

# The possibility of applying the geographic information system (GIS) to the management of hotel investment organizations: The hotels in Najaf Governorate as a case study

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## ABSTRACT

The current paper focuses on the possibility of using a geographic information system (GIS) to detect the locations of hotels in Najaf Governorate to provide accuracy, speed, time, and cost in providing service to visitors. The geographic information system is an advanced technology that provides several advantages to its users, whereby the locations of buildings and places can be determined, as well as providing descriptive information about each location.

## Keywords:

## Introduction

The geographic information system (GIS) is one of the outcomes of the data revolution that the world is experiencing nowadays. It identifies the geographical locations of countries, cities, forests, tourist and archaeological sites, and other uses that are not only specified for civilian uses but also extend to military uses. The current study investigates the possibility of using GIS to detect the locations of hotels in Najaf to reduce the time available to the Tourism Department

of Najaf and tourism companies in directing visitors towards available hotels as well as identifying the class of hotels, whether first or second class, etc. Moreover, this research examines the location of the hotel, its proximity to the sacred site, and the features it has in terms of serving the visitor, such as housing, eating, cleaning, etc., as it is possible to obtain these services through the geographical information system.

**First: The concept of the geographic information system (GIS).**

The word 'Geography' is of Greek origin "Geographica". It consists of two syllables: 'Geo', which means 'Earth', and the second, 'Graphica', which means description with images. On this basis, geography was early defined as "the description of the land or its image." The first definition of geography was "the science that studies the earth and its natural and human phenomena" (Al-Shammari, 2007: 15). The development that the world has witnessed in the field of information technology and the increasing need to develop maps of places as a result of the urban development of countries, have demonstrated the need to find a system that helps build accurate maps, preserve them from damage, and benefit from them when necessary in determining the locations of cities and countries. Therefore, the Geographic Information System arose. Although it has been used for many years in the natural resources, forestry, and environmental industries, it has recently begun to be used in a wide range of business fields and management functions, such as site logistics, facility management, marketing, decision-making, and planning. (Azaz, 2011: 299).

According to Al-Khafaf and Al-Abadi (2003), the name of GIS indicates that the GIS consists of two parts: the system and the geographic information. The system is meant to be the medium that allows the management of data and information. This process includes input, processing, and output. As for geographic information, it is spatial information that includes digital data, statistics, and cognitive facts, which necessitates the need to present this information in the form of a system or information packages that serve the decision-maker in the field to which he belongs, whether political, economic, or administrative, as well as the scientific researcher in all fields (Abdul, 2008: 11).

GIS has extended to the processing of geographical data, which is often also called spatial data. This means that GIS provides specific functions for data types, methods of accessing spatial data, and methods of data analysis (Wolfgang, 2000: 1). Geographic Information System (GIS) technology is being

used by enterprises worldwide to manage websites, data, and any localized knowledge. The purpose of this is to display certain data so that businesses and government agencies may enhance communications and better arrange their data, consequently improving the process of decision-making. (Bohari et.al, 2008: 2).

When organizations use GIS to generate maps, the information they need will appear. This is what is called business geography (Haag et.al, 2007: 189). GIS is defined as GIS in which hardware and software are integrated for the purpose of collecting, managing, analyzing, and displaying data in the form of geographic information. (Antouskova & Mikulec, 2010:6). It is also known as an applied form of computer technology that is concerned with performing special functions in the field of processing and analyzing information in a way that suits the desired applied goal, relying on distinguished human and electronic competence. (Nazir, 2001: 2).

On the other hand, Abdel Samad and Batayneh (2003:7) define GIS as a technology that uses a computer to collect, enter, process, and analyze spatial and descriptive data linked to a geographical source and transform it into information by storing, outputting, and displaying it in a way that suits its users. Both Oz Moy and Smith-Segerman defined GIS as a group of automated functions that produce advanced automated capabilities in the field of storing, analyzing, displaying, and retrieving data linked to its geographical location (Al-Dulaimi, 2006: 17).

Al-Samarrai and Al-Zoubi (2004: 35) defined GIS as the systems used to collect, organize, classify, and contain a huge amount of geographical information, process, interact, and provide outputs that help workers in the field of geography carry out their work efficiently and effectively. It is also an electronic system of input, storage, management, display, and analysis of data, whereby geographical locations can be accurately linked (Rob, 2003: 90).

