Social Interactions Around Public Transportation

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Abstract— **In this work, we explore how information services can be used to improve the travel experience in public transportation and reduce the perceived travel time. More specifically, we describe the creation of a mobile application for assisting passengers, which explores the integration of social networking features into the traveling experience. The overall objective is to understand how social networking concepts can become part of the travel experience and enrich that experience in a way that allows passengers to reduce the "psychological travel time" and to change the perception of waiting. We have conducted a focus group with 10 participants to elicit new forms of interaction within the transportation system and uncover new directions for integrating social network concepts. We have implemented some of them in our own mobile app for public transportation and shown how they can be combined with the more informative side of those applications.**

Keywords-component; public transportation; social network; entertainment;

I. INTRODUCTION

Public transportation is increasingly recognized as a fundamental element for the quality of life in cities and an essential element to cope with the increasing mobility of people, and the growing problems of traffic congestion and pollution [1]. Bringing more people to use public transportation systems instead of cars would help to alleviate some of those problems and it could have important economic advantages, for both the individuals and society.

However, even in cities in which there is a reasonable offer of transportation services, many people still prefer to use their own car. Handy et al. [2] have shown that many of the persons that are not using public transportation could have good alternatives if they wished to do so. Two main reasons are often pointed out for this apparent lack of attractiveness in public transportation systems: lack of adequate information when needed and the perception that the journey time is too long [3] .

An obvious approach to address the travel time issue is to invest in a better transportation service with more frequent and more optimized journeys. In our work, we explore an alternative path based on the rich use of information as a mechanism for improving the travel experience and reduce the perceived travel time. The rationale behind this effort is that even if we do not change in any way the actual travel time, we can use information to reduce waiting times and change the perception that people may have of the time they actually spend travelling. Reducing this "psychological time" [4] of

travel and providing people with information that may allow them to take more informed decisions and thus optimize their use of the system, e.g. reduce waiting times at the bus stops, may substantially improve the perception that people have about the traveling experience.

In this paper, we describe the creation of a mobile application for assisting passengers, which explores the integration of social networking features into the travel experience. The overall objective is to understand how social networking concepts can become part of the traveling experience and enrich that experience in a way that allows passengers to reduce the "psychological travel time" and to change the perception of waiting.

A social network for this purpose should exploit the specific properties of socialization in public transportation, such as the strong locativeness, the high mobility of people and their heterogeneity, the phenomena of familiar strangers [5] and the existence of specific mobility patterns. The social network should also be developed considering the ubiquitous technology present in public transportation system (public displays, localization systems) and passengers (mobile phones, internet access).

To help sketching the design space for this type of applications, we have conducted a focus group with 10 participants. The focus group session was structured in 4 different perspectives that represent different levels of engagement with the usage of the public transportation network. The results have provided a number of directions for integrating social networking concepts into the traveling experience. We have implemented some of them in our own mobile app for the public transportation network and shown how they can be combined with the more informative functionalities of those applications.

II. RELATED WORK

One complain often cited by passengers of public transportation is the lack of information. In this section we will present some applications that were designed to address this complaint, offering valuable information about the public transportation network. Those applications were selected because they illustrate different alternatives to show and to generate information about the public transportation network.

OneBusAway [6] is an application developed in the University of Washington that promises to offer information, in real time, for the buses and trains of Washington. The key features of the application are to show real time information

about the buses position and the time that the buses take to arrive at a particular bus-stop.

The application Journey Pro CONNECT[1] is a route planner for UK that integrates the following modes of navigation: public transportation, car and pedestrian. The application calculates the best options to a destination using all modes. It is also possible to integrate the application with Facebook and Google Calendar and, using the information of events from the user's accounts, the application calculates the various alternatives to arrive on time at the event.

Tiramisu [7] is an application that follows the same concepts of the previous applications - to show valuable information to the passengers - but is singular on how it generates information about the buses, because it gives the opportunity to the passengers to share information about the position and level of occupation of the bus they are travelling at.

