

NICOLÒ PARACIANI, LUIGI BIOGGA, MARCO PADULA E PAOLO LUIGI SCALA

# HOST - Tecnologias Inteligentes para Serviços Personalizados de Apoio à Independência de Inquilinos Idosos da Habitação Social

*HOST - Smart Technologies for Personalized Services to Support Independence of Older Tenants of Social Housing*

**Nicolò Paraciani** is graduated in Physics in 2005, is a Research Collaborator in Information Technology at the Rome Department of CNR-ITC since 2008. [paraciani@itc.cnr.it](mailto:paraciani@itc.cnr.it).

**Luigi Biocca** is Researcher and Responsible of the ITC Unit of Rome in “Housing and technology systems for domestic and urban quality of life of all users” and “Heritage access tools for the benefit of larger users’ groups”. Partner of EU funded projects. Lecturer for the Master in Assistive Technologies, Department of Informatics, Trieste University. [biocca@itc.cnr.it](mailto:biocca@itc.cnr.it).

**Marco Padula** is IT Senior Researcher, and heads the IT Department of CNR-ITC since 2004. He has more than 25 years skill on web-based interaction and services, information systems, e-learning; took part in National Projects Concerning Document indexing for online management, EU projects for the development of information management, dissemination networked platforms (Aquarelle: C-web, CONNIE), and Interreg projects. [padula@itc.cnr.it](mailto:padula@itc.cnr.it).

**Paolo Luigi Scala** has Master’s Degree in Information and Communication Technologies in 2010. Research fellow with a temporary position at the Information Technologies Department of the Institute for Construction Technologies of the CNR since 2005. Fellow in Computer Science and Techniques of Multimedia Writing at the Università Cattolica del Sacro Cuore. His areas of interest include: processes automation and formalization, WebGIS platforms development, ontology design and implementation, authoring environments for the semi-automatic publication of geo-referenced information. [scala@itc.cnr.it](mailto:scala@itc.cnr.it).

### Resumo

HOST, Tecnologias Inteligentes para autosserviço para idosos em Habitação Social é um projeto em curso financiado pela Comissão Europeia no âmbito do Programa AAL (Ambient Assisted Living), chamada 3, com o objetivo de fornecer uma rede de “conexão das habitações sociais” em três países parceiros: Itália, França e Reino Unido.

Um pacote tecnológico está sendo construído com *feedback* contínuo com os inquilinos, que começará a partir de suas necessidades e expectativas para a vida diária para sugerir possíveis soluções na modalidade de “self-service” como um pré-requisito do programa de financiamento.

O resultado final é um pacote tecnológico fácil de usar para a habitação social, permitindo uma melhor qualidade de comunicação e acesso para diferentes serviços. Após a implantação nos três países, um julgamento acontecerá testando um modelo europeu de “flats conectados” para as pessoas idosas com equipamentos específicos, que permitam relações mais fáceis com a família, prestadores de serviços e operadores de alojamento. O HOST tem a intenção de trazer mais conforto de vida para os moradores mais velhos, reforçar a inclusão social, permitir uma estada mais longa em suas casas, implementar funções de gerenciamento de casa e aumentar a participação humana para as atividades relacionadas com a casa.

Este artigo dará um esboço do projeto, descrevendo seu estado atual e as atividades que serão realizadas para alcançar os objetivos esperados, notadamente o processo coparticipativo relacionado ao desenvolvimento do software e a implementação da fase que constitui o atual marco para avaliar o impacto das tecnologias desenvolvidas pelo projeto.

**Palavras-chave:** Vida independente. Software como serviço. Habitação social

### Abstract

HOST - Smart technologies for self-service to seniors in social housing is an on-going project funded by the European Commission within the AAL (Ambient Assisted Living) Program, Call 3, aiming at providing a “social housing connectedness” network in three partner countries: Italy, France and UK.

A technology package is being built upon continuous feedback with the tenants, who will start from their needs and expectations for daily life to suggest possible solutions in a “self-serve” basis as a pre-requisite of the funding programme

The final outcome is an easy-to-use technological package for social housing allowing a better quality of communication and access to different services. After the deployment in the three countries, a trial will take place testing a European model of “connected flats” for elders with specific equipment enabling easier relations with family, service providers and housing operators. HOST is intended to bring more comfort of living to the older tenants, reinforce social inclusion, allow a longer stay in their house, implement house management functions, and enhance human participation to home-related activities.

