Using Geographic information systems (GIS) in Tourism Planning

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Abstract:

Geographic information systems (GIS) is a computer system designed to capture, store, manipulate, analyze, manage, and display all types of spatial data. GIS has a long history of applications in different fields including urban planning, Management and Policy, Planning and Economic Development, Natural Resource Management, Agriculture, Education, Health Care, Real Estate, Business, Civil Engineering/Utility, Political Science, and Environmental Sciences. However, tourism sector has not benefited fully from GIS capabilities. In this study, an extensive search about using GIS in tourism sector using ScienceDirect and other sources has been conducted, we found only twelve articles related to GIS and tourism. some case studies of GIS applications in tourism will be presented and discussed. The main aim of this paper is to encourage the use of GIS in tourism studies.

Keywords: GIS, Tourism, WebGIS,

1. GIS applications

Nowadays, GIS technologies have been applied to diverse fields to assist experts and professionals in analyzing various types of geospatial data and dealing with complex situations. GIS applications can be found in many fields such as ; Urban Planning, Regional Planning, Transportation Planning , Mapping, Education, Natural Resources Management, Business , Environmental Impact Analysis, Disaster Management and Mitigation, Landslide Hazard Zonation using GIS, Land use/Land cover changes, Flood damage estimation,

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Land Information System, Surveying, GIS Geology, Tourism Information System, Worldwide Earthquake Information System, Traffic Density Studies, Deforestation, Deforestation, Utilities, Development of Public Infrastructure Facilities, Public Health, Route Selection for many applications, Site Suitability for many projects, Coastal Development and Management, and Crime Analysis.

2. GIS applications in tourism sector

Although, GIS has different applications in most of fields, applications of GIS are very little in tourism sector. GIS can be used as a database for tourist resources (Inventory Function). It can be used as an analysis technique (Spatial Analysis Function). Moreover, it can be used as an evaluation tool for tourism planning (Decision Support System), and it can be used as well to promote and develop tourism sector using the integration between GIS and Web (WebGIS) for (Presentation and display function).

The author of this paper conducted a search about using GIS in tourism sector using ScienceDirect site. ScienceDirect is a website operated by the Anglo Dutch publisher Elsevier. It was launched in March 1997, Giussani (1997). It is a platform for access to nearly 2,500 academic journals and over 26,000 e-books. The journals are grouped into four main sections: Physical Sciences and Engineering, Life Sciences, Health Sciences, and Social Sciences and Humanities, ScienceDirect, (2014).

The author conducted this search in the mid of 2014 using term (GIS) in the "title field" for the period (1980-2014), 5007 articles were found, figure 2-a. Only nine of them related to tourism sector figure 2-b.

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Figure 2-A, Number of Articles related to GIS at ScienceDirect between 1980 and 2014

