Collective housing for seniors in Romania, in a paradigm of active and healthy ageing in community – from smart adaptation to architectural and design innovation

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Abstract

Currently, the existing collective residential fund in Romania is neither adapted nor refreshed in order to meet the needs of seniors, nor to the challenges of an ageing society. The current research aims to investigate, in the key of 2023, the ways in which architectural design in the residential sector responds to the challenges of the current Romanian society, aiming two objectives: identifying ways of adaptation and accessorization for existing apartment-type dwellings in multi-storey residential buildings in Romania and scoring innovative design solutions for new collective housing, so as to support an active and healthy ageing in community. The research is based on concepts such as ageing in place, ageing in community, age-friendly architecture, universal design, sustainable communities. The study involves the narrative review methodology. Using the principles of user-centered design, changes brought about by ageing are discussed in an interdisciplinary approach, specific geriatric pathology (medical doctor) and implicitly synthesized the needs of the elderly, the ways of architectural adaptation of the apartments needed by seniors (architect) and their accessorization with gerontotechnology (architect, psychologist, biologist, medical doctor) are presented in order to become a safe and engaging environment. Using research by design method, innovative assistive living facilities projects for seniors are presented, carried out with the 5th year students from IMUAU (2020 and 2022) and visions of contemporary architecture as a support for intergenerational sustainable communities in degree projects (2023). The adaptation of apartments for seniors involves interventions in: access, floors, doors, windows, lighting, spatial configuration, furniture, landmarks, decorations, color palette, visual stimulation, smart technologies. Five levels of intervention were identified: 1. labelling, signage, painting, planting; 2. assistive technologies for activities of daily living; 3. interior-exterior changes for doors, windows, floors; 4. building, accessorization, accessibility; 5. spatial layout and structure. The costs of these interventions differ and increase from point 1 to point 5. Compared to adaptations, the *ab initio* design of seniors' dwellings practiced in students' projects offers increased comfort. The disadvantage is the need to change residence around the age of 60. Degree projects (2023) demonstrate sustainable strategic thinking at the community level, with an emphasis on architecture as a support for intergenerational relations. The research results reveal the importance of interdisciplinary teamwork and the need for a paradigm shift in the design discipline of higher architecture education. Seniors' housing adaptation, including accessorizing with gerontotechnology, must be supervised by the architect so the results to be optimal, both in terms of comfort and aesthetics. The need for education for active and healthy

ageing of the Romanian society is highlighted.The work proves the importance of residential architecture but also of the public spaces in supporting ageing in community, optimizing opportunities for autonomy, participation and security. This research was funded through the Active and Assisted Living Programme, Project AAL-CP-2020-7-108-SI4SI-1, co-funded by the European Commission and the Romanian National IRD Funding Authority – UEFISCDI.

Keywords: age-friendly architecture, ageing in place, apartments for seniors, research by design, interdisciplinarity.

1. Introduction

In Romanian cities, housing is predominantly collective and happens in the vast majority in multi-storey residential buildings, built during the communist period. In recent years, real estate developments in terms of residential complexes on the outskirts of big cities-an eloquent example being Bucharest-bring to the attention, especially of young families, new living standards, the European product model that seems to constitute a guarantee of quality and aesthetics compared to the unpleasant, outdated, stereotyped communist model. The western model is idealized by young people who are looking to purchase an apartment, who most of the time overlook the location of these new real estate developments, very often with a fragile urban structure, insufficiently developed at the level of streets, sidewalks, utilities and public transport. Romanians have the mentality of being owners [1], of having a home of their own for the rest of their lives. [2] Regardless of whether the Romanians live in an old multi-storey residential building – this tipically means built during the communist era – or whether they live in a new block of flats, recently built, the same questions it is asked. Can that apartment, purchased with a lot of effort, be an apartment in which to live comfortably for the rest of your life? Does the apartment have the right sized spaces and public conections so that it can be comfortably used by an older person and, moreover, by an older person with age-specific health problems?

The population of Romania is ageing at the same rate as the population of Europe. In 2020, statistics estimated Romania's population at 19.53 million [3], with a life expectancy at birth of 75.83 years. [4] The proportion of elderly people 65+ in 2019 was 18.5% and it is estimated that by 2030 the percentage of elderly people will reach 21% in 2030 and 27.7% in 2050. [3] Half of the Romanian population lives in the urban environment (53.8% in 2020) [3] and the trend is continuously increasing.

Currently, the existing collective residential fund in Romania is neither adapted nor refreshed in order to meet the needs of seniors, nor to the challenges of an ageing society. On the other hand, the new residential complexes are on the outskirts, poorly connected to the facilities necessary for a comfortable life at the age of seniority, such as parks, agro-food market, hospital, cultural buildings risking becoming enclaves that can isolate the future older adults and not support them for ageing in community and to continue a consistent social life.

2. Objectives

The current research aims to investigate, in the key of 2023, the ways in which architectural design in the residential sector responds to the challenges of the current Romanian society, aiming two objectives: identifying the ways of adaptation and accessorization for existing

multi-storey residential buildings in Romania and scoring innovative design solutions for new collective housing, so as to support an active and healthy ageing in community.

3. Prior work

The research is based on concepts such as ageing in place, ageing in community, age-friendly architecture, universal design, sustainable communities.

In the last 13 years, we have been concerned, at the research level, with how architecture can respond to the challenges of an ageing society. In this sense, in recent years we have published a series of articles on architecture as a support for active and healthy ageing [5], elderly-friendly architecture, architecture suitable for elderly people with neurocognitive disorders on the spectrum of Alzheimer's disease, known as dementia-friendly architecture. [6] In terms of collective housing, ageing in place today requires an apartment that meets the needs of an older person, a smart home that optimally combines architecture and design with technology that sometimes has to be assistive.

