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STUDIES IN HEALTH TECHNOLOGY AND INFORMATICS 297

Transforming our World through Universal Design for Human Development

Proceedings of the Sixth International Conference on Universal Design (UD2022)

Editors: Ilaria Garofolo
Giulia Bencini
Alberto Arenghi

IOS Press

An environment, or any building product or service in it, should ideally be designed to meet the needs of all those who wish to use it. Universal Design is the design and composition of environments, products, and services so that they can be accessed, understood and used to the greatest extent possible by all people, regardless of their age, size, ability or disability. It creates products, services and environments that meet people's needs. In short, Universal Design is good design.

This book presents the proceedings of UD2022, the 6th International Conference on Universal Design, held from 7 - 9 September 2022 in Brescia, Italy. The conference is targeted at professionals and academics interested in the theme of universal design as related to the built environment and the wellbeing of users, but also covers mobility and urban environments, knowledge, and information transfer, bringing together research knowledge and best practice from all over the world. The book contains 72 papers from 13 countries, grouped into 8 sections and covering topics including the design of inclusive natural environments and urban spaces, communities, neighborhoods and cities; housing; healthcare; mobility and transport systems; and universally-designed learning environments, work places, cultural and recreational spaces. One section is devoted to universal design and cultural heritage, which had a particular focus at this edition of the conference.

The book reflects the professional and disciplinary diversity represented in the UD movement, and will be of interest to all those whose work involves inclusive design.

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TRANSFORMING OUR WORLD THROUGH UNIVERSAL DESIGN FOR HUMAN DEVELOPMENT

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The image on the front cover represents the Winged Victory of Brescia, a bronze statue from the first century CE. The statue is preserved in the Roman Archaeological Park in Brescia.

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Preface

> *"All over the world, people are struggling for a life that is fully human, a life worthy of human dignity. Countries and states are often focused on economic growth alone, but their people, meanwhile, are striving for something different: they want meaningful human lives."* (Martha C. Nussbaum, 2012. Creating Capabilities, p. 1, Cambridge, Massachusetts and London, UK, Harvard University Press)

From its first edition in 2012, the journey of the international conference on Universal Design has been the story of an expanding intellectual and practical movement. The aim of this movement is to put into practice the aspirations and goals of human-centred approaches to sustainable development founded on human rights, human development and equality for all, such as those encoded in the United Nations Sustainable Development Goals and the Convention on the rights of Persons with Disabilities (UNCRPD).

After the first meeting in Norway (Oslo, 2012), which was organised by several enlightened governmental bodies in the Scandinavian region as a forum for the exchange of views and sharing of good practice in Universal Design, the second edition in Lund in 2014 saw the entry of academia, with wide participation from across academic disciplines, setting the stage for UD practitioners, researchers and educators to connect directly and to share ideas, research and practice.

The role of academic institutions in organising the UD conference (York, 2016, Dublin, 2018 and Helsinki, 2021) has persisted across successive editions, strengthening over time, as universities have increasingly recognised and taken on board their responsibility as primary actors in working towards societies that are founded on equity, justice and sustainable development for all human beings through their research, educational and outreach activities.

The 2022 edition, held in the historic town of Brescia, Italy, marks another landmark in the journey of the UD movement, as it crosses the alps to be hosted in southern Europe for the first time. Three Italian Universities – the Universities of Brescia, Trieste, and Ca' Foscari University of Venice – have joined forces to make this edition possible, opening up a space for conversations between researchers, educators and policy-makers in a truly multi-disciplinary vision for UD.

The title: Transforming our World for Human Development is intentionally aimed at realising broad sustainable development goals from a person-centred UD perspective by engaging delegates in a conversation across cultural, geographical, and disciplinary boundaries about what sustainable development really means. This was eloquently put by our dear colleague and friend Elio Borgonovi:

> *"There is much talk about renewable energies, resources and circular economies. Most of the time, however, we forget that human beings, with their characteristics and capabilities, provide the most precious renewable energy of all. Human capabilities develop with age and grow through education and experience. People flourish when they are given the chance to exercise their potential. This potential is exercised in social and natural environments when human beings can contribute*

> *with their physical, intellectual, rational and emotional participation, by people, with people and for people."* (Address delivered at the University of Brescia, December 17th, 2020).

