Key-Drivers to Design Urban Mobility Services for Silver Age and Age-Friendly Cities

Jun 23rd, 9:00 AM - Jun 28th, 5:00 PM

# Key-Drivers to Design Urban Mobility Services for Silver Age and Age-Friendly Cities.

Stefania Palmieri
*Design Department, Politecnico di Milano, Italy*

Alessandro Ianniello
*Tu Delft, The Netherlands*

Mario Bisson
*Design Department, Politecnico di Milano, Italy*



## Citation

Palmieri, S., Ianniello, A., and Bisson, M. (2024) Key-Drivers to Design Urban Mobility Services for Silver Age and Age-Friendly Cities., in Gray, C., Ciliotta Chehade, E., Hekkert, P., Forlano, L., Ciuccarelli, P., Lloyd, P. (eds.), *DRS2024: Boston*, 23–28 June, Boston, USA. https://doi.org/10.21606/drs.2024.315

# Key-drivers to design urban mobility services for silver age and age-friendly cities

Stefania Palmieri[a], Alessandro Ianniello[b,*], Mario Bisson[a]

[a]Design Department, Politecnico di Milano, Italy
[b]Delft University of Technology, the Netherlands

*Corresponding author e-mail: a.ianniello@tudelft.nl

doi.org/10.21606/drs.2024.315

**Abstract**: The vision regarding ageing is often influenced by negative stereotypes, which lead to considering the over-55 user only in need of targeted assistance and care. Observing the current situation, this view should be no longer exhaustive: they are active users, capable of exercising agency, with needs and desires beyond care and assistance, and bearers of experience and knowledge. It is therefore clear that design strategies to develop services for this user group must necessarily broaden their horizons and begin to consider areas that have been scarcely explored. The contribution focuses on the topic of urban mobility and proposes a preliminary analysis process, based on the scientific literature and on the analysis of case studies to highlight good design practices, and carried out within a joint research platform, whose structure, functions, and role is also highlighted. Lastly, it proposes a mapping of design directions to be applied to implement age-friendly solutions.

**Keywords**: silver economy; active ageing; urban mobility; joint research

## 1. Introduction

The silver economy can be defined as the system underlying the production, distribution and consumption of goods and services strictly dedicated to satisfying the needs of the over-55 age group. It is a fast-growing economic sector that, for example, in Italy generates between 300 and 500 billion euro a year, equal to about 30% of the national GDP[1].

A fundamental concept in this field is active ageing: if until a few years ago the over-age group was considered a group mainly in need of care and assistance, in recent times it has been recognized to have different, more complex, and stratified characteristics and needs

[1] For further information consult the website https://www.itinerariprevidenziali.it/site/home/ilpunto/economia-societa/silver-economy-una-nuova-grande-economia-che-puo-valere-fino-al-30-del-pil.html

(Eum & Kim, 2021). Analyses and reports[2] estimate that by 2050 the silver age population will reach 1.5 billion, or 15.9 per cent of the world population, making active ageing an area of considerable political, cultural, social, and economic interest. Consequently, even service design must no longer focus exclusively on the implementation of solutions guided by the concepts of care and assistance, but must, instead, necessarily consider the new needs and desires of a group of users who are still active in various areas of everyday life (Dankl, 2017). Through a preliminary research process, focused on a demographic analysis, target market and socio-cultural and technological trends, and carried out in the context a joint research platform involving academia and industry, several potential areas of interest were highlighted for the development of innovative active ageing strategies and services, such as mobility, fashion, wellness, entertainment, social care, culture, and housing.

The contribution focuses on the theme of active mobility for the silver age within the urban environment and questions the role that design can play in the development of services in this field. The overarching goal of the research is to answer the following question: how can service design for silver age mobility become a means to foster social innovation within the context of age-friendly cities? Therefore, through a process of literature review and case study analysis, the research aims to map the main drivers for designing solutions that exceed the concept of care and assistance, restoring consideration and dignity to this category of users (Ma et al., 2021).

The first section of the paper is focused on the review of the literature concerning urban space, urban mobility services for the considered category of users, highlighting the infrastructures, the role of sustainability and digitalization, and the concept of servitization; the second section addresses the role that service design and design for social innovation can play in the context of reference. The third section deals with the analysis of the case studies examined, highlighting the selection parameters, and assessing the main strengths and weaknesses, to generate a mapping of best practices. The fourth one presents the definition of the guidelines that can be applied to implement urban mobility services for the target group, highlighting the differential value of design in this type of process and the methodological lines derived in the context of the joint research platform, whose structure, functions, and role will be pointed out (Fig. 1). Finally, the conclusions shall summarize the process explained above and consider the limits and potential developments of the research.

