

Using Geographic Information System to Visualize Travel Patterns and Market Potentials of Petra City in Jordan

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Abstract

The role of Geographic Information System (GIS) technology in tourism analysis and site selection is well established. The tourism industry have widely adopted information technology (IT) to reduce costs, enhance operational efficiency, and most importantly to improve service quality and customer experience. The paper explores the applications of Geographic Information System (GIS) that present travel patterns related data obtained from Petra city in Jordan. The paper demonstrates that Geographic Information System (GIS) is increasingly becoming critical for the competitive operations of the tourism sites as well as hospitality organizations in Jordan. As proposed by the system used in this study the paper provides various utilities and a proposal for the application of Geographic Information System (GIS) in marketing of tourist sites in Jordan. Furthermore, the paper will highlight the barriers the researchers encounter in applying Geographic Information System (GIS) in marketing of tourist sites in Petra city and Jordan in general.

Keywords: Tourism marketing, Geographic Information System (GIS), Petra city

1. Introduction

Tourism has considerable importance in the economic and social context of countries. It has the strongest effect on the economy, because it helps in developing other sectors. According to Bloch (1996) tourism is one of the world's largest industries and has historically been an early adopter of new technology. If the contribution of tourism to economy and its development potential are taken into consideration, traditional methods of tourism-related information dissemination are inadequate. Tourism is a composite of activities, facilities, services and industries that deliver a travel experience, that is, transportation, accommodation, eating and drinking establishments, entertainment, recreation, historical and cultural experiences, destination attractions, shopping and other services available to travellers away from home. While searching for information about all of these activities we may have to look at maps, tables, charts, lists, graphs or reports, and sometimes it is rather difficult or nearly impossible to pull all these sources of information together and make sense of them. Geographical information systems (GIS) however, have the capability to handle several types of information that can be related to a specific area. Therefore, by using Geographic Information System (GIS), it becomes possible to integrate tourism related information, visualize complex scenarios, present ideas and derive effective solutions. Fridgen (1991) underline that the success of any tourism business could be determined by tourism planning, tourism development and research and tourism marketing.

There are important issues that must be recognized by individuals and organizations who are involved in marketing through GIS. These issues are represented by the ideal use of marketing tools, as well as a clear vision

about which markets to target and the methods of managing the relationship with tourists themselves. Therefore, marketing through Geographic Information System (GIS) requires good management and clear plans to deal effectively with the continuous changes in both international and local markets. Furthermore, Geographic Information System (GIS) requires a huge amount of data to serve the system. Computer technology has certainly made it much easier to provide the information required for this system, thereby rendering tourism marketing more efficient, flexible and accurate.

According to Ghosh (1998) there has always been a direct relationship between tourism and cartography. Maps of travel routes and general information about the areas to visit are used in selecting the destination and in planning travel and stay Geographic Information System. (GIS) has been commonly used in different fields such as tourism activities enabling people from different countries and cultures to interact with each other. Tourism is a way of conserving the environment, creating jobs and promoting economic growth. Tourism has the potential of becoming the highest generator of foreign currency for many countries.

This study focuses on the importance of using Geographic Information System (GIS) in marketing Petra tourist sites in Jordan by designing a geographical database covering all natural and human components represented in this famous tourist sites in Jordan.

2. Research problem

This study attempts to identify the diverse components of tourism marketing aspects and potentials in the city of Petra using GIS. Building the essential geographical database for the Petra region will hopefully contribute towards making more effective use of the tourist attractions at Petra. Geographic Information System (GIS) has multiple uses according to the diversity of areas of application used in the modern tourism industry concerning planning, management, and marketing. This study, however, seeks to answer the following question: How can Geographic Information System (GIS) be used in marketing the tourist sites in Petra city?

3. Research importance

The tourism industry has become inherently global and this is reinforced by the use of the Internet, which is a medium that has no geographical boundaries. Local players in the industry will have to fit into the new global structure. At the simplest level, the growth of the Internet provides new markets for the industry and facilitates the development of a virtual value chain. Based on that, the study highlights a number of important reasons to conduct such research. First, this study will fill the gap in tourism literature and to complement what others have started in the field of marketing of tourist sites using Geographic Information System (GIS). The gap in tourism literature is represented by the commercialization of tourist sites using GIS as an important element in the marketing of tourism, which has not until now received adequate attention. The majority of studies in this field are limited by studying marketing without reference to the role of GIS and its importance in this field. In other words, there are inadequate studies, which have addressed marketing of tourism by Geographic Information System (GIS).

Secondly, due to the importance of tourism in national income, it represents an important economic resource for those countries characterized by limited resources, such as Jordan, in which tourism contributes 14 percent of the Gross Domestic Product (GDP) as well as providing a large number of employment opportunities in the country (Fakhori, 2009). Furthermore, it is very important to use Geographic Information System (GIS) in marketing, which in turn reflects the positive effects on the competitive advantage of the city of Petra. Thirdly, the scientific aspects associated with the use of Geographic Information System (GIS) applications in tourism marketing. It is considered a practical approach, which emphasises designing a practical module for Geographic Information System (GIS) applications in tourism marketing. Which give more credibility to the tourists using this system.

Finally, the system focuses on accelerating the flow of accurate data and information to potential tourist from official sources as well as other multiple establishments involved in the tourism industry such as airlines, tour operators and travel agents, visitor centres and decision-makers locally, regionally and internationally.

