RESEARCH-ARTICLE

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FABIO PITTARELLO, Ca' Foscari University of Venice, Venice, VE, Italy

AGNESE MARTINI, Ca' Foscari University of Venice, Venice, VE, Italy

FABIO PRANOVI, Ca' Foscari University of Venice, Venice, VE, Italy

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Fabio Pittarello
Università Ca' Foscari Venezia
Venezia, Italy
pitt@unive.it

Agnese Martini
Università Ca' Foscari Venezia
Venezia, Italy
agnese.martini@unive.it

Fabio Pranovi
Università Ca' Foscari Venezia
Venezia, Italy
fpranovi@unive.it

Figure 1: Blue seniors walking through a typical square (*campo*) of Venice, in front of the Lagoon.

Abstract

This paper explores the practical and social needs of old people living on islands and coastal areas. We will refer to these persons as *blue seniors*, characterized by fragilities due to their age and the fact that they live in areas that often are beautiful from an environmental point of view, but are characterized by logistical difficulties and extreme phenomena due to global warming (e.g. heat strokes, flooding). This work is focused on the analysis of a representative case study, the city of Venice, and presents the results of a full semester co-design activity targeted at proposing digital solutions for coping with the aforementioned seniors' needs. The activity involved more than 200 seniors and 100 university students living in Venice and nearby areas, giving interesting results in terms of design proposals and inter-generational dialogue.

CCS Concepts

• **Human-centered computing** → **Participatory design**; • **Social and professional topics** → **Seniors**.

Keywords

blue seniors, co-design, digital divide, inter-generational dialogue, social inclusion

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1 Introduction

This work describes the results of a full-semester design activity targeted at designing conceptual proposals of digital tools for supporting seniors in their everyday needs and social inclusion. The work has a special focus on seniors living in islands and coastal regions (ie, the *blue seniors*), which are affected by specific difficulties and exposed to special threats. The work will focus on an interesting scenario, the city of Venice, characterized by many issues affecting the seniors: difficulties in urban mobility, challenges

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in accessing social relationships and culture, and exposure to phenomena related to global warming (e.g., high tides). The design path is part of the activities of the Horizon Europe Bauhaus of the Seas Sails European project, which features seven pilots in different European cities, targeted at investigating many design themes. The main goals of the project are compliant with the three pillars of the New European Bauhaus [9], a movement launched by the European Commission in 2020 and targeted at giving design solutions to three of the most important problems of European society: sustainability, social inclusion, and beauty. These goals are interpreted in this project for the European coastal cities, which represent a very relevant target because they are inhabited by 41% of the European citizens. The city of Venice is one of the seven pilot cities of the project and is characterized by difficulties that are common to other European cities, such as depopulation, overtourism, and high sensitivity to natural phenomena due to global warming. The community of seniors is particularly affected by complementary issues such as urban mobility (ie, there are many bridges, most buildings can't be reached by vehicles, and most buildings lack lifts) and loneliness (younger families prefer the mainland for economic issues).

This work will illustrate the methodology and the results of a co-design activity done with about 100 bachelor students of the course in computer science at the local university and more than 200 seniors living in Venice or the nearby mainland. The design activity was also conceived as an occasion for activating an inter-generational dialogue, which was eased by the fact that many students were local, and therefore, for them, it was easier to get in touch with seniors: grandparents living on the island and nearby areas.

While the design space described in the following section was partially explored in previous work [21], this research provides a more extensive exploration, the formal identification of nine relevant themes that were defined also after the discussion with local social services and associations, a high number of conceptual proposals, and the additional focus on the impact of the experience on seniors, students, and inter-generational dialogue.

Overall, the contributions of this paper can be summarized as:

- a wide exploration of the design space, based on an extensive survey that involved seniors living on the island and near areas on the mainland;
- identification of the communities involved;
- preliminary evaluation of the design proposals;
- an analysis of the impact of the design activities on seniors;
- an analysis of the impact of the design activities on students;
- an analysis of the impact on inter-generational dialogue

The following Sections, after an analysis of related literature, will describe the design process and its results. The final Section will discuss the results achieved, drawing the conclusions.

2 Related Work

The older population has increasingly grown in the last decades [22], and projections underline that the trend will continue, bringing the number of individuals above 60 to over 2 billion individuals by 2050. Bloom et al. [2] underline the concept of *compression of morbidity*, meaning that the period of significant decline is being compressed into a smaller fraction of the lifespan. This brings the need to extend the focus of care from the mere support for managing chronic illness and disability to the active promotion of quality of life during these extended healthy years. Different systematic literature reviews identify seniors' needs [3] [16].

Digital technology can help, not only assisting during decline, but also enabling active aging. Technology offers substantial potential to address practical needs, but should be part of a holistic approach that integrates social and economic policies. Lower incomes can be a relevant issue, leading to experience disabilities and shorter lifespan [20]. Technological support should be provided keeping in mind also age-related physical and cognitive changes, which suggest an approach based on accessible design [5] [24]. Social relationships are of paramount importance for successful aging. As outlined in [12], they have the potential to help improve the quality of life and delay morbidity and mortality. Digital literacy can play an important role in this respect. Its lack can lead to a digital divide, increasing social isolation and loneliness [14].

