



Resilience between Sustainability and Historical Buildings “Case study: The Khedive Ismail Palace, Mansoura city, Egypt”

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ABSTRACT

Societies' values, cultural variety, and physical and intangible legacy are all being lost as a result of globalization, so, it is important to investigate how progress and legacy interact. Egypt has such a great legacy including the historical buildings that are considered to be a real gift. Unfortunately, most projects that aim at keeping those buildings were undertaken in the wrong way without adding real value. Those projects resulted in distorting the historical buildings. Mansoura City is considered one of the most beautiful cities in Egypt. It has such a great location on the river Nile, also it has a great number of historical buildings. All these buildings suffer from negligence and distortion. Although modern architecture has its features, it lacks the essence of Egyptian legacy. Rehabilitation allows the reutilizing of old depleted structures by assigning them new functions using new materials, and technologies, and introducing contemporary solutions to the historical buildings, without damaging their historical identity.

By applying sustainable development opportunities and considering the requirements, the interrelationships between the historic areas and the urban context will achieve sustainable tourism and a conservation action plan for the historic surroundings of the Khedive Ismail palace, which has been considered one of the featured historical buildings in Mansoura city. The paper aims to provide steps or guidelines to achieve sustainable development of the rehabilitated building and improve the economic state through processes of rehabilitation of the building by using modern building technology and adding sophisticated elements that did not initially exist at the time of construction, and its architectural style. Examples of such features include smart systems technology and building management system, which can significantly contribute to the success of the building's economic rehabilitation and renovation.

Keywords: Rehabilitation, Historical Buildings, Adaptive reuse, Mansoura City legacy, Restoration Methods.

1. Introduction

The legacy represents cultural architectural wealth, and the preservation of architectural legacy is receiving more and more attention, as it represents the cultural architectural wealth that cannot be underestimated. There are many ways to preserve archaeological historical buildings but reusing them has shown to be effective in preventing them from deteriorating due to lack of attention, and in adding a new value to these buildings that have lost their original function (Shehata et al. 2020) .

The greatest approach to reserving historic buildings is through rehabilitation, which provides new uses for these old places and is one of the sustainability pillars because historical building rehabilitation is linked to the essential principles of the concept of sustainability, thus rehabilitation is a must. Recognizing the significance of reviving an old building's functions, and how its rehabilitation and reuse following its renewal with modern functions will create an economic and income base for the building, allowing its sustainable renovation and maintenance, and ensuring its survival in the real estate matrix used within the framework of the economic, touristic, and cultural system (Abdallah MR 2018).

This study discusses “Rehabilitation of the existing building” as one of several methods in architectural conservation and exposure to the case studies of international and local rehabilitated projects. Historic Building is a visual link to the past, revealing how communities developed socially, culturally, and technologically (Shetabi 2015). Highlight in local projects in Egypt and how to rehabilitate them with the concept of sustainable development by studying and analyzing the case “Khedive Ismail Palace” in Mansoura, Egypt to find out:

- Mechanism of rehabilitating it again in 2021 for economic returns.
- Identifying its history and finding rehabilitate alternatives, using a modern technological system.

2. Research Problem

The research problem seeks to clarify the shortcomings of existing handling methods and governing laws when dealing with buildings of distinct value and listed as historical objects in need of preservation, as well as to emphasize how current laws and a lack of proper treatment methods are the primary causes of deterioration of such buildings, necessitating the intervention of a different strategy to address the failure of the current traditional handling methods.

Egypt has such a great legacy including the historical buildings that are a real gift but unfortunately, most of the projects that aim at keeping those buildings were undertaken in a wrong way without adding a real value. Those projects resulted in distorting the historical buildings. Mansoura City is considered one of the most beautiful cities in Egypt, and it has a great location on the river Nile, also it has a great number of historical buildings. All these buildings suffer from negligence and distortion. Although modern architecture has its features, it lacks the essence of Egyptian Legacy. The research encourages strategies and renovated ideas that provide a historical building with a certain level of liberalization is required to break away from traditional restrictions and have a fresh perspective of the examples of European countries and their historical cities that encompass historical buildings that have been redeveloped and renovated and rehabilitated.

3. The Main Objective of the Research

The research aims to use contemporary technology methods and materials for historic buildings on the "Khedive Ismail Palace" in Mansoura, Egypt by using rehabilitation tools and methods for spaces and forms of computational architecture that simulate conventional and local forms to add new activities and functions. That new function will create a source of income which benefits and supports the development of the community on the materialistic, cultural, and economic levels. Thinking about reusing the historical buildings will contribute to enhancing the economic and social aspects for these buildings, and for their surrounding region.