4. Approach

The study uses two types of research methods, narrative review and research by design.
In order to meet the specific dwelling needs of the elderly, residential architecture must take into account the health issues that may occure as we age. In this sense, with the help of the medical doctor fellow from the research team, the following clinical aspects in the elderly, related to the built environment, were identified: locomotor disability, bed-bounded, frailty syndrome, visual disorders, hearing loss, spatial disorientation, mood disorders, disorders of perception.

Using the principles of user-centered design, changes brought about by ageing are discussed in an interdisciplinary approach, specific geriatric pathology (medical doctor) and implicitly synthesized the needs of the elderly, the ways of architectural adaptation of the apartments needed by seniors (architect) and their accessorization with gerontotechnology (architect, psychologist, biologist, medical doctor) are presented so that to become a safe and engaging environment. Using research by design method, innovative assistive living facilities projects for seniors are presented, carried out with the 5th year students from IMUAU (2020 and 2022) and visions of contemporary architecture as a support for intergenerational sustainable communities in degree projects (2023).

5. Results

In Romania, living in multi-storey residential buildings is predominant in the urban environment. A useful tool for the local area, the interactive map of the blocks offers the possibility of consulting multi-storey residential buildings, according to the period in which these were built, respectively: 1950, 1950-1970, 1968-1978, 1977-1990, 1990-present. [7] On this map at the current moment, 2023, there are over 40,000 blocks from Bucharest and 10 other counties, in the future it is expected to develop this information. On this map, multi-storey residential buildings can be consulted according to certain criteria such as: height/number of floors, equipped with an elevator or not, number of apartments, seismic risk, year of construction completion, project year, project, structure, floor plans. For the discussed topic, namely the comfort of living for the elderly, we are specifically interested

in the aspects related primarily to accessibility. We are faced with two situations: low-rise residential blocks, ground floor and 3/4 floors, built without an elevator and high-rise buildings, over the ground floor+4 floors, which are equipped with an elevator. Most of them were built before the 90s.

Table 1 Apartments' areas in collective housing blocks in Romania built between 1950-1990

Planning years	1 room apartment Area (sqm)	2 rooms apartment Area (sqm)	3 rooms apartment Area (sqm)	4 rooms apartment Area (sqm)	5 rooms apartment Area (sqm)	Living Area (sqm)	Bedroom Area (sqm)
1984-1990 comfort 1	36-38	54-60	72-76	90-100	110-120	19-21	12-15
1978-1986 comfort 1	32-36	48-54	60-68	78-84	94-104	18-19	10-13
1966-1978 comfort 1	30-32	45-60	58-64	76-82	-	17-19	10-12
1960-1970 comfort 1	26-28	44-46	54-58	74-78	-	16-17	11-13
1950-1960	30-40	45-60	65-80	?	-	16-20	12-16
1978-1986 comfort 2	26-28	42-44	54-56	64-68	-	15-17	8-11
1966-1978 comfort 2	24-26	36-40	44-48	58-62	-	14-15	7-10
1966-1972 comfort 2	16-20	30-32	38-42	46-50	-	12-13	7-10

Source: https://www.hartablocuri.ro/planuri/

Living in an apartment in a multistory building implies, for the older person, risks such as [8]:

- Falls – by ignoring obstacles such as different barriers, stairs, glass doors or awkwardly positioned furniture;
- Fear- caused by inappropriate lighting, reflections, inappropriate prints, slippery or blunt finishes;
- Poor orientation- caused by insufficient lighting or blurred contrasts;
- Confusion- it can be caused or maintained by not keeping the routine and by changing certain elements in the design, lack of color contrasts, insufficient lighting;
- Safety – one of the most important aspects which involves the dimensions of the spaces (including the doors and how they open), the finishes of the floors and walls, the furniture in particular of the bathroom, various obstacles such as thresholds or unmasked cables.

The adaptation of apartments in order to meet seniors' needs involves interventions in: access, floors, doors, windows, lighting, spatial configuration, furniture, landmarks, decorations, color palette, visual stimulation, smart technologies.

The universal design guidelines for the adaptation of living space for elderly people with neurocognitive disorders identify five architectural levels of intervention: labelling, signage, painting, planting; assistive technologies for activities of daily living; interior-exterior changes for doors, windows, floors; building, accessorization,

accessibility; spatial layout and structure. [9] The costs of these interventions differ and increase from point 1 to point 5.

The adaptation of apartments, in addition to architectural and design interventions, can also be helped by smart technologies that, in the case of older adults, we will call gerontotechnologies.

In Romania, more than in Western European countries, people want to age in place, in their own homes, to grow old in the community where they have lived all their lives. In this sense, gerontotechnology integrated in residential architecture really increases the chances of living independently in old age, catalyzing the acquisition of an active and healthy lifestyle. Integrated into the residential living environment (but also in the indoor-outdoor common public spaces in the neighbourhoods) or in wearable devices, gerontotechnology involves sensors (presence and motion sensors, sensors for monitoring physiological and functional parameters, activity and participation levels, computer vision), data processing, application of decision and interpretation algorithms (including for behavioral and mood detection), artificial intelligence with the ability to provide constructive and assistive feedback to the user and caregivers [10] and a lot of work by interdisciplinary teams, side-by-side with potential users, in a user-centered and co-creation technology development approach. [11]

In order to stimulate active and healthy ageing in place and in community, more precisely, in the case of the present study, in an apartment in a multi-storey building, two types of solutions were identified: age-friendly architecture and ICT and sensored based gerontotechnologies. These two types of solutions can be applied to all five levels of intervention identified previously.

