



# Economic Efficiency of Highly Mixed Use Buildings

Gehan A. Elsayed

## KEYWORDS:

Multi-functional, sustainability, economic efficiency, urban concept

**Abstract**— Architecture has experienced a strong restoration over the last eras of the twenty's cen-tury, leading to the appearance of a new generation of architects that were inspired by the designs which had been made by pioneers such as Zaha Hadid , Gharry and Norman foster . As they integrate the designs by the current technology and their own creativity. Which leads to a variety of types, forms and functions of the buildings all over the world such as - multi use, mixed use and multifunctional buildings which are the signif-icance of sustainable architecture.

Multifunctional buildings are growing rapidly, especially in downtown spaces, repro-ucing a modern design or management approach that avoids urban problems. Also con-tribute to the regeneration of the urban areas where people can live and work in one building that contain stores, theatres, exhibitions, government workplaces, private ac-commodation settled in one building which has been designed to fit any function.

In the Upcoming years, the internal spaces inside buildings must produce an economical progress and living sustainability. Also, the concept of multi-functional buildings can add a language that expresses the sustainable ecology for life processes. So, the liability issue is for what value the ideal meaning of the multi-functional buildings can fit the meaning of sustainability in an eco-efficient way.

Finally, the paper presents some of the different aspects that are related and influence the idea of the urban concept of multi-functional building and economic sustainability

## I. INTRODUCTION

Since 19th century, a lot of countries have a rapid financial development as China, Hong Kong, Korea. Where gathering of residents and financial events in the center districts has been fast-tracked, so the creation of multi-functional administrative buildings and cities were the best solution for facilitating the focusing of the center regions and realizing adjusted regional developments. So,

creation of the multi-functional buildings is so important as a notable business that the whole regions all over the country make common success. Despite the fact that there has been numerous reactions and confusions. Until now the multi – functional executive building is currently historic realism which can't retreat. (Construction agency- 2006)

Moreover, the world is searching for the way to integrate sustainability with each development must be done, as sustainability represents development of three aspects ; environmental , social and economical , Therefore the main aspect Beyond the concern of the relations between sustainability and the buildings, mainly focus on the various

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**Corresponding Author:** Gehan A. Elsayed, Associate Prof.at Architectural Engineering Department, Modern University for Technology and Information (Gehanelsayed2@yahoo.com).

aspects of the building's functions and their efficiency. Suggesting that there is an un-limited relation between ecological sustainability and building efficiency.

Therefore, the paper methodology will be 1st: analyzing sustainability and its main accesses as an economic issue 2nd : measuring the aspects of sustainability that can be applied on the multi-functional building as a new trend to sustainable economies .

## II. SUSTAINABILITY

Is the way to sustain progress in a decent way in which the misuse of resources, the carrying of assumptions, the implementation of technological changes and economic adjustment are all in agreement and the renovation of existing and future assets to overcome human issues and goals. Brandt Land Commission used the definition sustainability to identify what has become the most common definition of sustainable development , meaning that it satisfies the needs of today without compromising future generations ' ability to fulfill their own needs.( Smith, Charles& Rees, Gareth .1998)

Conceptually, the field of sustainable development can be divided into three types: environmental sustainability, economic sustainability and social sustainability. It offers insight into the fact that sustainable development includes a variety of fields and emphasizes sustainability as the concept of environmental, economic and social development and justice, all within the constraints of the planet natural resources. (Daly, H. E. 1973)

**Social sustainability** aims to preserve social capital by investing and creating services that constitute the framework of our society. It means to preserve future generations and to acknowledge that what we do can have an impact on others and on the world. Social sustainability focuses on maintaining and improving social quality with concepts such as cohesion, reciprocity and honesty and the importance of relationships amongst people.

**Economic sustainability** aims to maintain the capital intact. If social sustainability focuses on improving social equality, economic sustainability aims to improve the standard of living. In the context of business, it refers to the efficient use of assets to maintain company profitability over time. As stated by the UK Government

**Environmental sustainability** aims to improve human welfare through the protection of natural capital (e.g. Land, air, water, minerals etc.). Initiatives and programs are defined environmentally sustainable when they ensure that the needs of the population are met without the risk of compromising the needs of future generations.

