DESIGNING ENGAGING EXPERIENCES WITH LOCATION-BASED AUGMENTED REALITY GAMES FOR URBAN TOURISM ENVIRONMENTS

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Abstract

Gameplay has recently unfolded as playfulness in various cultural forms using mobile technologies. The rapid affordability paired with the latest technology improvements enabled the diffusion of mobile devices among tourists, who are among the most avid users of mobile technologies. The advent of mobile devices has initiated a significant change in the way we perceive and connect with our environment and paved the way for location-based, mobile augmented reality (AR) games that provide new forms of experiences for travel and tourism. With the recent developments like *Pokémon Go* and a prediction of 420 million downloads per year by 2019, the mobile game market is one of the fastest growing fields in the sector.

Location-based AR games for mobile devices make use of players' physical location via the GPS sensor, accelerometer and compass to project virtual 2D and 3D objects with the build-in camera in real time onto the mobile game user interface (GUI) in order to facilitate gameplay activities. Players interact with the virtual and physical game world and overcome artificial challenges while moving around in the real environment. Where current mobile games withdraw players from reality, location-based AR games aim to engage players with the physical world by combining virtual and physical game mechanics in an enhanced way that increases the level of interactive educative and entertaining engagement. Despite some recent research on location-based AR games, game designers do not know much about how to address tourism requirements and the development of mediated playful experiences for urban tourism environments.

This study explores the use of location-based AR games to create engaging and meaningful experiences with the tourism urban environment by combining interdisciplinary research of social sciences, (mobile) game design and mobile game user research (mGUR) to contribute to experience design in the context of travel and tourism. Objectives of the study are to identify the influence of key game elements and contextual gameplay parameters on the individual game experience (GX). To achieve the aim, the study has taken a pragmatic interpretivist approach to understand the

player's individual GX in an evolving gameplay process in order to inform location-based game design. The project explores the interaction between the player, the game and the tourism context, which is assessed by a sequential triangulation of qualitative mixed methods.

Two games were identified to be relevant for the tourism application that fulfilled the attributes of a location-based AR game. The first game is a role-playing adventure game, set in the time and place of the Cold War, called *Berlin Wall 1989*. The second game, *Ingress*, is a fictive, large area, massively multiplayer role-playing game that uses the real world as the battleground between two game fractions.

A conceptual framework has been developed that presents the player engagement process with location-based AR games in urban tourism environments. The findings of the study indicate that gameplay is a moment-by-moment experience that is influenced by multiple aspects. The creation of engaging experiences between players, the game and the tourism context is related to six identified engagement characteristics; emotional engagement, ludic engagement, narrative engagement, spatial engagement, social engagement and mixed reality engagement. The study identified that the main motivations of playing a location-based AR game are the exploration of and learning about the visited destination, curiosity about the new playful activity and socialising with other players. Emotions underlie the creation of engagement stimulated by the alteration of playful interactions. The findings revealed that storytelling and simple game mechanics such as walking, feedback and goal orientation are essential elements in the creation of engaging experiences. Augmented reality, as a feature to connect the real with the virtual world, needs to create real added value for the gameplay in order to be perceived as engaging for players. The study proposes serious location-based AR games as an alternative form for tourism interpretation and has showed opportunities to enhance the tourist experience through self-directed, physical and mental interaction between players, the environment and the location-based AR game.

The findings of the research illustrate the complexity of designing location-based game experiences. The developed conceptual framework can be used to inform future location-based AR game design for travel and tourism.

Keywords: location-based augmented reality games, experience design, tourism urban environments, mobile Game User Research

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CHAPTER: INTRODUCTION

1. INTRODUCTION

1.1. Research Rationale

Advancements in mobile technology and the increasing use of mobile devices have motivated game designers to create innovative gameplay ideas starting from the early *Geocaching* (Groundspeak 2016) to the latest *Pokémon Go* (Niantic and Nintendo 2016). Where *Geocaching* gradually built up an avid player community of several million players worldwide, *Pokémon Go* was profiting from its brand recognition of comics, TV series and Nintendo Games to reach millions of players within a few days.

The above games are based on new smartphone technology with GPS-sensors and built-in camera which allows using the real world as a playground for new location-based augmented reality (AR) gameplay, however, mobile gaming technology is expected to develop further and is not limited to smartphones but will go beyond, expanding to wearable or smart glasses. These games make use of AR technology *"supplementing the real world with virtual objects that appear to co-exist in the same space as the real world"* (Azuma 1997. p.37). As the quantity and quality of mobile devices are increasing, mobile gaming has attracted a wide range of user groups and will be appealing to more players in different contexts (Desurvire and El-Nasr 2013). Recent technology advancements and dropping prices provide more people than ever access to hardware and hence to new mobile game experiences (Wetzel et al. 2011).

The symbiosis of mobile gaming and AR recently experienced a big hype (Hodson 2013). According to Juniper Research (Sorrell 2015), games were the major driver for mobile AR app download in 2013, not least because of *Ingress* (Niantic, Inc. 2012)*;* a massively multiplayer online pervasive game launched in 2012 by *Google's Niantic Lab.* Mobile AR games enhance reality with virtual objects in real time on the players' screen and send the players off on a physical journey to discover different locations within the local environment (Jacob and Coelho 2011; Blum et al. 2012). Mobile AR gaming is taking gameplay outside into the real world, which introduced a paradigm shift to video games where players immerse into virtual game worlds and are relatively isolated from their environment.

With these games, but also with related phenomena like gamification (Deterding et al. 2011), pervasive games (Montola 2005; Stenros et al. 2012) or applied games (Mayer et al. 2013), we experience a ludification of society (Raessens 2006; Hamari 2013). The term *homo ludens* was first introduced by the Dutch philosopher Huizinga (1938) who established games as a research field. Ever since, games became a mature and serious research field especially with the

development of online games in the 1960s. Today games are more than massively multiplayer online games (MMOG) but pervade all areas of life such as health, politics, education or business, to only name a few (McGonigal 2011).

The maturity of games on the one side, and the technology push on the other is the offspring of the innovative and creative development of location-based games. With the increasing use of smartphones in daily life, mobile technologies also penetrate travel and tourism. Tourists use mobile devices before, during and after their holidays to retrieve geographic information (Tussyadiah and Zach 2012), mediate touristic sites (Kennedy-Eden and Gretzel 2012) or share experiences in social networks (Radoff 2011). As the nature of tourism is to create extraordinary and personal experiences (Pine and Gilmore 1999), there is a constant pursuit of innovative methods and new technologies to enhance the tourist experience (Neuhofer et al. 2012). The increasing mobility of tourists, and their claim for distinct experiences, challenges tourism decision makers to create innovative products and services that are engaging and meaningful (Gretzel and Jamal 2009; Pattakos 2010; Boswijk et al. 2012).

Although the research on location-based games (LBGs) is not new, as it has been explored in some projects in the context of mobile learning (Huizenga et al. 2009), cultural heritage (Bellotti et al. 2012; Mortara et al. 2013) or creative tourism, it is still not extensively explored and more research has to be done in regards to game design and theory development (Engl and Nacke 2012). Two distinct research projects have piloted different types of location-based games in the travel and tourism context. First, *REXplorer* a LBG analysing the interaction between players and environment for the city of Regensburg (Ballagas et al. 2008). Second, *TimeWarp* an ARG game exploring the sense of presence in games (Wetzel et al. 2011; Blum et al. 2012).

Further studies connected to these ideas and went beyond to enhance visitor learning in cultural heritage sites (Ardito et al. 2010; Mortara et al. 2013), tell interactive stories of locations (Paay et al. 2008; Weiß and Müller 2008; Stenros et al. 2011), or advance the interaction between the visitor and touristic artefacts (Kim et al. 2012; Benyon et al. 2013a).

This study claims that the phenomenon has not yet been explored to its full extent, as game designers are still unaware of how to design for engaging tourist experiences (Benyon et al. 2013a) by adapting mobile gameplay to tourist specific needs. Games have the power to create greater engagement with the destination through mediated and playful interactions. More research is therefore needed on how location-based AR games need to be designed in order to create engaging experiences in tourism environments.

1.2. Research Aim and Objectives

The aim of the research is:

To explore the use of *location-based Augmented Reality games* to create engaging and meaningful experiences *with the tourism urban environment*.

The following objectives have been identified to achieve this aim:

1. To critically examine experience theory in game design and tourism as a theoretical underpinning to understand location-based augmented reality games for tourism urban environments.

2. To identify which *game elements* of location-based augmented reality games contribute to creating engaging and meaningful experiences in tourism urban environments.

3. To identify *contextual parameters* occurring during the game experience with the location-based augmented reality in the urban tourism environment.

4. To identify *individual player experience* with location-based augmented reality games in tourism urban environments.

5. To develop a *conceptual framework* elaborating key game elements, contextual parameters and individual player experience for location-based AR games to elicit engaging and meaningful experiences with the tourism urban environment.

1.3. Thesis Outline

The **second chapter** is the first of three chapters forming the theoretical framework of the thesis. The first section of the theoretical framework focuses on experience design and experience concepts in tourism and game design. As this study follows an interdisciplinary research approach, it draws on the connections between games and tourism through experience design. With the notion of mobile technology as a vehicle, both fields are united to explore the creation of engaging and meaningful mediated experiences for travel and tourism.

The **third chapter** is the second part of the literature review and gives an introduction to game design theory and how advancements of new mobile technologies change the landscape of gameplay. There are different types of location-based games that are introduced and discussed in this chapter in regards to the case studies analysed in the study. These games make use of particular game design elements, which are outlined in an overview.

The **fourth chapter** introduced the tourism urban environment as the contextual place where

gameplay unfolds and builds the context of the theoretical framework. Different contextual parameters are discussed that might have a positive or negative impact on the player experience. In this sense it is important to develop the understanding of the concept of context as it is defined differently in tourism and game design research.

From the perspective of the underlying epistemology and ontology, the **fifth chapter** outlines the methodology and research methods. This study applies mobile Game User Research (mGUR) as a new research approach to evaluate the interaction between the player and the game resulting in individual game experiences (GXs) with two location-based AR games. The methods are chosen in order to answer the objectives of the research. The two chosen case studies for the location-based AR games are also presented.

There are three findings and discussion chapters. The **sixth chapter** introduces the reader into the engagement process of gameplay starting out with the preconditions of play based on the model of Engl and Nacke (2012). The game experience is threefold and can be separated into the player, the game and the context. This chapter draws on this idea and draws on player motivation, player characteristics and previous experience with games to have an idea of tourists as players. It also represents the locations in which gameplay took place. The first time player experience phase is particularly critical in games as players decide if they continue or not.

The **seventh chapter** analyses gameplay in the process of engagement and identifies which factors contribute to creating an engaging and meaningful experience with location-based AR games in a touristic context. Engaging gameplay is an altering construct of emotions, playfulness, narrative, space, social and mixed reality that eventually contribute to meaning creation and engagement between the player, the game and the location.

The **eighth chapter** concludes with reasons for disengagement that are mainly of a contextual nature, such as weather constraints, crowded places or modifications of streets. Besides, this chapter reflects on the positive outcome of gameplay.

The **last chapter** concludes with the conceptual framework of the study and the contribution to knowledge. It is outlined what the study contributes to various fields and the implications for game design. Limitations are discussed along with suggestions for further research.

CHAPTER: THEORETICAL FRAMEWORK

2. DESIGNING FOR EXPERIENCES

2.1. Experience Design

Games and tourism are both temporary escapes into another world. In gameplay we leave our daily life behind and become immersed into countless hours of gameplay; fight virtual opponents, explore fantasy game worlds or fully embrace in our role as online avatar. The same applies to travel and tourism, where we spend days planning the next trip to an exotic destination, study maps, even languages, and seek out for the most exclusive places. In both cases, we are in search of unique and personal experiences that allow us to break out of our daily lives and indulge in another world where we seem to have more freedom, fun and adventures; a place of fantasy and dreams. According to researchers (Kultima and Stenros 2010; Tussyadiah 2014), both disciplines claim to consider themselves as the prime producers of experiences.

Living in a society of material wealth, we strive for something that adds value and meaning to our lives; something that cannot be found in the daily routine of our workplaces. The post-materialistic society is in need of self-expression, personalisation, active engagement and hedonism, which results in a highly individualised experience society (Schulze 2005). This does not mean that products are absolute, as especially technology is needed to shape desired experiences. However, it is the experience, which is in the core of interest as opposed to the mere ownership of a product (Hassenzahl 2013). People are not striving for materialistic goods anymore but are interested in the experience, feelings and emotions a product leaves. As an example, it is not important to possess a music CD but to connect to the feelings the songs leave, thus more customers decide for streaming, downloading or music clouds. Experiences are the essence of this transformation. Whole industries, such as travel and tourism or the games industry, are trying to close this gap by addressing the needs for unique and meaningful experiences that cannot be gained elsewhere. But how can we design for experiences that make us happy and create meaning to our lives?

Before discussing the design **for** experiences (Svabo et al. 2013), the creation of experiences need to be clarified. In everyday life, all human activities produce experiences as *a "result of individual interactions with the environment"* (Dewey 1938). Normally no further explanations are necessary, but experience is a broad concept. American philosopher and psychologist John Dewey (1938) describes experiences as *"not mere feelings; they are characteristics of situations themselves, which include natural events, human affairs, feelings, etc."* According to the Oxford English Dictionary, experiences are something (1) which persons have gone through

and gained knowledge of, are the content of direct observation or participation in an event (2) defined as a mental and bodily state and (3) are closely related to feelings and emotional sensations. Within game and tourism experience research, all of the above characteristics are applicable. Location-based gameplay becomes an interaction between the players, the game and their contextual environment in which players need to physically move to experience emotional sensations such as excitement or boredom based on game interactions. Thus, experiencing is a continuously interactive process in which the individual acts and interacts with the contextual surrounding, but also reflects on these experiences through meaning creation after the gameplay.

According to Boswijk et al. (2005), experiencing follows a systematic process that is presented in Figure 1. We perceive the world through **sensory perception** to receive multisensory stimuli from the interaction with objects or by observing events. Interactions with the world create knowledge or skills. However, it is impossible to pay attention to all stimuli, especially when going through a city where we are exposed to noise, visual stimuli or body perceptions. What we see and want to see depends on expectations, intentions, and personal history. The subconscious interpretation of orientation, filter, and search process allows us to separate important from unimportant stimuli.

Figure 1: The Process of Experiencing
Boswijk et al. (2005)

Perceptions are processed stimuli information, which lead to emotions, an involuntary, unintended, non-deliberate, way of dealing with the outside world (Frijda 1986). Emotions arise from context and show who we are, what we love and what we appreciate (Boswijk et al. 2012). Emotions have affective, cognitive, psychological and behavioural characteristics, which describe them as complex systems mediated by human hormones. Emotions can (1) be expressed in affective experiences (e.g. feelings of arousal, pleasure, disgust), (2) generate cognitive processes, (3) require adjustments to arousing conditions and (4) lead to (often) expressive, goal-oriented and adaptive behaviour (Kleinginna and Kleinginna 1981). Studies on emotions in tourism and marketing (Kim and Fesenmaier 2014) refer to Russell's research on emotion (Mehrabian and Russell 1974; Russell 1980) that separates them into positive and negative valence and high or low arousal. The first makes us happy, interested and adventurous, whereas in the latter we feel like avoiding the environment and show little interest to extend the experience. Emotions provide an index for qualitatively different experiences, either pleasurable or unpleasant of nature (Russell 1980) and thus can be regarded as essential characteristics of

experiences (Holbrook and Hirschman 1982). Whole industries such as travel and tourism or the games industry are concerned with creating positive emotional experiences to entertain and engage their target audience. For instance, the involvement in a gameplay may evoke tension and happiness after having achieved a challenge, whereas during travel, tourists feel amazed visiting a heritage site. By definition, experiences are the *process* and *outcome* of a lived-through activity (Dewey 1938).

But when everything lived through is an experience, how do we consider some experiences as more meaningful and forget others? Dewey (1934) separated ordinary, daily experiences from special experiences and named the latter **an experience**, which have a clear beginning, middle and end – in tourism terms pre-, direct- and post-exposure. These experiences are immediate and relatively isolated events with a complex of emotions that represent a certain value to the person within the context of the situation (Boswijk et al. 2005).

Mental interpretations, sense making and experience processing to form meaning in the sense of 'Erfahrung' (experiences) are not based on knowledge but gained by living through events, values, as well as personal and emotional encounters (Kahneman et al. 1999). Kahnemann suggests the concepts of 'experiencing self' and a 'remembering self'. The 'experiencing self' lives in the here and now, in that moment, but it is the 'remembering self' that assimilates the constructed mental life story upon which decisions are made. "Odd as it may seem, I am my remembering self, and the experiencing self, who does my living, is like a stranger to me." (Kahneman 2011 p. 390). Experiences are individual, subjective, holistic, situated, dynamic and worthwhile (Ellis and Flaherty 1992; Hassenzahl 2013). One can learn about a foreign country by reading a book, but really empathising with people living in this country, getting to know their daily life, tasting their food and smelling the air is based on real 'Erfahrung'. In order to create meaning, one has to go further. Gelter (2008) separates:

> *"An Erlebnis has only meaning within the context it occurs while an Erfahrung has meaning beyond the boundaries of its original context. The former has meaning only when the experience occurs while the latter can have meaning for the life. This makes the Erlebnis easier to analyse, stage and design but also easier to copy compared to the more complex Erfahrung, which is personal and therefore difficult to multiply." (Gelter 2008. p.50)*

Experiences in the sense of '*Erfahrung*' produce a complex mental journey of feelings, thoughts and actions that leave a person with a different perspective on the world. In the context of location-based gameplay in tourism, for instance, one refers to experiences in the sense of an *Erfahrung* as gameplay addresses universal psychological needs like relatedness, mastering, or admiration. The phenomenon of having performed playful interactions, learning something (e.g. about the history of the destination) or experiencing fun, are the source of happiness that shape

personal memories, which can lead to having a different outlook on the tourist destination (Sundbo and Hagedorn-Rasmussen 2008; Hassenzahl 2013).

According to Pine and Gilmore (2011), *Erfahrung* leads to change and transformation through doing and undergoing actions, which creates meaning for the individual in different contexts of life and how she sees the world. Boswijk et al. (2007) have combined the theory of experiences (Boswijk et al. 2005) with Csikszentmihalyi's (2002) flow theory in order to characterise meaningful experiences:

- There is a heightened concentration and focus, involving all one's senses.
- One's sense of time is altered.
- One is touched emotionally.
- The process is unique for the individual and has intrinsic value.
- There is contact with the 'raw stuff', the real thing.
- One does something and undergoes something.
- There is a sense of playfulness.
- One has a feeling of having control of the situation.
- There is a balance between the challenge and one's own capacities.
- There is a clear goal.

Playing a game or visiting a city are activities with a clear beginning, middle and end in which the player or visitor lives through an experience with a changing state of emotions and feelings that are processed in the person's mind and body (Hilgard 1980). Due to the nature of games, location-based gameplay experiences may create meaning for tourists through technology-mediated interaction with the physical environment, using storytelling and playful interventions. Hence, value is created for the individual in the context of tourism, which may lead to a transformative alteration in a person influencing other life perspectives (Boswijk et al. 2005; Jernsand et al. 2015).

Experience design currently gains momentum with service design, design thinking, user experience (UX), and human-computer interaction (HCI) and is concerned with the question of how experiences can be deliberately designed. Experience design is not a matter of the aesthetics of a product (interface, product design), but about the aesthetics of the (user) experience (Hassenzahl 2013). The nature of experience design has been discussed in game design (Nacke and Drachen 2011), HCI (Wright et al. 2006; Tullis and Albert 2008; Marcus 2011), tourism (Ritchie et al. 2011; Scott and Ding 2013; Tussyadiah 2014; Jernsand et al. 2015) and experience marketing (Leppiman and Same 2011).

As Svabo et al. (2013) claim, one can only design *for* experiences. But what does it mean to design for an experience in the context of human-computer interaction (HCI)? On the one hand, there are *moment-by-moment experiences* that focus on the aesthetics or interface - the doing,

thinking (what) and feeling (how) of a particular moment of interaction with a product (Greenberg et al. 2012; Hassenzahl 2013). This changes in the post-materialistic realm where *meaningful experiences* are created through technology and material becomes transcending. The experience itself is in the core, such as claimed by Boswijk et al. (2012). *Constructed experiences* (Hassenzahl 2013) have intrinsic value for the user as they support motivations, needs and requirements e.g. relatedness, autonomy and competence (Ryan and Deci 2000). Thus, these types of experiences are more meaningful for the user as they describe *why* a technology is used instead of *how*. As researchers suggest, one should design with the experience in mind that includes exploring the needs of people and connecting these to technology features. With these so-called socially driven innovations the focus is on the creation of meaningful experiences in which personal interaction, user stories and the social context are key, as opposed to a mere interface design of a technology. The designer is the author of the experiences of which the user has active control, as she decides what to do with a game and where to play it (Hassenzahl 2013).

What experience design means in the context of games and tourism still needs to be defined. Tussyadiah (2014) introduced a theoretical framework for tourism experience design drawing on multi-disciplinary research areas such as human-centred design, holistic experience concept and iterative process integrating various concepts, methods and theories from psychology, anthropology, cognitive and behavioural sciences. The author points out three theoretical underpinnings of tourism experience design, which are also followed in this study:

- **Human-centred design** (HCD), user-centred design (UCD) or emphatic design focuses on needs, wants, requirements and expectations of the user in order to connect one's internal stage to the design characteristics and context of the interaction. It is the aim of HCI to focus on users and identify their motivations, needs, and emotions.
- **Holistic experience concept** is a complex interaction between design attributes and socio-cultural contexts from which meanings and values emerge. It captures the richness of human experience design in order to bridge personal mental experiences with the strategic directions of the organisation.
- **Iterative designing process** follows a recurrent process of several iterations in which the results of iterations are implemented to change and improve the quality and functionality of the design (Tussyadiah 2014).

HCD and holistic experiences address the why of experience design as these concepts put users and their experiences at the centre of the design process (Hassenzahl 2013). In addition, the iterative design process ensures a closer design on user needs and requirements by evaluating user emotions and motivations throughout the design process.

The research at hand draws on psychological concepts such as self-determination theory (Ryan and Deci 2000), to explain the intrinsic and extrinsic motivation of using location-based games in the context of travel and tourism. It further integrates the concept of engagement to identify mental processes and embodied actions of tourists engaging in meaningful gameplay interactions. This intervention, which leads to a meaningful hedonic outcome, is complex due to the nature of individuality and temporality of experiences (Scott and Ding 2013). Tourists are not only passive receivers of experiences but interactive agents (Richards and Wilson 2006) who self-direct their experiences, as opposed to being passive spectators of staged experiences (Boswijk et al. 2012). This makes tourism experience design and design research multidisciplinary in nature. According to Tussyadiah (2014) the basis of tourism experiences is storytelling and the experiential context in which core and conceptual experiences take place. The contextual environment is the "experiencescape" such as physical (e.g. buildings, objects), social (e.g. interaction with other tourists) and timely restrictions in which experiences unfold. Storytelling gives meaning to the phenomenon from the perspective of the experience subject. The tourist has an embodied relation to these factors, which can be weak or strong (Svabo et al. 2013). Interactions shape tourist experiences (Pine and Gilmore 1999; Tussyadiah 2014). These can be influenced by tourism decision makers on an operational level by offering interactivity and triggering activities such as location-based gameplay in order to provide tourists with desired emotional and engaging experiences through mediation.

2.2. The Tourist Experience

The essence of tourism is to create experiences when people leave their familiar environment and travel to other places to interact with people and objects in those places (Aho 2001). 'Tourist experiences' is a socially constructed term associated with many interpretations within social and environmental activities, which make them reflective and inherently personal as these experiences cannot be separated from the tourist's individual psychological and emotional state, and are thus part of personal construct theory (PCT) (Kelly 1955; Botterill and Crompton 1996; Pine and Gilmore 1999; Tussyadiah and Fesenmaier 2009). Tourism experiences are *"a mental journey that leave the [tourist] with memories of having performed something special, having learned something or just having fun"* (Sundbo and Hagedorn-Rasmussen 2008. p.83). By definition, tourist experiences are a process (mental journey) and an outcome (memories) that are influenced by external stimuli (Scott and Ding 2013). Tourists travel for the essence of experiencing something new. This includes emotional change, intellectual inspiration, education of new practices and skills or to evoke a change in the mind, body or way of life (Aho 2001).

Two major trends recently shaped the contemporary tourist experience – the increased seeking of extraordinary experiences by travellers (Pine and Gilmore 2011) and the advent of mobile

technologies (Brown and Chalmers 2003; Gretzel and Jamal 2009; Tussyadiah and Zach 2012) as a tool to mediate experiences on-site in the destination. Since the development of the experience economy, tourist businesses explicitly respond to the desire of experiences creation by incorporating the tourist as a co-author into the tourist experience design (TED) process (Prahalad and Ramaswamy 2004; Pine and Gilmore 2011). With new mobile technologies, the design of those experiences becomes more personal, interactive and immediate.

2.2.1. Technology-Mediated Experiences

Travellers create meaning to places by using mediation tools that help getting to know the history and stories behind a monument. The anthropologist Marc Augé (1992) defines spaces as the basis for human identity, history and social work. Through travelling, spaces are experienced. Thus, meaningless spaces become known places (da Silva et al. 2011). Travelling is a process of meaning creation involving the tourist's mobility in physical, cultural and social places (Jansson 2002; Crouch and Desforges 2003) through understanding, feeling and learning (Jennings and Weiler 2004). Urry (1990) calls this phenomenon the *tourist gaze,* in which tourists subjectively interpret visited places by the means of mediation tools. According to Tussyadiah and Fesenmaier (2009. p.25) *"mediation and brokerage refer to the individual's active attempt to facilitate and/or interpret the outer experience of another individual."* Mediation tools in tourism can be personal (e.g. accompanying tourists, tour guides, tourist providers) or non-personal (e.g. signs, signage, design, and technology) (Jennings and Weiler 2004).

Technology use has become highly pervasive and touches all areas of life, including travel and tourism (Wang et al. 2012). Given the mobile nature of tourists (Sheller and Urry 2006), mobile technologies are highly valued by this target audience. The miniaturisation (Portolan et al. 2011) and multi-functionality (MacKay and Vogt 2012) of mobile technologies has pushed mobile devices to the most popular communication medium among tourists. With the application of new mobile technology, tourists are able to comprehend and connect tourism landmarks and routes in order to form a holistic understanding of the places visited (Tussyadiah and Zach 2012). There are a growing number of technology-based mobile tour guides that support enhanced tourist experience by means of mediation, entertainment and learning (Tussyadiah and Fesenmaier 2009; Gordillo et al. 2013). These technologies profoundly changed the way of tourist experiences, as tourists are able to receive information about places, connect to people at home and enable meaningful decisions, which go beyond the ease of navigation and identification of attractions (Neuhofer and Buhalis 2012; Tussyadiah and Zach 2012; Wang et al. 2012).

Tourism researchers (Wang et al. 2011; Kennedy-Eden and Gretzel 2012) classified mobile applications and found that they generally serve functional, efficient, aesthetic and social information needs of tourists. Mobile devices were hardly used to evoke emotional attachment between tourists and the visited destination in a sense of playfulness, hedonism and social interactions (Huizenga et al. 2009; Tussyadiah and Zach 2012). However, it is not the technology per se that creates emotions and meaningful experiences. The technology is rather the enabler of socio-psychological need fulfilment by encouraging users to explore the world around them or interacting with people in the real and virtual world. It is the satisfaction of having experienced relatedness, competence and popularity after the experience, which makes the phenomenon pleasurable, not the technology itself (Hassenzahl 2003).

Mobile developments enable tourists to mediate and shape their interactions with people and places by enhancing meaning through mediated interpretation (Crouch and Desforges 2003; Gretzel et al. 2011; Wang et al. 2012). This may involve facilitating, processing and sharing of information (Tussyadiah and Fesenmaier 2009) or enabling co-creation of tourism experiences (Neuhofer et al. 2013). Digital mediated tourism focuses on a variety of tourism contexts such as museums, outdoor, cultural heritage or theme parks in which a number of technological tools that have been employed to accommodate tourists (Durrant et al. 2011). Mobile devices with interactive maps, location-based services (LBSs) or virtual and augmented reality are popular tools for personal navigation and mediation of the tourist environment (Benyon et al. 2012). Although, learning has long been a neglected field in tourism research according to Falk et al. (2012), learning and exploring foreign cultures is the essence of travelling. These tools bridge the gap between tourists and locals (social mediation) as well as physical artefacts (physical mediation) and thus add value in the understanding of the foreign attractions and cultures.

Tourism research (Benyon et al. 2013b; Kim et al. 2013) laments that with the notion of smartphones, users increasingly withdraw from, rather than engage into the environment (Ling 2008). Every mediation tool, online or offline is a means that interrupts the tourist experience, as these tools require the conscious attention of the user. For instance, many LBSs fail to transmit the sensation of being present in the history of the tourist destination and simultaneously interact with the user (Benyon et al. 2012). Mobile devices are therefore often recognised as disrupting tourist experience as opposed to creating engaging experiences.

Latest technology advancements like AR, on the other hand, blend in virtual multimedia objects seamlessly in real time on the mobile screen (de Sa and Churchill 2013; Ganapathy 2013) and are eventually seen as being less interruptive as other multimedia technologies (O'Keefe et al. 2014). Research in ICT for travel and tourism (Kounavis et al. 2012; Linaza et al. 2012; Yovcheva et al. 2013a) as well as mobile HCI (Bolter et al. 2013; de Sa and Churchill 2013; Huang et al. 2013; Olsson 2013) evaluated how AR browsers and apps (such as *Junaio* and

Wikitude) need to be designed in order to satisfy user requirements and needs of retrieving on-site tourism information. As shown in Figure 2, real locations projected on the smartphone's screen through the camera and the GPS system of the device are enhanced by additional virtual information in the form of icons overlaying the reality in order to display contextual information about the location (Yovcheva et al. 2012).

Figure 2: Augmented Reality Browser
www.deepknowhow.com

However, studies in entertainment (Huang et al. 2012; Salo et al. 2012; Kim et al. 2013) and games industry (Mendenhall et al. 2012; Yamabe and Nakajima 2012) have only recently focused on hedonic needs of users in blended space. These studies go beyond navigational and informational requirements, which serve the purpose of efficiency and effectively, to evaluate experiences of pervasive playfulness. Despite the fact that mobile technology and game design advances, little is known about how to design location-based AR games for an urban tourism context. Early studies (Kiefer et al. 2006; Ballagas et al. 2008) on location-based games for travel and tourism fall short of integrating real tourists into the design research, and eventually insufficiently considered tourist requirements for those applications. Other studies focused on game immersion (Lankoski et al. 2004; Carrigy et al. 2010), flow (Jegers 2007; Bressler and Bodzin 2013) or presence (McCall et al. 2011; Blum et al. 2012) in location-based AR games that often implied withdrawing from reality as a consequence of deep game engagement.

2.2.2. Play as Leisure Experience

Despite the fact that Plato cherished play as the highest attribute of humanity and Huizinga (1938) describes play as a source of human culture, gameplay was long considered as a waste of time and a sign of unproductivity. Human *"civilisation arises in and as play*" and used language as a central role in the construction of disciplines like law, philosophy or art. Play is key to social lives, but often neglected in our contemporary society as being materially unproductive (Caillois 1961; Goffman 1974). According to Caillois (2006), **play** (paidia) is a timely, spatially

and socially separated activity, in which players voluntarily engage in free, explorative and uncertain actions by the means of it. A **game** (ludus) or the study of ludology, on the other hand, is a structured, rule-based formal system where players aim for a quantifiable, but negotiable outcome (Juul 2003). As game types are diverse, a universal definition encompassing all games is hard to achieve. Thus, Ferrara (2012b) identified three characteristics all games have in common:

1) **Game objective**: need to be explicit, measurable and reliable.
2) **Environmental constraints:** limits what players can and cannot do and are unable to change without changing the game experience.
3) **Formal constraint:** players agree to value the game rules

Prensky's (2007) extended original six structural game elements that include elements of Juul's (2003) and Ferrara's (2012b) definition; goals and objectives, rules (formal constraints), outcome and feedback, conflict/competition/challenge, social interaction and story.

Players attach emotions and values to the process and outcome of games as a source for stimulation, wellbeing, and emotions (Caillois 1961; Goffman 1974). Due to its spatial, temporal and social distinction from real life, games are often seen as separate from reality (Huizinga 1938; Klabbers 2006). However, the so called *Magic Circle* was challenged by many game researchers (Crawford 2003; Consalvo 2009; Calleja 2012a; Montola 2013) but became redundant with the notion of new mobile technologies and the pervasiveness of games.

Due to the long history and rich variety of games, one could think that research on games and leisure activities would be well explored, but despite a few recent studies on location-based gameplay and its influence on creative tourism (Boulaire and Hervet 2012; Ihamäki 2012a), marketing (Çeltek 2010; Xu et al. 2013) or player behaviour (Ballagas et al. 2008; Guenjens et al. 2013; Garcia et al. 2016), games are relatively new in the context of travel, tourism and leisure. Leisure researchers (Bull et al. 2003; Page and Connell 2010) acknowledged the benefits of play on wellbeing and personal growth such as teamwork, discipline, empathy and leadership. Play was long seen as a medium of entertainment, pleasure and escapism without considering the serious aspect play could have in regards to learning or personal skill development. Play is no longer regarded as a waste of time and non-productive. Indeed, Page and Connell (2010) emphasised the value of play activities enhancing leisure experiences by exploration, fantasy, spontaneity, creativity, humour, and joy. However, the impact of play and games needs to be further explored in the context of leisure and tourism as this area is still underrepresented in research.

There are recognisable parallels between play and leisure. Taheri and Jafari (2012) assert leisure becomes a significant aspect in one's life escaping from reality and daily pressure to indulge in

pleasure, excitement, socialising, play and fun. We are living in a world of entertainment in which more amusement parks, concerts, cinemas, theatres, recreational centres and online entertainment tools exist than ever. The concept of experience becomes more present in the contemporary leisure domain beyond the act of consuming or purchasing a product but actively co-creating experiences (Prahalad and Ramaswamy 2004).

Many museums, tourist attractions and sites make use of multimedia displays and technology to mediate history or other relevant information for the visitors (Schmalstieg 2007; Tillon et al. 2010). These installations are often far from interactively engaging a large public into an active state of learning and playfulness in which visitors are motivated to create their own knowledge, physical and social experiences. Tourist researchers (Yong-Chang et al. 2011; Falk et al. 2012) claim that engagement through interaction of tourists with the visited environment is crucial to develop an understanding of foreign places. Tourism researchers (Gross and Brown 2006) found that actively involving the visitor in location activities raises the sense of place attachment. Place attachment is an indicator of how visitors perceive a place during a visit and thus a crucial aspect for tourism marketers to identify location features, which are unique to a particular place and induce emotions. Paay et al. (2008) claim that people need astonishment and daydreaming and fiction to develop an immersive and engaging stance. Given the fact that people are carrying around their smartphones everywhere to listen to music, play games or interact in virtual social worlds, these fictional worlds can easily be built through technology mediation at cultural or urban places offering narratives and historical insights. The creation of engaging and meaningful experiences in tourism is crucial, as tourist experiences are often missing an important dimension of *actively* engaging tourists in the destination. Instead, tourism tries to engage tourists by presenting passive multimedia in form of 3D video screens (Tussyadiah and Fesenmaier 2009), mobile guides (Kim and Schliesser 2007; Wang et al. 2011) and other geo-information systems (Chu et al. 2012; Kennedy-Eden and Gretzel 2012). This type of one-directional communication media does not allow much interaction and creativity. There is a need for improvements in storytelling techniques and historicity, since tourists are visiting destination sites because of this. Tourists are seeking explorative, self-directed and entertaining experiences off the beaten tourist tracks. Choices of where to go are inspired by personal recommendations of friends and relatives in social networks rather more than tourism websites or print brochures (Ferreira et al. 2012; Neuhofer and Buhalis 2012). Games and play, however, are a long neglected area in travel and tourism research, which has many prospects, but needs to be further explored.

A recent study from Taheri and Jafari (2012) on playfulness in museum experience showed that the success of playful engagement depends on four aspects:

- **Creating fun***:* play positively contributes to physical and mental health, as it is a way to escape from reality and to reduce stress. Play slows down the pace of life.
- **Creativity and imagination:** strengthen individual and collective creativity by thinking about alternatives in a stress- and failure-free context in order to enhance the imagination.
- **Enhanced learning**: through gameplay in regards to skill development and concentration (analysing, thinking, identifying, synthesising) benefits the learning outcome consciously and unconsciously.
- **Social interaction**: sociability and shared experience of feelings, thoughts, and interests.

These engagement aspects are especially influencing children who gain more interest in the museum experience with a playful approach. Children, between 6 to 13 years old, are born into an entertainment-driven society for who (mobile) gaming is an integral part in media and non-media leisure activities. Adults on the other hand are seeking more playful and pleasurable experiences that extend childhood or provide opportunity to forget stressful daily deeds. With the new technical and physical mobility of mobile games, players have the freedom and flexibility to play at any location, at any time (Taheri and Jafari 2012; Hugger et al. 2013). Playful engagement is evident in mobile and location-based games providing amusing and compelling experiences (Harteveld et al. 2011; Guenjens et al. 2013). Those games offer a new opportunity to fill the gap between required playfulness and mediated interaction in tourist destinations (Schønau-Fog 2011; Benyon et al. 2012).

2.3. The mobile Game Experience

2.3.1. Game Experience and Playability

User experience (UX) and game experience (GX) design originate from the same family of human-computer interaction (HCI) and thus share many common characteristics such as theory, objectives, methods or practices. Both realms are concerned with the quality of a person's experience in dealing with technology. However, since the 1960s game and system design were going different ways which only recently and slowly crossed each other in correlating disciplines (Ferrara 2012b).

Where UX is concerned with the end users' subjective experience (emotional, physical or behavioural reaction) that is formed through the (anticipated) interaction with a product, service or system, GX deals with the pleasurable experience of game interactions (IJsselsteijn et al. 2007; Olsson 2012; Hassenzahl 2013). UX addresses personal needs and requirements towards an artefact and elicits situational, spontaneous emotions (Olsson 2012; Hassenzahl 2013). According to leading HCI researchers (Hassenzahl 2008; Law et al. 2009), UX is a momentary,

primary evaluative feeling (good or bad) arising during the interaction of a user with a product or service. Although, Desurvire and Wiberg (2010) characterise the boundaries between usability and UX as being rather blurred, UX addresses a more holistic perspective beyond effectiveness, efficiency and satisfaction and enhances the entire experience of a user by expectations, interactions and reflection (Zimmerman et al. 2007). According to ISO 20101, UX emerges from the interaction of humans with a product, system or service and results in emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviours and achievements. These human reactions occur before, during and after usage. Dealing with products will elicit emotions in form of pleasure, excitement, stimulation, identification and memories. Hedonic and pragmatic attributes are judged on the product characteristics, expectations and previous experiences of the user to decide if the product is suitable and appealing for a certain context (Hassenzahl 2003; Calvillo-Gámez et al. 2010).

Consequential from the statements above, it should be clear that games differ from information systems in terms of usability vs. playability. Within HCI, **usability** is defined in ISO 9241-11 as the *"extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use."* Usability derives from the larger issue of system acceptability, which deals with the question of whether a system is well designed to fulfil the user's requirements and needs, referring back to Hassenzahl (2013), the moment-to-moment experiences are key. If a system is providing value to the user, it is socially and practically accepted. A system becomes useful when it has utility and is useable to accomplish a desired goal. Where utility deals with the question of whether systems function is needed, usability is concerned with how well users can make use of the provided system functionalities (Nielsen 1993). According to Nielsen (1993) usability is multi-dimensional comprising of measurable attributes covering learnability, efficiency, memorability, errors and satisfaction.

With the separation of UX and GX it should be made clear that there are two different approaches within the same family of HCI. An overview of differences and similarities is provided in Table 1.

This study, however, will use game systems, meaning games as an artefact that clearly differentiate from the concept of **Gamification** as defined by Deterding et al. (2011) or others (Epstein 2013; Hamari and Koivisto 2013). Gamification is the use of game design elements and game design thinking in a non-gaming context. Thus, gamification uses parts of games to improve motivation, engagement or brand awareness (Deterding et al. 2011).

Table 1: Comparison of Game and Information System Characteristics

Characteristic	**Information System** **User Experience (UX)**	**Game** **Game Experience (GX)**
Type of Software	Productivity Software	Entertainment Software
Purpose	Outcome-orientated	Process-orientated
Aim	Pragmatic Goal-achievement	Hedonic Pleasure and fun
Experiences	Productivity-orientated Usability User experience	Experience-orientated Playability Game experience
Value	Pragmatic Value • Functional • Accessible	Hedonic Value • Emotional • Cognitive
Attributes	Effective, efficient, ease of use, performance	Fun, enjoyable, learning, exploring, stimulating, pleasure
Usability	Reduce obstacles accomplishment	Reduce obstacles to fun
Design Intention	High Quality Product	Pleasurable Process
Components	Hardware Software User/Game Interface	
Input Device	Keyboard Mouse Touchscreen	Keyboard, Mouse, Touchscreen, Joystick, Gamepad, Joysticks, Gamepads, Steering Wheels, Aircraft Yolks, Simulated Guns
Interaction	Functional	Recreational
Example	Gamified Tour Guide e.g. Foursquare	Location-Based Game e.g. Ingress

Although usability distinguishes from playability, some dimensions of usability apply to an extent also to game design, as games would be hard to play without a clear navigation or explicit user interface design. Thus, game design can profit from usability design in terms of user satisfaction. However, game design researchers (Malone 1981; Järvinen et al. 2002; Sotamaa 2005) argue that usability and playability cannot be seen as equivalent as game design is not about usability per se, but provides beneficial principles which might be applied in game design in order to allow a smooth gameplay (Pagulayan and Steury 2004; Sotamaa 2005). Playability involves the intentional withholding of play options in order to create challenges for the players, which defines the significant difference between productivity and playability systems (Sotamaa 2005).

Järvinen et al. (2002. p.17) define playability as *"a collection of criteria with which to evaluate a product's gameplay or interaction"* and lists four criteria:

- **Functional playability** maps the input requirements of the mobile device and analysis the efficiency and usability of the devices concerning interaction functionalities in game context (quantifiable using metrics).
- **Structural playability** is an expert evaluation of game rules, structures, patterns but also a player evaluation of skill, user experience (UX) and actions and can be compared with a usability heuristics evaluation.
- **Audio-visual playability** is concerned about the quality of the graphics and audio of the game elements and is closely related to functional playability of interface aspects, input controls and feedback (quantifiable using metrics).
- **Social playability** is the suitability of games to different contexts of use, using long-term anthropological and social studies to analyse games in the context of culture.

Playability is considered to build the foundation for enjoyable GX, even though Nacke and Drachen (2011) stated that a good GX is not dependent on usability as popular games may well have usability problems but can still be successful. Research has shown that usability methods (decrease error and failure rates) should be applied to games in order to improve user satisfaction and increase the individual GX (Charles et al. 2005; Zhou 2012). Köffel et al. (2010) support the argument of improving usability heuristics to progress the GX quality. Good usability and playability should be seen as a prerequisite for the creation of engaging GX.

Figure 3 shows the relation between **playability** and **player experience** adapted from Nacke et al. (2009). Playability is directed towards the improvement of game design, whereas PX deals with the evaluation of game experiences in order to inform design. The separation of terms is important for the research process in order to apply suitable research methods (Nacke et al. 2009; Desurvire and El-Nasr 2013). The focus of this study is the evaluation of location-based AR games in a tourism context, thus terminologies and concepts need to be clearly distinguished.

As explained earlier, experiences result from interaction and are therefore contextual and subjective. The same applies to games. Games are not an experience per se, but artefacts that enable experiences. The separation between artefact and experience is more obvious in games, as games cannot exist without the interaction of the player. Thus, game designers can only design for the imaginary – what seems to exist (Schell 2008). In order to get an idea of uncertain GX and to avoid ambiguity, games will need to be tested throughout the game design process in order to understand players and their experiences with the game (Bernhaupt 2010).

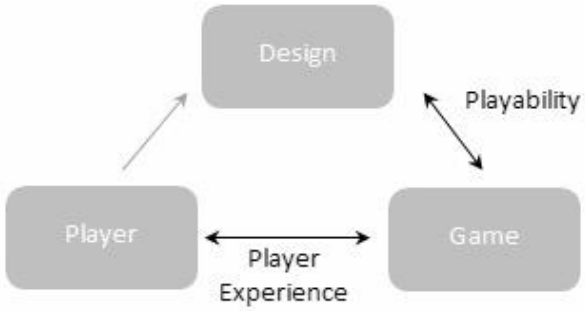


Figure 3: Interface between Player, Game and Game Designer
(Nacke et al. 2009)

Ermi and Mäyrä (2005a. p.2) define GX *"as an ensemble made up of player's sensation, thoughts, feelings, actions and meaning-making in a gameplay setting."* GX emerges from the unique interaction between the game and the player that are constructs in the player's mind influenced by their previous experiences, expectations and desires. This is what makes studying GX a highly subjective nature as the research relies on emotional responses of the user, which vary in time and context of gameplay (McCarthy and Wright 2004; Calvillo-Gámez et al. 2010). The subjectivity of the outcome makes research on GX a highly problematic and complex science, as generalisations of the phenomenon are hardly possible (Calvillo-Gámez et al. 2010; Nacke et al. 2010a; von der Pütten et al. 2012).

Single elements of GX such as fun, enjoyment and pleasure can be measured objectively by comparing individual player experience within the same context (Dewey 1934; Calvillo-Gámez et al. 2010). Game testing has been performed for decades, but methodologies from HCI have only been adapted recently to get a deeper understanding of the influence of technology on the GX (Pagulayan et al. 2003).

2.3.2. Game Experience Elements

In order to obtain a thorough understanding of GX, the concept needs to be clarified in its multi-layered aspects. There are several models and frameworks on game experience research starting with Hunicke et al.'s (2004) MDA-framework (mechanics, dynamics and aesthetics) for game design and research. The authors proceed on the assumption that gameplay starts with a bi-directional dialogue between players and game designers, who have different perspectives on the game – the experience (player) and feature-driven (designer) design. Both parties meet in an iterative dialogue around the MDA dimensions. A critique of this framework is that is does not encompass the game context in which gameplay unfolds, therefore it is perceived as less suitable for exploring the GX of location-based AR games in tourism. Other models explore the motivation of games, particularly the motivation of playing games (Lazzaro 2004; Koster and Wright 2010) or analyse game usability (Järvinen et al. 2002; Desurvire et al. 2004; Korhonen

and Koivisto 2006).

Engl and Nacke (2012) as well as Ferrara (2012b) were inspired by Garrett's (2010) UX layer model for web design to characterise experience elements for games. Ferrara (2012b) defines five layers of PX, presented in Figure 4, mirroring the process map of game design and thus follows a design-centric approach that is rooted in a psychological understanding of the player.

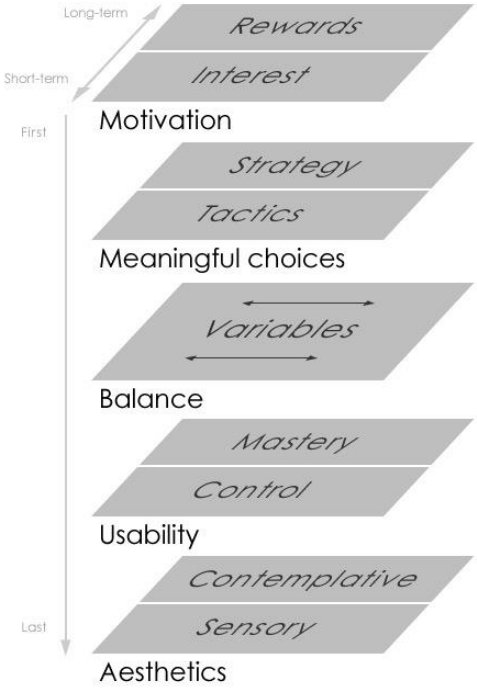


Figure 4: Player Experience Elements
Ferrara (2012b)

The layers are divided into short- and long-term effects. The first layer describes the motivation for playing games divided in interest (short term) and rewards (long term). The first critique is that players might be triggered by a particular interest in a game but long-term motivation is not satisfied by game rewards, as they only make for extrinsic motivation (Ryan and Deci 2000). The second and third layer are concerned with game elements and mechanics (meaningful choices and game balance). These variables can be actively influenced in and through gameplay. The last two layers include interface (usability) and aesthetic concerns. Another critique on the model is that Ferrara (2012b) makes use of the terms usability and playability interchangeably when he refers to how players should understand why they lost or won a game. Being able to master and control the game define the understanding of playability (Nacke and Drachen 2011). However, the framework falls short of including contextual aspects of GX as they only account for online games.

In the context of mobile games, Korhonen and Koivisto (2006) defined playability heuristics

that cover usability, mobility and gameplay which contributed to the first step towards mobile GX evaluation. New with this framework was the introduction of contextual events that could unforeseeably interrupt the GX. Although the paper discusses general constraints of mobile and leisure gaming, the framework comes short of presenting a holistic view on mobile GX. Related studies (Jegers 2007) on pervasive mobile gameplay represented a model on gameflow reflecting on elements of game concentration, challenge, player skills, control, clear goals, feedback, immersion and interaction, which did not take the contextual game environment and its effects on the mobile GX into account. Gentes et al. (2010) on the other hand were concerned with contextual urban events influencing the mobile GX such as city culture, temporary events or urban layout. Neither framework reflects the holistic game experience elements necessary for location-based games.

Engl and Nacke (2012) introduced a contextual game experience framework, represented in Figure 5, in which they see gameplay in three different layers of abstraction - the player, the game and game context following earlier studies (Nacke and Drachen 2011). The authors distinguish between four contextual GX factors, namely spatial, temporal, social, and cultural, which are further explored and linked to related theory of location-based gameplay and contextual tourism outlined in Appendix 2.

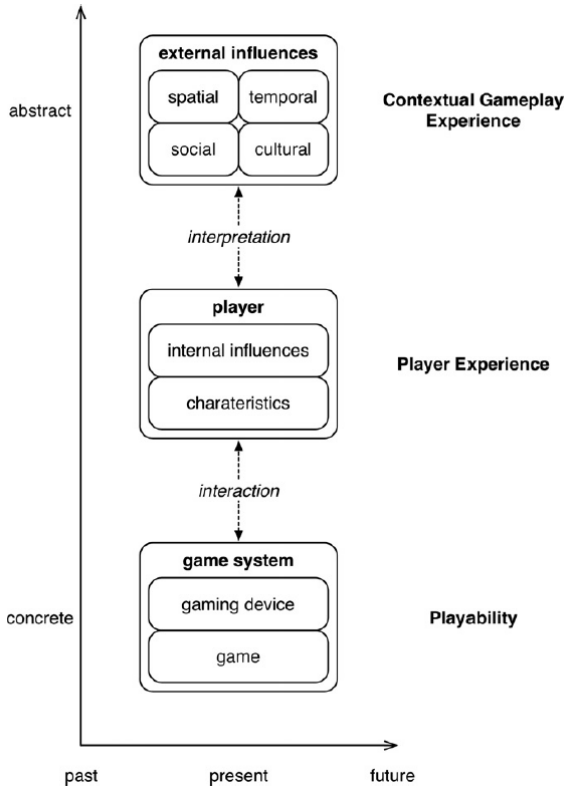


Figure 5: The Contextual Gameplay Experience Model
Engl and Nacke (2012)

GX emerges from the interaction of the players (internal influences) with the game system and

the contextual GX (external influences). The bottom layer is the game system with the gaming device (mobile, console, PC) and the game itself (genre, rules, game mechanics, controls) summarised as playability. The second layer the player groups with their characteristics (demographics) and internal influences (motivation, previous GX). Players interact with the game to form PX. The third level introduced the context of gameplay or external influences, which alters the GX. The model by Engl and Nacke (2012), although not explicitly developed for location-based AR games, is seen as the basis for the GX evaluation of the thesis. It provides a holistic and interconnected view to frame experience with special regard to the contextual influences that can affect each layer of the GX.

2.3.3. Game Experience Concepts

In contrast to online games, players experience the game environment through their own body in LBGs by physically moving around in the game environment. This involves player actions performed in the ordinary world, which provides an embodied experience and a change in perspective compared to online games (Ejsing-Duun 2011). Mobile GX is becoming the topic of interest in game design, but neither game designers nor game researchers have a conceptual understanding of the elements of location-based GX (Engl and Nacke 2012). There is a growing body of literature on GX using a variety of concepts such as immersion (Jennett et al. 2008), presence (Laarni et al. 2005; IJsselsteijn et al. 2007), involvement (Calleja 2007), and flow (Csikszentmihalyi 2008), which are often used interchangeably and all refer to the notion of engagement (Takatalo et al. 2010).

Carrigy et al. (2010) were the first to introduce the concept of immersion and engagement into the context of location-based gameplay. **Immersion** in gaming refers to the context of online video games or virtual reality (VR) where it is commonly used to express the sensation of being surrounded by a completely other reality or the feeling of being transported to a simulated place (Murray 1998). The level of immersion in online games depends on gameplay heuristics, which are presented by Ermi and Mäyrä (2005a). The authors distinguish between sensory (audio-visual aspects), challenge-based (interaction of players to test their skills) and imaginative (absorption of game story and identification with the game character) immersion. The SCI-model (sensory, challenged-based and imaginative immersion) is partly related to the concepts of flow (Csikszentmihalyi 2002) and presence (Lombard and Ditton 1997). Jennett et al. (2008) conducted a quantitative and qualitative study identifying components of immersion, similar to these from Ermi and Mäyrä (2005a) but enhanced by emotional involvement (empathy) and real-world-dissociation. The latter is particularly interesting for location-based gameplay as it characterises the attention shift of players between the real and the virtual world. They also add control as ease of interacting with the game as well as cognitive involvement represents

curiosity and interest that is closely related to motivational aspects of gameplay (Harteveld et al. 2011; Bouvier et al. 2014b). Bouvier et al. (2014b) defines immersion as an objective but measurable stimulation of a player's senses by replacing the perception of the real environment. Jennett et al.'s (2008) and Bouvier et al.'s (2014b) understanding of immersion is to withdraw from reality by simultaneously being absorbed into the game world. Thus, the concept is often understood as a passive act in which players become part of the physical or virtual game environment by losing awareness of time and real world (Douglas and Hargadon 2000; Brown and Cairns 2004). In the context of VR for instance, immersion refers to the concept of **presence**, which can be understood as a mental state in which a person feels present in a (virtual) location, even when one is physically present in another location (Lombard and Ditton 1997).

For Brown and Cairns (2004), the state of engagement and immersion is a continuum where the initial engagement with a game is associated with learning the game mechanics and thus a prerequisite for deeper immersion into the game. In this sense, immersion is close to flow (Csikszentmihalyi 2002). The **theory of flow** is known as an optimal experience, which is defined by eight criteria (Csikszentmihalyi 2008); encompassing (1) a challenging task, (2) player's full concentration, (3) achievable goals, (4) provides immediate feedback, (5) certain degree of control of the task, (6) player's feeling of amalgamation between consciousness and action, (7) player's feeling of less self-consciousness, and (8) an altered sense of time. Flow has been adapted to online games by Sweetser and Wyeth (2005) and pervasive games by Jegers (2007). Playing in the real world where the player's attention is challenged by contextual influences may destroy the experience of flow (criteria 2, 6 and 7). Instead, location-based AR games enforce the contrary - players should become more aware of their surroundings as opposed to withdrawal (Ejsing-Duun 2011).

It is argued that flow (Csikszentmihalyi 2008) cannot sufficiently capture mobile GX as gameplay with location-based AR Games is characterised as a continuous shift of player's attention in and out of the game. The conscious shift between game frame and non-static environment with the so called 'Verfremdungseffekt' make models like flow and immersion inadequate to explain game experience of location-based and pervasive games (Waern et al. 2009b; Stenros et al. 2012). The game flow in these games is occasionally and deliberately distracted while going from one location to another (Jegers 2007).

Game theorists Salen and Zimmermann (2004) provided a different theory stating that one-directional mediated experiences cannot become too sophisticated to produce illusions which are not distinguishable from reality. It would be a misconception of player engagement to think games are one-directional as gameplay is always interactive and thus engaging. Players become engaged in games while they are simultaneously aware of the medium and the artificial play

situation, which is separate from but connected with reality (Salen and Zimmerman 2004; Carrigy et al. 2010). This perspective acknowledges the concept of engagement as more complex and multi-facetted and is found to be more relevant for location-based AR games as players constantly shift their attention between the game and the physical environment and gameplay moves fluently between mediated and directly felt experience. In location-based AR games, gameplay is participatory and interactive as a result of direct and active engagement with the game mechanics as a key influencing GX (Carrigy et al. 2010).

2.4. Designing for Engaging and Meaningful Experiences

Derived from the previously discussed GX concepts, **engagement** is found to be the most appropriate concept to evaluate location-based AR games in travel and tourism. The concept of engaging experiences is equally essential in tourism and game research to understand how customers can actively participate in playful and gameful interactions (Brodie et al. 2011; Garcia et al. 2016). The need of customer engagement as a form of co-creating experiences and value has also been emphasised as key in marketing and services management (Brodie et al. 2011; van Doorn 2011). As Hassenzahl (2013) emphasised, users and their life experiences are in the centre of the design as opposed to the moment-by-moment experience. The questions of why location-based AR games in tourism are needed and how these games need to be designed imply having an understanding of the concept of engagement.

In general, the concept can be understood as *"...something draws us in, that attracts and holds our attention"* (Chapman 1997. p.3). A tourism artefact holds the attention of the tourist for a certain time as the tourist feels attracted by features of the artefact or is busy carrying out an activity.

In the context of HCI and technology, engagement is considered as a *"desire – even essential – human response to computer-mediated activities"* (Laurel 1993. p.112) and thus essential for gameplay (Brown and Cairns 2004; Schønau-Fog 2011), as the activity cannot exist without the interaction of the players. Indeed interactivity is identified as the core of (customer) engagement (Brodie et al. 2011) and technology engagement (O'Brien and Toms 2008). HCI researchers (Hassenzahl 2003; Laurel 2003; Tullis and Albert 2008) emphasise the importance of designing for engaging experiences, which goes beyond usability in order to capture the user's attention and focus it on the artefact or activity for some time. Successful technologies such as the iPhone are not only usable, but do engage with its intuitive and simple design. O'Brien and Toms (2008. p.949) define engagement a the quality of user experiences with technology that is characterised by challenge, aesthetic and sensory appeal, feedback, novelty, interactivity, perceived control and time, awareness, motivation, interest and affect. The definition suggests a

varying nature of intensity of these characteristics, which will also be occurring in location-based AR games, as players cannot equally be engaged in gameplay throughout the activity.

Game design researchers (Brown and Cairns 2004; Schønau-Fog 2011) define engagement as an activity or process, the willingness to continue playing. The nature of good (computer) games is to actively engage players into the gameplay activity. Game designers therefore must have a good knowledge of how to design for engaging GX which becomes more complex with location-based AR Games as external parameters intervene in the interaction of players and game system (Jacob and Coelho 2011; Blum et al. 2012). Harteveld (2011. p.203) outlines engagement for serious games as *"the connection between the player and the game."* He refers to the engagement framework from Malone and Lepper (1981; 1987) which defines five elements of engagement – challenge (feedback, goal, outcome), curiosity (sensory or cognitive), control (choice, mastery), fantasy (game world) and interpersonal (social context). These elements are similar to those defined by Bouvier et al. (2014b) for digital games, namely environmental (autonomy towards environment), social (relatedness), self (autonomy towards character) and action (competence, autonomy towards actions) engagement. The elements are based on the self-determination theory from Ryan and Deci (2000). Bouvier et al. (2014b) define engagement as *"the willingness to have emotions, affect, and thoughts directed toward and aroused by the mediated activity in order to achieve a specific objective."* The latter suggests that players' expectations need to be fulfilled in order to experience engagement. As this is not always the case in gameplay, as players can lose and yet remain engaged and willing to defeat the game, this definition has to be treated with care. Also, the authors concentrated on the mental aspect of engagement and the resulting player emotions from gameplay. However, there is also a physical aspect in location-based AR games, which needs to be taken into account, as walking and sensing the surrounding environment is a vital part in pervasive gameplay. Besides, emotions in location-based gameplay are not stimulated by the game itself but by the interaction between players, game and environment.

Therefore, engagement with location-based AR games (LBMARG) in the tourism context can be considered as:

> *a technology-mediated activity in which the tourist freely and actively dedicates mental and physical effort towards a game in order to attain a deeper connection with the environment through playful interactions.*

In this definition, engagement is clearly directed from the player to the environment mediated and supported through the game as a vehicle of playful interactions that connects the virtual with the real world. Gameplay occurs on a psychological level and the willingness to have emotions and sensations as well as on the physical level through behaviour (physical movements). The aim of location-based playful engagement is to enhance local experience and

bring the tourist closer to the visited urban environment.

In this sense, tourism decision makers will be concerned about how to engage tourists in alternative activities or locations (Hayes and MacLeod 2007; Brodie et al. 2011) in order to increase tourist's interest for the location (Scott and Ding 2013), their willingness to learn (Falk et al. 2012), create meaning though travel (Jennings and Weiler 2004; Pattakos 2010), as well as monetary concerns.

Research on the use of mobile technology in tourism has been limited to technology development (Portolan et al. 2011), technology adaption (Höpken et al. 2010), navigation (van Oostendorp and Karanam 2012), information supply (Clarke et al. 2009) or mediation (Tussyadiah and Fesenmaier 2009; Wang et al. 2012). Only latest research shows more interest in creating engagement between the tourist and the visited places applying engaging elements such as creativity, fantasy, feedback, goals, or emotional affect (Ballagas et al. 2008; Ferreira et al. 2012; Ihamäki 2012a; Linaza et al. 2014). However, it is yet unclear how playful experiences in travel and tourism need to be created in order to be engaging. This study contributes to experience research by exploring location-based AR gameplay interventions in order to create engagement between the tourist and the tourism urban environment.

In order to do so, the conceptual framework of defining engagement with technology of O'Brian and Toms (2008) is applied to analyse the stages of playful engagement in urban environments. The theoretical underpinnings of the framework extend beyond usability and include flow, aesthetic, play and information interaction. The framework portrays engagement as a process with a varying level of intensity that can be divided into point of engagement, period of engagement, disengagement and re-engagement. In the first stage the user starts the engagement process out of interest and inner motivation e.g. socially driven with a clear goal in mind. The period of engagement is a process of sensory attention to the technology supported by positive experiences such as enjoyment, fun and physiological arousal. The user loses the sense of time and self-awareness as she becomes engaged fuelled by feedback and the sense of control, key components of flow theory (Csikszentmihalyi 2008). Disengagement is caused by usability errors when the user does not understand how to interact with features. This soon leads to negative effects such as uncertainty, frustration or boredom with the technology. Besides, the experience can also be disturbed by external distractions of the physical environment or time constraints of the user. Positive experiences such as success or accomplishment are also part of disengagement. The research at hand used the theoretical framework of the model to analyse engagement with urban tourism environments mediated by playful technology interventions.

There are a variety of strategies contributing to engaging behaviour and outlined by HCI and game researchers. The attributes of technology engagement are based on the exploratory studies of flow (Csikszentmihalyi 2002), aesthetics (Beardsely 1982), play (Spikol and Mildrad 2008;

Schønau-Fog 2011) and interaction theory (McCarthy and Wright 2004; Hassenzahl and Tractinsky 2006). Emerging from the theoretical underpinnings, engaging experiences are characterised by means of challenge, positive effect, endurance, aesthetic, sensory appeal, attention, feedback, variety/novelty, interactivity and perceived user control (O'Brien and Toms 2008).