The sessions of the 2022 edition are characterised by their multi-disciplinary and multi-perspective nature, with sessions aimed at the design of inclusive natural environments and urban spaces, communities, neighbourhoods and cities, housing, healthcare, and educational facilities, mobility and transport systems, moving on to universally-designed learning environments, work places, cultural and recreational spaces. Contributions come from 13 different countries and various continents (Africa, Australia, Central America, East Asia, Europe, North America, South Asia) once again demonstrating that this is a growing international movement.

Our special thematic session is dedicated to Universal Design and Cultural Heritage. We believe that cultural heritage is part of what makes our lives human and meaningful. Providing full access for all human beings to cultural heritage combines two fundamental values crucial for human development and flourishing: cultural heritage provides each and every person with the possibility to engage meaningfully with their cultural and historical past, and at the same time it develops the awareness in each human being of the value of conserving the past so that we can better live in and understand the present.

A distinctive characteristic of the UD conference is the coming together of academic, governmental and professional communities under one roof. Our wish and invitation for the conference is for openness to others and to perspectives and experiences that may be different from our own, letting go of professional and disciplinary barriers, engaging with each other with empathy and curiosity. The experience of being so long deprived of face-to-face interaction due to the Covid-19 pandemic has made everyone more aware of the value of coming together during live conferences, in formal and informal ways.

The professional and disciplinary diversity represented in the UD movement is what allows us to transcend current existing separations between communities of knowledge and communities of practice, as well as existing separations between academic disciplines. Only when knowledge, practice and research from different disciplines are allowed to engage meaningfully and to feed into each other in a virtuous circle, can the power of ideas and actions become truly transformational.

Brescia, September 2022

Ilaria Garofolo, University of Trieste
Giulia Bencini, Ca' Foscari University of Venice
Alberto Arenghi, University of Brescia

About the Conference

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Adaptive Refurbishment for Aging in Place: Design Scenarios of Case Studies in Turin, Italy

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Abstract. The "aging" world implies a rethinking of housing models, to meet the needs of the elderly for physical and mental well-being, independence, social interaction, safety, and accessibility. "Aging in place" is recognized by experts and international literature as a fundamental strategy for maintaining conditions of well-being and reducing public spending on health care. However, often the houses do not have the requirements to easily adapt to the needs that change with aging and possible downsizing of the family unit. For the elderly, maintaining their own home can become unsustainable due to problems of costs, oversizing, physical and perceptual accessibility, and safety. The contribution, taking as a case study the residential building heritage of Turin (Italy), illustrates and critically compares scenarios of adaptive recovery of homes to make them suitable for the needs of the elderly, intending to promote "aging in place" and housing adaptive refurbishment as a sustainable strategy.

Keywords. Aging in place, adaptive refurbishment, residential building stock, circular strategies

1. Introduction

The "aging" world implies a rethinking of housing models, to meet the needs of the elderly for physical and mental well-being, independence, social interaction, safety, and accessibility.

Instead of hospitalization or institutionalization, the elderly should stay in their own environment as long as possible. "Aging in place" is recognized by experts and international literature as a fundamental strategy for maintaining conditions of well-being and reducing public spending on health care. Hence the importance of the home, the main context of the elderly people's life, in which they generally wish to remain as long as possible in conditions of security, independence and comfort [1].

However, often the houses do not have the requirements to easily adapt to the needs that change with aging and possible downsizing of the family unit. For the elderly, maintaining their own home can become unsustainable due to problems of costs, oversizing, physical and perceptual accessibility, and safety.

Italy, in particular, has a rapidly aging population and has an old residential building-stock, built mainly before the adoption of accessibility and energy efficiency regulations.

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On the other hand, the recovery of existing assets rather than the construction of new housing interprets the concepts underlying the circular economy and it drastically reduces the negative impacts on the environment.