**Human sustainability** aims to maintain and improve the human capital in society. Investments in the health and education systems, access to services, nutrition, knowledge and skills are all programs under the umbrella of human sustainability. Natural resources and spaces available are limited and there is a need to balance continual growth with improvements to health and achieving economic wellbeing for everyone. In the context of business, an organization will view itself as a member of society and promote business values that respect human capital.

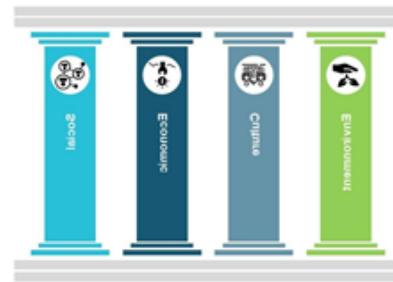


Fig. 1 pillars of Sustainability

### 2.1 Sustainable economies

If we face an elongated period of no net economic development, what does sustainable economic development will mean? First, qualitative economic growth can proceed regardless of whether quantitative development does not. We can concentrate on improving our lives to a great degree and diminish material utilization in the meantime. Second, the best technique for lessening the dangers of the change to a stable financial state is to make our urban areas stronger to monetary, ecological and social stuns. We can expand our versatility by concentrating on nearby confidence, decent variety, ecological responsibility, financial essentialness, important work, social equity, joint effort, and participation (Davis, John B. 2006)

**A green economy;** is defined as economy that aims at making issues of reducing environmental risks and ecological scarcities, and that aims for sustainable development without degrading the environment. It is closely related with ecological economics but has a more politically applied focus.

**A brown economy;** is one in which economic growth is largely dependent on environmentally destructive forms of activity, especially fossil fuels like coal, oil and gas. (Maslin, M., et al, 2017)

**A green technology;** is an umbrella term that describes the use of technology and science to create products that are more environmentally friendly. The goal of green tech is to protect the environment and, in some cases, to even repair past damage done to the environment.(Investopediawww.investopedia.com)

**Ecology;** is the study of the relationships between living organisms, including humans, and their physical environment; it seeks to understand the vital connections between plants and animals and the world around them. ([www.esa.org](http://www.esa.org))



Fig. 2. Scheme of influence of sustainable development

### 2.2 The economic Efficiency as a Factor of measuring Sustainable economies:

Efficiency is one of those terms that we can use in daily conversations, except that it means something special for

financial experts. The significance of productivity can turn out to be significantly more particular than that, however! Effectiveness in the interest and supply display implies that the economy gets however much advantage as could reasonably be expected from its rare assets and all possible exchange gains have been achieved. As such, it provides and disburses the ideal measure of any great and service. (James M. Buchanan, 1987)

Economic efficiency reflects a financial condition in which all investments are distributed to serve each user in the most efficient way available, reducing waste and wastage. Any advances made to help one individual in such an economy would hurt another. Efficiency also means the situation in which it is possible to generate a higher per-centage of welfare-total from the available resources with the given state of technology. In other words, the condition where it is possible to make certain people better off by reallocating the re-sources or services without making others even worse. (Sullivan, Arthur; Steven M. Sheffrin, 2003)

One monetary structure is more capable than another (in relative terms) on the off chance that it can create more items and dares to society without using more resources. In supreme terms, a structure can be called eco-productive if:

- Another worth should be made to improve yourself
- Increasing the quality of inputs to improve output.
- Producing at minimal cost per unit

There are several interchange definitions for eco-efficiency, which are: Dynamic effectiveness (which introduces economy that suitably balances short term concerns), and static productivity (with concerns over the long haul concentrating on empowering innovative effort). (Joseph E Stiglitz and Carl E Walsh, Economics, 2006)

### 2.3 The relationship between buildings and sustainable economies:

Nowadays, buildings are being built bigger and contain more different functions to meet the needs of a lot of users in one building. The tendency shows the need for understanding the design criteria for an organized structure. From the concept phase multiuse spaces should assure aesthetics, functionality, system efficiency, system safety, and environmental protection in the most effective possible way.

Nowadays contemporary buildings must emphasis on maximizing profit, where they are expressed in terms of economic returns. And if they stand as a dull building that doesn't connect with the city's public, social or physical characters and doesn't reflect its personality, they would be ignored as they would not be eco-efficient .