Other than information systems, games and playful learning systems focus on narratives, role-playing and social gameplay (Dickey 2005; Harteveld 2011; Schønau-Fog 2011). What is more, Schønau-Fog (2011) added an emotional component as contributing to engagement. Their research focused on the origins of engagement that motivate players to continue gameplay. They identified six types of game engagement – intellectual, physical, sensory, social, narrative, and emotional as part of the player engagement process. An overview of engagement strategies among different (sub-) disciplines of game research is presented in Table 2.

Table 2: Engagement Attributes in HCI and Game Research

HCI *O'Brian and Toms (2008)*	**Playful learning environments** *Dickey (2005)*	**Serious Games** *Harteveld (2010)*	**Game Research** *Schønau-Fog and Bjørner (2012)*
Challenge	Challenging task	Challenge	Intellectual
Variety/novelty	Novelty and variety	Curiosity	n.a.
Feedback	Affirmation of performance	Feedback	n.a.
n.a.	Social gameplay	Interpersonal	Social
Interactivity	Interactive choice	Novelty and variety	n.a.
n.a.	Narratives	Fantasy	Narrative
Specific/experiential goal	Focused goal	n.a.	n.a.
Perceived user control	Protection from initial failure	Control	n.a.
Endurance	Authenticity	n.a.	Physical
Aesthetic and sensory appeal	Clear and compelling standards	n.a.	Sensory
Positive affect	n.a.	n.a.	Emotional

The presented attributes of engagement are used as a basis in the study to explore which criteria contribute towards engaging experiences in location-based AR gameplay. Previous studies (Jegers 2007; Korhonen et al. 2008; Carrigy et al. 2010; McCall et al. 2011) have explored the concepts of immersion, presence or flow for pervasive games and focused on the player experience with the game. What however differentiates this research is the focus on meaning and engagement creation through the mediation of playful interactions.

In this sense, this study combines mediated tourism experiences with playful design in order to connect tourists to destinations and places. It is important to address a holistic approach of game mechanics (goal oriented, feedback, challenge), social interaction as well as creative and explorative design in order to design for engaging and meaningful experiences in travel and tourism. Tourism research (Knudson et al. 1999; Gretzel and Jamal 2009) emphasised the importance of meaning creation for mediated and interpretative tourism experiences. Particularly for children, playful interactions advance their understanding of the locations, cultures and history. Tourist locations have distinctive characteristic values and uniqueness that refer to the historical, structural and ecological nature of the place (genius loci). Interpretation thus helps to understand and mediate this nature using storytelling techniques and playful design where tourists can explore and create their own meaning in a co-creative approach. Experiences are thus self-directed (Boswijk et al. 2012) allowing for individual mediation at any time at the tourists own schedule and pace. Mobile devices provide the technological context by reaching any visitor in an urban tourism context, museum or cultural heritage site. New mobile technologies are ubiquitous and thus easy to apply for tourist mediated playful experiences.

This research is focused on both, the feature-driven elements and moment-by-moment experience, reflecting on the game experience of these games exploring meaningfulness and engagement using location-based AR games. It is a central aspect of the study to explore what the lived experience would be like to play a location-based AR game in a travel and tourism context. As it is still unclear which gameplay elements contribute to engaging and meaningful experiences, there is a need for further exploration. The study contributes to tourism experience design through investigating playfulness.

2.5. Summary

Experience design is a central tropic in tourism and game research. These research disciplines have been always regarded separately, but with the advent of new mobile technology and the increasing usage of mobile devices, these boundaries become blurred. There is a research demand how game design need to be adapted to suit tourists' requirements in order to gain an understanding of playful and engaging experiences. The next chapter reflects on the status quo of LB game design.

3. GAME DESIGN FOR LOCATION-BASED AR GAMES

3.1. Game Design Theory

3.1.1. Introduction to Games and Play

In recent decades, game research became more mature and games are now recognised as a new cultural medium alongside movies and literature (Montola et al. 2009). Parts of this development are new forms of **playfulness** and **gamefulness**. Understanding these notions, one has to go back to Caillois's (1961) concepts of paidia and ludus. Where paidia (play, playfulness, playing and playful design) refers to an explorative, expressive and spontaneous improvisational act, ludus (games, gaming, gamefulness and gameful design) represents a controlled, structured approach governed by rules and goal-orientation. The terms thus define two ends of a continuum in which other approaches are situated. A playful approach for instance combines elements of both and involves deriving playful experiences from everyday things or approaching these things with the attitude of play (Korhonen et al. 2009). Korhonen et al. (2009) established the Playful Experience framework (PLEX) for classifying PX in usability systems that take the spectrum between ludus and paidia into account. In a broader sense, **playfulness** can be understood as 'pleasurable experiences' or 'fun' (Fontijn and Hoonhout 2007). **Gamefulness** or **Gameful design** as an alternative to **gamification** is a complementary but distinct notion to playfulness and serious games and suggests the *"use of game design elements in a non-game context"* (Deterding et al. 2011).

With the advent of mobile devices, gameplay expands over traditional gameplay boundaries by combining the real with virtual world (Mäyrä and Lankoski 2009; Deterding et al. 2011). The pervasiveness or ubiquity of digital devices enables gameplay everywhere and anytime. **Pervasive games** create a new phenomenon of contemporary culture by introducing ludus and paidia into society and public spaces (Montola et al. 2009). The phenomenon is also known as the expansion of the magic circle (Montola 2005; Calleja 2012a). Mobile AR Games, location-based games, alternate reality games and serious pervasive games are parts of the pervasive game family (Deterding et al. 2011). As the name implies, the genre is also associated with ubiquitous games, alternate reality games, location-based/aware games or hybrid reality games. Montola et al. (2009. p.6) characterise these games that have *"one more salient features that expand the contractual magic circle of play spatially, temporally or socially*". De Souza e Silva and Sutko (2009) define pervasive games as *"playful activities that use mobile technologies as interfaces and the physical space as the game board".* Examples of early pervasive games that are set in public space are the *Human Pacman*, *Can You See Me Now?* (published 2001) or *Uncle Roy All Around You* (published 2003) of the Blast Theory (Wilken 2014). More are introduced as best practices in section 3.3.

Drawing on Deterding et al.'s (2011) overview of the ludification of culture, the concepts of games can be differentiated in games/play and whole/parts as poles of a spectrum. Full-fledged games in a non-game context and carriers of learning goals are defined as serious games including simulations, persuasive games, serious pervasive games or health games. Although long established before the introduction of digital entertainment, **serious games** can be understood today as *"interactive computer-based software for one or multiple players to be used in any platform and that has been developed with the intention to be more than entertainment"* (Ratan and Ritterfeld 2009). Game elements (partial games) in a non-game context belong to the concept of gamification, game technology and game practices. However, this study focuses on the playful aspect of whole games and extends them into deeper spheres of society and space.

Within the framework of game and play outlined by Deterding et al. (2011), this research focuses on location-based augmented reality games as whole game systems that have the purpose to mediate and thus inform tourists about the urban tourism environment. Thus, the study clearly distances itself from including forms of gamification or other forms of gameful design, although Deterding et al. (2011) state that "*subjectivity and contextuality in identifying gamification, it is not possible to determine whether a given empirical systems is a Gamified application or a game without taking recourse to either the designer's intention or the user experiences and enactments."* That said, it might be often unclear to distinguish a game from a gamified application, however in this context, two fully-fledged games are the artefact of consideration.

3.1.2. Advancements in Game Design Theory

Game design is a relatively new research discipline, which has only in the last four decades started to develop as an academic field since computer and video games became popular (Aarseth 2003; Järvinen 2007; Eyles and Eglin 2008), starting with the MDA model from Hunicke et al. (2004). So far, there is no overall methodology that can be applied to game design. Instead, existing methodologies from Human Computer Interaction (HCI) and related autonomous disciplines (shown in Figure 6) are adapted to answer questions in game design, to develop design processes of new artefacts (Eyles and Eglin 2008) or to evaluate GX.

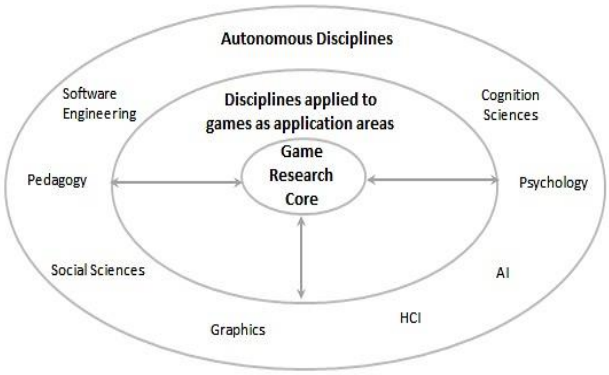


Figure 6: Disciplinary Structure of Game Research
Lindley and Sennersten (2008b, p.262)

Game design researchers (Chang et al. 2011; Nacke and Drachen 2011; Engl and Nacke 2012) argue how to approach game design theory (GDT), as a formal top-down approach might be insufficient for studying GX because this approach does not take account of the player as the central object (Pagulayan et al. 2003). Games are dynamic processes influenced by players' interaction with and reaction to gameplay. They unfold their whole potential in the interaction with human players by allowing them to use their abilities in order to master the gameplay and create individual experiences. The outcome of game consumption is **unpredictable** in comparison to other entertainment media like books and movies as it strictly depends on the individual players' skills and previous experiences (Engl and Nacke 2012).

Seeing games as dynamic processes, which unfold with the players' interaction, game design needs to be approached from the players perspective (bottom-up), which is also congruent with practices in HCI and experience evaluation (Pagulayan et al. 2003; Charles et al. 2005; Köffel et al. 2010).

Game design researchers (Lindley and Sennersten 2008b; Nacke and Drachen 2011; Engl and Nacke 2012; Mirza-Babaei et al. 2013) urge the necessity of a new methodological approach in game design in order to identify what is needed to create an optimal GX. While technology has developed rapidly, game design theory has evolved slowly (Ye and Ye 2004). Lindley and Sennersten (2008b) argue that conventional game design has developed an **implicit** culture that is characterised by isolated design principles but imitates well-established practices that only gradually lead to innovations in order to meet evolving player needs. Design principles and expertise unfold relatively slowly in comparison to the fast development of game media and new technologies. Implicit design approaches, which were comparatively stable and well-established for online games will no longer be suitable for the innovative and fast evolving game culture on mobile devices (Lindley and Sennersten 2008b). Thus, game design research needs to be more advanced to address new user requirements arriving with the technological evolution of mobile game media in order to facilitate engaging mobile GXs (Xiong et al. 2009;

Carrigy et al. 2010; Jacob 2011).

Game design research is also inexperienced in dealing with **special interest groups such as tourists** for location-based AR gaming. Apart from two research projects carried out in location-based (Ballagas et al. 2008) and AR gameplay (Blum et al. 2012), little is known about how to design for tourist requirements taking into account that they might be new to (location-based AR) gaming, have different cultural backgrounds and have time constraints for gameplay (Ballagas et al. 2008; Bryon 2012). Game design researchers (Pagulayan et al. 2003; Harteveld 2011; Mirza-Babaei et al. 2013; Smeddinck et al. 2013) suggest basing new design theories on three different research pillars to design engaging experiences presented in Figure 7. The research pillars can be described as:

1. **Theory Building**: in order to create better design, it is valuable to have an understanding of previous theories to add new aspects when applied in different contexts (Harteveld et al. 2011).

2. **Contextual Game Experience (GX)**: The increasing diversity in which gameplay takes place brings new challenges for game designers, which has to be respected in the design process of location-based AR games. It is essential to understand the context of gameplay and which contextual parameters influence the GX of players to either counteract or emphasise certain game experiences with adequate game mechanics. Yet, little is known about how location-based gameplay is experienced in tourism urban environments (Ballagas et al. 2008; Bryon 2012).

3. **Mobile Game User Research (mGUR*)***: Creswell (2013) describes theory as a general 'orientating lens' through which research can be seen. Mobile GUR combines methods from mobile Human Computer Interaction (HCI), social sciences, ethnography and psychology to improve game design and enhances mobile GX (Pagulayan et al. 2003; Amaya et al. 2008; Bernhaupt 2010; Mirza-Babaei et al. 2013). Mobile GUR is concerned with analysing players' perceptions, behaviour, and emotions occurring during and after the gameplay process in order to inform game design and game theory.

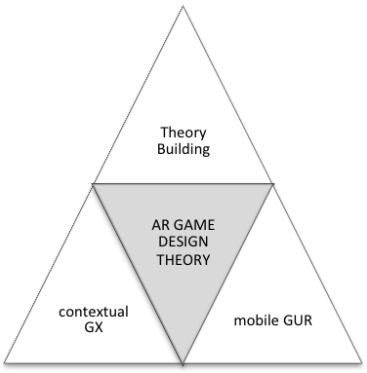


Figure 7: Theoretical Framework of Research Pillars
Harteveld et al. (2011), Pagulayan et al.(2003), Mirza-Babaei et al. (2013) and Smeddinck et al. (2013)

All three approaches are likely to have merit in the development of a new game design theory for location-based AR games for tourism environments owing to the following aspects.

First, mobile game design is set to become more complex with the emergence of new context-aware games into new markets. For the development of high quality mobile games, it is necessary to understand **previous theory** in this area in order to comprehend the status quo in research and develop suitable methods and processes to take innovation further and ensure engaging GXs.

Second, location-based gameplay emerges into new markets and target audiences, which makes common player profiles obsolete. It is necessary to develop an understanding of new player groups such as tourists as well as the different contexts gameplay will be taken with new mobile technologies. In this sense, **context** has to be re-defined for these different settings. Although several researchers (Mäyrä 2007; Xiong et al. 2009) outlined approaches to contextual GX, Engl and Nacke (2012) emphasised the lack of a holistic understanding of mobile GX. In terms of playful interventions, the tourism context is a new and thus sparsely researched area for location-based GXs (Ballagas et al. 2008; Ferreira et al. 2012; Linaza et al. 2014), which needs to be further explored.

Third, as gameplay does not only become mobile but contextual and pervasive, **mobile GUR** methods are needed to evaluate contextual GX in order to fully understand interactions of the gameplay activity. It will be the responsibility of the study to implement new methods in order to create new insights into and create a holistic picture of contextual GX. GUR becomes essential in exploring new user groups and the application of advanced technologies for location-based AR games (Ermi and Mäyrä 2005b).

Researchers (Nacke and Drachen 2011; Engl and Nacke 2012) have argued that models on contextual GX can be differentiated between three different layers of abstraction – the player, the game system and the context. This groundwork of abstracting gameplay interaction layers is

followed as an elementary structure within this study. The study introduced tourism as a new context for gameplay and continues to examine known game design elements for these games and best practices in order to serve the overall aim of creating engaging experiences with urban tourism environments applying location-based AR games.

3.1.3. Mobile Devices as Key Drivers

Traditional game design ideas have long emerged directly from game designers as the only source of successful game creation. But with the increasing complexity of games and the technological evolution, games are no longer played in massively multiplayer online games (MMOG) only addressing a small target group. Instead, these artefacts are attractive to a diverse player group. The growing popularity of mobile devices such as PDAs, smartphones and tablets are key drivers for mobile gameplay (Gentes et al. 2010). The advancements of new technologies such as augmented reality enable a new form of gameplay, which experiences a new popularity with emerging games (Sorrell 2015)

The differences between stationary online games and location-based AR games are outlined in Table 3. Technological advances of integrated Global Positioning Systems (GPS), camera and mobile Internet go parallel with a decreasing size and cost of these devices, which attracts due to affordability and desirability.

Unlike online games, location-based AR games are designed for the real world setting in which player's physical location and movements have a vital impact on the play progress (Grüter et al. 2010; Moore 2011; Calleja 2012a). This changes the relationship between players and game fundamentally (Hinske et al. 2007; Gentes et al. 2010).

Table 3: Features of Online and Mobile Games

Compo -nent	Feature	Online Game	Mobile Game
Game Device	*Environment*	Stationary	Portability, dynamic
	Interaction Elements	Mouse, physical keyboard, joystick, consoles	Touchscreen of smartphones and tablets
	Screen Size	Up to 30"	Normally up to 3.5"
	Visualisation	3D	2D and 3D
	Storage	Between 2-3 GHz 320 GB storage capacity	At most 1 GHz 32 GB storage capacity
	Power	Constantly connected	Short battery life but increasing with new generations

	Network Connectivity	Constantly connected	Varies between network availability and type of network (e.g. Wi-Fi)
	Audio	Dolby surround	High quality audio
	Positioning/ Geolocation	Not possible	GPS, Wi-Fi, IP Address, RFID, NFC, Bluetooth, QR-Code
Game Aesthetics	*Play worlds*	Virtual world (strict-separation)	Virtual and augmented reality
	Use of Locations	Fantasy (virtual) locations	Real locations in the environment (LB)
	Game Artefacts	Virtual artefacts (Game elements)	Virtual and real world artefacts
Player	*Characteristics*	Bartle's player types for MMOGs	Social player Leisure player
	Social interaction	Most anonymous interaction limited to gameplay	Real person-person contact within and outside the gameplay
	Communication	In-game chat voice communication	Natural speech In game-chat
	Real world interaction	No affect on real world	Move and interact in real world
	Motivation	Escape from reality, kill time, challenge	Exploring, socialising, easy fun

Bartle (1996); Kim (2000); Carrigy et al. (2010); Lee and Kim (2011); Lehmann (2011); Engl and Nacke (2012); Feijoo et al. (2012); Thompason et al. (2012)

3.2. Location-based AR Games

3.2.1. Definition, Characteristics and Classification

As presented in the earlier section 3.1.1, location-based and AR games belong to the family of pervasive games that with the notion of new mobile technologies expanded into new spheres of society and space. In order to gain an understanding of these games and specify location-based games (LBGs) further advancements, a definition will help in clarifying the concept. Jacob and Coelho (2011. p.1-2) define LBGs as:

> *"game[s] that uses the player's physical location, usually via a GPS sensor module, as an input or as a base for the generation of the game level or access to location-specific information (such as maps, weather, or location-based services). Due to the connectivity requirements, these games often impose; they are almost exclusively available on mobile platforms."*

It is explicit that LBGs use mobile devices as their medium to bring gameplay outside into the real world and extend the magic circle socially, temporally and locally. Gameplay will thus be made ubiquitous as players can easily enter the game wherever they are and whenever they want. Besides, gameplay will be contextual, using location-based services (LBS) to retrieve information about the location and enhance local gameplay interactions. The virtual game world will create a fusion with the physical world as one three-dimensional playground in which players interact as embodied avatars.

Augmented Reality (AR) games build on this concept and enhance the sense of reality by superimposing virtual content on the perception of real surroundings. AR is registered in 3D and combines virtual objects interactively in real time with the physical environment (Carmigniani et al. 2011). Virtual information is projected in the form of videos or 3D substances. AR can also distinguish parts of the real environment by superimposing them (Azuma 1997). Some researchers (Carmigniani et al. 2011) argue that AR is not limited to virtual images and graphics but could be extended to augmented sound, scent or touch. Nevertheless, these aspects are not objects of this research.

This research is considering AR as part of the Mixed Reality continuum between real and virtual environments as shown in Figure 8 (Milgram et al. 1994). Virtual Reality (VR), as opposed to AR, describes the phenomenon to create an artificial world around the user (Milgram et al. 1994; Weiser 1994) such as introduced by new virtual reality glasses like *Oculus Rift* or *Microsoft HoloLens*.

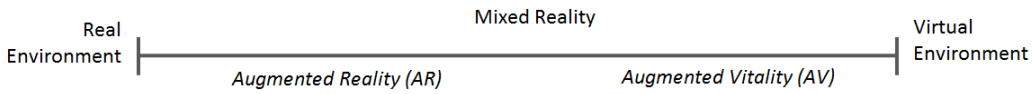


Figure 8: Milgram's (1994) Reality-Virtuality Continuum

The real world in which we live and the virtual world as an artificially created and computer generated pendent, often merge into one with the notion of new mixed-reality technologies. The proportions between the two worlds become dynamic and sometimes hard to distinguish. Considering these realms, three categories of games can be distinguished – traditional games such as board games (real environment), online games (virtual environment) and hybrid reality games (mixed reality).

This study is considering mobile AR Games as the object of research, which are part of the Mixed Reality. Mobile devices with the recent developments of integrated GPS and camera makes these platforms one of the most convenient and accessible for mobile AR gaming (Schmalstieg et al. 2011). Playing in different contexts by using GPS and the built-in camera enables AR games to combine virtual objects with the physical world (Delacruz et al. 2009).

Location-based AR games within the context of urban tourism environments can be defined as:

> *"Location-based AR games can be understood as outdoor games that make use of the player's physical location via the GPS sensor, accelerometer, compass and camera to project virtual 2D and 3D objects in real time onto the device interface in order to facilitate gameplay activities. The player interacts with the virtual and physical game mechanics to overcome artificial challenges and to proceed in the virtual and physical environment (movement)."*

The definition illustrates location-based AR games as symbioses between the real and the virtual world, which combine these worlds on the visual and gameplay level. Visually, reality and virtuality blend into mixed reality with AR annotations. Players experience physical objects enhanced by virtual game objects. Gameplay on the other hand can only progress when players visit physical locations where game challenges are to overcome. Game challenges can be then rewarded physically (e.g. with vouchers or physical artefacts) or with online game rewards.

According to Wetzel et al. (2011) mobile AR games can be distinguished between three categories.

First, a distinction can be made between **stationary and mobile devices**. Whereas the primary is tied to a local place, the latter is not bound to a specific location and thus makes use of the GPS, and the camera to display content on the mobile device screen.

Second, the use of space for content placement can be separated between near and far. The change of player's location changes the content presentation. Figure 9 summarises these separations. Mobile AR games are positioned on the right side of the diagram and separated into two subgroups. While **faux mobile AR games** are played on mobile devices they do not impose on players to physically change the location, **true mobile AR games** make use of the players' location and alter the content presentation accordingly. True Mobile AR Games provide the richest possibilities for game developers to create truly unique GXs by fully utilising the potential of AR (Wetzel et al. 2011).

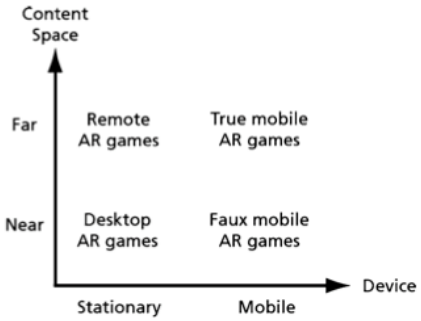


Figure 9: Classification of AR Games based on Device Mobility and Use of Content Space
Wetzel et al. (2011. p.515)

Third, mobile AR games can be separated according to the degree of the semantic coupling between content and location. Depending on the strength of the coupling, these games can be separated into location independent, loosely coupled and location dependent, contextual games presented in Figure 10.

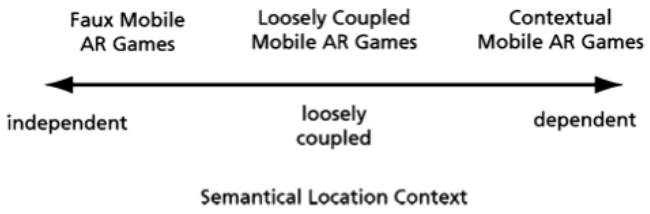


Figure 10: Classification of Mobile AR Games based on their Semantic Location Context
Wetzel et al. (2011. p.515)

- **Location independent AR games** belong to the category of faux mobile AR games. These **loosely coupled** location-based games are designed for large areas and can be played everywhere with very little or without any restrictions as their game mechanics are not closely depended on the location. They thus provide the freedom to be available and playable at all areas with GPS and Internet availability. Examples of loosely coupled mobile AR game are *Haunted Planet Ghost Hunt* (Carrigy et al. 2010) or *Pokémon Go* (Niantic and Nintendo 2016).
- **Location/context aware mobile AR games** on the other hand are deeply rooted in the play location. These games are available and playable in restricted areas. Situated games incorporate the local history of the city, its legends and tales and may also include historical characters or resident groups as virtual avatars in the gameplay (Grüter et al. 2005). An example of a location-aware mobile AR game is *TimeWarp* (Blum et al. 2012).

Contextual mobile AR games have strong connections to the location and its real places following the narrative of the city or an historical trial. These games create true mixed reality experiences, which might be of special interest for tourist destinations (Wetzel et al. 2011). Due to the close relation to the surrounding, these games cannot be transferred to other locations but create true authentic experiences.

The classification of location-based AR games supports the understanding of these game and their divers taxonomies. This research focuses on true mobile AR games location with dependent and independent coupled content. Two concepts of location-based AR games are evaluated and their strength and weaknesses are outlines. Tourists are a diverse target audience and have therefore different requirements. It is therefore important to identify which game approach is more suitable in the context of travel and tourism.

3.2.2. Conceptualisation

In order to be categorised as location-based AR games, the following elements need to be fulfilled (Ejsing-Duun 2011):

- **Players' location and movement**: the player location is the central aspect in these games as the outcome of gameplay depends on the location of the player (de Souza e Silva 2009; Xiong et al. 2009) indicated by location-aware technology such as built-in GPS sensors in the mobile device. The physical location and the movement of players are significant to progress in gameplay as it can only be made by moving through the real environment performing game actions at different locations (Jacob 2011).
- **Contextual gameplay** derives from the player location (Engl and Nacke 2012). As a consequence, game information adapts accordingly. The players' movement in the real world is predestined by the game design, which defines play goals, game rules and game area (Ejsing-Duun 2011).
- **Blend virtual and real world** the players' movement in real space is accompanied by uncertainty and ambiguity as boundaries between virtual and real worlds blur and are not exactly distinguishable for players. Players act in both worlds, which allow them to transform the physical space into the game world as a symbiosis of hybrid intuitive spaces (Ejsing-Duun 2011).
- **Multiple framing** (Goffman 1974) as a conceptual approach can help game designers to structure and understand the multifaceted dimensions of location-based GX (Mäyrä and Lankoski 2009). The mobile device is the window between real and virtual world exclusive to players. The mediation tool provides information, which can be interpreted different in the gameplay or real world. Uncertainty and ambiguity of interpretation is a game design element to call on player's creativity and cultivate meaning from gameplay. For instance, the functionality of litterbins for rubbish is clear in the ordinary world frame. In the game frame, litterbins might be a virtual door to another world. The symphony of the blended frames creates an alteration of GXs (Mäyrä and Lankoski 2009; Ejsing-Duun 2011).

3.2.3. Game Design Elements

Game design is about creating interactive game experiences in which players engage with the games resulting in pleasure, narrative play, exploration, creativity and social collaboration. Players interactions with the game elements and the game mechanics create the individual PX (Lindley et al. 2007; Nacke et al. 2009). Generally game elements are tied to the (virtual) game

world (Benford et al. 2005), but with pervasive games, game elements are exposed in both worlds and players need to negotiate between the worlds in order to master gameplay.

An understanding of game elements categorised by online game researcher (Hunicke et al. 2004; Schell 2008; Crawford 2011) became soon insufficient with the notion of new location-based games (von der Pütten et al. 2012). But what constitutes a good game design for location-based AR games applied in tourism urban environments? According to the concept of playability (Nacke et al. 2009; Goh and Lee 2011), this involves the incorporation of game elements namely game mechanics, game interface design and the interaction between the player and the game. But it also allows incorporating the context of play in order to create **meaningful and engaging gameplay experience** (O'Brien and Toms 2008; Boswijk et al. 2012; Engl and Nacke 2012). This may lead to the question of:

> *Which game elements of location-based AR Games contribute to creating engaging and meaningful experiences in tourism urban environments?* (Objective 2)

The answer depends on the different game genres, purpose of game and interpretation of the game approach (Deterding et al. 2011a). The discussion on every possible game design element for mobile AR Games will exceed the limitations of the report.

Table 4 portrays game design elements, which have been identified from literature as important in mobile AR game design to contribute to engaging player experiences. Table 4 lays the basis for the second objective of the thesis that is to explore the use of location-based AR Gaming to create engaging experiences, as it provides an overview of design elements, which are already successfully applied in games. It needs to be investigated, which **key game design elements** of location-based game design create engagement of tourists with urban environments.

Table 4: Game Design Elements for Location-based AR Games

Game Design Elements	Dimensions	Description	Supporting Literature
Game Mechanics	*Rules*	Rules apply to both physical and digital as they are not exclusively upheld by the mobile device	(Hinske et al. 2007; Chang et al. 2011; Ejsing-Duun 2011)
	Competition	Competing against other players or the game system	(Hinske et al. 2007; Chang et al. 2011; Ejsing-Duun 2011)
	Goals	The aim of the game should be clear to players	(Hinske et al. 2007; Chang et al. 2011; Ejsing-Duun

			2011)
	Outcome	Possibility for players to monitor the score of the game	(Hinske et al. 2007; Chang et al. 2011; Ejsing-Duun 2011)
	Meaningful Decisions	Freedom of players to make decisions anytime	(Hinske et al. 2007; Chang et al. 2011; Ejsing-Duun 2011)
	Instant Feedback	Rewards as feedback for the effort of player's actions helping for task completion	(Hinske et al. 2007; Chang et al. 2011; Ejsing-Duun 2011)
Mobility and Location	*Play Location*	Importance to choose the right setting for gameplay, deliver appropriate content for location, considering topological structure and path of the visit	(Carrigy et al. 2010; Blum et al. 2012; Lombardo and Damiano 2012)
	Physical Movement Patterns	Players movement in the real world can follow four different patterns or a combination of them	(Chang et al. 2011; Lehmann 2011)
	Gameplay Area	Size and shape of the geospatial gameplay area	(Grüter et al. 2005; Bernardes et al. 2008)
	Authenticity	Location as authentic game setting for the story due to particular atmosphere	(Mansfeld et al. 2008; 2011)
	AR Technology	Calibration of virtual objects to match the physical environment and blend both into a hybrid world	(Chang et al. 2011)
Multimedia and Interface Design	*Seamless Design (blending virtual and real world)*	Making sense of and integrating the technological seams through game design	(Chang et al. 2011; Benyon et al. 2013a)
	Sound	There is proof that sound increases the sense of feeling engaged. Moving through the physical world requires attention and thus reading is problematic.	(Carrigy et al. 2010; Paterson et al. 2010)
	Screen Size	Consider screen size and handling	(Chang et al. 2011)
	Network communication	Configuration of Network and Technology (Internet, GPS)	(Benford et al. 2005)
Social Inter-action	*Player Communication*	Social interactions with other players and objects within the real environment	(Sweetser and Wyeth 2005; Chang et al. 2011)
	Single- and Multiplayer	Needs a different approach in game design	(Harteveld and Bekebrede 2011)

	Player Interaction	Interaction between players and non-players as well as to virtual characters	(Sweetser and Wyeth 2005; Harteveld et al. 2011)
Location-based Learning	*Context-aware information*	Integrate rich local information (maps, plans, images, sounds) and match them dynamically to player's location and movement through physical space (availability and suitability)	(Benford et al. 2005; Paay et al. 2008; Jacob et al. 2012)
	Collaborative Learning	Learning in a group environment	(Cavanaugh 2009; Chang et al. 2011)
	Meaningful Outcome	Defining an overarching goal and sub-goals	(Cavanaugh 2009; Parsons et al. 2011)
Location-based Storytelling	*Narrative (Plot)*	Series of incidents made of character's actions and events connected through a causal chain	(Göbel et al. 2010; Lombardo and Damiano 2012)
	Role-Playing (Character)	Embodiment and interaction with virtual characters	(Barbas and Correia 2006; Akkerman et al. 2009)
	Dialogues	Well-balanced dialogues between player and game character supporting information transfer and knowledge	(Amory 2007; Lombardo and Damiano 2012)
	Story Location	Well-chosen locations of gameplay to match the storyline with physical path of the game. Players create own narrative of places according to physical movement pattern	(Carrigy et al. 2010; Lombardo and Damiano 2012; de Souza e Silva 2013)
	Story Form	Story narrative can evolve in a linear, non-linear or modular approach	(Göbel et al. 2010; Lehmann 2011)

Blum et al. (2012) suggest to consider **form, content** and **player characteristics** for a composed game design as these aspects have an impact on player's perceived experience (Lombard and Ditton 1997; Blum et al. 2012). Based on these aspects, Wetzel et al. (2011) created guidelines for mobile AR games (Appendix 1). These elements form the basis for a subsequent evaluation of case studies and lead to modified and extended guidelines for location-based AR Games applied in tourism urban environments.

3.2.4. Game Design Issues

Despite all engaging experiences, there are influences, which have to be taken into account that could harm or have other negative effects on the game experience. These aspects have been pointed out by several researchers in the field and are presented in Table 5. However as no researcher has conducted field research in the travel and tourism context and the fact that

technology is constantly evolving, some issues might become obsolete.

Going out in the real environment to play location-based AR game creates a high degree of uncertainty for the applicant scenario. First, the non-impressionable environment of a city can have negative effect on the game experience (Ballagas et al. 2008; Wetzel et al. 2011). It has to be explored which contextual influences affect the GX in order to suggest solutions where appropriate. Second, player diversity might be big due to the multiplicity of tourists playing these games. Game designers will need to have an understanding of player motivations, interests, and previous game experience (Jacob and Coelho 2011; Lehmann 2011). Finally, the mobile device or game application might be a critical factor for the game experience. Game designers need to be aware of potential problems arising and address them where possible (Wetzel et al. 2011). Table 5 provides an overview of potential issues discussed in related studies of AR and location-based games.

Table 5: Overview of Game Design Issues in location-based AR Games

Area	Item	Description	Literature
Game (Hardware)	*Device Variety*	Diversity of operating systems and mobile devices makes it challenging to optimise game app	(Hall and Anderson 2009; Chen et al. 2013)
	Battery Life	Consumption ends gameplay session	(Lehmann 2011)
	Sensor Accuracy	Inaccuracy or unavailability of Global Positioning System (GPS)	(Lehmann 2011)
	Data Connection	Access might be risky or too expensive	(Jacob 2011)
Game (Software)	*Mobile Game Design*	Gameplay involves physical interaction of players with the real world. Considering where and how players attempt to play. There is a degree of unpredictability	(Jacob and Coelho 2011)
	Game Bugs	There are a number of bugs possibly arising from programming, device variety, operating systems and others	(Yannakakis and Hallam 2008)
In-Game	*No single entry point of control*	Interactions between game system and player can take part on the controlled interface or be extended to real objects	(Dourish 2004)
	Transformed Interface	Sequential interaction requires the players to do things in a chronological order but this does not always make sense in LBMG. In the real environment, players interact physically and may do things that are not planned by the game designer	(Dourish 2004)
	Synchronisation	Synchronising the game world with the physical world and display suitable data on the screen	(Jacob 2011)
	Defining the Game Field	Game can only be played within the rendered physical area the game is designed for	(Jacob and Coelho 2011; Lehmann 2011)
	Multiplayer/	Game should allow single or multiplayer interaction	(Liarokapis 2006)

	Single Player	in the easiest and most natural way	
External Environment	*Passers-by and Crowded Places*	Busy places might not facilitate an engaging gameplay experience.	(Carrigy et al. 2010)
	Noise	High, medium, low noise might influence gameplay.	(Carrigy et al. 2010)
	Traffic	Immersed into gameplay might player forget about real world risks such as traffic	(Carrigy et al. 2010)
	Dynamic Environment	Unpredictability of the environment (road works)	(Jacob and Coelho 2011)
	Weather Conditions	Temperature (high, low) Weather (rainy, sunny, stormy)	(Jacob 2011)
Player	*Target Audience*	Knowing the player audience to optimise game according to expectations and purpose of the game.	(Tychsen and Canossa 2008)
	Player Life	Time of play, tiredness, boredom, Fitness and pace.	(Jacob and Coelho 2011)
	Safety	Risking own safety and that of others by trying to reach a goal in gameplay.	(Jacob 2011)
	Location-based Cheating	Players can alter the game and manually send GPS information to the game server. Emulators can be used to send false GPS data to the system.	(Lehmann 2011)
	Player's Attention	The interaction scheme of the game needs to be simplified that players understand the attention allocation between physical or real world.	(Herbst et al. 2008)
	Social Interaction	Cultural interaction depends on the characteristics of players. Players with different ethnological and cultural background have different ways of reacting and communicating.	(Liarokapis 2006)
	Data Protection	Protection of player's location information and personal data	(Jacob and Coelho 2011)

3.3. Practices and State of the Art

The following studies represent the most relevant and current examples related to the topic of location-based and AR games. Table 6 provides an overview of these studies and the evaluated GX attributes. The games are mostly an offspring of academic research project, which are limited to time and location, however, genuinely valuable to develop an understanding for location-based AR games. Mainly these games, in the context of travel and tourism, draw on the idea of combining entertainment and education outside traditional education settings (Carrigy et al. 2010; Admiraal et al. 2011).

Table 6: Overview of location-based and AR Games relevant for Travel and Tourism

Study	Author	GX Attributes
REXplorer	(Ballagas et al. 2008)	• Attention (Immersion/Participation) • Balance education-entertainment • Non-linear gameplay • Playing in public harms attention • Social play (multi-user)
Viking Ghost Hunt	(Carrigy et al. 2010)	• Interaction and immersion • Player control • Location • Role-play and narrative immersion
Frequency 1550 Medieval Amsterdam	(Huizenga et al. 2007; Akkerman et al. 2009; Huizenga et al. 2009; Admiraal et al. 2011)	• Location-based storytelling • Level of engagement • Mobile learning
Visions of Sarah	(Ejsing-Duun 2011)	• Social interaction • Real-virtual world continuum (player attention)
TimeWarp	(Herbst et al. 2008; Blum et al. 2012; von der Pütten et al. 2012)	• Social presence (virtual and real) • Physical presence • Temporal presence • Spatial presence
Travel Plot Porto	(Ferreira et al. 2012)	• Location based transmedia storytelling
ExCORA	(Linaza et al. 2014; Garcia et al. 2016)	• Explore natural environment • Educating visitors about history • Fun and interactive way to guide tourists
Geocaching	(Boulaire and Hervet 2012; Ihamäki 2012a; Ihamäki 2012b; Neustädter et al. 2013)	• Social interaction
Ojoo	Gamification and LBGs since 2015	• No academic research conducted for these games
Pokémon Go	Commercial LB AR game first published summer 2016 (Niantic and Nintendo 2016)	• No academic research conducted for this game • Published by Niantic Labs Inc. based on Ingress

As with the further development of smartphones, creating engaging experiences with location-based AR games will evolve from a niche to a wider audience. The game design of location-based AR Games is currently experiencing a flourishing interest from game designers and game researchers (Wetzel et al. 2011; Hodson 2013; Linaza et al. 2014). These games emerge in different application areas such as sports and playful training (Yamabe et al. 2011; Yamabe and Nakajima 2012), rehabilitation (Di Loreto et al. 2011) or cultural heritage (Mortara et al. 2013). An overview of AR games and their application is given by Bernardes et al. (2008) or more recent by Wetzel et al. (2011). However, these games are mainly academic research projects and thus terminated.

The first mobile, pervasive game for tourists was the research project **REXplorer** in the city of Regensburg, Germany (Ballagas and Borchers 2005). The aim of the project was to teach young tourists about the history of the city and influence their path through the city. The mobile device consisted of a modified mobile phone combined with a GPS receiver and could be rented from the tourist information centre. The game supported communication via text messages and audio-recorded material, but no Augmented Reality functionalities (Ballagas et al. 2008).

Viking Ghost Hunt is a location-aware Augmented Reality adventure game based on a Gothic ghost story in Dublin. The game is designed as a single-player game in which players take on the role of a paranormal investigator moving around the city chasing ghosts. Outcomes of the study revealed that location-based AR games should support real world interactions and gameplay locations need to be carefully selected for thematic relevance in order to support engaging game experience for players. Atmosphere, aesthetics, safety issues, lack of potential distractions and social context are important to be considered in game design while AR technology supports the creation of a hybrid reality experience (Carrigy et al. 2010). However, testing the game personally, the game narrative was experienced as rather vague and presented in a casebook, which is not an appealing feature to create an exciting experience.

An example of mobile game-based learning has been conducted with the project **Frequency 1550 – Medieval Amsterdam**, a mobile city game placed in the medieval town of Amsterdam in which pupils acquire historical knowledge about the town (Huizenga et al. 2010). The project merged learning contents to situated gameplay and found that pupils are more motived and actively engaged in the learning process by playing the mobile game. Technical constraints limit the study as it has only been carried out by a paper-based version of the game (Huizenga et al. 2010).

A serious location-based game (LBMG) for pupils has been created by Ejsing-Duun (2011) with **Visions of Sarah**. The game is based on a fictional story, which involves authentic, historic content of the city of Odense, Denmark. Game testing has been conducted with players navigating in the physical space (field agent) and others based as home agents giving instructions. The outcome of the study emphasised the importance of LBMGs as mediators between players and the location to create a hybrid intuitive space (Ejsing-Duun 2011).

TimeWarp (Herbst et al. 2008; Blum et al. 2012; von der Pütten et al. 2012) is a location-based AR game concerned with form and content issues impact on players' experience of presence (Lombard et al. 2009). The game is anchored in the city of Cologne, Germany, drawing on famous characters and historical places of the city exploring the boundaries between gaming and physical space. The study focuses on exploring the relationship between presence and game design, analysing realism, city context, narrative, embodiment and interaction.

Travelplot Porto combines storytelling and gaming elements to engage tourists in the UNESCO world-heritage city of Porto. Tourists explore the history, historic characters and most important places along the way to a hidden treasure. The project was concerned with the question if transmedia storytelling can create more engaging experiences for tourists, apart from media use across different social media channels and how willingness tourists are to interact with the story. The study revealed that tourist become more engaged and have more meaningful experiences through storytelling due to released emotions (Ferreira et al. 2012).

A pervasive AR Game called **ExCORA** for San Sebastian, Spain has been developed as a research project in which players are asked to embark on a treasure hunt and discover POIs that are connected to a story. POIs are presented in the game that players explore in a chronological order. Players check into a location by scanning a QR code as a validation that she has been at the location and to unlock the mini-game of the location. After completing the challenge, players are rewarded with virtual points or physical prizes. The game enables social interaction via in-game communication or a leaderboard. The game also uses AR to visualise the POI and enhance the experience between two POIs (Linaza et al. 2014; Garcia et al. 2016).

Despite above discussed research projects, a few augmented reality and location-based games have already successfully entered the mass market. The most established location-based game, **Geocaching,** holds a user group of around 15 million registered accounts worldwide and 2.89 million caches in 185 countries (Geocaching.org 2016). Recent studies (Boulaire and Hervet 2012; Ihamäki 2012a; Ihamäki 2012b; Neustädter et al. 2013) have looked into the impact of the LBG for creative tourism experiences and adventure tourism. Ihamäki (2012a; 2012b) concluded that geocachers are interested in sharing their positive and memorable play experiences and developed guidelines for tourism service developers and decision makers to take new managerial elements of creative tourism into account during service development. They discovered technology and social communities as the main drivers for creative behaviour in tourism.

Ojoo is a recent gamified system or location-based game, which destination management organisations, cultural heritages sites or museums could use for creating their own games. The games support linear and non-linear gameplay and enrich the game content with audio, video, 360° visuals and AR features. Although the games can be classified as contextual AR games, although they can technically be played everywhere when the content for the game is available. The games are adaptable for any location, tourist context and quantity of players. There is no empirical data available giving indication of player experience (Ojoo 2016).

Pokémon Go (Niantic and Nintendo 2016) is the first location-based AR game, which is said to be the killer application for finally commercialising these games. Being released in summer 2016, the game had already 50 million players due to the brand recognition of Pokémon from

the previous Nintendo game, comics and TV shows. The AR game is an offspring of Niantic Labs and Nintendo, in which players are asked to catch Pokémon creatures, train them in a gym and then fight against each other at Pokéstops (Niantic and Nintendo 2016).

Despite some research focusing on location-based and AR games, designers have very little advice on how to design for engaging and meaningful experiences in mixed reality settings, particularly in the context of urban travel and tourism (Benyon et al. 2013b). Wetzel et al. (2011) developed design guidelines for location-based AR games summarised in Appendix 1. Building upon these, the study will propose practical guidelines for location-based AR games in the context of travel and tourism in section 10.4.

3.4. Summary

Location-based AR games have been researched for quite some time with the outcome of having huge potential with a variety of game applications with different purposes. However, the majority of these games are still research projects with limited access to the market. It was only recently that LBGs gained more popularity and expand in new areas. The following section defines contextual parameters that have an influence on gameplay in the travel and tourism context.

4. THE URBAN TOURISM CONTEXT

4.1. Context and Context-Awareness

Schilit et al. (1994) first introduced the term context with their work in which they characterised context as location referring to people, objects and changes to those objects. The authors view context as where and who the player is and what resources are nearby. The most commonly used characterisation of context in HCI is given by Dey and Abowd (1999. p.309) who define context as:

> *"*[…] *any information that can be used to characterize the situation of an entity. An entity is a person, place or object that is considered relevant to the interaction between a user and an application, including the user and application themselves*."

It can be summarised that context is about the situation in which an application is placed. The enumeration of what will be relevant to a situation cannot be absolutely defined as it changes due to the location, people involved and activity. Thus, whether a piece of information is considered as **context** depends on the influence of the particular information on the situation. For instance, information about temperature might not have an effect on outdoor gameplay, but would become significant context-aware information when location-based gameplay cannot be carried out due to dropping temperatures. Dourish (2004) argues that context is non-existent per se, but something might be contextually relevant to an individual. Context cannot be defined in advance but is relevant to a particular setting (where), instances of action (what) and parties of that activity (who).

Game designers need to know for which context to design and which different situations in gameplay may occur, in order to apply and balance game design elements. Knowledge about the gameplay context is fundamental in location-based game design. On the one hand, designed artefacts must suit the anticipated situation and game experiences they are designed for, as gameplay would otherwise be unpleasant and irritating (Dey and Abowd 1999; Grüter 2008). Devices need to be sensitive enough to recognise location change and other parameter, which emerge and become relevant within and by the interaction with the game (Dourish 2004).

4.2. Philosophy of Context

In order to specify the influence of contextual parameters to a game, the game has to be assessed in its natural environment. There is still nonconformity between mobile game researchers (Ballagas et al. 2008; de Souza e Silva and Sutko 2009; Paavilainen et al. 2009a; Engl and Nacke 2012) about the range and impact of context parameters as researchers approach the discussion about context from two different philosophical perspectives (Dourish 2004).

1. **Context as representational** is rooted in the positivist philosophy based on a rational, empirical and scientific tradition (Dourish 2004). The concept of representational context is static and a predefined situation transferable from one entity to another (Grüter 2008). The representational context is a stable situation where information is known (Dourish 2004). Elements might vary between different applications but also between entities of an activity or even in other settings. Context and activity are regarded as two separate phenomena. Whereas context describes the elements in which the activity takes place, the activity happens within a context (Dourish 2004).

2. **Context as interactional** is seen through the lens of phenomenology (Merleau-Ponty 2005). In contrast to the positivist approach, context in interactions depend on the relation between objects and activities which is dynamic and unforeseeable but emerging within and by the interactions of an entity with conditions, persons and environments (Grüter 2008). Which parameter is seen as context and which not depends on its relevance to the activity. Context is particular to each occasion of activity, setting and instance of action (Dourish 2004).

Context relevant parameters for gameplay need to be **individually** identified. Grüter (2008) followed a process-oriented method characterising the game system, players and the play activity as representational context, which is stable and does not change from one play session to another. In the study at hand, context is seen as a highly dynamic variable of location-based GX as its parameters change according to the play situation. In order to understand the change of contextual parameters, the study follows a qualitative approach described in the methodology.

4.3. Framing Context

Exploring location-based game experiences of tourists in the mediated context of urban tourism environments will be a complex endeavour. The interaction between players, game and context is multi-layered as players transcend between virtual and physical boundaries. Thus, game and real boundaries become blurred and intertwined such as by hearing music during the gameplay from a street artist. In order to grasp the complexity of the phenomenon the methodology of **Framing** (Goffman 1974) is used to identify the layers of location-based game experience.

The **Frame Analysis** introduced by Goffman (1974) is as a tool to organise experiences, which becomes central in the experience evaluation of location-based AR games. A frame can be understood as a convention defining situations and consisting of mutual expectations organising experiences and behaviour in relation to specific types of situations and player's subjective involvement in them (Goffman 1974). Frame Analysis emerged as a solution to capture the

wealth of unstructured experiences (Consalvo 2009; Deterding 2009). Playing in an exposed environment such as urban places opens the door to complex multiple and overlapping frames to which players have to adjust. Players may face an information overload of shop advertisement, traffic rules, road-working noise, street music and others while playing in an urban environment. With the frame approach, the world is organised in meaningful cognitive structures, which facilitates the interpretation of diverse information. According to Goffman (1974), the world can be seen in different frames, revising the previous example; 'shopping frame', 'traffic frame', 'road working frame' and 'music frame' (Mäyrä and Lankoski 2009).

The frame approach can also be applied in location-based AR gameplay in which virtual and real worlds merge into one, as represented in Figure 11. Players physically move in the real world but simultaneously progresses in the virtual game world (Paavilainen et al. 2009a). Real artefacts may be part of the virtual gameplay and have a different meaning in the virtual world (Mäyrä and Lankoski 2009). The blending of both worlds makes it difficult for the researcher to evaluate GXs as real and virtual experiences are not strictly separable from each other. Frame analysis brings clarification in this phenomenon.

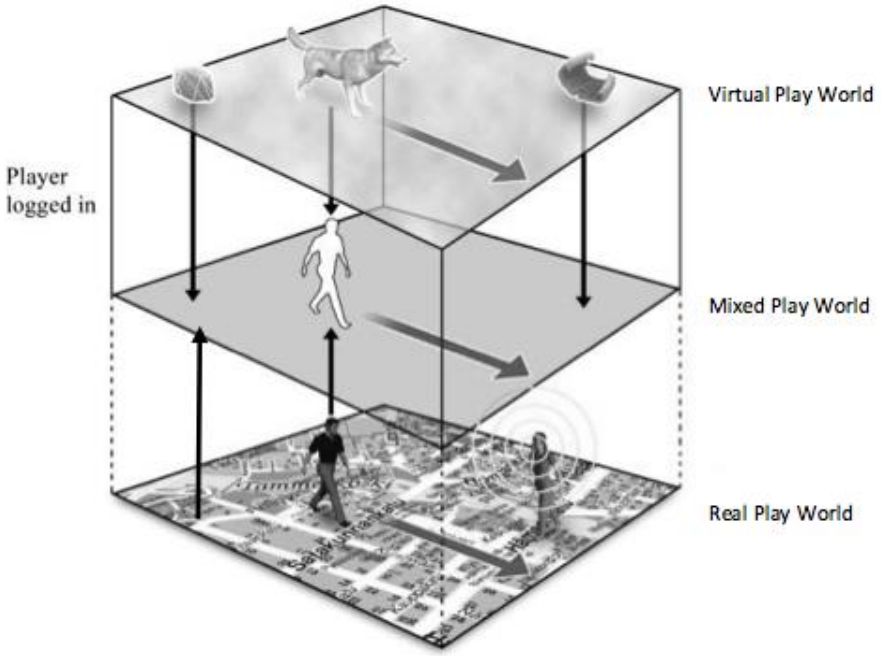


Figure 11: Frame of Game Reality

Lankoski, P, Helio, S., Nummela, K. Lahti, J., Mäyrä, F. & Ermi, L. In: Mäyrä and Lankoski (2009)

Everyday things might get a new meaning in the context of location-based gameplay, which is known as the **liminal interface** based in the player's mind (Nieuwdorp 2005). The liminal interface regulates the semiotic switch between the real and the mixed game world, which can be divided into the paratelic and paraludic.

- The **paratelic interface** disregards rules and conventions of the real world and

implements game rules on top of it, e.g. the mobile device is a magic stick operating as tool for time travelling.

- The **paraludic interface** allows players to act according to the game conventions, which exist in the domain of the virtual world, e.g. time travelling and communicating to different time spheres.

In location-based gameplay, players often have to suspend their disbelief and prior knowledge about the real world to fully engage with the game world and its own conventions. Players shift between the game and real world frame (Nieuwdorp 2005. p.89) by adopting a lose attitude that allows them to accept game rules, real world rules and to mediate between them. In other words, gameplay takes part outside the game application and becomes pervasive in form of the physical artefacts, which create a new meaning in gameplay. A church is a church in the real world, where people worship, but in the game world, this may change to a portal that has strategic meaning for the game. As a consequence, the player may translate game information onto the environment and thus create meaning for the gameplay (Nieuwdorp 2005).

4.4. Contextual Parameters

As opposed to online gaming, location-based games use the built-in GPS sensor, which allows receiving geo-referenced data on the game application essential for gameplay interactions and progress as these games use mobile positioning for level advancements. Moving in the game world means physical movement of players in the real world in order to progress gameplay (Paavilainen et al. 2009a).

The change of the environment and the synchronous modification within the game application are known as **context-awareness** and comprise of collecting, processing, and managing context data. Context-awareness simultaneously adapts accordingly to the location (Schilit et al. 1994) and is closely connected to **context-sensitivity** and **mobile positioning** which provide important aspects for mobile gameplay such as communication between players, territory mapping, player mobility and internet connection (de Souza e Silva and Sutko 2009). The three most important aspects of context-awareness agreed by researchers (Schilit et al. 1994; Brown et al. 1997; Dey 2001) are:

- Where are you? - Player's location
- Who are you with? - Social Play
- What resources do you have? - Device

Contextual parameters however are equally important in the area of tourism and games concerning location-based systems (LBSs) for tourist applications or location-based gameplay. Context plays a crucial role for tourism organisations as an information facilitator and

distributor in order to provide context-relevant data for tourism services (Lamsfus et al. 2010). Due to the wealth of information that is available for a tourist on-site, it is vital to define contextual parameters in order to present only most relevant information on mobile services. However, tourism researchers (Tan et al. 2009; Lamsfus et al. 2013) agree that there is **no consensual understanding of context in tourism**, as different definitions exist mainly borrowed from HCI (Schilit et al. 1994; Dey and Abowd 1999; Christensen et al. 2006).

Thus, researchers (Chevrest et al. 2002; Paavilainen et al. 2009a; Tan et al. 2009; Engl and Nacke 2012) in both fields are concerned in defining what context means in their application field and came to similar but also distinguishing parameters presented as an overview in Appendix 2. In order to understand context in the field of location-based AR games in travel and tourism, the proposed contextual parameters in tourism and gaming are discussed in the following.

Both fields (Tan et al. 2009; Engl and Nacke 2012) have a consensus on the parameters of **time, location, environment,** and **social**. Besides, game researchers (Engl and Nacke 2012) suggest to extend the proposed basic parameters by players' identity and psychological background.

In the following the contextual parameters are introduced and discussed in gameplay and tourism. They build an elementary part in the theoretical framework of the thesis in which the influence of contextual parameters on the experience of tourist playing a location-based AR games are explored. This addresses the fourth research objective of the thesis.

The symbioses of contextual parameters for tourism and games studies can be summarised as presented in Figure 12.

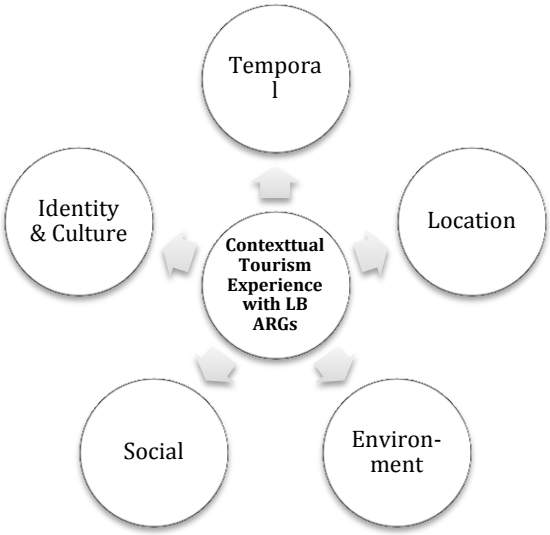


Figure 12: Contextual Parameters for Tourism Experience with LBGs

de Souza e Silva (2009), Paavilainen (2009), Ballagas et al. (2008), Engl and Nacke (2012) and Tan et al. (2009)

Temporal

In the context of game and tourism research, time is part of the contextual parameters. It was found that some sub-parameters of time are similar in both disciplines. First, the time of day may have an influence on the mobile player experience as in the morning players might be more awake for gameplay than in the evening or vice versa. Second, playing during daytime or night as well as different year seasons might impact the GX (Tan et al. 2009; Carrigy et al. 2010; Wetzel et al. 2011). Relevant in gameplay, the available time period might be an issue, as players might not have the time to play a four-hour game (Engl and Nacke 2012), particularly when they are travelling. Also, in the spatio-temporal context, there might be timely limited events or activities hindering gameplay at a particular location (Cheverst et al. 2002; Tan et al. 2009).

Locational

In LBMGs, designers cannot shape play locations how they would like to, as physical places are primarily public. LBMGs are unique in the way they relate to physical places and combine the virtual and the real world (Ejsing-Duun 2011). Tourism research refers to location as the physical position of the tourist and nearby tourist attractions, as well as distance between locations and travel direction (Tan et al. 2009). The physical embodiment of players to a location provides means of interaction in the virtual and real world. This means that not only the current location is concerned but also surrounding locations and the space between them. Ejsing-Duun (2011) distinguishes between space and place in a sense that places are meaningful for people such as a game location is as gameplay takes place there. The surrounding area is just the insignificant space between locations. Spatiality describes this relationship between space and place as well as between digital and the mediated (physical) places that provide meaning with gameplay. The spatial parameter defines the physical environment in which players are moving while playing. This involves the play space, body position of players, and distance/proximity (Paavilainen et al. 2009a).

Environmental

Dey and Abowd (1999) define environment as another synonym for context. Environment, however, is the physical space in which players interact with the game and thus the direct player surrounding (Engl and Nacke 2012). The authors include in the environmental parameter weather, lighting conditions, noise level, available space for gameplay, and seating availability. Paavilainen et al. (2009a) particularly focused on weather as an environmental parameter and its influence during pervasive games. The tourism perspective on the other hand, despite

encompassing weather, was concerned with traffic and road conditions (Tan et al. 2009). Eventually, environmental parameters shape the atmosphere of a place and influence how players experiencing a place or destination. The mood of a place involves players emotionally by holding mental and emotional qualities. The atmosphere of a place has an impact on players' mood and can be directed into positive or negative moods (Böhme 1995) depending on the purpose of the game.

Social

The social parameter defines the relationship of players to their peer group and the role of players in the social environment. This involves situational and spontaneous relationships with other players and non-players (e.g. bystanders) but also includes known and unknown players. The social parameter requires the presence of other (non-) players sharing the same game environment (de Souza e Silva 2009). Players might also feel socially connected to the virtual avatar of the game (Yan and Cordry 2011; Martinez-Reyes and Hern'ndez-Santana 2012). In tourism, social context also refers to travel companions, in these case potential co-players. This also includes groups around the traveller, know or unknown (Cheverst et al. 2002).

Identity

In tourism, location-based data can vary based on the user's profile or identity, such as interest, language or duration of stay (Tan et al. 2009). But game studies see the larger society where gameplay takes place and incorporates cultural aspects such as player's habits, trends, implicit rules, and the ethical issue of cultural acceptance of the game in the society. Thus, as tourists come from different cultural background, the GX might be different for every player as they put a diverse meaning in the gameplay and interpret things different. Many implicit rules have to be interpreted for the gameplay regarding habits, fashion, trends and cultural values. Gameplay might be inappropriate in a certain situation for some cultural groups (Engl and Nacke 2012).

Engl and Nacke (2012), however, proposed an additional contextual parameter of psychological influence. But at this involves player motivation, previous game experience, and expectations and thus personal player characteristics, the psychological parameter is not considered as a part of context.

4.5. Summary

As presented in the literature review, research on location-based AR games is a young research discipline. Although some research has been conducted to understand the concept of experience design in LBGs covering social interaction (Ejsing-Duun 2011; Ihamäki 2012; Guenjens et al. 2013), game design concepts (Ballagas et al. 2008; Herbst et al. 2008; Carrigy et al. 2010;

McCall et al. 2011) or storytelling (Huizenga et al. 2009; Naliuka et al. 2010; Ferreira et al. 2012), it is still not clear how these games need to be designed in the context of tourism mediation.

But as location-based AR games are used in different play contexts with multiple purposes, we need to develop an understanding how these games need to be developed to create engagement between players, the game and the environment. Not much is known about how location-based AR games need to be designed for travel and tourism, what motives tourists to play or how engagement with the location can be created. The following section introduces the methodological approach of the study with the philosophical stance and applied research methods.

CHAPTER: METHODOLOGICAL APPROACH

5. METHODOLOGY

5.1. Philosophical Approach on Experience Design

5.1.1. Theoretical Perspectives

"*When discussing anything in the world we are taking a view of the world. Any knowledge that we have is dependent on this view of the world […]*" (Eyles and Eglin 2008. p.274). Philosophical worldviews (Lincoln and Guba 1995) or assumptions provide the foundation of how new knowledge is developed and thus shapes the process of the research inquiry. Before conducting an inquiry, the nature of reality (ontology) has to be considered as well as the nature of the potential created knowledge (epistemology). These stances inform the further methodological approach of the inquiry and the incorporated methods (Creswell and Clark 2011).

The analysis of game experience (GX) for location-based AR games in tourism urban contexts can be approached by the researcher from a social sciences, HCI or (game) design perspective. None of the fields gives preferentiality to a specific philosophical worldview, but foster discussions.

5.1.2. Philosophical Worldviews

In Social Sciences

The main worldviews applied in the social sciences are discussed by Guba and Lincoln (1995) and Creswell and Clark (2011). Referring to the questions how the world can be seen and what can be known about it, social sciences distinguish between five worldviews (metaphysics or beliefs). **Positivism**, also known as naïve realism, considers nature as being real which can be tested by hypothesis (objective) and summarised in time- and context-free generalisations. Arisen from this worldview is **post-positivism** which assumes that reality only exists imperfectly and apprehensible as human agency has to be taken into account and thus dualism of the former positivism is abandoned. Both worldviews tend to demand a quantitative, deductive methodology. **Constructivism**, on the other hand, allows the existence of more than one reality as reality is seen as a mental construct formed by individuals and their subjective nature. Although elements of the personal understanding of reality can be shared through language, constructivism does not follow one truth. Research is shaped from the 'bottom-up' with the aim of theory generation (inductive). The distinction between ontology and epistemology disappears within constructivism as the researcher is interactively linked with the

object of investigation and the data collected. Constructivism is associated with a qualitative methodology (Lincoln and Guba 1995). **Pragmatism,** on the other hand, does not follow a clear ontological ideology but allows choosing the knowledge, language, concepts and science that are most suitable for practical use and rejects unpractical knowledge. Due to its flexible nature, pragmatism is often applied in a mixed methods approach (Creswell and Clark 2011). Pragmatist researchers focus on the 'what' and 'how' of the research problem. The pragmatic paradigm places "the research problem" as central and applies all approaches to understand the problem. Thus, data collection and analysis methods are chosen as those most likely to provide insights into the question with no philosophical loyalty to any alternative paradigm (Creswell 2013. p.11).

In HCI

McCarthy and Wright (2004) argue for a **pragmatic approach** within the complex and changing relationship of user-technology interaction. Pragmatism embraces the primacy of human action, practicality of human involvement, materiality of the world, interaction of senses and formative power of technology. Applying pragmatism in HCI allows clarification of basic aspects of user's felt experience with technology. According to Dewey (1934), experience is a personal construct expanding user's behaviour, knowledge and feelings. As a more practical oriented philosophy, pragmatism supports the notion of a user-centred design (UCD) methodology (Pagulayan et al. 2003; Fullerton 2008). Both approaches focus on users and their experiences by employing qualitative and quantitative evaluation methods in an iterative process to eventually inform the design of technology.