### **Second: The emergence of the geographic information system.**

GIS was first used by Roger Tuveson, who was called the father of geographic

systems, in Canada in 1964. During the 1970s, the number of companies specializing in GIS software and the number of specialists in this field increased. Along with the spread of computers and the decline in software prices, the 1970s witnessed a significant improvement in software and the possibility of using it to perform several tasks. After that, the spread of GIS in the United States began. In 1967, GIS was used in New York for land use management, and in 1969, it was used for regional purposes in Minnesota. In 1970, a scientific bulletin was issued by the US Fish and Wildlife Foundation, which stated that the GIS reached 54 systems in 1977. Since then, government organizations have taken responsibility for the development of their own GIS, specifically after the development of both satellite imaging technologies and the computer industry, with the increased possibility of storing information (Al-Dulaimi, 2006: 21-22).

In the 1980s, geographic information systems spread in most countries of the world in a more developed manner than before. It has spread throughout the Arab world, including Iraq, and the companies that manufacture these systems have begun to work on developing the capabilities of the new systems in terms of physical components as well as creating modern and advanced software used for modern systems. The American Environmental Systems Research Institute (ESRI) has had a significant impact on spreading modern and advanced systems and software in most parts of the world. (Abdul, 2008: 13)

### **Third: Advantages of GIS.**

The GIS achieves several advantages for organizations, including: (Al-Shammari, 2007: 45)

1. Facilitating the process of drawing maps, regardless of their size, with high accuracy, so that people can use them in their work.
2. Facilitating the process of saving data with large maps inside the computer so that they can be easily accessed and modifications made.
3. Ease of displaying data on maps without the need to project them manually, as

the required data is displayed in the form that the user needs and with great ease.

4. Ease of making backup copies of data and maps and using them when needed.
5. Performing searches within spreadsheets. For instance, if we want to find a piece of land with special specifications, we can specify these specifications so that the computer can search and display the results in a short period of time.
6. Performing calculations on spreadsheets.
7. One of the modern advantages of this system is the ability to create 3D maps and benefit from them, especially in the case of mountainous cities or those located in non-flat areas.
8. In the field of street networks, the tools of the program can be used to analyze the paths and choose the most appropriate ones.
9. One of the new features is the ability to connect between several computers via local networks or the Internet to view and exchange data at high speed.
10. The most important thing that distinguishes GIS programs is their amazing and continuous development, which will meet all the needs related to human life.

### **Fourth: Elements of GIS.**

The GIS consists of the following elements: (Al-Dulaimi, 2006: 45)

1. Spatial and descriptive information.
2. Basic GIS software.
3. Automated computers.
4. Labor (human element).
5. Tools used in GIS.

### **Fifth: Functions of GIS.**

The GIS performs several functions for its users: (Al-Taani, 2010: 43)

1. Spatial (cartographic) representation of Earth's surface phenomena and their descriptive information.
2. Data linking.
3. Data query (data inquiry).
4. Displaying data.

5. Outputs such as maps, reports, figures, and illustrations.
6. Data analysis.

### Sixth: Stages of GIS work.

In order to work on GIS, there are several steps that must be followed: (Abdul, 2008: 13-14)

(1) Collecting geographical and statistical data through:

A- Remote sensing includes:

- Satellite images.
- Aerial photos.
- Digital camera images.
- Ground positioning system.

B- Thematic maps.

C- Tabulated statistical data, such as tabulated statistical and descriptive text data.

(2) Entry: After the data is collected, the process of entering it involves using:

A- Direct methods, including:

- Numbering is used to enter maps.
- The scanner is used to input satellite and aerial images.
- The keyboard is used to enter text and numerical information.

B- Indirect methods, using programs to convert data from different systems to the GIS used.

(3) Data conversion: In this phase, the data is transferred and converted to the information base, whether according to the Raster or Vector system.

(4) Storage: In this phase, the edited data is stored, either temporarily on the hard disk in the computer memory or permanently on a floppy disk or laser disk.