[2] For further information consult the website https://www.who.int/news-room/fact-sheets/detail/ageing-and-health

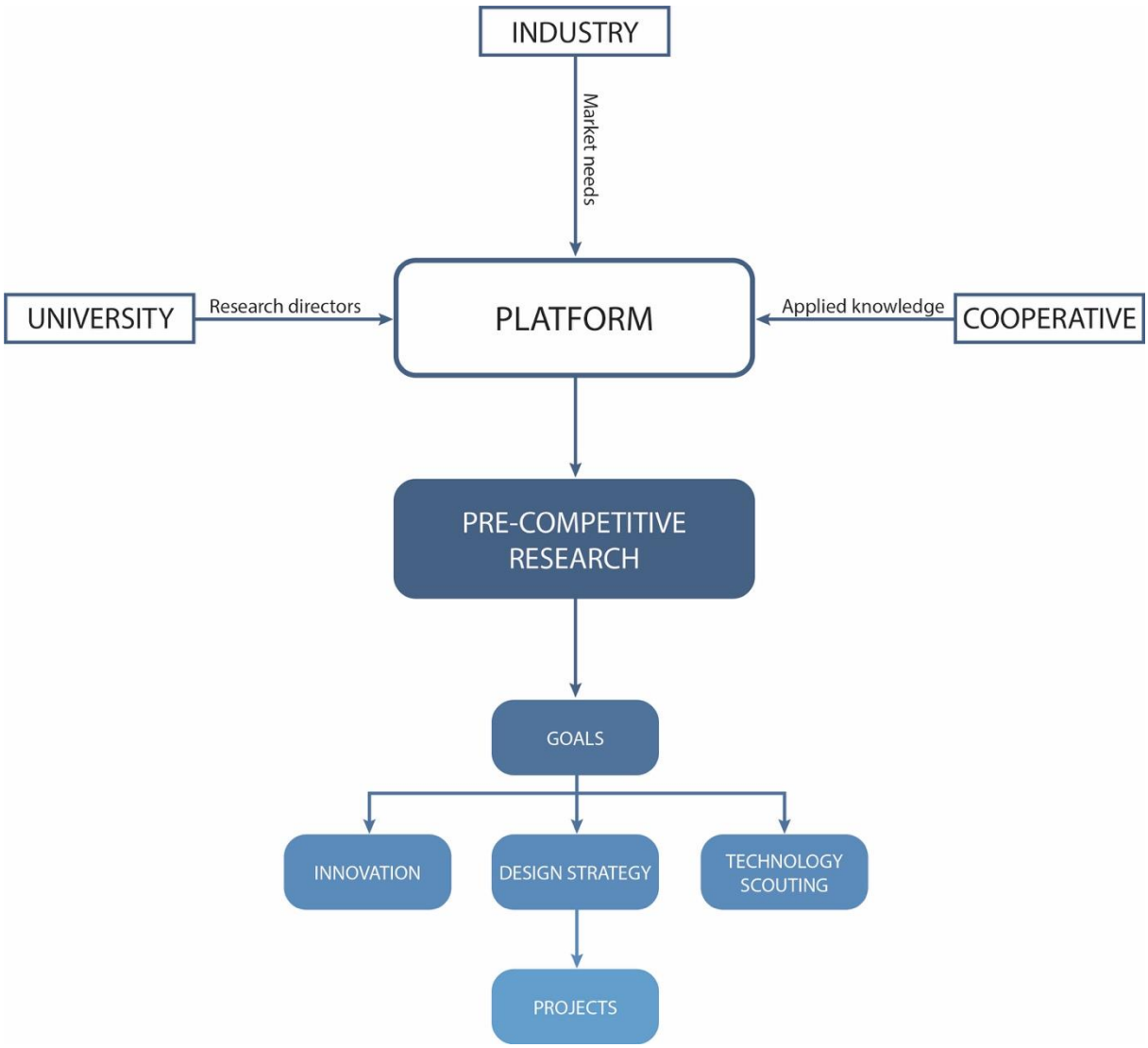


*Figure 1 Structure of the research platform and its outputs.*

## 2. Urban spaces and services for active ageing mobility

The concept of mobility begins to spread with phenomena such as globalization, digital revolution and increasing urbanization, which have significantly altered city spaces and increased the demand for intra-urban travel (Torku et al., 2021). In addition, the focus on sustainability and the evolution of urban models strongly influenced by technology (van Hof et al., 2021), are other factors driving transformations in this area (Sgambati, 2021a). Thus, it can be argued that the ageing population phenomenon is closely intertwined with urban transformation, being influenced by it and, in turn, being a strong impact factor for this type of environment (Sgambati, 2021b). Cities must therefore transform themselves into places that provide opportunities for all the people who inhabit them, making accessibility (Caglione et al., 2021) one of the fundamental pillars for their design or re-design. Urban spaces must therefore be inclusively and sustainably designed, considering the needs of all citizens, to avoid loss of autonomy and discomfort in performing daily activities, in using

necessary services, and in participating in sociality (ARUP, 2019; Aroogh et Shahboulaghi, 2020).

