Using Geo-Business Intelligence and Social Integration for Smart Tourism Cultural Heritage Platforms

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Abstract— The Geo-Business Intelligence or Localization Intelligence is a collection of technologies that combines Geographic Information Systems (GIS) and Business Intelligence (BI). Thanks to the application of these technologies to the field of Cultural Heritage it is possible developing Smart Tourism applications to engage travelers with their social networks.

In this paper we describe a model architecture for Smart Tourism Systems (STS) tailored for Cultural Heritage and territorial data. The proposed architecture prompts a rethinking of the key paradigms: interactive travel, tourist gaze, hospitality, authenticity and social networking data.

This approach can contribute significantly to improve tourism web platforms yielding new business opportunities.

Keywords-component; Globalization, Business Intelligence (BI), Smart Data Location (SDL), Cultural Heritage, Smart Tourism, social network.

I. INTRODUCTION

Business Intelligence is a technology devoted to analyze business data and processes with the aim to obtain the appropriate KPI (Key Performance Indicators) of interest, to keep them under control, and to hold an immediate visualization (reports, dynamic dashboards, historical analysis systems, etc.).

Many methods for this purpose have been developed in research areas such as data mining, machine learning and statistics [1].

These methods are increasingly being integrated into other information systems and tools (e.g., customer relationship management, database management systems and network security) [2][3].

Recently Business Intelligence (BI) and GIS (Geographic Information Systems) have become closely integrated [4] and the merger of these two tools, embracing the mash-up between business and maps, provides a powerful visualization system incorporating company data in the context of smart map-based reports [5].

We define GEO-Business Intelligence (GEO-BI) as a geo-referenced BI, which adds to the business information extracted from Data Warehouse the territorial information concerning the positioning of the quoted sizes within dashboard.

Hence, the Geo Business Intelligence or Location Intelligence is a set of technologies, combining the Business Intelligence with Geo-Location.

Moreover, the growing diffusion of Smartphone apps already doing the connection to mapping layers such as Google Maps, is enhancing the importance of embedding BI tools results enriched with geo information derived from GIS servers.

In this paper we describe a model architecture for Smart Tourism Systems (STS) tailored for Cultural Heritage and tourism data. The proposed architecture (being social networks a powerful advertising channel for users) implements a Social Media Strategy and it prompts a rethinking of the key paradigms: interactive travel, tourist gaze, hospitality, authenticity and social networking data.

This platform will be useful for developing websites providing user tourist information (hotel reservations, price comparison, market overviews) and much more enabled by personalized intelligent tools for travelers.

This approach can contribute significantly to improve tourism web applications and it may represent a business opportunity for Touristic Operators.

The paper is organized as following: the next section introduces the Geo Business Intelligence by exploring the applicative context and their potential socio economical implications. The discussion has been carried out through the required technologies by remarking the main reasons for implementing a Geo Business decision system.
The third section describes the model architecture for Smart Tourism Systems (STS) tailored for Cultural Heritage and territorial data.

The fourth section describes a case study where the proposed architecture exploits touristic information coming from online communities exchanging geo-referenced data and services.

Finally, section five present a discussion on concluding remarks.

II. THE GEO BUSINESS INTELLIGENCE

The Geo Business Intelligence, or Location Intelligence, is a collection of technologies integrating Business Intelligence with Geo-Location systems and used to implement decision support systems with the purpose to improve the efficiency of business activities in service environment. From a general point of view, Business Intelligence aims to achieve Process Optimization and Costs Reduction. Basically, this will be obtained through tools to analyze business data and processes with the aim to obtain the appropriate KPI (Key Performance Indicators) of interest, to keep them under control, and to achieve an immediate display of them (reports, dynamic dashboards, historical analysis systems, etc.).

![Business Intelligence Platform](image1)

Figure 1: LOCATION INTELLIGENCE

To make business decisions that result in terms of: greater awareness revenue, reduce costs and greater efficiencies we need enhanced system expanding the possibilities of analysis on any type of KPI: graphic, geographic, documentary, digital, financial, statistical, etc.

In next sub-sections we report the reasons for introducing the location intelligence to achieve a system of decision-Geo Business Intelligence that continuously improve the quality of data.

In the Figure 1 the decision-making system of Business Intelligence is integrated with Location Data System, or rather with spatial data and spatial queries, making the Data Analyst able to correctly represent data to the user.

The manager, in this new system, will have a series of reports in the form of maps (Map Report) with a much more immediate impact on the territory than to that shown in the previous system.

III SMART TOURISM SYSTEM ARCHITECTURE

While there are a large number of websites specialized for the dissemination of cultural heritage and tourism site that use social networks [6] to support travelers, yet there are no social-websites in which touristic and cultural information are combined and georeferenced (with information’s maps for geolocation).

Moreover, just like the Web 2.0 has transformed the Web and the way people use it, we felt the need to develop a system, based on the principles of Web 2.0 (Collaboration, Sharing of Knowledge and Enhancement of Social Networks) whose objective is embodied in the integration of the cultural heritage and tourism in order to use it in network as a "common good" for citizens and visitors, also allowing users to share their knowledge.