Also, if the building acts as each one has specific physical features. This will lead to several towering that able to deal with the needs of everyone. So, users will refuse renting this building or the rent will be reduced to make it affordable. (Edward, Allen, 2005)

## III. RELATION BETWEEN MULTI-FUNCTIONAL BUILDINGS AND SUSTAINABLE ECONOMIES

### 3.1 Historical buildings that achieved multiple functional:

Especially in downtown areas these kinds of buildings are skyrocketing. As they represent a way of design or management that avoid urban problems while mapping and can encourage the redevelopment of the downtown area where people can live and work. As a single building could contain various functions gathered together as; stores, theatres, galleries, government offices distributed in various voids settled to suit their functions (construction agency, 2006). And this appeared since the roman civilization as the market core shows the platform of shops raising above them the residential buildings as shown in fig (3), as the vertical symmetry of the building was broken by means of the residential building and this lead to the dynamic involvement of the building within the urban realm.

Also the public bathes seems to be of mixed use manner as shown in fig (4), as the shops seems to penetrate the bath plan but from outdoor, so it breaks the form and appreciate the sense of time (fazio et al., 2009). And other buildings carried the same strategy in such civilization as shown in fig5(a,b)

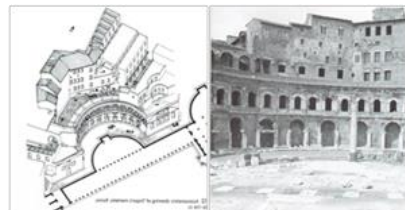


Fig (3) Trajan's market, Rome 100-114ce. The markets are built into the hillside as a series of shops that form a semi-circle and act as a retaining wall (Fazio et al., 2009)



Fig (4) forum baths, Pompeii, ca. 80 b.c (Fazio et al., 2009)



Fig5 (a) plan of the house of Pansa, Pompeii, 2nd century as it carries several shops and apartments in its lateral body (Fazio et al., 2009)

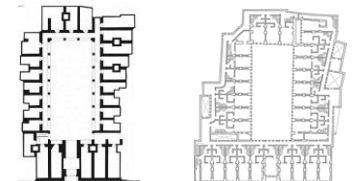


Fig5 (b) plan of the house of the surgeon, Pompeii, 2nd century as it carries several shops in its lateral envelope

Also the Mamluks, and the later Ottomans, in Egypt built WIKALAS (caravanserais; also known as khans) WEKALAH building is multi-use, commercial, administrative, and residential, in addition to warehouses and animal storage. Due to the important role of trade and commerce in Cairo's economy. [4] The most famous and best-preserved example is the Wikala al-Ghuri,



Fig (6) The wikala (sometimes wakala or wekala) is a building which housed merchants and their goods and served as a center for trade, storage, transactions and other commercial activity.



### 3.2 New trend of multi-functional buildings:

Designing a multi-functional building, requires the clarification of some concepts like 'function', 'multi use,

'transformation' and 'expansion' of architectural space. As the words 'change' and 'expansion' show, by their very nature.

Multi-functional building is a new trend of design referring to the multi-use spaces that are separated into two sections; one managing the working in a type of a solidarity shape i.e. the Hyper compacted lateral envelope with super structure. (Contemporary architecture 3-2003) where the other mentions to the high-rise buildings to undertake the eco-efficiency, lessening the land use and permits function flexibility. (Robyn Beaver, 2006)

### 3.2.1 Solidarity buildings:

The worldwide financial aspects and telecommunications have introduced the universal spaces which is called solidarity buildings, which mention to the declaration that no need to place again. With no evident necessity for focal point for activities, no doubt teleworking and Internet-system disbursing would seem to make it probable to return to a more urban lifestyle. On the other hand, these devices stand to the worldwide pattern of extended rural living.

as the **Brisbane Convention & Exhibition Centre (BCEC)** which was entitled 'Hi-Tech shed': (Fig 7) a large-span, structure made out of substitutable components organized on a standard framework to amplify adaptability. (Chris Abel, 2004)

#### \* *Its Green Initiatives:*

- -The Centre's escalators are sensor driven resulting in a 30% reduction in escalator energy usage
- The Centre is an official QLD Fluoro Cycle Signatory. Fluoro Cycle is part of the National Waste Policy which seeks to increase the national recycling rate of waste mercury-containing lamps.
- -Recycled water is used to clean the facility's roof, approx. 37,500m<sup>2</sup>. The process of blocking storm water drains and redirecting water to collection containers recycles 170,000L for reuse and preventing pollution from entering the storm water system.
- 309.42 kilowatt solar system on our Grey street building, generating 40% of our Grey street building's power and 18 per cent of the entire Centre's power requirements.