4. Research Methodology

The methodology of this research depends on three major approaches:

4.1. The Primary Approach

Rehabilitation defines the following steps:

- The general meaning of rehabilitation, and the need for rehabilitation in communities.
- The rehabilitation advantages for the environmental, economic, cultural, and social aspects.
- The most important rehabilitation objectives that enhance the relationship between historical buildings and their surrounding environment.
- The rehabilitation standards of historic and iconic buildings that serve the case study of research.

4.2. The Analytical Approach

This approach provides examples for European countries that encompass historical buildings that have been renovated and rehabilitated through adding new extensions to adapt with the surround environment needs or to enhance the original function of the historical building. This approach will represent an applicable reference for the case study of the research.

4.3. The Practical Approach

This approach displays Case study of Khedive Ismail Palace which is located in Mansoura City. The case study starts with a site analysis of Khedive Ismail Palace and a visual image of its urban environment. A historical approach to the palace is also considered the main approach to the field study, and then touches on the concept that forms the newly added mass to the historical palace.

5. The primary approach to rehabilitation.

5.1. Rehabilitation Definition

Rehabilitation means the reuse of outdated buildings by giving them new uses through the application of modern materials and technology and the introduction of contemporary solutions to the historical structures without compromising their historical identity (Antalya Expo Center 2012). Architectural legacy is typically re-usable through repair or alteration, allowing the building to be utilized in a modern way while keeping its historical and architectural features. This method enables either the main function's preservation or its modification.

Rehabilitation involves the widest range of preservation activities, the three processes of rehabilitation are renovation, adaptive reuse, and remodeling (in order of increasing intervention) (Gary Duguay 1992):

a) Renovation

Allows capabilities and vital functions that give those deteriorated buildings new legitimacy through using all possibilities to restore their functional efficiency either for the same old use or other uses at the least possible physical intervention in their architectural characteristics. Renovation allows minor modification in a way that prevents further deterioration and achieves building sustainability (Hawas S. 2013).

b) Adaptive reuse

It is a procedure that transforms a useless or ineffective item into a new one with multiple uses. The inheritance significance of the structure and its surroundings should be minimally impacted by the adaptive reuse of historic buildings. The historical status of building should be understood by developers, who should then follow the building's development to give it a new use. The created here adaptive reuse for historical initiatives that respect and preserve the building's current layer, which adds value for the future, is the most successful as shown in Fig. 1 (Australian government 2004).

c) Remodeling

Remodeling is the process of updating an existing structure to meet modern requirements, frequently for purely aesthetic motives as opposed to practical ones. The building's historical, architectural, and cultural significance is frequently disregarded. Remodeling may entail stripping the present building down to its explicit elements and refurbishing it to make it stand out as a new structure. This specific strategy is also known as modernizing.

A hybrid appearance that is neither new nor old is frequently produced by either technique of renovation, which involves using architectural aspects from several, mostly earlier times to simulate an older building (Gary Duguay 1992).

5.2. The Need for Rehabilitation

Existing buildings are subjected to processes of degradation with time, which leads to a situation in which they became unable to fulfill the purpose for which they were built. Sometimes, there is also the need to improve the conditions offered by existing buildings or to adapt them to new functions. Nowadays, climate change is intimidating all aspects of human life; "Environmental Sustainability" is a value missing from the discourse of historical assessment as an additional tool in the retaining of historic building, and as a common language between conservationists, architects, and urban planners in the discussion of sustainable adaptive reuse (Shetabi 2015).

5.3. Rehabilitation Trends and Policies

Where a building is listed, scheduled, or within a conservation area and of acknowledged historic deserves the Architectural Heritage Fund (AHF) can be helped by being involved at the earliest stages of a project to give advice and information, working constructively with organizations to identify viable new uses for redundant or under-used buildings, providing vital financial assistance in the form of grants and competitive loans, and putting

people in touch with other organizations working in their area (The Community Ownership Support Service 2016). Reuse the building as it was historically or be given a new use that requires minimal changes to its distinctive materials, features, spaces, and spatial relationships. The historic character of the building will be retained and preserved. A new addition to a historic building that meets the standards can be any architectural style traditionalist, contemporary, or simplified version of the historic building. The need to incorporate cultural legacy as a vital component of sustainable development was highlighted; however, only the historical, cultural, social, and economic aspects of legacy were emphasized (ICOMOS 2011). Nonetheless, there must be a balance between differentiation and compatibility to maintain the historic character and the very identity of the building being enlarged. Fig. 2 shows examples for historical buildings which achieved that balance through rehabilitation.