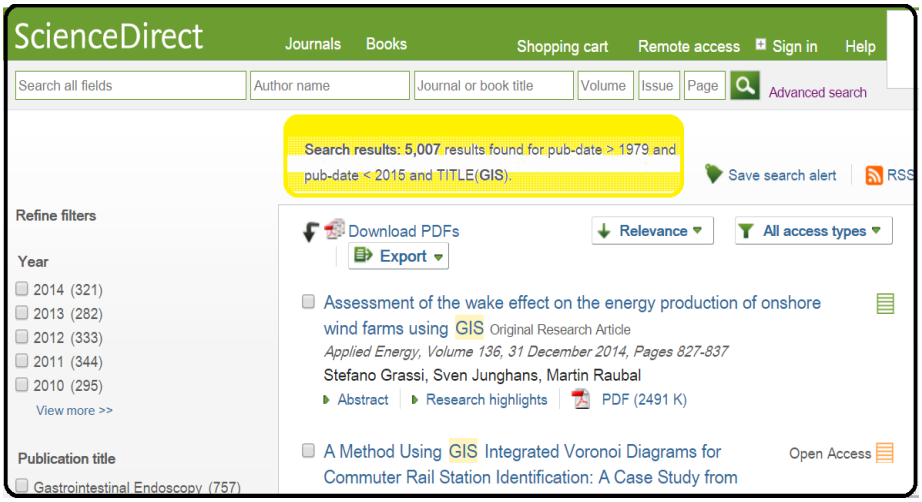
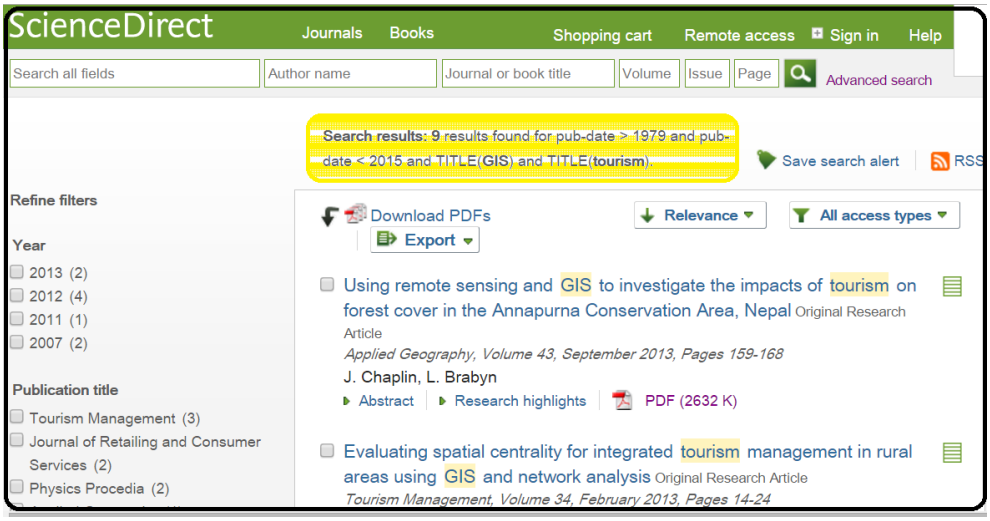


Figure 2-b, Number of Articles related to GIS and tourism at Science Direct between 1980 and 2014



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When term "Geographic Information System" used in the "title field", 404 articles were found, figure 2-c. Only three of them related to tourism sector, figure 2-d. After combining the results of this search from ScienceDirect and other sources, we found only twelve articles related to GIS and tourism, table 1, shows these articles.

Figure 2-c, Number of Articles related to Geographic Information Systems at ScienceDirect between 1980 and 2014

Figure 2-d, Number of Articles related to Geographic Information Systems and tourism at ScienceDirect between 1980 and 2014

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This means that the applications of GIS in tourism sector are very little. It can be noticed also that not all the articles related directly to tourism. In the following lines, Some of the applications of GIS in tourism sector will be highlighted.

Table 1, scientific articles related to GIS and tourism between 1980 and 2019

	Title	Authors
1	Using remote sensing and GIS to investigate the impacts of tourism on forest cover in the Annapurna Conservation Area, Nepal	J. Chaplin, L. Brabyn
2	Evaluating spatial centrality for integrated tourism management in rural areas using GIS and network analysis	Sang-Hyun Lee, Jin-Yong Choi, Seung-Hwan Yoo, Yun-Gyeong Oh
3	A mobile 3D-GIS hybrid recommender system for tourism	José M. Noguera, , Manuel J. Barranco , Rafael J. Segura , Luis Martínez
4	Unified GIS database on cycle tourism infrastructure	Michal Bíl, Martina Bílová, Jan Kubeček
5	The Secondary Development Based on MapX——GIS of TourismDesign and Implementation	Fu Chunchang
6	The Design and Implement of Tourism Information System Based onGIS	Fu Chunchang, Zhang Nan
7	Web-based GIS in tourism information search: Perceptions, tasks, and trip attributes	Grace Chang, Lowell Caneday

