

## **ARCHAEOLOGICAL REPLICA MODELS: A NEW VISITOR MANAGEMENT TECHNIQUE TO SUSTAIN THE HERITAGE SITES**

---

---

**KHALED SOLIMAN ABD ELHALEM**

**FACULTY OF TOURISM AND HOTELS, SOUTH VALLEY UNIVERSITY, LUXOR BRANCH  
EGYPT**

**DOAA ABDEL MOTAAL AHMED**

**FACULTY OF TOURISM AND HOTELS, MINIA UNIVERSITY, EGYPT**

**AHMED EBIED**

**FACULTY OF TOURISM AND HOTELS, SOUTH VALLEY UNIVERSITY, LUXOR BRANCH  
EGYPT**

### **ABSTRACT**

*Egypt is known all over the world by its unique heritage. Though, utilizing this heritage as a tourism attraction without using scientific visit management influences it negatively. Visitor management methods and techniques such as, limit of acceptable change, visitor impact management, carrying capacity, and visitor activity management process are some of the conservation tools that are used to reduce the negative impacts and protect the heritage sites. The current study attempts to gain a deep sight on the visitor management framework that could be used in the heritage sites particularly the Archeological Replica Models. The replica model of King TutanTutankhamen khamen tomb in Luxor city is used as a case study. Many research methods are used in this study such as; questionnaires targeted the tour guides and the archeological inspectors in the city of Luxor. Moreover observation checklist applied on the replica of Tutankhamen tomb. The main results of the study showed that replica models have an important role in preserving heritage sites and an effective instrument to sustain it. The Study recommended spreading replica models in other endangered cultural heritage sites, and achieving cooperation with foreign companies specialized in production of 3D facsimiles in order to transfer the skills and expertise to Egyptian experts.*

**KEYWORDS:** Archaeological, Heritage; King Tutankhamen; Replica Models; Sustainability; Visitor Management.

### **INTRODUCTION**

The continuous growing of international tourism since the 1950s, affects significantly on both natural and man built environments, this is caused by tourist activities (Youell, 1998). The cultural world heritage sites attract visitors from all over the world cases; hence those sites should be administrated to receive this large number of visitors. However particularly in developing countries, many of these sites have poor visitor management policies which need to be developed (Coccosis, et al., 1996; Shackley, 2000). Visitor management has become a very significant trend in many destinations all over the world; it plays an important role in sustainability, conservation, protecting and maintenance of cultural heritage sites (Wearing and Neil, 1999; Jayawardena, et al., 2008).

There are many methods and techniques used to manage the environmental and heritage sites. Shaw and Williams (2002) stated that these methods are visitor management, area conservation, environmental impact evaluation, estimated carrying capacity, and limits of acceptable change. Wearing (2000), declared that the previous methods as management guidelines used to hinder the impacts of recreational fields on the environmental resources. Furthermore Wearing mentioned other ways for managing heritage site such as visitor impact management and visitor activity management process.

Ancient Tombs in luxor at the west bank need asset of procedures for managing ,monitoring ,conserving and preventing site from deterioration as a result of badly managed visitation. Visitor management technique is considered an important way and useful to manage such various endangered heritage sites.

In this study replica models or facsimiles utilized as a technique that will help not only for enjoyment of the tourists but also preservation of such an international heritage.

The aims of the study are to assess the usefulness of the replica models in general and as a visitor management technique in the heritage sites in Egypt. As well identifying obstacles that face replicas and to determine the facilities and services that are required in replica models, the study focuses on these techniques because Valley of Kings suffers from many problems, such as crowd and erosion. Therefore inspectors are responsible for managing and preserving this ancient site using these techniques.

## **LITERATURE REVIEW**

Heritage tourism is considered as one of the fastest growing category of tourism industry, (Dans and Gonzalez, 2019).Heritage tourism has an increasing importance for outstanding global organizations and

governments such as, UNESCO. Visiting heritage sites has become one of several priorities in the motivation to travel. The demand for heritage tourism has increased because of an increasing awareness of heritage (Park et al., 2019). Heritage tourism provides essential economic and social contribution to host communities, considerable challenges face heritage tourism destinations, including the conservation of heritage sites (Little et al., 2019).

Cultural Heritage is defined as a group of buildings, archaeological sites and artefacts characterized by historical, artistic and scientific value (Bec, 2019). Heritage is considered inherent part of components of society cultures, beside traditions, customs, beliefs, rituals, arts and festive events (Kim, et al., 2019). The nature of heritage is unique, friable and matchless, therefore it needs sensitive utilize as well as an effective management to make it the substratum of tourism projects in a sustainable way. Consequently when someone understand the concept of sustainability and apply it, he will protect and conserve these sites for the long term (Asfaw, 2016).

### **SUSTAINABLE CULTURAL TOURISM**

Sustainability has been defined by the World Commission on Environment and Development (1987) as development that meets the present needs without prejudice to the future generations' ability to meet their needs (Tribe, 2005).

Sustainable Tourism has defined by Shaw and Williams (2002) as an approach that works for the long term viability and quality of both natural and human resources".

