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ViaggiaTrento: an application for collaborative sustainable mobility

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Abstract

In this paper we present a case study about the development and delivery of a mobile application fostering sustainable urban mobility by supporting collaborative behaviours among travellers. This application, called ViaggiaTrento, has been designed based on the requirements expressed by student commuters reflecting on their travelling experience with local transport in the city of Trento, Italy, and has then been fed back to this initial community and subsequently to the rest of citizens. A critical mass of users has been growing since then, with a relevant percentage of citizens downloading and positively rating ViaggiaTrento.

Keywords: urban mobility, sustainable mobility, collaborative behaviours.

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1. The Smart Campus project

ViaggiaTrento is one of the applications developed within the Smart Campus project, which unfolds on the concept of social innovation [1] and has now been running for more than two years. The project aims to empower the local University students to more actively contribute in designing and developing services for their own community, fostering their participation in campus matters. This goal has been pursued by designing and developing a service infrastructure for the local Province to establish a Living Lab: a technical and a social component of the infrastructure were designed and developed in parallel, through several phases of analysis, interpretation and iteration. The technical stream is grounded on open data and service oriented architectures; the social stream has experimented with principles and techniques of interaction and participatory design (PD) [4] leading to participatory development. These two streams met in a process of community building around the design of artefacts.

Similarly, the goals of the project are twofold: the social one is to facilitate student participation in service design and seed the ground for a larger scale intervention in the city; the technical one is instead to develop a service platform, i.e. a permanent facility to be handed over to the community of citizens that has been cultivated around the project. The University campus acts as the playground to experiment with a vision that emphasises the role of the community as decision-maker and service-builder.

The Smart Campus project involves several stakeholders: TrentoRISE, the funding body, is an innovation catalyst aiming at benefiting the local community by utilizing the results of computing research and education provided by two other main stakeholders, the University of Trento and the Fondazione Bruno Kessler, a regional research centre. An important role is however also played by a community of approximately 500 University students: each of them contributes to the project in a different way depending on his / her skills and level of engagement.

2. The innovation milieu

Since the Smart Campus project relies on the collaboration of a supporting community, we firstly needed to prepare an environment that was receptive to social innovation and participatory design: this has been the main focus of our social infrastructuring activities.

Social innovation, conceived as the development of products, services and models that meet social needs and enhance society's capacity to act [12], is a complex and multifaceted process, which has been investigated by scholars belonging to different areas of business, design and computer science [14][9][1][6]. However, these streams of research mainly concentrated on working contexts and may demonstrate considerable weaknesses when stretched to fit the public sphere [3], as several issues emerge for instance in terms of scale, context and ethical responsibilities.

When innovation moved to the public sphere, in fact, the boundaries of what was to be designed – and by whom – became blurred. According to Björgvinsson [1], this activity entails "Thinging and infrastructuring": referring to Latour's discourse [8], "Thinging" relates to the evolution from the design of objects and services (i.e., "things") to the assembly around "matters of concern" (i.e. "Things"); "infrastructuring" relates to the ongoing processes of pursuing democratizing innovation by aligning and adapting to changing situations. These processes bring forward several challenges: stakeholders usually belong to large and heterogeneous groups, which are difficult to manage and keep informed; in addition, they might not recognize the immediate relevance of their involvement, thus making it hard to achieve active participation [3]. Furthermore, the development of infrastructures is another main challenge: it is not uncommon to find participatory design projects delivering innovative, feasible and desired designs which ultimately are not realized also because of "the gap between politics and techniques" [7].

The Smart Campus project tries to instantiate participatory development, which we interpret in the literal sense as leaving the development to volunteers in the students community. These members have the capability of embedding the outcome of participatory design (Things) in objects or services (things): therefore, this approach can lead to the self-sustainability of the process in the long run. This is in fact not enabled by the involvement of users in the design process alone; users should also "gain in their ability and willingness to take the role of the animator(s)" [2].

Another aspect to be considered is the extent to which the environment is ready and receptive for a PD initiative. Even though PD has witnessed worldwide reach, reproducing its success outside Scandinavia might be difficult due to "significant differences in labour, legislative, and workplace environments" [11]. This paper reports a case study in Italy, a country that is increasingly disengaging from participation in public matters as clearly witnessed by the number of voters, which fell from 94% in 1976 to 75% in 2013[*]. In this context, a number of design initiatives subsuming active and democratic participation have been launched, also related to sustainable mobility [5][10]: however, to the best of our knowledge, challenges and limitations related to the Italian innovation milieu have not been thoroughly articulated in the literature. The city of Trento is indeed a special environment with respect to this, as it scores very high in smart cities rankings[†] and the local administration has recently started several projects in order to establish a Living Lab.