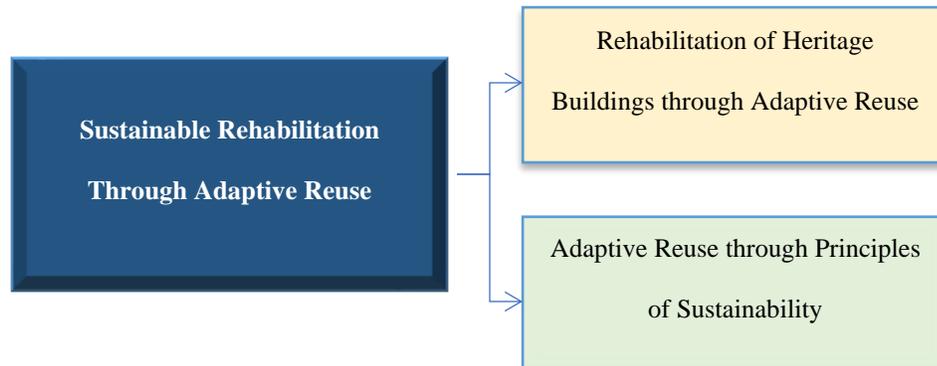


Figure 1: Sustainable Rehabilitation through Adaptive Reuse. (Researchers)



Figure 2: Historical Buildings Merges Old and New Style of Retrofitting Principles (www.archello.com)

5.4. Rehabilitation Standards

The rehabilitation of historical and iconic buildings has implications for architectural, structural, economic, historic, and social order, depending on the degree and extension of the intervention. Rehabilitation of a building calls for an overview of the location in which it is set and an understanding of its relationship with the surrounding and urban context. The most sensitive aspect of the rehabilitation of existing buildings is their structural rehabilitation, i.e., their structural safety. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. Embodied energy plays an important role in the modeling of life-cycle assessments (LCA) of structures to

increase the reliability of analysis and allow for useful comparisons to be drawn across materials concerning functionality (Ben McAlinden 2015).

The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale, proportion, and massing to protect the integrity of the property and its environment. Fig. 3 shows the principles of retrofitting which include five main principles.

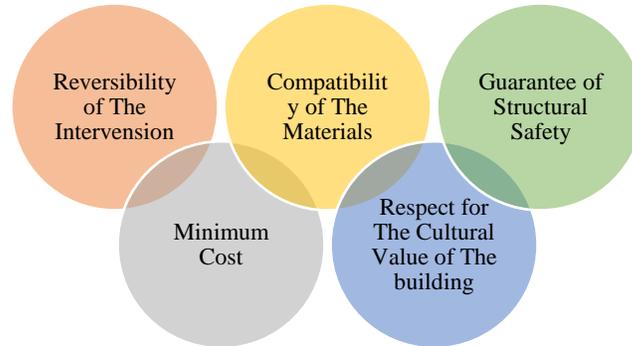


Figure 3: Principles of Retrofitting. (Researchers)

5.5. Rehabilitation Advantages

Rehabilitation has benefits and is more efficient than reconstruction as follows Fig. 4:

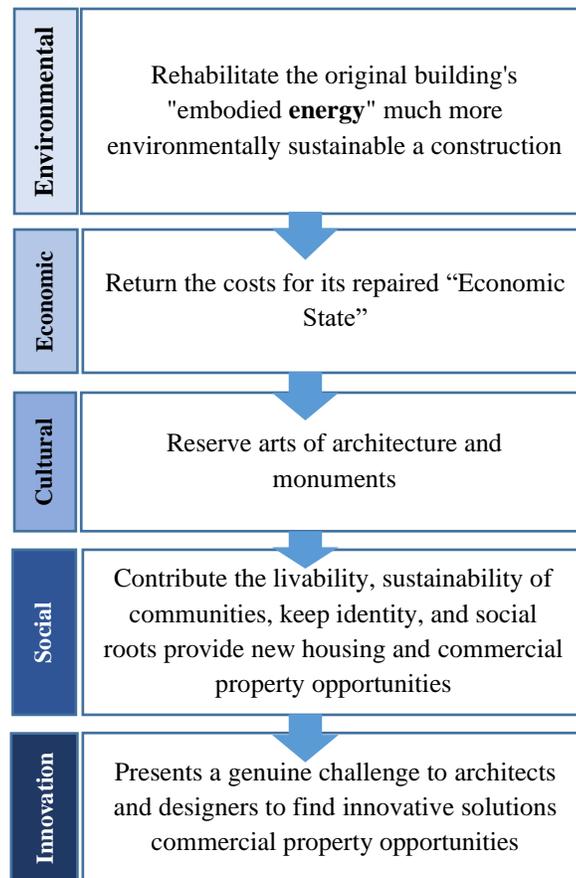


Figure 4: Advantages of Rehabilitation. (Researchers)

5.6. Tools of Rehabilitation:

Abdallah (Abdallah MR 2018) presents tools to deal with the historical building in the existing structure as shown in Fig.5:

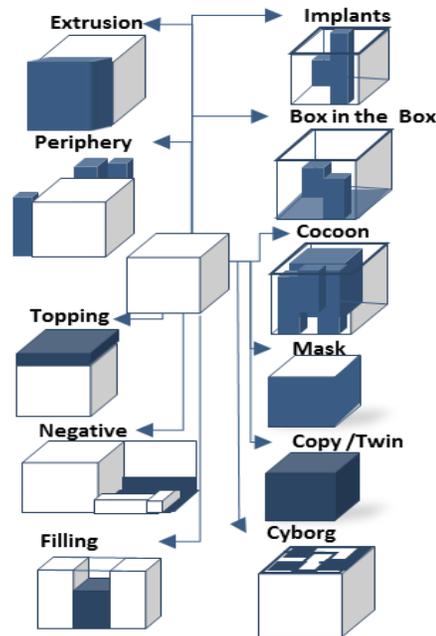


Figure 5: Tools of Rehabilitation. (Researchers & (Abdallah MR 2018))

6. The Analytical Approach

Review of the theoretical underpinnings of the policies relating to handling urban heritage, as well as contemporary methods and concepts of handling (preservation- modification - addition- deletion), and the requirements of international conventions of heritage buildings and design in the context of heritage (Shehata et al. 2020).

According to the tools described above, examples of international project that have been rehabilitated were presented to support the tools used in the case study as shown in Table. 1.

The paper displays a design strategy to deal with the historical buildings which are allowed to add modification. The proposed strategy, as shown in Fig.6, divides into three main stages as the following:

- **The Data Compilation Stage**, in which the current conditions of historical buildings are investigated and recording them through set of items (building established date, the original name, the original owner, the building site, the architectural style, materials, structural system, building area, stories number, original function, etc.).
- **The Planning Stage**, in which the building data which has been documented in the previous stage is analyzed through sketches and drawings illustrate site analysis, and the surrounding environment.

Then, the new project requirements are selected and based on that, the appropriate or a sustainable use is selected.

- **The Intervening Stage**, in which the designer offers innovative solutions match the project requirements and its surrounding environment based on a philosophical concept, achieves the integration between the historic architectural style and the contemporary architecture.

Table 1: Some International Buildings Illustrates Tools Used In the Case Study

Project 1	The Royal Ontario Museum, Toronto, Canada	
	<i>Client</i>	Royal Ontario Museum
	<i>Architect</i>	<i>Daniel Libeskind</i>
The Methods Used	Topping + Extrusion	 <p>[a]</p>
	Dresden Military History Museum	
Project 2	<i>Client</i>	Dresden Military History Museum
	<i>Architect</i>	<i>Daniel Libeskind</i>
	The Methods Used	Topping
Port of Antwerp		
Project 3	<i>Client</i>	Antwerp Port Authority
	<i>Architect</i>	<i>Zaha Hadid</i>
	The Methods Used	Topping

^a <https://libeskind.com/work/royal-ontario-museum/>

^b https://www.dresden.de/en/advertisement/museum_of_military_history.php

^c Hadid, Z., The Complete Works, Thomas & Hudson – British Library, 2014.