In particular, flexibility and adaptability are key-strategies in the frame of design for circular economy, aimed at prolonging the lifespan of the building and accommodating changes in requiring modifications. As defined by Addis and Schouten [2] a flexible building is “a building that has been designed to allow easy rearrangement of its internal fit-out and arrangement to suit the changing needs of occupants”. Moffatt and Russel included flexibility and convertibility as sub-strategies to design for adaptability: according to the authors, adaptable buildings should be maintainable, versatile, and capable of responding to changing circumstances, for example, with a more efficient use of space, with minimum quality loss and environmental impacts [3].

Moreover, a circular approach to the refurbishment of existing residential buildings can extend their useful life and generate multiple benefits by contributing to economic and social development, considering several variables (such as the context and the changing needs of users [4].

2. Objective and methodological approach

Starting from the World Health Organisation guidelines [5], several researches have focused on adaptating of housing units to favour aging in place. However, the proposed solutions are linked to country-specific characteristics, which are difficult to adapt in a 'universal' way [6].

From these considerations, the research “Circular approach to aging in place in existing buildings”, taking as a case study the residential building heritage of Turin (Italy), illustrates and critically compares scenarios of adaptive recovery of homes to make them suitable for the needs of the elderly, intending to promote "aging in place" and housing adaptive refurbishment as a sustainable strategy.

The adaptive refurbishment scenarios of housing, to make them suitable for "aging in place", are built based on an analysis of the residential building stock of the city. Based on the information available from the national housing census and the Real Estate Observatory, some representative dwelling typologies are defined, different in size, construction period, level of physical accessibility. Circular refurbishment interventions are simulated, taking into account the obstacles (e.g. identification of the most efficient interventions, costs) and opportunities (grants for the recovery of assets) and associating the typologies with different kinds of elderly users (e.g. alone, in couples, with the need for partial assistance, with physical disabilities, owners, tenants, with different income levels). Figure 1 summarizes the methodological approach.

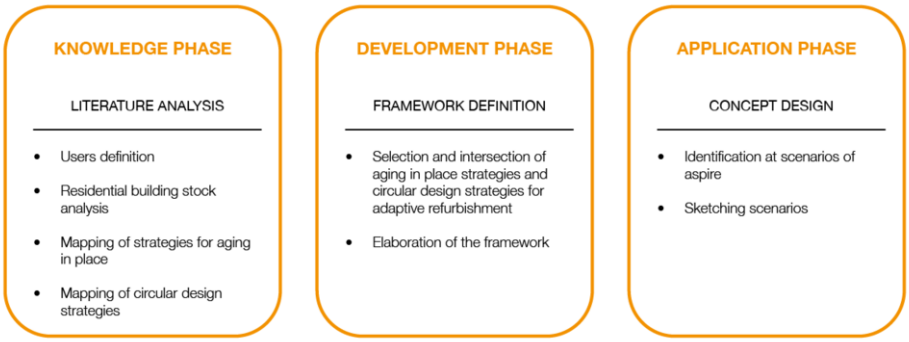

Figure 1. Synthetic scheme of the Research Methodology.

2.1. Italian residential building stock

Aging in place refers to the possibility for individuals to live as long as possible in their own home and community in a safe, independent and comfortable way regardless of their age, economic status and level of habitability [7]. The provision of new housing options is crucial to enable older people to "age in place". Despite the fact that there is a trend in the housing market to offer new housing solutions for the elderly who are still independent, designed with good levels of accessibility and security, the possibility of buying a new home remains an option for a few and implies a removal from the social context of origin.

However, the option of adapting housing to the new needs and changes in the households of the elderly comes up against as many difficulties, which are in part due to the characteristics of housing in our country. The Italian residential building heritage is largely made of historic buildings, which have undergone deep transformations and adaptations over time. 74% of residential buildings were built before 1980 and therefore before the laws and regulations that established minimum requirements for safety, energy efficiency and accessibility.

In addition, about 30% of the buildings constructed before 1945 are in a state of conservation considered of low-quality or very poor, and the percentage drops to only 25% for buildings constructed between 1946 and 1970.

The houses built in response to the housing emergency after the Second World War have been designed for large families, but the contemporary family models have radically changed.

The introduction of minimum requirements for the accessibility of houses dates back to the late 1980s, as well as the obligation to provide a parking space. Most of the residential buildings in urban contexts are currently without the minimum accessibility features of parking the car and getting to the house by a lift.