(5) Processing: In which data is received from the input devices and stored in a way that preserves its accuracy, retrieved, updated, and re-represented after being processed and analyzed by the database management systems available in the system used. Processing includes several tasks, namely:

A- Cartographic functions include:

- Changing the scales of maps (minimize or maximize).
- Changing the map projection, as some programs in the systems allow dealing with several projections (planar,

Mercator, transverse, Lambertian, Cassini, and others).

- Creating base maps through the ability to draw at the required scale, delete, add, and sign symbols and map keys.
  - Creating new maps requires merging one or more layers of the maps that have been entered.
  - Measuring the displayed features (distances, areas, volumes, and coordinates).
- B- Spatial tracking or spatial search for point, linear, and spatial locations or phenomena to determine angles and distances.
- C- Statistical analyses: These include simple, descriptive statistical operations that show centrality measurements, redundancy analyses, and diffusion measurements with more complex correlation coefficients. The GIS can also perform complex statistical analyses such as spatial autocorrelation and neighborhood analyses.

Sixth phase: Output: It includes the results obtained from using the system, such as maps, graphs, tables, and appendices. It is displayed either on a display screen or in the form of discs or paper sheets, whether on a printing device or a drawing device.

### Seventh: Stages of Establishing GIS.

When adopting GIS, organizations must follow the following stages: (Al-Sirafi, 2005: 202-206)

1. Initial study of the system: When thinking about establishing a new system, all or some of the following factors should be taken into account:
  - A. Work need.
  - B. The damage to the current system and its numerous problems.
  - C. Viewing new technology updates.
2. Determining the purpose of the system: After the organization has confirmed the desire to build the system, it must precisely define the goals desired by the system. This information is extremely important for the systems analyst later on, as it represents a guide that he keeps in mind during his later work. At this

stage, the organization must inventory its resources and capabilities so that the purpose is clear and within the reach of the organization's capabilities.

3. System feasibility: This means studying the financial costs resulting from developing the system. All components of the system should be taken into consideration, including equipment, individual salaries, management, etc.
4. System analysis: The organization must provide systems analysts with the opportunity to obtain all data in all ways. It requires workers to cooperate with them and provide them with the information they need.
5. System design: In this stage, system designers study the necessary steps to implement the system and transform it from an idea into a tangible reality.

This is made through several stages:

- A. Establishing system specifications.
- B. The costs of the competent authorities for implementation.
- C. Training on the system.
- D. System maintenance.

#### **Eighth: The proposed model for GIS in hotel management**

Tourism is one of the most important and rapidly expanding industries in the world, and it contributes to increasing the gross national product in some countries. The Geographic Information System (GIS) has the advantage of connecting information and databases associated with the place it expresses and has the superior ability to easily store, recall, and analyze metadata and geographical data. Maps, aerial photographs, and satellite images are considered the main sources of geographical data, as this data is converted into multiple layers, as shown in Figure (1). For instance (roads, waterways, urban areas, etc.), each of them is considered a layer. Therefore, it is easy to deal with it on the map in a way that allows adding, deleting, or hiding some components of the map. This is what distinguishes digital maps. The GIS links the landmark to its geographical location on the map with descriptive information (Al-Taani, 2010: 39–40). For instance, if someone wants to detect the location of a hotel in Najaf and learn about the number of guests, the date of their stay at the hotel, the date of departure, and other information, this information will appear in the form of symbols on the map and associated statistical tables.