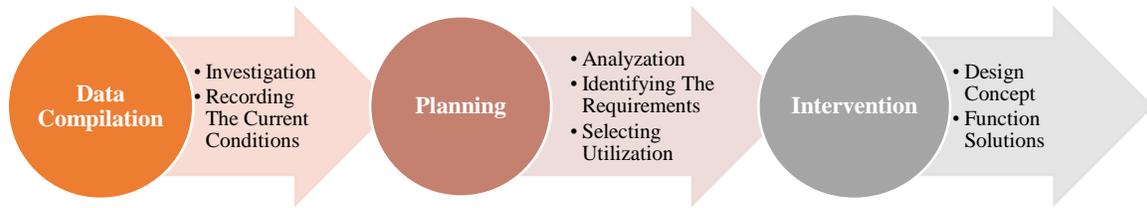


Figure 6: The Stages of Proposed Design Strategy (Researcher)

7. An Applied Study: Development of Khedive Ismail Palace, Mansoura, Egypt.

The proposed strategy will be applied on the palace of Khedive Ismail Pasha as a case study of the rehabilitation of one of the historical buildings in Egypt. The motivation behind choosing the Khedive Ismail palace as a case study is the unique location of the palace in Mansoura city, and besides, the historical importance of the building. The palace was established in 1863 in Mansoura city in the governorate of Dakahlia.

The palace consists of three buildings: the main building of the palace, an annex building to the palace, and the rest building of Khedive. The current use of the palace is as follows; the appeals court replaces the main building, the court extension replaces the annex building, and the national party building replaces the rest building.

Table. 2 show the basic building information according to the first strategy (Data Compilation).

Table 2 : The Basic Information Of Khedive Ismail Palace

The Original Name	Khedive Ismail Palace
Project Location	41 Farida Hassan Street, Mansoura, Egypt.
Original Owner	Khedive Ismail Pasha
Architectural Style	New Classic
Established Year	1863 - 1866
The Old Use	Residential Palace Royal Anchor of Khedive Ismail's Palace
The Current Use	The headquarters of the mixed court
Structural System	Solid Slab
No. of Floors	3 Floors (Palace 01) 4 Floors (Palace 02) 1 Floor (Marina)

7.1. Field Study and Site Analysis:

Khedive Ismail Palace is located in Mansoura city which belongs to the Dakahlia governorate. It is about 130 kilometers away from the Egyptian capital, Cairo, as shown in Fig. 7.

The palace has a main view of the Nile and lies on the main street in the city. Many historical buildings surround the palace of Khedive making it a special historical area in Mansoura city as shown in Fig. 8.

Some of the historical buildings adjacent to the palace such as Mahallawy villa (not currently used), twin buildings (not currently used), another historical palace (Headquarter of the Coptic youth association currently). Fig. 9 shows actual shots of these buildings.

When focusing on the Khedive palace, we will notice that the three buildings gather on one straight axis. The axis is perpendicular to the Nile, so the building's facades overlook the Nile as shown in Fig. 10.

The rest building directly overlooks the Nile, and is one floor above the street, while the two other buildings rise four floors above street level Fig. 11.

Fig. 12 shows Circulation paths Of The Urban Environment for the three historical buildings.

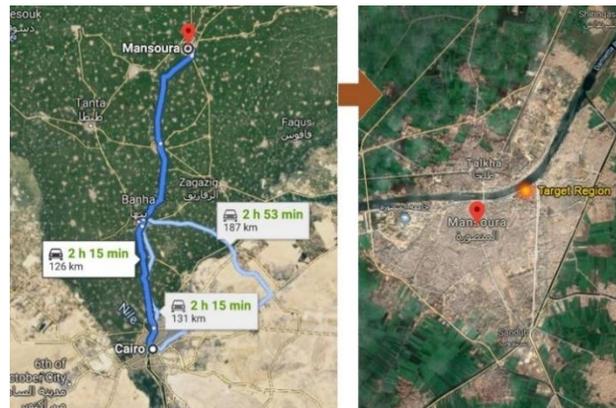


Figure 7: Site Location Map

(<https://www.google.com.eg/maps/place/El+Mansoura+Appeal+Court/@31.0506407,31.3911454,16.69z/>)