Hence, it can be argued that the field of mobility should be shaped by a holistic approach, whereby all systemic elements and human factors are accounted for, so that the system can meet the needs of all users involved (Carpentieri et al., 2019). Consequently, the introduction of innovative public transport services is a key factor to be developed, as well as the understanding of behavioral patterns with regard to mobility, in order to build efficient and satisfying user experiences (Linchuan, 2018). Other indispensable systemic elements are autonomous and inclusive forms of transport and walking as a means of ensuring healthy and prosperous longevity. The attributes of accessibility, inclusivity and urban sustainability can be declined in the definition of an age-friendly city, which succeeds, therefore, in ensuring the active ageing of its population (Sgambati, 2021b). Alongside these fundamentally important factors, it is essential to consider the impact that technologies have on the daily lives of these users, which they are necessarily influenced by (Grimaldi et al., 2016): in a complex and rapidly changing context, some users need more time to adapt and learn to use these new tools, which they inevitably depend on to access certain services and information (Barakóvic et al., 2020; Hänninen et al., 2021). The smart city and, by extension, the smart mobility must therefore be designed to be sustainable and inclusive also from a technological point of view, without building further barriers to access or introducing elements capable of generating potential discomfort for reference users (Butler et al., 2020; Pava et al., 2021).

Given these premises, the context and scope of reference and the users involved in the research, the theme of social innovation can be identified as one of the key elements for it: namely, new services that are able to satisfy needs and requirements and create innovative social relationships (Sultan & Qaed, 2020). It can be stated that the main objective of these processes is to achieve social change and not to solve a particular problem (Ardill & de Oliveira, 2018). Thus, the close relationship that exists between service design and the design of social innovations is clear.

## 3. Service design and design for social innovation for active ageing mobility

The role of service design is to activate and develop collaborative local enterprises, creating a network of complementary and interconnected models. In this context, the designer is seen as a participant in the process, capable of listening to and understanding the needs of users and facilitating reflection and discussion in this regard. The main characteristic of a service is, therefore, to generate an interactive performance where both the service provider and the user are involved in the same way (Olivastri, 2019). Design for social innovation, on the other hand, can be developed in two main ways: by identifying existing cases and providing them with the right support or by stimulating new ways of thinking and acting that can catalyze an innovative process (Yang & Sung, 2016). By applying this lens, socially innovative services can be activated, supported, and disseminated, recognizing these

cases as models for the creation of dedicated solutions (Cipolla, 2018; Dennington, 2017; Manzini, 2014; Patricio et al., 2018).

The topic of active ageing is approached in different ways by the various design bodies (Dankl, 2017): on one hand, there is a preference for the construction and exploration of new scenarios, the way they intersect with the social and cultural context and the impact they can have in the daily lives of the target users; on the other hand, products and services are developed with a focus on aesthetic and inclusion principles, which, however, are not always able to change the predominant idea on ageing (Yang & Huang, 2015).

Some of the aspects where service design can act on are therefore the lack of social support networks, which can make all urban spaces livable for this category of users (Olivastri, 2019) and the tendency to generate solutions designed explicitly and exclusively for the over-55 population, with the risk of increasing the feeling of social exclusion or depression. For this reason, the work of service designers must include the development of proposals that closely connect institutions and citizens, who, in this way, can become users and promoters of the services developed, which become collaborative, especially thanks to the spread of digital technologies (Menghi et al., 2018).

Referring to the concept of the age-friendly city and linking it to the theme of digitalization of urban spaces and services, there is a clear need to build a layer that allows reference users to have access to those elements that are useful for preserving and improving well-being and quality of life (Pedell, 2021): for example, fostering active social participation, through digital platforms capable of communicating in an inclusive manner, can be a way to limit the phenomena of isolation and marginalisation (Zhu et al., 2022). In relation to the design and implementation of digital applications for target users, some characteristics can be listed that can serve as directions and guidelines: minimize the effort related to each task; avoid discriminating solutions; use multiple services that personalize the user experience, which should necessarily be fluid; explain the processes in detail; highlight the advantages and benefits of these applications (Grimaldi et al., 2016). However, a form of design that is guided by technological stereotypes towards the silver age and thus limited to implementing solutions that promote an active approach to technology should be avoided (Giaccardi et al., 2016).

## 4. Urban mobility services for active ageing: A case study analysis

In this section, different case studies concerning service solutions for silver age urban mobility are discussed, with the aim of highlighting the state of the art within the field and those best practices that can guide the design processes in this regard. The selection of the case studies was based on many parameters, which consider the degree of development of the service, its potential daily use, its holistic vision with respect to the reference system, the activation of alternative and innovative social networks and the possibility of being exploited by all segments of the population and not exclusively by the reference users. The case studies were evaluated through the following criteria: accessibility, intended as the degree

to which a service can be used and exploited by all the potential users' groups within a system, such as a city, while facilitating access to other activities (Arias-Molinares & García-Palomares, 2020); inclusion, considered a means to foster social relationships, have easy access to any kind of support, and be respected as a part of the community (Scharlach & Lehning, 2012); enabled autonomy, seen as the ability to receive information and make decisions that should bring to an action (Scott et al., 2003), and, thus, to more active lifestyles; promotion of a healthy lifestyle, described as mix of processes that optimize, improve and preserve physical, cognitive and social wellness, independence and quality of life (Brunner, 2005); and use of technology that should work as a real support for the elderly without posing a threat for using a particular service (Sourbati & Behrendt, 2021).