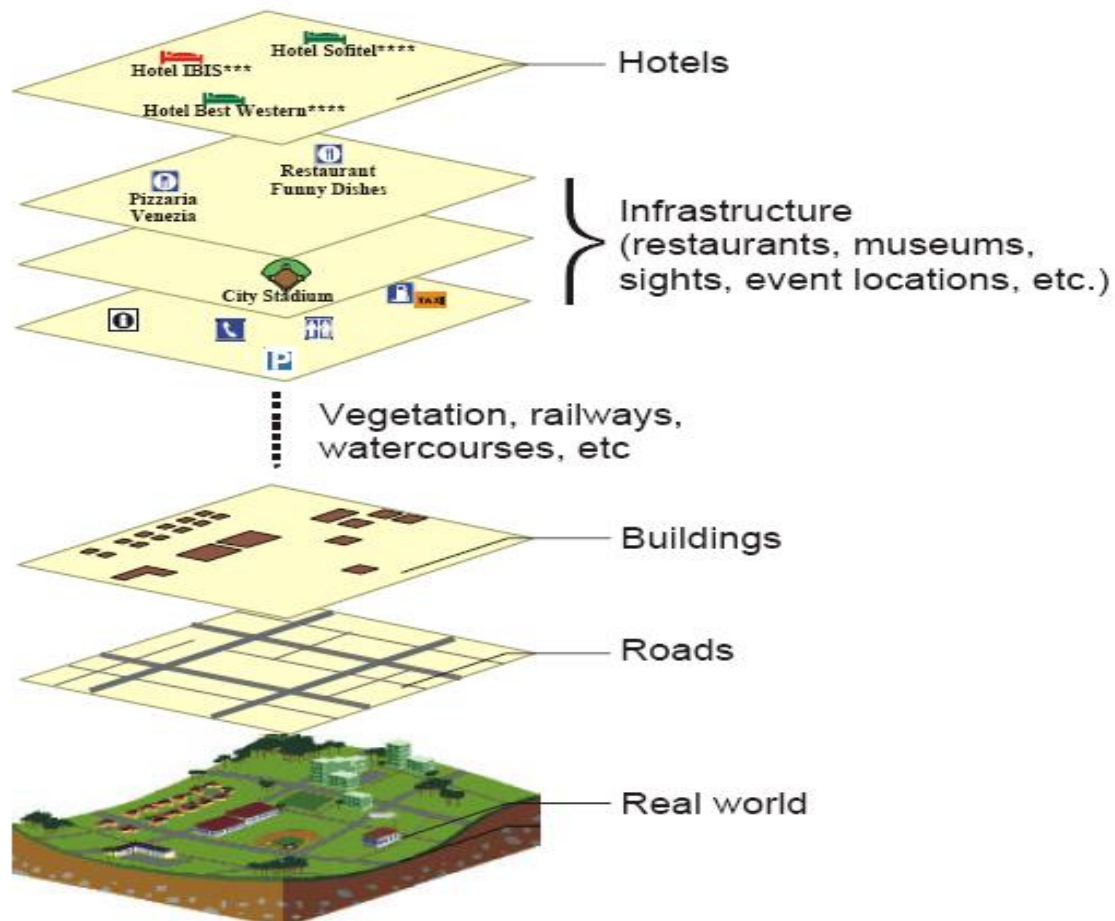


Figure (1) GIS hierarchy in determining the location of the hotel

Source: Jovanovic&Njegus,(2008),”the application of gis and its components in torism”,Yugoslav journal of operations research,vol.18,no.2

The proposed GIS model for hotel management consists of the steps mentioned in paragraph six as follows:

(1) Collecting geographical and statistical data on the hotels included in the governorate by Tourism Department of Najaf, which is the body responsible for organizing visitors’ affairs in the governorate, in cooperation with the Najaf Municipalities Department, which include a department specialized in the GIS in the governorate, through:

d- Remote sensing, which includes:

- Satellite images.
- Aerial photos.
- Digital camera images.
- Ground positioning system.

e- Thematic maps.

f- Tabulated statistical data, such as tabulated statistical and descriptive text data.

The data includes the following: name of the hotel, first class, second class...etc., accommodation fees per night, proximity to the Holy Shrine, level of quality of service provided, number of suites, number of rooms, area...etc. other information.

(2) Entry: After the data is collected, then the process of entering data starts:

C) Direct methods, including:

- Numbering is used to enter maps.
- The scanner is used to input satellite and aerial images.
- The keyboard is used to enter text and numerical information.

D) Indirect methods, using programs to convert data from different systems to the GIS used.

(3) Data conversion: In this stage, the data is transferred and converted to the information base, whether according to the Raster or Vector system.

(4) Storage: In this stage, the edited data is stored, either temporarily on the hard disk in the computer memory or permanently on a floppy disk or laser disk.

(5) Processing: In this stage, data is received from the input devices, stored in a way that preserves its accuracy, retrieved, updated, and re-represented after being processed and analyzed by the database management systems available in the system used.