However, there are some opportunities provided by state incentives and tax deductions for building renovation, both on individual residential units and on the common parts of buildings. Incentives concern not only the improvement of energy performance, in line with the objectives of the European green deal, but also accessibility, with specific measures for disabled users, and the purchase of new furniture. The research on age-friendly assessment of housing [9] by University Federico II of Naples

gives a complete picture of the problems related to the adaptation of homes to the needs of the elderly user and, analyzing the main obstacles to the adaptation of homes, highlights not only the costs but also the difficulty in understanding how to carry out the work and the difficulty in finding honest and responsible professionals to whom to entrust the work.

2.2. Housing situation of older people in Turin

The research took into account different kinds of elderly users. On the one hand, the family unit was specifically analyzed (e.g. alone, in couples, with the need for partial assistance, with physical disabilities). These characteristics are linked to the need for accessibility and security with a view to making the elderly person's life autonomous in their own home. A survey carried out on a sample of 1118 people with an average age of 74 years reveals that 34% of the users live alone while 61% live with one or more family members. 74% of the sample are homeowners; about 50% of their homes are between 80 and 120 m^2, with an average size of 90 m^2 [8].

As regards the income, at national level ISTAT data show that the average amount of the pension is 1,616 euros which is the only source of income for 92% of the users over 65 years old [9]. House maintenance commits 11.3% of income for users over 65. The percentage drops considerably for the lower age groups.

2.3. Identification of a reference framework

Based on the analysis of scientific literature, the research linked circular economy strategies for adaptive reuse of residential buildings with the specific needs of adaptive-refurbishment scenarios in relation to elderly users.

As regards the circular approach, the analysis of the relevant publications on circular economy strategies for building design suggests several ways of action. In particular, the framework suggested by BAMB [10] identifies guidelines based on the main reuse and transformation criteria and their interactions, interdependencies and importance. Four key design criteria define spatial reversibility (dimension, position of core elements, building disassembly level, capacity of the core) and eight key design criteria define technical reversibility (functional decomposition, systematization and clustering, hierarchical relations between elements, base element specification, assembly sequences, interface geometry, type of the connections, life cycle coordination in assembly/disassembly). These criteria can guide the adaptation of a home to the new needs of the elderly. Interventions according to spatial and technical reversibility by adapting the existing apartments to new housing options are necessary to enable older people to "age in place".

3. Intervention scenarios on a representative case study

With the aim of outlining different possible scenarios on the recovery of a house that become unsuitable for the needs of an elderly user, an example, representative of the housing stock in the city of Turin, is illustrated. It is a flat of about 90 m^2 in a house with balcony access. The building is constructed in load-bearing masonry and has already undergone some interventions to improve accessibility, while the flat is in its original state with the insertion of the lift in the stairwell.

We assume an elderly user, over 75, owner, still self-sufficient and alone, for whom the size of the flat and the costs related to its maintenance and management are not compatible with his needs. In the hypothesis it is considered that the flat has reached the end of its life cycle and needs a complete renovation of the internal finishes and systems and that there is a general condition of unsustainability and incompatibility between the elderly person's life needs and the characteristics of the flat. Several scenarios can be considered:

- A, new dwelling;
- B1, minimal adaptation of the existing flat;
- B2, adaptive refurbishment;
- C, social care facility.

In scenario A, the user sells the flat and moves into a new home designed to suit his or her needs. Figure 2 illustrates a layout of a dwelling designed for ageing people that ensures complete accessibility, use and safety. First of all, it presents an optimal orientation and distribution through a large balcony conceived to be also a space of aggregation and meeting with other users. There is a large living area that allows use without physical obstacles (open space) connected to a terrace and the toilets are also accessible by a disabled user in a wheelchair. The strength of scenario A is the guarantee of maximum accessibility and usability for the user, the risks are the economic unsustainability of the operation (the original unrestored flat could be sold at a minimum price) and the separation from the original urban and social context.

