

Tracking tourists in a Gamification Process: a theoretical approach

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Resumo | Este artigo propõe uma abordagem teórica à utilização de novas tecnologias de rastreamento de turistas: uma aplicação (*app*) de smartphone baseada num dispositivo de G.P.S (Sistema de Posicionamento Global) e associada a um processo de gamificação. Destinado a incentivar os turistas a partilhar o seu comportamento espaço-temporal durante a sua estadia, esta *app* permite recolher informação relacionada com os movimentos turísticos, como a territorialidade, padrões de movimento, orientação e locomoção e como a visita multi-atração é muito comum em visitas em destinos urbanos, fornece ainda um conjunto de dados relativos à intensidade e especificidade da visita. Baseada em tecnologia de G.P.S., tem a vantagem de associação com outras tecnologias avançadas, tais como S.I.G, *Google Earth* ou outros, é muito precisa em áreas urbanas devido à elevada cobertura de rede e não é muito intrusiva. Apesar de limitada à vida útil da bateria do smartphone foi projetada para rastrear sem conexão com a internet e enviar os dados automaticamente para a "*cloud*" assim que seja encontrada uma conexão sem fios. Uma das principais inovações introduzidas é a possibilidade de rastrear os turistas durante toda a sua estadia sem ser intrusiva, contribuindo para uma compreensão mais profunda do comportamento espaço-temporal dos turistas, tornando simultaneamente a sua visita mais divertida, apelativa e proveitosa.

Palavras-chave | Comportamento espaço-temporal dos turistas, tecnologias de rastreamento, gamificação

Abstract | This article proposes a theoretical approach to the use of new technologies to track tourists: a smartphone application based on GPS devices associated to a gamification process. Designed to encourage tourists to share their time and space behaviour during their stay, it allows to collect information related with the tourist movements, like territoriality, movement patterns, orientation and locomotion. As the multi-attraction visit is very common while visiting a urban destination during the multi-destination trips, it will provide a set of data related to the visit intensity and the visit specificity. Based on GPS devices, the association with other advanced technology, has advantages such as GIS, *Google Earth* or others, is very accurate in urban areas due to high coverage, and it is not very intrusive. Despite being limited to smartphone battery life it was designed to track them without an

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internet connection and to send data automatically to the “cloud” as soon as a wireless connection is found. One of the most innovative methods is the possibility to track tourists not for only one day but for all the entire stay without being intrusive, contributing to a deeper understanding of tourist’s space and time behaviour. It provides, simultaneously a much more appealing and profitable visit to the tourist.

Keywords | Tourist space-time behaviour, tracking technologies, gamification

1. Introduction

Despite still being one of the most popular forms of tourism, urban tourism is still a less studied phenomenon (Shoval, McKercher, Ng, & Birenboim, 2011) and because tourists and residents usually have different activities some challenges, problems and conflicts might occur. Tourists’ behaviors always take place in time and space and consequently, understanding their space and time behaviour like tourist activities, places visited, the time they spend and the facilities and services they use, can contribute to the improvement of destination management, the development of the product and the marketing of attractions; to the planning and location of infrastructure and new attractions, minimizing adverse impacts on sensitive destinations; to the development of transport and destination planning; to respond to the impacts of tourism, influencing appropriately the tourists behavior redirecting tourist flows to avoid overcrowding; to identify potential places for leisure activities; to improve tourist information, tourist signs and relating the tourist spatial behaviour to the evaluation of experience (Caldeira, 2014; Lew & McKercher, 2006; Pettersson & Zillinger, 2011; Toha & Ismail, 2015; Van der Knaap, 1999). For these reasons, understanding urban tourist flows will give an important contribution to improve the city management in a smart city environment.

This work aims to give a theoretical contribution to the development of a smartphone application in order to collect a set of data related

to tourists’ space-time behaviour without inducing them to follow a certain path or using particular services. Based on GPS devices, can be associated with other advanced technology, is very accurate in urban areas due to high coverage and being not very intrusive. Despite being limited to smartphone battery life it was designed to track without internet connection and to send data automatically to the “cloud” as soon as a wireless connection is found.