In 1998, the World Tourism Organization (UNWTO) defined sustainable tourism as a form of tourism that meets the present tourists and host regions needs while conserving and enhancing opportunities for the future (Asmelash and Kumar, 2019). Sustainable Tourism leads to manage of all resources in such a way that economic, social, and aesthetic needs can be achieved while preserving cultural integrity, essential ecological processes, biological variety, and life support systems (Safaei, 2017).

The increasing numbers of tourists have a positive impact on economics, but they impact negatively on the environment in all its aspects natural, cultural and historic fabric (Arslan, et al, 2016). Briefly if heritage sites are not managed carefully, conflicts between preservation and tourism will be happen. Because tourism activities do not take place without a cost, risks such as fire, graffiti, traffic congestion, atmospheric pollution, and

crowding are considered as among the major problems that threat heritage sites globally (Omar, 2013).

Balance between consuming and preserving cultural products is crucial. Attaining sustainable cultural tourism development is important for continuous benefit for cultural tourist, national governments, private sector and local communities. Cultural and heritage assets are often physically fragile, so they need to be handled carefully. So, display and carrying capacity should be planned and monitored carefully (Durovic and Lovrentejev, 2014).

### **VISITOR MANAGEMENT TECHNIQUES**

Visitor management is an essential instrument for achieving sustainable cultural tourism. It is a process used to affect visitor activities through maximizing their positive impacts and minimizing their negative impacts. The method has shown its proficiency and efficiency at various historic and natural sites for many years to diminish and prevent destruction to sites, animals, plants and geological features. It has increased in natural, cultural, heritage and historic sites, and this benefits both the guest and local society. Visitor management is vital to heritage sites; it provides high level of resource conservation. This will lead to tourist satisfaction and develop the economic of local communities, there is a conflict between the necessity of sites preservation and the people rights or people access (El – Barmelgy, 2013).

Different techniques should be applied to protect heritage sites from human effects. Carrying capacity of the site should be set up at first, before limiting visits. There are several ways could be undertaken to accomplish this limits as following: (Wearing, 2000; Swarbrooke, 1999).

- Limited utilize: through limiting the number of visitors yearly or daily; regulatory tactics concerning paying; controlling and limiting; the entrances' points or the patterns of the tourist activities and converting the visitors from the overcapacity sites to less ones to keep the sites up righteously
- Limited services and facilities: by reducing the number of sensitive site's visitors or close the site temporary in order to reduce the influences of the infrastructure
- Delivering information to the visitors before entering the site: using flyers and maps to improve the visitors' attitude toward the site this information should change the attitude and behavior of visitors not only to aware them.

- Replica models: This technique should be applied to decrease the pressure of visitation in the actual heritage sites, beside all this keep the visitors satisfy and in the same time preserve the original site.

## **REPLICA MODELS**

The concept of replica means a facsimile or an exact copy of original. it must represent the original and easily recognizable. Replica models are linked with fakes, experimental archaeology which means reconstruction archaeology, museum displays. For example the facsimile of museum displays is an important in case of the original model is damaged. Museum experts can display replica while the original is in storage, undergoing preservation or when it will be loaned out (Mcmanus, 2016). replica is also identified as establishment of an exact copy of an existing construction (Adeniran and Akinlabi, 2011).

## **SIGNIFICANCE AND FUNCTION OF REPLICAS**

If local museums can't rely on protection means for conserving Archaeological artifacts displayed. Original models will be transferred to another museum .in these cases local museums should use replica models in their displays as alternatives for the original. Therefore many reproductions are often showed at excavating sites. Replica is required in case of originals have been seriously destroyed, or when tombs are opened in carelessly way. In such cases facsimiles may be employed to make display more clear (Yan, 2010). Replica models play a vital role especially when something is lost, in addition to replicas work as records of current eroded monuments (Foster and Curtis, 2016).

A lot of important sites such as, Altamira Caves, The Thracian Tomb of Kazanlak, and Lascaux Caves are too fragile, too inaccessible and very small. So World Heritage Committee agreed to construct replicas in each case due to the negative impact of tourist activities in these sites. Replicas are designed to match the original model, as replicas contain the same original defects, same painting, and colors. Hence visitors can't distinguish between them. Lighting and electrical components are easily installed in replica sites. On the contrary this is not permission in the fragile original site. Replicas can use fans and other systems to control humidity and pollutions (Mcmanus, 2016).

Replicas are used as educational tools through helping children and students to understand culture and increase awareness of importance ancient monuments, this lead to make students more interested to acquire further information about these sites (Yan, 2010). A replica or facsimile have five main benefits for any site: replica can be considered an exact

copy, not an approximation of the original. It conserves and prevents further deterioration of the original site. It has the ability to offer an equivalent experience for tourists and associated income derived from them to ensure their continual involvement, education and pleasure. It also provides ongoing or additional occupations for local residents. It helps to record the original state of the site, together with any previously unrecorded and unobserved details (Byrnes, 2013).