4. Research Objectives

In order to capitalise on the above-mentioned benefits, the main objectives of this study are:

1. To develop a geographic database, including all tourist sites in Petra city
2. To promote tourist sites in Petra city especially in light of Petra being voted as one of the New Seven Wonders of the World.
3. To identify the actual role of GIS applications in tourism marketing in the context of the continual growth of tourism sector.

5. Literature Review

5.1 Previous Studies

The advances in modern technology can provide many opportunities for the application of Geographic Information System (GIS) in marketing tourist sites. For some time now (e.g. Baker *et al.* 1998) it has been claimed that technology is changing the emphasis of marketing, enabling more interaction with customers than ever before. Before the use of Geographic Information System (GIS), potential tourists face a wide range of problems on the Internet. For example, they require knowledge of where to search for the destination sites, since conventional search engines are not effective. It also takes time to visit each destination site to view the information. Different servers typically present information in different formats and it requires perseverance to make valid comparisons (Bloch *et al.* 1996).

Furthermore current studies in tourism marketing have mostly focused on traditional aspects in studying the marketing of tourist sites. For example, Law & Hsu (2006) study focused on how customers purchase tourism products through websites, and how they perceive that a website's image and usability directly affects their purchase intentions. Cheyne, *et al.*, (2006) and Kozak (2007) analyzed travellers from different countries and concluded that different nationalities require different information sources. Travellers required different information from the Internet at different stages of travel. For instance, before departure, the availability of information can affect travel planning while later on they may seek reassurance from review sites that they have selected the right products (Lehto, *et al.*, 2006). For customers searching on the Internet for the lowest room rates, the websites of travel agents and reservation agents are likely to be the best choice (Law, *et al.*, 2007). Interestingly, tourists can locate additional information on the Internet, one study showed that many tourists ate at a restaurant that they had found on the Internet (Litvin, *et al.* 2005). More recently, some studies focused on mobile technologies that provide a new and convenient way for tourists to gather information from any location, and perhaps more significantly at the touristic destination. Mobile technologies support location-based services, interpretation at the destination, and dynamic interaction with tourism suppliers (Buhalis and Law, 2008).

While on the other hand there are relatively few studies devoted to the development and marketing of tourist sites using Geographic Information System (GIS). Lau and McKercher (2006) used Geographic Information Systems (GIS) to track the tourists' movement pattern within a destination. They conclude that this technique can have great benefits for tourism marketers to understand consumer behavior at the destination and to develop strategies for creating tourism experiences.

Abu Shouk (2005) study shows how to take advantage of the rapid technological developments in the design of GIS for the marketing of the tourism sector in Egypt. It illustrates the activation of this system to become familiar to the entire staff in the tourism sector for both private and government institutions. The results show the importance of Geographic Information System (GIS) and its ability to accomplish many tasks in the marketing of tourism activities, ranging from supply and demand, market division, the identification of specific visitors and their characteristics, as well as the promotion of tourist sites using multi-purpose maps with image and sound. In the same manner, the three-dimensional holograms can be representative of reality, as well as the possibility of using these systems in different statistical analyses such as road networks.

Another study was done by Giles (2004) on the application of Geographic Information System in tourism planning in British Columbia. This study addresses the importance of the use of Geographic Information System in tourism planning, given that the tourism sector is one of the most complex sectors of the economy. Many of the tools require high efficiency in the process of planning and management of tourist sites. This study, therefore, points to the failure of traditional methods of planning to achieve sustainable tourism and the results that can be achieved by using GIS in tourism planning. Another finding of this study show the ability of applying GIS not only in tourism planning but in other scientific areas as well such as for environment and water supply. Additionally, there are many problems militating against the use of Geographic Information System GIS in the planning of tourism because of the lack of knowledge and resistance to change.

Boon (2000) believes that the use of Geographic Information System in marketing of tourism depends largely on the availability of necessary information and systems. This process can be achieved through maps. It depends on the so-called interactive maps or virtual maps. A single click can identify features of multi-sites of tourism including tourist attractions, locations, hotels, services provided, archaeological sites, which considered the shortest and fastest routes to reach tourist destinations, travel agencies, hospitals, and airports.

Another study by Bertazzon (1997) provides an explanation of Geographic Information System, and the use of T_ GIS in planning and marketing of tourist sites in Canada. This study concludes that the modern trend in tourism marketing is linked to the success of this new marketing trend by the number of potential tourists who visit and use

this site on the Internet. There are many marketing advantages to be derived from a well-designed website including the use of video clips elements of animation and the opportunity of receiving useful feedback from potential customers.

5.2 Applications of GIS in demand and supply of tourism

The integration of Geographic Information System techniques with the Internet has many applications in the area of tourism marketing in both demand and supply of tourism. It enables marketers in terms of identifying the arrival of tourists and the tourism generating regions. At the same time, it provides information regarding other competing destinations. Furthermore, such systems contribute to geographical distribution for tourism offices and their branches as well as the locations of tourism boards and their outlets. Tourism markets may be local, regional or global, and perhaps they might be divided in the first place on a geographical basis as well as other factors such as demographic, psychological and behavioural factors, in order to draw a map of the market. This division for these markets based on geography in anticipation of meeting the many needs and desires of tourists. These demands can be identified and studied by Geographic Information System (Abdul-Raouf, 2005). Geographic Information System can present all these choices, by making a perfect map of the market to assist in decision-making. Geographic Information System can also present the official views of the marketing knowledge concerning places in which to establish offices incharge of marketing. Moreover, it can also help in making flight booking and reservations for visiting tourist sites (Bertazzon, 1997). Davod (2005) asserts that the rapid development of the tourism industry in using a geographic information system, along with the abolition of laws restricting freedom of movement, may activate and accelerate the changes that may occur in the industry itself.