In this *App*, tourists are invited to follow the instinct of the 15th century Portuguese sailors who ventured for uncharted waters. In this context they are induced to know some of local History and are encouraged to share their discoveries in social networks. In addition it is possible to obtain virtual rewards and allow a connection to the real world through the association of some touristic services that wish to participate offering real prizes to items virtually achieved. Tourists can also upload real photos into the app, write their comments and be invited to answer some questions about their consumption patterns in order to know how much they spend. One of the most innovative method is the possibility to track tourists not only one day but the entire stay without being intrusive, contributing to a deeper understanding of tourist’s space and time behaviour. At the same time aims to provide the most fun, appealing and profitable visit to the tourist.

2. Tourist space-time behaviour conceptualization

Touristic activity necessarily entails the movement of tourists and not only the movements performed by the tourists until the destination but also the movements performed within the destination itself, are conducted in a given territory (space) and in a variable duration (time). An important consideration in tourist space-time behavior analysis is the aggregation of tourist space-time paths to create generalized types and to extract patterns that consider sequential elements quantitatively (Shoval & Isaacson, 2007).

Independent tourists have a great deal of discretion in how they can spend their time budgets, particularly in a multi-attraction visit. Hence, they are the subject of this project. Time used in decision making process is related to the absolute amount of time available and to the set of activities that tourists wish to consume during their stay (McKercher, Wong, & Lau, 2006). The activities tourists take part in, where and how they sequence their visit, deals with the micro-spatial and temporal dimensions of tourism analyzed by Grinberger, Shoval & McKercher (2014) and it is this perspective that will be adopted in order to understand the tourist consumption of a destination. The understanding of the tourist flow of movement in the cities, is a fundamental set of data to improve the city management in a smart city environment. In this context it recommended the possibility to integrate the flow of tourists and the normal city flows avoiding the stress to the tourists and to local citizen daily activities (Curry, Dustdar, Sheng, & Sheth, 2016).

Intra-destination movement patterns of tourists has been object of research in several studies (McKercher, Shoval, Ng, & Birenboim, 2012; Sho-

val et al., 2011; Xia, 2007; Xiao-Ting & Bi-Hu, 2012) and in order to understand the importance of these studies and the methodology they used it is relevant to identify the factors that influence both the intensity and spatial dispersion of movements. These factors will then be embedded in the smartphone application prototype conceptualized in this proposal.

Xiao-Ting & Bi-Hu (2012), classify the tourist behaviour patterns studies according to socio-demographic or psychological factors and according to the tourist behaviour characteristics, give special attention to the typical behaviour patterns. Grinberger et al., (2014) suggest that the tourists study behaviour has been extended to other topics such as the choices of destination, the tourist experience, the segmentation of tourists and the tourist consumption of the destination. But in general, the studies about tourists space and time behaviour highlight several factors on which they have focused: the origin or cultural background of tourists (Dejbakhsh, Arrowsmith & Jackson, 2011); first-time and repeat visitors (McKercher et al., 2012; Oppermann, 1997); special interest of tourists (Fennel, 1996); the type of trip destination and tourist characteristics (Lew & McKercher, 2006); Hotel location (Shoval et al., 2011); first and last day of the visit (McKercher & Lau, 2008) or sociodemographic characteristics of tourists, like age, gender, household income and educational background (Driver & Tocher, 1979; Hanson & Hanson, 1981 cited by Dejbakhsh et al., 2011; Caldeira, 2014). Other researches focus their attention on tourist satisfaction (Caldeira, 2014), the impact of distance travelled from the country of origin (Caldeira & Kastenholz, 2015) and on environmental sustainability (Dickinson et al., 2013; Edwards & Griffin, 2013).

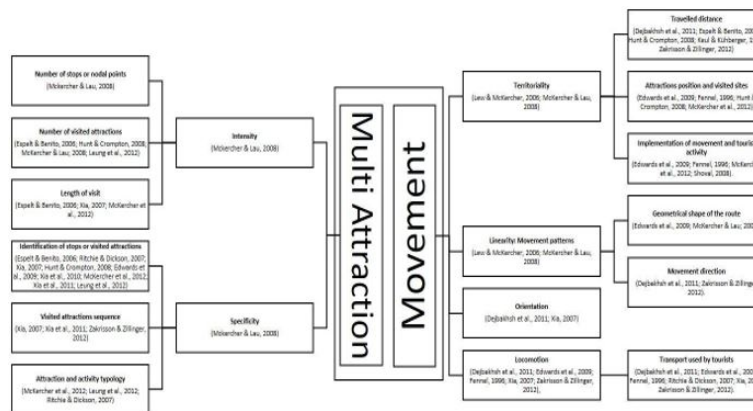


Figure 1 | Operational and conceptual dimensions of tourist space-time behavior.