This paper will give an outline of the project by describing its current state, including the activities that are currently being carried out to reach the expected goals, notably the co-design process, related to software development, and the implementation phase, which constitutes the actual benchmark for assessing the impact of the technology developed by the project on all its target users, that is, elderly tenants and their carers, as well as social housing operators.

**Keywords:** Independent living. Software as a service. Social housing

## Introduction

HOST is a research project launched in May 2011 within the framework of the European programme for research funding Ambient Assisted Living (AAL). It is coordinated by the French public entity Opac du Rhône, that manages social housing in the Rhône Region; the full partners' list, along with their role in the project and the country they're from, is summarized in Figure 1.

The project addresses the field of social housing, which the European definition is referring to residential housing, which may be either public or cooperative, but has a central focus on affordable housing. Social housing is an interesting field for the application of service provision connected with new information technologies, and dedicated to people with special needs, such as elders or people with disabilities. In fact, these users usually are not able to find adequate services on the market, both because of generally high costs and because of interfaces which are not user-friendly enough, being therefore too complex to be easily operated. In the case of older residents, these problems are even more serious.

In this context, HOST intends to provide senior users of social housing with safe and easy technologies and remote devices, so as to assure an efficient and reliable access to service packages and a better quality of communication, through the experimentation of a European model of network-connected flats.

In the European Union there are various organizations representing social housing: many of them belong to the European Federation called CECODHAS (<http://www.housingeurope.eu>).

As a general rule, the field of social housing doesn't only provide a dwelling, but is concerned with supporting residents, most of all the frail ones, such as elders and people with disabilities, by offering a broad range of services like call centers, house management and maintenance, social activities and so on.

Figure 1

HOST Partners' list.

Source: Opac du Rhone, 2011, pp. 1 of AAL HOST project.

Name	Type	Country	Role
Opac du Rhône	Users organization	France	Social housing
Finabita	Users organization	Italy	Social housing
NCHA	Users organization	United Kingdom	Social housing
Adama/Avizen	SME	France	Technologist
bioresult	SME	Italy	Technologist
tripleplay	SME	United Kingdom	Technologist
Érasme – Conseil Général du Rhône	Research institution	France	Research
CNR-ITC – National Research Council, Construction Technologies Institute	Research institution	Italy	Research
Polibenestar – Universita de Valencia	University	Spain	Research
AGIM – Université Joseph Fournier Grenoble	University	France	Research

## Services

With these objectives, HOST aims at defining a “software as a service” distributed as a Web platform hosted by a specific server for each group of flats, relying on dedicated databases with information and support data.

More specifically, the services that the project intends to deploy belong to the following four macro areas:

- home management: providing the elders with easy access to information related to the residential structure (e.g. cost, maintenance, deadlines);
- direct relationship with the local “Circle of Support”: to manage a contact list of service providers and operators for home management, shared among the elders, their relatives and acquaintances, the social housing operator and the volunteer organizations;
- house and condominium maintenance: to report malfunctions and to ask for support and maintenance services to the social housing manager, who is in contact with a group of trusted professionals (e.g. electricians, plumbers);
- access to e-commerce services by the means of simplified procedures: to access special offers and shop in a secure environment.

For each group of flats, a server will provide to each tenant a set of services specifically tailored to his/her needs, both for what concerns contents and user interface. To do so, each tenant will be asked about which kind of services and contents she/he would like to access from his/her home. Moreover, special needs will also be recorded, such as simplified user interfaces for visually impaired people, or speech-recognition interfaces.

This kind of information will be stored in the dedicated database and automatically fetched to configure the services directed to a specific user.

In this way, it can be offered a component-base platform represented by a common core of functionalities and utilities that is extended with additional components, i.e. more complex and personalized services. The main advantages offered by component-based platforms are interoperability, easiness of maintenance and product evolution, reusability of components, and cheapness (SZYPERSKI, 2002).