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8	Significance and variety of geographic information system (GIS) applications in retail, hospitality, tourism, and consumer services	Rachel J.C. Chen
9	Geographic information systems (GIS) applications in retail tourism and teaching curriculum	Rachel J.C. Chen
10	Research on the Application of Geographic Information System in Tourism Management	Wei Wei
11	Spatial database and web portal for tourist resources of Oman using remote sensing, Geographic Information Systems (GIS), and WebGIS for Ministry of Tourism	Lotfy K. Azaz
12	Publishing of religious tourism sites in the city of Medina on the Internet using a Web geographic information systems technology (WEB GIS)	Lotfy K. Azaz and Amal El-shikh
13	Qassim WebGIS	Lotfy K. Azaz

a. Spatial database and web portal for tourist resources of Oman using remote sensing, Geographic Information Systems (GIS), and WebGIS for Ministry of Tourism by Lotfy K. Azaz,(2007)

Oman is gifted with plenty of unique archeological, cultural, tourist resources. These resources can put Oman in the position where tourism can be a big share of the national income. The starting point to benefit from this promising resource is to plan it. The first phase of any successful planning is to quantify all available resources. The Principal Investigator of this project, Dr Lotfy Azaz composed a team

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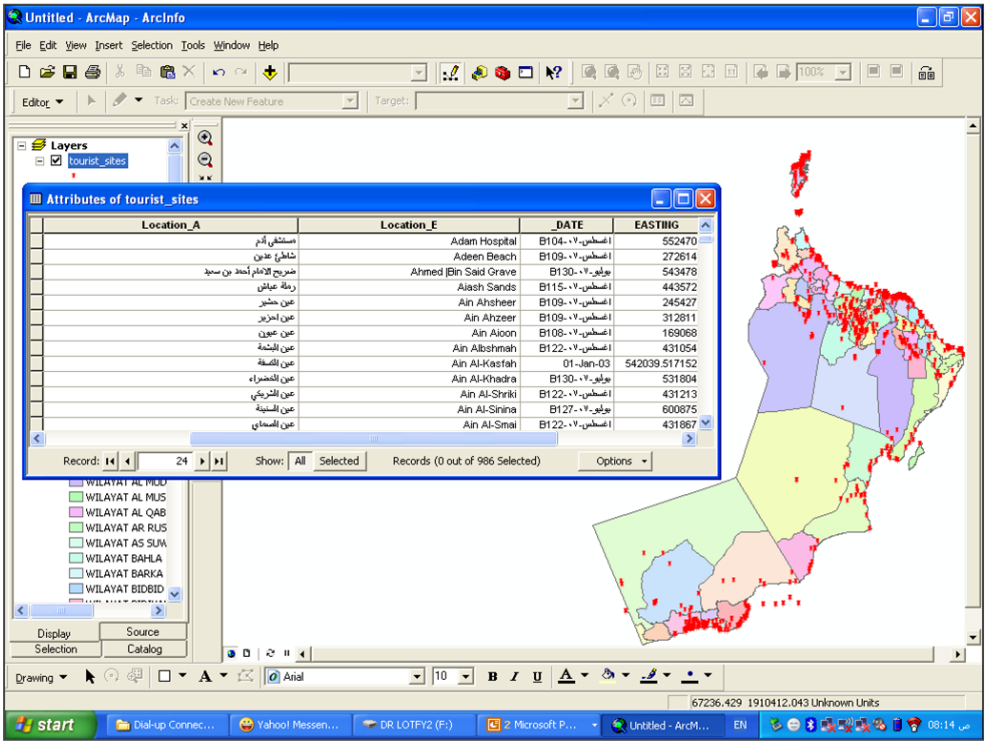
from Sultan Qaboos University and the Ministry of Tourism. The main objective of this project is to build a Spatial database for all tourist resources in Oman using Geographic Information Systems (GIS), Remote sensing and Global Positioning Systems (GPS). The project started with Data Collection phase through filed Surveys all over the Sultanate of Oman. Members from our integrated team collected coordinates data using GPS devices and ancillary data as well (digital photos, descriptive data…etc). In the second phase, all spatial data were transferred to our customized spatial database using ArcGIS for processing. Ancillary data were linked to the spatial data as attributes, Figures 3 and 4.