Gerontotechnology was created to be used by older people, with the aim of increasing the level of quality of life (QOL), by improving the safety and the level of performance of the activities of daily living (ADL). [12] Gerontotechnology is any product, tool, equipment or technical system used by an older person, produced specifically or generally available for the prevention, compensation, limitation of the disabilities associated with old age that may appear with ageing. [13] At the complex level, gerontechnologies can compose complex ecosystems, made up of independent and interdependent devices and programs that communicate with each other through a wired or wireless connection, that are able to respond and change continuously, according to the needs of the user. The integration of gerontotechnologies in residential architecture aims to: make ADL accessible & easier, improve the degree of functional independence in ADL, improve the QOL of both the older person and the family or the possible caregiver. Gerontotechnologies have three types of protective role: compensatory as support for an independent life as long as possible, recuperative as support for rehabilitation and preventive for safety, primary, secondary and tertiary prophylaxis. [14] Currently, smart home solutions are already on the market and include: presence sensors, physiological parameters sensors, inertial sensors, computer vision, processing algorithms, interpretation, even Artificial Intelligence. [15, 16, 17] The latest gerontotechnologies cover all the areas necessary to ensure the well-being of senior users, such as access and protection, indoor microclimate, the performance of ADL and

recreational activities, the performance of physical activities in safe conditions, participation in family life and other social activities.

From our personal experience, we would like to highlight the SI4SI project – Smart solutions for Senior Isolation [18], a recent finalized AAL project, in which age-friendly scenarios have been developed for the implementation of smart assistive technologies in users's homes for older adults. The SI4SI solution includes sensors of presence in spaces intended for certain categories of known activities, wearable sensors for monitoring physiological parameters and a smart application providing users with meaningful feedback and with the means to safely and efficiently communicate with peers and family. Starting from the analysis of the level of activity and the health condition of the user, we want to: stimulate activity for a good physical and mental condition, ensure a safe and stimulating environment for carrying out social communication with people with the same fields of interest, through digital means, stimulating interest in digital solutions that offer relevant information and possibilities and monitoring and also investigating anomalies in activity/functioning patterns by professional healthcare providers.

5.1. Smart apartments for the elderly: age-friendly architecture and gerontotechnology

A contemporary smart apartment involves the following aspects [19]:

- Safety: surveillance camera / CCTV, alert reminder system(s), automatic shut-off on gas, automatic power off, automatic stop of water supply, intelligent smoke detectors;
- Entertainment: smart TV, intelligent audio systems, noise control system, automatic lighting;
- Thermal: automatic air conditioning, automatic fan;
- Openings: automatic curtains/blinds, automatic window control, automatic door control;
- …and More: automatic lifting installations on tracks, smart appliances (including kitchen appliances and cleaning appliances), smart furniture, assisted breathing device, home backup generator.

Ten important aspects have been identified in the comfort and safety of the older person's residence, for which, in the following, solutions are presented in the two already identified categories: age-friendly architecture and gerontotechnology:

5.1.1. Home access

Access to multi-storey residential buildings in Romania is always achieved through a set of indoor or outdoor steps which for an older person using a mobility device (frame, crutch, cane or, in the most difficult case, a wheelchair) is risky, dangerous or even impractical.

- Age-friendly architecture: It is necessary the construction of an access ramp with slope inclination of maximum 15% for unevenness <20cm and of 8% (recommended 5%) for unevenness >20cm; [20]
- Gerontotechnology: Lifting platform [21] attached to the railing can be mounted that must accompany the stairs outside or inside the building. Lifting platforms are a solution for the unrestricted access for disabled elderly and these are generally

installed in buildings of public interest. For residential buidings with maximum groundfloor+3/4 levels, in order to become elderly-friendly, it is necessary the installation of an external elevator.

5.1.2. Floors

- Age-friendly architecture: It is recommended to give up carpets or rugs that can constitute a danger of obstruction and also cannot be maintained easily. The floor must be easy to maintain, in this sense, non-slip ceramic tiles are recommended, especially for elderly that suffer from urinary incontinence. It can be also used the resistant laminated parquet with a high resistance class (32 or 33) [22] that withstands frequent washing and disinfection. Durable PVC floors, with a five-layer composition, resistant to frequent washing and disinfection [23] can also be used. If it still wanted to cover the floor, it is recommended a carpet for heavy traffic, resistant to repeated cleaning [24], that is fixed to the wall by a plinth and does not constitute a danger of obstruction. The chromatic contrast between floor and walls [25] is used as an age-friendly design principle;
- Gerontotechnology: Giving up carpets involves issues raised by a floor that can be cold, in this sense the use of underfloor heating is recommended. [26] Also, trip and fall monitoring sensors can be used. [27]

5.1.3. Doors

- Age-friendly architecture: In order to be used including by an older person in a
- wheelchair, the doors should have a minimum width of 80 cm (90 cm is recommended). [20] It is also recomanded to remove the thresholds and for the doors to have frame and round sill to avoid injuries;
- Gerontotechnology: Doors cand be activated by presence sensors or after computer vision recognition, portable buttons, keypads, smartphone apps via Bluetooth or WIFI, wireless card readers that open when you're in range of the door. [28]

5.1.4. Lighting

- Age-friendly architecture: During the day, generous natural lighting is necessary to fight against depression, in this sense it is recommended to give up thick walls and curtains and to use adjustable sun control devices such as blinds. In the evening, uniform and consistent artificial lighting is recommended [29], let's not forget that the elderly need a lighting level three times higher than the young adult. Intelligent lighting also assumes task lighting, smart lights with presence sensors and light trajectory tracing; [6]
- Gerontotechnology: An intelligent lighting assumes light on/off via voice control (when paired with a smart speaker), apps that allows older person to see which lights are on/off, in this regard timers or lighting groups can be set. [30]

5.1.5. Spatial configuration

- Age-friendly architecture: In elderly-friendly interior design, the general recommendations are towards a classic design with traditional furniture [31], however, they are not recipes because the elderly are different as any other person

of any age and then the profile of each beneficiary must be analyzed separately. Regardless of the design, it is recommended to free circulation paths of unnecessary pieces of furniture and kitchen-living-bathroom route must be highlighted as clearly as possible. [32] The most important aspects are related to the minimum dimensions of some spaces, because a wheelchair user needs free space with the size of a circle with a diameter of at least 1.5ml in order to be able to move freely; [20]

- Gerontotechnology: Intelligent technologies can increase comfort by developing the space with projections that recreate certain relaxing environments [33], perhaps giving the impression of more space, more light.