Fig7: Brisbane convention Exhibition Centre(BCEC) is a convention Centre in Brisbane, Australia. It is located in South Brisbane large-span, structure composed of substitutable elements arranged on a regular grid to maximize flexibility. <https://www.bcec.com.au/wp-content/uploads/2016/10/exterior-building-300x221.jpg>

Fig 8: *Malaysia Energy Commission Headquarters (Diamond Building)*, Speaks to another methodology toward

atmosphere responsive building structure in Malaysia. Vitality reserve funds of multiple times that of typical places of business demonstrate the natural and money related advantages of strategies. The Diamond Building is one of the country's first buildings that goes beyond energy efficiency, incorporating sustainable design and strategies that reduce environmental impact. include graywater recycling and on-site composting. The diamond form with the Tilting Façade avoid direct sun rays into building, Tilting Façade results in smaller building footprint which allows for more area for landscape , 7 Green Roof Elements are incorporated on Level 8 , Building Integrated , Photovoltaic(PV) Panel , Glass Dome , Rainwater Harvesting , Roof Light Trough , Greeneries on the Roof Insulated Concrete Roof , Roof/ Floor Slab Cooling(Chris Abel, 2004)

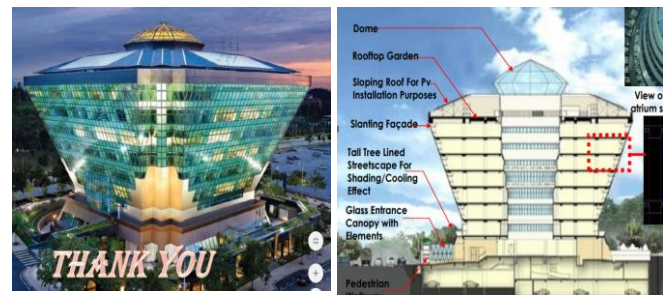
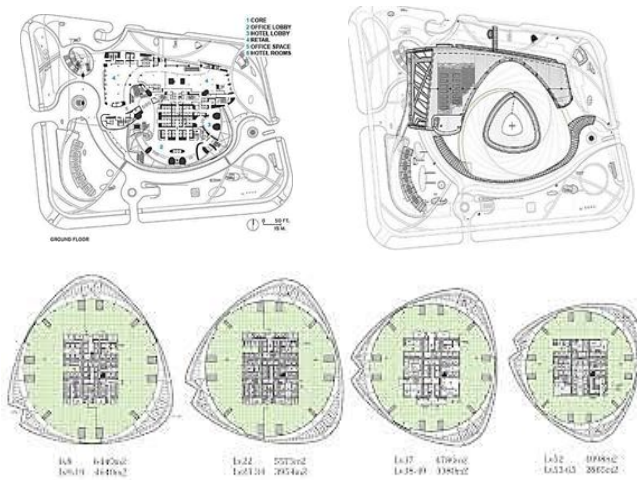


Fig8:Malaysia Energy Commission Headquarters (Diamond Building),Malaysia<https://www.google.com/search?q=DIAMOND+BUILDING&tbm>

