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Implementation of an Interactive Crowd-Enhanced Content Management System for Tourism Development

Ioannis Paliokas[1], Eirini E. Mitsopoulou[1], Athanasios T. Patenidis[1], Evangelos A. Stathopoulos[1], Alexandros Kokkalas[1], Sotiris Diplaris[1], Elli Karyati[2], Spyros Tsafaras[2], Eleana Tasiopoulou[3], Christodoulos Riggas[3], Georgios Meditskos[1], Stefanos Vrochidis[1], Konstantinos Votis[1], Ioannis Kompatsiaris[1], and Dimitrios Tzovaras[1]

[1]Information Technologies Institute, Centre for Research & Technology Hellas, Thermi, Greece
[2]Tetragon S.A., Thessaloniki, Greece
[3]Piraeus Bank Group Cultural Foundation; Athens, Greece

ORCID:
Ioannis Paliokas: http://orcid.org/

Corresponding Author:
Ioannis Paliokas
ipaliokas@iti.gr

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Abstract

This paper investigated the role of interactive tourist mobile apps in tourism development. The researchers presented the e-Tracer application, which was developed taking into consideration the recent advantages in mobile computing, the importance of user-generated content and the needs of northern Greece and the lower Balkan countries. Apart from crowd-based content creation, a new generation of apps for tourism development may include additional components like serious games for tourists, map-based navigation systems and augmented/virtual reality applications, in order to offer memorable user experiences for tourists. An agile content management system design methodology was followed by taking into account the needs of alternative tourist destinations, small to medium sized real-world museums and driver rest areas located around highways which connect cross-country destinations in the lower Balkan countries and Turkey. This work positioned the role of interactive crowd-enhanced platforms for content management of tourist-related information in tourism development, economic growth and sustainability of the Egnatia motorway surrounding areas in Greece.

Keywords: mobile computing, content management systems, recommender systems, serious games, virtual/augmented reality, tourism development

1. Introduction

Online travel agencies, like TripAdvisor (https://www.tripadvisor.com) and Google Travel, (https://www.google.com/travel/) are websites (offered also as mobile apps) which have become extremely popular as they allow tourists and visitors to search for information, make reviews, manage their travel & accommodation and find hidden attractions that match their personal preferences. This relatively new category of mobile apps has played an important role in the recent development of travel and tourist services around the world [1, 2]. As Miguéns et al. imply [3], the so-called Travel 2.0

has a huge impact on the travel and tourism industry, mainly because tourism related topics have become of central importance for travel planning.

Modern cross-country highways allow people to travel fast and easy to distant destinations, but on the other hand this may reduce their level of tourist satisfaction as they do not get in contact with nearby Points of Interest (POIs), local events and activities. Egnatia Odos (in Greece), or other future projects like the Adriatic–Ionian motorway and some similar projects with full motorway standards in Greece and other countries of lower Balkan and Eastern European region usually raise such concerns for the survival of the economies of the surrounding areas.

This study suggests online mobile technologies for tourism sustainability and economic growth of the areas nearby motorways and presents the implementation of e-Tracer, an interactive mobile app designed for that purpose. As the main intellectual output of the e-XNILATIS project (https://e-xnilatis.gr/en/home-en/), the e-Tracer application combines a set of Travel 2.0 tools based on innovative spatial interconnection technologies for multiple POIs and local events of touristic, cultural and environmental interest. It was designed to propose alternative touristic routes to travelers who intend to use Egnatia motorway to reach their destination and to support them in all phases of their travel: planning, searching, orientation and evaluation.

2. Raising Trends in Online Tourist Business Models

The philosophy of online social collaboration and media sites has a significant effect of tourist's intentions and actual behaviour [4] and actually has trained the recent generations of travelers in new behavioural patterns. More or less, those new behaviours contain three main activities: 1) starting from planning (before the actual trip), users collect information using web technologies (usually with a mobile end-device) and keep notes on most important POIs and activities, 2) make a plan out of collected information and follow predefined navigation routes at the time of travel (sometimes in real-time), and 3) make reviews on the touristic services and products they consumed to share with others the quality of their experience.

Online environments for tourists (intention sharing platforms, evaluation sites, map-based navigation apps) have become extremely popular in the recent years taking advantage of the mobile computing development [1] and the willingness of travelers themselves to contribute to the content development [5], in order to address all the needs of the tourist communities. Those initiations usually operate websites and mobile applications to deliver expert and user-generated content on demand. Moreover, there are engine-based recommendations (Recommender systems) which apply collaborative filtering algorithms to study user's history, classify users based on their preferences and similarities and finally propose recommendations with a high possibility to be accepted by the user as in the work of Borras et al. [6].

