

Intelligent Tourism Management System

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Abstract

Access to relevant and accurate information is at the heart of tourism, more so in this era of the Internet information overload has become a prevalent phenomenon and as such a serious issue for those seeking for appropriate information. Furthermore, various researches have been carried out on how to make information on tourism website more effective. Intelligent tourism management system tries to bridge the gap by noting what a tourist perceives as relevant, in terms of content pertaining to tourism products in tourism websites. This study focuses mainly on content because it is seen as the key factor associated with an effective website. Hence, the aim of this research entails the design and implementation of an intelligent platform that will assist tourists in gaining access to information on tourist locations in Nigeria. In view of the forgoing, the system was implemented using Rational Unified Process as the adopted software development process, whereas MySQL, HTML and PHP were the implementation tools used in the development of the system. Upon completion, the system was able to provide information by fetching information from the web pertaining to the subject of interest to assist tourists in decision making process. It was also able to act intelligently by using hybrid recommendation technique to recommend tourist locations based on their preference.

Keywords: Tourism; Intelligent; Tourism Management; System.

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1. Introduction

Over the years, tourism has continued to gain massive interest at a global scale. It is a major foreign exchange earner for a good number of advanced and emerging economies. It is also true that information explosion makes it cumbersome times to access relevant information to enhance decision making. This has given rise to the emergence of intelligent systems or mechanisms that facilitate quick access to relevant content found in the Internet [1,2]. For developing countries like Nigeria, tourism is one of the untapped but potentially big income generator. There are about 142 tourist destinations that spread across the 36 states of the federal republic of Nigeria. Whereas some exist naturally, others are manmade [3].

In this era that has witnessed rapid advances in information technology, information overload has become a serious problem to those seeking for information online. Recently, intelligent search mechanisms have been deployed on the web that shows that the problem of information overload can be partially eliminated by providing a platform with more intelligence to assist tourists in the search for relevant information [4]. Google.com is an example of an intelligent search engine that helps users with information and another class of intelligent system that has proven relevant in addressing the problem of information overload are recommender systems [5].

In the aspect of tourism, Internet and web technologies have made more readily available information on tourist locations, accommodations, transportation, shopping, food, festivals, and other attractions, thus improving tourism experience [6].

The goal of this research is to design and implement intelligent platform that will aid tourists in Nigeria to have access to information on tourist locations thus help fasten their decision making process.

2. Review of Closely Related Works

So many researches have been carried out relating to intelligent tourism management systems with significant impact in the tourism industry around the globe. Some of the research works carried out by researchers as related to intelligent tourism management system are discussed in the succeeding sub-sections.

2.1. The Application of Intelligent Tourism Mobile Client Based On Ontology

This paper proposed the application of ontology theory in the research of intelligent tourism mobile application client. The adopted method (ontology) helps to structure the kind of information given to tourists thus eliminating room for information ambiguity. The strength of this research work is based on the fact that it makes use of an organic combination of the major elements that are closely linked to tourism, and infiltrates them into every aspect of tourism which produces an effective, intelligent and efficient tourism information system. However, its weakness is based on the fact that it is mobile-based and hence accessibility is limited to mobile device users [7].

2.2. Destination Information Management System for Tourists

The system was designed for tourists taking Nigeria's tourism into consideration. This was to provide tourists with intelligent interaction based on virtual community concept of tourism and locals that have common interest theme. The system aims at bridging the gap; which is the lack of interaction that exists between tourists and locals at a particular destination. The system was designed using Java Applet (Netbeans IDE 6.1), HTML, PHP and Java script whereas MySQL was used to design the database. The advantages of the system is it is user-friendly, interactive, supports security and compatible to various web servers but the system lacks intelligence in providing information to tourists, thus reducing the stress at which tourists seek for information on the system [1].

3. Methodology

The approach employed in designing the proposed system is the Rational Unified Process (RUP). The RUP methodology is based on the fact that the system represents an organized way of gathering business requirements and building the goal of the project. This was employed, because it is an object-oriented and web-enabled program development methodology and also a framework for developing software systems. It also clearly outlines the different roles of the individuals involved in the project, such as the project manager, business analyst and developers. Some characteristics of Rational Unified Process include;

- i. **Developing iteratively:** This involves developing software in repeated cycles. With each cycle, additional features are designed and developed in the system until the system is fully functional and ready for deployment to the customer.
- ii. **Managing requirements:** This involves explicit documentation of the user's requirement and keeping track of changes with respect to the requirement. It also analyses the system and the impact those changes will make on the system before taking them into consideration.
- iii. **Using component-based architectures:** This involves structuring the system architecture into components.
- iv. **Modelling software visually:** Using graphical UML to present the software's dynamic and static view
- v. **Quality verification:** It ensures that software meets the organizational quality standards
- vi. **Control over changes:** it gives room for changes in the software to be managed efficiently using a change management system and configuration management procedures and tools [8].

