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Location-based challenges for playful neighbourhood exploration

Geertje Slingerland ^a, Xavier Fonseca ^a, Stephan Lukosch ^b and Frances Brazier ^a

^aFaculty of Technology, Policy and Management, Delft University of Technology, Delft, Netherlands; ^bHIT Lab NZ, University of Canterbury, Christchurch, New Zealand

ABSTRACT

Location-based activities can challenge citizens to explore their neighbourhood in new playful ways. This paper presents a classification of such playful activities based on the literature and experience gained (1) in co-creation sessions and (2) gameplay for neighbourhood exploration with citizens in the Hague. The location-based game designed for this purpose encouraged neighbourhood exploration and social interaction that went beyond the everyday normal. Results showed that citizens are specifically interested in activities that allow them to discover new information about, and places in, their neighbourhood when these are related to their own life. The results of this paper provide new knowledge on game design to inform designers on which type of interactions and activities foster neighbourhood exploration and social interaction.

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Neighbourhood exploration; social interaction; location-based games; play testing

1. Introduction

Cities are complex and dynamic (Salim and Haque 2015; Mulder 2014), and often socially fragmented with disparate communities living near to each other while neighbours do not know each other (Gaventa 2004). One of the main purposes of urban design in cities is to ensure liveable and safe neighbourhoods for their citizens (Corbett and Le Dantec 2018). One way to improve the liveability of local neighbourhoods is for urban designers and city planners to encourage citizens to take responsibility for their neighbourhood and actively participate in local activities (Comes 2016; Meerow, Newell, and Stults 2016). Local governments have started to experiment with public participation policies to prompt such citizen engagement (Seyfang and Smith 2007; Taylor et al. 2018). The ultimate aim for cities is to increase social resilience and improve social cohesion within their neighbourhoods (Fonseca, Lukosch, and Brazier 2018; Manturuk, Lindblad, and Quercia 2012; Hampton and Wellman 2003). For this to work, citizens need to feel attached to and part of their neighbourhood: they need to know others in their neighbourhood to be able to participate (Zaff, Kawashima-Ginsberg, and Lin 2011; Manturuk, Lindblad, and Quercia 2012; Kim and Ball-Rokeach 2006; Li, Pickles, and Savage 2005).

Digital games have potential to connect citizens with each other and with their neighbourhood (Fonseca, Lukosch, and Brazier 2018). A number of games have

been successful in bringing people together by supporting play, participation, and involvement of citizens in urban environments (Nijholt 2017; Jones et al. 2017; de Lange and de Waal 2013). In particular, location-based games (i.e., games that use technology to situate players in their location) afford novel types of digital, social, and physical playful interaction in public spaces (Paay and Kjeldskov 2005; Bilandzic and Foth 2012; Papangelis et al. 2017; Paulos and Goodman 2004). These games are able to persuade citizens to go out and explore their neighbourhood; to visit new places and interact with other residents (Papangelis et al. 2017; Paulos and Goodman 2004). However, little insight is available on how location-based games achieve this effect. More specifically, it is unclear which types of location-based activities within these games persuade citizens to explore their neighbourhood and interact with their neighbours.

To investigate *What kind of location-based activities do citizens prefer to interact with their neighbours and to playfully explore their neighbourhood?*, this paper studies the influence of game dynamics, the purpose of neighbourhood exploration (beyond pure entertainment), and the role of physical surroundings and contextual information on social interaction in a specific neighbourhood in The Hague (NL). A group of seven adults interested in contributing to the liveability and safety of their neighbourhood participated in two co-creation and gameplay sessions to explore their

CONTACT Geertje Slingerland  g.slingerland@tudelft.nl

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neighbourhood. Based on insights gained from these sessions and the literature, this paper proposes a classification of location-based activities and identifies citizen preferences for activities that support interaction to encourage players to physically interact with people and places in their neighbourhood.

The next chapter first reviews the literature focusing on prior work on playful experiences and location-based games (LBGs) specifically. This review shows a lack of knowledge on which part or elements of LBGs contribute to behavioural change, in this case to support social interaction and playful exploration. To address this gap, a location-based game ‘Secrets of the South’ was developed and studied in this research. After an outline of how this game and its content were developed in two phases prior to the research on which this paper focuses (chapter 3), the rest of the paper concentrates on the third phase of the study. Chapter 4 explains the procedure to prepare and execute two workshops in which citizens play tested Secrets of the South and designed activities to play within this game, called challenges. These workshops provided insight into the preferences of participants for challenge designs and these results are presented and discussed in the final chapters of this paper.

2. Playful experiences for increased neighbourhood engagement

Playful experiences in urban environments have been facilitated in many ways including urban playgrounds with or without specific technology support, location-based media (devices with sensors, such as smartphones, that can detect location and provide corresponding contextual information), and custom-made technological installations (Fonseca, Lukosch, and Brazier 2018). Such fun and playful playgrounds often encourage citizens to explore their neighbourhood or engage in social interaction during play (Slingerland et al. 2020; Nijholt 2017), like ‘Koppelkiek’¹. Koppelkiek fosters playful meetings and social interaction throughout public spaces, inviting players to take and submit photos with other people from the neighbourhood. When Koppelkiek was played in Utrecht (NL) over a period of three weeks, residents reported the number of social interaction in the neighbourhoods to have increased significantly (De Lange 2014).

In contrast to ‘Koppelkiek’, ‘mood.cloud’ (Scolere et al. 2016) and ‘Jokebox’ (Balestrini et al. 2016) were created with the intention to foster social interaction and create awareness of others. Interviews with citizens using ‘mood.cloud’ showed they became more aware of the community of which they are part and started to

reflect on how they could become more involved in this community. Research on the ‘Jokebox’ (Balestrini et al. 2016), a physical installation placed in a neighbourhood that invites citizens to coordinate movements to hear a joke, showed that citizens not only talked and laughed together while using the installation, but that they also had more elaborate discussions on the reason why the Jokebox was placed to begin with. These examples show that playful urban installations can influence people’s behaviour, enticing engagement through social interactions with neighbours and interaction with the environment around them. Meanwhile, such installations are limited in terms of scale (the number of citizens that can use an installation), time (the time span for which an installation can be employed) and re-use (the possibility to move an installation to another location) (Golsteijn et al. 2016), due to resources and location specific characteristics of the installations.

One way to deal with these limitations is to use location-based mobile games (LBGs) designed to support citizens in exploring their environment and interacting with each other (Yang and Liu 2017). Location-based games are increasing in popularity (Procyk and Neustaedter 2014). They merge digital gameplay with the physical world around a player’s specific location² (Arango-López et al. 2017). Within these games, players can work together or play against each other, distributed or co-located in outdoor physical spaces in urban environments (Soute et al. 2013; Arango-López et al. 2017), interacting with the technologically enhanced environment around them (such as street furniture (Nijholt 2017)). Other LBGs have been designed to increase neighbourhood awareness and place attachment, for example by providing information about specific locations and physical objects in a neighbourhood (Bergstrm et al. 2014), such as objects with a mediaeval history (Huizenga et al. 2009). The well-known LBG ‘Pokemon GO’ (Clark and Clark 2016) promotes new patterns of human mobility throughout neighbourhoods and cities (Colley et al. 2017), and develops communities of players, even though increasing new interactions in the neighbourhood was not its initial purpose. Thus, location-based games have shown to support behavioural change (Clark and Clark 2016; Papangelis et al. 2017) and community building (Vartiainen and Tuunanen 2016; Patubo 2010; Scolere et al. 2016). They can also lead to acquisition of new meanings of familiar places for citizens and encourage citizens to explore new ones (Papangelis et al. 2017).