Although the so-called blue spaces can bring benefits in terms of human health [10] [23], with specific benefits for older people [7], living on the coast and islands can bring additional vulnerability issues, amplified by climate change. Working-age population tends to relocate to the mainland, and this brings additional isolation and dangers in case of disaster events [4]. Remote island communities, mentioned in [26], experience even deeper isolation because of their geographical location, requiring a different approach, heavily based on ICT, for medical support.

Technology adoption among seniors is increasing, leading to a substantial narrowing of the digital gap between generations, as outlined also by the seniors' interviews conducted for this work (see Table 1). Yang et al. [25] outline how the perceived usefulness and ease of use can impact the acceptance of technology in health care, reducing the need for institutional care.

Despite that, there are several barriers, including unfamiliarity with digital tools, age-related physical and cognitive limitations, concerns related to privacy, and lack of awareness of the potential of digital tools [11].

Co-design, a collaborative methodology that involves the final users in the design process, can be very helpful for overcoming these barriers, making seniors feel like equal partners throughout the design process [6]. Duque et al. [8] performed an extensive review to investigate the active participation of seniors in the development process of new technologies. Aforementioned studies [11] outline the potential of co-design for challenging preconceived notions and stereotypes about the older generation. In this sense, rather than being a mere methodology, co-design is a powerful social tool activating inter-generational dialogue.

3 The Process

The development of the design proposals went through several phases that can be summarized as follows:

- interview for identifying practical and social needs of seniors living in Venice and nearby areas;
- definition of the design themes for the proposal of the digital platforms;

Figure 2: The focus group with seniors living in Venice.

- definition of the stakeholders interacting with the digital platforms;
- conceptual design;
- evaluation of the final prototype and analysis of the impact on seniors and students

3.1 Initial Interview and Complementary Activities

The interviews were performed by the bachelor students and were based on a set of closed and open questions on different issues, including the perception of the home environment, the practical needs, the social relationships, and the use of digital devices in everyday activities. The most interesting results of the survey were shared by the students in a collaborative presentation where each of the small working groups participating in the design activity was asked to present the most interesting interview. All the interviews were then shared in a common digital space based on the Miro whiteboard for further reference. The results of the interviews were complemented by a focus group with 23 seniors (see Fig. 2), organized in collaboration with a local association, which represented an additional opportunity to focus on seniors' needs in the city of Venice. Talks with social services were another important occasion to explore the seniors' needs, focusing also on the issues derived from delivering support to fragile persons in a water city.

Students were also asked to fill in a survey before the beginning of the design activity, focused on their awareness of the seniors' needs and the perceived importance of digital platforms for supporting their practical and social needs.

3.2 Definition of the Design themes and Stakeholders

The investigation led to defining the design themes, targeting the most important practical and social needs of seniors. Students, organized in small working groups, were asked to choose a single theme, to avoid producing proposals broad in the topics covered but superficial in defining the related features. Interviews with social services and local associations were important to outline the role of volunteering and an organizational effort in supporting the community of seniors. As a consequence, the inclusion of these stakeholders became a relevant requirement for the design of the digital platforms, bringing to the specification of three main communities accessing the platforms themselves. We named them with the generic names of *seniors*, *caregivers*, and *supervisors*. These roles were interpreted by different persons/associations/organizations for the different design concepts, but in all cases, they were the main actors of the digital ecosystem of interfaces.

3.3 Conceptual Design

The selection of the design theme by each group was preceded by a field trip in the pilot area, so that students could experiment firsthand with some of the issues outlined in the interviews with seniors. All the groups were asked to comply, in their project, with a list of design requirements that can be summarized as follows:

- focus on smartphones as the primary device to interact with; this stemmed from the results of the survey and the possibility of using them in an urban context;
- focus on usable and accessible solutions, targeted to the community of seniors; for this purpose, compliance with the general usability heuristics defined by Nielsen [18] and the specific seniors' heuristics by Johnson et al. [15] was required;
- focus on solutions designed specifically for a water city (Venice)

Students were asked to specify the persons/ associations/ organizations covering the three main roles identified in the previous analysis work (ie, seniors, caregivers, supervisors). Following this specification, students worked on the definition of the informational architecture of content and services for all the devices and stakeholders; the result of this activity worked as an input for the prototyping phase, which was accomplished with the Axure prototyping tool [1].

In parallel, students described the role of the context in the interaction with the devices using a set of narrative storyboards [13]. The design was made following an iterative design process, with intermediate reviews for checking the correctness and the quality of the proposal.

3.4 Evaluation with Seniors and Surveys

The final deliverable of the design activity was, for each group, a prototype of the digital platform that could be navigated using a standard smartphone, simulating the behavior of a real application.

For the evaluation, students were asked to involve not only the seniors whom they had already interviewed but also additional volunteers, to organize a small pilot study with eight participants for each project. Students were provided with a precise protocol to follow during the evaluation, which included an initial explanation of the goal of the digital platform, the autonomous testing of the prototype by the senior, and the completion of the survey. The survey was based on a set of closed and open questions on different issues, including the point of strength and weakness of the prototype, the engagement measured according to the 6 parameters proposed by O'Brien [19], the relation with the use of technology, and the new generations.