3.1. Entity Relationship Diagram

Entity relationship diagram as depicted in Figure 1, is a graphical representation of entities and their relationships with each other. It is also refers to as the organization of data within the database or system on the logical representation of the database on Intelligent Tourism Management System (ITMS).

3.2. Hardware And Software Requirement

For the software to be able to run efficiently on computers, it needs certain hardware components or some software to be present. The software requirements are:

- i. Operating System (32 or 64bit Windows 7/vista/XP and latter , Linux, mac OS, android OS)
- ii. Processor (1 dual core or single core processor)
- iii. Internet browser (Mozilla Firefox (most suitable), opera mini, Google chrome, or internet explorer)

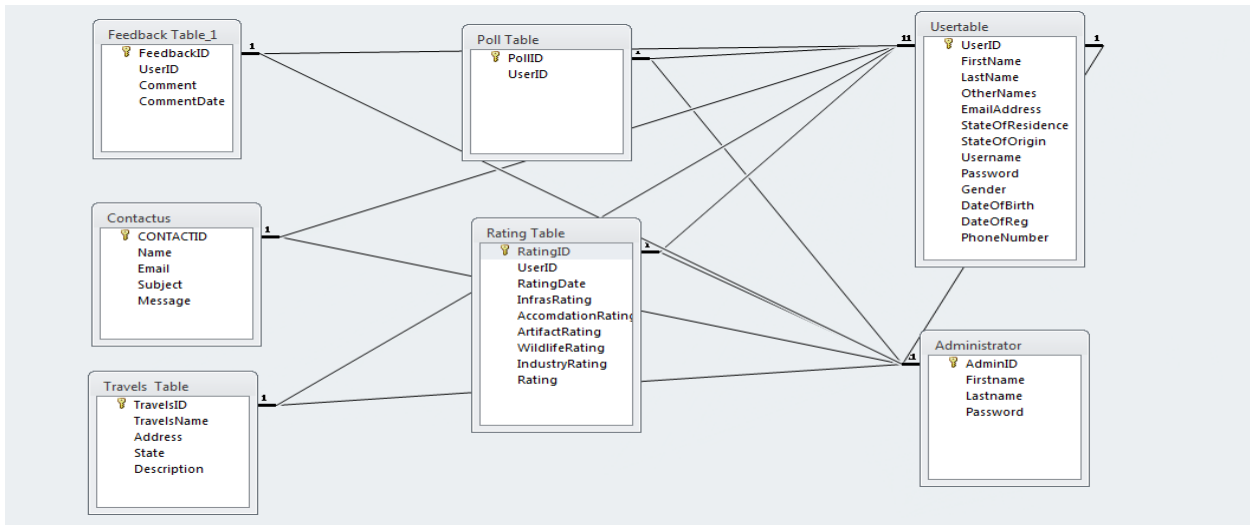


Figure 1: Entity Relationship Diagram for ITMS

The hardware requirements are:

- i. CPU (Pentium III, 950MHz, CPU)
- ii. Memory (256MB RAM)
- iii. Video graphics adaptor (16bit VGA)
- iv. Network card (1GB Ethernet)
- v. Hard disk (5GB)

3.3. Sequence Diagram

A sequence diagram shows the interaction of how processes operate with one another and in what order they operate. It illustrates how messages are sent and received between objects. A system sequence diagram as captured in Figure 2, depicts the following;

- i. The actor of the use case
- ii. The messages from the actor to the system
- iii. The order in which the messages occur
- iv. The external system that sends the message to system and
- v. The system itself (in a block format) [9].

In addition, Figure 2 which captures two diagrams labelled 1 and 2, shows the sequence diagram for searching the tourist locations in Nigeria and for using the Intelligent Tourism Management System respectively. The use case begins when the user decides to register in the system; the system provides the user a login form to enter required information. If the system searches through the database and finds this information to be correct, it

displays to the user the system homepage and allows the user to make use of the system. However, if not valid, the user will be redirected to the login page.