The question this paper addresses relates to the means with which these games have achieved these results: which part(s) of the game or which elements,

contributed to such behavioural change? These insights are needed to help designers to create LBGs that support players to explore their neighbourhood and interact with fellow residents. Examples of successful location-based games show the importance of adjusting the game to the context in which it will be played (Paay and Kjeldskov 2005; Bilandzic and Foth 2012). Game designers need to integrate local knowledge of the play environment into their design. To this purpose game designers often include citizens (being potential players) who are familiar with the context at some point in the design process. In view of this, the research presented in this paper includes citizens from the target neighbourhood in the design process from the start, realising that this is intrinsically complex (Hossenlopp et al. 2007; Avison and Fitzgerald 2003), and hence is often not done (Kasurinen, Maglyas, and Smolander 2014; Calle, Neufeld, and Schneider 2010, 2006).

3. Research background

The presented research is embedded within a joint effort between the Participatory Systems Initiative at the Delft University of Technology and the Municipality of the Hague. The Participatory Systems Initiative³ focuses on the design and orchestration of the class of (large-scale) complex social-technical systems for which self-organisation and emergence are key characteristics. Such systems mandate design for empowerment, engagement, and trust; to provide participants with the ability to act and take responsibility for their actions (Brazier and Nevejan 2014). The participatory system designed and researched in this study is the location-based mobile game 'Secrets of the South' (SotS), presented in the next section. The aim of this game is to facilitate social interaction on the streets and thus neighbourhood exploration.

Since the start of this research programme in 2016, several iterations of SotS have been developed and evaluated in three phases, as outlined in Figure 1. Co-creation (Sanders and Stappers 2012) has been the fundamental approach throughout this programme to support acquisition of knowledge on the tacit and latent knowledge of participants, on what they know, feel, and dream (Sanders and Stappers 2012, p.66). By enabling citizens to become participants in the design of the game, a deeper understanding is acquired on what citizens prefer for the game and its content, and the reasons for these preferences. To position this paper in relation to previous work in this research programme the three phases are depicted in Figure 1. The first two phases are briefly described below, while the third phase shown on the right is the focus of the rest of this paper. In fact, the

purpose of this paper is to evaluate the Secrets of the South game and its challenges in two gameplay workshops, to understand the type of challenges citizens prefer to foster social interaction and neighbourhood exploration.

3.1. Phase 1: Game design

As shown in Figure 1 and described above, each phase engaged citizens in a co-design workshop. The workshops in the first phase explored the types of outdoor activities in which participants are interested in general, asking participants specifically to co-design game ideas for social interaction. As documented in Fonseca, Lukosch, and Brazier (2018) and Fonseca et al. (2017), these workshops resulted in a list of game requirements and an initial design of the game 'Secrets of the South'.

Secrets of the South (SotS)⁴ is a location-based game that uses smartphones to mediate outdoor activities (called challenges) for social interaction. Players are presented with challenges (i.e. tasks) to enable them to engage with both strangers, friends, or other players, walk around outdoor public spaces in their neighbourhood, and search for solutions to complete challenges and advance in the game (Figure 2). The challenges are designed to foster social interaction both in the real world (e.g. in the form of face-to-face communication with others, or physical contact such as shaking hands), and in the digital world (e.g. exchanging messages and images left behind in the neighbourhood through QR codes). The challenges provide players with opportunities to encounter and engage with others in their surroundings and are strategically located to expose players to both places and local activities often unnoticed around the neighbourhood (e.g. local heroes, or the most important landmark in the country). The game motivates and encourages players to advance in the game by giving them points when they scan other players' QR codes to collect the other players' card. Points represent the players' progress in the game, relating to both the number of challenges solved and to the number of players befriended (or "collected").

3.2. Phase 2: Challenge designs and categories

The second phase (see Figure 1) focused on evaluation of the initial design of Secrets of the South and further development of the content of the game: the challenges. The co-creation workshops organised for this purpose involved citizens in both the design and play testing of challenges which citizens designed themselves in their own neighbourhood (Slingerland, Lukosch, and Brazier 2020; Fonseca, Lukosch, and Brazier 2018; Fonseca et al. 2020).

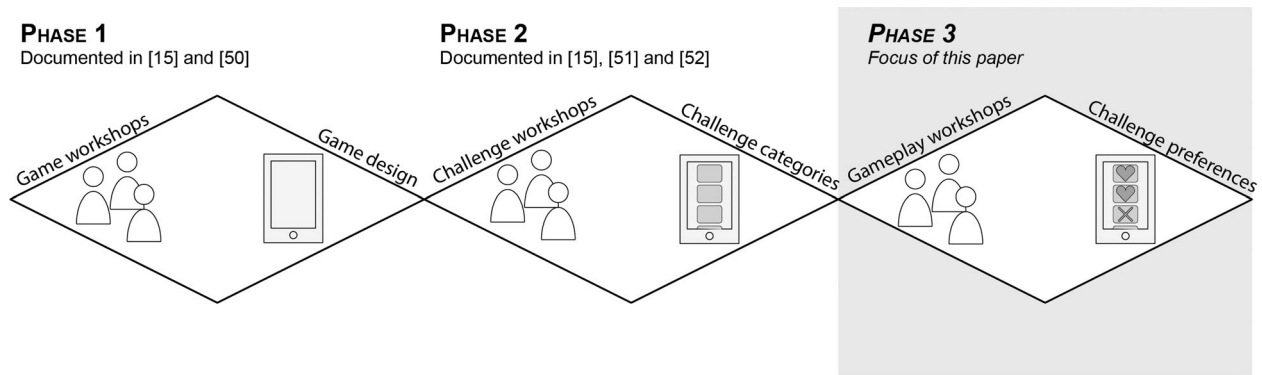


Figure 1. Secrets of the South is developed in three phases, of which phase 3 is presented in this paper.

The participants identified interesting locations and activities for gameplay (i.e. new challenges) to increase neighbourhood pride and social interaction (Slingerland, Lukosch, and Brazier 2020; Fonseca et al. 2020).

During these co-creation workshops, participants designed more than 50 challenges. As further elaborated in Fonseca et al. (2020), these challenges were categorised according to associated player behaviour required to perform the challenge. For example, some challenges require physical activity, while others ask players to take a detailed look at their environment to find a specific point of interest. Four challenge categories were distinguished based on the associated player behaviour: *Athlete* (physical behaviour), *Detective* (searching behaviour), *Explorer* (exploring behaviour) or *Inventor* (creative behaviour). During gameplay players can serendipitously encounter a location with a challenge and Secrets of the South then reveals the category to which the challenge belongs and hence the type of behaviour associated with this challenge.

The four challenge categories are:

Athlete: This category requires physical activity to solve the challenge. The challenge can be solved by either doing a specific activity requiring physical action (e.g. engaging with at least five people for a given purpose), or by varying the quality of the performance itself (e.g. see who can finish the free-running the fastest). This links to research from phase 2 that showed players to appreciate challenges that entail physical activities in their neighbourhood (e.g. running around, or doing games that elicit competition and collaboration) (Fonseca et al. 2017).