Figure 3, A screen shot from Oman spatial database (Oman General)



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The third phase was Data Delivery, where GIS data were delivered to Ministry of Tourism to be used as a base for the GIS unit and to be used for WebGIS portal of Ministry of Tourism. This will enable tourists and holidaymakers to plan their tours to Oman and book it as well. The fourth phase was maps production for English version of OMAN TOURIST ATLAS (Get Going). The First edition was published in 2010. The Atlas is composed from twelve chapters, 101 maps with different scales, plenty of photographs, and descriptive information about tourist places in Oman. Figure 5 shows the cover of OMAN TOURIST ATLAS (Get Going). In 2013, the Arabic version of OMAN TOURIST ATLAS was published, figure 6.

Figure 4, A screen shot from Oman spatial database (Detailed)

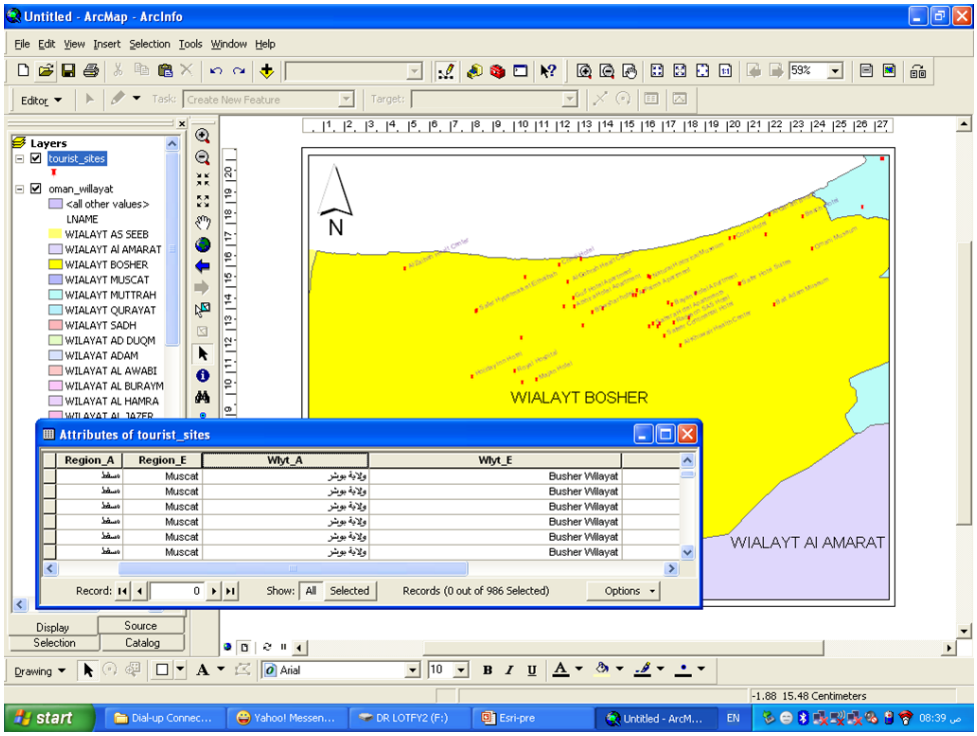

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Figure 5 The cover of OMAN TOURIST ATLAS (Get Going)