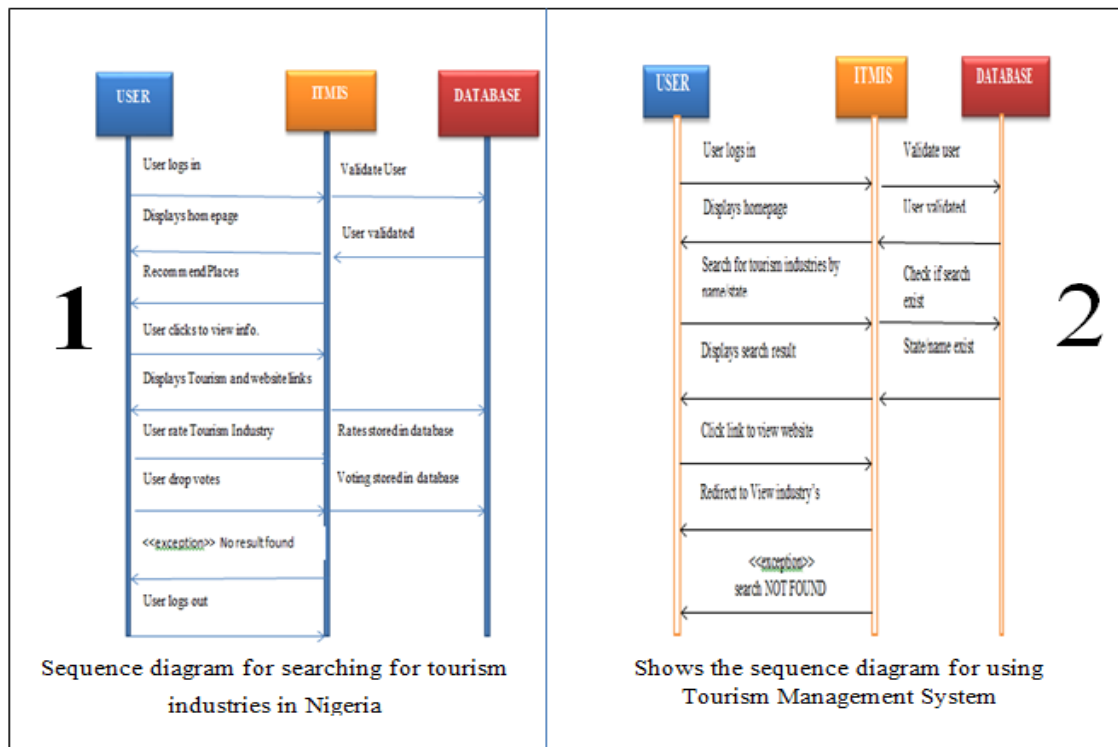


Figure 2: System Sequence diagram for ITMS

4. The Proposed System

ITMS is a web-based application designed to minimize the amount of time required for data management and operation on the system. It allows one to easily access relevant information, make recommendation for places, and make bookings online for travel and accommodation.

4.1. Functional and Non-Functional Requirements

Functional requirements show the operation and activities the system must be able to perform. The functional requirements of ITMIS are that tourists;

- i. should be able to rate tourism places after visiting their website or surfing through the information
- ii. should be able to search through the database either by name or state
- iii. shall be provided a link to the website of tourism industries they have searched for (that is if the website exist)
- iv. shall be updated about news of tourism industries on the system homepage
- v. should be able to view virtual tours of the tourism industries (when they are available)

The non-functional requirements are constraints upon the system behavior or quality attributes of a system. Consequently, the non-functional requirements of ITMIS are that the system;