## *4.1 Turku's mobility map*

The first analysed case is a digital service[3] enabled by the municipality of Turku, in Finland, subsidized by a European grant and developed by researchers of the Faculty of Applied Sciences of the University of Turku. It consists of an online map, created through an open-source platform, which shows the services located within the urban area to guide the people who need to access them. In addition to displaying the services, points of attraction and activities, making it usable by all citizens, the peculiarity of this service consist in the mobility map, a section of the site, divided according to the type of mobility (pedestrian, by bicycle or scooter, by car and by boat). Once selected the travel method, it is possible to see the different itineraries (cultural, natural, for physical well-being), the service and parking stations for bicycles, the car sharing services, the car parks, and other useful information. The second function of considerable interest is the accessibility setting system: users have the possibility to indicate their perceptive or mobility issues and to save this data, so that the map is able to return information contextualized to the needs of reference users.

The project aims to facilitate the accessibility of city services and activities, providing relevant information on how to move according to the points of interest for the reference users; in doing this, the service enables greater autonomy, allowing users to select, based on their characteristics, the most suitable and inclusive methods of travel to reach the points and activities of interest. The section dedicated to the mobility map has a strong correlation with the concept of mobility as a tool for maintaining a healthy physical condition and, consequently, a situation of psycho-cognitive well-being; finally, being an exclusively digital service, it relies on technologies which, however, taking up models already widely accepted and used by the majority of users (digital maps) do not affect its use, nor can they increase the discomfort or marginalization in the reference category of users. The main weakness of this solution is its exclusively presence on web platforms, not having a dedicated mobile application: in this sense, it is the accessibility of the service that suffers, as it is not easily consultable at the actual time of travel.

[3] For further information consult the website https://palvelukartta.turku.fi/en/

## *4.2 Active ageing pilot program*

The second reported case is the Active Aging Pilot Program[4] project, created and delivered in the municipality of Santa Monica (LA), in collaboration with Alta Planning + Design, AMMA Transit Planning, Wise and Healthy Aging and Santa Monica Spoke. Generally, the objective of the project is to build an accessible and sustainable transport network, which allows users to move independently within the municipality. The program has envisaged different urban interventions to facilitate pedestrian mobility for all categories of users, as well as the creation of an application for traveling by bicycle, favoured by the establishment of a bike centre, where it is possible to park the vehicle; rent one in case of need; take advantage of repairs. One of the most interesting actions of the program is the MODE service, developed by the non-profit association Wise and Healthy Aging, specialized in the provision of services for the silver age, by the transport company Big Blue Bus and by the service provider Lyft. The solution consists of an on-demand transport service that allows users to book a trip from any starting point to points of interest related to care and health, education, socializing and the purchase of everyday products. The service also exploits vehicles capable of meeting the different needs of the reference group. There are different ways to access this solution, to allow any user to be able to actively interact with the service: through a mobile application, available for the different types of smartphones, developed and provided by Lyft; via a computer, by accessing the dedicated website; by calling the reservation service by telephone.

The program turns out to be extremely efficient with regard to the accessibility of the different services, both physically and digitally, as well as it promotes inclusion processes, allowing the users to maintain a certain level of autonomy in daily activities and outside the home environment. It consciously relies on technologically modern solutions and interfaces, while continuing to exploit traditional methods of interaction. From a macroscopic perspective, the project manages to promote a healthy lifestyle and to be useful for all categories of users and not exclusively for those most in need of such projects. Although it appears to be an extremely complete project and capable of concretely improving the urban life quality, a particular criticality can be highlighted, related to the objectives that the project sets for itself, namely that of educating the population in the planning of their movements, using the technological tools made available at a systemic level. Trying to meet the different needs that this heterogeneous group of users may have, in particular in relation to the MODE service, however, a not entirely consistent perspective is highlighted with what has been declared: users do not seem to be actually pushed to use certain technologies, whose presence is now essential in the daily life of all people, given the possibility of interacting with the services in a traditional way.

[4] For further information consult the website https://www.santamonica.gov/programs/active-aging#:~:text=The%20Santa%20Monica%20Active%20Aging,to%20get%20around%20the%20community.

### *4.3 TRIPS*

The last case study is the TRIPS[5] project, carried out by a consortium of organizations and institutions belonging to different sectors, such as transport, management and strategy, design, policies, which collaborates with various local authorities. The project was funded by a European Horizon 2020 call and has developed pilots in various European cities: Bologna, Brussels, Cagliari, Lisbon, Sofia, Stockholm, and Zagreb. The project aims to design concrete actions, through the development of digital solutions, to enable all user groups to travel in an inclusive manner. The consortium therefore carries out research aimed at investigating the state of the art of the field, and at identifying trends capable of generating innovation; moreover, the consortium supports the various stakeholders in designing the applied solutions, and the policymakers in defining the frameworks and strategies necessary for the implementation and integration of new solutions, systems and services. In particular, the project carried out in the municipality of Cagliari is discussed, which, following a preliminary phase of research and sharing of objectives with the various local stakeholders, was developed in three phases: design, development, and testing. The agreed objectives were to increase the physical accessibility of bus stops and the digital accessibility of the application dedicated to journey planning on public transport (BusFinder, already existing); specifically, the solutions outlined in the preliminary phase concerned the mapping of the stops, according to their physical accessibility, and the inclusion of this information within the application; the integration of voice commands to facilitate interaction even by people with sight problems and a new function that allows users to inform the driver about the stop at which they want to get off, the route they are taking and the type of disability. In this way, the user can establish a trustful relationship with the driver of the vehicle (who undergoes specific training), who becomes a real discreet guide while on the move.

