

# Towards Sustainable Documentation of Geographical Names of Touristic and Heritage Sites in Occupied Jerusalem Using Geographical Information System (GIS)

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## Abstract

Geographical Information System (GIS) is an important tool in documenting and managing archaeological and heritage sites in the city of Jerusalem in order to benefit from its high capabilities in monitoring, documentation, analysis, presentation and other capabilities required by the documentation of archaeological and heritage sites in Jerusalem with their Arabic names, which deal with large amounts of spatial and descriptive data, also to maximize the use of spatial data collected on archaeological and heritage sites in Jerusalem, and the conversion of geographical databases electronically, which allows more than one user or management access to data and modifying it simultaneously, which saves a lot of time, effort and cost in medium to long term, giving later a wide horizon for disseminating data and designing practical applications, and contributing to the electronic and comprehensive documentation processes of archaeological and heritage sites in the city of Jerusalem in a sustainable manner. The study has concluded that it is important to adopt modern technology systems in documenting Arabic names of heritage sites in order to preserve these names for future generations and to resist the Judaization and preservation of these names over time. Moreover, this study recommended to adopt the proposed documentation system and to expand the processes of building electronic databases to Jerusalem and other Palestinian cities in order to sustainably protect it based on scientific foundations that contribute in providing the electronic database.

**Keywords:** Geographic Information System (GIS), Spatial Decision Support System (SDSS), Logical Model, Physical Model,) RS (Remote Sensing), occupied Jerusalem.

## 1. INTRODUCTION

Proper planning, whether environmental planning for natural resource management, urban planning, or economic planning has become an urgent necessity to ensure the growth of any society. This planning requires a great deal of accurate and detailed information that is closely related to the land. The process of collecting, organizing, analyzing, presenting and coordinating this huge amount of information in a system that allows retrieving it easily to be placed before decision-makers are the main concern of the Geographic Information System (GIS). Indeed, adopting information systems reduce costs, build staff morale, enhance service quality, and respond quickly to the increasing demand from customers (Masa'deh et al., 2013; Kateb et al., 2015). There must be a great deal of accurate and detailed information closely related to the land and the process of collection, organization, analysis, presentation, and coordination of this information, although it is so large, has become a system that it could be called easily and quickly opened and restored.

Geographic Information systems (GIS) has become a newly developed and important tool to reserve geographic information about the nature of places and monitoring all resources in it and analyzing them besides setting models for them as well as monitoring the effects resulted from touristic development, Geographic information systems (GIS) have been adopted as a useful tool by a wide range of disciplines and solving variety of planning problems to making good decisions, find solutions for marketing and delivering better services (Dangermond, 1990; Davis, 1993; Rumor, 1993; Woodbury, 1996; Van and Pienaar, 1997; Joerger et al., 1999; Rachel, 2007; Haklay et al, 2008; Bazazo, 2009a; Bazazo, 2010a).

We find that it has become an essential tool in the analysis and as a means of presenting touristic and archaeological places and other resources in the form of geographical maps contribute to the provision of all information and data that support touristic planning. Geographic Information System (GIS) technology is a system based on the availability of computers, software packages, geographical data, maps, aerial photographs,

satellite images and tabular data, operated by qualified personnel. This system collects, stores, updates, processes, analyzes and displays all forms of geographical data (Miller, 1993; Carver, 1995; Heywood et al., 1998; Dumper, 2002; Bazazo, 2012).

The objectives of the study sought to achieve building an electronic database containing all heritage and archaeological sites in the holy city. Documentation of geographical names of heritage and archaeological sites in the Holy City, Providing scientific reference that contains all archaeological and heritage sites that have been Judaized and their Arabic names have been changed and Providing a sustainable historical record that documents all the geographical names of heritage and archaeological sites in the Holy City for future generations (Welfare Association, 2004).

