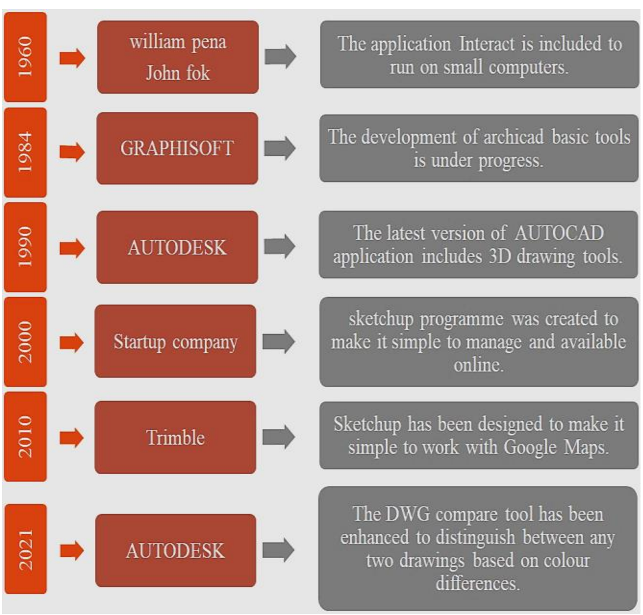

Fig (1) standard programs development (2) (3) (4)

Despite these programs, architects encountered information flow issues, prompting a shift in focus to the Building Information Modeling system, which has the capacity to construct an integrated project with benefits not accessible in earlier engineering systems.

Building information modeling "BIM" has been the most detailed tool utilized by individuals, companies, and government agencies concerned with the environment, development, and sustainability up until now.

Many architects' visions led to the creation of the BIM concept.

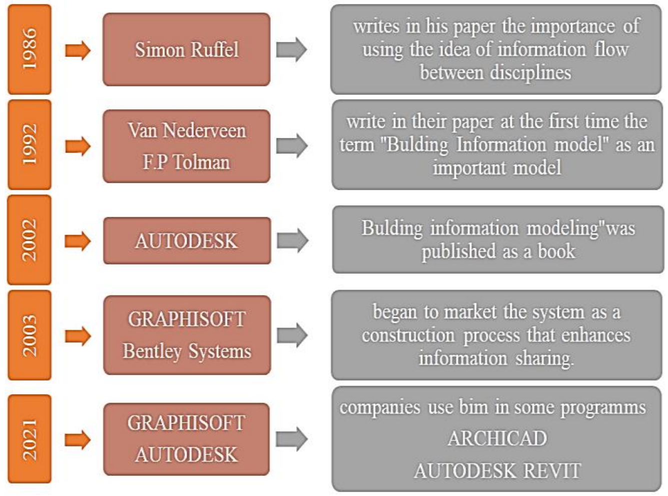

Fig (2) Bulding Information Modeling development

Refrence : In Appendix 6: Letter to the author, p. 281, *Ingram, Jonathan (2020). Understanding BIM: The Past, Present and Future. Abingdon: Routledge.* ISBN 9780367244187.

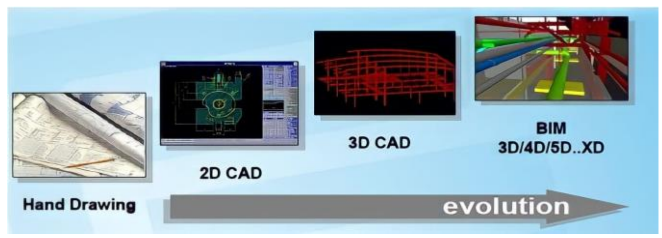

Fig (3) The evolution of architectural programs to reach BIM

III. THE IMPORTANCE OF USING BIM IN ARCHITECTURAL PROJECTS

With the advancement of technology, it became essential to create massive programs in order to design large projects.

3-1 Historical study (the concept of BIM):

BIM was in the minds of engineers until it began to appear through the most famous architectural programs for it, Revit, and then began to appear for it with many other complementary programs that include all disciplines, such as Navisworks and others, making BIM a system rather than just a program. (5)

- Many countries have begun to use BIM in the building projects, the most well-known of which being the recently completed Grand **Egyptian Museum** and **Sofi Stadium**.

3-2 Building information modeling as a system, not a program:

BIM is a system adopts design the building as elements that have their own characteristics and not as geometric shapes, which allows for a rapid transformation from design to executive engineering results. Thus, this system combines AutoCAD programs and simulation programs with analysis and case studies, allowing the architect to complete the work faster. Programs that follow that system also make it simple to share information across all project disciplines.

3-3 BIM Features:

The concept that BIM is a system and allows for easy information flow is one of its most important qualities.

