Design for public engagement

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Abstract
In this workshop paper we elaborate on the role of public engagement and social infrastructuring in public design. We discuss about the shift from designing for user engagement to designing for public engagement and how infrastructuring can influence the way people engage. We illustrate this view by reflecting on two case studies that use participatory sensing as part of a mobility mobile application: these case studies use the same design and technology, but have been laid on different social infrastructures. Results indicate different levels of engagement and highlight the relevance of social infrastructuring.

Author Keywords
Interaction Design; Urban environment; Engagement; Infrastructuring.

ACM Classification Keywords
K.4. Computers and society

Introduction
The technological push and the growing interest for designing in the public dimension are influencing the field of Interaction Design. Researchers and practitioners seem to be moving from designing for personal contexts towards designing for the public dimension: some of them have explored the challenges posed by this move and elaborated on the "third wave" in HCI [1] or "design in the wild" [10]. Defining User

eXperience (UX) dimensions and reproducing ecological settings are some of the challenges faced when designing in personal contexts [6]; designing for the public dimension raises specific issues such as large and diverse groups of stakeholders, undefined context boundaries, dynamic requirements [1], infrastructuring participation and ethical considerations [4]. When designing for the public dimension, the object and boundaries of design become blurred: if designing for UX means designing for qualities such as fun, aesthetics, enjoyment and pleasure, what does designing for the public dimension mean? Some practictioners and researchers highlight the relevance of designing for engagement and the need of shifting from user engagement to public engagement [3]. In this workshop paper we present our experience in designing for public engagement and elaborate on the relevance of social infrastructuring in public design.

Related work

The growth of "Smart Cities" and "Living Labs" demonstrates the increasing interest towards the integration of technology (e.g. sensors, displays, and networks) into the public dimension, as witnessed by several initiatives around the world. For example, in 2011, the European Union launched the "Smart Cities and Communities" Innovation Partnership, whose goal is to improve city life through integrated solutions such as "applied innovation, better planning, a more participatory approach, higher energy efficiency and better transport solutions"[1]. This vision of the Smart City as a network of sensors, invisible artefacts and connected networks has been heavily influenced by Weiser and Brown's view of ubiquitous computing as a form of "calm technology" [11].

In spite of the hype around Smart Cities and Living Labs, some voices are being raised "against the Smart City" [5], advocating for deeper reflection on the implications of introducing ubiquitous and networked technologies into urban environments. Greenfield presents a critical view on different aspects of the Smart City such as surveillance, data handling, and power distribution. He discusses "public objects" as objects of design in the Smart City, that is artefacts located in publicly accessible areas, which can be used, accessed, and shared by anyone. The data gathered by "public objects" should be open, free and modifiable for citizens as long as it does not represent a public harm [5].

In 2006, Rogers [9] proposed to shift from designing calm technology to designing for engagement. In her view, ubiquitous computing should not envision people as passive entities, but rather as engaged actors who are able to change and improve the environment in which they live. Design for engagement in the public dimension has indeed been the focus of attention of several researchers and practitioners ever since, although the focus varies from user [2] to public engagement [3].

Participatory Sensing was first introduced in 2006 as a paradigm to "form interactive, participatory sensor networks that enable public and professional users to gather, analyze and share local knowledge" [2] and can therefore be meant as a paradigm to foster engagement. It has been used in several research and industry projects in urban environments. For example,

[1] http://ec.europa.eu/eip/smartcities

the Common Sense project allows gathering and analysing environmental data, such as air quality, using information provided by mobile phones; Waze is a mobile application, acquired by Google in June 2013, which allows people to contribute and check maps and traffic updates (e.g. traffic jams, accidents, alternative routes); Tiramisu[2] is a mobile application developed at Carnegie Mellon University which "provides easy access to schedule and real-time arrival information for the local and public transportation" in the United States. Although Participatory Sensing can potentially provide more timely and localized data than traditional data gathering methods, the reality is that these systems are facing the challenge of motivating people to participate. As reported in [12], this lack of engagement might be related to the fact that the user who provides her contribution does not directly benefit from it: for example, if a user reports a bus delay, this data will only be useful to users who are located in subsequent bus stops.

Shifting the focus of design from user engagement to public engagement can support moving from contributing for personal gains to contributing to achieve higher goals (e.g. improving the city's public transport). Creating a supporting social infrastructure can help achieve this shift. Infrastructuring can be understood as the set of required activities for fostering the creation and support of groups of people who share, in Latour's terms [7], similar matters of concern. Under this understanding, creating a social infrastructure can contribute to the engagement of people around a shared issue [4].