(6) Output: It includes the results obtained from using the system, such as maps, graphs, tables, and appendices. It is displayed either on a display screen or in the form of discs or paper sheets, whether on a printing device or a drawing device. The above-mentioned stages, the structure of GIS, and relationship with its beneficiaries can be presented as follows:

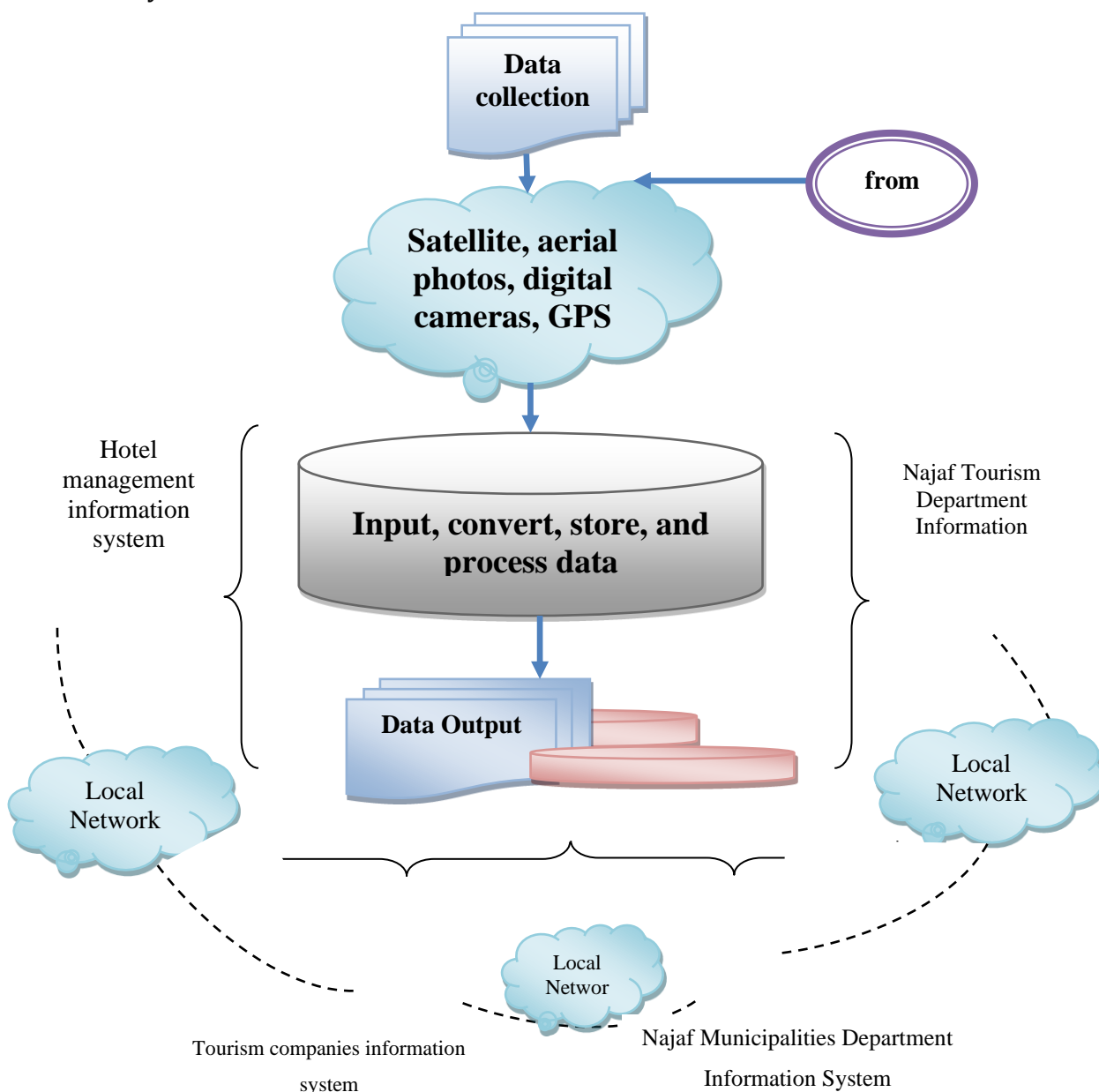


Figure (2): Structure of the geographical information system for hotel management.