In general, Geographic Information System is capable of answering the following questions:

1. Where do tourists exist and what are their most prominent characteristics?
2. What is the expected share of the global tourism market before the tourist in international markets?
3. Where should be tourism development offices be located in the world? Or should we expand the existing tourism representation offices?

5.3 Rationale for applying Geographic Information System in marketing of Petra city

The following are the main reasons to apply Geographic Information System to help in marketing Petra city:

1. The possibility of using high quality Geographic Information System in the marketing of tourist sites by linking all related metadata, such as location, services, prices, etc.
2. The data to be entered in the database related to the tourist site is the spatial data. Primarily this data is linked to specific geographic locations, which are responsible for Geographic Information System
3. High efficiency of these systems in the process of analysis of networks. It depends on the system which deals with the road networks, transportation, and tourist sites.
4. High potential for Geographic Information System to deal with several types of data. It deals with reports, statistics, tables, and maps. That makes sense of refinement and precision to the outputs of the system.
5. Expected results from the proposed system depend on the geographical analysis of specific sites, which is easily available in Geographic Information System.

Moreover, we choose Petra city for the following reasons:

1. Despite its valuable historical and touristic importance, there is no any Geographic Information System system applied for this city.
2. Petra is a centre for archaeological tourism in Jordan as well as being the main gate of tourists into Jordan.
3. The diversity of determinants of human and natural (environmental) tourism in Petra. This was reflected in the information layer 12 and, therefore, demonstrates the possibilities of the system in the marketing of various tourism activities in Petra.
4. Small number of items under each information layer in the system. This enables the researchers to collect data by themselves without the need for team work. However, building the system need a Systems Manager, Geographic Information System Analyst, Data Base Manager, Data Processing namely Senior Processor, Cartographer, and data entry operators.
5. Inadequate marketing campaign and tourism activities in the area of Petra. There is a need to support these activities, which can be strengthened using the proposed system.

6. Methodology

6.1 Program used in the design of the proposed system

The system proposed by the researchers is based on the designer program (ARCGIS 9.3) which is used to process all layers of the proposed system through the software. This system has been downloaded from the Internet via (ARCIMS 9.3) which is a program for the dissemination of geospatial data via the local internet. It can be made available to the staff of tourism businesses through access to all the details and rules of geographical data. Furthermore, the system is global and can be accessed by tourists all over the world through the Internet, mobile phones and wireless devices.

The characters (IMS) represent the Internet Map Server i.e. "internet map". The word used by the researchers was "server". In addition, through this technology, it becomes possible to build sites on the Internet, the primary function being the marketing of tourist sites, including content from all the natural and human components of hotels, tourist offices and car rental companies. The most recent version of this program is ARCIMS 9.3, which is considered one of the components of a package ESRI ARCGIS. This program is ARCIMS from ESRI, one of the most useful programs available, and specializes in marketing tourism sites through the dissemination of GIS data via the Internet. This program also allows easy access to this data from all over the world. In this context, there is a site called "Guide to Dubai-mail", one of the sites that uses Arabic ARCIMS, and uses the revitalization of tourism in Britain, which this system has (www.reud.com).

It's noteworthy that for marketing tourist sites, we can use different systems operating through GIS software such as (PDA) Personal Digital Assistant Handled Computers, including (MVD) Map View Display, (LVD) List View Display and mobile phones through GPRS

6.2 ARCIMS software components

The system consists of two main parts: the provider, namely (Server), and the tourist, namely (customer). A detailed explanation about the provider is given below.

6.2.1 ARCIMS provider

This part works on the central system. On one hand, it is associated with geographic data including maps and databases and all tourism applications. On the other hand, it works using an internet provider. It deals with several internet providers such as Planet, Apache and IIS. Moreover, ARCIMS provider can connect between geographic databases in more than one tourist location both locally and globally. For example, we can recall a Base Map saved at a different company's computer to apply on top of other layers such as roads or hotels saved in another computer at another company in another country.

Internet provider can send a map to the tourist browser as in two Figures; the first is Image Rendering by taking a snap shot for the map we want to sent to the browser as an image; the second is Feature Streaming. The maps are sent to the browser as Vectors drawing system. Although this system has the capability to do more, it needs Java viewer to download it.

Tourists can connect to ARCIMS and view the entire database that represents any tourist site through HTML and JAVA, these two systems coming with the ARMCIMS package. ARCGIS Desktop is another way. The third way is through mobile phones and Wireless Application Protocol (WAP) through <http://www.esri.com/software/arcims/index.html>.

6.2.2 Steps in creating an Internet site using ARCIMS

There are three main steps in creating Internet site using ARCIMS. First, the establishment of the tourist map configuration file; the map for any tourist site is initiated through ARCIMS author. The database can take several Figures; they can be files designed through ARCGIS/ARCINFO 9.3, they can be layers called ARCSDE or take the form of image files. This technology enables users to edit colours, names and other applications which can be saved in a special folder namely Map Configuration File which is programmed using ARCXML software.

Secondly, through initiating and operating the map services which works through the program ARCIMS Administrator. An active tourism map is provided to work on the provider. This can be achieved by establishing the map service configuration.

Thirdly, the site is designed using ARCIMS designer by following consequent steps and the use of templates. Some characteristics can be changed such as selecting tools, which appears on browsers' bars. The researchers, however, propose HTML for the maps, which were produced from the proposed ARCIMS designer.