Table 1: Use of digital and communication devices by the 101 seniors who were interviewed

Device	N. of Seniors	Percentage
Smartphone	81	80,2%
Tablet	13	12,9%
Smartwatch	4	4,0%
Digital Assistant	4	4,0%
Computer	22	21,8%
Phone (non smart)	5	5,0%
None	11	10,9%

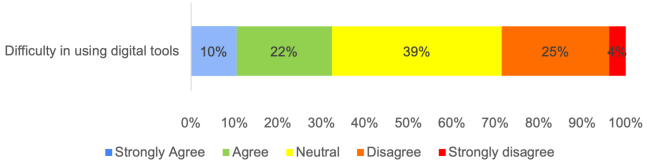

Figure 3: Difficulty in using digital technology.

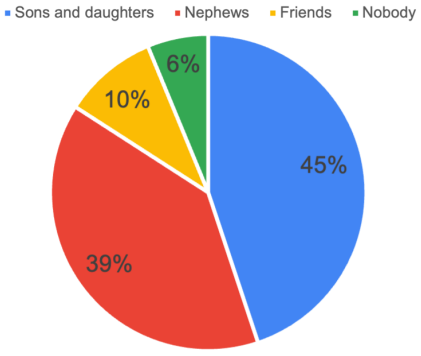

Figure 4: Support in using digital tools.

Students were asked to fill in a final survey too, which was targeted to understand if their participation in the design experience had changed their awareness and perception of the perceived importance of digital platforms for supporting the practical and social needs of seniors. Finally, students were asked a couple of questions related to the impact of their project and the potential of the new generations for supporting seniors.

4 Results

4.1 Survey

The interview involved 101 elderly people. 56% of the seniors were 75 and over, while 23% of them were between 70 and 74, and 21% were between 65 and 69. 75% of the interviewees were women, and 54% of all the seniors lived or had lived in Venice and nearby islands. While a full analysis of the answers is out of the scope of this paper, the following figures share the most important results related to the needs, relationships, and technology.

Figure 5: The word cloud describing relevant keywords from the interviews.

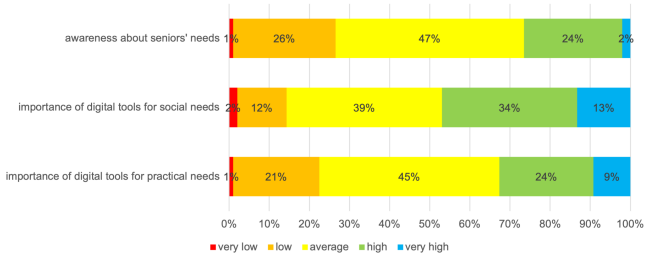

Figure 6: Students' initial awareness about seniors' needs and perception of the importance of digital tools for social and practical needs (before the design activity).

Table 1 shows the use of digital and communication technology. Smartphones were the most used device (81% of the interviewed seniors), largely preferred to personal computers and tablets. This represents a confirmation of a trend outlined by other researchers [17]. Smartwatches, which could have a positive impact on the real-time monitoring of health conditions and detect sudden falls, were barely used. About 11% of seniors didn't use any kind of communication technology, including TV. Despite the wide use of digital technology, a relevant part of the sample (see Fig. 3) declared to experience difficulties in using technology.

Fig. 4 reveals the importance of the family (sons and grandsons) in supporting seniors with digital tools. Only 10% of the sample declared to be supported by friends in this task. We asked students to extract the most relevant 10 keywords from each interview, and Fig. 5 summarizes the results as a word cloud. The representation outlines the variety of topics that led, together with the results of the focus group and the interviews with social services and associations, to the definition of the nine design themes.

