Testing Stamp Rally Mobile Application to Encourage Self-learning Local Area Enhancing "Wayfinding" and "Place Legibility" in Multicultural Society

Dae Yong Kim[1], Matthias Pietsch[2], Nicole Uhrig[2]

[1]Anhalt University of Applied Sciences, Bernburg/Germany · daeyong.kim@hs-anhalt.de
[2]Anhalt University of Applied Sciences, Bernburg/Germany

Abstract: This paper aims to demonstrate the implementation of a gaming method and mobile application to encourage users to independently learn a local area in multicultural society. The authors tested a stamp rally mobile application on 13 international students from eight different countries who had little information about the city. It is expected that these methods will be employed to encourage public participation at the early stages of information input in the planning process. Moreover, it is considered that these game methods can be tailored to the implementation of "public hearings" to establish the views of local people in regard to the current state of the environment and compare the perceptions of people from different cultural backgrounds by increasing the awareness of the surrounding area and highlighting problem areas. This test and case study illustrate the presentation and participation applications using a mobile application and provide a foundation for further research.

Keywords: Game strategy, self-learning, stamp rally, public participation, multicultural society

1   Introduction

Public participation benefits environmental planning by enabling people to directly influence planning and possibly decide on changes to their own town or city. Public participation increases people's sense of ownership (LACHAPELLE 2008) because changes come about as a result of their efforts. Moreover, and, most importantly, the people who live in a place are the ones most affected by changes to that place. Public participation also helps people collaborate and eliminates conflicts and misunderstandings by improving inhabitants' understanding of the whole process of planning and its potential problems and limitations.

In Germany, many studies have highlighted the challenges posed by recent "demographic and socio-cultural changes" in relation to drawing the public's attention to, and generating interest and active involvement in, public participation in spatial planning, in comparison to previous years. Moreover, public participation has become increasingly important of late (KÜSPERT et al. 2017).

Over the last few decades, Germany has undergone dramatic demographic changes, and many cities are suffering from the shrinking city phenomenon (TRÖSTER 2012). The natural trend in Germany is towards an aging and declining population, leaving the country largely dependent on the influx of immigrants for population growth (SWIACZNY 2014). The number of foreigners has skyrocketed in the past two years (2015-2016), in "the biggest net increase in 50 years" (SANDERSON 2017). This is due to the mass arrival of migrants from both European Union (EU) and non-EU countries due to political (i. e., refugees), economic (i. e., employment), family (e. g., marriage) and educational (i. e., students) reasons. These factors are rapidly transforming Germany into a multicultural society. As a result, we would like to suggest that city planners and local authorities consider finding different and more effective

methods to encourage public participation in a multicultural society, taking consideration of both language and cultural barriers, as well as space and time.

The authors believe that the right tools and effective strategies can lower these barriers and consequently encourage public participation among the inhabitants of a particular place. The use of information technology (IT) tools can raise awareness of current local and environmental issues and development plans (i. e., disseminate information) and encourage more active public participation despite cultural and language differences, even making such participation fun.

EUROPEAN INSTITUTE FOR PUBLIC PARTICIPATION (2009) notes that "well informing" is the first step of public participation. When the public is properly informed, the level of understanding is advanced, which facilitates public engagement. In this regard, it must be considered how we can deliver information to the local people – who consist of both native inhabitants and newcomers, whether migrants, foreign students or refugees – to better inform, and ultimately motivate and engage them, fostering collaboration and improving public participation in the context of a multicultural society.

2 Gaming for Autonomous Learning of Local Area

According to BORGES et al. (2015), public participation requires people to understand spatial information. GERMANCHIS et al. (2005) notes that gaming and the actions of navigating and orienting oneself enhance "wayfinding" and "place legibility" (LYNCH 1960), which helps local inhabitants understand a place. Furthermore, digital game-based learning is a powerful educational tool for those who have grown up with technology (PRENSKY 2001). A participatory project undertaken in Boston's Chinatown in 2010, which used a computer gaming scenario, provides an excellent example of how to use the functionality of gaming and gaming strategy to encourage public participation in the development planning of a local area by allowing local inhabitants to consider local issues and engage with local development planners (WALSH 2017, GORDON 2010).