Detective: the Detective category requires players to undertake challenges such as finding information and answering questions about factual knowledge. Players have to search for information in their neighbourhood, for example asking people about local heroes depicted in tiles in the footpaths in their neighbourhood. This type of challenge links research from phase 2 that identified *information about activities or places for activities* and *information about people from the neighbourhood* helps citizens to build pride in their neighbourhood (Slingerland et al. 2018).



Figure 2. In Secrets of the South, challenges allow players to encounter people or locations that otherwise stay unnoticed.

Explorer: Challenges associated with the Explorer category require players to travel through their neighbourhood to learn and comprehend more about their own neighbourhood and the people who live there. Challenges of this type might include discovering the origins of a neighbourhood or lead a player to an unknown point of interest of the neighbourhood (e.g. an old building, a local initiative) and then asks them to engage with random people to discover its origins. It resulted from phase 2 where citizens expressed to enjoy to go out and explore what is happening in their neighbourhood and engage with fellow neighbours about local history (Slingerland et al. 2020).

Inventor: Inventor challenges require players to propose new ideas to address an issue in the neighbourhood. Players in this type of challenge may explore interventions for their neighbourhood and suggest new ideas to increase the liveability of their neighbourhood. Examples of this challenge include asking citizens to reflect on interventions to change their neighbourhood, such as designing a new playground, or a new colour scheme of buildings. This type of challenge links to phase 2 where citizens mentioned to want to think about improving their own world (Fonseca et al. 2017).

These first two phases resulted in the design of the game *Secrets of the South* and its content with four different categories of challenges. The next phase, the focus of this paper, explores the extent to which these challenge categories suffice in different circumstances with different players, and how they are experienced by players in practice (see Figure 1). In particular, this phase focuses on increasing understanding of player preferences with respect to the types of challenges they prefer to interact with other players and to playfully explore their own neighbourhood. The next chapter describes the steps taken in the third phase: the two workshops that were organised, and how they were analysed to identify challenge preferences of participants.

4. Phase 3: Methodology

The leading research question in phase 3 is: *What type of location-based activities do citizens prefer to interact with their neighbours and to playfully explore their neighbourhood?* A neighbourhood that is interested in increasing social cohesion, for example by increasing interaction between neighbours (Fonseca, Lukosch, and Brazier 2018), was selected for this study. Bouwlust, a neighbourhood in The Hague (NL) with almost 30.000 inhabitants, was found to suit this description and provided the context of this research. Bouwlust has transitioned over the years to what it is now: a neighbourhood with a very diverse group of inhabitants (almost 60% of its residents migrated from outside of the Netherlands) and a relatively high number of social housing (about 70%) (Den Haag 2015). Residents try to connect the various communities

in the neighbourhood and increase social cohesion to find ways to deal with liveability and safety issues, such as burglaries and drug-related crimes and abuse.

The number of initiatives and small citizen community groups within Bouwlust indicates that citizens are interested in contributing to a safer and more liveable environment. They use Whatsapp and Facebook groups to share information. However, these efforts remain only visible in the digital space for those who are connected. The initiatives are not always visible in the physical environment, and accordingly citizens who are not active on digital platforms and can only be reached offline are excluded (Slingerland, Lukosch, and Brazier 2019). A location-based game has the potential to couple digital and face-to-face interactions, and to connect these activities to physical locations in this neighbourhood.

Figure 3 illustrates the steps taken to address the main research question on which this paper focuses, namely to identify which types of challenges citizens prefer. Two workshops with citizens were organised, in which participants play tested the game (Workshop 1) and designed challenges for the game based on their play test experience (Workshop 2). Each step is explained in more detail in the paragraphs below.

4.1. Recruiting participants

During the past two years of this research programme, in the context of the joint effort between the Municipality of the Hague and TU Delft's Participatory Systems Initiative, a citizen network has emerged with approximately 45 participants. This network comprises of citizens whom are interested in improving their neighbourhood and contributing to its liveability and safety. Participants for the two workshops were recruited from this network. Each member of this network was invited to the two workshops, either in person, by phone, or email. In total, 10 citizens agreed to participate of whom seven (5 female, 2 male; age group 36–75 years) attended the first workshop, four (two female, two male) also attended the second. Unfortunately, the second workshop had fewer participants due to unexpected time constraints, and severe weather conditions. The second workshop was continued despite the low number of citizens showing up, to honour the citizens who did come. Furthermore, the citizens who participated can be classified as community leaders and can represent a larger group of citizens (Le Dantec and Fox 2015).

4.2. Challenges for play test

The research team designed five challenges for Workshop 1. The designed challenges, presented below,

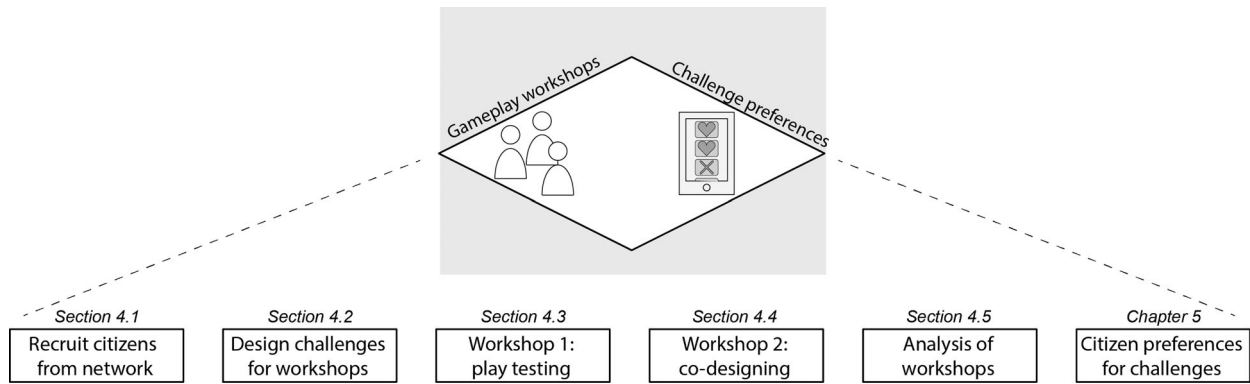


Figure 3. Citizens were recruited from our network to participate in two sequential workshops that comprised play testing and designing challenges.

aimed to provide participants with a greater understanding of the types of activities (i.e. challenges) that could be performed within the game. These challenges were implemented in *Secrets of the South* for citizens to play during Workshop 1.

4.2.1. Challenge 1: Make the neighbourhood yours

Players were asked to pretend that the Municipality would like to build a museum focused on their neighbourhood, physically positioned within their neighbourhood, and that they have been asked to provide information on their neighbourhood that needs to be considered. They are asked to collectively think about and discuss characteristics of their neighbourhood, to create a word cloud and/or drawings on a sheet of paper. Their ‘artworks’ will be put to vote, and the names of the authors of the winning ideas will be mentioned in the fictitious museum. As part of the challenge, at the end, all players see the other players’ creations and together decide which is best by voting. This challenge is classified in the *Inventor* category, as it is designed to foster the creation of an artwork for the neighbourhood museum by working in collaboration with fellow citizens - in this case a word cloud or drawing. This challenge invites participants to reflect on their perspective of the neighbourhood and the views of others during and after the creation process.