- There are lower risks because of the safety mechanisms in place on the job site, as well as the early detection and settlement of project conflicts.
- And there's always the project's -on visualization, where the simulation runs continuously throughout the project's life cycle, allowing viewing even the tiniest details in sectors and mechanical connections.
- Easy communication between various engineering specialties working on the same project.
- During the virtual design of buildings, BIM tools precisely compute building quantities and prevent material waste.
- Automatically updating data on models across all engineering disciplines when any discipline makes a change.
- Creating an accurate and unified model that contains all relevant data.
- Due to the availability of unique maintenance models and the ability to link them to warnings, the project can be simply maintained after it has been implemented.
- Time and budget commitments are more important than any other engineering system.
- Constant simulation of project phases from excavation to completion.
- Due to the continuous and automatic information flow between disciplines, you may avoid the redesign dilemma. (6)

3-4 The significance of BIM for engineering disciplines is as follows:

TABLE1
COMPARING BETWEEN SYSTEMS
The horizontal lines in the table determine comparisons between traditional and BIM systems in a few points (7)

Comparing	Traditional systems	BIM system
Drawing method	The wall is separated into two lines.	The wall is a tool that has width, height and all data are found in this tool.
Data information	Choppy work flow	Continuous work flow
Saving time	Because of the disparity in disciplines, redesigns are required.	Compatibility between the architect and the civil engineer from the start in the unified model
Architectural classification	Lines are part of layers, and they can be placed wherever you want, even if they don't match other designs.	There is no method to insert any line in another layer because the architectural classification, not the layers, determines what can be done.

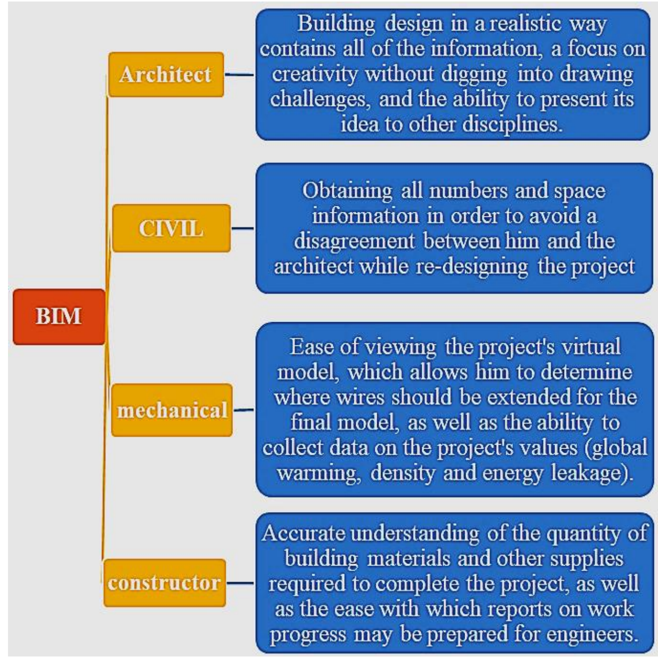

Fig (4) BIM benefits for all disciplines (8)

3-5 BIM committees:

BIM is not just software but a system, so that committees are established to divide responsibilities, this is the first step to implement BIM in any project.

3-5-1 Committees are divided into:

A) BIM steering committee
B) Project steering committee
C) BIM support unit

A) BIM steering committee:

They are members of the administrative leadership who set the project's goals and strategy, as well as enlist the help of some specialists, such as the BIM manager, who is in charge of attaining the objectives

.

***B) Project steering committee*:**

They are the people that are involved in using BIM in a project following an engineering way.

C) BIM support unit:

They are responsible for establishing standards and conducting research.

3-5-2 One of the most important BIM teams in any project is consist of:

➢ **BIM Manager:**

He is responsible for the project model and its progress:

- At the company level, establishing a broad structure for BIM projects.
- Making plans to apply BIM and following up their progress.

- Establishing an appropriate schedule to achieve the set goals.
- Disseminating the most recent scientific developments in BIM technology.

➢ **Coordinators:**

Coordinating of the different clash detection geometries:

- Establishing objectives for implementing BIM in the project.
- Examining the project on a regular basis.
- Converting all management directives into executive orders that the design team may readily carry out.

➢ **Modelers**:

They are responsible for development stages. They are also responsible for implementing the model according to each engineering discipline such as the method that can be printed or converted (IFC, DWG, DWF, PDF, etc.) (9)

3-6 BIM Implementation Challenges:

- Where it lies is in the huge information flow of data and our capacity to process it effectively, which necessitates several training courses for engineers and other project stakeholders, as well as the creation of new job titles such as BIM manager and coordinates.
- The expense of transitioning from old design systems to a building information modelling system, as well as how to train cadres while maintaining production, and the cost of special hardware needed to operate this system.
- The destiny of engineering expertise that is unable to adapt to the BIM environment.
- There aren't enough trained cadres to construct whole production units.