In addition, KIILI (2005) notes that providing participants with clear goals and challenges facilitates a seamless experience by "examining the sequences in which a person perceives his surroundings" (BURCKHARDT 2015). KIILI goes on to recommend the use of stories in game design, since storytelling is critical to the ability of a game to immerse and engage participants.

In this regard, we experimented with a simple city rally game incorporating a stamping activity, popular with tourists, which provides a simple goal along with a souvenir (i. e., stamping on a stamp book). We tested web-based stamping city rally software integrated with a geo-positioning system on new foreign students. The aim of the study was to investigate whether these gaming activities could provide participants with the ability to independently learn a local area by enhancing "wayfinding" and "place legibility" (LYNCH 1960), and establish whether this would be applicable even to newcomers to a place.

3   Stamp Rally

3.1   City Rally as a Spatial Learning Tool

At the beginning of the first semester of every year since 2014, orientation days have included a city rally game aimed at new foreign students who have little knowledge of the local area. The aim is for them to gain familiarity with the city and its facilities through an entertaining activity. For this game, each group is provided with (1) a paper map, (2) old pictures of the city, and (3) several missions, including locating landmarks or city facilities by exploring the city by themselves.

The students are given tasks such as taking selfies that match the pictures of the old city and locating various city facilities such as the city hall, supermarkets, the post office, and so forth. When they have finished their missions, they are asked to present their findings to their colleagues, thereby sharing new information and experiences.

Fig. 1:   City rally score board and one of the missions on the screen in 2014 (left). One student presents what his group has found/known in the rally (right).

In October 2017, after three years of paper-based city rally experiments, we implemented a web-based mobile technology developed by UFO79®, an independent software engineering group in South Korea, adding a stamping function on the site using a mobile phone. The website (https://www.ufo79.com/PIX/ufo/bct/stamp) was originally developed to draw tourists' attention to new events or landmarks in a South Korean city, and guides visitors using icons on Google Maps, which was integrated with stamping activities on smartphones.

The software is web based; anyone can access the site using a link via a messaging or social media app without the need to download a sizeable new app, the data and time costs of which can be a barrier for visitors.

3.2   Methods

In preparation for the city rally, pictures of landmarks and important city facilities were uploaded to a server and each mission and its geo-coordinates were added to tables on the admin page. The pictures were then automatically coordinated and illustrated as pin icons on the Google map integrated into the web page (Fig. 2).

Name of place	Mission	Picture	Latitude	Longitude
Post Bank	How much does it cost for sending a 500g of gift for your friend in your country? Get the information and take picture of your group selfie on the same spot.		51.795700	11.741972
Rathaus (City Hall)	Take a hilarious group selfie!		51.794333	11.735814

Fig. 2:   Admin page to input missions, and the geo-coordinates of each location

The parameter of proximity was set as 20 meters in diameter from the point of interest (POI), at which point participants can activate the stamping icons and access their missions. It is advisable for the proximity distance to be set within the range of 20-30 meters; when the proximity is set too narrow or too wide, it can be either too difficult to position the POI, depending on the smartphone's GPS sensitivity, or too easy to activate the task icon from far away. Fig 3. shows the inactivated black POI icon (left) being activated, represented by a change to red, when a participant (represented by the icon "me" on the right) approaches within 20 meters of the POI (middle). Once this location is reached, participants can access the mission page (right) by clicking on or touching the activated pin icon. For example, when participants approach within 20 meters of a post office, the icon on the smartphone software (center) changes color to indicate that it has been activated, and a task appears: "How much does it cost to send a 500g gift to your friend back home? Get the information and take a selfie of your group on the same spot".