The effectiveness of the use of adaptable and customizable component-based systems has been proved by many documented real cases (GINIGE, 2003, p. 1-8, STEVENS et alii, 2006, p. 269-294), and by the growing spread of this approach in the world of software development. The elders can choose to interact with the services offered by the platform by the means of devices such as PCs, TVs equipped with a dedicated set-top box, smart screens or tablet PCs with haptic interface, depending on what the residents prefer. The system aims at meeting the requirements and needs of older residents, by facilitating their choice of custom solutions and providing technological support to help them live as independently as possible. Implementing the service is intended to deliver the following objectives:

- making older people's life more comfortable, by making easier recurrent tasks such as bills' payment or planning simple home maintenance activities;
- improving social inclusion by installing smart screen devices in public areas to exploit on-demand digital contents or to get updates about ongoing maintenance activities. Furthermore, the presence of common digital equipment enables a digital tutoring between inhabitants in the residence and it creates sociability and assistance around the digital space. This configuration will be tested, and the real impact on collective trade will be measured;
- extending their permanence in their home as much as possible, avoiding unnecessary hospitalization, by allowing the elders to easily keep in touch with their "Circle of support", that is their relatives but also volunteers and nurses. Moreover, a tele-assistance service will, in response to a phone call, return information on the elder's screen. At the question "can you give me passing bus schedules?", the answer could be "they are displayed on your screen, you now have time to review at your convenience".

### **Stakeholders of the system**

The main stakeholders of the system described above are:

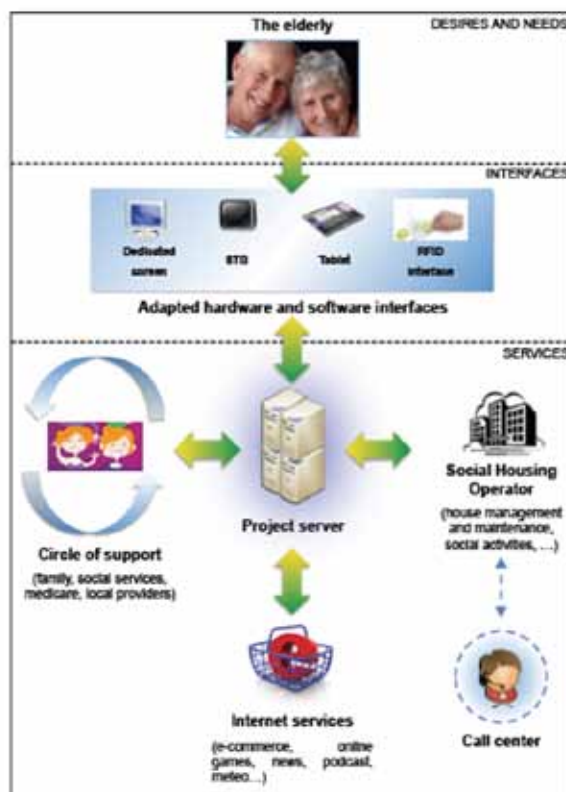
- residents, particularly elderly and vulnerable people: the system as a whole, the services offered and the interaction styles implemented are all conceived, designed and developed according to their needs that will be gathered in various phases of the project. Initially, they will be interviewed about their needs and expectations, offering them different choices and solutions. Later, during the project, the services will be activated and their usability, together with their actual adherence to the elders' needs will be verified by the means of usability tests and interviews;
- the managers of the social housing structures will host the system in their structure and will report problems and malfunctions to the ICT operators;
- ICT operators will install and maintain the platform, and provide the infrastructures needed to link to the telecom operator;
- telephone operators will provide the infrastructure to offer tele-assistance services delivered by volunteers' associations;
- trader services and contents providers will offer specific services under special commercial terms (e.g. online shopping, movies or music streaming).

A representation of the system, the services offered and the relationships linking them to the main stakeholders involved, is depicted in Figure 2.

Figure 2

HOST platform.

Source: Opac du Rhone, 2011, AAL HOST project.



## Work plan description

The activities of the HOST project are structured into five work packages (WPs), four of which are dedicated to research and development, while the fifth is devoted to project management and dissemination.

The first WP concerns the definition of user requirements.

A direct assessment of specific requirements will be performed by using active contributions from residents, according to criteria considering two main categories of needs:

- general needs: comfortable life style, independence and self-esteem, safety, usability of spaces and home equipment, social support network/services, need for specific aids related to sensory impairments, participation in social activities and relationships;
- technological needs: they include awareness in choosing custom services based on needs and confidence with the human-machine interaction process.

Furthermore, during WP1 home maintenance services will be defined to the purpose of supporting older people in keeping their home efficient or helping them in carrying out daily activities. The services might be different between countries, according to the specific needs shown by users.

Another task belonging to this WP is the development of the project website <http://www.host-aal.eu> (see Figure 3) for dissemination, which is already partly completed and includes a private section that can be accessed by project partners for the exchange of information concerning the progress of project activities. In the public area, people can gather information about the HOST project, its objectives, and the services it intends to offer to the elders, as well as information about the partners, and all the stakeholders involved.

Figure 3

HOST website.