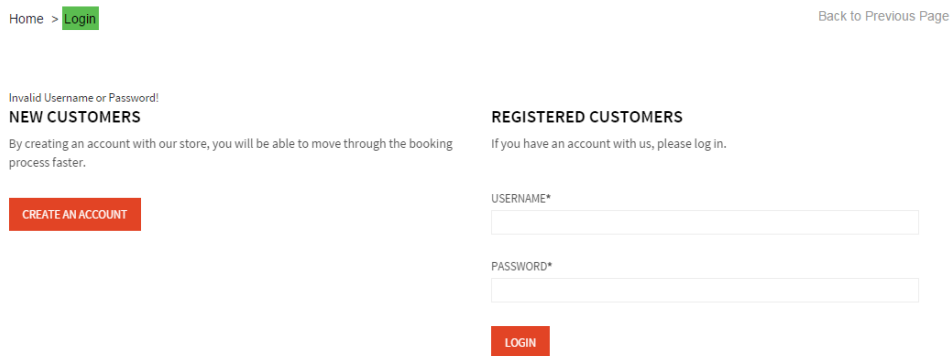
- i. should be developed to be simple and efficient for the end users and also should be easy to understand
- ii. shall be able to minimize the rate of errors generated by users
- iii. should perform calculations and provide feedback quickly
- iv. shall be compatible to any hardware
- v. should be able to upgrade without disturbance to the service

4.2. System Testing and Component Testing

System testing is the integration of two or more components of a system as it relates to the functionality of the system and running an integrated test on the entire system. The software was tested with Web browsers namely Internet Explorer 8, Google Chrome version 47.6 and Opera 35.0. Windows OS and Mac OS and WAMP server version 2.5 was also used to test the software.

Component testing also known as module testing is the process of testing the individual components of the system to determine if its desired functionality is met. It helps to find defects in components or modules of a system; making sure all faults in the components are exposed for correction. Component testing is essential because it helps to find bugs before integration testing is carried out.

4.3. User Validation



The screenshot shows a user validation page with the following elements:

- Top left: "Home > Login" (where "Login" is highlighted in green)
- Top right: "Back to Previous Page" (a link)
- Center: "Invalid Username or Password!"
- Left side: "NEW CUSTOMERS" section with the text "By creating an account with our store, you will be able to move through the booking process faster." and a red "CREATE AN ACCOUNT" button.
- Right side: "REGISTERED CUSTOMERS" section with the text "If you have an account with us, please log in." and two input fields labeled "USERNAME*" and "PASSWORD*", followed by a red "LOGIN" button.

Figure 3: User Validation page

Figure 3 shows the user validation page. In the event that a user who intends to have access to the system but ends up inputting a wrong username or password, the system displays a warning message showing "Invalid Username or Password" but gives the user another trial to input the right details before redirecting to the system homepage.

4.4. Registration Verification

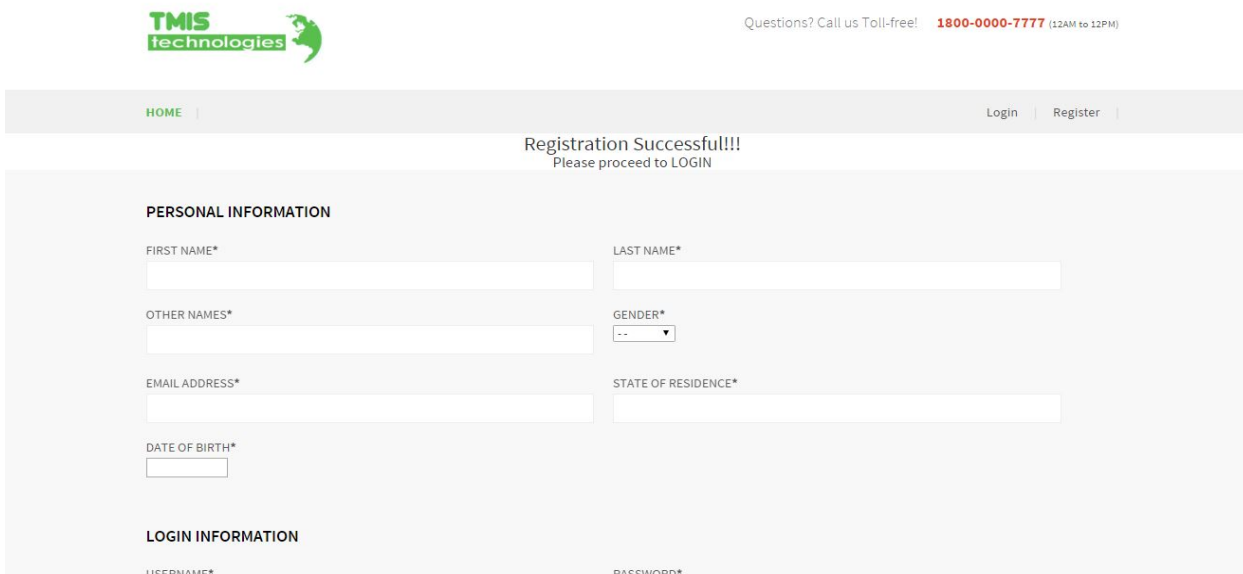


Figure 4: Registration Verification

Figure 4 shows the registration verification after a user has successfully filled in the boxes with the appropriate information. The system returns a message to the user showing the left blank boxes to fill and a “Registration successful, proceed to login” message if all boxes are filled correctly. This information is stored in the database and in turn this information is used by the user to login to the system.

