Research article

Towards a residential socio-physical framework: positioning subjective experiences in physical environments

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Abstract

We spend most of our time in and around buildings. The architectural design of the environment inherently affects our everyday subjective experiences. We refer to this connection between the physical environment and our experiences as the 'socio-physical environment'. The residential environment, which is studied by different disciplines, ranging from design/spatial disciplines to social sciences, is fundamental in this regard. However, as they all approach the topic from different perspectives, there exists a need for a common language within this multidisciplinary research field. By analysing three commonly used frameworks in architecture and evaluating their constituent parts, we propose a new framework that is specifically tailored to the residential environment. Its typological categories are organised around an individual resident's experiences and therefore include life environment, neighbourhood, dwelling, tectonics and personal stuff. The goal of the framework is to guide empirical or theoretical research on individuals'

housing experiences and to allow research on dwelling experiences to be explicitly rooted in their physical context and scale.

Keywords　socio-physical environment; housing research framework; housing experiences; architectural design; typology

Introduction

Architecture shapes the physical environment in which people spend most of their time and therefore plays a prominent role in shaping subjective experiences. In this article, the interconnectedness between physical environments and subjective experiences will be referred to as the 'socio-physical environment'. As most of our time is spent indoors or at home,[1] the residential sphere, specifically, which plays a significant role in socio-physical environments, will be the focus of this article.

Housing has been a fundamental topic in architecture since the twentieth century. Important in this regard is the 1927 Weissenhof Estate Exhibition, where western European architects experimented with new forms of dwelling under the guidance of Mies van der Rohe,[2] and the second CIAM (Congrès Internationaux d'Architecture Moderne) in 1929, which explored the topic of 'Existenzminimum' housing.[3] These housing explorations should be understood in the economic and political context of the period around the First and Second World Wars. Innovation was focused on exploring rapid and cost-effective construction techniques and approaching housing quality with a focus on hygiene and the functional organisation of the dwelling. However, it can be argued that modernist ideology centred on progress and functionalism. This resulted in a departure from traditional urban and architectural typologies that has contributed to the rise of a sense of place, creating a complicated relationship between modernity and domesticity.[4] In response to this predominant pragmatism and minimalist approach to housing, several twentieth-century architectural theorists approached housing from an existential perspective. Heidegger,[5] Bachelard[6] and Lefebvre[7] explored the existential role of housing and its psychological and social implications. Within the discipline of architecture, these writings were adapted by theorists like Norberg-Schulz[8] and Frampton,[9] who strove for an architecture rooted in place, examining the metaphysical meaning of dwelling. Overall, the challenges and questions raised in the twentieth century by architects, theorists and philosophers have placed housing in a central position in contemporary architectural discourse, research and design exploration.

The Covid-19 pandemic disrupted housing habits and introduced lasting changes to our experience of the residential environment. As the pandemic forced people to spend more time at home, the importance of the home environment for subjective well-being became increasingly apparent. The pandemic also highlighted inequality in access to quality housing.[10] Even in the aftermath of the pandemic, lasting effects can be perceived in the organisation of domestic life with, for example, the intrusion of the work sphere into the domestic sphere the result of more people working from home.[11]

Thus, today it has become more important to have a deeper insight into the role of the residential environment on residents' experiences, also known as the research field of the socio-physical residential environment. This is approached from a multitude of disciplines, including both spatial disciplines, such as architecture, interior architecture and urbanism, and social sciences, such as anthropology, social work, health studies and environmental gerontology. As these research disciplines stem from different ontological approaches, seeking intersections and opportunities to apply research findings across disciplines can be challenging.[12] This article aims to contribute to finding a common language by offering a framework of the socio-physical environment rooted in architectural typology.