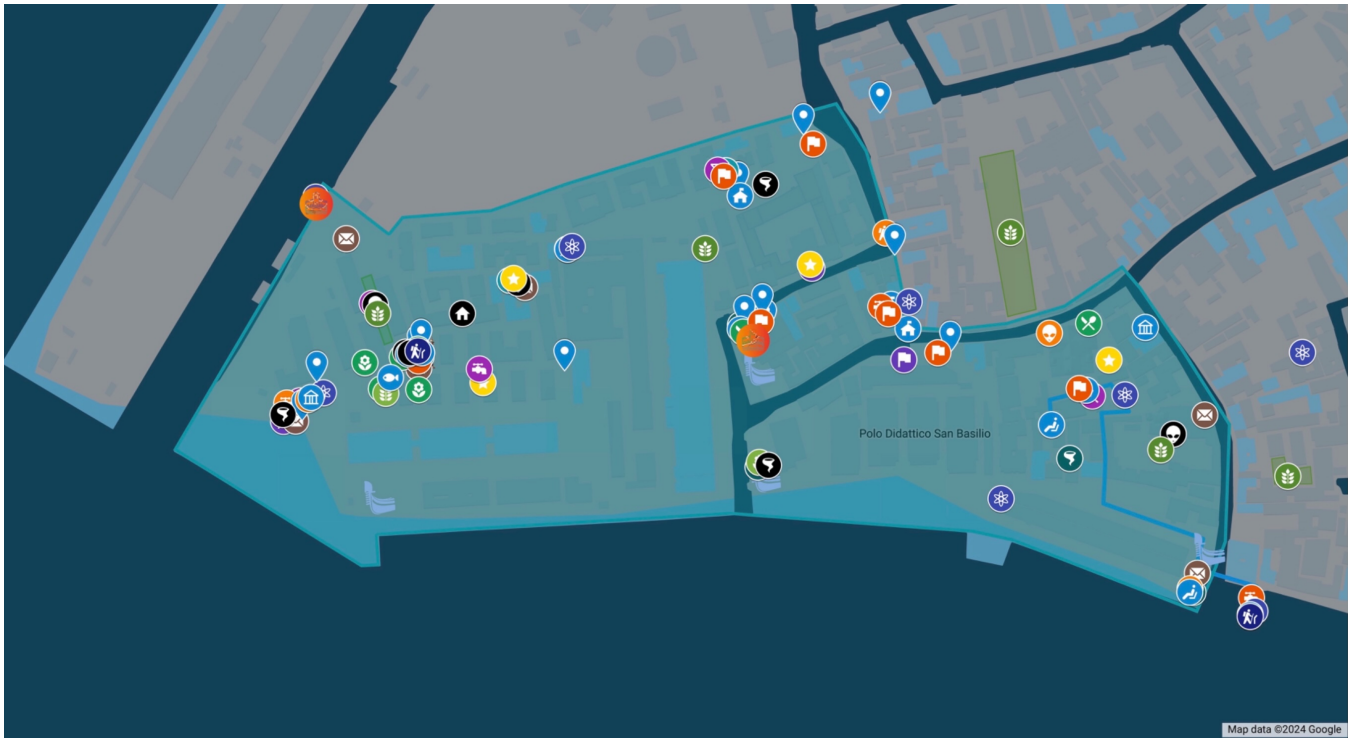

Figure 7: The map of the pilot area with the relevant locations related to the proposals of digital platforms.

Fig. 6 provides a summary of the survey proposed to students before the beginning of the design activity. The representation shows the self-attributed awareness of the seniors' needs and the perceived importance of digital tools for supporting the practical and social needs of seniors.

4.2 Definition of the Design Themes

The analysis activity led to the definition of nine design themes, which were shared with the working groups:

- *Accessible blue spaces to improve the quality of life*;
- *Neighborhood networks for everyday life and emergencies*;
- *Disappearing seniors*;
- *Seniors and Venetian culture*;
- *Cuisine between tradition and sustainability*;
- *Seniors and new generations*;
- *Venetian shadows and waters in the global warming scenario*;
- *Urban and lagoon gardens.*

A full summary for each theme is available in the Appendix.

4.3 Project Development

27 working groups of 3-4 students took part in all the design phases and delivered a final proposal. Fig. 7 shows the pilot area, a district of Venice characterized by the traditional urban fabric, the port activities, and the old industries, now converted to university sites. The multifaceted nature of this urban space, still partly characterized by fences and walls that separate the different functions, explains the non-homogeneous distribution of the landmarks,

Figure 8: The identity card of the *BlueSpots* project, related to the theme *Accessible blue spaces to improve the quality of life.*

which were placed by the working groups in locations relevant for their project (eg, associations' sites, cultural sites, residential areas, urban gardens, etc.).

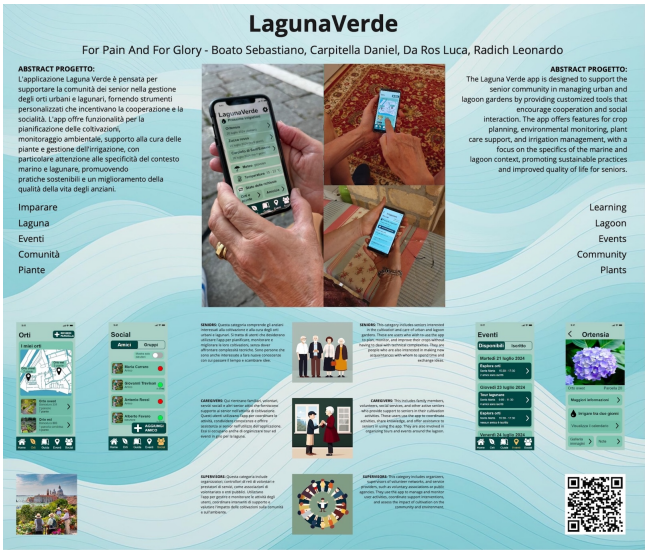

Figure 9: The identity cards of the *Laguna Verde* project, related to the theme *Urban and lagoon gardens.*

Figure 10: One of the narrative storyboards illustrating relevant patterns of the user experience for the project *Experience Venice*, related to the theme *Disappearing Seniors.*

Fig. 8 and Fig. 9 illustrate two examples of the final deliverables, the project's *identity cards*, visual summaries of the project that include: an abstract of the project, a list of keywords identifying the project, the specification of the stakeholders involved, the reference to one of the nine design themes (ie, the small icon on the left bottom of the layout), a selection of screenshots from the interface of the prototype, a set of images taken during the final evaluation with the seniors and a QR-code for accessing the prototype. Each identity card contained Italian and English text and was also designed for public displays, as an opportunity for stimulating discussion about the themes and the design proposals.

Each group was asked to design a set of narrative storyboards to describe interesting patterns of the user experience, including the relation between interaction and context.