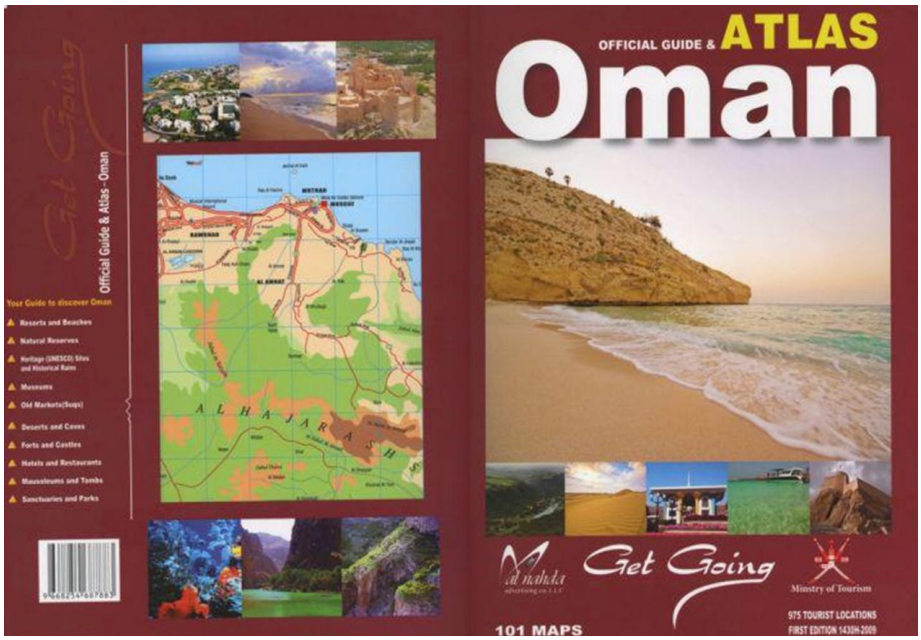

Figure 6 The cover of OMAN TOURIST ATLAS (Arabic)

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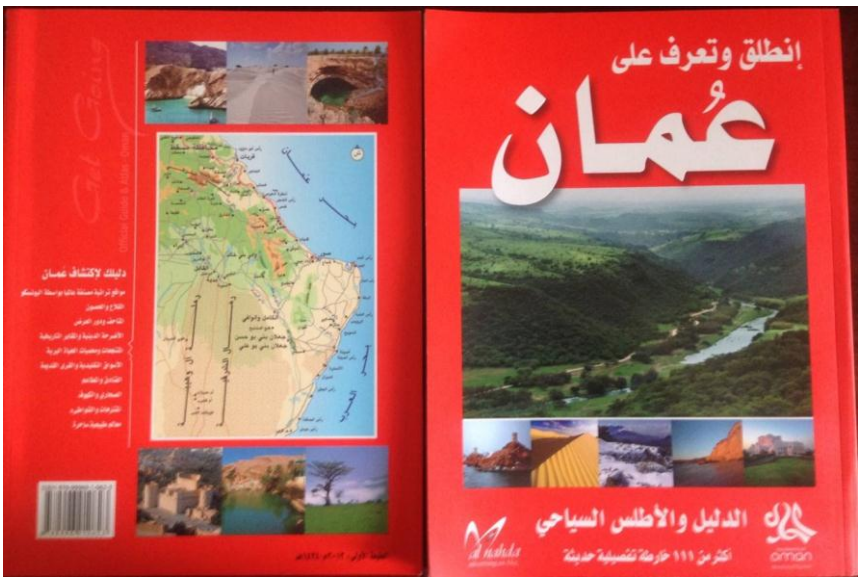

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b. Publishing of religious tourism sites in the city of Medina on the Internet using a Web geographic information systems technology (WEB GIS), Azaz, Lotfy K. and El-shikh, Amal, (2013)

This study aims to design and create maps showing religious tourism sites in Medina using GIS software (ArcGIS) , then these maps will be published later on the Internet using Web geographic information systems technology (WEB GIS). To achieve that goal, 61 tourist religious sites in Medina were located using global positioning (GPS) devices. Descriptive data (Attributes) associated with these sites were collected and stored in a spatial database. Digital maps containing these sites have been produced and published on the Internet using WebGIS technology, figure 7. The website is available to the researchers and scholars to perform spatial analysis. The site is available also to the visitors to help them to identify the religious tourism sites in Medina. In addition to that, visitors can benefit from this site in planning their tourist trips to Medina. Another benefit is for those who wish to visit Medina, and they could not afford to do that. They can pay a virtual tourism tour through this site. Finally, this research highlights one of the most important practical aspects of GIS especially in the field of tourism. This study is the first of its kind in the Arab world – according to the knowledge of the authors - that discuss and apply the concept of WEB GIS.