[2] www.tiramisutransit.com

The Smart Campus project

We reflect on the case study represented by the Smart Campus project, which started almost three years ago with the short-term goal of creating an ecosystem that may foster students' active participation in the design and development of services for their own campus. On the longer run, the project is meant to act as a sandbox for an experiment of fostering public engagement. With these goals in mind, we envisioned supporting the emergence of an infrastructure that would foster discussion on shared *matters of concern* [7] and provide the required resources to generate action when addressing those concerns [8].

At the beginning of the Smart Campus project we adopted various UCD techniques in order to investigate the concerns of the student population and understand issues that were negatively affecting their daily experience of academic life. Several activities such as focus groups, diaries, online ethnography and workshops were put in place, engaging 60 BSc and MSc students. We also performed a benchmarking of mobile apps offered by other universities. This initial information was used to build personas and use-case scenarios. Commuting resulted to be one of the less pleasant moments in a student's day: in fact, the location of scientific departments in a suburb forces students to reach them typically by bus. Moreover, most of the students live beyond walking distance from the city centre and the departments, due to economic factors and to the location of the main student houses. In this context, a mobility urban application was designed and developed in collaboration with the students.

Figure 1 - Input the delay

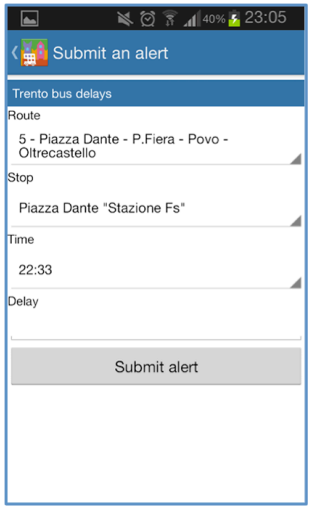
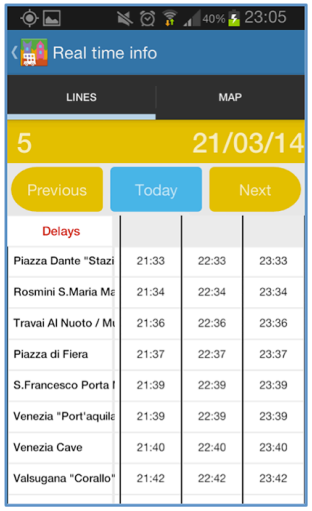


Figure 2 - Visualise delay



Supporting Urban Mobility

Following participatory design approaches we developed ViaggiaTrento, a mobile application to support urban mobility in Trento. The application allows planning trips over different means of transport such as local trains, buses, car-sharing and walking. The system is able to take into account user preferences (e.g. most frequently used means) and save users' recurrent routes (e.g. path followed while commuting) in order to receive push notifications in the case a delay or service interruption affects their route.

In particular, the application relies on the active participation of travellers in order to provide real-time, accurate information on delays. Users standing at a bus stop or train station can broadcast a delay notification through a quick form (Figure 1), specifying which ride they are waiting for and how late it is; the notification is then propagated to all users monitoring the same ride, or whose journey would be affected by the delay. This information is also shown on the timetables for urban and extra-urban buses and local trains, which the application gathers all in the same place (Figure 2). This participatory sensing practice among travellers allows ViaggiaTrento to provide information that is not even available to the local transport company itself.

Social infrastructuring

ViaggiaTrento was released to the students attending the HCI class at the Department of Information Engineering and Computer Science during the first semester in 2012 (N = 90) and 2013 (N = 117). In this way, our seed base of students-users was introduced to the Smart Campus project as a real-world application of the methodologies and techniques taught in class; furthermore, their particular area of learning allowed them not only to provide feedback on existing artefacts, but also to generate, design, and code new services for their own needs. Suggestions for improvement were then integrated into the app; proposed functionalities included, for instance, timetable checking, which had not been foreseen in the original design of the app.

After a few months of evaluation, the application seemed to be stable and usable enough for it to expand its user base beyond the initially seeded group of people. Therefore, in collaboration with the Municipality of Trento, we released ViaggiaTrento on the Google Play Store on 11th October 2013, thus making it publicly available. In the same period, the nearby Municipality of Rovereto expressed interest in the Smart Campus project. Leveraging on the by then available technical infrastructure, we created a customized version of the application called ViaggiaRovereto and released it on the Google Play Store as well. In this case, the Municipality was available to provide us with more data: therefore, ViaggiaRovereto also informs people about public notices regarding mobility issued by the Municipality and concerning, for instance, detours or roadwork.