5.1.6. Furniture

- Age-friendly architecture: It is recommended to avoid furniture with edges, blunt surfaces and to place furniture items at accessible heights to avoid improvised climbing. It should be remembered that the bathroom is the most dangerous room in an apartment- 79% of injuries occur in people 65+ happen in bathroom [34] – so it is recommended to replace the bathtub with a shower at floor level, to install grab bars both in the bathroom and in the hallways;
- Gerontotechnology: Intelligent technologies can increase comfort by furniture that can be transformed, such as adjustable ergonomic chairs [35] that help the elderly user to stand up beds with adjustable height and inclination [36] and also with assistive fall prevention devices [37].

5.1.7. Landmarks for orientation

- Age-friendly architecture: It is recommended to encourage autonomy by avoiding disorientation with a possible different chromatic marking of the access to the bathroom and, if the elderly lives in the extended family, with a different marking by color or texture of the door of their own room. Clocks and calendars [38], which should be present in every room, are also handy orientation elements, good reminders for older persons with neurocognitive disorders;
- Gerontotechnology: During the night, for orientation, smart trajectory can be used, tracing solutions and bells with warning light [39], the toilet bowl can also be illuminated.

5.1.8. Color pallete

- Age-friendly architecture: As an elderly-friendly and dementia-friendly principle, it is recommended to use contrasting colors between walls, floor and furniture [6], for example a light-colored sofa on a colored wall, or the toilet bowl in a contrasting color to the wall, or just a colorful seat for the toilet bowl;
- Gerontotechnology: Colored lighting can be used that changes depending on the time of day or the situation, for example exposing the older person with neurocognitive disorders to a blue light before going to bed, prolongs deep sleep. [40]

5.1.9. Navigation outside the home

- Age-friendly architecture: An age-friendly outdoor space is an accessible space, without bumps or if they exist, bumbs are taken over with ramps, with rest areas, protected from the strong sun. An interesting exercise are the dementia-friendly therapeutic gardens that use loop circulation for the management of wandering [41], have orientation landmarks, reminder triggers such as vintage car [42], both activity and rest areas;
- Gerontotechnology: Shoes with ultrasonic, waterproof sensors attached to the toe of each shoe [43] can be use in order to preserve the safety of older person. Whenever it encounters obstacles, the sensors send vibrations or make some sounds to signal the wearer.

5.1.10. Socialization

- Age-friendly architecture: Maintaining social contacts is very important for active and healthy ageing. Socialization and direct interactions take place especially outside the home, in this sense, in the design of public spaces, areas with benches and chess tables attract the elderly [44], as do dedicates community centers for seniors [45].
- Gerontotechnology: The Covid-19 pandemic has further stimulated long distance communication, so even for the elderly, digital devices (phones, tablets, laptops) connected to the Internet contribute to well-being. [46] More advanced technologies are support avatar applications or even telepresence and social robots. [47]

5.2. Innovative elderly-friendly facilities in Bucharest, Romania: student projects and diplomas

The ab initio design of elderly people facilities-whether these are dwellings for independent elderly people or with varying degrees of dependence, nursing homes that provide institutionalized assistance-proves its advantages related to safety and comfort, increasing the quality of life, catalyzing independence and well-being. [48]

Together with the 5th year students from the Faculty of Architecture, within the "Ion Mincu" University of Architecture and Urbanism, in two consecutive generations, 2019-2020 and 2021-2022, the development of a project in the real site of the former Zefirul Factory, in the neighborhood Vatra Luminoasă, Bucharest, under the age-friendly umbrella concept. Starting from the results obtained with the first generation of students (2019-2020) which proved the architectural potential of the Vatra Luminoasă neighborhood in the paradigm of an age-friendly architecture [49], the exercise was repeated with the next generation of 5th year students (2021-2022) which also showed interesting, diverse, creative results.

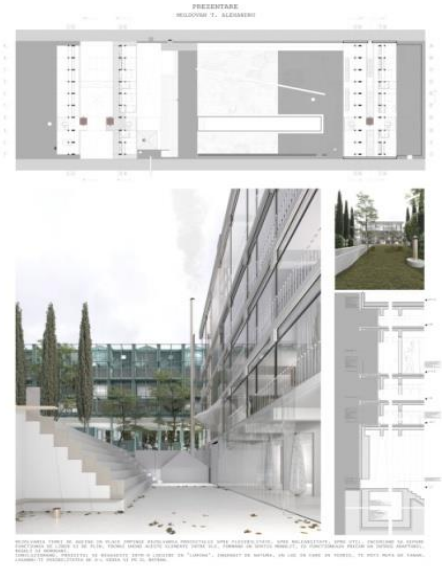
5.2.1. *Elderly Dwellings │"Street with Garden"│ Vatra Luminoasă*