Fig. 3:   The inactivated black POI pin (left), the activated red pin (center), and the activated missions in the pop-up window (right) (Map source: Google Maps)

Following the data upload and setup of the web page, a test was executed on a desktop computer. The testing tools can be found on the Chrome web browser following the path View>Developer>Developer Tools, as shown in Fig. 4. Using the developer tools, the site can be tested with mobile devices with different screen sizes, such as the iPhone X or Galaxy S8, to see if the information renders correctly on various screens. When a custom location was added to the geolocation menu (see the blue box in Fig. 4), the browser located a device

at the POI that could be used to test the stamping rally remotely without visiting every location in person. Later on, testing was conducted at each site in person using a smart phone to identify any malfunctioning features. Following testing, City Rally was deemed ready.
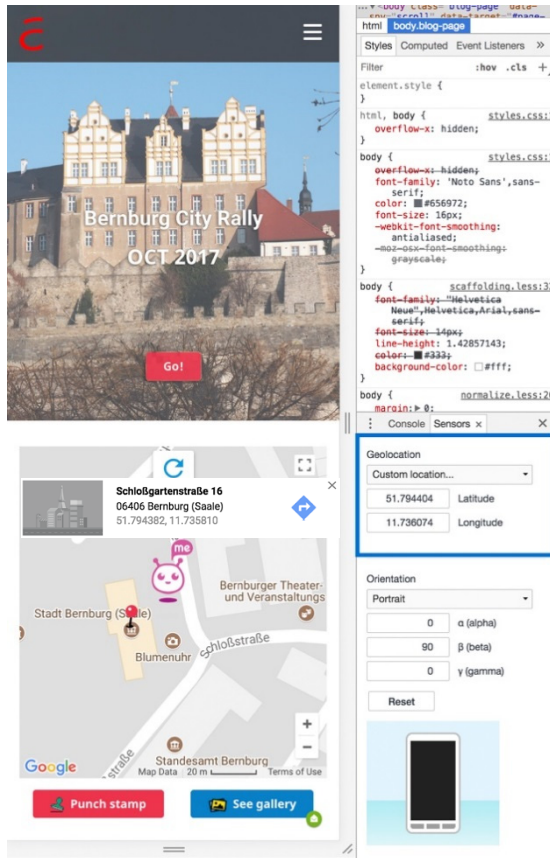

Fig. 4: Testing page on the Chrome web browser (Map source: Google Maps)

It took us 10 days to prepare, including 1) three days of pre-test with sample pictures and manipulated geolocation on a desktop computer and on a smart phone at a site, 2) five days of data collecting (i. e., selecting the attraction points and collecting/taking pictures), data uploading/geo-coordinating and missions assignment, 3) one day of test at the sites and 4) one day of correction and re-test at each site.

On October 10, 2017, 13 students from eight different countries – Bangladesh (4), Chile (2), Egypt (2), Hong Kong (1), India (1), Iran (1), Jordan (1) and Niger (1) – participated in the game. Six people (46.1 %) had been resident in Bernburg for less than one week, four (30.7 %) for two weeks, two (15.3 %) for three weeks, and one (7.6 %) for an unknown period. Following a short introduction and after logging in to users' Facebook accounts in order to identify the users and allow them to upload pictures of the POIs, the students were divided into four groups and began the rally.
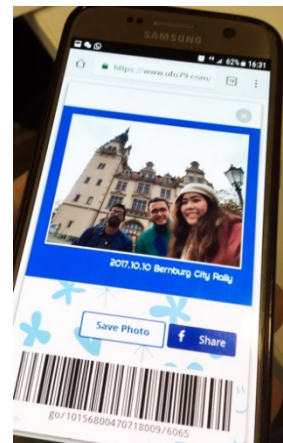
1. Finding POI on the map
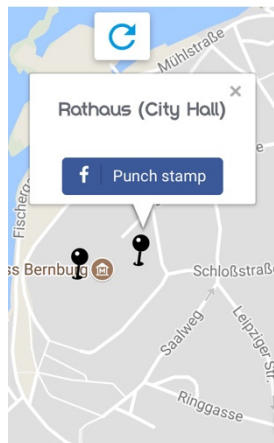
2. Punching the stamp and completing the mission
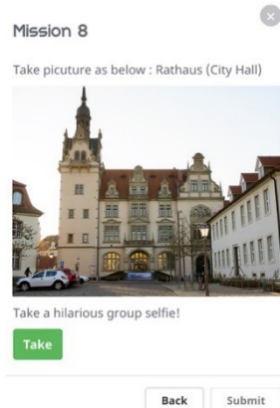
3. Taking pictures and saving them on the gallery