The design and development phases were aimed at creating the service's UX and at integrating the new functions within the pre-existing application. The solutions have been tested with a relevant group of users, dividing the activities into two moments, to have the possibility to focus on small and specific objectives. At the end of this phase, a reiterative process, the solution was launched in beta version and is currently used. The described solution, which represents one of the many activities that have characterized and defined the complexity of the project, certainly manages to achieve the objectives of improving accessibility for travelling on an urban scale; moreover, the relationship that it builds and facilitates between the users and the drivers, it proves capable of triggering a process of social inclusion and, due to the nature of the application, of digital inclusion, too. However, from a systemic perspective, it shows limits regarding social innovation: while generating an extremely broad, inclusive and qualitative research, the derived solutions (even those developed in other municipalities), despite being co-designed, fail to activate branched and widespread relationships starting from the targeted service, outside from the one described above (Fig. 2).

[5] For further information consult the website https://trips-project.eu/about-the-project/

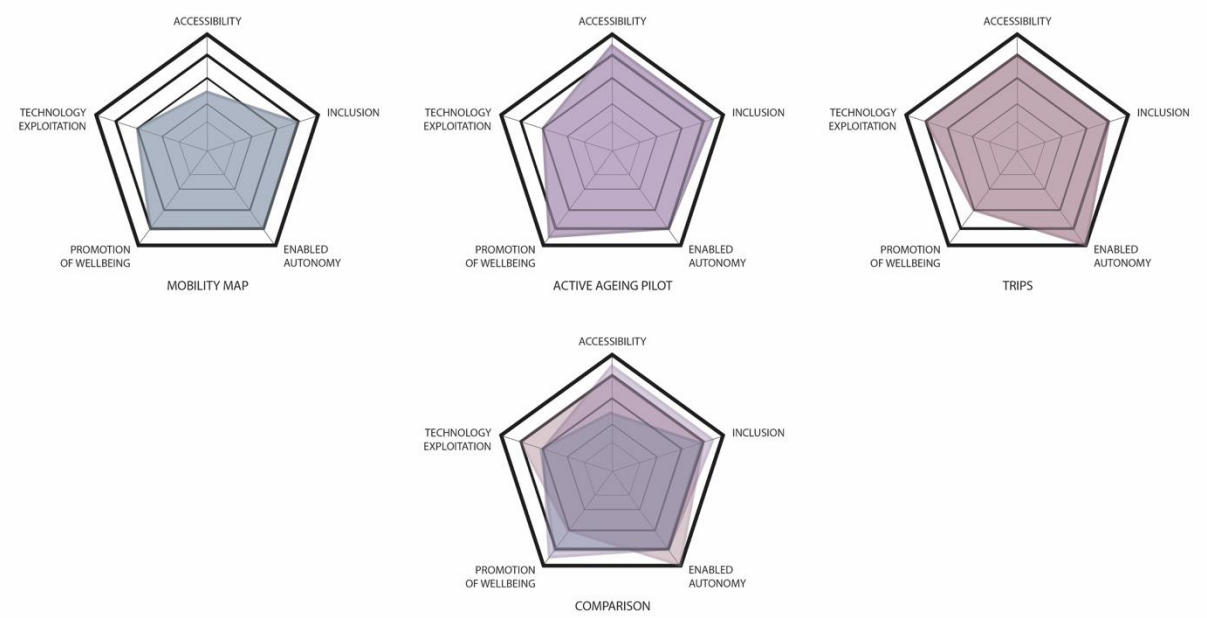


*Figure 2 Comparison between the different case studies.*

By comparing the above examples, two elements are identified which to propose a reflection on: in the first case reported, the project saw the collaboration of two bodies for the development of the service, neither of which pertaining to the discipline of design; while in the other two cases at least one of the actors involved in the process of construction and provision of one or more services is a design body. Observing the methodological process, the results achieved, their complexity and impacts, it can be understood that the first case study is not structured and built through a systemic perspective, and its objective is to act effectively tackling a bounded problem and not encouraging processes of social innovation and network construction, while being an efficient service designed in accordance with the reference context. The other two cases, including a design knowledge in the process, show how a strategic, systemic, and structured perspective and approach towards the issue addressed can act in a complex and stratified way, addressing social innovation. The second element of reflection concerns the size, heterogeneity and multidisciplinarity of the teams that have dealt with developing the projects: comparing the case studies, as it is easy to understand, a high diversification of the knowledge involved and the types of institutions, bodies and organizations enables a complex reading of the addressed issues and a greater ability to generate solutions which not only are able to tackle and resolve specific problems, but, furthermore, to activate new networks of relationships and values, through the solution's proposals.