IV. CASE STUDIES

Many worldwide architecture projects have been completed in our globe; some have been successful, while others have been completed correctly but not at the desired level of efficiency, and have taken a long time to complete.

One of these projects is **Petronas Towers:**

Fig (5) Malaysia flag Fig (6) Petronas Towers view
Refrence:https://arz.m.wikipedia.org/wiki/

Location: in Kuala Lumpur, Malaysia
Designer: César Pelli (Argentine-American architect)
Height: 452m (88 floors)
Designed: 1992
Opened: 1999
Functional orientation : (malls- restaurants- science center- playground areas- arts hall).

The two towers were not designed using a modern engineering system as BIM, so some obstacles in its implementation were occurred, which eventually led to a significant increase in cost, time, and effort. (10)

As a result, the project was not included in the list of projects that were highly efficient:

➢ The construction faced many problems in the first period, the most important was changing the location of the building by a few meters, after subsidence in the ground was discovered after the completion of the first five floors. The cause for this due to the inaccuracy of soil examinations.

➢ Construction was stopped when a batch of concrete used at the beginning of the project failed a regular stress test. therefore, the cost of the construction slowdown was $700,000 per day.

➢ Due to a low-cost concrete design, iron was imported, causing the structure to weigh twice as much as before, affecting its foundation.

All of these issues are avoided from the start when applying BIM, which will be demonstrated in two projects where the system was used.

4-1 Shanghai Tower in China:

Fig (7) China flag Fig (8) Shanghai Tower
Refrence:https://www.theplan.it/eng/magazine/2015/the-plan-083-06-2015/shanghai-tower

Location: Z3 lot, Lujiazui Fanatical Center, shanghai, china.

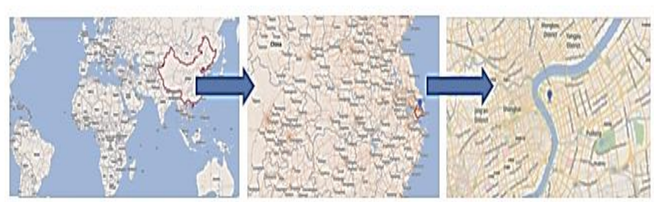

Fig (9) Shanghai Tower location

Designer: Marshall strabala (American architect) & Jun Xia (Chinese architect and the director of the Gensler architecture firm).
Height: 632m (128 floors)
Designed: 2008
Completed: 2014
Opened: 2015
Functional orientation: (offices - Deluxe Shopping Mall - hotel - Features Meeting Facilities) (11)

4-1-1 Using BIM technology:

BIM system has been used in the design and construction of the world's second tallest tower, and the most important benefits of adopting BIM will be shown through analyzing the project at various phases.

TABLE (2)
SHANGHAI TOWER ANALYSIS

Project Analysis		
Projects Phases		**The Impact**
(1)	*Pre-design*	Two points should be completed (information gathering – concept).
	1-information gathering	• Tower located in trade zone, Shanghai. • Within an area of 420,000 ㎡. • On soft soil in a city where hurricanes, winds, and earthquakes abound. • The owner's desire that the project will be the highest project in China. (12)  Fig (10) Shanghai tower landscape Refrence:https://www.pinterest.se/pin/293156256984036808/
	2- concept	Shanghai Tower will be the third tower built after the Shanghai World Financial Center and the Jin Mao towers, indicating the beginning of China's gradual economic dominance. The Shanghai Tower will be the tallest of the three towers, avoiding the impact of disasters while also saving money and time. As a result, the BIM system was chosen because of its capacity to provide accurate design and quick execution. (13)  Fig (11) Three towers (Shanghai Tower, Shanghai World Financial Center and the Jin Mao towers) Refrence: The Skyscrapers Center. "Shanghai Tower." The Global Data Base of CTBUH, (2015).
(2)	*Schematic design*	By utilizing the BIM system, the visualization of the building model, and the relationships between spaces, Gensler's proposal was accepted as the winning concept, showing the project's capacity to minimize energy consumption and cost. (14)  Fig (12) Gensler's proposal is a winner Refrence:https://en.wikipedia.org/wiki/Shanghai_Tower
	Wind load study	Many tests were carried out using BIM programs to find the best rate torsion for the building, and the best result was chosen, as the results showed that the scaling factor is about 55%, and that rotating the building at 120 degrees can save up to 24 percent in structural wind loading and cladding pressure. This final version of the model resulted in a saving of $50 million dollars. (15)