### 3.2.2 High rise buildings:

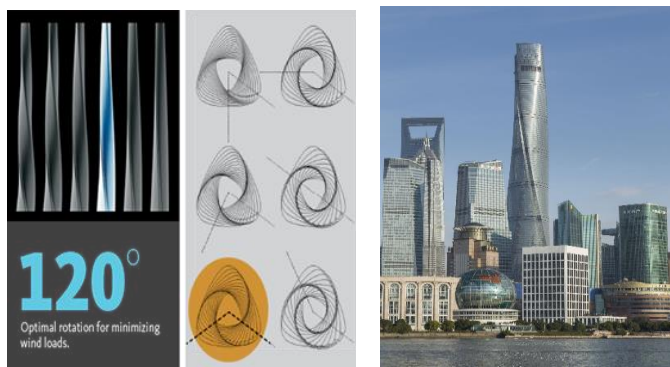
Right now, the increase in population and land cost have been forced the cities to construct high rise building or vertical advancement or growth. Among the advantages of vertical extension of the cities is that saving cultivable land to provide needed food for population growth, decreasing environmental demolition due to decreasing construction on natural land, As cities spread in the horizontal direction and people take more time traveling in their cars, levels of energy consumption and Pollution increase ,so the major design factors that are essential for attaining a high performance high rise building are: use of materials, urban context, structure and environment, energy consumption, eco-logical balance, use of water, community development, etc. Because of these various aspects of design for high rise buildings. So high-rise buildings form an important part of the diversity because it gives a more economical long – term use of land and asset. These towers react to the extended demand for office space and the necessity of significant open plan workspaces. (Robyn Beaver, 2006), The Shanghai Tower

fig 9 (a,b) shows a new way of envisioning cities, corroborating the implementation of the vertical theory of urban design. Because of its height and iconic character and undulating, transparent façade, the tower will be visible from all directions and be another new landmark for the city.



(Fig 9 a): The Shanghai Tower  
 (The Shanghai Tower-Plan and cross-section | Download Scientific Diagram | Shanghai tower, Shanghai, Tower, 2021)  
<https://www.pinterest.com/pin/720224165404495133/>.

The building is one of the most sustainable buildings in the world. The tower's swiveling, asymmetrical glass façade confuses the organization of wind forces and reduces wind loads on the building. The building's spiraling parapet collects rainwater to be used for the tower's heating and air conditioning systems, and wind turbines situated below the parapet generate on-site power. Power for the building will potentially be generated by wind turbines.



(Fig 9b): The Shanghai Tower Was designed by the American architectural firm Gensler, with the design group headed by the Chinese architect Jun Xia. [www.eco-business.com](http://www.eco-business.com)

**SHANGHAI TOWER** is one of the most iconic green building projects in China. These technologies have allowed the building to reduce its total energy consumption by 21 per cent, slash its carbon footprint by an estimated 37,000 metric tons yearly, and save US\$58 million in material costs. The glass lateral envelopes, which finishes a 120° turn as it rises, is expected to lower twist stacks on the building by 24%. Which reduce the construction materials. The doubled layered protecting glass shaping the facade was intended to decrease the requirement for indoor air ventilation and is made out of a developed strengthened Sikorite with high temperature resilience. Also the reason for the rotation of the tower is to reduce the winds shadow area behind the building and reduce the air vortices around it. That allows building reducing the public spaces surrounding the high-rise.

#### IV. ECONOMIC EFFICIENCY AND THE MULTIFUNCTION BUILDING

High rise buildings as a multi-function building produce adverse effects on the microclimate, due to wind funneling and turbulence around them at their base causing inconvenience for pedestrians. Also, High rise buildings cast large shadows, affecting adjacent properties by blocking sunlight. Towers are environmentally damaging when they fail to incorporate energy efficient design solutions in their heating, cooling, and ventilation systems. However, High rise buildings may have potential environmental advantages, such as ample access to sunlight and wind for the incorporation of solar panels, photovoltaic cells, and wind turbines. High rise buildings can create problems, such as overcrowding around it that can decrease the quality of life unless conceived and adequately mitigated during the planning stage for the building's long term function.

If we considered that economic efficiency which is the main term of the sustainable economy is the main factor of marketing ,then we are searching for how efficiency could be embedded in architectural spaces .

Luckily Sustainability so far has its own criteria which represents the efficiency needed with response to nature which we discuss before. As the evaluation process is summarized by a checklist that is used in evaluating the degree of sustainability that is attained in a building based on the four pillars of sustainability we can add the last pillar for creating sustainability which is titled "**Innovation & Design Process.**" It is an open category that awards credits for original design ideas that lead to more sustainable buildings.