## **FAMOUS REPLICA MODELS**

### **DECORATED CAVE OF PONT D' ARC**

Cave of Pont d' Arc Located in a limestone plateau of the Ardèche River in southern France, which contain the earliest-known and best-preserved figurative drawings in the world, dating back as early as the Aurignacian period (30,000–32,000 BP). These cultural properties considered the oldest and classified as a World Heritage site by UNESCO It contains more than 1,000 drawings, predominantly of animals, including several dangerous species, in addition to huge quantity of archaeological and Paleolithic vestiges. After it became clear that the cave will not receive visitors again because of the bad effects of visiting like moisture and air composition inside the cave which may damage drawings and paintings. (UNESCO, 2018)

The establishment of the Cavern of Pont-d'Arc is considered exclusive cultural, scientific and technological project in its design and in its dimensions (3 000 m<sup>2</sup> ground surface area and 8 180 m<sup>2</sup> of geological features - floors + walls + ceilings). The replica of the cave represents the geological and archeological signs such as; bones, fireplaces and imprints and full-size from the scanned originals. The project has asset of features such as:

- The Cavern of Pont-d'Arcbroje project considered the largest replica ever made. (The biggest replica project in the world),
- About 55 million dollars investment.
- The number of visitors per year from 300000 to 400000 people.
- It takes 30 months of work and it was opened in 2015.
- 35 companies contributed in this work. (Ardeche department, 2018)



Figure 1. The construction of Chauvet-Pont-d'Arc Cave replica.  
Source: (Amey, 2015)

Figure 2. Drawing design of the replica according to the original model.  
Source: (Amey, 2015)



Figure 3. Replica of the cave is the biggest in the world.  
Source: (Amey, 2015)

### **THE BRONZE OAK PROJECT**

The Bronze Oak Project aims to create special new public artwork through reproducing a life-size 900-year-old oak from Windsor Great Park (England) perfectly in bronze (Bronze Oka Project, 2018).

the project started in April 2016 and presented in October 2016 by Factum Arte company used techniques such as new scanning and 3D printing

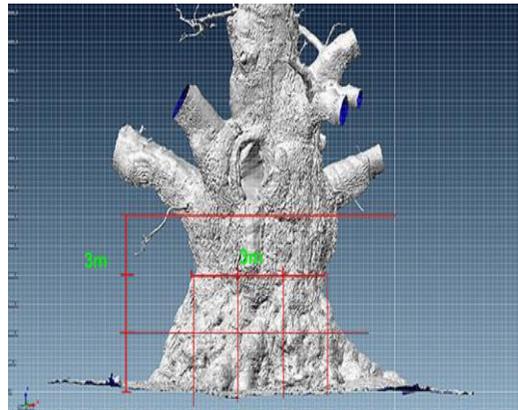
technology to make it possible to scan this 900 year old oak tree ( Factum arte Company, 2018c).



Figure 4. Old Oka tree at at Windsor Great Park, England.

Source: (Factum arte Company ,2018c)

Figure 5. Replica of Oka tree using 3D Technology.  
Source: (Factum arte Company , 2018c)



### **A REPLICA OF THE TOMB OF KING TUTANKHAMEN**

It is essential to note that each monument facing specified challenges. Tutankhamen’s tomb is small and the sarcophagus lid decrease the accessible working space. The tombs were designed to last but were never expected to be visited (Factum arte Company, 2018 b). Although there are restrictions on the tomb's visitor numbers, they still face many problems. These problems are caused by changeful heat, the dampness of human breath, organisms brought in on tourists’ clothing, the continuing vibration from tourist’s feet, and large volumes of sand-filled abrasive dust, which is difficult to eliminate without harmful pain work and plaster. Taking photographs by tourists damage paintwork by the cameras' flash. Using diesel transportations several years ago to transport tourists from the car park to the Valley of the Kings led to adding noise, fumes and oil into the mix, polluting the atmosphere. These problems lead to undermine the attachment of paint to plaster and plaster to the rock-cut walls. (Byrnes, 2013) as well as tombs were exposed to flash floods (Ogiso, et al, 2017).

## **BUILDING A REPLICA OF KING TUTANKHAMEN TOMB**

Due to the the threats to the tomb of Tutankhamen were raised in 2008. The supreme council of the antiquities agree with factum Art Company to carry out a project to preserve the tomb (Byrnes, 2013).

Factum Art Company started to reproduce an exact copy of the original tomb using advanced 3D technologies and recording them to replicate the original tomb (Factum arte Company, 2018 a). In the spring of 2009 the responsible entities completely recorded the burial chamber and sarcophagus in the tomb of Tutankhamen. The replica of Tutankhamen tomb was completed in 2011 and fixed at the entrance of the Valley of the Kings near the Carter House. 30th April 2014 Its officially opened. The tomb's replica established underground using natural ventilation and climate control (Factumfoundation, 2018 b).

### **THE OBJECTIVES OF THE PROJECT**

This project encourages the sustainable management of the world's cultural heritage in conjunction with the mass tourism and massive popular interest. The facsimile has very specific objects:

- To promote a positive and sustainable approach to tourism and to encourage awareness that sustainable tourism can be a positive force in the conservation of Egypt's cultural heritage.
- To simplify the transmission of technology and skills to set up workshops on Luxor's West Bank.
- To create long term skilled jobs in Luxor (Factum arte Company, 2018 a).