6.2.3 Layers of information contained in the proposed system for Petra

The tourist map of Petra, which is used in a number of tourism marketing layers and contains all the natural and human ingredients are shown in Table (1), and Figure (1)

7. Databases used in the proposed system for marketing Petra using Geographic Information System

ARCIMS software provides much of the analysis on the map. The entire map has been linked to the scale of metadata. The data includes information describing the geographical spatial data and metadata associated with these spatial data through the coding system. It defines the goal of the database required, as well as identifying what needs to be done, which is important in the knowledge of the type of data required and the Figure of output. However, we can classify database applications according to the objective as follows: first, Single User Small Data Bases for users on the level of the tourism initiative. Secondly, Corporate Data Bases for users (tourists) worldwide. Through tourism databases, tourists may inquire about any tourism activity. These databases, however, include a number of tables about hotels, furnished apartments and other forms of accommodation.

There is a set of information that the proposed system can provide accurately and on a permanent basis regardless of the time and place, including input, processing, management, inquiry and analysis. This can be achieved through the presence of the tourists on international network to get information (while browsing the Internet). Moreover, the proposed system is recognised for its ease of use. However, some of the most recognized uses and services introduced by the system are:

7.1 First utility: the definition of a feature or a particular phenomenon

When you click on any element of the system features on the tourist map, using the Identify tool, this shows a table with the name of the feature or the phenomenon, the ID, type the title, as shown in Figure (2).

7.2 Second utility: The classification of a particular feature through the proposed system for Petra city

The classification of a particular feature, phenomenon or group of features of a particular condition (Identifying Features Based on Conditions). It offers the possibility of a tourist to search for hotels or furnished apartments within a certain price range or a particular classification. For example, the tourist can search for 5, 4 and 3 star hotels with a price not exceeding € 50 per night, as shown in Figure (3). Another example of the tourist search might be dependent on the name, or type, as shown in Figure (4).

7.3 Third utility: Access through the Hypertext link

It is also possible to search using the title of the former tourist attraction in terms of name, address, price and type of tourism. Moreover, it is possible to inquire about the various natural and human components of tourism in Petra. In addition, the proposed system provides access to hotels, car rental, offices of tourism and other tourism events. This is accompanied by written information, photographs and live video to allow tourists to access the system electronically and become acquainted with the various factors of tourism. In addition, it is possible to access direct-mail inquiries through the Association Hypertext Hyperlink, as can be seen in figure (5).

7.4 Fourth utility: Proximity analysis

Proximity or the dimension of the phenomenon of a particular feature and another feature is determined by a certain distance. As shown in Figure (6) for the analysis of proximity and distance based on more than one layer of information Analysis Overlay. The sense that it can select a hotel from the hotel information layer and then the application of the rules that identify the nearest car rental office. Thus, the system chooses the nearest car rental from the car rental layer based at the hotel, which was chosen from the hotels layer. Which mean analysing more than one layer to access the information required by customers.

7.5 Fifth utility: Analysis of proximity and distance (Proximity Analysis) and analysis based on more than one layer of information (Analysis Overlay).

This tool in the system focuses on road network analysis and helps how to find the shortest path between two phenomena or tourist destination. This can be done using the

Add Edge Flag Tool. Simply, a flag is put in the place we want to move to, and then another Flag to be placed on the place we want to go. And then we select the tool "Solve" where the system will draw a path connecting the two locations. Moreover, we can do a conditional selection between two features. For example, we can choose the nearest and the easiest between two features. Another benefit form this function is to find a linear distance. This can be achieved by using the tool "Measure". The distance shows in lower part of the screen as shown in figure (7).

7.6 Sixth utility: Performing statistical operations

The proposed system provides the possibility of some statistical operations such as calculating the number of

hotels which follow the classification given by the Ordinance of the “Count” including the identification of the contents of the minimum, maximum sum, average, and standard deviation; or by choosing the field “X” from the table and multiplying it with factor “I” and adding it to the coefficient “N” and finally, showing the result in a new field under a name of “total area”, as shown in figure (8).

7.7 Seventh utility: Magnifier tool

Also it is also possible to enlarge any of the places in the tourist map using the Magnifier tool. Using this tool can magnify the feature up to 400% as shown in Figure (9).

Eighth utility: Ability to amend geographical features

In addition, it is possible to change the geographical features and to amend the tables in the database automatically and vice versa. The amendment in the tables followed by modification of the geographical phenomena are shown in figure (10).

7.8 Ninth utility: Appearance of name based on tourist search

The proposed system offers the possibility of presenting tourist attractions when accompanied by the help of “Tips” to identify the features, an area or title that appears, depending on what the tourist wants, as shown in Figure (11).

7.9 Tenth utility: Finding a particular feature or locating a specific attribute

This can be done using the tool “Find”. A tool box shows the request by entering the name of the feature that the tourist wants to inquire about. After finding the feature, it gives multiple choices to select from, including features such as Flash, Select, Zoom, Identify, or Unselect, as can be seen in Figure (12).

8. Proposal for the application of Geographic Information System in marketing of tourist sites in Jordan based on the system proposed by this study

There must be a clear strategy for the application of this system. To achieve better results there should be a real cooperation amongst the various bodies that can provide support for the design and production of its mainstream plan of action for such systems.

The features of the plan as the researchers see can be illustrated by the identification of tourist sites in Jordan, which requires their presence on the tourist map. In addition, the identification of the tourist sites requires more precise positioning; for example, places of classical and cultural tourism sites (Greek - Roman, Nabataean and Islamic sites), locations of physiotherapy, hotels, restaurants, tour operators and travel agents, car rental companies, international airports and border crossings, main and side roads.