4.2.2. Challenge 2: Discover your neighbourhood

In this *Detective* challenge, players are asked to find a specific point of interest in the Buurtkamer (the ‘neighbourhood room’). They are asked to walk to this location and answer some open ended quiz questions about the location, namely (1) What types of activities are possible at this location – what could a neighbour be doing here?, (2) Can a neighbour also organise something here for themselves?, and (3) Who should a neighbour contact to find out more details? Answers can be discovered

either by talking to someone in the Buurtkamer, or, if this is not an option, by finding QR codes posted on the window of the Buurtkamer building for this purpose (when QR codes are scanned, answers are provided, and points attributed). The questions are designed to encourage citizens to investigate locations in the neighbourhood, by identifying specific people who can help reveal the answers to information not known to the players. This challenge belongs to the *Detective* category.

4.2.3. Challenge 3: Interview your neighbours

The *Explorer* challenge seeks to find out more about a neighbourhood. In this case, players are asked to explore favourite places of people in their neighbourhood. They do this by questioning residents; players are requested to ask five people on the streets about their favourite places in the neighbourhood and why. Pens and papers are handed out, so that people’s responses can be written down. The questions in the *Explorer* challenge are open, without a clear or correct answer, and seeks to make players discover the perceptions of other residents on what locations they prefer in their neighbourhood, requiring orientation and exploration.

4.2.4. Challenge 4: Photo story

For this challenge, players are asked to make a photo story of the rhythm of their neighbourhood. They should take pictures of their daily routine, and illustrate the life rhythm of their neighbourhood. When do people go to the parks or do their grocery shopping nearby? They are asked to document what happens around them. Albeit this challenge can be solved without any social interaction, it stimulates citizens to reflect on the different daily routines that co-exist in the neighbourhood and consider which people undertake these routines. This is an *Explorer* challenge: it is very open, players are free to focus on activities of their choice: they can take pictures of activities in parks, cars, buildings,

schools, of people, animals, and anything else of interest in their exploration of their neighbourhood.

4.2.5. Challenge 5: Get to know each other

To perform this challenge, players are asked to first think about characteristics of their neighbourhood. One word from the winning word cloud from Challenge 1 is chosen, all participants are blindfolded, and asked to represent that word using a piece of rope. This exercise is done by all teams together, facilitated by mediators (to guarantee safety), requiring collaboration to solve this challenge. Rewards are awarded on the basis of the quality of performance. This challenge is of the type *Athlete*. Players have to physically work together and collaborate to solve the challenge (shaping the rope while blindfolded).

The above five challenges were specifically designed to be played by participants during Workshop 1. Players were required to interact with each other and with others on the street. While playing these challenges, they acquired a general impression of the game and could experience the four different types of challenges.

4.3. Workshop 1: play testing

The first workshop was held in January 2019. Participants were introduced to the research challenges and the workshop schedule. They were also requested to formally provide informed consent for participation in this research project and use of experimental data acquired. To start, all participants were handed a story about a new resident in the neighbourhood with information gaps that participants were asked to fill in as an activity to warm them up for the gameplay that followed (see Figure 4). Next, participants were asked to form teams. This resulted in two teams of two and one team of three participants (The members of the individual teams were friends or acquaintances). The first challenge ('Make the neighbourhood yours', see challenge 1 above) was located just outside the front door of the community centre. It was an introductory challenge designed for players to get acquainted and to start thinking creatively about their neighbourhood. After this challenge was completed, participants were free to choose which challenge they would play next (Challenges 2, 3, 4 and 5 from the description above).

Figure 5 shows participants outside playing the game. Not all five challenges were played by all teams. In fact, the Photo Story challenge was the only challenge played by all three teams. The challenge 'Discover your neighbourhood' was played by two teams. The 'Interview your neighbours' challenge was played by only one team. Participants all played three of the four different

types of challenges (Detective, Explorer, and Inventor) during the workshop. In total, participants had one hour to play the different challenges, after which they came back to the community centre for a plenary debriefing session of 20 minutes, a SUS questionnaire (Brooke 1996), and an open question survey. The open question survey contained in total nine questions about the following topics: quality of the challenges, meaning of social interactions during gameplay, and the neighbourhood. The questions about the quality of the challenges asked whether participants would want to play the game again, which part of the gameplay, which challenge they enjoyed the most and why, and if the game initiated interaction with others. The questions regarding the social interactions asked to what extent participants felt that the social interactions evoked by the challenges were meaningful and why. Finally, one question was asked about the neighbourhood: whether participants learned something new about the neighbourhood while playing the game.

4.4. Workshop 2: designing challenges

The second workshop held a week later focused on the co-design of challenges. Using simple brainstorm exercises, participants were asked to design challenges for the Secrets of the South game that would suit their neighbourhood. Participants were asked to think about and then write down on post it notes the different elements that comprise a challenge: such as locations, interactions, and activities. Table 1 shows the questions and triggers used in this exercise. Participants had five minutes for each question.

Participants were then split up in teams of two to design challenges based on the different elements they generated in the previous exercise as shown in Figure 5. Each team was handed sheets of paper that contained several boxes with which the game elements in a challenge could be described. These included: challenge location, type of interaction players are to pursue while playing the challenge, type of challenge, which information is to be shared while playing the challenge, and the challenge activity. Participants were given 20 minutes to design challenges after which they presented their designs to each other. The workshop ended with a brief discussion amongst participants about their challenge designs.

4.5. Data Analysis

During the workshops a wide variety of data were collected as shown in Table 2. In Workshop 1, each of the teams was accompanied by a researcher during gameplay.

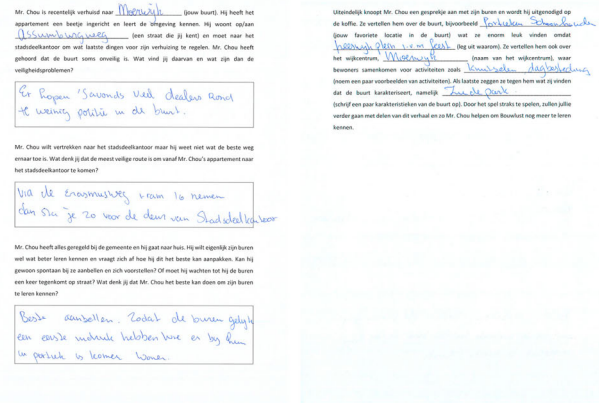


Figure 4. Participants working on the warm-up exercise inside the community centre (left) and one of the warm-up stories filled in (right).

The researcher observed interaction, took notes of the gameplay and experiences expressed by participants. They specifically wrote down how participants interacted with each other and with strangers, if they stated that they had learned new things about the neighbourhood, and if they indicated that they were enjoying themselves. This data was subsequently transcribed and used in the analysis. In addition, data were collected at the end of the first workshop on the usability of the game using the SUS questionnaire (Brooke 1996), the open question survey on social interactions, and notes taken by the researchers during the debrief discussion. The open question survey contained questions on the quality of the game and the challenges, the meaning of social interaction in the game, and whether participants had explored new places in the neighbourhood resulting from playing the game. The answers to these questions were analysed to understand citizens' preferences for challenge activities. Data from the second workshop came from audio recordings of the co-design session, challenge presentations, and

discussion, which were transcribed. Furthermore, the challenge designs that resulted from Workshop 2 were themselves treated as data which was then analysed. Three sub-questions guided the qualitative analysis of the data and supported the researchers to consider different elements of social interaction and neighbourhood exploration that could be mentioned by participants:

- Why and how did the participants interact with each other and the neighbourhood while playing the game?
- Which type of challenge activities are preferred by the participants (and why)?
- Which physical elements in the neighbourhood (locations/objects/people/etc.) are considered by participants to be fruitful for exploration?