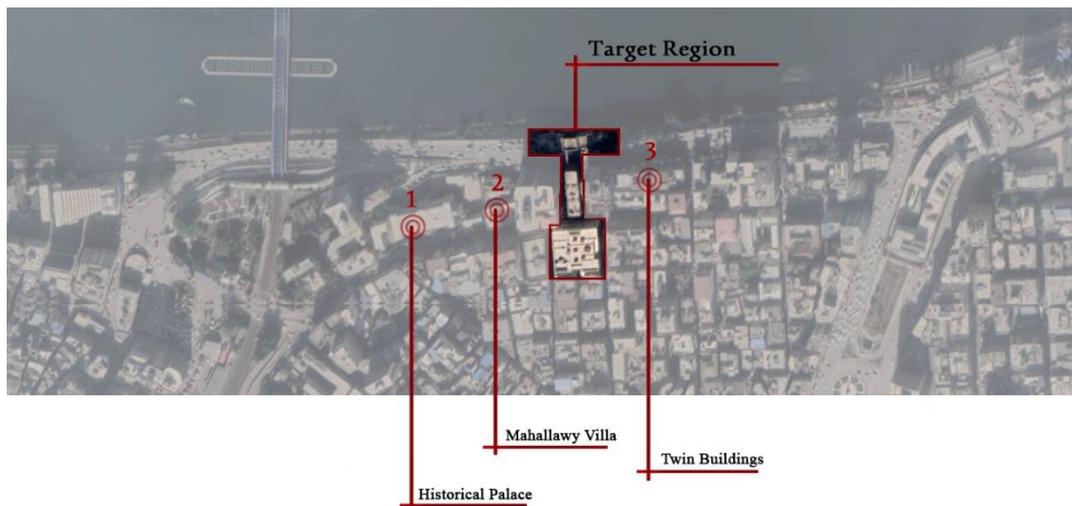


Figure 8: Site Analysis: The Historical Buildings Adjacent to the Target Region. (Researchers)



Figure 9: Historical buildings adjacent to the palace. (Researcher's photography)

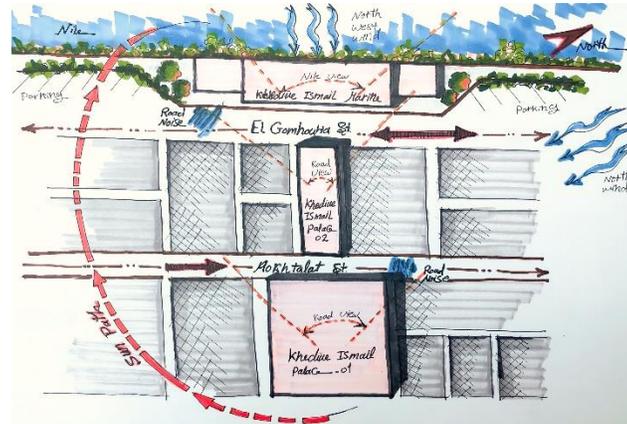


Figure 10: Site Analysis. (Researcher)



Figure 11: Three of Historical buildings are the khedive ismaeil palace 01, the khedive ismaeil palace 02, and the khedive Ismaeil Marine. (Researcher's photography)

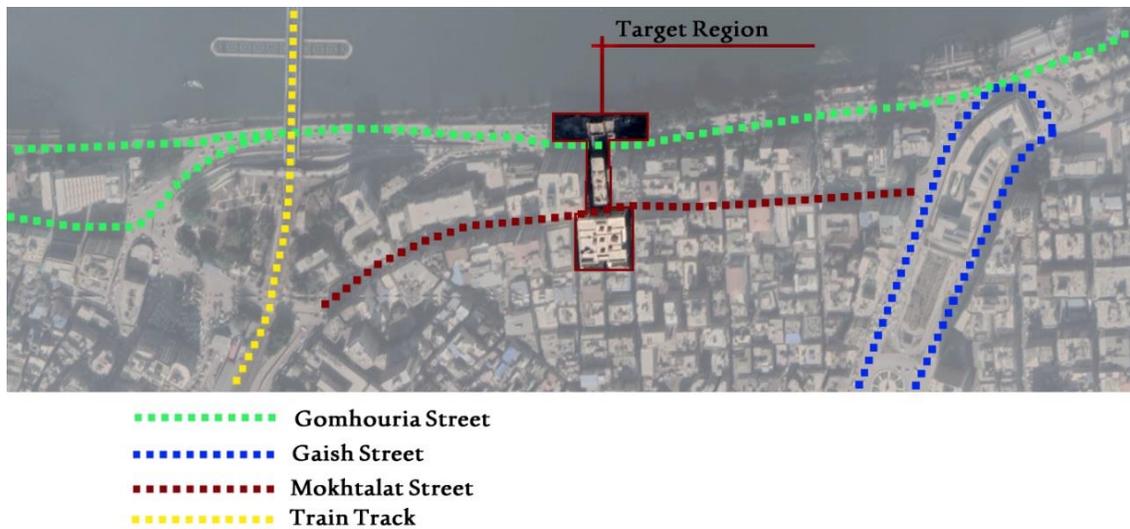


Figure 12: Site Analysis: Circulation of the Urban Environment (Paths). (Researchers)

7.2.Design Concept

The main target of restoration is to reinforce the historical value of Khedive Ismail Palace in Mansoura City by focusing on the architectural style of old buildings and merging it with a new modern form. Therefore, the design concept follows three directions: order, form, and materials.