University Year: 2019-2020
Authors: St. Arch. Răzvan Badea Șuțu &
St. Arch. Teona Dascălu
Tutors:
Prof. PhD. Arch. Dan Șerban
Lect. PhD. Arch. Mihaela Zamfir
Lect. PhD. Arch. Ana Maria Vesa (Dobre)
Arch. Simina Dron

Fig. 1 Elderly Dwellings │"Street with Garden"│ Vatra Luminoasă
Source: Group 52_2019-2020 Archive

"Small is beautiful"

5.2.2. Elderly Dwellings │"Strips"│ Vatra Luminoasă



University Year: 2019-2020
Author: St. Arch. Alexandru Moldovan
Tutors:
Prof. PhD. Arch. Dan Șerban
Lect. PhD. Maria Vesa (Dobre)
Arch. Simina Dron Arch. Mihaela Zamfir
Lect. PhD. Arch. Ana

Fig. 2 Elderly Dwellings │"Strips"│ Vatra Luminoasă
Source: Group 52_2019-2020 Archive

"Elderly friendly architecture, ageing in place"

5.2.3. Elderly Residential Center │"The 5th Garden"│ Vatra Luminoasă

University Year: 2021-2022
Author: St. Arch. Andreea Pribeanu
Tutors:
Prof. PhD. Arch. Dan Șerban
Assoc. Prof. Arch. Karoly Nemeș
Lect. PhD. Arch. Mihaela Zamfir
Lect. PhD Arch. Alexandru Crișan

Fig. 3 Elderly Residential Center │"The 5th Garden"│ Vatra Luminoasă
Source: Group 52_2021-2022 Archive

"Elderly-friendly architecture and nature"

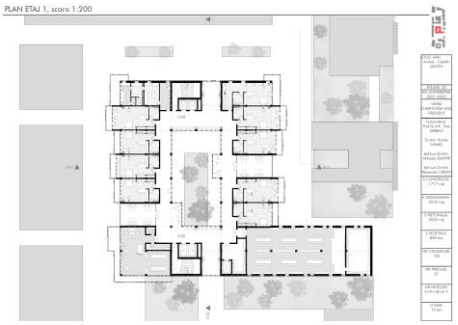
5.2.4. Elderly Nursing Home │"The 5th Garden" │ Vatra Luminoasă

University Year: 2021-2022
Author: St. Arch. Elena Preda
Tutors:
Prof. PhD. Arch. Dan Șerban
Assoc. Prof. Arch. Karoly Nemeș
Lect. PhD. Arch. Mihaela Zamfir
Lect. PhD Arch. Alexandru Crișan

Fig. 4 Elderly Nursing Home │"The 5th Garden"│ Vatra Luminoasă
Source: Group 52_2021-2022 Archive

"Frailty as a shaping need in age-friendly architecture"

5.2.5. Assisted Living Facilities for Elderly │"Generational Wealth Community Center"│ Vatra Luminoasă



University Year: 2021-2022
Author: St. Arch. Andrei Jantea
Tutors:
Prof. PhD. Arch. Dan Șerban
Assoc. Prof. Arch. Karoly Nemeș
Lect. PhD. Arch. Mihaela Zamfir
Lect. PhD Arch. Alexandru Crișan

Fig. 5 Assisted Living Facilities for Elderly │"Generational Wealth Community Center"│ Vatra Luminoasă
Source: Group 52_2021-2022 Archive

"Light as architectural tool in modeling age-friendly architecture"

Active and healthy ageing, in the community, requires, in addition to an adequate housing, social participation [50], interaction both among members of the same age group and between different generations. [51] Community centers can support the social role of each person, regardless of age.

The young are the first to give the pulse of society, of changes and implicitly of the needs that arise. The Covid-19 pandemic meant for more than a year, the limitation of direct interactions, face-to-face participation in education, work and relaxation activities. The desire to resume life before the pandemic as soon as possible, of joint activities, was felt in 2022 and in the choice of diploma subjects of the 6th year students from the Faculty of Architecture of the "Ion Mincu" University of Architecture and Urbanism, Bucharest, Romania. Community centers, from the experience of the main author of this article, Lect. PhD. Arch. Mihaela Zamfir, constituted a subject with a great potential. Even if community centers dedicated to the elderly in particular were not the first option in 2022, the strategic, sustainable approach, the idea that an active and healthy longevity is maintained with an active lifestyle, in the community, from a young age, is to be appreciated. Architecture forms social behaviors, supports relationships in the community throughout life. [52]

The seven diploma projects with themes of community architecture, guided for the July 2023 session by Lect. PhD. Arch. Mihaela Zamfir are:

5.2.6. CULTURE MINE. Socio-cultural community center │Petroșani, Romania │Diploma project │July 2023 session │ st. arch. Irina Corduneanu (fig. 6);

5.2.7. TAB Cultural incubator. Conversion of the Bucovăț Tannery | Bucovăț, Dolj | Diploma project | July 2023 session | st. arch. Cristina-Georgiana Fotescu (fig. 7);

5.2.8. ETHOS(m)ART. Socio-cultural art and science center for young people | Luigi Cazzavillan Park, Bucharest, Romania | Diploma project | July 2023 session | st. arch. Alina Alexandra Iancu (fig. 8);

5.2.9. WAVES. Community Center for Youth | Constanța, Romania | Diploma Project | July 2023 session | St. arch. Maria Ispas (fig. 9);

5.2.10. (in)KÜLTÜR. Socio-cultural center for the Turkish-Tatar community | Constanța, Romania | Diploma project | July 2023 session | st. arch. Melis Musa (fig. 10);

5.2.11. REintegrated. [HER]a Garden Multifunctional center of integrated services for combating and preventing domestic violence | Ferentari, Bucharest, Romania | Diploma project | session July 2023 | st. arch. Maria Antoaneta Smarandache (fig. 11);

5.2.12. CO-Z. Student center, co-living, co-learning | Parcul Carol, Bucharest, Romania | Diploma project | session July 2023 | st. arch. Florentina Mihaela Trandafir (fig. 12).