Source: Dejbakhsh, Arrowsmith, & Jackson (2011); Edwards, Griffin, Hayllar, & Dickson (2009); Espelt & Benito (2006); Fennel (1996); Hunt & Crompton (2008); Leung et al. (2012); McKercher & Lau (2008); McKercher, Shoval, Ng, & Birenboim (2012); Ritchie & Dickson (2007); Shoval (2008); Xia, Zeephongsekul, & Packer (2011); Xia (2007); Zakrisson & Zillinger (2012). Own construction.

As tourists physical movements and consumption behaviors are visible, they can be quantified, measured and even predicted (Xia, Zeephongsekul, & Packer, 2011; Xiao-Ting & Bi-Hu, 2012), so, in order to find out what tourists do and where they go, a behavioral perspective based in their objective and observed movements should be adopted. And to understand it, a special attention should be given to the dimension of “movement” and to the dimension “multi-attraction” (visited attractions). The literature review about tourist space-time behavior allowed to find a set of variables organized in two operational and conceptual dimensions previously presented: the dimensions

of “movement” and “multi-attraction” (fig.1) used and conceptualized in Caldeira’s research (2014). Each dimension is constituted by a set of factors: territoriality, linearity (movement patterns), orientation, locomotion, intensity and specificity (fig.1). There is also a set of factors that influence the movement of tourists in space and time: internal factors (related to the tourists themselves) and external factors (Zillinger, 2007, cited in Caldeira, 2014) identified as well by Lew & McKercher (2006) as destination features and tourist features, operationalized by Caldeira (2014) as tourist features and visit characteristics (fig.2).

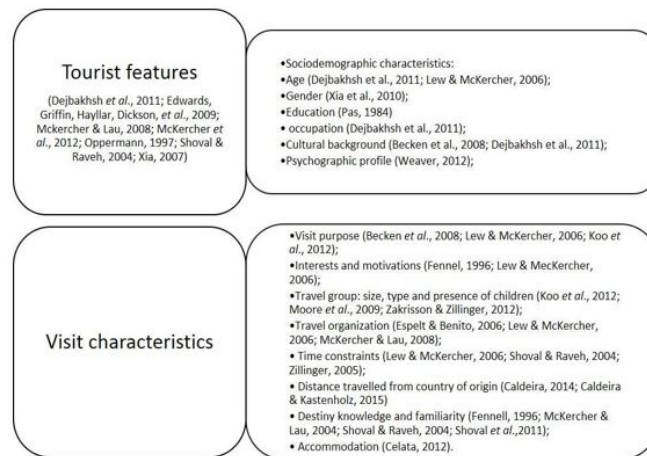


Figure 2 | Tourist features and visit characteristics

Source: Becken & Simmons (2008); Caldeira & Kastenholz (2015); Caldeira (2014); Celata (2012); Dejbakhsh et al., (2011); Edwards et al., (2009); Espelt & Benito (2006); Fennel (1996); Koo, Wu, & Dwyer (2012); Lew & McKercher (2006); McKercher & Lau (2008); McKercher et al., (2012); Moore, Smallman, Wilson & Simmons (2009); Oppermann (1997); Pas (1984); Shoval, et al., (2011); Shoval & Raveh (2004); Weaver (2012); Xia (2007); Zakrisson & Zillinger (2012). Own construction.

The GPS (Global Position System) technology has been the most used to track tourists and is very well documented in literature (Grinberger et al., 2014; McKercher & Lau, 2008; McKercher et al., 2012, 2006; Shoval & Isaacson, 2007; Shoval et al., 2011; Shoval, 2008). In fig.3 we present the main advantages and disadvantages of modern tracking technologies.