Figure 6. The west side of the sarcophagus is recorded through 3D structured light scanner recording  
Source: (Factumfoundation, 2018a).



Figure 7. The assembly process of the tomb.  
Source: (Neild, 2014)

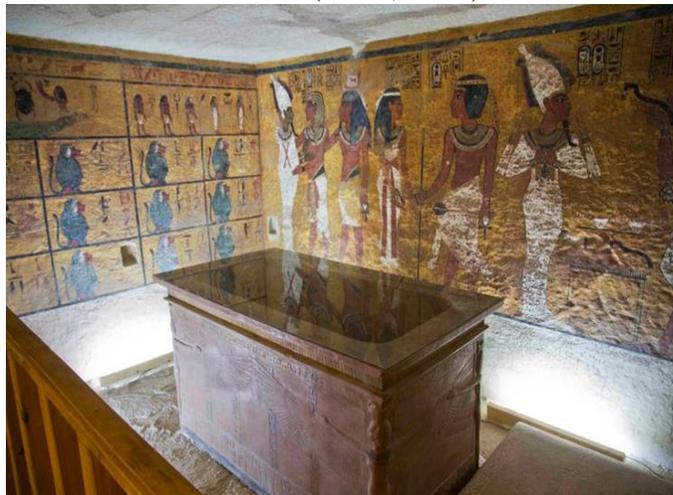


Figure 8. Facsimile of the Tomb from inside.  
Source (Nicholson, 2012).

## **METHODOLOGY**

The aim of this study is to assess the usefulness of the replica models in general and as a visitor management technique in the heritage sites in Egypt. Mixed method (Quantitative and Qualitative) have been undertaken to achieve the previous aim.

Questionnaire strategy was implemented with a Likert scale (1 strongly disagree and 5 strongly agree), and it is analyzed through SPSS program. A questionnaire form was designed based on the related literature review.

The questionnaire was divided into four main parts. Part one is about personal data. The second part was dedicated to the importance of replicas in the preservation of archaeological heritage, it consists of 17 elements. The third part aimed to know what the disadvantage of replicas is, and it consists of 5 elements. Final part is about Importance of facilities and services in replicas model.

Personal Observation checklist was designed to be completed by an observer to determine or evaluate the level of facsimile of King Tutankhamen tomb in Luxor. This checklist contains 13 items as follow; Lighting Service, Ventilation service, Carrying capacity, Take pictures, Number of entries to the Tomb, Facilities for visitors with special needs, Distance from the original model, Facilities and Services, Providing information for the preservation and sustain of tombs, Security and Camera Check, Parking, The road to the replica tomb, Transportations.

The population of this study includes tour guides and archeological inspectors at historic sites in Luxor to know the importance of replicas; its disadvantages; and explore their views about facilities and services in replicas model. Survey forms are distributed among tourist guides and archaeologists at historic sites in Luxor, A total of 85 questionnaire forms were distributed among tour guides and inspectors, only 58 questionnaires were collected (31 tour guides and 27 archeological inspectors).

Data analysis were conducted by using the Statistical Package for Social Sciences (SPSS) version 25 Appropriate statistical analyses such as means, standard deviations are calculated for all variables, Cronbach's alpha to measure internal consistency, T-Test, Analysis to identify the differences between guides and inspectors with regard to importance of replicas; its disadvantages; and facilities and services in replicas model, Correlation Coefficient Test to confirm the internal validity of the items. Questionnaire forms responses contain a five point Likert scale, respondents were asked to indicate their level of agreement or disagreement for each variable.

Cronbach's alpha was used to assess the reliability for all scales, Reliability coefficient of 0.70 or higher is considered "acceptable" in most social science situations. In this study, the Cronbach's alpha was used to assess the reliability of the data. This is due to the fact that Cronbach's alpha is a meaningful measure of internal consistency of a survey. The results showed that the alpha coefficient was above 0.80 which indicated that the instrument was reliable for being used.

**FINDINGS AND DISCUSSION**

According the main aim and the methodology of this research the researchers displayed the results in two themes as follows;

**THEME ONE: THE IMPORTANCE AND THE REQUIREMENTS OF REPLICA ACCORDING TO TOUR GUIDES AND ARCHEOLOGICAL INSPECTORS.**

The main characteristics of the research sample declared that, 74.1 % of the sample was males and 25.9% of the sample was females. Regarding to job 53.4% of the sample were tour guides, 46.6 % were archeological inspectors. As for Experience 44.8% of respondents have an experience From 5 to 10 years, 37.9% of respondents have an experience More than 10 years, and 17.2% of respondents have an experience Less than 5 years. The majority 79.3% of respondents have Bachelor’s degree , 17.2% of respondents have Master degree , 3.4% of respondents have PhD degree .

