Gamification for Better Experience in Queues During Entertainment Events

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Abstract-It is a trend that large technological events of multiple attractions become research points of regional and urban development strategies. While most studies investigate economic factors, population-oriented or marketing, our study is focused on the experience lived in these events by the participants. This study made an investigation based on significant events and fairs of digital games in Brazil that can be applied to other events of the same nature. We conducted an investigative study using design thinking techniques such as desk research, interviews, awareness book, one day in life, empathy map, persona, simulation and ideation workshop. As a prototype result, we proposed a design of a gamified mobile application that communicates with a wristband with identifiers (QRCode) scattered throughout the event. Our findings, besides helping in the design of a solution, showed the real need of managing queues and providing a good user experience in these queues. This design can contribute to a new vision and development trend of applications that seek to manage events of large and diverse simultaneous attractions environment.

Keywords-Queues, Entertainment events, Gamification, User experience, Design thinking

I. INTRODUCTION

In large technological events, it is quite common for the presence of multiple attractions, which generates a variety of public of different sub-interests. In particular, technological events of digital games, such as E3, Brazil Game Show, SBGames and others. are extremely attractive to diverse categories of public, from children to older adults of all genres. This is due to the great massification and heterogeneity of existing games types that make this public increasingly heterogeneous [6], [7], [13].

Because of these diverse categories of public and a large number of different attractions in gaming events, it is quite common for the presence of big queues. They generate uncomfortable sensations in its participants before, during and after the event, such as anxiety, tiredness, discouragement, irritation, feeling of not enjoying the event, among others. Human queue management is an essential area for a vast market. Several places need to deal with queues of people, and some basic examples are airports where people need to wait in queues to pass security, shops, and baggage dispatch. Amusement parks where the management of queues is necessary where people wait for their turn to get in the attractions. According to Parameswaran et. al [11], ineffective management of queues can result in unfair service and customer dissatisfaction, which in turn leads to loss of revenue by the service provider. Given this importance of queue management, it is possible to note the need not only to monitor individual queues but to understand the motives that make this queue emerge.

In this work, a solution is proposed based on design thinking to improve the user experience in queues inside multi-attractions events. We performed several stages of Immersion and Ideation as well as a dynamic with cards that involves the mix of these two steps. We developed a simulation of an event with queues, where users answered questions in the back side of assorted cards using a gamification rewards system [4].

II. RELATED WORK

From the standpoint of gamification, Pope et.al [12] made a study on the process used to design a mobile game that encourages real physical activities through virtual rewards (in the mobile game). During the process were evaluated, 50 students from the 2nd year of 5 teachers from a diverse school with 1006 students, were: 47.91% students with low income, 35.98% non-white students and 17.99% English learners. The authors used the YPAR (Youth Participatory Action Research) methodology during the design process in collaboration with students. During this design process, 30minute classes were given daily by two researchers and a game designer, consisting of theory and good game design practices. They were used to design four-game contents and four art styles to be chosen later. Each student received four colored stickers and voted separately using consensual voting on two favorite game contents and two favorite art styles. Through the suggestions of the evaluated, the authors were able to conclude that the majority choice reflected the dominant and natural behavior of motivation for rewards of adolescents, which according to research done by Pope et al. is even higher than in adults, since adolescents have a neural system of rewards that corresponds more with social stimulus than adults.

In the work of Mora et.al [9], the researchers investigated how to provide design focused on IoT (Internet of Things) users, providing tools to help engage people who were not experts in ideation (users with no experience). Mora et al. present a methodology for the ideation phase with cards to assist in the collaborative thinking. According to Mora et al., the cards provide a source of inspiration for non-specialists. Specifically, the cards inspired: a set of IoT technologies, creative and critical thoughts and means of reflection to evaluate the ideas generated. According to the authors, the cards facilitate collaborative and divergent thinking by providing means of communication among stakeholders and also allowing the exploration of ideas so that each idea is evaluated and analyzed through different points of view. The researchers produced 110 cards of size 9x6cm, divided into seven distinct categories (differentiated by color to facilitate). One side of the card informed the purpose of that card and the other side (its back) provided the contents of each card.