Understanding where tourists go within a city and how they negotiate their way from one point of interest to the next is not something discovered through subjective observation (Edwards, Dickson, Griffin, & Hayllar, 2010 cited in Caldeira, 2014). So, tourist spatial-temporal behaviour can be understood through the tracking of tourists in order to allow to know their physical movement in space and time (Xia et al., 2011). In the empirical studies about tourist mobility, traditional and modern methods can be used. Versichele et al. (2014) admit that this kind of studies using traditional methods like direct observation or per-

sonal interview, are not very common due to their labor-intensive and often expensive nature. Other traditional methods, like space time diaries are characterized by a low reliability. For these reasons a new set of modern tracking technologies has been used in several studies in order to get more accurate data about tourist's movements. Through the analysis of fig.3, GPS tracking technology and smartphone application based on GPS, despite their limitations and disadvantages, are the most appropriate technologies to track tourists. But the use of GPS in this kind of empirical studies are limited by the low sample size of tourists, by the long time frame to track tourists, by the difficult survey of tourist motivation being part of the study, by the limited battery life of GPS logger and the expensive nature of the equipment. Besides being intrusive, GPS tracking can be also limited by signals blockage from buildings and foliage.

Quadro 1 | Advantages and disadvantages of modern counting and tracking technologies

Method	Advantages	Disadvantages
GPS tracking (a)	High resolution More accurate and precise information Large amount of information Mature technology Easy to use and carry Can be used worldwide	Intrusive Low sample size GPS signals blockage from buildings and foliage Long time frame to track tourists High risk of loss of GPS equipment Difficult survey of motivation Limited by battery life Expensive
Timing Systems (b)	Non-intrusive High resolution High sample size	Expensive Limited by battery life and data logger memory
Mobile phone tracking (b)	Non-intrusive High resolution Low-cost	Signals blockage from buildings and foliage Privacy security issue
PDA tracking (b)	High resolution can communicate with tourists in real-time Can track their decision-making process	Intrusive Low sample size GPS signals blockage from buildings and foliage High risk of loss of equipment Expensive
Destination cards/smartcards with an embedded chip (c)	Non-intrusive Easy to use High sample size Low-cost	Limited to visited attractions
Smartphone application based on GPS (d)	High resolution Easy to use High sample size Large amount of information Low-cost	Intrusive Signals blockage from buildings and foliage Limited to visitors with smartphones More accurate in urban areas due to high coverage Medium time frame to track tourists Privacy security issue Limited by battery life Difficult survey of Motivation
Bluetooth tracking data (e)	Non-intrusive High sample size	Limited coverage of sensors Detection of all devices belong to visitors and locals

Sources: (a) Toha & Ismail (2015), Xia (2007), Yun & Park (2014); (b) Xia (2007); (c) Zoltan & McKercher (2014); (d) Toha & Ismail (2015), Yun & Park (2014); (e) Versichele et al. (2014). Own construction.

Smartphone APP'S based on GPS devices offer ever-more-useful and practical information about time and space (Shoval & Isaacson, 2007; Shoval, 2008) and has the advantage of association with other advanced technology present in current smartphones and, as the prior, can be also associated with other technologies such as Geographic Information System (GIS), Google Earth, and so on (Yun & Park, 2014). Using a Smartphone with an application based on GPS we still have some of the GPS limitations. Although more accurate in urban areas due to high coverage, still is intrusive with difficult survey of motivation and limited by battery life of smartphone. As a new technology there is the possibility to get only young participants with consequences in the small sample size and representativeness of captured data (Yun & Park, 2014), however smartphones and other te-

chnological devices are becoming widespread whereby the development of an APP with a gamification process, intuitive and user friendly can help to solve this problem.

Having regard to the limitations of the existing technologies and the inherent needs of tourists' space-time behaviour researches, we suggest the creation of a new smartphone application that allows carrying out the tracking of tourist movements during a day visit or even during all their stay, without the necessity to adopt additional devices as GPS logger. Using information generated by GPSA, accelerometer, digital compass and the digital clock, along with the meta information provided by the camera device, a set of data can be raised in order to assess the items described above in a very precise way. The difficulties in the survey of tourist motivation can be reduced through the

gamification process that give the tourists the opportunity to record all their stay with routes, photos and several comments that could be shared in social networks. There is also the possibility to introduce an offer, like hotel discount or others in order to encourage tourists to participate in particular researches. The application doesn't need the smartphone to have an internet connection during the tracking, so the problem raised by the high cost of "roaming" will not prevail. All information stored by the mobile device will be automatically transferred to the "cloud" as soon as a Wi-Fi network is detected. This way, the device battery won't be fully committed, although the current smartphones already have excellent performances in what regards to battery life. The introduction of a gamification process associated to tracking also allows the tourists encouragement to respond to a set of questions that will be introduced throughout their stay without the application of a questionnaire on paper. After downloading the APP tourists should make their registration using data from their social network like Facebook, authorizing the sharing of their biographical data with the App. The gamification of this data acquisition process serves to create a playful environment where users feel encouraged to participate and to provide the necessary data. This App, which we call the "21st Century Explorer" (21CE) induce the most fun and interesting visit, appealing and profitable for the tourist.