4. Presenting and explaining their findings

Fig. 5:   Chronology of stamping city rally (Map source: Google Maps)

4   Results

Following the rally, a questionnaire was administered to the participants. The questionnaire revealed that the use of integrated gaming activities using smartphones was interesting to and drew the attention of the new students. In particular, the students confirmed that they came to know the location of important city landmarks and city facilities and to gain essential knowledge of the local area such as how to use the post office, where to find the city hall, and how to locate the weekly specials at the supermarket.

What follows is a selection of questionnaire results (N=13).

Q. I found the city rally is useful and fun.		Very much	Some-what	Neither	Some-what	Very much	
Q. I found this using mobile device and the application is usable and fun.	Strongly Disagree	–	–	1	**4**	**8**	Strongly Agree
	Strongly Disagree	–	–	–	**4**	**9**	Strongly Agree

A short interview with one of the participants was elicited the following feedback:

> *"After I used this city rally, I know the direction and location really clearly. Also, I know…uh… identify where this is, what it is…where the Rathaus* [city hall] *is, where the post office is. This is really useful program. I really like it."*
> Wingyan Ho from Hong Kong, resident in Bernburg as of October 10, 2017.

5   Conclusion and Future Research

This study demonstrated a stamp rally game using a mobile web application to establish whether gaming can be applied to help locals enhance "wayfinding" and "place legibility" through navigating and orienting themselves.

The stamp rally activities (e. g., completing missions such as taking selfie pictures in front of city landmarks and uploading these to their own Facebook pages or the city rally gallery) were evaluated as fun and useful, and the use of mobile application was considered usable. The storytelling was also found to function well. For example, one of the POIs was a bridge in a dry meadow that drew the attention of the participants. When participants were told the story of the bridge after the rally, they seemed to find the activity more meaningful.

The results of the questionnaire and the interview indicate that the application has the potential to be applied in service of informing the public to encourage public participation, which will help local residents understand their surroundings. This is particularly useful for new residents who have little information about the local area.

Additionally, such game methods can be used in "public hearings" to establish local people's opinions regarding the current state of the environment. Moreover, if additional functionality (e. g., the ability to leave comments, pictures and send messages to others) were added to the software, it could also serve to compare the perceptions of people from different cultural backgrounds, to evaluate the existing situation and to suggest to improve the actual situation.

Among the different levels of public participation: "inform, consult, involve, collaborate and empower" (INTERNATIONAL ASSOCIATION FOR PUBLIC PARTICIPATION 2014), this case study focused on the informing level of public participation in the context of multicultural society. Therefore, it needs to be more discussed how we can implement the methods in the whole process of public participation not only to increase the awareness of the surrounding area but also to bring collaboration and the empowerment.

As the next step in this research, we would suggest the addition of more functions, such as the ability to comment on and express feelings toward a point of interest by means of various icons or colors. Moreover, the use of virtual reality (VR) and augmented reality (AR) features such as those used in Pokémon Go may be of use; as SMITH et al. (2009) argue, more immersive environments, whether in the real or a virtual world, elevate participants' levels of motivation and understanding and increase game users' levels of engagement and activity, which may be used in the participation process in the early stage of Geodesign project as a communication tool.

Acknowledgment

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