Source: <http://www.host-aal.eu/>

The second WP deals with the definition of system architecture, the specification, and development of all services supplied to the residents; the project aims to offer applications based on locally defined user groups. Each application is implemented with an interface allowing users to interact with the system in order to activate functions for performing designated activities, such as:

- interaction between an older resident and the social housing manager (information, expenditure, new services, agenda);
- interaction between an older resident and his/her circle of support, which includes relatives and friends, as well as neighbours and volunteers;
- interaction via messaging, pictures;
- interaction within the circle of support (information exchange among formal and informal carers).

The third WP aims to integrate the system, i.e. assemble the software components and check their connectedness and functioning, so to enter the trial stage. In accordance with the specifications of the general system architecture and local applications, devices and programs for connecting to the social housing manager are installed. Moreover, an assessment activity shall be carried on, based on TEMSED (Technology, Ergonomics, Medicine, Society, Economics, and Deontology) approach, a specific social and economic efficiency-based assessment method for the HOST system.

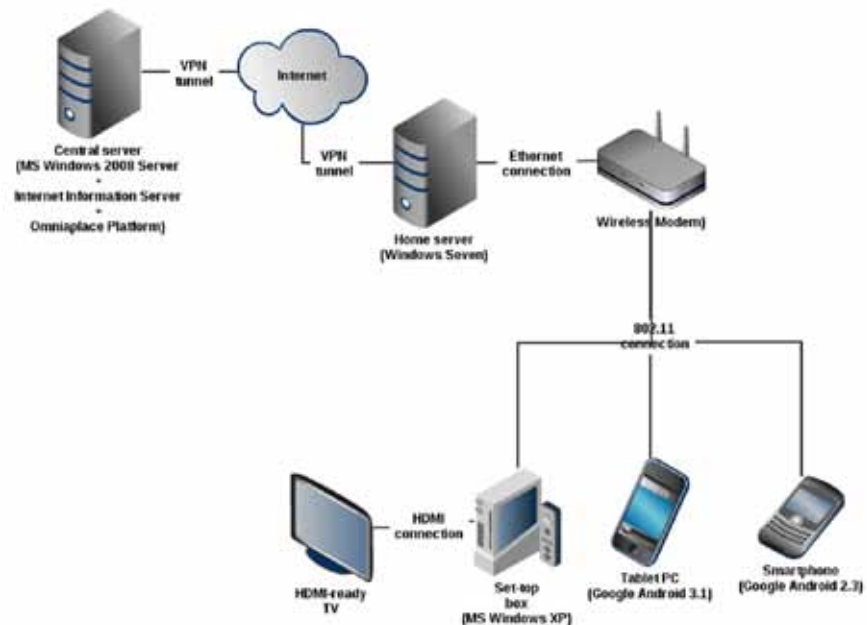


The WP4 includes the dissemination of the outcomes, communication, and marketing strategies. On this purpose, the CECODHAS network, as subcontractor and together with the partners, will ensure a valuable support in such activities. Moreover, since AAL projects must outcome a quickly marketable product (“two year time to market”, as AAL program recommends), this WP includes also a market exploitation plan with the potential market scenario and size, the buyers and the projected growth in the short run, and finally the potential end users of the services.

## System Architecture

Figure 4

The system architecture



The system architecture is shown in Figure 4. Users can access the services offered by the platform by exploiting different devices: a set-top box connected to a television, provided with a special remote control, a tablet PC or a smartphone.

As for what concerns Italy, users have chosen to use the tablet PC, in some cases configured as a set-top box connected to the TV. This choice, as well as allowing users a faster adoption of the system (providing them with well-known and simple tools, such as a remote control) is also particularly advantageous from the economic point of view.

The set-top box can be in fact connected directly to the network plug without the need of a wireless modem and the home server, since all of the functionalities implemented by the latter are implemented by the system embedded in the set-top box.

The only requirement that must be met is the presence of an HDMI Interface on the TV which the set-top box will be connected to. In this way, users will interact with a graphical user interface displayed on the screen of their TV using the buttons on their remote control, to activate and access the services provided by the platform, implemented as Web Services on the central server.

The central server is the heart of the whole system: it contains the user profiles, the configuration parameters of the interface devices, features and data related to the services offered, and the profiles of all the operators interacting with the elderly, whether they are employers of the social housing cooperative that houses the platform or volunteers working for associations that offer external services such as “il Filo d’argento AUSER”, which provides social services through the phone for the elderly (<http://www.auser.it/>).

