

# Co-design social robotic system by using IDEO's HCD model

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## Abstract

Recent technological transformations lead to imagine a future in which man will be aided by innovative collaborative robotics solutions with advanced skills and socially acceptable behavior (social robotics). Design discipline can make a decisive contribution in terms of human-robot interaction, by investigating new and transversal approaches to the project.

The hereby presented project aims to conceive and develop new solutions in the field of ICT assistive robotic technologies, that can prove to be capable of supporting people in carrying out health care services. This paper presents the results of the co-creation activity of a robotic system based on the IDEO HCD model. Starting from this consolidated model, through the interdisciplinary contribution of over seventeen public and private partners, new methods of participatory planning have been experimented. Therefore, among the results we present the definition of the concept within the project, but also the testing of a promising design method.

## Activity Description / Materials and Method (with charts, photo, etc)

Our project aims to conceive and develop new solutions in the field of ICT assistive robotic technologies proving capable of supporting people in carrying out health care services, acting with socially acceptable behavior. Si-Robotics is a research project co-financed by the European Union on "Research and Innovation 2014 and 2020" PON funds, pertaining to the Specialization Area "Technologies for Living Environments".

The scientific objective of the project is to devise and implement easily adaptable technological solutions to help the elderly in daily activities and evaluate the progress of their physical and cognitive decline (fragility, dementia, slight cognitive impairment). It is based on the idea of creating socio-technical systems that integrate hardware technology (robots, sensors), software (traditional and intelligent SW) and human beings (elderly people, family members, assistance network composed of doctors, formal assistants, organizations, companies of services).

The technological objective of the project is to create connected robots capable of assuming increasingly "human" skills and traits, such as perception, adaptation, learning, manipulation and interaction. The distinctive feature of the project is the implementation of advanced behavioral and interaction models, designed to create a positive perception of care in order to encourage older people to participate in their care process. Our ambition is to provide and evaluate new assistance processes for continuous care carried out through a wide range of health services, including different levels and degrees of assistance at home and in residential areas.



Participatory game design.



Live-drawing co-design activity.

## Findings / Impact

**CO-DESIGN WORKSHOP:** The activity was conducted in a multidisciplinary team (designers, architects, sociologists) working with focus groups of 5 participants, for a total of 20 individuals between 65 and 75 years old. Users enrollment was carried out in order to ensure homogeneity of sex and degree of school education (diploma/degree). The activity carried out was aimed at investigating with users the formal and interactional aspects of the robot. Specifically, it was decided to use participatory game design as a method, a prototyping process that allows participants to express their needs through practical game actions and/or physical composition. For this purpose, special cards have been created, which depict the main components of a humanoid robot, in different iconic shapes and configurations (square, rectangle, circle). Participants were asked to compose their own robot by pasting the figures on a form to be filled in with further comments, opinions and explanations in relation to the choices made.

**Results:** The chosen methodology proved to be flexible, capable of gathering the interviewee's point of view without forcing it, economic and capable of returning numerous useful information. This co-design process led to the definition of several possible configurations of the e.g. reduced dimensions to facilitate movement in narrow spaces; furniture-like shape to allow a more graceful integration into domestic environments, clearer warning signals in case of emergency, illumination of the mobile base in order to support navigation even in low light conditions and integration in the interaction process of smartphones or tablets to enable the possibility of controlling the robot via mobile devices. The robot was acknowledged as a useful tool for the safety of the elderly, even though its size and height, which were reckoned to be potentially excessive, can create a sense of oppression for the user. A number of users claimed that the robot should aid the user movement and his social life: for this reason, recreational and telepresence applications were taken into account. Users participating in the workshop repeatedly underlined the need to actively use the robot. The robot should be managed autonomously with different functions and it should be possible to move it easily and use it for emergency calls. However, for a successful interaction the robot should maintain a simple shape.

**LIVE DRAWING CO-DESIGN ACTIVITY:** The results obtained from the co-design activities created the basis for structuring a second participatory activity, in full compliance with the iterative design perspective. The carried-out activity was aimed at investigating with users the formal and interactional aspects of some concepts developed on the basis of previous activities. The experimental methodology made use of an illustrator and a projector: the concepts were co-designed with users in real time and projected on a wall in 1:1 dimension. The illustrator prepared a few drawings of the concepts before the activity; these were then submitted to the users by the sociologist who moderated the co-design process. The user sample was formed by the same people who took part in the previous session, in order to offer them a full overview of the design process and receive their suggestions and opinions as their understanding of the theme evolved.

**Results:** The activity was a great success regarding users' engagement. In particular, the capability to see a full-sized drawing of the concept allowed users to have a deeper understanding of the design problems and possibilities. Without it, a person who is not used to draw and design wouldn't have been able to clearly visualize the concept and positively interact with the designers. After an initial shyness, users unlocked their creativity and were fully involved in the activity: they stood up from their chairs and started to discuss their opinion directly with the designers and the illustrator, proposing changes and additions to the concepts projected on the wall. These proposals were deeply insightful and will be taken in great consideration for the definition of the final design.