Furthermore, through the process of case study analysis, it was possible to identify, outline and define potential guidelines to design urban mobility services for the silver age, which will be detailed in the next section.

## 5. Design directions for urban mobility services in age-friendly cities within a joint research platform

Urban mobility services for the silver age must be designed in an accessible manner for all user groups and, clearly, with particular attention to those belonging to the reference category. The concept of accessibility also represents the main objective that these solutions must set: they must guarantee the possibility of moving to all places of need and interest and to all the activities carried out, allowing a certain degree of autonomy, in order to avoid the processes of social marginalization and consequent discomfort which can result from it. With reference to this, it can therefore be said that they must be designed to achieve social inclusion of a social group which is still capable of exercising its agency, and moved by needs and desires not necessarily linked to their health status.

The theme of inclusion characterizes another aspect to be strongly tackled: the role of technology and the relationship it establishes with users belonging to the silver age. These services, contextualized within a smart and age-friendly city must be inclusive and easily exploitable from a technological point of view; at the same time, they must not refer to or promote wrong stereotypes towards the reference users. This could generate a further sense of unease and marginalization. Mobility should not be understood exclusively in relation to moving towards a point of interest, but also in terms of promoting a healthy lifestyle, which can limit the normal aging processes: solutions capable of combining these two aspects of mobility can be more effective and efficient and improve the psychophysical condition. As briefly anticipated before, to create a real and profound social inclusion, projects in this area must be conceptualized and designed to meet the demands and needs of more than one user group, starting from the reference one, but with impacts and benefits for the entire population. In this sense and guided by the need to activate processes of social innovation, one of the main objectives of these designed services must be the creation of urban networks, made up of citizens, which enable their widespread participation in social processes and different activities with a strong intergenerational impact. Finally, they must be co-designed together with citizens, in multidisciplinary and multistakeholder collaborative contexts, made up of different bodies, institutions and organizations.

These guidelines are derived from the preliminary processes of literature review and case study analysis, carried out in the context of a joint research platform on active ageing, established between academic bodies in the area of design and gerontology, a social cooperative working in the field of ageing, and a foundation related to the field of academic research. This multidisciplinary platform aims to build connections between institutions and bodies that carry out research and companies in the secondary and tertiary sector, with the goal of developing different pre-competitive analyses, guided by user and reference market requests and capable of generating multi-temporal strategies and solutions to respond effectively to emerging needs. Therefore, the platform performs multiple tasks: it acts as a continuous observatory on issues of interest, to constantly map trends and signals that can direct and catalyze new projects; it enables different levels of research, preliminary, applied and clinical, which the guidelines presented above are a declination of; it is also a co-

planning tool that connects different actors, knowledge and disciplines and creates an effective context for the construction of innovative strategies and services from a social point of view. In this scenario, design is required to assume the dual role of catalyst and facilitator of the processes of interpretation of the research carried out and of project development (Magistretti et al., 2021).

Taking up what was stated in the last part of the previous section, and following the discussion started by Dankl (2017), regarding the role and the approach that the different design bodies have towards the theme of active ageing, it can be stated that platforms such as the one just described and explained, can, on one hand, generate tools and guidelines that inform and direct the implementation of applied projects; on the other, to co-design solutions capable of changing, in a systemic way, the vision that one has around the theme of aging involving companies and users. Due to their multidisciplinary and multistakeholder conformation, they can activate multitemporal research and design processes.

## 6. Conclusions

The contribution addresses the theme of active aging from the point of view of service design and design for social innovation and, in particular, focuses on the issue of mobility in the context of smart and age-friendly cities. Through an initial research process carried out in the context of a joint research platform, it highlights a first set of key-drivers and guidelines to design urban mobility services for silver age. These can also be activators for processes of social inclusion, avoiding phenomena of marginalization and discomfort, and for the construction of socially innovative networks and activities, as well as modifying the traditional perception towards ageing. Being contextualized in the smart cities and, therefore, strongly influenced by the use of technology, this element must also be taken into strong consideration, avoiding, on one hand, the promotion of incorrect stereotypes and, on the other, generating solutions technologically inclusive, also from a social point of view. Thus, these services must be designed with a holistic and systemic perspective to co-create urban networks together with citizens and other stakeholders, as enablers of social participation and activities with high intergenerational impact.

This set of guidelines has been defined in the context of a joint research platform on the topic of active ageing, which has the objective of connecting different stakeholders from the world of research and from the secondary and tertiary sector, to generate pre-competitive analyses, strategies, and projects in the area of interest. It represents a first step of a process that must undertake several phases to see its outcomes: after having built a first theoretical base, what is needed is to validate the guidelines together with the stakeholders of the platform who have an expertise in the area of silver age mobility. During and after this step, a further process of literature review and case study analysis should be carried out to highlight and better define the guidelines. At that moment, it would be possible for the tertiary sector actors to start up a pilot to generate interventions and services.