The communication between the tablet PC/set-top box and the central server is made possible by a Virtual Private Network, or a virtual network with restricted access achieved by adopting specific client-server communication protocols supporting data encryption and users authentication mechanisms. The VPN is also used for temporized synchronization between the central server and the tablet PC/set-top box. In fact, the latter maintains locally the data that will have to be stored in the central database, then sends its IP address to the central server, so that it can access the device’s local database and generate PUSH events to transfer the data.

This strategy allows to efficiently exchanging data between the client devices and the central server, and to modify and update it in real time. Real-time data updating is used to send data and instructions in PUSH mode, so that the central server can send data and commands to the tablet PC/set-top box, which executes them immediately. Common data synchronization is managed with a polling strategy instead (i.e. through periodical interrogations), to ensure an efficient use of network bandwidth.

Finally, the Omnicare platform developed by BioResult (a project partners) is used server-side to manage all the details related to the services offered to end users, together with the data and information needed to configure and customize them, and all the information related to users who are in charge for the platform’s administration. The platform, which is implemented as a Web-based application, can be accessed only by authorized users, via a login procedure. In this way, based on the category to which the logged in user belongs to (administrator, manager, tutor, service providers, or user), he/she will have access to different information and functionalities offered by the platform.

Figure 5

An example of the client side interface



The client-side application user interface can be seen in Figure 5: it has been conceived and implemented so that it can be easily adopted by older users. Services are hierarchically organized by typology, with a graphic icon of suitable dimensions associated to each one of them, which clearly indicates the kind of service that will be activated by pressing it. A brief textual description is also displayed when the icon is selected. During the various co-design meetings (also see “Co-design phase” section), the elderly made suggestions to change icons that they considered unclear or confusing, so to implement a user interface more adherent to their needs. The services are then chosen by interacting with a horizontal scrolling menu that is browsable using the left and right arrows on the remote control or through the Tablet PC touch screen. Once the desired service is selected, all the necessary information is specified with the same style of interaction. The hierarchical organization of menus allows keeping only the necessary information on the screen at that time, avoiding confusion and fatigue to the user.

## Co-design phase

The activities involving co-design have been carried out during 2012, with the aim of enabling the actual end users of the system, i.e. the elders, to actively participate in the development process, by giving feedback about the set of services that they would like to have access to, as well as about aspects involving user interfaces and user experience in general. Therefore, the older tenants have been directly involved in workshops and meetings, that were held in the three partner countries developing the platforms, that is France, Italy, and UK.

In France, the co-design process involved a total number of 15 users, all located in Lyon (in two different neighbourhoods) and living in social dwelling provided by Opac du Rhône. At first, users were informed about the scope of the project and the nature of their involvement, and then a series of almost 20 workshops followed. Users were divided into two groups consisting of 6-8 people for each workshop, in order to facilitate interaction. A gradual approach was adopted in order to introduce users to the technologies that would be used, notably the iPad and the Internet (web platform). This led to the definition of a set of 30 types of needs that would be reflected by services, grouped into the following categories: organizing/memory exercise, communication/sharing, food and cooking, health and medicines. This also helped defining recommendations for the implementation phase, as well as improving the evaluation and assessment protocol to be followed.

In Italy, five sites distributed over the entire national territory, and involving five different social housing operators, had been previously identified for both co-design activities and implementation. A total number of 20 users were engaged in the process, by recruiting them on a voluntary basis with a first step consisting of mainly information activities.

For each site, two workshops were then conducted: one involving representatives of the social housing operator (who would then pass on information to tenants), and one with the elderly users, as well as their relatives and/or carers. The co-design process was carried out with the aid of three questionnaires, which were previously developed by partners Finabita, AeA, and CNR-ITC as deliverables of WP1, denoted by letters A, B, and C. Questionnaire A is intended to be used with older people, questionnaire B with social housing operators and questionnaire C with caregivers and volunteers.

The topics addressed by the questionnaires are related to, mainly: information about the living and social situation of the elderly users, needs and preferences in terms of services, status of the habitations, preferences in terms of technology devices to be used, including interface characteristics, and degree of familiarity with ICTs. The co-design workshops provided useful data concerning the possibility for integration of the HOST system within the framework of existing services being provided by the social housing operators, in addition to feedback and requirements to be implemented in the development of the platform itself.