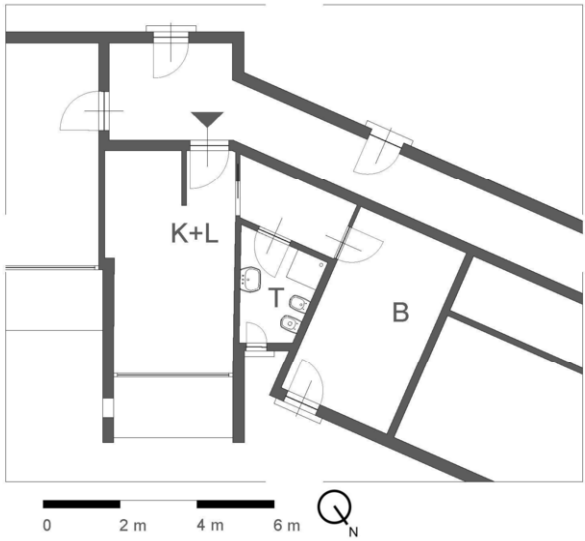

Figure 2 Scheme of a new age-friendly house based on the project of Bianchetti Greppi - dwellings and services for ageing people, Collebeato, Brescia, 2008.

In B1, the user keeps the flat by adapting it with minimal interventions, such as the replacement of furniture (safer and more functional and minimal adaptations of plants) without modifying the internal distribution or carrying out masonry works. Figure 3a shows the original state, with an interior layout characteristic of this type of building very common in the historic urban context: three rooms and a bathroom and kitchen facing the inner courtyard. In this case the problems of internal accessibility (e.g. of the toilet)

are not solved and the problem of the expenses for maintaining the flat, which is too large for the user, is not solved too.

In scenario B2, the user transforms his home (fig. 3b), dividing it into two units. The elderly user keeps one, while the other can be sold or rented. In this scenario, which is more complex to implement than the others, the elderly person could remain "in place" and find a financial balance that allows him to live in a fully accessible, safe, usable and circular home. The constraints to the transformation are multiple: the structure with load-bearing masonry does not allow a free redefinition of the layout, just as the external openings cannot be modified, it is difficult to suppose a free relocation of bathrooms and kitchen far from the drainage stacks, the user must in any case adapt his living habits to a smaller surface giving up part of his goods and furniture. In addition, the house is unusable during the adaptation work. It should be taken into account that the current legislation on home accessibility prescribes that renovations of private dwellings must guarantee accessibility for users with physical disabilities or demonstrate adaptability with simple adaptation measures for the full use of the toilets and living areas of the dwelling.

Figure 3. Figure 3a shows the 90 m2 dwelling in the original state, while 3b shows a possible transformation in scenario B2.

However, the benefits are manifold, environmentally, economically and socially. The renovation of the existing building reduces the environmental impact, the consumption of new resources and the use of land. Retrofitting is carried out with light reversible technologies, allowing the restoration of the original dwelling unit or further modifications that may become necessary over time. From an economic point of view, the conversion of the dwelling is sustainable through the sale or rental of the additional dwelling unit. From the point of view of social well-being, the independence and familiar setting and routine is maintained.

In C the user, even if still with a good level of self-sufficiency, is transferred to an assisted structure. This scenario, besides being often not very sustainable from an economic point of view, not only for the user, but also for the burden on the public social-welfare system, leads to a radical change of the living conditions, which can be in some cases traumatic, and to a considerable reduction of the autonomy of life.

4. Results

The comparison of possible intervention scenarios allows pointing out problems, opportunities, strengths, and weaknesses of "aging in place" with particular reference to the national context. The scenarios are compared with each other and with the opposite scenario of transfer to a care facility.

Scenario B2 is probably the least frequent, not only because of the complexity of the architectural intervention, but also because it requires determination and commitment on the part of the user and in a certain sense a capacity for vision and planning (fig. 4). However, it represents an interesting perspective that can be facilitated by a proactive attitude of a series of subjects supporting the elderly person. Support from relatives in helping to encourage and assist the elderly person in a complex intervention is crucial. The professional is required to make a greater commitment to design solutions that are compatible with the many architectural constraints and knowledge of appropriate technologies, often different from traditional ones, to meet the requirements of reversibility. It is also required to focus more attention on project management and effective coordination of contractors.