This last phase will have also impacts on the research side, becoming a ground for further improvements of the guidelines in a research through design process (Stappers & Giaccardi, 2017) useful to understand how their different aspects may integrate and intertwine with each other in a high complex context.

They are a first attempt of the joint research platform to apply a social innovation lens to service design for silver age mobility, trying to foster a diverse perspective concerning this social group, which sees at its very center the concepts of dignity, autonomy, agency, and power still strongly characterizing the elderly.

Mobility represents one of the areas in which the platform is active and, given its multi-temporal approach, the research and outputs presented here represent the first phase of a complex process aimed at building projects applied in the various addressed areas.

## 7. References

Ardill, N. & Lemes de Oliveira, F. (2018). Social innovation in urban spaces. International journal of urban sustainable development, 10(3), 207-221. https://doi.org/10.1080/19463138.2018.1526177

Arias-Molinares, D. & García-Palomares, J. C. (2020). The Ws of MaaS: Understanding mobility as a service from a literature review. IATSS research, 44(3), 253-263.

Arup (2019). Cities Alive: Designing for ageing communities. Available at: https://www.arup.com/perspectives/publications/research/section/cities-alive-designing-for-ageing-communities

Baraković, S., Baraković Husić, J., van Hoof, J., Krejcar, O., Maresova, P., Akhtar, Z., & Melero, F. J. (2020). Quality of life framework for personalised ageing: A systematic review of ICT solutions. International journal of environmental research and public health, 17(8), 1-20. https://doi.org/10.3390/ijerph17082940

Brunner E (2005) More evidence that a healthy lifestyle matters: Converting epidemiology to policy. Evidence-based Healthcare & Public Health, 9, 108-110.

Butler, L., Yigitcanlar, T. & Paz, A. (2020). How can smart mobility innovations alleviate transportation disadvantage? Assembling a conceptual framework through a systematic review. Applied Sciences, 10(18), 1-40. https://doi.org/10.3390/app10186306

Carpentieri, G. Guida, C. & Masoumi, H. (2019). Measuring Multimodal Accessibility to Urban Services for the Elderly. An Application at Primary Health Services in the City of Naples. Planning, nature and ecosystem services, 5, 810-825.

Cipolla, C. (2018). Desis Network: Strategies to advancing systemic social innovation through service design. Proceedings of the ServDes. 2018 Conference, Italy, 150, 25-36.

Dankl, K. (2017). Design age: Towards a participatory transformation of images of ageing. Design Studies, 48, 30-42. https://doi.org/10.1016/j.destud.2016.10.004

Dehi, M. & Mohammadi, F. (2020). Social participation of older adults: A concept analysis. International journal of community based nursing and midwifery, 8(1), 55-72. https://doi.org/10.30476/IJCBNM.2019.82222.1055

Dennington, C. (2017). Service design as a cultural intermediary. Translating cultural phenomena into services. The Design Journal, 20(1), 600-613. https://doi.org/10.1080/14606925.2017.1353008

Eum, M. J. & Kim H. S. (2021). Relationship between Active Aging and Quality of Life in Middle-Aged and Older Koreans: Analysis of the 2013-2018 KNHANES. Healthcare, 9(2), 1-11. https://doi.org/10.3390/healthcare9020240

Gaglione, F., Cottril, C. & Gargiulo, C. (2021). Urban services, pedestrian networks and behaviors to measure elderly accessibility. Transportation research part D: Transport and environment, 90, 1-21. https://doi.org/10.1016/j.trd.2020.102687

Giaccardi, E., Kuijer, L., & Neven, L. (2016). Design for resourceful ageing: Intervening in the ethics of gerontechnology. In the proceedings of the Future focused thinking - DRS international conference, UK, 1-15. https://doi.org/10.21606/drs.2016.258

Grimaldi, R., Opromolla, A., Parente, G.A., Sciarretta, E. & Volpi, V. (2016). Rethinking Public Transport Services for the Elderly Through a Transgenerational Design Approach. In Zhou, J. & Salvendy, G. (Eds.), Lecture notes in computer science: Vol. 9755. (pp. 395-406). Springer. https://doi.org/10.1007/978-3-319-39949-2_38

Hänninen, R., Taipale, S. & Luostari, R. (2021). Exploring heterogeneous ICT use among older adults: The warm experts' perspective. New media & society, 23(6), 1584-1601. https://doi.org/10.1177/1461444820917353

Magistretti, S. et al. (2022). Framing the multifaceted nature of design thinking in addressing different innovation purposes. Long Range Planning, 55(5), 1-14. https://doi.org/10.1016/j.lrp.2021.102163

Manzini, E. (2014). Making things happen: Social innovation and design. Design issues, 30(1), 57-66. https://doi.org/10.1162/DESI_a_00248