3. Gamification process project

After collecting and analyzing all the data it is possible to know and understand the tourist's space-time behavior, like what are the preferentially used routes, modes of transport, time spent in each place, money spent by day, attractions satisfaction, among others. According to Kapp (2012), a game is a system in which players engage in an abstract challenge, defined by rules, interactivity and feedback which results in a quantifiable output and which often causes an emotional reaction. According to the author, it is important to realize that gamification does not address the simple adoption of game rewards of mechanical in processes that are not games. Thus, gamification can be defined as a careful application of the design thinking of games used to solve problems (Werbach & Hunter, 2012; Zichermann & Cunningham 2011). In terms of the proposed platform, gamification was thought to encourage interaction and learning, using all appropriate elements of the games. Nowadays gamification is present in various services such as listening to music (Last.fm), watching television (GetGlue) or exercise monitoring (Fitocracy, FitBit, Nike+). These services use game elements like badges, rewards, clear goals with immediate feedback, leaderboards and monitoring the mastering process seem to entice users to reuse these services. In addition to the game elements previously mentioned, one of the most essential is the social process based on the sharing of results and the possibility of interpersonal interaction (Hamari & Koivisto, 2013; Hamari Koivisto & Sarsa, 2014; Hamari, 2015).

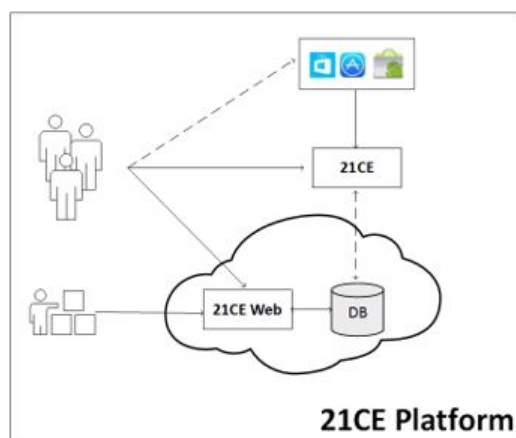


Figura 3 | General framework of 21CE platform

The use of a mobile platform such as Smartphones consists on a process of creating a pervasive and ubiquitous application about an increasingly present and inseparable device of a citizen's life. Smartphone devices include, in their great majority, a set of sensors that allow multiple measurements related to their users if previously allowed by them. Using information generated by GPSA, by accelerometer, by the compass and clock and by the meta information provided by camera device and from the data of social networks as Facebook, it is possible to get a set of information that can be used for assessing the items described in a very precise way (fig.1).

The choice of gamification in this data acquisition process serves to create a playful environment where users feel encouraged, not only to participate but also to provide the necessary data. The platform proposal is designed to be flexible, allowing the participation of different devices with different operating systems: iOS and Android, for this reason it was decided to build the mobile application in the development environment HTML5/CSS3/JS. The proposal App platform will have a mobile application that will serve to collect data and to be the mobile user interface, as well as a web application that will be used to access a set of more general information like user accounts and for the reports generation from the data provided by participating users. In this site

it is also possible to manage the participation of any partnerships established with institutions, organizations and private companies that pretend to collaborate with this application, allowing access to information from users and providing of gifts, bonuses or promotions as well as the receiving conditions for participants. Figure 3 shows the general characteristics of 21CE platform.

3.1. App Story

In the 21st century few places on earth are still considered unexplored, but the power of technology to put a virtual look in practically every corner of our inhabited world allows us to travel virtually almost anywhere. To observe a place through a virtual process, no matter how immersive it is, still doesn't allow us to have the same physical experience of being there. Physical contact with the environment and atmosphere of the place is something we can't have virtually, yet. Therefore, a real travel still provides a large range of unique sensations. In addition to the sensations there is a complex process related to how these sensations were experienced. And this app is designed to explore the experience of these travel sensations.