The old palace had a Suspension bridge between the main building of the palace and the rest building penetrating the annex building, as shown in Fig. 13. This bridge no longer exists. The concept of design confirms the old bridge, so the new design forms a linear block that orders the axis that divides the three old buildings.

Applying a sustainable methodology and strategy to the historical building, by Preserving the exterior appearance of the heritage building, will provide a new recreational function in the structure which encourages investment and economic income while maintaining it.

Considering cultural, social, and economic requirements, to express the Periods of deterioration, colonization, and neglect that the palace was exposed to. The materials of the new modeling are reflective aluminum and glass to reflect the old facades of historical buildings in the region, to achieve this integration between classic and modern architecture. Freehand sketching for the new modeling follows the three directions in design: order, form, and materials.



Figure 13: Old Picture for the Khedive Palace Appears the Old Bridge between the Palace and Its Rest Building. (<https://www.pinterest.com/basimaldabousy/mansoura-egypt/>)

The new modeling simulates the old bridge that Khedive Ismail used to arrive at his rest building from inside the main building of the palace. The new block will be reached from the roofs of the buildings to maintain the current palace as shown in Fig. 16. The palace rehabilitation keeps the shape of the building's external facades, interior plans, and structure system, also, it re-uses the palace buildings to include a permanent museum, library, and temporary museum as shown in Fig. 17, Fig. 18, and Fig. 19.



Figure 14: Concept of the marine building and bridge of two the palaces related to order, form, and materials. (Researchers)

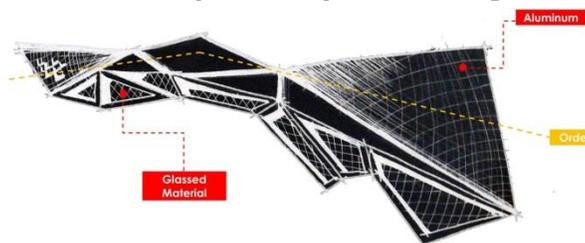


Figure 15: Sketching explains the main concept of design. (Researchers)

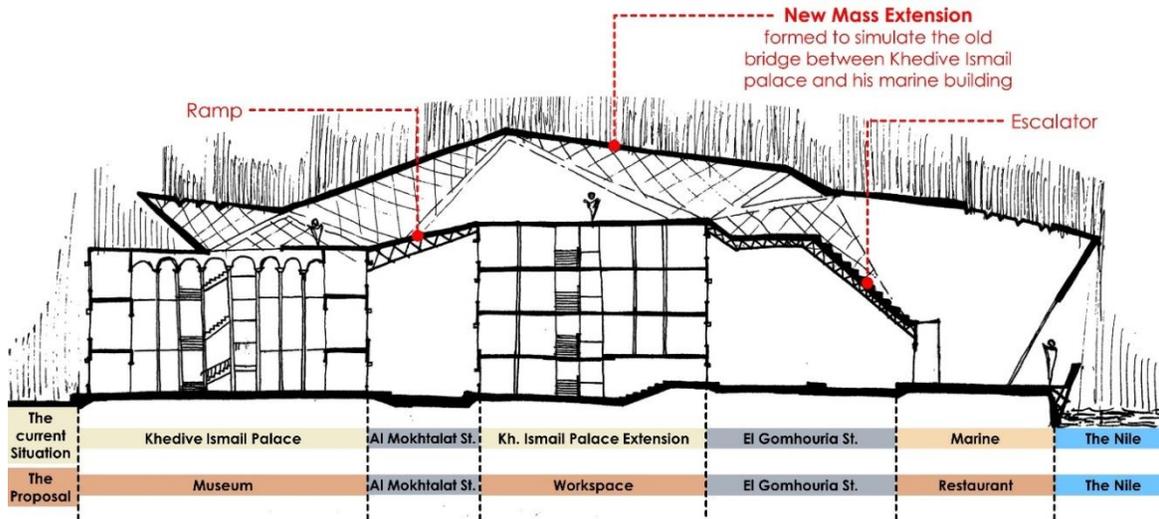


Figure 16: Sketching Shows A Longitudinal Section in Three Buildings. (Researchers)