The issue of the sustainable documentation of heritage and archaeological sites in Jerusalem, in particular, the documentation of geographical names in the Holy City, is one of the important means of preserving the names of these sites for future generations. The maps are the most important aspects that can contribute to documenting these sites geographically in their Arabic names, However, geographic databases mean more than mere mapping, since they are databases of all spatial data or attributes data, some of which are linked to specific geographic locations (coordinates), and others have various forms, such as: tables, pictures, films, written and cartographic documents, No doubt that (GIS) technology has the potential to be effective in documenting these sites, as a digital repository, as well as the distinct analytical capabilities of these data provided by these systems in processing of spatial databases (Bazazo, 2009b; Bazazo, 2010b).

Geographic Information Systems (GIS) are considered packages of data, data and extensive application for sustainable tourism development. The use of spatial data (environmental) to explore conflicts, study impacts and assist decision-making for organizations and tourism companies (Crerar, 1998). GIS plays a role in examining environmental conditions. Impact assessment and simulation are increasingly important in tourism development, examining the relevance of sites to proposed developments, and identifying conflicting interests and modeling relationships. Systematic assessment of environmental impact is often hampered by lack of information but also by data integration, manipulation, visualization, and analysis tools. It is known that some respondents in the studies were aware of these issues. The conscious and positive decision not to use GIS is based on a full understanding of its advantages. We can summarize attitudes towards the information system through a knowledge assessment when users interact with the features of the information system elements. Tourism often uses geographic information systems to determine the suitability of sites for tourism development. The interoperability of land, free use, availability of infrastructure, and the enabling or restriction of natural resources are the basic geographical variables used to determine the potential and capacity of a city or region as a tourist destination (Large, 1996; Loughlin, 1998; Rojas, 1999; Barndt, 2004; Bazazo, 2011; Predrag, 2015).

## **2. PROBLEM OF THE STUDY**

The study seeks to demonstrate the importance of Geographic Information System (GIS) in documenting archaeological heritage sites in their Arab geographical names in a sustainable way in the city of Jerusalem, and attempts to manage and plan it through the construction of a geographic database which helps to manage and to plan heritage and archeological sites to reach a sustainable and comprehensive documentation of these sites, according to the multiple applied used fields. These uses are based on differing views on the definition and classification of the applied objectives, in order to preserve the old Arab geographical names, which have been replaced by Jewish geographical names, especially in recent times.

In order to do that, the study tries to answer the following questions:

How to document the geographical names of heritage and archaeological sites using ARCGIS software in the Holy City.

How could Geographic Information System be used to manage and to develop heritage and archeological sites by applying it to touristic sites in Jerusalem?

## **4. THE IMPORTANCE OF THE STUDY**

1. Utilization of GIS applications in the documentation of Arab geographical names in Jerusalem and the management of heritage and archeological sites.
2. Designing a practical model to apply geographic information systems in documenting heritage and archeological sites in Jerusalem.
3. Preserving the heritage and archaeological sites in their Arabic names by providing a comprehensive database characterized by sustainability and continuity.

### *4.1 Justifications for the study*

The importance of the city of Jerusalem from religious and historical perspectives at the international level. Preserving the Arabic geographical names of the heritage and archaeological sites in Jerusalem that have been exposed to Judaization process rapidly in recent times.

## 5. OBJECTIVES OF THE STUDY

The study aims to achieve a number of objectives that contribute to the development of a general vision of a proposed electronic system that can be built in order to document the geographical names of the heritage and archeological sites in the Holy city. Here we refer to a number of objectives that the study seeks to achieve, such the followings:

- 1-Building an electronic database containing all heritage and archaeological sites in the holy city.
- 2-Documentation of geographical names of heritage and archaeological sites in the Holy City.
- 3-Providing scientific reference that contains all archaeological and heritage sites that have been Judaized and their Arabic names have been changed.
- 4-Providing a sustainable historical record that documents all the geographical names of heritage and archaeological sites in the Holy City for future generations.

