Instituto Universitário de Lisboa

Departamento de Ciências e Tecnologias da Informação

CULTURAL HERITAGE GAMIFICATION AND ITS EFFECTS ON THE TOURIST SATISFACTION

Nuno Miguel de Jesus Grilo Cavalheiro

Dissertation submitted as a partial requirement to obtain the degree of

Master in Information Systems Management

Supervisor:
Invited Assistant Professor Helena Maria Correia Neves Cordeiro Rodrigues
ISCTE-IUL

Cosupervisor:
Invited Assistant Professor Luís Filipe da Silva Rodrigues
ISCTE-IUL

November, 2019

Page intentionally left in blank.

Agradecimentos

"Nascemos sozinhos, vivemos sozinhos e morremos sozinhos. Somente através do amor e das amizades é que podemos criar a ilusão, durante um momento de que não estamos sozinhos."

Orson Welles

Dedico o presente trabalho aos meus avós.

Gostaria em primeiro lugar de expressar o meu agradecimento à Professora Doutora Helena Rodrigues e ao professor Doutor Luís Rodrigues pelo acompanhamento e orientação desta dissertação bem como pela motivação transmitida ao longo da sua elaboração.

Agradeço também a todos os meus amigos e familiares presentes durante esta fase da minha vida, pelos bons momentos partilhados e que de uma ou outra forma contribuíram para que me fosse possível realizar esta investigação.

Agradeço em especial à minha amiga Ana Rita e ao meu amigo Filipe pelo grande papel que tiveram na minha vida ao longo do ano em que realizei este trabalho, são um exemplo para mim e em muitos momentos uma enorme motivação. Este trabalho não teria sido possível sem a vossa amizade.

Aos meus antigos colegas de trabalho na Parques de Sintra pelo excelente período que vivenciei nessa empresa e durante o qual comecei e desenvolvi grande parte deste trabalho. Foi um enorme prazer partilhar os meus dias com um grupo tão especial de pessoas que muito contribuiu para o meu bem-estar durante um período tão desafiante.

Ao grupo de jovens que tão rapidamente aceitou participar no focus group realizado neste trabalho e ao Ruben Sousa pela sua preciosa ajuda na modelação da estrutura de dados da GamiSintra.

Por último, mas mais importante, obrigado aos meus pais sem os quais nada na minha vida teria sido possível. Obrigado pela paciência nos momentos mais difíceis, obrigado pelo encorajamento e por acreditarem em mim. Tudo o que sou a vós vos devo.

Page intentionally left in blank.

Resumo

O turismo é uma das principais atividades sociais e económicas do mundo originada há mais de dois milênios atrás. Por outro lado, a gamificação é um tópico recente, referenciado inicialmente em 2008, que se tornou objeto de amplo estudo na década atual, tendo vindo a ser aplicado a vários sectores devido à sua capacidade de melhorar a experiência, moldar comportamento, aumentar reconhecimento de marca, entre outras vantagens.

O turismo não foi uma exceção na implementação da gamificação, embora a sua aplicação e pesquisa sejam ainda escassas nesta área em comparação com outras.

Atualmente, devido ao fácil acesso que os turistas possuem a informação relativa a preços, é cada vez mais necessário que as diversas ofertas turísticas existentes se distingam através da criação de serviços diferenciados, podendo-se recorrer à gamificação neste contexto para aprimorar as experiências turísticas e aumentar a lealdade dos clientes.

Este artigo tem como objetivo contribuir para a pesquisa existente, testando o efeito do uso da gamificação no contexto de visitas a locais históricos. Realizamos uma pesquisa qualitativa que analisou primeiro os requisitos que os turistas têm no contexto de visita a estes locais, e com base nos resultados obtidos, projetamos uma aplicação móvel com elementos de jogo que visa auxiliar a visita e melhorar a satisfação. A análise do protótipo desenvolvido sugere que a gamificação representa uma maneira bem projetada de apresentar locais de interesse cultural, moldar o comportamento do utilizador, auxiliar a visita e aumentar a satisfação através da criação de um ambiente interativo e informativo.

Palavras-Chave: Turismo, Gamificação, Satisfação, Património Cultural, Sintra

Abstract

Tourism is nowadays one of the world's main social and economic activities, who's origin dates to more than two millennia ago. Gamification, on the other hand, is a recent topic only initially referenced in 2008, and which became a subject of wide study in the present decade and has been applied to several sectors due to its capacity of improving experience, shaping user behaviour, motivating desired behaviours, increasing brand awareness among other advantages.

Tourism has been no exception in the implementation of gamification, although appliance and research are still scarce on this subject compared to others.

Existing technology provides tourists with an easy access to pricing information, therefor no longer can businesses in this sector effectively differentiate themselves through price, but rather being forced to adopt a differentiated service offer. Existing research concludes that gamification can be used to enhance tourist experiences and improve loyalty.

This paper aims to contribute to this growing subject by testing the effect of using gamification in the context of visits to historical sites. We conducted a qualitative survey which first analysed the requirements that tourists have on the context of a visit to historical sites and based on that information designed a mobile application with game elements which aims to aid their visit and improve their satisfaction. The analysis of the developed prototype suggests that gamification does represent a well-designed way to present sites, shape user behaviour, aid visit and increase satisfaction through the creation of an interactive and informational environment.

Keywords: Tourism, Gamification, Satisfaction, Cultural Heritage, Sintra

Index

Index of Tables

Index of Figures

List of Abbreviations and Acronyms

UNESCO - United Nations Educational, Scientific and Cultural Organization

UNWTO – United Nations World Tourism Organization

PSML – Parques de Sintra – Monte da Lua, S.A.

VR – Virtual Reality

UML – Unified Modelling Language

Chapter 1 – Introduction

1.1. Theme framing

Gamification which has been defined as "the use of game design elements in non-game contexts" (S. Deterding, O'Hara, Sicart, Dixon & Nacke, 2011: 10) has become a trading investigation topic of the current decade. Existing research concludes that it can be used to support and enhance user engagement being therefore considered a trending marketing method. Gamification has been applied in numerous sectors, mainly to health and education, being directed both at external and internal customers as a way to increase motivation and in the last scenario, also as a way to increase productivity (Robson, Plangger, Kietzmann, McCarthy & Pitt, 2016).

Tourism has seen an unparalleled increase in the last few decades, mainly after the end of the great world wars. This increase is expected to continue and as so is its impact on the world economy. In Portugal the enormous increase of the number of tourists made the country become one of the leading destinations in Europe and in 2017 the sector income constituted 7.8% of country's GDP, representing 50% of the income of service's exportation (Travel BI, 2017).

One of Portugal's main attractions is its cultural heritage, both tangible and intangible with one of the best places to witness the first being the picturesque town of Sintra, located in the Sintra Hills where continental Europe westernmost point is located. The town is known for its numerous historic palaces and castles that together with its natural landscape achieved in 1995 a World Heritage Site and the first in Europe to be recognized as Cultural Landscape, a UNESCO category to distinguish the combined works of nature and of man.

This study intends to analyse how a gamified application whose main objective is to aid tourists on their visit to the Cultural Site of Sintra influences the satisfaction of tourists.

Although gamification is also being applied to tourism and some research on this field has already been conducted, this effort is still reduced when compared to other sectors.

1.2. Study Objective

The main objective of this study is to analyse the effects that a gamified mobile application which aims to aid tourists on their visit to historical sites in Sintra has on their satisfaction.

This application developed in the context of this study is based on the literature review and the identification of requirements, best practices and motivators for the use of gamified applications in the context of tourism.

The main purpose is to aid the tourist to navigate while on-site, by obtaining meaningful information and encouraging the user to interact and understand what is being witnessed, but also, it should encourage the user to visit less often (but of interest) visited places within the attractions.

The descriptive analysis will be based on a qualitative methodology with the aim of analysing the effects that a gamified mobile application has on tourists' satisfaction of the visit.

The following attractions were used for the realization of these tests:

- Park and Palace of Pena;
- Park and Palace of Monserrate;

Objectives:

- Analysis of requirements for the proposed application;
- Modelling and implementation of application prototype;
- Analysis of the effect the concept app can have on tourists’ satisfaction;

Considering the above-identified objectives, the following investigative question is proposed:

How can a gamified mobile application affect tourists' visits to heritage sites?

Chapter 2 – Literature Review

2.1 Tourism Context

Tourism is nowadays one of the world main social and economic activities and although it's historic origin dates to more than two millennia ago, it was only during the 17th and 18th centuries and what became known as the Grand Tour that it became a subject of higher relevance (Towner, 1985). During the Industrial Revolution, an era which witnessed many technological innovations, of which transport means were no exception along with an economic growth allowed for a new lifestyle where tourism would win an even higher role. It was during this period that the expression Tourist first appeared in the literature. The big tourism boom can be traced back to the 20th century, this was a century of truly great development due to factors such as:

- Development of car and plane;
- Growth of the middle class;
- New labour rights;
- The creation of mass communication means;

World War II resulted in a reduction of the tourism activity, but it would quickly recover and enter its golden era in the post-war:

"Everyone has the right to rest and leisure, including reasonable limitation of working hours and periodic holidays with pay" (UN General Assembly, 1948: 7).

Although many authors have tried to define tourism there is no consensus as such this paper will consider the definition proposed by the World Tourism Organization (UNWTO) which defines tourism as comprising "the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes."

ICOMOS - International Council on Monuments and Sites (1976) defines Cultural Tourism as "form of tourism whose object is, among other aims, the discovery of monuments and sites. It exerts on this last a very positive effect insofar as it contributes – to satisfy its own ends – to their maintenance and protection. This form of tourism justifies, in fact, the efforts which said maintenance and protection demand of the human

community because of the socio-cultural and economic benefits which they bestow on all the populations concerned".

2.1.1. Tourism in Portugal and Lisbon

Located in south and the westernmost corner of Continental Europe, Portugal, although a small country in landmass is very rich in its touristic offer, ranging from the traditional sun and sea to a cultural destination which allowed it to be elected in 2017, 2018 and 2019 as the world's best Touristic Destination by the World Travel Awards.

Lisbon, the Portuguese capital and its metropolitan area is the most visited region in Portugal (34.7%) and the one with the lowest impact of seasonality (31.2% compared to 36.6% mean average of the country) (Instituto Nacional de Estatística, 2017).

The district of Lisbon which is the 3rd smallest one of Portugal in landmass is also the most populated one with a total of 2.884.984 residents.

Tourism in Portugal has been rapidly increasing in the last decade, going from 13,336,173 guests in 2007 to 20,641,860 in 2017, an increase of 54.78%. With an estimate of 21,200,000 international arrivals in 2017 which makes it the 10th most visited destination in Europe and a weight of 7.8% of the country GDP, tourism has become one of the most important economic activities of Portugal (Instituto Nacional de Estatística, 2017).

Portugal is mostly visited by Europeans, with the main inbound market being the United Kingdom (20.9% of non-residents overnight stays), followed by Germany (13.8%), France and Spain (9.9% each) and the Netherlands (5.8%), with the internal market corresponding to 28% of the total overnight stays. The fastest-growing market registered in 2017 was Brazil with a rise of 39.3%.

The main motivations of travel of the main inbound markets above mentioned for the region of Lisbon are Sun and Sea, City Breaks, Culture and Nature, with the Dutch having the higher percentage of Culture and Nature motivation 33% and 42%. Other worthy mentions of motivation for visit are Specific Events, Adventure and Wellness and Health. As seen, Lisbon although a small region is sought for a big variety of motivations and different products, being recognized as an international brand with worldwide increasing notoriety. The main motives for visiting Lisbon per source market can be seen in Table *1* - Main motives for visiting per source market.

Table 1 - Main motives for visiting per source market

Source: Entidade Regional de Turismo da Região de Lisboa, 2014

	Spain	France	Germany	United Kingdom	Italy	Netherlands
Sun and Sea	43%	41%	35%	43%	46%	40%
City Breaks	20%	19%	21%	15%	27%	21%
Culture	27%	19%	27%	18%	23%	33%
Nature	19%	19%	33%	17%	21%	42%
Specific Events	6%	5%	5%	11%	6%	6%
Adventure	5%	8%	17%	9%	4%	18%
Wellness / Spa / Health / Treament	7%	17%	16%	4%	13%	4%

Although the city of Lisbon is the main brand and the most sought location of the region, other regions also present high levels of tourism development which are complementary to the city of Lisbon, the main ones being the regions of Sintra and Cascais, also with worthy mentions of the Arrabida Region, to the south of the Tagus river and surrounding boroughs such as Mafra (Entidade Regional de Turismo da Região de Lisboa, 2014).

2.1.2. Sintra

Sintra is a village and a municipality in the District of Lisbon, the capital city of Portugal. With 382,521 residents it is the second-most populous municipality in the country.

Located in the green mountains where continental Europe meets the Atlantic Ocean at its most western point, Sintra is rich both in natural and edified heritage (as seen in Figure 1 - Parks and Palaces of Sintra – Map), making it one of the main touristic destinations in Portugal and a UNESCO world heritage site, having been in 1995 the first site in Europe to be classified as Cultural Landscape, a category established in 1992 which recognizes the combined works of nature and man.

Sintra (as a destination) is recognized as a strong international brand with strong links and complementarity with Lisbon and the municipality of Cascais (located on the opposite side of the Sintra Hills, also recognized as a tourism destination mainly sought by its Sun and Sea offer). Sintra presents highly developed cultural attractions with its

main concept and element of identity being its unique ambience as a romantic icon (Entidade Regional de Turismo da Região de Lisboa, 2014).

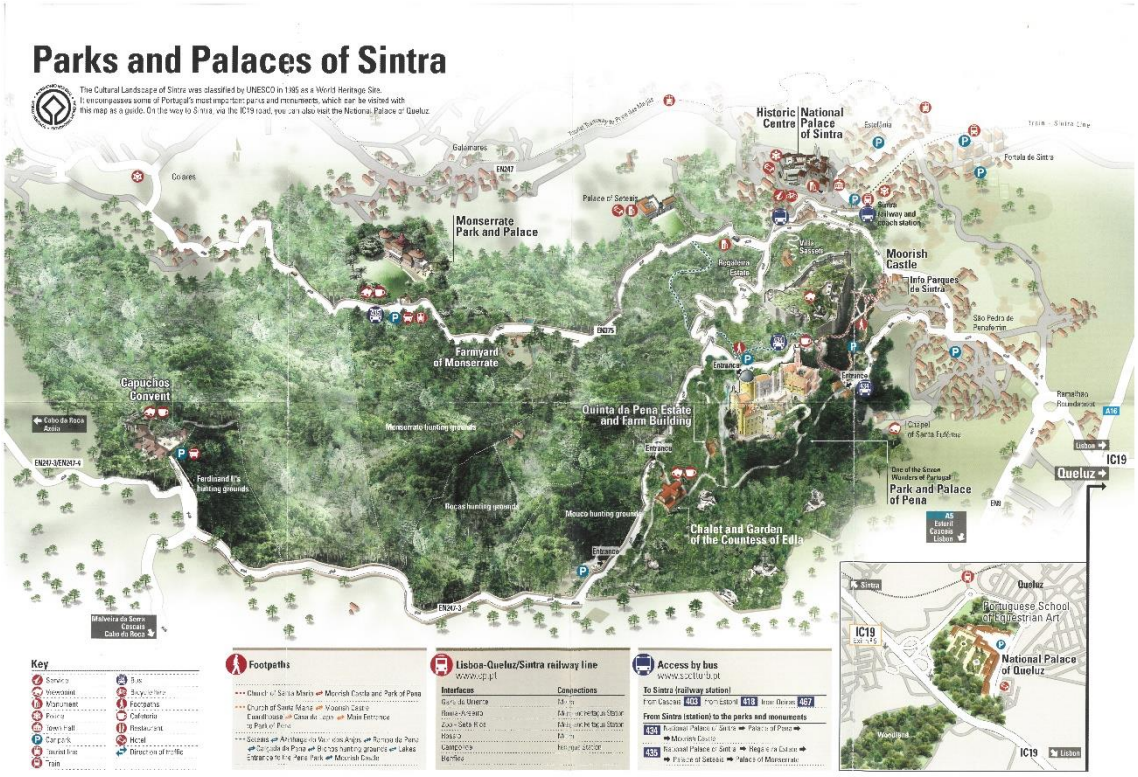

Figure 1 - Parks and Palaces of Sintra - Map

Source: Parques de Sintra – Monte da Lua

Although as previously mentioned that Sintra is mostly known for its outstanding monuments and palatial houses, making culture its main product, it also has a strong offer of nature-related products, the highest number of golf courses in the Lisbon Area and substantial gastronomy offer.

The main events held on the sites managed by this company can be seen on Table 2 – Regular and sporadic activities per site.

Table 2 – Regular and sporadic activities per site

Source: Own elaboration

Site	Regular		Sporadic	
Moorish Castle	Hiking Trails	School and family-orientated activities	Thematic medieval displays	Thematic events Night Openings
Palace of Sintra			Musical evenings	
Pena Palace	Horse and pony riding tours Carriage rides			
Monserrate Palace			Piano concerts Cinema sessions	
Capuchos Convent	Donkey rides			
Palace of Queluz			Musical evenings	

Following the classification of Sintra as world heritage in 1995 and with the objective of merging the different institutions holding responsibilities for safeguarding and valuing the Sintra Cultural Landscape the Portuguese state deliberated the creation of a state-owned company: Parques de Sintra-Monte da Lua, S.A. (PSML).

Nowadays PSML is responsible for the management of all but one of the main cultural attractions in Sintra, being responsible for the restoration, maintenance and management of those spaces, doing so with its own income generated by sources such as the entrance fees and support facilities. The main indicators of the company can be seen on Table *3* - PSML main indicators

Table 3 - PSML main indicators

Source: Parques de Sintra – Monte da Lua (2018)

Year	Income	Investment	No. of Visits
2006	2,124,828.00 €	233,013,00 €	649,791
2007	4,154,107.00 €	1,039,393.00 €	778,589
2008	6,258,639.00 €	4,062,523.00 €	860,520
2009	6,883,023.00 €	3,974,530.00 €	887,025
2010	8,157,561.00 €	4,335,097.00 €	967,600
2011	9,210,306.00 €	5,140,309.00 €	1,068,261
2012	11,069,878.00 €	3,827,638.00 €	1,293,876
2013	14,965,789.00 €	3,436,844.00 €	1,708,405
2014	17,612,536.00 €	4,001,104.00 €	1,927,992
2015	21,163,845.00 €	6,004,170.00 €	2,233,234
2016	25,724,096.00 €	4,664,760.00 €	2,625,011
2017	30,822,825.00 €	6,020,618.00 €	3,192,816
2018	34,603,715.00 €	7,023,325.00 €	3,513,200

Moorish Castle

Built circa the 10th century upon one of the peaks of the Sintra Hills this fortified site offers an amazing viewpoint to perceive the true beauty of the village of Sintra.

Constructed by the Moorish people of North Africa that controlled most of the Iberian Peninsula at the time to control Sintra along with its surroundings and the mouth of the Tagus River, it was later conquered by the Cristian king and founder of the Portuguese nation, Don Afonso Henriques along with the Conquest of Lisbon in the 12th century. Although Afonso Henriques and his close descendants made efforts to repair and maintain the Castle, it would later be neglected and fall into disrepair around the 15th century and receive further damage during the earthquake of 1755.

In the 19th century, Dom Fernando II, the same king to order the construction of the Pena Palace undertook the task of conserving the castle, being responsible for the stabilization of the walls and surrounding infrastructure. The Castle would receive further interventions during the 20th century with extra major works being undertaken during this century.

Number of Visitors: 592,578 (2018)

Management: Parques de Sintra-Monte da Lua, S.A.

National Palace of Sintra

"A grandiose and magnificent palace of the Kings of Portugal."

Damião de Góis

Located in the heart of the historic center of the village of Sintra the first records of this Palace date back to the Moorish era, it was however only after Portugal fully established its border, during what became known as the Iberian Reconquest that king Dinis of Portugal (reigned, 1279-1325) became the first Portuguese monarch to show interest in this Palace. The Palace would in the following centuries witness several building campaigns with the last major work taking place during the reign of Manuel I (reigned, 1495-1521).

The National Palace of Sintra is easily recognizable by its two conical chimneys that became a symbol of Sintra "has characteristics of medieval, Gothic, Manueline, Renaissance and romantic architecture. It is considered an example of organic architecture, of a set of apparently separate structures, but which are part of an articulated whole, through courtyards, stairs, corridors and galleries" (Câmara Municipal de Sintra, 2013).

Number of Visitors: 521,402 (2018)

Management: Parques de Sintra-Monte da Lua, S.A.

Park and National Palace of Pena

"D. Fernando's summer palace is different, more beautiful and picturesque. It is built high up and overlooks the whole region."

Hans Christian Andersen

"Located in the Sintra hills, the Park and Palace of Pena are the fruit of King Ferdinand II's creative genius and the greatest expression of 19th-century romanticism in Portugal, denoting clear influences from the Manueline and Moorish styles of architecture." (Parques de Sintra, 2018),

The National Palace of Pena which is one of the best expressions of 19th century architectural Romanticism is currently the most visited monument in Portugal (2017). The palace construction dates back to the 19th century when King Ferdinand II (reigned: 1836 – 1853) acquired a formed monastery on that location that was at the time abandoned since the suppression of the religious orders in Portugal. By that time the building was in disrepair and the king ordered it to be repaired. Under the vision of Ferdinand and the genius of Wilhelm Ludwig von Eschwege (architect, 1777-1855) the monastery would become what is now one of the wings of the Palace, with a full new wing being built under the kings' orders.