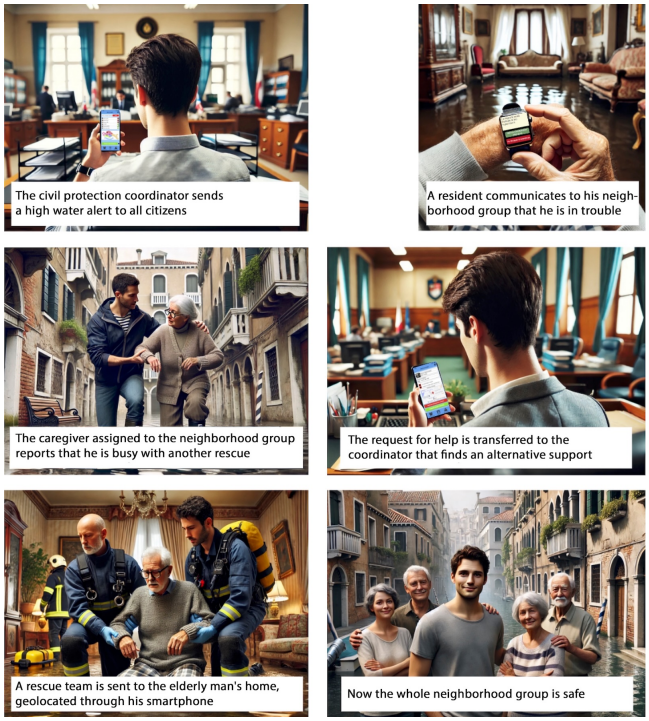

Figure 11: One of the narrative storyboards illustrating relevant patterns of the user experience for the project *UnityCare*, related to the theme *Neighborhood networks for everyday life and emergencies.*

Fig. 10 shows an interaction pattern related to the theme *Disappearing Seniors*. A senior in a wheelchair reads, using her smartphone, about gardening courses organized by a seniors' association. The mobile application offers the chance to register for the course and ask for a volunteer to bring her to the destination, taking care of obstacles that characterize Venice, like the difficulty in reaching public transportation starting from home, and crossing many bridges. At the end, the senior reaches the destination, ready to start the course and to meet other seniors.

Fig. 11 shows another example, related to the theme *Neighborhood networks for everyday life and emergencies*. This scenario concerns the creation of neighborhood networks to support the population in the case of emergencies. In the example, following a high water alert, a senior communicates to his neighborhood group that he is in trouble. Unfortunately, the local caregiver associated with his neighborhood group is busy with another rescue. But he passes the request to the coordinator, who finds an alternative support that is timely sent to the senior. Geolocalization provided by the smartwatch worn by the senior allows a rapid tracking of the senior's location, allowing the neighborhood group to meet in a safe location.

4.4 Evaluation

While a full evaluation of each single project is out of the scope of this work, we'll focus on a general overview of the results in terms

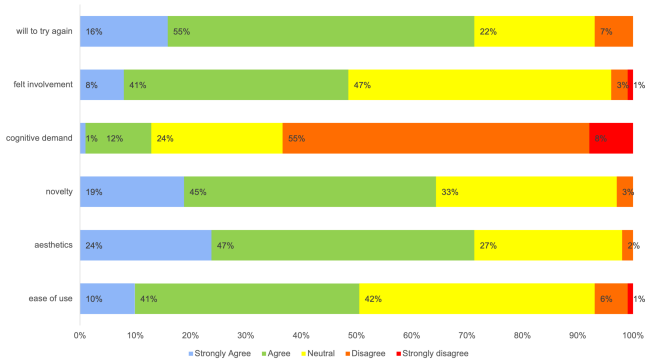

Figure 12: The six dimensions of engagement.

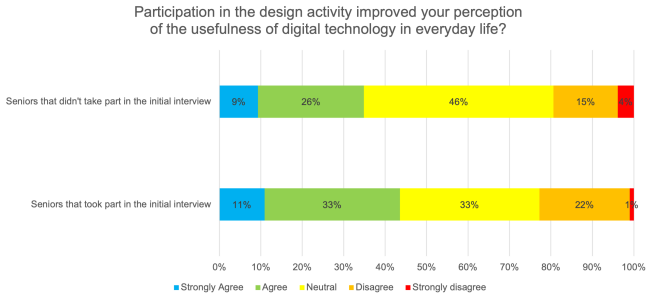

Figure 13: Seniors' improved perception of the usefulness of digital technology.

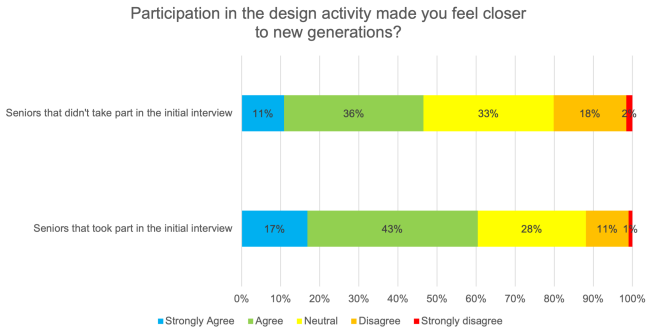

Figure 14: Seniors' perception of closeness to new generations.