## 6. THE SITE OF THE STUDY

The city of Jerusalem is located in the heart of Palestine on a rocky hill at 25.13 North and 52.3 east of Greenwich. The city was built on four highlands surrounded by a group of valleys. The city is surrounded by mountains such as Ras Abu Ammar and Mount of Olives, it rises (291) meters above the sea, Kidron, Hinnom, and Tyropoeon Valleys intersect in an area just south of the Old City, Jerusalem is 60 kilometers east of the Mediterranean Sea and approximately 35 kilometers away from the Dead Sea. It is bordered to the east by the city of Jericho and to the west by the towns of Ramle and Lod, from the north by Ramallah and from the south by Bethlehem. Jerusalem is connected by main roads that penetrate the highlands from the far north to the far south. The city of Jerusalem is divided into two parts: the Old City (East Jerusalem). It is full of religious monuments and includes most of the holy sites. The most important of these are the Al-Aqsa Mosque, the Holy Shrine of the Muslims and the Church of the Resurrection. The new city (West Jerusalem): that is supplied with modern buildings and roads.

## 7. STUDY METHODOLOGY

The study is based on the proposal of building an electronic system for all archaeological and heritage sites in the Governorate of Jerusalem, this geographical database are founded on a number of technical stages and methodological steps that include: needs assessment, logical design, physical design, applications design, execution, and turnover. The stage of determining the current situation and estimating the required needs of hardware, devices, data sources, transmission networks, applications, programs and operating systems for the implementation of the proposed system, as well as the human competencies required to perform the required work. Identification of the needs of the documentation of heritage and archeological sites from the geographical data layers in Jerusalem. Determine the operating systems and GIS software required to manage the system. Specify the specifications of servers, workstations, computers, data and data transmission network, data protection methods and storage capacities for the system. In addition to determining the number of human disciplines required to establish the system.

The process of building and designing the proposed system includes the design of the logical model, the physical model of the geographic database, the design of the methodology for the production of baseline map of the environment of the GIS, and the design of the data and information transmission network through the establishment of a data and information network for heritage and archaeological sites in Jerusalem, by providing and creating a baseline map of heritage and archaeological sites from the available sources of topographical maps and satellite imagery representing the study area, using the physical model based on the management and processing of geographic databases.

The stages of building a database related to all heritage and archaeological sites in Jerusalem: data collection and correction. The spatial data includes all forms of data related to heritage and archaeological sites in Jerusalem that is connected to specific coordinates monitored by Global Position System (GPS) technology, since each heritage or archaeological site in the Holy City is determined specifically by two coordinates (X, Y), or three dimensional coordinates (X, Y, Z). the Spatial data is classified in three groups of features when represented in maps: Point features, Line features, Arial Features (Radwan,1999).

The proposed system depends in documenting the Arabic geographic names of the heritage or archaeological sites in the Holy City on the aid of Aerial Photographs and Satellite Images after defining their coordinates so as to make a clear comprehensive image through what is known by Mosaic and Stereovision by using Stereoscope Scanning of many Arial images. The second stage is represented by inserting geographic data and its descriptive information and building the database where the previously collected data is translated from Hard Analog media into Digital Format that could be utilized by the computer through GIS software. The final outcome will be a complete system that includes all information based on spatial databases and its descriptive information that has the ability to deal with the huge amount of data and manage it in a perfect and sustainable manner.

The proposed system is based on utilizing GIS programs (ARCGIS) which are characterized by its superior ability to treat spatial data and performing in depth analyses in an accurate and flexible way, moreover these programs have the ability to connect non-spatial data in the database with spatial data, so we made the GIS Relational Data Base that enable us to perform documentation processes for all the heritage or archaeological sites in the Holy City with the possibility to get information related to each archaeological site comprehensively, the matter which provide an important tool in the process of documenting, managing and developing all the heritage or archaeological sites in the Holy City and preserving its Arabic names in its sustainable form enhanced with digital map comprised a number of layers that include all natural and human information.