4.5. Message Verification

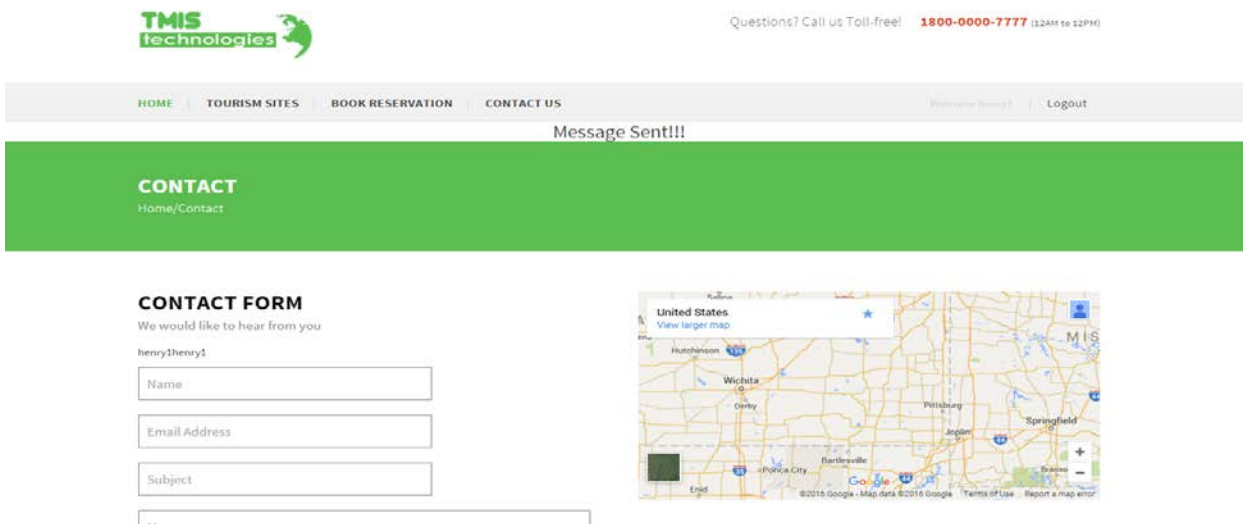
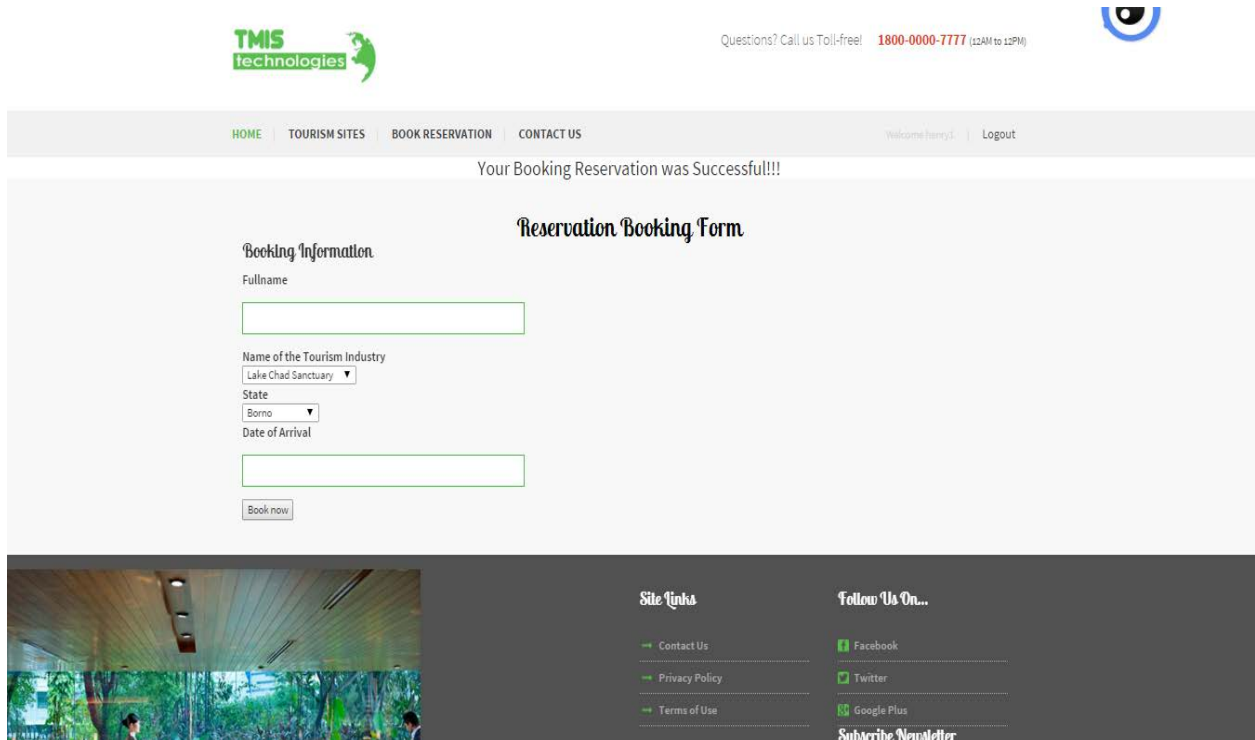