**Ninth: The advantages provided by GIS for hotel management**

When using GIS, many advantages can be achieved:

1. Reducing the time, effort, and potential cost of locating hotels that are not occupied by the Najaf Tourism

Department, tourism companies, or the visitor himself.

2. Determining the capacity of each hotel.
3. Determining the locations of hotels near the Holy Shrine and the level of service available at them.
4. Determining the cost of accommodation per night for each hotel.
5. Determining the hotel class: first, second, third, etc.
6. Identifying tourist sites in Najaf Governorate, the time spent on reaching them, and the resulting costs. In addition to the holy places, Najaf Governorate includes many tourist places, including Khan Al-Rub' (Khan Al-Musalla), Khan Al-Nas (Khan Al-Hammad), Tarat Al-Najaf, Khan Al-Shilan, Khan Al-Rahba, Umm Al-Qurun Minaret, Al-Numan Bin Al-Mundhir Palace, and the Stone Bridge.
7. Linking all of the hotel departments, the tourism department, and tourism companies, as well as the municipalities of Najaf, to an information network facilitates not only the provision of services to visitors but also the diagnosis of crowded streets, especially at times of major religious events in the governorate. This connection will enable accidents to be avoided on these occasions.
8. The benefits provided by GIS can also be extended to the management of police stations, which allows easy access to the accident site.

However, there are also some disadvantages, namely:

1. The high cost of the system: Creating the GIS requires large equipment, specialized manpower, and allocating huge amounts of money to create it.
2. Lack of cooperation by some hotel departments: Some hotel departments, as well as tourism companies in the governorate, may not have reached the level that qualifies them to accept and apply modern technology. This may be

considered an interference in its field of work or a type of spying on its activities.

**Tenth: Numbers and classes of hotels in Najaf Governorate**

Table (1) Numbers of hotels, class, and capacity of each hotel in the Najaf Governorate, as follows:

Table (1): Number of hotels and their capacity

Hotel Class	No	No. of rooms	No. of suites	No. of beds
1 <sup>st</sup> Class	2	212	5	560
2 <sup>nd</sup> Class	63	3920	8	9056
3 <sup>rd</sup> Class	60	2123	3	4944
4 <sup>th</sup> Class	57	1337	/	3306
Total	182	7612	16	17866

Source: Tourism Authority/Najaf Tourism Department.

As for the number of tourism companies in the governorate, there are (58) tourism companies distributed throughout the governorate. Table (1) shows the number of hotels in the governorate and their capacity, which represents one of the inputs to the geographical information system.

**Eleventh: Summary**

The development that the world has witnessed in the field of information technology and the growing need to map places, which have become increasingly complex as a result of the urban development of countries, have created the need to find a system that helps to build accurate maps, preserve them from damage, and use them when necessary to map cities and countries. Therefore, GIS was developed. Although it has been used for many years in the natural resources, forestry, and environmental industries, it has only recently begun to be used in a wide range of business fields and management functions such as site logistics, facility management, marketing, decision-making, and planning. Hotels are one of the vital facilities that provide accommodation services for visitors to cities from all countries as well as local residents. Najaf Governorate is



one of the most important cities locally and globally, as it is visited by many visitors from all countries in the Islamic world. It has been a religious and cultural center for hundreds of years. For the purpose of providing distinguished service and efficiency in completing work in terms of speed, accuracy, cost, and comfort for the visitor, the current research suggests adopting the use of GIS to achieve high-end and distinguished performance.

When GIS is applied, it provides many of the following features, including:

1. Reducing the time, effort, and potential cost of locating hotels that are not occupied by the Najaf Tourism Department, tourism companies, or the visitor himself.
2. Determining the capacity of each hotel.
3. Determining the locations of hotels near the Holy Shrine and the level of service available at them.
4. Determining the cost of accommodation per night for each hotel.
5. Determining the hotel class: first, second, third, etc.

However, there are also some disadvantages, including:

1. The high cost of the system: Creating GIS systems requires large equipment, specialized manpower, and allocating huge amounts of money to create it.
2. Lack of cooperation by some hotel departments: Some hotel departments and tourism companies in the governorate may not have reached the level that qualifies them to accept and apply modern technology. This may be considered interference in its field of work or a type of spying on its activities, or perhaps it does not even have sufficient budget to take technological development into account.

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