The Right to Choose
Democratising Older People's Housing Design trhough Mass Customisation

Ana Belčič, University of Ljubljana

Sara Eloy, University Institute of Lisbon (ISCTE-IUL)

Intermediate doctoral stage

Supervisors: Anja Planišček, University of Ljubljana; Jana Mali, University of Ljubljana

old-age housing, community-based ageing, mass customisation

Abstract

This paper presents the topic of non-institutional old-age housing responding to the needs of older people craving both community and independence. This is done in the context of the potential transformation of existing Slovenian single-family houses into co-housing units for community-based ageing that promotes socialising, resource sharing, and reciprocity. The proposal responds to the need to address a universal issue of our ageing population in their largely maladjusted, privately-owned housing, considering a factor that is often neglected – the need for personalisation. To guide this architectonic adaptation, we present a design-driven research method, based on a mass customization approach, used as a tool for tackling a socially prevalent problem. The tool employed was a formalised design method that can cater both to the demands of mass, large scale problems and equally, to personalised needs, and deliver a large number of design solutions that meet diverse requirements; a transformation shape grammar.

Paper

Old age is often seen as a time of lessened capability, disease and need for constant care, however, with recent advances in medicine and prolonged life expectancy, the notions associated with old age are being challenged and transformed. Older people are active, have various lifestyles, are increasingly independent and live longer. They crave autonomy and a sense of agency over their own life, just like people of other ages. It is also a matter of changing demography — the ratio of older people in our society has increased by four times since the onset of the industrial revolution and we can expect the next generation's old age duration to take up as much as one-third of their life expectancy [1] [2]. Put simply, people used to live into their sixties, but now we can expect them to reach their

eighties or nineties. In Slovenia, organised housing for older people is mostly limited to retirement homes and a limited scope of (mostly commercially driven) sheltered housing. Both of those represent housing styles that employ age-based segregation. This reflects the societal view of older people as outsiders and does not fit ideals of inclusivity and integration that should be pursued if we are to produce progressive, socially advanced housing solutions.

Evidently, diverse and well-developed social networks are an important component of older people's lives. They even influence health by providing feelings of acceptance and inclusion — older people who have rich social lives better retain their cognitive capabilities, whereas social isolation can produce a chronic stress state and thus speed up ageing (4). Retirement homes provide older people with social interactions, but due to a limited number of available rooms, they often need to move to distant regions to use these services, and the people they end up living with do not represent their chosen social network. Because of this, they can still feel isolated or detached from society [5] [6]. Forming alternative, non-institutional and personalized dwelling solutions can contribute to older people's empowerment, inclusion and sense of personal agency. An approach to this that is being endorsed by experts of various fields, is *ageing in place*. This refers to housing solutions for older people that allow them to continue dwelling within their familiar and chosen social environments, with some degree of independence, without needing to move or leave behind their lifestyles [7]. This is especially relevant in Slovenia, as data shows that neighbourhoods form well-integrated social networks and neighbours are even viewed as an important source of secondary caregiving for older people. Despite this, it is still important to address the problem of loneliness in older people. The survey on the housing needs of pensioners and other older people [8] found this to be a widespread phenomenon in Slovenia. The

intensity of feelings of loneliness is also related to architectural barriers that hinder older people's freedom of movement [9]. As much as 67% of older people who report feeling lonely regularly face three or more physical obstacles at home on a daily basis [10]. Living space characteristics can influence social interactions — they are enhanced when people have opportunities for mutual contact and appropriate, well-accessible spaces for socializing [9][11]. For a sense of community, it is not enough for people to share a place of residence, the space must enhance and cater to joint activities that promote the development of reciprocity, social support and mutual exchange of knowledge and skills [12].