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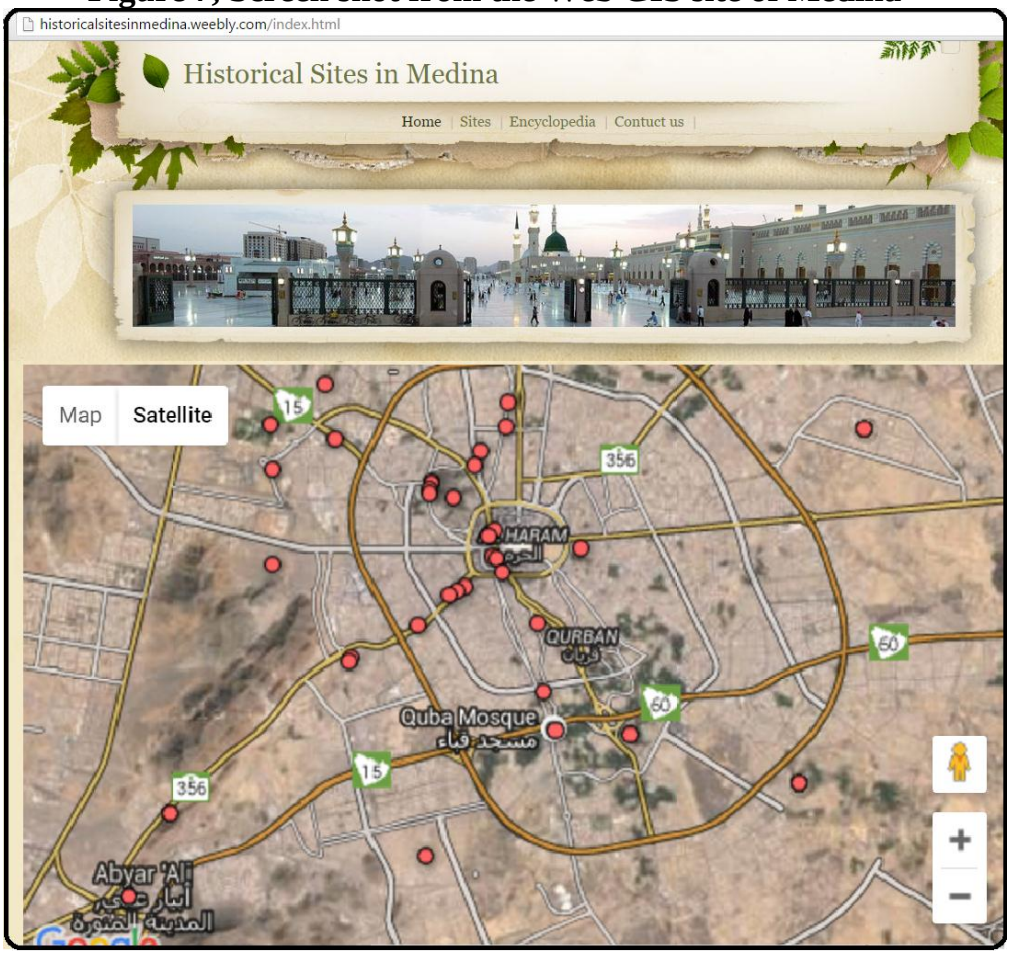
Figure 7, Screen shot from the Web GIS site of Medina



c. Qassim WebGIS

d. A mobile 3D-GIS hybrid recommender system for tourism by Noguera et al. ,(2012)

The amount of touristic and travel information existing on the Internet is overwhelming. Recommender systems are typically used to filter irrelevant information and to provide personalized and relevant

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services to tourists. In this context, mobile devices are particularly useful because of their ubiquitous nature that turns them into an attractive platform for assisting on-the-move tourists to choose points of interest to visit according to their physical location. However, mobile devices also present several usability limitations that should be considered in order to provide information in a direct and intuitive way. In this paper, They presented a novel mobile recommender system that brings together a hybrid recommendation engine and a mobile 3D GIS architecture, figure 8. This system allows tourists to benefit from innovative features such as a 3D map-based interface and real-time location sensitive recommendations. The details related to the design and implementation of the proposed solution are also presented, along with an empirical evaluation of user experience with the mobile application, Noguera et al., (2012).