In the Encyclopaedia of HCI, Svanaes (2013) introduced the **Philosophy of Interaction** drawn on Heidegger's (1996) philosophy of *being* and Merleau-Ponty's (2005) *interaction of perception*. Whereas Heidegger provides the interpretation of technology in context, Merleau-Ponty (2005) describes that experience with technology is formed through interaction. Humans experience technology different depending on the cognitive senses. Besides, personal background, experiences and habits shape the way of interaction in the world. For game design, this means that not only the user-interface (look) is important, but also haptic characteristics (feel) of a mobile device.

In Game Design

Game design (Crawford 2003; Bates 2004; Adams 2010) and game user researchers (Bernhaupt 2010; Desurvire and El-Nasr 2013; Mirza-Babaei et al. 2013) are not concerned about approaching game experience (GX) with a particular philosophical worldview, which might be due to the nature of researchers grounded in technology. According to Beccari and Oliveira

(2011), philosophy of design follows a **post-positivist** approach presented by Kuhn (2012) and Popper (2005). Although, numerous game design researchers (Desurvire et al. 2004; de Kort et al. 2007; El-Nasr et al. 2013b) seem to follow this path, in regards to exploring experiences, this perspective is regarded as rather unsuitable as it is believed that experiences are personally constructed and thus not quantifiable. However, discussions of developing and applying suitable methods to understand GX and game design continue (Eyles and Eglin 2008; Grüter 2008; Bernhaupt 2010).

Eyles and Eglin (2008) proposed **critical realism** based on Bhaskar (1978) in which reality is described as three overlapping domains: real, actual, and empirical. Meaning, game mechanisms (real) create game events (actual) that are perceived as GXs (empirical). Avatar-player interactions take place in the virtual game world (computer) and are thus transparent by the user interface (UI), which projects the experienced events into the players' minds. This changes with location-based AR games where players are the embodied avatar, moving in the real environment and interacting with real and virtual objects and persons. Experiences are shaped by the external incidents and interaction between the player and the real world. Players do directly express their feelings and emotions towards an object or a person by interacting or withdrawing from it.

In critical realism, the researcher has knowledge of the player's physical body and the game, but can only anticipate the inside of the player's mind. Though the researcher constructs a model of what the player might think and feel, consequently the experience of players of the same game event in time and space varies. That is why Schell (2008) argues that there is only the reality which can be known of experiences that is not the real reality, as it is interpretable, personal and subjective. We filter reality through our senses, minds and consciousness which is an entity of illusion, making it real for ourselves but not for everybody else. The designed experience thus can be perceived as real and meaningful for one player but not for another.

5.1.3. Adopted Philosophical Stance

Derived from the above discussions in the related research fields, exploring the experience of tourists with location-based AR games follows two complementary and successive positions. First, conducting research on experiences involves developing an in-depth understanding of how participants, as the central object of study, perceive and interact with objects in the virtual and contextual environment. The research study aims to understand which contextual aspects impact the experience and which game elements engage players with the physical environment. Knowledge and insights are derived from participants' personal experiences. These are thus created as individual constructs in order to gain an understanding of these experiences.

The study therefore follows an **interpretivist** approach described by Goldkuhl (2012), which believes that reality as we know it is a mental construct based on personal experiences and the context in which the experiences have been made. In regards to this study, the participants have been invited for a field study in which a game was tested at different locations and times. Knowledge emerges out of experiences based on human senses. Participants interact with the game, the environment and people around them and thus make individual experiences, which they interpret based on their worldview, previous experiences and the situation. Thus, there are multiple realities inherited by the person, time, place, interest and personal interpretations of it. As a researcher, one can only collect data in a form of stories and interpretations, which needs to be considered as the relative and situational truth. The researcher forms a picture of multiple realities in which some elements might be shared between participants as they have similar experiences, and other elements of this experience hugely differ. It is then to the researcher to make meaning of the multiple interpretations, which are often apprehensible, conflicting and altered. This is an emergent, collaborative approach without true or false but a reality based of the made experience. The knower cannot be separated from what it is known (Goldkuhl 2012). Interpretivism goes along with game research, which acknowledges individually created experience (Björk et al. 2002; Aarseth 2003; Engl and Nacke 2012). Game experiences are multiple and specific constructed viewings of the play 'reality' (Huizenga et al. 2009). The notion of the ontology is thus relative, as it changes from each player and play session.

The gained knowledge of made experiences will inform location based game design for urban tourism applications in a second step and will therefore be based on practice-oriented research in design (Bleijenbergh et al. 2011; Tussyadiah 2014). Through the primacy of human action and interaction between players and the game system, research takes on a **pragmatic** view in which research informs design for the purpose of technology improvement (McCarthy and Wright 2004). This goes along with the user centred design approach introduced by researchers in game design, HCI and tourism (Pagulayan et al. 2003; Tussyadiah 2014). Verschuren (2009) claims that knowledge should not only be gathered for its own sake but for the goal to improve society and in this case technology. Practice-oriented research currently experiences hype with design thinking and human-centred design (Brown 2008).

Both stances are combined with each other in a sense that **interpretivism is seen as instrumental for pragmatism**. There are several studies (Braa and Vidgen 1999; Goldkuhl 2012) on how interpretivism can be combined with intervention research. Even though this research does not follow the whole design intervention cycle (Brown 2008), it provides inducement for following up the design cycle in order to improve game design for these games and meet tourist requirements. In this sense, interpretivism is used as the base paradigm allowing elements of pragmatism to be used in an instrumental way in the epistemology.

5.1.4. The Role of the Researcher

When undertaking qualitative research, the role of the researcher should be clearly defined due to two reasons; first, informing the reader about previous experiences in the wider research context and second, positioning the role of the researcher in the process of data collection and interpretation applying an interpretative perspective.

Having conducted research in mobile tourism before, the study at hand can be seen as an extension of my previous research interest, but cannot be compared in regards to the methodological approach. My undergraduate research applied a mixed methods approach to evaluate the adoption of mobile technologies in hiking and cycling tourism in German speaking countries (Weber and Schegg 2010), conducting expert interviews with tourism and technology decision makers and an online survey among tourists. Further postgraduate studies were concerned with future application of Near Field Communication (NFC) for tourism destinations and used scenario techniques based on expert interviews. Conduction research in a contextual urban play field is therefore a new terrain for the researcher, especially in regards to mobile game research.

Drawing on interpretivism as a philosophical stance of this research, data collection was based on individual reflections of player experiences conveyed through stories. The applied interpretative stance aims generally for an understanding (Goldkuhl 2012) of location-based gameplay experiences in the context of travel and tourism, which then informs game design to promote change (pragmatism). Both paradigms, however, share the vision of understanding and complement each other as interpretative research broadens the focus to what people actually do and pragmatism opens up to what people actually think (Goldkuhl 2012).

Having occasionally played 'Geocaching' since 2010, this grew and expanded to other location-based and mobile games with the start of the research project. I began playing location-based and mobile games in order to gain a feeling for mobile usability, navigation, storytelling, game mechanics and structure. I also played with other researchers who were more experienced in this type of games to gain an understanding of mobile game user research (mGUR) and particularities in location-based gaming.

For the data collection it was aimed to take a more *etic* view as apposed to an *emic*, participative approach where the researcher takes fully part in the game experience such as described by Mayrs (2009) or Karppi & Sotamaa (2011) and outlined in Appendix 3. However, although aiming for an outside objective view, there were moments, especially during the introduction where the researcher was an insider explaining the game to the participants. Also based on the previous experience this role might have influenced research participants as not much introduction into the games was given, although sometimes needed by the novice players. The

same applies to the data analysis and interpretation. With the pre-knowledge of the researcher, a pure objective view could not be always achieved due to individual interpretations, the use of language and own player experience (Punch 1998).

5.2. Mobile Game User Research (mGUR)

5.2.1. Introduction

Studying game experiences of location-based AR games is not an easy endeavour according to Waern et al. (2009a) due to the nature of these games using the physical environment. There are many different factors that have to be taken into account as they shape the notion of player experiences. Gameplay does not take place in a controlled lab in which influences can be controlled and eliminated. However, the beauty and likewise the challenge of mobile game user research (mGUR) is that players and game are analysed in their natural environment. This requires the application of new and appropriate methods in order to explore the subjective and individual PX and gain a holistic picture of its nature (Waern et al. 2009a; Stenros et al. 2012)

Games have been studied since the 1980th and many studies show that there is a trend going beyond classic usability (Federoff 2002; Desurvire et al. 2004; Korhonen and Koivisto 2006; Desurvire and Wiberg 2009) and more towards game experience research (Engl and Nacke 2012; Lankoski 2012; Stenros et al. 2012; Mirza-Babaei et al. 2013). The practice of mGUR is an emerging field, which combines mobile HCI and game development aiming to improve game research methods and game analysis (Mirza-Babaei et al. 2013). MGUR administers user-centred research methods within a game design environment to evaluate **player-game interaction** with the objective of using the results to improve the game, user experience and/or the game design process (Amaya et al. 2008; El-Nasr et al. 2013a; Smeddinck et al. 2013). Within the bigger picture of the research, mGUR provides the tools and methods to conduct game research considering the specifications of the mobile game context.

As game industry matures, there is a need to develop scientific methodologies to meet evolving player requirements according to innovative technological changes (Fallman 2003; Nacke and Drachen 2011). Theory building includes the adaptation of new concepts, heuristics and methods to justify specific design choices (Lindley and Sennersten 2008b; Desurvire and Wiberg 2009; Gielkens 2011).

An **iterative design approach** has been proven useful for complex processes such as the development of products and technology, as well as for the evaluation of user's emotional experiences incorporating usability and UX aspects (Chen and Su 2010; Pallot et al. 2010). Within game design, iterative design unfolds new game ideas that will not necessarily appeal to game designers designing for diverse contexts. Game design is a complex task, which requires

information other than from the game designer's perspective (Ermi and Mäyrä 2005b).

Player requirements are diverse. Incorporating players into the game design process will provide an understanding of the target audience, as there is still an insufficient knowledge of player types (Huizenga et al. 2007; Korhonen et al. 2008; Nacke and Drachen 2011; Sedano 2012). Tourists have not been considered as a target audience for location-based game design apart from a few recent studies (Ballagas et al. 2008; Ihamäki 2012a; Xu et al. 2013; Garcia et al. 2016).

A high-level design theory needs to integrate **different contexts** (Lindley and Sennersten 2008b). As outlined in the previous chapters, various parameters influence mobile location-based gameplay, which need to be considered with mGUR methods (Pallot et al. 2010).

5.2.2. Methodological Approach

The design research approach of this study follows an **integrative approach** that explores user experiences in order to inform or renew the design of mobile game systems. Integrative research aims for iterations in the design cycle by continuously testing and feeding back the testing outcome from experience evaluations. According to Tussyadiah (2014) tourism design research (TDR) frames the fundamentals for tourism experience research design, which is grounded in a multi disciplinary notion of human-centred design (HCD), iterative design process and holistic experience concept. Designing *for* experiences requires the conceptualisation of experience in the intersection of HCD and holistic experience concept through **naturalistic inquiry** that gathers information about user behaviour, emotions and thoughts in a natural experience setting and real use situation. In order to serve the qualitative form of the research inquiry, several immersive design research tools are applied that involve interactions between the researcher and the participant through observations, mobile interviews, among others in a real use situation. The inquiry has an explorative character into alterations of individual player experiences and the changing context during mobile gameplay (Randall and Rouncefield 2013). A qualitative approach is found to serve a deep understanding of this phenomenon and its broader contextual relations in which it emerges (Marsland et al. 2000; Grüter 2008).

Previous research shows a mainly qualitative methodological approach evaluating mobile GX for location-based and mobile AR games. The applied methods range from Grounded Theory (Strauss and Corbin 1998) to Mixed Methods (Creswell and Clark 2011).

Table 7: Methods used in Previous Studies for Mobile AR Game Experience Evaluation

Study	Author	Publication Year	Research Strategy	Research Methods	Study Participants
REXplorer	Ballagas and Borchers; Ballagas et al.	2005-2008	Qualitative	Grounded Theory (Observations)	Tourism
Time Warp	Herbst et al.; Blum et al.; von der Pütten et al.	2008-2012	Mixed Method	Observations Video Interviews Questionnaires	IT-Students
Viking Ghost Hunt	Carrigy et al.	2010	Qualitative	Post-game Qualitative Survey	Students
Visions of Sarah	Ejsing-Duun	2011	Qualitative	Observations Interviews Experience as Player and Designer	Students

The study at hand applies a combination of research methods in a *qualitative mixed methods triangulation* to ensure "corroborating evidence" (Ely et al. 1991; Lincoln and Guba 1995; Creswell 2013) for a holistic understanding of contextual GX in tourism urban environments (Stenros 2012). Every GX is individual and subjective and thus best evaluated by a combination of complementary qualitative methods (Hoonhout 2008; Vermeeren et al. 2010). Several game researchers (Eyles and Eglin 2008; Grüter 2008; Mendenhall et al. 2012) support the argumentation of applying qualitative methods to explore the gameplay context and player-game interactions in mobile urban environments and provide the following reasons:

(1) **Triangulation of methods:** The triangulation of methods allows reflecting on mobile GX from different perspectives. Self-reported player experiences are explored from the I-perspective of players e.g. with mobile interviews (Vermeeren et al. 2010). The triangulation of methods is matched to provide additional proof and credibility (Creswell 2013). Data from different sources allows for comparison and provides a sensible understanding of the research phenomenon.

(2) **Capturing contextual game experience:** Bargas-Avila and Hornebeak (2011) reveal that half of HCI studies use qualitative methods to evaluate user experiences. Qualitative methods however, are also common tools to capture experiences in mobile technology studies (Rogers et al. 2007) and mobile game research in order to understand context and interaction of gameplay (Stenros et al. 2012).

(3) **Deductive and inductive reasoning:** While, acknowledging previous research (Wetzel et al. 2011; Engl and Nacke 2012), the study uses inductive reasoning to allow the development of emerging patterns from research. Novel insights of mobile GX may arise from an open evaluation (Vermeeren et al. 2010).

(4) **Process- and outcome-orientated methods***:* GX unfolds during the activity of gameplay and is simultaneously outcome of the game as it leaves players with emotions, experiences and memories. Evaluating mobile GX means evaluating experiences during the process activity and as end product (Calvillo-Gámez et al. 2010). The study combines observational methods such as game logs and observations that are complemented by outcome-oriented methods like semi-structured interviews (Stenros et al. 2012; Winckler et al. 2013).

(5) **Verbal and non-verbal methods:** Both methods have successfully been used in game experience research (Bernhaupt 2010; El-Nasr et al. 2013b). Although the vast majority of game researchers use verbal measures, as their strength lies in the validity and applicability for most mediated experience. Limitations are biased outcomes due to personal player statements (Sadowsky and Stanney 2002). Non-verbal measures, on the other hand, are not commonly used in qualitative game research (van Baren and IJsselsteijn 2004) but are valuable to reflect the psychological state of player emotions (Nacke et al. 2010b). Verbal in-game methods (e.g. think-aloud) are accompanied by non-verbal observations to reflect if imparted experiences match the emotional state of players (Hoonhout 2008; Vermeeren et al. 2010).

(6) **Lab and field-based methods:** Studies on UX show that most evaluation methods can only be used in one location at a time (Vermeeren et al. 2010). This might be either in a lab-environment (e.g. psychophysiological methods) or natural setting (e.g. contextual inquiry). According to the nature of location-based AR games, GX can only be evaluated in their natural environment as related studies show (Brown et al. 2011; Takatalo et al. 2011; Wetzel et al. 2011; Smeddinck et al. 2013). Research has to be conducted in their natural environment for location-based games; this makes the evaluation harder as the equipment such as diaries, interview guides, audio-recorder has to be taken around.

Using different types of data collection methods has also its disadvantages. As Vermeeren (2010) et al. pointed out the more data is collected the more needs to be analysed, which requires time, resources and skills from the researcher. Besides, collecting data with various methods means more work for participants who might feel overwhelmed and exhausted in the length and depth of the inquiry. Last, it might be a challenge for the researcher to consolidate all the data from different sources and draw holistic conclusions.

5.2.3. Applied Methods

Studying and evaluating location-based AR game experiences (GXs) is a complex endeavour, as it comprises of several methodological issues concerning the selection of appropriate evaluation

methods and research approaches. As de Sá et al. (2008) stated, there is a need for novel concepts and methods to evaluate mobile GX. Game researchers draw on a variety of research methods from HCI (Nielsen 1993; Hassenzahl 2003; El-Nasr et al. 2013b), game design (Desurvire et al. 2004; Bernhaupt 2010; Stenros et al. 2012) and social sciences (Berg 2007), which reach from classical interview and observational methods (explicit) to creative tools (e.g. flow charts, diaries, 3D models). The latter provides a more implicit knowledge of how players feel and dream (Sanders 2002). With the tools at hand, game researchers need to pervade the complex nature of mobile GX. A number of mobile GX models help unravel the complexity of this phenomenon and separate the experiences into different frames (Goffman 1974; Deterding 2009). According to Chang et al. (2011) and Engl and Nacke (2012), mobile GX can be divided into three methodological frames **system experience, individual player experience** and **location-based experience**. The separation makes it easier for the game researcher to find the most suitable evaluation method or a combination to best to serve the research purpose (Nacke et al. 2010a; Vermeeren et al. 2010; Mayer et al. 2013). Table 8 presents an overview of the most common research methods applied to analyse and explore the methodological frames. The following chapters justify the choice of research methods, which were applied in this study and found to best provide knowledge in the methodological frames.

Table 8: Evaluation Methods for GX Frames

Objective	Description	Commonly used Methods	Authors in the Field
Game Elements (Objective 2)	Ensuring the quality of the system regarding usability	Functional testing Usability testing Unit testing Compatibility testing	(Nielsen 1993, 1994; Desurvire et al. 2004; Soomro et al. 2012)
Contextual Parameters (Objective 3)	Studying players in their natural environment focusing on contextual parameters influencing the mobile GX	Contextual Design Observation methods Ethnography	(Aarseth 2003; Engl and Nacke 2012)
Individual Player Experience (Objective 4)	Exploring the Testing the reflections and effects of game mechanics, dynamics and aesthetics to player emotions and cognition	Interviews Observation methods Psychophysiological methods, Evaluation of emotions	(Nacke et al. 2010b; Nacke and Drachen 2011; Mirza-Babaei et al. 2013)

There are no recommendations applying a particular method or triangulation in mGUR. The selection of research methods needs to be rather carefully chosen in order to serve the research aim and objectives. Although, some methods can be used from general GUR, the context of mobile gameplay differs due to the mobility of players and the influence of the game context, which makes the evaluation process more difficult (Smeddinck et al. 2013). In order to find the

most suitable methods, an overview of applied evaluation methods in mGUR has been conducted and summarised in Appendix 3.

Bargas-Avila and Hornbeak (2011) provided an overview of UX methods in HCI and found that questionnaires, semi-structured interviews, user observations via video are the most common methods. According to Smeddinck et al. (2013) proven methods remain more stable in making informed decisions about the adequate research set up concerning general parameters, research purpose and research focus.

Whereas some research suggests that there is no significant difference between lab- and field-based research (Kjeldskov and Graham 2003; Kallio and Kaikkonen 2005), others argue that recent developments make research "in-the-wild" much more convenient and practical (Brown et al. 2011). To understand contextual GX in a tourist urban environment, it seems to be essential to conduct the gameplay inquiry in its natural setting (McMillan et al. 2010; Ejsing-Duun 2011). As lab conditions and controlled environments are not representative for location-based gameplay, it is important to find the right evaluation methods for inquiries on the move. New methods have to be applied (Waern et al. 2009b). Within in-situ inquiries, the researcher gains insights into how players incorporate game systems into their existing practices and how players change their contexts and practices (McMillan et al. 2010). The choice of each method within the qualitative method triangulation will be individually justified for each case in the following section. Within this research, a two-staged GX evaluation strategy is applied to minimise the risk of the post-game lie (Stenros et al. 2012). Post-games lies arise when experiences are evaluated at the end of gameplay as the outcome can heavily influence experiences. Especially during long play sessions, players cannot recall their feelings from the beginning and (Waern et al. 2009b).

5.2.4. In-Game Experience Evaluation

The following section outlines the applied methods for in-game research and explains how the triangulation of methods complements each other (Desurvire and El-Nasr 2013). Research was conducted in field-based play sessions with prospective game players being on a journey in an urban tourism environment. Play testing normally involves numerous players with different experiences of gameplay, playing through a game for hours or even weeks. However, this was not possible due to limited time resources of tourists.

Player and Contextual Observations

Observations were conducted to understand individual and contextual GXs (Engl and Nacke 2012). This method gave indications of participant's emotions and behaviour caused by game

elements or contextual influences that were noted down in a research diary. The strength of direct player observations lies in detecting the reality as it is in real time. Not only players were observed but also contextual parameters influencing the GX. Special attention was paid to social player interactions between (1) players, (2) player and non-players and (3) players and the contextual environment (McCall et al. 2011).

Conducting the Process

The researcher has taken on the role as an outsider in the play sessions taking notes and not getting directly involved with the activity itself. This role has been chosen, as it was believed that a participating role would distract gameplay and not fulfil the requirements of a natural inquiry (Creswell 2013). Field notes of the game context were gathered shortly before and during gameplay. A notebook was used to record all influences including time stamp and location.

Complementing other Methods

Observations belong to the non-verbal methods and thus are best suited to complement self-reported methods (e.g. mobile interviews) to reflect if observed behaviour matches the verbal reports (Hoonhout 2008; Vermeeren et al. 2010; Creswell 2013) and go beyond what was said by participants. Observational notes were included in the interview transcripts to understand the context of gameplay and explain the behaviour of players.

Limitations in Conduction

Regarding individual player observations, field notes have been considered a challenging, as players were looking down on the mobile device and thus not all emotions and facial expressions could be properly captured bearing in mind the inquiry was moving which made it even harder to handle all the research equipment besides the notebook (Arhippainen and Tähti 2003). Observations are generally hard to conduct, as it may lead to disengagement of the researcher only funnelling on one aspect of the observations as opposed to capture the broad amount of information (Creswell 2013). The researcher, thus, selects information that influence the event and could unconsciously manipulate the event. Other challenges of observations included a time-consuming data analysis.

Wheel of Emotions

Emotions are considered as the bases of experiences and are thus highly personal and often confusing due to the involvement of different sentiments at the same time. Some game research studied players' emotions (Banos et al. 2004; Lazzaro 2004; Nacke et al. 2010b; Lankoski 2012). These studies, however, were based on online games that allow for an undisturbed GX evaluation in a lab-based setup as opposed to naturalistic field-based research as we find it with

location-based AR games. Lab-based research also allows an undisturbed set up of psychophysiological methods (Nacke et al. 2010b; Marczak et al. 2012; Mirza-Babaei et al. 2013), which are still difficult to conduct in the field because of the steady technology equipment.

Waern et al. (2009a) were the first to introduce the self-reporting tool for mobile pervasive games for evaluating GXs during an on-going game session. The reporting tool, represented in Figure 13, is based on Russell's Wheel of Emotions (Russell 1980) and is also known as the Circumplexmodel of Affect. Players' emotions are mapped on a two-dimensional matrix with two axes corresponding to activation/deactivation and pleasant/unpleasant emotions. Waern et al. (2009a) argued that player experiences are based on activities (Bockman 2003) and activity-related emotions (Boehner et al. 2007), which makes this tool suitable for the mobile gameplay. Implementing this tool in a pervasive game, Waern et al. (2009a) modified the model using colours and facial expression icons to make it easier to relate emotions to actions.

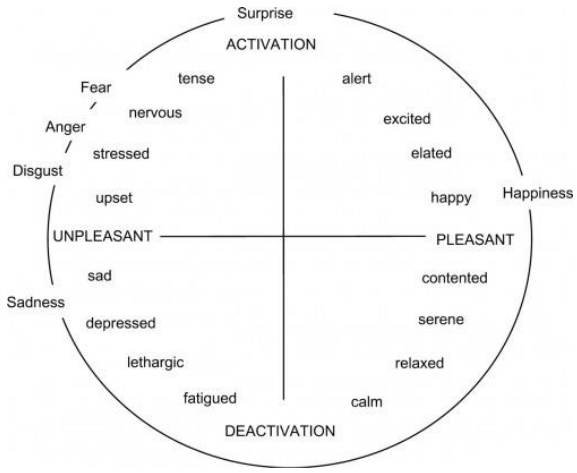


Figure 13: Russell's Wheel of Emotions

It can be criticised that the model does not directly correspond to player emotions integrating sentiments as 'engaged' or 'bored' or that labels restrict the choice of emotions. However, the model reflects the player control over the game activity as argued by Waern et al. (2009a). The tool captures emotions in a self-reporting way by indicating momentary and immediate but subjective emotions during gameplay. Researchers (McMillan et al. 2010; Stenros et al. 2012) testified an easy and convenient use of the model for evaluating mobile gameplay emotions.

Measures

The model was found to capture a notion of players' emotions during gameplay from which conclusions of perceived game interactions and game design could be drawn. It was believed that participants would experience difficulties in expressing their emotions or finding the right words, they were not used to reflect on feelings. The model encouraged to name them and

having a conversation about these altering sentiments by integrating them into the game context (Boehner et al. 2007; Waern et al. 2009a).

Application in the Study

The model was used as a basis for expressing player emotions, though not pushing participants into using it when they did not see their emotions being reflected in the model. Indeed, they are encouraged to express their emotions freely, come up with their own terms and explain in a greater context why they felt this way. It is also free of choice to combine different emotions when participants think this expresses their emotions best.

Different than in the study from Waern et al. (2009a) where the model was integrated in the game and shown automatically after some time, a paper-based version of the Circumplex Model was used after four times of gameplay. Evaluations were presented at the onboarding phase, first and second play locations, and at the end of gameplay. Participants were asked to circle the emotion, which best represented their feeling at the very moment. Asking the participants four times during gameplay should indicate the transformative nature of player emotions during gameplay and give indications of the source of the change.

Complementing other Methods

In order not to interfere in the sensation of gameplay, measurement tools need to be created with as little perceptual load as possible. This is achieved with the Circumplex Model of Affect (Russell 1980). The advantages of a visual anchored measurement paid off in terms of efficacy and transferability by assessing different GXs of players (Lavie 2005). The model complements mobile interviews and participant observations were participants gave the reasons for their emotions.

Method Limitations

It was not feasible to develop a self-reporting in-game evaluation tool, which will not disturb the GX. Disruptions of the GX have been reported as acceptable by Waern et al. (2009a) and McMillan et al. (2010). The tool provides pre-defined items, but can be difficult for participants to understand and thus concerns about the accuracy may arise. Waern et al. (2009a) stated that reports on activities seem to be easier than on emotions as participants have to distance themself from the game to think about how they feel. Another criticism may be that not all emotions were reflected in the model, and thus restricted participants in their choice.

Mobile Interviews

Mobile interviewing is a variation of qualitative interviewing, in which interviewing is opened up to a situated talk (Brown and Durrheim 2009). Mobile interviews are also known as ‘go-along’,

‘walking’ or ‘walk along’ interviews and are rooted in the social sciences supporting an interactive, contextual and natural interview style. As contextual and field research in tourism is increasing due to new mobile technologies, new research methods are needed to address emerging research challenges (Carpiano 2009; Pooley et al. 2013). Mobile interviews are a form of in-depth interview that are considered to be suitable for mobile gameplay. Knowledge is constructed in and through the mobile interactivity of the researcher and participant. The movement in space prompts conversations to the context of research and enables a co-creative and interactive data generation. This means that data is actively constructed with the participants by studying the (game) activity, embodied experiences and relationships (Gracia et al. 2012).

Measures

It is believed that mobile interviewing provides great utility in conjunction with other methods for exploring and understanding a person’s contextual experience. Mobile interviews support the examination of players’ interpretation of the context (Carpiano 2009). Players gave instant feedback on their experiences of the tourist urban environment and situated player emotions. The interview guide for the mobile interviews is presented in Appendix 4.

Conducting the Process

The interview was conducted in a semi-structured form, which allowed a conversational nature of interviewing. An item list was developed and printed on handy interview cards. Topics derived from the literature review and were added as ad hoc questions from prior play sessions (Carpiano 2009). Mobile interviews were conducted in between play sessions while going from one play location to other using audio-recordings. Players gave instant feedback to their individual and contextual GX (Engl and Nacke 2012). Aiming for prompt responses in between play sessions made it easier for players to recall their GXs, as they were still ‘fresh’.

Complementing other Methods

According to Carpiano (2009), mobile interviewing complements field observations and evaluations of emotions, as all the methods stipulate contextual insights of the GX from different perspectives. Mobile interviews build the verbal equivalent to observation and compensate its limitations of catching all the information on PX. By asking questions, the method is focussed on identifying individual PX, emotions, thoughts and reflections. These can then be triangulated with outcome of the Wheel of emotion and player observations. Besides, the method offers potential benefits for studying how place matters in contextual gameplay, as it refers to incorporating contextual artefacts into the conversation (Carpiano 2009).

Method Limitations

As the interviews were recorded in an urban environment, participants’ answers were

occasionally overplayed by external noises and a minor part of the data was not identifiable. Weather conditions or other environmental factors were also influencing the recordings. However, where possible, quiet interview locations were chosen. Some participants were observed to feel uncomfortable being interviewed in public (Gracia et al. 2012).

Game Logs

Game system or activity logs provide useful information in terms of recording the game progression. Although PXs were not captured with the available methods at the time of data collection, activity logs are meaningful when used together with other qualitative GX methods (Jegers 2008; Stenros et al. 2012). Game logs run in the background of the mobile device recording the screen of the game application in order to know where players progress faster or get stuck with usability issues or difficult game mechanics.

Measures

Activity logs provided an indication of which level of the game players are in and how fast they progress. These logs hold a wealth of quantitative statistics such as the time for task completion that were not considered in this study, as they did not suit the nature of qualitative inquiries (Benford et al. 2006). However, it was analysed which with part of gameplay players had the most difficulties with or how interactions with the game user interface went.

Conducting the Process

A log system has been installed on the mobile device that was running in the background of the play-session. Players were informed that all the activities on the screen were monitored and used for data analysis.

Complementing other Methods

Game logs are used as a supportive in-game method complementing the Wheel of Emotions and mobile interviews (Carpiano 2009). Arhippainen and Tähti (2003) confirmed the importance of recording the screen of the device for the researcher to know what players were seeing.

Method Limitation

Game logs did not monitor players' emotions but captured players' choices in the game. The method found to be partially suitable for GX evaluation as the synchronisation with the game location could barely be made. Besides, recording the screen might course ethical, legal and technical difficulties as this tool might be seen as a surveillance of the game session (Waern et al. 2009b).

5.2.5. Post-Game Experience Evaluation

Semi-structured Interviews

Interviews belong to qualitative self-reported methods and were applied after the gameplay (Mayer et al. 2013). Interviews are considered as the chief method of capturing GX (Stenros et al. 2012) and have been applied successful in serious games (Benford et al. 2005; Mayer et al. 2013) as well as in LBMARGs before (McCall et al. 2011; Blum et al. 2012; Bressler and Bodzin 2013). The focus of the interviews was to reflect on the GX directly after the game session in order to gain more insights and critically reflect on the gameplay. Games are engaging activities and as thus it was less favourable to interrupt the game session to ask about experiences. Instead in-depth interviews were conducted at the end of the gameplay sessions.

Measures

Semi-structured interviews are suitable to gain general information about GX, like perceptions, thoughts and ideas (Hoonhout 2008). Interviews were based on pre-defined topics identified from literature but also provide room for players to report on situational aspects. Guidelines for the semi-structured interview are presented in Appendix 5.

Conducting the Process

Players were invited after the play session to give a retrospective interview and reflect on their previous GX (Müller and Bianchi-Berthouze 2010). The interviews were audio recorded and took around 30 minutes.

Complementing other Methods

Interviews complemented other data collection methods such as observations, game logs and mobile interviews as they allowed a review on GXs (Hoonhout 2008). The Wheel of Emotions supported memories of the gameplay session but the interview gave detailed information of the reasons.

Method Limitation

A few post-game interviews suffered from the so-called ‘post-game lie’ that involved that the outcome of the game influenced the whole GX, but also that players could not remember all details of their GX after a longer play session (Waern et al. 2009). The ‘post-game lie’ is particularly dramatic in long play sessions. Turning GX in a narrative changes the meaning of the GX into a more subjective way (Benford et al. 2005). The success of the semi-structured interviews depends on an experienced, well-trained researcher to avoid potential biases, not coercing the participant in a certain direction and sensibly formulate questions (Hoonhout 2008).

Wheel of Emotions

The tool has been tested suitable in use to prevent the post-game lie by giving instant evidence of the GX (Waern et al. 2009b). Players were able use the tool as the basis to reflect on altering player emotions and recall particular events (Waern et al. 2009b; Stenros et al. 2012).

5.3. Research Design

The research process, presented in Figure 14 is separated into two sequential stages of data collection covering in- and post-gameplay in the form of a triangulation of qualitative measures in order to receive a holistic view of the nature of mobile GX. The first stage of the sequential design, evaluates the mobile gameplay activity of the players within its natural urban environment. The first stage informs the second one with follow-up semi-structured interviews. Although, the two stages complement and inform each other, qualitative means are the lead in the development of a contextual understanding of the phenomenon.

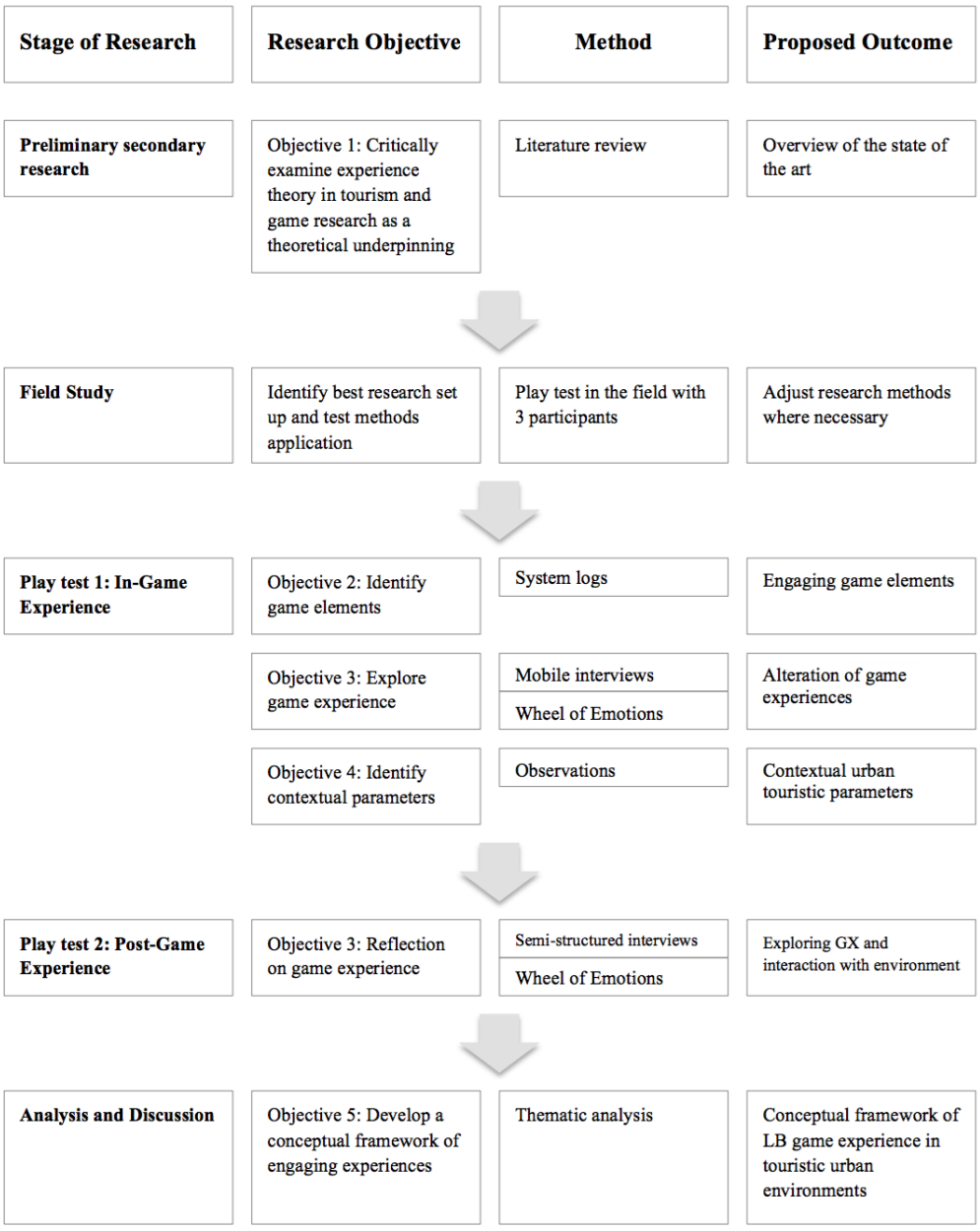


Figure 14: Research Design of the Study

5.4. Analysed Game

For the play test, two games, *Ingress* and *Berlin Wall 1989*, have been chosen as application cases to explore how engaging experiences are created with location-based games in an urban tourism environment. Choosing two established games was found to be the most suitable as at the time of research there were only a few commercial location-based games established apart from the research projects, mentioned earlier in the thesis. As mGUR and tourism experience design (TED) are young research areas, case studies are regarded as the most useful method to explain the phenomena of location-based games in the context of urban tourism environments (Ballagas et al. 2008; Carrigy et al. 2010; Blum et al. 2012).

First, case studies enable the analysis of complex contextual interactions between players, game and environment. Whereas quasi-experiments and surveys (Sánchez and Olivares 2011) are limited to deliberately limit the number of variables within the context of research, case studies are intensive empirical studies explaining presumed causal links in a complex real-life intervention as location-based gameplay.

Second, case study research supports a triangulation of different methods and encompasses an a priori development of theoretical frameworks within the research field to guide the data collection and analysis. The application of multiple methods such as interviews and observations make case studies a profound research strategy (Yin 2008). Using multiple sources of evidence such as observations or mobile interviews. This enables the development of converging lines of inquiry and produces more accurate findings (Yin 2008). For instance, a single fact within the findings is supported by multiple sources of evidence showing similar results.

Third, case studies illustrate certain areas within an intervention like gameplay to explore particularities within a case (in-case analysis) and among different cases (cross-case analysis).

Last, case studies are generalizable to theoretical propositions but not to populations or universes. Case studies do not represent a sample but instead the aim is to generalise theories in an analytical way not empirically or statistically (Yin 2008).

Two games were selected for the evaluation within the scope of this study. Cases where chosen due to the following characteristics:

(1) Location-based game,
(2) Augmented Reality,
(3) Playable on a mobile device,
(4) Applicable or relevant to travel and tourism.

The choice was made for Tripventure's *Berlin Wall 1989* and Google's *Ingress*, which were

found to be the most suitable in regards to meet the requirements above. Although Ingress does not support any Augmented Reality features (yet), as understood and defined by Wetzel et al. (2011) and Milgram (1994), it was found to be of importance for travel and tourism as it has an internationally growing community of 10 million players who travel to different places just for playing *Ingress*. Both games distinguish profoundly from each other as they use *locations* in different ways. *Berlin Wall 1989* is a limited area role-playing game that uses locations of the city as a historical setting to evolve the game narrative and create a special atmosphere of spies and secret services of the former divided city. *Ingress* on the other hand, is a wide-area game based on a science fiction story. The play area is not bound to any specific location but uses the physical space to perform gameplay in which players can explore locations shown on the digital game map. Both concepts are of high interest for travel and tourism, as they provide interesting application opportunities for location-based AR games.

5.4.1. Berlin Wall 1989 of Tripventure

Berlin Wall 1989 was a close-area location-based AR game created by Tripventure, a Berlin based start-up (Tripventure 2012). The game is an adventure game set in the time of the Cold War in which players hunt through the city of Berlin in order to investigate secret documents from a dead CIA agent eventually leading to the fall of the Berlin Wall.

Game Narrative and Background

Narrative and mechanics of the game are those of a classical adventure game. Players are introduced to a situation of an inciting incident (setting the scene), which calls for adventure. Players embark on a journey through the city of Berlin in search of some hidden documents, which help to knock down the Berlin Wall.

The game is placed in Berlin's recent history of the Cold War before 1989. The CIA is following *Mission Mauerfall* intensively. Key of this plan is a missing notebook of the CIA agent Gertrud Liebig who died in 1966 in a GDR jail. She kept important documents somewhere in East Berlin that now need to be found from players. Players take on the role of Bruno Fuchs, a student who discovered the notebook from his great aunt Gertrud and setting off to an adventure with his girlfriend Henny. Players meet virtual characters that help solving the case by guiding through the real world scenery of Berlin. The gameplay involves finding clues to advance the story and gameplay. A virtual backpack with inventories and the virtual friend Henny help solving the riddles.

Game Interface

The game runs on *Android Jelly Bean* and *Apple's iOS* operating systems. Players download the Tripventure app from the *Apple iStore* or *Google Play Store* and is asked need to pay 2,50 € for the game content downloadable within the Tripventure app. The game design is in a comic style that distinguishes from the real world environment as shown in Figure 15.

(1) 

(2) 

Figure 15: **Screenshot from Berlin Wall 1989**
(Tripventure 2012)

The first picture shows an Augmented Reality scene in which a game avatar is placed in the real environment in real time on players' screens.

Game Flow

By entering the game an introduction is shown and players are asked to go to the first play location in order to start gameplay. The narrative of the game is being unlocked by entering a gameplay location in the real world. Players are set into a dialogue (text form) in which she interacts with the game avatars and decides about the next steps of gameplay by choosing the answers to questions asked by the game avatars. A virtual rucksack holds objects (Figure 15-1), which are used to complete the challenges. Each item is used per location. The game combines real and virtual world elements as shown in Figure 15-2. The second figure is an example of a location-based puzzle in which players need to count the letters on a sign in the real environment in order to fill in the missing letters in the virtual diary (Tripventure 2012). A progress bar indicates player advancement. The gameflow of the first scenes is presented in Appendix 7. After successfully finishing a puzzle in one location, the task and the content for the next location is unlocked.

5.4.2. Ingress of Niantic Labs

Google's Niantic Lab (2012) launched *Ingress* 2012 first in a beta-phase and opened it up to the public in December 2013 for Android. Ingress is a pervasive massively multiplayer online

roleplaying (MMORP) game that can be played on a mobile device independently from a specific location. It uses players' GPS coordinates to find and detect virtual portals anywhere in the world. Ingress runs also on iOS since late 2014. The game app is free available of charge in the Google Play Store and App Store.

Game Story and Background

Humankind is threatened by the takeover of an unknown 'shaper' force from space. The aim of the game is to either partner with the 'Resistance' to defend the takeover or assist the alliance by the 'Enlightenment'. Augmented control fields are installed all over geographic areas from which fields have to be defended or alien field be attacked. Game progress is made by the number of controlled portals by each faction, which is shown on a virtual map. These portals are claimed by either of the group and linked to more powerful control fields over hundreds of kilometre distance. The links between portals are formed by the power of resonators, which work like protection shields to a place. When three portals are connected to each other, a control field is created over an area; it will be shown on the virtual map as a green or blue overlay. Depending on the population density, this area receives 'mind units' which work as a protective shield against the opponent party. The ultimate aim is to collaborate with other players within the same party to secure and liberate the world. The collaborations between players make *Ingress* a powerful location-based game that has touristic relevance as many players meet in game events to play in different cities. (Niantic Labs 2015). According to the game developers, players travel up to 250 km to play the game.

Game Audience

Since the release of Ingress in 2013 the game community is constantly growing. Official numbers of the Play Store show 10 Mio players on Android devices. However, also here there are no official information about player audiences and behaviour.

Game Interface

The interface design of the game is based on a map showing current location of the player and surrounding streets of the area. An additional layer projects game specific elements on the map (**Figure 16**) such Exotic Matter (XM, blue floating energy) and virtual portals (blue crystals) on the map. Players navigate on the virtual map with the direction of a blue arrow representing physical movement in the real world and a proximity cycle that indicates the distance to the target location (Niantic Inc. 2012).

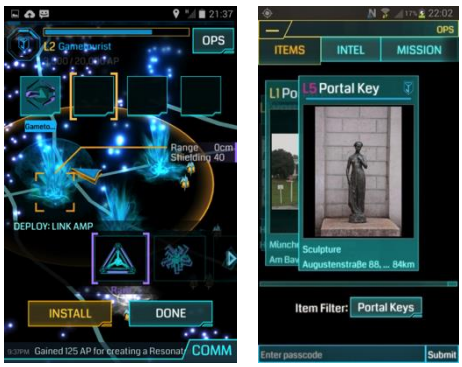


Figure 16: Screenshots Ingress – Portals

(Niantic Inc. 2012)

Game Mechanics

The aim of the game is claiming and owning portals which can be achieved in the first levels as a single player and demands partnering up with team members from the same fraction in more advanced gameplay. Portals can be unlocked by tapping on the blue crystal figures on the map and indicating commands to hack the portal (Figure 17). Game levels and progress bar indicate the level of energy.

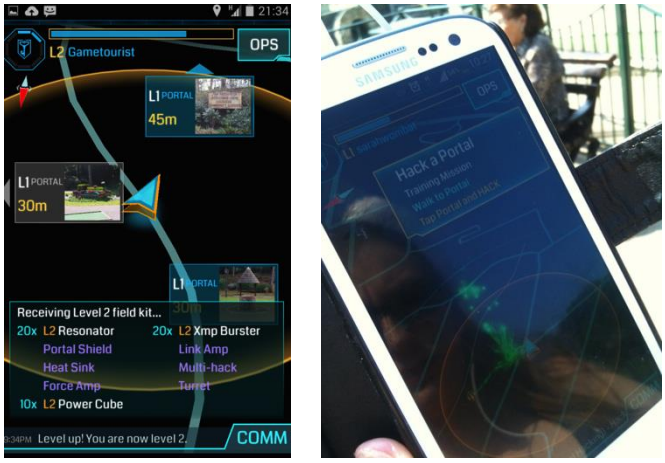


Figure 17: Screenshot Ingress Navigation and Portal Hack

(Niantic Inc. 2012)

The game flow of Ingress is shown in Appendix 8.

5.5. Field Research

5.5.1. Field Trial

Conducting field trials or pilot tests provide valuable benefits for qualitative research according to Sampson (2004). Field trials are mainly conducted to evaluate the practicality of research methods and design in order to minimise research risk and resources. They are vital in terms of

defining the research direction and improving the overall quality of the research by identifying weak points in the procedure (Sampson 2004; Yin 2008). Studying GX on the move is a difficult and a much harder process than observing players in a stationary game environment (Stenros et al. 2012). The differences between lab and field-based research have to be evaluated first hand, as the researcher may face unpredictable methodological and organisational issues (Grüter 2008).

The pilot study was planned to mainly answer two questions; (1) to get used to the handling of the applied evaluation methods and (2) to identify if the research instruments compile useful data. Both aspects contributed to the researcher's experience conducting mobile field studies and allowed for enough time for adjustments of the process and methods. In this respect, the outcome of the pilot study answered practical questions of the inquiry.

In order to test the proposed methods in the natural play environment (Hoonhout 2008), field trials were conducted in June 2014 at Bournemouth town centre with three participants. The location exemplified a representative place as requested by Bowser et al. (2013). Location-based AR games do not allow for alternative testing methods than the natural environment, as experiences cannot be simulated. Each trial lasted 45 to 90 minutes in which the participants were given a brief introduction to the game and research purpose. The participants played *Ingress* of *Niantic Lab* (Hodson 2013) as it was not bound to a specific location and thus flexible to be played close to university.

Learning from the field trials resulted in the following amendments of the data evaluation. First, it was planned to videotape players in order to ensure a detailed analysis of GXs, as adopted from von der Pütten et al. (2012). It proved, however, that handling a video camera and other research equipment was not feasible for one researcher and video recordings were less effective as they did not provide additional information contributing to the research objectives. Besides, players felt disturbed having a video camera monitoring their behaviour and expressions. Players were leading the walking direction, pace and breaks, which resulted in walking behind the participants and not being able to catch player emotions from the front. Thus, video camera was replaced by taking pictures and notes.

Second, gaining feedback from a senior researcher regarding interview questions, the question technique was adapted in some cases, as some questions could be answered with yes/no or were biased. The style of interviewing was adapted and revised.

Third, participants found it helpful to have the Wheel of Emotions as a support to express their emotions after the gameplay session. However, it was not always obvious what participants meant and what they refer to in the game; ways of communicating made experiences ranged from explicit to latent (Sanders 2002) and is therefore somewhat subjective. Trying to use

explicit forms of language and explain the tasks at hand is a necessity.

Fourth, it was originally planned to capture the movement of the participants in the city via GPS tracking data. This would have given more information about where participants walked, stopped, how much time they spend at one location, proximity to POIs and the distance they travelled from one play location to another. Data collection was, however, found to be inaccurate due to technical limitations of the mobile device running screen recordings, the game and GPS tracking synchronically. Besides, the GPS signal was not always clearly received in the urban environment, which made a reliable data collection insufficient and thus it was decided not to use the GPS data in the findings.

Last, other more practical learnings from conducting research in the field was to use laminated interview cards instead of A4 papers, which were considered less handy for mobile play sessions as paper could get wet or worn off after several usage. In addition, it was recognised that extensive mobile gameplay drains the battery of the smartphone really quick and therefore an external battery was used to ensure power for longer or multiple play session.

5.5.2. Play Tests in the Field

Play tests were conducted in Berlin and Bournemouth as the nature of *Berlin Wall 1989* required to do research on site in Berlin. Bournemouth was chosen, as it is an important coastal destination and popular among British holidaymakers, but also convenience and easy accessible for the research. Location-based AR gaming includes collecting data from the 'natural' environment (Brown et al. 2011) and involves some form of movement (Lehmann 2011) through the urban tourism space. To fully capture the mobile GX, the research needed to be conducted under real playing conditions (Stenros et al. 2012). This involves the usage of real mobile AR games (Charles et al. 2005), authentic tourists as potential players (Ballagas and Borchers 2005) and the natural setting for testing.

Lab-based research is found inappropriate for the evaluation of location-based AR games, as the gameplay experience will be influenced by the clinical atmosphere and isolation from the real world. A lower quality of the research outcome can expected in a lab-based setting (Coulton 2014), due to the fact that not all contextual influences can be identified. The physical environment is not separable from the context in which gameplay takes place. This said, whatever happens during the gameplay cannot be influenced or controlled like in a lab-based setting, this however is acknowledged as each case supports the distinctive situation in which contextual parameters are of interest.

Table 9 provides an overview of the setup of play test and the equipment used. After the introduction, participants were asked to fulfil three tasks that are based in the game's training

mission. This tutorial is integrated in the game for novice players who want to get familiar with the game and found to be suitable for the research as it reflects a typical first time user play session. Field trials are used to make necessary adjustments in the methods and the inquiry process before going into the field, to ensure a maximum output for analysing mobile AR game experiences.

Participants were met at the play locations on site. In the case of *Berlin Wall 1989*, the first play location was Checkpoint Charlie following on to Gendarmenmarket. Play locations for *Ingress* varied due to participants' preferences and convenience to reach nearby play locations. One play session was conducted in Berlin, Friedrichstrasse corner Checkpoint Charlie and the other seven play tests took place in various places in Bournemouth; including Bournemouth Square, Bournemouth University, and Boscombe Gardens.

Table 9: Plan for Play Testing

	Ingress	**Fall of the Berlin Wall**
Mobile device	Google Nexus 4 Game App Screen Capture App	
Equipment	Audio recorder, 2nd mobile phone for field note recordings and photos, interview guides, questionnaire, Russell's Wheel of emotion, pens, notebook	
Players	8 - 10 per game (individual, pairs and multiplayer)	
Place	Bournemouth	Berlin
Play locations	Exploratory/random locations within the city	First 3 settings of the gameplay • Checkpoint Charlie • Gendarmenmarkt • Palast der Tränen
Game tasks	1.Familiarise with the game by trying out the Training Missions 2. Find a portal and navigate towards it. 3. Create a Field	1. Familiarising with the game 2. Solving the 1st puzzle challenge 3. Solving the 2nd puzzle challenge
Game methods	1. Observations 2. Mobile and semi-structured interviews 3. Wheel of Emotions 4. Screen recording/game logs	

Following a short introduction into the research aim and the ethical regulations of the research, an induction into history and usability of the games were given. It was aimed that players felt and behaved as natural as possible, thus no interventions were made by the researcher during the continuation of gameplay. Participants were free to choose their preferred position, path, pace or play locations. Participants, however, have been made aware of the fact the before changing the play location, short evaluations will take place reflecting on the GX.

5.5.3. Sampling

Involving players into the centre of GX investigations makes research an exciting but also challenging endeavour (Hassenzahl and Tractinsky 2006; Amaya et al. 2008; Bargas-Avila and Hornbeak 2011). As player types become increasingly diverse (Dovey and Kennedy 2006), a variety of potential players should be involved into the game design process in order to reflect on different needs and requirements for the game. The aim of game design is to create meaningful and engaging game experiences, which is hard to accomplish when game designers do not understand players and the context in which the game is played. Game developers (Pagulayan et al. 2003; Charles et al. 2005; Sotamaa 2005), on the other hand, appreciate the integration of players' feedback as a valuable resource. The incorporation of players allows reflection on PXs that provides a holistic view from players' perspectives. Especially when it comes to integrating children into the design process, game designers might be stretched to their limits (Ruland et al. 2008). Due to the novelty of the research topic, the target audience playing location-based AR Games during their travel has not been defined yet. It is assumed that the target audience goes beyond hard-core video gamers and expands to a wider, more diverse market (Mäyrä and Lankoski 2009; Stenros et al. 2012). Thus, it was aimed to incorporate a heterogeneous group of players into the sampling to represent the diversity of the target audience of tourists.

Marshall (1996) discusses three different approaches for naturalistic sampling in qualitative research; convenience, judgment (or purposeful), and theoretical. Convenience sampling involves working with the most accessible participants, and is the easiest and most inexpensive approach but highly unrepresentative. With **purposeful sampling**, the "*researcher actively selects the most productive sample to answer the research question*" (Marshall 1996. p.523); that is also considered as the most commonly used in HCI. Theoretical sampling involves recruiting participants who are most likely to help building the theory that is emerging through data gathering and analysis.

However, in qualitative research it is important to recognise that the research is conducted in a naturalistic setting as opposed to artificial isolation. This involves taking into account temporal, spatial and situational influences given the context of the study (Marshall 1996). Kujala and Kauppinen (2004) recommend to choose participants who are most likely to represent users from the main target audience as identified in the user-centred design approach to insure that all potential users are considered in the study.

Participants were selected based on the following characteristics:

1) Being a tourist in an urban environment
2) Experienced or interested in playing games and

3) Being familiar with smartphones or other mobile devices.

As stated by Marshall (1996), sampling is not always entirely free from convenience sampling. Given the available time of one month during summer 2014 for conducting play tests in Berlin, participants have been chosen according to their availability during this time.

In semi-structured qualitative studies, the number of participants is most commonly 10 to 20, but requires rich data collection. However, most researchers struggle specifying a number of required participants for a study. It is rather advised to collect data until the theoretical categories of analysis are saturated (Blandford 2013). Charmaz (2006) explains: "categories are 'saturated' when gathering fresh data no longer sparks new theoretical insights, nor reveals new properties of your core theoretical categories". In other words, you stop gathering data when it no longer advances the study.

Play sessions were attended by 22 participants in total, from who one half played *Ingress* and the other half *Berlin Wall 1989*. In regards to the nature of the two games, play tests for *Berlin Wall 1989* were conducted exclusively in Berlin as the game used the historical, physical and geographical environment of the city, whereas *Ingress* was played only with two players in Berlin and the majority in Bournemouth due to logistical reasons of conducting play tests.

In Berlin, recruitment flyers were distributed in Youth Hostels and cafés with a brief introduction of the request and contact details of the researcher for approximately 0.5-hour gameplay and a follow-up interview. Participants received a voucher for the *Computer Games Museum* in Berlin as appreciation for participation in the field study.

In Bournemouth, participants were also directly contacted (Blandford 2013), but in this case in public spaces and university. There were a few students new to the town, who have been recruited some time after their arrival.

5.5.4. Test Locations

As described in the previous sections, play tests were conducted in two urban settings; namely Berlin and Bournemouth. Whereas *Berlin Wall 1989* demarcates a pre-defined route of play locations presented in Figure 18, *Ingress* allows for exploratory gameplay and players' choice and preferences for locations. For the latter, game locations varied for each gameplay session depending on which portal the player detects initially nearby or chooses because of travel preferences.

In *Berlin Wall 1989*, gameplay starts at Checkpoint Charlie; Berlin, Friedrichstrasse corner Kochstrasse, the former main border-crossing checkpoint between East and West Berlin; between the Sowjet Union and the Western allies. Besides this significant historical place, the

game leads to other meaningful historical places of the Cold War. The gameplay follows a predefined path, which players have to follow the defined locations in order to discover the game narrative.

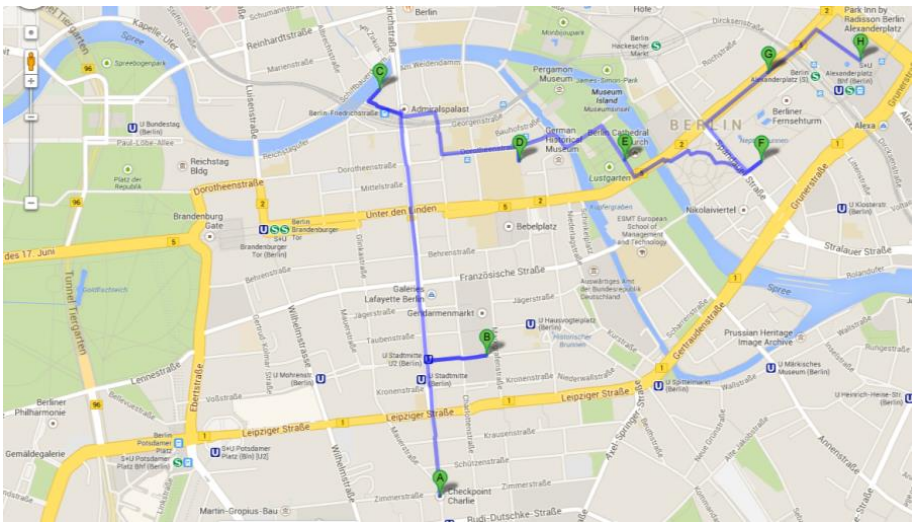


Figure 18: Play location Berlin Wall 1989, Berlin-Mitte
maps.google.com

In *Ingress*, on the other hand, participants had the choice of locations offered by the game and presented in Figure 19. There is a variety of POIs in the town centre of Bournemouth that were chosen as play locations in the sessions; particularly the ones around the Square and Middle Gardens (circled). As evident from Figure 19, the POIs are not linear connected, the connection between a few portals are only virtual, strategic links.

Figure 19: Play locations of Ingress, Bournemouth

(NianticInc. 2016)

5.5.5. Technical Equipment

The games were tested with two different mobile phones due to the lower technical requirements of *Berlin Wall 1989*, as the game developers did not support it anymore at the time of testing. *Berlin Wall 1989* has been evaluated with a Samsung Galaxy S3 with the operating system Android 4.2 Jelly Bean, whereas *Ingress* has been tested with a Google Nexus 4, Android 4.4 KitKat.

The device had the SCR Screen Recorder Pro installed that was running in the background during the play tests in order to record the interaction on the mobile screen. The movies of the screen recordings were matched with the interviews in order to identify engaging game elements.

An external portable battery charger was used in order to ensure constant energy supply during the gameplay sessions. The decision has been made due to high battery drain of the running applications taking into account that player experiences could be influenced otherwise.

5.6. Data Analysis

According to Boyatzis (1998) and Braun and Clarke (2006) **thematic analysis** is a method in which patterns or themes are identified and analysed that emerge from a rich data set. The themes contribute to answering the research question and are thus important for the description of the research phenomenon. The following section outlines the steps of the data analysis process followed in this study to provide a holistic chain of evidence of the research findings and ends with arguments why thematic analysis was found to be the most suitable approach.

Data Management

The aim of data management is to curate and organise the data in a sense-making process for an efficient data analysis. With the application of different research methods, data comes in various forms and multiple structures (Yin 2008), which requires the creation of an adequate database to unite the data and prepare for the analysis process. Data exists in the form of observation notes (text), interviews (audio), mobile screen recordings (video), a survey (text), and player movements (GPS tracks). The different formats were unified where possible. In order to achieve this, mobile and semi-structured interviews were transcribed word-by-word, enriched by observational notes and annotated with protocol information (play location, date and participant code) for identification of the interviews during the analysis process. Additional observations taken from the screen recordings and screenshots of the device screen were also inserted in the interview transcripts to gain a holistic picture of the individual gameplay experience.

All interviews and the included observation notes have been imported to NVivo 10 for Mac, as it was found the most efficient way to structure and process the analysis. Appendix 8 shows an excerpt of the NVivo documentation, which shows the audit trail of transcribing, initial and axial coding in order to provide an trustworthy and reliable documentation of the findings.

Besides organising and analysing text-based data in NVivo, Google Earth has been used to present and compare the movements of the individual player from GPS tracks. Results are presented in section 8.5.

Coding Process

Coding and theming was done according to the process proposed by Braun and Clarke (2006). After familiarising with the data, the coding process started. Codes (in NVivo nodes) are the smallest items and can contain words, word groups, sentences or paragraphs. All interviews, observational notes and notes from the video recording were initially coded following an **a priori approach** based on related literature in the area of location-based and augmented reality games and contextual parameters of the urban tourist environment that influence the individual gameplay experience of the tourist. However, new evolving themes have emerged from the data and were coded and added to the framework as contribution to theory and improvements of the game design based on tourist's requirements.

The initial codes were grouped into potential themes by reviewing all codes and combining them to *intrinsically homogenous* but *extrinsically heterogonous* themes. In some cases it may occur that codes did not only relate to one unique theme but could be assigned to two or more themes. According to Braun and Clarke (2006), a theme is not dependent on quantifiable measures but whether it captures something important about the data in relation to the research problem, which is central in the aim of the study.

Data analysis cannot only be seen as a static result, but needs to be understood as an evolving, iterative process in which new themes unfold and collapse into one. Thus, it was important to continuously ask questions to the data in order to identify the answers and structure for the research objectives. Initial themes were revised again to ensure that they are internally homogenous and externally heterogeneous, before they were eventually named and defined. Definitions of the themes are based on the data in consultation with the literature. As stated by Braun and Clarke (2006), the actual process of data analysis should not remain a black box but be as transparent as possible. The data analysis needs to provide rigour and evidence, which is ensured by a coding handbook and NVivo documentation (Appendix 9 and 10).

As two games have been tested, data were analysed across the cases as proposed by Gagnon (2010) in order to identify similarities and differences in the individual player experiences.

Each theme is considered individually by clearly defining its meaning and scope. Potential sub-themes are identified where necessary. Extracting the interesting sides of the themes and discussing these aspects with literature creates a consistent narrative. Immersion of the researcher into the evidence allows the drawing of connections between the themes to identify the story which each theme tells and how this fits into the broader overall picture in relation to the research problem (Yin 2008).

Theory building was treated as a creative endeavour starting with generating explanatory ideas by moving back and forth between ideas, literature and evidence in the data. Comparing evidence for a new theory with established theory in the field for proposing new theoretical explanations is a plausible process of approaching a new research topic (Yin 2014). Alterations and similarities between the two cases (games) are acknowledged, and atypical individual and extreme phenomena in the cases identified and devitalised with counter evidence (Yin 2008). The aim of interpreting the data is to understand the phenomena and its relationships on an abstract level.