It also awards credits if an architect or engineer who has been accredited as a LEED expert is involved in the design of the project. Although this list is still evolving, it is already serving as the basis for certifying the degree to which a building is sustainable. Additionally, it is a powerful vehicle for raising the environmental awareness of architects, engineers, and builders.

So engineers and most twentieth century technologies have intended diverse use and appropriation. They are not only designing specifically, but also as open-ended. They do not design for function, but design for functionality promoting the idea that one artifact can respond to a number of different technical and social situations.

Multifunction as an aspect for the building efficiency seems to port some roles which can be pointed in some scores as follows:

- The multifunction of the unite element of the building.
- The transparency of the space.
- An innovative form.

And within these roles the eco- efficiency can be measure as follows;

##### 4.1 The multifunction of the unite element of the building:

Multifunctional buildings are one of the leading buildings of today's urban group. However, it is difficult to introduce any systematic among objects that exist. It can be said that the integration of functions in one building is currently associated

with the expectations of an investor who defines his demands in the project. From a theoretical and practical point of view, it would be useful to combine functions with respect to the wider environment. Such an approach is useful for functional reasons. The benefits of combining urban functions into an integrated one are significant. Multifunctional systems also have a social, economic and environmental dimension.

At the past building functions occur in separation however these days any component in the building has an impact of bigger process, as it is not economical to take shape all relations. as; the mission is to focus on the integrated design. So; it is essential from the beginning to define the building achievement. Also, in order to realize the functionality of the building, it's function can be divided into certain criteria to study its functions separately. Nearly each element in the building work for more than one function within environmental sustainability.

In the design of a building, the following principles must be followed: (Frederick S. Merritt,2001)

1. The building should be constructed to serve purposes specified by the client in a specified period of time.
2. The building should be capable of withstanding the elements and normal usage for a period of time specified by the client.

Also , the functions which are expected from buildings elements are related with one another so that a designer cannot imagine how functions are affected by one an-other as shown in the design office in Germany seen in fig (10) as the structural system of the external envelope seems to be multifunctional as it carries the envelope cladding at the same time it carries the shading system which represents the photovoltaic units acting as an active environmental system responsible for the renewable energy. (EDWARD A., 2005), (Frederick S., Merritt, 2001).

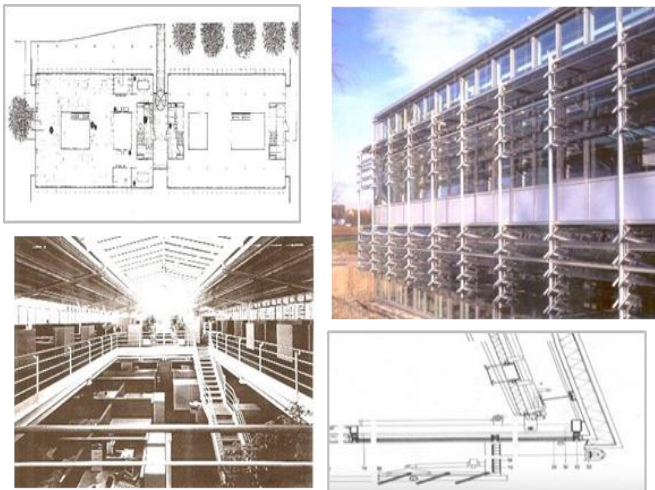


Fig 10; The design office: Germany, Kurt Acker-mann, 1993 a visionary space with sky light in-side the inner court. At the same time the structural system shown in section seems to play a multifunctional role(Frederick S. Merritt ,2001)

So, any project looking for eco efficiency must look for information gathering, conceptual and schematic design.

#### 4.2 The Transparency of the space:

Unique open plan idea has been developed which takes after the wide traditions of Modernism, enabling the pioneers to expert freely with very unique methodologies. As it advances open designs free from basic structural elements (passive design to allow direct natural light). As Organized daylight distribution inside buildings is a basic element of such sustainable de-signing. As daylighting enables good energy performance as well as satisfaction, productivity and health of the residents .