For many years, along with Spain, Portugal was the stage of a series of uncharted water adventures. The navigation Discoveries led to the overseas ex-

pansion process that in addition to these two main protagonists had the later interest of England, Holland and France. In the 15th century, Portuguese Discoveries were boosted by several factors such as insufficient precious metals for minting currency, lack of agricultural products and labor, need for new markets, the early establishment of a national state, the desire to expand the Christian faith, the nautical knowledge and a favorable geographical position. Some noteworthy Portuguese navigators are presented in Fig.4. In the gamification process the tourist adventure in Portuguese territory will be called the “21st Century Portuguese Periplus”. In this adventure every tourist becomes an explorer and assuming the avatar of one of the great navigators mentioned above will explore Portuguese territory in search of their achievements. In this process, the tourist/explorer will be encouraged to show what he discovered and how he explored the visited places. All findings and achievements could be shared with friends through social networks and the tourist/explorer could also launch challenges to their friends. Once they have accepted and succes-

fully completed, tourists/explorers can get some extra points.

3.2. Gameplay

Tourists access the App in their mobile device APP store, download it and run the installation, accepting the access that is required by the platform. Once installed, the App starts to require the user to log in, through their Facebook account and using some of the information available in the social network to complete tourist registration. Then the tourist chooses his avatar from the ones available in Figure 4. From this point the adventure begins. Tourists may become explorers making the registration by the Web site of the App platform. The login process is similar to that made in the APP and allows the users to visualize their achievements and all information that was collected by their mobile device APP. In the Web application tourists/explorers can also edit the data obtained by the mobile APP.

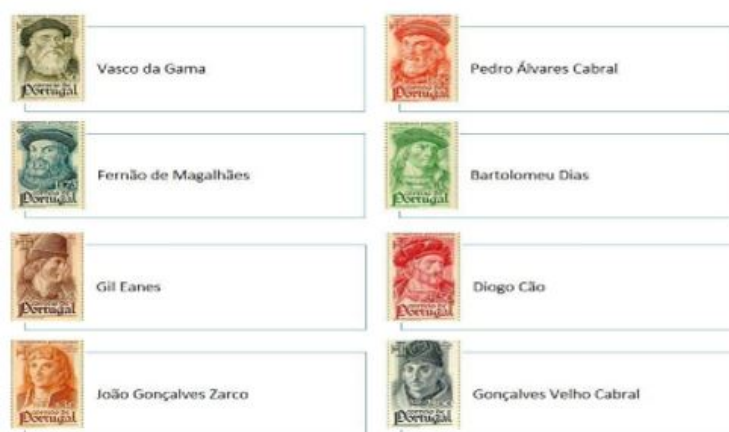


Figura 4 | Portuguese navigator's avatars available in App.

Source: <http://fotos.sapo.pt/conceicaojaneiro/fotos/?uid=qo20Q8ZVDFsL90w5bSKI> consulted on 30th July 2015. Own construction.

Through the App Web site all tourism institutions, organizations and firms who wish to join this

gamification process can make their registration, offering gifts or deals to App users. Figure 5 shows

the flow of the gamification process regarding both to the mobile APP and the Web APP. Each explorer, when using the 21CE APP on his mobile device will record day by day the route of his discoveries. The APP operates without the need of continuous Internet connection (configurable), and all collected data and realized achievements will be stored locally. When the browser is connected to WiFi, data is synchronized with the server in the cloud but if the tourist/explorer configures the possibility of using the data packet, this synchronization can occur in real time. The 21CE APP is designed to make use of sensors available in the tourist/explorer smartphone in order to track the tourist's movements. Mobile tracking operation is always dependent on the available sensors, at least GPSA and the accelerometer are required. If these sensors are not available, the APP warns the tourists about the elements that will be part of tracking. The Explorer can perform their movements in the tourist destination in many ways. The 21CE considers the following types of trans-

port: on foot, by bike, by car (owned or rented) and by train. When the mobile device is tracking, movement speed informed by GPSA will be used to distinguish the different types of ground movement. The Explorer/Tourist can also check the land transportation adopted by the APP and make any corrections if necessary. Tourists/Explorers achievements and their respective scores will be taken into account only if all tracking movements were informed by GPSA. When GPSA data indicates a territory change, from one city to another for example, without tracking, the APP prompts the user to rectify how he gets there. If the transfer aerial, the APP is programmed to ask about the flight data. This information will then be checked for the movement validation and achievements' scores effect. Points, and tourist/explorer achievements are earned through a number of combined factors that are transformed into points by using weights which give more or less significance to the actions.