Two researchers independently reviewed the data and marked data fragments relating to the questions. Each fragment was coded independently and compared.



Figure 5. In Workshop 1 participants discussed their daily rhythms during the Photo story challenge (left) and in Workshop 2 participants designed challenges for the game (right).

Table 1. Brainstorm questions and triggers.

Brainstorm question	Triggers used
Which locations in your neighbourhood would be appropriate to play a challenge?	Maps of neighbourhood
What things do people like to talk about?	Pictures of neighbourhood
What do you know about the history of the neighbourhood?	No triggers used
How can people interact with each other on the street?	Pictures of neighbourhood
What activities are happening in the neighbourhood	Pictures of neighbourhood

The researchers discussed differences between their codes and jointly decided to add, remove, or re-code a data fragment when both researchers agreed. They collaboratively defined meaningful clusters of codes to address the main research question.

5. Results: Citizen preferences for challenge designs

The following sections describe which *challenge types and activities* participants considered to support playful social interaction and neighbourhood exploration, the *physical elements* in the neighbourhood that stimulated exploration, and the *types of interaction* participants preferred for exploring their neighbourhood.

5.1. Challenge activities for playful social interaction and neighbourhood exploration

Data from the open question survey, observation notes, and the challenges participants designed themselves provided insight into which kinds of challenge activities participants considered for social interaction and neighbourhood exploration. The next sections describe the types of activities participants believe foster social interaction and neighbourhood exploration.

5.1.1. Discovering the neighbourhood

All of the challenges designed by participants in Workshop 2 involved discovering the neighbourhood. For example, one guided citizens towards particular landmarks in the neighbourhood and then asked the players to mark their discovery of the landmarks by scanning the QR codes on them. The purpose of this challenge was, according to its designers, to “show what things are

around in our neighbourhood” (P3, P4; Workshop 2). Such preferences for enabling others to discover their neighbourhood was also reflected when participants were playing the game: in one of the teams, one participant (P3, Workshop 1) spontaneously started to show the other two around the area, telling them stories on the shops that used to be there and how the neighbourhood had developed over the years. So the game triggered neighbourhood discovery by evoking personal storytelling.

5.1.2. Preference for familiar technology

During the gameplay and challenge co-creation sessions, all participants indicated a preference for technology with which they are familiar, beyond pen and paper writing. Participants had access to different means with which to support the exploration of the neighbourhood within the gameplay. They could scan QR codes, take pictures, write text into the game, discuss amongst each other, or use pen and paper to write and draw. When designing their own challenges, all four participants chose to use QR codes (used in two challenge designs) or pictures (used in three challenge designs) to solve challenges, and two challenge designs proposed writing text in the game to answer questions. The participants seemed to choose these technologies because they had also used them during the gameplay in Workshop 1.

Furthermore, face-to-face discussion or pen and paper writing were not preferred by participants because they were not considered to be engaging, as reflected in the observation notes. When playing the ‘Make the neighbourhood yours’ challenge, for which participants needed to create a word cloud about their neighbourhood on paper, the teams did not express behaviour that indicates fun, such as laughing, nor did they vividly interact with each other while solving this challenge. According to the observers, all teams were “taking the task very seriously” (observer 2) and “divided the tasks amongst team members” (observer 1 and 3). In this context, this challenge did not seem to be effective in creating a playful and fun experience for the participants to explore their neighbourhood.

5.1.3. Relevance of sharing information

All five challenges played by participants in Workshop 1 allowed them to share information about the neighbourhood in different ways. In the survey after the

Table 2. An overview of the two workshops activities and collected data.

Date	Workshop	Activity	Collected data
24-01-2019	Workshop 1	Play testing SotS with pre-designed challenges, debriefing	Observations, debriefing notes, SUS questionnaire, survey
31-01-2019	Workshop 2	Brainstorming challenges, presenting and discussing the outcomes	Audio recordings of workshop, challenge designs

gameplay, one participant indicated that sharing information about the neighbourhood “broadens her horizon” (P1, Workshop 1). One observer noted that participants discussed mutual problems, such as street youth, and possible ways of solving these problems. In the challenges participants designed themselves, the information required to be shared was about specific landmarks or stories about a location or object in the neighbourhood. For example, two participants (P1, P2; Workshop 2) designed a challenge for which players needed to discover the meaning behind street names. One participant (P2, Workshop 2) also mentioned that stories on the development of the neighbourhood are potentially interesting to be shared. The stories told by participants were, for example, about where the city used to end and how the city has gradually ‘stolen’ land to expand. All four participants (Workshop 2) found stories that include a kind of controversy interesting for challenge activities.

5.1.4. Designing challenges with purpose

When participants presented their own challenge designs to each other, it became clear that they had designed each challenge with a particular purpose. They deliberately designed challenges to acquire input from their neighbours on a local topic (one challenge design, P3, P4; Workshop 2), bring a certain issue to the attention of residents (one challenge design, P1, P2; Workshop 2), or stimulate a discussion amongst neighbours (one challenge design, P3, P4; Workshop 2). The explanations participants provided in the survey at the end of Workshop 1 on what they liked about the game and why, showed that participants enjoyed challenges that connect to their daily life. This was notable in the Photo Story challenge, in which observers wrote down that one team was very engaged and having fun in discussing their daily rhythm and taking pictures to document this rhythm, while another team did not enjoy this challenge because it was not at a location they usually frequent, and thus not connected to their daily life.

5.2. Physical elements in the neighbourhood for challenge design

Next to the challenge activities itself, participants also mentioned interest to explore certain locations and objects, and to share information about these places. These physical elements, and the information shared about them, could be used to design challenge activities.

5.2.1. Locations

During Workshop 1 and 2, participants mentioned various locations that are suitable to play challenges

or that could be explored as part of a challenge activity. In addition to naming specific locations in their neighbourhood, such as religious buildings, schools, or playgrounds, participants also named necessary characteristics of such locations. Participants mentioned several preferences regarding the proximity and distribution of challenge locations: even distribution throughout the neighbourhood, but also close to the centre. Challenge locations need to be close to each other, for those whom are less mobile to be able to play (P2, Workshop 2) and to enable multiple challenges to be solved within a short time frame (P1, Workshop 2).

Social locations, where activities happen and people gather, were also named specifically. For example, one challenge design was created by participants to be played at ‘De Uithof’, because “there are many activities being organised there” (P1, P2; Workshop 2). For these locations, the two participants expressed that a good atmosphere is important. One team (P3, P4, P5; Workshop 1) discussed their preference for a specific community space to drink coffee and meet neighbours was solely determined by this factor. The other factor that influenced choice of locations was their aesthetic appearance, such as parks or streets with beautiful trees around. One participant stated that “there are only beautiful streets in our neighbourhood,” and that it is kind of a “tree museum” when you walk around (P3, Workshop 2).