In Slovenia, over 90% of housing is privately owned and older people are often homeowners [10]. Single-family houses, usually consisting of 120 – 200 square metres of habitable space, make up a large percentage of the built environment [13][14]. A large proportion of the houses in question was built in the 1970s, with pattern-book houses gaining popularity. Many of those houses were self-building projects, with the older people who own them being personally involved in the construction process. With the moving away of any potential children, these houses are now often inhabited by only a single older couple or even a single person. The houses can differ from contemporary building standards regarding spatial compositions, plumbing, heating, insulation and other technical infrastructure that adheres to older standers, making maintenance costly and difficult. Nevertheless, older people often view their ability to dwell in this housing type as the symbol of independence, "normalcy" or social relevance and are therefore reluctant to let it go. Most wait until a serious illness or disability makes mobility and everyday tasks impossible before moving to an institution, like a retirement home – it is often the last resort. Older people can, e.g., develop a mobility impairment and be forced to leave their home environment, despite being otherwise independent. We are left with a gap – there is a lack of

housing adaptation solutions that make ageing in place a viable option. A solution that is endorsed by the main Slovenian older people's representative organization, is *co-housing.* The organization even produced a publication championing this as an alternative to institutional old-age housing [15]. Henceforth, typical single-family houses have been chosen as a possible resource – they are very common and largely underused, while communal old-age housing is needed and lacking.
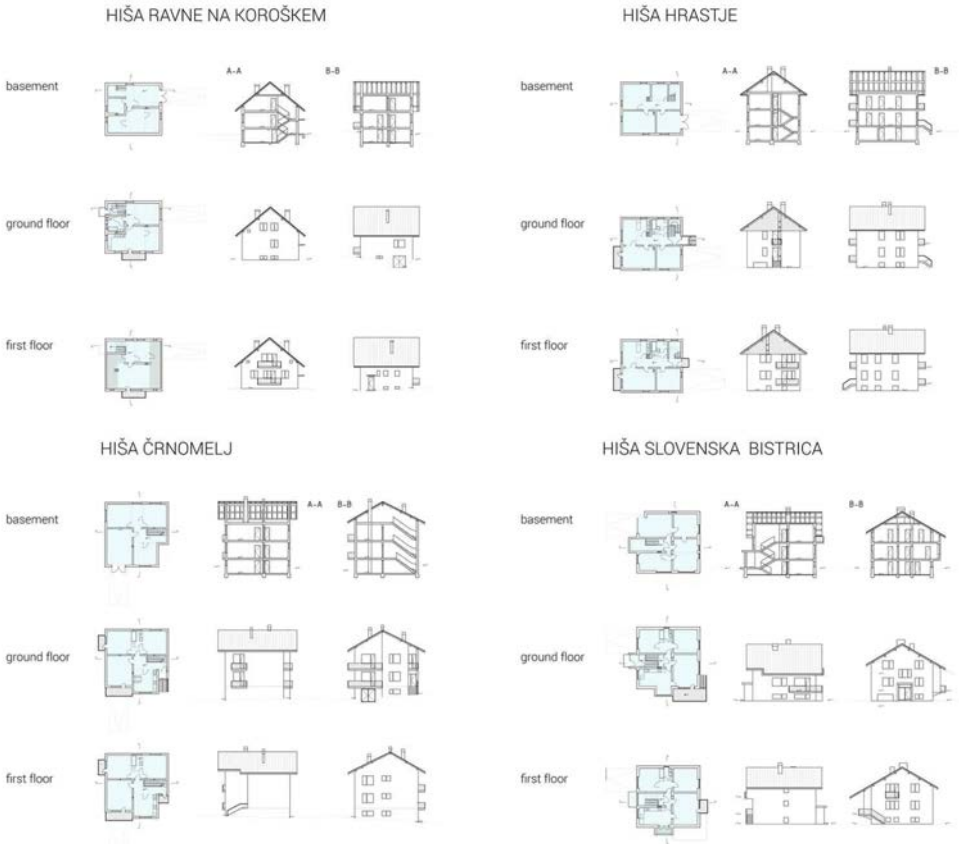

Figure 1: *Four selected typical Slovenian single-family house examples, floor plans gathered from owners in the field.*
Source: Ana Belčič

Figure 2: *Locations of the four selected typical Slovenian single-family house examples.*
Source: Ana Belčič

Co-housing signifies a way of communal living that brings together people who are not connected by social ties but wish to co-inhabit a household with other people. This way they can share resources and benefit from the support and social relationships formed in such an arrangement. Usually, individuals or couples are provided with personal spaces — usually at least a bedroom — whereas communal spaces are designed to increase socializing — usually including at least a common kitchen and dining area. Co-housing helps older people age in a chosen community, increasing the potential for collaboration in household tasks, as well as sharing leisure activities. This also helps potential professional caregivers visit multiple people at once, reducing costs. Significantly, older people could combine limited personal budgets towards refurbishing an existing, spatially accommodating single-family house. Co-habitation can also establish a system of mutual help and support between people with various ability levels or preferences. The act of communal living can help support feelings of increased safety and the ability to depend on other household members [16] [17] [18] [19].