Putting the passengers to socialize with each other is another way to provide entertainment to passengers in the public transportation network, and consequently to reduce the "psychological travel time". These 3 projects exploit this concept, each one in a different way. Their approaches are being considered in the design of our own application.

With the help of the site Tales of Things[2], the company of public transportation Kolumbus created a social network oriented for their buses. The concept was created by the project TOTeM [8], which is a collaborative project between five Universities, and consists in the association of QR Codes to objects. Each object has a unique QR Code that identifies it. By scanning that QR Code it is possible to obtain or add information about the object. Kolumbus took that concept and spread 9000 QR Codes throughout their public transportation network. The objective of Kolumbus was to involve people with the objects they use on the public transportation network (for example, passengers starting to use the bus-stops to leave messages to friends that will use the same bus-stop).

The project London Undersound [9] had the intent to create a social network where the social object is to share music. The project consists in creating ways for passengers of the London Underground to share music between each other during their trips, using Wi-Fi or Bluetooth connections. During the design phase of the project, it was identified a problem that could lead to failure of the project, related to the copyright of the shared songs. Mechanisms to deal with these problems, such as filters to remove content with copyright, were suggested by the authors of the project. Nevertheless, the project was canceled by the authors because the company, Transports for London, raised concerns about eventual security problems that the project could bring.

The company Yahoo, in a marketing action[3], installed 20 touch screens in several bus-stops distributed in the city of San Francisco in the United States of America. The objective with the installation of screens was to create a game that involves the city. That game consists in putting face-to-face the passengers in every bus-stop, and allowing them to play against each other a set of available games.

These, and many other projects, address the "psychological travel time" concept. However, they do not integrate information provision and socialization features. These projects are only focused in filling only one of those categories. A project that combines more than one category, while offering valuable interactions between them, could spark more interest in users, thus generating more interactions, which may result in more entertainment for them.

III.   SOCIAL NETWORKS IN TRANSPORTATION SYSTEMS

Our design of the social concepts for public transportation systems has been based on the framework described by Crumlish and Malone for Social Interfaces Design [10]. In this section we describe our initial conceptualization of social interactions around public transportation systems.

For people to socialize, it is necessary that they have something in common. The concept of social object was first introduced by Engeström [10] as being a shared object that supports a number of activities and practices that connect people in a social network. This would be photos for Flickr, videos for Youtube or URLs for del.icio.us. The verbs in the context of a social network, is what people do with the social objects. On Facebook the verbs are *like*, *share* and *comment*. On Amazon they are *buy* and *sell* and *review*. On Foursquare it is *check-in*.

As social ecosystem designers, we should begin by defining the type of activity (collect, share, comment) that we want to encourage in our space and on what social objects they should be supported. These will be the activities that will engage people into some form of socialization.

The public transportation has unique specificities that can help to identify and to define the social objects. One important characteristic of the public transportation system is the high mobility of people. Normally, the passengers only use the public transportation network to reach a specific place. This factor can be explored in the context of the project to generate interactions that have this function into consideration.

The occurrence of the "familiar strangers" phenomena in the public transportation network is also a characteristic that will be explored in the project. The regular users of the public transportation network have a routine, and despite the passengers familiarity with other passengers, they usually do not interact. Putting the passengers to interact with each other could contribute to reduce the "psychological travel time".

The public transportation is used by a large set of different stereotypes of persons, such as students, senior citizens and tourists. This characteristic of the public transportation must be taken into consideration in the design phase, in particular while specifying the interactions of the system.

IV.   FOCUS GROUP

A key part of this research was a focus group aiming to elicit ideas for possible social interactions around public transportation systems. We have selected this approach because

[1] http://www.navitime.com/jpconnect/
[2] http://www.talesofthings.com/
[3] http://www.busstopderby.com/

it is a propitious way to generate ideas. This type of discussion is frequently used to identify a specific problem and to generate different solutions. We also believe, that through this type of approach, we will obtain an interesting set of insights about possible social interactions around public transportation. That set can give us an important support to start developing a platform capable of providing information, entertainment and socialization to public transport passengers.