## 8. BACKGROUND OF STUDY

GIS applications has been used for operations research and for analyzing the network characteristics of the site, the value of this application lies in its ability to identify areas of potential risk from activities. The subject of the current study is a very modern subject, using the technological means based on the use of geographic information systems and remote sensing in the documentation process in the Holy City. Most of the previous studies used a number of traditional methods in the documentation of heritage and archaeological sites in the Holy City. In addition, the current study is based on the documentation of the Arab geographical names of the heritage and archaeological sites in the Holy City. Therefore, we see that the studies that dealt with this subject are characterized by scarcity and inclusiveness, and were limited to studies based on partial foundations. Therefore, we see that the studies dealt with this subject are characterized by scarcity and inclusiveness, and were limited to studies based on partial foundations. The most important studies are the study of the Jerusalem Documentation Center in 2015, which focused on the most important ideological basis of the geographical names of Palestinian cities and their Judaization mechanisms reviewing the most important Palestinian cities and villages, whose names have been changed. The study concluded that the Palestinian Arab names should be documented and supported in order to document these names in a sustainable manner, while (Abu Alhaija, 2001) in his study entitled "Conservation of Palestinian Urban Heritage: The Danger of Destruction and Methodology of Documentation," documents some of the important resources concerned with Palestinian urban cultural heritage, identifies problems of archaeological and traditional buildings' registration under occupation and the lack of modern scientific approach. It also presents analytical studies and scientific methodology in order to prepare basic fundamentals of documentation process from the administrative and technical point of view, also the study highlights the Palestinian urban cultural heritage on the local and international levels, and proposes legislative and planning tools necessary to conserve the urban heritage and organize the documentation phases.

(Al-Tafkeji, 2013) the study, entitled "Preservation of Arab Geographical Names as an Arab Heritage and the prevention of its change and its disappearance," used many tools for the documentation of geographical names of Palestinian cities and villages, based on topographic and historical maps, especially issued by the United Nations. The study has monitored the most important sites that have been Judaized and their names have been changed.

The present study is a continuation of what others have started in an attempt to document the geographical names of heritage and archaeological sites in the city of Jerusalem through the use of technological means, by providing spatial databases for all Arab sites that have been Judaized, and to give Arab national figures to all heritage and archaeological sites in the Holy City. These figures are comprehensively connected and provided with digitized images and schematic layouts that contribute to the sustainable conservation of these sites for future generations. The proposed system is based on a number of layers in documenting the geographical names of the archaeological and heritage sites in the Holy City. The digital map contains a number of layers; these layers contain all the information in the study area, as shown in Figure (1).