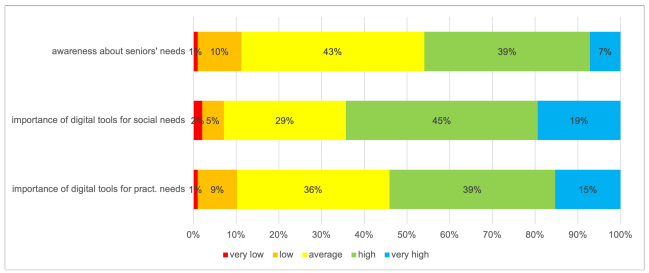

Figure 15: Students' final awareness about seniors' needs and perception of the importance of digital tools for social and practical needs (after the design activity)

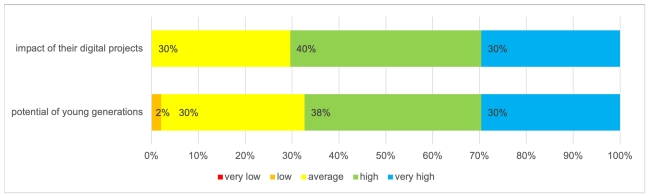

Figure 16: Students' perception of the impact of their design activity and the potential of the new generations for seniors.

of engagement and impact of the co-design activities on seniors and students.

Fig. 12 gives an overview of the results for the engagement, stemming from the testing of prototypes by the 228 seniors involved in the evaluation. The representation gives only a rough feedback, because scores should be considered separately for each of the 27 different projects. However, the representation shows that the prototyping activity as a whole was well received, with each of the six parameters that define the engagement receiving a positive evaluation. It is useful to underline also that the prototypes were tested with the seniors only after an intermediate check with the teacher, to detect possible catastrophic failures before the final test with the seniors.

Seniors were asked if their participation in the design activity had an impact on their perception of the usefulness of digital technology. Fig. 13 shows the results, distinguishing seniors who didn't take part or took part in the initial interview. Seniors were also asked if their participation in the design activity had an impact on making them feel closer to new generations. Fig. 14 shows the results, distinguishing also in this case seniors who didn't take part or took part in the initial interview.

Concerning the impact of the design activity on the students, we measured again (see Fig. 15) their awareness about seniors' needs and perception of the importance of digital tools for the social and practical needs of seniors. Students were also asked about how they self-estimated the impact of their project on seniors and the potential that new generations can have on improving seniors' conditions (see Fig. 16).

5 Discussion and Conclusion

The activity done so far has permitted the achievement of many interesting results, starting from the identification of a wide design space, identified thanks to surveys, focus groups, and talks with social services and local associations. Talks with associations and social services, which work in the field and often have already experienced the points of strength and weakness of possible approaches, were very useful to guide the students during the design process and come to more credible proposals. The discussions with social operators were also very useful to move from an initial hypothesis of development based only on technical requirements to the definition of the digital platforms as social platforms supporting the

contribution and communication between the different involved stakeholders (seniors, caregivers, and supervisors).

Another relevant aspect, stemming from the dialogue with associations, and that was shared with the young designers, is that seniors shouldn't be considered as a single and passive community to support. In Venice, many seniors contribute actively to local associations, producing a great impact in terms of the quality and quantity of work done. This aspect was outlined to the students as an additional input for their design work, and a more appropriate definition of the stakeholders was defined for their projects.

As mentioned before, the design activity resulted in 27 proposals that received an evaluation using a set of open and closed questions. Each proposal was treated in the final evaluation as a different pilot study, evaluated with at least eight seniors. While an accurate evaluation of the different projects is out of the scope of this work, it is interesting to note that the design activity as a whole was well received (see Fig. 12). This is probably because seniors tested proposals that they considered interesting (ie, the connected themes stemmed from the aforementioned interviews).

The analysis of the impact of the design activity on seniors gave interesting results. A relevant part of the seniors affirmed that their participation improved their perception of the usefulness of technology in everyday life. Fig. 13 distinguishes between seniors who didn't take part in the initial interview and seniors who took part in both the interview and the final evaluation. Results represent a confirmation of the potential of co-design for the acceptance of design solutions and the importance of involving the seniors in different phases of development (seniors who took part in both phases assigned higher scores). The participation in the co-design activities gave even more interesting results on the side of intergenerational dialogue. Fig. 14 shows that a relevant part of the seniors felt closer to the young generations (ie, the students they interacted with), and this became a major proportion when considering seniors who also took part in the initial interview. This result represents a very important confirmation of the role of co-design not only as a methodology for obtaining improved technical results, but also to knock down walls and strengthen social relationships among different communities.

The analysis of the impact of the design activity on students gave additional confirmation of the role of co-design for promoting the inter-generational dialogue. The comparative exam of Fig. 6 and Fig. 15 shows a marked improvement, after the design activity, of the positive scores for all the variables considered: the awareness about the seniors' needs, the importance of digital tools for social and practical needs. The very positive scores assigned to the questions related to the esteemed impact of their projects and the potential of young generations for supporting seniors (Fig. 16) seem another result stemming from mutual knowledge and trust derived from the joint design activity.

Concluding, the work performed so far gave interesting results in terms of the identification of the design space and stakeholders involved. This, together with the co-design methodology defined and experimented with the blue seniors, represents a finding to share for future research. It is useful to underline that the start of the co-design activity represented probably one of the most difficult parts of the design activity. The involvement of grandparents and local associations working in the field was of paramount importance for instating a feeling of confidence and trust that then permeated all the following interactions.