In order to provide guidance during the workshop, the authors created this technique to be used for a minimum of 2 and a maximum of 6 participants. The technique consists of identifying the problem, analyzing the problem, generating a potential solution and a critical reflection on the ideas and solutions generated. All activities use a "playbook" which is a description of the seven design actions that participants must perform according to the rules and limited time. The "playbook" also limits the number of cards that can be used in each design session.

The purpose of each workshop was to design an IoT application that could support sustainable behaviors in smart cities for a set of personas and scenarios. The authors concluded that during the process the kit was handy for guiding and informing non-expert participants quickly, generating ideas for IoT applications. It also assisted in the development of strategic thinking among participants.

III. DESIGN THINKING METHODOLOGY

We use design thinking as a methodology to conduct the process phases to develop our design prototype. To perform this research, we used the Stanford d.school design thinking model [3]. The Figure 1 shows the pipeline used in our design process. It is essential to know this sequence of stages is not obligatory and the activities can be mixed. In that sense, we combined one activity from deep immersion stage (queue simulation) with the ideation stage.



Figure 1. Pipeline of our design thinking process.



Figure 2. Magic Band used at Disney theme parks with the goal of stopping queues and waiting time for users who opt to pay more for the convenience.

IV. IMMERSION STAGE

According to Brown et. al [3], Martin [8] and Norman [10] this step is intended to provide the initial understanding of the problem.

A. Preliminary immersion

Mainly techniques used in the preliminary immersion are: exploratory research and desk research. Desk research comprises searching for information using existing resources, such as the press, the Internet, analytical reports and statistical publications. This is then followed by cross referencing and the collation of data. In this work, we used desk research through online videos, press and photos of entertainment. One solution found that caught our attention and we found most interesting was the Disney Magic Band (Figure 2).

The bracelet is attached to a digital system that integrates different Disney services. It is an armband which has a builtin radio frequency chip, the so-called RFID. With this chip on the wrist, Disney can identify you inside parks, shops, and hotels and offer you a variety of personalized experience, including avoiding queues at attractions [2].

As part of the exploratory study we performed an interview with a former employee of Brazil Game Show¹.

We asked two opened questions:

- Q1: How is queuing control done in BGS?
- Q2: What do you think you could improve to avoid long queues?

For Q1 the former employee replied that it is carried out a manual queue control, with the employees themselves managing and controlling the queues for each attraction. In Q2, he suggested use of a paper wristband with a unique identifier for each visitor so that the control in queues could be semi-automatic.

¹Brazil Game Show: The most important game event in the Latin America http://www.brasilgameshow.com.br



Figure 3. Register of the entrance queue in an event of digital games.

B. Deep Immersion

The deep immersion stage has the objective of discovering deep in the context of the lives of the actors studied and of the subject worked with. At this stage, there is a search for information, thoughts, attitudes, and feelings of the actors involved [3], [8]. In this phase, we applied four techniques: Awareness book, One day in life, Empathy map and Persona.

1) Awareness book: We use the awareness book to register initial information of an event with diverse attractions and queues of attractions by a visitor's vision. The volunteer (in this case a non gamer user) was free to write whatever he or she wanted in the awareness book, but at the end of the book, we included a questionnaire with five Likert scale questions regarding the evaluation of the event. The questions covered the following aspects: event stocking, number of different stands, event location facilities and quality of services in general. We noticed that the volunteer had a specific difficulty in locating the attraction of interest in the event. The book used to register the volunteer impressions can be seen in Figure 4(A)).

2) One day in life: In this work, one of the researchers (in this case a gamer user) went to an event of digital games and had the experience of one day in life for this type of event. In Figure 3 it is possible to see the entry queue for the Brazil Game Show event. According to the researcher observations, for an event of around 10 hours, he lost about 2 hours only in the entrance queue of the event.

3) Empathy Map: An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. At this stage we performed an workshop with the contribution of ten volunteers (re-searchers engineers, designers, gamers and non gamers participants). The map of empathy was divided into six categories of sensations that the actor could witness during the event: what people talk about, what people listen to, what people feel, what people see, what people like, what people do not like. Results of this activity can be seen in Table I.