Conceptual Framework

When the proposed explanations are found to fit the evidence of the raw data, they were then discussed on the basis of existing literature with the aim to identify and analyse differences to contribute to theory. The final stage of the analysis involved relating the findings and key themes back to original literature and theory in order to strengthen results and identify particularities for this research.

Findings are represented in a conceptual framework and written text as explanations of the framework and its relations of parameters. The report comprises of themes that tell the complex story of the data in a concise, coherent and logical way. The representation of the data goes beyond a descriptive process but makes an argument in relation to the research problem. Data extracts are embedded into the analytical narrative to provide evidence for each theme and present the findings more vividly by giving the participants a voice (Braun and Clarke 2006).

Thematic Analysis

Thematic analysis is a common method of qualitative data analysis as it provides the necessary level of flexibility to unite the data of different applied methods. It helps to identify similar patterns even when the data set is large as it was given in this study. Similarities and differences across the data could relatively easy be identified.

However, steps of the thematic analysis need to be applied rigorously regarding theory and method. Thematic analysis goes along with the working practices of the underlying paradigms

of the research leaving freedom for interpretations of the data as with the method, key features of a large body of data can easily be summarised but still provide a thick description of the data set (Braun and Clarke 2006).

5.7. Credibility and Transferability

Within the study, several practises are used to ensure the credibility and transferability of the study, as research on experiences is a difficult endeavour in which findings need to be traceable. The following section describes the different strategies in more detail.

Credibility

Credibility is the most important principle for guiding qualitative research and entails the authentic representation of experience. Conducting experience research will lead to a landscape of multiple realities as participants reflect on their experiences with the game, which is inherently intrinsic, individual and contextual. Credibility is the understanding through interpretation that those who have the experience can identify it and those outside the experience can understand the findings. The notion is based on the assumption that there are multiple realities that are all individually constructed, which demands for the reflection of all perspectives without dominating one over another (Lincoln and Guba 1995; Baxter and Eyles 1997). There are different strategies for ensuring credibility within a qualitative study that are applied in this study.

- **Purposeful sampling:** Is regarded as the most productive sample to answer the research question (Marshall 1996), as the respondents are at ease to talk freely and thus provide rich information about their experiences (Baxter and Eyles 1997). Sample size is mainly based on including as many experiences as possible, but should stop when (thematic) 'saturation' is reached. This occurred, when no new insights occurred from the data (Lincoln and Guba 1995). It was aimed to select from samples from different groups including single travellers, families and groups in order to cover a diverse audience with the sampling with multiple perspectives.
- **Triangulation of methods:** A triangulation of methods is used in this study to overcome the limitations of one method and compensate or gain an additional perspective with the application of another method in order to increase the trustworthiness of the findings (Robson 2002). The alignment of research methods should strengthen the credibility of the process (Tobin and Begley 2004), but also expand on new knowledge. For instance the Wheel of Emotions is used to help the participants finding the right wording for their emotions, which might be difficult to

express in an interview. As Tobin and Begley (2004) suggest, each methods needs to be valued equally as otherwise an unbalance towards one method occurs.

- **Interview Practices:** The researcher is seen as an instrument for developing rapport and ensuring information-rich conversions in qualitative studies. Power relations (e.g. age, gender) in the interview process can have an influence how the participants react and respond (Baxter and Eyles 1997). Lincoln and Guba (1995) call the awareness of one's own socio-demographic background 'bracketing'. Such an effect was only recognised in the interviews with the two teenagers, who were sparse in their responses of their game experience. This, however, could also have other reasons such as personality or immersion into the game.
- **Persistent observation:** is the focus on contextual information that is relevant for answering the research question. The type of observation seeks a diversity of influences but also depth of the observation (Lincoln and Guba 1995). In the study it was aimed to gain a rich understanding of the contextual influences on the GX, therefore observations have been done already before gameplay started to capture the environment.

Transferability

It can be argued that the findings cannot be transferred to fit a different context outside the study situation as specific games have been evaluated and that GXs can hardly be transferred (Lincoln and Guba 1995; Baxter and Eyles 1997). It is true that experiences are time and context bound, however, with the thick description of the themes and the relation back to literature. It can be said that the majority of the elements in the conceptual framework can be transferred to similar contexts such as a cultural heritage or museum context with minor limitations, but will still produce comparable outcome.

Confirmability

As the research is based on an interpretative approach, there is a risk for biases, one-sided interpretation or other influences such as interest that can harm the data accuracy. Thus, a rigorous documentation of the data analysis process was conducted by keeping an audit of the theme development and a coding logbook, which can be found in Appendix 9 and 10. All codes were exported into an Excel table and grouped based on the model of Engl and Nacke (2012) the game system, individual player experience (PX) and contextual parameters. However, the researcher needs to pay attention to what is said in the data instead of making the data fit into a pre-perceived framework. NVivo was used as it allows for iterative coding where categories can be defined and relations between the categories can be made. Changes need to be made

traceable and explicit in order to have a transparent and reasonable thread of findings, which was ensured with annotations of the codes and working with different versions of a document.

The coding process is an on-going procedure in which codes and themes emerge and collapse into one to ensure homogeneity of a theme and heterogeneity across themes. Occasionally the data could not be coded this rigorous as it fell in two categories as the following examples shows:

> *"As the game can be pretty immersive looking down on the screen, I think you have to watch pedestrians more carefully that you don't walk into people. So I think it's really important to have a little bit of space where you can unfold and not hit people. Yeah, just testing out the game and get used to play it."*

The first sentence was coded as 'awareness of health and safety risks' (sub-theme) categorised in the theme 'player's attention shift' (theme), which belongs to area 'Real/Virtual Continuity'. Both sentences were also coded as 'crowded places' (sub-theme) categorised in the theme 'negative environmental influence' (theme) and 'appropriate play space' (sub-theme) categorised in the theme 'play location' which both belongs to the area 'Context'. Within this statement, the participant makes relations to more than one theme, which has been coded accordingly. Where codes show a relation to more than one theme, it is also an illustration of the close connection between the themes.

5.8. Ethics, Health and Safety

Conducting research on mobile gameplay is ethically challenging (Montola et al. 2009), especially when it comes to observing players in the natural play environment. There are some issues, which have to be considered by the researcher in order to protect the health and safety of the participants who are directly and indirectly involved. Applying mobile technologies in field research might harm the participants in many respects.

First, playing with participants in public distracts players' attention and it might be that they do not pay attention to traffic or other harmful influences (McMillan et al. 2010; Jacob and Coelho 2011). Players have been made aware of the risk of playing in an urban environment and assured that they act to their own responsibility. In case of dangerous situations, the researcher will interfere and interrupt the inquiry.

Second, personal data of participants will be only used for the research purpose and the completion of the thesis or associated research publications (McMillan et al. 2010). Data will be used anonymously and stored securely on the server of Bournemouth University, but deleted after having finished the research.

Third, parents or chaperons accompany participants under age for the time of research. The researcher is not accountable for people under age (Creswell 2013)..

Fourth, people who are not involved in the inquiry might be involuntarily involved as bystanders and be unaware of it (Montola et al. 2009).

Participants have signed an informed consent before participating in the inquiry to inform about the health and safety concerns and to get consent to use their data for research purposes (McMillan et al. 2010). An ethics checklist has been submitted and has successfully been approved by the Ethics Committee of Bournemouth University.

5.9. Limitations

The aim of applying mobile GUR methods was not to produce a generalizable outcome but to provide rich, qualitative data of participants' game experiences in urban tourism environments. The applied methods leave space for interpretation and thus, do not fully exclude fallibility of data and its interpretation. These methods only deliver a part of peoples' reality, which means that participants might not have expressed all inner feelings or emotional experiences elicited by the game (Ellis and Flaherty 1992). However, applying a triangulation of methods should address this issue to a certain extent by examining the phenomenon from different perspectives.

Combining the data from different research methods is challenging and time-consuming. As data comes in different forms and unstructured nature, chances of misinterpretation are likely when the data is not synchronised (Hoonhout 2008). Therefore, time stamps have been used in this study for the interviews and game logs to synchronise them and identify the context of GX.

The sample of participants was not designed to be representative for all potential tourists who are interested in location-based gameplay but represents a group who are already avid smartphone users and interested in games and are thus representative early adapters of these games. This said, these games might not be attractive to many tourists in urban tourism environments but some treated as an alternative leisure activity besides tour guides.

Mobile gameplay is a social interaction with other players and new technology. Players might be overwhelmed by the novelty of playing in an unfamiliar environment, besides handling the new technology. The technological aspect of ARGs often overwhelms first-time players, who often respond to the novelty of the situations rather than to underlying GX (Wetzel et al. 2011). But as tourists currently are novel players no distinction could be made between experienced players and novice players due to the novelty of ARGs

Emotions like astonishment or excitement might be exaggerated due to the newness of outdoor gameplay for the inexperienced tourists. Thus, evaluated emotions have to be treated with care

and in the context they arose in order to interpret them in the right manner.

Within the interviews, participants might want to please the interviewer and avoid embarrassing answers, which have a distorted influence on the research outcome (Hoonhout 2008). Especially by doing research in a gaming context, where participants can lose the game, some participants might feel ashamed in some situations.

The data of mobile GX in a tourism context might also be so highly specific to the context that transferability to other areas cannot be done completely (von der Pütten et al. 2012). The developed conceptual framework would thus need to be adapted in a different context.

CHAPTER: FINDINGS AND DISCUSSION

6. CONCEPTUAL FRAMEWORK

The findings initially intended to mirror the structure adapted in the literature review following the Contextual Gameplay Experience Model from Engl and Nacke (2012) in which the player, the game system and external influences (context) are separately discussed from each other. However, as data analysis proceeded, it has been recognised that this model does not reflect the game experience process.

First, Engl and Nacke (2012) described the contextual gameplay experience as an in-line experience with players encompassing the central role of the PX by **interacting** with the game system and **interpreting** contextual influences which alter the behaviour and the individual PX. The data confirms this statement as apparent. Contrary to the model from Engl and Nacke (2012) it has been discovered that player interactions and interpretation build a bi-directional connection between player and game as well as between player and context. The nature of location-based AR games requires players to constantly shift attention between the game and the real world in order to interpret game mechanics from both worlds (Ejsing-Duun 2011; Jacob et al. 2012). Therefore the player, game system and context cannot be analysed separately but instead have to be seen as an interconnected unity.

Second, these games are altered by and make use of the play location implying a direct connection between the game system and the context. The Contextual Gameplay Experience Model (Engl and Nacke 2012) comes short of drawing this connection as the game has no connection with the location in which it is played it as they used mobile games instead of location-based games. As a consequence it is proposed to interconnect the player, the game and the context in a three-cornered model like the Triadic Game Design Model by Harteveld (2011) who combines meaning (player), play (game) and reality (context) in a triangle. Thus a balanced game design acknowledges theses aspects in order to create engaging game experiences for serious games.

Third, although Engl and Nacke (2012) emphasise that the objective of their model is not to provide a methodological framework for GX evaluation, but focuses on contextual influences, which affect aspects of the GX, the model only identifies context influencing the player experience. Data findings however showed that influences are not only sourced from context but also game-based and player-based as outlined in chapter 7.

Last, it is not apparent from Engl and Nacke's model that gameplay engagement follows a **process** of interaction, emotion and experiences. GXs are simultaneously *process* and **outcome** of a constant interpretation between the player, the game and the context (Dewey 1938;

Calvillo-Gámez et al. 2010). Thus, the findings propose an integration of the contextual gameplay experience model into the conceptual framework of Defining User Engagement with Technology from O'Brien and Toms (2008) in order to explain GXs simultaneously as a process and outcome.

Figure 42 shows the final conceptual framework originated from the data, which is grounded in the theoretical structure of Engl and Nacke (2012) and O'Brien and Toms (2008). According to the authors, the engagement process is separated into four parts: point of engagement, process of game engagement, factors of disengagement, and reengagement (O'Brien and Toms 2008). The findings of the study follow the thread of engaging experience creation and subsequently identify engagement attributes through a systematic analysis derived from the individual player experience.

Player engagement consists of the process of creating *an experience* with a clear beginning, middle and end (Dewey 1938). The participants create an experience as a **dynamic process** by interacting, sensing and interpreting between the game and real world but preserve the experience also as an *outcome* in form of developed skills, emotions and value creation (Dewey 1938). Within the sense of meaningful experiences, people are aware of the meaning of feelings and experience they undergo by individual reflection on how they see the world (Boswijk et al. 2012).

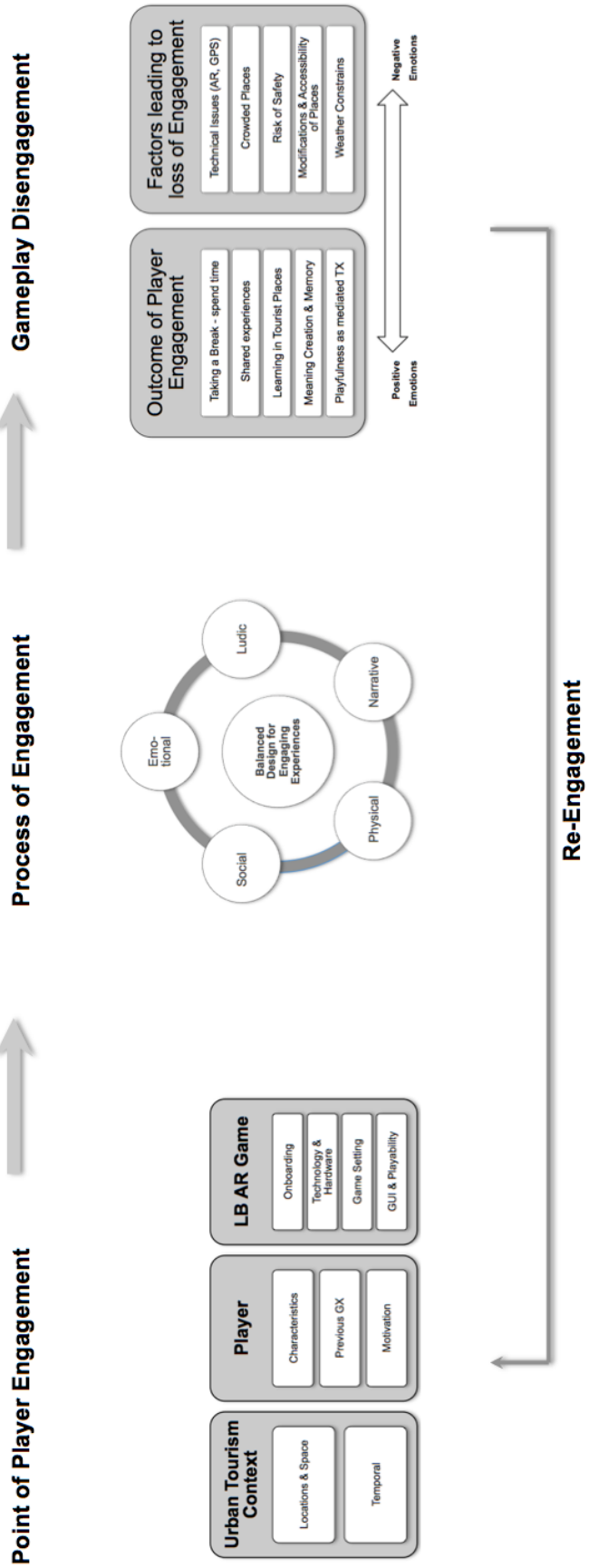


Figure 20: Conceptual Framework of the Player Engagement Process with LB AR Games

Based on O'Brien and Toms (2008); Engl and Nacke (2012); Schell (2008) and Harteveld (2011)

Chapter 7 introduces the **point of player engagement** by setting the reader into the context of gameplay illustrating the 'onboarding' process (Schell 2008) in which the player gets to know the game and experiences their first game challenges. The first section outlines the urban tourism context, in which gameplay was carried out. By identifying how gameplay fits temporally and socially into the travel activity of participants, this section provides a detailed analysis of gameplay locations and space (Engl and Nacke 2012).

Chapter 8 reflects on the **process of game engagement**. This section is concerned with the interaction between the player, the location-based mobile AR game and the urban tourism environment during the gameplay process. Attributes are identified, which contribute positively to the creation of engaging meaningful experiences. This process is a constant negotiation of the player interacting and creating meaning between the game and the real world. The second part introduced the participants by representing the demographics, previous GX and motivations towards gameplay (Ryan and Deci 2000; Schønau-Fog 2011).

Chapter 9 analyses positive and negative **player disengagement** based on player, game and contextual parameters. This phase of the theoretical framework highlights the game outcomes after the individual play sessions, which at their best lead to a player's *reengagement* and repeated gameplay.

7. POINT OF PLAYER ENGAGEMENT

7.1. Introduction

The following sections present the objects of study: players, the game and the context by analysing their characteristics. These characteristics build the prerequisites for the overall gameplay engagement process initiated with the point of player engagement (O'Brien and Toms 2008) and the onboarding phase. Figure 21 portrays the parameters of urban tourism context, player and location-base AR game at the beginning of gameplay.

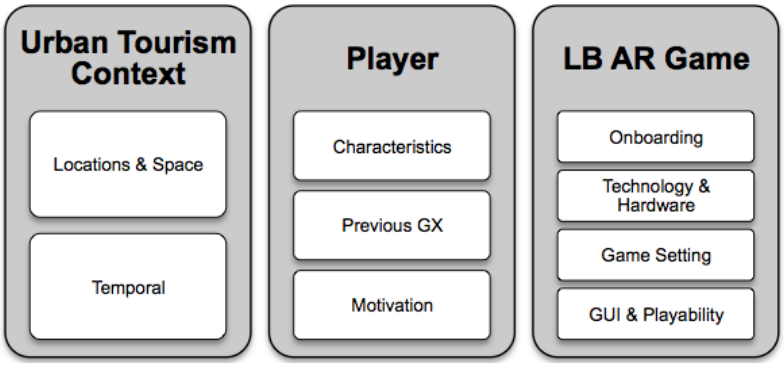


Figure 21: Point of Player Engagement
Based on O'Brien and Toms (2008); Engl and Nacke (2012) and Schell (2008)

The last section analysis the game in regards to onboarding, technology and hardware and game settings (Schell 2008).

7.2. The Urban Tourism Context

The following sections portray the urban tourism context in which gameplay took place during the field study, which feeds partially in answering the third objective of the study that aims to identify contextual parameters of gameplay that contribute towards engaging player experience with location-based AR games in an urban tourism context.

Depending on the situation, multiple contextual parameters influenced the player-game interactions. To reinforce the contextual parameters, they are described similarly in tourism (Dey and Abowd 1999; Tan et al. 2009) and game design literature (Paavilainen et al. 2009a; Engl and Nacke 2012) comprising of **spatial, temporal, environmental,** and **social** aspects. Contextual parameters, which emerged from the data, are shown in **Error! Reference source not found.** and confirm the literature.

Table 10: Contextual Parameters in an Urban Touristic Game Setting

Location & Space	Temporal	Environmental	Social
• Spatiality • *Atmosphere* • *Tourist relevance of locations*	• Available and actual play time • Point of gameplay • Temporal events	• Noise • *Real world rules* • Crowded places • Traffic • Weather • *Modifications & Accessibility*	• Shared Experiences • Socialising • Virtual/real communication

Based on the TILES-Framework from Tan et al. (2009) and Paavilainen et al. (2009a)

The identified parameters reflect Tan et al.'s (2009) TILES framework, which was introduced earlier in this work and summarised in Appendix 2. The first two parameters location and space as well as temporal are generally determined by the game or player and thus defined before gameplay starts. Environmental and social parameters on the other hand, emerged during the game activity as strong characteristics, which had an impact on the game engagement process. Some of the parameters even brought the gameplay to a standstill or involuntary break. Social parameters were mainly identified to contribute to engagement with the game and play locations.

New emerging sub-parameter not covered in the literature elsewhere and related to tourism urban environments, such as *atmosphere*, *tourist relevance, modifications and accessibility of places* and *real world rules* are indicated in italic as contribution of this study to contextual gameplay experiences.

7.2.1. Locations & Space

As demonstrated by previous game literature (Ejsing-Duun 2011; Engl and Nacke 2012), play locations can be assigned to the *context* of gameplay as well as to the *game* area of the conceptual framework as game locations are actively chosen by game designers. It is found, however, that characteristics of the game locations are a priori as they were shaped by social structures, physical texture and human rules. Many aspects of play locations such as atmosphere, spatiality or tourist relevance of places are out of the game designer's influence, but need to be considered, as they have an impact on the GX. The game designer can choose a location for a game based on its suitability for gameplay and game theme.

Play locations have a crucial part in designing location-based AR games and, as it will unfold within the discussion, both games take a different approach on the interpretation of play location being suitable for the particular game setup. *Berlin Wall 1989* started in a specific location, whereas *Ingress'* players were free to choose the first play location according to personal

preferences or proximity. Play locations can be separated into three distinct urban environments with specific characteristics.

Spatiality

Spatiality can be understood as the physical space that is available for the players in which they perform gameplay and interact with physical objects (Engl and Nacke 2012). Aspects of spatiality were mentioned by the participants of the study but also observed during the game testing and involve appropriate space for gameplay, players' position in the play location and the surroundings.

Players discussed the availability of **appropriate space** for carrying out gameplay from both games during the interviews, which varied as outlined in the following sections. Games were played in smaller and larger spatial areas such as parks, squares and on pavements, where players could unfold and move around with minimal restrictions. However, participants appreciated a more open game space such as squares and parks where they could freely move and focus on gameplay without being disturbed by external influences such as non-players or traffic. Open and wide areas create a feeling of freedom and make gameplay carefree, as attention could be put on the gameplay as opposed to the environment around them.

Pedestrian areas, such as at Checkpoint Charlie, had less space available for location-based gameplay, as they were much visited and too narrow to move around freely. This had a negative impact on the GX, as player had to pay much attention to their surrounding environment. The space restrictions were of greater concern for group players, as they had to stand close to each other or felt in the way of non-players. Hence, players chose their physical position depending on the available space and often stood aside from the rush of people, in quiet corners at the pavement or shadows of buildings, lampposts and vending machines. Thomas, for instance, who played with Tanja and Tom in a group of friends, raised the concern of appropriate game space in tourist attractions and the impact on their GX:

> *"As the game can be pretty immersive looking down on the screen, I think you have to watch pedestrians more carefully that you don't walk into people. So I think it's really important to have a little bit of space where you can move freely and not hit people." (Thomas, 29, Group Player, Berlin Wall 1989)*

For location-based games, there is some game space required in order to move freely and without any hesitation having to watch non-players or other physical obstacles. Schell (2008) defines it as functional space and describes the various spaces in which gameplay takes place. These places are related to one another as in the case of *Berlin Wall 1989* or *Ingress*. Not all physical places are play locations but are connected through space. Where the game space in

Berlin Wall 1989 is discrete, the *Ingress* game field continuously extends with new player content and is thus without any boundaries and can hardly be influenced.

Squares and markets provide enough space for the players to move around freely and enjoy a more relaxed atmosphere as Samuel points out here:

> *"I think here at Gendarmenmarket it is better. It feels more relaxed in terms of space. So I don't have to worry about bicycles and cars around me." (Samuel, 28, Single Player, Berlin Wall 1989)*

Drawing on these statements, it can be said that narrow space negatively influences the game experience as players felt distracted from the gameplay having to pay attention to their environment and people around them as the first play location in *Berlin Wall 1989* was too crowded. Carrigy et al. (2010) confirmed similar findings from their study of a location-based AR game in which players embarked on a ghost hunt. The relative remoteness of play areas, such as churches or parks, increased player immersion due to the quietness and fewer populations. Another study (Blum et al. 2012) claimed that play locations should be chosen carefully by game designers as these locations need to provide enough empty space for free play and avoid potential dangers such as traffic, stairs or crowds. Although the choice of location lies in the hands of the game designer or other stakeholders of the game, Ejsing-Duun (2011) emphasised the limitations of game designers' influence in creating location-based AR games due to the fact that those locations are mainly public places. Game designers cannot shape play locations to best suit game rationales but can make a conscious choice to integrate certain locations into the game over others.

Play spaces: Squares

Gameplay took place at Gendarmenmarket, Berlin and Bournemouth Square, which are both surrounded by cafes and shopping facilities as shown in Figure 22-1 and 2. A square is an open pedestrian area, which offered a spacious precinct for gameplay interactions where traffic or cyclists did not disturb players. These places however could get crowded during certain times of the day or week. Both squares distinguished themselves by their size and atmosphere.

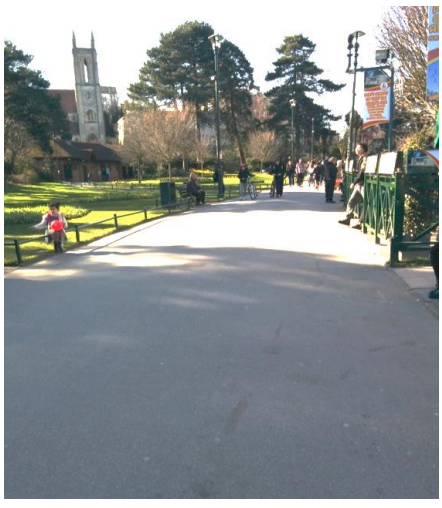
(1)  (2) 

Figure 22: Play Locations: Square

Whereas Gendarmenmarket (1) is an 18th century square of the size of around two football fields in a rectangular shape enclosed by the German and the French Cathedral from two opposite sites and the Concert Hall in between, Bournemouth Square (2) is a pedestrian precinct that connects two shopping streets. The Square is surrounded by nightclubs and public transport facilities and is highly frequented at the weekends and during events, which creates a rather lively atmosphere. Gendarmenmarket in contrast offers a spacious area where people watch street music and performances in a quiet atmosphere or sit in a café.

Play spaces: Park

Characteristic for parks are open spaced, green areas for short-term recreational purposes. Gameplay took place in Bournemouth Lower and Central gardens and Boscombe Chine Gardens. All gardens hold recreational and leisure facilities such as cafés, playgrounds and sports facilities and offer a calm and open setting for gameplay.

(1)  (2) 

(3)  (4) 

Figure 23: Play Space: Park

Play spaces: Pavement

Urban footpaths, normally facilitating mobility of pedestrians, were used as play areas for both games. Pavements can generally be considered as safe places for people that are separate to and lead along streets. The pavements where gameplay took place were approximately between three to five meters in width and mostly attached to busy roads. Space on the pavement was rather limited and small as in the case of Checkpoint Charlie, Berlin (Figure 24-2) where players shared the play space with other non-players who were visiting the tourist attraction. Bourne Avenue, Bournemouth (Figure 24-1) and Bournemouth University (Figure 24-3) provided a larger play space, which were occupied only by a few pedestrians.

(1) 

(2) 

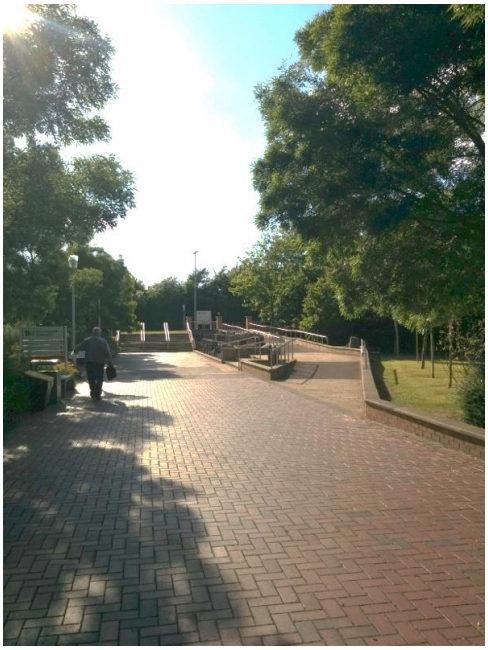
(3) 

Figure 24: Play Space: Pavements

Atmosphere

Atmosphere is sensed and interpreted differently by players. One's personal interpretation of experiencing a place, as well as the time of day players encounters a location, plays a key role in the perceived atmosphere. Thomas, for instance, who was playing in two play locations, experienced a difference between them:

> *"At Checkpoint Charlie it was crowded. You got into the play and it was more like the agent story and when you are here [at Gendarmenmarket], it's calmer. You meet someone in secret. That's reflected really well within the game. All the people around Checkpoint Charlie are absolutely important and also here. The atmosphere here is perfect for the theme of the game." (Thomas, 29, Group Player, Berlin Wall 1989)*

As the participant emphasised, the change between the two atmospheres of the locations was essential to support the game narrative and create game engagement. The first game plot put players into a tense situation to urge the importance of the mission, whereas the second plot at Gendarmenmarket used the shadows of the trees close to the Opera House to give players the feeling of confidentiality that he is part of the game mission.

Play locations are chosen by the *genius loci* and the emotions they generate, which should support the game theme. Carrigy et al. (2010) confirmed the importance of place atmosphere analysing the influence of a clerical environment for the GX in a ghost game. The authors revealed that player experiences vary in relation to the ambience of locations. Wider areas such as parks were found to be inviting for gameplay contributing to players' level of game immersion. Game dynamics and narratives change, and so does the atmosphere with altering cityscapes. The rapid change can also be seen as the *atmosphere of mobility*, which constitutes the alternating relation between the moving tourist and the environmental space (Böhme 1995; Dalsgaard and Kortbek 2009). The unalike atmospheres can be used by game designers as a stylistic tool to emphasis and create a narrative climax in gameplay (Wither et al. 2010). *Berlin Wall 1989* is a good example how the atmosphere of locations is used to create a narrative tension, by choosing dissimilar locations and letting players follow a linear game narrative through the city (Lehmann 2011). Thus, every location was chosen according to its individual ambiance and characteristic role for the storyline. Players should feel excited and aroused at Checkpoint Charlie and, in contrast, calm and incognito at Gendarmenmarket. Ejsing-Duun (2011) implies that play locations are chosen to stage the game based on the explicit distinctive characteristics of a location.

This alternation of the place atmosphere influenced the emotions of the participants as testified here by Diana:

> *"I think it's quite stressful to play in a crowd of people as we found at Checkpoint*

Charlie. It is much more relaxed to play here at Gendarmenmarket." (Diana, 26, Single Player, Berlin Wall 1989)

Physical spaces evolve players emotionally by holding mental and emotional tones pervading the environment around a player, such as here with the busy location that arouses stress. It can be understood as *atmosphere of a mood*, which influences the player experience either negatively or positively (Böhme 1995; Dalsgaard and Kortbek 2009).

Busy locations, like Checkpoint Charlie, demand a high level of cognition from players, which can lead to stressful and tense emotions. Participants found it disadvantageous being confronted with a stressful situation at the beginning of the gameplay. As novice players, they need some time to adjust to the new outdoor play situation and orient themselves in the physical and virtual gameplay environment. Samuel made this point clear when he said:

"It wasn't too crowded this evening but on a Saturday it could be worse. Maybe this is not the perfect point to start the game to calibrate the mind of the user but if it's a quiet place like this one [Gendarmenmarket] and then go to Checkpoint Charlie afterwards […] to settle the player into the application first" (Samuel, 28, Single Player, Berlin Wall 1989)

Samuel's statement reveals two points. First, atmosphere changes according to the time the player encounters the play location and is therefore an essential part in understanding the construct. Atmosphere transforms with the interrelation of players, play space, co-players, non-players and the game technology (Dalsgaard and Kortbek 2009).

Second, Samuel suggested that highly visited places are less attractive to introduce a player into gameplay, as players could feel overwhelmed by too much stimulation. Players need time to adapt to the concept of playing outdoors. A tense atmosphere will increase the level of pressure for players in the beginning when players have to develop an understanding of the game application. This might be too much for some players, as they do not want to experience stress in their leisure time. Concerning the fact that most participants were new to games, they need a relaxing atmosphere at the start of gameplay to adapt to location-based AR gameplay.

It can be concluded, that the atmosphere of a game location has an influence on the individual GX of players. Mood and feelings are a response on the perception of the multisensory aspect of atmosphere such as sight, sound, smell, humility, coldness, shadow or sunshine such as described by Boswijk et al. (2012). Busy and stressfully perceived locations have a role to play in the game atmosphere, as they are essential for the dramatic structure of the game, however these location should not be chosen at the beginning of gameplay to not put players in a stressful situation from the beginning. Game designers need to be aware that places implicitly embody a certain type of ambience, which is again difficult to influence as these places are public

locations and primarily designed for other purpose than gameplay. Locations can temporary change, for instance with road works or weekly markets, which has an influence on the GX. Consequently it is essential for LBMG design to choose game locations carefully and according to their suitability for gameplay. Besides, as suggested by Carrigy et al. (2010) and supported in this study, game locations should have thematic relevance to the game narrative and represent the atmosphere of the game.

Tourist relevance of places

A majority of participants mentioned the importance of choosing the right game locations in relation to their journey. In other words, POIs are places to play, which should also be significant and worth a visit. But when do places become relevant or worth a visit?

It is dependent on the tourists' interests and motives to engage with the touristic site. Most game places of *Ingress* were landmarks, art installations or local symbols. Some have the potential to be visited by tourists as they had a rich touristic or historical background, but the majority of play locations were commonplace. However, the games raised awareness of these common places, which changed the perspective of tourists and their value creation. Antje, who discovered the Bournemouth Millennium Flame[1] during her gameplay, describes the process of meaning creation as follows:

> *"Now I know that this is not just a normal street lamp but has a meaning behind it, although it's not so important for me. Some people like churches and others don't like churches. It's just a personal thing." (Antje, 28, Single Player, Ingress)*

According to Harrison and Dourish (1996) tourists impose meaning on spaces based on their previous experiences, knowledge, interests, motivations and expectations. A place becomes relevant for tourists when they relate a cognitive (perception), mental (memory), spatial (proximity), or social (interpretation) value to it and recognise an added value for the journey (Bremer and Olsen 2006; Dalsgaard and Kortbek 2009). In this case a previously ordinary location, turned into a meaningful encounter.

Tourists' main motivations for visiting urban environments were to discover new places and increase knowledge, and as Diana pointed out to "*[…] get to know as many places as possible" (Diana, 26, Single Player, Berlin Wall 1989)*. This might lead to the expectation that key points of interest (POI) need to be integrated into these games as stated by Mathild:

> *"An app for tourists must include the tourist highlights. If I am coming to Berlin for a short trip, I want to see all the tourist sites of course. And when someone then uses a*

[1] Local churches installed the Millennium Flame to celebrate the 2000th birthday of Jesus.

game to explore the city, all the highlights of the destination need be integrated in the game."(Mathild, 34, Group Player, Berlin Wall 1989)

Because tourists have only a limited timeframe for visiting a destination they want to have seen all the important tourist attractions of a place. Cities likewise provide an enormous number of POIs and attractions, which cannot all be managed to be visited in the short period of a visit (Chevrest et al. 2002).

Knudson et al. (1999) address this issues by proposing a thematic approach for the design of interpretative tourist trails. Most tourist destinations provide a variety and a wealth of POIs, which might not be equally interesting and suitable for all tourists such as families, groups, or individual travellers. Thus, identifying locations that are attractive to a particular audience of tourists and essentially depend on the theme of the game. Play locations are key and need to relate to the story in order to support the creation of a holistic game atmosphere. Knudson et al. (1999) suggest to concentrate on one main trail and design additional trails with different themes to suit the variety of tourist's interests. A similar approach should be taken in location-based, mobile game design, especially when the game is thematically based on the destination's history. Not all tourist locations can be included in the game but perhaps several games can be designed to suit the diverse needs and interests of tourists.

The evaluated games followed different approaches on incorporating key tourist POIs. *Ingress* unified renowned and lesser-explored sites of a destination and took players off the beaten tourist tracks. Although this game was not exclusively focused on tourist attractions, it introduced participants to some significant POIs, which were appreciated by players and highlighted by Antje:

"[…] with the game I don't have to do the normal touristic things that everybody sees. I would probably go somewhere where you normally wouldn't go to that easy. So that's what I like about the game. It's something different and not just the main monuments." (Antje, 28, Single Player, Ingress)

On the one hand, the flexibility of the *Ingress'* game locations allowed players to be more explorative and adventurous by combining and choosing a walking trail based on individual interests. When these games propose a variety of game locations, it is easier for players to match gameplay to their particular interests. This again supports the tourists' motivation of being explorative and adventurous identified earlier in the study and supported by touristic researchers (Oh et al. 1995; Xu et al. 2013).

Berlin Wall 1989, on the other hand, trailed a narrative approach staging key locations of the Cold War. The choice of play locations was defined by game designers but included tourist relevant locations, as outlined by Marcus here:

"Well, the places we've been visiting definitely. Checkpoint Charlie is one of the most well-known tourist places in Berlin. The concert house and the Gendarmenmarket probably too and the other locations in the game, I suppose as well." (Marcus, 25, Group Player, Berlin Wall 1989)

Two questions arise from the statement above. First, what types of POIs need to be included in a location-based game in order to be attractive for tourists? From a tourism perspective, early studies on tour guiding (Daengbuppha et al. 2006) identified four classes of (heritage) attractions, ranking from *desired destinations* to *interesting, worth a visit* and *just when time allows* categories. The classification could give an indication of desirability of attractions but has not yet been used for game design. *Berlin Wall 1989* had remarkable attractions as play locations, but some key POIs, although related to the theme of the game such as the Brandenburg Gate or the Reichstag, were missing.

Second, how can personal interest, subjectivity or multiplicity of visitors and their preferred choices of POIs be considered? Tourist destinations such as London, Paris or Berlin provide many interesting sites, which are widespread in the city and of particular interest for tourists and play locations likewise. Some attractions might have a high cultural relevance but are not of interest for a particular visitor group such as families. Current mobile AR guides on city and heritage tourism implemented personalised tours based on the activity cluster from the UNWTO and touristic user profiles (Kourouthanassis et al. 2015). The clustering of special interest groups relates to activities such as history, entertainment or action-based and proved to be successful in recent tour guides (Vansteenwegen et al. 2011; Kourouthanassis et al. 2015). Decisions over which POIs to include in a game therefore present a challenge to game designers. It cannot be generalised and needs to be decided on the individual case of the game.

7.2.2. Temporal

The following section provides insights into the temporal aspect of location-based AR gameplay as part of the tourism and gameplay context (Wetzel et al. 2011; Engl and Nacke 2012). Player engagement is contingent on the temporal horizon of the game activity and the time of day the gameplay took place.

Available and actual playtime

It emerged that tourists' available and intended playtime differed from each other. The majority of participants had generally little time on disposal during their city weekend trip. The time participants were keen to invest ranged between one to six hours. Only a few players were eager to dedicate a great amount of time from their journey as it was found that gameplay pays off after having invested some time in understanding the game usability and familiarising with the

play environment.

> *"I think I would play like two to three hours. I mean when you're here for this purpose then you dedicate some time to it. I don't only play for half an hour to familiarise my self with the software and stop playing. I think it's okay when it takes some time. It can be even five to six hours." (Nick, 31, Single Player, Berlin Wall 1989)*

The willingness to free some time for gaming varied considerably between participants. Marcus (25, Group player, Berlin Wall 1989) acknowledged that he would only play when he is at least one week visiting the destination, as he did not want to use valuable leisure time for gameplay. Engl and Nacke (2012) also pointed out that availability of time in a fixed situation, in this case a journey, could be a playing constraint. Time constraints have an influence on the GX, as players might not start the game when there is not enough time available. Antje, another player, on the other hand stated that time does not matter for her as she sees gameplay as a facilitator to walk around for several hours exploring the city:

> *"I could easily walk around for ages because I walk around a lot when I visit a city and it doesn't matter if it's the whole day. So, I could imagine that the game works well for more than 3 hours when we've already played for 25 minutes." (Antje, 28, Single Player, Ingress)*

The participant was used to exploring the urban environment by foot from previous journeys and the game is a new way of supporting her in this engaging and playful activity. In this sense, the game was not only perceived as a tool to spend spare time but as a valuable application for people to explore the tourist urban environment and its multiple locations.

The above cases exemplify participants who were willing to dedicate a reasonable amount of their travel time for gameplay, but there are tourists who have less time to spare. For those, these games need to be designed on a flexible drop-in basis with a short play period. Many participants were surprised that the game activity took an unexpectedly long time at the first play location as Marcus pointed out here:

> *"Well, when we've already played for 1.5 hours, I don't know […] if it's supposed to be like this. But then it's not manageable in 2.5 hours or you have to use a bike to change locations quicker." (Marcus, 25, Group Player, Berlin Wall 1989)*

Certainly, players need time to settle into the gameplay, which has to be considered by the game designers. *Berlin Wall 1989*, for instance, was designed to be played within 2.5 hours for 8 play locations but players already needed one third of the time to understand and overcome challenges at the first game location, given that they know where Checkpoint Charlie was and not having to search for the start site.

Overall it can be said that players have diverse objectives on location-based AR games. Some players tend to an extensive usage and are willing to dedicate up to two or five hours to the game. This type of player wanted to see as many POIs as possible of the urban destination and were therefore willing to engage with the gameplay for longer and even used it as a tour guide (Rasinger et al. 2009; El-Sofany and El-Seoud 2011). A few players only had a short time span available in-between activities where they wanted to try out the game. To address these temporary needs, it is important to design flexible gameplay sessions but also test the actual playtime. Others were using these games as a type of exercise game (exergame) (Marins et al. 2011) or other sport activities.

Time of gameplay

The moment at which gameplay takes places is critical for the PX (Engl and Nacke 2012). The time of day not only has a unique meaning for players in terms of being awake and alert for gameplay, but affects the atmosphere of the play locations (Dalsgaard and Kortbek 2009), which was described by Diana, who played on a busy summer afternoon at Checkpoint Charlie, Berlin.

> *"Especially at rush hour it's quite difficult to have a mobile phone in front of you and watch the game. […] I think it's a factor, which is especially considerable between rush hour and peak season." (Diana, 26, Single Player, Berlin Wall 1989)*

Time alters the atmosphere of a location, which influences the GX in a positive or negative way. Whenever a location is highly frequented, players feel distracted or unable to move freely with the mobile device in the play location due to passers-by or traffic.

The game designer cannot directly influence at which time of day a game is played, however this aspect needs to be acknowledged by game design providing a variety of game aesthetics from which players can chose the most suitable for the game location. This may include different sound, vibration, symbols or text. Given that phones are context-sensitive regarding location and time, game aesthetics can change automatic to the contextual situation. Players then have the choice of combining these features in the most suitable way to benefit the play environment and the GX.

7.3. The Player

7.3.1. Demographics

The following sections introduce the player as the central part in the individual GX evaluation. The triangulation of semi-structured interviews, observations and questionnaires aims to draw a

thorough picture of the multidimensional GXs. At this point, it has to be acknowledged that the study is based on a purposeful sampling that includes tourists who may consider playing a location-based AR game during their journey.

Table 11 and Table 12 introduce the participants of introduce the participants of the study under their pseudonym names to ensure anonymity of players' stories. This practice is frequently chosen in qualitative research to create a closer relationship between the reader and data (Miles and Huberman 1994; Creswell 2013).

Table 11: Participants of Berlin Wall 1989

Pseudonym	Nationality	Background
Thomas, Tanja and Tom	German	The group of friends played the game during their weekend trip to Berlin. Tanja (27) and Tom (24) came from the south of Germany to visit their friend Thomas (29). Tanja and Thomas occasionally play games, whereas Tom plays more frequently. All of them are new to location-based AR games.
Linda, Lee, Lauren and Lesley	German	Linda (36) is a single mother and was visiting Berlin with her children Lee (16), Lauren (13) and Lesley (9) as a summer holiday excursion to show them the history of the formerly divided city. Linda grew up in the East and experienced the German reunification, and hence wanted her children to get to know this episode of German history.
Mathild and Marcus	German	Mathild (34) and Marcus (25) are two friends travelling from the north of Germany. They were staying for the weekend to explore the city together. Both have been to Berlin before. Both are avid gamers but Marcus has already experience in location-based AR gameplay, as he is a first adaptor of *Ingress*.
Samuel	Greek	Samuel (28) is a young professional, who recently moved to Berlin. He is a frequent gamer and has experience with playing mobile games.
Diana	German	Diana (26) is an occasional gamer. She likes social games and real interactions with people in games. She plays on her mobile phone but has never played an LB game. Diana has lived in Berlin for 2 years and still feels like a tourist.
Nick	German	Although Nick (31) does not describe himself as a player, he has experience with playing LB games. He rarely plays leisure games and has been to Berlin to visit friends.

Table 12: Participants of Ingress

Pseudonym	Nationality	Background
Mary and Mathew	British	Mary (35) and Mathew (36) do not play games. However, their children are getting to an age where they are getting more excited about gameplay. They were keen on exploring this opportunity.
Ethan and Eric	British	Ethan (12) and Eric (11) are brothers playing video games on a daily basis but have never explored mobile or LB gameplay before. They were on a day visit in Bournemouth and accompanied by their parents who were waiting in a café during the game testing.

Brendan	British	Brendan (15) is an occasional video gamer who has not played LB games before. His mother who was not actively participating in the gameplay accompanied him.
Naomi	British	Naomi (16) barely plays games at all, and has never done so on her mobile phone. She travelled with her mother who was waiting for her during the game testing.
Eva	Portuguese	Eva (27) occasionally plays leisure games online but has no experience in playing on a mobile device. She travelled independently from abroad. She owns more than one smartphone.
Antje	Dutch	Antje (28) just recently moved to Bournemouth, which qualified her as a participant. She is an occasional gamer but has never played on a mobile device before.
Wen	Chinese	Wen (13) has played an LB game before but only plays occasionally otherwise. His father who did not take part in the gameplay session accompanied him.
Peter and Paolo	German and Brazilian	Peter (31) and Paolo (30) are friends visiting Berlin for a few days. Paolo is an avid player of leisure games on his mobile phone, whereas Peter barely plays games. Both have never played LB games.

Data of player demographics, travel behaviour and interests were asked in a short survey after the gameplay and presented in Appendix 6. It was identified that players were responding to a phenomenon to which the majority of participants were unfamiliar. This was mainly due to the relative recent occurrence of these games in travel and tourism at the time of data collection.

7.3.2. Previous Game Experience

It was identified that LB gameplay was a first-time experience for most participants. All participants owned a smartphone and used it on a regular basis, but only two have played an LBG such as *Ingress, Alien Attack* or *Geocaching* before. However, the majority of participants had previous experiences with online games and three out of five considered themselves regular gamers, who play games on a daily to weekly basis. The majority of participants had little to no experience with mobile games.

The low previous game experiences of participants leads to the assumption that tourists are *occasional leisure gamers* or *casual gamers* defined by Bamford et al. (2006) who are characterised as:

- Buying fewer games, buying popular games, or playing games recommended to them;
- Enjoying shorter play sessions – playing in short bursts
- Preferring having fun, or immersing themselves in an atmospheric experience
- Generally require a simple user interface (e.g. puzzle games)
- Considering game playing as another time-passing entertainment tool like TV or films.

Due to the little experience with LBGs participants were often apprehensive. Play testing

revealed a variety of player insecurities due to inexplicit game usability and mechanics, which was sometimes difficult for novice players to understand.

7.3.3. Motivation

Participants described four motivational factors for playing location-based AR games on a journey. Mainly, these games address tourists' interest in fun, exploration, knowledge acquisition, storytelling and social activities (Ryan and Glendon 1998; Page and Connell 2010; Scott and Ding 2013; Xu et al. 2013).

Motivation is a condition for player engagement (O'Brien and Toms 2008; Bouvier et al. 2014a) and an intrinsically and extrinsically aspiration to perform an activity. According to the self-determination theory (Ryan and Deci 2000), players' drive for gameplay is attributed to intrinsic motivation, which refers to people's inherent enjoyment of performing an activity. Extrinsic motivations induce gameplay because of its instrumental value provided by the game system (Ryan and Deci 2000; Przybylski et al. 2010).

The concept of player motivation is concerned with why people *begin to play*, whereas the concept of engagement is related to why people *continue playing* (Schønau-Fog 2011). As a consequence, motivation can be understood as the trigger for player engagement. A number of game researchers (Bostan and Kaplacali 2010; Yen et al. 2011; Yee et al. 2012) analysed motivational aspects of gameplay and explained the underlying concepts of game motivation. Participants' main motivation to play a location-based AR game was to experience immediate fun, enjoyment and entertainment, which are shared with co-players and friends. Fun is a diverse concept with many facets (Lazzaro 2004; Koster and Wright 2010) which expresses in emotions such as astonishment, surprise, laughter but also insecurity, frustration and disappointment. These emotions contribute to becoming and staying engaged in a game (Schønau-Fog 2011; Bouvier et al. 2014a).

Four types of player motivations have been identified for travel and tourism in this study that explain why people play LB mobile AR games during their travel. Although these player types have been identified elsewhere in online games, the categorisation is new to the context of travel and tourism:

- Players liked to explore the environment in their leisure time and are curious to discover places and their history. This type of players can be summarised as **adventurers.**
- Games provide a platform to socialise with friends or other (known/unknown) co-players. A player group was interested in the shared experiences with their co-players and mainly focused on social interactions. This type was identified as **socialisers**.

- Some players were interested in combining the playful activity with learning about the history, personalities or stories of the real world and can thus be characterised as **serious gamers**.
- Tourists are mostly **Leisure Gamers**, who are in search for quick and instant fun during other tourist activities.

Xu et al. (2013) identified a similar categorisation for tourists' player motivation during holidays: curiosity; exploration (discover the destination); socialization between other tourists and locals; fun and fantasy and challenge and achievement. The following sections provide evidence of the four identified players' motivations:

The Adventurers

A first group of players can be called adventurers, who like the explorative character of these games. Discovering a city in a playful way ties in with what Lazzaro (2004) defines as *easy fun.* It describes the art of experiencing an activity through fantasy, curiosity or surprise when hunting for treasures in gameplay. The tourists' interests of playing a game on a journey are in line with the individual player personality classification developed by Bamford's et al. (2006). The authors developed four player personalities - the conqueror, the manager, the wanderer and the participant, in order to understand the particular interests of players. The data provided evidence that participants had much in common with Bamford et al.'s (2006) classification of the *wanderer*.

This group is defined in Bartle's taxonomy (1996) as explorers who are interested in the interaction with the game world. They like wondering around and being surprised by the treasures they found.

The nature of tourist experiences is to know places, which is supported with location-based gameplay. Many participants identified the process of engaging with places as one of the primary motivations for location-based gameplay was identified as the following:

> *"We discover parks where we are usually not hang around" (Peter, 31, Group Player, Ingress)*

And his fellow player Paolo added:

> *"I found it fun to walk and see the portals of the game in reality, so I get really excited to discover them soon […] when I am alone wondering around in the city, I would try to discover more portals." (Paolo, 30, Group Player, Ingress)*

Players enjoyed discovering the game area and finding unfamiliar places using the game. The aspect of uncertainty in the game provides players the freedom to explore the tourist destination

and steering it in any direction. The experience of discovering virtual game locations in reality triggered excitement in players as LBGs enabled tourists to be explorative and adventurous in an unfamiliar environment. Presenting game locations on a map, participants became motivated to discover the new locations, which triggered an interest for tourist places.

> *"I think you can really learn a lot from different places. Those games can make you more curious about the environment and I think Ingress can do this while combining places with missions." (Peter, 31, Group Player, Ingress)*

The majority of participants have reported the exploration as key motivational aspect for LB gameplay, which was originally identified by Hunicke et al. (2004). Tourists enjoyed the explorative character of the playful activity and learned about places in the city, which they would normally not visit.

Hunicke et al. (2004) described the exploring and discovering nature as a desirable state in gameplay in which players find something new about themselves or the game territory. The exploring motive contains an undiscovered mysterious aspect of places, which makes players curious. There is an element of adventure to it that is perfectly reflected in these types of adventure or treasure hunt games like *Berlin Wall 1989*. A related study of video players discovered similar motivational ambitions regarding exploration and adventure. Schønau-Fog (2011) who researched players' continuous desire of playing video games discovered that players were equally interested in exploring the game world, discovering new game elements and encountering the unexpected. This ties in with motives from travel and tourism identified by Oh et al. (1995). Tourists travel to experience new cultures and history as well as seeking for adventure and novelty.

In contrast to video games, participants explored the tourist urban environment that was perceived as most fun and playful. In this context, fun experiences are defined as seeking for adventures and discovering new places:

> *"However, I think it's interesting because you did get to move around with the game rather than just sit around with your phone and just playing with it." (Naomi, 16, Single Player, Ingress)*

Exploration and discovery are participants' main aspects of interest while playing location-based AR games. These motives are equally important for tourists to initiate travel (Oh et al. 1995; Ryan and Glendon 1998). According to Iso-Ahola (1982), tourist leave their everyday environment behind to seek personal rewards, adventures or mastery. Location-based gameplay as well as travelling encourage people to move around and explore their environment. As tourists, participants were familiar with moving from one location to another in order to view and experience different places. But the combination of strolling around in a city while having

playful interaction was something new to participants. People referred to curiosity, novelty and uniqueness when speaking about their first experiences with location-based AR gameplay as outlined here by one of the players:

> *"But I quite liked the idea of taking a different perspective on the city to play a game." (Peter, 31, Group Player, Ingress)*

Introducing gameplay into the tourist experience was an aspect participants were interested in as it supported the tourist desire to explore and uncover places and stimulating their creativity. Novelty seeking and significant experiences are the main reasons for travelling (Chandralal and Valenzuela 2013), which was perfectly presented in the games.

Both games were adventure games and therefore supported the nature of tourists being explorative and adventurous in an unfamiliar environment (Oh et al. 1995). Ihamäki (2012a) supports this finding with her study on geocaching as a creative tourist experience by confirming that tourists are interested in adventures and exploring new experiences introduced by activities like location-based gameplay.

Socialisers

Some participants liked the idea of socialising with their friends or even with foreigners during travel. Socialising is an important aspect in gameplay and travel. Games that facilitate social play are more popular as people like to share their experience and exchange with others:

> *"It's a possibility to make friends when someone else finds out that you're also playing Ingress and then you start to chat about it." (Paolo, 30, Group Player, Ingress)*

Games provide a platform to socialise with people who are open to play with strangers. Particularly, during a period with little social contacts such as experienced by single travellers, these games provide a new opportunity to connect to people travelling around in the same destination. A few players were keen on getting in contact with people outside their friends and family circle as LBGs break down the boundaries of anonymity, which exist in online games through virtual chats and remote gameplay. In LB mobile AR games, players share the same physical game space, which means that players could meet in real life. This is a boundary many participants were not eager to cross, but preferred to socialise with people they already know.

> *"I feel more comfortable to play with others and this is like the touristic experience I am used to. I want to experience things with people I know. So this would be the best way for me, to play it in a group of friends." (Diana, 26, Single Player, Berlin Wall 1989)*

Playing with others becomes an objective in itself as participants reported social play stimulates engagement through shared experiences and reinforced friendship. Participants of the study

were mainly interested in sharing time with each other and the game gave them another opportunity to do so. As Lazzaro (2004) puts it, *people fun* is the excuse to spend time with friends and share amusing memorises (pictures) and experiences with each other. This player type prioritised sharing stories around the journey and gameplay as a social activity and also characterised by Bamford et al. (2006) as the *participant* player type. Other game researchers (Spikol and Mildrad 2008; Lin et al. 2011; Schønau-Fog 2011; Guenjens et al. 2013) discussed comparable benefits of social play. Lin et al. (2011) argues that social play is of elementary motivational importance for mobile gameplay as it furthers interaction of players through competition and collaboration. This also relates to reasons why people travel. As discussed by Iso-Ahola (1982) motivational aspects of tourism relate to searching for interpersonal rewards during travelling by seeking social contacts and interactions with new and old friends, family and the people they are travelling with. One can say that socialisers are searching for social contacts in travel and gameplay.

Serious Gamers

Participants reported a strong curiosity in gaining knowledge of the tourist sites through gameplay. Tourists are generally interested in getting to know the visited locations and gaining some knowledge. Many participants agreed on the importance of integrating historical facts of the destination into the gameplay activity:

> *"[…] because it gave some historical background which was really important in this part of Berlin. The game tries to bring you in the real setting of the particular history. I think it's good." (Samuel, 28, Single Player, Berlin Wall 1989)*

This aspect supports the work of Ballagas et al. (2008) who combined education and entertainment to engage visitors with the history and culture of Regensburg through the location-based game *REXplorer*. Serious games combine elements of education with gameplay and have been widely discussed in game design (Harteveld 2011; Bellotti et al. 2012; Mortara et al. 2013) and creative experience research (Richards and Wilson 2006; Tan et al. 2011) with the aim to create meaningful encounters between players and game environments.

It was generally agreed among participants that the main points of interest (POIs) should be integrated into the game to add value to the gameplay and increase players' interest in culture and history of the destination (Oh et al. 1995; Ryan and Glendon 1998). Connecting the game narrative to real historical places was found to be necessary as one of the participants explains that she would be

> *"[…] interested in it [gameplay] because of the storytelling and it's another way of experiencing the city […] because it's not only facts but facts imbedded in a story."*

(Diana, 26, Single Player, Berlin Wall 1989)

Previous researchers (Egan 1989; Crawford 2004) have cherished storytelling as one of the oldest form to pass on knowledge. With the notion of new mobile technologies storytelling became ubiquitous with connecting stories to locations and telling them instantly from the palm of one's hand (de Carvalho and Ishitani 2012; Ganguin and Hoblitz 2012; Parsons et al. 2012). Ballagas et al. (2008) urged the importance of blending historical facts of the destination into the game narrative to bring the local story to life and make history more authentic. With location-based games, tourists can be an active part of the history, which creates a new form of tourist experience that is due to choices players have of game themes (Boswijk et al. 2012).

Serious LB, mobile AR games contribute towards an understanding of local history and culture in a playful way by making topics more accessible for a broader audience such as children or people who would normally not visit a museum or historic places.

Leisure Gamers

Based on the data, players were likely to initiate gameplay out of two motives: killing time in between main tourist activities or perusing intrinsic motivations such as exploring the area on curiosity. The latter applies to the type of adventure, social and serious gamers, whereas leisure gamers are more inclined to play when they were waiting or unexpectedly had time available on their journey:

> *"[…] when you are waiting for a friend somewhere then you can just go around and hack a few portals. It'll be good to just pass time and have fun at the same time." (Ethan, 12, Group Player, Ingress)*

It was identified that most participants would initiate gameplay to 'pass time'. Game researchers (Järvinen et al. 2002; Huizenga et al. 2009; Lin et al. 2011; Yen et al. 2011) affirmed similar reasons for mobile gameplay motivations. Mobile games, however, make it easy for players to pick the mobile device for a quick game session, as gameplay is independent of location or time. A short and spontaneous game session in which players experience *easy fun* can be understood as temporary engagement in fantasy or creativity (Lazzaro 2004).

Many location-based games, however, do not support spontaneous gameplay, particularly when these games are bound to a certain physical play location like *Berlin Wall 1989.* These types of games have a fixed starting point, which makes gameplay inflexible and rather strict as affirmed by Lehmann (2011) and Ballagas et al. (2008). Wide area games such as *Ingress* are loosely-coupled and thus provide players the freedom to play anywhere and anytime (Wetzel et al. 2011).

Participants indicated that they were generally short of time when they visit a destination and

thus want to explore and see as much as possible. Leisure researchers (Chevrest et al. 2002) confirm this notion. If and how much time tourists dedicate to gameplay varied among the participants and depends on the anticipated added value and aim of the game.

Other players were less favourable for gameplay as they feared that the game would consume too much of their valuable time and not add any value to the travel experience but mainly distract. Particularly for the first gameplay session, tourists would need to invest time to familiarise themselves with software and game mechanics before eventually having an enriched GX. It is essential that the game is understandable in order to perceive an entertaining experience:

> *"I think it takes too much time in respect to the information in the game and also to the fun in the game. As I am in Berlin only for a weekend trip, I would not spend time on such a game." (Tom, 24, Group Player, Berlin Wall 1989)*

The Participant's main critique was that gameplay would be too time-consuming or supporting of the touristic experience. It was in the interest of the tourist to engage with the city locations as opposed to being distracted. HCI researchers (Jøgensen 2004; Ye and Ye 2004; Hassenzahl and Tractinsky 2006; Cai 2009) also pointed out that the handling of technologies requires some time to learn functionalities, processes and structures of the device. Most participants, however, were not willing to invest this time.

7.3.4. Initial Player Emotions

A meaningful experience starts with emotions or emotional involvement of the person. An initial evaluation of player emotions was conducted in the first phase of gameplay (onboarding). In the case of *Ingress* this was after the 'contact mission' and after the introduction video of *Berlin Wall 1989*. In the first few minutes of gameplay, participants were familiar with the call-to-action and GUI of the game.

In order to get an overview of players' emotions, Russell's Wheel of Emotions was introduced as many participants struggled to find the right words for their experiences. However, it can be argued that the tool, put words into the participant's mouth to fit a model of what the researcher wanted to hear leading to exaggeration or underestimation of an emotion, which would lead to misinterpretation. This is a limitation of self-reported methods in psychology and cognitive research (Desmet 2002).

To counteract any adverse effects and avoid influencing participants, players were encouraged to add their own emotions or described their emotions more in detail. The aim was to portray a holistic picture of PXs in its individuality and complexity by using a triangulation of different

methods.

Figure 25 shows a general trend of player emotions in the beginning of the game session. As this study follows the nature of an interpretivist approach no absolute numbers were integrated but instead it has accumulated from players' evaluation. It can be said that player emotions are predominantly in the quadrant between active and pleasant, which indicated that the majority of players enjoyed the gameplay.

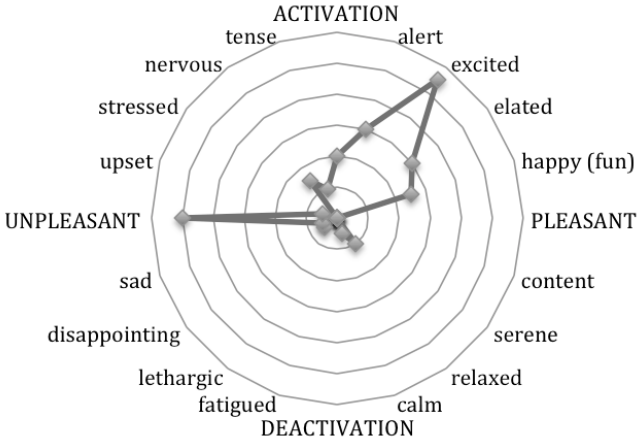


Figure 25: 1st Wheel of Emotions - Player Emotions during Onboarding

Participants shared a prime curiosity and excitement towards the games supported by positive sentiments. Location-based gameplay was experienced as a novel activity in urban environments, which was new and unusual for almost all participants. Thus, the novelty of the activity made people occasionally feel intrigued, alert or happy as expressed by Diana here:

> *'[…] a little bit excited because I didn't know what to expect at the beginning.' (Diana, 26, Single Player, Berlin Wall 1989)*

Onboarding players in the right way and providing all the necessary information in order to enable a smooth gameplay experience should be the aim of a successful introduction. The onboarding process is crucial in the overall GX as the first few minutes determine whether players continue playing or not (Rouse 2005). Tourists, for instance, who generally do not have much time and patience to read long manuals, expected gameplay to be intuitive and easy.

During the first minutes of gameplay, players encountered some difficulties with the game technology, GUI and correct interpretation of the game mechanics. This caused a shift towards negative player emotions for some participants. These negative associations arose through unclear game instructions or insufficient feedback (analysed in the next sections). Particularly novice players struggled to understand the complexity of the game, which lead to nervous reactions.

The tool, however, could only partially reflect player emotions and concrete GX stories were

reported in the interview. Many players felt guarded, confused or wondered if they are on the right track (summarised under unpleasant). These emotions related to unsupportive GUI and playability, which is further discussed in the following chapters.