**Table 1: The importance of replicas in preserving archaeological heritage**

Statements	Mean	SD	Rank
Replicas are an important way to preserve the original site from the risk of increasing number of tourists.	3.56	1.2155	9
Replicas are an important for preserving Original archaeological sites from the wrong behaviors of some tourists.	3.58	1.1244	8
Replicas are one of the successful ways in case of the original model is exposed to climate changes like Temperature, humidity and dust that affect negatively on it.	3.87	0.8393	4
Replicas are an essential in case of the original model is lost.	3.51	0.9776	11
Replicas help in increasing life of the original model.	3.51	1.2029	11
Replica models are considered as a mean of sustainable development for preserving Egyptian cultural heritage.	3.44	1.0950	12
Replica models provide income as a return of visiting the new site.	3.12	1.0273	15

Replicas are projects that serve local community by creating long-term Job opportunities.	3.74	0.9833	6
Replica models are used as learning tools for school and university students.	4.17	0.8194	1
Replica models are a new tourist attraction beside the original model.	3.20	1.0721	14
Replica models use modern technology such as 3D and colors that are more visible enabling researchers and academics to study and understand the tomb in a clear way.	4.15	0.8746	2
Replica models document the original model.	3.96	0.8157	3
The replicas raise awareness among visitors about the risks which the original models are exposed and the need to preserve them.	3.68	0.9589	7
Replicas are more appropriate than traditional conservation and restoration methods to preserve unique sites.	3.34	1.1630	13
The creation of replicas with modern technology will help to transfer such technology, expertise and skills to Egyptian experts	3.82	0.9576	5
Replicas will help to follow the status of the original models and the changes happened on it.	3.53	1.0296	10
Replicas are used as promotion of the original product and tourist destination, especially if they are abroad.	3.87	1.0273	4

The aim of this question was to find out the importance of replicas in preserving archaeological heritage. As shown in table (1), the first rank has been given to statement which indicates that the replicas are used as learning tool for school and university students. with a mean of (4.17) and standard deviation 0.8194, followed by replica models use modern technology such as 3D and colors that are more visible enabling researchers and academics to study and understand the tomb in a clear way, With a mean 4.15 and standard deviation 0.8746.the statement which

indicates that replica models document the original model has been ranked as the third with a mean 3.96 and standard deviation 0.8157 ,the statement that indicates that replicas are one of the successful ways, in case of the original model is exposed to climate changes like Temperature, humidity and dust that affect negatively on it., has been ranked as the fourth one with a mean of 3.87 and standard deviation 1.0273. In the last rank statement which indicates that Replica models provide income as a return of visiting the new site, with a mean of 3.12 and standard deviation 1.0273.

**Table 2: Disadvantages of replicas**

Statements	Mean	SD	Rank
Replica models are against property rights.	3.72	1.2109	1
Replica models haven't a historical value.	2.91	1.1283	4
Replica models are costly and require more time and great effort to implement it.	3.22	0.9559	3
Replicas have a negative influence on cultural tourism.	2.91	1.0806	4
Egyptian replica models around the world will impact on the rates of Egyptian tourism negatively.	3.48	1.3277	2

To determine the disadvantages of replicas, the respondents were asked to identify from their point of view these disadvantages. The results in table (2) indicated that the most important obstacle facing replica models are against property rights, with a mean of 3.72 and standard deviation 1.2109, followed by Egyptian replica models around the world will impact on the rates of Egyptian tourism negatively with a mean of 3.48 and standard deviation. Lastly, two items: Replica models haven't a historical value with a mean of 2.91 and standard deviation 1.1283, in the same rank Replicas have a negative influence on cultural tourism with a mean of 2.91 and standard deviation.

**Table 3: Facilities and services required in replica models**

Statements	Mean	SD	Rank
Lighting and ventilation services are well provided.	3.82	1.0283	7
Carrying a large number of tourists.	3.86	0.9261	6
There are visits to people with special needs.	4.24	0.8847	1
Close to the original site.	3.60	1.3499	9
Visitors and journalists are allowed to take pictures and use camera flash in replica models.	3.78	1.0609	8
There are a sufficient number of entrances and exits for easy traffic.	4.12	1.0273	2
There is a library containing important books on archaeological and heritage site beside replicas.	4.24	0.7329	1
Replicas have halls to display paintings and screens to view documentary films on the site.	4.10	0.7652	3
Replicas have Bathrooms beside it.	4.01	1.1919	4
Restaurants and cafeterias are available near replica models.	3.94	0.9809	5

The detailed examination of the results presented in Table (3) reveals the respondents' responses pertaining the importance of facilities and services in replica models; the first rank have been given to statements there are visits to people with special needs. There is a library containing important books on archaeological and heritage site beside replicas, with a mean of 4.24, followed by sufficient number of entrances and exits for easy traffic.

With a mean 4.10, the statement which indicates that replica models should have bathroom beside it with a mean 4.01. The lowest mean score is 3.60 in the statement which indicates that replica model should Close to the original site.

**Table 4: Significant differences between tour guides and archeological inspectors**

Statements		T	P-value
The importance of replicas	Replicas help in increasing life of the original model.	2.258	0.028*
	Replica models are considered as a mean of sustainable development for preserving Egyptian cultural heritage.	2.267	0.027*
Disadvantages of replicas	Egyptian replica models around the world will impact on the rates of Egyptian tourism negatively	-1.813	0.075*
Facilities and services required in replica models	Close to the original site.	2.064	0.044*

\* Statistically- significant difference where P-value < 0.05.