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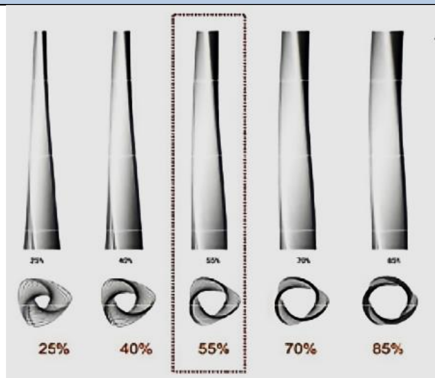
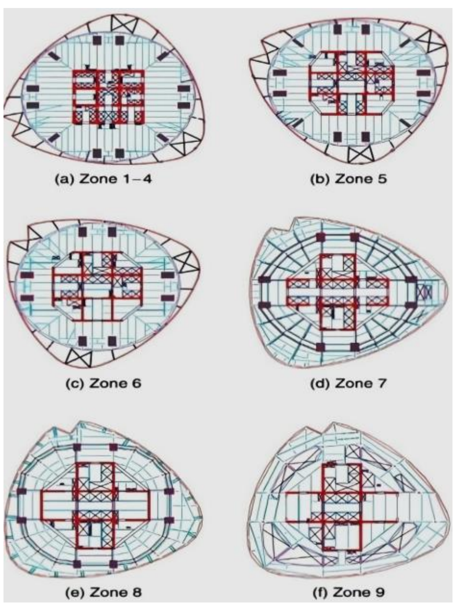
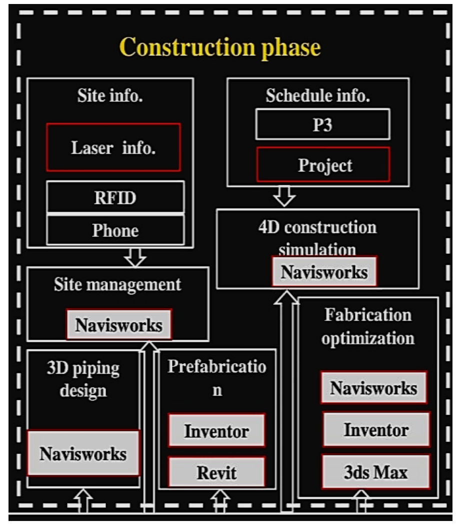
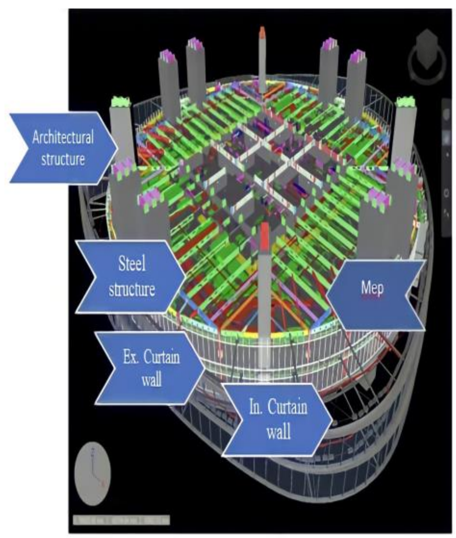
TABLE (2): CONTINUED

The Impact		Projects Phases
(2)	*Wind load study*	 Fig (13) Wind tunnel study scaling models to get the best percentage of the design of the tower for wind resistance Refrence: "The Shanghai Tower: One of World's Most Sustainable Skyscrapers". Parsons Brinckerhoff. January 2014. Retrieved 20 January2015.
(3)	*Design developmen*	At this stage, the structural engineer receives all of the drawings and information via BIM system, which benefited his work and provided a link between him and the architect to resolve any conflicts that may have arisen after implementation, saving him time and effort.
	tower zones	Shanghai Tower is divided into nine vertical zones, with all of these aspects explained by the sectors that emerged from the BIM design. <u>Zone 1:</u> is the base-level retail of boutiques, cafés and lounges. <u>Zones 2 through 6</u>: are comprised of office floors. <u>Zone 8 and 9:</u> Consist of hotels. (16)
	Tower zones plan	 fig (14) tower's zones plan (9 zones) Refrence: Zeljic, Aleksandar. "Shanghai Tower, Façade Design Process." 2010 International Conference on Building Envelope Systems and Technologies, Vancouver, Canada, (2010).
(4)	*Construction documents*	The cooperation between constructor and architect was achieved through the ease of extracting the perspectives by using BIM system programs such as "Navisworks program" to find the optimal solution and form for the tower's structure in accordance with the architect's concept. (17)  Fig (15) Programs used in Construction documents phase
	work cooperation	The cooperation of all disciplines in the project in a major engineering work under the auspices of the BIM system. (18)  fig (16) an unified model Refrence: Ge, Qing. "BIM Applications in the Shanghai Tower Construction." CTBUH 2012 9th World Congress,

The horizontal lines in the table determine analysis elements to show the value that BIM added in Shanghai Tower

4-1-2 Conclusion of the importance of using BIM in the Shanghai Tower:

- About 3% to 5% of the total cost of the project goes to engineering changes and information exchange errors. This can be avoided through the BIM system, which saved about

160 million yuan wasted in waste due to rebuilding work. With following up the schedule and monitoring any deviations in the progress of the project schedule, which can be detected early and working to provide feedback in a timely manner.