Results

Figure 3 compares the number of active installations of ViaggiaTrento and ViaggiaRovereto, as retrieved from Google Play Store. Before the 22nd October 2013, most of the new installations were done by students who migrated to the public version of the application. On the 22nd October, the major of Rovereto presented ViaggiaRovereto to the city in a public event, which was reported the day after in several local newspapers. As illustrated in the chart, the number of installations of ViaggiaRovereto raised from 185 to 292 after the

major's intervention. After that, the spreading of the application remains overall stable over the following months. In the case of ViaggiaTrento, no specific event was organized to advertise the application, relying instead on the Smart Campus social infrastructure (e.g. social channels, forum, word-of-mouth): as illustrated in the graph, ViaggiaTrento has experienced a relatively slow but steady increase in the number of installations over time.

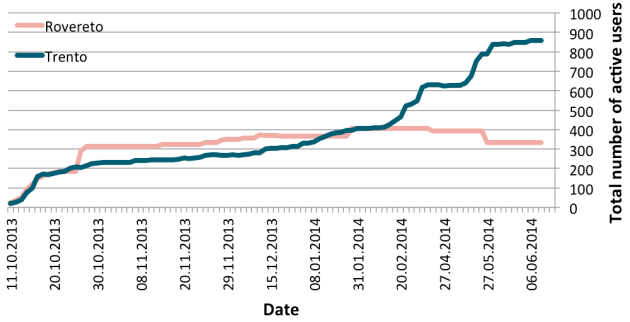


Figure 3 - ViaggiaTrento and ViaggiaRovereto active installations

Figure 4 shows the percentage of notifications of delay issued in ViaggiaTrento and ViaggiaRovereto over a period of 231 days (i.e. from 22nd October 2013 to 9th June 2014), normalized by number of active installations. Users of ViaggiaTrento reported 153 delays in 84 different days, while users of ViaggiaRovereto reported 32 delays spread over 16 days. Trento is a larger city than Rovereto, and has more bus lines; this might partially explain a higher number of notifications per day. However, the quality of the transport service is comparable between the two cities: in the case of a similar level of engagement we could expect notifications to be spread over a similar number of days. However, the difference in the number of days in which the notification functionality has been used suggests different levels of engagement between users of ViaggiaTrento and ViaggiaRovereto. In Figure 4 it is interesting to notice how citizens especially used both applications to broadcast transport delays during disruptive events, such as a transport strike on 16th December 2013 or a snowstorm on 30th and 31st January 2014. The consistency in notifications peaks between the two applications can be a good indicator of data quality, since both cities tend to experience similar transport disruptions due to their close geographical location.

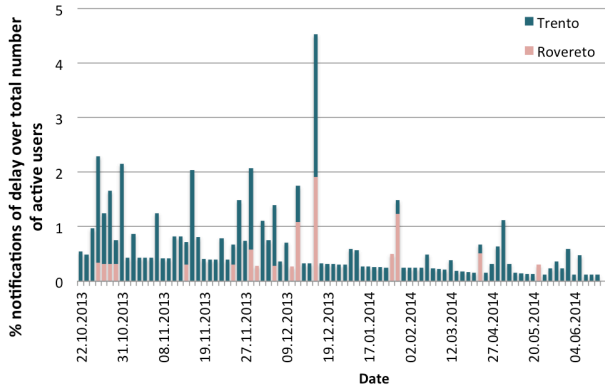


Figure 4 –Percentage of notifications of delay in ViaggaTrento and ViaggiaRovereto

Discussion

In this workshop paper we have presented the case study of a mobile application that uses participatory sensing for collecting data on bus delays. The application was used in two scenarios, corresponding to two nearby cities. While the technical and design

characteristics of the applications were very similar, the infrastructuring activities largely differed between the two scenarios. In one scenario, the infrastructure emerged as a result of several social and didactic activities and the establishment of communication channels between users, developers and designers. In the other, no social infrastructure emerged over time since the mobile application was "dropped" onto the city. We believe that the results reflect these differences, as the city in which the infrastructure dynamically emerged and was actively sustained over time shows higher participation and engagement.

In our understanding, when doing public design - whether it is a mobile application, a service or a public display - is not enough to design an artefact but it is also needed to support the emergence of a social infrastructure. During the workshop, we would like to discuss the role of interaction designers to foster not only user but also public engagement and reflect on the activities that can support the emergence of a social infrastructure.

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