Figure 5: Message Verification page

Figure 5 shows a verification module. A user having problems relating to the system performance, tourism

product or information sends a message to the admin. The admin in due process responds to the message after which a confirmation message displays that “a message has successfully been delivered” to the admin.

4.6. Booking Verification



The screenshot displays the TMIS Technologies website interface. At the top, the logo for TMIS Technologies is on the left, and contact information (Questions? Call us Toll-free! 1800-0000-7777 (12AM to 12PM)) and a circular icon are on the right. A navigation bar contains links for HOME, TOURISM SITES, BOOK RESERVATION, and CONTACT US. A user is logged in as 'Henry J.' with a 'Logout' option. A central message reads 'Your Booking Reservation was Successful!!!'. Below this is the 'Reservation Booking Form' with the following fields: 'Booking Information', 'Fullname' (text input), 'Name of the Tourism Industry' (dropdown menu showing 'Lake Chad Sanctuary'), 'State' (dropdown menu showing 'Borno'), and 'Date of Arrival' (text input). A 'Book now' button is located at the bottom of the form. The footer features a 'Site Links' section with links to Contact Us, Privacy Policy, and Terms of Use, and a 'Follow Us On...' section with icons for Facebook, Twitter, and Google Plus, along with a 'Subscribe Newsletter' link. A small image of a modern building interior is visible on the left side of the footer.

Figure 6: booking verification

The user has a choice of making reservations online during and before visitation. Figure 6 shows a validation of a user request who has successfully made a reservation.

4.7. Database Testing

Database testing is essential because it helps to obtain errors which might affect the system performance, reliability, consistency and security. It also helps to validate the system against the requirement specified by the user [10]. It is essential one performs database testing to obtain a database system which satisfies the acid properties (Atomicity, consistency, isolation and durability) of a database management system [11].

4.8. Booking Table

Table 1 shows the booking table which holds information about the user requesting for reservation on a particular tourism centre. The table keeps record of the user names, tourist centre, state, date of birth as well as the date of registration.

4.9. Contact Table

Table 2 shows the contact table in the system. The table holds messages from the user relating to their suggestions and complaints about the system and tourism products. It also keeps the user details as well as the subject of the message for proper identification.

Table 1: Booking table

#	Name	Type	Collation	Attributes	Null	Default	Extra	Action
1	id	int(100)			No	None	AUTO_INCREMENT	Change Drop Primary Unique Index Spatial Fulltext Distinct values
2	fullname	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
3	tourist_site	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
4	state	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
5	doa	date			No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
6	date_of_registration	timestamp(6)			No	CURRENT_TIMESTAMP(6)	ON UPDATE CURRENT_TIMESTAMP(6)	Change Drop Primary Unique Index Spatial Fulltext Distinct values

Table 2: Contact Table

#	Name	Type	Collation	Attributes	Null	Default	Extra	Action
1	id	int(100)			No	None	AUTO_INCREMENT	Change Drop Primary Unique Index Spatial Fulltext Distinct values
2	name	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
3	email	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
4	subject	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
5	message	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values

4.10. Travels Table

The table holds the 50 tourist locations used in the system as well as the information pertaining to each of the sites. See Table 3.