7.4. The Games

Both games shared the characteristics of a location-based game defined by Jacob and Coelho (2011) but differed in their game mechanics, locative storytelling, GUI and technologies to deliver distinct GXs.

This section discusses the onboarding phase of players into the games and highlights the elements, players found most crucial in this phase. This includes an understanding of the game aim, appropriateness of the story and GUI/playability. Besides, this chapter touches on technology hardware and game settings as pre-requirements for a smooth GX.

7.4.1. Game Introduction

Finding the right play location

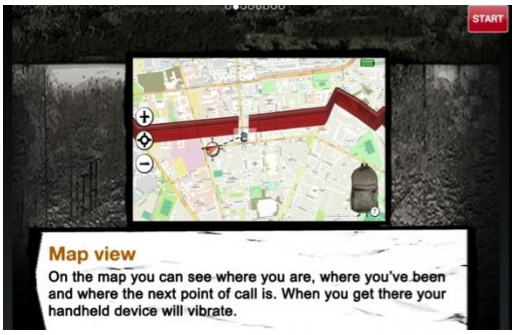
It was observed that for the beginning of the gameplay participants tried to find a discreet play location to familiarise themselves with the game and initiate gameplay interactions. Depending on the physical conditions and the quantity of people in the location, players chose to stand aside from assemblages of people and preferred quieter areas. Some player groups sat on a bench listening to the introduction video of *Berlin Wall 1989* before they moved closer to the play area, whereas other groups stood closely aside.

Finding a suitable play location for onboarding the game, turned out to be one of the first challenges for players. Some participants took some time to find their first location, which negatively influenced their initial player emotions. They described their emotions as confused, alert and tense like Paolo here:

> *"I would not say I was calm, because I felt that I had to focus on the game and there are a lot of people around here. There is a lot of traffic and people here and so I could not be calm and relaxed." (Paolo, 30, Group Player, Ingress)*

The onboarding phase, in which participants felt nervous and alert, was an adversarial stage in which sufficient game feedback was necessary especially in finding the first play location. Visual appliances such as maps or arrows help to direct players to the right geo-location (Figure 26). Device vibrations can support the visuals indicating players' proximity to the play area. This feature, however, did not always function the way it was supposed to and thus participants

were sometimes lost. They tried to find the right way, instead walking off in any direction.

(1) 

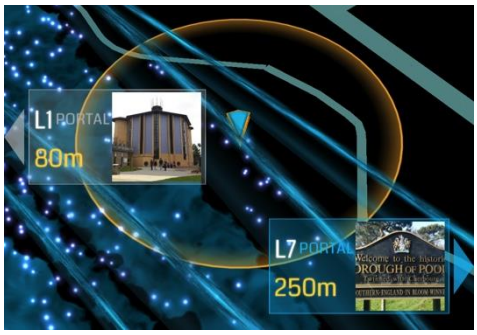
(2) 

Figure 26: Screenshot - Player Location and Proximity
(Niantic Inc. 2012; Tripventure 2012)

Ingress overcomes this obstacle by signposting the proximity to the closest play location. A compass in form of a blue arrow indicated the direction (Figure 25), though it had the downside that the arrow was often misinterpreted by players, who initially walked in the wrong direction like Peter describes here:

> *"When we walked 20 meters into one direction, we noticed that it's the wrong direction. This point could be a little bit more obvious. Where to start? Where to go? The blue arrow is not really this big from which we could notice the right direction to go to." (Peter, 31, Group Player, Ingress)*

Participants from both games experienced difficulties identifying the target location and orientating themselves in the streets of the real world using the game map. Close bodily presence of the player to the play locations is crucial for gameplay activities (Merleau-Ponty 2005) and participants innately knew that physical movement was involved in the gameplay activity. To avoid unnecessary player movements and spoil a player's game, directional instructions need to be distinctive and precise. This is especially difficult as technical functionalities depend on fully operating GPS.

Onboarding - Familiarization with the Game

Introducing players to gameplay mechanics, GUI and playability is an essential requirement for novice players like tourists. Apart from two players, all participants were new to location-based AR games and thus required a systematic introduction. Leading players 'by the hand' in the first time game experience is crucial for a successful game overview. Both games followed different strategies to do this.

Berlin Wall 1989 immediately started with a cinematic video induction, which presented the story and the first steps of the Hero's Journey including the call to adventure to players. *Ingress*, on the other hand, provided a training mission for novice players, which was found to be a

helpful in most cases by practicing game mechanics and getting to know the storyline. Particularly novice players expressed a need for the game tutorials as articulated in the following statement:

> *"First, we were pretty lost. We didn't know how to play the game and push the right buttons. We weren't guided quite well in the first place, so we had to find out how it works." (Thomas, 29, Single Player, Berlin Wall 1989)*

Finding the right balance and pace to deliver information is a challenge within location-based AR games. Both games quickly draw players into the gameplay activity by assuming that players get acquainted with game mechanics and the story easily, but some participants felt overwhelmed by the amount of information. Paolo and Peter, for example, found the quality and quantity of information not appropriate to understand gameplay:

> *"The instructions were a bit too much; I don't get all of this at once." (Paolo, 30, Group Player, Ingress)*

On the contrary Paolo's fellow player Peter criticised that he did not have enough information to settle down into the game.

> *"Well, for me it was a really short introduction. I think we should google it to find out more about the story and the game background." (Peter, 31, Group Player, Ingress)*

Acquainting players to the game is a crucial step towards player understanding and eventually pleasure, which was also recognised in previous research (McCall et al. 2011; von der Pütten et al. 2012). Game designers sometimes underestimate the necessity for game tutorials especially for novice players. According to a recent study (Robinson 2015), 20% of players feel lost in 'free to play games' within the first two minutes. Explanations or step-by-step guides make this process easier and prevent players from exit the game.

Participants such as Peter appreciated the training mission as he could learn and understand quickly when he tells about his first time player experience:

> *"It sounded interesting and there were a lot of new tasks I wasn't familiar with like discovering and linking portals together. It could be overwhelming […] but with the small task list, it was manageable. Once we hacked the first portal we got the hang of it and it worked out at the end." (Peter, 31, Group Player, Ingress)*

Novice players such as tourists request clear instructions to control and master gameplay in an interactive learning environment. *Ingress* provided a separate tutorial with different levels to learn the features step by step. Players appreciated this, as it did not overwhelm them as expressed by Naomi here:

> *"It's nice because there are always instructions on the screen how to play the game. So*

when I forget what to do, I have the short instructions to help me remember. Because, when you are on holidays, you always get distracted by some things and by going to new places it's worse because you are always looking around." (Naomi, 16, Single Player Ingress)

In-game tutorials work as a reminder, to bring players back into gameplay or help them to accomplish tasks. This aspect is supported by Rouse (2005) who suggests that novice players need a recap on what they have to do in gameplay in order to perform activities. The division of the training into different categories, shown in Figure 26 made it easy for the player to learn the game step-by step and support the understanding of different game mechanics and interactions required to progress gameplay.

Figure 27: Ingress Training Mission
(Niantic Inc. 2012)

Many game researchers (Rouse 2005; Schell 2008; Harteveld 2011) advice to start the onboarding process with a game induction. This has been taken into account by related projects such as *TimeWarp* (McCall et al. 2011; Blum et al. 2012; von der Pütten et al. 2012) or *REXplorer* (Ballagas et al. 2008). A successfully integrated training scenario positively influences the playability of the game. Since players found it hard to learn game mechanics and usability by themselves, they are likely to stop playing when they do not understand. In order to overcome a low level of engagement at the beginning of gameplay, training missions need to be embedded into gameplay (Sweetser and Wyeth 2005; Harteveld 2011; McCall et al. 2011). In the case of *Ingress* for example, the training mission is rather hidden in the depth of the game menu and only appears once after installation.

Berlin Wall 1989 on the other hand used a video tutorial, which made it hard for players to understand game mechanics and playability. Explanations about usability were hardly given and the tutorial was not available after the first play session.

Many game design researchers (Sweetser and Wyeth 2005; Jegers 2007; Lindley and

Sennersten 2008a; Schell 2008) suggested to introducing in-game tutorials. Mendenhall et al. (2012) presented two types of a instructions in their AR game *NerdHerder*, which should be considered a best practice for location-based AR games. They provided players with a choice considering that some players are more experienced than others. In *NerdHerder*, novices played a tutorial named 'Orientation' to learn the GUI of AR, whereas a second tutorial guided players step-by-step through the basic game mechanics. With this option, players would have the choice to revisit the usability-based or story-based game induction at any time in gameplay when they need help or clarification.

Game Aims

One of the main concerns in the semi-structured interviews addressed the understanding of the game aim. In order for players to know why they should play the game, the game aim needs to be explicitly communicated. *Berlin Wall 1989* used a small introduction video giving a briefing as shown in Figure 27.

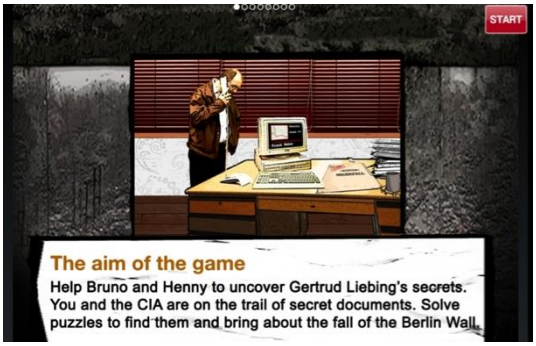


Figure 28: Screenshot Berlin Wall 1989 - Aim of the Game
(Tripventure 2012)

Some participants felt the introduction video was too fast and could therefore not be properly understood by the majority of participants, who reacted with confusion and did not know how to proceed. Players could not follow all the game instructions and consequently the gameplay objectives were not clear to most players as indicated by Nick in the following:

> *"I have to complete a mission and I think I have to destroy East Germany. I have to get information to destroy East Germany. But sometimes I missed what's happening and it was too fast." (Nick, 31, Single player, Berlin Wall 1989)*

On the other hand, players with previous GX wanted to skip the long introduction to start immediately with the gameplay but were obligated to go through the game induction. Some procedures were found to be too long or too fast for players as mentioned by Diana:

> *"I felt a bit lost because I could not go back or at least I haven't found out how to go back into the navigation. Maybe I should have shown the diary and checked the rucksack*

before." (Diana, 26, Single Player, Berlin Wall 1989)

Players mentioned that the game objective was too abstract, which was especially the case with *Ingress*. Participants named several reasons why the game aim was not understandable to them. Game researchers (Hunicke et al. 2004; Salen and Zimmerman 2004; Jegers 2007; Schell 2008) urge the need for establishing a clear and achievable game goal that is communicated at an early stage of gameplay and to present intermediate goals at appropriate times during gameplay, depending on the structure of the game narrative. Players have to be informed from early on about game tasks and the consequences for the gameplay. Players also questioned if there will be an end to the game in which all portals are conquered by one fraction. The end of this game is not entirely defined yet and probably intentionally left open for discussions by *Niantic Lab* as part of the game story and strategy. But participants would have liked to know what they were aiming for and consequently questioned the purpose of the game as this meant that play activities became meaningless repetitions:

> *"It's too nonsensical because it was a sort of challenge that just leads to anything. As I said, if there was a clear itinerary or something like in the sense of "this is the path where this person walked" then fair enough; you just walk in their steps and that's interesting […]" (Mary 26, Group Player, Ingress)*

Mary pointed out here that the game did not lead her in any physical or game direction, which made her feel unguided in the game world as well as in the real environment. It was observed during game testing that some participants had different expectations of a location-based game and unintentionally took it for an information or navigation system, which will lead them the way to the nearest tourist place or attraction.

Appropriate Game Story

Game stories need to be easily **comprehensible** for players in order to interact and react appropriately to the game narrative. In some situations however, players were not able to understand the game story right away and had difficulties in identifying what to do. Participants did not connect to the game story and tasks. Game jargon, such as exotic matter (XM), portals and resonators, introduced during *Ingress* gameplay was unfamiliar to players, who needed to adapt quickly in order to understand the game actions. The use of specific terms made it difficult for players to instantly identify what was asked from them as the following statement from Brendan shows:

> *"Hm, I don't really know because I don't know what it means and what the aim of linking two portals is." (Brendan, 15, Single Player, Ingress)*

Players even tried out different options in the game but perhaps found themselves in a narrative

loop as experienced by Marcus and Mathild in *Berlin Wall 1989*:

> *Mathild: That's a kind of a time loop.*
> *Marcus: We have been through this dialogue a few times already.*
> *Mathild: With all possibilities*
> *Marcus: And we cannot proceed and don't know what to do next.*

It was observed that participants of both games experienced similar situations like the one above in which players had difficulties proceeding with the game. The game narrative was not explicitly clear and players had difficulties to clarify their role and tasks. Samuel for instance reflected on an interaction with an avatar:

> *"Some parts of the gameplay weren't clear for me. The policeman for example why was he there and what was his role in the game? He wanted something but as I gave him the visa, he didn't want to see it. It was quite confusing. There were inconsistencies within the game story." (Samuel 28, Single Player, Berlin Wall 1989)*

Players behaved and interacted in a natural way with the game narrative, thus it was irritating to them when gameplay did not proceed as expected. Game narrative interactions and progress should be clear and obvious to players in order to avoid player dissatisfaction and cannot be anticipated by game designers.

Players shared different opinions concerning the game story and topic. People often felt overwhelmed and fatigued by the omnipresent German history education. This was particularly the case for German participants who were very familiar with the recent history of the Cold War. A few players even commented on the game narratives presenting a **biased view on history**, which came up in the *Berlin Wall 1989* game expressed by Tom here:

> *"[…] I think it could be a problem of learning or teaching history via giving the person who learns a role. Because then, if young people that do not know the history play the game, their view on that history is biased from the beginning because they have a certain position in the game. But this is not the problem of the game; this is a problem of teaching history in every situation." (Tom, 24, Group Player, Berlin Wall 1989)*

The interpretation of historical facts depends on the tourist's previous experiences, sociocultural background and mindfulness (Moscardo 1996). Tourists have a different understanding and perspective on the same historical event than residents do. In the case of the *Berlin Wall 1989* game, a Russian tourist would perhaps play the game differently to a French tourist, but the game left no choice to change the game protagonists or narrative, thus people played the game from the imposed perspective. This aspect recognised in the *Berlin Wall 1989* game underlies touristic interpretation in general. Uzzell (1992) discussed the issue of contested history mediation in his study on *Hot Interpretation of War and Conflict* where he outlined the

weighted mediation in Berlin history.

Remarkably many German tourists were less interested in topics closely related to national historical themes. Germans were particularly unconcerned with being introduced to history themes in their leisure time after having learned the history at school or on TV. A few participants indicated that they would instead seeking for fun and entertaining experiences on their journey and would abandon serious topics as they are too emotional. This type of mediation was characterised by Uzzell (1992) as *hot interpretation.* Uzzell argues that there is a need for provoking, shocking but also interesting, engaging and entertaining interpretation of history:

> *"We learn about it in History in school and it's no fun anymore because it's just too much and you find this topic and WWI and WWII everywhere on TV and Internet; and I completely lost interest in these topics. It's just badly made most of the time." (Marcus, 25, Group Player, Berlin Wall 1989)*

This might be different for international tourists who are not familiar with the local history and culture and have an interest in these topics.

Ingress, however, enabled players to choose the group they want to support which opened a different game narrative – players could chose the perspective of gameplay in the beginning. This is in line with what Richards and Wilson (2006) argue that players should be able to create their own narratives and bring in their own creative and imaginative potential into creative experiences like gameplay as opposed to follow ready-made storylines.

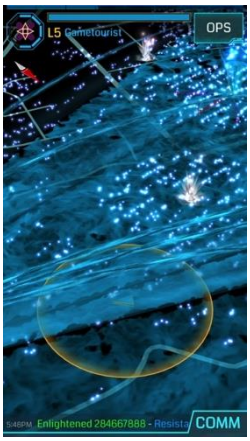
Participants indicated the importance of the narrative topic. A general preference of a story topic could not be identified due to the diversity of players' interests, expectations and knowledge. Families like Mary and Matthew, parents of two 6-year-olds were looking for playful and peaceful experiences with a focus on social interactions. Male teenagers, between 11 and 16 years, on the other hand, were interested in challenges and fast game progression, immersing themselves into gameplay and competing with each other. Thus, the interest for game themes ranged from adventure stories to action and history.

7.4.2. Game User Interface (GUI) & Playability

Game user interface (GUI) design distinguishes between both games as they follow diverse objectives.

Ingress, for instance, is based on a science-fiction story and followed a map-centred approach in which portals are shown in three different colours: blue (Resistant), green (Enlightened) or grey (neutral). The futuristic visual style of the map representation is reminiscent of an advanced

scanning tool that enabled players to identify paranormal locations, which are hidden otherwise for none players. The futuristic GUI supported the atmosphere of the game and simultaneously transports players into the game story of paranormal investigations and engages players in the process of searching game portals. Players could interact with the game world via touchscreen gestures and physical movements in the environment. The game in return provided multiple feedback on player activities and movements such as changing the colour (Figure 28-1) of the portals or indicating the physical proximity of players to a portal with a blue arrow and yellow interaction circle within a forty-meter radius (Figure 28-2).

(1) 

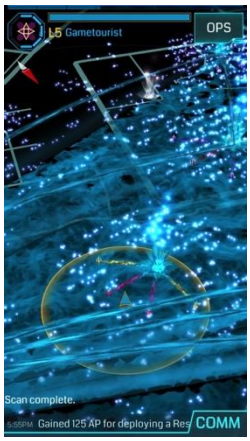
(2) 

Figure 29: Screenshot Ingress - Game User Interface
(Niantic Inc. 2012)

Alternatively, *Berlin Wall 1989*, as a historical game, illustrated the real story of the divided city of Berlin during the Cold War. The UI changed according to players' interactions and locations. (Figure 30-1) The map view showed the physical location of players in the game world. A red arrow indicated movement and direction of players whereas; the dashed line indicated the way to the next play location. When approaching a play location, the mobile device signposted the proximity by vibrating and moving the arrow (Figure 29-1)

(1) 
(2) 

(3) 

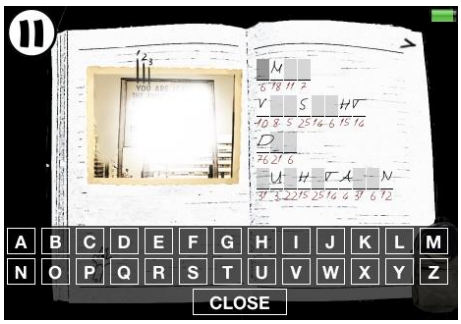
(4) 

Figure 30: Screenshots Berlin Wall 1989 - User Interfaces
(Tripventure 2012)

The dialogue interface presented a false AR showing a comic game character in the front and a picture of the current play location in the background. (Figure 30-3) The rucksack inventory is presented as an overlay on the map presenting all including items. (Figure 30-4) Interactions to accomplish the game challenges were accessed by opening the diary. The diary can be browsed and modified by using the in-game keyboard.

Game designers should not anticipate what players can and cannot do but indirectly control their behaviour by applying design techniques such as colour, symbols or input mechanics. A common design technique is to guide player to a particular object the game designers want them to interact with (Schell 2008), which is also the aim of many AR applications (Kourouthanassis et al. 2015). In the first game challenge, for instance, players had to access the secret diary of Gertrud (Figure 29-3) and solved the puzzle in the diary (Figure 29-4). Some players, however, were not aware of the diary, which was marked in black. A gleaming effect would have indicated that at this play location it is necessary to interact with the diary in order to proceed to the next location.

Players enter the game via the game controllers (Brown and Cairns 2004) and master the game mechanics (playability). Mutual and learned interactions with the mobile device such as handling the map or scrolling is easier to perform, as player's already have existing tacit knowledge (Calleja 2007; Jegers 2007). The GUI needs to be as easy to control as possible as players have less tolerance for learning new interactions in a touristic setting. Thus usability of the game needs to be easy to learn. Either way, it is important to give players the feeling of having control over the gameplay at all times and avoid feeling helpless. Usability is a crucial concern in game design (Pagulayan and Steury 2004; Bernhaupt et al. 2008; Desurvire and Wiberg 2009) and needs to be distinguished from playability. Game designers have to take into consideration that if players cannot figure out how the game works, they will soon lose interest and abandon the game.

It was also observed that the GUI should be customisable according to the contextual situation and players' preferences. Participants experienced problems with reflecting screens (Figure 31)

due to sunshine where audio would have been more appropriate.

Figure 31: Participants protecting Screen from the Sun

In another case, participants could not hear anything due to the traffic and hassle at the play location, but suggested audio for a different play situation in the evening when the city becomes quiet and the screen is hardly accessible.

> *"I mean when you are playing in the evening and when it's becoming darker, then sound makes more, sense at this time of day [afternoon]." (Lauren, 13, Group Player, Berlin Wall 1989)*

Also in other situations, a combination of audio and visual interface needs to be applicable as external or player needs need to be satisfied that players are able to play. The same applies for accessibility that encompasses the possibility to address any kind of impairment or special needs of players. Blind tourists, for instance, should also have the availability to the play these games. The same applies to senior tourists who have difficulties in reading small characters. Yet if there are audio interface or customisable GUI such as variable text size, gameplay would be improving or made possible.

7.4.3. Hardware & Technology

Mobile Internet

Both games were GPS based and needed a continuous update on players' location. A mobile Internet connection was only necessary to update the games' current map information or to withdraw additional information such as in-game linking to Wikipedia in *Berlin Wall 1989*. Although none of the players used this feature in the game, Mary illustrated a different example where mobile Internet was required during one of the day trips with her family:

> *"I literally googled St Peter's Pump and there was a nice website and I was reading through and this enhanced our experience and we learned far more than what the*

National Trust gave us by just using Google on a 4G mobile phone." (Mary, 35, Group Player, Ingress)

This illustrates players' interest in receiving additional information about the locations they visit, although in this case through an external website rather than directly in the game. Currently this would still include roaming costs for international tourists, which will cease to exist by 2017 (Europa.eu 2016). For the time being, game designers have learned to work around and enabled offline playability such as *Ojoo* (Ojoo 2016) or *Geocaching* (Groundspeak 2016). However, mobile Internet is a prerequisite for game updates and in-game communication like the *Ingress* chat function. Thus, mobile Internet is still a weak point of LBMGs, although most games are not necessarily dependent on it, mobile Internet enriches the gameplay experience and will further be inevitable.

Display Size

Players critiqued the size of the mobile device screen as being unfavourable for gameplay especially for more than one player. The display was too small to let more than two players read properly at the same time and thus found to negatively influence their GX. Lauren, who was playing with her brother Lee and mother Lauren, outlined:

"Playing with each other, the display felt really small and we had to stand really close to each other to be able to see the display. The secret letters were too small and we got easily lost in the lines." (Lauren, 13, Group Player, Berlin Wall 1989)

The first challenge of *Berlin Wall 1989* asked players to fill in missing letters in a secret diary by counting letters on a nearby board at Checkpoint Charlie. The handling of the interface was reported to be very small and fiddling, also for children's hands. It was observed that participants had difficulties in interacting with the game interface especially typing the letters on the in-game keyboard. Using the keyboard of the operating system, which players are used to and which was implemented by *Ingress* would have been preferred in that case.

It was generally believed among participants that real AR features would have provided a better experience on a lager screen and the bigger display would be more effective for enhancing their game experience. Controversially, players were not willing to carry a larger device around on their travel due to the weight. They indicated that tablets would not be an equivalent substitute for smaller more convenient devices like smartphones, such as stated in the following by Nick:

"I think the game makes much more sense on an iPad or tablet. But I don't like running around with a tablet taking photos because it would look wired. But it makes no sense only the display is bigger, there is more space for the menu and the icons and then more photorealistic AR would be possible. So I think to get a better game experience, tablets

would insert improved pictures." (Nick, 31, Single Player, Berlin Wall 1989)

This also supports the findings of previous game researchers (Laarni et al. 2005; Chang et al. 2011; Wetzel et al. 2011; Thompason et al. 2012) shared a similar view on the size of the display influences the GX to a certain extent. Chang et al. (2011) confirmed the restricted presentation of visual effects on a smaller screen whereas Wetzel et al. (2011) recommend that the display properties and the weight of handheld devices should be considered in the design of ARGs. Also, Thompason et al.'s (2012) study shows that the level of immersion is higher for lager screen sizes (iPad) in comparison with smaller ones (iPod) and concluded that screen size is an important factor in game immersion. Laarni et al. (2005) agreed that players experience a higher level of presence with a larger screen.

However, the concepts of game immersion and the feeling of presence are not the concerns of this study as outlined earlier. Alternatively, players should become more engaged with the physical environment and co-players, which previous literature implied is independent of the screen size (Laarni et al. 2005). It is believed that the level of engagement could only be increased by employing new and intuitive forms of player engagement such as natural gestures to perform specific actions in games as suggested by Chang et al. (2011). Small screen devices can instead be used as metaphoric artefacts such as a magnifier, which players use to see through or to raise awareness of particularities in the physical environment. This allows players to interact with the game environment and extend the GX beyond the traditional display usage.

2nd Device

It was observed among group players that often, a second device was used to support the main gameplay activities. The most common use of a second device was to provide navigational support via Google Maps. Mathild and Marcus, for instance, got stuck after completing their first game challenge of *Berlin Wall 1989* by trying to find the way to Gendarmenmarket. There were no signs showing the way and players were also not interested in searching for way finders or asking passers-by. Instead, Marcus suggested that:

"We should ask Google to find the right way and be on the save side. But first reboot the system." (Marcus, 25, Group Player, Berlin Wall 1989)

Participants shied away from seeking external help from non-players such as locals but instead trusted technology to help them out. This technology-focused and self-isolated behaviour was a typical behaviour observed among participants. This phenomenon was described by Erving Goffman (1963) as *civil inattention* and is evident in the later work of Richard Sennett or Rowan Wilken (2010) who describe a world in which people pass by without daring to speak with each other and isolate themselves. Wilken (2010) calls this *psychic cocooning*. Urban

citizens protect themselves with the invisible shield of anonymity and claimed their right to be alone (Bull 2007; Wilken 2014), or hide behind their smartphones pretending to be busy. The described phenomena were also observed among participants, who did not feel comfortable breaking into someone else's privacy by asking for directions but were relying on technology instead.

Other players used the second device as an auxiliary device to write down the solution word of the first challenge of *Berlin Wall 1989* as they did not manage how to work out the in-game keyboard, which would appear by tapping on the missing letter page in the secret diary. Missing game instructions did not make it obvious for players how to work with the game interface.

Ingress players proposed the employment of a second device for co-players to play their own play sessions and enabling social gameplay. As player interactions were recorded on the screen, it would have been difficult to synchronise game sessions on two devices with players playing with or against each other but worth future investigations with the right equipment.

7.4.4. Game Settings

Language Setting

Another aspect, which belongs to the handling and feeling in controlling the game, is the language setting of the game. Both games were played in English apart from one player group, who chose to have the play settings of *Berlin Wall 1989* in German to understand the gameplay due to the unfamiliarity of the children with playing in English. *Ingress*, on the other hand, was only played in English, which was not recognised as an impediment for participants as all of them spoke English.

It was recognised that the language setting in *Berlin Wall 1989* was not consistent throughout. For instance, safety instructions were displayed in German although the game was played in English. This confused players who checked the setup of the language and reloaded the game again. Consistency in the language setting was outlined in previous games and tourism research. Arhippainen and Tähti (2003) found that the device language affected the understanding of the game and thus has a negative or positive effect on the user experience. Thus, especially designing systems for tourism applications, Höpken et al. (2010) emphasized an adaptable language setup of mobile tourism systems which can be changed extrinsically by the user. Ferreira et al. (2012) also suggested that tourist players need a diversity of languages, which has to be considered by game designers who create games for this specific context.

Save Game Settings

It was identified during the experience evaluation that participants of the study requested

different save options:

Save the game after quitting the game session: saving game settings and the last game session are important features assumed by players and encompassed in both games. Leaving the game application should instantly save the session and can lead to distractions among players when the game started with the previously played level as experienced by Nick:

> *"Well, the gameplay should not start from the absolute beginning as opposed to lead the player to the point he last left the game otherwise it's just confusing and disappointing. You first saw the progress in the first gameplay session and after quitting, the game is reset, this is disappointing." (Nick, 31, Single Player, Berlin Wall 1989)*

Saving the last game session is a self-evident feature in games as in any other software. Players feel distracted when basic features are not intuitive to handle or not working as expected.

Save visited locations in a gallery and walked routes: to present achievements such as the last visited locations should be accessible any time for players to know where they have been and enable sharing with fellow players. The same applies for walked routes; players would use this as a breadcrumb path or satellite navigation to find their way back to the original play location.

7.5. Summary

The previous chapter portrays the beginning of the engagement process of players with the game and the surrounding environment. It outlines why players are motivated to play location-based AR games such as leisure and social interests, seeking for adventure or learning opportunities. In the initial onboarding phase, it is key to clearly communicate the aim of the game to players besides incorporating suitable play locations that match the theme of the game, support with atmospheric characteristics and provide enough game space for players to engage into a continuous gameplay activity. The next section explains the levels of gameplay engagement and how they contribute to create a holistic tourism experience.

8. GAMEPLAY AS AN ENGAGING EXPERIENCE

8.1. Introduction

The second part of the finding chapters reflects on the process of unfolding gameplay and its influence on the individual player experiences (PX). Through the triangulation of qualitative research methods, namely player observations, mobile interviews and Russell's Wheel of Emotion, the aim was:

> *To explore the individual player experience in the engagement process with location-based Augmented Reality Games in tourism urban environments* (objective 4)

The Process of Player Engagement (Figure 32) is the core part in the conceptual framework portraying the player engagement experience with location-based AR games. Although PXs unfold on an individual basis, six engagement characteristics could be identified. It is important to understand gameplay as a flexible and unpredictable process of activities, in which the individual PX is shaped by the game mechanics and external influences of the game environment. Players interact and react to the game elements of the location-based AR game shifting between the game world and the urban tourism environment.

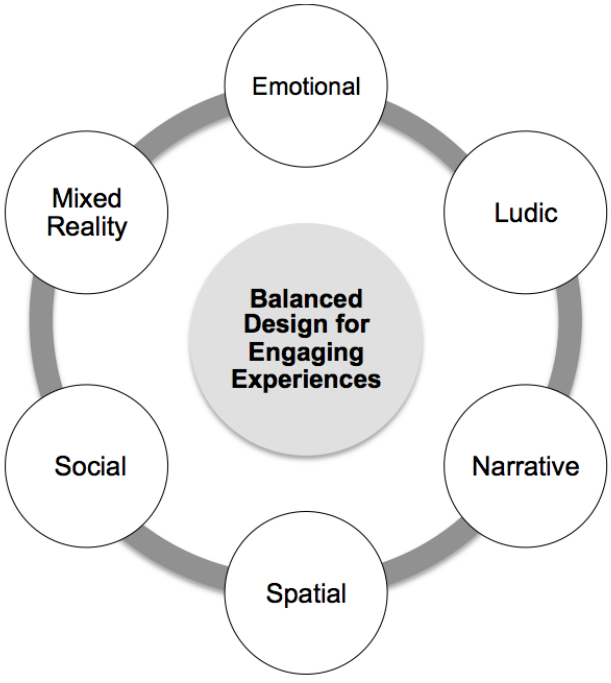


Figure 32: Process of Player Engagement

The characteristics contributing towards engagement are discussed in the following sections in detail and can be summarised as:

- **Emotional engagement** reflects the mental reactions, feelings, and emotions of players evoked by the gameplay and the interaction with the environment and other players. The nature of player emotions can be positive or negative, but are subject to the individual and thus contextual.
- **Ludic engagement** describes the playfulness. Gameplay uses different mechanics to engage players, which are mainly centred on a suitable reward system. Appropriate and regular feedback on player behaviour was identified to contribute towards mastering challenges, reflecting on competition and cooperation activities and enabling meaningful choices.
- **Narrative engagement** is concerned with engaging players into the game story. In order to attract players to the narrative, game stories are required to be authentic to the tourist places so users can identify with the game characters. A linear or non-linear storyline can engage players for a longer period or allows for short and flexible gameplay interventions.
- **Spatial engagement** can be separated in location engagement and space engagement. Where the first addresses engagement with the play location and the ability to create meaning through gameplay from the locations, the latter is concerned with the space in between the play locations. This involves orientation and navigation as well as the distance between the POIs.
- **Social engagement** is identified to positively contribute towards player engagement as game experiences are shared through interaction between local/familiar players and remote/unfamiliar players.
- **Mixed Reality engagement** depends on players' ability to draw connections between the virtual and the real game place. Players continuously mediate between these two worlds supported by Augmented Reality and matching the virtual with the real world in order to identify play locations. Besides, game sound and environmental noises merge into a hybrid of either supporting or impeding the GX, the same applies for real and virtual world rules, which becomes part of the mediation process.

The components are connected and directed by player emotions and behaviour that influences the PX. These intentional emotions (Desmet 2002) involve the relation between player/game, player/location and player/player. But as emotions only exist for a relatively short time as game and external circumstances are changing, they were monitored during the engagement process

and at the end of it.

Ideally, the game design elements continually balance out in order to create positive and engaging experiences for players, though this is not always possible. Positive and negative PXs are explored and recommendations are made for the game design to address accordingly and maintain player engagement with location-based AR games.

8.2. Emotional Engagement

To outline player emotions during the gameplay session, participants were asked to indicate their sentiments on Russell's Wheel of Emotions presented in Figure 33. Here, it can be seen that there is a strong indication towards active and pleasant emotions, specifically toward excitement, fun, alertness and pleasure. These feelings were primarily expressed during the discovery of new POIs and when participants finished a challenge.

On the other hand, the figure also indicates that a few players felt occasionally unpleasant, stressed or nervous. The level of negative emotions is mainly due to technical issues, which have been encountered during gameplay. The wheel postulates a genuine overview or tendency of player emotions summarising the quantity of statements collected after the second play location.

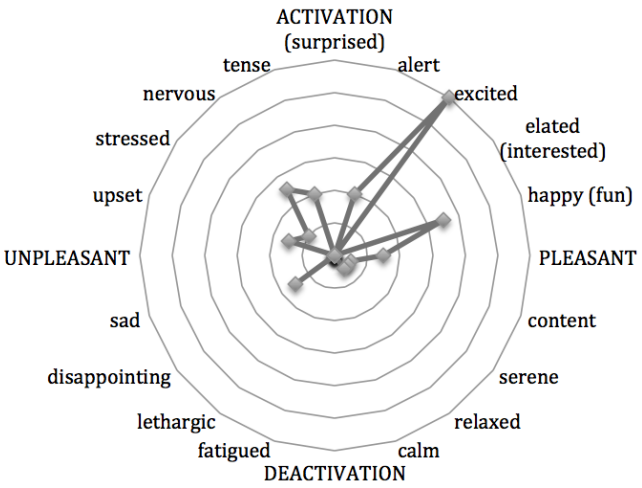


Figure 33: 2nd Wheel of Emotions during Gameplay

The figure shows a trend towards positive and pleasant emotions during gameplay, which differed from initial player emotions in the sense that players indicated not being generally interested or alert during gameplay. Some players lost interest due to usability difficulties, which was reflected in being upset or sad.

Most players, however, maintained their high level of excitement from the beginning of gameplay. The increasing difficulty of game challenges and the exploration of new game

locations evoked attentive and exciting emotions in players. With the underlying emotional tendencies in mind, the engagement process is discussed in more detail in the following sections.

8.3. Ludic Engagement

Meaningful and engaging game experiences result from the interaction of players with game mechanics (Chang et al. 2011) based on meaningful choices. Location-based AR games follow conventional gameplay proposed by Juul (2003) as specific location-based mechanics such as walking. The combination of traditional game mechanics and natural interaction distinguish location-based games from online games.

The following sections focus on the application of game mechanics in the evaluated games and show how players perceived gameplay throughout the game tests and how game mechanics can be directed towards a more balanced and engaging game experience.

8.3.1. Game Feedback

Giving players feedback on game tasks has been identified as the most essential game feature in location-based AR games being played by first time players in the tourism context. It sounds simple and game researchers (Hinske et al. 2007; Schell 2008; Chang et al. 2011; Ejsing-Duun 2011) have emphasized the meaning of providing adequate feedback in pervasive gameplay before, but it was recognised that participants experienced most difficulties with measuring their game progress due to insufficient feedback. As Schell (2008) urges, rewards are the way to tell players that they have done well and to keep players into the gameplay loop by constant encouragement and gratification. Receiving clear, appropriate and instant game feedback has been mentioned by play participants from both games as a major issue as given with the example of Nick here:

> *"The game should give some more feedback and very clear feedback about the status. I don't want a miraculous badge for something I don't understand, but when there was something happening, I need instant feedback like 'You have a badge because you solved all the codes'." (Nick, 31, Single Player, Berlin Wall 1989)*

As Nick stated, instant and clear feedback is important for players to know their progress in gameplay but also reward player for achievements and punish them for losses. Many participants reported that in-game rewards and feedback mechanisms were not sufficient to provide them appropriate response on their game progress. Players were not clear whether they had ended a mission at one play location and felt insecure about moving on to the next play

location as reported by Samuel:

> *"Actually there is no interaction, so I don't know if I've finished with this location.'"(Samuel, 28, Single Player, Berlin Wall 1989)*

The participant is describing a critical part in location-based gameplay, as physical movement from one to the next play location is a choice the player makes after receiving feedback that he completed one mission and progresses to the next. It occurred in the play test that one player continued to the next game location without solving the riddle from the first and was then unable to progress further. This incident would have meant a return to the first play location to retake the mission, which led to frustration for the player. With a missing or ill-defined feedback system, players are not able to make well-informed decisions leading to negative player emotions such as dissatisfaction, uncertainty and confusion. But it also leads to a disconnection of cognitive and physical flow (dual flow) as described by Sinclair et al. (2007). Players feel neither engaged in the game nor want to continue walking when game feedback is not appropriate.

The games used some feedback mechanisms. *Berlin Wall 1989*, for instance, implemented a counting system (Figure 34) showing how many stages players completed so far and also used a point system, which worked more as a badge collection.

(1) 

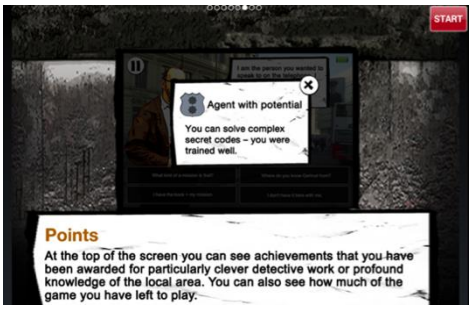
(2) 

Figure 34: Screenshot Berlin Wall 1989 - Game Feedback Mechanics
(Tripventure 2012)

It was unclear, however, what type of progress was measured as players seem to progress by going through the dialogues with the game characters but not for solving puzzles, proceeding to the following location or overcoming challenges as indicated by Nick.

> *"The progress bar showed me I have five out of 25 tasks completed. So that would make me successful on that place I guess. I don't know if I did everything right, which is bad because I should know if I achieved all the targets. […] There was no end, no reward, no nothing." (Nick, 31, Single Player, Berlin Wall 1989)*

As Nick's reflections on the game feedback show here, the player raised concerns about the insecurities he felt not having received enough response on his game activities. He was insecure

though he achieved all the tasks and completed the level.

In the described case above, the player did not receive any immediate feedback on his actions, and therefore felt less engaged and dissatisfied. However, game feedback could be realised in many forms for location-based games as implemented in *Ingress.*

The game mechanics shown in Figure 35 are examples of in-game rewards used in *Ingress*. The progress bar in the first picture monitors the energy level players' gain by walking around. Players receive points by hacking or linking portals, which help to level up in gameplay. Badges can be obtained for special tasks such as discovering and successfully submitting new portals for the game. Hinske et al. (2007) emphasized the importance of quantifiable outcome in pervasive games and that players should always have the possibility to inquire the current score, which is given with the agent profile overview in *Ingress*.

(1) 

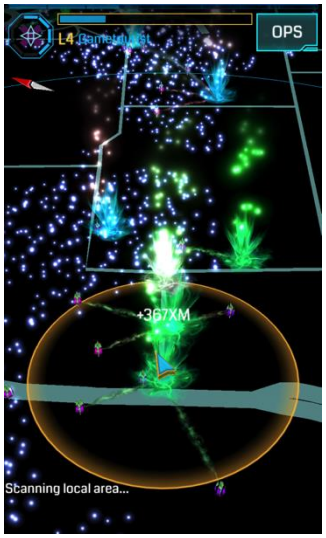
(2) 

Figure 35: Screenshot Ingress - Game Feedback
(Niantic Inc. 2012)

One of the most basic rewards is praise (Schell 2008), which was implemented in this game as a sound system indicating the collection of exotic matter (XM energy). This simple mechanic turned out to encourage players to walk more and was found to be fun as brought up by Antje:

> *"Any time I got some XM […] you think that you have to walk quite far to get the blue points [XM] but they actually come to you and make "dididing" you got the points. It's quite nice. Yeah. You can hear it and you see it." (Antje, 28, Single Player, Ingress)*

Using sound was an effective method for indicating player activities and giving instant feedback on players' walking performance in the physical environment. Sound as an appraisal mechanism encouraged players to walk more and get into a kind of physical and mental flow state, also known as dual flow (Sinclair et al. 2007).

Game researchers (Jegers 2007; Lindley et al. 2007) indicate that players need to receive appropriate feedback at suitable times and also expect to be rewarded for the time, struggle and learning effort they have invested playing the game. A missing 'gameplay gestalt' described by Lindley (2002) in the form of absent feedback leads to ludic disengagement of players interrupting the interactions with the game. The consequence is a disruptive game experience. Appropriate and regular game feedback on the other hand, ensures players in their actions and decision-making process within a game. Players feel mentally secure and confident when they receive regular and appropriate feedback in the form of rewards or even a sound. Feedback is thus identified in contributing positively towards engaging experiences.

8.3.2. Competition & Cooperation

Competition is closely connected with cooperation, as stated by Schell (2008) in his *Book of Lenses,* these are the most favoured reasons for people to play games. A competitive but also cooperative aspect is implemented in *Ingress* facilitating multi-player gameplay with and against each other, whereas *Berlin Wall 1989* as a single-player role game enabled cooperation only with the virtual game characters.

The participating *Ingress* players generally liked the idea of competing against each other and had varied views on whether this should be friends or strangers as shown in the following:

> *"I would hack it back, of course. He's hacking my portal.* [laughing] *I just got it blue; I don't want get it green again. Yeah, I would hack it back." (Antje, 28, Single Player, Ingress)*

Antje indicated here how important the aspect is to defend her recently covered territory and that she will protect it against enemies. Wen (13, Single Player, Ingress) agreed that competing in gameplay would be something he would be interested in doing with friends, whereas Antje is happy to compete with strangers who she met through gameplay. According to Schell (2008) competition and cooperation are about improving personal skills and learning about the skills of co-players. They are best combined in team gameplay like in *Ingress* where players can choose if they want to compete against the rival faction or partner-up with teammates and friends in coalitions.

However, some players were less keen on the competitive aspect, as they found this game mechanic supports a typical male behaviour as argued by Mathew here:

> *"It becomes a competition of who has got the biggest gun and how can do the most damage […]. I can imagine some people getting into it but I cannot imagine myself doing it." (Mathew, 36, Group Player, Ingress)*

Implementing competitive ideas in a game was frequently discussed among participants as some like to compete with their co-players and found it fun but some like Mathew above disliked being competitive. The argument by Schell (2008) that particularly males are seeking challenges and competition to prove their abilities and that females are more sociable cannot be confirmed by the data. Hinske et al. (2007) proposed a smooth approach to implement a fair competition among players in order to attract a broader audience.

Competition and cooperation support the social aspect with known and unknown co-players that come with gameplay. LB mobile AR games would need to support these mechanics, although in a more moderate way for the application in travel and tourism. Classical tour guides (Pond 1993) and mobile tour guiding applications (Rasinger et al. 2009; El-Sofany and El-Seoud 2011; Suh et al. 2011) are missing these components in tourist experience design.

8.3.3. Game Challenges

Both games provided a game tutorial for players to learn and understand the basic game mechanics. Players could test themselves out on new activities that were divided into small challenges within the game tutorial as described by Peter here:

> *"It sounded interesting and there were a lot of new tasks I wasn't familiar with, like discovering and linking portals together. It could be overwhelming for some people but with the small task list, it was manageable. Once I hacked the first portal I got the hang of it and it worked out at the end." (Peter, 31, Group Player, Ingress)*

Guiding players gently to an obstacle and increasing the difficulty of the puzzles is a challenge game designers have to master and could be implemented with a training mission in which players learn the game mechanics step by step.

Overcoming artificial game obstacles is the core motivation of gameplay according to game academics (Juul 2003; Csikszentmihalyi 2008; Schell 2008). For location-based AR games, however, this is not an easy task as game obstacles can appear in the game as well as in the real world. Game designers cannot influence the latter. Carrigy et al. (2010) applied more natural gameplay mechanics such as walking around and searching for hiding game avatars. The physical movement evoked a sense of achievement and was found to be the most engaging aspect concerned with mastering gameplay mechanics.

For the first time player experience, it is important to design appropriate and understandable tasks for novice players (tourists, families with kids) and to create easy and positive game experiences (Korhonen and Koivisto 2006).

> *"Well, first level wasn't really complex. Once it started to collect energy, I could just*

continue walking so it wasn't that complex at that point." (Peter, 31, Group Player, Ingress)

Game researchers (Sweetser and Wyeth 2005; Jegers 2007) claim that developers should gradually raise the level of challenge according to the progress and skill players' level and introduce new challenges at an appropriate pace and time.

Some players experienced difficulties overcoming game obstacles, as they did not understand how to utilise the game or had to physically move in order to progress. The most challenging obstacle among players, however, was linking challenges in the game to the real world. For instance, players needed hints to solve the first puzzle in the *Berlin Wall 1989* game, as they did not make associations to count letters on a signpost indicating the border crossing between the east and west sector of Berlin and write these letters in a diary provided in the game. Games require players to be innovative and think actively, to try out different solutions to a problem (Rouse 2005). Game mechanisms were solved differently than intended by the game designer; Samuel, for instance, filled in the letters of the first puzzle without drawing a connection to the signpost.

"*I think it was fair for its purpose. The task with the signpost [at Checkpoint Charlie] could be even more difficult but then it would be really challenging. Too much, so for a tourist I suppose." (Samuel, 28, Single Player)*

Game challenges, however, always involve a learning experience for players to develop skills. This might include improvement of spatial skills, learning empathy in a role-play or combining different elements to solve a tricky puzzle (Rouse 2005).

8.3.4. Meaningful Choices

Decision-making is one of the main actions in gameplay. The type of gameplay, its game mechanics and structures delimits the process of making a choice and consequently influencing the outcome of the game event. For some games a long-term strategy is needed, whereas for other games short-term tactics are sufficient in mastering gameplay.

In the role-playing game *Berlin Wall 1989,* for instance, participants had to engage in a dialogue with the game protagonists by choosing one out of four possible dialogue options to precede gameplay. Participants, however, found it difficult to make a qualified and meaningful choice, as it was unclear which consequences it would have on the further gameplay outcomes. Diana, for example, provides reasons why she struggled with making meaningful choices:

"[…] because I don't know what would have happened when I had chosen another answer from the dialogue. The player only has one possibility and one trail to do it. So I am not sure if I did everything right." (Diana, 26, Single Player, Berlin Wall 1989)

It was observed that in order to decide which way to go, players were agitated and unconfident in their actions due to the variety of choices. The level of ambiguity evoked a lack of confidence among participants, as they were constantly concerned they had missed an opportunity because of a possible wrong decision. Ferrara (2012) discussed the balance of meaningful choices in his book *Playful Design* in which he claims that players easily lose appeal when there is too much ambiguity during gameplay or no basis to distinguish between good and bad choices. Participants of *Berlin Wall 1989* felt confronted with both aspects, the number of answers presented in the game as well as the lack of information to make an informed decision. The finding was player insecurity and disengagement.

It was observed that particularly novice players, like tourists, need substantial support in location-based gameplay. They are faced with the novelty of the location and thus first need to orient themselves, but are also challenged with new experiences such as handling a technology, overcoming game mechanics or engage in playful interaction with urban places. Game designers need to ensure players are not overwhelmed with too many cognitive challenges. This aspect is fundamental in tourism, as most players have only little time at a location, which has an influence on the choice of which places are worth a visit and which places are not.

Ingress, in comparison, provided multiple ways for players to progress gameplay and to influence game events. For instance, game mechanics enabled short-term tactical decisions like the freedom of choice to hack or protect portals close to the player's current game location. But it also holds the possibility for advanced players to engage in more tactical and strategic decisions influencing and shaping the game narrative. In the latter, players are part of the bigger game story and could actively influence the outcome of the game as requested by Przybylski et al. (2010) for location-based games. Players' choices had a deeper implication than just defeating the opposing fraction, which was particularly key for many female players, who found it otherwise hard to connect to the fictive story such as expressed by Antje here:

> *"I could not imagining myself walking around just searching for the green things [portals] and destroy them but now I realise that there is actually a meaning behind it and not just destroying things" (Antje, 28, Single Player, Ingress)*

The importance of meaning creation among female players was also discussed by Schell (2008) who stated that women's motivations for gameplay lie in searching for meaning, whereas men prefer to master gameplay challenges. However, gameplay needs to facilitate a clear decision making process and reduce ambiguity and uncertainty in order to create engaging gameplay interactions with humans or virtual agents (Ferrara 2012; Bourvier et al. 2014).

8.3.5. Walking

The physical movement of players is a crucial game mechanic of location-based AR games, which is outlined by location-based game researchers (Paay et al. 2008; Montola et al. 2009; Ejsing-Duun 2011). Naturally moving around in the urban environment was part of the game experience and was enjoyed by all the participants of the game sessions as affirmed by Naomi here:

> *"However, I think it's interesting because you did get to move around with the game rather than just sit around in a café with your phone and just playing with it." (Naomi, 16, Single Player, Ingress)*

Participants highlighted different reasons for location-based gameplay, which connect directly to motivational aspects for gameplay discussed in earlier sections. Players of *Berlin Wall 1989* liked the new geographical knowledge about the urban destination:

> *"It was quite okay to walk because we passed lots of interesting buildings and especially as a tourist I find the whole way really interesting" (Diana, 26, Single Player, Berlin Wall 1989)*

Whereas, player of *Ingress* got enthusiastic about getting rewarded with points for the distance walked. This extrinsic reward was an explicit game mechanic to motivate players discovering the urban environment and search for POIs (portals).

> *"I was walking around and then suddenly the points are coming and I was like 'Oh yeah, good! I did something good.' It's cool." (Antje, 28, Single Player, Ingress)*

Game designers (Waern et al. 2009b; O'Keefe et al. 2014) and also tourism researchers (Kim and Schliesser 2007) claim to use authentic and real world interactions such as walking to create engaging location experiences. Having visited some locations added value to participants' positive emotions and overall GX as expressed by Antje here:

> *"Funny how it works. You can just walk around and play. No big negative things. All in all a positive experience." (Antje, 28, Single Player, Ingress)*

Simple play mechanics like walking become more meaningful in gameplay. Without a game, the tourist moves through space from one location to another most likely being equipped with a tour guide for meaning creation and mediation on site. With location-based gameplay on the other hand, the activity of *moving* in physical space transforms to *discovering* or *exploring* a location while advancing in the game world (Walther 2007; Ejsing-Duun 2011), which evoked positive emotions in participants. As indicated by previous studies (Ballagas et al. 2008; Waern et al. 2009b; Carrigy et al. 2010; Blum et al. 2012) on LBGs, the most successful game mechanics are those that combine real world activities, such as walking, with game interactions.

8.3.6. Mastering Gameplay

The ability of mastering gameplay forms a key trait contributing to the creation of engaging GXs. If players feel they cannot control game activities or defeat the game, they will soon be annoyed or eventually abandon the game. Participants of the study encountered a number of difficulties, which prevented them from mastering the gameplay and experiencing a deeper game engagement. Some players found it challenging to identify when a game challenge had ended or to proceed to the next location such as mentioned by Marcus:

> *"For me, it's confusing that the missions are not clear and I don't understand when I've finished the mission […]" (Marcus, 24, Group Player, Berlin Wall 1989).*

Particularly in *Berlin Wall 1989* mission tasks were not clearly given by the game. Thus, it happened that players felt insecure about how to proceed. In *Berlin Wall 1989*, for instance, players could not find the start of the first challenge, which was written in a secret diary hidden in an inventory (rucksack). This hurdle caused some players to proceed to the next play location without having finished the first one. This had an impact on players' GX and their engagement process resulting in negative player emotions. Mastering gameplay is a crucial part of gameplay that positively contributes to *action engagement*. Completing challenges, mastering gameplay, or winning are key aspects freeing positive player emotions such as accomplishment, self-esteem or arousal (Bouvier et al. 2014a). Players will make unconscious associations with locations having had a certain experience or feeling there. According to Lehman (2011) this influences the memory of the location and the game, which was played there.

Other LBGs in tourism had a clearer game mission and were explicit on when a game challenge had finished. In ExCORA (Linaza et al. 2014), a pervasive ARG for tourism, the next game location was only unlocked when players have finished a mission. This might be a good strategy to ensure players have finished the mission, but it leaves players no options to choose from a variety of POIs as the game follows a linear structure.

Player observations and interviews confirmed that a low engagement did not result from little player skills or a lack of competence but often from difficult game usability that had influenced the playability of the game (Engl and Nacke 2012). Participants raised these usability issues many times during game testing. One of them requested that the game should allow focusing more on the surrounding locations than on the activity itself:

> *"I think it takes much time with trial and error to find out what to do next and maybe there are too many icons, so it makes it difficult to decide what to use when. I don't know if most of the tourists want to spend this much time on the game and not looking around in the city." (Tom, 24, Group Player, Berlin Wall 1989)*

This situation is a typical case of a playability issue described by Järvinen et al. (2002) defined

as audio-visual, functional or structural playability and a prerequisite for immersive GXs. Although the enjoyment of mastering gameplay involves a trial and error process in which player skills are challenged on the competence level (Ryan and Deci 2000) and autonomous decision-making (Ryan et al. 2006; Hamari 2013), a clear distinction to game usability needs to be made.

Yet, games should gradually increase mastering in order to give players a feeling of control and maintain interest. The risk is high that players abandon gameplay when level decisions are too complicated such as in the case of *Berlin Wall 1989* or it is assumed that players know about functionalities or game mechanics. On the other hand, when players are enthusiastic and rapidly build up mastery, they might find gameplay too easy and will also abandon gameplay. Addressing a broad touristic audience with location-based AR game, requires knowing the audience and previous GXs and needs (Xu et al. 2013). However, much more research needs to be done to build up a thorough understanding of this particular target group. Games for different skill levels need to be created to reach a broader target group and address novice and advanced players equally. As Pagulayan et al. (2003) argued it is very difficult to define where the basic skills of players stop and the challenging skills start, so input from users becomes necessary to distinguish good challenges from incomprehensible design.

Mastering gameplay is also closely related to the onboarding phase of a game in which players learn the game mechanics and techniques. Paavilainen et al.'s (2009b) statement that games should be easy to learn and difficult to master is only partially correct in this context. Concerning location-based AR games for tourism, where most of the participants are novice players, challenges need to follow a simple rule-set without losing the richness of game options as presented by Schell (2008). There is a trade-off not making gameplay too easy, and taking players by the hand in the beginning of the game but then increasing the difficulty and letting players master the challenges. Players, however, always need to have an opportunity to visit a 'help section' in times she gets stuck.

During the gameplay sessions, though, participants often missed guidance, which prevented them from becoming truly engaged as expressed by Diana who states that she

> *"Really find[s] it quite complicated from the first impression. […] I don't know what would have happened if I had chosen another answer from the dialogue. The player only has one possibility and one trail to do it. So I am not sure if I did everything right." (Diana, 26, Single Player, Berlin Wall 1989)*

Other participants even suggest that the game

> *"[…] should be a bit easier in order to meet the level of the user and to get more people engaged into the game. Because when you haven't got much experience in gameplay*

maybe people would drop out of the game really easy." (Samuel, 28, Single Player, Berlin Wall 1989)

One way is to provide sufficient feedback so that players feel content but also competent of achieving interim goals. Ferrara (2012) claims players need to understand why they have lost or won and which actions are available towards achieving the game's goal. As observed in the game tests, appropriate and ample game feedback is an important aspect in supporting players for meaningful choices. However, this has been encountered as a major difficulty among participants since instructions and game structures were often unclear as expressed by Nick here:

"I think the game giving hints doesn't really work so far as it's most guessing what could be right."(Nick, 31, Single Player, Berlin Wall 1989)

Earlier discussions showed suitable and sufficient game feedback is a central outcome of this study, which has been identified and supported by other game researchers likewise (Sweetser and Wyeth 2005; Marczak et al. 2012).

In summary, designing for player control is a crucial part in gameplay as it has a direct impact on players' feelings and behaviours. An adequate and appropriate feedback system combined with an onboarding tutorial is a step towards an understanding of game mechanics from the start. A rewarding and appreciative approach increases positive feelings such as a sense of accomplishment, challenge and mastery, which contributes to higher engagement with gameplay. Game designers need to acknowledge that the touristic audience is a diverse group of novice, intermediate and advanced players, who have to be addressed according to their individual player skills. Whereas novice players need additional guidance and feedback, experienced players will master gameplay more quickly.

It is significant in gameplay that players are interested and engaged in the gameplay by experiencing a flow state, but as stated earlier cognitive flow is not enough for location-based games as players should not only focus on the game itself but on walking around in the environment. Sinclair et al. (2007) introduced a double flow model that also incorporates the physiological aspect of flow. As it will be presented in chapter 8.5, players got enthusiastic about walking and discovering the environment.

8.4. Narrative Engagement

8.4.1. Linear and non-linear location-based storytelling

Visiting interesting touristic sites remains the main reason for travelling to urban destinations (Mansfeld et al. 2008). The interest is foremost grounded in the story that these places tell.

Stories of famous legends and local heroes are the most popular among visitors. Location-based games often take up these stories, enriched by destination information integrate these into a gameplay narrative. This opens up new and experiential ways of experience design in which tourists get to know history through interactive location-based storytelling.

During play tests, participants pointed out two aspects of the narrative, which made their visit more engaging compared to a visit without game mediation. Firstly, game stories deliver a **rich picture of the visited places** incorporating background knowledge of the place into the narrative. Diana outlined that she became interested in the game

> *"[…] because of the storytelling, as it's another way of experiencing the city, and because it's not only facts but facts imbedded in a story." (Diana, 26, Single Player, Berlin Wall 1989)*

Secondly, using the **real world as the storyboard** for the game was a completely new experience for many players as they either played video games at home or used audio tour guides during a trip, but never before assimilated these two technologies. With location-based gameplay, stories are brought outside into the real world, which fascinated the participants as Lee describes here:

> *"I personally quite liked it because this type where you're guided through a story also exists in Dungeon in Amsterdam or Berlin – aiming for a different type of storytelling. I really quite liked it that you can use the history of the city as a basis for game design." (Lee, 16, Group Player, Berlin Wall 1989)*

The use of storytelling techniques in location-based games intrigued many participants and encouraged them to find out more about the cultural background of the tourist sites. Many participants engaged in these new stories, which would have remained unknown otherwise. In fact, most players were actively searching for information in the game and left rather disappointed when the game did not satisfy their need for information as in the case of Mary and Mathew:

> *"So in this context, when this is a sculpture, there could be a little story about the artist of the Geological Terraces because it holds a lot of opportunities, e.g. could tell a story about where this rock comes from." (Mary, 35, Group Player, Ingress)*

This statement implies that some participants were expecting a more informative approach from the game teaching players about the places, as opposed to merely entertainment. Similar observations were also confirmed by Lombardo and Damiano (2012) for an anthropomorphic storytelling guide.

Ingres, for instance, shows a description and a picture for most locations, which were more or

less detailed depending on the information submitted by the player community as a co-creative process. However, this information is often insufficient for tourist meaning making. Although *Ingress* does not claim to have an educational mission like a serious game (Harteveld 2011), it displays information about POIs in the game to facilitate meaning creation and mediation in an interactive and playful way. In order to be more applicable for tourist on-site experiences, these games need to meet basic levels of information provision (Wang et al. 2012; Fernandes et al. 2013) and storytelling (Paay et al. 2008; Ferreira et al. 2012). *Ingress* attempts to engage visitors with the places visited, but failed to relate POIs in a way that meaning making was fruitful. The structure of *Ingress* made it less appealing for players to access or find information of POIs or connect them in a sense-making way. To retrieve information, players needed to actively tap on the location picture, which was often not available or poorly researched and thus less valuable for mediation of the tourist site (Figure 35). In addition the POIs did not tell an individual story that is linked to the game, instead they only repeated bare facts (O'Keefe et al. 2014).

(1) 

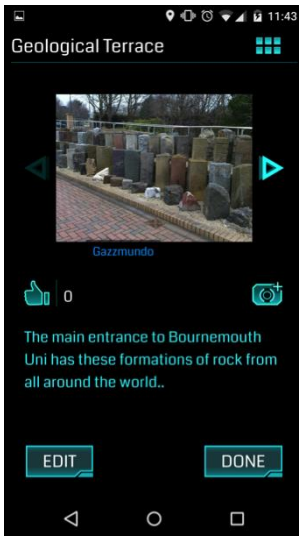
(2) 

Figure 36: Profile of a POI in Ingress

Berlin Wall 1989 on the other hand not only told a story incorporating different tourist places of the city, but integrated physical artefacts of the environment in the storytelling to engage players more with the tourist site. For instance, it used signposts at Checkpoint Charlie to compete a game task.

In order to understand location-based narratives in games, two gameplay concepts need to be considered, which have been introduced earlier in this study. Narratives in LB games may follow either a classical **linear or non-linear structure** proposed by Parsons et al. (2011) or Lehmann (2011). The first is often intervened with the monomyth or the Hero's Journey (Campbell 1949), such as in *Berlin Wall 1989* where the story unfolds in fixed, pre-defined play

locations. Non-linear games, such as *Ingress*, on the other hand, allow for flexible location choices and more flexibility for players to play at any location.

However, both ways have their advantages and disadvantages depending on tourists' needs and requirements like travel behaviour and available time. Tourists with more time preferred a guided gameplay tour, which could take up to one hour or more, whereas participants who were short of time favoured flexible and explorative gameplay at nearby locations.

The **pre-structured (linear)** gameplay following a set-up game story was often mistaken as a guided city tour and believed to be played at places relevant to tourists only. Decision-making was a subordinate component in this type of gameplay, as players enjoyed being led by the story as opposed to actively deciding where to go next. Players, preferring this style, appreciated the security and planning, which came with these games as pointed out by Diana:

> *"I found it quite good because I like these pre-structured city tours and I am always happy to have some support. I would say, if it were a very insightful game, they have thought about the route and it's truly touristic relevance. I am convinced that this way is the best to experience the city." (Diana, 27, Single Player, Berlin Wall 1989)*

In this case, the participant liked the structured and linear storyline of the game, which leans on the traditional tour guiding approach (Pond 1993) and is often used in pervasive games for tourism (Linaza et al. 2014). Especially for single and group players, the game structure plays a more important role. As the statement above shows, some single players like structural gameplay whereas groups and couples prefer explorative games. Eva, who travelled alone and played *Ingress* preferred the flexibility she had as a single traveller and would not leave out this in gameplay.