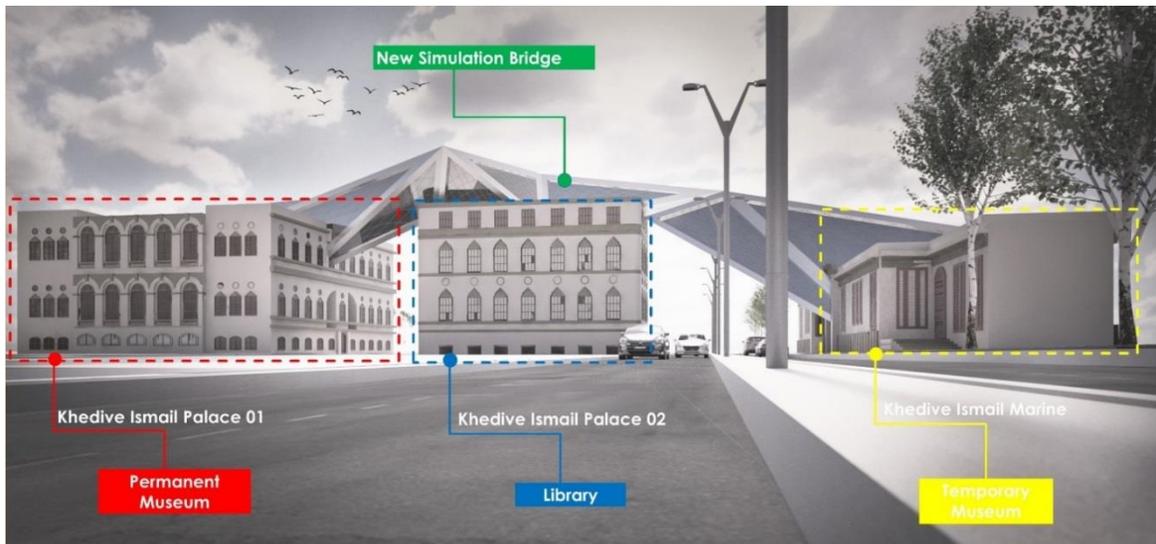


Figure 17: Simulation Study for Three building with the New Extension. (Researcher)



Figure 18: Virtual Shots of New Modeling. (Researcher's Rendering)



Figure 19: Virtual Shots of New Modeling. (Researcher /Rendering)

7.3. Tourism Value

Since repurposing historic structures as tourist attractions and raising the number of visitors which is considered as an indicator of success through the collection of admission fees, historic preservation is seen as a gateway to historical tourism (Shehata W. 2014).

The following factors are used to determine the economic value of historic property for tourism (Daily spending - Number of visitors). Evaluators with access to the most recent information, who have authorities in their disciplines, and who are familiar with the effects on the value of historic structures, do the best assessment for the economic value (Donovan Rypkema et al. 2011).

Conclusion

A building gains additional dimensions of investment and is given a new life because of the use of modern construction technology in the rehabilitation of its historical structures or by adding extensions that are suitable and safe to the original structure using the tools previously classified in the methodology of this research paper.

Mansoura city has a lot of historical buildings which belong to different eras; these buildings suffer from neglecting and passive rehabilitation. This paper studies one of the most famous historical buildings in the city which is called Khedive Ismail palace.

The deterioration phenomenon of historical buildings is a natural result of a variety of factors, the most important of which is the lack of flexibility in managing these buildings.

The new modeling links the three historical buildings with each other to simulate the old bridge by contemporary character through deconstructive form and using materials of aluminum and glass to reflect the other surrounding historical buildings, besides, keeping the external facades of palace buildings and inner plans with new re-using for spaces. The historical buildings become a tourism and investment attraction that supports their new purpose and supports their visual image by incorporating contemporary concepts of architecture into the addition of new structures to the old building.

Recommendations

The applications of rehabilitation methodologies and tools of re-using the historical buildings are beneficial to all parties such as the owner and government agencies through investment and tourism.

Not Applying new ideas and innovations to preserve the civilizational and cultural legacy will be lost from the identity and culture of the region and subject to disagreement between the owner and the government authorities. Using materials, a long-life cycle as structure and functional aspect by technological features to suitable usage.

This project is in high demand to build and retrofit a historical building in Mansoura city related to its historical events in this era.

For new uses of historic structures to be compatible with important values and sustainable development, it is necessary to identify and select the tools and methodology of rehabilitation.

Disclosure

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