- 90% reduction in poisonous work and hazard, ex. welding, glue, etc.
- 60% site work reduction.
- 70% prefabrication of pipe and ductwork.
- The tower is a multifunctional building with 7 structural systems and more than 30 electrical and mechanical subsystems. It is a complex structure that requires a large number of specialists and professionals in various disciplines to work together smoothly. Hence, the project employs more than 30 consulting firms in architecture, structure, mechanics, electricity, and fire protection. It also contracted with dozens of contractors in the field of foundation, structure and machinery. This huge number of employees and specialists put project managers in front of a challenge to find an effective strategy for the coordination system. They searched for an effective IT that achieves a flexible harmony between all disciplines through a single unified platform that makes the project implementation possible and successful. To achieve this goal, they adopted BIM technology. (19)

4-2 The National Museum of Qatar in Doha:

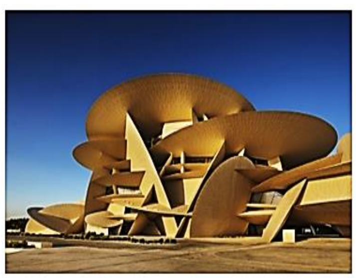


Fig (17) qatar flag fig (18) the museum view
Refrence : https://qm.org.qa/ar/visit/museums-and-galleries/national-museum-of-qatar/

Location: Location: Museum Park St Doha - Qatar

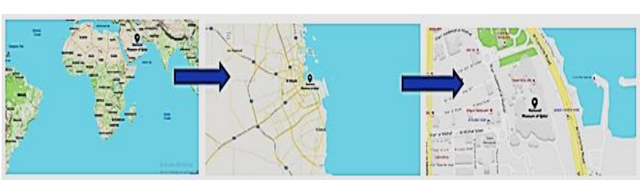


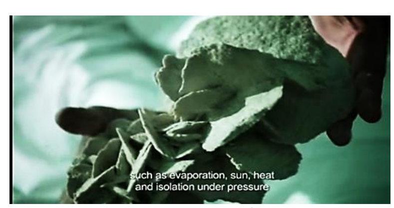
fig (19) Qatar museum location

Designer: Jean Nouvel (a French architect and a founding member of Syndicat de l'Architecture.)
Area: 40.000 m2
Height: 40m
Designed: 2011
Completed: 2018
Opened: 2019
Functional orientation: (exhibitions -park - research center- laboratories- an auditorium - a conference room - restaurant- a museum shop -storage facilities). (20)

4-2-1 Using BIM technology

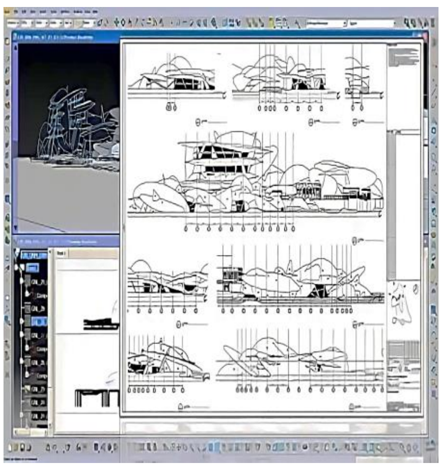
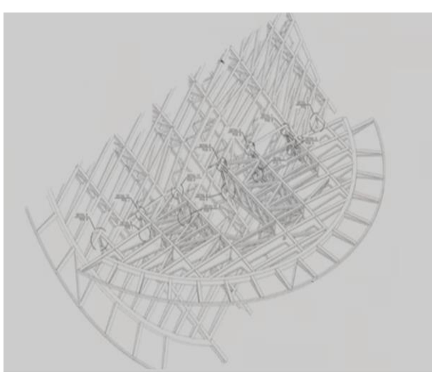
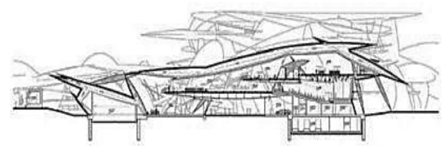
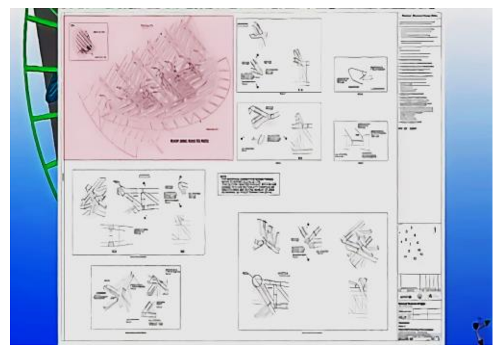
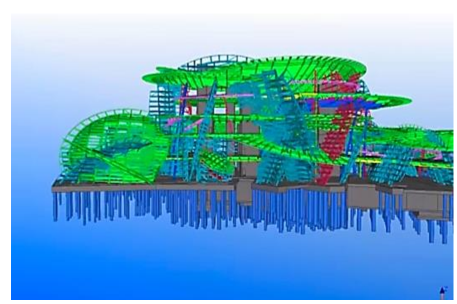
The use of BIM in this unique museum is a manifestation of the efficiency of BIM and its ability to achieve the best public and difficult projects that were very difficult to build.