Finally, ethical issues about unfulfilled expectations are often not directly discussed in the PD literature. In spite of designers' commitment and good-will, it is difficult at times to ensure that participants' efforts will be rewarded and expectations created by envisioning desired designs will be fulfilled. Since few PD projects move from a research setting to full-scale development [7], the discussion on the ethical implications of engaging in PD has been difficult. Yet, it is the designers' responsibility to ground their intervention on serious considerations of what would be the consequences for the participants if the project should not deliver as requested. Keeping this in mind during the Smart Campus project, we have been fine-tuning our approach over time in order to maximize gains and minimize possible losses for involved users.

3. Design of the application

At the beginning of the Smart Campus project, user studies were carried out to identify the needs of each stakeholder, and mainly of students: in particular, we wanted to understand what issues in their opinion were negatively affecting their daily experience of academic life. Several activities such as focus groups, diaries and workshops were put in place, engaging 60 bachelor and master students overall. 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. For this reason, the concept of ViaggiaTrento was designed in spring 2012 by the project team, with the involvement of the Municipality and of the local transport company as additional stakeholders. A benchmarking phase was also performed in order to relate the application to limitations and strengths of existing mobility applications available in other urban environments.

[*] http://elezionistorico.interno.it/

[†] http://saperi.forumpa.it/story/73757/icity-rate-2013-la-nuova-classifica-italiana-delle-citta-intelligenti ; http://www.between.it/SmartCityIndex/Between_SmartCityIndex2014.pdf

Issues reported by students were also related to travelling around the urban area: Trento is in fact a medium-sized city (115,000 inhabitants approximately), composed of an historical centre and of several suburbs spread over the surrounding hills and along the river Adige, thus covering a rather large territory (158 kmq approximately). Students reported the unreliability of transport, as local buses are often late. Moreover, a generalised lack of knowledge about timetables, location of bus stops and routes of each line often hampers the usage of public transport, even though students expressed their intention to use it; a related limitation consisted in the absence of a unique point where to find this information altogether. We tried to address these concerns by making relevant information easily accessible through the ViaggiaTrento smartphone app.

Other requests had to be discarded due to technical unfeasibility or unavailability of resources instead: for instance, as buses are often overcrowded, students had proposed to rate and notify the quality of each bus ride, or to broadcast a request for a car lift.

4. The ViaggiaTrento app

ViaggiaTrento provides several functionalities. First of all, it allows multi-modal planning of trips (Fig.1): by simply entering the departure and arrival addresses and the intended departure time, the system will suggest different travelling options, automatically combining different means of transport (local trains, buses, car sharing, but also personal car and walking).

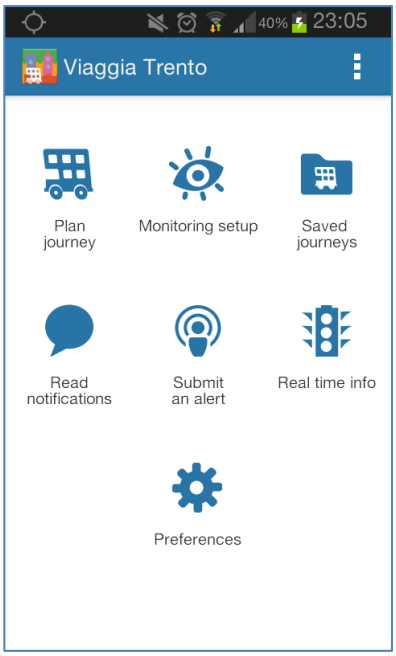

Figure 1. Home page of the ViaggiaTrento app

The system is also able to take into account user preferences such as the most frequently used means or characteristics of the preferred travel (shortest walking distance, least number of changes, fastest route).

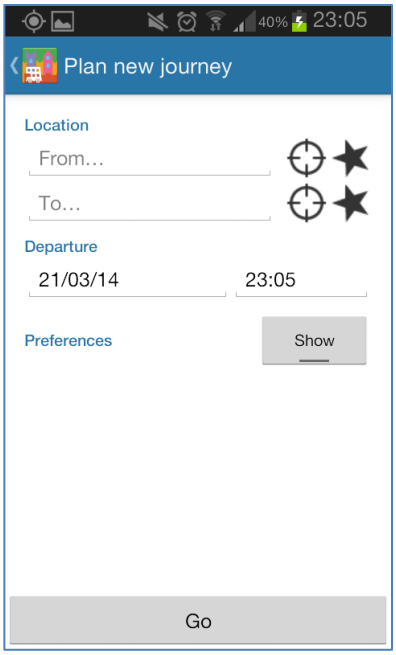

Figure 2. Journey planning functionality

Figure 3. Details of a proposed route

Users can also save their recurrent routes (Fig. 4), such as the path followed while commuting: by specifying a limited time span, they can then receive push notifications on their smartphone in case a delay or service interruption affects their route.