5.2.2. Landmark Objects

Objects in the neighbourhood that are considered to be appropriate for exploration are mainly landmarks. The suggested landmarks are often related to the historical development of the neighbourhood or they are suggested because they are simply remarkable in their design or location. Landmarks suggested by participants were, amongst others, bridges, statues, or historical landmarks. The latter is not necessarily interesting due to the object itself or its location, but rather because of the story that can be told about it. For example, one participant (P4, Workshop 2) told the group about two milestones that were placed in the neighbourhood, to mark the history of the Roman Empire, and that this specific place had once been in Roman hands.

5.2.3. Sharing information about physical elements

Interestingly, all four participants (Workshop 2) proposed challenges related to information sharing connected to a physical location, although the physical location itself was not necessarily of significance. For example, participants discussed how information about activities in the neighbourhood, stories and

initiatives could be physically distributed in the neighbourhood, using a specific challenge. They also discussed the use of other types of media such as a local newsletter that could be used to this purpose (not necessarily related to the game). These spontaneous discussions indicate that participants had a high need for information in their neighbourhood, and that currently a solution for sharing information is lacking.

5.3. Interaction leading to exploration

The gameplay during Workshop 1 supported several types of interaction and players were free to choose which type of interaction they apply to solve challenges. The way participants, thus, interacted while playing the game provides insight in their preferred type of interaction. The data also indicated that specific types of interaction and behaviour were triggered by the game.

5.3.1. Enjoying natural conversations

All seven participants (Workshop 1) enjoyed natural conversations with other citizens, who were not necessarily participating in the game, during gameplay. Participants interacted with their teammates and people on the streets. They engaged in natural conversations with them, by asking questions or by simply talking to each other as they were playing. In the survey, participants mentioned that they enjoyed meeting people (all participants; Workshop 1) and interacting with them during the gameplay (P1, P5, P6, P7; Workshop 1). The same can be concluded from the observation notes. Interactions with familiar people, such as their teammates, were experienced as bonding with friends, while greeting and talking to strangers was perceived as a way to create useful connections. When visiting the Buurtkamer, for example, four participants (P1, P2, P6, P7; Workshop 1) promised the representative of the Buurtkamer to come again and join one of the activities in the near future.

5.3.2. Collaboration

Participants worked in teams to solve the challenges, so collaboration was an important part of the gameplay. Participants were also able to take on different roles, such as the leader, during the gameplay. In the survey, three participants (P2, P5, P7; Workshop 1) explicitly mentioned that collaboration was important to them and that they enjoyed this about the game. However, not all challenges necessarily required interaction according to the participants. Some challenges were solved rather independently, some by dividing the tasks. Nonetheless, in the challenges participants

designed themselves, they indicated that teamwork and collaboration were important aspects.

5.3.3. Lowering the barrier for interaction

For some participants (P1, P6, P7; Workshop 1) the game activities lowered the barrier to interact as they engaged with strangers on the streets. They greeted strangers while playing the game or interviewed them about their favourite place in the neighbourhood to solve one of the challenges. Some of them did this naturally, while for others the boundary was lowered due to the gameplay. One participant mentioned in the survey: “Apparently for me the threshold to just walk in, and ask what they are doing and if I can join in, is high” (P1; Workshop 1). This indicates how the game has the potential to stimulate social behaviour and interaction.

5.4. Usability of the game

The results so far mainly describe how participants behaved in the gameplay and which activities they enjoyed, especially with regard to neighbourhood exploration and social interaction. As the game used was a prototype, the usability might have influenced the experience of participants and thus the outcome of this research. Consequently, the usability is briefly discussed in the following two paragraphs, to indicate to what extent usability issues might have influenced the results. The average score for the SUS questionnaire after playing the game (although not significant due to the low number of participants) is 62, and 68 is considered to be an indication of generally good usability (Brooke 1996). During the gameplay in Workshop 1, two usability issues were observed.

Albeit not all participants, especially the ones belonging to the age group of 65+, were proficient with a smartphone, they navigated through the game in general without help. All participants were able to find the list of challenges, open one, and to start navigating to its location. However, each team member had his/her ‘own’ phone with the game and the phones did not always show the same distances or directions to the required location, causing confusion within teams. All teams fixed this by just focusing on one phone to not allow further disturbance of the gameplay. The precision of the GPS receivers in the phones were the cause of the differences.

A second issue occurred when participants arrived at a challenge location and the challenge on the phone did not open because their GPS location was not close enough to the pre-determined coordinates. This led to some frustration. This also distracted participants

from engaging with the neighbourhood, as one observer noted: “This player is mainly engaged in figuring out why the game is not working, even though I told her multiple times to just join the discussion and use the other player’s phone to answer the questions. However, she kept on focusing on the phone and did not engage in the discussion with the Buurtkamer coordinator” (observer 1). Despite these two usability issues, the conclusion that participants generally understood how to use the game and their experience was not severely impacted, seems warranted.

5.5. Discovery through local information sharing

The theme of *Discovery through local information sharing* seems to be intertwined through all results: It plays a role in challenge activities, physical elements, and interaction. Participants can become motivated to explore the neighbourhood with the expectation of discovering an interesting location or story they do not know about. The workshops show that participants became very engaged with the game when they were learning new things, whether it was getting to know new people or stories on how the neighbourhood developed. Their curiosity was triggered during the gameplay; participants came up with questions themselves rather than following the game questions.

Considering everything that participants said and that was written in the observation notes, participants seemed to have enjoyed activities in which they share information about their neighbourhood. They told stories or presented interesting locations which they feel other citizens should know about. When discovering new locations themselves, as for example required for the challenge with the Buurtkamer during the workshop, participants became very excited, as reflected in their responses in the open survey (six participants named this explicitly) and the observations made. This illustrates that *discovery* is something participants highly valued and appreciated in the gameplay.

One crucial element for discovery in the neighbourhood is local information. The purpose participants assigned to challenges are related to stimulating information sharing amongst neighbours: either about a particular local issue that needs awareness, or an interesting activity that is being organised but not many people know about. It is clear from these suggestions that participants currently experience a lack of information sharing in the neighbourhood and would like to change this.

However, maximising the idea of discovery cannot endlessly stimulate neighbourhood exploration. The results express a paradox related to familiarity in the neighbourhood. On the one hand, participants want to

play at a location they do not know yet to discover new things. On the other hand, they want to engage with citizens from their own neighbourhood, and want locations to connect to their daily lives. This paradox was illustrated in the Photostory challenge, when one team did not enjoy this challenge because they were not at a location they usually frequent. This is similar for the familiarity of people that participants play with: they enjoy to be in teams with people they know, but also really like to meet new people during the gameplay. This illustrates the necessary balance that needs to be found between familiarity and discovery.

6. Discussion

The results of this paper present challenge preferences of citizens for location-based activities to foster social interaction and neighbourhood exploration. These insights can help game designers and researchers to understand which factors play a role and what is their influence. Furthermore, this research identified several new gaps around balancing discovery and familiarity in game design and collaboration as a game dynamic which need to be addressed in future work.

6.1. Discovery versus familiarity

The preferences of citizens for location-based activities that foster neighbourhood exploration creates a paradox for design: citizens want to discover new things at places that are familiar to them.