Fig. 6 CULTURE MINE. Socio-cultural community center | Petroșani, România | Diploma Project 2023 | UAUIM | Author: St. Arch. Irina Corduneanu | Tutor: Lect. PhD. Arch. Mihaela Zamfir
Source: Mihaela Zamfir educational archive

Fig. 7 TAB cultural incubator. Conversion of the Bucovăț Tannery │ Bucovăț, Dolj, România │Diploma Project 2023 │ UAUIM │Author: St. Arch. Cristina Georgiana Fotescu │Tutor: Lect. PhD. Arch. Mihaela Zamfir

Source: Mihaela Zamfir educational archive

Fig. 8 ETHOS(m)ART. Socio-cultural art and science center for young people │Luigi Cazzavillan Park, Bucharest, Romania │Diploma Project 2023 │ UAUIM │Author: St. Arch. Alina Alexandra Iancu │Tutor: Lect. PhD. Arch. Mihaela Zamfir

Source: Mihaela Zamfir educational archive

Fig. 9 WAVES. Community Center for Youth | Constanța, Romania | Diploma Project 2023 | UAUIM | Author: St. Arch. Maria Ispas | Tutor: Lect. PhD. Arch. Mihaela Zamfir
Source: Mihaela Zamfir educational archive

Fig. 10 (in)KÜLTÜR. Socio-cultural center for the Turkish-Tatar community | Constanța, Romania | | Diploma Project 2023 | UAUIM | Author: St. Arch. Melis Musa | Tutor: Lect. PhD. Arch. Mihaela Zamfir
Source: Mihaela Zamfir educational archive

Fig. 11 REintegrated. [HER]a Garden Multifunctional center of integrated services for combating and preventing domestic violence | Ferentari, Bucharest, Romania │ Constanța, Romania │ │Diploma Project 2023 │ UAUIM │
Author: St. Arch. Maria Antoaneta Smarandache │Tutor: Lect. PhD. Arch. Mihaela Zamfir
Source: Mihaela Zamfir educational archive

Fig. 12 CO-Z. Student center, co-living, co-learning │Parcul Carol, Bucharest, Romania │ Diploma Project 2023 │ UAUIM │
Author: St. Arch. Florentian Mihaela Trandafir │Tutor: Lect. PhD. Arch. Mihaela Zamfir
Source: Mihaela Zamfir educational archive

The students were encouraged to develop their diploma projects in the cities where they were born, in the communities they know best. Degree projects (2023) demonstrate sustainable strategic thinking at the community level, with an emphasis on architecture as a support for intergenerational relations. [49] The quality of dweeling is supported not only by the quality of residential buildings and apartments, it is also supported by the community facilities in the neighborhood. This aspect makes the difference between ageing in place and ageing in community.

6. Implications

The research results reveal the importance of interdisciplinary teamwork**.** The need for education of the Romanian population for active and healthy ageing is highlighted. This means: understanding the phenomenon of ageing and adopting a healthy and active lifestyle; information on Western models of good collective housing practices for seniors and elimination of prejudices; budgeting of apartments' adaptation expenses starting with the age of 55 or changing residence. The adaptation of housing for seniors, including accessorizing, must be supervised by the architect so that the result is optimal in terms of comfort and aesthetics. The need for architects to include the perspective of age in architecture in the design process, especially for dwellings, is highlighted.

We have to take into account that on average, people with Alzheimer's disease can live between 3 and 11 years from the time they are diagnosed, but there are people who live up to 20 years. [53] These aspects are important when we have to consider adapting an apartment in an existing multi-storey residential building: what are the adaptation costs of an apartment in a block built before the 90s, compared to the period in which the elderly will live in it; how much and how well the adaptations can be made so that the necessary conditions for a quality of life and a state of well-being are met. Certainly, from this moment on, new apartments should be designed in such a way that these have dimensions and areas in order be lived in comfortably and as independently as possible for the rest of their lives, to be apartments for life. It is certain that future collective housing design must include flexibility and the possibility of adapting to the requirements that change with age. Another solution are residential complexes of assisted living facilities type [54], which involves apartments designed specifically for the needs of the elderly and which involve moving at a certain point in life.

Future attitudes must take into account more generous aplication of Assisted Living Facilities concept for the new residential complexes.

7. Value

The work proves the importance of residential architecture but also of the public spaces and social-cultural facilities in supporting ageing in community, optimizing opportunities for autonomy, participation and security.

The adaptation of existing apartments in multi-storey buildings in Romania to the comfort and safety requirements of the elderly is technically possible, but it is necessary to be taken into account in advance, until the age of 60, because it requires budget investment, time and mood. More difficult are the necessary adaptations in the outdoor spaces of the

apartments, and here we highlight the situation of blocks with four levels, without an elevator, which require additional investments with which all residents must agree, namely the installation of a possible external elevator.

Because the Romanian society is ageing in the same trend as all European countries, it is necessary that the future residential complexes that are built to take into account greater flexibility in the subsequent adaptation of the apartments for the older age. It is also recommended for Romania to implement the assisted living facilities model and to build residential complexes for the elderly.

At the research level in higher education, there is creativity and experimentation in student projects and an openness towards the application of the age-friendly architecture concept. The residential architecture of the future is an architecture that intelligently and flexibly integrates the perspective of age in architecture, customarily and creatively assimilating the needs of users of all ages and integrating intelligent assistive technologies into the design. More than ever, the apartments of the future must be designed by the architect in collaboration with specialists from related fields, in interdisciplinary teams.