The features can also be illustrated by designing and processing geographical data using Geographic Information System for tourist sites in Jordan. It can also be useful to upload the system, which was designed for each location or for all the tourist sites in Jordan on the Internet using ARCIMS software.

It is important, however, to produce such a system in the form of hard copy such as paper maps or atlases of all tourist sites all over Jordan. In other words, it is necessary to establish a bank of data for GIS to document all tourist sites and their associations in the country. Such data includes paper or digital maps of different scales to be recognisable by all tourists. The features of this plan as proposed by the researchers are:

- 1). Determine which tourist sites require to be identified on the tourist map of Jordan.
- 2). Identify potential tourist attractions, human and natural tourist attractions that must be presented on the tourist map for each of the tourist sites, such as hotels, guest houses, restaurants, tour operators, medical tourism places and environmental and cultural sites.
- 3). The design of a Geographic Information System for each tourist must be provided on CD-ROM for the marketing of a tourist site. This needs to be promoted through initiatives represented on the tourism map because it is one of the benefits of the marketing programme.
- 4). Compilation of all the tourist sites in Jordan on the map to include all the information on the human and natural resources as well as tourist sites that have been identified in advance.
- 5). Uploading the site which was designed for marketing tourism to the internet. This will enable tourists to choose and browse freely through the site.
- 6). Provide this system in the form of hard copy, whether as paper maps or atlases containing all the features on the map.
- 7). The administrative leadership in tourism sector in Jordan, who are responsible for decision making, must have

a significant role in promoting this technique in the field of tourism as well as to encourage applying and using this technique on a large scale.

Regarding data required for the design of the system:

- 8). Create a database of tourist information for each tourist site in order to provide all the contemporary data on the geographical location of the tourist maps, paper or digital maps of different scales, defined by the sites and roads.
- 9). Use information from the Royal Jordanian Geographic Centre.
- 10). Use information from Jordan Tourism Board.

Regarding design, maintenance and updating of the system:

- 11). Conducting training sessions on the use of Geographic Information System in marketing tourism in Jordan for both public and private sector employees.

9. Barriers in applying Geographic Information System in marketing of tourist sites in Jordan

While conducting this study, the researchers encounter many obstacles and barriers in applying this system in marketing Petra site. Those obstacles and barriers are summarised as follows:

- 1) There is a lack of adequate training and specialized programs at universities for teaching the competencies required for dealing with systems such as GIS. This has generated a negative impact on the spread of the application of such systems.
- 2) The training and selling settings for these systems are small in number and even the whole procedure in Jordan is almost limited to the Royal Jordanian Geographic Centre and the Centre for Info graph. Thus this reduces the chances for the different programs to be improved and this is one of the reasons for the lack of sufficient awareness concerning the importance of GIS in the marketing of tourist sites.
- 3) Weakness of the material necessary for the operation of these systems, programs, equipment and tools.
- 4) Lack of information and difficulty of obtaining data on Geographic Information System and/or the high cost.
- 5) The lack of sufficient awareness of managers at tourist sites concerning Geographic Information System and its importance in tourism marketing.
- 6) Lack of awareness about the need for this new technology and systems in line with the modern world and its importance in tourism marketing.

10. Conclusions

The study shows the reality and practicality of marketing Petra city by using Geographic Information System. There are many uses of Geographic Information System according to the multiplicity of areas of application used in the modern tourism industry including marketing, planning, and management. This depends on the use of different views on the identification and classification of target market and how to be applied to them. The use of Geographic Information System in planning saves time and effort. It depends on special and aerial photos and topographic maps with great accuracy. In addition, it is possible to analyse and access more accurate results in a very short period of time when compared to the time required for the planning of any tourist site.

Geographic Information System can perform several tasks in the marketing of tourist sites. Performance starts from supply and demand to market segmentation to identifying the characteristics of tourists to end up with effective promotion of tourist sites. It can expand to include the use of multi-purpose maps of images and sounds with the possibility of various statistical analyses and road networks analysis. A geographic information system is not currently used in the marketing and planning of tourist sites in Jordan by the official bodies responsible for this such as the Ministry of Tourism, Ministry of Planning and Jordan Tourism Board. The reasons for not using the system are the lack of knowledge-based planning and marketing of tourism in Jordan about the importance of the system and its uses in general, and in the field of tourism planning and marketing in particular. There is a scarcity of material required for the operation of these systems, programs, tools and equipment. There is also a lack of sufficient awareness of those who run the tourism sector in Jordan of the importance of Geographic Information System and its role in marketing and planning of tourist sites in Jordan.

Many managers and employees in the tourism sector have limited IT knowledge. They generally do not have a clear understanding of how Geographic Information System can improve their performance, and thus cannot communicate well with potential tourists. Limited technical IT knowledge, however, is not a sufficient reason for lagging behind. To remain competitive, practitioners should explore the potential opportunities emerging through Geographic Information System, and be proactive in recognizing the capability of the Geographic Information

System. To achieve these goals, tourism and hospitality managers should maintain a good relationship with customers by using technology-assisted tools, irrespective of the size of their company. In addition, Centralized IT systems should be incorporated into the business environment, and standardized procedures of coding and operations adopted.