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References

[1] Axure. 2025. Axure Software Solutions. https://www.axure.com/
[2] David E. Bloom, Axel Boersch-Supan, Patrick McGee, and Atsushi Seike. 2011. Population aging: facts, challenges, and responses. *Benefits and compensation International* 41, 1 (2011), 22.
[3] Juan Carlos Briede-Westermeyer, Paula Görgen Radici Fraga, Mary Jane Schilling-Norman, and Cristhian Pérez-Villalobos. 2023. Identifying the needs of older adults associated with daily activities: a qualitative study. *International Journal of Environmental Research and Public Health* 20, 5 (2023), 4257.
[4] Anamaria Bukvic, Julia Gohlke, Aishwarya Borate, and Jessica Suggs. 2018. Aging in flood-prone coastal areas: Discerning the health and well-being risk for older residents. *International Journal of Environmental Research and Public Health* 15, 12 (2018), 2900.
[5] Bo Campbell and Susann Keohane. 2017. Accessible Design for an Aging Population. https://www.ibm.com/think/insights/accessible-design-aging-population
[6] Andrew Darley and Áine Carroll. 2022. Conducting co-design with older people in a digital setting: methodological reflections and recommendations. *International Journal of Integrated Care* 22, 4 (2022), 18.
[7] Seraphim Dempsey, Mel T Devine, Tom Gillespie, Seán Lyons, and Anne Nolan. 2018. Coastal blue space and depression in older adults. *Health & place* 54 (2018), 110–117.
[8] Ezequiel Duque, Guilherme Fonseca, Heitor Vieira, Gustavo Gontijo, and Lucila Ishitani. 2019. A Systematic Literature Review on User Centered Design and Participatory Design with Older People. In *Proceedings of the 18th Brazilian Symposium on Human Factors in Computing Systems* (Vitória, Espírito Santo, Brazil) *(IHC '19)*. Association for Computing Machinery, New York, NY, USA, Article 9, 11 pages. doi:10.1145/3357155.3358471
[9] European Union. 2020. New European Bauhaus. https://new-european-bauhaus.europa.eu
[10] Mireia Gascon, Wilma Zijlema, Cristina Vert, Mathew P. White, and Mark J. Nieuwenhuijsen. 2017. Outdoor blue spaces, human health and well-being: A systematic review of quantitative studies. *International journal of hygiene and environmental health* 220, 8 (2017), 1207–1221.
[11] Zahra Shams Ghahfarokhi. 2025. Challenges in health and technological literacy of older adults: a qualitative study in Isfahan. *BMC geriatrics* 25, 1 (2025), 247.
[12] Heather Gilmour and Pamela L Ramage-Morin. 2020. Social isolation and mortality among Canadian seniors. *Health reports* 31, 3 (2020), 27–38.
[13] Saul Greenberg, Sheelagh Carpendale, Nicolai Marquardt, and Bill Buxton. 2012. *Sketching user experiences: The workbook*. Elsevier.
[14] Melanie Gruben, Ashley Sheil, Sanchari Das, Michelle O'Keeffe, Jacob Camilleri, Moya Cronin, and Hazel Murray. 2025. "It's Like Not Being Able to Read and Write": Narrowing the Digital Divide for Older Adults and Leveraging the Role of Digital Educators in Ireland. In *Proceedings of the Nineteenth International Conference on Tangible, Embedded, and Embodied Interaction (TEI '25)*. Association for Computing Machinery, New York, NY, USA, Article 34, 15 pages. doi:10.1145/3689050.3704945
[15] Jeff Johnson and Kate Finn. 2017. *Designing User Interfaces for an Aging Population*. Morgan Kaufmann, Boston.
[16] Pouria Khosravi and Amir Hossein Ghapanchi. 2016. Investigating the effectiveness of technologies applied to assist seniors: A systematic literature review. *Int. Journal of Medical Informatics* 85, 1 (2016), 17–26. doi:10.1016/j.ijmedinf.2015.05.014
[17] Agnieszka Kolasinska, Giacomo Quadrio, Ombretta Gaggi, and Claudio E. Palazzi. 2018. Technology and Aging: Users' Preferences in Wearable Sensor Networks. In *Proceedings of the 4th EAI International Conference on Smart Objects and Technologies for Social Good* (Bologna, Italy) *(Goodtechs '18)*. Association for Computing Machinery, New York, NY, USA, 77–81. doi:10.1145/3284869.3284884
[18] Jakob Nielsen. 1994. *Usability engineering*. Morgan Kaufmann.