In the UK, the co-design phase involved 24 residents of the Muskham View residential Home in Newark and started in August 2011. The main aims were to: understand the needs in terms of communication and information that could be delivered via digital interactive TV, as well as define appropriate ways to deliver and present related information services. In order to achieve these goals, a participatory approach was taken, therefore senior users were engaged and guided through the process of defining the content and functionality of the system. Workshops with seniors were then organized, in a total number of 16 spanning almost a year. This enabled the project staff to regularly gather the views of the users and implied their active participation in the project activities as co-designers, which led to an increasing level of acceptance of the system. The contribution from users to the development process consisted mostly in the definition of GUI requirements, especially regarding the drawing of menu icons.

## Implementation and experimentation phase

The implementation and experimentation phase is one of the most important project activities, since it provides an indispensable benchmark for testing the technological output of the project in a thorough way, by monitoring its use by the seniors, both in terms of technical aspects involving the running of the various features, and in terms of further development issuing from user feedback, thus continuing co-design with a progressive approach.

The first step of the implementation consisted of setting up the technological devices to be used, by configuring appropriate user profiles, in order to make sure that each device would correspond to individual user needs. These profiles were defined in the central database of the server-side platform which client application is connected to in order to download updates, and can be therefore easily modified and integrated in time by system administrators, in order to ensure that user requirements are met continuously.

Devices were then delivered to users in plenary meetings, where also first training was provided for enabling them to effectively use the basic features of both the device and the HOST application. This stage also led to establish some of the elderly users' preferences in terms of features and modalities of interaction with the device (for example, in Italy, when the tablets were first distributed, it became clear that seniors were not comfortable in using a small remote control for the tablet - which had been initially considered - and did not want to connect the tablet itself to the TV screen - that was suggested as an option - so both these features were dropped from the implementation). Users were also provided with a series of tutorials and guides for reference, detailing various aspects related to technological features, as well as performing tasks with both the tablet and the HOST system, which were arranged according to their difficulty level.

During the implementation, a monitoring procedure was established in order to check progresses made by the users, evaluate their needs, as well as provide helpdesk assistance when system failures, bugs or other malfunctioning occurred. The former was accomplished by asking the seniors specific questions on a regular basis, aimed at assessing the quality of their fruition of the HOST package, while the latter was carried out by dedicated project staff who were available to be contacted by seniors (usually via communication facilities provided by the application) and perform interventions, both remotely and in person when needed.

The types of features that were tested, and are still being tested, in the implementation differ between the partner countries conducting the experience.

In France, mostly communication services are being deployed in the form of a simplified social network-style web platform, named “Host Comm”, through which the seniors can share information and documents (such as pictures or links) between them, and also communicate with their social housing operator. Another application (“Host Org”) is being tested as well: it is an iPad application that provides the seniors with aids and facilitations for organising and performing their house management activities, mostly related to paying bills and rents.

In Italy, the implementation revolved around home delivered services that were provided by local entities in cooperation with Auser volunteers, who previously agreed to join project activities and committed to physically deliver the services to the senior tenants. However, a major role was played by the communication features of the HOST Android application, which allow users to send each other text messages and initiate Skype calls and video calls, through system aid. The contacts which each senior can communicate with are those forming his/her own circle of support, that is, a group of friends, relatives, carers, as well as HOST users, who participate in the social life of the individual. This list of contacts is customizable by the user, since new contacts can be added at any time directly through the application itself. The services that have been tested so far are mostly home delivery of pharmaceuticals, carried out in conjunction with local pharmacies, and accompaniment by car. In the next future, it is planned to test and deliver a set of home maintenance services, directly involving social housing cooperatives.

In the UK, the system provides users with information about their condition as tenants of the social housing facility, enabling them to communicate with the operator, as well as with each other. However, service provision has not been implemented as yet, since development and updating of the application has been recently suspended.

## Final considerations

The integration of services and technologies for older people’s independence is increasingly necessary in housing and particularly in social housing. In this paper we have presented HOST, an on-going European project aiming at providing a “social housing connectedness” in social housing structures hosting older tenants. HOST offers to the elders a software platform establishing a better quality of communication between them and their circle of support (i.e. formal and informal carers), as well as their housing owners, and giving access to various services focused on allowing a longer and safer stay in their house.

At present, three different prototypes of the HOST platform are being tested and as-

sessed in France, Italy, and UK, and a final evaluation of all these experiences is expected to show results coming from a comparative analysis of experimental data. Finally, since the platform has a modular structure, it will be possible in the future to develop and deploy additional services and features, even after the end of the project, so that users will be able to profit a more and more complete and customizable system.

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