> *"If I am traveling with a group, I would rather follow some points and then I would go point one, two and so on, but when I travel by myself I would rather go wherever I like. So this should also work because the places should always tell some stories although I am not following a particular path. It would really depend on my travel behaviour." (Eva, 27, Single Player, Ingress)*

Here, Eva identifies that LB games need to provide a certain amount of flexibility, which was requested by the majority of participants, seeking exploration and freedom of choice such as Antje explains here:

> *"I'd rather be more explorative and flexible that way you could go and cross the whole of Bournemouth instead of just going in a certain way." (Antje, 28, Single Player, Ingress)*

It can be said through the research, there was no definite trend if tourists prefer linear or non-linear storytelling in location-based games. As Eva described, it depends on tourists' travel

habits, needs and experiences. Gameplay needs to be adaptive to these preferences and adapt both strategies. As Dickey (2005) emphasises, the linear nature of books and films should not rigorously be imposed on games, as games live from interaction and spontaneous choices. The challenge for designers is though, to tell a story by permitting players to direct these choices and possibly change the story. Dickey (2005) though suggests branching stories with different outcome depending on where players access the game and which choices they make during gameplay.

Lim and Aylett (2007) also suggest an **adaptive (non-linear) storytelling approach** that can be tailored to the individual preferences of tourists incorporating interests and previous experiences, as well as type and length of the tour. Game designers, like Paay et al. (2008), stress the importance of a dynamic content strategy based on players' location and movement.

Flexible gameplay becomes more crucial for LBGs as players need to have the possibility to skip play locations when they lay outside of players' interest or tourist routes or when players are unable to solve the riddle at one location as happened to Thomas:

> *"Is there a possibility within the app to skip quizzes in order to proceed in case you cannot solve them?" (Thomas, Group Player, Berlin Wall 1989)*

Players can easily get stuck at one game location and therefore require alternative location proposals because otherwise player frustration occurs. This was observed to often be the case with *Berlin Wall 1989.* Players had no choice but go to the fixed geo-location in order to proceed with the gameplay.

Players of location-based AR games acknowledge the flexibility of gameplay and the dynamic in the storyline, which furthers player engagement between the physical and virtual play space. Although this approach would be ideal, it makes the narrative design for location-based games a challenging task for game designers. It is unforeseeable at which point players enter the game or how they chose and combine the play locations (Naliuka et al. 2010; Wetzel et al. 2011).

Game designers and tourism researchers propose non-linear gameplay as the optimal solution, suggesting different implementation scenarios. Ibanez et al. (2003) advised a dynamic tour guide approach by improvising audio locations, which was further developed by Lim and Aylett (2007) and Naliuka et al. (2010) mapping improvisational storytelling to tourists' interests and creating a flexible narrative that allows non-linear storytelling with multiple branches joining into a bigger story. It will never be possible to include all relevant POIs of a touristic destination into one game and design a meaningful, consistent experience. Another solution of LB game narrative design is proposed by Barbas and Correia (2006) who argue that players should take ownership of their choices. Thus, the narrative needs to be separated in location sequences from which the first and the last POIs are pre-defined for logical purposes and players randomly

choose locations in-between. This may destroy the story climax (Wither et al. 2010), as each location needs to have an independent and in itself complete story sequence and sufficient story content (Barbas and Correia 2006). Location-based ludonarratives need to be approached different than cinematic narratives. Ferreira et al. (2012), for instance, designed an approach with her transmedia storytelling game in which stories and game levels are organised in separate chapters. These chapters can be played in any order and still make sense to the overall game story. Besides, players take an active part in creating the story during the game process. This approach is similar to gameplay in *Ingress,* where play locations are loaded on players' demand on a map and chosen by players.

Game designers should aim to create self-contained parts for each play location. Instead of weaving different locations into one central game story, different game interactions could take place at one location and unlock additional destinations from which players can choose according to their travel plans. Thus, the play locations are in the centre of gameplay, as opposed to the game narrative. It is important for players that the game leads them to places of tourist value and relevance, but also that these places represent meaningful and playful experiences. Thus, some games support co-creation for content development, such as *Ingress*. Players can submit new play locations and missions and thus decide on how far they want to walk in their self-created mission. Allowing the participation of players in the game design or narrative creation furthers creative experiences and draws upon tourists' imagination as opposed to providing a set storyline. Richards (2011) argues that tourists need to be more involved in the design process of tourism products and services in order to enable creative, flexible and authentic experiences. These games provide an opportunity with the human-centred approach to incorporate users in the design process.

8.4.2. Engagement with the Story

Engaging players into the game story and directing them to the narrative of the game was a challenging task. First, players found it difficult to engage with the story, as the narrative was not explicit like a massively multiplayer online game (MMOG) for instance. One participant phrased it as follows:

> *"It's different from a shooter where you get in load your weapon and you just know what to do." (Marcus, 25, Group Player, Berlin Wall 1989)*

It took participants of the study some time to embark on the game story, to identify which characters are involved and what kind of role players embody. With the Role Playing Game *Berlin Wall 1989*, the story revealed steadily during the gameplay, which was obscure for players to foresee the narrative and as Mathild claims here, more information was needed to

understand:

> *"Of course, there is relatively less information, but I think that we have to play the next one or two locations to get to know the story." (Mathild, 34, Group Player, Berlin Wall 1989)*

Observations confirmed the above statements. Participants took almost the whole play-session to get engaged in the story. As discussed in the onboarding section, tourist players need more guidance and information in the beginning of gameplay to perceive a high level of engagement.

Second, some players could not get access to the game story due to their different interests outlined in the previous sections. On the other hand, some players like the detective story of *Berlin Wall 1989* and got so engaged into the narrative that time and distance of the gameplay did not matter.

> *"I really got lost on the walk between Checkpoint Charlie to Gendarmenmarket. So I don't really know how long the walking took because I really wanted to know what Frank wanted to tell me. I wanted really to reach the place […]. So I think this part worked for me."(Diana, 26, Single Player, Berlin Wall 1989)*

Diana described getting lost in gameplay; as for her the story was so exciting that she felt suspense between walking from the first to the second location. The emotional engagement of players into the game story is particularly important for location-based games to ensure players will continue gameplay while going from one location to another. The possibility of encountering distractions on the way, may lead to interruptions or exiting the game (and is extensively discussed in the following sections). Good storytelling holds players in the gameplay as it gradually constructs a narrative in players' minds and leads them to particular POIs. Linking storytelling of the game to the physical location creates relevance for players (Lim and Aylett 2007). In the case of *Berlin Wall 1989* players got to know the real places of the cold war with which they associate the game story now. As Bryon (2012) states, good stories have the ability to engage the tourist intellectually and emotionally with the destination making the tourist visit more personal and meaningful. Lombardo and Damiano (2012) support this argument but also argue for a subordinate approach of storytelling to other game mechanics. They claim that too much storytelling would withdraw players from the physical game world and immerse them into the imaginative world (Ermi and Mäyrä 2005a), which might be true to a few cases observed during game the testing of *Berlin Wall 1989* where storytelling had a major influence on the game flow.

However, game engagement does not only depend on the game narrative but also how the story is embedded into the game design. Regarding the two different narrative approaches of the analysed games, Lombardo and Damiano's (2012) argument is not supported. In the case of

Ingress the participants found it difficult to engage with the game because the story was too abstract and implicit.

The more authentic story presented in *Berlin Wall 1989* allowed less room for interpretations of historical events as the narrative was told from one perspective of a western German journalist. The narrow approach was criticised as being less engaging by a few participants. Depending on the tourist's background, players were able to come up with their own interpretations of the history and reflect on the event differently which was also discussed by Tozzi (2000).

The narrative structure of the location-based games was appreciated by most study participants reasoning that this approach differed from most conventional mobile technologies usually applied in tourism mediation (see for example Dickinson et al. (2014) or Wang et al. (2012)). It can be concluded that a game narrative supports the understanding of the tourist destination paired with the interaction between the player and the game adding to a deeper narrative engagement. Game design, however, needs to offer a flexible game story in order to allow player flexibility and freedom of choice based on personal preferences. In this sense, *Berlin Wall 1989* is too rigid in following a linear game route (Parsons et al. 2011), however it presents an enriched story. *Ingress'* narrative, on the other hand, allows more player flexibility but was found to provide an artificial story to which tourists could hardly relate.

8.4.3. Authentic Story

The evaluated games took a different approach on the game narrative. As the data revealed, participants of this study associated authenticity to how closely the game story is bound to the play locations.

Berlin Wall 1989, for instance, was closely connected through the game narrative to the historical places of the city. Therefore, participants had expectations that the game would lead them to relevant places based on the story of the divided city such as the Brandenburg Gate or Potsdamer Platz where still some debris from the Berlin Wall is visible in order to make the game more consistent. Participants acknowledged authentic places of the game story as described by Samuel here:

> *"The game tries to bring you in the real setting of the particular part of the history. I think it is good." (Samuel 28, Single Player, Berlin Wall 1989)*

Samuel who is a new resident of Berlin appreciates the different approach LBGs take to get to know the city. In the same way, single mother Linda (36) who still remembers Berlin's history of the Stasi spies wanted her children Lauren (13), Lee (16) and Lesley (9) to get to know the history, who lived in Berlin all their life. They outlined the authenticity of the game narrative being closely connected to history as follows:

Lee: "With the spies and stuff, yes. Everybody is aware that there were spies in the city and I personally find it [game story] suitable."

Linda: "We just went along the former line of the Berlin Wall when we came here and was actually standing here and when we crossed the former border later you could see in the pavement that there are special engraved stones as landmarks."

The game transported players back to the time of the Cold War and let them experience history in authentic places. Current POIs help commemorate former buildings. Bryon (2012) confirmed that tourists desire to engage with stories and locations, which make their visit more personal and meaningful such as in the case of the young family described above. The children were too young to experience the time of the divided city but for their mother it was real and present for a certain period in her life. Historical games allow players to explore events in history and take on a role of a character that is part of an exciting adventure, interesting activity or meets fascinating people (Rouse 2005). Similar to the *Berlin Wall 1989* game, Ballagas (2008) created the medieval game narrative *REXplorer* around the authentic setting of the old city of Regensburg to make the tourist feel they had travelled to the medieval century and increase player immersion. Bryon (2012) emphasised the importance of authentic places and personal stories in tourist storytelling, which is also confirmed by game researchers (Mayes and Cotton 2001) as one of the key indicators for game engagement to further naturalness and consistency of the game.

Some participates criticised the game design of *Ingress* for not being closer to reality. The fictive narrative was too abstract for the tourism gameplay context and, hence participants found it difficult to associate with the fictive story. A part of the participants could not truly connect to the topic of science fiction, which was represented in the game but yet they appreciated the use of real places that make gameplay more authentic as indicated by Brendan here.

"I am not sure I liked the story or storyline but it's actually quite good because instead of using a fake place it uses the real places and makes it as realistic as possible […]." (Brendan, 15, Single Player, Ingress)

People, who are more interested in the places, will not be particularly concerned about the game story whereas vice versa, enthusiastic players can get really immersed into gameplay as stated by Peter:

"Well, I think, when you are into sci-fi and really into gaming, you care about the places less." (Peter, 31, Group Player, Ingress)

Peter here describes the phenomenon where players withdraw from reality to completely immerse in the game activity. Rouse (2005) implies that there is always an element of fantasy in storytelling, which allows players to get away from their ordinary life and escape into different

worlds. However, fantasy and storytelling do not imply withdrawing players from reality as successfully seen in *Berlin Wall 1989* or *REXplorer*. Moreover, it is a question of how the game story is designed to offer imagination but also to create authenticity in gameplay.

Game design researchers (Ballagas et al. 2008; Herbst et al. 2008; Akkerman et al. 2009) stress the necessity of creating authentic and meaningful gameplay experiences using the history of the destination as a base. Ballagas et al. (2008) suggests a thorough and realistic research of the history that encompasses the expertise of tour guides, actors and historians in the game design process.

Authenticity is a major aspect in the tourist experience as it defines the credibility of a product or service (Pine and Gilmore 2011; Chandralal and Valenzuela 2013). Players in the tourism context prefer authentic games above science fiction. Authenticity can be understood as regional or local habits. If a product represents a local culture or identity, for instance incorporated in a gam, it is perceived as being authentic. The customer defines authenticity in the dialogue with the product (Mansfeld et al. 2008). In terms of games, authentic historical stories add value and thus create meaning to the tourist experience (Tarssanen and Kylänen 2005). Stories transfer credibility by providing evidence of facts, e.g. what life was about a few centuries ago. Authenticity of a touristic product is based on the credibility of stories, which is crucial in creating a holistic experience, meaning and significance. Authenticity of game stories was also a main factor for players in their GX and a facilitator for engaging with the game environment. As stated by Tarssanen and Kylänen (2005 139-140) 'story is the clue of an experience product and the reason for the customer to buy it' or in this case play it.

8.4.4. Identification with Game Characters

The integration of game characters ought to contribute to game engagement or self-directed engaged behaviour (Bourvier et al. 2014) and facilitate the connection between players and the character by taking on ownership.

Both games notably differed in the presentation of virtual game characters. *Ingress* has not included personalised characters but a customisable logo, which stands for the individual player representing the fraction. *Berlin Wall 1989,* on the other hand, introduced several game avatars in the story and assigned players to the key avatar. Accordingly, a few players developed a sense of empathy to the virtual characters of *Berlin Wall 1989* and even identified themselves with the avatar. This was mainly based on players' interest in the game genre, as described by Tanja here:

> *"I had no problem with identifying myself as a CIA-agent. I also watch these types of movies, so playing a CIA-agent is suitable for me. I felt engaged with the story and many*

people like detective stories." (Tanja, 27, Group Player, Berlin Wall 1989)

In this case, the imaginative immersion as described by Ermi and Mäyrä (2005a) applies here. The player was deeply engaged in the game and even thought she was an agent in the game. Here, player's self-directed engagement (Bouvier et al. 2014a) gained more depth than with other participants. The player shows a sense of ownership for the game, identifying herself with the main protagonist by relating it to her favourite film genre. There were several indications that Tanja reached a high level of emotional player engagement. For instance, she was in the lead of the mobile device and made the decisions in the game. In a different statement, she declared that she felt excited going from one play location to another to know the progress of the story. Lombardo and Damiano (2012) claimed that through the emotional engagement of players and the interaction with the game character with natural dialogue and non-verbal communication, this very experience leaves a persistent memory with the tourist site. Tanja confirmed that she would remember having played at these locations in Berlin.

However, the majority of participants did not engage deeply with the game characters as in the case of Tanja. Most participants referred to the short playing time and the notion that they were still at the introductory level and therefore felt insecure of one's own and the game avatar's role. Thomas describes his insecurity in identifying with the game character as:

> *"[…] hard to say if we are really engaged with the character or not […] but I did not really feel like being the character the moment we stopped playing." (Thomas, 29, Group Player, Berlin Wall 1989)*

Other players felt a bit like the game character but less engaged in the game as stated by Samuel:

> *"No, not really. I mean, yeah I was in the history of the game and feeling a bit like the game character but not enough in order to feel fully engaged in the game." (Samuel, 28, Single Player, Berlin Wall 1989)*

The level of engagement and identification with the game characters depends on each individual player and their relation to the game. Some players feel more empathy than others towards the game characters. O'Keefe et al. (2014) also observed a lower player engagement with game characters as participants could not fully relate to the game characters.

To create engaging experiences between players and the game characters, natural behaviour and interactions of avatars was more important for participants than visual appearance.

> *"I didn't feel like part of the game but when I was walking and I could see the characters standing in front of the opera house, I could imagine standing here talking to people. So I think this is a feeling, which develops throughout gameplay." (Diana, 26, Single Player,*

Berlin Wall 1989)

Here, a natural interaction is described. Blum et al. (2012) indicated that in ARGs character design should focus on formal elements to support the overall GX and help elicit emotions through game narrative, voice or dialogue. These elements create a deeper self-directed engaged behaviour of players with the game.

Ingress players did not have the option of developing a deeper player agency. Players could build up ownership by modifying a player profile in the form of a logo and name. However, this was already chosen at the beginning of game testing. Bouvier et al. (2014a) stated that with the personalisation of avatars, such as possible with the new *Pokémon Go* (Niantic and Nintendo 2016), players sympathise with the role and feel ownership over this role. Apart from a few participants, the level of player identification with the game avatar was rather low. Most participants could not emphasis with the specified game avatars. For most *Ingress* players, the story was too abstract to understand in the given time.

There are multiple features engaging players into gameplay using the game narrative and other storytelling characteristics. As the real world is used as the storyboard, tourists requested that game narratives are based on real stories or at least have a connection to the place where they were playing, and thus are authentic. Players also engage more when they are part of the design process, this can involve personalisation of the game avatar, actively directing the outcome of the game story, flexible game narrative or authentic places. Bouvier et al. (2014a) call this phenomenon self-directed player engagement. Players decide how deep the connection to the game character goes.

8.5. Spatial Engagement

8.5.1. Place Engagement

Participants engaged in different ways in the gameplay. But as the exploration of experience engagement sits in the heart of this research, special attention has to be paid towards the engagement between players and the location. The main question to be answered is if location-based games could draw a closer connection between players and the location and whether game elements support this engagement. Based on the definition of engagement given earlier, engagement is investigated by reflecting on aspects of exploration, location awareness and game challenge.

Engagement with the Location

There were two types of engagement identified during play tests; first the awareness and

curiosity of discovering new locations and second, a raised level of location engagement through meaningful interaction. It has to be indicated, however, that the level of location engagement is dependent on the individual player and his willingness to use the game as an engagement tool.

Firstly, the most engaging moments occurred during gameplay when participants **discovered new POIs.** This largely related to *Ingress* as this was less stimulating in *Berlin Wall 1989.* The freedom to explore the urban environment was identified as a central aspect of touristic, location-based gameplay. Especially *Ingress* players gained renewed stimuli from the game-map to sightseeing surrounding POIs. Some participants were so inspired by the game that they were motivated to extend their walking tour to find more POIs as described by Paolo here:

> *"I would even walk a longer way to the restaurant and spend the extra time just to collect more points in the game, […] discover areas and shops I've never been before." (Paolo, 30, Group Player, Ingress)*

Walking around and exploring places was mainly of interest for the tourists and an indication of enjoyment and fun in both games.

> *"[Hesitating] Yeah, I think exploring Checkpoint Charlie was fun. […] I think there was definitely a fun aspect in the game. It was also nice to walk around and instead of staying at a café." (Samuel, 28, Single Player, Berlin Wall 1989)*

Many players engaged in the explorative character of the game by leaving or extending the planned tour to discover unknown POIs that were commonly off the beaten tourist tracks. This connects to the **curiosity** described by Harteveld (2011) as well as the **variety** and **novelty seeking** of O'Brien and Toms (2008) which both support the concept of engagement. The diversity of undiscovered POIs displayed on the virtual game map triggered the desire in participants to seek out novel locations in their near surrounding.

The above statement entails a sense of what Bouvier et al. (2014a) explain as contemplation in the virtual game world. Players stroll around in the game world driven by the notion of exploration, novelty and curiosity without having a concrete goal in mind. Participants often described these GXs as a feeling of excitement, surprise and joy, which indicates a high level of mental engagement.

However, it is not entirely clear if players were more engaged in the act of exploring new physical play locations or focused on conquering new game portals. *Ingress* players for instance found it most engaging finding and conquering new play locations, which could sometimes lead to excessive play behaviour described by Eric and Ethan:

> *"It's quite addictive finding other portals and to keep linking them and hacking them. It*

seems like addictive as it goes on." (Eric, 11)

And his brother added:

> *"And probably you get quite carried away when you play it and you end up playing it somewhere where you've never been before." (Ethan, 12)*

The player described an addiction to collecting locations (portals), which was observed to be a trophy hunt rather than an engaging experience with the tourist destination. Some players were more interested in collecting as many portals as possible or achieving extra game accomplishments. They saw tourist locations only as game targets without any further meditational aspects. In this case, location was of secondary order to the players, as the main focus was to accomplish the game mission. This fascination can be interpreted as 'challenged-based immersion' (Ermi and Mäyrä 2005a) resulting from players' ability to master game mechanics and playability by simultaneously meeting player skills. Players feel at ease in this situation rising from a good game experience (Jennett et al. 2009). Immersion into gameplay often led to a misperception of time and often players found themselves surprised at having already played for half an hour or longer. This can be interpreted as an indication of an intense level of engagement for some players.

Secondly, there is evidence in the data that location-based AR games **raised the level of tourists' location engagement** due to different phenomena occurring during game sessions. Many players reported that the game raised their awareness of the site and made them more conscious about the places where playing took place. Players got more curious through gameplay and liked the different perspective the game provided as reported by Peter:

> *"I never noticed the stones here although I have been to this place before […] Well, once we hacked the portal we would sit down somewhere and enjoy the surrounding. I don't think it affects our GX necessarily. […] I quite liked the idea of taking a different perspective on the city and play a game […]. Those games can make us more curious about the environment." (Peter, 31, Group Player, Ingress)*

Location-based gameplay was for many players an opportunity to (re-) discover the environment and become aware of places which are less obvious, as they did not seem interesting for tourists on first sight. Gameplay transformed this stance by allowing the tourist to slow down, interact with the location, reflect on experiences or just enjoy the atmosphere sitting on a bench after finishing a game challenge. The game intervention changed the perspective for some players in quantity and quality of urban places. Gameplay made them curious of discovering more urban places but also engage with them through interactions in meaning making. All players agreed that they have discovered a place, which they had not visited before or at least saw a known location from a different viewpoint with the games. Players engaged

with locations, which they would normally have taken for granted or not paid attention to. Former meaningless locations became meaningful through game interventions by pointing players to surrounding sites or parts of them. Thus, these games facilitate a conscious cognition of players to the environment through playful interactions.

Apart from the raising interest of tourists for surrounding sites, it was observed that their level of interest also increased once having discovered these new places. There was an interesting discussion between two *Ingress* players referring to this aspect:

> *Mathew: "I've looked at that before but I've never really seen it, and when I say I've never seen it, I mean I've never looked at the sculpture. So actually the game engaged me with something new."*
>
> *Mary: "Well, you didn't engage in it. You just tried to conquer it…"*
>
> *Mathew: "Yeah, my life isn't much richer because of that…"*
>
> *Mary: "We don't understand why the sculpture is there neither why the geological stuff is there, who did it nor why some people decided to put it on the game. So [we are missing] a link making you engage in the physical environment as much as possible."*

The aspect players were criticizing in *Ingress* is that the game raised awareness and interest of the game location but did not go any further. Deeper and more meaningful interactions were not encouraged by Ingress as background information about the locations was often missing. *Ingress* falls short of facilitating meaning making like tourist are used to from tour or audio guides. Certainly, this game can be used for tourists to raise awareness of places, but not for providing valuable location-based information defined for example by Rasinger et al. (2009). However, this is not the main purpose of the game yet. Although the co-creative and participative design approach of *Ingress* invites players to contribute with new game locations, Google's quality assurance is often not consistent and invalid for tourists playing to get to know a destination. Most of the game locations are missing descriptions, which are essential for tourist meaning making.

However, it was recognized in both games that gameplay was a reason for players to pause, reflect and having the permission to play in an urban environment where life is ever so serious and fast-paced. They furthered participants' interest in nearby sites or told stories like in *Berlin Wall 1989* in which players played an active part. Interestingly, participants emphasized that the game slowed them down as described by Nick:

> *"[…] the game can be an interesting approach to stay longer, to stick around and see not so obvious places. I could have quickly passed the locations, but it was more the game, which slowed me down" (Nick, 31, Single Player, Berlin Wall 1989)*

Being on a city weekend trip means many tourists have a limited time frame to visit the 'must-see' tourist attractions of a city. In cities like Berlin or London this might result in a marathon. Games, however, can inspire tourists by mapping out particularities and the uniqueness of a city by drawing attention to features in the urban environment or searching for hints to solve puzzles. This interrupted the pace tourists would normally have. Participants saw this new perspective as something positive. They often decided to stay a bit longer at a place, take a coffee break or wondered around without a particular goal to enjoy the surroundings.

8.5.2. Space Engagement

Player Orientation and Navigation

The in-game routing worked using real-time GPS navigation with a visualisation on the map that was perceived differently within the two games. It became apparent that participants experienced these features as the most difficult to handle, due to the fact that the GPS technology was still not precise enough at the time of testing and thus had a negative influence on the mobile AR feature.

Localisation and navigation was found to be the essential aspect in location-based gameplay, as tourists moved around in an unfamiliar environment, which raised questions of which direction to choose or where to find the next play location. Both games used a modified map as the basis for navigation. But as street names and POIs were not labelled in either of the game maps, participants found it difficult to identify where they were in the physical world:

> *"But there are no street names. I have to find out which direction to walk. I am following the direction of the arrow, but I don't know if this is Friedrichstrasse or maybe the other one." (Paolo, 30, Group Player, Ingress)*

The imprecise identification of the play location was intentional. The game mechanic should challenge players finding POIs. Both games showed the structure of the streets, a compass and a location indicator as an arrow. But it was perceived as rather difficult by participants to identify their exact location, which made them feel stressed.

Thus, participants' normal reaction was to head into any direction in order to see where the arrow would move on the virtual map but then suddenly head towards the opposite direction. Eva reflects on her experience with navigating to the play location here:

> *"It works with the arrow where you have to go. I am not good with arrows and navigation things but this somehow worked and I was just turning it around and saw where I had to go." (Eva, 27, Single Player, Ingress)*

This trial-and-error location search mechanic worked well in *Ingress*, but was experienced, as a

disturbance in *Berlin Wall 1989* as searching for the game location was too imprecise and aggravating to the players. Participants had to focus too much on the game screen. Participants rely on the system to lead them the right way (Paay et al. 2008). However, a solution for the route-finding problem is needed which facilitates a more engaging experience with the physical environment and allows concentration on the gameplay activity.

O'Keefe et al. (2014) also identified player immersion on the mobile device as a negative influence for physical game engagement. Therefore, they introduced a system of an accelerometer and picture of the POI to create a simple compass around a half-open circle that is believed to work better for navigating with LBGs. When the user points the device in the right direction, the circle becomes complete and lights the path to the next POI. The study verified that the improved GUI provides enough direction for the user to discover the real environment by looking around for the next play location and not to getting too absorbed with the mobile device.

Besides using the game map and arrow, participants experienced challenges to orientate themselves between the play locations. It was often unclear from the map in which direction to go, thus many *Ingress* players used in-game navigation. If unexpected incidents were encountered like road closure, road works or temporary events, players have to find alternative routes to reach a POI, as in the case of Naomi:

> *"But it wasn't so easy to find because of the construction sites, you had work your way around them." (Naomi, 15, Single Player, Ingress)*

As the majority of participants were unfamiliar with the physical game environment, which lead to a poor orientation and player insecurities due to insufficient information, participants experienced diminished confidence about their navigation and orientation skills, which was reinforced by playing in an unfamiliar environment. When players moved away from the play location, the level of uncertainty raised. Orientation in an unfamiliar environment is particularly important for tourists, as they got lost easily, which might lead to a disengaged GX.

However, most participants used physical landmarks for orientation. Siegel and White (1975) describe the spatial recognition in an unfamiliar environment as a two-dimensional mental process of geographical learning. First, players recognised and orientated themselves using landmarks such as hotels, underground stations, or high buildings. Second, they combined this knowledge to form routes and a coherent destination map. Geographic experiences acquire interactions with physical spaces where geographical knowledge is gained. Geo-based technology can be supportive in this process (Tussyadiah et al 2012). LBGs enhance geographical experiences through gameful interactions such as walking and discovering unknown places and thus developing a sense of direction, distance and orientation that again

created more engaging experiences with the destination that is visited as tourists create a mental map of the urban area.

Annotations of play locations helped in the process of geographical knowledge acquisition such as described by Ethan here:

> *"... the picture helped to identify…when you clicked on it you know "okay it's this one". With AR it's not like a flat picture and you know okay it's going to stick out a bit when you look at it in real." (Ethan, 12, Group Player, Ingress)*

AR could play a role in gaining geographical knowledge via AR annotations. As suggested by Yovcheva et al. (2012) AR can help to find tourist places and directions in an urban touristic destination more easily as it superimposes nearby POIs on the mobile device.

Distance between Play Locations

Participants perceived walking distances between play locations as reasonable and manageable. During gameplay, participants on average walked one kilometre in 25 minutes while playing *Berlin Wall 1989* and approximately 650 meters in 23 minutes for *Ingress*. In the latter, play locations were in close proximity to the starting point. Thus walking from one play location to another was comparably short. This was criticised by some players as they found walking an important game mechanic of location-based AR games:

> *"And also, this is a location-based game but we don't have to walk. The portals are already here next to us. I thought we are supposed to walk but we are staying here." (Paolo, 30, Group Player, Ingress)*

As *Ingress* participants were playing the training mission, they only had to walk to the next geo-location and additional play portals were simulated around the physical location, while *Berlin Wall 1989* on the other hand with its pre-defined play locations required more walking. This game had an average location distance of 550 metres, although some POIs range up to one kilometre from the previous play location. Some participants remarked that many interesting tourist places were not included in the game although they were on route and very suitable for the game topic such as the Brandenburg Gate.

> *"And especially the longer way is another way to experience the city because you pass 'Unter den Linden' and a lot of interesting spots. […] I would have liked some spots in between to not stretch the distance between one experience and the other because I think the game character gets lost somewhere in between." (Diana, 26, Single Player, Berlin Wall 1989)*

Participants pointed out that too long a walking distance would be an obstacle for game

engagement as players can become easily distracted as pointed out by Samuel:

> *"I guess the player should be really engaged at this point of the gameplay to move on to the next kilometre otherwise there are many nice cafes." (Samuel, 28, Single Player, Berlin Wall)*

The distance between play locations was in both games no more than ten minutes. However, when players are new to the urban area and need to find the way, the time they need, can unexpectedly expand, which results in a loss of player interest. This was particularly evident for *Berlin Wall 1989*, as players did not know the next POI. Thus, players were not informed about the distance to the next play location. This contrasted with *Ingress*, which showed multiple surrounding play locations from which players could choose. *Berlin Wall 1989* revealed play locations only after accomplishing a mission. However, players want to know how far they are from the next play location and if it is of interest them. O'Keefe et al. (2014) introduced a real-time metric, which suggested how far the user is away from the next geo-location indicating the distance in meters. New tour guides like izi.TRAVEL (Iziteq 2016) or the Tube Map London Underground (Mapway 2016) indicate the time it takes from one location to another as people are not good in interpreting distance.

The design of location-based AR games needs to pick locations that are not only suitable for the game content and narrative but also have an appropriate walking distance. Some games cover a large play area. Thus, in order for players to stay interested while walking from one play location to another, distances have to be considered as well as the premise that tourists have less time to wander around for a long time in the city. Designing location-based AR games for this particular target audience will always be a trade-off between incorporating attractive POIs and balancing game mechanics to engage players in the urban location.

8.6. Social Engagement

The majority of participants played in groups, which requires a closer exploration of social interactions between co-players and non-players. The creation of shared experiences is believed to positively contribute to the game engagement as it strengthens connections between players, elicits emotions and occasionally expands the social network of individual players and groups (Schønau-Fog and Bjørner 2012; Bouvier et al. 2014a).

Observations revealed that player groups were characterised by dynamical interactions in which one player generally took the lead and co-players followed. Either a leader naturally emerged or players decided to take the lead in turns. The **lead player** was in charge of the mobile phone and gave directions and instructions received by the game to the group. Observations confirmed that lead players seemed more engaged in the gameplay compared to the rest of the group as they

directly interacted with the game and co-players only facilitated in navigational and supportive tasks. A participants' statements support this observation:

> *"In this setting there is always one person who dominates it a bit more. So I am the activist, dive in and press the buttons. When I get stuck and was about to give up, you [Mary] would take over and be a bit more persistent and possibly figure it out." (Mathew, 36, playing with Mary, 35, Ingress)*

Both games were designed for a single player per mobile device. As people normally do not travel alone this may not be practical for tourism purposes. It needs to be considered in the game concepts that tourists would like to share GXs as requested by Nick here:

> *"I think it should be designed that 2 or 3 people can play together as tourists normally do not walk around alone." (Nick, 31, Single Player, Berlin Wall 1989)*

This entails that the game experience of all players should be considered when designing location-based AR games, as it was observed that some group players were occasionally less engaged. Currently, these games only consider the GX of the lead player, although game researchers like McCall et al. (2011) claim the necessity for a better experience of all participating players. It might be at times boring to not be involved primarily in gameplay and only fulfil a supportive role. However, Ballagas et al. (2008) understood how to integrate the second player into a more meaningful gameplay by assigning different roles and tasks to players. The use of different devices or physical artefacts helped all players feel equally important by having a role in mastering gameplay (McCall et al. 2011).

Observations of group interaction and player interviews confirmed that the **size of the player group** should not extend three people as otherwise issues in interacting with each other and with the game interface may occur. Specific problems were observed with groups of children of different age, as not all of them were tall enough to see the screen. Moreover, when the group is too big, people cannot gather around a mobile screen as one of the group players describes here:

> *"Playing with each other, the display felt really small and we had to stand really close to each other to be able to see the display." (Lauren, 13, playing with her mother Linda, 36, and siblings Lee, 16, and Lesley, 9, Berlin Wall 1989)*

Gameplay is a social event according to Rouse (2005) and Harteveld et al. (2011) but if players feel excluded from gameplay due to physiological or technical constraints, social engagement decreases. Enabling gameplay between players of different heights for instance is one aspect, which has to be considered by game designers as people travel with family, friends or other social groups. A solution might be that players use different devices for gameplay, which additionally opens up the activity to other players even when they are not directly in their social scope. Games that facilitate multiplayer gameplay by including a second device can thus be

seen as a solution. It is important for players to interact with co-players, either known or unknown, as gameplay is about competing against and collaborating with each other. As play tests have shown, players like to be in control of their own game progress and decision making, but this becomes hard to facilitate when more than two players are involved.

Participants preferred **real to virtual communication**. Although only *Ingress* offered a virtual in-game chat, participants were rather reluctant in getting to know other players or communicating with strangers, as Diana explains here:

> *"I always find it a bit strange it's like surreal. I am not confident of that. It's too much virtual interaction and I feel more confident having real people around me." (Diana, 26, Single Player, Berlin Wall 1989)*

Direct and in-person communication was only possible with group players. This situation allows for the exchange of ideas, helping of each other to solve puzzles or discussing of the navigation. Participants explained that they are used to either real life interactions or virtual online communications such as chats or audio messages in games. Most location-based games, however, combine both and provide players the choice of communicating with co-players. *Ingress* for example has a multi-player option and an in-game chat function, which was not used by participants during play test as tourists felt reluctant to approach other players. By contrast, Bouvier et al. (2014a) as well as Schønau-Fog and Bjørner (2012) found that social behaviour such as expanding or connecting social relations positively contributes to player engagement with the game. But despite the fact that both games operated in a semi-virtual sphere in which players could easily engage with real/virtual players, it was observed that they were reluctant to do so due to social boundaries and the unfamiliarity with the game leading to discomfort for the participants.

This situation might change when participants advance their experience with location-based AR games and have the chance to meet real players at a different occasion like organised game events. These types of events aim for social interaction between players and are arranged by Niantic Lab Inc. for *Ingress* players (see Google+ networks with regional and international *Ingress* groups). At these events, advanced and novice players collaborate and compete in highly engaging gameplay, which often goes beyond the game activity as players often share similar interests and are likely to develop real life friendships. This exceeds Lehmann's findings (2011) which describe social interaction in video games, since location-based players meet face-to-face and also have more possibilities to network outside gameplay. At the time of play testing, only one player had previous experience with LBGS, the others felt rather novice to the type of gameplay.

Another sign of highly immersive gameplay by the novice players was lowered interest in **non-players.** Participants even found them a disturbing factor as they were hindering their game experience and prevented them from getting engaged.

> *"I am not so interested in people because we came here to hack these portals and when there are people standing here who are taking picture after picture, we have to go through the crowd and it's difficult." (Paolo, 30, Group Player, Ingress)*

With both games, there is no active integration of non-players into the activity. Thus, outsiders are seen as rather disturbing and do negatively contribute to the game engagement process. This was especially the case in Berlin with particularly busy places due to summer holidays. McCall et al. (2011) claimed that the integration of non-players is difficult to implement, which has to be disagreed as people who work on-site such as shop assistances, local guides or even the guards from Checkpoint Charlie can be easily part of the game. The interaction with strangers would add real value to the game especially for single players as meaningful interactions and conversations with locals arise. This could be particularly good in situations where visitors meet local people at attractions or during tour guides and interact with POIs, but might ask for the support of locals

As outlined by Harteveld and Bekebrede (2011) design in single-player and multi-player games needs a different approach since the experience of all incorporated players and non-players has to be considered. Particularly in a touristic context, gameplay could be approached from a multi-player perspective. As the majority of tourists travel in social groups want to interact with each other. Single travellers, on the other side, perceived it as a barrier to connect to unfamiliar co-players via online chat or personal dialogue. These barriers need to be broken down in order to make gameplay more social and connected. Game designers, for instance *Ingress*, know about this desire and organise player events where players meet, socialise and play against or with each other. Many players agreed that social integration such as team formation, acceptance from others or the sense of belonging contributed towards their engagement. A shared game experience positively enhances social gameplay and the desire to continue gaming.

8.7. Mixed Reality Engagement

8.7.1. Identification of the Game Location

The recognition of game locations was the first step towards a player-location engagement, which was mainly supported by interactive maps and pictures of POIs. Arrows showed the direction to the next target location, which players used for calculating the proximity. Ethan and Eric describe the process of finding and identifying locations in *Ingress* as follows:

"[…] the arrow showed it and the way it turned…" (Ethan, 12)

"The picture helped to identify…when you clicked on it you know 'okay it's this one'." (Eric, 11)

As the picture of the play location was the main feature to identify the site, it is crucial that the game content (pictures) is clear, distinct and updated so users can identify the game site in an unfamiliar environment. Otherwise players would search, as in the case of Paolo:

"Also, the pictures are old and when I compare the pictures in the game with the real life I would guess I am not in the correct place." (Paolo, 30, Group Player, Ingress)

Especially when the game sites are not obvious and harder to detect, as it happened with Eric and Ethan:

"That one [Centenary Pergola Plaque] was quite hard to find. You couldn't really pimp on it, but when it were something big like that café, it's quite easy." (Eric, 11, Group Player, Ingress)

One opportunity to make it easier to identify the game location and engage players through gameplay interactions is the application of AR, which still faces some technological challenges in terms of AR annotation (Yovcheva et al. 2013b), but will improve with the technical development. AR can facilitate closer connections between the real and virtual game world by blending both realities onto the player's screen but also helping players to look upright as opposed to down and using the mobile device as a lens to see through (Bressler and Bodzin 2013; O'Keefe et al. 2014). This view was also shared among several participants, who know about technological advantages of AR:

"I think you are looking at this [device screen] too much now and then you don't know what your surrounding is doing […] but when you have AR, it would be quite clear what you are looking at." (Antje, 28, Single Player, Ingress)

AR is believed to be a supporting feature enhancing the real world with virtual annotations in order to support the identification of physical game targets. Both games, though, did not explicitly facilitate interactions between players and locations. *Berlin Wall 1989*, for instance, could have requested a real interaction between players and AR avatars, which participants found hard to interrelate with. AR applications would also make sense in drawing a stronger connection between the virtual and real world and identify physical locations with AR annotations as before discussed for instance by Yovcheva et al. (2013b). This would make interactions between the game and the real world not only more fun but engaging, as players see, for instance, that they have changed the colour of the play location through gameplay. There are many other supporting examples where AR is used for geographical information

retrieval (Fritz et al. 2005; Linaza et al. 2012; Yovcheva et al. 2012), yet missing a gameful approach in order to make the experience more engaging.

8.7.2. Augmented Reality

Augmented Reality can be seen as the connecting technology between the virtual and real game world, which was also the objective of *Berlin Wall 1989*. Although *Ingress* claims to be an AR game, mobile AR was not implemented as understood and defined by Furht (2011) or Schmalstieg and Hollerer (2012), which means visual 2D or 3D virtual annotations did not enhance the real world as an overlay on the mobile screen.

Location-based AR games do only slowly discover the market and were recently introduced as travel and tourism applications. Due to the unfamiliarity with these apps, participants encountered initial difficulties concerning **AR usability and handling** of the mobile device. In order for AR to function, users need to hold the smartphone upfront (Figure 37-1), which is a learned behaviour and known from taking pictures. Participants were not aware of this as most were so immersed into the mobile screen looking down without recognising the environment (Figure 37-2).

(1)  (2) 

Figure 37: Smartphone Positions with (1) and without (2) AR during Play testing

For players, using the mobile phone as a see-through device or augmented lens (Figure 37-1), superimposing virtual game information on the screen, was not intuitive:

> *"I think the biggest difficulty for me I found was right at the beginning, as I didn't really know how to hold the phone with the Augmented Reality stuff"' (Diana, 26, Single Player, Berlin Wall 1989)*

Participants experienced major difficulties in figuring out how to handle the AR and map mode in *Berlin Wall 1989*, as the in-game tutorial was often not detected, as it was hidden in the game menu. Game designers will need to ask themselves how players generally learn and understand their game. If it takes too much time or is too complicated, people will stop playing. Tourists as

novice players need some extra instructions on how to handle and understand the gameplay usability. An initial orientation phase is also discussed by Rouse (2005) indicating that players need some time to adapt even with the most realistic games. Thus, it is important to guide players when introducing new technical features. Otherwise, technology creates an imbalanced game experience.

Instead of **directing the attention with AR** towards the tourist environment and raising awareness of a certain type of information, object or person, participants were mainly focused on the interaction with the device. Instead of engaging players into meaningful location-game interactions, both games mainly withdrew players from reality. Players criticised this, as the focus of the game was not fulfilling the role of a playful mediation tool for the urban environment.

> *"The game dragged me into the game more than showing me around. That's what I meant with saying that there was not a real guidance around here." (Thomas, 29, Group Player, Berlin Wall 1989)*

Participants did not want to withdraw from reality but engage with the surrounding and its stories, history and artefacts. Participants could not fully embrace the beauty of play locations, as they were too immersed in the gameplay activity. Especially the posture of the participants reflected players' emotional state. Figure 37 replicates players' position looking down on the screen interacting with the game interface. With AR the mobile phone is used as a natural extension of the hand holding the device upfront and seeing through it as if it were a magnifier displaying additional information and becoming aware of the surroundings. Participants generally showed a positive response towards the implementation of AR. The AR feature per se was experienced as helpful in changing between play and reality realm:

> *"I think I can switch between the two. Especially as I said before, the comic style made it easy to drop in and out." (Diana, 26, Single Player, Berlin Wall 1989)*

There is a thin line between the game and the real world. When the UI is well designed and clear for players to understand, the shift between play world and reality becomes easier (Stenros et al. 2012). Jegers (2007) developed a Gameflow Model for pervasive games based on Sweetser and Wyeth (2005) that enables players to shift focus between the two worlds by seemingly transition between them. The study suggests that pervasive games need to support players in the process of switching between in-game tasks and the physical environment without overloading players with cognitive or perceptual stimuli (Jegers 2007). Moreover, players should be made aware when it is time to focus on the physical game environment with virtual stimuli such as AR annotations and vice versa.

Participants appreciated the integration of **AR visualisation** when it added value to their GX.

This can include facilitating interaction between players and the physical game environment or identifying game locations by superimposing AR annotations or animations. However, in most cases AR features were experienced more as a barrier than an enhancement due to technical problems such as imprecise GPS reception or handling difficulties. Samuel, for instance, criticised the implementation of AR technology for its own sake, which was found to be unsatisfactory and disengaging.

> *"They [AR annotations] were floating around in the environment. They don't add any value to the game; that's the problem, for example to help me to do something." (Samuel, 28, Single Player, Berlin Wall 1989)*

Another player added:

> *"I recognised that the AR features are not really sophisticated yet. When we were holding the mobile phone upfront, the camera showed people in reality and AR characters were jumping from one location to another and were appearing and disappearing all the time." (Lee, 16, Group Player, Berlin Wall 1989)*

Difficulties with the AR technology were found to be disrupting the GX as players expected an improved standard of the technology. In *Berlin Wall 1989*, AR was used to represent the game avatars. By means of the current AR standards at the time of testing, the technology did not seemingly integrate virtual objects in the physical environment. As presented in Figure 38-2 AR characters are floating around and did not have a stable location or authentic size matching the surrounding environment, whereas Figure 38-1 shows a deceptive AR. In the latter case the decision was made to create a more stable system and compensate inaccurate AR tracking traits influencing the GX due to sudden camera moves and high consuming AR components.

Mainstream mobile AR still struggles with technical boundaries of the GPS system and processing power of the mobile device, which affects the rendering performance of the application. More sophisticated AR annotations will use more performance of the mobile device and rapidly drains the battery, which again will be unsatisfying for the user. GPS tracking issues combined with the graphical realism of AR objects has been described by other AR game researchers (Herbst et al. 2008; Carrigy et al. 2010) for some time now and had not satisfies current standards (at the time of testing).

(1)  (2) 

Figure 38: Screenshots Berlin Wall 1989 - Comic Game Character in AR Mode
(Tripventure 2012)

AR object proximity did not appear to be real and affected the GX negatively as it was dependent on a player's position and inclination of the mobile device. Wetzel et al. (2011), Lombardo and Damiano (2010) and Carrigy et al. (2010) point out that game designers need to be aware of the malfunctioning of technology due to weak GPS reception in urban areas. GPS tracking is still inaccurate, being only able to measure within a range of between 6 to 20 meters. Various approaches are used to combat this inaccuracy by for instance using fiducial markers (QR, NFC or RFID) but these are found to be less efficient in LB gameplay by some researchers (Chang et al. 2011; Olsson 2012). The latest research on AR propose proximity markers (Deliyiannis and Papaioannou 2014) or iBeacons (Finch 2015) to overcome the proximity problem and creation of more authentic AR experience. Despite on-going GPS accuracy issues, the technology is still the first choice for localisation and can only be supported by supplementary technologies such as NFC, QR codes or iBeacons to ensure more precision in some locations. The latest research (Kasapakis and Gavalas 2015) suggests to bridge current GPS accuracy flaws by incorporating GPS shadows or provide explanations into the game design to avoid player frustration and compromise the trust in the game. As technology continuously evolves, GPS receivers will surely improve in the near future, which makes the revealed issues obsolete (Naliuka et al. 2010; Lehmann 2011).

Wetzel et al. (2011) emphasised that the use of AR should not only be reduced to aesthetically pleasing graphics and interfaces as the novelty effect will soon be worn off, but should instead add real value to the GX. Such as in the case of Diana, who identified a game place based on the AR interface:

> *"I had not really identified it if it was real AR or only a picture which was taken beforehand but I think the latter one is right. You had the people [game characters] right in front of the building at Gendarmenmarket for example. For me it was quite obvious that this is exactly the location where I am at this very moment." (Diana, 26, Single Player, Berlin Wall 1989)*

The rapid identification of real world artefacts is indispensable for tourists who are unfamiliar with the environment. Thus, game designers can support players in finding the play location

(unless exploration is a game mechanic) by incorporating AR visualisations.

AR can also **visualise game targets** or indicate player accomplishments after game interactions between the real and virtual game world. *Ingress*, however, disregarded implementing these connections using AR visualisations to help players identify real world artefacts or places. This aspect has been criticised by many *Ingress* participants who wished to have a closer connection between the game interface and physical play locations. Eva, for instance, indicated that AR would have helped her to find portals easier.

> *"It could have connected the reality with the game and I could see the resonators on the real object. […] With AR it would be nice. It would have helped me to find the portals better when I look around with the camera and then I tap on it and hack it immediately." (Eva, 27, Single Player, Ingress)*

Antje added that the AR visualisation would not only support carrying out gameplay activities but also make them more interactive and visual attractive.

> *"So that [AR] would make it [gameplay] easier and maybe more fun because I see the normal surrounding like it is now and then look with the camera like 'Oh cool'." (Antje, 28, Single Player, Ingress)*

Indeed it is a task for game designers to create an authentic AR game experience, which smoothly and seamlessly integrates into the real game setting. Due to the inaccuracy of AR annotations, this feature is still seen as an add-on but not an essential part of LB gameplay. Reciting one of the participant's words, AR is

> *"Like a cherry on the cake, it's not important but makes the game beautiful." (Paolo, 30, Group Player, Ingress)*

At the time of game testing, **AR visualisations were not clear** because of the issues discussed above. However, game designers tried to circumvent negative aspects, which still come with temporary AR and GPS technology limitations. AR visualisation in the game was illustrated in a comic style. This might have been the reason most online games make use of the stylistic medium; alternatively this may be because of temporary rendering limitations.

There are various reasons to make use of a comic style in games. First, comics or cartoons are pervasive in every culture and can therefore easily be understood and interpreted by everyone (McCloud 1993). Furthermore, comics suit the mental model of our brain and serves simplification aspects of LBMGs. It makes it easier for players to 'drop in and out' of gameplay, testified by Nick when he clarified:

> *"I didn't expect to have a photo-realistic AR showing up. It's a small display. […] I think that to get a better game experience tablets would implement better pictures.*

It wasn't really good looking, the policeman that is. But it worked and served the purpose, which is the most important thing. Nobody cares how it looks really and nobody expects a photo-realistic person there. It may even be distracting because people are walking around and the comic style is much more visible, obvious and sticks out." (Nick, 31, Single Player, Berlin Wall 1989)

According to Schell (2008), the brain needs to do less interpretation with comics in order to understand the picture as these images are simplified reflections of reality. Besides, AR annotations are highlighted with the comic style while 'visual clutter' is reduced, which maximises players' attention for the game character and action (Schmalstieg 2005). As confirmed by the data, AR made it easier for players to switch between the game and the real world. Finally, Blum et al. (2012) argued that the creation of truly visually believable game characters is still an unachievable task in location-based AR gaming due to rendering power and tracking precision. This will only be a temporary problem as technology is continuously evolving and more advanced systems emerge into the market such as *Microsoft Hololens* or other head-mounted displays (HMD) (Fan et al. 2016). Many players will not expect authentic and photo-realistic characters in LBGs at this stage of AR development.

8.7.3. Game Sound & External Noise

Participants had the choice in both games to play with sound and headphones or without. Sound is a crucial element as it influences players' behaviour and a feeling on the one hand and on the other supports the game atmosphere. The majority of participants **used headphones** during gameplay in order to enjoy the game sound, but also to immerse themselves in the game activity.

Most players playing in pairs used at least one headphone or the loudspeakers to allow interactions with co-players, whereas almost all single players used both headphones to completely immerse themselves into the game. As co-players had to constantly pay attention to each other and the environment, a full immersion into gameplay was not possible as reported by Ethan:

"Well, if you had two headphones in, then you could have probably focused on this [gameplay] more but we only had one. This is a bit different. It would affect you slightly but not enough to stop playing the game." (Ethan, 12, Group Player, Ingress)

The close proximity between players allowed natural conversations and interactions between each other. Previous studies (Ballagas et al. 2008) have contradicted this statement and found that headphones were not supporting multiplayers and their conversations. Players' attention was divided between the game and social interaction, but sound did not form an impediment.

Mathild, playing with Marcus, reflects on how she was immersed in reading the dialogue on the screen:

> *"If I had have headphones on top of that, I would not have recognised the reality around me anymore." (Mathild, 34, Group Player, Berlin Wall 1989)*

Although Mathild is an experienced player, she was not keen on being completely immersed into the game, which was due to the game location. Mathild and Marcus started playing at Checkpoint Charlie, which was very busy with people and traffic during the time of gameplay. The contextual environment, thus, would have made it dangerous to play with headphones. Moving through the physical environment requires the attention of the participants, as it can otherwise lead to dangerous situations (Paterson et al. 2010).

In a different context, single players used both headphones to totally immerse themselves in the game activity, whenever the contextual environment allowed it. They experienced reality as an external distraction of GX. Eva for instance was playing in a calm park area with no traffic and was immersed in gameplay. She described the use of headphones as follows:

> *"I prefer playing with headphones because I am just listening to the game and the music in the game, which makes me more focused on the game." (Eva, 27, Single Player, Ingress)*

The usage of headphones depends on players' choice and situation, personal preferences and the context of gameplay. Headphones will only make sense in situations where players concentrate on the game and are not endangered by traffic. Headphone usage can be a supportive engagement tool for directing player attention towards a physical artefact for underlining the authenticity of the ludonarrative.

Carrigy et al. (2010) conducted an unrestrained use of headphones in their play test of a context-based ARG supporting the findings from above. The authors confirmed that headphones help engage players with the game by reducing external distractions and disconnecting players from the ambient sound of the location, which was still audible despite headphones.

In-game sound, however, can support games in many ways. Sound can be used to indicate players *approaching a target location* like in *Ingress* and explained by Antje here:

> *"The nearer I came to the target, the more I could hear the beeping sound. So it got faster and I knew I going to get there, so that worked really well." (Antje, 28, Single Player, Ingress)*

Especially for players playing in an unfamiliar environment, it was essential to identify play locations and targeted artefacts by using a map or pictures. Some participants, for instance, had difficulties finding the right target. But increasing vocal amplitude and speed of sound based on

GPS data indicated players' proximity and reinforced interactive immersive experiences, which confirms the work of Paterson et al. (2010) and Carrigy et al. (2010).

Implementing **authentic sound** that matches the game theme is a powerful tool for in-game sound effects. *Ingress,* for instance, as a futuristic science fiction game was found to serve this aspect well and represent the genre through sound. The combination of an authentic voice instructing the training mission and the sound transported players to a futuristic ambiance.

> *"Yes, it's so spacy and the whole game looks kind of spacy, I don't know. It's just when you get into the training mission and activate it, you get a message and then "diding". The sound …uhh you know it's like something important I have to look at. The sounds are really cool and they support the gameplay. They helped me to feel drawn into the game story."' (Antje, 28, Single Player, Ingress)*

Some players even reported a mild sense of addiction to sound elements as identified by two *Ingress* players:

> *Ethan: 'The sound is really futuristic.'*
> *Eric: 'Yeah, sci-fi like in the movies when doors open and you click the buttons.'*
> *Ethan: 'It makes you feel a little bit interested when it's like telling you the mission and you are like "Yeah, let's do this mission" and it's quite like addictive. Yeah, you do one mission and then you want to find the next one.'*

Sound helps players feel engaged with the gameplay activity as it alerts them of new game challenges or activities. The audio call-to-action instantly focused players' attention in *Ingress* and transported them into the game. Paterson et al. (2010) emphasised the importance of audio to alert players of the virtual world and engage players emotionally in order to encourage play activities. Schell (2008) refers to sound as *language of soul* that touches players on a deeper level without realizing it. Audio is incredibly powerful (Schell 2008) and because of the inherently great scope which sound can offer, any types of location ambience can be supported (Wetzel et al. 2011).

Enabling time travel into the past or future, sound provides the right atmospheric soundscape reflecting what the game is going to feel and look like, such as *Ingress* transporting players into a paranormal environment. This accentuates the authenticity of interactions between player and play environment, which is also confirmed in game literature (Schell 2008; Wetzel et al. 2011). Carrigy et al. (2010), for instance, designed a dialogue scene from the past with the game avatar enriched by authentic sound effects.

Referring to dialogues in games, players preferred a **real voice game avatar** instead of reading a text-based dialogue as in the case of *Berlin Wall 1989.* Samuel states that he

> *'[…] had preferred that the game avatars would have spoken to you or each other instead of reading from the screen.' (Samuel, 28, Single Player, Berlin Wall 1989)*

A vocal dialogue between player and game avatar feels more authentic and thus engages players more into the gameplay. Wetzel et al. (2011) even suggest to choose professional voice actors and create convincing characters in order to emotionally engage players with the dialogue.

Ingress, for instance, understood the importance of providing clear and instant **player feedback by using sound**. Antje reported an episode where she was hacking a portal at the Bournemouth Square and instantly got audio feedback of the performance.

> *"It is like 'Oh cool, I am attacking something now.' [laughing] So the sound works pretty well and I think it wouldn't be that cool without the sounds. Because then I just see it but I don't know what I've been doing. I don't know if I attacked something. But the sound does a lot in the game, yeah. That's cool."(Antje, 28, Single Player, Ingress)*

It can be claimed that that sound is an important mechanic for feedback on player activities. Schell (2008) also pointed out that different types of music and sound is used to symbolize and reflect a player's action such as achieving a goal or indicating a loss.

As players are not always aware of the game sound due to external noise, there need to be alternative ways to catch players' attention. Carvalho and Ishitani (2012) applied vibrations in mobile serious game design for the elderly. Also *Ingress* and *Berlin Wall 1989* supported vibration alerts to alert players of nearby target locations.

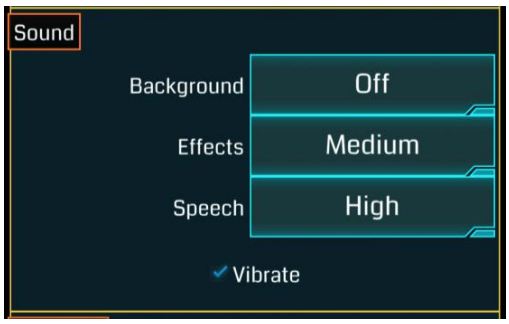


Figure 39: Screenshot Ingress - Sound Settings
(Niantic Inc. 2012)

GPS issues and technical constraints made this feature sometimes unreliable in its performance as confirmed by Paterson et al. (2010). Alternative mediation features are worth further research as they are particularly promising for the creation of engaging experiences and mitigate attention distractions from the mobile screen (Paterson et al. 2010; Kasapakis and Gavalas 2015).

One of the key questions among players and game designers of LBMGs is the application of

sound, text or **vibration** for communication purpose. The majority of players preferred to have sound and text as complementary media in case external influences impact the transmission. For instance, during one of the play test sessions a storm was approaching, which influenced the GX of Mary and Mathew:

> *"The wind was blowing quite strong and in terms of hearing, the sound may be affected a little bit but as a natural fact we could still read on the screen." (Mary and Mathew, Group Players, Ingress)*

Game sound can impair the GX and disengage players from the activity. Providing text as a supplementary element to convey game information is a common practice of game designers. Ijsselsteijn et al. (2007) proposed the use of more effective mechanisms such as vibration or allowing the use of headphones, which was also recommended by both games and proved helpful during the game's introduction. Participants had the choice of text and audio and chose according to their preferences. They could control the pace of textual iterations for a better understanding. In order to revisit some episodes, Wetzel et al. (2011) argued, it is easier to refer back to text instead of audio dialogues. This was also experienced among participants of both games. *Berlin Wall 1989*, for instance, had a video introduction in which players were introduced into the story. Most players, however, had to repeat the introduction.

The data revealed that a combination of visual, sensual and audible feedback on players' actions have been identified as the most valuable symbiosis in the design of LBMGs. Players receive activity alerts via three senses; seeing the task alert in text on the screen, feeling the vibration of the mobile device in their hand, and hearing the alert via sound notification. Game designers should try to provide a combination in their games and give players a choice to decide which bests fits their preferences and suits the contextual gameplay environment. Paterson et al. (2010) referred to three different sound effects for games by distinguishing between *background sound*, which provides an atmospheric soundscape and sets the mood of the location, and *sound effects*, which support the game and narrative *dialogues* where game avatars talk (to players). This division is also applied in films.

For the game introduction, for instance, audio and text material is recommended to provide players with a choice of how information is acquired. Dialogues between players and game avatars should be designed as natural as possible and Carrigy et al. (2010) added that in order to realistically match the game sound to those naturally occurring in the environment, game designers need to acknowledge the context of the game location to deliberately create ambiguity between the two worlds. The aim of implementing different sound techniques should serve a balance between game narrative, player needs and gameplay context.

8.7.4. Real & Virtual World Rules

In contrast to virtual games but central in location-based AR games is the continuous negotiation between the real and the virtual world. As humans we have the ability to distinguish between reality and play as a vital form of communication from early childhood (Goffman 1974). In order to experience joyful location-based gameplay, players often need to suspend their disbelief and immerse into the virtual world. Thus participants were in inner conflict when the game asked them to do something, which was not allowed in the real world, as expressed here by Peter:

> *"[…] do something against the law. I mean not every lawn is allowed to be stepped on and when there is a portal to be reached you do something which is not allowed in the real world but the game's rules don't stop you."(Peter, 31, Group Player, Ingress)*

The *Magic Circle* described by Huzinga (1949) has been criticised by many game researchers (Montola 2005; Consalvo 2009; Calleja 2012a) with the notion of pervasive and location-based games. Within these games, players move between the semi-permeable state of 'everyday reality' and 'game reality' (Goffman 1974; Mäyrä and Lankoski 2009). LBGs are embedded into the social and cultural systems of the surroundings they are played in and can thus not be studied in isolation (Mäyrä and Lankoski 2009).

However, according to the authors, location-based games mirror child's play, which requires players to distinguish between multiple frames of reference. It is crucial for players to constantly shift between the game (paratelic) and reality (telic) frame (Walther 2007; Ejsing-Duun 2011), similar as being in two parallel worlds. The paratelic frame disregards real world rules and implements the game rules on top of the real world as the only valid system. Participants were sometimes in doubt if their actions were allowed or not and were asking themselves if they were acting according to the game conventions (paraludic) or rather with respect to real world rules.

These situations need to be eliminated by game designers who should be aware not to disregard real world rules for the sake of gameplay and ensure that player's actions are in compliance with norms and rules. The games might negatively influence players to act irrespective of or simply against the law trespassing on someone's lawn or entering abandoned factory buildings, for example. International tourists are not always aware of local norms and regulations, but location-based AR games for travel and tourism could sensitise tourists to the cultural difference or even work as a tool to understand cultural norms of behaviour.

8.8. Towards a Balanced Game Design

Location-based AR games are characterised by the game, players and the gameplay context (Engl and Nacke 2012). The challenge is now to balance these realms in a way to create player engagement with the environment throughout gameplay interactions. For game designers, this feels like juggling a ball in the air, which can drop the second the person gets disrupted or loses concentration. Especially in urban tourism environments the game competes with external stimuli (e.g. coffee break, weather constraints or noise), which can easily interrupt the game activity. It is thus the duty of the game designer to maintain engagement through the revelation of game mechanics in interplay with external stimuli in order to create a composed and balanced game experience.

As this is an on-going process, player's attention will continuously shift between the game realm and the physical world. Participants felt more engaged at times than at others, which was due to game mechanics, playability and external stimuli (e.g. café break, weather constraints). Previous sections mapped out in which situations players felt more engaged into gameplay, locations and interactions with co-players than others and which stimuli aroused that. Important in this sense is the attention shift of players being re-directed towards the game and the physical environment. Ideally these realms blend into one and players devote their attention towards the pervasive game world.

The previous discussion has shown that the realms were occasionally out of balance, as either the game or the urban environment dominated the GX. Thus, meaningful interactions between the realms were not always achieved and possible.

One reason for an unbalanced game design was the **immersive state** players found themselves getting used to the GUI of the games. Players were less aware of their surrounding by leaning forward lowering their head on the mobile screen. Looking down on a mobile phone is not a natural behaviour of human beings but one that was learned through interaction with technology. Humans adapted to smartphones in the palm of their hands, as opposed to smartphones supporting the natural behaviour of walking upright. As a consequence, participants did not realise what was going on around them and were mentally still in the gameplay when they got interrupted as the following situation shows:

> *"[…] like when that dog came up to me. I didn't really realise and it was like 'Oh what's going on?' […] because your brain is trying not to fall over or something like that… it's just trying being half between the game and being aware." (Ethan, 12, Group Player, Ingress)*

Here Ethan reflects on his state of game immersion while unexpectedly being interrupted and brought back into 'reality'. Game researchers (Brown and Cairns 2004; Jennett et al. 2008;

Carrigy et al. 2010; Herrewijn et al. 2013) describe this state as transient that progressively deepens with increasing game advancement. Rather than investing in sophisticated GUI that withdraws players from reality, games designers should focus on game mechanics that build a bridge between the virtual and real world, as the example above shows.