Menghi, R., Papetti, A., Carbonari, S., & Germani, M. (2018). Designing a product service platform for older people: From needs to requirements. In proceedings of the Smart Homes and Health Telematics, Designing a Better Future: Urban Assisted Living: 16th International Conference, Singapore, 16, 23-34. https://doi.org/10.1007/978-3-319-94523-1_3

Olivastri, C. (2019). Service design: Thinking experiences for playing an active role in society. In N. Casiddu, C. Porfirione, A. Monteriù, & F. Cavallo (Eds.). Lecture notes in electrical engineering: Vol. 540. (pp. 353-363). Springer. https://doi.org/10.1007/978-3-030-04672-9_25

Paiva, S., Ahad, M. A., Tripathi, G., Feroz, N., & Casalino, G. (2021). Enabling technologies for urban smart mobility: Recent trends, opportunities and challenges. Sensors, 21(6), 1-41. https://doi.org/10.3390/s21062143

Patrício, L., Gustafsson, A. & Fisk, R. (2018). Upframing service design and innovation for research impact. Journal of Service Research, 21(1), 3-16. https://doi.org/10.1177/1094670517746780

Pedell, S., Borda, A., Keirnan, A., & Aimers, N. (2021). Combining the digital, social and physical layer to create age-friendly cities and communities. International Journal of Environmental Research and Public Health, 18(1), 1-14. https://doi.org/10.3390/ijerph18010325

Scott P.A., Välimäki M, Leino-Kilpi H., et al (2003). Perceptions of Autonomy in the Care of Elderly People in Five European Countries. Nursing Ethics, 10(1), 28-38. https://doi.org/10.1191/0969733003ne572oa

Sgambati, S. (2021a). Urban accessibility and city redesign [L'accessibilità urbana e il ridisegno della città]. In Gargiulo, C. & al. (Eds.), Ageing cities between past and future. Strategies, methods and proposals to improve urban services accessibility for elders [Le ageing cities tra passato e futuro. Strategie, metodi e proposte per migliorare l'accessibilità degli anziani ai servizi urbani] (pp. 69-97). FedOA Press.

Sgambati, S. (2021b). Cities and population ageing [Le città e l'invecchiamento della popolazione]. In Gargiulo, C. & al. (Eds.), Ageing cities between past and future. Strategies, methods and proposals to improve urban services accessibility for elders [Le ageing cities tra passato e futuro. Strategie,

metodi e proposte per migliorare l'accessibilità degli anziani ai servizi urbani] (pp. 29-68). FedOA Press.

Scharlach, A.E., & Lehning, A.J. (2012). Ageing-friendly communities and social inclusion in the United States of America. Ageing Society, 33, 110–136.

Sourbati, M., & Behrendt, F. (2021). Smart mobility, age and data justice. New Media & Society, 23(6), 1398-1414. https://doi.org/10.1177/1461444820902682

Stappers, P.J., & Giaccardi, E. (2017). Research through Design. Delft, The Netherlands: TU Delft.

Sultan, R., & Qaed, F. (2020). Service Design Thinking and Social Innovation Sustainability. Proceedings of the 2020 Second International Sustainability and Resilience Conference: Technology and Innovation in Building Designs, Bahrain, 51154, 1-5. https://doi.org/10.1109/IEEECONF51154.2020.9319998

Torku, A., Chan A., P. J. & Yung E. H. K. (2021). Implementation of age-friendly initiatives in smart cities: probing the barriers through a systematic review. Built environment project and asset management, 11(3), 412-426. https://doi.org/10.1108/BEPAM-01-2020-0008

van Hof, J., Marston, H. R., Kazak J. K., & Buffel, T. (2021). Ten questions concerning age-friendly cities and communities and the built environment. Building and environment, 199, 1-26. https://doi.org/10.1016/j.buildenv.2021.107922

Yang, C. F., & Sung, T. J. (2016). Service design for social innovation through participatory action research. International Journal of Design, 10(1), 21-36.

Yang, C. H. & Huang, S. N. (2015). Building the empowered community towards a service design perspective: Case study of West Central District in Tainan. Proceedings of the 2015 International Conference on Orange Technologies, China, 63-66. https://doi.org/10.1109/ICOT.2015.7498507

Yang, L. (2018). Modeling the mobility choices of older people in a transit-oriented city: Policy insights. Habitat international, 76, 10-18. https://doi.org/10.1016/j.habitatint.2018.05.007

Zhu, D. et al. (2022). Social inclusion in an aging world: Envisioning elderly-friendly digital interfaces. In the proceedings of the 5th International Virtual Conference on Human Interaction and Emerging Technologies, France, 1082-1087. https://doi.org/10.1007/978-3-030-85540-6_139

About the Authors:

**Stefania Palmieri** is an associate professor at the Design Department of Politecnico di Milano where she teaches in product design courses. Her research and work are at the intersection between design and industry.

**Alessandro Ianniello** is a post-doc researcher at TU Delft working at the intersection between critical and speculative design and more-than-human design. He is a coach in interaction design courses.

**Mario Bisson** is an associate professor at the Design Department of Politecnico di Milano where he teaches in product design courses. He is the scientific director of two research groups focused on experience, perception and environments.