Therefore, much work especially in the restoration projects shows a strong recognition between form and use. Also, Energy preservation is considered to have a major priority, what's more, it helps to achieve creative passive energy design. (Frederick S. Merritt, 2001) hence, all building types seem to meet in one building of a typical floor design. In any case, past this, the spatial geometry, texture of the material, and formal character of the venture may vary uncontrollably, as per the place not the program included. This negligible influence the geometrical partition of the space, where the dialect of the time has its effect on the space as the space needs to react to the nature with its persuasions. The main reasonable division found, is the sky court which has the most essential job in accomplishing warm solace and additionally regular lighting and normal ventilation through by compelling air in on the windward side and sucking it out on the downwind side, as appeared in the plan office in Germany. (Fig 11).



Fig 11: New Central Library by Christian Moeller, As the space is considered visionary has no divisions except of the sky courts. At the same time the structural system shown in section seems to play a multifunctional role, and the interior of the library is dominated by a six-story atrium.

Day lighting has to be the first step in design process because its characteristics typically have significant effects on building mass and lateral envelope design. (choice of Top lighting or side lighting) which leads to different management issues for designers.

#### 4.3 The innovative form:

Nowadays the form doesn't be influenced by the building function only but also by the identity of the site which the building will be found, as each site has unique qualities. Moreover, it is possible to think about where the sun will be,

the way it changes during the day and the potential for shading. Sun diagrams and graphs may be used to quickly get information about sun points, as powerful computer models give an elective technique to track the location of the sun and the lighting levels can be anticipated foreseen numerically or through day lighting models. Also, it seems that the essential attention of building configuration is the basic role of its lateral envelope (walls, roof, floor and openings) as it plays together with mechanical systems providing visual, thermal, and acoustical comfort. (Alison G. Kwok, AIA+ Walter T. Grondzik, PE, 2007, 2011)

Designing of building lateral envelope begins with site selection and the right settlement of the building on site, designing of plans and sections, location of openings and skylights. Orienting the building on an east-west axis thus positioning the bulk of the window opening on the north and south elevations create a successful solar and lighting control. Also, shading devices can terminate the need for solar control glazing. Over-all, Site analysis has to be the first step in the design, This kind of lateral envelopes give the chance to produce the multifunctioning, as they seem to be universal buildings dealing with the mixed use aspect and produce ecological functional forms reflecting the surrounding urban context. And two famous examples can represent the unique form which are; the city hall building and Swiss Re Headquarters building as shown in (Fig. 12). it seems that in *the Shard* building that Renzo Piano was committed on producing a design that emerged against the London skyline without trying to be excessively overbearing or indelicate. It was designed to use particular windows with an explicit glass that reflects light obviously. The glass would reflect diverse powers of light in a manner that would change the presence of the building during different seasons or times of day, (Robyn Beaver, 2006). On the other hand *the Swiss Re Headquarters building* is unique for its pointed envelope which allows the air to flow around the building.



Fig 12: The Shard Completed in 2012, Renzo Piano's Unique Shard building is home to various eateries, workplaces, a lodging, and a survey display. Motivated by the idea of a vertical building, the more than 1,000-foot-tall structure is one of the tallest towers in Europe. (Robyn Beaver, 2006).

Development in technology saving and presentation analysis have been joined by additional developments in electronic meditation and fabrication.

***In the design of high rise buildings, The following criteria must be followed to create economic sustainability:***

1. The concept should be constructible according to known techniques and accessible Job and techniques, within a reasonable period.

2. The structure should be visually attractive at both inside and outside.
3. Design of the building should be done to reduce a negative environmental effect.
4. The building activity should consume a minimum amount of energy, while enabling.
5. environmental sustainability in the LEED criteria calls for preserving the natural environment, human comfort, resources, and ecological conservation.