Designing a location-based game for neighbourhood exploration needs to put discovery as a strong element in the gameplay. Citizens expressed, both verbally as through their behaviour, that they enjoyed exploring locations in their neighbourhood which they had never visited before, they liked to get to know new people from their neighbourhood, and they took pleasure in hearing novel stories about their neighbourhood. This insight resonates with previous work, although there the focus was on learning as a motivator for participation, not stressing discovery specifically (Robertson and Simonsen 2012). In the research of Disalvo et al. (2008), for example, citizens used simple sensing robots to explore their neighbourhood and became more engaged with the project when they started to acquire new insights on their neighbourhood, like the high sound levels of cars at a certain crossroad, based on the data they collected with the sensing device. Discovering what is happening in the neighbourhood and what are the so-called matters of concern (Bjögvinsson, Ehn, and Hillgren 2012) is a motivator for citizens to engage

and become active (Gooch et al. 2018; Erete 2015). This insight specifically is supported by this research as well.

Discovering experiences can be facilitated by distributing challenges in areas known to players, as well as areas they do not often frequent. For this to happen, game designers or researchers need to understand which areas and locations are familiar to players, for example by talking to citizens and walking around in the neighbourhood (Slingerland, Lukosch, and Brazier 2020), to make a reasonable distribution of challenge locations. This interplay between design and the local environment is also acknowledged by others (Cila et al. 2015; Ehn 2008; Le Dantec and Fox 2015). Location-based activities for neighbourhood exploration and social interaction can, therefore, not be designed without taking the surrounding neighbourhood into account. The locations need to be appropriate for the designed activities and be relevant for the citizens who will engage with them (Kuijjer, De Jong, and Van Eijk 2013). It is, therefore, vital that researchers and designers engage with citizens of the neighbourhood through extensive field research, to understand which challenge locations and activities are appropriate for the specific context for which groups of citizens (Kendall and Dearden 2018; Slingerland et al. 2020).

Albeit citizens can be motivated through the promise of discovering new places, people, and stories, citizens do not like to explore a place that is completely unfamiliar and unrelated to them. This finding corresponds with previous work (Papangelis et al. 2017), in which participants reported that playing at locations they connect with is more meaningful than places they had never seen before. People have different ways of connecting to places (Friedmann 2010; Pink 2008; Crivellaro et al. 2016) and this research revealed that citizens connect through the familiarity and comfort of knowing a place because they have previously visited it numerous times. Therefore, it supports earlier findings that citizens prefer to play in areas and teams that are familiar to them which connect to their daily life.

6.2. Collaboration as an important game dynamic

The location-based games and other urban playful experiences that were reviewed in the background section, show a dominance of using a competitive dynamic in the gameplay (e.g. Clark and Clark 2016; Papangelis et al. 2017; Sotamaa 2002; Pyae, Luimula, and Smed 2017; Hodson 2012; Peitz, Saarenpää, and Björk 2007). Collaboration and cooperation as game dynamics were used in previous research, for example in Epidemic Menace (Fischer et al. 2007). In this game, players had to collaborate as a team

and compete against other teams in finding who released the virus. They reported that they enjoyed communicating and working in pairs while competing with the opposing team. Players indicated cooperation as a positive element of the gameplay, which corresponds with the results from the current study; namely that citizens have a strong preference for challenge activities based on collaboration and the act of playing together in small teams encouraged social interactions.

Citizens expressed that collaboration in their neighbourhood community is important to them, and specifically designed challenges where players need to work together to solve a problem. Nonetheless, many games discussed in seminal work mainly use the game dynamic competition and not collaboration, though it plays a major role for building citizen communities (Slingerland, Lukosch, and Brazier 2019; McMillan and Chavis 1986; Nicotera 2008; Collins, Neal, and Neal 2014; Kim and Ball-Rokeach 2006). For such communities to thrive, citizens need to work together and achieve something collectively. This research further highlights that citizens prefer collaborative activities if they jointly explore the neighbourhood in a playful way. Consequently, game activities that aim to support neighbourhood exploration and social interaction require the use of collaboration as a game dynamic, for citizens to be motivated to play.

6.3. Three new challenge types

During Workshop 2, citizens deliberately came up with challenges that served a particular purpose. These challenges differ from the current challenge types in the kind of behaviour they prompt from players. As a result, three new challenge types are proposed based on the challenges citizens designed themselves as part of this research. All aim to foster neighbourhood exploration, either through examining new locations, having social interactions with people on the street, or learning about neighbourhood stories. The three new types of challenges proposed by the participants in this study extend the current classification with four challenge types to include:

Hunter: The behaviour elicited by this type of challenge is linked to finding specific type of people or objects, as opposed to finding random people (which would be the *Explorer*). Hunter is about finding tangible things that can be human, animal, or an object. For example, finding the person responsible for the community centre to ask what types of activities can be done there. If and when such people cannot be found at a given time, players can find ways to still address the challenge (e.g. finding a QR code attached to the community centre explaining exactly what they would like

to ask the person.)

Artist: This type of challenge requires players to design artwork in and about their neighbourhood, based on creative processes individually or collaboratively. Such artwork might be abstract and personal or collective, and represents a creative expression about the player's neighbourhood. For example, creating a song or musical performance (rapping), writing a poem, or storytelling.

Volunteer: This type of challenge invites players to contribute towards the community, and supports behaviour to help others or contribute to the quality of life in the neighbourhood. An example of a challenge of this type is picking up trash at a specific location to make a nice piece of art with it, and taking a picture of it to publish in the media of the local community, before the trash is collected.

These three challenge types, together with the other four (*Athlete*, *Detective*, *Explorer*, and *Inventor*), ask for different type of play behaviour and interaction to solve a challenge. They require players to do physical activities (*Athlete*), find information and factual knowledge (*Detective*), explore the neighbourhood (*Explorer*), propose ideas and explore opportunities (*Inventor*), find specific things or people (*Hunter*), create and express thoughts, feelings, interests in some form (*Artist*), and contribute to the environment and help others (*Volunteer*).

6.4. Co-creation approach

This research used a co-creation approach (Sanders and Stappers 2012) to cultivate knowledge and understanding of the context of urban neighbourhoods. During gameplay, citizens shared information with each other on their own neighbourhood, through which they discovered new things. This paper identified the kinds of information citizens prefer to share, but realise that this also depends strongly on the participants and context (Ehn 2008; Kuijer, De Jong, and Van Eijk 2013). For example, all participants in this research are engaged with neighbourhood initiatives, and were therefore interested to know more about other initiatives to see how they could be connected. Previous work stresses as well that connecting with the local community to understand what drives them is vital to the design of something meaningful (Balestrini et al. 2017; Kendall and Dearden 2018; Comes 2016; Le Dantec and Fox 2015). To design meaningful activities for neighbourhood exploration, researchers need to build relationships with community members and spend time in the local context, to connect with the community and understand what is important to them (Slingerland, Lukosch, and Brazier 2020).

Throughout the research, citizens were not only subjects but were treated as co-creators of the research and

game design. They could influence the design process of the game by designing parts of it themselves, like they did during the Workshop 2. Despite many researchers and game designers involve players in the development of the game (e.g. Jones et al. 2017; Wolff et al. 2007; Pang et al. 2019), they do not directly allow their target group to design parts of the game as presented in this work. However, allowing citizens to design parts of the game not only provides better insights into what interests them (Sanders and Stappers 2012, p. 67), it also increases their motivation to engage with the game because citizens start to feel ownership towards their own game designs (van Rijn and Stappers 2008). As such deep knowledge on the context is required to design an effective game that properly addresses discovery and information sharing, co-design is a suitable approach for this purpose.