TABLE (3)
THE NATIONAL MUSEUM OF QATAR ANALYSIS

Project Analysis		
Projects Phases		**The Impact**
(1)	*Pre-design*	As before, two points should be completed (information gathering – concept).
	1-information gathering	• The museum is located in the Qatari capital. • In a special location that attracts visitors from the whole world because of its proximity to the airport road. • The soil is usable • The concept must reflect the Qatari culture. (21)  fig (20) *the national museum of Qatar* layout refrence: http://bubblemania.fr/wp-content/uploads/DOHA-MUSEUM-QATAR0061.
	2- concept	Architect Jean Nouvel took inspiration of his design from gypsum crystals found in a desert in Qatar, so that the museum has been formed of interlocking discs. (22)  Fig (21) Gypsum crystals from which the concept came Refrence: The National Museum of Qatar". Time Magazine. USA. 22 August 2019. Retrieved 29 August 2019.

(Continued on next page)

TABLE (3): CONTINUED

Projects Phases		The Impact
(2)	*Schematic design*	After the architect chooses the work team and determines the jobs, the initial designs for the project are started and the architectural drawings begin.
(2)	*Schematic design*	In BIM programs, after designing plans, the initial drawings of the project are extracted and the museum's 3D perspective is produced. Also, all the sections are shown for the sake of the important details in order to complete the architectural vision of the project and to ensure that it is on the right path easily without the need to draw the sections from the beginning. (23)
(2)	*shop drawings*	 Fig (22) The museum sections Refrence : trimble consulting
(2)	*shop drawings*	The architect began to crystallize the desert flower, determine the minimum thickness that it can have, and calculate the different dimensions, all of that done accurately by BIM system.  Fig (23) Perspective section showing how the overlap and thickness of the disk in certain parts
(3)	*Design development*	Because of the difficult building design, it was necessary to clarify the complex relationship of the ceilings with the design of the spaces inside the building to ensure that the concept is not opposed to the design of the plans and to achieve the functional performance of the building. (24)  Fig (24) A section of the building showing the shape of the roofs with the spaces
(3)	*Provide the details of the museum design*	Issuing the construction board for the discs, which are the main component of the museum structure, and showing all the details and overlaps, for avoiding the existence of disputes, and smoothing the workflow. (25)  Fig (25) structural disks drawings show all details Refrence: en.wikiarquitectura
(3)	*The benefits of using the BIM at that phase*	The museum contains many tablets where exists a large amount of iron 28,000 tons which is almost four times more than the amount needed to build the Eiffel Tower in Paris , as it was designed in a unique way in the Tekla program.  Fig (26) Perspective section by Tekla from the BIM system Refrence : Tekla UK BIM awards

(Continued on next page)

TABLE (3): CONTINUED

<table>
<tr><th colspan="2">Projects Phases</th><th>The Impact</th></tr>
<tr><td>(3)</td><td>The benefits of using the BIM at that phase</td><td>Tekla has an effective role in identifying and resolving clashes within the model with attention to placing the elements in the correct places.

Fig (27) Avoiding and clarifying structural collisions through BIM</td></tr>
<tr><td>(4)</td><td>Construction documents</td><td>Tekla BIM sight plays an important part in discovering and resolving model incompatibilities, with special emphasis paid to arranging elements in the correct locations.

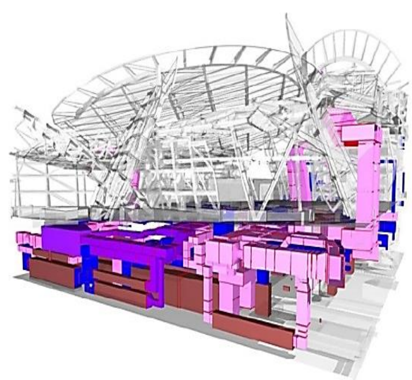



Fig (28) 3D perspective showing details
Refrence : architizer journal</td></tr>
</table>

The horizontal lines in the table determine analysis elements to show the value that BIM added in the National Museum of Qatar

2-2-4conclusion of the importance of using BIM in the National Qatar Museum:

- Implementing the museum in a way that is otherwise very difficult to implement in an ideal time.
- Reducing the cost by accurately limiting the amount of iron used in the building.
- Extracting a complex masterpiece whose shape has not changed from design to implementation due to harmonious coordination in BIM system.
- locating and resolving the structural overlaps through the perspective sections of the museum and the suitability of all drawings of the disciplines in a unified program, which is the Navisworks to avoid any errors during constructing such a complex building like National Qatar Museum.