We can therefore assume the hypothesis that community-based ageing in a chosen co-housing group can prove to be more attractive than institutional living. Judging the availability and large size of typical Slovenian single-family houses we can also assume that architectural solutions to repurpose them as co-housing units for older people can be developed. We

can achieve that through renovation and spatial adaptation efforts, which raises the following questions: what are the key architectural factors that influence the independent, safe, and community-oriented use of living spaces for the elderly? How to use them to design a system for transforming existing typical single-family houses into cohabiting communities? How can the problem of old people's living be addressed with a systematic approach that can incorporate adjustments to the needs of the individual user?

RAVNE NA KOROŠKEM

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Figure 3: *Inferring the grammar - colour-coded variations derived by the students in the workshop.*
Source: Student workshop, supervised by Ana Belčič, Sara Eloy and Anja Planišček

We decided to construct a workshop on the possible repurposing of typical single-family houses that would employ the elements of *mass customisation* to test the feasibility and potential of this method in resolving the problems of Slovenia's old age accommodation. *Mass customisation* is a way of both controlling and democratising design by providing design alternatives for personalisation within a coherent systemic framework that

helps tackle a wide-ranging problem. As explained by Kolarevic and Duarte, mass customisation can be used as a tool to help lower building or refurbishment costs using large-scale production methods, while satisfying the unique requirements of each individual household to guarantee customer satisfaction [20]. This gives us two objectives – firstly, to find the design code and secondly, to discover how the design code can be manipulated to generate customized designs [20]. The system employed in this study is driven using *shape grammars*. Shape grammars were invented by Stiny and Gips in the seventies. A shape grammar is a set of shape rules applied step-by-step to generate a set, or language, of designs. Shape grammars are both descriptive and generative. The rules of a shape grammar generate or compute designs, and the rules themselves are descriptions of the forms of the generated designs [21]. It is a method of architectural design that operates by determining clear design intentions and rules that allows for the formalization of the design process, providing us with an extended "universe of solutions" [22]. In the vocabulary of architecture, it could be described as a combination of standardised, unified construction (or renovation) with personalization, adapted to the end-user, as well as the environment [23]. Furthermore, shape grammar theory has also advanced over the years to expand its scope into including parametric logics, emergency features and parallel formalisation, among others. All these extensions to the original shape grammar formalism have been developed to compute certain kinds of designs more easily or expressively than with a standard shape grammar, as explained by Terry Knight [21]. For the functional renovation of existing buildings, we can employ the use of transformation shape grammars. Such a transformation grammar needs to be *parametric* due to the variety of shapes and dimensions of the rooms found in existing dwellings – it needs to be designed to identify rooms, walls, and spaces whilst taking several features into account [24].

Figure 4: Determining the design rules based on the changes
made to the floor plan – an example.
Source: Student workshop, supervised by Ana Belčič, Sara
Eloy and Anja Planišček

By using shape rules and a sequence of actions, working as an algorithm, shape grammars enable the development of a wide variety of compositional design solutions to a specific architectural situation by responding to different dwelling requirements. In this case, it makes it possible to develop a formalised design system to approach various single-family houses and transform them into co-housing communities for specific users – older people with prescribed scenarios. This was the basic premise for organising the workshop, intended to employ and test the concept. The workshop was conducted in May 2021 and represents an analysis of a set of Slovenian single-family houses and the study of their potential transformations into co-housing units. The exploration of different co-habitation options was, as mentioned, scenario-driven to help produce an initial framework for more possible lifestyle choices to be expanded on further in the following studies. The chosen scenarios consisted of three options. The first was a married couple, 65 and 75 y/o, active and quite healthy who wish to co-inhabit it with another couple (or two) while keeping adequate marital privacy. The second was a widow, 78 y/o needing some assistance in everyday chores and in the garden, willing to share

the house with people of various generations. The third was a gentleman, 81 y/o, with mobility issues, who craves the company of other people of a similar age to spend time with. The scenarios targeted the supposed owners of single-family houses and possible constellations of their cohabitation with other people. From this exercise, developed with architecture students, a simple shape grammar was inferred. In our case, the starting point was assessing the geometric properties of single-family houses and associated plots, and the transformation was guided by the parameters for transforming the architecture of existing houses into co-housing communities. Transformation parameters were designed according to the desired architectural features best befitting the user profiles. The workshop produced 12 variations of co-housing units for older people, set within four different typical single-family houses, providing a useful exercise for the further development of research.