An important element is the **link of game mechanics to the physical environment**. Observations and go-along interviews confirmed players were immersed in GUI and game mechanics as opposed to establishing a connection to the real environment through gameplay. This aspect was often criticised by participants as the game falls short going beyond raising mere awareness of the existence of the play locations.

> *"I didn't experience any connections between the game and the reality, only when I clicked on the portals. Then I could see the places. But on the screen I could just see that I am in the middle of the park not on the road." (Eva, 27, Ingress, Single Player)*

Especially Ingress players missed a deeper connection between the game and the play location, which was limited to the requirement being in a 20-meter range of the POI in order to 'hack' or 'capture' it. But during the activity, players were immersed on the smartphones interacting with the GUI and mechanics. Studying the POI or looking at it was not required, which is the main critique on this game.

Other game researchers such as Paay et al. (2008) who used a game prototype for interactive storytelling, found that players explicitly seek interactions with the physical surrounding as opposed to immerse themselves in the virtual world – otherwise they could play a virtual game where real world interactions are not desired. Particularly in tourism, this connection is important as it builds the mediation channel for real world interpretation. Bryon (2012), for instance, emphasised that a meaningful mediation in tour guiding can only be accomplished with technology allowing authentic communication. AR could be a solution to draw a closer connection between player and location when used sensibly and free of usability issues. Usability issues were often a barrier in achieving engagement with the game and impeding interactions with the surrounding (see also Carrigy et al. (2010) or more recent by Yovcheva et al. (2013b), Linza et al. (2014) and Kasapakis and Gavalas (2015)).

As we have seen in the cases above, game engagement is hard to accomplish. Players do not play in isolation like in online games. It is not possible to separate players from surrounding distractions or eliminate all external parameters, as location-based gameplay is dependent on place and time in order to unfold. Thus, it is a natural behaviour of players to divide the attention to in-game tasks and back to the real world (Jegers 2007; Blum et al. 2012). Antje describes her experience of a balanced game design between real and game world:

> *"It's not that everything else is blocked out when you're playing. It is still there and I*

know that I am still in this environment because otherwise it wouldn't be the right thing. The sounds [from the environment] are still there and also the beeping [from the game] but it's somewhere in the background. But when I actually get to a portal and attack it, it comes to the front. But while walking around, I don't concentrate on the game that much, I just go to my next target and it moves to the front again." (Antje, 28, Single Player, Ingress)

The example shows well how sound engages and releases the player while she is going from one play location to another. With a well-balanced sound, game designers can direct players to find their optimal GX. Especially in location-based AR Games, it is vital that players are directed to the location without directly telling them 'Go to Brandenburg Gate', which feels rather like a navigation system than a gameful experience. Schell (2008) proposed six methods of indirect player control to balance freedom and game design –music, characters, visual design, interface, goals and constraints. It should not be the goal to capture players' attention for the whole game duration, but let them have a transient GX that is jumping in and out of the game world. With a vanishing and increasing sound, players' attention is captured as soon as they are close to potential play locations. Paterson et al. (2010) also experimented with game sound in LBGs and found that the game should come to the front of player's attention when players are in close proximity to a POI which is supported by vanishing music or sound.

8.9. Summary

Engagement is not a fixed process influenced by interactions between the player, the game and the game context. The aim was to explore the interactive and thus changing experience of players with the game and if location-based gameplay supports engagement between players and locations. Six concepts have been identified that contribute to a positive engagement process, namely emotions, ludic, narrative, space, social and mixed reality engagement.

In summary it can be said that experiences are changing due to the interplay between player, game and context (emotional engagement). Players need to be encouraged to continue gameplay through regular feedback, meaningful choices that have an explicit outcome for the gameplay. Players need to have the feeling of being able to master the game and not feel concerned that the game is hardly understandable as the story or game mechanics are too complicated (ludic and narrative engagement). Touristic players search for authenticity and credibility in gameplay. That is why games should match the story of the locations they are set in and leave players the choice to decide on the next play location. Engaging is also when players found it easy to navigate between play locations. As they have to orientate themselves in an unknown destination, maps, directions and hints for the next POIs contribute towards player's geographical knowledge. Walking and exploring the touristic destination was experienced as a

key component contributing to engagement (space engagement). As games and travel are social activities, it was found to be necessary to include the social component through chats or personal interactions (social engagement). Augmented reality is used in these games to connect the real with the virtual world and support the engagement of players between the two worlds, which was not always successful (mixed reality engagement). However, there were many positive aspects of gameplay that are discussed in the next chapter.

9. GAMEPLAY DISENGAGEMENT

9.1. Introduction

According to O'Brien and Toms (2008) disengagement is sourced in two aspects; either players make a conscious choice to stop gameplay or they get interrupted by the external environment that causes the activity to end. The first is an intentional choice from the participants, whereas the latter is brought about unintentionally. Both notions are represented in Figure 40.

Generally theses notions present players from engage deeper with the activity, however they cannot be solely seen as negative. In the case of location-based AR games, the reason for disengagement can also be a positive outcome either through achieving a goal set or external stimuli prompting players to stop being engaged with the surrounding environment.

The categories for disengagement follow the threefold classifications of Engl and Nacke (2012) as part of the theoretical framework of the thesis. Each of the categories is separated between contributing to (positive) and disturbing (negative) the overall GX (shown in Figure 40) in order to demonstrate that not all GXs resulted in a positive outcome.

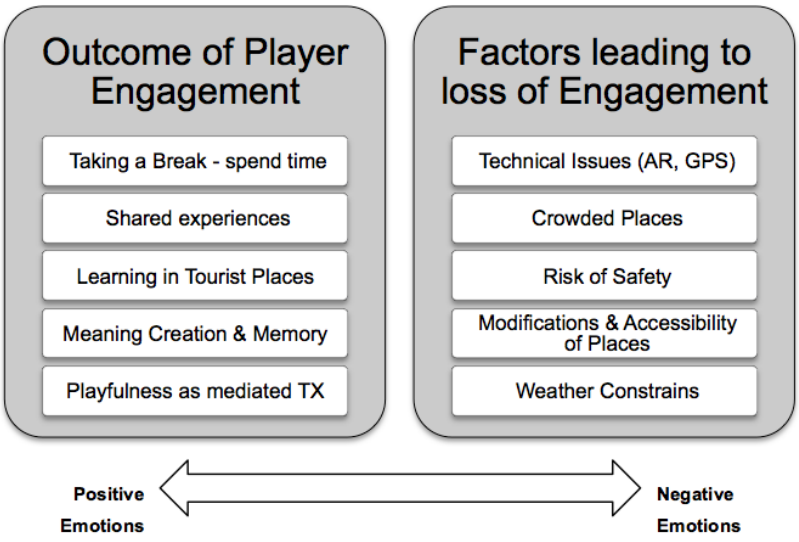


Figure 40: Elements at the Point of Disengagement

Each of the disengagement categories will be discussed in the following sections with a special emphasise on the gameplay outcome.

9.2. Resulting Players Emotions

Participants reported mixed emotional experiences at the end of the play session, which are represented in Figure 41. The diversity of emotions is due to players' different positive and

negative experiences at the end of gameplay. Positive emotions such as happiness, excitement, feeling serene and relaxed mainly resulted out of mastering game tasks and having explored one or more locations with the game. Happiness, excitement and feeling upset are the most frequent player emotions. Little can be said about the strength of player emotions, but based on participants' expressions and observations it can be affirmed that players showed sometimes strong emotions such as smiling or cheerful faces and equally expressed their anger and disappointment when they experienced technical issues.

Many studies in tourism (Brunner-Sperdin et al. 2012; Scott and Ding 2013; Kim and Fesenmaier 2014) and game (Calleja 2011a; Lankoski 2012) experience have shown that the nature of experiences are based on emotional states (Boswijk et al. 2005). Participants' emotions are an indicator of their engagement during gameplay (*process-based*) but also reveal how pleasant or unpleasant the overall GX (*outcome-based*) felt. Emotions are an altering and impressionable state stimulated by external stimuli and interactional processes, which continuously reshape experiences (Kim and Fesenmaier 2014).

The continuous interaction process of gameplay influenced participants' experiences. Players shaped their experiences via their perceptions of the real and virtual environment, which elicited positive (i.e. mastering gameplay) and negative (i.e. technical difficulties) emotions. Emotions created an experience in the player's mind used to judge if an activity was either meaningful (value-creation) or not in order to adapt one's behaviour. Reflecting on the gameplay activity, the majority of participants found that the games added value to their tourist experience in the form of learning, fun, playfulness, positive emotions and uniqueness.

Although self-reporting tools have their limitations (discussed by Kim and Fesenmaier 2014 for instance) as the Wheel of Emotions only captures a moment in time it illustrates an overview of player emotions during and at the end of the game testing of two location-based AR games, which was found to be suitable in the triangulation with interviews and observations.

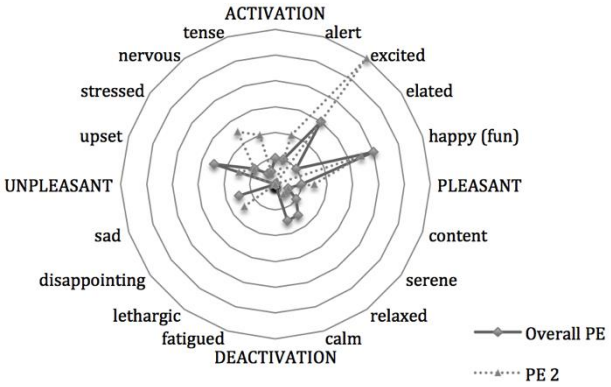


Figure 41: 3rd Wheel of Emotions at the End of Gameplay

Figure 41 represents the contrasting comparison between the player experience at the middle of

gameplay and the overall player experience at the end of gameplay. As presented, most participants expressed excitement and happiness as their main emotions at the end of gameplay, which is a notable indication of players' pleasant state at the end of gameplay. The other half of participants felt rather unpleasant due to reasons explained in the following section.

9.3. Factors Leading to Loss of Engagement

Some participants felt stressed and disappointed during gameplay, which shifted towards being upset and sad at the end of the game session. This was mainly due to technological but also external difficulties that were encountered during gameplay. The main reasons were malfunction of technology (GPS and AR), unclear game challenges and too crowded play locations. The following sections elaborate more on the reasons for player disengagement.

9.3.1. Technical Issues

Participants' main criticism was **technical problems** concerning GPS and its influence on the AR performance. The research found that mobile devices from 2014 still had shortcomings regarding graphic-intensive AR games. The main issues were the hampering procession of mobile AR tracking and image rendering. Technical failures were observed to be responsible for many instances of disengagement with the game activity:

> *"I got very quickly upset. I had a problem with the technical issues as they distracted my game experience." (Thomas, 29, Group Player, Berlin Wall 1989)*

Interviews and observations revealed that technical issues, which have been identified in previous research (Benford et al. 2006) are still omnipresent today. Unavailable and inaccurate GPS and AR are still a reason for players' disappointment and frustration as expectations of modern technology are high. Most participants did not tolerate usability issues as their overall game engagement was affected.

9.3.2. Crowded Places

As experiences are created in the specific context of space and time (Boswijk et al. 2005), participants had different occurrences and emotions at different locations and times of day. Atmosphere and physiology of locations had a direct impact on the GX and player emotions. Particularly with more crowded places like Checkpoint Charlie or the Bournemouth Square, participants felt stressed and inattentive during gameplay:

> *"Out of a sudden I thought 'Oh my God I am in the way of all these people' and stepped a bit aside because I didn't want to stand in the way of people. I considered that as a little stressful for me." (Diana, 26, Single Player, Berlin Wall 1989)*

Instead of being able to concentrate on the gameplay, participants had to pay attention to pedestrians. The quantity of people in the location influenced players' perceptions of the location atmosphere and the level of stress or tension. Goulding (2000) speaks of physical crowding when people do not have enough space to perform an activity, which consequently has an impact on behaviour. The quantity of people is dependent on the attractiveness of locations as well as the time of day. Some places like the Bournemouth Square or Checkpoint Charlie were highly frequented during the summer weekends, whereas others like Bournemouth University or the Lower and Middle Gardens were less busy and likewise provided more space for gameplay. The result was, that participants felt distressed, irritated, nervous and tense in highly crowded places as it distracted them from their goal (Goulding 2000) of getting engaged with the game.

Participants pointed out that a play location should be in the first place suitable for location-based gameplay. It was a new experience for most player to play in a public space, participants had to get used to the new experience

> *"If it's like crowded and tight it gets annoyed because then you have to watch where you're going instead of just reading the map and just go" (Brendan, 15, Single Player, Ingress)*

As high accumulation of people in the play location has a negative impact on GX, game designers should avoid putting players in stressful situations. Players feel easily overwhelmed in this situation by too much cognitive stimuli and cannot engage with the gameplay. Location-based game (Paavilainen et al. 2009a; Engl and Nacke 2012) and tourism researchers (Tan et al. 2009) support this argument and emphasis that an engaging experience should not be compromised. Wetzel et al. (2011) thus recommend in their guidelines for AR games to only incorporate less populated places so that the GX can unfold in an unimpeded manner. This, however, may raise concerns about the safety of players, when gameplay is carried out in a remote or quiet area and players get injured or are robbed out.

9.3.3. Safety Risks

Different to the safe world of a video game, players had to pay attention to traffic and security of (non-) players. Both games advised players to be careful during the gameplay and put safety first. All participants were aware of the risk and therefore often decided to play without headphones or game music to be able to hear an approaching car or other environmental noises.

Game areas were chosen based on varied location characteristics to observe players' behaviour. Some of them had to cross streets more than once to reach the play location. Players were aware of the risk involved approaching the road; they looked up, searched for a zebra crossing or

traffic lights.

> *"But I think the game developers have taken this into account by saying that you have to watch the traffic. But I think this is a factor, which is especially considerable during rush hour and peak season." (Diana, 26, Single Player, Berlin Wall 1989)*

Safety was absolute priority during game testing, as there was the risk that players could feel tunnelled by the mobile AR experience (Koh et al. 2012) or be goal-driven risking their own safety and that of others (Jacob and Coelho 2011). Participants were rarely so immersed that they neglected serious safety protections, although one group kept standing at an access gate and only moved when they were asked to clear the driveway. However, players appropriately judged dangerous situations in most situations during the gameplay, which is different than observed by Ballagas et al. (2008), where participants ran into a construction zone as they were too focused on the game screen. But it is also the duty of the game designer to place game locations at less dangerous or risky places, as suggested by Wetzel et al. (2011). Until now, there are no standardised rules for what is considered as a suitable game location. With the emergence of new LBGs entering the market and a co-creative approach in game development (players can submit their game location in *Ingress* and *Geocaching*), there is a need for security standards. Both games supply guidelines and have approval mechanisms before locations are officially implemented in the game (Neustädter et al. 2013; Niantic, Inc. 2015), these however may change for other suppliers.

9.3.4. Modifications & Accessibility of Play Locations

The urban environment is not static, but undergoes constant changes, either temporary or permanent. Designing with a changing environment in mind, game designers have to be aware of modifications of game locations and play area. Alterations can change the play environment to such a degree that players' experience is affected in a negative way. These alterations could entail that:

(1) The player has difficulty identifying the game location due to **space modifications**.

> *"But the trouble with all of these things is that art collections move […] which means that the sculpture could have been moved last week and the game would kind of fall apart relying on that the objects are still in place." (Mary, 35, Group Player, Ingress)*

(2) The player needs to take an alternative route due to **inaccessibility** or **restricted areas**.

> *"But it wasn't so easy to find because of the construction side, you had to work your way around them." (Naomi, 16, Single Player, Ingress)*

Some game locations can be entirely out of reach for players as on the one hand some locations

are not allowed to be accessed without permission or hurdles (paying entry) as it is not a public place.

On the other hand, play locations can be inaccessible for tourists with disabilities or restricted walking abilities, as the topography of a location is not recognisable from the game map. One player had the experience in Boscombe Gardens that one game location requested climbing up stairs, which was not apparent from the game.

Thus, game designers and players need to take responsibility to ensure gameplay at a safe location and a smooth GX for players. It is nothing more frustrating for players than feeling lost or stuck in the middle of the gameplay because the site is not accessible or dangerous.

9.3.5. Weather Constraints

As for every outdoor activity, location-based AR games are dependent on the weather situations. The majority of gameplay sessions started in sunny and warm conditions with occasional clouds, which were found to be beneficial for most of the participants. Too much direct sunlight, however, influenced the game experiences negatively, which was particularly the case with multiple players as affirmed by Peter, who states:

> *"The light is affecting now."*

and fellow player Paolo continued while he was protecting the screen with one hand:

> *"Yeah, it does. I mean here, in the sun, I cannot see anything but maybe there could be a day and night vision to make it more readable." (Paolo, 30 and Peter, 31 Group Players, Ingress)*

The influence of bright weather conditions have to be taken into account by game designers in regards to display properties as too dark GUI design can hinder players from gameplay (Ballagas et al. 2008; Carrigy et al. 2010) and thus make games unplayable according to Wetzel et al. (2011). Participants of the study, however, did not experience major problems with the sunlight but were inventive and covered the reflections with their hands, jackets or changed the game settings on the display.

Weather conditions partially changed during most of the game sessions, which implies that there is a strong influence of weather on location-based AR gameplay. In two game sessions, heavy rain forced participants to stop gameplay as it made it impossible to play.

> *"Yea, for sure. If it's raining it's half the fun. I don't want put my phone's display out into the rain or walk around covering it and searching for portals." (Mathew, 36, Group Player, Ingress)*

Participants found extreme weather conditions such as being too hot, wind, coldness or rain as

unplayable and thus preferred not to proceed with the activity. This implies that tourist players are unlikely highly motivated gamers but take more convenient choices.

9.4. Outcome of Player Engagement

9.4.1. Taking a Break

It can be assumed that breaks during gameplay are regarded as an interruption to the engaging experience and indeed players are separated from the game. But in the context of travel and tourism, breaks were used to engage more with the environment, rest in a nearby café or exchange with co-players. After an exhausting gameplay, participants often decided to have a coffee in- between or relax on a bench to experience the atmosphere of a location. If players get stuck during gameplay, they often stopped for a moment and re-engaged with the game after a certain time for another try. Thus, breaks cannot be rated as something negative but are the result of an engaging game experience where players have time to reflect. Participants were not willing to play until exhaustion and thus sought opportunities to have more breaks:

> *"But I think the attention span shouldn't be stressed too much to solve a puzzle. There should be chances to take a break for example when going from one place to another. Maybe mini-missions would be fun or the option to continue at a later time." (Nick, 31, Single Player, Berlin Wall 1989)*

Players were lead to new places through the gameplay, which they appreciated and explored more during a game break. Some participants took the time to read historical information or just relax and enjoy the atmosphere.

> *"But I think when you want to see the city in more detail you would take this opportunity and go somewhere along the way and explore it a bit more or just have a drink in-between." (Diana, 26, Single Player, Berlin Wall 1989)*

Participants chose to stay longer at a place where they liked the atmosphere, just by sitting down on a bench or staircase. Especially when players are in a group, it was more likely that they decided to have a quick break before continuing gameplay at a later point. In this case, games should remember the state where players left the game, so that players can continue playing from there, which was mentioned earlier in section 7.4.4. about Game Settings. In regards to choosing game locations, tourism decision makers and game designers need to take into account to chose suitable POIs for relaxation and excitement to ensure a change of atmospheres between tension and release (Dalsgaard and Kortbek 2009; Stenros et al. 2012).

9.4.2. Shared experiences through gameplay

Shared experiences are a crucial part in gameplay and tourism. Participants stated that they like to share and discuss their experiences with co-players and exchange information about the places they have visited. Participants found it an important aspect of their tourist experience that the group of players was together for a certain time and participated in an activity together, which strengthened the connections between each other:

> *'The game is a facilitator to connect people which should serve this purpose. […] or even go with a group of friends and explore the city and hack a few portals in-between. […] It should just not be so time consuming because it's not all about the game. It's about the game, the place and socialise with friends.'(Peter, 31, Group Player, Ingress)*

Peter pointed out that the gameplay activity itself is not the main focus for him but provides an opportunity to meet with friends, socialise with them and discover the city together. The central aspect in meeting for gameplay is sharing the same experiences with each other, which is known as 'shared involvement' from online gaming (Calleja 2011b). Shared involvement is the awareness of other player agents and the formation of social bonds between them by taking part in the same activity.

Some players reported that they were particularly interested in gameplay interactions such as competing with other players. Especially the massively multiplayer role-playing game *Ingress* facilitated the feature of competition between co-players.

> *"Yeah, definitely because this is something I could easily do with my friends because it's said that you can go against other people right?" (Wen, 13, Single Player, Ingress)*

Other game researchers (Li and Counts 2007; Calleja 2011b; Engl and Nacke 2012) agreed that competing and defeating is an effective motivator for casual gameplay. A few participants were even keen on competing with others who they knew from gameplay and were happy to get to know the foreign co-player in a chat or real life. Social interactions easily create emotional engagement for the participants through exchange with other people. The emotional component of social engagement is important for both tourism (Chandralal and Valenzuela 2013) and game research (Guenjens et al. 2013).

Both games facilitated players **learning from each other**, which was advantageous for players in case they were stuck. All player groups created a supportive atmosphere in which ideas were discussed and exchanged in order to find a joint solution for solving game tasks. Tanja reflected how she interacted with her co-players:

> *"When we had a problem, it's an advantage. So maybe many ideas lead us forward" (Tanja, 27, Group Player, Berlin Wall 1989)*

Shared experiences helped players to build up confidence in gameplay as single players showed insecurities during gameplay. Social interactions are a main aspect of travelling according to Chandralal and Valenzuela (2013) as it facilitates short-term bonding and relatedness.

For some players, the game was used as a platform to maintain or expand their social network. This type of player was interested in getting to know other players and start a personal conversation without using the social game chat, which was often found inconvenient.

> *"[…] it's a possibility to make friends when someone else finds out that you're also playing Ingress and then you start to chat about it." (Antje, 28, Single Player, Ingress)*

Emotions generated during social interactions referred to social confidence (Freire 2013) in this case identified as player support, shared experiences, collaboration (in *Berlin Wall 1989*) and competition (*Ingress*). It can be summarised that participants felt most comfortable playing with their friends and family members with whom they were travelling.

Location-based games function as enablers to **connect tourists** who share the same interests, either physically in the real world or virtually in the game world and some players were keen on getting to know other tourists who were also playing as the assertion from Antje shows:

> *"If I can meet them in the game and I know that they are around, why not? […]You get to know people like this. So I wouldn't have problems with that. But probably not when I play with somebody else, but when I was alone, why not?" (Antje, 28, Single Player, Ingress)*

The findings support Kim et al.'s (2013) argument that there is social need to connect with other players. Game features and functions of the application can support this social engagement through networking facilities e.g. in-game chat or integrated social media enable players to connect with each other.

In two negative cases it was pointed out that the participant felt uncomfortable making new friends through the gameplay:

> *"[…] usually I travel with someone I know and not with strangers. […] I wouldn't socialise with strangers." (Eva, 27, Single Player, Ingress)*

> *"I feel more comfortable to play with others and this is like the touristic experience I am used to. I want to experience things with people I know. This would be the best way for me, to play it in a group." (Diana, 26, Single Player, Berlin Wall 1989)*

Some players did not feel comfortable playing with people they do not know, although they do not completely exclude the option of playing with someone they are unfamiliar with in the game world. This form of co-presence refers to the feeling of being with someone at a remote location such as meeting in the game world as opposed to the physical presence of a player, which might

be too intimidating for participants as emphasised by Eva and Diana (Lombard et al. 2009; Blum et al. 2012).

According to game researchers (Lin et al. 2011; Schønau-Fog 2011; Chandralal and Valenzuela 2013; Guenjens et al. 2013) social engagement is correlated with the interaction between players during gameplay and in real life. Social play facilitates meeting up with friends and unfamiliar people in the virtual and real world. Thus, gameplay becomes a social event in which players interact with and learn from each other, network or strengthen friendship.

It happened however, that the majority of participants of the game evaluations were single players who had wished to play and share their experiences with friends as emphasised by Nick:

"It was fun alone, but I think it would also be fun playing it together." (Nick, 31, Single

This quotation mirrors the desire to share experiences with other players such as friends and family, which has also been revealed by Kim et al. (2013) as a motivation for social engagement. Inter-player relations are a vital aspect in gameplay, as agreed among game researchers (Calleja 2011b; Harteveld et al. 2011; Schønau-Fog and Bjørner 2012) and are also considered as 'the most fun' in *Ingress*. The data affirmed this statement but it needs to be differentiated for social gameplay in the tourism context. Game designers should consider three aspects:

- In virtual contexts tourists seem happy to interact with players they don't know.
- In terms of meeting in physical spaces, tourists are generally less keen and would rather play with friends and family.
- Players appreciated opportunities to compete against real tourists as opponent players.

Thus, location-based AR games should support multi-player functions, which enable players to play against or with other tourists as they frequently travel with others.

9.4.3. Meaning Creation and Memories

Concerning tourism research, meaningful experiences and memory creation are crucial aspects (Tung and Ritchie 2011), which have only recently gained interest specifically in relation to new mobile technologies (Gretzel et al. 2011; Tussyadiah and Zach 2012).

Location-based AR games helped the majority of the participants to gain an understanding of their urban environment and to create unique experiences. These games pointed the participants to particular POIs, which seemed to be less renowned or obvious sites, but after gaining interest, the tourist spent some time to find out more about the particular site as explained by Antje here:

"Hm, I don't get this thing [Bournemouth Flame]. I mean it's cool that it's here and for

some people it has a meaning but I would just pass it and not look at it again. Now, I forever see the Bournemouth Flame different. [laughing]" (Antje, 28, Single Player, Ingress)

Without the game, Antje would have not been aware of the tourist site and mistaken the landmark for an ordinary street lamp. The game created awareness of the site and gave a new meaning to the street lamp, which turned out to be a religious site in the real world and a game portal in the virtual world.

POIs have not only the meaning given by authorities, but inherit a double meaning imposed by gameplay. For instance, Checkpoint Charlie as a previous border crossing is a game portal in *Ingress* or a meeting place in the *Berlin Wall 1989* game. In order to engage in the GX, players need to suspend their disbelief (Nieuwdorp 2005) from the original meaning and adapt the game meaning to the location. Meaning making always involves the world of reality (Harteveld 2011) and is a result of a construct on how a person sees the world.

Emotions are a vital aspect in creating meaningful experiences. Whereas during the game activity, most participants were quiet and concentrated, they were enthusiastic and cheerful at the end of the testing. In the interviews players confirmed, positive GXs such as excitement, happiness and surprise were due to the achievement having mastered gameplay as one of the participants explains here:

"Good I would say because as the game went on I understood how to play it and then it got easier to play."(Brendan, 15. Single Player, Ingress)

Other players found it an excited and happy experience as they saw many places during gameplay, could share their experiences but also mastered the game. Especially as at the end of gameplay, participants learned to understand the game mechanics, actions became clearer and participants felt pleasure in playing. The feeling of achievement and mastering the game strongly contributed to participant's positive emotions and proudness.

Location-based technology contributes towards a more meaningful and authentic understanding of places. As Tussyadiah and Zach (2012) pointed out, the use of geo-based technologies assists tourists in their travel decisions on site and creates a positive contribution to meaningful creation. According to the authors, mobile technology allows for an emotional attachment to tourist places by supporting sensory, emotional and cognitive interaction with the location. Participants of the game analysis, however, did not support this argument. The majority did not feel emotionally involved in the place as described by Tanja here:

"I would remember that I've played here the game but I couldn't say that I am totally emotionally involved because of the game. It's like I remember because I've done it but it's not a deep feeling." (Tanja, 27, Group Player, Berlin Wall 1989)

It stood out in the data that although participants did not feel emotionally involved in the location, they would definitely remember having played a location-based game at the particular places such as attested by Peter:

> *"But I think for now the game is definitely something that sticks in my mind when I am in this area again. Maybe not so much but more in a kind of 'Oh, I've been there and played Ingress'." (Peter, 31, Group Player, Ingress)*

Here the game added meaning but also created memorable experiences. According to Chandralal and Valenzuela (2013), perceived meaningfulness of a trip refers to the value someone gains from traveling including an enhanced intellect, broadened perspectives or obtained new skills. A trip also becomes meaningful for tourists when they experience a notion of novelty in having done something the first time or walked off-the-beaten tracks. It was the uncommon activity of location-based AR gameplay, which introduced the participants to unusual places and taught them new skills. The surprising perceptions during gameplay triggered participants' emotions, who created personal and value-based experiences. Some travellers reported having enhanced their skills by developing empathy to the history of touristic sites but also improving multi-tasking abilities through gameplay or and sharpening navigational skills.

9.4.4. LB Serious Gaming

Location-based AR Games could become a new form of tourist interpretation media as these games provide learning opportunities throughout gameplay. The analysed games offered background information about the local history and geo-locations, which were useful for tourists in an unfamiliar environment.

Both games included additional information about play locations by either linking to a Wikipedia article as in *Berlin Wall 1989* or providing a location (portal) description co-created by *Ingress* players. Many players actively requested location information and were looking for knowledge such as Samuel here:

> *"[…] it gave some historical background, which was really important at this part of Berlin. […] If they had integrated more things from the environment, it would be better. To make the tourist more aware of what's in the reality like the stories and history they have displayed next to the border-crossing." (Samuel, 28, Single Player, Berlin Wall 1989)*

The majority of participants were interested in learning about the urban environment through gameplay in order to make sense of the visited places and interpret the history in a meaningful way. Ordinary places turn into a meaningful game places with the right information at hand

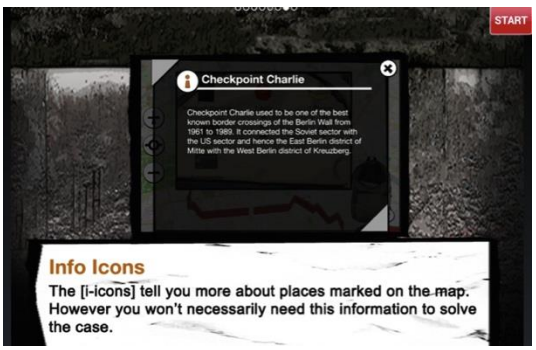
(Dalsgaard and Kortbek 2009; Ejsing-Duun 2011). Foreign players, like Samuel, were often not aware of the recent German history and got interested in learning about the divided city. Games with a historical focus teaching culture can be quite beneficial for players, according to Belotti et al. (2012) who analysed learning and education in a virtual cultural heritage setting. They identified substantial opportunities of serious games for foreigners who are not familiar with local art or cultural heritage. This heritage needs to be interpreted and understood by tourists in order to create meaningful encounters. Another study by Chang et al. (2011) used ARG to present virtual content in physical spaces to allow collaborative learning among players.

Both analysed games included geographical information, which was of relevance for tourists. Paolo, for instance, attested the importance of building names for his orientation and understanding of the destination:

> *"But it's a great opportunity to get to know the city anyway through the gameplay, because every building is described in the map. I mean not in depth but you get to know the names of the buildings. There is additional information in the game of what kind of building it is, whether it's a bar or anything else shown as little symbols which might not be easy to understand for anybody I suppose." (Paolo, 30, Group Player, Ingress)*

The geographical information provided in *Ingress* supports the development of players' understanding of the visited places. Tourists learn the meaning of locations and are able to relate its importance into the social and geographical context of the urban destination to create meaning through interpretation and previous experiences.

In-game information of the play locations in *Berlin Wall 1989* was explicitly represented as info icons, location drawing or overlays with a direct link to Wikipedia as shown in Figure 42-1. *Ingress* also provided in-game information like pictures and a location description, shown in Figure 42-2.

(1) 

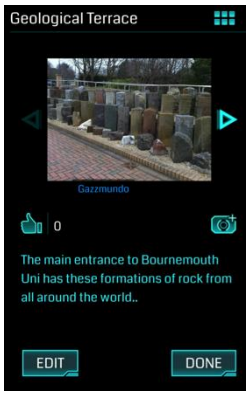
(2) 

Figure 42: Screenshot - In-Game Information
(Tripventure 2012; Niantic Inc. 2012)

The majority of participants were interested in perceiving historical information. However, there

was no consent how information should be presented in games. Some players found reading information as an appropriate practice but were not recommending to link to external web sources for more information to not interrupt the GX, such as described by Antje:

> *"When I want to have background information and I am not walking around with a guide, then I probably wouldn't know what it is unless I could get out of the game, go on the Internet and google it and find out what it is. So maybe that is something that… I wish to have a little more information. This would keep me into the game." (Antje, 28, Single Player, Ingress)*

Besides, tourists were preferred gaining information form the play interaction instead of reading physical interpretation boards displayed at the POIs.

> *"Imagine this hut would be a touristic spot, yes I would be interested in physical boards but I would find it more interesting when there would be an image in the game and could just click that would directly get information about the spot." (Eva, 27, Single Player, Ingress)*

As the statements above show, players are interested in gaining knowledge of the play locations besides playing. Reading, however, was found to interrupt the GX. Presenting information as text does not distinguish from reading a brochure or tour guide and has less to do with playful interaction. Games aim for a different purpose, which includes fun, entertainment, challenges and storytelling. In a well-designed game, information need to be incorporated in a way it brings value to the educational tourism, as well as to the playful side. This could mean that historical information is incorporated in a story without players realising it. This entails a challenge for game design as expressed by Huizenga et al. (2007). Besides, it was found in this study that participants also struggled to combine these two aspects into edutainment (Kotler 1978; Pine and Gilmore 2011) and suggested to focus either on entertainment or education.

> *"I would prefer an app in which information is provided where to go and what happened there and not combine it in the story within the game. The story was not particularly important for me. I would be more interested in the locations themselves without a story. Like in some travel guides, you have some walks adjusted for you. From my point of view, I would prefer these things on the smartphone instead of the game." (Tom, 24, Group Player, Berlin Wall 1989)*

Other participants suggested to present in-game information in an interactive way such as videos or pictures to further engagement. This feature was also mentioned by Parsons et al. (2011) and Mortara et al. (2013) who attested that, learning would be more immersive with interactive media to raise cultural and heritage awareness and create an engaging learning environment. Depending on the aim of the game, location-based AR games additional

multimedia information may provide in-depth information and transfer it to players in a more interactive way than text-based information.

Location-based games underlie occasional changes in the play locations, which need constant update by the game designer. Paolo and Peter, for instance, tried to find a location in the real world, which was shown as a picture in *Ingress*. It took some time to recognise that the art installation they were looking for was dismantled.

> *"There is a man on one of the portals, but it's not here anymore, so something is wrong in this picture and even this building is not here. It looks a bit different in the game than in reality. The picture might be old. Also, the pictures are old and when I compare the pictures in the game with the real life I would guess we are not in the correct place." (Paolo, 30, Group Player, Ingress)*

Players rely on the trustworthiness of the game content and found it irritating searching for the right play locations.

Integrating a serious educational aspect into location-based AR gameplay fosters new opportunities for tourism mediation as it enriches the learning perspective of tourism experience, which has long been neglected (Falk et al. 2012). Game base mobile learning may become increasingly popular due to new developments in mobile technologies (Huizenga et al. 2009; Parsons et al. 2011). As previous studies have shown (Huizenga et al. 2009; Parsons et al. 2011), people who engage in serious gameplay learn significantly more than pupils in regular received lessons. The learning potential of mobile and location-based technologies lies in the possibility to embed authentic material in order to enhance engagement and learning outside the formal educational setting (Huizenga et al. 2009). It is to the game designer and the aim of the game to not overwhelm players with historical facts but give players a choice of how deep to engage with knowledge. The aim is to find the right balance of information about tourist places and entertainment. Tourists are in their leisure time and are searching for a touch of adventure and exploration and are not interested in receiving a history lesson. Presenting multimedia information within the game in the context of the realistic setting of the tourist destination enables the tourist to create meaningful and actively engaging encounters such as reported by Huizenga et al. (2009) and their mobile city game *Frequency 1550* about medieval Amsterdam. Location-based storytelling in gameplay seems to be an emerging and promising approach, but a positive gameplay experience depends much on player's expectations of the game and the game topic itself.

One can ask what shall **tourists learn from the visited places** and how does the game need to be designed in order to support these goals? Although none of the analysed games claims to be a serious game in particular, they can be implemented as such in the tourism context due to the

following reasons. First, these games enable players to discover many tourist POIs, which otherwise do remain unknown. Many participants agreed that the location-based game pointed them to new sites, which they have never seen before and sharpened their attention for particular features of the POI.

> *"Berlin has a lot of history and I think it's pretty easy to play here as there are a lot of portals and among them some interesting points where you can learn about history. There are signposts everywhere explaining the tourist sights. So I guess smart placing of those portals can elevate our experience." (Peter, 31, Group Player, Ingress)*

The way both games were designed did not necessarily contribute to engaging into the location as only a few participants became more interested in finding out more about the place, although many more said they would engage more if they had time. However, particularly the children pointed out that this kind of activity is enjoyable, fun and an alternative to classroom learning.

> *"It would be a good thing to do or use for school because it would be quite educational and fun as they try to find new ways of learning and stuff that are bit easier than writing and reading all the time." (Ethan, 12, Group Player, Ingress)*

With the playful interactions, participants felt transported into the exact time of history, but also raised interest in finding out more about the current site. The use of ICT for learning purpose has been researched extensively, particularly in regards to mobile learning with location-based city games (Huizenga et al. 2009; Admiraal et al. 2011). Huizenga et al. (2009) revealed that students are more engaged in game-based learning through direct involved in gameplay interactions than conventional learning techniques. However, learning is a highly individual and contextual experience and as observations have shown, participants were quite selective in what they were interested in and what not, based on past experiences and motivations. Thus, some POIs were less interesting for the participants than others.

These games could be a new platform to engage tourists in game-based learning in order to meaningfully construct an (unfamiliar) environment. The analysed games triggered some information, for instance, by incorporating Wikipedia articles or descriptions of the POIs. But they did not fully engage the tourists into a meaningful learning experience based on playful and educational values. For the majority of the participants it felt as if the provided information were variously spread in the game without thoroughly connecting to the game content. Contrary to past assumptions of the exclusiveness of education and entertainment, Falk et al. (2012) argued that these aspects are complementary and even synergetic, which is also supported by serious game researchers (Bellotti et al. 2012; Janarthanan 2012; Obikwelu and Read 2012). In order to design a location-based AR game that is not only concerned about fun, but also educative for tourism purposes, these realms need to be intertwined with each other on a

narrative basis. There are already some projects (Kim and Schliesser 2007; Ferreira et al. 2012) that include this aspect and implement education and fun to an informative gameplay interaction. Ferreira et al. (2012) integrated different information about the Port wine into the game, from which players learned about the harvest until the production.

9.4.5. Playfulness as a new Mediated Tourist Experience

Introducing the concept of playfulness to tourists and taking gameplay into the real world was definitely something new for all participants. They described gameplay as an alternative and innovative experience to conventional tour guiding as mentioned here by Lee:

> *"I actually found the idea quite cool doing urban tourism by following a gameplay or role-playing game. Of course, it's not made for everybody, some people might like it, and others don't. There are people prefer being guided through the city from a tour guide, but I found it a really good idea." (Lee, 16, Group Player, Berlin Wall 1989)*

For some, these gameful experiences changed their view and connection to the physical environment. Playing let tourists feel excited and childlike as it allows fantasy and imaginary aspects that are in some way missing in the real world. The following quote states it well:

> *"I feel like a child again. I don't play games too much really, and for sure not on my telephone but this is like being a child again. Being small and just walking around on an adventurous mission […]." (Antje, 28, Single Player, Ingress)*

These games have the ability to transform players into adventurers who wanted to explore their environment – like a child is exploring it's surrounding. As players were taking on the game role of an investigator in *Berlin Wall 1989* or an agent in *Ingress*, it was easier for them to sympathise with the game and its missions. Gameplay enabled them to recall childhood feelings like exploration, fantasy, imagination, and playfulness.

Leisure researchers valued the benefits of play on cognitive and physiological aspects of people especially the positive impact on the tourists' mood and personal development (Page and Connell 2010; Freire 2013). Although leisure researchers point to playing games as leisure activities, they highlight the passiveness of online games and the bodily involvement of sports games (Freire 2013). Location-based AR games combine these features and bring fantasy, adventure exploration and imagination into the real world of tourist destinations.

Tourists who were playing a location-based AR game used to go on guided tours or had guidebooks for meaning creation. However, these games are designed in a different way allowing for playful interactions, storytelling and social gameplay. It is not said that this way is a 'better' way but a different and new one for tourists as expressed by participants here:

"But I quite liked the idea of taking a different perspective on the city to play a game. [Gameplay] was a new experience for me as I'm normally not playing mobile games in public, which connect the environment but it changed my view." (Peter, 31, Group Player, Ingress)

Another player, who had been visiting Berlin for many times, shared a similar view.

"Now as I am the tenth time in Berlin, gameplay is a different way to explore the city." (Marcus, 25, Group Player, Berlin Wall 1989)

As experiences are individually constructed (Lincoln and Guba 1995), the only reality which can be known by tourists is the reality of 'living through an emotional sensation' such as playing a location-based AR game in an urban environment. The tourist experience becomes more personalised and individual.

Tourist not only discover new urban sites with location-based AR games but develop a new perspective of the city – a playful view in which the tourist destination turns into a playground. This also has managerial and in particular marketing implications for tourist destinations and decision makers providing strategic advantages by repositioning on the market with a new product (Xu et al. 2013). It is not said that tourists will exclusively visit a destination for playing a location-based AR game, but they might discover these games as an alternative activity, which elicits more experiential and creative experience, particularly for children.

These games can be an alternative tool for mediated learning in the travel and tourism context. During the play tests it was observed that especially children showed a growing interest in these games; as outlined in the following statements by Ethan (12) and Eric (11):

"I am playing that game for 2 hours probably just go with the time and play it in-between. Or let's say you want to know what a certain landmark means and check it with one of the portals and check what it is." (Ethan, 12, Group Player, Ingress)

The children came up with different playing scenarios:

Ethan: "Or let's say mom is doing some shopping and we could just hack some portals meanwhile."

Ethan: "Imagine […] we do big drives up to Scotland it would be cool to see what's on the way with the game."

Eric:"[…] you can go to a restaurant while hacking a portal and have a meal while at the same time having fun and do what you need to do in the game."

As discussed in previous sections, children gain a different perspective on how they perceive the environment with location-based AR games. Game design researchers (Tan et al. 2011; Koh et

al. 2012; Obikwelu and Read 2012; Vasalou et al. 2012) confirm the success of location-based games in a classroom context. Formally, parents tried to stimulate their children with audio or self-guided tours, but these games enable more playful interactions with locations. Families could for instance do a guided city tour in which the children play an LBG and the parents follow a guided history tour. In this way the family has a shared experience in which everybody is engaged in their preferred medium without sacrifices. Some current platforms enable this type of shared experience already.

Playfulness can also be regarded as an alternative solution for less attractive tourist places for increasing desirability, brand repositioning or expansion of the target audience (Xu et al. 2013). Having the choice between alternative mediation tools, allows tourists to pick their preferred type. For sure not every attraction becomes an Eiffel Tower but emphasis can be laid on playful interactions with the attraction, which creates added value such as positive emotions or learning outcome.

> *"You always get guests and have to show them the tourist places and these games are a good solution to show your guests around, which could be fun with these games. It would even work […] in a city with not so many tourist attractions. Then this could be a great solution." (Tanja, 27, Berlin Wall 1989)*

Location-based games are already a substantial part for some tourism marketing organisation (Boulaire and Hervet 2012; Ihamäki 2012a). They promote outdoor locations using a tourism experience framework focused on discovering a destination and its wealth of places, which are often missed by tourists due to their remote location. Tourist destinations can internalise games and create new products and services to attract a new target audience or increase their visitors.

Location-based AR games, however, can only be means to the end bringing people together for shared playful experiences and discovering a location. In the following statement, Peter explains which roles these games should play during a journey:

> *"It should just not be so time consuming because it's not all about the game. It's about the game, the place and socialise with friends. I think it would be a good combination to learn about the places. E.g. visiting the Siegessäule recently was a great experience for me. If a game could lead me to these tourist attractions, I think, it's not a big step to continue and enjoy whatever it offers. […] I might even consider consuming something at the tourist attraction." (Peter, 31, Group Player, Ingress)*

Often players were not inevitably interested in discovering the deeper meaning and history of a location as proposed by Blum et al. (2012), which cannot be imposed but a voluntary option. However, players are in continuous communication with the surrounding environment perceiving cognitive stimuli upon which actions are carried out (Merleau-Ponty 2005). Players

incorporate playful activities into their experiences, which are adding to the knowledge as well as to the social dimension of tourist experiences.

9.5. Summary

It has been identified that gameplay has two possible outcomes at the time of disengagement; either players got interrupted by external influences such as weather constraints, crowded places, modifications of places or technical issues or gameplay had a deeper meaningful impact on the visit of the destination. These games have the potential to present knowledge in a playful form and thus engage tourists in an unconventional way spatially and socially. These games gave meaning to the visit by interactive storytelling, challenge and competition. However, gameplay is not at the centre of travel but can be seen as a vehicle for co-creative, shared experiences of collaborative learning, exploration and fun.

CHAPTER: CONCLUSION

10. CONCLUSIONS & IMPLICATIONS

10.1. Introduction

The study explored the experience design of location-based AR games in the context of travel and tourism. It contributed to the theory of game design in a sense that two games have been evaluated to understand how playful experiences need to be designed. Qualitative mobile game user research (mGUR) including mobile and semi-structured interviews, emotion evaluation (Wheel of Emotions) and game logs have been applied to identify how the tourists thinks, feels and behaves playing location-based AR games in a natural setting. The aim of the study was to identify which aspects contribute to create engaging experiences between the player and the visited urban destination. This included the identification of player characteristics, needs and wants for these games, as well as game design elements that contribute towards engagement and contextual parameters can positively or negatively influence the experience.

A conceptual framework has been developed, which has been extensively discussed in the findings and discussion chapter and will be finally introduced in section **Error! Reference source not found.**. The developed conceptual framework should help to understand how these games need to be developed in order to be beneficial for travel and tourism as the games are used as a playful and interactive mediation tool of location-based storytelling, playfulness and social interaction.

After the presentation of the conceptual framework, this chapter will summarise the research objectives in a review and discus the contribution to the fields of knowledge before outlining the limitations of the study and suggesting directions of future research.

10.2. Review of the Research Objectives

One of the objectives of this study was to develop a conceptual framework of the player engagement process with location-based AR games. As the framework was presented in the previous section, the following section provides a summary of the remaining four objectives of this research, extracted from the findings chapters.

Objective 1: To critically examine experience theory in game design and tourism as a theoretical underpinning to explore location-based augmented reality games for tourism urban environments

The literature review showed that there is a good understanding of experience theory in the

social sciences and especially in tourism research, but a deeper knowledge and understanding of what it means to introduce playful interventions coming with location-based AR games to the on-site mediation of touristic visits is still missing. Literature showed a limited understanding of what it means to design games for tourism urban environments, as the contributions only focus on a few case studies (Ballagas et al. 2008; Blum et al. 2012; Ferreira et al. 2012; Linaza et al. 2014). The limited understanding of the science behind experience design is joined with a mutual consensus of dialogue to argue that playfulness is still lacking in the creation of engaging and meaningful experiences in travel and tourism. Particularly with the notion of new mobile technologies, there is a gap in the understanding of game design for touristic purposes such as mediation of touristic sites, landmarks or other urban locations. Only slowly connections between experience design in game theory and tourism research are made but the research fields can profit much more from each other by joint collaborations. Despite the research aspect, tourists are not aware of location-based AR games yet and do not consider it as an alternative medium for touristic mediation, that distinguishes from tour guides and travel books by playful interactions, social engagement, narrative contributions and the symbiosis of virtual and real game worlds.

Objective 2: To identify which *game elements* of location-based augmented reality games contribute to creating engaging and meaningful experiences in tourism urban environments

Choosing the right game elements and balancing them with contextual parameters cannot be quiet foreseen in location-based AR game design. However, there are aspects, which have to be considered in order to keep players engaged and eventually create meaningful gameplay. First, in the onboarding phase or first time player experience a game tutorial is essential to introduce the game user interface (GUI), game mechanics (playability) and usability. Gameplay would need to be found easy to understand by players. This especially includes the understanding of a clear and achievable game aim, an authentic story and feedback. The latter was found to be most essential as players otherwise are irritated and soon disengage from the game. Game feedback should be of intrinsic and extrinsic nature, but foremost appropriate and well balanced. Comprehensible game challenges and meaningful choices also contribute towards player engagement. In order to master the game and having the feeling of controlling it, players need to make clear and qualified choices that are based on a limited level of ambiguity. A high level of engagement is reached when players are in a double flow state that involves cognitive and physical engagement. It can therefore be concluded that players engage more in gameplay, when game mechanics are explicit and easy to understand.

Objective 3: To identify *contextual parameters* occurring during the game experience with the location-based augmented reality in the urban tourism environment

Regarding contextual parameters, four could be identified in the study; namely location and space, temporal, environmental and social. The main parameter for outdoor gameplay is the location, as with the location the GX of players is largely influenced. Game designers or players make a conscious choice of game locations based on the suitability for the game or personal preferences. Play locations should provide enough space for gameplay that players can freely move without disturbing someone or being disturbed, as thus engagement with the location will be disturbed. Most suitable locations for gameplay are parks, squares or quiet areas. Places inherit a mutual atmosphere, which can contribute towards engagement. A wealth of different POIs supports the game story. In order to be beneficial, game locations are chosen according to the atmosphere and the suitability to the game theme and narrative. In this sense it functions as a stylistic tool for the experience design. It was identified in the study that engagement with the location is mainly sourced in the curiosity of discovering new places and raised engagement through playful interactions. Gameplay was beneficial for the touristic experience, as it did not only stimulated taking breaks at some concealed places but also created meaning and memories through eliciting different kinds of emotions through which participants gained a higher engagement with locations.

The temporal parameter, however, was perceived as being essential to be considered in game design, as the time of day the game is played and the available time can have an influence on the game experience. Particularly as these games are played in public locations that are visited more or less frequently, timing was identified as negatively contributing to engaging game experience, as touristic sites can be crowded at certain times of a day. It also emerged that touristic players are not eager to dedicate much time for gameplay, as there are other activities to be done during a visit to a city. The available playtime does often not align with the actual playtime that is estimated from the game designer. The temporal parameter is important, though it may not be as significant as location.

Environmental parameters emerged at the end of the gameplay, as they were identified to be the reason for disengagement. These were mainly crowded places where players experienced difficulties to engage and re-engage with the game. Also, safety reasons were recognised to influence the GX as players had to be aware of the dangerous aspects of playing in the real world and were sometimes disengaging because of reflecting on how to avoid unsafe game situations. The same applies to modifications of roads or places, which was disengaging due to the search for alternative play locations. Due to the sun or rain, the weather was also leading to a loss of engagement, as it made it harder for players to protect the screen from contextual constrains.

Social engagement was found to mainly positively contribute to player engagement. Players in existing familiar groups reported to develop a stronger relationship and connections between each other resulting from the shared experience. The participants learned from each other having previous experiences with games or taking on different roles in the gameplay. Interactions between players were dynamic, which means that the lead player changed during the activity. Thus, it occurred that some players felt more engaged than others at time. Another aspect of social engagement that occurred was the willingness to engage with people outside the social network. The majority of participants regarded gameplay as another opportunity to make friends and feeling included in the wider social network of travellers to share the same interests. Others saw a barrier in connecting to strangers over an in-game chat and therefore decided to play alone.

In general the location is beneficial for creating engaging experiences through gameplay. Play leads tourists to new places but also raises the awareness for particularities at the POIs by creating understanding and meaning.

Objective 4: To identify *individual player experience* with location-based augmented reality games in tourism urban environments

The player experience is in the heart of the conceptual framework of the thesis and with it, the experience design. The consumption of gameplay is driven by different motives including exploration and adventure, socialising, learning from locations and spending time at a leisure activity. Tourists and players consume to stimulate emotions (Brunner-Sperdin et al. 2012). Tourists and players in their very nature consume experiences during the time of travelling and gameplay.

Previous experience is also important for engagement. The research identified that inexperienced players were a little reluctant but soon became curious about the new experience and showed interest to engage. As early literature proposes, experiences are based on sensory perceptions and emotions. This alters in gameplay depending on the stimuli from the game and play environment. Generally, players were positivity engaged, as gameplay provided extrinsic value to the tourism experience by connecting individual requirements with game motivation.

Objective 5: To develop a *conceptual framework* elaborating key game elements, contextual parameters and individual player experience for location-based augmented reality games to elicit engaging and meaningful experiences with the tourism urban environment

A conceptual framework of the engagement process with location-based AR games was presented in section 9.2 and discussed in the conclusions and findings chapters. As a finding of

the qualitative mobile Game User Research (mGUR) conducted in this study, six segments contribute towards the creation of engaging and meaningful experience design in tourism with location-based AR games. Emotional engagement is considered as the base of the experience design with ludic, narrative, spatial, social and mixed reality engagement.

10.3. Contribution to Knowledge

The interdisciplinary synthesis of game design, tourism research and experience design in this study has resulted in a new way to examine engagement with location-based AR games and, thus, made a broader contribution to social science. The application of location-based AR games was believed to be new paradigm in the context of travel and tourism, which needed further exploration as a tool to create engaging and meaningful experiences with the touristic urban environment, as their main application field. The theory of *engagement with technology* of O'Brien and Toms (2008) was used to explain the engagement process and outcome of the playful experience. Engagement in the context of location-based AR games in tourism can be understood, as *the processes of freely and actively interact with a location-based AR game on a mental and physical level, in order to attain interaction and interpretation with the mediated tourist environment*. The phenomenon was explored using a qualitative mGUR approach and adopting an interpretative stance in the data analysis as the basis for pragmatic design recommendations (Braa and Vidgen 1999; Goldkuhl 2012). A thematic analysis was conducted using the engagement model of O'Brien and Toms (2008) as a theoretical basis and enriching the model by the contextual gameplay experience model of Engl and Nacke (2012). Other theoretical aspects for game and experience design, discussed by game and tourism researchers, are incorporated in the contribution.

The study explores tourists' experience with location-based augmented reality games in urban touristic environments, which has resulted in a number of contributions to empirical and theoretical knowledge. As stated earlier in this study in Figure 7 (Pagulayan et al. 2003; Harteveld et al. 2011; Mirza-Babaei et al. 2013; Smeddinck et al. 2013), the theoretical framework and the contribution of this study is based on three research dimensions: contextual game experience (empirical), theory building (theoretical) and mobile GUR (methodological). This section reflects on these dimensions and outlines the main contributions to the three areas.

10.3.1. Empirical Contribution

Located within social sciences and mobile game theory, this interdisciplinary study contributes empirical knowledge to the disciplines of location-based AR game design and tourism experience design. The main aim of this study was to explore the use of *location-based*

Augmented Reality games to create engaging and meaningful experiences *with the tourism urban environment. Contributions are made* towards Game Design Theory through generating new knowledge about characteristics, which location-based AR games should have to create engaging experiences between the player, the game and the urban tourism environment.

Existing studies on location-based gameplay in travel and tourism have focused on human-computer interaction (Ballagas et al. 2008), social interaction (Ihamäki 2012a), transmedia storytelling (Ferreira et al. 2012) and educating tourists in a fun and interactive way about tourist history (Linaza et al. 2014; Garcia et al. 2016). Whereas this study, by acknowledging previous research, draws a holistic picture of tourists' game experience by exploring the design of location-based AR games for travel and tourism in order to create engaging and meaningful experiences between players and the visited location. The research revealed that that these games are still not designed to create engaging experiences for travel and tourism. The main reason for this lies in the approach of game and experience design, which does not embrace an iterative human-centred design to create a holistic experience concept as claimed by Tussyadiah (2014). Technology enhanced experience design in tourism should be approached by focussing on needs, motivations and expectations of the end users. The study contributed to the identification of human needs, motivations and expectations of location-based AR games by applying explorative research in a naturalistic setting (Tussyadiah 2014).

This study provides insights into player motivation. This research discovered that players are motivated by adventures, socialising, knowledge (serious games) and fun (leisure games). The study is consistent with the findings of Xu et al. (2013), who also evaluated motivational aspects in the context of tourist play, in regards to exploration, curiosity, socialising and fun. The similarity of findings makes both studies stronger due to their comparable outcome. There was an opposition to the idea of transferring knowledge of the visited destination through games, which is essential in a serious game approach. Whereas it was not mentioned by Xu et al. (2013) to use games for educational purposes of tourists, this study contributes to knowledge in a sense that location-based AR games are used as an alternative tool for tourist mediation. In contrast to some of the earlier studies of Bostan and Kaplacali (2010) that identified materialistic, power, affiliation, achievement, information and sensual needs for online gameplay, this study discovered that location-based gameplay motivation in travel and tourism is mainly focused on easy gameplay (leisure games) and historical knowledge transformation (serious games).

This study contributes to game design theory by exploring location-based AR games for the creation of engaging and meaningful experiences in tourism urban environments. Findings were consistent with previous studies (Rouse 2005; Sweetser and Wyeth 2005; Schell 2008) that have identified the need of a **gameplay introduction** or tutorial for increasing playability. In this study, the majority of tourists stated the need of a game tutorial to manage the GUI and game

mechanics. In this respect, it can be stated that the level of engagement of novice players like tourists will increase by extra support in form of a tutorial that clarifies playability and usability and provides feedback, meaningful choices, and a game aim. This findings support the studies of game researchers (Schell 2008; Chang et al. 2011; Ejsing-Duun 2011; Harteveld 2011), who identified that a balanced game design depends on the composed position of game elements.

This study also contributes to empirical knowledge with regards to **location-based storytelling**. In contrast to O'Brien and Toms (2008) and Boswijk et al. (2012), this research revealed that storytelling is an essential element for experience design as the oldest forms of human communication (Ferreira et al. 2012). This study found that stories are used in tourism for meaning making and mediation of touristic sites. This finding is supported by the study of Huizenga et al. (2007), which identified that players learned more about history in a game than students in a history lesson. The study also contributes to propose a flexible (non-linear) game story, customisable game characters and the free choice of game locations. Especially the latter is beneficial for players, as it will ease gameplay and allow for more player freedom, based on individual preferences as proposed by Lim and Aylett (2007) for a mobile tourist guide. This aspect feeds into Richards and Wilson's (2006) claim to integrate tourists into the design process for better service development in tourism or Pagulayan's (2003) claim for a user-centred game design. Whilst this research found that the game narrative should support the understanding of tourism meaning making with the tourist site, it also revealed that many tourists found simple game mechanics the most engaging in their playful experience. The study contributed to tourism meaning making and mediation by introducing playful mechanics as motivational factors for tourism learning and meaningful experiences. As with the claim that playful interactions help to understand tourist sites, the study feeds into Knudson et al.'s (1999); Gretzel and Jamal's (2009) and Falk et al.'s (2012) statement that interactions and meaning making further engagement with tourism destinations. The study contributed to the increase of engagement by applying playful interactions in which tourists are motivated by a goal, game feedback, challenges and positive emotions to discover the tourist destination and add value to their experience. The added value lies in the discovery of unknown locations, stories, histories and memoirs that uncover with playful interactions. A strong connection was identified in this context in regards to augmented reality. The study contributes to mobile HCI while recognising that the mediation of real and virtual game worlds was best realised by the application of AR despite the fact of technical difficulties that have been identified in this study. This is consistent with the findings of Yovcheva et al. (2013b) and in line with game design researchers (Carrigy 2010; Wetzel et al. 2011; Lombardo and Damiano 2012) who support the statement that with rapid advancements of the technology and AR browsers connections between the two worlds become more fluent and seamlessly integrate into another.

In general, there was a high level of **social engagement** with an interest in bonding and strengthening friendships between players despite the hesitance of a few players who did not want to engage with others. The study contributed to the social sciences in a sense that social interactions were found to positively contribute to create engaging experiences. This is consistent with the findings of Schønau-Fog and Bjørner (2012) and Bouvier et al. (2014a) who found that the creation of shared game experiences positively contribute to engaging experiences through emotions, social bonding and an expanding social network. The study found that shared experiences between familiar people (friends and family) has a strong impact on social engagement as revealed by Kim et al. (2013) and that players are hesitant to make new friends. This challenges the findings of Lehmann (2011), who explained relations between players on the level of virtual interactions. Findings of this study go beyond that and expand into real worlds, where players have the opportunity to meet in person during the gameplay and create real social interactions that go further than gameplay, as indicated by some participants who were traveling alone. The study also revealed that players have a strong sense of belonging even they travel alone. This confirms findings of Rouse (2005) and Harteveld (2011) who argued that players should not be excluded from gameplay through physiological or technical constrains.

It was also identified in this study, which **contextual parameters** contribute to the loss of engagement that strengthen related studies on location-based AR gameplay. The study identified crowded places as a main factor for disengagement, as players easily feel distracted by too many people surrounding them. This feeds into the findings of game (Paavilainen et al. 2009a; Engl and Nacke 2012) and tourism (Tan et al. 2009) researchers, who argue that engaging experiences should not be sacrificed. With regards to safety and the accessibility of public places, the study contributed to map player emotion to locations by using a psychological founded tool to identify emotions. Exploring human emotions in a physical location supports the study of Kim and Fesenmaier (2014) who evaluated visitor emotions in an urban environment during a city trip and explored the reasons for emotion alteration. Locative emotional and behavioural studies are rare in tourism research. The study has contributed towards the identification and characterisation of contextual gameplay parameters in the context of urban tourism travel. A contribution to understand context and contextual parameters has been achieved in this study by extending the contextual gameplay experience model of Engl and Nacke (2012) by own empirical research and previous studies in tourism (Tan et al. 2009) in order to inform game design for travel and tourism applications. As outlined in the model by Engl and Nacke (2012), context includes a temporal, cultural, spatial and social dimension. However, the study refers to the TILES framework of Tan et al. (2009) who distinguish between temporal, identity, location, environmental and social. In contrast to Engle and Nacke (2012) and Tan et al. (2009), the parameters ‘cultural’ and ‘identity’ are considered as player

characteristics and not integrated into contextual parameters. Besides, the study contributes to the characteristics of the contextual parameters. Key contributions resulted from in the identification of 'atmosphere' and 'tourist relevance of places' as additional characteristics of the location parameter. Besides, it was identified that 'recognition of real world rules' are important characteristics of the environmental parameter and therefore influence the engagement of game experience, which has not been acknowledged elsewhere in literature.

This study is one of the first to identify the meaning of **gameful interactions for mediation** in travel and tourism. It contributes to tourism experience design by integrating playful aspects to mobile technologies and thus building an alternative mediation to conventional tour guides. With the application of location-based AR games, tourists gain a new perspective on the visited destination adding value of fantasy, imagination, exploration, spontaneity, humour, fun and challenge. Most important, tourists are creating their own experiences, which are self-directed and individual, as demanded by Boswijk et al. (2012). These games have a positive impact on the tourists' mood and personal development as people are learning through gameplay about the historical background of touristic sites. Contrasting to tourist researcher Freire (2013), who saw games only as a passive leisure activity and sports simply as bodily involvement, location-based AR games combine both characteristics that are used for tourism and leisure activities. The study makes an important contribution to **tourism experience design** through the demonstrated applicability of game design theory to tourism research. Understanding of tourists' engagement with playful interactions has been enhanced in this study by examining experience design in relation to psychological and behavioural theory. The application of psychological and behavioural theory to explain experiences in travel and game design offers an interesting perspective. Tourism and games research is grounded on the psychology of peoples' experiences, the argument is made that the study is strengthened by the joint application of experience theories and models from both disciplines.

Considering the innovative and multi-disciplinary approach undertaken in this study, the research has contributed to relevant disciplines in the social sciences such as tourism research and experience design as well as in the discipline of games research in the field of location-based game design.