The focus group was formed by 10 participants, all of them researches from our lab but not directly involved in this project. All the participants were collaborative and tried to contribute to the session.

A. Structure of the discussion

The objective for the session was to identify possible social interactions during the stay of a passenger in the public transportation network. To provide some structure, the discussion was organized around 4 different user perspectives, corresponding to different stages of usage of the public transportation system.

- **Observing outsider** – This is someone who is not a regular user of public transportation systems and is not yet planning to become one. These interactions should essentially engage people to use the public transportation systems, increasing their familiarity with the system and potentially attracting new clients to the use of the public transportation network.

- **Prospective passenger** – This is someone who is already considering the use of the transportation system, but is not yet using it.

- **Waiting passenger** – This is someone who already knows the public transportation journey he or she wants to follow and is waiting for the bus to arrive.

- **On-board passenger** – This corresponds to the situation where someone has already taken some public transportation journey and is now travelling to the destination.

B. Questions

For each of the situations described above, the participants were challenged to evoke possible ideas for social interactions. This was achieved by asking three questions, each aiming at a different concept of interaction.

The first question was *"How can I see what is happening around the use of public transportation systems?"* The objective was to prompt reflection on how to increase awareness about the activity of others in relation to public transportation use and how that could be relevant for the participants and their familiarity with the transportation system.

The second question was *"Which interactions can I do and with what/who?"* The objective was to identify possible interactions and characterize them. The exercise was conducted to avoid focusing specifically on interaction between people, specifically broadening the scope to interactions with elements from the transport network such as bus-stops, routes or vehicles.

The last question was *"What could I share with others?"* The objective was to find out what people want or could share with the others users of a social network.

To facilitate technological assumptions, it was said to the participants that passengers could have a mobile phone with an application, and the public transportation could also have a public display.

V. RESULTS

The analysis of the results from the focus group has shown that the suggestions made by participants can be classified in 3 main categories: information, entertainment and socialization.

Figure 1 shows the number of different interactions suggested for the four different moments (observing outsider, prospecting, waiting, and on-board) divided in the 3 different types that were identified (socialization, information, and entertainment). We can observe that the three categories only coexist in the last two moments. The last moment (*On-board*) is the one with more interactions, and this could be due to the increase of the number of interactions suggested for the *socialization* category. For the three categories identified, the category with more suggested interactions was the *information* category (15 interactions suggested), and the category with less suggested interactions was *entertainment* (7 interactions).
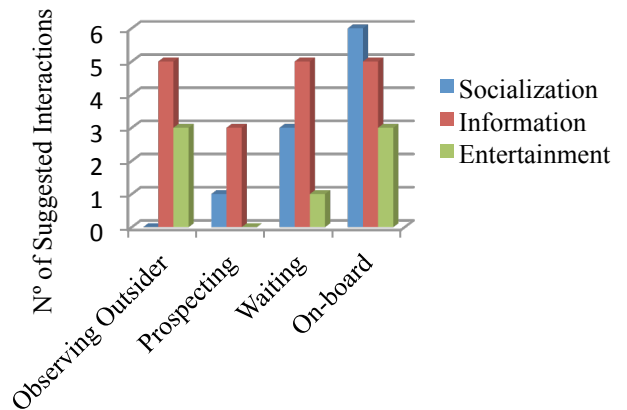

Figure 1 - Quantitative analysis of the collected data.

The interactions proposed were all aiming at least to one of these goals. We will now describe the list of interactions obtained from the focus group session, for each of the moments previously identified.

A. Observing Outsider

Our objective for this moment is to create interactions to attract new passengers to the public transportation network. With that in mind, the participants suggested interactions that fall into two categories: *information* and *entertainment*.

The category *information* can be divided in two sub-categories, *information about public transportation network* and *information that can show the benefits of the use of public transportation*. For the sub-category of *information about public transportation network*, some of the interactions suggested were: show the schedule of the public transportation

network and show information in real time about public transportation network. In the sub-category, *information that can show the benefits of the use of public transportation network*, some of the interactions suggested were: the relative costs of the use of public transportation instead of the private car and show the travel times.