## V. CONCLUSIONS:

Recently, the building turned into a product within the aspect of the multi-use, whereas the production and its promoting are estimated as rate of outputs per of time. Referring that the ecological design is the focal point of advancing economic productive building. That has a lot of outputs in different periods as it can fit the different projects that the clients require at any as governments targets in new capital

More notably, the new capital city aims to be a "Smart City" that will "integrate a sustainable ideology" by taking advantage of "today's sustainable technologies as well as being adaptable to future technology, further improving its resource efficiency"

- In some high-rise buildings as Bahrain Tower for example the reason for stopping the wind turbines in the Tower is due to sound noise and the effect on ecology
- The mixed use structures have two sorts fundamentally the Solidity structures and the skyscraper towers which apply the viable stream of criteria particularly the Eco-productivity as it indicates in what manner will a framework send the most extreme favored profit with a specific intelligence of wellsprings of data and open development. As Efficiency is improved if greater profitability is made without evolving inputs, where the fundamental jobs of effectiveness are as per the following:

1. Another worth should be made to improve yourself
2. Increasing the quality of inputs to improve output
3. Producing at minimal cost per unit

Mainly there are some features have been attained in efficient buildings which can improve the Eco-efficiency of high-rise buildings which are the following:

- The multifunction of the unite element of the building.
- The transparency of the space.
- The innovative form.

Which are related to each other and each one integrates with the others.

Therefore, the previous points outfit any program with no modifications as they actually suit the ecological sustainability. So, they are in harmony with nature with no damage.

There are two types of sustainable multifunctional buildings which are economical sustainability and ecological sustainability. Which are integrated with each other, although each one of them has its own aspects which affect the design of these buildings.

*Outcomes and general findings:*

- ✓ The LEED missions are the major call for the space efficiency, specially the economic efficiency.

- ✓ Recently, multifunctional buildings seem to be working under two sustainability variables which are economic sustainability and environmental sustainability as the key call of the era and each of them has its own design factors.
- ✓ In architectural theory structure has played a strong mythical role as the essential and irreducible logical part of architecture.

## VI. RECOMMENDATIONS:

- The researcher would indicate that high rise buildings are a significant part of variety, because they offer a more efficient long-term use of land and route if properly constructed. It is a solution to the problem of the extension of residential and service construction in countries with limited lands and high population density
- The key demand for multi-use buildings really has to be followed by the existence of a new call for the final performance of a shape, as What about form follows function when there are multi- purpose buildings then ,must the form be indifferent? Or it must be indifferent as it follows the environmental sustainability.
- Governments must respond to the concerns for safety by developing building codes. These codes dictate both the work of the interior designer and architect, and the way in which the building's mechanical, electrical, plumbing, and other systems are designed and installed. As developing these municipal building codes in response to this new era call for the multiuse, will simplify the usage of the building.
- Governments that suffer from narrow land areas should be interested in researching solutions to high-rise building problems, especially safety-related problems in those buildings.

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## Arabic Title

### الكفاءه الاقتصادية للمباني متعدده الاستخدامات

## Arabia Abstract

شهدت العمارة تقدماً قوياً على مدار الفترة الأخيرة من القرن العشرين ، مما أدى إلى ظهور جيل جديد من المهندسين المعماريين الذين استلهموا تصميماتهم من الأفكار والنظريات التي صنعها الرواد مثل Zaha Hadid و Gharry و Norman foster حيث أن التصميمات تكون ناتجة من خلال الجمع بين التكنولوجيا الحالية وإبداعاتهم. الأمر الذي يؤدي إلى إنتاج مجموعة مختلفة من المباني في جميع أنحاء العالم ، مثل - (المباني متعددة الاستخدامات) والمباني متعددة الوظائف التي تعد مؤشراً مهماً للعمارة المستدامة.

المباني متعددة الوظائف ، لا سيما في مساحات وسط المدينة تتزايد بسرعة ، لتمثل منهجية جديدة لتصميم مباني تساهم في حل قضايا حضرية. كما أنها أيضاً تساهم في إعادة تطوير مساحات وسط المدينة حيث يمكن للناس العيش والعمل في مبنى واحد يحتوي على متاجر ومسارح ومعارض وأماكن عمل حكومية وأماكن إقامة خاصة تتواجد في مبنى واحد تم تصميمه ليناسب أي وظيفة..

في السنوات القادمة يجب أن تتيح الفراغات الداخلية للمباني تقدماً اقتصادياً واستدامة معيشية. لذا فإن مفهوم المباني متعددة الوظائف يمكن أن يضيف لغة تعبر عن البيئة المستدامة. لذلك ، فإن المشكلة البحثية هي كيف يصبح المبنى المتعدد الوظائف مبنى مستدام يتسم بالكفاءة الاقتصادية