4) *Persona:* Through the data obtained in the deep immersion stages (Awareness Book, One day in life and Empathy Map), it was possible to construct a fictional persona based on the typical visitor to an event of digital games.

"Natálio, 24 years, is on the 7th semester of Computer Science in South Narnia University and currently is working as a software developer. His biggest hobby is playing videogames and practice martial arts. His goal is to go to Brazil Game Show (BGS) and have an incredible experience. Natálio, for being in the computing area, has a considerable experience with technologies and one of the reasons to attend the fair is to get in touch with the new trends in the game market. Despite being a junior programmer, Natálio does not work with game development but has the dream of working with it in the future. Natálio is also a fan of KOJIMA, a video-game developer present at the BGS. Natálio considers himself an organized person and likes to plan his trips and tours, so he is getting ready to go to Brazil Game Show with 3 to 6 months in advance."



Figure 4. The Awareness book (only in portuguese).

V. IDEATION STAGE

At this stage, the intention was to obtain information on how the user felt waiting in queues and what was his needs. We developed a deck of 90 cards (Figure 5) with questions that are different but linked to the central problem of users who awaits in queues at events. We created a simulation of a micro-event with three attractions, where the total duration per person was up to 10 minutes. During these 10 minutes, each person should go through as many attractions as possible. Each attraction was represented by a box with two types of cards identified by the attraction each with a different question based on one theme.

This stage was divided into two main phases: The first phase was divided into two mandatory steps that the users should pass simulating the entry to the event and the first view of the event after entry. The second phase was composed of optional attractions, where the user could choose

 Table I

 Empathy Map Construction Register Detailed.

users say about it?		
participation		
- related experiences		
- social networking issues		
- event common issues		
users feel about it?		
nt		
ime feeling		
Positive Points:		
- good experience		
- draws		
- promotions		
- zones without queues		
Negative Points:		
- little gameplay time		
- delays		



Figure 5. Cards used during the event simulation. (A) Sample of entrance queue card, (B) Sample of location card (C) Sample of stand card. All cards are asking about user's feelings during the event. (Translated from Portuguese)

which attraction (stand) he or she would visit. Each of the steps has different waiting times in a queue. The mandatory steps (Entry and Location) had time equal to 2 minutes per user. The optional stages of phase two had different times (Stand 1 - 3 minutes, Stand 2 - 6 minutes, Stand 3 - 2 minutes).

A. Ideation Workshop with Queue Simulation

The simulation (Figure 6) was performed by two researchers and ten volunteers, among them, seven males and three females. Each researcher was responsible for managing



Figure 6. Micro-event simulation.

up to 5 users. A researcher managed the time users had in the first two steps (entrance queue and localization queue), and the other managed the users time in the optional attractions (stand 1, stand 2 and stand 3). Each user passed by the queues and answered at each step a set of questions on each assorted card (where it existed on the two different types of questions per theme/stand/box). For each box, the user would remove one or two cards (depending from the box) and answer the question on the back of the card. Each had a waiting time informed at the front of the card which was the time the user had to answer the question or questions and advance to the next step.

We used this time to simulate waiting time in queues of events, where the waiting time of a participant in the queue directly influenced the time of other participants who entered the event after that. During the micro-event, all users were warned that they could visit as many boxes as they wanted for 10 minutes. The time count started when the user removed the first card from the entrance box (first box). To motivate the participants, we developed a system of rewards for points based on the numbers of answers. The participant that achieved most points would earn a custom key ring as a prize.

At this point we used the fixed action reward technique, where users need to complete one or more tasks to get a reward (in this case the user knows exactly what is the reward) [5]. This technique was also used in the application design.

B. Participants Answers

We identified all participants by numbers from 1 to 10 and registered all the responses.

1) Box 1 - Input - 2 minutes response (2 cards to answer): Question 1: When you go in an event what do you usually carry in your backpack? food, devices, cameras, portable video-games?

