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# Mobile Awareness: Design for Connectedness

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**Abstract**

This article describes our ongoing research project about design for behavior change, which is facilitated by Ubiquitous Computing technologies. In particular in this paper we discuss the potentiality of mobile devices to facilitate the mobility behavior change among people who are currently living at Turin, Italy. To this aim we illustrate our conceptual design of a mobile game, which is designed to facilitate mobility behavior change.

**Author Keywords**

Connectedness; Sustainable Behavior; Ecological Thinking; Self-Awareness; Internet of Things; Persuasive Design

**ACM Classification Keywords**

H.5.2. Information interfaces and presentation (e.g., HCI): User Interfaces

**Introduction**

The theoretical construct of self-awareness<sup>1</sup> has been applied in different contexts, including the context of social psychology. We have been based our work on the

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<sup>1</sup> Self-awareness refers to the capacity of becoming the object of one's own attention (Duval & Wicklund, 1972), that means one can perceive stimuli, during an event and consequently feel emotions, but self-awareness rise up when the person find the connections between stimuli, events and emotions.

## The Survey:

This survey has formulated in 26 questions and it's been structured in four essential parts: the demographic and the building's physical characteristics questions, followed by questions about people's willingness of going through altruistic actions (e.g. participate in UNICEF, helping other people, etc.), their habits and behaviors regarding mobility, waste generation and consumption of goods, water, food and other products, followed by the auto-valuation questions, through which they were asked how they value themselves and their communities regarding sustainability and happiness and questions about perception of smart objects and services. We have collected by now 300 responses and this survey will remain active until July 1<sup>st</sup> 2015.

definition of self-awareness as the personal experience of social community, which is connected to different layers of the environment. Self-awareness is also connected to the self-empowerment, as the Riva's Positive Technology framework affirms [1]. Authors proposed a framework to classify technologies according to their effects on personal positive experience and on improving social integration and connectedness. The term "connectedness", in psychology describes the extent to which individuals consider themselves parts of the universe [2] and is defined as the extend individuals cognitively include natural ecosystems in their representation of selves, which is the principle of ecological thinking.

As an individual or group's level of connectedness directly affects their level of ecological thinking and correlates with their desires for adopting sustainable behaviors [3] in this project we intend to investigate the role of self-awareness for designing a mobile game application which affects ecological thinking among users. Consequently we expect this to foster the sustainable behaviors among users.

In other words, to foster sustainable behavior, people need to improve their level of self-awareness and ecological thinking [4]. For this purpose, mobile and Ubiquitous Computing technologies which have changed the way we perceive ourselves and also our connection to the environment, can help people to become more self-aware, which is very important to make better choices and change behaviors. [5], [6]

## Research objectives

To address this issue, we need educational tools that develop the cognitive capacity of ecological thinking<sup>2</sup>. The education of sustainability is an area with high potential for application of this concept since it seeks to promote people's motivation and engagement [7], [8]. Through this paper we introduce the preliminary analysis and a conceptual design of a digital mobile instrument, which might help people to overcome the lack of self-awareness and shift from exclusive behaviors to more inclusive behaviors [2]. (Figure 5)

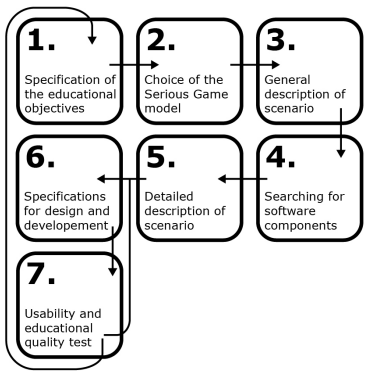
## Methodology

An ongoing survey has been conducted online since April 22<sup>nd</sup> 2015, among people who are living in Piedmont region, which is the largest Italian region situated in northwest of Italy. The objective of this survey is evaluating and analyzing the level of ecological thinking and sustainable behaviors among people in order to design appropriate product and services, which would help to change, foster or maintain a certain behavior.

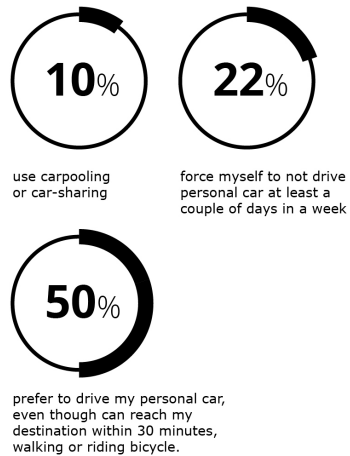
Due to the educational purpose of this project, we also need to use proper tools. We are planning to apply Gamification principles and Serious Games tools, which is a concept intending to use elements and processes from real games into non-games applications. We will apply this tool to improve user's self-reflection skills, in order to understand the relation between them and their social and natural environments. An example of

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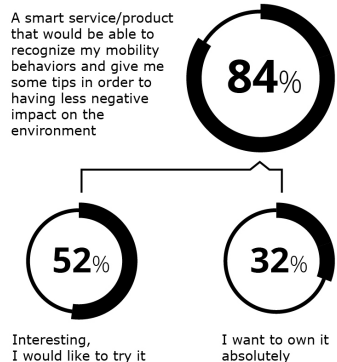
<sup>2</sup> Ecological thinking is the ability to understand the whole world, including natural elements, humans and artificial elements, as a highly interconnected mesh.