Figure 8, Some examples of 3D mobile guide running on an Apple iPhone, Noguera et al., (2012)

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e. Geographic information systems (GIS) applications in retail tourism and teaching curriculum, Chen, (2007)

This study used the ESRI's ArcView system, tourism-retail trading decisions, attraction allocations, and visitor demographic data to demonstrate the value of GIS to decision makers and planners of tourism destinations. Results suggest that the analyses of the GIS provide comprehensive access to the database, query features, and create themes, layouts, and reports.

f. Research on the Application of Geographic Information System in Tourism Management, Wei (2012)

The geographic information system applied to tourism management is the preferred platform of tourism information. On the basis of introducing the concepts of Geographic Information System (GIS) and Travel Geographic Information System (TGIS), this paper illustrates the role that the geographic information system plays in tourism management. Tourism has a strong geographical attributes. GIS itself is information system offering services to geographic research and decision-making, which can play a role in tourism management. In particular, possessing the functions, such as data collection, storage, processing, and spatial analysis and so on, GIS directly provides services for tourism management. The roles of GIS in tourism management are mainly in the following areas: conducting tourism information management; being able to produce a comprehensive thematic map. The paper analyzes the existing problems of GIS applications in tourism management. Take a panoramic view of the current technology and management system, the key technology and problems to establish TGIS are; the construction of tourism geographic information database; the establishment of data structure and the data model; the design of Tourism Geographic Information Database System. The essay also proposes the development prospects of the combination of GIS with new information technologies. GIS

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applied in Tourism Management has played a significant role. At the same time, it should be noted that ,information technology continuously changes, GIS applied in tourism management also need to be improved according to the development of information technology to adapt to the information technology development. Looking at the prospects of GIS applied in tourism management, the following areas need to be improved: RS, GPS as supplementary means applied to GIS data collection and update to enhance information collection ability of the system; combining the multimedia and virtual technology with GIS to enhance the attractiveness of the system for tourists. Combining the expert system technology with GIS is vital to enhance the capacity of the system to solve travel problems, Wei (2012).

3. Conclusions

As we can notice from this study, Using GIS in tourism is very little. Chen, (2007) emphasized that few researchers have applied GIS to tourism planning and management practices. The following are a number of opportunities for GIS applications in tourism planning (Farsari and Prastacos, 2004): 1. Visitor flow management: This involves the use of GIS to identify principal tourist activity spaces within a destination and the flows among destinations. Authorities may implement strategic plans for superior infrastructure (e.g., building public transportation systems linking various tourist activity spaces). 2. Facility inventory and resource use: This involves the use of GIS in connection with the issue of environmental justice (namely the fact that tourism may not benefit all segments of society equally). It also involves developing an inventory of resources in order to identify conflicting but also complementary land uses and activities, available infrastructure, and natural resources. 3. Assessing impacts of tourism development: GIS can be used to demonstrate tourism impacts on various industrial sectors in a time-series and spatial

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format (Chen, 2006). Within this category, analysts can use all or several of the previous categories by employing the ‘‘what-if’’ tool of GIS. This tool allows the development of scenarios for predicting what the effect of a change in a certain variable(s) will be in the destination. Farsari and Prastacos (2004) reported, most applications of GIS in tourism relate to identifying suitable areas for developing tourism activities in the future (land suitability analysis) while the use of GIS in already developed (mature) tourist destinations has been avoided. They suggested that; there are a number of ways in which GIS can benefit the study of tourism, and implementation of sustainable practices in destination areas. This study invites GIS researchers to expand their applications to the tourism sector generally, and tourism planning particularly.

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