- 1. Snacks, chocolate and water, portable video-game, camera.
- 2. Cellular, food.
- 3. Food, portable charger and a tablet.
- 4. Water, notebook, food.

- 5. Video-game, keys, wallet, water and food.
- 6. A backpack with portable video-game and a camera.
- 7. Snacks, cell phone, makeup and notebook.
- 8. I usually avoid taking things because of non-existing storage places.
- 9. Mobile phone, water, snack (cookies or sandwich).
- 10. Food, telephone, portable video-game, water (bottle) and reusable cup.

Question 2: When you are at events how long do you usually lose in queues? How long does it feel being in the queue?

- 1. Long time! the queue takes hours!!!
- 2. About 30 minutes. Sensation of hours in the queue.
- 3. From 20 to 30 minutes. At least one hour.
- 4. 15 minutes. It depends on the company, between 10 to 30 minutes
- 5. Forgot how much time lost in queues.
- 6. Maximum of 1 hour. It depends on the event sometimes more than 1 hour
- 7. I spend a lot of time, about 20 min. In more difficult situations, fast 10min(rarity).
- 8. I lose 30min, Feeling of 1h.
- 9. I lose +/- 20min, Feeling 40min or more.
- 10. 1 hour lost in queues, I feel like half the event.

2) Box 2 - Location - 2 minutes response (1 card to answer): Question 1: How do you plan the order of visiting the stands in an event?

- 1. Searching first for the smallest queue, then my greater interest.
- 2. First I go where I think will bigger queues latter the day, going to stands that I like the most.
- 3. Plan according to the attractions, in the order in which I'm more interested.
- 4. Pre-plan the top attractions in order of priority. I also consider a "B" plan if the top attractions are full.
- 5. I look at everything and I go in the ones that are empty the first.

Question 2: What is your experience with event maps? Good or Bad and Why?

- 1. Good, I can usually locate myself quickly and easily and find the places I want to go.
- 2. Good experience (for the events in which I visited), since they were associated with information boards and facilitated the locomotion to the stands / auditoriums.
- 3. Bad, since there are usually few informative and unorganized.
- 4. Bad, I usually prefer to ask. In this case, I get a reason to get a "small talk".
- 5. Good, because I was guided to certain parts of the event but does not make anything clear about the queues.

3) Box 3 - Stand 1 - 3 minutes response (2 cards to answer): Question 1: Imagine that the event you are in

has its own application, which features would you like it to have?

- 1. Show the attractions, show the queues on each stand, show the time event.
- 2. Competitive games.
- 3. A program with the time of attractions and feedback on queues sizes
- 4. Schedule time to visit more crowded attractions.
- 5. If the lecturer has canceled the lecture and will no longer appear.
- 6. Indication of estimated public (interested).
- 7. Games, see which foods have in the food court and their price, queue management and a schedule of the event.

Question 2: Have you been to an event that ended before you could see everything you wanted? Why that happened?

- 1. Yes, due to loss of time in large queues.
- 2. Yes, due to the lack of programming and delays in the event.
- 3. Yes, large queues, little time at the event, paid attractions.
- 4. Already, because the queues were large.
- 5. Yes. Many attractions at the same time distributed in many places. Others when attraction was held at business hours.
- 6. Yes; because of queues that didn't move or I wanted to go to some attraction that everyone else also wanted.
- 7. Yes, because of the number of queues or large numbers of stands or something that had no interest.

4) Box 4 - Stand 2 - 6 minutes response (2 cards to answer): Question 1: Imagine a situation where the more queue time you have, more rewards you would receive. Would that please you? Name 3 possible rewards you'd like.

- 1. Yes, candies, event souvenirs, geek/nerd key-chains.
- 2. I would! More time to stay in the event, credits to skip queues or money.

Question 2: If the queues can't be EXTERMINATED, what might distract you while waiting in a queue?

- 1. Some attractions with people singing or counting jokes, something sonorous.
- 2. A preview of what will happen in the event/stand.

5) Box 5 - Stand 3 - 2 minutes response (1 card to answer): Question 1: What do you do to entertain yourself while you are in queue? Do you use any device to entertain yourself?