6.5. Challenges for future work

Several guidelines were identified in this paper on how to playfully foster neighbourhood exploration. These findings also lead to new questions and thus challenges for future work. The first finding states that discovery is an important motivator for citizens to explore their neighbourhood. Discovery is something that can be done only once per location, person, or story. Accordingly, the question pops up how discovery needs to be addressed on the long run. For example, can players re-do challenges, for which every time they discover more details about a place or story? Research of, for example, Jones, Theodosis, and Lykourentzou (2019) shows that this is an option: games can facilitate reflection on a familiar place to support the discovery of new meaning. Another option could be to allow citizens to add challenges, that entail discovery themselves, and this would require citizens to know which places might be interesting to be discovered by others. Hence, one challenge that needs to be addressed in future work is how discovery in the game can be addressed on the long run.

This paper shows that discovery needs to be balanced with familiarity, to make sure the items that are discovered relate to the daily lives of players. That this is complex was shown during the workshops. Participants had different levels of familiarity with areas in the neighbourhood in which the game was played, but this did not directly impact their engagement during gameplay. This means that also other factors played a role, such as the challenge activity or personal interests. Hence, for certain types of challenges discovery may be more important as a motivator than for others. This balance needs to be explored

further in future research, because this research only identified some indicators of this balance, but not how it exactly should be manifested. In general, future work could focus on exploring these mechanics as well as scaling the research up by involving more participants and from a wider age group.

Another point for future work results from the three new challenge types that were proposed. Future research should investigate whether these challenge types are able to foster neighbourhood exploration and social interaction, and whether they are preferred by citizens to be played with this purpose in mind. Furthermore, the temporality of the interactions as a result of gameplay can be investigated further for all challenge types. For instance, whether social interactions are sustained after gameplay and if some challenge types are more effective in supporting sustained interactions than others. The challenge types can be related to the work of Bartle (Bartle 1996, 2005) on player types, describing roles often seen in games that evoke social play (Salen, Tekinbaş, and Zimmerman 2004; Bartle 1996). The challenge typology can also be associated with the player traits and characteristics described in other research (Tondello and Nacke 2019; Tondello et al. 2019). A direct overlap between these preferences of players and the challenge types cannot be found, possibly because they are based on virtual or pervasive games, respectively. Future research could investigate the relationship between player traits and the proposed challenge types, to create a coherent and consistent classification of challenges for neighbourhood exploration.

Finally, the gameplay takes place within the urban environment, where citizens are not the only actor. Public institutions, such as local governments or community centres, might also become players of the game. They could add location-based activities to inform citizens on important topics or the activities might require citizens and neighbourhood professionals to collaborate. Playful location-based activities could thus play a role in fostering direct contact between the various actors in the urban space and future research could focus on how different location-based activities can facilitate this process.

6.6. Limitations due to sample size and context

This study comes with some limitations regarding the generalisation and applicability of the findings. It is based on one location only (The Hague, The Netherlands). Albeit the effort to involve as many citizens as possible, and to have a group of participants that is representative of the chosen location, the participant

sample was small and not representative for the neighbourhood. The majority of participants in the first workshop were women, and in the second workshop both male and female genders were equally represented. Diversity in ethnic background, age, and therefore the preferences of these non-represented citizens is not accounted for. Nonetheless, measures were taken to ensure credibility of the work. This study applied triangulation regarding researchers, and regarding data collection. Researcher triangulation was achieved by having three different researchers observing the teams playing the challenges. Triangulation regarding data collection was achieved by having two researchers independently coding the data resultant from the workshops. The results are, therefore, considered trustworthy and can be transferred to other neighbourhoods that are similar to the presented case study area. Further research is needed to explore the applicability of this study in locations that are dissimilar to the presented case study. Similar studies in different locations could render different results due to different social rhythms, norms and values of both individuals and communities. The reported types of challenges are considered to be stable, as they are not solely based on this study.

7. Conclusion

For citizens to be able to contribute to the liveability and safety issues of their neighbourhood, they need to have adequate knowledge of their fellow citizens and of both the current and historical developments in their neighbourhood (Zaff, Kawashima-Ginsberg, and Lin 2011; Manturuk, Lindblad, and Quercia 2012; Kim and Ball-Rokeach 2006; Li, Pickles, and Savage 2005). Albeit mobile technology and games are able to foster social interaction and engagement of citizens with the urban environment (Nijholt 2017; Jones et al. 2017; de Lange and de Waal 2013), the aforementioned seminal work does not explicitly state what kind of activities within these games should be included for this purpose.

Therefore, this paper examined a location-based game with the following research question: *What kind of location-based activities do citizens prefer to interact with their neighbours and to playfully explore their neighbourhood?* Two workshops were organised in The Hague in which citizens played different activities, called challenges, of the location-based game *Secrets of the South*, and designed their own challenges for this game. The contribution of this paper is a classification of different types of location-based activities and insight into citizen preferences for these activities, that foster neighbourhood exploration and social interaction. The central finding is that citizens prefer to play challenges

in which they jointly discover something about their neighbourhood, such as a location or an activity, but that these discoveries, in order to be engaging, need to relate to their daily lives.

The resulting outcomes further suggest several pathways for future work. One can only discover something once, so it needs to be further investigated how discovery can be sustained as a game dynamic. There are other things to explore in the neighbourhood besides locations and activities, and these might enable citizens to keep on discovering things about their neighbourhood. For example, stories on what happens in the area, who lives there, and how the neighbourhood develops is something that can be build and continued long-term (Crivellaro et al. 2016). The next step for this research is to explore alternative ways of discovery in the neighbourhood.

This research extends the current discourse on designing location-based games by proposing a set of game activities which complement the mobile digital gameplay of a location-based game with physical elements and social interaction in a neighbourhood. It identified motivations for citizens to go out to explore and which locations, people, or landmarks are suitable to build playful experiences. It identified collaboration as an important game dynamic for stimulating exploration and interaction, while many current games for this purpose are based on competition. Game designers and researchers can use these findings as a guidance in creating playful experiences aimed at fostering neighbourhood exploration and social interaction in the future.

Notes

1. <https://whatsthehub.nl/projects/koppelkiek/>. Koppelkiek, 'couple snapshot' in Dutch, last visited on 01-Mar-2019
2. These games are mainly supported by smartphones and mobile devices, because they are networked, using sensors (predominantly GPS and Wi-Fi), widespread, and easily accessible (Valente and Feijó 2017; Magerkurth et al. 2005).
3. See <http://www.participatorysystems.nl> for more information.
4. <http://secretsofthesouth.tbm.tudelft.nl/>, Secrets of the South, last visited on 19-Mar-2020

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ORCID

Geertje Slingerland  <http://orcid.org/0000-0002-3938-2427>

Xavier Fonseca  <http://orcid.org/0000-0003-0558-3172>

Stephan Lukosch  <http://orcid.org/0000-0001-7203-2034>

Frances Brazier  <http://orcid.org/0000-0002-7827-2351>

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