[19] Heather L. O'Brien and Elaine G. Toms. 2010. The development and evaluation of a survey to measure user engagement. *J. Am. Soc. Inf. Sci. Technol.* 61, 1 (2010), 50–69.
[20] Office of Disease Prevention, Health Promotion, et al. 2023. Social determinants of health and older adults. *US Department of Health and Human Services. Retrieved October* 29 (2023).
[21] Fabio Pittarello. 2022. Designing Interactive Systems for Seniors: Living on an Island. In *2022 IEEE 19th Annual Consumer Communications & Networking Conference (CCNC)*. 1–6. doi:10.1109/CCNC49033.2022.9700593
[22] Miriam Sander, Bjarke Oxlund, Astrid Jespersen, Allan Krasnik, Erik Lykke Mortensen, Rudi Gerardus Johannes Westendorp, and Lene Juel Rasmussen. 2015. The challenges of human population ageing. *Age and ageing* 44, 2 (2015), 185–187.
[23] Niamh Smith, Michail Georgiou, Abby C King, Zoë Tieges, Stephen Webb, and Sebastien Chastin. 2021. Urban blue spaces and human health: A systematic review and meta-analysis of quantitative studies. *Cities* 119 (2021), 103413.
[24] W3C. 2025. Older Users and Web Accessibility: Meeting the Needs of Ageing Web Users. https://www.w3.org/WAI/older-users/
[25] Hyo Jun Yang, Ji-Hyun Lee, and Wonjae Lee. 2025. Factors Influencing Health Care Technology Acceptance in Older Adults Based on the Technology Acceptance Model and the Unified Theory of Acceptance and Use of Technology: Meta-Analysis. *Journal of Medical Internet Research* 27 (2025), e65269. Issue 1. https://pubmed.ncbi.nlm.nih.gov/40153796/
[26] Miyuki Yoshida, Madoka Tatsukawa, Shinsuke Otani, and Kazumi Fujimura. 2025. Thoughts of older adults living in an isolated community on a remote island while continuing to live in familiar surroundings. *[Nihon koshu eisei zasshi] Japanese journal of public health* 72, 2 (2025), 161–170.

A Appendix

A.1 Design Themes

A.1.1 Accessible blue spaces to improve the quality of life. Blue spaces have the potential to improve the quality of life of seniors, also in terms of preserving or slowing down neurodegenerative diseases. Access to these spaces becomes essential to ensure this improvement. Furthermore, the contribution of seniors, who know the Venetian places, can be important for identifying and sharing interesting blue places, starting from those that are outside the usual classic tourist routes. Seniors can give suggestions on how to equip these spaces, to improve their accessibility, and livability (e.g., with the positioning of street furniture such as benches, shaded spaces to protect from heat strokes, or shelters for bad weather and the relationship with the sea).

A.1.2 Neighborhood networks for everyday life and emergencies. This scenario concerns the creation of micro-networks of citizens to support the resident elderly population, which can be made up of both active elderly people and other age groups. The objective is to create a neighborhood network that can be of help in everyday life and that, in the event of an emergency (e.g., a failure to activate the Mose, an emergency linked to a torrid summer), can be of help, reaching the people in charge or directing relief efforts for assistance.

A.1.3 Disappearing seniors. This scenario explores the theme of the relationship between seniors and the possibility of maintaining this relationship, also thanks to the use of digital tools, for those who, for reasons related to age, disappear from the horizon of sociality. The goal is to maintain a connection through digital tools, allowing both remote participation in social and cultural initiatives (visits to museums, trips to the lagoon), and organizing a network of volunteers, which allows, for example, to deliver to the seniors' home materials related to the initiative (e.g., a catalog for a visit to a museum, painting materials for a painting course, or seedlings for a gardening course) or to bring them to the location of the social and cultural initiatives.

A.1.4 Seniors and Venetian culture. Venice is a city rich in cultural and artistic offerings, home to important museums and cultural institutions. Despite this, most of the initiatives are not aimed at elderly residents. This scenario explores the theme of cultural initiatives for the elderly, creating a digital hub in which cultural proposals, availability of volunteers, and individuals/associations of seniors interested in using them can converge. Proposals that have a cultural value and that, at the same time, have the value of an opportunity for social integration.

A.1.5 Cuisine between tradition and sustainability. This scenario explores the theme of the relationship of the city of Venice with food, in the places where the fishermen responsible for food supplies resided. It is a scenario in which knowledge of culinary tradition, the link with the lagoon, the theme of food sustainability, and new cuisines converge. In this scenario, seniors, young people, new citizens, and those who propose new eco-sustainable culinary proposals can meet.

A.1.6 Places and routes to tell the story of Venice, its lagoon, and the tides. It is a scenario designed for seniors who have the possibility of moving around the urban area, but also for those who, although they no longer have the possibility of moving, can still tell stories about the places of Venice and the lagoon. The aim is to define, also through the active contribution of seniors, a network of interesting places and routes, also associated with tours in the lagoon, where it is possible to tell and listen to stories.

A.1.7 Seniors and new generations. In the city of Venice, a community of seniors and a community of young people who attend one of the many universities or other educational institutions coexist, and they could receive mutual benefits from greater proximity and collaboration (e.g., beds, knowledge of the places, and Venetian culture on the one hand, availability for company or small household chores/assistance in the use of digital devices/assistance outside the home). This scenario explores the theme of communication between these communities and the bonds that could develop from frequenting and/or cohabiting.

A.1.8 Venetian shadows and waters in the global warming scenario. Access to urban spaces is of fundamental importance for the mental and physical health of the elderly, as well as for carrying out practical tasks and accessing health services. Despite this, access can be complicated due to the environmental situation, which can become difficult in the summer due to global warming, or in other periods due to high water (the Mose could be activated only in the case of significant tides). This scenario concerns the use of digital systems that increase awareness of the state of the weather and provide indications regarding routes and time slots in which to carry out activities outside of one's home.

A.1.9 Urban and lagoon gardens. The availability of urban green spaces for growing vegetables, encouraged by municipal initiatives, can represent an excellent opportunity for the physical and mental health of seniors who want to try these practices, also offering the most active seniors the opportunity to play a role as instructors and involve the senior community.