The reconstruction of the former monastery transformed it into a castle-like residence, a style based on the German romanticism (Ferdinand II had German ancestry, having born in Viena, Austria). Many symbols of several cultures and building styles can be found throughout the palace, including but not limited to vault arches, Medieval and Islamic elements.

Around the palace lies the Park of Pena, a big, romantic and exotic garden with winding paths and rich natural display, with hundred different species of trees and plants from around the world.

"In the second half of the 19th century, King Ferdinand II and his future second wife, Elise Hensler, the Countess of Edla, created a Chalet and a Garden in the western part of the Park of Pena, a private space designed in accordance with the romantic taste, which served as a refuge and leisure area for the couple. Strategically situated to the west of the

Palace of Pena, the building followed the model of Alpine Chalets, which were then very fashionable in Europe." ("Chalet and Garden of the Countess of Edla," n.d.)

Following the death of King Ferdinand II in 1885, the palace and park which were private property of the monarch were left in his will to the Countess of Edla, the portuguese state would, however, acquire the property mere 5 years later.

Number of Visitors: 1,976,367 (2018)

Management: Parques de Sintra-Monte da Lua, S.A.

Main Points of Interest:

- Valley of The Lakes
- Statue of the Warrior
- High Cross
- Fountain of the Small Birds
- The Chalet of the Countess of Edla
- Pena Farm
- Temples of the Columns
- Palace

Park and Palace of Monserrate

"True vignette of the One Thousand and One Nights, a fairy tale view."

Hans Christian Andersen

The origins of this site date back to the 18th century when wealthy English merchant, Gerard de Visme, decided to build there a house of Neo-Gothic style, this house would however quickly fall into ruins. Francis Cook who would later receive the title of Viscount of Monserrate bought the property in 1863 and commissioned architect James Knowles to transform the property into yet another great display of Romantic architecture in Portugal.

Around the palace exists a magnificent garden with surprisingly contrasting scenery, composed by plants of very scattered points of the globe, ranging from palm-trees, and

tree ferns from Australia and New Zealand to agaves and yuccas from Mexico. A true delight with plants from five continents.

Although the palace fell in disrepair and was left abandoned for several years, the transfer of the property to Parques de Sintra – Monte da Lua in the year 2000 resulted in a profound restoration work which restored it the Palace and the surrounding garden to its former glory, allowing it to be once again reopened to the public in 2007 ("Park and Palace of Monserrate," n.d.).

Number of Visitors: 149,156 (2017)

Management: Parques de Sintra-Monte da Lua, S.A.

Main Points of Interest:

- Mexican Garden
- Chapel Ruins
- Indian Arch
- Boulder House
- Rose Garden
- Ornamental Lakes
- Palace

Capuchos Convent

"I*n all of my kingdoms, there are two things I have that greatly please me, El Escorial because it is so rich and the Convent of Santa Cruz because it is so poor*."

King Filipe I of Portugal (Filipe II of Spain)

A small convent built in the heart of the Sintra Hills during the 16th century that was awarded to the Franciscan Order by Dom Álvaro de Castro (son of the fourth viceroy of India).

"The convent is remarkable for the extreme poverty of its construction and the extensive use of cork in the protection and decoration of its tiny spaces, thus embodying the ideals of the Order of St. Francis of Assisi: the search for spiritual perfection by removing oneself from the world and renouncing the pleasures associated with earthly life. The

extremely small convent was built in respect for harmony between the human construction and the pre-existing natural elements: the divine construction" ("Parques de Sintra," 2014).

The convent would later be abandoned during the 19th century along with the dissolution of religious orders in Portugal, this would however only last 39 years, with Sir Francis Cook, Viscount of Monserrate buying the property in 1873 and the Portuguese state acquiring it in 1949.

Number of Visitors: 39,573 (2017)

Management: Parques de Sintra-Monte da Lua, S.A.

Regaleira

A romantic palace with a luxurious and mysterious surrounding garden built during the final period of the Portuguese monarchy by the initiative of the Portuguese businessman António Augusto Carvalho Monteiro (1848-1920) and designed by the Italian architect Luigi Manini (1848-1936).

This property which presents features of Renaissance and Manueline styles is known for its hidden tunnels and many symbols related to the Knights Templar, the Masons and dark alchemy ("Quinta da Regaleira," n.d.).

Number of Visitors: +1,000,000 (2018)

Management: Fundação Cultursintra, FP

National Palace of Queluz

A rococo style palace located in the city of Queluz (17 km away from Sintra but within the municipality limits), unlike the other monuments presented in Table 2, the National Palace of Queluz isn't located in the cultural landscape of Sintra and isn't as such considered world heritage.

Sometimes called the Portuguese Versailles, the palace was originally conceived as a summer residence and a place for leisure and entertainment of the royal family, even though it would be later used as the main residence by some monarchs.

This is both the birth and death place of Pedro I, imperator of Brazil, making it a special point of interest to the Brazilian tourists in Portugal.

Currently, the palace is sometimes used for states events, possessing an exclusive guest room for foreign state leaders ("Palácio Nacional de Queluz," 2013).

Number of Visitors: 180,432 (2017)

Management: Parques de Sintra-Monte da Lua, S.A.

Seteais

A palace built during the 18th century currently used as a hotel rather than a touristic attraction.

Management: Tivoli Hotels & Resorts / Parques de Sintra-Monte da Lua, S.A.

Visitors by country of origin

In 2017 the monuments managed by Parques de Sintra-Monte da Lua (PSML) received a total of 3,193,287 visitors, of which 80.5% were foreigners and 19.5% Portuguese, with the last being, in fact, the fastest-growing market of visitors in the past 3 years, increasing 6.8% since 2015 (when Portuguese visitors represented 12.7% of the total). Foreign wise the USA presents the biggest percentage increase, going from 5% (2015) to 7.7% (2017). Brazil is also a market on the rise with an increase of 0.7%. All other origin markets either kept their share (no significant variance) or lost weight. The United Kingdom registered the highest decline going from 20% back in 2015 to only 13.1% in 2017.

China although a small market with only 2.5% of the total share is a worthy mention since their share increased 0.3% since 2015.

Table 4 - Percentage of visitors by country (PSML managed sites)displays the site's visitors origin evolution through recent years.

Table 4 - Percentage of visitors by country (PSML managed sites)

Source: Parques de Sintra – Monte da Lua

Position	**Country**	**2015**	**2016**	**2017**
1	Portugal	12.7%	17.8%	19.5%
2	United Kingdom	20.0%	16.0%	13.1%
3	Spain	11.4%	12.3%	11.3%
4	France	13.2%	13.5%	11.3%
5	Brazil	7.4%	7.6%	8.1%
6	United States	5.0%	6.1%	7.7%
7	Italy	4.5%	4.6%	4.5%
8	Germany	4.6%	4.0%	3.6%
9	Russia	2.6%	2.2%	2.6%
10	Others	18.7%	15.8%	18.2%

2.2 Tourism Satisfaction

Satisfaction is a key point of destination differentiation, technologies such as Booking.com empowered tourists, allowing them an easy and transparent access to pricing information, due to this, no longer can businesses in this sector effectively differentiate themselves through price, being now rather forced to adopt a differentiated service offer, it is due to this fact that it is now critical to ensure visitor satisfaction, for a destination to ensure its long term success (Wang, 2016).

Satisfaction can be defined as "the result of the interaction between a tourist's experience at the destination area and the expectations he had about that destination." (Pizam, Neumann & Reichel, 1978: 315), furthermore stating that it is "a collection of tourists' attitudes about specific domains in the vacationing experience" or as "the degree to which a tourist's evaluation of a destination's attributes exceeds his/ her expectations" (Alegre & Garau, 2010: 57).

Figure *2* - Six Competitive Advantages through Customer Satisfaction, Sheth (2001) model allows us to perceive the various advantages that can be obtained through costumer satisfaction, and its connection with the overall business performance.

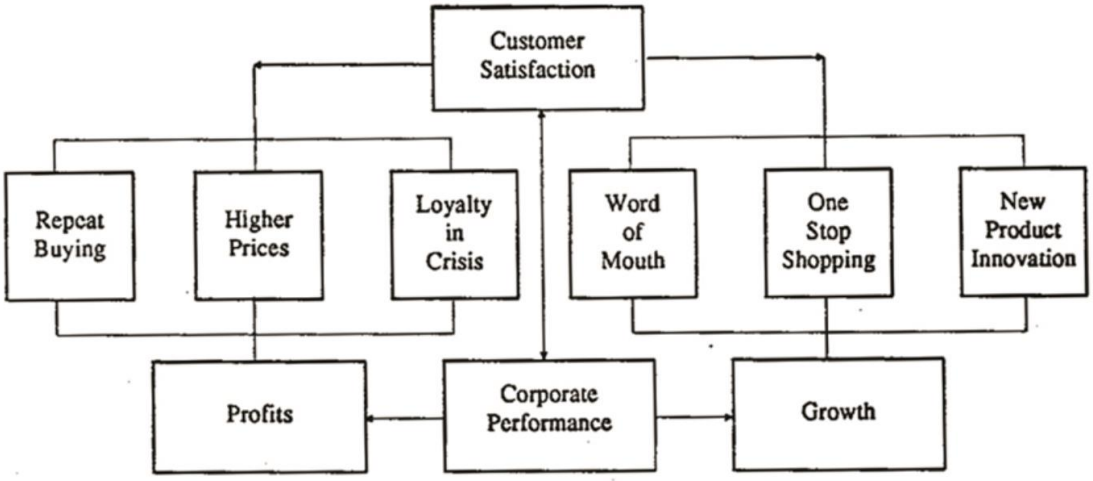

Figure 2 - Six Competitive Advantages through Customer Satisfaction

Source: Sheth (2001)

Kano, Seraku, Takahashi & Tsuji (1984) propose a model which distinguishes three types of product requirements that influence customer satisfaction in different ways:

- **Must-be Requirements:** Not fulfilling these requirements results in the customer being extremely dissatisfied, they are however taken as granted and will as such not increase the satisfaction.
- **One-dimensional requirements:** Customer satisfaction is proportional to the level of fulfilment, therefore, the higher the level of fulfilment, the higher the customer's satisfaction and vice versa. These requirements are usually explicitly demanded.
- **Attractive requirements:** Attractive requirements not expected by the customer, fulfilling them lead to more satisfaction, not meeting them doesn't, however, result in dissatisfaction.

Although early research focused on satisfaction at the global level, latter research investigated it as an attribute-level, with the overall satisfaction being a sum several attributes. Although related overall and attribute satisfaction should be considered as distinct measures, with attribute satisfaction having a direct impact on overall satisfaction. "Overall satisfaction with a hospitality experience is a function of satisfactions with the individual elements/attributes of all the products/services that make up the experience, such as accommodation, weather, natural environment, social environment, etc" (Chi & Qu, 2008: 626).

Research also concludes that positive satisfaction results in increased destination loyalty (Chi & Qu, 2008).

Pizam, Neumann & Reichel (1978) identified eight factors of tourism satisfaction, these aren't however universal as they depend on the destination and its characteristics and offer. The identified factors were: 1. Beach Opportunities; 2. Cost; 3. Hospitality; 4. Eating and drinking facilities; 5. Accommodation facilities; 6. Campground facilities; 7. Environment; 8. The extent of commercialization.

Zhao, Zhang & Tian (2018) research indicates that cultural heritage "enhances the attractiveness of tourism attractions and significantly positively influences the overall satisfaction of tourists". The World Heritage brand affects the tourism destination selection, attracts tourists, boosts the local economy and overall enhances the tourist satisfaction.

According to Chen & Chen (2010: 34) "a well-designed way of presenting the cultural product, including location, internal distribution, walkways, lighting or informative

panels, could stimulate and increase the visitors' interest and involvement", thus creating experience quality, which leads to visitors' perceived value, satisfaction and eventually customer loyalty.

2.3 Gamification

The term gamification was first mentioned in 2008 and has since then been a widely studied topic in current decade, generally described as "the use of game design elements in non-game contexts" (Sebastian Deterding, Dixon, Khaled & Nacke, 2011: 10) with the aim of improving user experience, shaping user behaviour in intended direction, motivating desired behaviours, increasing brand awareness among others. As shown in Table 5 - Gamification Definitions, Deterding's definition is not the only one, with several definitions having so far been proposed.

Table 5 - Gamification Definitions

Source: Adapted from Souza, Varum & Eusébio (2017)

Authors & Year	Definition
Sebastian Deterding, Dixon, Khaled & Nacke (2011: 10)	"The use of game design elements in non-game contexts."
Zichermann & Cunningham (2011: 14)	"The process of game-thinking and game mechanics to engage users and solve problems."
Huotari & Hamari (2012: 19)	"A process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation."
Werbach (2014: 268)	"The process of making activities more game-like."
Robson, Plangger, Kietzmann, McCarthy & Pitt (2015: 412)	"The application of lessons from gaming domain to change behaviours in non-game situations."

Although gamified application use game elements these should not be considered full-fledged games, nor do they use every game element, it is as such important to identify what elements should be considered for gamified applications. Deterding, O'Hara, Sicart, Dixon, & Nacke (2011) surveying of existing literature allowed to identify that game design elements are often described on varying levels of abstraction. Table *6* - Levels of Game design elements identifies these levels, ordered from concrete to abstract (note: not all these elements need to be present to create a gamified experience).

Table 6 - Levels of Game design elements

Source: Deterding, O'Hara, Sicart, Dixon, & Nacke (2011)

Level	Description	Example
Game interface design patterns	Common, successful interaction design components and design solutions for a known problem in a context, including prototypical implementations	Badge, leaderboard, level
Game design patterns and mechanics	Commonly reoccurring parts of the design of a game that concern gameplay	Time constraint, limited resources, turns
Game design principles and heuristics	Evaluative guidelines to approach a design problem or analyse a given design solution	Enduring play, clear goals, variety of game styles
Game models	Conceptual models of the components of games or game experience	MDA; challenge, fantasy, curiosity; game design atoms; CEGE
Game design methods	Game design-specific practices and processes	Playtesting, playcentric design, value conscious game design

Gamification provides positive effects, these are however very dependent on the context of implementation and the personal qualities of the user and not always are the effects the ones desired, in fact, gamification, if done incorrectly, can provide negative results (Hamari, Koivisto & Sarsa, 2014). Additionally, the same study indicates that the results of gamification may be short-lived, likely because of novelty and curiosity effects. Despite this, it was also concluded that removing the game elements mid-use may lead to negative effects, likely due to the loss of earned rewards such as points or badges (Hamari, 2011). Abruptly changing the game can also lead to players feeling betrayed and therefore quitting the experience (Robson, Plangger, Kietzmann, McCarthy & Pitt, 2016).

People use of game-like systems for different reasons. Gamification, when designed, needs to analyse and consider the targeted users' intrinsic motivations for using such application and their context. Game elements won't improve the user experience if their main motivation of use isn't being fulfilled, as such design should be made around the main reason of use and what they user seek, with the game elements being used to motivate and deepen the engagement. There isn't a unique development recipe for gamification, it needs to be centred around the targeted user needs (Deterding, 2012) and "just because gamification is trendy does not mean that it always works or is the best strategy" (Robson et al., 2016: 33).

It is as seen very important to understand user motivation, this motivation can be split in two, the extrinsic motivation which are the game elements themselves that motivate people from an external point of view, and the intrinsic motivation which is not dependent on external influence but rather one's own will. (Conway, 2014; Hanus & Fox, 2015) As seen failing to recognize the last one can mean the failure of the gamified system.

Although gamification uses game elements, e.g: rewards, these said rewards are shifting from the traditional gratification, such as monetary to others like information, with users being driven by self-efficacy, group identification, and social approval. Social environment plays a big role in gamification, as users look to interact and be recognized by others and meaningful, positive connections, create positive effects (Deterding, 2012).

It is necessary to properly design the timing of rewards. Intended behaviours should be rewarded in order to encourage the player to repeat it, as such good performance should be rewarded as quickly as possible (Robson et al., 2016). Not only is it important to decide the time of rewards but also to decide which types and quantity. Rewards should be meaningful and aligned with the player intrinsic motivation. Giving out too many rewards

will reduce their overall strength and better reward value should be based on the challenge difficulty to achieve it.

Robson, Plangger, Kietzmann, McCarthy & Leyland Pitt (2015: 413-414) identify several stakeholders and participant roles of gamification:

- Players: The ones who compete in the gamified experience. As previously mentioned, these players can be internal or external to an entity. Players are the main performers and are as such highly immersed.
- Designers: The decision-makers and the ones responsible for developing and designing the gamified experience. Also responsible for overseeing the experience one in use and ensuring that it meets the established goals.
- Spectators: "Individuals who do not directly compete in the gamified experience but whose presence will influence how the gamified experience works". Spectators although passive, are also immersed in the experience and have the capability to alter the player behaviour by, for example acting as a source of support, ensuring that the experience goes smoothly.
- Observers: Do not intervene nor do have a direct impact on the experience, their presence and quantity will impact the popularity of the experience.

Both observers and spectators might seek a more active role and by so become players and player can also assume the role of spectators by for example cheering other players.

Robson et al. (2015) also propose a framework of three gamification principles to explain how gamified experiences can be created. This proposed framework of gamification principles designated MDE outlines the interdependent relationship of gamification principles that together create the player experience. It is important to recognize and understand each of the proposed principles:

- Mechanics: The decisions made by those who wish to gamify a non-game context, these include the goals, rules, settings, context, the type of interactions and the boundaries of the gamified system. Mechanics remain constant during the experience, do not differ from player to player and can be split into three different types:
    - Setup mechanics
    - Rule mechanics
    - Progression mechanics

- Dynamics: These are not set by the designers but are instead produced by how players decide to follow the designed dynamics. Dynamic reflects the player behaviour in-game, the actions and interactions taken. An example of dynamic can be the strategy taken by the player, either of cooperation with others or instead an individual and competitive style. Dynamics can be affected by the spectator role previously mentioned, as player tend to be more or less competitive depending on who and how many persons are watching.
- Emotions: These are defined by "the mental affective states and reactions evoked among individual players when they participate in a gamified experience". They derive from players generated dynamics and should ensure the enjoyment of the user, if the felt emotions are instead negative (including disappointment and sadness) the player will drop the use of the gamified system. Excitement, amusement, amazement, surprise among others are an example of the desired emotions, these can, however, be mixed with other more negative feelings such as sadness (for example deriving from not being able to win a reward).

It has been previously mentioned that the personal qualities of each user make the effects of gamification different to each kind of player and that when designing the gamified system, the intrinsic motivations of each one need to be considered, it is as such important to conceptualize players and understand the different types before designing a gamified experience. Gamification, as mentioned, is used to enhance engagement, be it of internal employees or of costumers, as in everything different persons seek different things as such different mechanics will be necessary to engage different players with distant goals. Robson et al. (2016: 2) identified four types of players, depending on what they seek the most when patriating in a gamified experience, two dimensions were used in this attempt to conceptualize players:

- Player orientation: "Describes whether the player is oriented predominantly toward other players or towards themselves".
- Player competitiveness: "The extent to which the individual engages in competitive behaviour".

Based on a matrix (seen on Figure 3 - Typology of players) of the two identified dimensions, four types of players were defined:

- Strivers: Play to engage in personal development and seek to achieve the best score.
- Slayers: Those who play to be better than the other player.
- Scholars: Want to learn and understand the gamified experience.
- Socialites: Wish to network and socialize with other players.

		PLAYER ORIENTATION	
		SELF	OTHERS
PLAYER COMPETITIVENESS	HIGH	**Strivers**	**Slayers**
	LOW	**Scholars**	**Socialites**

Figure 3 - Typology of players

Source: Adapted from Robson et al. (2016)

For gamification to be successful designers need to consider the different types of players and then design the game mechanics according to the chosen strategy, either to design the mechanics in such a way that they are appealing for all types of players, or instead focusing on a precise segment while alienating others.

2.3.1. Tourism Gamification

Although the term gamification wasn't used up to recently in tourism, similar programs have existed for a long time, namely the loyalty programs used by hotel chains and airlines companies, that offer rewards in exchange of achieving certain objectives.

"Gaming in tourism is a new and emerging area. Technically, it is very challenging in two aspects. One is that the game designers need to understand both the tourists' needs

and the gamers' desires, and then blend them seamlessly to deliver memorable, fun, and engaging gaming experiences." (Xu, Tian, Buhalis, Weber & Zhang, 2015: 2).

Gamification in tourism can be directed to the clients (to encourage customer engagement and enhance the experience) and also to organization employee's (to improve engagement but this time within the organization) with the aim of increasing both parties motivation for example to buy products (clients) or to increase work efficiency (employees) (Xu, Weber & Buhalis, 2013).

Xu, Weber, and Buhalis (2013) identify the following benefits of the application of gamification in Tourism:

- Encourage tourist engagement;
- Enhance tourism experiences;
- Improve tourist loyalty: Possible through loyalty programmes with deeper interaction between the customer and the system (vs the so far static systems such as loyalty cards);
- Increase tourism brand awareness: In-game placement of logo or brand name, creating opportunities for the user to interact with the brand;

Gamification can be used to promote tourism destinations by creating informative and entertaining settings which can be used to interact and communicate and therefore act as a marketing tool that would work primarily in the pre-trip stage, but not only since it can also be used to help and improve experience on-site for example by giving the user meaningful information such as recommendations and by allowing tourists to experience points of interest in an engaging and gamified system (Xu et al., 2015).

Designing gamified systems is challenging and shouldn't be considered just for the sake of adding the game elements with the expectation of it working as a magical formula for success. The use of gamification should be voluntary and only applied where suitable, always with the user initial and intrinsic motivation in mind, otherwise, the gamified systems might not only not improve, nor motivate the user but have the opposite effect, being perceived as a controlling and monitorization tool, therefore worsening the user experience. Game elements that act as extrinsic motivators, such as rewards should be perceived as informational elements to the user (Hanus & Fox, 2015). Overall intrinsic motivations such as socialization and challenge should be given priority in design thinking over extrinsic motivations (points, badges and so on) (Xu et al., 2013).