Among the 12 variations, some particular solutions appeared to repeat in a similar way – for instance, the joining of various rooms to form a larger communal area, particularly on the ground floor, and the composition of an enlarged bathroom that can cater to two bedrooms. Such similar solutions, as well as others — more specific, were inferred into a transformation grammar. The main discovery was the fact that personalisation needs to address not only the various living and cohabitation scenarios, but also the desired scale, technical difficulty, and budget of each renovation. We must address the fact that some of the options discovered within the design process by the students would, in real life, have larger financial and building construction requirements than others. This was recognised as a possible expansion of the research and development for the mass customisation project, which is planned to be tackled in the PhD dissertation, entitled *The renovation of single-family houses for community-based living of old people.* We could also assign a label to each

solution according to the estimated technical difficulty and costs. To put it simply – each intervention could have an S, M and L version to suit different users and their capabilities. Overall, the experiment showed that single-family houses were flexible enough to facilitate the organization of co-housing units for older people, and have clear potential for re-use.

Figure 5: Two different approaches to dealing with the same floor plan
Source: Student workshop, supervised by Ana Belčič, Sara Eloy and Anja Planišček

Apart from the compositional and structural aspects of the project, the problems of application need to be addressed. The fact that most of the housing is privately owned makes organized refurbishment more difficult. It also means that solutions on a mass scale would involve the support of various stakeholders, governmental bodies, experts, and of course older people. It would also require new financial and management mechanisms to be developed. Nevertheless, the transformation grammar could be used immediately by planning and construction companies that would apply it on demand to suit individual clients or client groups. This design method can also become a tool for educating

and informing the public of the wide variety of options available for the re-use of the existing building fund for accommodating older people who wish to age within their chosen communities.

It is also evident that within the workshop, we have only skimmed the surface by trying to establish if and to what extent these houses can be transformed into functional co-housing units. What is missing is to delve deeper into exploring more playful, unexpected variations. Much of this can also be achieved through thinking about how transitions from the outside space to the interior play a part in both developing the compositions and relationships with the neighbouring community. Entrances, terraces, ramps, sunken or elevated features, balconies, even perhaps vertical gardens – all of those options are yet to be further explored since the detached houses we are looking at usually have ample plot sizes and appear in various contexts and terrains. They must be explored not only as architectural elements but as social catalysts within space. With this in mind, scenario and functionality testing must advance into deeper creative territory. The expansion needs to help the resulting shape grammar evolve into something that can provide a foundation for a truly free and open-source design language. A design language that is – most importantly – also accessible to older people who can use it directly to express their needs and influence as well as shape their dwellings.

1——————— **Vertot, Nelka and Križman, Irena (2010):** Starejše prebivalstvo v Sloveniji. Statistični urad Republike Slovenije, www.dlib.si/?URN=URN:NBN:SI:DOC-BZ3DXFBF (3. 1. 2021)

2——————— **Miklič, Erna (2012):** Stanovanjska problematika v Republiki Sloveniji - Spremljajoče gradivo k osnutku Nacionalnega stanovanjskega programa 2013 – 2022, Ministrstvo za infrastrukturo in prostor RS, www.stat.si/doc/sosvet/Sosvet_25/Sos25_s1900-2013.pdf (3. 1. 2021)

3——————— **Republic of Slovenia Statistical Office – SURS (2015):** data recieved via e-mail, 25. 3. 2019.