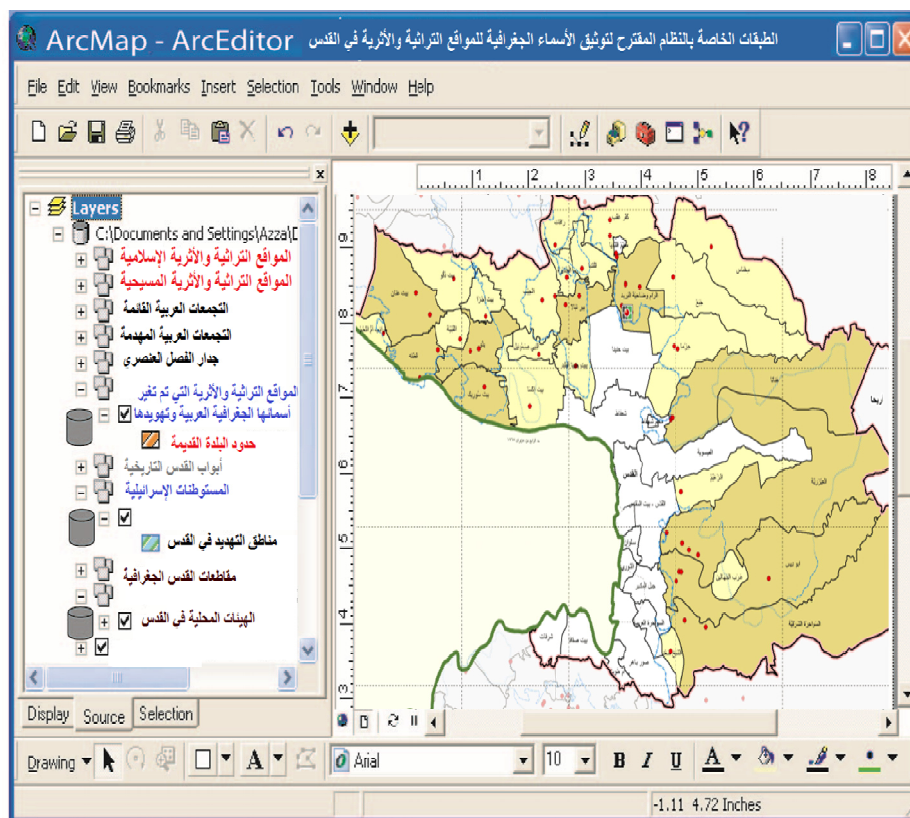


Figure 1. System contains a number of layers in the study area

Figure 1 shows that the proposed system contains a number of layers in the study area. These layers included all the topics related to the process of sustainable documentation of the geographical names of archaeological and heritage sites in Jerusalem, including:

1. The layer of Islamic archaeological and heritage sites in Jerusalem.
2. The layer of Christian archaeological and heritage sites in Jerusalem.
3. The existing and destroyed Arab complexes.
4. Arab geographical names that have been Judaized and changed.
5. The districts of Jerusalem.
6. Local bodies in Jerusalem.
7. Israeli settlements and the wall of the apartheid wall

The proposed system provides the possibility of identifying all the details of the heritage and archaeological sites in the Holy City, and its geographical distribution, with the possibility of providing descriptive data tables linked to the spatial database known by digital coordinates, using the satellite data as shown in Figure (2)



Figure 2. Islamic and Christian heritage and archeological sites in the Holy City

The proposed system provides the possibility of identifying the Islamic and Christian heritage and archeological sites in the Holy City, in addition to the possibility of identifying the changes in this site over time, and the extent of Judaization of the names of these sites as shown in Figure (3).