Although gamification uses game elements, namely rewards it is important to consider that these are shifting from the traditional monetary gratifications to others such as information which is a very precious asset in the tourism context. The social environment also plays a big role in gamification, as users look to interact and be recognized by others, Deterding (2012) point out that meaningful, positive connections, create positive effects. "Designers need to understand both tourists' needs and the gamers' desires, and then blend them seamlessly to deliver memorable, fun and engaging gaming experiences for this particular segment" (Xu et al., 2015: 2).

As pointed information is one of the most sought resources by tourists, this information is however very specific which sometimes results in it being hard to incorporate into a gamified system, however as previously mentioned information is becoming a leading reward in gamification which results in applications being designed with the explicit purpose of providing information.

It is of utmost importance to understand that tourists are a very particular type of game players. Tourists play in an unfamiliar environment and with only a short amount of time at their disposal as their focus is to perceive and discover the surrounding environment as such the use of mobile games in the tourism context is often related with the will to explore the destination (on-site and before) (Xu et al., 2015).

Generally "games are used for enjoyment and to satisfy the needs for competence and relatedness" (Xu et al., 2015: 4) and players motivations vary, while most are looking for social enjoyment, others seek achievement, to explore and to face and defeat others with the last being a very small group (Bartle Richard, 1996), these motivations derive from one's personal features and qualities such as gender, age, personality and life experience (this correlates with Robson et al. (2016) research on player types).

During holiday, games are mostly used to kill time and relax on the way to the destination or during the evening upon returning to the hotel. Although as mentioned while on destination tourists prefer to focus on their surroundings, Xu et al. (2015) identified the following motivations to play tourism-related games during holiday (this study sample focus on Chinese students, therefore, it is safe to assume that results aren't linear across all types of tourists, as mentioned motivation derives from personal qualities). The main motivations identified are as follow:

- Curiosity: Identified as the most popular theme. The fact that gamification on the tourism context is something new attracts the idea of trying it. This correlates with the previously identified point that gamification effects may be short-lived due to novelty and curiosity elements (Hamari, 2011);
- Exploration: Discover and learn practical information of the destination allied with the fun element of gaming (entertainment). "There are lots of ways to get to know the destination but playing a game and getting to know the destination is more fun". Virtual Reality is confirmed as a potential influence in enhancing tourists' experiences;
- Socializing: The inquired focus group sees gamification as a tool with the potential to get to know other people at the destination, both other tourists and locals. Meeting other people on the destination opens several possibilities among which are learning from the locals and co-creating experiences with other tourists (exchange of ideas, travel in company, sharing costs). Socialization has previously been identified as an important dimension of holidays;
- Fun: Games in the tourism context can be used to animate the travel experience and engage with the destination in an interactive way. It is also identified as a funnier way to learn about the destination (vs the traditional guide books or online search) and to share the destination and on-site experience with friends;
- Challenge and Achievement: Respondents recognize the challenging aspect of games and understand how it can be used in the tourism context (e.g: a challenge to visit a certain number of attractions in a limited time and being rewarded for the achievement). Tourists might start using a gamified system in search of information but stay for the challenge - achievement element. "Challenge and achievement, together with competition, are intrinsic motivations. They support the flow of the game and are considered fundamental motivations in traditional game play";

Overall Xu et al. (2016) identifies that "gaming can enhance tourists' interest in the destination, provide experiences and knowledge, which otherwise are not available". Tourists' main motivation to use such application would be to obtain pertinent information (before, during and after the visit) as well as to socialize with other people. It also identifies that gaming in the tourism context can be used before travelling as a way to promote the destination (marketing tool) and to increase brand awareness. It can also

be used to help the user explore special interests, allowing marketers to deliver highly personalized experiences.

Cunha, Mendonça, Paulo Morais & Carvalho (2016: 6128) indicate that the potential of heritage gamification is huge, with the capability of awakening interest in material and immaterial heritage and to promote and preserve patrimony, the authors do however point out that the current lack of multimedia content often required for this type of application results in difficulties of game development, it is further pointed out that "it will be necessary to create conditions for game developers to have access to authentic and quality heritage artefacts, giving developers assurances that the products they develop will be successful".

2.4 The use of information technologies in tourism

Whenever travelling and visiting unknown places access to information is of vital importance, historically tourists were very dependent on printed guides and on-site provided information (Simao Da Graca Dias, Beinat & Scholten, 2005), but the development and spread of use of the internet changed that, in fact, internet has today become the most frequently used source of information when making travel plans, with a lot of this information being provided via smartphones, more precisely through thousands of applications, of which most are free. Information provided through mobile services not only is more practical and resourceful than traditional sources, it also holds power to affect the satisfaction of travellers, and even has a significant effect on destination revisiting intentions. For these to happen, however, developers need to consider what do tourists value the most on mobile technologies on tour context, with current research identifying that interface design quality is more important than the history and cultural knowledge quality (Kim, Chung & Ahn, 2019). Despite this fact, design quality will be wordless if the content provided doesn't meet the users' needs.

Literature review allowed to identify several informational requirements through a 2015 research based on the Kano Model. The study by Federica Palumbo (2015) identifies the following requirements divided by category:

Must-be:

- Multilingual option.
- Friendly and efficient user interface.

- Compatibility with different operating systems.

One-dimensional:

- Multimedia information;
- Geo-located map;
- Possibility to store loyalty cards, coupon and voucher;
- Free download;

Attractive:

- Recommendations for personal routes;
- Augmented reality;
- Service available off-line;

As seen before interface design quality is considered more important to users than the quality of the content itself, therefore it should also be analysed how to design such mobile app, it is exactly this that a 2012 paper by author Stefania Boiano does, by outlining of the aspects regarding the planning and production of cultural content for mobile usage, regarding its design strategy. According to this research, there are 7 content typologies that need to be addressed:

1. Text which should be kept as short as possible;
2. Images which should be high-contrast;
3. Audio considered excellent content for mobile devices since it can be heard using earphones, like text it should not be too long and clearly audible;
4. Video which can add an emotional layer to the cultural information, pointing however that they do distract the user from the surrounding environment, and should, therefore, be used carefully;
5. Maps with interactive capability;
6. Social features;
7. Updates and maintenance;

When it comes to User Interface this paper recommends keeping it simple and intuitive as possible (Boiano, Bowen & Gaia, 2012).

An analysis conducted in 2013 by Theresa Karolina Shieder analysis the current offer of apps dedicated to UNESCO sites. By analysing 115 apps dedicated to UNESCO sites this research identified 49 indicators which were grouped into 7 categories:

1. General Information;
2. UNESCO world heritage sites;
3. Multimedia;
4. Place;
5. Tourism;
6. Entertainment;
7. General features/settings;

Of these General Information was the most represented category, which includes indicators such as description, history and geography of the site and suggested tour(s), selected points of interest/highlights and proposals was the most frequently present indicator (80%). The study also concluded that at the time only 11.3% of the apps offered virtual tours and that AR features were only present in 5.2%, despite being considered a major trend in mobile tourism domain (Schieder, Adukaite & Cantoni, 2013).

Most visitors can be classified as short time visitors which are highly heterogeneous, therefore requiring different kinds of information. Although access to information can be provided in several ways one must consider the need to filter it according to the end-user needs, enabling easy and fast access to what is needed by who, at what moment, thus facilitating exploration. Tour personalization has been a topic of research for over two decades and although its need has since long been acknowledged, the way by which it is provided has been improved through technological advancements, going from a manual process to a more dynamic and less noticeable one. Research found that people do not like to be stereotyped into a specific group to have access to more personalized information, instead preferring dynamic personalization, this should, therefore, be an unnoticed process, provided in the background and not by directly asking the user for input (Ardissono, Kuflik & Petrelli, 2012).

Chapter 3 – Methodology

In order to design this paper's proposed mobile application, we first needed to analyse what information tourists expect to have access to while visiting cultural world heritage sites, to that end we considered the few literature review found on this topic and conducted a qualitative survey directed at tourists. This survey was carried out at the entrance of two of the main cultural sites of Sintra, the National Park and Palace of Pena and Park and Palace of Monserrate, and was directed at tourists who were either about to visit or who had just visited the previously mentioned cultural sites, in order to together with the present literature review on this paper, allow for the creation of an adequate prototype. The structure of this survey along with the collected answers can be found in the attachments A to F of this paper, along with an article published based on the results obtained, in attachment H.

A schema resuming this paper's investigation methodology can be found below.

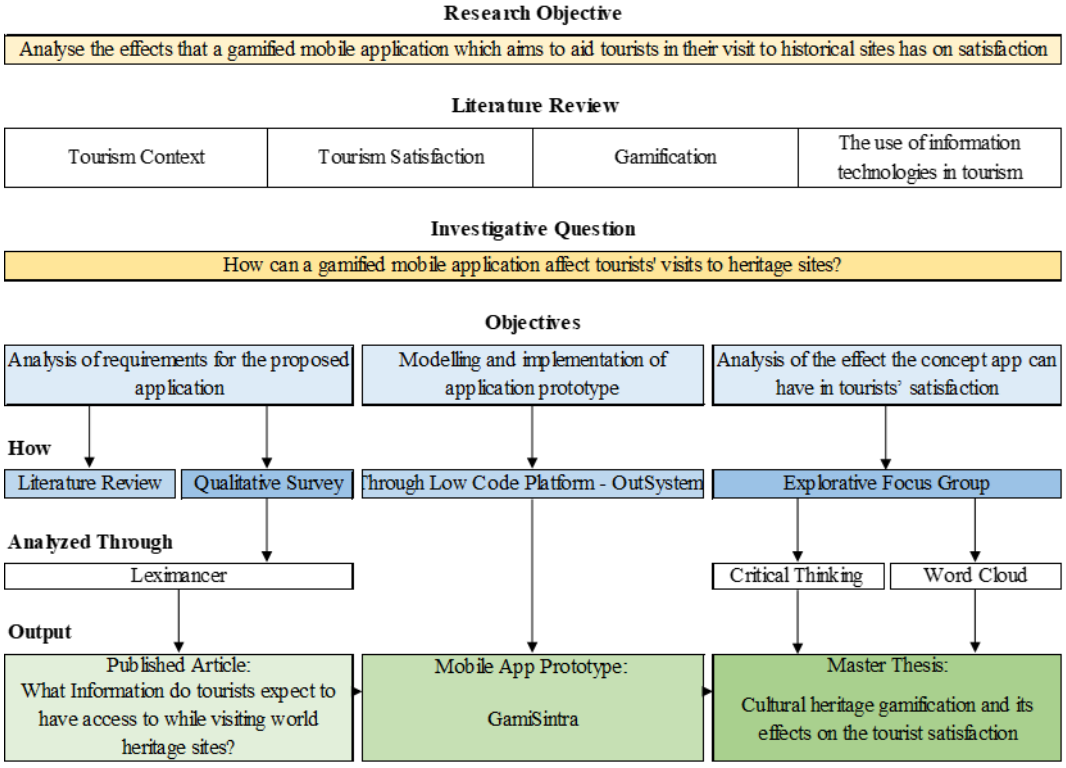

Figure 4 - Investigation Schema

Source: Own elaboration

A total of 40 surveys were conducted with N = 39 being considered valid, 21 before the tour and 18 after, 20 females, 19 males. A total of 13 nationalities were interviewed, with Brazilian and Portuguese being the most expressive ones (both with 9 respondents), followed by Americans and Germans (4 each). 59% of the enquires had an age of 39 years or younger.

All answers were compiled in an excel file, with each row representing an inquired tourist, and a total of 1358 word being obtained considering all answers.

To analyse the answers obtained we resorted to Leximancer, a content analysis tool adequate for processing qualitative data and large chunks of text, identifying the main concepts present in the same and clustering them into themes with little manual intervention ("Leximancer," n.d.).

3.1 Data Analysis

Using Leximancer 4.5 we automatically generated a conceptual map composed of 5 main themes: History, Use, Information, View and the most relevant one, Map. Each one of these themes is associated to important concepts such as location, pictures, sites and guide (map theme), history, time, understand, indications and architecture (history theme), support, search, and free (use theme) (see Figure 5).

This survey is expected to contribute to the future development of APPs dedicated to cultural heritage sites, therefore it is our hope that the analysis of the present concept, which presents the potential consumer assessment of requirements will contribute to diminish the existing gap between supplier and demander interpretation of requirements, allowing for improved user acceptance (Rising & Janoff, 2000) and by allowing heritage site managers to provide useful information where it is needed the most, on-site (Simao Da Graca Dias, Beinat & Scholten, 2005). By ensuring that heritage site managers are able to provide their visitors their true needs of information we're are allowing them to present the cultural product in a well-designed manner which could stimulate and increase the visitors' interest and involvement, thus creating experience quality, which leads to visitors' perceived value, satisfaction and eventually customer loyalty (Chen & Chen, 2010).

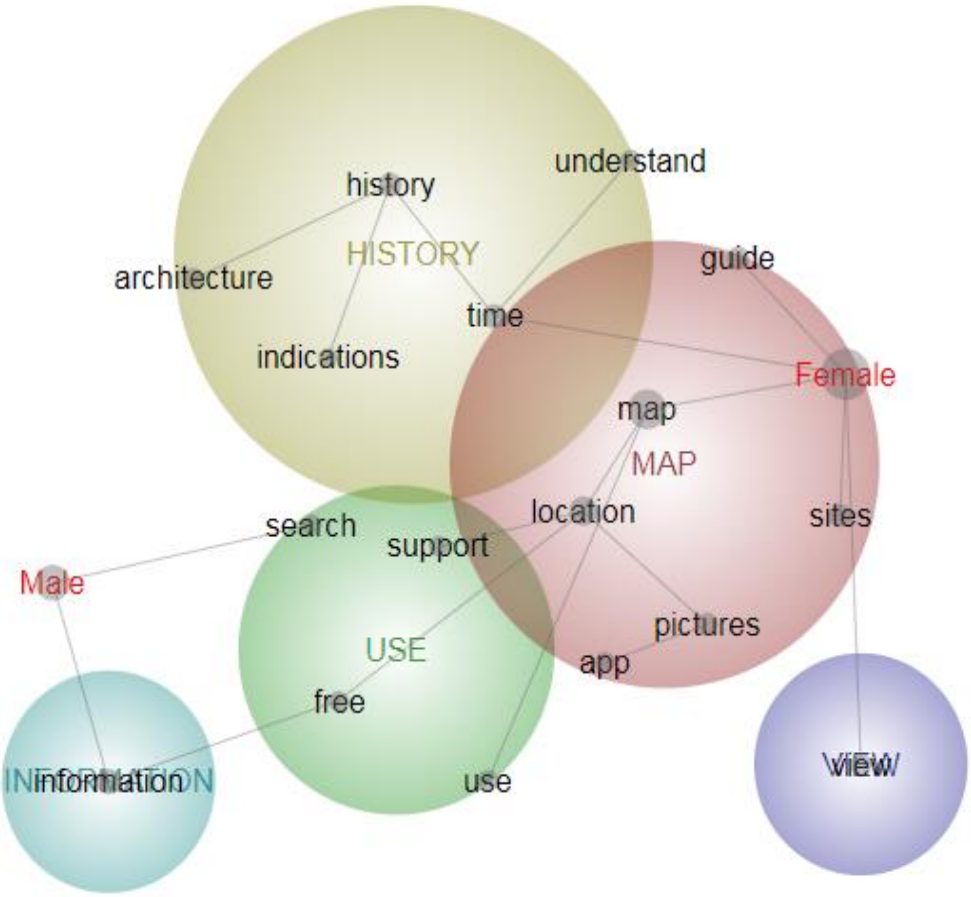

Figure 5 - Concept map displaying tourists' expectations towards their visit and information requirements

Source: Own elaboration

3.2 Result Analysis

According to results map was the most relevant theme and concept identified by the inquired tourists, this concept is connected to others such as location, sites, pictures, guide and can be linked to our previous literature review, which allowed us to conclude that map, GPS and overall geographical location features were not only one of the most provided feature in this kind of APPs but also deemed as necessary as explicitly demanded requirement by users, with its presence improving overall satisfaction of use (Palumbo, 2015; Schieder et al., 2013). A map feature allows for visitors to not only understand the space being visited and its main sites and how to get there but also to pick their route based on personal preferences.

The second most relevant theme identified was History, which holds concepts such as understand, time, architecture and indications. History is, in fact, the main information requested by tourists and is heavily connected with the wish to understand the site being visited and the culture attached to it. The concept time here refers to the historical era of the site origins and yet again the desire to understand how it connects to the site. Likewise Map, History too is already one of the main concepts present in current APP offer (Schieder et al., 2013).

Along with Map and History which can be considered as the, in fact, main information requirements, the survey allowed us to identify a third theme of different characteristics, Use. Unlike the previous two themes, this one is related to the design and functionalities of the application, rather than information itself. The concept free here present refers to the desire of tourists to be allowed to download the application without direct cost associated. Yet again this concept was also identified in previous research, as other studies identify this requirement as having a customer satisfaction proportional to the level of fulfilment (Palumbo, 2015). Most of the already existing offer is indeed provided by free, therefor meeting tourist's desire (Kim et al., 2019).

Lastly, we have two one concept themes, View and Information, with the first being more associated with female users and the second to males. Information is connected to the content required, such as the concepts connected to the history and the map of the site. Similarly to what we identified in literature review information should be concise and based on the need at hand, therefore easy to obtain and navigate, not only that it should allow for a personalized experience (Ardissono et al., 2012). Apart from the topics already identified (history and map), another type of sought information includes that linked to the facilities of the site itself, including schedules of buses, dining services and site opening and closing schedule. The View theme connects with viewpoints and the, in this case, the wish to behold the village of Sintra and its surroundings that lie on the slopes of the mountain from the high position of the Pena Park, which allows from great pictures to be taken.

Through the analysis of the generated concept map, we can conclude that the main informational requirement that tourists seek access to while visiting world heritage sites, namely cultural ones is a map feature to help them get around the site and choose what to see. The second major requirement is connected to the historical information of the site itself, in order to be able to understand the space that is being visited, its architecture and

overall history. Thirdly we can also conclude that tourists also expect such application to be easy and free to use.

3.3 Prototype Analysis

Following the requirement analysis and the development of the proposed prototype, we undertook the necessary tests to answer the paper's question. To this effect we resorted to a focus group, a qualitative technic of data collection, obtaining the necessary answers from a pre-selected group of individuals based on their fitting and expertise of the topic being analysed. Morgan (1997) describes Focus Group as a controlled discussion of a group of people which allows for observation and registration of experiences and reactions which would otherwise not be possible to obtain.

To form a group, one must analyse the topic being investigated and conclude from it the characteristics need from those individuals that will compose the focus group, which should be homogenous and common to all, with a Focus Group being constituted between 6 to 12 persons.

To guide the focus group, we must resort to a moderator, which must apply the role of leadership and guidance while still attempting not to interfere too much in the discussion. It is also up to the moderator/investigator to plan the discussion, ensuring that the needed topics are discussed.

After the discussion has been had the analysis should be carried on with the help or by the moderator as he will have access to information otherwise not available (such as body expressions employed by the members of the focus group). This analysis should contain and describe that main idea discussed, allowing for conclusions to be taken (Galego & Gomes, 2009).

We opted to hold a focus group because this methodology allows us to further explore the subject and obtain more detailed information which would otherwise be harder or impossible to obtain. Explorative techniques are often used in new emerging areas, yet not deeply understood, which is still the case of gamification in the tourism context (Xu et al., 2013).

To conduct this focus group, we opted for a sample of young age master students, based on the facts present in Table *7* - Group Justification.

Table 7 - Group Justification

Young students do in general hold advanced capacities in the technology field.	Blackburn (2011); Brigham (2015); Kurup (2010); Williams, Yee & Caplan (2008)
Most game users are young and university students.	
Early adopters of technology.	
Millennials are the generation with the highest rate of travel days per year.	Sofronov (2018)

5 participants are students of ISCTE – University Institute of Lisbon, with the remaining element being a student at the Estoril Higher School of Hospitality and Tourism. All participants travelled abroad in the past year and visited several cultural sites both aboard and in Portugal in the same period.

The focus group was conducted according to the interview script which can be found in attachment G of this paper.

Chapter 4 – System Modulation

Once the information requirements for guiding visitors on their tour had been analysed, we proceeded with the development of an artefact information system that allows testing this paper's objective, such artefact is as previously mentioned a mobile application for smartphones. Before developing the said system (or any information system to be precise), it is necessary to analyse and model the application (before constructing an infrastructure one must first draw its architecture, information systems are no different). The present chapter is composed by a series of illustrations drawn according to Unified Modelling Language (UML), in order to simplify the development of the application, containing it's expected functional characteristics and expected functions.

UML is the result of several modelling languages merging together in order to simplify and standardize the market, initially released in 1995. It contains several diagrams to represent diverse factors of information systems, of which Class Diagram and Use Case are worthy mentions (Alturas, 2013).

4.1 Functional Requirements

Table *8* - Functional Requirements represents the functionalities that the proposed mobile application shall contain and is based on the requirements identified in chapter 3.

Table 8 - Functional Requirements

Requirement	Definition
List of sites	Allow the user to verify the attraction sites whose information is present on the application.
Site description and history	Allow users to understand the site being visited.
List of points of interest	A list containing the main points of interest in each site and their description.
List of facilities	A list containing the main points where support facilities can be found in each site and the services provided.
Site Routes	Provide the user with information of recommended locals to visit as well as indications on how to reach them.
Site pictures	Allow users to visualize each local.
Map	Allow users to use geographical location features to locate sites.
Audio guide	Allow user to listen to certain parts of the information provided.
Locate user on a map	Allow for the use of GPS features to locate the user in real-time.

