Between the Tangible & Intangible Smart Reading of Heritage Buildings

Gehan A.N. Radwan[1], Sanaa Ibrahem Abdel-El-Maksud[2]

[1]*Assisstant professor of Architecture, The British University in Egypt, gehan.nagy@bue.edu.eg*
[2]*Assisstant professor of Architecture and Heritage Consultant, sanaamaksud@yahoo.com*

Abstract. Information era have brought out several technologies that have added a lot into heritage buildings, starting from documentation technologies, virtual presentation technologies, in addition to various dissemination techniques and technologies that connect the public with heritage buildings and spaces. Never the less, HBIM technologies have provided more depth in dealing with heritage buildings in the scope of efficiency, retrofitting in addition to management. All the previous smart technologies have dealt with tangible aspect of heritage providing a physical reading for buildings and spaces. This paper deals with the results of the use of technology in recording and documenting archaeological heritage buildings and the extent of its success in its goals, including the reading of history through the building to check the logic of the argument of Ebn Rushed in his book 'The Incoherence of the Incoherence', where he argues that: " If one looks into a made of any manufactures without perceiving the wisdom behind such made and the purpose intended, and if it does not stand originally with such wisdom one might think it is possible that there are so made, which agreed in any form and any quantity agreed and put any agreed-volume and in whatever order." Such argument will be investigated through the analysis of a case study with a proposed methodology to assess the results of retrofitting heritage buildings with the consideration of intangible historical aspects rather than tangible physical aspects alone.

Keywords: tangible heritage; intangible heritage; building memory; hidden wisdom; smart reading

1 Introduction

In recent years, the generation of 3D cultural heritage models has become of great interest to the architectural world. The reason behind the facilitation of such occurrence is the wide spread of recent technologies such as laser scanning and photogrammetry that has enabled the recording and documentation of cultural heritage sites. Such technologies have made it possible to accurately read and document complex heritage structures from a distance which would have not been possible with previous survey methods. In addition, smart reading of heritage buildings has enabled the presentation, analysis and archival of heritage

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documentation. Moreover, not only has it helped in the smart documentation of heritage buildings, it also has become of major significance to the restoration of such buildings. According to Charter of Venice, "The goal of the restoration is to preserve the aesthetic value of the heritage object", (Charter of Venice, 1964). However, in order to be able to accomplish a successful conservation practice, one must fully understand the historical background and the cultural heritage of the object. Moreover, value has always been the fundamental of heritage conservation. This paper aims to assert as well as explain the importance of understanding the cultural heritage and value behind the structure in order to accomplish both tangible and intangible smart reading and proper assessment of the building.

2 Building Reading Methods

According to Marta de la Torre, when it comes to the assessment and analysis of heritage buildings, there are two main types of assessment necessary to insure a successful conservation practice: Physical Condition Assessment and Cultural Significance and Value Assessment (Torre, 2002). The two types of assessment represent both the tangible and the intangible reading of the building. The following diagram represents a new simplified version of Torre's planning process methodology necessary for the conservation process.

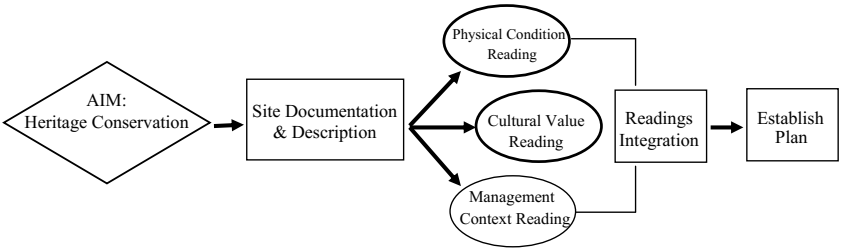

Figure 1 Heritage Conservation Planning Methodology

2.1 Physical Reading

Physical reading or assessment is crucial for the conservation practice where it involves heritage practitioners analyzing every physical aspect of the building in order to fully understand how to carry out the conservation process. Physical reading includes analyzing the current physical condition of the building, building materials, its construction system, the surrounding environment and natural factors, the building behavior, the external physical factors etc. All these physical aspects and more help form an accurate physical reading for the heritage building.

2.2 Heritage Value Reading

Heritage Value Assessment has become crucial in any heritage conservation practice since value strongly shapes the decisions that are made. The purpose of the heritage value assessment or evaluation is to understand the heritage significance of the subject building. One of the main drives of executing a Heritage Significance Evaluation is not to evade the heritage value of the object but rather advocate its value through its conservation. There is no standard method explaining how heritage significance should be evaluated. It merely depends on the structure and procedures vary throughout the world. According to Hermann and Rodwell, there are many types of heritage values such as cultural, economic, political, aesthetical and more which makes it slightly difficult to carry out a heritage value assessment (Carsten Hermann, 2015). However, when it comes to assessing heritage significance, cultural values are considered to be of outmost importance.

This following section will showcase a case study example where heritage value assessment (intangible smart reading) was a key factor in the success of a conservation process alongside the physical assessment.

3 Case Study

3.1 Case Study Introduction

The case study comprises the restoration of the Ahmed Ibn Tulun Mosque Minaret. Minarets are one of the most important elements in Islamic Architecture that are worthy of studying and analysing their contained building, art and decoration technique. In addition to being a wonderful record of all phases experienced by Islamic Architecture in Egypt, manufacturers competed and excelled in the refinement and development of its forms making the minaret of the Ibn Tulun a unique model between the Egyptian minarets. The Mosque is located in Cairo, Egypt and it is considered one of the oldest mosques in the city surviving in its original form. In addition, it is the largest mosque in Cairo in terms of land area.