In the light of those new changes Travel 2.0 has brought to our lives, tourist apps have been offered as an holistic solution for most of the user needs before, at the time and after the travel experience. Moreover, additional components like crowd-sourcing evaluation (*Participation-for-Others* as mentioned by Roeffen & Scholl-Grissemann [7]),

Gamification [8], and e-Marketing solutions [9] may be integrated into the travel apps in order to keep tourists' interest high and allow stakeholders to maintain contact to their customers. For example, mobile apps like OneAppy [11] introduced such a model used to integrate e-Marketing campaigns into tourism and lifestyle products/services in order to allow business owners to develop and maintain a powerful online presence and establish interactive communication channels with their customers.

Gamification, another hot trend in tourism market sector, can contribute to a higher level of user satisfaction due to the more rewarding interactions and the increased loyalty to the destination [11]. And more than that, as Negruşa et al. [13] explained, the results of Gamification should not be evaluated in the surface of product/services consumption rates, but also in terms of the people's intention to adopt sustainable behaviours which are introduced as recommendations by the gamification providers.

Virtual/Augmented Reality applications have been previously used in a wide range of market domains like the education, industry and scientific visualization, but recently, with the advantage of mobile computing technologies, the model of portable mobile app for technologically intensive travel experience has been introduced by utilizing enlarged augmented reality innovation [13]. Virtual Reality may be used for indoors applications and usually requires the use of specialized equipment, while Augmented Reality takes advantage of the availability of mobile devices to offer outdoors navigation, information, routing and game-like services on demand. Kečkeš & Tomičić published a review research in applications utilizing the AR technologies in tourism context [14] and identified a wide range of functionalities like search and browse, routing and navigation, communication, mobile commerce, social networking, collaboration, tour generation and recommendation services.

Last but not least, content development is a critical factor in the tourism business success story [15]. Users may appreciate interface design and overall usability as long as they can access large amounts of data with tourist interest. Traditionally, data integrators are in charge of discovering what tourists may be interested in and provide pieces of information as new nodes in the overall construct. But this manual process has certain limitations and can increase the maintenance cost of the solution at degrees that competition will stress the business.

The solution that most successful initiatives have adopted is crowd-sourcing. According to this approach, end-users share their experiences with other users after the travel of site visit to help others [7]. Travel advisor (by TripAdvisor Inc.) is a typical example of such an application which takes advantage of user's evaluations to maintain up-to-date information and provide alternative solutions to tourists and visitors. But again, the crowd-sourcing model even if it is successful, it requires a critical mass of users who can produce the collective effect in content development. An alternative option could be Data Mining technologies which can help data integrators to automatically discover tourist information already published on the web and integrate these new pieces of information into the internal database of the recommender system. Indeed, there are innovative Website Crawlers for tourist content monitoring which crawl a targeted part of the available web information and the related links (following certain rules) in order to obtain the kind and quantity of information established by the crawl objectives [16].

3. The e-Tracer Application

The e-Tracer application (e-ΧΝΗΛΑΤΗΣ in Greek) aims at designing, developing and evaluating a system which will be used by travelers moving via motorways to discover unknown POIs, local events and suggestions for outdoors activities. It consists of a Content Management System (CMS) for tourist information, a recommendation system to automatically produce highly personalized recommendations to users based on the user profile they maintain on the e-Tracer platform, a cartographic application for navigation and planning of alternative routes, a crowd-based evaluation system and a set of Augmented/Virtual Reality applications for local site and museum visitors. The architecture of the e-Tracer app can be seen in Figure 1.