4.2 Use Cases

A use case can be considered a typical interaction between user and system, a mean to achieve a user objective and a group of sequential actions need to be undertaken in order to achieve a desired outcome.

This diagram is composed of the system users (represented by a stick man with role name in the bottom) and a set of actions represented by circles within the system boundaries (Alturas, 2013).

Figure 6 - Use Cases Diagram displays the main use cases identified for the creation of the prototype APP.

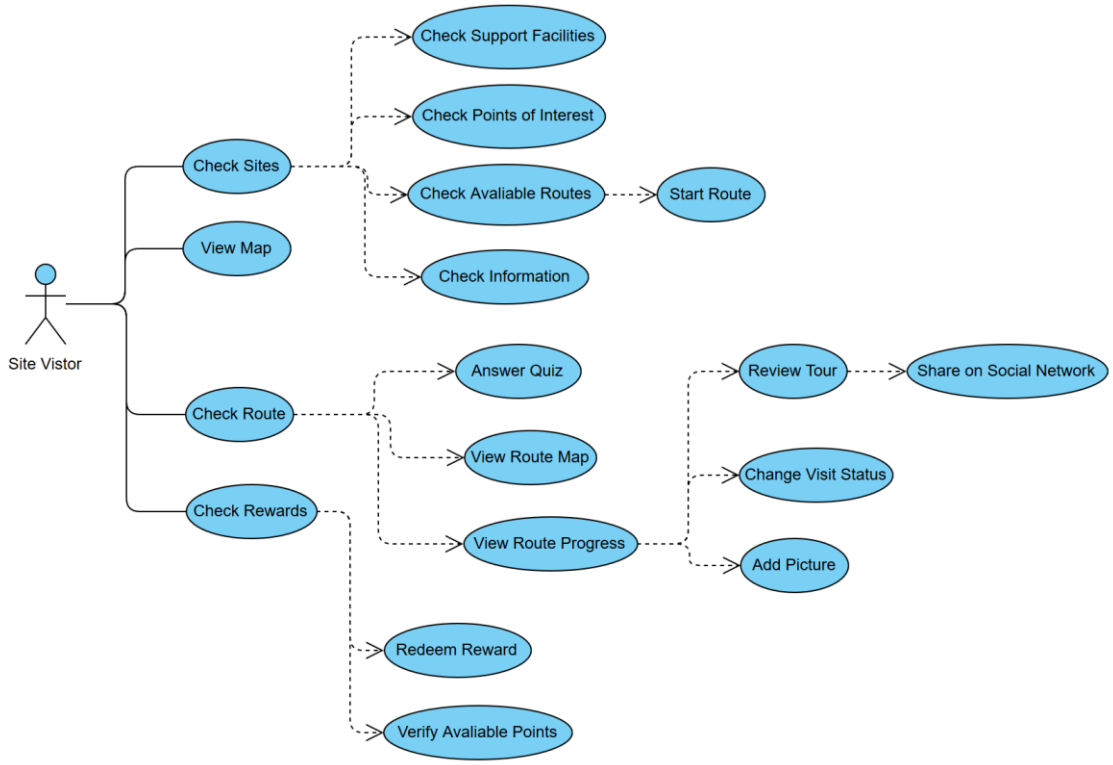

Figure 6 - Use Cases Diagram

Source: Own elaboration

Use Cases Description

- **Check sites:** The user shall have access to a page with a list of the sites of which the application provides information of. This list will provide access to each site detail page.
- **Check information:** The site detail page must contain the information that the users require (as identified in the previous chapter), which includes description, history and relevant people.
- **Check available routes:** List of suggested routes for each site, containing the order of visit.
- **Start route:** Enable the user to select one of several routes in order to gain access to its detail as well as to register its progress.
- **Check list of points of interest:** List containing the main attractions of each site including a picture of each site, description as well as option to listen to the description.
- **Check list of support facilities:** List containing the support facilities present in each site as well as the services provided by each.
- **View map:** Map containing the localization of each site.
- **Check route detail:** Allow the user to verify the detail of each selected route and its progress.
- **Verify sites on route:** List of the locals by which each route passes, containing the visit status of the user, the order of visit and the site description.
- **Verify route on map:** Allows the user to visualize the route locals' position on the map and therefore simplify navigation on the site.
- **Answer route quiz:** Provides the user with a set of questions for each route, which allows him to test his acquired knowledge of the site.
- **Check rewards:** Enables the user to verify how many points have been obtained and unlock rewards with them.

4.3 Data Modelling

GamiSintra data structure was modulated around key concepts which can be split into 5 categories: Site, Local, Quiz, Route and Reward.

The following figures contain the application database tables, displaying their attributes and relations.

Site

Contains the concepts directly related to each site present in the application, centred around an entity with the same name and 4 extensions:

Site Marker: Contains the geographical coordinates of each site, enabling location on map.

Site Image: Contains an image of each site to display on list.

Persons: Contains the bibliography of persons directly connected to the site.

Timeframe: Contains the main events associated with the site throughout the years.

These concepts can be seen on the class diagram present on Figure 7 - Site entities.

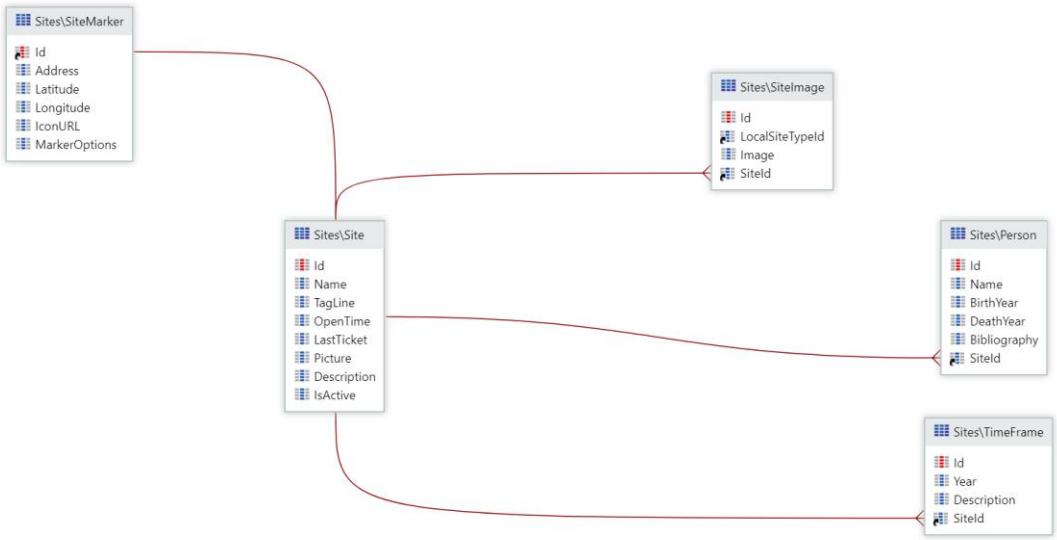

Figure 7 - Site entities

Source: Own elaboration

Local

A sub concept of site. Each site contains several sub-locations within it, which can be points of interest or support facilities. Yet again the concept is built around a table of the same name, which also has extension tables to hold two sized images. Each local is associated to either a Park or Palace concept depending on its location within the site through the 'LocalSiteType' entity, each site is also qualified as either Point of Interest or Facility via the 'LocalType' table, and also a subtype which is the type of services provided if facility (e.g: shop, ticket office, among others).

Figure 8 - Local Entities displays the class diagram of the entities above described.

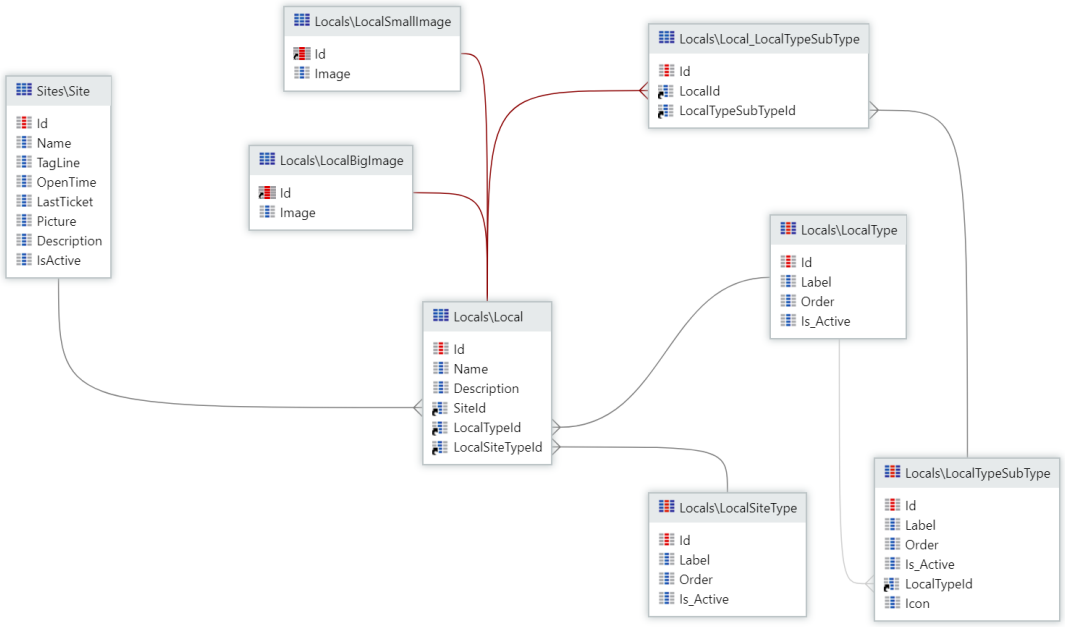

Figure 9 - Local Entities

Source: Own elaboration

Route

The concept which enables the presentation of route templates and allows for the generation of each route to users, allowing them to keep track of their progress, as seen in the class diagram present on Figure 10 - Route Entities.

Each route is connected to a single site but contains several locations which can be present in more than one route.

Each route local (the connection of a local to a route and the order by which it is present in it) is associated with a route marker, yet again to allow geographical map features. Upon starting a route, a record of 'UserRoute' is created to associate the user with the said route, and for each local present in that route, a record of 'UserLocalVisited' is also created, allowing the user to keep track of its progress within each route.

Each Route Local is associated with reward points (flow presented further ahead), each local visited awards a certain number of points based on its importance and usual visit rate (with less often visited locals being awarded more points).

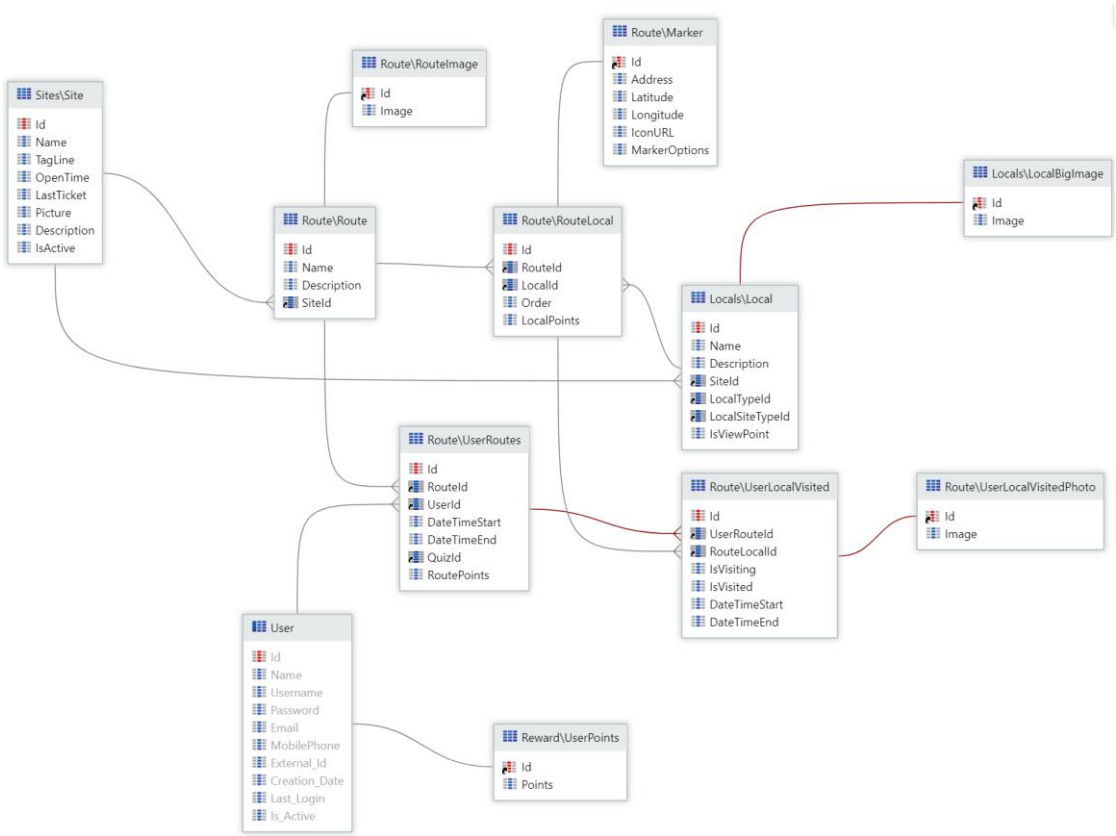

Figure 11 - Route Entities

Source: Own elaboration

Quiz

Concept connected to Route, which allows for the existence of a quiz associated with each route. Each quiz has several questions and for each question, there are several options. The history of the user answer to each question is stored in the 'UserQuizAnswer' entity and other exists to keep track of the general performance of the user in each quiz 'UserQuizResult'. This behaviour can be seen on Figure 12 - Quiz Entities.

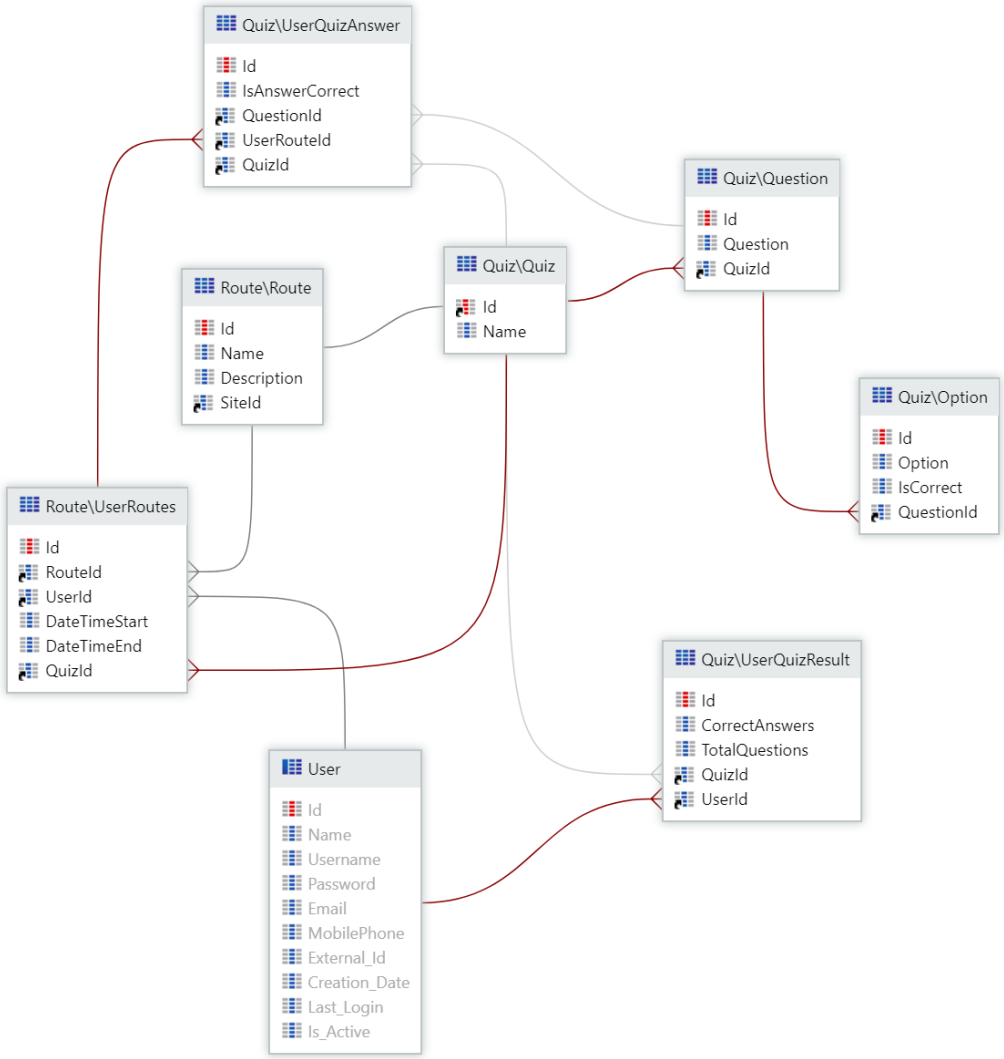

Figure 12 - Quiz Entities

Source: Own elaboration

Reward

Group of entities centred around the ability to keep track of user conquered points, allowing users to spend those points on listed rewards.

Each user has a set of points which can be collected by visiting route locals. Figure 13 - Reward Entities presents the described behaviour through a class diagram.

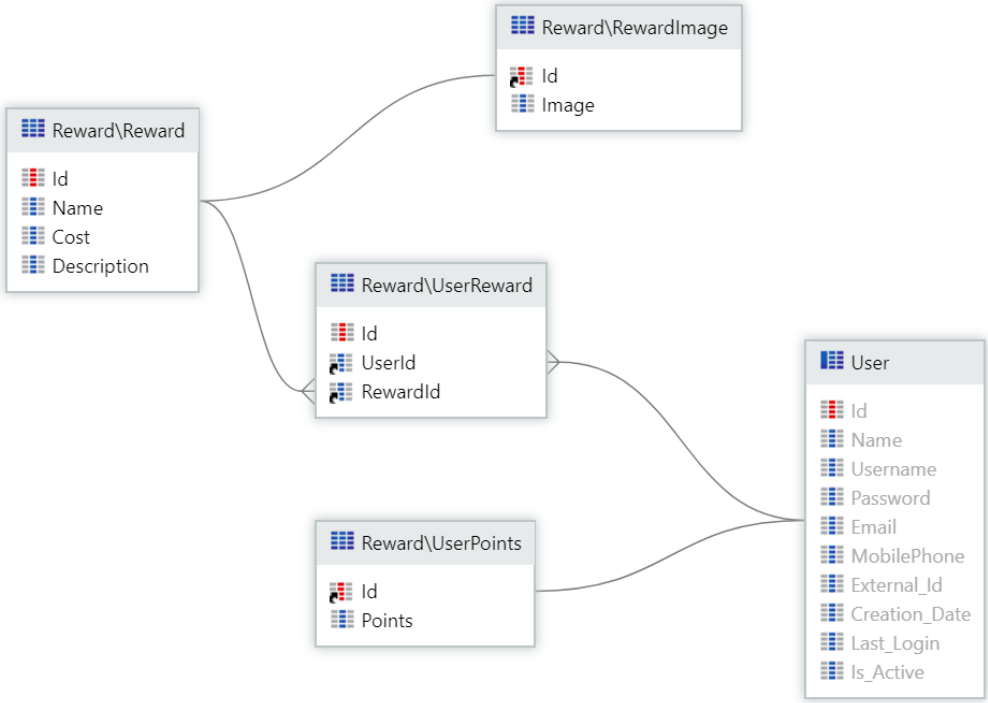

Figure 13 - Reward Entities

Source: Own elaboration

Page intentionally left in blank.

Chapter 5 – System Development

The proposed information system artefact was developed using the OutSystems platform. OutSystems is an easy to learn low code software that greatly accelerates the delivery of mobile and web applications. Although a licence must be purchased for commercial use, a free version is also provided for trial and personal usage.

OutSystems uses HTML, CSS and JavaScript to generate world-class front-ends, while also allowing the management of back-end through C# and SQL technology. It also allows for fast integration with other systems via REST and SOAP APIs.

All this is possible through the OutSystems' Integrated Development Environment, Service Studio, which allows both to design UI integrated with the web technologies previously mentioned (while providing live preview), as well as to design data models and back-end actions (functions). Service Studio provides many features including a debugging tool ("OutSystems," n.d.).

5.1 Site List (Main Page)

After loading, the application will display its home page, as seen in Figure 14 - Site List. This page contains links to the detail page of each site present in the application (in this case the Parks and Palaces of Monserrate and Pena), while also providing image preview of these sites. Pressing one of the items will open the corresponding detail page. It is also possible to open the sidebar menu of the application by clicking on the list icon on the top-bar and to quickly access the other app pages via the bottom-bar (also present in the other pages).

Figure 14 - Site List

5.2 Site Detail Page

This is the most extensive page of the application and features several tabs with different types of information. By default, the page opens with the About section selected, which itself also contains 3 subcategories, Description, History and People, by default the first is open. It is this tab that provides the user with most of the information requirements identified in chapter 3.

Description, as the name says, contains a short text describing the site, its origins, architectural style and other relevant site information such as open and closure time.

The second tab is History and contains a timeframe of the site, with its most important events ordered from older to most recent.

People is the last tab of About and contains the bibliography of the most relevant persons to that site (for example Don Fernando II in Park and Palace of Pena, being the king who ordered its construction).

All these pages (which can be seen on Figure 15 - About Tab and Figure 16 - Routes, Sites and Facilities) possess the option to play text which reads aloud the entire text currently present on the screen.