4——————— **Hlebec, Valentina et. al. (2009):** Starejši ljudje v družbi sprememb, Maribor: Aristej

5——————— **Mali, Jana (2008):** Od hiralnic do domov za stare ljudi, Ljubljana: Fakulteta za socialno delo UL

6——————— **Mali, Jana (2013):** Dolgotrajna oskrba v Mestni občini Ljubljana, Ljubljana: Fakulteta za socialno delo UL

7——————— **Wiles, Janine L.; Leibing, Annette; Guberman, Nancy; Reeve, Jeanne; Allen, Ruth E. S. (2012):** The Meaning of "Aging in Place" to Older People, The Gerontologist, Volume 52, Issue 3, Pages 357–366, https://doi.org/10.1093/geront/gnr098

8——————— **Sendi, Richard; Černič Mali, Barbara; Jakoš, Aleksander in Filipovič Hrast, Maša, (2002) [i.e.] (2003):** Stanovanjske potrebe upokojencev in drugih starejših oseb, Ljubljana: Urbanistični inštitut Republike Slovenije

9——————— **Daban, Ferran; Garcia-Subirats, Irene; Porthé, Victoria; López, M. José; de-Eyto, Begoña; Pasarín, M. Isabel; Borrell, Carme; Artazcoz, Lucía; Pérez, Anna in Díez, Elia (2021):** Improving mental health and wellbeing in elderly people isolated at home due to architectural barriers: A community health intervention, Atención Primaria, 53:5

10——————— **Majcen, B., Uršič, S., Srakar, A., Mašič, S. (2017):** SHARE: Kako Slovenci živimo v drugi polovici življenja. Ljubljana: Inštitut za ekonomska raziskovanja, http://www.share-slovenija.si/ (5. 1. 2020)

11——————— **Williams, Joanna (2005):** Designing Neighbourhoods for Social Interaction: The Case of Cohousing, Journal of Urban Design, 10:2, 195 - 227

12——————— **Jolanki, Outi in Vilkko, Anni (2015):** The Meaning of a "Sense of Community" in a Finnish Senior Co-Housing Community, Journal of Housing For the Elderly, 29:1-2, 111–125

13———————**Brezar, Vladimir (1995):** Stanovanjska gradnja v Sloveniji včeraj in danes. Urbani izziv, 28/29, 98–108. https://www.dlib.si/details/URN:NBN:SI:doc-DZVVGY48 (11. 12. 2020)

14———————**Brezar, Vladimir (2011):** Pragmatično graditeljstvo ali sindrom 4 metrov. AR. Arhitektura, raziskave, 11:2, 85–90. http://www.dlib.si/?URN=URN:NBN:SI:DOC-YFHTCUGJ (11. 12. 2020)

15——————— **Boljka, Urban in Ogrin, Alenka (2013):** Da je skupaj lažje biti sam: zbornik prispevkov o (so)bivanju starejših, Zveza društev upokojencev Slovenije, Ljubljana www.zdus-zveza.si/da-je-skupaj-lazje-biti-sam-zbornik-prispevkov-o-sobivanju-starejsih (27. 3. 2019)

16——————— **Rosenfeld, Jeffrey P. in Chapman, Wid (2008):** Home Design in an Ageing World, New York, Fairchild books

17———————**Andersson, Jonas E. (2011):** Architecture and Ageing – on the interaction between frail older people and the built environment, Stockholm: KTH, School of Architecture and the Built Environment, http://kth.diva-portal.org/smash/get/diva2:441455/FULLTEXT01.pdf (8. 10. 2019)

18——————— **Arentshorst, Marlous Elisabeth; Reinier Kloet, Roy in Peine, Alexander (2019):** Intergenerational Housing: The Case of Humanitas Netherlands, Journal of Housing For the Elderly, 33:3, 244–256

19——————— **Leung, Monica (2019):** HOME: Housing Our Mature Elders. Harvard: Society of Architectural Historians, H. Allen Brooks Travelling Fellowship 2018, https://issuu.com/monica2792/docs/brooks_report-issuu (5. 12. 2019)

20——————— **Kolarevic, B. and Duarte, J.P. (2018):** Mass Customization and Design Democratization (1st ed.). Routledge. https://doi.org/10.4324/9781351117869

21——————— **Knight, T.W. (2000):** Shape grammars in education and practice: history and prospects. Available at http://web.mit.edu/tknight/www/IJDC/

22——————— **Duarte, José Pinto (2005):** Towards the mass customization of housing: The grammar Siza's houses at Malagueira, Environment and Planning B Planning and Design 32:3, 347–380

23——————— **Blenkuš, Matej (2003):** Uporabniku in okolju prilagojeno načrtovanje stanovanjske gradnje, Fakulteta za arhitekturo UL

24———————**Eloy, Sara in Duarte, José Pinto (2011):** A Transformation Grammar for Housing Rehabilitation, Nexus Network Journal 13:1, 49–71