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References

[1] C. Reștea, "Cum locuim în România?," *Raport CES: Avem cea mai mare rată de supraaglomerare din Europa/ Peste o cincime din populație nu are toaletă, duș sau cadă/ Costurile de construcție au crescut cu 49% în 10 ani, de aproape trei ori mai mult decât media UE,* 2022.

[2] C. Boboc, "La vremuri noi, lucruri noi," *De la blocul comunist la ansamblu rezidențial; https://e-zeppelin.ro/la-vremuri-noi-lucruri-noi-de-la-blocul-comunist-la-ansamblu-rezidential/?fbclid =IwAR22Ob5Figbm2Uk4pSSAgJu3t92cWfGMjqNpR0TT-rEit9mlq4ogjRuE6CE,* 2016.

[3] N. S. Institute, "Romania in figures," *National Statistics Institute Publishing, Bucharest, Romania,* 2020.

[4] U. N. P. Division, "World Population Prospects: the 2019 Revision," *https://population.un.org/wpp2019,* 2023.

[5] M. M. M. B. D. Zamfir, "Future cities' architecture, architecture for active and healthy ageing," *Smart Cities and Regional Development Journal,* pp. 103-116, 2020.

[6] M. Zamfir, I. Ciobanu and A. Marin, "Theraupeutic Architectural Tools in the Management of Perceptual Disorders in the Elderly with Alzheimer's Disease," *Argument,* vol. no. 14, pp. 138-157, 2022.

[7] "hartablocuri.ro," *https://www.hartablocuri.ro/ani/,* 2023.

[8] J. Johnson and K. Finn, "Designing User Interfaces for an Aging Population," *Towards Universal Design, Morgan Kaufmann, Cambridge, United States,* 2017.

[9] T. Grey, M. Pierce and S. Cah, “Dementia Friendly Dwellings for People with Dementia, their Families and Carers,” *https://universaldesign.ie/Web-Content-/UD-DFD-Guidelines-Full-Document-non-acc-June-15.pdf,* 2015.

[10] I. Dratsiou, A. Varella and E. Romanopoulou, “Assistive Technologies for Supporting the Wellbeing of Older Adults,” *Technologies,* 2020.

[11] J. Sumner, L. Chong and A. Bundele, “Co-Designing Technology for Aging in Place: A Systematic Review,” *The Gerontologist,* vol. Volume 61, p. e395–e409, 2021.

[12] M. Fotteler, V. Mühlbauer and S. Brefka, “The Effectiveness of Assistive Technologies for Older Adults and the Influence of Frailty: Systematic Literature Review of Randomized Controlled Trials,” *JMIR Aging,* 2022.

[13] M. Fotteler, T. Kocar and D. Dallmeier, “Use and benefit of information, communication, and assistive technology among community-dwelling older adults – a cross-sectional study,” *BMC Public Health,* 2023.

[14] M. MacNeil, E. Hirslund and L. Baiocco-Romano, “A scoping review of the use of intelligent assistive technologies in rehabilitation practice with older adults,” *Disabil Rehabil Assist Technol,* pp. 27:1-32, 2023.

[15] M. Chan, D. Estève and C. Escriba, “A review of smart homes-Present state and future challenges, Comput Methods Programs Biomed,” pp. pp55-81, 2008.

[16] P. Carnemolla, “Ageing in place and the internet of things,” *How smart home technologies, the built environment and caregiving intersect, Vis. Eng.,* 2018.

[17] E. Tural, D. Lu and D. Cole, “Safely and Actively Aging in Place: Older Adults' Attitudes and Intentions Toward Smart Home Technologies,” *Gerontol Geriatr Med,* 2021.

[18] "SI4SI-AAL Project,” *https://si4si-aal.com/,* 2023.

[19] C. Bridge, F. Zmudzki and T. Huang, “Impacts of new and emerging assistive technologies for ageing and disabled housing, AHURI Final Report,” *Australian Housing and Urban Research Institute Limited, Melbourne, Australia,* vol. No. 372, 2021.

[20] M. Dezvoltării, “Lucrărilor Publice și Administrației,” *Normativ privind adaptarea clădirilor civile și spațiului urban la nevoile individuale ale persoanelor cu handicap indicativ NP 051-2012-revizuire NP 051/2000,* vol. 2021.

[21] Liftech, “Platforme pentru persoane cu dizabilități,” *https://www.liftech.ro/platforme-persoane-dizabilitati.html,* 2023.

[22] epardoseli.ro, “Ce înseamnă clasa de rezistență la uzură a parchetului laminat,” *https://epardoseli.ro/ce-inseamna-clasa-de-rezistenta-la-uzura-a-parchetului-laminat/,* 2022.

[23] tarkett.ro, “Covoare PVC pentru locuințe,” *https://www.tarkett.ro/ro_RO/node/covoare-pvc-pentru-locuinte-2772,* 2023.

[24] tarkett.ro, “Mocheta pentru trafic intens: Care este cea mai bună și rezistentă mochetă,” *https://blog.tarkett.ro/mocheta-pentru-trafic-intens-care-este-cea-mai-buna-si-rezistenta-mocheta-1656.html,* 2019.

[25] enablingenvironments.com.au, “Enabling Environments,” *Colour Perception and Contrast,* 2023.

[26] S. Guy, E. Shove and G. Walker, “Conditioning Demand: Older people, thermal comfort and low-carbon housing,” *Energy Policy,* p. pp.191–194, 2015.

[27] P. Vallabh and R. Malekian, “Fall detection monitoring systems: a comprehensive review,” *J Ambient Intell Human Comput,* p. 1809–1833, 2018.