It is evident that the use of Geographic Information System in tourism marketing reflects positive effects on competitiveness and comparative advantage of the tourist sites in Jordan and therefore, we can rely upon this system in future to be used in marketing and planning of tourism in Jordan. There is general agreement from all the officials that the use of a Geographic Information System in tourism marketing adds a competitive advantage to Jordanian tourism. However, there is a keen aspiration from the officials to rely on Geographic Information System in marketing tourism in Jordan in the future.

Managers in both private and government sector can, and should, deal with future IT-related issues by integrating IT into the company's strategic management and business mission. A way to achieve this goal is to constantly upgrade the IT knowledge and skills of staff, as in this way overall technical proficiency can be assured. Additionally, managers should maintain close contact with the IT industry so that they will be able to appreciate technological trends and developments. Finally, we managed to provide substantial amounts of information by using the Geographic Information System, which in turn make it available for customers in non-traditional way of dealing with searching for information about Petra city. However, through the specifications and standard operation of Geographic Information System we can obtain a number of alternatives regarding the tourist sites chosen, and this will enable us to establish priorities to achieve the rates and numbers of tourist visitors required.

11. Recommendations

It is preferable not to apply Geographic Information System to all tourist sites in Jordan in one phase. The availability of the necessary action plan for the implementation of the system should be a matter of cooperation between the various bodies that could provide support for the design and dissemination of this system. Therefore, it would be preferable not to apply the rules in all tourist sites in Jordan in full in one stage, but to create an action plan for the gradual implementation of the system.

It is recommended that the use of Geographic Information System technology be expanded on a wider scale in the marketing and planning of tourist sites in Jordan as there is a need to provide Geographic Information System within the Ministry of Tourism, with more effective supervision and management of tourist sites. It is necessary to develop systematic and clear Terms of Reference for the use of Geographic Information System in the planning, development and marketing of tourist sites in Jordan.

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Table 1.

1.	Archaeological sites
2.	Car rentals
3.	Restaurants
4.	Parks and gardens
5.	Hotels
6.	Exhibits
7.	Tourism offices
8.	Museums
9.	Hospital
10.	Security centres
11.	Roads and transport
12.	Panorama sites