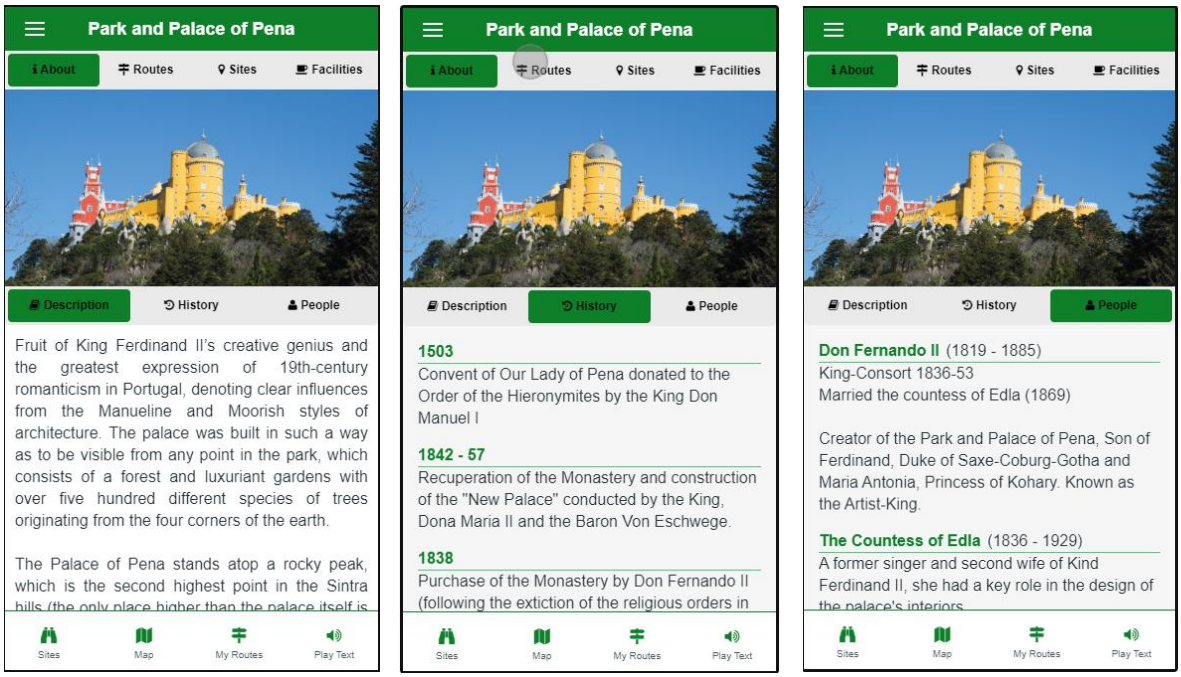

Figure 15 - About Tab

The second main tab of this page contains the available routes, the points of interest it encompasses and the option to start the route (and by it adding it to the user's routes, allowing each user to keep track of his progress).

Sites is the third tab and contains the list of the points of interest in each local, being divided by Park and Palace category. Each site contains the option to view description, read aloud the description and to locate on the map. Since the list can get quite extensive, it is also possible to search by name using the upper magnifying glass.

The last tab is Facilities and contains a list of the supporting infrastructure with the option to locate them and view which services each offer (ticket-office, wi-fi, toilet, cafeteria, store, etc).

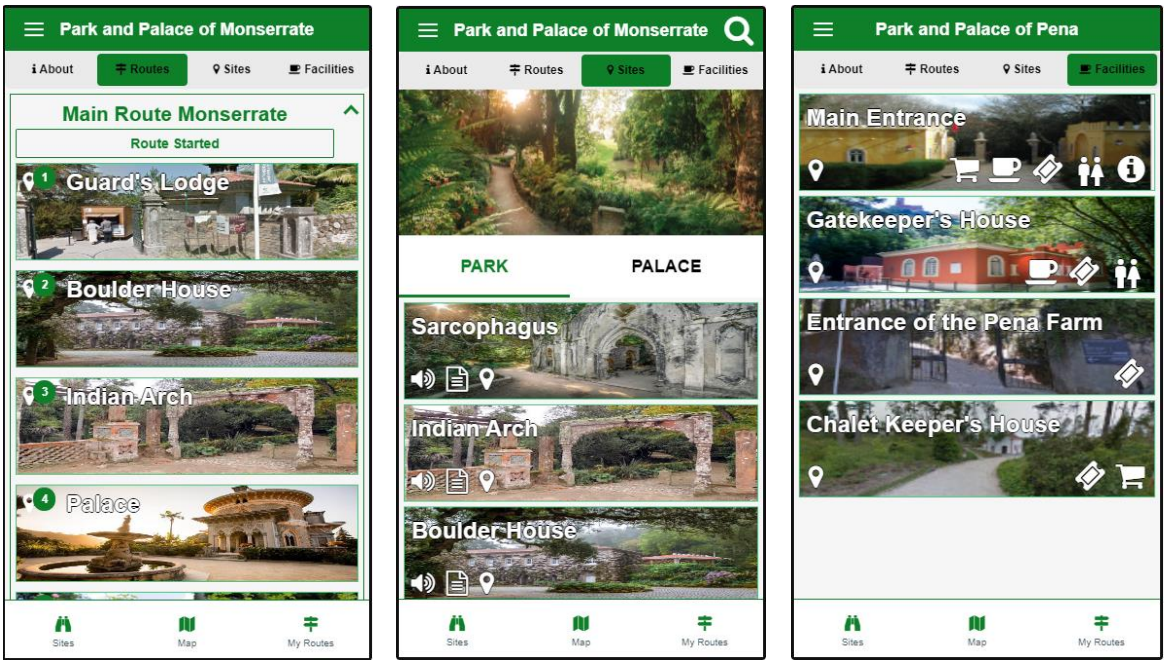

Figure 16 - Routes, Sites and Facilities

5.3 Map

This simple page intends to answer the main requirement identified in chapter 3 by integrating the google maps API into the APP. It allows locating several sites using the action links present in each site detail page, as well as to locate the user position, as seen in Figure 16 (user position represented by the blue dot). Clicking on the images below the map will centre the map on the chosen site. It is also possible to centre back on the user using the button on the upper left corner.

5.4 My Routes

This page displays the routes that the user started and allows him to select one and keep up with his progress.

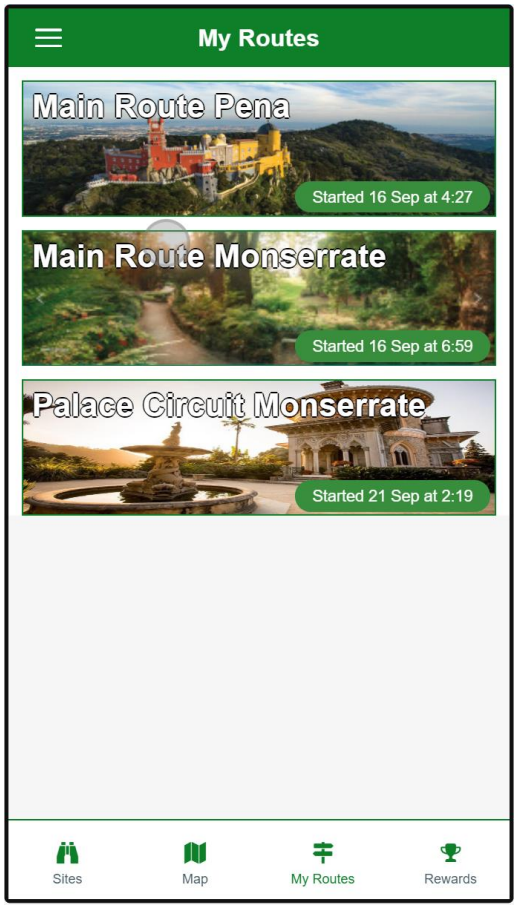

Figure 17 - Route List

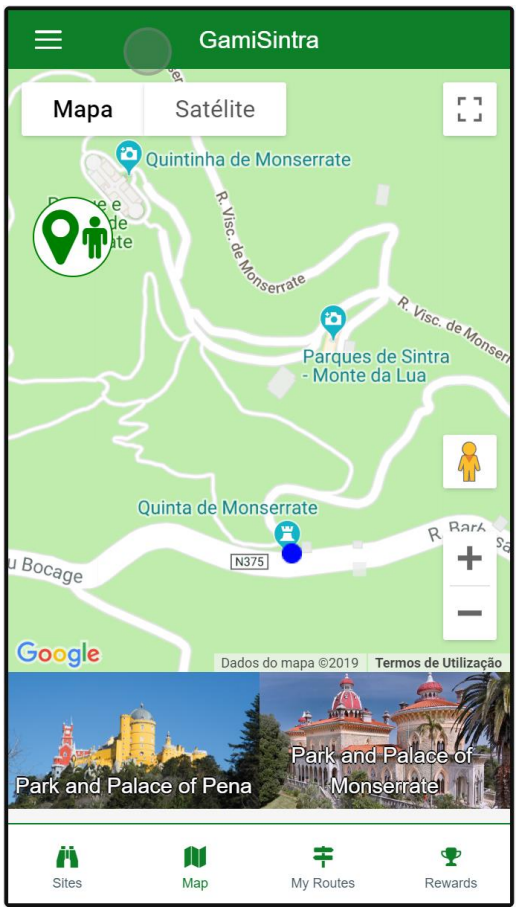

Figure 18 - Map

5.5 Route Detail

A page containing the detail of each route along with the user current progress on it, as seen on Figure 20 - Route Detail (Sites) and on Figure 19 - Review Experience. It contains 3 tabs, the first, Sites, contains the progress of the user, allows and the sites included in the route, including their order of visit and description (along with audio-description). Each local contains the option to mark the site as being visited and later as visited. To mark the site as visited the user needs to take a photo of the site. This allows the visitor

to keep track of his progress on each place, how much time he spent there, compare himself with other visitors and latter review his experience based on the photos taken.

In the scenery of this thesis, the status of visit must be assigned manually by users but in a real-world scenario, it would be wise to implement automatic detection using proximity beacons, which would signal the application to switch its visit status automatically upon user arrival and after leaving the site (Hiramatsu et al., 2017; Lee & Choi, 2007).

To the right of the visit status, it is possible to verify how many points visiting each site awards. This is the main game element of the app, which intends to extrinsically motivate the user to visit more sites, namely sites which are less often visited, to encourage this behaviour the points each site awards were based on how often they are visited, with less crowded attractions rewarding the user with more points.

The bottom message which can be seen in, in this case, 'Keep Going' is dynamic and changes based on the user amount of visited sites. This feature intends to further improve the interactivity between the APP and the user and to encourage the user to keep on exploring the site. The messages are the following:

- No sites visited: 'Enjoy your tour';
- From 1 site to half: "Keep going!'
- More than half visited: 'Nearly there!';
- All sites visited: 'Great job!';

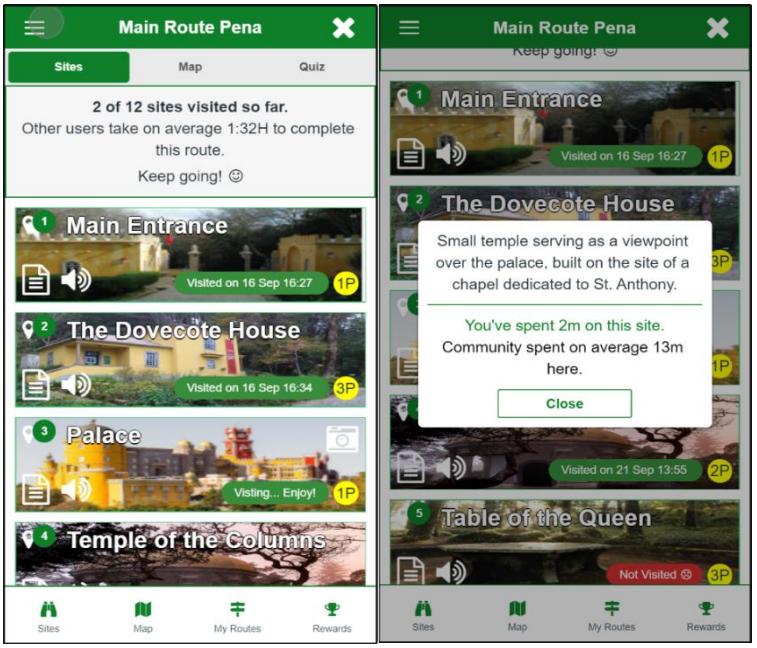

Figure 20 - Route Detail (Sites)

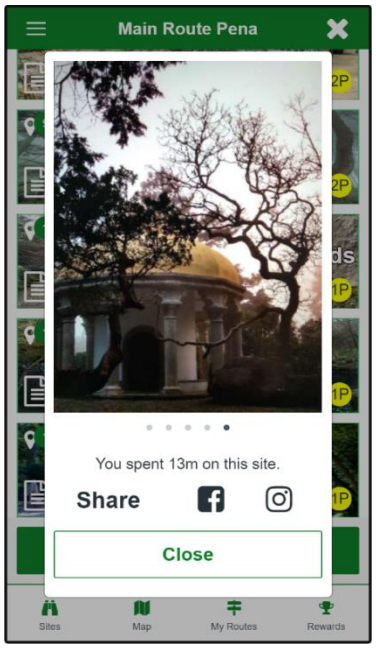

Figure 19 - Review Experience

At the bottom of this page, it is also possible to find a 'Review Experience' button, this button opens a popup containing the user taken photos along with the time spent on each site. This popup also allows the user to share his tour on social media. These features intend to add socialization to the APP, by sharing achievements and experiences with friends and to implement competition between users (Xu et al., 2015, 2013).

The second tab, seen on Figure 21 - Route Map, of this page contains a map which displays the route site locations along with their order of visit and user geographical position, allowing the user to easily navigate the site and reach the route locals with ease, answering an explicitly demanded requirement by users (Boiano et al., 2012; Cavalheiro, Rodrigues & Rodrigues, 2019; Palumbo, 2015).

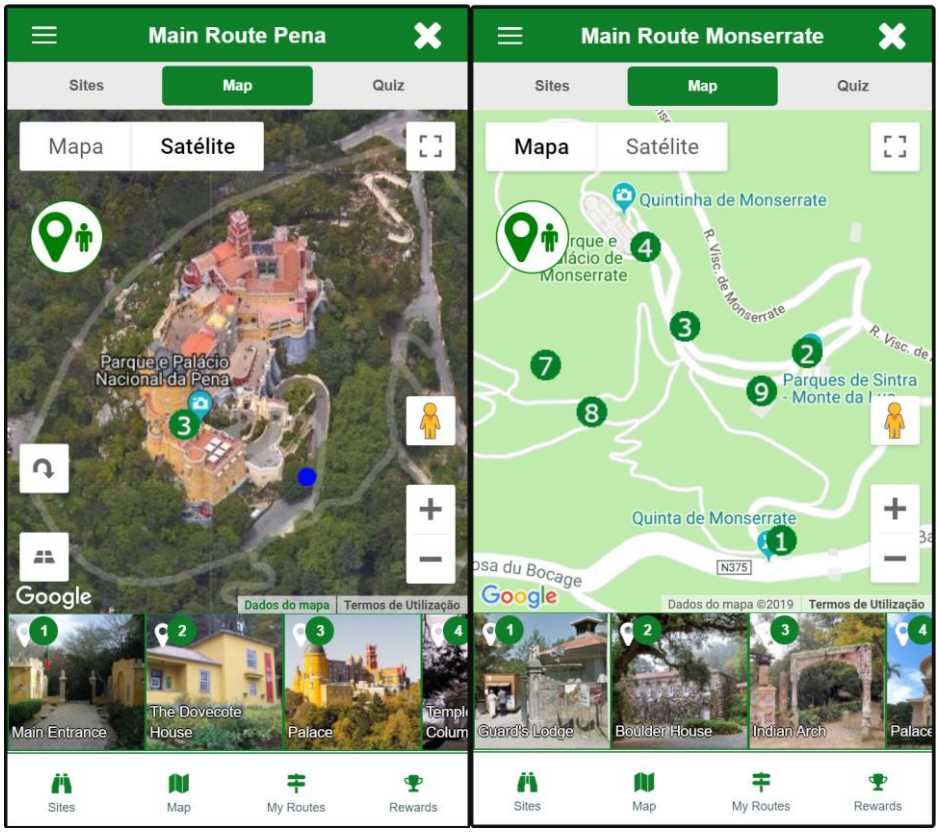

Figure 21 - Route Map

The last tab of this page is Quiz (as can be seen on Figure 22 – Quiz Screen), and as the name says contains a quiz which allows the user to assess his acquired knowledge of the site. Each route possesses a single quiz with questions based on the information provided

on the application about the sites present in each route. The quiz is composed by several multiple-choice questions and upon clicking the 'Finish Quiz' button present at the end of the page the user will get a feedback message with his performance info, informing him of how many questions he got correct, how many questions other users get correct on average, a feedback message based on the performance either, 'There's still some room for improvement' or 'Great job!'. At the bottom of this feedback lie two buttons which allow the user to either retry his luck or to view the solution. The quiz feature intends to further gamify the APP, and by it encourage learning of the site and further competition between users. No points are awarded by this feature, an intended behaviour in order to test the standard appealing of this functionality.

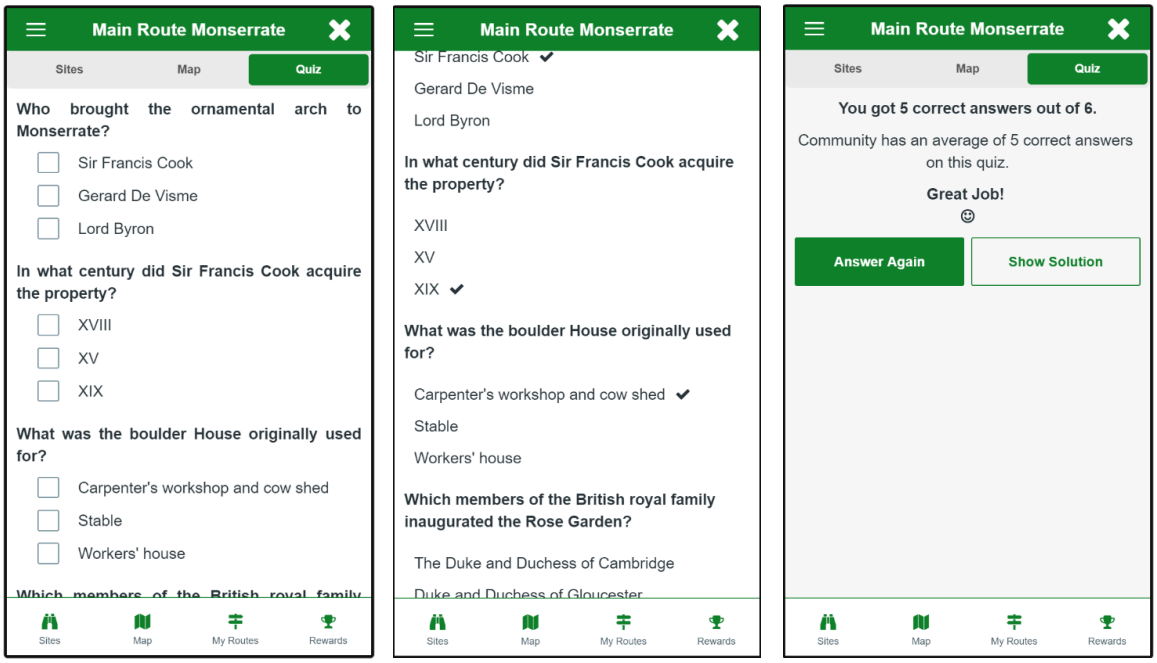

Figure 22 – Quiz Screen

5.6 Rewards

A screen displayed on Figure *23* - Reward List which displays the current number of points that the user has conquered, along with a list of available rewards that users can exchange for them. The rewards proposed on the prototype are both real (such as ticket discount) or app virtual (such as a personalized current position map marker).

This feature is expected to be the main extrinsic motivator of the APP, by further encouraging users to visit points of interest by rewarding intended behaviour, in this case, visit more points of interest, mainly less often visited ones (Deterding, O'Hara, Sicart, Dixon & Nacke, 2011; Robson et al., 2016).

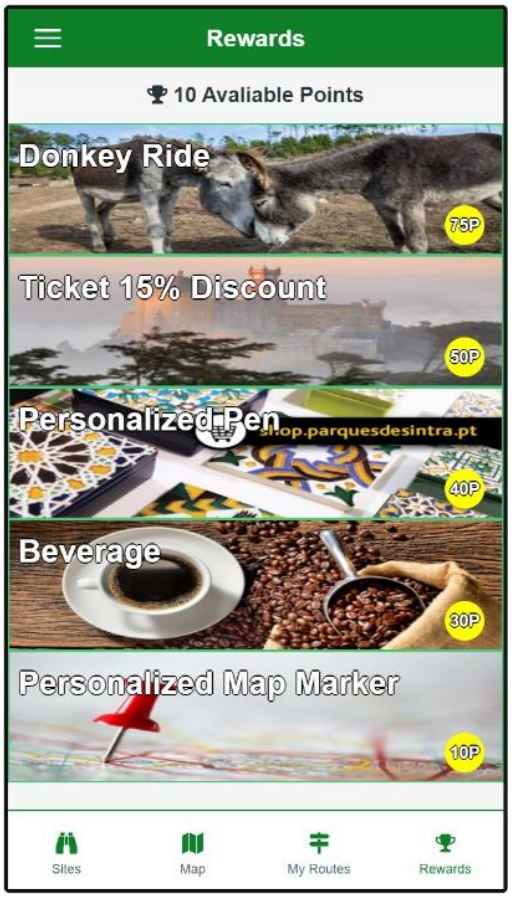

Figure 23 - Reward List

Chapter 6 – Results and Discussion

In order to validate that the delivered prototype was developed in accordance to the requirement analysis conducted on chapter 3, the participants were informed of these requirements and then asked if they felt the prototype functionalities fulfilled the requirements identified. All participants agreed that the prototype complies with the requirements gathered, noting however the following points:

- One of the participants noted that he didn't notice information regarding viewpoints (concept View).
    - This information is present through an icon on the site (points of interest) list. Improved visibility should be considered.
- Other participant found the Image requirement to be poorly present, with only one image per local, noting that the application should allow for several pictures and for users to share theirs with others, on the application.
    - This suggestion could indeed expand the socialization functionalities of the application, yet again pointing this to be a desired feature by users (as seen in the literature review) (Boiano et al., 2012; Xu et al., 2015).
- The same participant also didn't like the map feature present in the bottom bar, regarding it makes no sense with the current functionalities and considering that a more detailed map is present on the routes' page.
    - Future work should consider an improved version of this functionality.