From the suggestions made that fit in the *entertainment*, they can be divided into two sub-categories: *list activities to perform while staying in the public transportation network* and *list activities that might happen in the public transportation network*. Some of the interactions that fit the first sub category, *see what is possible to do during the stay in the public transportation network*, were: show games that can be played and see what other people did in the public transportation network. For the sub-category *see what is possible to happen in the public transportation network*, the suggestion proposed by participants was: show stories that happened during the travels.

B. Prospective passenger

In this moment, the person already has the intention to use the public transportation network, and this is the most significant difference between this moment and the previous one (observing outsider). Our objective for this moment is to provide informations that could be relevant to a passenger that have the intention to use the public transportation. For this moment, like in the previous one, the interactions suggested by the participants can be divided into two categories: *socialization* and *information*.

For the *socialization* category, the interaction suggested was: *report that I have the intention to take a specific journey*. This interaction is similar to the concept of check-in adopted in other social networks oriented to space, like Foursquare[4] and Gowalla[5].

The interactions suggested to the category *information* are similar to the suggested for the moment *observing outsider*, like, *see the schedule of the public transportation*. In addition to these interactions, new types of interactions were suggested to fill the social component. The interactions presented were: *see who is in the public transportation network* and *see who has the intention to take a specific journey*.

C. Waiting passenger

In this moment the context is completely different from the previous moments. The physical space where the interactions occur is the public transportation network. Our objective for this moment is to provide entertainment to the passengers waiting for transportation bus or a train. With this objective in mind, the participants suggested interactions that can be organized in three different categories: *socialization*, *information*, and *entertainment*.

For the *socialization* category, some of the interactions suggested were: check-in (in a place of the public transportation network) and apply the concept of wall (similar

[4] https://foursquare.com/
[5] http://gowalla.com/

of the Facebook[6]) in the places of the public transportation network.

In this moment, the user already knows the journey he wants to take, so for the category *information*, the suggestions made by the participants were focused on information about a specific journey. Some of the suggestions made were: *see how many passengers are doing the journey*, *curiosities about the public transportation facilities (brand, year, accessibilities for people with disabilities)* and *pollution levels*. In addition to the previously presented interactions, a different type of interaction was suggested, that consists in: *show the list of people in the public transportation network with which I usually share a journey*.

In the context of the *entertainment*, it was suggested to create a game that consists in *a story that evolves based on the places we visit*. So if we want to know the next chapter in the story, we need to visit new places in the public transportation network.

D. On-board passenger

For this last moment, our objective is to provide entertainment to the people while in the public transportation vehicles and waiting to arrive at the destination. This moment also introduces a new component, the public displays that can be present inside the public vehicle. On that basis, the participants suggested interactions that can be divided in three categories: *socialization*, *information*, and *entertainment*. The interactions can also be divided based in the two platforms: *mobile application* and *public displays*.

For the *socialization* category, the most part of the interactions suggested to integrate the two components (mobile application and public display). Some examples of those interactions are: *show pins (small images in the displays) in the public display that the users have collected, during the stay in the public transportation network, using the mobile application, show posters that are left in the place using the mobile application* and *share stories on the mobile application and show them in the public display*. Besides these interactions, some of the interactions suggested are only based on the mobile application, such as: *leave virtual tags in the buses* and *collect badges (similar to the Foursquare)*.

The interactions suggested for the category *information* fit in the two platforms (mobile applications and public displays), but are more indicated to the public displays. Some of the suggestions made were: *provide statistics about the passengers inside the bus*, *show warnings about the public transportation network* and *show relevant information based on the location of the public transportation vehicles*.

In the *entertainment* category one interaction suggested to be developed to the public display and the mobile application was: *show questions on the display that the users can respond using the mobile application*. Besides this interaction, two games were suggested. The first game suggested was: *try to discover the names of the persons in the same journey*. The other game suggested was: *try to predict which is the bus-stop where the person will leave the bus*.

