INTELLIGENT OR SMART HOUSES: POLICIES AND STATE-OF-THE-ART IN ITALY

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ABSTRACT

The context of the manuscript is the social requirements and individual needs are changing the design and equipping of houses with upgraded technology that improves lifestyles for the 3rd millennium.

The objectives are the presentation of national/local policies for addressing new housing design guidelines. Some case studies illustrate how housing redevelopments benefit from new technologies, in terms of support for different lifestyles.

The key messages of the manuscript are the implement and adaptation to various users’ needs is a relevant key to make life easier, safer, and more time and cost-effective. Technologies from different sources (home automation, informatics, electronics, and communication systems) can better assist home routines, personal support, remote health/care aid, safety and security and leisure time.

The conclusion is, integrating technologies to housing allows for customizing different tools for everyday life as well as accessing a wider range of remote facilities/services via communication systems. Home technology exploitation, although relatively recent, has instigated some successful professionally run projects and initiatives.

Key words: Design, housing, users, lifestyles, technologies
New social requirements, an ageing population, family separation, increasing institutionalization costs, individuals’ changing needs and users’ demand for a better quality of life invite a review of many housing issues that have remained substantially unchanged for decades. In fact, as a core location of any individual’s life, housing with its layout and equipment can relevantly affect and interface with the above factors in everybody’s lifestyle. The way any user lives comfortably inside the home reflects his/her requirements outside. The new vision of housing that looks at meeting a wide range of new users’ needs associated with lifecycle and home evolution, must start with the layout.

In fact, most houses have basically kept the original layout for a long time and the equipment is more or less the same as that installed at the building phase. Nowadays this no longer responds to current family patterns and our increased physical needs.

House layout is therefore not adjusted in most cases to everyday life. Old townhouses and apartments, originally designed to accommodate families of four, five and even more, are now too big for singles, couples and smaller families, resulting in more running costs (cleaning, bills, refurbishments) for space redundancy, while at the same time no more suitable to higher levels of demand, especially in terms of comfort, safety and security.

An increase in the number of older people has led to the spread of physical and sensorial difficulties among the population, thus affecting home activities and making home layout unsafe and potentially dangerous due to obstacles, risk of accidents and falls. Most houses still feature traditional systems that no longer fit with a contemporary lifestyle. Moreover, systems are often obsolete and do not meet safety requirements.

Lacking or missing technologies cannot provide effective home functioning and access to outside communication facilities/services. Apart from a few new constructions automation technologies are not even inserted.

Rethinking a New Housing Design

The issues outlined above can stimulate new solutions for housing design. In particular, the Universal Design, i.e. ‘vision-for-all-users’ concept is now commonly accepted and taken for granted in housing design because it does not stigmatise ages and abilities. Instead it aims to include the largest number of user categories as possible.
Once housing is designed to better accommodate different users’ needs as well as to offer a good quality of life with regard to accessibility and usability, technologies can then follow the same inclusive concept to help people’s domestic lifestyle regardless of physical abilities. A well-designed house with an ‘ageing-in-place’ concept and flexibility will last throughout any user’s life and along with his/her changing physical conditions/abilities.

The concept of IT technology in dwellings has largely been connected with housing units for the elderly and for people with disabilities. A variety of technical home service equipment is now available to support augmented living for disabled people and for people with other kinds of functional disorders – so-called assisted living. Several studies have been carried out regarding IT technology in homes for the elderly (Himanen, 2003; Bowes, 2003; Doughty, 2003). Another recent example is a study examining the quality of life in homes for assisted living (Mitchell & Kemp, 2000).

Several studies (Pragnell, Spence & Moore, 2000; Venkatesh, 2001) have investigated the interest to live in a home with IT technology. However, there are very few evaluations of residents’ opinions about the IT functions in their home (Sandström et al., 2003). Another issue is IT technology has in most cases been developed and designed without consideration for the users’ opinions.

In Italy, a number of recent initiatives, funded by the national program for housing ‘Neighbourhood Agreements’, is involving some City Councils in promoting urban regeneration/housing renovation plans of areas, with a higher regard for life quality and relationship with the community in mind - thanks also to the support of basic technology packages and tools.