3.4 Conclusion of the importance of using BIM in case studies:

TABLE (4)
BENEFITS OF USING BIM IN CASE STUDIES

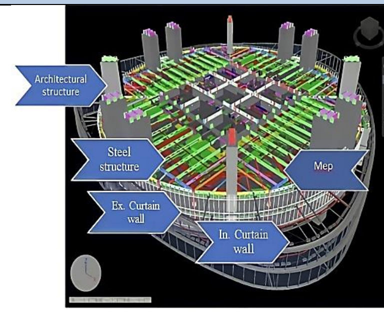
<table>
<tr><th colspan="3">BIM benefits</th></tr>
<tr><td rowspan="3">Shanghai tower</td><td>The most significant feature of the BIM system is the flow of information between the disciplines of a project in a single main model</td><td>

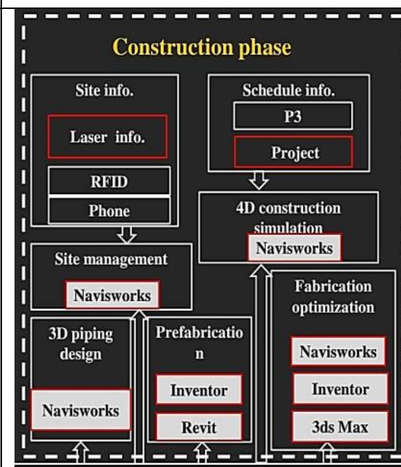
fig (29) an unified model that connects all disciplines
Refrence: Ge, Qing. “BIM Applications in the Shanghai Tower Construction.” CTBUH 2012 9th World Congress,</td></tr>
<tr><td>Make a list of the programs that will be used at each stage of the project.</td><td>

Fig (30) Programs used in Construction documents phase Show good planning by BIM</td></tr>
<tr><td>The capacity of BIM to link between climatic studies before beginning project implementation without modifying the project concept or the geometry of the building, as well as the continual compatibility across all disciplines.</td><td>

Fig (31) Wind tunnel study scaling models to get the best percentage of the design of shanghai tower for wind resistance
Refrence: "The Shanghai Tower: One of World's Most Sustainable Skyscrapers". Parsons Brinckerhoff. January 2014. Retrieved 20 January2015.</td></tr>
</table>

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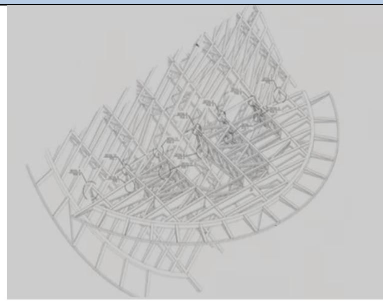
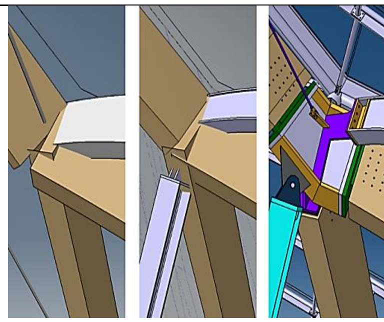
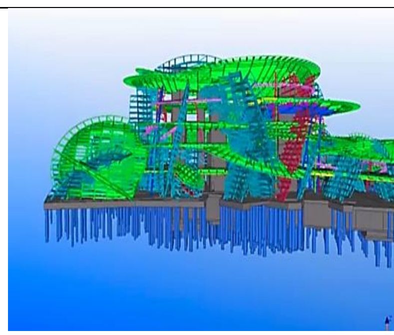
TABLE (4): CONTINUED

BIM Benefits		
National museum of Qatar	The benefit of using BIM was clarified in this project due to its difficulties, which included the issuing of perspective panels for all architectural features, including discs.	 Fig (32) Perspective section showing how the overlap and thickness of the disk in certain parts (by Tekla)
	Resolving clashes within the model with attention to placing the elements in the correct places.	 Fig (33) Avoiding and clarifying structural collisions Early through BIM
	Tekla BIM is critical for detecting and resolving model incompatibilities, with a particular focus on placing pieces in the correct locations.	 Fig (34) Perspective section by Tekla from the BIM system shows details Refrence : Tekla UK BIM awards

V. RESULTS

The research discovered the following after researching the evolution of architectural systems in projects and the enforcement of the building information modeling system on engineering projects:

1. Traditional systems are no longer at the scientific level required to produce advanced architectural projects that keep pace with modernity.
2. The work flow between disciplines in the same project is one of the most important elements that effect projects quality, positively or negatively.
3. Building information modeling is so far considered one of the most important and most distinguished architectural systems to product high-efficiency projects.
4. Architects are tempted to learn such a system because it makes their work easier than before
5. Some countries and organizations throughout the world begin to use this system to produce international architecture projects.
6. To improve the design phase, it is vital to recognize that sub-optimal information sharing is the primary source of information waste, as well as to fully comprehend the iterative nature of the conceptual and schematic design stages.
7. The entire information channel between the entities in a project's supply chain is becoming increasingly important to its success. The essential interventions and desired modifications can be implemented by studying the interactions among the participants and the associated information exchange. Such modifications can improve project player connectedness, allowing for a free flow of information throughout the project's life cycle, transforming delivery into a lean and waste-free operation.

VI. CONCLUSIONS

The building of highly efficient architectural projects is dependent on the use of modern systems and the choice of the best in construction technology. To raise the efficiency of architectural projects, it was required to consider the following factors:

- Engineering sectors conduct a thorough study of the BIM system
- An increase in the number of companies wishing to activate the BIM system in their projects due to its efficacy in completing the work in a more developed and beneficial way.
- Governments should encourage the private sector to adopt this method because of its positive impact on production and material management, as well as improving project production in a shorter time frame, which has an impact on the country's economy.
- Appointing private sector companies to work on BIM system development so that the best sophisticated architectural projects are constantly available.
- Relatively large companies that use traditional systems can transition to the building information modelling system by electing a portion of their cadres and forming an integrated work group that secures a new and advanced production line, and thus can transition to the new work method gradually and without disrupting the company's production process, as a section of traditional engineering expertise can be integrated into these groups and absorbed in them, and upon the complete transmutation.
- That also recommends increasing seminars in the engineering syndicates that enrich the application of that system in engineering circles.

After researching the necessity of using BIM to improve project efficiency and the presence of practical challenges, particularly in areas where it is not yet widely used, It is beneficial for relatively large companies to begin using it as recommended, and it is in the interest of researchers in that sector to continue to develop the system and do the necessary research in order to enhance productivity, and some of recommendations are:

- Every government should provide recommendations to engineering institutions to do research on the nature of the BIM system's application in the country, as well as expectations for the system's spread in the future and its implementation method.
- Studying the BIM system in engineering colleges to ensure that a high number of new engineers are familiar with it.

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1- Conception or design of the work: Alaa *Mohamed Eleishi, Ahmed Al-Tantawy Al-Maadawy, Alaa Mosad Ibrahim* (30%/ 35%/ 35%)
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TITLE ARABIC:

أثر استخدام نظام نمذجة معلومات البناء في مرحلة التصميم لإنشاء مشاريع عالية الكفاءة

ARABIC ABSTRACT:

تزامنا مع التقدم المستمر في نظم البناء لم تعد الطرق التقليدية في تصميم المشاريع المعمارية هي الخيار الأنسب لإنتاج مشاريع عالية الكفاءة في وقت وتكلفه اقل، فإن التحدي الاساسي التي تواجهه الطرق التقليدية هو وضع استراتيجيه لتدفق المعلومات بين جميع العاملين في المشروع من (أصحاب المصلحة، الملاك، المهندسين، المقاول، إلخ) بصوره مرنة مما يؤثر على كفاءه المشروع بصفه عامه.
تعتبر نظم البناء الحديثة من اهم الممارسات التي يتم على اساسها قياس مدي كفاءه المشاريع، فمن خلال دراسة وتحليل القيمة المضافة باستخدام نظام نمذجة معلومات البناء تم طرحه كبديل ناجح حتى الآن في إنتاج مشاريع ناجحة من خلال التدفق المستمر للمعلومات بين أطراف المشروع في جميع مراحل المشروع المختلفة لكافة التخصصات الهندسية والذي يستفيد منه كل من (المعماري، المدني، الانشائي، المقاول، وغيره) في مراحل تصميم وتنفيذ المشروع وتشيده وتسليمه ويقتصر البحث على مرحله التصميم المعماري الخاصة بالمعماري.

تهدف الدراسة الي أهمية استخدام وتطبيق نمذجة معلومات البناء في تحسين كفاءة المشاريع المعمارية من خلال استراتيجيات مخطط لها بنجاح في مرحله التصميم المعماري تحديدا، وتقوم منهجيه الدراسة الي تحليل دراستي حاله : 1) برج شنغهاي في الصين ؛ 2) متحف قطر الوطني حيث يعتمد كل منهما علي تطبيق تقنية نمذجة معلومات البناء لإظهار فاعلية النظام في استخراج مشاريع عالميه ناجحة, ليخلص البحث الي وضع توصيات تطرح أليه تطبيق نظام نمذجة معلومات البناء بصوره اكثر انتشارا في الاوساط الهندسية بغرض زياده كفاءه المشاريع المعمارية.