To this purpose we have designed and implemented an innovative platform called STS (Smart Tourism System), based on the idea of integrating traditional WTS (Web Service Tourism) and Geo Business Intelligence Systems. The main role STS role is to provide a social platform for delivering innovative solutions to enhance the Tourism sector’s.

![STS Platform](image2)

Figure 2: STS Platform

This will be obtained by connecting tourism/culture services with tourism actors (touristic operators, travel agents, citizens, etc.) to satisfying the needs of marketing solutions such as the ones required by personalized tourism products.

The main STS platform issues are the following ones:

- **SENSING**: collecting data and information from structured and unstructured sources;
- **INFORMATION CREATION**: data processing and data interpretation;
- **WORKFLOW MANAGEMENT** Definition of "Cultural Itinerary" and its dynamic re-planning;

- **DECISION SUPPORT SYSTEMS** Governance;

- **BUSINESS INTELLIGENCE** Analysis and Reporting.

- **BIG DATA ANALYSIS** The platform will help tourism business to acquire information on Big Data generated through the use of social networks (blogs and forums) to respond quickly to customer trends.

- **CLOUD INFRASTRUCTURE** Using STS platform you can create Web portals for the development and delivery of SaaS (Software as a Service) cloud environments.

From software developer point of view, the STS platform offers a large number of tools and plug-in easily integrated into leading platforms such as Eclipse and Net Beans. In addition the CMS-based front-end organization can be used to provide a suitable administration level.

From the User point of view, as it shown in Figure 2, STS, involves Touristic Operator and Touristic Citizen. Touristic Operators represent Stakeholders (touristic operators, travel agents). Touristic citizen may be simple visitor or specialized user (for example travel angels, that is platform user willing to help other people (Travellers) planning to visit their city for giving information). By means of the service platform touristic visitor, asking for a trip, will be constantly updated on nearby points of interest, accommodation, dining options, weather etc.

### IV CASE STUDY

As a case study of STS platform application we describe ArtBook a Smart Tourism Systems tailored for Cultural Heritage and territorial data that integrates the **touristic “Angels for Travellers” Social Network Service**.

The **Touristic Angel-Social Network service** has been included to show an example in the field of Tourism 2.0 in which touristic information comes from online communities communicating through geo-referenced services.

In fact Travellers can express their opinions on their experiences, on the courtesy and capacity of their guiding Angel, on the quality of the hotels where they stayed and on the beauty of the places they visited.

The Travellers must fill out a simple registration form in order to become part of the community.

The following screen-shot represent Angel’s platform registration interface.

To become an Angel the user must write his profile: name surname, age, photos, interests, languages spoken.

![Image](image1.png)

**Figure 4: User Registration as Touristic Angel, step 1**

![Image](image2.png)

**Figure 5: User Registration as Touristic Angel, step 2**

Then after the registration is possible to answer to the questions of the Traveller. Every Angel will have references which will be updated (and visible on the site) based on the assessments of the Travellers.

In the Figure 6 there is an example of Smart WTS (Web Tourism Service) user interface which can be used by people interested to visit places for which required information could be enhanced with the help.

![Image](image3.png)

**Figure 3: STS ArtBook: Event insertion Form**

**Angels for Travellers** is a community of people (Angels) who are willing to help other people (Travellers) planning to visit their city.
of social network contribution posted by other people (touristic angels).

In the STS platform, it is possible to choose the own touristic angel and through the down menu it’s possible to make a selection on a particular type of trip, on the basis of user interest (environment, architecture, art, wine and food, go round with children, go round by bike, literature, shopping, music, theatre, night life).

By clicking on the corresponding name a window opens where you can get in touch with the touristic angel selected.

In the STS platform, it is possible to choose the own touristic angel and through the down menu it’s possible to make a selection on a particular type of trip, on the basis of user interest.

The main goal of STS platform is to facilitate the connection between tourism/culture services and tourism actors (touristic operators, travel agents, citizens, etc.) to meet better and quicker the needs of the evolving market of more tailor-made, personalized tourism products.

We look at the Smart Tourism System described above, as a strategy to relaunch the economy in Europe. In fact tourism has been identified by the Italian government as a sector with the potential to create up to 500,000 new jobs by 2020 and to gross domestic product (GDP) from 134 billion to 164 billion euros annually. Moreover Smart Tourism can generate the financial resources needed to invest in the rehabilitation of historic buildings and conservation areas.

V CONCLUSION

In this paper we have introduced STS (Smart Tourism System) platform an innovative model architecture based on the idea of integrating traditional WTS (Web Service Tourism) and Geo Business Intelligence systems to realize social websites for the delivering and provisioning of innovative solutions to enhance the Tourism sector.

Then we have described a case study of STS platform application through ArtBook, a Smart Tourism Systems tailored for Cultural Heritage and territorial data that integrates the Touristic Angel-Social Network service.

REFERENCES