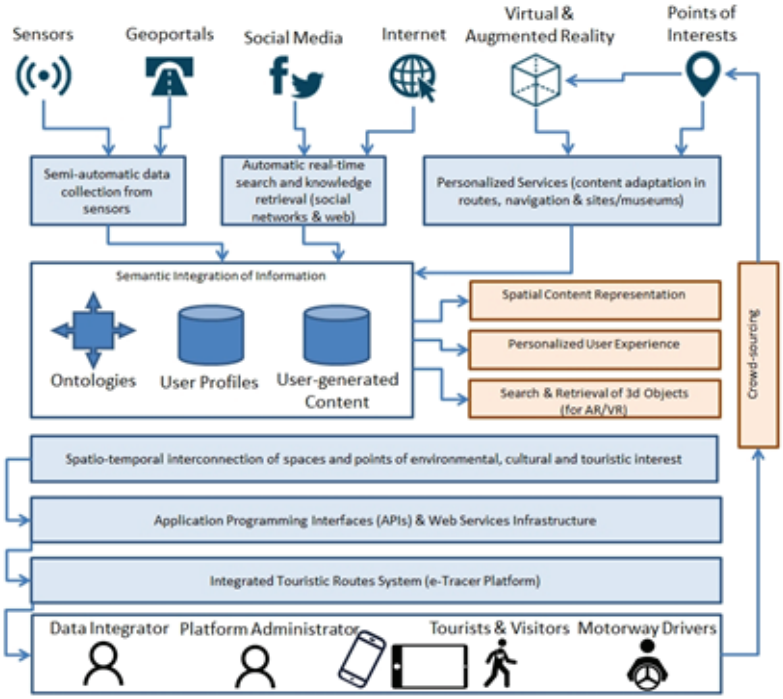

Figure 1: A graphical representation of the e-Tracer platform architecture.

Starting from the lower part of the diagram, main user categories are considered tourists, visitors and motorway drivers. More detailed user groups include educational school visits to museums and archaeological sites to be considered for indoor augmented reality applications. Those target-audiences use their own equipment (mobile devices like smartphones and tablets) to access the e-Tracer platform and services (following the Bring-Your-Own-Device principle). Thus, the e-Tracer thin client is delivered as a mobile app which contains a single-entry point for the web-based cartographic application and native AR applications for use in local museums and outdoors navigation. A set of programming interfaces (APIs) are being used to deliver user's requests to the back-end system of the platform. Tools for semantic integration of information are used to maintain content, personalization of content for adapting the services to user's own preferences and needs (according to each unique user profile), and for crowd-based evaluation (collection of user's feedback). At the top of the diagram, there are various Geoportal and sensor reading services like motorway sensors (traffic,

emergencies, and notifications). That additional information is important for close to real-time notification of unexpected incidents and last-minute changes made by the system to tourist recommendations.

Apart from manual data entries -from a technical point-of-view- the application can consolidate semantic information from multiple online sources, and thus help data integrators (e.g. tourist operators, museum curators, and other professionals) merge massive amounts of data already available on the Internet and finally provide users with the ability to organize integrated touristic routes.

What makes e-Tracer different from other Travel 2.0 initiatives is the fact that combines tools to manage tourism information before travel, at the time of travel and after the travel experience in an interactive and playful way. Moreover, it combines tools for navigation both in the physical world (map-based recommendations like as presented in Figure 2) and in the web environments (AR museum apps) for indoor and outdoor visitors.

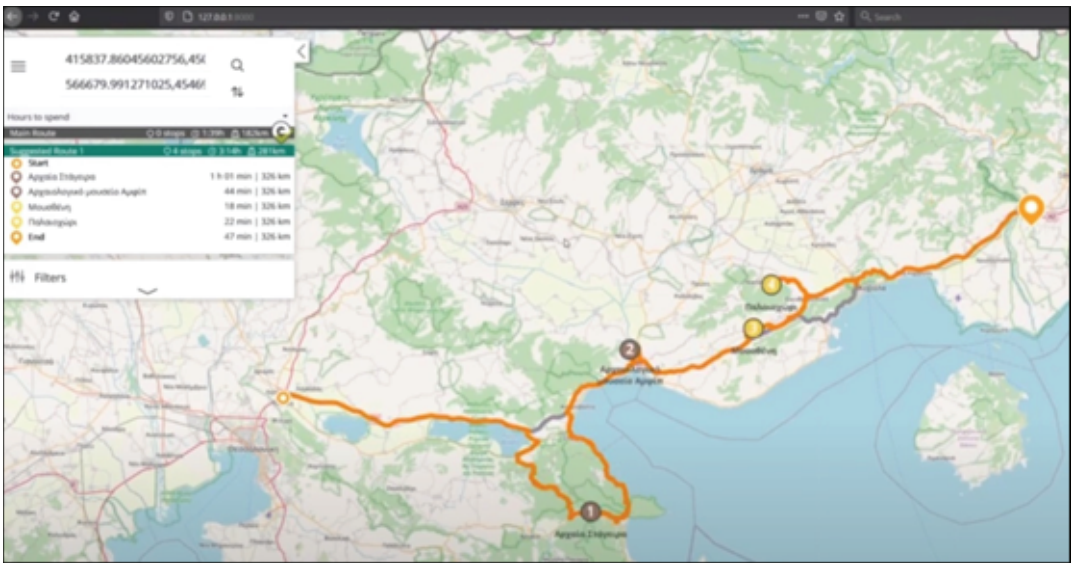

Figure 2: Screenshot from the e-Tracer cartographic navigation with alternative routes recommendations

4. Conclusion

In today's digital business landscapes, people are increasingly dependent on ICT tools to access products and services, while tourist services are not an exception. Disruptive technologies like Mobile Computing, Augmented Reality, Gamification and Social Networking have altered the landscape of worldwide tourism product. In a broader sense, the digital transformation of travel and tourism has led us to the era of Travel 2.0 [17, 18] in which web and mobile technologies can help people to benefit from improved tourist services, better planning, accessibility and inclusion, employment growth and sustainable economic development.