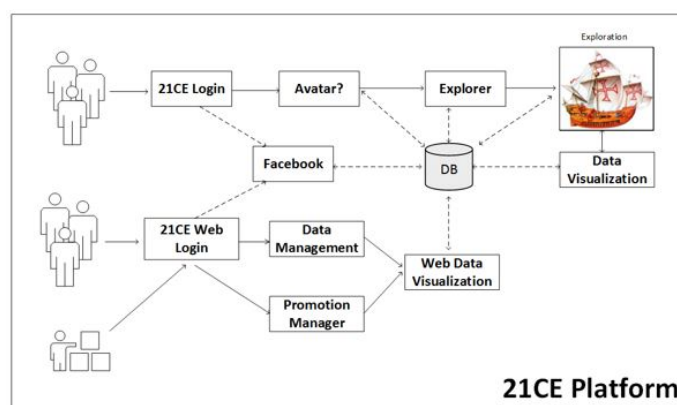


Figura 5 | 21CE Platform Flow

Particular attractions, when visited, will give access to challenges previously introduced in the platform. These challenges operate independently of the platform and thus can be developed by others (tourism firms or institutions, among others) who want to provide entertainment and

information to the Tourist/Explorer. The points that are conquered in these challenges are incorporated into the explorer's score as well. In this case it is only required that the challenges being consistent with the platform plot and following the same design guidelines. The platform also provides

a set of information about the visited destination, so to explore the territory, the explorer/tourist will have access to several information pages that are released as the exploration takes place. These information pages are customized regarding the explorer experience. To incipient explorers, will be included more information, like operating tips provided by experienced explorers. As the explorer's experience increases the information pages will be directed to the attractions that are being visited. Upon reaching the level of experienced explorer, the tourist/explorer is then asked to provide tips and advice for new explorers. The act of finding a hint or advice from a more experienced explorer, appropriately validated, will point to the explorer who supplied the information. Thereby, the explorer will feel motivated to give useful and interesting information to increase significantly their experience and importance within the group belonging to the platform.

The map used in the platform shows not only the local best-known tourist attractions as well as visited attractions and the route that the explorer is doing. As the exploration occurs and the platform records and stores the data, there is the possibility of creating an original storytelling covering the desired days of the trip that can be shared in Facebook. The platform originates a file containing the photos and videos that were made in those days coupled with geolocation data and information pages displayed. With this file, the user can see their exploration associated with a map and information that were shown throughout their journey. The 21CE platform also provides a travel financial organizer based on an APP scan and OCR of expenditure payment receipts that are being made. This organizer allows in a quick and easy way, to maintain control of financial resources available for the trip. This financial information may also be included in storytelling done by the tourist/explorer since configured to be visible.

3.3. Gamification process mechanics

As the 21CE is not a game there isn't a specific condition of victory or defeat. The explorer can improve their profile until the time he wants since it is considered interesting. Mechanical proposed takes into account the ability of the system to be updated constantly in order to always offer new features for tourists to enjoy and remain interested in using the platform. The basic mechanics is to offer points and badges to explorers according to the distance travelled, places explored and according to the social impact generated by the sharing of certain information like routes, attractions and others. With acquired points and badges, institutions that wish to participate in 21CE platform can offer promotions and gifts.

Having consciousness about the famous "problem of empty bar", usual in social games, when users' social characteristics can only be present when a reasonable number of users relate each other using the same platform, 21CE gamification process it was thinking as a fun process even to be used by someone alone. As new explorers join the platform the weight given to the social impact becomes more significant, contributing to a greater appreciation of the social aspects of the gamification process.

There are three basic levels of explorers in the proposal App:

- i) Beginner: the novice explorer. Every explorer that subscribe 21CE platform starts at that level. In this situation the operator has the benefit of having a set of more detailed touristic information about some routes and the area where he is located. Important tips are included on these pages. The level of the challenges presented is also smaller enabling the operator to gain knowledge and points with higher speed. To have progress to the next levels, tourists have to explore different places in at least 2 of the 5 regions of Por-

tugal;

ii) Medium: is the intermediate level explorer. The explorer reaches this level after covering a distance that will be endorsed by earned points. The longer the path travelled by foot, for example, the greater the number of points achieved and a faster explorer leaves the beginner level to the medium. Here, the user must have travelled through over more than two regions and less than four;

iii) Expert: is the most experienced explorer who has visited attractions in at least four regions. To those users 21CE platform aims to score no longer the travelled path but mainly the shared information and its social repercussions. A special set of challenges is designed for those explorers as well as prizes and promotions to reward those who know the country very well.