In general, the inquired participants found the APP to be user-friendly, regarding it as simple, approachable and fast to understand, therefor presenting good usability.

Following this validation, and in accordance to the Kano Model (Kano et al., 1984), participants were asked if they consider this type of application a visit requirement, and which effects its existence or nonexistence has on their satisfaction. Respondents considered the application concept very useful, reporting that they would certainly use this application or similar ones, mainly if on an unknown location. They also agreed they wouldn't expect cultural sites to have this kind of applications and that their nonexistence wouldn't disappoint them, but on the other hand, its existence would greatly positively surprise them. A participant also noted that although he thinks that support applications

aren't that rare, commonly they have terrible quality, greatly reducing the use intention. Based on the feedback obtained it is possible to conclude that a gamified application, being evaluated according to the Kano Model would fall into the 'Attractive requirement' category, not being expected by the visitors, yet resulting in increased satisfaction if present, while not resulting in dissatisfaction if not.

This step was followed by asking the members of the focus group, questions directly related to the gamification elements of the prototype. When asked about the application and the conceptual capacity to encourage the visit of more locals and further explore the parks and palaces, the focus group participants agreed that the existence of rewards along with the other features and characteristics would indeed encourage them to further explore the sites, with one participant stating that:

"It is a free application that offers me things because I am visiting things I like to see. I see no reason not to continue the visit."

Other features were also highlighted, namely the existence of route suggestions, along with a list of points of interest in each site. Another participant stated:

"I think this all works very well together. First because if I start a route, I'm already planning every moment, ok, I can be late on one or other (local) but I'll be sorry (for missing locations) for two reasons, because I didn't see that and because I didn't receive the points of that too. I think everything together will work well. The points are an extra you will always think about".

The results obtained in this matter correlate to those found in previous research, gamification does allow to improve user experience, shape user behaviour in intended direction, motivate desired behaviours (Deterding, O'Hara, Sicart, Dixon & Nacke, 2011; Xu et al., 2015).

Focus group participants enjoyed the existence of dynamic feedback messages based on progress but noted that they should be only positive, motivational messages, noting that negative messages or other display of negative feelings do have a negative impact on their experience. A result which yet again follows the same trend of previous results obtained in other researches, that gamification if not properly designed can lead to negative effects (Hamari et al., 2014).

A participant said that the feedback messages increase user-application interaction which leads her to like the app more and increases her will of continuous usage. Other member

stated that messages should not be too intrusive, which could remove his focus from his intended application use.

An interesting idea was also raised regarding the question of whether the game elements encourage the visit of more locals, namely those less often visited, with the recommendation that point rewards (for visiting each local) should be dynamic, according to the on-moment number of visitors of each site, rewarding more points for currently less crowded places. This feature is already present in the application but does not consider the real-time number of visitors, which would, in fact, require further technology to be present in each site but could prove beneficial for both visitors and site management.

The results obtained do match those found on other researches present on this paper's literature review, indicating that gamification if properly implemented has the capacity to encourage tourist engagement and shape user behaviour in the intended direction (Deterding, O'Hara, Sicart, Dixon, & Nacke, 2011; Xu et al., 2015). It further correlates with other papers' conclusions by finding that gamification can also result in negative effects (as in accordance to the bad feelings displayed by users, regarding negative expressions and feedback messages (Hamari et al., 2014).

When questioned about the impact of the quiz feature on their will to learn more about the site, members were quick to note the fact that the prototype doesn't offer points for answering questions, followed by a discussion of whether it should offer more or fewer points than visiting locals. Several recommendations were made, with the most notorious one being that questions should be based not on information present on the APP but rather on-site, therefore improving the interactivity between the application and the real world. Although the participants were notoriously disappointed with the fact that no points are provided for answering questions, they also, in general, noted that it would be a good functionality, considering it allows for increased interaction. On the other hand, one member stated that he would not miss this feature if it was removed. Another recommendation made to increase the impact of this feature was to add a leader board which would allow for increased competition between users. Such a feature would be better employed on a larger scale scope, with many more sites being present in the application. Considering its current scale of the prototype the max number of points would be very reduced.

These results do raise the question if a quiz feature does match an intrinsic motivator of users to learn more about the site, and further research on this subject could be carried out on the future.

Regarding the present comparison metrics such as time spent on each local, participants had mixed feelings, with one stating:

“If you want me to be honest, it doesn’t do anything, and I even think the terms of comparison you're putting in are a bit stupid in the context of the application. For example, the time taken to take the route, (the visit) is not a speed test, it makes no sense. The time you stay there? Okay, it can be cool because if visitors normally stay there a long time (you think) “this should be cool! I will try to enjoy it”. But then being there (you can think) "I don't like this, why do visitors stay here so long?"

And then the answers (on the quiz) are not there to prove if you're dumb or if you're smart so this thing of "oh the others usually get 4 right and I went there and only got 1", that removes the user enjoyment.”

This point is even more interesting because the same member agreed with the leader board proposal on the previous question, but it also sums up a general feeling in the group that information such as spent time on each site should be there for user guidance not for competing reasons, which either reflects a negative effect of gamifying this feature, or gamifying it on the wrong way (Hamari et al., 2014). These results also do not correlate with previous research which suggests that challenge and achievement, together with competition, are intrinsic motivations of gamification in the tourism context (Xu et al., 2015).

When asked about the possibility of the application distracting the visitors from their main objective (visiting and enjoy the site), or on the other hand improving their interaction with the site, participants agreed they felt it would improve their interaction with the site and not distract them from their objective, stating that the main gamification element of the app is not distracting (win points by simply visiting sites) but that if the application was to encourage more competition it would probably further distract them.

The results obtained do match those desired, which intended to consider both the tourists’ needs and the gamers’ desires, and then blend them seamlessly to deliver an engaging experience and the fact that the game elements should be related with the will to explore the destination (Xu et al., 2015). Furthermore, game elements, acting as extrinsic

motivators, as in this case points, should be perceived as mere informational elements (Hanus & Fox, 2015).

A user stated:

“Here you consult whenever you want, you always have the information there. You just get there (locals) and get points so it doesn't distract you from the way. Now even a pamphlet will probably distract you more than a phone because with the phone you have the option to have the lady talk to you (audio guide), so it's less distracting than the flyer they give at the entrance.”

In direct discordance with the rest of the group, one of the participants stated he felt the application would distract him, because he expects to spend time reading descriptions or instructions rather than enjoying the site, on the other hand, the same participant also stated he didn’t feel this to be a negative effect.

Concerning the effect of rewards on the satisfaction with the cost factor, participants unanimously agreed that it would have a very positive effect and that it would encourage them to visit other sites they hadn’t planned to visit.

On the other hand, the same group also unanimously agreed that the application or its concept would have no effect on their notion of the site’s hospitality.

Regarding the impact on their notion and evaluation of the supporting facilities of each site, participants agreed that although information on these sites is welcome and nice addition that would have a positive effect, they also agreed that from the user point of view it doesn’t make much sense for these type of facilities to be connected with the game elements, stating however that it could make sense from a business perspective and to still have these locals in the routes, namely if they represent the endpoint of routes.

These results allow concluding that gamification has a positive effect on at least one attribute level of satisfaction while not seemingly impacting others (Pizam et al., 1978).

Participants stated that the application concept does represent a well-designed way of presenting the cultural product, which, in accordance to Chen & Chen (2010), can further increase visitor interest and involvement, thus leading to increased satisfaction. Focus group participants stated that the application could be a complement to information obtained on google and that it has the great advantage of aggregating a lot of information on the same space. Two interesting quotes can be found below:

“It helps us go to more places because it makes us go all the way and get to know more than maybe we would. If we didn't have that gamification, maybe I would just see the main things and probably I wouldn’t even know that others existed, and perhaps even if I knew, I wouldn’t visit them for other reason.”

“It's a security because it explains things to you, it gives you points, you can see all the possible locals. If I go there with this tool I won't be barefoot anymore. Objectively it increases the likelihood that you want to visit. And increasing the likelihood of wanting to visit increases the likelihood of actually visiting.”

Lastly the group was asked in general, how they thought GamiSintra or another gamified app could support their visit to the Pena and Monserrate Parks and how it would distinguish itself from a physical map or an app without gameplay elements, to which they replied that the prototype is much more interactive than a physical map and that the game elements would make the application stand out among others by creating an interesting experience. A last comment was made on the fact that mobile application either gamified or not do provide a more environmentally friendly than the traditional physical pamphlets.

The transcription of the audio record allowed for the generation of the word cloud seen in .

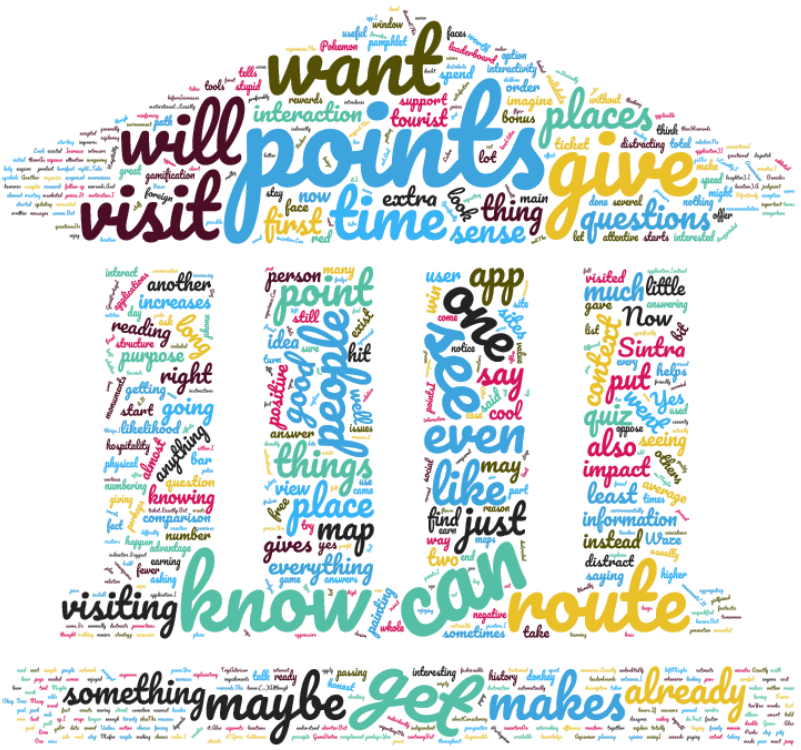

Figure 24 - Focus Group Word Cloud

The most mentioned words were Points, Application, Can, Give, know and route.

Note: Think was the most mentioned word but only twice was it employed in another context than “I think” or equivalent.

With Points being the most mentioned word, it is possible to conclude that the possibility to obtain points with which rewards can be obtained was the central topic discussed by participants, which demonstrates the effect that gamification does have on the perception of the application.

The Give concept relates to the possibility of obtaining information, points and rewards throughout the application, which denotes a great recognition that the application does give its users value but also that the users expect to receive a lot, either information or rewards.

Similarly, to the previous concept, the word Know also relates to the information that the application allows users to obtain, and knowledge it allows them to obtain.

The Route concept is justified by the existence of route suggestions on the app, which is, in fact, its main and most important feature, with one focus group participant even stating:

"Now I, for example, would not install the application because of the points, but because of the route."

This clearly represents that the wish to obtain information, namely routes are the intrinsic motivation of the application utilization while rewards and game elements would play an extrinsic motivation role.

Chapter 7 – Conclusion

This paper's main objective is to analyse how a gamified mobile application can aid tourists' visits to historical sites and affect their satisfaction, to achieve that result we began by analysing the existing literature on gamification and satisfaction applied to tourism and by framing the region and sites proposed for this analysis, in this case, Sintra.

We followed by conducting a survey on what requirements potential users of the proposed system have while visiting historical sites. Based on these requirements, along with those identified in literature review as well as that of the gamification subject, we designed and conceived a prototype which would meet the user requirements as well as allow us to test and answer how can a gamified mobile application affect tourists' visits to heritage sites. To obtain data which allows us to answer said question, we opted to organize a focus group with early technology adopters in order to explore their feelings on the subject here presented, and how they would feel about using the proposed system.

The results obtained allow us to validate that the user requirements identified in chapter 3 have in general been met and that the prototype is suitable to be tested. In accordance with the Kano Model, we concluded that historical sites visitors' do not expect sites to have this system concept but that its existence positively affects their satisfaction. Similarly, when analysing satisfaction at an attribute level, we found that it has the capacity to improve satisfaction with the cost factor, however having no correlation with satisfaction regarding hospitality notion or satisfaction with support infrastructures.

Regarding the direct effects of gamification, the obtained data allow us to conclude that like what other researchers found, gamification has the capability to encourage engagement and shape user behaviour in the intended direction, resulting in this case in further motivation to explore the historical sites and less often visited points of interest.

The results found, do allow us to conclude that gamification applied to tourism, namely cultural, historical sites' visit, does represent a well-designed way to present sites, shape user behaviour, aid visit and increase satisfaction through the creation of an interactive and informational environment.

In sum, this study contributes to understanding tourists' expectations about mobile applications to help visits to heritage sites, which could allow us to propose a conceptual

model to explain their perceptions and development requirements, also considering the satisfaction they may have using the gamified mobile application while visiting heritage sites.

This thesis' conclusions are limited to the context of Sintra, a small sample of testers and a non on-site post utilization analysis. Future work should focus on analysing this concept on other sites and through other analysis techniques, namely by testing the APP on site and reviewing of results post usage. Future work should also further develop the concept of the application by introducing more socialization features and further increasing the interaction between the system and the real world. The developed prototype could also be used to analyse the impact on the historical sites' management perspective, by further investigating the capability of gamification to increase revenue or to create a more sustainable environment, namely by better-redistributing visitors across points of interest, which could result in a lesser negative impact on historical sites.

Bibliography

Alegre, J. & Garau, J. (2010). TOURIST SATISFACTION AND DISSATISFACTION. *Annals of Tourism Research*, *37*(1), 52–73. https://doi.org/10.1016/J.ANNALS.2009.07.001

Alturas, B. (2013). *Introdução aos Sistemas de Informação Organizacionais*.

Ardissono, L., Kuflik, T. & Petrelli, D. (2012). Personalization in cultural heritage: the road travelled and the one ahead. *User Modeling and User-Adapted Interaction*, *22*(1–2), 73–99. https://doi.org/10.1007/s11257-011-9104-x

Bartle Richard. (1996). Hearts, Clubs, Diamonds, Spades: Players Who Suit MUDS, 24.

Blackburn, H. (2011). Millennials and the adoption of new technologies in libraries through the diffusion of innovations process. *Library Hi Tech*, *29*(4), 663–677. https://doi.org/10.1108/07378831111189769

Boiano, S., Bowen, J. P. & Gaia, G. (2012). Usability, Design and Content Issues of Mobile Apps for Cultural Heritage Promotion: The Malta Culture Guide Experience. Retrieved from http://arxiv.org/abs/1207.3422

Brigham, T. J. (2015). An Introduction to Gamification: Adding Game Elements for Engagement. *Medical Reference Services Quarterly*, *34*(4), 471–480. https://doi.org/10.1080/02763869.2015.1082385

Cavalheiro, N., Rodrigues, H. & Rodrigues, L. (2019). What Information Do Tourists Expect To Have Access To While Visiting World Heritage Sites? *EDULEARN19 Proceedings*, *1*(July), 3993–3999. https://doi.org/10.21125/edulearn.2019.1020

Chalet and Garden of the Countess of Edla. (n.d.). Retrieved January 5, 2019, from https://www.parquesdesintra.pt/en/parks-and-monuments/chalet-and-garden-of-the-countess-of-edla/

Chen, C.-F. & Chen, F.-S. (2010). Experience quality, perceived value, satisfaction and behavioral intentions for heritage tourists. *Tourism Management*, *31*(1), 29–35. https://doi.org/10.1016/J.TOURMAN.2009.02.008

Chi, C. G.-Q. & Qu, H. (2008). Examining the structural relationships of destination image, tourist satisfaction and destination loyalty: An integrated approach. *Tourism*

Management, *29*(4), 624–636. https://doi.org/10.1016/J.TOURMAN.2007.06.007

Conway, S. (2014). Zombification?: Gamification, motivation, and the user. *Journal of Gaming & Virtual Worlds*, *6*(2), 129–141. https://doi.org/10.1386/jgvw.6.2.129_1

Cunha, C., Mendonça, V., Paulo Morais, E. & Carvalho, A. (2016). The Role of Gamification in Material and Immaterial Cultural Heritage, (April), 25–26. https://doi.org/10.1016/j.jrurstud.2014.01.012

Deterding, S., O'Hara, K., Sicart, M., Dixon, D. & Nacke, L. (2011). Gamification: Using game design elements in non-gaming contexts. In *Conference on Human Factors in Computing Systems - Proceedings* (pp. 2425–2428). https://doi.org/10.1145/1979742.1979575

Deterding, Sebastian. (2012). Gamification: designing for motivation. *Interactions*, *19*(4), 14. https://doi.org/10.1145/2212877.2212883

Deterding, Sebastian, Dixon, D., Khaled, R. & Nacke, L. (2011). From game design elements to gamefulness. In *Proceedings of the 15th International Academic MindTrek Conference on Envisioning Future Media Environments - MindTrek '11* (p. 9). New York, New York, USA: ACM Press. https://doi.org/10.1145/2181037.2181040

Entidade Regional de Turismo da Região de Lisboa. (2014). Plano estratégico para o turismo da região de Lisboa 2015-2019, 1–112. Retrieved from https://www.visitlisboa.com/sites/default/files/2016-10/2015_19_Plano Estratégico_0.pdf

Galego, C. & Gomes, A. (2009). Emancipação, ruptura e inovação: o "focus group" como instrumento de investigação. *Revista Lusófona de Educação*.

Hamari, J. (2011). Perspectives from behavioral economics to analyzing game design patterns: loss aversion in social games. *CHI 2011, May 7–12, 2011, Vancouver, BC, Canada.*, (August), 6.

Hamari, J., Koivisto, J. & Sarsa, H. (2014). Does Gamification Work? -- A Literature Review of Empirical Studies on Gamification. In *2014 47th Hawaii International Conference on System Sciences* (pp. 3025–3034). IEEE. https://doi.org/10.1109/HICSS.2014.377

Hanus, M. D. & Fox, J. (2015). Assessing the effects of gamification in the classroom: A

longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & Education*, *80*, 152–161. https://doi.org/10.1016/J.COMPEDU.2014.08.019

Hiramatsu, Y., Sato, F., Ito, A., Hatano, H., Sato, M., Watanabe, Y. & Sasaki, A. (2017). Designing Mobile Application to Motivate Young People to Visit Cultural Heritage Sites. Retrieved from https://www.semanticscholar.org/paper/Designing-Mobile-Application-to-Motivate-Young-to-Hiramatsu-Sato/ee63ecb4310a04ea25b37772ffc49029b664201f

Huotari, K. & Hamari, J. (2012). Defining gamification. In *Proceeding of the 16th International Academic MindTrek Conference on - MindTrek '12* (p. 17). New York, New York, USA: ACM Press. https://doi.org/10.1145/2393132.2393137

ICOMOS. (1976). The ICOMOS charter on cultural tourism. *Heritage*. Retrieved from https://www.icomos.org/publications/93touris15.pdf

Instituto Nacional de Estatística. (2017). *Estatísticas do Turismo 2017*. *Isbn 978-989-25-0447-6*. https://doi.org/10.1007/s13398-014-0173-7.2

Kano, N., Seraku, N., Takahashi, F. & Tsuji, S. (1984). Attractive quality and must-be quality. *Journal of the Japanese Society for Quality Control*.

Kim, J. Y., Chung, N. & Ahn, K. M. (2019). The impact of mobile tour information services on destination travel intention. *Information Development*, *35*(1), 107–120. https://doi.org/10.1177/0266666917730437

Kurup, V. (2010). The New Learners—Millennials!! *International Anesthesiology Clinics*, *48*(3), 13–25. https://doi.org/10.1097/AIA.0b013e3181e5c1b4

Lee, H. & Choi, H. (2007). *International journal of software engineering and its applications : IJSEIA*. *International Journal of Software Engineering and Its Applications* (Vol. 10). SERSC. Retrieved from https://www.earticle.net/Article/A273104

Leximancer. (n.d.). Retrieved April 20, 2019, from https://info.leximancer.com/

Morgan, D. (1997). *Focus Groups as Qualitative Research*.