**Figure 1:** The seven steps for designing Serious Games [7], revised by authors.



**Figure 2:** Their attitudes towards mobility (Results of the survey)



**Figure 3:** Their tendency to use appropriate smart object and service in order to recognize their habits and assist them to change their mobility behaviors (Results of the survey)

the steps for designing an educational game is reported. [7] (Figure 1)

### Partial results and conclusions

We have analyzed the survey partially, and we understood that while the most part of the respondents (65%-85%) concerns about the sustainable energy consumption and also waste recycling (80%-90%), they pay less attention regarding the sustainable mobility behaviors, (Figure 2). Also it has been identified that they have tendency to use appropriate smart object and service in order to recognize their habits and assist them to change their mobility behaviors, (Figure 3) and is evident that they are aware of the role they can play on environmental and social sustainability. (Figure 4)



**Figure 4:** Their willingness to change behavior (Results of the survey)

On the result of this analysis we have decided to design a mobile game through which, user will interact with personal informatics [5]. By personal informatics we mean an activity by which people collect and reflect on personal data to gain better understanding of their own behaviors. Personal informatics tools can vary among websites, mobile devices like a smartphone, etc. among those, we have chosen the smartphone. We chose smartphone, because it's considered the symbol of "personal digital life", which is although a personal mobile device but it also broadens the boundary

beyond the personal life, towards family life and even to the city mobility life.

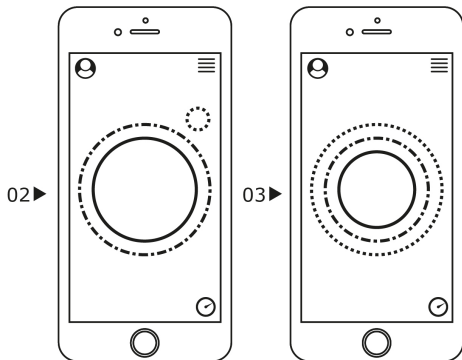
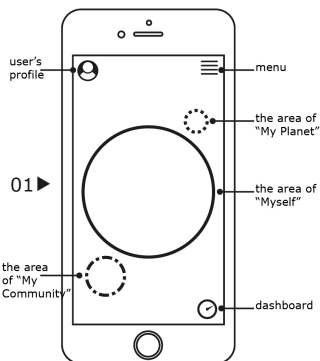
1	<b>Collect data:</b> Through user's self-declaration
2	<b>Learn:</b> User's mobility behaviors
3	<b>Suggest:</b> Appropriate action
4	<b>Assist:</b> During the process of behavior change
5	<b>Engage:</b> Through Gamification
6	<b>Give awareness:</b> About the effects of user's actions

**Table 1.** The six main functions of the mobile game

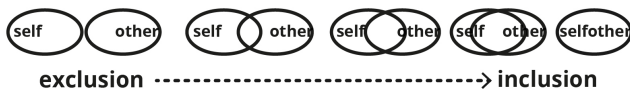
This mobile game application will consist of three fundamental sections of "My Self", "My Community", and "My Planet" which are graphically presented as three circles on the mobile interface. The area of "My Self" collects information regarding personal wellbeing and economy. For this area we focus on collection of personal data for the purpose of gaining insights and understanding of oneself. The data can be both qualitative (e.g. moods) and quantitative (e.g. heart rate). The area of "My Community" regards the contagiousness of one's actions. This will explain how the user's daily choices affect the choices made by user's community. This area also concerns about the relations of the user with the community, whether real or virtual. (e.g. social networks) Finally the area of "My Planet" demonstrates the effects of personal choices on planet's health and environmental sustainability.

### Sketches and expected outcome

The graphical language of the user interface (Figure 6) recalls the Schultz's integrated cognitive representation of self and other. (Figure 5)



**Figure 6:** Sketches of mobile game interface.



**Figure 5:** Schultz's integrated cognitive representation of self and other, 2001.

### Future steps

We will conclude the data collection from survey in order to have guidance on design process, and then will analyze the results through focus groups and co-design sessions, conducted among the target emerged from the survey. For co-design sessions we will use appropriate participatory design tools and then we will build a low fidelity and navigable prototype to conduct usability test with users. This mobile game application is expected to be connected also to other designed smart objects at home environment in order to be able to learn all other behaviors which is related to interact with tangible artifacts. (e.g. smart key holder.)

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