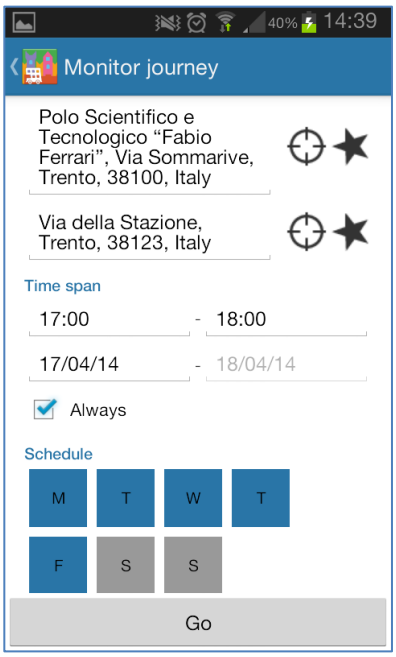

Figure 4. Monitoring of a recurrent trip

Moreover, thanks to the collaboration with the local Municipality, the application can provide real-time information about the availability of slots in the public parking lots of the urban area (Fig. 5), which are furnished with sensors. Parking lots are also listed by increasing distance from the detected position of the user for easier consultation.

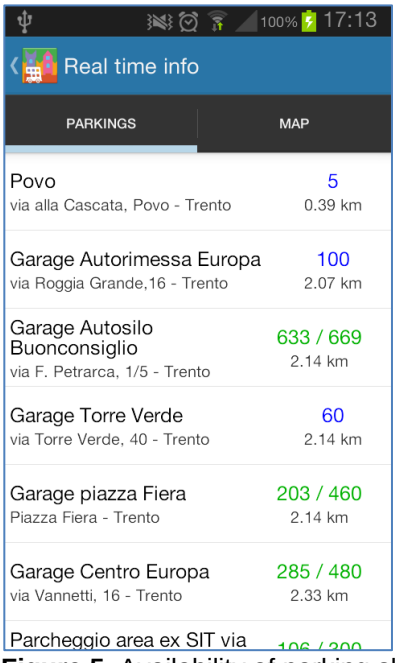

Figure 5. Availability of parking slots

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 (Fig. 6), 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 (Fig. 7). This collaborative behaviour among travellers allows Smart Campus to provide information that is not even available to the local transport company itself.

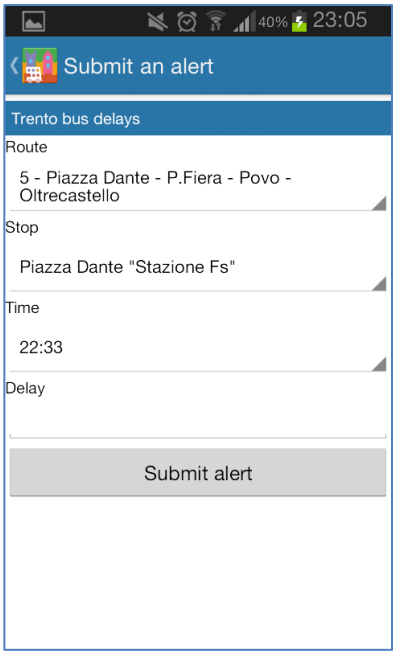

Figure 6. Form for broadcasting delay notifications

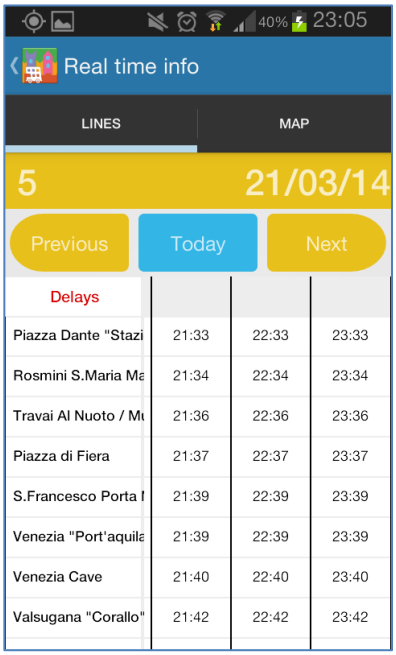

Figure 7. Timetables of local buses

5. Seeding the community

The Smart Campus applications, including ViaggiaTrento, were released to the students attending the HCI class at the department of Information Engineering and Computer Science (N = 90) in October 2012. HCI and PD practices were therefore incorporated into the academic career of this first set of students-testers. In this way, our original base of users was introduced to the Smart Campus project as a real-world context of 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. This activity resulted in a large amount of qualitative feedback, which was analysed by the Smart Campus team in order to derive suggestions for improvement which were then integrated into the application; proposed functionalities included, for instance, the very timetable checking, which had not foreseen in the original design of the application.