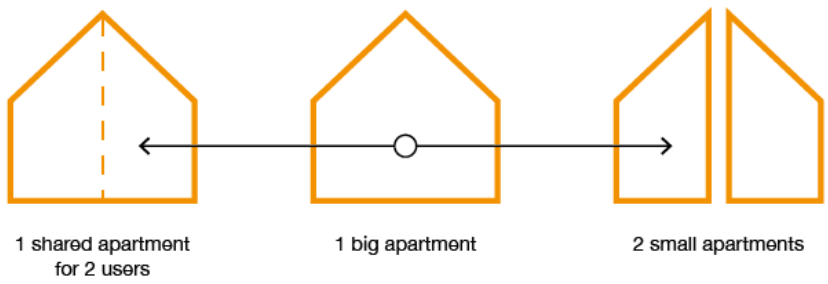

Figure 4. Adaptive refurbishment for aging in place.

5. Conclusion

According to the World Health Organization, cities should develop new housing options, to allow citizens to "age in their home". The contribution illustrates the scenario of a typical and recurrent condition, with the awareness that the problem is very complex and that the most effective solutions must be developed on a case-by-case analysis, taking into account the specific needs of the user. The advantages are individual and collective: the overall well-being of users, the decrease in public spending on health care, the

recovery and continuous maintenance of the building stock in a circular economy perspective. However, in the national context, there are numerous problems related to the characteristics of the buildings (accessibility, safety, poor state of conservation, poor energy performance, comfort), to the burden of costs for refurbishment interventions, but also to a lack of attention in architectural design and the difficulty in establishing the priority of interventions. However, "aging in place", by adapting homes, is a sustainable strategy, for which it is necessary to build the necessary conditions (regulations, technical support, grant opportunities) towards a new horizon of social housing.

References

[1] Luciano, A., Pascale, F., Polverino, F., & Pooley. Measuring age-friendly housing: A framework. Sustainability. 2020, 12(3), 848.
[2] Addis, W.; Schouten, J. Principles of Design for Deconstruction to Facilitate Reuse and Recycling; Ciria: London, UK, 2004.
[3] Moffatt, S.; Russell, P. Assessing the Adaptability of Buildings. IEA Annex 31. 2001. Available online: https://www.researchgate.net/profile/Amir_Causevic/post/Is_there_any_scientific_method_for_assessing_the_flexibility_and_adaptability_of_buildings/attachment/59d61f2dc49f478072e97900/AS%3A271749810196482%401441801611675/download/APS-CA+Assessing+the+Adaptability+of+Buildings.pdf (accessed on 04 April 2022).
[4] Cellucci, C.. Circular economy strategies for adaptive reuse of residential building. VITRUVIO-International Journal of Architectural Technology and Sustainability. 2021, 6(1), 110-121, Available online: https://polipapers.upv.es/index.php/vitruvio/article/view/15404 (accessed on 04 April 2022).
[5] World Health Organization, Global Age-Friendly Cities: A Guide, World Health Organization, Geneva, Switzerland, 2007. Available online: https://apps.who.int/iris/handle/10665/43755 (accessed on 04 April 2022).
[6] Van Hoof, J., Marston, H. R., Kazak, J. K., & Buffel, T. Ten questions concerning age-friendly cities and communities and the built environment. Building and Environment, 2021, 199: 107922.
[7] Lux, M., Sunega, P. The impact of housing tenure in supporting ageing in place: exploring the links between housing systems and housing options for the elderly. International Journal of Housing Policy, 2014, 14.1: 30-55.
[8] Luciano, A. La valutazione dell'"age-friendliness" delle abitazioni. Abitare Anziani informa, Associazione AeA. 2020. Available online: https://www.abitareeanziani.it/wp-content/uploads/2020/01/AeA_Magazine_01-2020_completo.pdf (accessed on 04 April 2022).
[9] ISTAT, Istituto Nazionale di Statistica, https://www.istat.it
[10] BAMB - Buildings As Materials Banks, Design Strategies for Reversible Buildings, Available online: https://www.bamb2020.eu/wp-content/uploads/2019/05/Reversible-Building-Design-Strateges.pdf.
[11] https://www.abitareeanziani.it/wp-content/uploads/2020/01/AeA_Magazine_01-2020_completo.pdf (accessed on 04 April 2022).