According to table (4) that displays the result concerning the Tour guides' and Archeologists' evaluation of The importance of replicas in the preservation of archaeological heritage, the study assured that there is a significant difference between tour guides and Archeologists with regard to the following statements : replicas extend the life of the original model. Where the value of T is equal (2.258) and this value is statistically significant at level (0.028).

Replica models mean sustainable development to preserve Egyptian cultural heritage where the value of T is equal (2.267) and this value is statistically significant at level (0.027).

There is a significant difference between them with regard to the statement which indicates that replica models should be Close to the original site, where the T value is equal (2.064) and this value is statistically significant at level (0.044). there is a significant difference between tour guides and Archeologists with regard to Egyptian replica models around the world will impact on the rates of Egyptian tourism negatively the value of T is equal (-1.813) and this value is statistically significant at level (0.075).

There are not significant differences between tour guides and archeological inspectors with regard to residual statements, but tour guides are more support to replica than archeological inspectors.

## **THEME TWO: ASSESSMENT OF THE KING TUTANKHAMEN REPLICA ACCORDING TO THE PERSONAL OBSERVATION**

The researcher analyzed the facsimile of King Tutankhamen tomb according to a scientific observation form. The results showed that the original tomb and its facsimile are the same. The analysis of the observation checklist revealed the following:

- Lighting Service: It is well inside the Tomb and everywhere, the replica is designed so that the lighting from the ground with yellow color appropriate to the shape of the tomb.
- Ventilation service: available to some extent, there are only 2 ground fans in the tomb, also it is not adapted and buried under the sand.
- Carrying capacity: Small size bears almost 15 people and no more.
- Take pictures: Visitors are not allowed to take pictures and use camera flash.
- Number of entries to the Tomb: only one entrance.
- Facilities are available for visitors with special needs: Facilities for guests with special needs are not available.
- Distance from the original model: somewhat close to the original tomb, it is approximately 8 km away from the original model, located at the entrance of the Valley of the Kings. The site is close to Carter House and there is a museum.
- Facilities and Services (toilets, Cafeterias and restaurants, rest stop, bazars, tourist market.....): toilets are not available in or beside the replica, and the existing toilets are dedicated to the management and staff of the place, while the service of restaurants and cafeterias is not available, also there are no rest stop, bazars, and tourist market in the area close to the replica of king Tutankhamen Tomb.
- Providing information for the preservation and sustain of tombs: Provide information like raising awareness of the dangers facing the tombs in the Valley of the Kings and the need to create a replicas models to achieve sustainable development.
- Security and Camera check not enough, there are no surveillance cameras inside the Tomb, and there are no electronic checkpoints.
- Parking: The existing car park is very small, not suitable for large numbers of cars and buses.
- The road to the replica tomb: The current system of lighting outside the tomb is unsatisfactory and inappropriate. Roads are paved to the Tomb, but from Carter's house to the replica, the road is sandy.

- **Transports:** The vast majority of visitors to KV travel by bus, Taxis and private cars are the second most common means of transport. Horse carriages, donkeys, tramline, and bicycles are rare.

## CONCLUSION

The aim of this study is to assess the usefulness of the replica models in general and as a visitor management technique in the heritage sites in Egypt questionnaires are distributed among tour guides and archaeological inspectors at historic sites in Luxor The study showed that replica models have an important role in preserving heritage sites and an effective instrument to sustain it. The results highlighted that replica models help in extending the life of the original model by reducing visits to the original and replacing it by replica, Replicas are one of successful ways, when the original model is exposed to climate changes like Temperature, humidity and dust that impact negatively on it, replicas play a very positive role as (educational tools) for school and university students. As well as they are important in case of the loss of the original model. Replica models will help to follow the status of the original models and the changes happened on it. Also replica models facilitate the transfer of technology and skills to Egyptian experts and the ability to do this. These moles promote and encourage an awareness of sustainable approach to conserve heritage sites, in addition to this, the study showed that also replica models have some disadvantages, the most notable defects are Replica models are against property rights especially abroad and the Egyptian replica models around the world will impact on the rates of Egyptian tourism negatively. The results revealed the importance of services and facilities which should be taken into consideration like Lighting and ventilation are well provided. Availability visits to disabled people, as well as library, restaurants, cafeterias and Bathrooms should be near replica models, and replica models should have halls for displaying paintings and screens to view documentary films on the site.

The results showed that replica models are applied in many heritage sites like Tombs, Museums, caves ... etc.

## **RECOMMENDATIONS**

According to the study results, some recommendations should be provide such as:

- Raising awareness about the importance of replica models in preserving original models, as a tool for sustainable development.
- Generalize replica models in other endangered cultural heritage sites.
- Achieving cooperation with foreign companies specialized in production of 3D facsimiles in order to transfer the skills and expertise to Egyptian experts.
- Promoting replica models through tourist governmental and private sectors using web sites, brochures, newsletters and social media.
- Encouraging visits by schools and colleges to replicas, as they are considered an educational tool for spreading tourist and archaeological awareness among these students.
- Providing facilities and services alongside replicas such as bathrooms, restaurants, cafeterias, and specialized libraries.
- Reviving the lost artifacts by making replicas and resurrecting them.
- Providing visits to disabled people.