OutSystems. (n.d.). Retrieved September 21, 2019, from https://www.outsystems.com/

Palácio Nacional de Queluz. (2013). Retrieved January 7, 2019, from https://cm-

sintra.pt/index.php?option=com_content&Itemid=209&catid=29&id=71&view=article

Palumbo, F. (2015). Developing a new service for the digital traveler satisfaction: The Smart Tourist App. *The International Journal of Digital Accounting Research*, 33–67. https://doi.org/10.4192/1577-8517-v15_2

Park and Palace of Monserrate. (n.d.). Retrieved January 5, 2019, from https://www.parquesdesintra.pt/en/parks-and-monuments/park-and-palace-of-monserrate/

Parques de Sintra. (2014). Retrieved January 3, 2019, from https://www.parquesdesintra.pt/parques-jardins-e-monumentos/castelo-dos-mouros/descricao/%0Ahttp://www.parquesdesintra.pt/parques-jardins-e-monumentos/parque-e-palacio-nacional-da-pena/

Parques de Sintra - Monte da Lua. (n.d.). Retrieved January 2, 2019, from https://www.parquesdesintra.pt

Pizam, A., Neumann, Y. & Reichel, A. (1978). Dimentions of tourist satisfaction with a destination area. *Annals of Tourism Research*, *5*(3), 314–322. https://doi.org/10.1016/0160-7383(78)90115-9

Quinta da Regaleira. (n.d.). Retrieved January 3, 2019, from http://www.regaleira.pt/en/quinta-da-regaleira

Rising, L. & Janoff, N. S. (2000). The Scrum software development process for small teams. *IEEE Software*, *17*(4), 26–32. https://doi.org/10.1109/52.854065

Robson, K., Plangger, K., Kietzmann, J. H., McCarthy, I. & Pitt, L. (2015). Is it all a game? Understanding the principles of gamification. *Business Horizons*, *58*(4), 411–420. https://doi.org/10.1016/J.BUSHOR.2015.03.006

Robson, K., Plangger, K., Kietzmann, J. H., McCarthy, I. & Pitt, L. (2016). Game on: Engaging customers and employees through gamification. *Business Horizons*, *59*(1), 29–36. https://doi.org/10.1016/J.BUSHOR.2015.08.002

Schieder, T. K., Adukaite, A. & Cantoni, L. (2013). Mobile Apps Devoted to UNESCO World Heritage Sites: A Map. In *Information and Communication Technologies in Tourism 2014* (pp. 17–29). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-03973-2_2

Sheth, J. (2001). Competitive Advantages through Customer Satisfaction.

Silva, J. C. V. (2013). O Palácio Nacional de Sintra. Retrieved January 2, 2019, from https://cm-sintra.pt/index.php?option=com_content&Itemid=209&catid=29&id=67&view=article

Simao Da Graca Dias, E., Beinat, E. & Scholten, H. J. (2005). Effects of mobile information sharing in natural parks. CERN, Geneva. Retrieved from https://www.narcis.nl/publication/RecordID/oai:research.vu.nl:publications%2F624bf51d-cc64-4fcc-85f3-c2b9b1e33cbf

Sofronov, B. (2018). MILLENNIALS: A NEW TREND FOR THE TOURISM INDUSTRY. *Annals of Spiru Haret University. Economic Series*, *18*(3), 109–122. https://doi.org/10.26458/1838

Souza, V. D. S., Varum, C. M. D. A. & Eusébio, C. (2017). O Potencial da Gamificação para Aumentar a Competitividade dos Destinos Turísticos: revisão de literatura baseada na Scopus. *Revista Turismo Em Análise*, *28*(1), 91. https://doi.org/10.11606/issn.1984-4867.v28i1p91-111

Towner, J. (1985). The grand tour: A key phase in the history of tourism. *Annals of Tourism Research*, *12*(3), 297–333. https://doi.org/10.1016/0160-7383(85)90002-7

Travel BI. (2017). Turismo em Portugal 2017, 1–131. Retrieved from http://travelbi.turismodeportugal.pt/pt-pt/Documents/Análises/Economia/turismo-em-portugal-2017.pdf

UN General Assembly. Universal Declaration of Human Rights (1948). Retrieved from https://www.refworld.org/docid/3ae6b3712c.html [accessed 21 September 2019]

Wang, Y. (2016). *More Important Than Ever: Measuring Tourist Satisfaction*.

Werbach, K. (2014). (Re)Defining Gamification: A Process Approach (pp. 266–272). https://doi.org/10.1007/978-3-319-07127-5_23

Williams, D., Yee, N. & Caplan, S. E. (2008). Who plays, how much, and why? Debunking the stereotypical gamer profile. *Journal of Computer-Mediated Communication*, *13*(4), 993–1018. https://doi.org/10.1111/j.1083-6101.2008.00428.x

Xu, F., Tian, F., Buhalis, D., Weber, J. & Zhang, H. (2015). Tourists as Mobile Gamers: Gamification for Tourism Marketing. *Journal of Travel & Tourism Marketing*, *33*(8), 1124–1142. https://doi.org/10.1080/10548408.2015.1093999

Xu, F., Weber, J. & Buhalis, D. (2013). Gamification in Tourism. In *Information and Communication Technologies in Tourism 2014* (pp. 525–537). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-03973-2_38

Zhao, P., Zhang, L. & Tian, R. G. (2018). Tourism Attraction and Tourist Satisfaction with World Heritage: A Case Study of Mount Wuyi. Journal of Marketing Development and Competitiveness.

Zichermann, G. & Cunningham, C. (2011). *Gamification By Design*.

Attachments

A – Before Tour Survey (English)

PLEASE ANSWER BEFORE STARTING YOUR TOUR
I really appreciate your 5 minutes

Hello, my name is Nuno and I'm currently working on my thesis which intends to analyze
the effects that a mobile app with game elements that aim to aid tourists on visits of historical sites in Sintra has on tourist satisfaction. Before this analysis can be done I need
to design this application. The questions below will help define the functionalities it needs to have.

Q1. What are your expectations for the visit?
(Please provide some context of your travel behavior, reasons for visiting, etc)

_____
_____
_____
_____

Q2. Do you expect the support material and information provided at the location will be enough to guide your visit? (please explain what you expect and why)

_____
_____
_____
_____

Q3. What information do you consider most important to have at your disposal during the visit? (Please give 2 or 3 examples)

_____
_____
_____
_____

Q4. What advantages and features/functionalities would you like from an APP to guide you during your visit?

_____
_____
_____
_____

Q5. Could you please tell us a little about your self?
Age: 24 or under ☐ 25-39 ☐ 40-60 ☐ 61 or above ☐
Gender: _____
Nationality: _____

Thank you for your time! I hope you have a great visit.

B – After Tour Survey (English)

PLEASE ANSWER AFTER YOUR TOUR IS OVER

I really appreciate your 5 minutes

Hello, my name is Nuno and I'm currently working on my thesis which intends to analyze the effects that a mobile app with game elements that aim to aid tourists on visits of historical sites in Sintra has on tourist satisfaction. Before this analysis can be done I need to design this application. The questions below will help define the functionalities it needs to have.

Q1. Were your initial expectations for the visit totally satisfied?
(Please provide some context)

_____
_____
_____
_____

Q2. Do you consider that the provided support was enough to guide you during the visit?
(Please explain why and specify what resources you used)

_____
_____
_____

Q3. What other information or support could have been useful during your visit?
(Signs, spot locations, help, etc...) (Please give 2 or 3 examples)

_____
_____
_____

Q4. What advantages and features/functionalities would you like from an APP to guide you during your visit?

_____
_____
_____

Q5. Could you please tell us a little about your self?

Age: 24 or under ☐ 25-39 ☐ 40-60 ☐ 61 or above ☐

Gender: _____

Nationality: _____

Thank you for your time! I hope you had a great visit.

C – Before Tour Survey (Portuguese)

RESPONDA ANTES DE INICIAR A VISITA

Obrigado pelos seus 5 minutos

Olá, o meu nome é Nuno e estou actualmente a trabalhar na minha tese que pretende analisar os efeitos que uma aplicação móvel com elementos de jogo que visa ajudar os turistas em visitas a locais históricos em Sintra tem na satisfação do turista. Antes que essa análise possa ser feita, eu preciso projetar essa aplicação. As perguntas abaixo ajudarão a definir as funcionalidades que ela precisa de ter.

Q1. Quais são as suas expectativas para a visita?
(Por favor, forneça algum contexto, motivo de visita, etc)

_____
_____
_____
_____

Q2. Você espera que o material de apoio e as informações fornecidas no local sejam suficientes para guiá-lo durante a visita? (Por favor, explique o que você espera e por quê)

_____
_____
_____
_____

Q3. Quais informações você considera mais importantes para ter à sua disposição durante a visita? (Por favor, dê 2 ou 3 exemplos)

_____
_____
_____
_____

Q4. Quais vantagens e recursos / funcionalidades você gostaria de ter num aplicativo para orientá-lo durante a sua visita?

_____
_____
_____

Q5. Demografia

Idade: 24 ou menos ☐ 25-39 ☐ 40-60 ☐ 61 ou mais ☐

Sexo: _____

Nacionalidade: _____

Obrigado pelo seu tempo! Espero que tenha uma ótima visita.

D – After Tour Survey (Portuguese)

RESPONDA DEPOIS DE INICIAR A VISITA

Obrigado pelos seus 5 minutos

Olá, o meu nome é Nuno e estou actualmente a trabalhar na minha tese que pretende analisar os efeitos que uma aplicação móvel com elementos de jogo que visa ajudar os turistas em visitas a locais históricos em Sintra tem na satisfação do turista. Antes que essa análise possa ser feita, eu preciso projetar essa aplicação. As perguntas abaixo ajudarão a definir as funcionalidades que ela precisa de ter.

Q1. As suas expectativas iniciais para a visita foram totalmente satisfeitas?
(Por favor, forneça algum contexto)

_____
_____
_____

Q2. Você considera que o apoio e informação fornecido foi suficiente para guiá-lo durante a visita?
(Por favor, explique por que e especifique quais recursos você usou)

_____
_____
_____

Q3. Que outra informação ou apoio poderia ter sido útil durante a sua visita?
(Suporte, materiais, sinalética de orientação, ajuda ...) (Por favor, dê 2 ou 3 exemplos)

_____
_____
_____

Q4. Quais vantagens e recursos / funcionalidades você gostaria de ter num aplicativo para orientá-lo durante a sua visita?

_____
_____
_____

Q5. Demografia

Idade: 24 ou menos ☐ 25-39 ☐ 40-60 ☐ 61 ou mais ☐

Sexo: _____

Nacionalidade: _____

Obrigado pelo seu tempo! Espero que tenha uma ótima visita.

E – Answers (After)

Q1.

1. Yes, good beautiful nature, old architecture and some great views.
2. Had high expectations that were met, expected to see more rooms though.
3. Yes, the castle is a magical location and beautiful.
4. Yes, but there are much tourists. Got what expected, great park and view.
5. I came with the family. I already knew it but I was surprised by the repair.
6. They were. My expectations were to see a XIX century castle within vegetation. They were met because there were true. It went beyond my expectations.
7. Know the history. I like nature, stroll in nature and understand the culture of the time.
8. Yes, we came to see the garden and the remodulation of the palace, and also to find a place to take pictures for the wedding.
9. They were, from the historical point of view of the palace.
10. Yes, I expected an old palace. We had previous information.
11. Yes, absolutely, especially the surroundings.
12. Yes, we were happy about the lots of signs in English.
13. Yes, of course. I found exactly what I expected. It was good.
14. Yes. I didn't think it was going to be this beautiful. The architecture is great.
15. They were. The history of the palace. Wonderful architecture.
16. More art.
17. Very satisfactory, the view is beautiful the palace too. I will definitely return.
18. Yes! Completely. I know Sintra and I just wanted to enjoy the beautiful natural landscapes around the palace. However, that is not related with the visit itself.

Q2.

1. Yes, everything was understandable
2. Yes, we use the map that is explicit.
3. Yes. We wanted to wander and just used the signs
4. Not really, the information wasn't well placed.
5. Yes, I did not miss any information. It had what I needed. I was not obliged to read, I was free not to.
6. We got a bit lost. More clear signposts would be appreciated.
7. Yes, the map of the bus. Didn't receive support from the location. It was well signalized and it was all well explained.
8. We liked the map and the indications. It was sufficient.
9. Yes, I used map and explanatory plates.
10. Yes, the location signs.
11. Yes, it was correct. Used information from the main gate and google search.
12. No. It would be nice to have a guide in dutch. The map was good.
13. Yes because the map allows you to go everywhere. They internet allows you to understand everything.
14. We didn't use other resources, other than the map.
15. The map was enough. We managed to get to the locations. Guide and itinerary.
16. No, they only give the itinerary. We had to search for a map. There was no guide.
17. The map was more than adequate, it was noticeable everywhere we went.
18. It was enough because there aren't so many places where I could go wrong. But, at the time I visited, I only saw one or two guides. The texts written around the places are ok for the ones who have patience to read them.

Q3.

1. More info on Russian
2. Audio Guide
3. Didn’t anwser
4. Didn’t answer
5. Didn’t answer
6. More indications, more historical context of the park and houses.
7. Didn’t answer
8. Didn’t answer
9. Didn’t answer
10. Some more boards with information and audio.
11. Information on how to reach places.
12. To have audio guide in dutch. Map from the inside of the palace.
13. More spot locations. The ticket office should open earlier to reduce the time waiting.
14. Time slots, schedule to enter.
15. Ease of access. Transport.
16. More story.
17. a real picture of the sites worth seeing, could be plaques at the beginning of the "roads" for each site.
18. Above everything else: more contact with guides who truly know what they are talking about.

Q4.

1. Not enough food information.
2. To have a map to orientate and whenever you were in a room, let us know more about it's history.
3. For it to know where I was at and to provide information based on that
4. It would be very nice to have augmented reality to see how it was on the XIX century. To see how it was on the king's time.
5. I do not like applications. I like to explore without support.
6. It would be cool if it was web instead of mobile. Setup location (gps). Pin your location to show text together with pictures to explain the context. Context based on location.
7. Description of what's inside the castle.
8. gps, schedules, itineraries, information of where to eat.
9. Interactive map
10. I would like audio and visual. Good user interface. Information of the room we are in. allow to appoint visits.
11. Some audio to explain the history.
12. I don't like mobile. It takes away attention. I would rather like audio guide to hear as I look.
13. A map with locations and itinerary. It has to be free.
14. Scheduling. Buying tickets in advance. Historical information, audio.
15. Tell where the transports are and the bathrooms. Services for those who have little mobility.
16. Map.
17. In the app there could be a map with our location and the actual pictures of the sites.
18. An APP should give the general informations. However, I think the app should answer particular questions. An example: the construction methods applied, etc. As an engineer I am particularly interested on those details.

Respondents' Profile

Age	Gender	Nationality	Site
<=24	M	Russian	Pena
40-60	F	Portuguese	Pena
61>	F	American	Pena
<=24	M	German	Pena
25-39	M	Italian	Pena
<=24	M	French	Pena
25-39	F	Brazilian	Pena
40-60	F	Portuguese	Monserrate
40-60	F	Brazilian	Pena
<=24	M	American	Pena
40-60	M	Spain	Pena
40-60	F	Dutch	Pena
<=24	F	Italian	Pena
40-60	F	Iran	Pena
25-39	F	Brazilian	Pena
25-39	F	Portuguese	Monserrate
<=24	F	Portuguese	Pena
<=24	M	Portuguese	Pena

F – Answers (Before)

Q1.

1. See the gardens and the Palace. We had already been here. We're visiting Sintra.
2. Know the place.
3. That place has wheelchair accessibility.
4. I heard it's beautiful.
5. To have a great view. I'm not sure of what I'll find.
6. To see a nice palace and garden.
7. Expect a disney village.
8. Couldn't visit because was too late.
9. Expect to see historical things and to learn about history
10. To see the castle and the garden. It looks nice. To have a view of Sintra.
11. Castles, big beautiful castles. Hills. Nature.
12. Visit the castle.
13. We came to discover.
14. History, constructions, beauty of the place.
15. Nothing much.
16. Learn about history.
17. Just visiting. Didn't like the taxi. Bad access, bad parking lot and transportation
18. Different Style.
19. Beautiful tower.
20. Never visited.
21. Old stuff, park, nature, walking.

Q2.

1. I hope so. Map, audio guide, detailed information. Bar code for mobile app.
2. Yes. I expect a guidance pamphlet.
3. Yes, information on historical factors.
4. Yes. I heard it's good. I expect a map and explanation of the exhibition.
5. Yes, I think so.
6. Expect history of the place.
7. Yes, a map.
8. I didn't get any material.
9. Expect it to be enough, to get the most of the location. To be well informed about how it was built.
10. Yes, information about opening and closing times and buses.
11. Maps are enough, no need for more. Signs.
12. Think so.
13. No, map is important.
14. Guides would be useful. Written material.
15. Yes.
16. Yes.
17. Yes.
18. No, we have a guide.
19. I hope, expect to have information panels. No brochure.
20. Hope so.
21. Yes, folder or walking tour.

Q3.

1. Building motifs, history, dates of reference.
2. Map, date of construction, signs.
3. historical site information and its architecture.
4. Map and dates.
5. Historical information.
6. Map. Indications of where to go.
7. Map and history.
8. Opening times, prices.
9. Map to choose things of interest. Not too much information but only crucial one. In paper.
10. Plan of the park.
11. Consistent time table for buses, schedule.
12. Interest points, clear paths.
13. History.
14. Background history, understand why it's called da Pena.
15. History, dates, quick facts.
16. History, where to go, walk.
17. History.
18. History.
19. More history
20. Information, more signs.
21. Good guide.

Q4.

1. Map, directions of the visit.
2. I'd like historical information and a map.
3. I would be a good tool. Ease of use. Historical and architectural information.
4. Audio Guide.
5. Locations to rest.
6. history, maps, background.
7. Map, where you are and what you're seeing.
8. Would be a good idea because it would have more information about the place in hands.
9. I would be awesome if it knew where I am, to have live information about stuff.
10. To tell interesting sites. Something about plants and their origin, who lived in. the palace. Music from the time. Allow you to close your eyes and think you are there.
11. Real time schedule. Countdown for buses, news, map, locations, minimal pictures, number of buses.
12. map, attractions, important stuff.
13. imitate a guide, notes, each visit at your pace.
14. Interesting. Application would be more practical. It would take the guide job.
15. Interesting, quicker.
16. Basics, map, intuitive.
17. Help with the row.
18. Easy to use, no registration.
19. Ability to get tickets.
20. Didn’t answer.
21. Interest points, short info.

Respondents' Profile

Age	Gender	Nationality	Site
40-60	M	Portuguese	Monserrate
40-60	M	Portuguese	Pena
25-39	M	Portuguese	Pena
25-39	M	American	Pena
>=61	F	French	Pena
25-39	M	German	Pena
25-39	F	Dutch	Pena
40-60	M	Brazilian	Pena
<=24	M	German	Pena
25-39	F	German	Pena
N/A	F	American	Monserrate
40-60	M	Dutch	Pena
<=24	F	Portuguese	Pena
>=61	M	Brazilian	Pena
<=24	M	Brazilian	Pena
25-39	F	Brazilian	Pena
25-39	F	Brazilian	Pena
40-60	M	Finland	Pena
>=61	M	Canadian	Pena
>=61	F	Brazilian	Pena
25-39	F	Belgium	Pena

G – Focus Group Script

Focus Group – Guião

Local: _____ Data: _____ Tempo de Discussão: _____
Notas:_____
_____
_____

Parte I – Introdução e Preparação

1. Receção aos participantes;
2. Identificação do investigador e participantes;
3. Breve explicação do conceito de focus group;
4. Apresentação da temática em estudo e objetivos do trabalho a desenvolver
    a. Breve sintetização do conceito de gamificação;
    b. Explanação do objetivo do estudo;
5. Esclarecimento de dúvidas;
6. Formalização do consentimento;
7. Iniciação da gravação áudio;

Parte II – Requisitos do Protótipo

1. Sucinta apresentação dos requisitos identificados para o protótipo;
    a. Requisitos Informacionais;
        i. História;
        ii. Arquitetura;
        iii. Evolução temporal;
    b. Fácil compreensão, navegação e rápido acesso à informação;
    c. Indicações;
    d. Mapa;
    e. Imagens;
    f. Listagem de locais;
    g. Miradouros (locais de observação);

Parte III – Questões

Analisando as funcionalidades oferecidas pela aplicação…

1. Julgam que as mesmas vão de encontro aos requisitos que foram identificados? Como?

Quando em visita aos Parques e Palácios de Sintra…

2. Consideram a existência de uma aplicação móvel deste gênero para apoio à visita como um requisito? Qual o impacto da sua existência ou não existência na vossa satisfação?

Pensando agora nos elementos de jogo disponibilizados…

3. Qual julgam ser a capacidade de encorajamento conferida pelos mesmos para visitar mais locais e explorar melhor os Parques e Palácios?

4. Em que medida a possibilidade de responder a questões altera a vontade de aprender mais sobre o local?

5. De que modo as métricas de comparação para com outros utilizadores afetam a vossa visita?

6. Acham que a aplicação e nomeadamente os seus elementos de jogo podem distrair o utilizador do verdadeiro objetivo da visita? Ou por outro lado aumentar a sua interação com o local? Porquê?

Considerando o custo, a hospitalidade e a existência de infraestruturas de apoio como atributos individuais da satisfação global da vossa visita…

7. Qual o impacto que as recompensas de desconto ou oferta de algum brinde teriam na vossa satisfação global para com o custo da visita?

8. De que modo a existência de uma aplicação gamificada afetaria a vossa noção global do nível de hospitalidade fornecida?

9. E qual o efeito na satisfação para com as infraestruturas de suporte? (considerando que as mesmas se encontram incluídas em algumas das rotas disponibilizadas na aplicação e a visita das mesmas contribui para a obtenção de recompensas).