3.2 Physical Reading

All physical data and analysis concerning the minaret were collected and documented in order to set a proper plan for the restoration process. Including physical measurement data where it was found that the dimensions of the minaret where in violation with the Nile Scale (54.05 cm) used in the construction of the mosque during a documentary of the minaret in 1993. Moreover, after the 1992 earthquake the minaret underwent a thorough examination where the internal examination showed that there is disintegration in the stones and breadth in the vertical seams, in addition some mortar was missing as two column hulls were displaced. Moreover, the external examination showed that the upper parts of two opposite columns (hull) of the upper

floor were shifted 5cm to the outside in addition to deterioration of the stones in the western direction and erosion in the southwest.

Figure 2 The effect of the 1992 earthquake

Furthermore, each climatic factor was analysed in terms of its effect on the physical condition of the minaret. This analysis showed that sunrays caused deterioration in the north-west, west and southwest facades. As for the temperature, it showed that the use of stone with different thicknesses and different grading provides protection even to the parts of smaller thickness through shade and shadows, thus increasing air movement because of difference in temperature. In addition, wind analysis showed that the difference in temperatures creates a difference in pressure causing air to move more efficiently as seen in figure 3. The direction, speed and intensity were monitored through wind movements in Cairo. Ventilation and its impact on the design of the openings were also analysed.

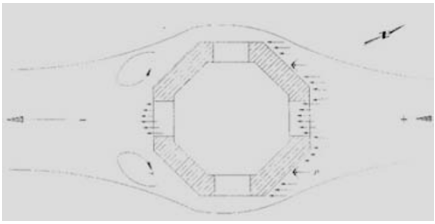

Figure 3 Wind movement in space surrounding minaret

Structural assessment of the minaret was also carried out and it included studying the balance and behavior of the minaret under the influence of static loads. The aim was to figure out a way to transfer those stresses as well as the distribution of loads and moments through structural elements, so that the restoration process can be carried out in an appropriate manner and allocate the elements of importance to transfer load.

After carrying out the physical assessment of the minaret and analyzing every physical aspect exits, it was of outmost importance to understand the history and the

historical value behind the minaret in order to carry out a proper restoration process that would preserve the original value of the minaret if not add to it.

3.3 Historical Value Reading

After conducting the physical assessment, it was important to understand the historical value of the minaret and fully comprehend the history behind its construction. After doing that it was understood that the architect had originally planned for the hulls of the columns on the east and west to be in two parts, thus determining the key movements and impact of the horizontal forces arising from the quake at those two locations. Therefore, it has to absorb most of the horizontal impact forces in the form of kinetic energy, not stresses and thus to maintain the equilibrium of the minaret in the new situation and to reduce the impact on the rest of the columns. Moreover, noticing the use of wooden beams on the upper part of the minaret shear frames, which led to reduced conformation horizontal incident at the top of the minaret. As a result, the hull minaret moves from high callus flexibility to stability. In addition, through the structural analysis of the manner of distribution of loads, Palmiznh found that the structural elements sectors were quite enough to withstand the stresses, therefore the re-construction of the minaret can continue and it was found that it was the best method of restoration. This process assessment was fundamental to study the importance and uniqueness of the minaret and to stress the genius of architecture in the Islamic period in addition to realizing the influence of the Muslim architecture on the dynamic loads of the wind and earthquakes.

Only when the historical value of the minaret was understood alongside analyzing its physical condition that, the restoration team was able to generate a proper and appropriate planning process for the minaret restoration where every aspect was taken into consideration to ensure a successful restoration.

3.4 Reading Integration outcome

When information gathered from the different assessments the restoration team was able to produce an outcome that would help shape the planning for the restoration. This outcome is as follows. The minaret was subjected to an earthquake in October1992, followed by another one in November 1993 and did not fall or collapse, which shows how equilibrium static force is stable in the minaret. When columns where shifted to the outside, the loads moved and where distributed to neighboring parts. However, Brazier was still out of equilibrium so there was no need for a solid purpose to lift the burden as much there was a need to follow the installation process accurately in order to require the work of a scaffold. In addition, there was a solid threshold for openings on the lower level because the openings weakens the wall and attracts cracks. Finally, the aim of the work done to the displaced parts is to take the vertical load in addition to avoiding any defect and fall of stones during restoration.

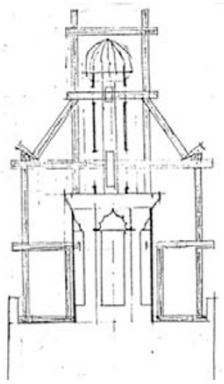

Figure 4 Suggested Scaffold

4 Conclusion

In conclusion, recent technologies such as laser scanning and more, has helped a great deal in the preservation of our herit/age and has enabled us to digitally document heritage buildings. However, smart reading of a heritage building does not only include tangible assessment and digital documentation, one must also assess the significance of the building by understanding its cultural and historical value; the intangible smart reading. One might say that the only thing smart in the smart reading of a building is being able to relive its history and learn from it. As seen in the showcased case study, only when tangible and intangible smart reading combine, does the conservation practice ensured to be successful.

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