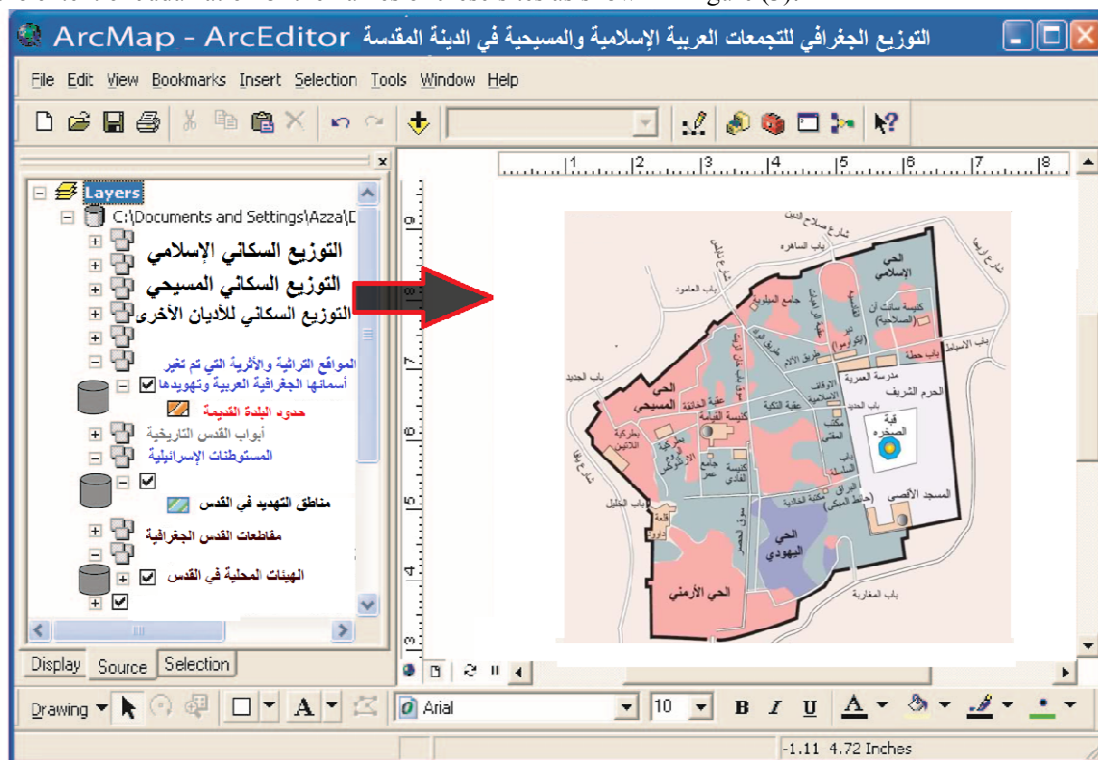


Figure 3. Identify the most prominent cities and villages

The proposed system provides us with the ability to identify the most prominent cities and villages whose geographical names have been changed and replaced by Jewish names as shown in Figure (4). The system provides a comprehensive view of all sites whose names have been changed and linked to precise geographical coordinates.

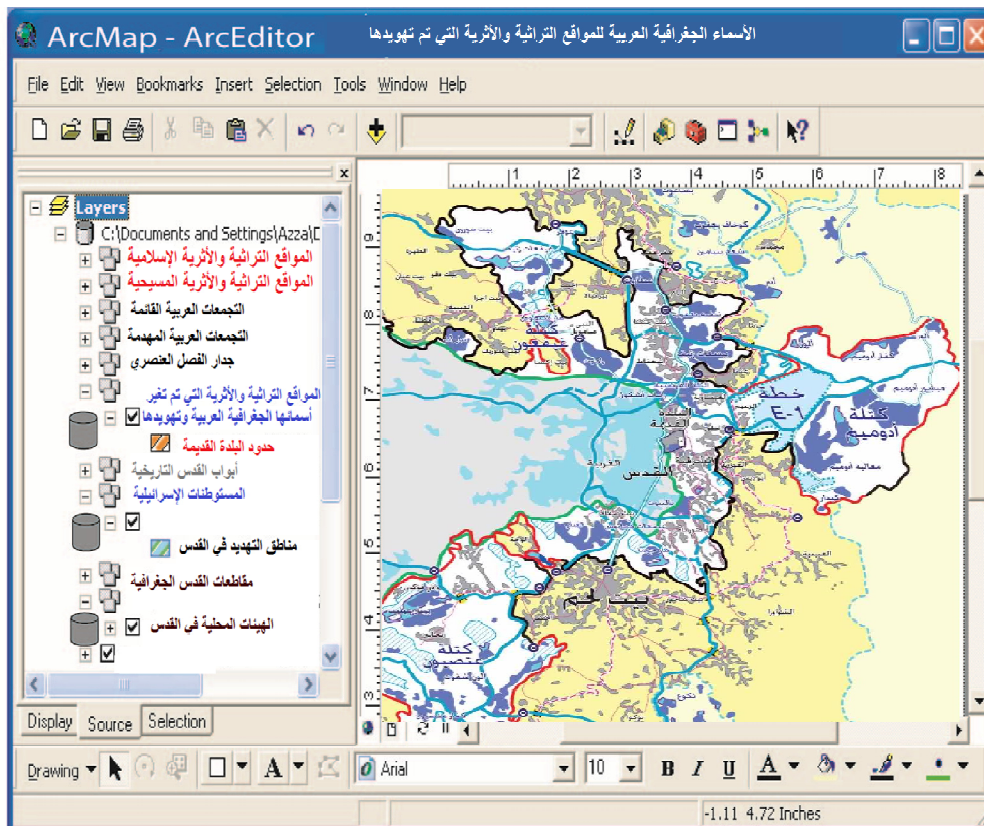


Figure 4. Identifying the Arab geographical names of the heritage and archaeological sites that have been changed and Judaized

The proposed system provides the possibility of identifying the Arab geographical names of the heritage and archaeological sites that have been changed and Judaized by a variety of patterns of Jewish labels, as shown in Figure (5). Anisotropic Names: an example of the most important Arabic sites whose name has been change is Jerusalem that renamed as Judea and the south of Jerusalem has become Simeon, while the heart of Jerusalem is known as Mia Shearim. Talmudic names: One of the most important examples of this type of designation is the area of ShichMarzouk Mountain southwest of Jerusalem has been named bar Giora after *Simon* bar Giora , one of the major Judean rebel factions during the First Jewish-Roman War in 1st-century. The names belong to the rabbis, such as: Abu Madin, near the Western Wall, is named after the Jewish poet Yehuda Halevi.