One aspect of the Balkan countries tourist development includes modern motorways which may follow the ancient routes of Roman roads like Via Egnatia and Via Militaris

(or Via Diagonalis). However, motorays bring destinations closer and actually people go too quickly to their destinations to allow themselves to interact with local sites and contribute to the local economy [19, 20]. According to literature evidence, there is an employment growth of around 20% in municipalities nearby highway segments, in comparison to municipalities without highway construction [22].

The e-Tracer project (e-ΧΝΗΛΑΤΗΣ in Greek) aims to overcome such limitations and offer tourists and motorway travelers the chance to discover sites of great ecological and cultural significance, which can now be visible to them through the e-Tracer mobile app. In the long term, access to the nearby sites can change consumer's behaviours on local products like food and wine for example [22].

For the reasons explained earlier, Travel 2.0 applications have experienced a significant increase in the recent years. But the majority of existing travel apps simply suggests individual Points of Interest (POIs) that are considered popular, without taking into consideration user's preferences, or certain travel restrictions like weather conditions, accessibility issues, etc. [23]. The e-Tracer mobile app was designed to fill this gap by providing personalized recommendations to tourists and motorway drivers based on alternative routes proposed as short brakes. The recommendations are generated automatically based on the starting and destination points, the user profile characteristics, conditions (e.g. weather), accessibility and level of difficulty (for activities) [23]. Other added value services on offer include easy management of tourist destinations, events and outdoors activities at the time of travel preparation or during travel time. Moreover, a set of e-Tracer web crawlers have already automatically scanned for local events and interest touristic destinations and have interesting proposals to make. This feature helps travelers to avoid searching manually for interesting sites and also help them have all materials in a single app. Peripheral components like the Augmented Reality apps for helping museum visitors to navigate themselves into selected museum exhibitions can extend the user experience in more interactive ways. Overall, e-Tracer aims to support travelers during all phases of their travel: 1) from route planning to reaching winning destinations based on user profile, 2) from cartographic motorway navigation to indoors navigation using Augmented Reality (in selected destinations), and 3) from user intention sharing to crowd-based evaluation of tourist destinations.

Currently, the platform is under review (delayed due to COVID-19 pandemic) and we hope that it will be a competitive e-Tourism product which follows current appropriate trends for pursuing sustainable economic growth in traditional and new tourist destinations.

As an example of a similar application we can mention SPETA, which takes into consideration the current user's location, profile settings (e.g. personal preferences) to generate recommendations and deliver complete tour guide services [25]. Apart from the fact that SPETA is an older initiation and addressed challenges of that time (e.g. considered offline services that could keep active the system without suffering from network disconnection), e-Tracer aimed to integrate tourist services in a single entry point using diverse navigation technologies like AR and cartographic optimized routing. Another smartphone app designed to eliminate the information overload to travelers when they use Internet to search for potential destinations and related services is STAAR

(Semantic Tourist information Access and Recommending) [25]. This app provides various semantic search features and considers personal interests and available time (itinerary length) to recommend travel routes.

In the long term, the development of more powerful ICT tools to support interoperability, personalization, and networking will empower both travelers and destinations businesses to re-engineer their communication strategies [26]. On the other hand, during the last decade or so (2013) tourist industry in Greece appears to have made a steady progress [27]. At this point we can assume that future trends in sustainable tourist development will be based on models like those underlying e-Tracer platform or similar. Navigation apps, travel planning, review platforms and marketing tools for local products will be more and more unified under a single User eXperience (UX) model.

The next step for the e-Tracer project is the development and inclusion of AR content for additional tourist destinations (currently we support four museums) and the finalization of usability and technology acceptance evaluation with the participation of tourists and travelers who are moving along Egnatia motorway in Northern Greece. But since the project became independent from Egnatia Odos SA in 2020, our future plans also include the exploration of collaboration opportunities in Balkan and Eastern-Europe counties.

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