App points are accounted in various ways, and are being considered always as the result of a magnitude multiplied by a weight (w) specified during the balancing of gamification process. Points arising, e.g., from the distances travelled by the explorer/tourist are calculated as a result of the number of kilometres travelled, multiplied by the weight " w " related to the travel mode: on foot, by bicycle, motorized forms (land or sea), or by plane. Points can be obtained in some of the following ways: i) Length of the distance travelled; ii) When explorer check-in on a place that allows this possibility; iii) When the explorer contributes with comments on platform in places that offer this possibility; iv) When the operator gives suggestions on places where this possibility exists (suggestions are more punctuated than comments on the places where the two possibilities are available); v) In the unlocked challenges along the route performed; vi) In the social repercussions of the elements socialized by the explorer.

Badges allow the user to identify and better understand the structure proposed by the gamified

process. The badges are associated with a clear way of showing the goals that have been achieved. This promotes a sense of satisfaction and pleasure, showing even more clearly the links between the elements available in the platform, its use and what you can get them. It is a cognitive mechanism to encourage explorers to have behaviours aimed at conquering challenges (Hamari, 2015). Badges are divided into the following categories: Distance, Challenges, Check-in and Social.

Challenges aim to give the user the ability to earn points, have fun and learn. Challenges are coupled to the platform and can be developed by other users. Challenges will first be categorized in relation to the difficulty of the levels in which explorers are. So there are the basic challenges for the beginners, medium challenges for the Mediums and the high difficulty challenges specifically designed for Expert explorers.

Similarly, to the challenges, pages of information work attached to the 21CE platform. This means that other users can develop these pages since they follow a design pattern specified by the platform and respect the communication protocol for the correct data exchange. It will be available in the most important touristic places and attractions in order to show the user the history of where he is and where he has been (Signoretto, et al., 2014, 2015). Pages can be used to provide many different types of information as historical, literary, cultural, social, infrastructures and even advertisements from member institutions associated to 21CE ecosystem and that can work together with the challenges of advergames type. Information pages can be grouped together with the challenges to compose a storytelling so that explorers/tourists can engage more deeply in their searches (Signoretto, et al., 2015).

Balance issue is one of the most important factors in a game in order to be what it has to be: fun. Likewise, in a gamification process, balancing what is presented to users should be carefully studied to have no excesses, don't carry the explorer

with many things to do and don't leave the explorer without information. It is important to have the notion that tourists are looking for a different destiny from their routine, and for that reason, it is not a platform aim to make them immersed in a virtual reality performing tasks.

The set of challenges and information pages are used to what to show and what tasks require to explorer. Associating this to a set of context information that can be obtained from the sensors available on the mobile device and with partnerships with other applications (weather, traffic, and others) it is possible to get a very flexible set of resources to work balancing, even while executing the platform, making this process more dynamic and in real time.

4. Conclusion

Track tourists during their visits can result in several advantages to Development and Management Organizations (DMO's) in order to improve the tourist satisfaction and destiny competitiveness, therefore, this App can give an important contribution to the promotion of urban innovation not only in tourism sector but in the welfare of city residents as well, giving an important contribution to the establishment of a "smart city" where data is collected and analysed in real time.

This theoretical approach highlights the use of a smartphone application based on GPS devices associated to a gamification process. Designed to encourage tourists to share their time and space behaviour during their stay, it allows to collect information related with the tourist movements, visit intensity, visit specificity, tourist features and visit characteristics. Based on GPS devices, the advantage of association with other advanced technology, such as GIS, Google Earth or others, is very accurate in urban areas due to the high coverage, and is not very intrusive. Despite being limited

to the smartphone battery life it was designed to track without internet connection and to send data automatically to the "cloud" as soon as a wireless connection is found. One of the most innovative method is the possibility to track tourists not only by one day but the all entire stay without being intrusive, contributing to a deeper understanding of tourist's space-time behaviour. At the same time aims to make the most enjoyable, appealing and profitable visit to the tourist.

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