In particular, some of the recent calls and tender for new housing establish mandatory or highly recommended basic home IT installations necessary to support a person’s independence and to minimize emergency and alert situations.

The CNR ITC Experience

CNR ITC has been recently involved in a city office consulting group for defining technology guidelines and supportive care/assistance facilities/tools for the benefit of older tenants accommodated in a newly built housing complex in Pinerolo, a small city of Northern Italy (Biocca, Morini & Pomposini, 2003).

The urban renovation project of Pinerolo aimed to redevelop a degraded built area that had long been without facilities or a social connection with the community. The situation prior to renovation reported obsolete houses with poor materials and equipment, no heating or insulation system, some disused factories and poor maintenance of common spaces. Inhabitants were no longer feeling any identity as an
integrated town district (D’Innocenzo, 2003). The new master plan gave the opportunity of a new urban image by retrofitting/adjusting older dwelling blocks and building a new housing complex with adaptability to evolving household needs, materials sustainability and energy saving in mind (see Fig. 1).

Besides these relevant issues for improving the housing quality, the technological devices/systems were considered as basic factors in order to support and supplement the effectiveness of daily life. Adopting new technologies is therefore one of the crucial issues in the house upgrading process.

![Figure 1](General view of the master plan (Source: Pavoni, see References))

Five old blocks of dwellings have been equipped with new systems, fittings, and double ventilated facades. Accessibility was improved by installing elevators. When lacking room, lifts with connecting passages have been added to the block (see Fig. 2).

![Figure 2](View of the outside lifts and double ventilated façade (Photographer Luigi Biocca))
A disused area is now being replaced by a housing complex of 34 one and two-room dwellings, with some common halls and facilities, connection to teleaid service and a basic package of technologies for supporting tenants’ everyday life at home (see Fig. 3). Houses were not designed specifically for older people, but are suitable also for younger couples in order to encourage community exchange and participation as well as a new awareness as a core town district (Pavoni, 2003).

![Figure 3 View from the south (Photographer Luigi Biocca)](image)

The common areas of the complex are usable and accessible (see Fig. 4); all dwelling units are visitable (see Figure 5), while three of them are entirely accessible and can accommodate people with serious mobility difficulties.

![Figure 4 View of the community hall (Photographer Luigi Biocca)](image)
User participation also allowed future tenants to customize the layout of key rooms according to their needs and lifestyle, so that houses feature a good flexibility level. Features related to accessibility, usability and safety include:

**For corridors and common rooms:**
- Slip-proof floor;
- colour and contrast orienting pathways;
- emergency lighting system automatically switching on/off;
- teleaid system for health emergency remotely alerted;
- smoke and water flood detecting systems remotely alerted.

**For dwelling units:**
- solar balconies at the first floor;
- floor shower areas;
- electric cooking counter;
- outlets and devices easily visible;

*and for people with disabilities:*
- electrically adjustable kitchen counter;
- adjustable washbasin in the bathroom;
- electric door opening control;
- lifting system in the bedroom.
Additional technology tools for dwelling units include:
- alarm control button in the living room;
- two alarm control wires in the bathroom;
- wearable alarm remote control;
- smoke detecting system;
- water flood sensor system.

Alert situations are transmitted to an emergency station and forwarded to outside aid centres. The decision of what to include was made by the Municipalities, together with technicians and builder companies, taking into account the possible future residents, but not directly involving them in the decision process. This is due to the fact that the technology is not so widespread and known to allow final users to make a choice between different options. Of course, the users’ point of view can be investigated in the post evaluation, checking how inhabitants are assisted by the technologies and identifying the main difficulties in their application.

As we can see, technological features were installed for all the units, regardless of the type of future inhabitant, apart from those specifically devoted to people with disabilities. The choice for the Municipality and its technicians was therefore the ‘flexibility’ of the dwellings; all equipped for safety and security aspects.

If this is the general description of the building complex, we shall see the work that CNR ITC carried out in order to help public decision-makers choose the most suitable technologies and identify the characteristics of the system (in terms of reliability, user-friendliness, etc.) to be used for their final inhabitants.