## **REFERENCES**

- Adeniran, A., and Akinlabi, F., (2011). Perceptions on Cultural Significance and Heritage Conservation: A case study of Sussan Wenger's building, Osogbo, Nigeria, *African Journal of History and Culture*, 3, (5),73- 88, Available at <http://www.academicjournals.org/AJHC> (Accessed 6/04/2018).
- Amey, K., (2015). It's Just Like Stepping Back in Time! Stunning Replica of Chauvet Caveand its 36,000- year- old wall Drawings to open to Tourists. *Daily Mail*, March Available at: [https://www.dailymail.co.uk/travel/travel\\_news/article-3009681/Replica-Chauvet-Pont-d-Arc-Cave-open-France.html](https://www.dailymail.co.uk/travel/travel_news/article-3009681/Replica-Chauvet-Pont-d-Arc-Cave-open-France.html) (Accessed 22/4/2018).
- Ardeche Department, (2018). The Decorated Cave of Pont-d'Arc Inscribed on UNESCO'S World Heritage List. Available at: [http://www.ardeche.fr/cms\\_viewFile.php?idtf=1030&path=59%2F1030\\_811\\_CP-UNESCO\\_UKV2.pdf](http://www.ardeche.fr/cms_viewFile.php?idtf=1030&path=59%2F1030_811_CP-UNESCO_UKV2.pdf) (Accessed 20/4/2018).
- Arslan, T. V., Yeke, S. T., and Durak, S., (2016). Significance of Cultural Heritage Preservation in Sustainable Cultural Tourism: Muradiye Complex in Bursa, Turkey, *European Journal of Sustainable Development*, 5, (4), 1-12.

- Asfwa, G. W., (2016). Visitor Management and Stakeholder Involvement as Tools of Heritage Management in Aksum: Northern Ethiopia, *African Journal of Hospitality, Tourism and Leisure* Vol. 5, (2). 1-15.
- Asmelash, A. G., and Kumar, S. (2019). Assessing Progress of Tourism Sustainability: Developing and Validating Sustainability Indicators. *Tourism Management*, 71, 67–83.
- Bec, A., Moyle, B., Timms, K., Schaffer, V., Skavronskaya, L., and Little, C. (2019). Management of Immersive Heritage Tourism Experiences: A conceptual Model, *Tourism Management*, 72, 117–120.
- Bronzeoak project, (2018). Available at: <http://www.bronzeoak.org/proposal/> (Accessed 22/11/2018).
- Byrnes, A., (2013). Replicating the Tomb of Tutankhamon. Conservation and Sustainable Tourism in the Valley of the Kings, *Egyptological*, 8. Available at: [http://www.factumarte.com/resources/files/fa/texts/Text\\_tut\\_Andrea\\_Byrnes.pdf](http://www.factumarte.com/resources/files/fa/texts/Text_tut_Andrea_Byrnes.pdf) (Accessed 6/04/2018).
- Coccosis, H.; Priestly, G. and Edwards, J., (1996). Sustainable Tourism: European Experiences, CAB International, London.
- Dans, E., and Gonzalez, P., (2019). Sustainable tourism and social value at World Heritage Sites: Towards A conservation Plan for Altamira, Spain. *Annals of Tourism Research*, 74, 68–80.
- Durovic, M., and Lovrentjev, S., (2014). Indicators of Sustainability in Cultural Tourism, *A multidisciplinary journal of global macro trends, Macrotheme review* 3, (7), 180-189.
- El- Barmelgy, H. M., (2013). Visitor Management Plan and Sustainable Culture Tourism (Presenting the VMP project for the Cairo Citadel of Salah El Dien), *International Journal of Education and Research*, 1, (12), 1- 29.
- Factum Arte Company (2018 a). Exact facsimile of the Tomb of Tutankhamun installed in Luxor Available at: [http://www.factumarte.com/download?f=resources/files/ff/Media/Luxor\\_installation\\_PR\\_April\\_2014\\_FINAL\\_ENG.pdf](http://www.factumarte.com/download?f=resources/files/ff/Media/Luxor_installation_PR_April_2014_FINAL_ENG.pdf&n=Luxor_installation_PR_April_2014_FINAL_ENG.pdf) (Accessed 20/4/2018).
- Factum Arte Company (2018 b). The authorized Facsimile of the Burial Chamber of Tutankhamun with Sarcophagus, Sarcophagus lid and the Missing Fragment from the south Wall . Available at: [http://www.factum-arte.com/resources/files/ff/publications\\_PDF/Tutankhamun\\_Report\\_2012.pdf](http://www.factum-arte.com/resources/files/ff/publications_PDF/Tutankhamun_Report_2012.pdf) (Accessed 20/4/2018).
- Factum Arte Company (2018 c). The Bronze Oak Project. Available at : <http://www.factum-arte.com/bronzeoak> (Accessed 22/11/2018).