10.3.2. Theoretical Contribution

The second contribution pillar refers to building new theory by adding to pervious established theory and models in the disciplines of game design and tourism research. The following section outlines the theoretical contributions of this study.

Certainly the main contribution of the study lies in the combination of tourism and game design

research into a multidisciplinary research field. As identified in many studies before, the application of mobile technologies in tourism is not new (Höpken et al. 2010; Kennedy-Eden and Gretzel 2012; Linaza et al. 2012; Dickinson et al. 2014), using playful interactions, however, to mediate and create engaging experiences with the urban environment is a new approach.

Contribution to the concepts of 'experience' and 'engagement' as a result of combining Tourism and Game Design Research

As outlined in the beginning of the study Game Design and Tourism Research unites the concept of 'experience design' and 'engagement'. However, both disciplines have a different understanding of these concepts that come short of some characteristic underpinnings.

The findings of this research contribute to the understanding of the engagement concept in the context of playful interactions. Experiences and engagement are processes defined by multiple attributes presented in Chapter 2.1 (Boswijk et al. 2012) and Chapter 2.4 (O'Brien and Toms 2008). As Boswijk et al. (2012) define experiences on the base of Csikszentmihalyi's (2002) 'flow' model, it complements the research of O'Brien and Toms' (2008) that outlines attributes of engagement with technology. Both studies, however, fall short when applying these concepts to location-based AR games. This study identified additional attributes that contribute towards the creation of engaging and meaningful experiences. They are namely emotional, ludic, narrative, spatial, social and mixed reality engagement and build the theoretical contribution of the study.

Underpinning this study is the contextual gameplay experience model of Engl and Nacke (2012) that analyses contextual influences on player experiences of mobile games and separates the experience in contextual gameplay experience, player experience and playability. The findings of the research support the theoretical framework of the model. However, the model of Engle and Nacke (2012) falls short of extensively identifying attributes that characterise the game experience. This study provides a detailed overview of how experiences are created, what causes them and how players react to them..

In contrast to the HCI study of O'Brien and Toms (2008) but in line with game researcher Harteveld (2011) and experience researcher Boswijk et al. (2012), this research found that **emotions** are the underlying foundation of engagement. The study contributes to this aspect by identifying a landscape of different emotions that result from the interactive experience of players with the game and the game context. Findings of the study confirm the emotional alteration of players' mood that is indicated with the altering Wheel of Emotions (Russell 1980).

Contributions of the study refer to the **ludic** engagement. Although Boswijk et al. (2012) included 'playfulness' as an attribute of experiences, it falls short of attributes that are related to

other ludic characteristics that have been derived in this study and were defined in the original 'flow' model (Csikszentmihalyi 2002) and elsewhere in game design literature (Hinske et al. 2007 ; Schell 2008; Chang et al. 2011). These include mastering, meaningful choices, competition and cooperation. The study also supported findings of O'Brien and Toms (2008) who identified aesthetics, novelty, goal-oriented, control, feedback, interactivity and motivation as attributes of engagement. The tourism literature falls short of providing motivational reasons for visiting many tourist sites during a visit. This study contributes to the aspect of using game elements to encourage walking as a ludic engagement that is underpinned in the model of 'dual flow' by (Sinclair et al. 2007).

In this respect, tourism and game research can learn from each other in terms of **narrative** engagement. The research identified authenticity as a main attribute for engagement with location-based AR games in the tourism context. Tourism research LBGs (Ballagas et al. 2008; Bryon 2012; Chandralal and Velenzuela 2013) supports this aspect, although authenticity plays a minor role in common game design research. It is one of the contributions that an authentic story that is linked to the locations of the tourist destination is perceived as engaging.

One of the main contributions regarding **spatial** engagements results from the discovering of places as a motivational consequence. This contribution is closely connected to the ludic engagement and the motivation of walking to play a game. It was identified in literature (Benyon et al. 2012) that tourism engages visitors into the urban tourism environment by walking and discovering new places. This study contributes to this aspect, supported by game research (Harteveld 2011, Bouvier et al. 2014; Wetzel et al. 2011), in creating curiosity, adventure and novelty seeking through playful interactions.

It was identified in this study that the location-based AR games were created as single player games per one device. Travelling, however, is a **social** activity, which requires the feature of a multiplayer approach to create social engagement. Tourism research comes short in identifying adequate activities that facilitate social engagement between tourists. The study contributes to the social aspect of tourism by introducing game design thinking to create tourist engagement. Game research (Schønau-Fog and Bjørner 2012; Bouvier et al. 2014a) presents a variety of opportunities to overcome these shortcomings and create shared experiences through gameplay.

Where tourism research is concerned about the calibration of AR browsers for information search (Yovcheva et al. 2013), a **mixed reality** approach for location-based AR games had the aim to create higher levels of engagement between players and the real world. The study contributes to the aspect that AR visualisation needs to add value for the game, such as claimed by Wetzel et al. (2011). Under the premises of technology advancements this value should be justified, especially when it supports players in identifying and shifting between the real and the virtual game world. The study makes a point in a seemingly transition between both worlds

needs to be realised in order to create player engagement. This aspect is supported by game research (Jegers 2007; Stenros et al. 2012).

Contributions to Tourism Mediation

Travelling is understood as contributing to meaning making and mediation. Mobile technologies used for tour guiding falls short of addressing hedonic needs of tourists, but are concerned with the efficiency and effectiveness of processing a quantity of information (Wang et al. 2011; Kennedy-Eden and Gretzel 2012). The study contributed to the understanding of how to design location-based games in order to create engagement between players and the visited location, as many previous studies fall short of this aspect or follow a different aim with their game (Kiefer 2006; Ballagas et al. 2008; Wetzel et al. 2011). However, mediation is a crucial aspect in travel and tourism (Tung and Ritchie 2011) from which game design can profit. As pointed out earlier, emotions support in creating engagement. Although the study could not confirm an emotional attachment to places as identified by Tussyadiah and Zach (2012) for other mobile technologies, the study could contribute to influence travel decisions and the memory of places due to the playful activity that has taken place at these locations. The six engagement criteria of the conceptual framework contribute to this aspect. The study contributed with the conceptual framework to defining what it means to create engaging experiences through gameplay and thus added value to a visit of an urban destination. As outlined by tourism researchers Chandralal and Velenzuela (2013), added value to the experience is the essence of travelling. Tourists' intellect and skills regarding empathy to unfamiliar cultures, historical understanding or social competencies will improve through playful interactions. The study contributed to the understanding of the creation of engaging experiences using gameplay as a source to connect visitors through mental and physical interactivity by introducing game design elements as a motivation tool, where generic tourism research only concentrated on functional need fulfilling of mobile applications. The study proposes serious location-based AR games as an alternative form for tourism interpretation and has showed opportunities to enhance the tourist experience through self-directed, physical and mental interaction between players, the environment and the location-based AR game. As a result of the above reasoning, the study claims to contribute to tourism mediation as a tool changing players' perception of the environment, as meaning making is constructed through gameplay.

10.3.3. Methodological Contribution

The last research pillar of Table 7 where contributions are made refers to mGUR. As a new emerging research discipline, a substantial body of valid research methods is still missing. The

majority of play tests are still focused on online games that are conducted under lab conditions, but with the notion of new technologies and the growing number of mobile devices, research in the field under real life conditions can provide valuable knowledge. To do so, methods need to meet challenges coming with mobile devices, location-based games and different usage scenarios (Smeddinck et al. 2013). In order to gain more insights and develop game theory further, new methods have to be applied in a new setting or adapted from related research fields.

This research contributes to the literature on mobile Game Design presenting explorative data obtained from 22 participants through qualitative mGUR of two case studies (games). The main purpose was to gain insights into the nature of location-based experiences with mobile AR games in a tourism context and reveal new understandings about human interactions with these games. Knowledge was obtained in regards to user behaviour, emotions and contextual parameters of gameplay.

In regards to social sciences and tourism research, only little is known about how to evaluate visitor emotions with mobile technology in tourism settings. Apart from more recent tourism research on emotions (Brunner-Sperdin et al. 2012; Scott and Ding 2013; Kim and Fesenmaier 2014) that are applying questionnaires, psychophysiological (biometrics) measures and interviews (in-depth and semi-structured), touristic experience research on emotions is rare.

This study uses a tool first introduced by Russell as the Circumplex Model of Affect in 1980 and has been used successfully in many studies evaluating emotions for game experience (Nacke et al. 2009) or environmental psychology (Mehrabian and Russell 1974). Waern et al. (2009) were the first to introduce Russell's Wheel of Emotions to mGUR evaluating situational emotions in a pervasive game. The tool was recognised as being less intrusive than other applied research methods, as it was easy and convenient for most participants to evaluate their emotions on the model.

Observational research in tourism can profit from this, as there is still a gap in applying appropriate cognitive evaluation methods for mobile field research. This study contributed to introduce situational and momentary experience during an activity in a field. Considering the increase of mobile technology in travel and tourism, there will be a need for new and innovative measures to evaluate situational experiences based on emotions in a travel and tourism. Mobile user experience studies evaluating technology will profit from this tool particularly in a triangulation with complementary methods. Especially in the interaction with mobile technologies in a contextual situation, users feel emotionally challenged or attached. It is difficult for researchers to capture the alteration of emotions in retrospective, as most users forgot what they felt. With the Wheel of Emotions, momentary experience can be related to selective activities and immediately track users' feelings.

10.4. Practical Contribution: Implications for Game Designers

Drawing on Wetzel et al.'s (2011) design guidelines for location-based AR games, Table 13 proposes guidelines for these games derived from the game tests and tailored to the context of travel and tourism in urban environments.

Table 13: Practical Guidelines for location-based AR games in tourism

Area		Guideline	Description
Player	*Knowing the players*	Player motivations and interest	Four player motivations were identified for touristic players: adventurer, socialiser, serious gamer and leisure gamer. These should be considered in developing player personas and in choosing a game topic.
		Previous game experience	Touristic players generally have little GX and can be defined as occasional leisure gamers that like short game sessions, a simple GUI, are interested in fun, want to pass time and do not buy many games.
		Play scenarios	It has to be considered that tourists are playing at diverse occasions and with different people such as in families, groups, as couples or alone. Games should be flexible to these requirements and
		Altering player emotions	Players sensitively react on alterations in the game and on contextual parameters. Where they first react excited and curious, it easily changes with interaction and reaction on stimuli. Player emotions are not fixed but can be influenced by experience design elements.
Location-based AR Game	*Game Mechanics*	Onboarding tutorial	As novice players tourists need an introduction into the game mechanics, GUI and usability of the game. It needs to be explicitly communicated or easy to learn how the game works, as players are not willing to spend the time.
		Communicate the aim of the game	The aim of the game needs to explicit from an early stage of gameplay. Players should know what the achievement of the game is and how to reach it.
		Continuously rewarding players	Extrinsic and intrinsic motivation keeps players in the game. Game feedback is most essential game mechanic, as players are irritated and unable to progress without clear, appropriate and instant feedback.
		Control & master gameplay	Player should be able to control the game mechanics and overcome challenges according to player skills and abilities. This applies for cognitive and physiological challenges (dual flow). Due to different skill levels of players, a choice of customisable difficulties is advised.
		Avoid ambiguity	Choices in the game should be based on knowledge or expertise that players are able to gain through gameplay or from the location. Decisions need to be based on qualified advice from which players can clearly distinguish between bad and good alternatives.
		Well-defined game challenges	Game challenges should be clearly defined, understandable and achievable that players know when they mastered a task and can continue to the next game location.
		Walking	Players feel intrinsically rewarded by discovering and exploring unknown places, as it builds up proudness. To encourage players to walk more with the LB mobile AR game, walking needs to be rewarded extrinsically with game feedback (dual flow).
	GUI & Playability	Game navigation	Players should be able to easily learn the navigation in the game and be able to find the main game settings effortlessly.
		Customizable	Regarding different game scenarios, the GUI need to be

		GUI	customizable in order to suit the situational requirements such as night/day setting, font size, audio/text setting.
		Game settings	In travel and tourism, LB mobile AR games will address different target groups who require different languages. Besides, saving visited locations in a gallery or the last game session is also a requested feature.
		Limit cognitive overload	Players are mostly new to the gameplay activity, handling augmented reality and orientating themselves in the unfamiliar location, therefore cognitive stimuli should be kept to a minimum and GUI should be as easy as possible. Simplicity is key.
		Use of AR	AR usability is learnable and needs to be explained in the game tutorial to the user, but when figured out, AR can be used to direct player's attention to artefacts and locations. In this sense AR should add value to the game e.g. by visualising and enhancing.
	Game Narrative	Narrative for meaning making	The game narrative should support the understanding and meaning making of the location by providing additional information of the location, with stories, histories and memoirs. Through stories, a connection between the game and play location is made and players learn about the visited places.
		Authentic storytelling	Tourists are interested in local stories that are enriched by information of the destination, thus they will gain a rich and authentic picture of the place.
		Non-linear narrative	Players want to be flexible and engage in gameplay wherever they are. Thus, game stories will need to be flexible and dynamic catering for exploration and player's freedom of choice. Players need to be able to direct the game story with different branches and outcome. Also players should be able to skip play locations when they lie out of players' interest or are too difficult to play.
		Customizable game character	In order to build ownership and thus strengthen the relationship between players and the game character, game avatars should be customizable. Player agency is developed by the personification of players' imagination and natural behaviour like natural dialogue between players and the game avatar. The more imagination players can put into the avatar, the more sympathy is developed.
	Serious Games	In game learning	In regards to meaning making, players want to learn about the destination and expect information in form of stories in the game. Stories engage and connect players to the POIs and raise the awareness for local history. Players are interested in learning and exchange with other players around them.
Context	*Choice of locations*	Location for onboarding	Players are getting adjusted to the gameplay and need peaceful and open play locations at the beginning to which they do not have to pay much attention to in order to help players engage with the game.
		In regards to game narrative	The game narrative should be a central aspect in the choice of play locations. Depending on the thematic topic, locations should be authentic and use real places of historical setting. Depending on the dramatic structure, tension should be reflected in the atmosphere of the place.
		Different atmosphere of places	Locations should be used as a stylistic and dramatic tool to reflect the game theme and narrative structure. With the movement in the urban environment, atmosphere and mood of places change should change according to the game story.
		Touristic interesting places	Tourists visit a city to see relevant places such as landmarks, art installations, heritage sites or other touristic POIs. Whatever places are included in the game, they should provide meaning based on tourists' interest, motivation and previous GX to add value to the tourist journey.
		In regards to visitors' interest	Places should be chosen in regards to motives and requirements of tourists for gameplay. This includes special interest groups such as families, people with disabilities, or people interested in particular characteristics of a destination such as parks, culture, literature, art, or animals.

		Accessible play locations	Locations for the game need to be carefully chosen as gameplay takes place in a changing environment. Some public places can be used for events or other temporary installations. The same applies to restricted areas in which gameplay is not permitted such as private and company grounds or cemeteries.
		Avoid crowded and unsafe places	As outlined by other researchers (Carrigy et al. 2010; Wetzel et al. 2011), engagement is not created in crowded places, as heavily populated places can hardly be incorporated in game design. Also, unsafe places should be avoided too. Players cannot and must not share their attention to the game and traffic. Risking the health and safety in the interest of gameplay goes too far.
		Orientation between play locations	Tourists are unfamiliar to the urban environment and therefore dependent on the GPS for navigation and orientation. Players engage more with the game and the location when navigation and way finding is part of the game mechanics and players develop their geographical skills through gameplay such as building up a sense of direction, orientation to eventually create a mental map of the destination by the end of gameplay.
		Identification of play locations	Play location need to be easy to identify by maps, pictures, or AR. An explicit connection between the real and the virtual world should be made that players can identify and relate the play and real world.
	Temporal	Available time	Players want to be flexible with the time they spend on gameplay, most suitable in the travel and tourism context are situational drop-in sessions when ever and where ever time allows. Thus, LB mobile AR games need to be accessible anywhere and any time.
	Social Gameplay	Multi-player	LB mobile AR games should allow for multi-player options, as tourists are travelling in groups and open to play with others by competing or collaborating in teams. Players could also address different roles in order to engage all players equally.
		In-game communication	Tourists are reluctant to connect with people they do not know but are eager to communicate in their own social network.

The above guidelines can be understood as a complement to Wetzel et al.'s (2011) design guidelines. As they derived from contextual touristic gameplay, the above guidelines are mainly interesting for game designers planning to extend location-based games into travel and tourism or related fields.

10.5. Limitations of the Study

The methodological limitations of the study have been discussed in chapter 5.9. These limitations also include an underrepresentation of the elderly target audience in the play testing, in particular those aged 40 and older. It was assumed that these target groups would not belong to the group of early AR adaptors or heavy players according to a Juniper Report on mobile AR games (Sorrell 2015). The most essential limitation of this research, however, concerns the transferability of the research findings to other gameplay situations. Two location-based AR games have been analysed in order to identify the game experience in tourism urban environments. As it could be identified from the analysed games, experiences differ between the games based on the nature of the game design and the situation in which they are played. This includes, for instance, the difference of wide-area and limited area games, the game narrative, multi-player approach, and other specific game mechanics. If the study were to analyse a third

game, the outcome of the game experience would be different again.

At the time of research, these games were identified as the only available and commercial location-based AR games on the market at the time of evaluation. Therefore, some outcome cannot be identically transferred to other games and play situations. The case study evaluation is demonstrative for the evaluated games and can be used as a basement for further game user research in a related field.

Whilst the sample is based on the locations of Berlin and Bournemouth, it is not necessarily representative for the whole of Germany or the UK population. Therefore, the findings can only be generalised to tourists travelling to these two destinations in the summer month, and not to all tourists. However, the findings and conclusions are still relevant for the development of future location-based AR games for tourism urban environments. Game designers and researcher gain an insight of what is needed to develop for this particular context and that tourists are a special interest group who have diverse interests in exploring the location, learning and socialising.

Validity of the study is ensured by the triangulation of the findings from chosen methods. Reflection on the findings of the mobile interviews, observations and Wheel of Emotions have shown that there is a consistency between the findings and that the methods confirm the outcome from multiple perspectives, which made the contribution to the research objectives stronger.

10.6. Further Research

There is scope for more research on identifying the target group and different play scenarios. There are many forms of travelling and leisure, such as short city trips, beach holidays, cultural heritage and museum visits, events and entertainment, to only name a few. Bearing in mind the different forms of travel, and tourists' motivation and interests, further research should look at how location-based AR games need to be designed to meet the diversity of tourists' requirements. The conceptual framework of this thesis delivers a starting point for creating engaging experiences in other tourism and leisure fields besides city tourism. That said, further research could to be undertaken to gain more knowledge of the player as target audience for location-based AR gameplay. Apart from a general overview of player motivation, not much is known about who players are in travel and tourism and in which situations they seek an opportunity to play. Different play scenarios could be created to answer questions such as: who are location-based AR players and what defines these players in tourism? Which play scenarios are there for playing during a travel and how likely would tourists play as an alternative to other tourist activities? Which games are attractive to be played in a tourism context? These games

might not be attractive to many tourists in urban, outdoor and cultural heritage tourism environments but worth exploring who potential target audiences are and in which situations during their travel they would consider playing a location-based AR game. In this sense, game design needs to follow a player-centred approach to best address the requirements and player expectations of a game.

Further research could be concerned about the validation of the conceptual framework, developed in this study, and testing the outcome with empirical studies applying a user centred design approach. This can embrace including players early in the design process of a location-based AR game, starting by developing player personas and different play scenarios in a participative design formation with potential players. This will lead to more insights into mobile game design for multiple application cases and the creation of more engaging experiences for travel and tourism. The framework or parts of it can be used as a basement to explore and validate experiences in play scenarios testing different game genres. This takes us to into further explorations of the conceptual framework and extensions into other tourism contexts such as cultural heritage, hospitality, outdoor tourism or leisure and attractions.

As within the nature of games, there are complex artefacts covering a diversity of game cultures and genres, addressing various players within multifaceted contexts. Further research could also investigate how different game genres are applied in travel and tourism. The focus of this study was the evaluation of serious games, which concerned about the learning aspect these games bring for the understanding and mediation of tourist sites. Further research could concentrate on the application of different types of gameplay such as adventure, casual, puzzle or strategy games in travel and tourism. In this respect, the aspect location-based storytelling and its different approaches for location-based AR gameplay are worth further explorations. Research could go into the direction when a linear or non-linear, flexible game narrative is most appropriate and suits best the different types of games.

Future research may also be concerned with privacy, ethical and social issues that come with the application of location-based AR games. With the creation of an account or connecting the game to social media networks, players reveal their private data for the gameplay. Besides, location-based data is traceable which makes it possible for to create user and movement profiles from players that can be used for different purposes than gameplay. Future research can look into the impact these games have regarding players' privacy as well as ethical and social issues that location-based AR games cause when they are played in public places.

Other research may look into the business model and marketing of location-based AR games for travel and tourism purposes. It is still not clear what kind of business model is best to follow for tourism destinations implementing these games in their portfolio. How can the return on investment be achieved by offering a location-based AR game for a touristic site like

‘Stonehenge’ or the pilgrimage way of ‘Camino de Santiago’? Besides, further research can also include aspects around marketing planning and in more detailed answer questions to marketing strategy, appropriate advertisement, target audience, affiliate programs and market reach of these games.

10.7. Epilogue

Considering the fact that one quarter of apps are used once in the first six month after download (Statistica 2016), it will be difficult to convince tourists to download an app, which they will probably just use during the time of travel. When tourists agree to engage in a location-based game and invest some time, they will not tolerate learning extensive usability descriptions but want to master the game straight away. Thus, most games such as *Geocaching, Ingress, Tourality* or *Ojoo* are aware of this problem and either created a wide-area game or combined locally restricted games in one app, which can be played in many locations. The first allows players to master gameplay in different tourist places. The latter is generally based on the same principles but provides independent games within one app, which are exclusive for each destination. In order to be more sustainable and bind the audience to a continuous app use, mastering gameplay should not be something, which is exclusively for one destination, but allows continuous gameplay wherever and whenever players wish to. This can even extend beyond the travel time to expand into leisure and the daily life of players.

A reasonable question at this point is: ‘Are location-based game apps one of the best ways to engage tourists with their visiting environment?’ The adoption of tourism apps and smartphones as socio-cultural devices changed the way tourists engage with the visiting location (Wetzel et al. 2011; Ferreira et al. 2012; Linaza et al. 2014) but also how they retrieve information or mediate places (Wilken 2008; Dickinson et al. 2014; Peretta 2014). It can be concluded that these games unquestionably raise the awareness of visitors for hidden or not so obvious locations and thus are an opportunity for touristic stakeholders.

Games are ubiquitous in our lives (Raessens 2006; Coulton 2014) and have been brought to the attention of DMOs that have already started to explore this new opportunity and implement game into the travel process. There are games, which can be played before or after travel such KLM’s music game helping older visitors with the online check-in or new virtual reality games for tourism. These games besides being entertaining can transmit tourist information and raise brand awareness among potential visitors. The types of games played on site were location-based games like *Geocaching* but soon developed in more interactive augmented reality games that combine virtual and real world elements.

At the current stage, location-based games are still an innovative idea of DMOs and those cities

that have implemented these games certainly belong to the early adapters (Peretta 2014; Garcia et al. 2016). Therefore, it is important to understand how location-based AR games need to be designed in order to create engaging and meaningful experiences between players and the location. Tourists are genuinely equipped with mobile devices for accessing, communicating and sharing information, but will also use the technology as their personal assistance (Höpken et al. 2010) for mediating and co-creating experiences. This development empowers consumers as they can create their own personal, independent and locative experiences. It also gives the DMO the opportunity to communicate with their tourists (Wang et al. 2011) in a different form and raise brand awareness of touristic stakeholders by incorporating them into the game. These games can lead tourists to locations that are normally not in their scope as they are off the beaten track, like landmarks, parks, public art installations or historic buildings. Visitors can thus be guided to find these hidden locations and connect with them in a playful, entertaining and interactive way that still holds many opportunities as a new mediated experience for the application in travel and tourism.

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Appendices

Appendix 1: AR Game Design Guidelines based on Wetzel et al. (2011)

Area	Guideline	Description
General	Justify use of AR	Use of AR only for nice looking graphics and intuitive interface, novelty effect will wear off, *Human Pacman:* transporting the game into the real world which enhances the feeling or original game – new look and atmosphere, human players as ghosts.
	Engage Players Physically	Players explore location where they normally come around, game uses different path speed from strolling to faster walk or running by giving them time critical-tasks (competition) to engage them physically.
Virtual Elements	Create Meaningful AR Content	Virtual features need to live up potential, What does AR bring instead of other technology, creating characters, overlaying large objects, encounter virtual buildings (ancient houses, artefacts), - physical engagement to the interaction.
	Create fully-fledged Characters	Enhance different attributes of character (convincing characters), professional sounding voice, actors, emotionally engaging dialogue, emotions and personalities of characters, let the characters follow the player, instead of only transporting the player into the final destination/time, give characters social behaviour, "uncanny valley" (Freud 1919- The Uncanny): too convincing artificial characters might create disgust in people.
	Create Rich Scenery	Do not overwhelm players with too much virtual content that player loses sight of reality, Atmospheric scenery help players to immerse themselves into a place, use real world elements for the creation of an atmospheric time period in the game.
	Go beyond the visual	Apart from visual augmentation, there are other ways as well, e.g. sound effects to support believability of interactions, feedback sounds, and atmospheric background sound.
Real World Elements	Make the Journey interesting	Playing path should be designed to fit the theme of the game and the narrative structure, clear start, end and middle points to create a dramatic build up and reward for players, try to keep locations and places new without having to walk back to a place visited, long distances reduce immersion and sense of presence, overcome the problem by creating virtual elements along the pathway or for the second visit.
	Comprise Atmospheric Elements	Not only use visually interesting places; every place can have different audible, olfactory or other effects which engage the player, e.g. church bells, traffic noise, smell of flowers, freshly baked bread.
	Include (non-) digital media	Possible to include non-digital media such as maps, cups, glasses or other objects to encompass the game experience.
	Think about Security	Playing in a real environment impairs the player to correctly judge danger of notice safety harassed situations such as roads, stairs, non-players, players are in danger when they do not pay attention to real life obstacles, game designers need to be cautious about placing the game in risky or too dangerous places.
	Plan ahead	*Plan ahead*: check physical and temporal suitability for ambience, avoid crowds, ensure mobile phone connectivity, avoid planned events at the location (construction works, festivities etc.).
Social Elements	Use complementing Roles	Players perform different tasks or roles with their devices, one player with a smartphone and other with a map, encourage devices sharing, brings players closer together, creates collaboration, balance teamwork and make roles equally important.
	Use non-player characters	Allows natural interactions with the players, not part of virtual game space, let players compete or collaborate together.

Area	Guideline	Description
	Encourage Discussions	Increase engagement when players have to discuss thoughts with fellow players e.g. strategic decisions, meaningful decisions evoke discussions and engages players on much richer levels, moral questions, story dilemmas.
	Avoid Crowded Areas	Reactions of none-players might be unforeseeable, reactions of playing in public, noise disturbance, not possible to incorporate crowds into the game, distracting for the player, best to avoid heavily populated places, people are getting used to smartphones used in public, playing might not be an issue.
Technology and Usability	Make the technology part of the game	Adapt AR to the theme of the game, technology to support the underlying game structure, modern technologies might create a contrasting experience and reduces engagement or disbelief, device as part of the game and not artificial.
	Keep the interaction simple	Technology naturally occupies lot of player's attention; interaction should be rather simple though as players do not have access to player aids, intuitive way of interaction.
	Display properties into account	Reflections of sunlight easily render games unplayable, weight of game device, do not let player hold the device all the time upwards, consider small screen.
	Take tracking characters into account	GPS tracking might not be accurate all the time.
	Avoid occlusion rich areas	Mutual occlusion between real and virtual objects is a common issue, when a virtual object hides behind a house it should be accurate, not possible with temporary objects.
	Design seamful and for disconnection	Malfunction of technology due to bad reception of GPS, no perfect conditions for network communication, connectivity problem or PPS shadows as part of the design.

Appendix 2: Comparison of Contextual Dimensions of Tourist and Game Experience

Contextual Dimensions	Tourism Attributes	Literature	Game Attributes	Literature
Temporal	• Time of day and year • Latest events • Season of the year	(Cheverst et al. 2002) (Tan et al. 2009)	• Time of day and year • Available Play time • Season of the year • Reality/Play time	(Carrigy et al. 2010; Wetzel et al. 2011) (Engl and Nacke 2012) (Paavilainen et al. 2009)
Location [Spatial]	• Current location Nearby attractions Travelling speed Distance between locations • Travel direction	(Tan et al. 2009)	• Player Position and Movement in Reality • Play Space • Noise Level	(Paavilainen et al. 2009; Engl and Nacke 2012).
Identity [Cultural]	• User interests • Profile (birth, country, age, sex) • Language • Duration of stay	(Tan et al. 2009)	• Cultural (Player/Play) Background	(Engl and Nacke 2012)
Environmental	• Weather • Traffic/Road conditions	(Tan et al. 2009)	• Weather	(Paavilainen et al. 2009; Engl and Nacke 2012)
Social	• Group's Interests • Nearby People • Recommendation • Travel companions	(Cheverst et al. 2002; Tan et al. 2009)	• Player/Player Relationship • Player/Non-Player Relationship • Player/Avatar Relationship	(de Souza e Silva 2009; Engl and Nacke 2012) (Yan and Cordry 2011; Martinez-Reyes and Hern'ndez-Santana 2012)
Psychological	• Travel Motivation • Previous Travel Experience • Travel Expectations	Page and Connell (2010)	• Player Motivation • Previous Experiences • Player Expectations	(Engl and Nacke 2012)
Real/Virtual World Continuity	N. A.		• Continuum from Real and Virtual World	(Jacob et al. 2012)

Appendix 3: Overview of Game User Research Methods

Time	Background	Method	Description	Advantages	Disadvantages	Application
In-Game Evaluation	Expert Evaluation Usability Evaluation	Heuristics Evaluation or Usability Testing	Expert-based usability inspection method Experts give feedback on game if the usability meets established usability principles Rules of thumb Affordances of a user to a system	Provides enough information to judge on all possible problems User interface evaluation Early stage evaluation Most informal Solves genre specific issues in GD Builds up genre specific principles of good design (general guidelines) Time and cost efficient		Nielsen 2003 Nielsen and Macke 1994[1] Pagulayan et al. 2003 Koeffel et al. 2010[1] Nacke et al 2010 Desurvire et al 2004
		Playability Heuristics for mobile Gameplay	Usability: user interface, game controls Gameplay: game mechanics Validated by usability experts and game designer Tested with different game styles Based on Nielsen's usability heuristics and game design guidelines	Modular structure: flexible Can be applied pre- or post-production phase Use mobile context Valid scientific foundation from perspective of verification and validation	Only 3 mobility heuristics	Korhonen and Koivisto 2006
		Rapid Iterative Testing	Usability testing Highly iterative design process	When detecting a fault it is addressed immediately in design and re-tested Classification of design issues within the team		Medlock et al. 2002[1]
		Personas	Player profiles to compare user behaviours metrics and prompt changes in game design	Knowing the user	Limited to a particular user group	Drachen et al. 2009 Tychsen and Canossa 2009

						Campos 2011 Nielsen 2012 Tychsen & Canossa 2008 Putman 2010
		Usability Heuristics	Identify usability issues in an early stage of development		Might be too generic	For computer games Nielsen Desurvire et al. 2004[1] Schaffer 2008[1] Federoff 2002[1]
		Concurrent Think-aloud	Usability testing Verbal protocols-verbalise experience Require multi-method approach to address different aspects of GX Usability of game interface is primary concern	indication of players what they (dis-)like comparable usability results in terms of number and relevance higher detection of problems than Retrospective Think aloud common used approach with children	Less suitable for address level of joy and engaging power of game: having to think aloud is killing the experience (not having a joyful experience and talk about it the same time) Time-consuming Not suitable for analysing cognitive processes May change the way the task is being performed Participant might not have the right words to describe the task Many things might happen in a short time which makes it difficult to verbalise the events Forget to mention	Hoonhout 2008 Van Someren et al 1994 (design and conduct verbal protocols)

					aspects Less suitable in combination with verbal tasks	
		Retrospective Think aloud	Recording the interaction on video Participant watch the video and verbalise thoughts	comparable usability results in terms of number and relevance revealing problems that are not observable preferred as preserve the experience during the game interaction which cannot be inferred from observations alone	Ease or difficulty depends on length of the task Increase in test session duration Participants chose carefully what to say as researcher is listening afterwards (even higher) Participants might differ in skill and experience level as well as being more talkative than others	Hoonhout 2008 Van Someren et al 1994 (design and conduct verbal protocols)
		Verbal protocol	Recording any comments voiced by participants Only in combination with other methods (logging interactions, record observable behaviour, closing interview, questionnaires) to ensure a richer picture	Still a useful feedback Used with children and interaction of play (playing in pairs, recording the communication, transcribe and analyse utterances and combined with observed behaviour) Collect feedback on unclear elements in game interface (general with game controls and enjoy ability of game), combined with closing interview, questionnaire, observed behaving	Not a complete protocol in forms of a running verbalisation accompanying the interaction	Stienstra 2003 Hoonhout and Stienstra 2003 Fontijn and Hoonhout 2007
		Interviews	Ask participants	Flexible means	Individual	Hoonhout

			how they feel about experience Complement data collected via other means (observations usability test, verbal protocols, game logs) *Structured interview:* question wording and order are precisely defined *Unstructured interview:* general topics discussed, very early phase of the project (ideas, concepts not clear yet) *Semi-structured interview*: predefine topics to be discussed, wording and order are open, can be conducted during play session, open questions (why, how, can you elaborate, NOT: do you think it's a good game?) Useful conduct a pilot trail (2-3 participants) 30 mins is enough (to 60 mins)	of gathering information about experience, opinion and previous exp., perceptions thoughts, ideas Rich set of qualitative data Direct and interactive contact with participant (benefit and risk) Asked for further clarification *Semi-structured interview* more suitable as all relevant aspects are covered Clarify any issues during gameplay (eg. Struggling with one interface element)	ideas Success of interview depends on skills and experience of interviewer Unstructured interview is not appropriate: Highly skilled task, well-trained researcher, aware of potential biases, careful formulating questions, not coerce participants in a certain direction Social situation: participants might want to please the interviewer, avoid embarrassing answers Time-consuming Unstructured nature of collected data-ease to misinterpret or censored the data Participants might not be able to provide answers (incomplete, biased) Data in conflict with other means (observation ≠ interview data)	2008 Nisbett and Wilson 1977 Oppenheim 2000 Corlett 2005
In-Game Evaluation	Participatory Methodology	Participatory Play	More important than gaining knowledge about GX is not by reading about it but playing a game	In-game study is widely recognised Describes how playing needs to be done Instrumental in	May not seem like a proper scientific method of extracting knowledge Hard to	Aarseth 2003[1] Mayra 2008 [1] (Introduction to game

				finding key issues in a particular game In combination with interviews-allows the researcher asking the right questions	measure Gained insights may seem less valuable than from real players	studies) Karppi & Sotamaa 2011[1] (Rethinking playing research)
		Participatory Observation	Researcher acts as an observer of the social interplay in and around the game Researcher is taking part in GX equally as other players Researcher goes through all the steps of a game Spend time before, during and after gaming	Researcher accesses the game frame and the social frame (Goffman 1974)	Researcher is playing actively which creates a tensions observer or evaluator Researcher might tent to steer the game	Kultima and Stenros 2010[1]
		Observation	Video observation Clear separation between player and researcher			Ballagas et al. 2008 Ejsing Duun 2011 McCall et al. 2012 Herbst et al. 2008
	Direct Runtime Game Experience Reporting	Russell's Circumplex Model of Emotion (Russell 1980)	Graphical interface in which the player quickly logs feelings and activities Gather information immediate and first-hand Player's subjective basis Logs are used for discussion in post-game interview	Includes a visualisation tool (aid postgame interviews to recall events) Easy and convenient Provides notes for events and context when revising data (bookmark system for researcher) Reviewing the log helps remembering why reported what player did and how players interpreted the details of UI of the game	Disrupt the GX – but reported as acceptable No verbalised or quantifiable outcome Lack of remember to report after/during most interesting game periods Concerns about right report (accuracy) Difficult to report on emotions	Waern, Ahmet and Sundstrom 2009[1] McMillan Morrison, Brown, Hall and Chalmers 2010[1] (providing qual. Data)
		In-Game Evaluation Runtime	For game-mastered and story-driven	Excellent understanding of how much	Diegetic report experience are	Stenros, Montola, Waern et

		Reporting	games	players have seen and understood of the game content Valuable resource of game mastering When players are slowing down or are confused it will show up in in-game reports	turned into stories Frequency of reports is not constant and might not be in depth (nothing happened in gameplay) May effect player engagement: forced to reflect on GX – more difficult to captivated by play	al. 2009
	Psychophysio-logical Methods (Player emotion and cognition in relation with game metrics)	Electromyography (EMG)	Recording electrical activation of muscles	Evaluating basic emotions in facial expressions Mapping of emotions in the circumplex model of affect (Russel 1980)	Important to understand what happens in the brain and what does the body tell	Nacke et al. 2010 Nacke 2013 Game Analysis (El-Nasr, Drachen Canossa 2013)
		Electrodermal Activity (EDA)	Increase sweat gland activity is direct related to physical arousal	Easy to conduct Most commonly used	Not suitable for LBMG as sweat increase can also be due to physical activity (running) Important to understand what happens in the brain and what does the body tell	Nacke et al. 2010
		Electroencephalography (EEG)	Measure of brainwaves		Participant wears scalp electrons Important to understand what happens in the brain and what does the body tell	Nacke 2013
		Functional near-infrared Spectroscopy (fNIR)	Highly applied by HCI for UX		Important to understand what happens in the brain and what does the body tell	Nacke 2013
	Indirect Runtime Game	Informants	Spies to track the play Participate as	Different perspectives of GX	Ethical issues Needs a team of researchers	Stenros, Montola, Waern et

	Experience Reporting		players, and work as connection between players and game masters		and players	al. 2007 [1]
		Special instructed participants	Special characters as part of the game mastering team Objective to inform players or influencing them to do s.th.		Ethical issues Needs a team of researchers and players Manipulating players	Bichard and Waern 2009 [1]
		Activity logs	Technical logs to log game metrics	Wealth of statistics Useful information in terms of activity levels, game progress Meaningful when used together with qual. data	Translating wealth of statistics is difficult GX is not captured	Benford 2007 [1]
Post-Game Evaluation		Postgame Interviews	Interviewing the Player after the game session (retrospective interviews)	Valuable in concert with playing the game and observation Allow a more general view on GX	Do not capture experience as it happens = experience are turned into stories Narrative framing changes the meaning of the experience/very memory of experience In long games, people tend to forget their GX Sequential (1^{st}, 2^{nd}) If people hear other GX they tend to adapt their GX When players make investment in Game (money, time, status) tend to whitewash the GX *Postgame lie*: consistent but false picture	Pervasive Games Benford et al. 2004[1] Rowland et al 2009[1] Schell 2009[1] McCall et al. 2012, Herbst et al. 2008, von der Putten et al. 2012 (Mixed M.)

					of what player experienced by reflecting on the game exposed role of researcher (no co-design)	
	Questionnaire	Presence Questionnaire		Easy to administer High face validity Lack of measurement-related interferences during exposure Conduct factor analysis Identifications of underlying dimensions of presence Low cost Mobility Sensitivity Easy to analyse and interpret	Assure validity as participants must understand the concept of presence Invalid as theory could be brought into existence by asking questions about it Inaccurate recall Inability to assess temporal variations in subjective sense of presence	Van Baren and IJssesteijn 2004 Wissmath et al. 2010 Slater 2004 Van Baren and IJssesteijn 2004

Appendix 4: Interview Guide – Mobile Interviews

Game System

Usability

Tell me about how you familiarised with the game a

- Getting to know/understanding the game app (on-boarding, introduction)
- Experienced difficulties

Game Elements and Mechanics

I would like to know more about how you experienced the game mechanics in the first/second game session. Game Mechanics are the characteristics, which define every gameplay (aim, rules, feedback, points, story).

- Outcome of your first/second play session
- Game feedback (points, progress)
- Game story (characters, role playing, narrative)

Mobility and Location

Tell me about your experience with the play location. Which effect had the location on your game experience?

- Crowded/open space
- Light conditions
- Sacred/vibrant/calm/daunting/spooky/excited…

Player Experience

Emotional Response

I am interested in what you felt during the gameplay.

- Circumplexmodel of Affect (Russell)
- Change of feelings and triggers (internal/external)

How did you settle into the game story?
- Drawn into game story (presence, engagement)

Fun

How did you experience fun? What was fun for you in the first play session?

What did you enjoy the most/least?

Social Measures

Playing with other people is a major element of gameplay. Please tell me how you perceived interacting in the first gameplay session with

1. Other players
2. Non-players
3. Game characters

Mobile Learning

One aim of LBGs in tourism is to learn about the location you are visiting. What did you learn from gameplay so far?

- Location of gameplay
- History
- Skills in gameplay (social interaction, collaboration)

Physiological Measures

LBGs involve changing the location in the real environment. How did you experience the physical movement between two play locations?

- Too far, appropriate, difficult to find…

<u>Contextual Experience</u>

Temporal

You have played for some time now. Tell me about your experience with the playtime.

- Appropriate playtime

Location/Spatial

Tell me about how you perceived the location of gameplay.

- Appropriate for playing
- Space to play

Identity

I would like to know about your experience feeling part of something bigger

- Gameplay
- Game community.

Environment

How about your experience with the game environment? How have the environment had an effect on your GX?

- Facilitate/limit GX (light, crowd, noise

Real/Virtual World Continuity

Did you experience a connection between the game story and the location?

Appendix 5: Interview Guide – Semi-Structured Interviews

Game System

Usability/Handling

Tell me about your experience with the usability of the game.

- Handling of the game
- Navigation with the card/digital map
- Technical problems (GPS, AR)

AR and Interface Design

Tell me about the design of the game. How did you experience:

- Sound elements
- AR features/ AR support gameplay
- Perception of virtual objects as real

Game Elements and Mechanics

I would like you to reflect on the game elements again. Tell me about what made the gameplay exciting for you.

- Aim of the game
- Game rules
- Influence of GE (points/XM, progress in gameplay, story) on GX
- Game feedback/progress
- Being in control
- Game story/narrative

Was there anything in the game that influenced your GX negative? Could you give some examples please?

Mobility and Location

Tell me about your experience with the play location. Which effect had the location on your game experience?

- Touristic relevance of play locations
- Awareness of locations before gameplay
- Emotional attachment
- Creating different emotions

Reflect on going from one play location to another:

- Clear where to go next (game)
- Ease of navigation/finding right direction (map)
- Distance between places

Player Experience

Psychological Measures

Fun

Reflect on the fun you had while you were playing.

- When experienced most fun

- What made the situation fun
- Kinds of fun (people fun, hard/challenge fun, easy fun, serious fun)

Emotional Response

Reflect on your emotions during the gameplay

- Circumplexmodel of Affect (+/-)
- Change of emotional state/triggers
- The game story is fictive. How much did you feel transported into the time of gameplay?

Social Measures

Playing with other people is a major element of gameplay. Please tell me how you perceived the interaction in the gameplay with

- Other players
- Non-players
- Game characters

Tell me about your feeling of engagement with other people. How did the gameplay might have (not) facilitated engagement?

How did you feel by playing with people you don't know?

Mobile Learning

A major aim of playing in a tourist environment could be to learn. Would you agree? Tell me about your main learning outcomes

- Learning from the location
- Game story and history (tourist relevance, facilitate understanding, further interest)
- People in the area

Physical Involvement

Tell me about your feeling of engagement with the places you've visited and played in.

- Gameplay facilitate engagement
- Gameplay support understanding of location

Contextual Experience

Context has a major influence on game experience for LBGs. I would like to reflect on some aspects, which might have influenced your personal GX.

Temporal

Tell me about how time influenced your gameplay.

- Duration of gameplay
- Loosing sense of time
- Playing during daytime/night
- Playing in different time frames (past, future)

Location/Spatial

Tell me about how you experienced playing in a public area.

- Unknown locations
- Navigating in the area

Identity

Please reflect on playing an agent to rescue the world.

- Identification with game character
- Feeling part of game community

How would you describe your feeling playing in a public space? (Being identified as a player)

Environment

Tell me about your experience playing in an unknown environment

- Effect/influence of surrounding on GX (noise, scaffolding, crowds, weather, language…)

Real/Virtual World Continuity

With LBGs it is important that the information shown in the game world matches the real world location. Tell me about your experience on this aspect.

- Technical issues (GPS, AR)

Appendix 6: Player Questionnaire

Player characteristics

4. Sex: Male ◯ Female ◯
5. Age: _____
6. Nationality: _____

Previous GX & Motivation

1. Would you consider yourself as a player?

   Yes ◯ No ◯

2. How often do you play games?
   Every day ◯ 1-2 per week ◯ Every other week ◯
   1-2 per month ◯
3. What do you normally play?

   _____

4. Have you ever played a location-based Augmented Reality Game?

   Yes ◯ No ◯

5. Which one(s) did/do you play?

   _____

Ingress

1. Would you play this game with friends/family on a journey?

   Yes ◯ No ◯

2. Would you recommend this game for other visitors wanting to get to know the city and different experience?

   Yes ◯ No ◯

3. Does the played game have a tourism purpose for you?

   Yes ◯ No ◯

4. If you could change anything on the game, what would that be?

   _____

Game Themes for Tourism

1. Is the game theme important on whether you would play it or not?

   Yes ◯ No ◯

2. Are there themes you would be interested in playing?

_____

3. Is the history of the location important to be integrated in the game?

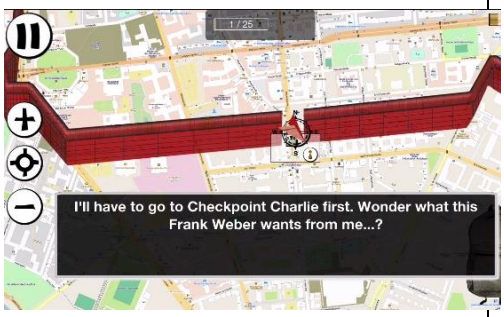
   Yes ◯ No ◯

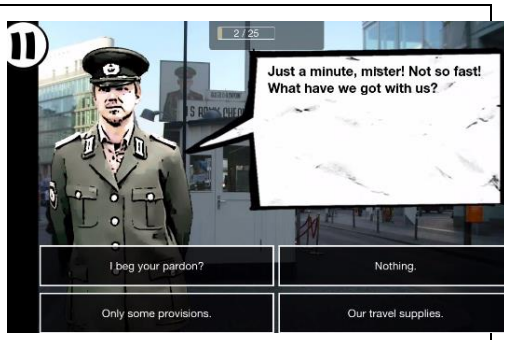
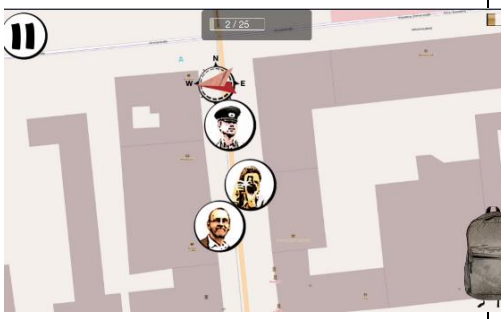
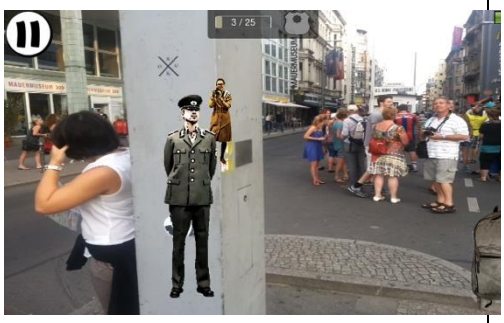
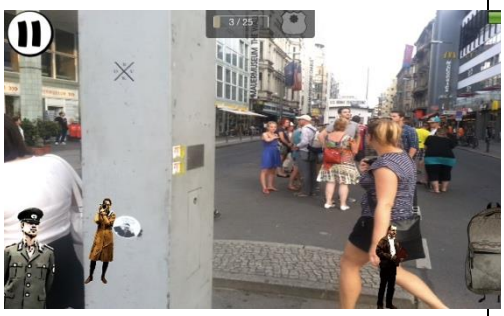
4. Do you have a closing comment?

_____

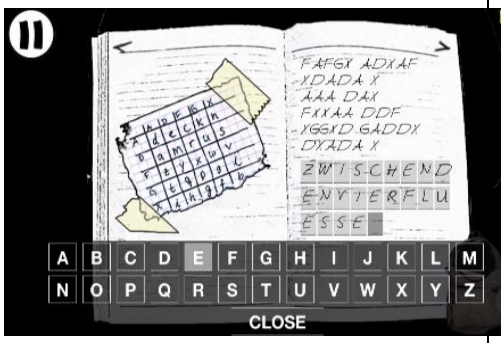
Appendix 7: Flow Chart 'Berlin Wall 1989'

Safety Advice	
Splash Screen	
Game Intro	
Game Intro	

Game Intro	
Game Intro	
Game Intro	
Call to action – Go to Checkpoint Charlie	
First Level Checkpoint Charlie	

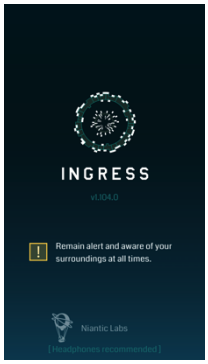
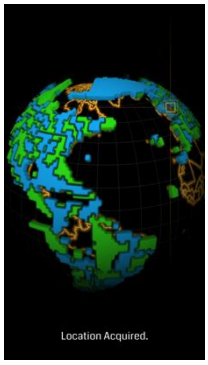
First Level Checkpoint Charlie	
Map Mode	
AR -Mode	
AR- Mode	
1st Letter Puzzle	

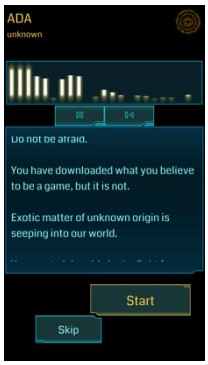
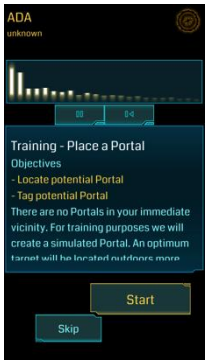
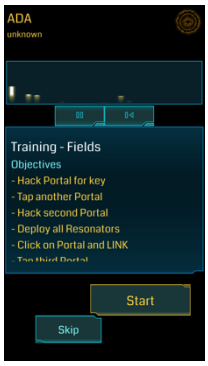
//Achievement unlocked – Sound //Great achievement… but…	

2nd Letter Puzzle
 	
// counting letters two times – quite similar riddle style
 	
// orientation to not skip letters is fiddling
	

//Achievement unlocked – Sound //Great achievement… but…	

Appendix 8: Flow Chart 'Ingress'

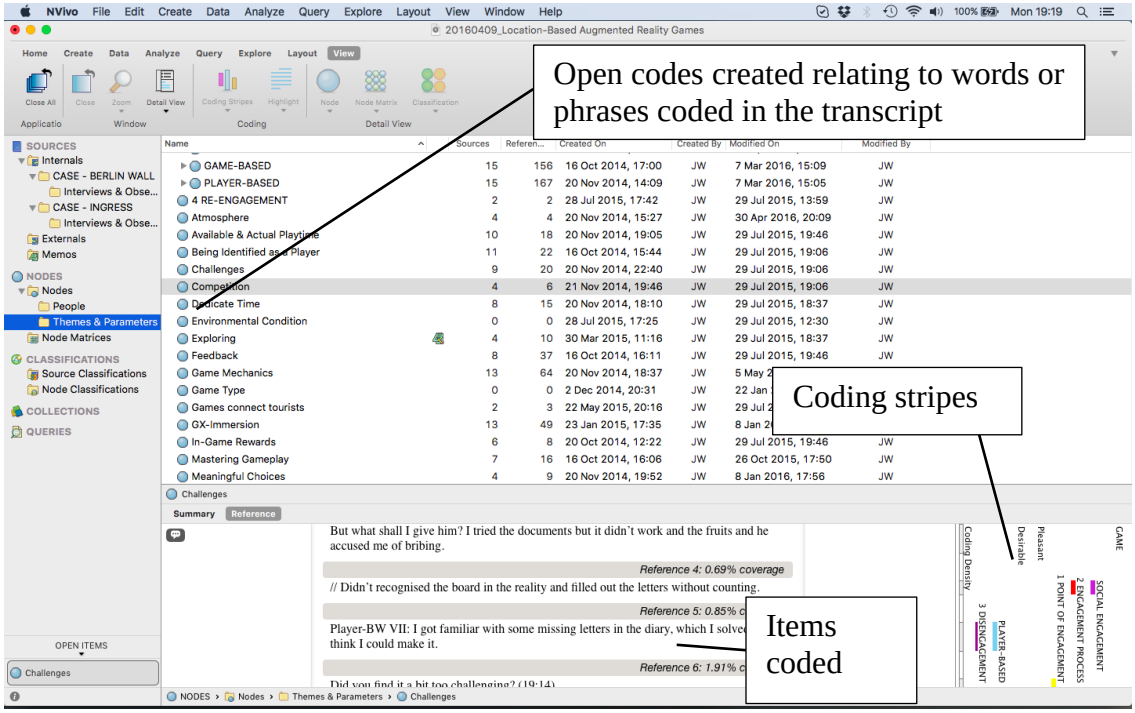
Safety Advice & Welcome Screen	
Searching for player's location	
Player location	
Player profile	

Call to action	
First challenge – Retrieve XM	
Second challenge – Capture a portal	
Third challenge – creating a field	

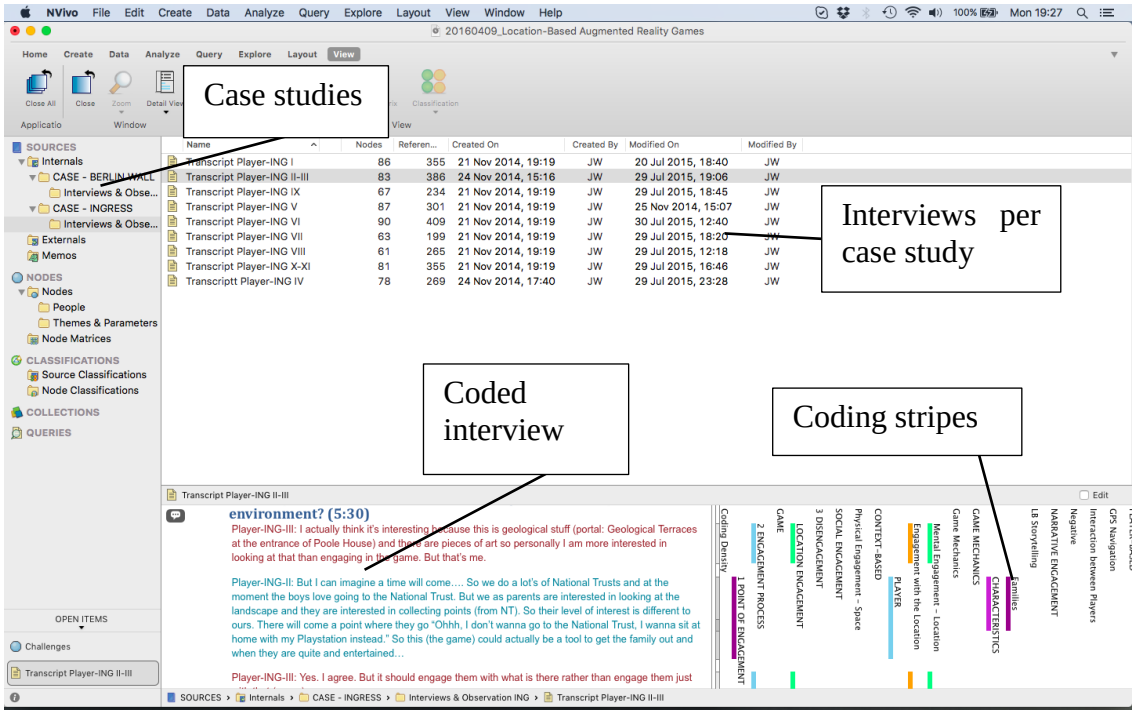
Appendix 9: NVivo Documentation

Screenshots from NVivo showing the process of coding transcripts

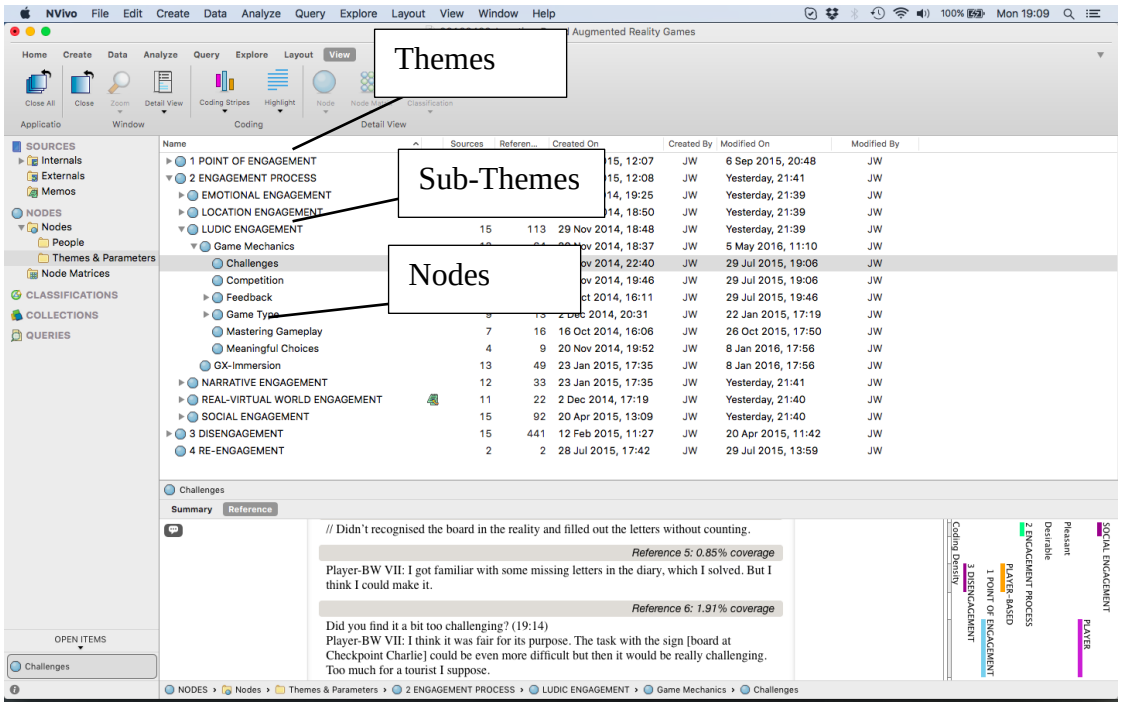
1: Applying open coding to the transcript



2: Coded interview with coding stripes



3: Combining Nodes into Themes and Sub-Themes from both Case Studies



Appendix 10: Excerpt of the Coding Log Book

CONTEXT - Objective: Objective 3: To identify *contextual parameters* contributing to and against engaging experience creation with location-based, mobile Augmented Reality games in urban tourism environments

Point of Engagement

Category	Theme (Codes)	Sub-Theme	Description	Quotes	Literature
Context	*Location & Space*	Spatiality	Appropriate Space for Gameplay for carrying out game activities and interact with physical objects	*"As the game can be pretty immersive looking down on the screen, I think you have to watch pedestrians more carefully that you don't walk over people. So I think it's really important to have a little bit of space where you can unfold and not hit people." (Thomas, 29, Group Player, Berlin Wall 1989)* *"I think here at Gendarmenmarket it is better. It feels more relaxed in terms of space. So I don't have to worry about bicycles and cars around me." (Samuel, 28, Single Player, Berlin Wall 1989)*	Carrigy et al. (2010) (Blum et al. 2012) Ejsing-Duun (2011)
		Atmosphere	Play location supports game theme by reflecting the story's atmosphere and emotions	*"At Checkpoint Charlie it was more a rush. You got into the play and it was more like the agent story and when you are here [at Gendarmenmarket], it's calmer. You meet someone in secret. That's reflected really well within the game. All the people around Checkpoint Charlie are absolutely important and also here. The atmosphere here is perfect for the theme of the game." (Thomas, 29, Group Player, Berlin Wall 1989)* *"I think it's quite stressful to play in a crowd of people as we find at Checkpoint Charlie. It is much more relaxed to play here at Gendarmenmarket." (Diana, 26, Single Player, Berlin Wall 1989)*	Carrigy et al. (2010) (Wither et al. 2010). (Lehmann 2011). Ejsing-Duun (2011) (Böhme 1995; Dalsgaard and Kortbek 2009).
		Tourist Relevance	Places are considered as important and significant and worth a tourist visit	*"Now I know that this is not just a normal street lamp but has a meaning behind it, although it's not so important for me.* [She compared it to churches] *Somebody likes a church and*	Harrison and Dourish (1996) (Bremer and Olsen 2006; Dalsgaard and Kortbek 2009) (Ryan and Glendon

				others don't like churches. It's just a personal thing." (Antje, 28, Single Player, Ingress) Diana pointed out to '*[…] get to know as many places as possible' (Diana, 26, Single Player, Berlin Wall 1989* *'An app for tourists must include the tourist highlights. If I am coming to Berlin for a short trip, I want to see all the tourist sites of course. And when someone then uses a game to explore the city, all the highlights of the destination need be integrated in the game.'(Mathild, 34, Group Player, Berlin Wall 1989)* *"[…] with the game I don't have to do the normal touristic things that everybody sees. I would probably go somewhere where you normally wouldn't go to that easy. So that's what I like about the game. It's something different and not just the main monuments." (Antje, 28, Single Player, Ingress)* *"Well, the places we've been visiting definitely. Checkpoint Charlie is one of the most well-known tourist places in Berlin. The concert house and the Gendarmenmarket probably too and the other locations in the game, I suppose as well." (Marcus, 25, Group Player, Berlin Wall 1989)*	1998) (Chevrest et al. 2002). Knudson et al. (1999) Oh et al. (1995) (Damala 2007) (Daengbuppha et al. 2006)
Context	*Temporal*	Available and actual play time	The available time the player has for the gameplay and the time the game designer planned for the game	*"I think I would play like two to three hours. I mean when you're here for this purpose then you dedicate some time for it. I don't only play for half an hour, familiarise with the software and stop playing. I think it's okay when it takes some time. It can be even five to six hours." (Nick, 31, Single Player, Berlin Wall 1989)* *"I could easily walk around for ages because I walk around in cities a lot when I visit a city and it doesn't matter if it's the whole day. So, I could imagine that game works well for more than 3 hours when we've already played 25 minutes." (Antje, 28, Single Player,*	(Wetzel et al. 2011; Engl and Nacke 2012) (Rasinger et al. 2009; El-Sofany and El-Seoud 2011) (Marins et al. 2011)

				Ingress) *"Well, when we've already played for 1.5 hours, I don't know […] if it's supposed to be like this. But then it's not manageable in 2.5 hours or you have to use a bike to change locations quicker." (Marcus, 25, Group Player, Berlin Wall 1989)*	
		Time of gameplay	The time of day when gameplay takes place	*"I mean when you are playing in the evening and when it's becoming darker, then sound makes more, sense as at this time of day [afternoon]." (Lauren, 13, Group Player, Berlin Wall 1989)* *"Especially at rush hour it's quite difficult to have a mobile phone in front of you and watch the game. […] I think it's a factor, which is especially considerable between rush hour and peak season." (Diana, 26, Single Player, Berlin Wall 1989)*	Engl and Nacke 2012)