GoEco!

A smartphone application leveraging eco-feedback and gamification techniques to nudge sustainable personal mobility styles
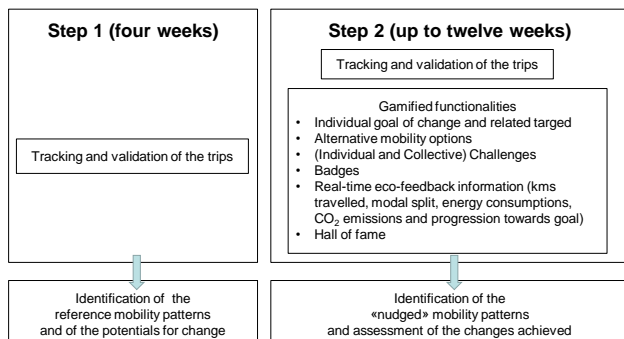
Francesca Cellina[1], Vanessa de Luca[1], Nikolett Kovacs[1], Andrea E. Rizzoli[1], Roman Rudel[1], Dominik Bucher[2], Paul Weiser[2], Martin Raubal[2]
[1] University of Applied Sciences and Arts of Southern Switzerland   [2] ETH Zurich
Department for Environment Constructions and Design   Institute of Cartography and Geoinformation

1. Aim and objectives

How can we encourage people to engage in more sustainable mobility lifestyles?

We overcome traditional awareness-raising and develop a smartphone application (app) that leverages eco-feedback information, social norms and peer pressure, adopting a "gamification" approach (cf. Weiser et al. 2015). The app will be tested in 2016 using a "living lab" approach (Higgins and Klein 2011), addressing users with some degree of intrinsic motivation to change.

2. Key functionalities

3. Tracking and validation of the trips

The *GoEco!* app exploits the APIs on the users position tracked by the commercial, free app Moves (https://dev.moves-app.com/).

Moves tracks the points visited and identifies if the user is walking or cycling. The other means of transport are identified by overlay between Moves points and the graph of the public transportation system (stops and lines).

The reason for the trip is inferred by means of map-matching algorithms and adopts the same set of values as the Swiss Microcensus Mobility and Transport (BFS, ARE 2012).

The user is asked to validate the means of transport and the reason for the trip.

4. Suggestion for alternative options

The user gets suggestions for alternative mobility options both at the end of Step 1 (in a static, final report) and during Step 2 (directly in the app).

Alternatives are identified for single trips whenever meaningful, e.g., using information from existing databases such as the SBB public transportation route tables (http://www.fahrplanfelder.ch).

5. Eco-feedback

At the end of Step 1 the user receives a report showing her reference patterns:

The report also indicates the potentials for change in case she adopts suggested alternatives:

Decrease in the % of kilometers your travel by car	57	
Increase in in the % of kilometers you travel by public transport	36	
Increase in the % of kilometers you travel by bicycle and foot	88	(on a weekly basis)
Decrease in the total amount of kilometers you travel	0	
Decrease in your weekly energy consumptions	22	
Decrease in your CO_2 emissions	51	

A corresponding eco-feedback is offered to the user on a weekly basis in Step 2.

6. Individual goal

At the start of Step 2, the user is asked to choose an individual goal for change respect to the reference mobility patterns and to indicate a specific target value:

I will decrease the percentage of kilometers I travel by car	
I will increase the percentage of kilometers I travel by public transport	by ... %
I will increase the percentage of kilometers I travel by bike and on foot	(on a weekly basis)
I will decrease the total amount of kilometers I travel	
I will decrease the energy consumptions due to my mobility needs	
I will decrease in the CO_2 emissions due to my mobility needs	

Besides the weekly eco-feedback (See Section 5), in Step 2 the user also gets feedback on the progression towards her personal goal: she is shown the percentage of her individual goal she managed to achieve (average weekly values from the beginning of Step 2).

7. Challenges and badges

In Step 2 every week the user is offered new challenges. If the system detects she manages to complete her challenges, she is rewarded with a publicly visible badge – in addition to the intrinsic reward produced by getting aware of the progression towards her individual goal.

Week after week, the level of difficulty of challenges might increase:

In order to keep up the attention and interest of users, once a month a collective challenge is offered. Unexpected badges are also attributed when the system automatically detects uncommon (but highly sustainable) patterns, such as the following:

8. Social comparison: the «hall of fame»

In Step 2, every week the users' performances are compared based on the percentage of achievement of their own individual goals. The "hall of fame" section awards users who:

- achieve the highest percentages of their own goal;
- obtain more badges or are the first to obtain a new badge.

An highly visible pie chart also shows the distribution of the other users respect to the level of achievement of their own individual goal.

9. Discussion

We consider progression towards one's individual goal as the key motivational factor, both for the individual and the social comparison eco-feedback.

Differently from most gamification processes, we do not rely on a scoring system: we do not want to patronize the user with a non-customized, over-imposed and not always transparent reference system respect to which attributing points. The user is free to progress at her own pace and in her own direction.
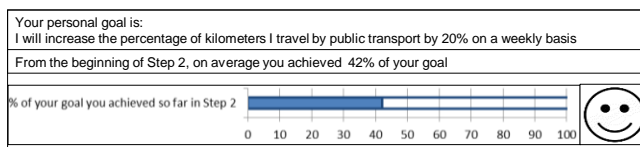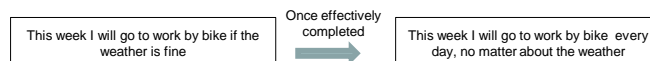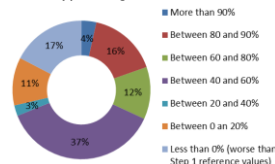
References
Weiser, P., Bucher, D., Cellina, F., De Luca, V. (2015). A Taxonomy of Motivational Affordances for Meaningful Gamified and Persuasive Technologies. *In Proceedings of the 3rd International Conference on ICT for Sustainability (ICT4S)*. Atlantic Press.

Higgins , A., Klein, S. (2011). Introduction to the living lab approach. In *Accelerating Global Supply Chains with IT-Innovation*, Y.-H. Tan et al., Eds. Berlin Heidelberg. Springer-Verlag.
BFS, ARE (2012). Mobilität in der Schweiz. Ergebnisse des Mikrozensus Mobilität und Verkehr 2010. Swiss Federal Office for Statistical Office (BFS in German), Swiss Federal Office for Spatial Development (ARE in German), Neuchâtel.