Table 3: Travels Table

#	Name	Type	Collation	Attributes	Null	Default	Extra	Action
1	id	int(11)			No	None	AUTO_INCREMENT	Change Drop Primary Unique Index Spatial Fulltext Distinct values
2	product_name	varchar(80)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
3	product_img_name	varchar(80)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
4	state	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
5	description	varchar(1000)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
6	website	varchar(255)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
7	rate	int(11)			No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
8	dt_rated	timestamp			No	CURRENT_TIMESTAMP	ON UPDATE CURRENT_TIMESTAMP	Change Drop Primary Unique Index Spatial Fulltext Distinct values
9	id_post	int(11)			No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
10	ip	varchar(40)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values

4.11. State Table

Table 4 holds the 36 states present in Nigeria. It shows up on the registration platform and on booking platform and also useful while recommending tourism places for users.

Table 4: State Table

#	Name	Type	Collation	Attributes	Null	Default	Extra	Action
1	id	int(11)			No	None	AUTO_INCREMENT	Change Drop Primary Unique Index Spatial Fulltext Distinct values
2	names	varchar(50)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values

4.12. User Table

Table 5 is used to store information of users who have registered with the system. The information stored in the user table is mainly the information inputted by the user during registration.

Table 5: User Table

#	Name	Type	Collation	Attributes	Null	Default	Extra	Action
1	user_id	int(100)			No	None	AUTO_INCREMENT	Change Drop Primary Unique Index Spatial Fulltext Distinct values
2	fname	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
3	lname	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
4	user_name	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
5	sog	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
6	password	varchar(1000)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
7	oname	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
8	gender	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
9	email	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
10	sor	varchar(100)	latin1_swedish_ci		No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
11	dob	date			No	None		Change Drop Primary Unique Index Spatial Fulltext Distinct values
12	dor	timestamp(8)			No	CURRENT_TIMESTAMP(8)	ON UPDATE CURRENT_TIMESTAMP(8)	Change Drop Primary Unique Index Spatial Fulltext Distinct values

5. Findings/Results

In the design of the ITMS, information pertaining to tourist locations in Nigeria was not completely gathered thus reducing the functions ITMS is intended to carry out but design maintains a centralized database of fifty (50) tourist locations and all related information in Nigeria. In addition to managing tourism information, we were able to implement a recommendation filtering system that can improve science and autonomy of the system thus assisting tourist in decision making process. The designed system is user-friendly, interactive, and compatible to every web browsers running on any hardware and the interface was beautifully designed for attractiveness and to promote efficiency and productivity of the website.

6. Limitations

The study was limited to fifty (50) tourist locations in Nigeria; spanning both the Natural and artificial attractions. There were cost and time implications during the course of the study as it required gathering information of tourist locations over a large geographical area.

7. Future Research

It is worth mentioning that this research work is open for further enhancement, with the expectation that it becomes more robust and better enhanced; covering every single tourist site in Nigeria. In addition, certain constraints, such as inadequate information sources for each of the tourist locations in Nigeria, some features were not included which would have made ITMS a more robust management system.

Some of these features include the following;

- i. In this study, only 50 tourist locations in Nigeria were used. Therefore, an improved system should incorporate every tourist site in Nigeria for better insight on available tourist attractions.
- ii. Provision of advertisement platform so that tourists will be able to get latest information on all the tourist locations in Nigeria
- iii. A fully functional reservation platform so that booking could be made via credit cards.
- iv. Provision of content scheduler to eliminate outdated information.

8. Conclusion

In conclusion, this software will solve many problems in Nigeria relating to management of product and information pertaining to tourism. Tourists will get acquainted with all the tourist sites in Nigeria and information pertaining to those sites without physically extracting information from people or having to travel long distances to see what the location has to offer. With the availability of the Internet, users have access to ITMS application; hence they are empowered with current and relevant information pertaining to tourism in Nigeria. The application will go a long way in assisting tourists in decision making, and also as a source of revenue to the country. ITMS will make tourism round the country fun and easy because of easy access to relevant information.

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