10. Consideram que a disponibilização de uma aplicação gamificada com a GamiSintra constitui uma forma bem projetada para apresentar o produto cultural, aumentando o vosso interesse no local?

11. De uma forma geral de que modo julgam que a GamiSintra ou uma outra aplicação com elementos de jogo poderia apoiar a vossa visita aos Parques da Pena e Monserrate e de que forma a mesma se distinguiria de mapa físico ou de uma aplicação sem elementos de jogo?

H – Published Article

WHAT INFORMATION DO TOURISTS EXPECT TO HAVE ACCESS TO WHILE VISITING WORLD HERITAGE SITES?

Nuno Cavalheiro[1], Helena Rodrigues[2], Luís Rodrigues[3]

[1]Instituto Universitário de Lisboa (ISCTE-IUL) (PORTUGAL)
[2]Instituto Universitário de Lisboa (ISCTE-IUL), Business Research Unit (BRU-IUL) (PORTUGAL)
[3]Instituto Universitário de Lisboa (ISCTE-IUL), ISTAR-IUL (PORTUGAL)

Abstract

Tourism has seen an unparalleled increase in the last few decades and as such, the number of visits to UNESCO world heritage sites is also on the rise, and alongside this is the use and proliferation of smartphones, which allowed the development of apps in many fields including tourism. Despite this fact, research on what information tourists seek while visiting historical sites is still scarce. The present study aims to verify the information that tourists consider more critical to have at their disposal during their visit to world heritage sites, to this end a qualitative survey with open questions was conducted at the entrance of two of the most visited world heritage sites in Sintra, Portugal, the first site in Europe to be recognized as Cultural Landscape and which houses a large cultural offer within its area.

Through interviews with tourists, we obtained the data to elaborate a concept map – using Leximancer –, in which we found five main themes (History, Map, Use, Information, and View), representing the most important concepts in the proposal and development of the intended tourist app

This paper proposes the key concepts, or requirements, that must be taken into account in the development of a new technological prototype for supporting and guide tourist during their monument or tourist attraction visit

The needs of the tourist user should always be considered when designing products as such this paper proposes the requirements necessary for a world heritage site guiding app and compares it with what the currently existing apps deliver.

Keywords: Tourism, Cultural Heritage, Information, World Heritage Sites, Devapp, Education.

1 INTRODUCTION

Tourism is nowadays one of the world main social and economic activities, with culture being one of its main drivers. ICOMOS - International Council on Monuments and Sites (1976) defines Cultural Tourism as "form of tourism whose object is, among other aims, the discovery of monuments and sites. It exerts on this last a very positive effect insofar as it contributes – to satisfy its own ends – to their maintenance and protection. This form of tourism justifies in fact the efforts which said maintenance and protection demand of the human community because of the socio-cultural and economic benefits which they bestow on all the populations concerned".

Not only do we live in an era of tourism expansion, but also in a digital one, which offers many options of to improve tourist's satisfaction by enhancing on-site experience. Not too long-ago tourists had to rely solely on physical guides and on-site information, but that scenario has now greatly changed due the wide use of cellphones, namely smartphones and wireless technology which allows for anyone to carry the power and information of the world wide web right on their pocket. Other studies already recognize smartphones as an emerging trend in tourism which holds great potential to transform the way people experience travel [2]. Although smartphones possess web browsers and allow tourists to surf the web and search for required information on mostly static web pages, apps allow for the integration of cellphone features such as the GPS and camera, which offer a better usability and interaction with the physical space. The number of dedicated apps for tourism context is rapidly increasing and many devoted to UNESCO World Heritage Sites already exist [3].

Despite the expanding offer of Apps dedicated to tourism in general and UNESCO sites in specific, research on what information do tourists exactly expect to have access to while on this context is still scarce. In this study we intend to analyze the information that tourists wish to have access to while visiting cultural heritage sites, for we cannot design good apps to aid anyone, without understanding

their true needs and expectations. The information was obtained through an open question survey conducted directly with tourists who were either about to visit or had just visited historical sites in Sintra, Portugal. The collected information allowed us to generate a conceptual map of themes which can be used to gain knowledge of what main features and information should be considered when designing mobile apps in this context.

1.1 The use of information technologies in tourism

Whenever travelling and visiting unknown places access to information is of vital importance, historically tourists were very dependent on printed guides and on site provided information [4], but the development and spread of use of the internet changed that, in fact internet has today become the most frequently used source of information when making travel plans, with a lot of this information being provided via smartphones, more precisely through thousands of applications, of which most are free. Information provided through mobile services not only is more practical and resourceful than traditional sources, it also holds power to affect the satisfaction of travelers, and even has a significant effect on destination revisiting intentions. For these to happen however, developers need to consider what do tourists value the most on mobile technologies on tour context, with current research identifying that interface design quality is more important than the history and cultural knowledge quality [5].Despite this fact design quality will be wordless if the content provided doesn't meet the users' needs.

In this study we aim to contribute to that research, and we must identify what previous research found on this field, to compare our results. Literature review allowed to identify several requirements through a 2015 research based on the Kano Model, which distinguishes three types of product requirements that influence the customer satisfaction in different ways:

- Must-be Requirements: Not fulfilling these requirements results in the customer being extremely dissatisfied, they are however taken as granted and will as such not increase the satisfaction.
- One-dimensional requirements: Customer satisfaction is proportional to the level of fulfilment therefor the higher the level of fulfilment, the higher the customer's satisfaction and vice versa. These requirements are usually explicitly demanded.
- Attractive requirements: Attractive requirements not expected by the customer, fulfilling them lead to more satisfaction, not meeting them doesn't, however result in dissatisfaction (since they weren't expecting) [6].

The study by Federica Palumbo [2] identifies the following requirements divided by category:

Must-be:

1 Multilingual option.

2 Friendly and efficient user interface.

3 Compatibility with different operating systems.

One-dimensional:

1 Multimedia information.

2 Geo-located map.

3 Possibility to store loyalty cards, coupon and voucher.

4 Free download

Attractive:

1 Recommendations for personal routes.

2 Augmented reality.

3 Service available off-line.

As seen before interface design quality is considered more important to users than the quality of the content itself, therefor we should also analyze how to design such mobile app, it is exactly this that a 2012 paper by author Stefania Boiano provides us with, the outlining of the aspects regarding the planning and production of cultural content for mobile usage, regarding its design strategy. According to this research there are 7 content typologies that need to be addressed. 1) Text which should be

kept as short as possible 2) Images which should be high-contrast 3) Audio considered an excellent content for mobile devices since it can be heard using earphones, like text it should not be too long and clearly audible 4) Video which can add an emotional layer to the cultural information, pointing however that they do distract the user from the surrounding environment, and should therefore be used carefully 5) Maps with interactive capability 6) Social features and lastly 7) Updates and maintenance. When it comes to User Interface this paper recommends keeping it simple and intuitive as possible [7].

Now that we have analyzed the advantages of mobile technologies in the tourism and cultural context and previous research on what users expect it to have and how it should be presented, it becomes interesting to understand the current offer of apps dedicated to UNESCO sites, mainly its spread and most frequent features. An analysis of such type was conducted in 2013 by Theresa Karolina Shieder. By analyzing 115 apps dedicated to UNESCO sites this research identified 49 indicators which were grouped into 7 categories. 1) General Information 2) UNESCO world heritage sites 3) Multimedia 4) Place 5) Tourism 6) Entertainment and 7) General features / settings. Of these General Information was the most represented category, which includes indicators such as description, history and geography of the site and suggested tour(s), selected points of interest / highlights and proposals was the frequently present indicator (80%). The study also concluded that at the time only 11.3% of the apps offered virtual tours and that AR features were only present in 5.2%, despite being considered a major trend in mobile tourism domain [3].

Most visitors can be classified as short time visitors which are highly heterogeneous, therefore requiring different kinds of information. Although access to information can be provided in several ways one must consider the need to filter it according to the end user needs, enabling easy and fast access to what is needed by who, at what moment, thus facilitating exploration. Tour personalization has been a topic of research for over two decades and although its need has since long been acknowledged, the way by which it is provided has been improved through technological advancements, going from a manual process to a more dynamic and less noticeable one. Research found that people do not like to be stereotyped into a specific group to have access to more personalized information, instead preferring dynamic personalization, this should therefore be an unnoticed process, provided in the background and not by directly asking the user for input [8].

1.2 The context of Sintra

Sintra is a village and a municipality in the District of Lisbon, the capital city of Portugal. With 382,521 residents it is the second most populous municipality in the country.

Located in the green mountains where continental Europe meets the Atlantic Ocean at its most western point, Sintra is rich both in natural and edified heritage, making it one of the main touristic destinations in Portugal and a UNESCO world heritage site, having been in 1995 the first site in Europe to be classified as Cultural Landscape, a category established in 1992 which recognizes the combined works of nature and man.

Sintra (as a tourism destination) is recognized as a strong international brand with strong links and complementarity with Lisbon and the municipality of Cascais (located on the opposite side of the Sintra Hills, also recognized as a tourism destination mainly sought by its Sun and Sea offer). Sintra presents highly developed cultural attractions with its main concept and element of identity being its unique ambience as a romantic icon [9].

Following the classification of Sintra as world heritage in 1995 and with the objective of merging the different institutions holding responsibilities for safeguarding and valuing the Sintra Cultural Landscap the Portuguese state deliberated the creation of a state-owned company: Parques de Sintra-Monte da Lua, S.A. (PSML).

Nowadays PSML is responsible for the management of all but one of the main cultural attractions in Sintra, being responsible for restoration, maintenance and management of those spaces, doing so with its own income generated by sources such as the entrance fees and support facilities.

The number of visitors has witnessed a continuous increase since the creation of PSML, with its managed cultural attractions having received a total of 3,192,818 visitors in 2017, which resulted in an income of 30,822,825.00 €, of which 6,020,618.00 € were applied in direct investment.

1.3 Park and Palace of Monserrate

The origins of this site date back to the 18th century when wealthy English merchant, Gerard de Visme, decided to build there a house of Neo-Gothic style, this house would however quickly fall into ruins. Francis Cook who would later receive the title of Viscount of Monserrate bought the property in 1863 and commissioned architect James Knowles to transform the property into yet another great display of Romantic architecture in Portugal.

Around the palace exists a magnificent garden with surprisingly contrasting scenery, composed by plants of very scattered points of globe, ranging from palm-trees, and tree ferns from Australia and New Zealand to agaves and yuccas from Mexico. A true delight with plants from five continents.

Although the palace felt in disrepair and was left abandoned for several years, the transfer of the property to Parques de Sintra – Monte da Lua in the year 2000 resulted in a profound restoration work which restored it the Palace and the surrounding garden to its former glory, allowing it to be once again reopen to the public in 2007 [10].

Number of Visitors: 160,706 (2018)

1.4 Park and National Palace of Pena

Located in the Sintra hills, the Park and Palace of Pena are the fruit of King Ferdinand II's creative genius and the greatest expression of 19th-century romanticism in Portugal, denoting clear influences from the Manueline and Moorish styles of architecture.

The National Palace of Pena which is one of the best expressions of 19th century architectural Romanticism is currently the most visited monument in Portugal (2017). The palace construction dates back to the 19th century when King Ferdinand II (reigned: 1836 – 1853) acquired a formed monastery on that location that was at the time abandoned since the suppression of the religious orders in Portugal. By that time the building was in disrepair and the king ordered it to be repaired. Under the vision of Ferdinand and the genius of Wilhelm Ludwig von Eschwege (architect, 1777-1855) the monastery would become what is now one of the wings of the Palace, with a full new wing being built under the kings' orders.

The reconstruction of the former monastery transformed it into a castle-like residence, a style based on the German romanticism (Ferdinand II had German ancestry, having born in Viena, Austria). Many symbols of several cultures and building styles can be found throughout the palace, including but not limited to: vault arches, Medieval and Islamic elements.

Around the palace lies the Park of Pena, a big, romantic and exotic garden with winding paths and rich natural display, with hundred different species of trees and plants from around the world [11].

Number of Visitors: 1,976,367 (2018)

2 METHODOLOGY

The aim of this research is to analyze what information tourists expect to have access to while visiting cultural world heritage sites, to that end and considering the lack of research on this field, we decided to conduct a qualitative survey directed at tourists. This survey was carried out at the entrance of two of the main cultural sites of Sintra, the National Park and Palace of Pena and Park and Palace of Monserrate. Two structured surveys were created, with previously defined and fixed questions [12], one aimed at tourists who were about to visit and other directed at those who had just visited, both contained 4 similar open questions. Before Tour Survey:

1 – What are your expectations for the visit? (Please provide some context of your travel behavior, reasons for visiting, etc) 2 – Do you expect the support material and information provided at the location will be enough to guide your visit? (Please explain what you expect and why) 3 – What information do you consider most important to have at your disposal during the visit? (Please give 2 or 3 examples).

After Tour Survey:

1 – Were your initial expectations for the visit totally satisfied? (Please provide some context) 2 – Do you consider that the provided support was enough to guide you during the visit? (Please explain why

and specify what resources you used) 3 – What other information or support would have been useful during your visit? (Signs, spot locations, help, etc…) (Please give 2 or 3 examples).

A 4th question was asked on both versions: What advantages and features/functionalities would you like from an APP to guide you during your visit?

A total of 40 surveys were conducted with 39 being considered valid, 21 before the tour and 18 after, 20 females, 19 males. A total of 13 nationalities were interviewed, with Brazilian and Portuguese being the most expressive ones (both with 9 respondents), followed by Americans and Germans (4 each). 59% of the enquires had an age of 39 years or younger.

All answers were compiled in an excel file, with each row representing an inquired tourist, and a total of 1358 word being obtained considering all answers.

To analyze the answers obtained we resorted to Leximancer, a content analysis tool adequate for processing qualitative data and large chunks of text, identifying the main concepts present in the same and clustering them into themes with little manual intervention [13].

3 RESULTS

Using Leximancer we automatically generated a conceptual map composed by 5 main themes: History, Use, Information, View and the most relevant one, Map. Each one of these themes is associated to important concepts such as location, pictures, sites and guide (map theme), history, time, understand, indications and architecture (history theme), support, search, and free (use theme) (see Figure 1).

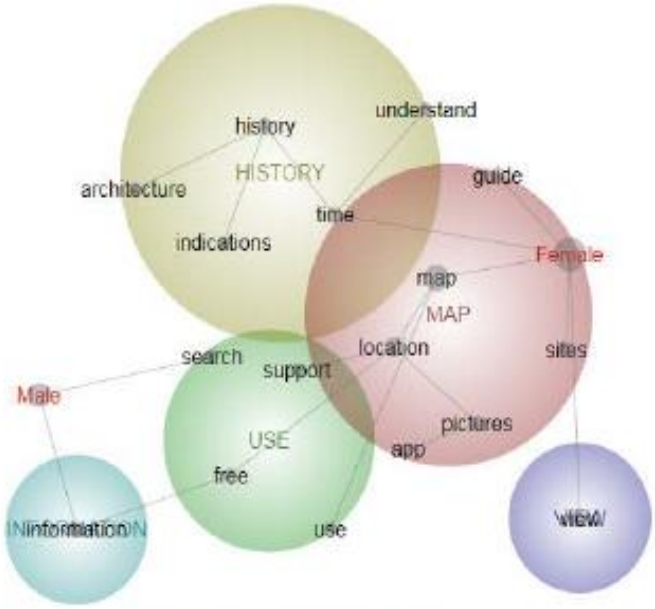

Figure 1. Concept map displaying tourists' expectations towards their visit and information requirements

With this study we aim to contribute to future development of APPs dedicated to cultural heritage sites, therefor it is our hope that the analysis of the present concept, which presents the potential consumer assessment of requirements will contribute to diminish the existing gap between supplier and demander interpretation of requirements, allowing for improved user acceptance [14] and by allowing heritage site managers to provide useful information where it is needed the most, on site [4]. By ensuring that heritage site managers are able to provide their visitors their true needs of information we're are allowing them to present the cultural product in a well-designed manner which could stimulate and increase the visitors' interest and involvement", thus creating experience quality, which leads to visitors' perceived value, satisfaction and eventually customer loyalty [15].

According to results map was the most relevant theme and concept identified by the inquired tourists, this concept is connected to others such as location, sites, pictures, guide and can be linked to our

previous literature review, which allowed us to conclude that map, GPS and overall geographical location features were not only one of the most provided feature in this kind of APPs but also deemed as necessary as explicitly demanded requirement by users, with its presence improving overall satisfaction of use [2][3]. A map feature allows for visitors to not only understand the space being visited and its main sites and how to get there but also to pick their route based on personal preferences.

The second most relevant theme identified was History, which holds concepts such as understand, time, architecture and indications. History is in fact the main information requested by tourists and is heavily connected with the wish to understand the site being visited and the culture attached to it. The concept time here refers to the historical era of the site origins and yet again the desire to understand how it connects to the site. Likewise Map, History too is already one of the main concepts present in current APP offer [3].

Along with Map and History which can be considered as the in fact main information requirements, the survey allowed us to identify a third theme of different characteristics, Use. Unlike the previous two themes, this one is related to the design and functionalities of the application, rather than information itself. The concept free here present refers to the desire of tourists to be allowed to download the application without direct cost associated. Yet again this concept was also identified in previous research, as other studies identify this requirement as having a customer satisfaction proportional to the level of fulfilment [2]. Most of the already existing offer is indeed provided by free, therefor meeting tourist's desire [5].

Lastly, we have two one concept themes, View and Information, with the first being more associated to female users and the second to males. Information is connected to the content required, such as the concepts connected to the history and the map of the site. Similarly to what we identified in literature review information should be concise and based on the need at hand, therefor easy to obtain and navigate, not only that it should allow for a personalized experience [8]. Apart from the topics already identified (history and map), other type of sought information includes that linked to the facilities of the site itself, including schedules of buses, dinning services and site opening and closing schedule. The View theme connects with viewpoints and the in this case the wish to behold the village of Sintra and its surroundings that lie on the slopes of the mountain from the high position of the Pena Park, which allows from great pictures to be taken.

4 CONCLUSIONS

Through the analysis of our generated concept map we can conclude that the main informational requirement that tourists seek access to while visiting world heritage sites, namely cultural ones is a map feature to help them get around the site and choose what to see. The second major requirement is connected to the historical information of the site itself, in order to be able to understand the space that is being visited, its architecture and overall history. Thirdly we can also conclude that tourists also expect such application to be easy and free to use.

We'd like to mention that although the interview tourists showed in general a positive attitude towards the possibility to use a mobile application to help them explore the locations being studied, most were still satisfied with the information currently being provided, namely the free leaflets provided as well as the info boards and find it to be enough to explore the sites.

Lastly, we can conclude that our study and the requirements here found follow the same trend of previous research and that the requested information as well as map feature is already present in most of the existing applications.

The present work might be limited to the size of its sample and therefor it is our hope that it can be used to encourage similar research on other sites with a larger sample.

ACKNOWLEDGEMENTS

The authors would like to thank the support of Parques de Sintra – Monte da Lua, S.A. for allowing this survey to be conducted.

REFERENCES

[1] ICOMOS, "The ICOMOS charter on cultural tourism," *Heritage*, 1976.

[2] F. Palumbo, "Developing a new service for the digital traveler satisfaction: The Smart Tourist App," *Int. J. Digit. Account. Res.*, pp. 33–67, 2015.

[3] T. K. Schieder, A. Adukaite, and L. Cantoni, "Mobile Apps Devoted to UNESCO World Heritage Sites: A Map," in *Information and Communication Technologies in Tourism 2014*, Cham: Springer International Publishing, 2013, pp. 17–29.

[4] E. Simao Da Graca Dias, E. Beinat, and H. J. Scholten, "Effects of mobile information sharing in natural parks." CERN, Geneva, 2005.

[5] J. Y. Kim, N. Chung, and K. M. Ahn, "The impact of mobile tour information services on destination travel intention," *Inf. Dev.*, vol. 35, no. 1, pp. 107–120, Jan. 2019.

[6] N. Kano, N. Seraku, F. Takahashi, and S. Tsuji, "Attractive quality and must-be quality," *J. Japanese Soc. Qual. Control*, 1984.

[7] S. Boiano, J. P. Bowen, and G. Gaia, "Usability, Design and Content Issues of Mobile Apps for Cultural Heritage Promotion: The Malta Culture Guide Experience," Jul. 2012.

[8] L. Ardissono, T. Kuflik, and D. Petrelli, "Personalization in cultural heritage: the road travelled and the one ahead," *User Model. User-adapt. Interact.*, vol. 22, no. 1–2, pp. 73–99, Apr. 2012.

[9] Entidade Regional de Turismo da Região de Lisboa, "Plano estratégico para o turismo da região de Lisboa 2015-2019," pp. 1–112, 2014.

[10] "Park and Palace of Monserrate." [Online]. Available: https://www.parquesdesintra.pt/en/parks-and-monuments/park-and-palace-of-monserrate/. [Accessed: 05-Jan-2019].

[11] "Park and National Palace of Pena." [Online]. Available: https://www.parquesdesintra.pt/en/parks-and-monuments/park-and-national-palace-of-pena/description/. [Accessed: 21-Apr-2019].

[12] A. Srivastava and S. B. Thomson, "Framework Analysis: A Qualitative Methodology for Applied Policy Research." 02-Jan-2009.

[13] "Leximancer." [Online]. Available: https://info.leximancer.com/. [Accessed: 20-Apr-2019].

[14] L. Rising and N. S. Janoff, "The Scrum software development process for small teams," *IEEE Softw.*, vol. 17, no. 4, pp. 26–32, 2000.

[15] C.-F. Chen and F.-S. Chen, "Experience quality, perceived value, satisfaction and behavioral intentions for heritage tourists," *Tour. Manag.*, vol. 31, no. 1, pp. 29–35, Feb. 2010.