The pre-requisite of the project was a housing scheme able to integrate the requirements of a planned dwelling equipped with accessible and easy-to-use furniture/fittings to assist older users whose independence may be hindered because of health problems.

The goal was then to enhance the user’s lifestyle at home, with both home and health supportive systems/tools, also through communication systems with outdoor facilities centers (Biocca & Morini, 2001).

The work plan consists of the following two activities:
- Survey of state-of-the-art technologies and products available in the marketplace and suitability for the older tenants’ needs;
- Definition of guidelines of suitable house design in harmony with the suggested technologies/tools/facilities to install for the real and useful benefit of future residents.
Such tasks have been conducted with the concept of ageing in place and home modifiability, i.e. to give solutions that can be adopted or implemented in the future, according to the changing needs of residents, so they can choose to enjoy a good life quality at home with any kind of aid they need.

ITC is assessing the most proper home technologies and supportive aids for people at different levels of technology complexity as part of a research hypothesis for home technology classification. The follow-up will be to mainstream future housing surveys, renovations, installation and guidelines into a grid of the defined user needs, requirements, solutions and technologies.

Classification is then in accordance with the following system subcategories:

*First Level System* (or Basic System): this category includes products, tools and/or technologies resulting in a basic system equipment of housing, suitable for elderly with fairly good abilities or, in any case, with no need of specific supports.

*Second Level System*: this category includes products, tools and/or technologies resulting as additions to the basic system, in order to comply with specific needs we can find in some cases of non self-reliant older citizens (aids for orienting, dementia, Alzheimer, support for cognitive problems).

The definition of guidelines for supportive tools/technologies at home, drawn from the checklist above, is a milestone that includes a larger range of newly built or renovated housing stocks for the benefit of older citizens’ life independence in home-related activities. These guidelines become records of products, tools, technologies and facilities each with description, information, user target and installation/use characteristics, criteria and recommendations (see Figure 6).

The purpose of this classification was to give information and support to decision-makers and installers in the technology selection and installation process as well as to make residents aware of the technologies’ ease-of-use and comfort for their daily home life.

In fact, the promoters were encouraged to choose and adopt easy-to-use and affordable (in terms of running costs) technologies for the benefit of the residents. On the other hand, the residents, although initially reluctant to accept installations, were finally satisfied with them and aware that they could effectively meet their requirements. Users’ participation in selecting some installations was also encouraged, even though the evaluation phase of the residents’ satisfaction status has not yet started (presumably, it will start next October).
With the aim of supporting the Pinerolo Municipality technicians, files and guidelines are being periodically updated and/or implemented by introducing new products/tools. In addition, a collection of some representative samples of good practices in home equipment and installation covering a large range of needs has been filed with the aim of promoting them as a current ordinary practice for future housing renovations. This information will be made available to other Municipalities (Biocca & Dewsbury, 2004).

**Figure 6** Template of a technology classification record (Source: Biocca, Morini, Pomposini, see References)

**Conclusion**

The case study of Pinerolo is as significant as other outstanding Italian key-interventions of housing and technologies. Design-oriented technologies, as applied in Italy, means tools that enhance the individual’s independence and freedom of movement. Technologies are best intended to provide support and/or compensation to any person’s difficulty or loss, with no intrusiveness or control on the user’s lifestyle,
except for the use of passive alarms. In fact, the user must maintain control over them for operation of all housing functions and technology must simply service him/her.

The user-focused approach becomes then a space where technology does not play a primary role. These experiences seem to ‘camouflage’ technology inside the home, so that even users not very familiar with technology can benefit from their use. This mode allows a technology system to act autonomously inside the home and to be customized with no need for the user’s intervention and, moreover, simplifying/limiting the user’s involvement to the easiest tasks.

What users really need has been partly investigated so far and will extend to other user groups in order to define more precisely the impact of technological features on home lifetime benefits. Other contexts also need to be reviewed for similarities/differences. This can lead to a more comprehensive post evaluation of installed technologies among residents as well as building an assessment quality label of domestic applications in housing.

References