Layers forming the database of the studied area



Figure 1. Analytical Processes by the Proposed System for Petra city



Figure 2. Identifying Specific Feature

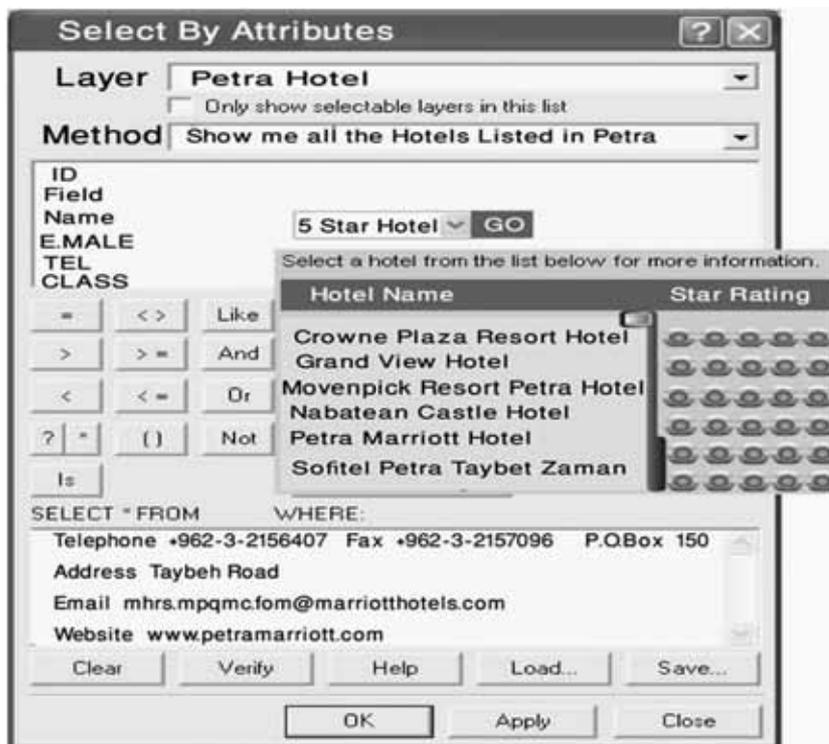


Figure 3. Searching for hotels using star rating by using the proposed system

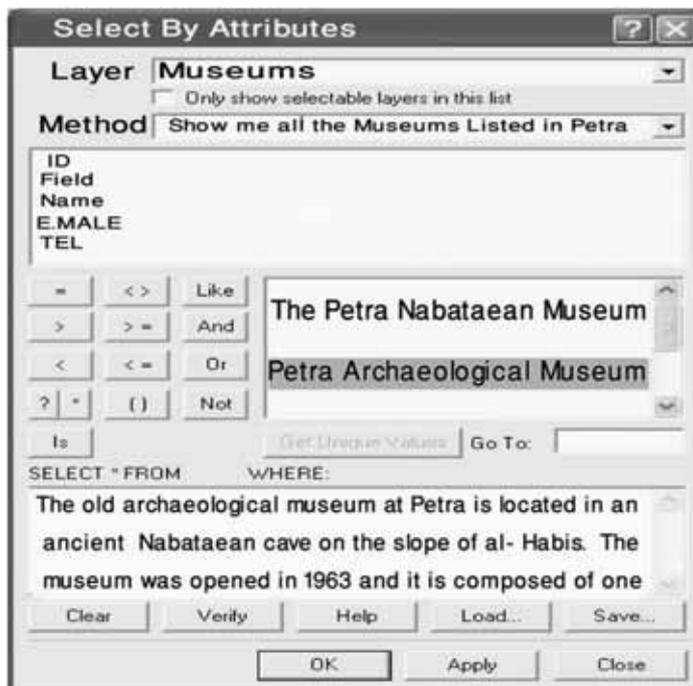


Figure 4. Searching of places and activities by using the proposed system

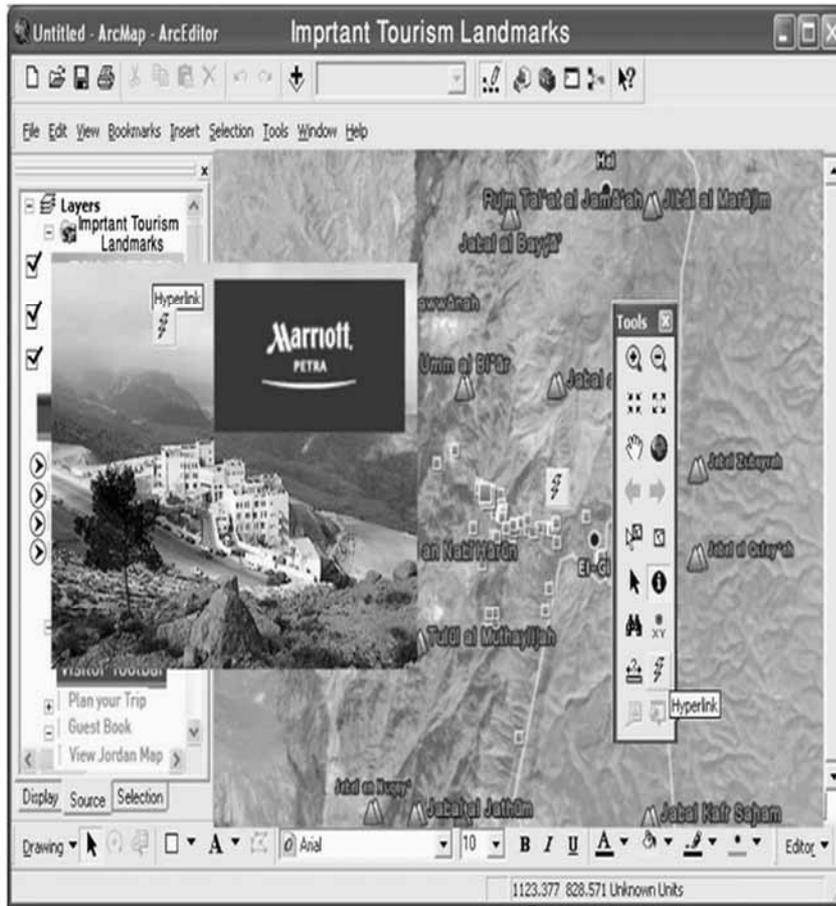


Figure 5. Access through the Hypertext link to many tourist activities such as the Petra Marriott Hotel