The names belonging to Zionist symbols: such as Jabal Al-Shorfa located west of Jerusalem which is, was named Herzl when the bones of the founder of the first Zionism was transferred to it in 1949. The names belonging to Zionist warriors as reminiscent of their names: Examples of this type are the designation of the Jerusalem mountains in the name of haganah because it was the place where secret training of the Haganah gangs was held during the British mandate, and Tel Ha Tayasim in commemoration of the fall of six pilots in the 1948 war. The names belonging to the nature of the place: Examples of this type mountain head of the Lord named Har Ourah named after the plant watercress spread in the region. The names belonging to the leaders of Israel, such as Tel Al-Masharef in Jerusalem, were named after Minister Moshe Haim, and one of the old doors of Jerusalem was named Mordecai Gore Street near the door of the tribes. The names attributed to the Israeli colonies. Distorted name from Arabic, Names translated into Hebrew.





Figure 5. System to document the heritage and archaeological sites in the Holy City

It is clear from the above the great possibilities offered by the proposed system to document the heritage and archaeological sites in the Holy City in all spatial analysis and connectivity, with the possibility of processing and updating data in a timely and accurate manner, without high costs, providing a reliable geographical database in performing temporal comparisons more easily compared to traditional means.

## 8. Conclusion

The system proposed in this research shows the importance of adopting geographic information systems, remote sensing and all supporting technological means, and their impact on the accuracy and quality of the final outputs in documenting the heritage sites in the Holy City. The main findings of the study are as follows, the touristic and heritage sites of in occupied Jerusalem that have great cultural and economic value in recording the history of people and communities, represent the greatest witness to its civilization, and the true historian of its various stages and varied throughout history. The research confirms that the occupied Jerusalem contains many valuable touristic and heritage sites, which have not been documented or recorded yet, so they must be quickly documented and classified as heritage areas in all its details and characteristics and then develop the best methods to maintain the nature of urbanization and social structure.

The documentation of archaeological and heritage sites using geographic information system (GIS) is characterized by saving time and effort and relying on aerial photographs, satellite and topographic maps with high precision, and conducting accurate analyzes and results in a very short time when documenting archaeological and heritage sites. Easy access to the effective geographical database of heritage and archaeological sites, which helps to analyze the spatial and descriptive data stored in it, and easy identification of all the sites that have been Judaized and their Arabic names have been changed. Provide the proposed system outputs of projectors, presentations, and reports in a professional image of high quality. The possibility of managing the geographical database of archaeological and heritage sites and storing them centrally. The possibility of editing and spatial analysis by several users, departments electronically. Provide high capacity to deploy the GIS database through the Internet or Intranet for more than one user, which maximizes its utilization. Provide high flexibility in expanding the Scalable archaeological database.

Also, several researchers consider the information systems and in particular the information technology (IT) and its flexibility as an enabler to achieve the desired competitive advantages, and as a crucial support to operational and strategic business decisions (Shannak and Obeidat, 2012; Tarhini et al., 2016); thus further research is required to examine the role of such IT applications in enhancing the managerial decisions regarding documenting and managing archaeological and heritage sites in the city of Jerusalem in order to benefit from its high capabilities. Attention should be given to preparing a geographical database for all regions in Palestine in

order to document all sites with the same Arab name and to preserve them for future generations. Establishing a geographic information system center, provided with digital maps and descriptive information by institutions, this center will electronically link all institutions concerned with heritage and archeology. Expanding the use of geographic information system technology on a wider scale in the inventory and documentation of archaeological sites throughout Palestine. Issuing a unified electronic Atlas of all archaeological and heritage sites in Jerusalem in particular and Palestine in general. Work on the inclusion of heritage and archeological sites in their Arabic names on the UNESCO list.

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