[28] G. Diraco, G. Rescio and P. Siciliano, “Review on Human Action Recognition in Smart Living: Sensing Technology, Multimodality, Real-Time Processing, Interoperability, and Resource-Constrained Processing,,” *Sensors,* 2023.

[29] O. Osibona, B. Solomon and D. Fecht, “Lighting in the Home and Health: A Systematic Review,” *Int. J. Environ. Res. Public Health,* 2021.

[30] S. Kim, “Exploring older adults’ perception and use of smart speaker-based voice assistants: A longitudinal study,” *JMIR Mhealth Uhealth,* 2021.

[31] M. Zamfir (Grigorescu), A. Marin and A. Ciobanu, "The concept of dementia enabling built environment from an interdisciplinary perspective," *Argument, 12,* pp. pp.95-122, 2020.

[32] O. Jonsson, "Furniture for Later Life: Design Based on Older People's Experiences of Furniture in Three Housing Forms," *Department of Design Sciences, Faculty of Engineering, Lund University, Sweden,* 2013.

[33] C. Yu, H. Lee and W. Lu, "Restorative effects of virtual natural settings on middle-aged and elderly adults," *Urban Forestry & Urban Greening,* 2020.

[34] S. T. C. East, "The Most Dangerous Room in the Home," *https://www.trustedchoice.com/insurance-articles/home-family/most-dangerous-room-in-home/,* 2020.

[35] willowbrook.co.uk, "Choosing The Best Adjustable Chairs For The Elderly," *https://willowbrook.co.uk/advice-guides/best-adjustable-chairs-for-the-elderly/,* 2023.

[36] Lindeke, "J. Best Adjustable Beds for Seniors," *https://www.sleepfoundation.org/best-adjustable-bed/best-adjustable-beds-for-seniors,* 2023.

[37] centralhealthline.cax, "Your Guide to Fall Prevention," *https://www.centralhealthline.ca/healthlibrary_docs/YourGuidetoFallPreventionDoc.pdf,* 2023.

[38] N. Evans and L. Collier, "An exploration of the experience of using calendar reminders for people with dementia and family carers," *Dementia (London),* pp. pp.1912-1933, 2019.

[39] V. S. Corp, "How Smart Home Technology Can Help Aging in Place," *https://www.linkedin.com/pulse/how-smart-home-technology-can-help-aging-place-vp-supply-corp,* 2023.

[40] K. Janků, M. Šmotek and E. Fárková, "Block the light and sleep well: Evening blue light filtration as a part of cognitive behavioral therapy for insomnia," *Chronobiol Int.,* pp. pp.248-259, 2020.

[41] V. Murroni, R. Cavalli and A. Basso, "Effectiveness of Therapeutic Gardens for People with Dementia: A Systematic Review," *Int. J. Environ. Res. Public Health,* 2021.

[42] M. Zamfir, I. Ciobanu and A. Marin, "Memory Anchors in Dementia-Friendly Architecture and the Limits of Spatial Versatility in the Context of the COVID-19 Pandemic," *Argument, No. 13,* pp. pp.11-30, 2022.

[43] D. Gokalgandhi, L. Kamdar and N. Shah, "A Review of Smart Technologies Embedded in Shoes, J Med Syst," 2020.

[44] D. I. I. N. M. Onose, "Too Old for Recreation? How Friendly Are Urban Parks for Elderly People?," *Sustainability,* 2020.

[45] M. Zamfir, "Reconsiderarea centrelor pentru vârstnici. Perspectiva medicului geriatru," *Argument, No. 3,* pp. pp.84-92, 2011.

[46] M. Nguyen, J. Gruber and J. Fuchs, "Changes in Digital Communication During the COVID-19 Global Pandemic: Implications for Digital Inequality and Future Research," *Social Media + Society,* 2020.

[47] M. Conde, V. Mikhailova and N. Döring, "Towards Augmented Reality-Based and Social Robot-Based Social Integration of Older Adults: A User Requirements Analysis," *In: Stephanidis, C., Antona, M., Ntoa, S., et al. (eds) HCI International 2023 Posters. HCII 2023. Communications in Computer and Information Science,* vol. 1833, 2023.

[48] I. Grazuleviciute-Vileniske, L. Seduikyte and A. Teixeira-Gomes, "Aging, Living Environment, and Sustainability: What Should be Taken into Account?," *Sustainability,* 2020.

[49] M. C. I. Z. M.-V. Zamfir, "Vatra Luminoasa, age-friendly-study of intergenerational architecture in a Bucharest neighborhood," *Smart Cities International Conference (SCIC) Proceedings,* pp. 437-460, 2023.

[50] M. Dehi Aroogh and F. Mohammadi Shahboulaghi, "Social Participation of Older Adults: A Concept Analysis," *International journal of community based nursing and midwifery,* p. pp.55–72, 2020.

[51] S. Zhong, C. Lee and M. Foster, "Intergenerational communities: A systematic literature review of intergenerational interactions and older adults' health-related outcomes," *Soc Sci Med,* vol. Vol. 264, 2020.

[52] L. Landais, O. Damman and L. Schoonmade, “Choice architecture interventions to change physical activity and sedentary behavior: a systematic review of effects on intention, behavior and health outcomes during and after intervention,” *Int J Behav Nutr Phys Act 17,* 2020.

[53] M. Clinic, “Alzheimer's stages: How the disease progresses,” *https://www.mayoclinic.org/diseases-conditions/alzheimers-disease/in-depth/alzheimers-stages/art-20048448,* 2023.

[54] A. Liao, “Getting Better with Age: Design for Senior and Assisted Living Facilities,” *https://www.architectmagazine.com/practice/getting-better-with-age-design-for-senior-and-assisted-living-facilities_o,* 2018.