We underline that, during this phase of evaluation of the existing applications and participatory design of new concepts, the infrastructuring activities were ongoing. In particular, for what concerns the social infrastructuring, we focused our efforts on seeding a community of users and providing ways for them to interact with the Smart Campus staff. To this end, several communication channels were set up to decrease the gap between designers, developers and users [13]: these channels ranged from forum, social networks and a bug tracking system to personal diaries, face-to-face meetings and questionnaires. Through these communication channels, students reported technical and usability bugs to the *Smart Campus* staff: these suggestions were used to progressively refine the application. Moreover, students gave their opinion on possible improvements and new functionalities.

A similar study was performed again one year later, involving the students of the attending the HCI class (N = 117) in fall 2013: the Smart Campus applications, including ViaggiaTrento, were much more mature, therefore the activities performed with the class were more geared towards boosting the engagement of other students into the community rather than on applying HCI knowledge to improve the design of the applications. Nevertheless, we obtained further feedback from the students, which was once more analysed and implemented.

6. Going public

The community of students has now been testing ViaggiaTrento for almost a year and a half. However, after a few months of user testing, we were confident that the application was stable and usable enough and that an initial user community was seeded; therefore, in collaboration with the Municipality, we released ViaggiaTrento on the Google Play Store around mid October 2013, in order to make it publicly available also for general citizens of Trento. We are indeed witnessing the growth of a critical mass: as of June 9th, 2014, we have reached 886 active installations of the application over 1415 total downloads; the average rating over 64 reviews is 4.5 out of 5. This is indeed a good result if compared with the other applications about Trento available on the Google Play Store: only three of these urban mobility applications, in fact, exceed a thousand downloads. The most downloaded one is the official application developed and advertised on buses by the local transport company: launched in January 2014, it has more than 5000 users, but shows the very low rating of 2.7 on the Google Play Store and rather negative comments overall. The other two apps we take into account all have between one and five thousand users; however, they only provide a subset of the ViaggiaTrento functionalities (e.g. timetable checking, journey planning). The rating of all these three apps is anyway below 4 out of 5. These results seem to suggest that the design activities conducted at the beginning of the project and the overall process of involving students have been helpful in delivering a satisfactory user experience.

7. Branching

While ViaggiaTrento was being published on the Google Play Store, the nearby Municipality of Rovereto expressed interest in our project: leveraging on the reusability of the developed technology, we created and published a version of the application customized for that city and called ViaggiaRovereto. In this case, the Municipality was available to provide us with more data: therefore, ViaggiaRovereto also informs citizens about public notices issued by the Municipality concerning for instance detours or roadwork. ViaggiaRovereto has reached 324 active installations as of June 9th, 2014, over 660 total downloads since its release in mid October 2013; the average rating over 33 reviews is 4.3 out of 5.

Given this favourable environment, we once more adopted a participatory design approach to see how the application could become even more fitted to the citizens' needs: this time, however, we involved a different community of students thanks to the collaboration with a technical high school in Rovereto. Many pupils commute to this high-quality institute from all over the Province and from nearby valleys, and some even live in student houses during the week. A group of approximately 30 third year students was introduced to the basic concepts of usability, evaluation through field studies and scenario prototyping and then asked to try out the application in their daily life for a month. At the end of this period, students had come up with a variety of proposals about functionalities they felt necessary, including for instance the possibility of planning a journey by specifying the intended arrival time rather than the departure time. Proposals also addressed the interaction design of the

application: for instance, one suggested prompting the user for delay notification rather than relying on his motivation to actively open the relevant form, as in his opinion this would facilitate user contribution and result in increased collaboration.

8. Conclusions

In this paper we have presented a case study about the development and delivery of a mobile application, called ViaggiaTrento, fostering sustainable urban mobility by supporting collaborative behaviours among travellers. Given the good results in terms of the number of downloads and ratings of the versions of the application available, we feel that the requirements expressed by student commuters reflecting on their travelling experience with local transport were indeed representative of the needs of the local community with respect to transport. We need to underline, however, that the establishment of an underlying social and technical infrastructure and of a local institutional support were both instrumental to ensure that ViaggiaTrento could really make a difference on the daily life of students and citizens. We now plan to follow the spreading of the application and its appropriation by the local community.

Acknowledgements.

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