Figure 6. Proximity analysis

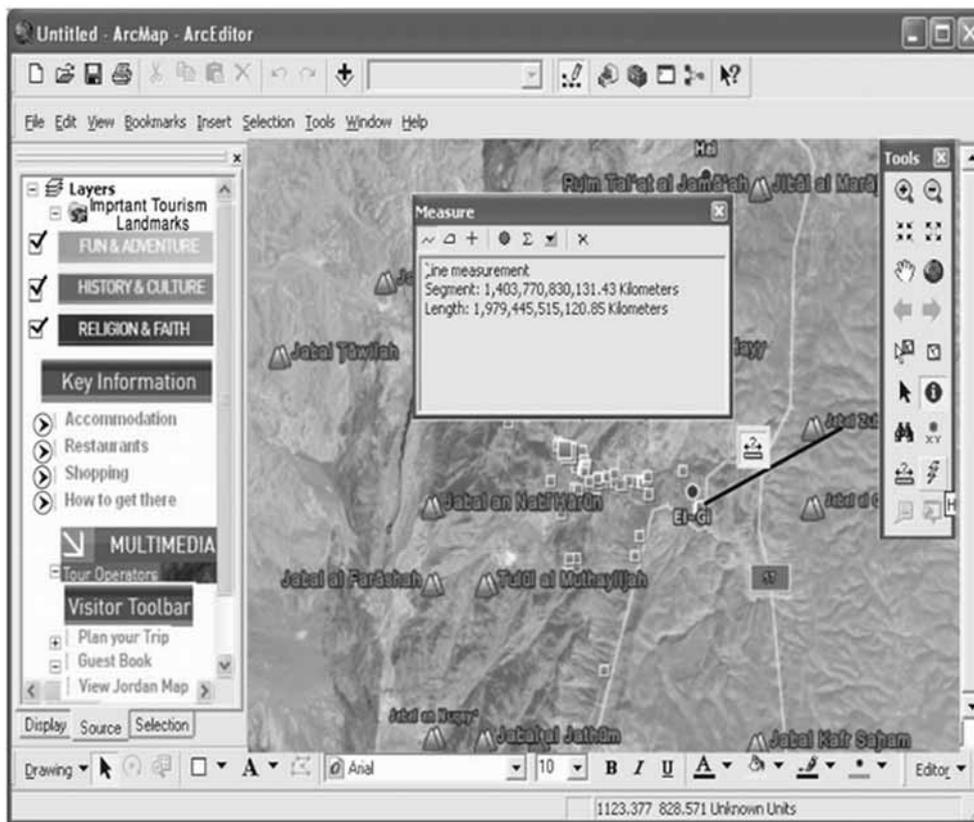


Figure 7. Analysis of proximity and distance

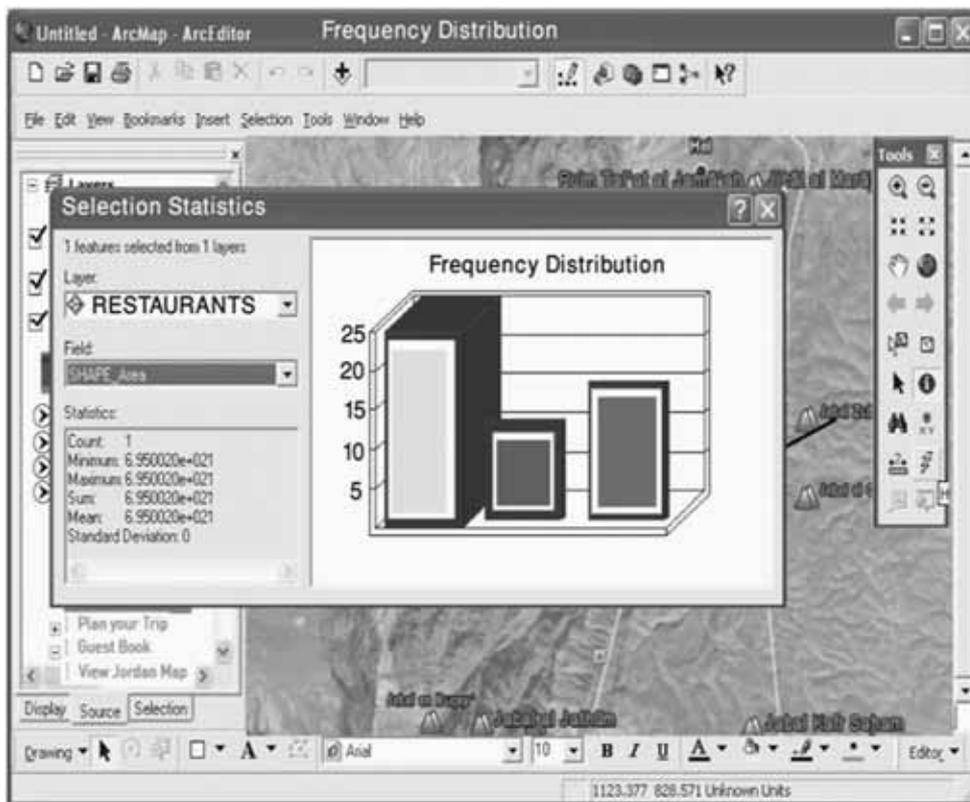


Figure 8. Statistical operations carried out by the proposed system

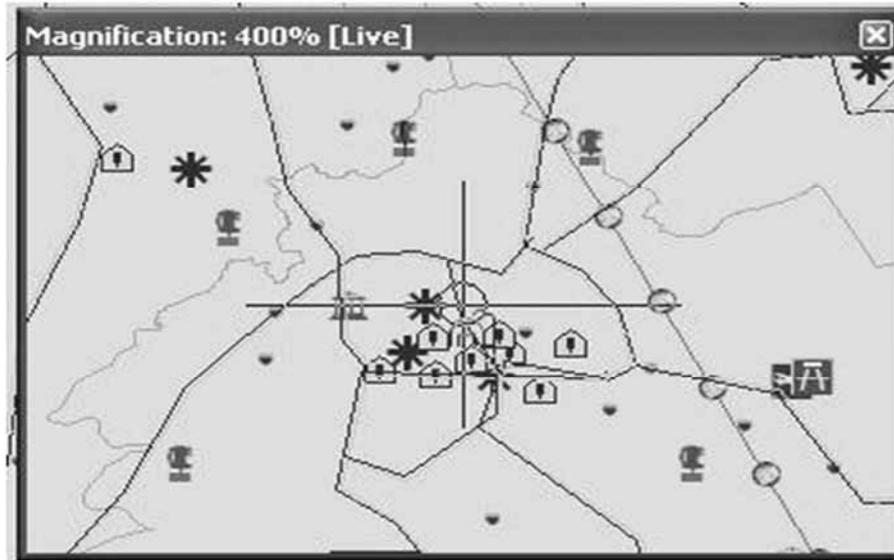


Figure 9. The possibility of using the zoom tool “Magnifier”

Attributes of Restaurant		
Address	Restaurant Name	Restaurant type
▶ Crowne Plaza Petra	Olive Tree Restaurant	Arabic
Movenpick Petra	Al Iwan	Arabic
Petra	Basin	Casual Dining/Pub
Petra	Oriental Restaurant	Casual Dining/Pub
Petra	Petra Kitchen	Casual Dining/Pub
Petra	Oriental Restaurant	Casual Dining/Pub
Petra	Aliwan Restaurant	Casual Dining/Pub
Petra	Al Saraya Restaurant	Casual Dining/Pub
Movenpick Petra	Ghadeer Roof Garden	Coffee Shop
Petra Marriott Hotel	L'Affresco	Italian
Petra	Casual Dining	Casual Dining/Pub
Petra	Al Ghadeer Roof	Casual Dining/Pub
Petra	Dushara	Casual Dining/Pub

Figure 10. Ability to amend geographical features



Figure 11. Gasr Elbint appears through the tool “Tip”



Figure 12. Finding a tour operator on the map using the Find Feature