- Factumfoundation (2018a). Recording the Tomb of Tutankhamun. Available at: <http://www.factumfoundation.org/pag/207/Recording-the-Tomb-of-Tutankamun> (Accessed 22/4/2018).
- Factumfoundation (2018 b). Shipment to Cairo and Installation in Luxor. Available at: <http://www.factumfoundation.org/pag/211/Shipment-to-Cairo-and-Installation-in-Luxor> (Accessed 20/4/2018).
- Foster, S. M., and Curtis, G. W., (2016). The Thing about Replicas- Why Historic Replicas Matter, *European Journal of Archaeology* 19, (1), 122-148.
- Huh, J. (2002). Tourist Satisfaction with Cultural Heritage Sites: The Virginia Historic Triangle, MA.Thesis, Blacksburg, Virginia. Available at: [www.http://scholar.lib.vt.edu/thesis/available/etd05142002171010/unrestricted/thesis.pdf](http://scholar.lib.vt.edu/thesis/available/etd05142002171010/unrestricted/thesis.pdf) (Accessed 8/6/2008).
- Jayawardena, C., Patterson, D., Choi, C., and Brain, R., (2008). Sustainable Tourism Development in Niagara: Discussions, Theories, Projects and Insights, *International Journal of Contemporary Hospitality Management*, 20, (3), 258- 277.
- Kim, S., Whitford, M., and Arcodia, C. (2019). Development of Intangible Cultural Heritage as A sustainable Tourism Resource: The Intangible Cultural Heritage Practitioners' Perspectives. *Journal of Heritage Tourism*, 1–14.
- Little, C., Bec, A., Moyle, B. D., and Patterson, D. (2019). Innovative Methods for Heritage Tourism Experiences: Creating Windows into the past. *Journal of Heritage Tourism*, 1–13.
- Mcmanus, R. L., (2016). An Analysis of Full-Scale, Ex Situ Replicas of World Heritage Sites, Master Thesis, The graduated Faculty of The University of Georgia ,Athens. Available at: [https://getd.libs.uga.edu/pdfs/mcmanus\\_rebecca\\_1\\_201605\\_mhp.pdf](https://getd.libs.uga.edu/pdfs/mcmanus_rebecca_1_201605_mhp.pdf) (Accessed 04/ 04/ 2018).
- Neild, B., (2014). King Tut Replica Tomb opens to Public in Egypt, Cable News Network, May, Available at: <https://edition.cnn.com/travel/article/tutankhamuns-replica-tomb-egypt/index.html> (Accessed 22/4/2018).
- Nicholson, H., (2012). A facsimile Fit for a Pharaoh: Replica of Tutankhamun's Tomb unveiled in Egypt, *Daily Mail*, November. Available at: <https://www.dailymail.co.uk/travel/article-2232766/Replica-Tutankhamuns-tomb-unveiled-Egypt.html> (Accessed 22/4/2018).
- Ogiso, Y., Sumi, T., Kantoush, S., Saber, M., and, Abdelfattah. (2017). Risk Assessment of Flash Floods in the Valley of the Kings, Egypt, *DPRI Annals*, No. 60 available at:

- <http://www.dpri.kyoto-u.ac.jp/nenpo/no60/ronbunB/a60b0p54.pdf>  
(Accessed 6/04/2018).
- Omar, H.,(2013). The development of Sustainable Cultural Heritage Tourism in Malaysia: Implication for Planning and Management, Ph.D. Thesis, Newcastle University, Available at:  
<http://etd.uum.edu.my/3595/7/1092.pdf> (Accessed 8/ 7/ 2018).
- Park, E., Choi, B. K., and Lee, T. J., (2019). The Role and Dimensions of Authenticity in Heritage Tourism, *Tourism Management*, 74, 99- 109.
- Safaei, N., (2017). The Increase in Sustainability Level of Heritage Tourism Through the Dynamic Planning Model, *International Journal of Scientific and Engineering Research*, 8, (8), 1766- 1770.
- Shackley, M., (2000). *Case Studies from World Heritage Sites*, Buterworth Heinemann, Oxford.
- Shaw, G. and Williams, A. M., (2002). *Critical Issues in Tourism: A Geographical Perspective*, Blackwell Publishers Ltd, 2<sup>nd</sup>, Ed., UK.
- Swarbrooke, J., (1999). *Sustainable Tourism Management*, 2<sup>nd</sup> ed., CABI Publishing, Oxon, UK.
- UNESCO, (2018). Decorated Cave of Pont d’Arc, known as Grotte Chauvet-Pont d’Arc, Ardèche. Available at:  
<https://whc.unesco.org/en/list/1426> (Accessed 22/4/2018).
- Yan, B., (2010). Significance of Originals and Replicas in Archaeological Site Museums With a Case Study of the Han Dynasty Site Museums in China, ICOM General Conference in Shanghai, China,7-12 November, Available at:  
[http://network.icom.museum/fileadmin/user\\_upload/minisites/icmah/publications/Actes-Shanghai-complet2.pdf](http://network.icom.museum/fileadmin/user_upload/minisites/icmah/publications/Actes-Shanghai-complet2.pdf)
- Youell, R., (1998). *Tourism, an Introduction*, Longman, New York.
- Wearing, S. and Neil, J. (1999). *Ecotourism, Impacts, Potentials and Possibilities*, Buterworth-Heinmann, Oxford, Boston.