[6] https://www.facebook.com/

VI. PROTOTYPE

To implement some of the interactions obtained from the focus group session, we decided to update a mobile application prototype that already provides information about public transportation networks, such as the buses' position over a map and the next bus to arrive at a particular bus stop. After the focus group session, we developed a plan to analyze how to involve the social layer in the prototype, which only shows information about the public transportation network.
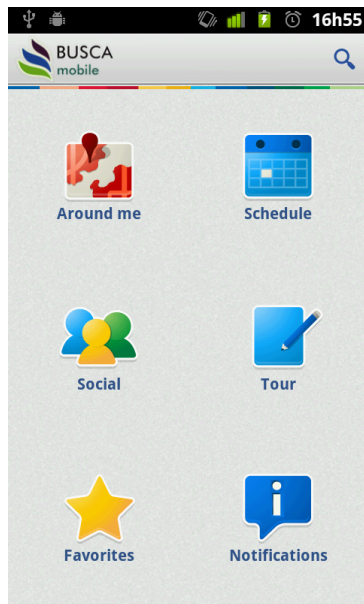

Figure 2 – Mobile application dashboard.

The first decision was to introduce a dashboard in the prototype. Figure 2 illustrates the dashboard introduced in the application, where it is possible to identify the three modes *Around me*, *Schedule* and *Tour,* that will present three different ways to show information about the public transportation network to the users. The menu *Social* will be responsible for offering support to social interactions. The objective of the menu *Favorites* is to give a shortcut to public transportation vehicles and stops that the user uses most frequently. The menu *Notifications* will include notifications from the social layer and from the public transportation companies.

Besides the introduction of the dashboard, we have introduced another two social interactions, the *Check-in* and the option to *Post a message in the bus*. In the menu *Around me*, after the user selects the bus-stop for which he wants to obtain information, a list of the buses that will arrive at that bus-stop will appear (Figure 3). If the user selects one of the buses in the list, an option to do the check-in in that bus will appear. The social options related to that bus would only be available if the user makes the check-in. In this version of the prototype, the only social option available after the check-in is *Post a message in the bus*.

This approach is different from the ones implemented in other applications developed for the public transportation network. With this application we intent to provide information about the public transportation, and additionally to offer social

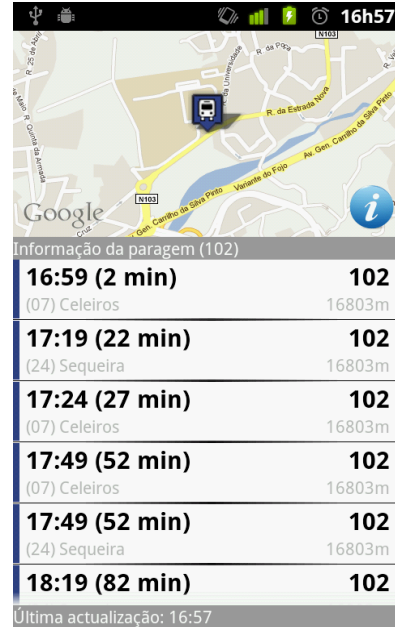interactions in that context, while other applications only focus on one of them.

Figure 3 – Buses expected at a specific bus-stop in the near future.

VII. CONCLUSIONS

In this paper we have studied how social conversations may become part of the information space associated with public transportation and how that can be used to improve the user experience. We have conducted a focus group to collect interaction ideas around what we believe to be key perspective on system usage. The results from the focus group can be organized in three different categories: information, socialization, and entertainment. We have seen that people value informative content, but they have also shown how the information needs can easily be mixed with entertainment and socialization. In regard to the specific forms of socialization, the most commonly suggested interaction has been the *check-in,* followed by *content sharing* with the other passengers (images and histories). The concept of wall as a place to post content shared in a bus has also been suggested by participants.

To gain some more insight into the possibilities of incorporating these social features into common public transportation applications, we have integrated some of them into our own mobile application. The main observation resulting from that effort was the importance of carefully integrating social features in the parts of the application where they can be contextually more relevant.

The other interactions will be integrated in future releases of the mobile application, or discarded after we analyze their value and conclude that they not generate valuable information to the project.

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