- 1. Games or social networks on the phone, reading the event folder and listen to music on the phone.
- 2. Yes, I usually use social networks to distract me.
- 3. I am always listening to music on my headphones.
- 4. I try to talk to friends or distract myself on my cell phone.

Question 2: Would you like to have souvenirs, gifts or something that is unique to the event attended?



Figure 7. (A) User's profile customization screen, (B) Application map screen with selected filters and (C) QRCODE Check-in and Scanning screen.

- 1. Yes.
- 2. Yes, both for me and for giving to other people.
- 3. Yes.
- 4. Yes, interesting gifts like pens, t-shirts and mugs. But not things like buttons, papers, etc.

VI. PROTOTYPE DESIGN

During the simulation, some users were not able to visit the same number of boxes as others. Some users by choosing a box with a longer queue time (shown in the card) generated a long queue and waiting users, in this queue, were not able to answer questions from other queues (some gave up of that queue and changed to faster queues). With this, we managed to verify a need for optimization and management of those queues in events.

Through the results of the previous steps, we observed that the main features that the application needed were: map of the event, map the stands according to the interests of the user, check-in when entering queues, mobile games during the queue, promoting friendly competition (without penalties for losing), accumulate points during the waiting in the queue or with the queue mobile game, points to be exchanged for Gifts or Fast-Pass (skip one queue), tags scattered in the event can give points and/or gifts, estimated queuing time of a stand and a place in a virtual queue.

From these results we propose, the design for screens of a supposed application with the design elaborated to work on a smart-phone.

- Home Screens: The Application has a welcome screen and the user profile setup screen (Figure 7(A)), on this screen the user can set the preferences for his/hers interests on the event map.
- Event Map Screen: The event map will allow filtering options to suit the user's interest. The filters can be removed at any time. Each stand on the map has a colored circle (Green, Yellow or Red). These colors represent the size of the queue in the stand, with a green



Figure 8. (A) In Game screen, the user can play with other users while waiting on the queue. There is an accumulation of points per game time and victories, (B) In Reward screen the user can exchange points obtained in the event for exclusive gifts or advantages.

circle few people and red a large number of people (observed in Figure 7(B)).

- Check-in at a queue: We propose the use of QRCODE scanning (Figure 7(C)) to perform the check-in of each visitor in a queue. In each Check-in the user may accumulate points during the wait in the queue, these points being counted in only in the check out time of the queue.
- Informative pop-ups: During the use of the app, a way to interact and inform the user is through informative pop-ups that helps the user not to miss information that will ensure the correct accumulation of points obtained at the event or when he/she is next in the virtual queue (Figure 8(C)).
- Queue Play: During queue, the application will enable the user to play cooperative/competitive games with other users who are in the same queue or on others queues of the event. This game will also help in the accumulation points and will show a ranking of accumulated points per user (Figure 8(A)).
- Exchange Points for Rewards: Through the accumulation of points, either by playing or waiting in a queue or by recognizing of hidden tags in the event the user can exchange points for gifts in this screen. (Figure 8(B)).

VII. CONCLUSION AND FUTURE WORKS

In this work we used design thinking techniques to design a mobile application that covers the needs of visitors in a multi-attraction event. To discover these needs, we created a group dynamic with ten users using stages of immersion in



Figure 9. (First) Pop-ups confirmation of queue check-in. (Second) The visitor is warned not to forget to checkout when leaving the attraction. (Third) The visitor is informed about the number of points received.

a simulation of an event with real queues and question cards to be answered while waiting. Through the results obtained, we were able to list the functions of most importance for the proposed application. We developed the screens design and functionalities of an application based on the needs of visitors of events with multi-attractions. We concluded that instead of trying to design an solution only to try to eliminate the queues we should think about the user experience as a whole. Queues will exist in some way, they may even be reduced, but they will continue to live. However, we believe it is possible through creative design to improve positive experiences for the visitors in these queues. In that sense, as future works, we intend to apply our design solution in a simulation workshop using the screens designed. As a final contribution and in order to help other researchers on this topic we make available all created cards in the public domain [1].

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