Research context: HOUSE project

This article is part of the HOUSE project, a larger research effort that aims to increase insight into the socio-physical residential environment. It is a collaboration between Hasselt University and Vrije Universiteit. In this project, researchers from both architecture and social science disciplines focus on studying the effects of the residential environment on older adults' subjective well-being. The study concentrates on two distinct demographic age groups in Flanders, northern Belgium: future older adults

(45+ years) and current older adults (65+ years). The context of ageing is therefore added to the question of the influence of housing on subjective well-being in this project.[13]

Finding a common language for research

This research underlines the necessity for a shared language within multidisciplinary research teams studying the residential socio-physical environment. We argue that this research field can benefit from architecture's understanding of the physical constituents of the socio-physical environment. Our goal therefore is to propose a first step towards creating a common language in the form of a framework. More specifically, we hope that such a framework can explicitly locate findings from social research into space and materiality. This framework emerges from the concept of typology in architecture. Typological thinking in this context serves the purpose of abstracting the environment into categories that can be conceptualised independently. Due to the physical nature of architecture, the differentiating elements of these categories are often defined by their physical scale. We hypothesise that this concept can serve as an aid to explicitly link knowledge of social experiences with the spatial and material character of architecture. We evaluate three frameworks that are widely used in architecture and offer a typological abstraction of the environment. These frameworks are analysed according to three criteria:

1. *Physical scope*: we evaluate the physical range of each framework. As the concept of a dwelling can be experienced and studied on different scale levels, such as the neighbourhood or the interior, we examine the scope of the framework in relation to the residential environment. More specifically, we examine to what extent the residential environment is holistically portrayed.
2. Usability as a *communication tool*: the terminology of each framework is assessed. For example, attention is given to how a specific terminology is understandable to researchers without a spatial background, while maintaining as much precision as possible. The goal is to create a new framework that functions as a communication tool within multidisciplinary teams.
3. Usability as a *research tool*: the frameworks are examined for their potential to be adapted as a research tool for studying the socio-physical environment both empirically and theoretically. Taking into account the multidisciplinary nature of the field, this implies that the frameworks should be able to combine knowledge from architectural and social science disciplines, essentially serving as a bridge between them.

As each of the selected frameworks is examined below – in an order of increasing complexity rather than in chronological order – a general description is given, followed by an analysis according to the three abovementioned criteria.

Assessment of architectural frameworks

How Buildings Learn by Brand (1994)

In the book *How Buildings Learn*, Stewart Brand adopts an architectural framework that was proposed by Frank Duffy in 1990. Duffy's framework introduces a time-based understanding of buildings. He distinguishes between the shell, services and scenery of a building, with each having its own time frame before being replaced or adapted.[14] Brand subsequently acknowledges that Duffy was one of few theorists of change rate in buildings at the time his book was published in 1994. To adapt Duffy's framework for more general use, Brand renames the layers proposed by Duffy and adds additional layers.[15] The resulting framework contains six typological levels which are referred to as 'shearing layers'. According to Brand, a building is constantly tearing itself apart due to the difference in longevity of these various layers. As Table 1 shows, these layers include site, structure, skin, services, space plan and personal stuff.

In terms of the physical scope, Brand's framework provides a holistic overview of the architectural environment from a physical point of view. Interestingly personal stuff is included as the smallest and most rapidly changing layer. Here, Brand implies that the creation of an environment is not limited to the architectural fabric. Rather, the process includes the intervening impact of the users or residents themselves, usually through the arrangement of furniture and other objects. At the other end of the scale, the largest shearing layer is the site. The scope of the framework, therefore, includes the

building itself and the spaces found directly around it. Brand emphasises the interrelation between the typological categories, meaning that the larger layers play a determining role for the smaller layers.[16] For example, the structural grid (structure) of the building determines the possibilities for the interior division made by non-load-bearing walls (space plan). At the same time, based on the positioning of these non-load-bearing walls, the layout of the rooms (space plan) partly dictates the placement of furniture (personal stuff).

Table 1. Typological framework of 'shearing layers' from *How Buildings Learn* by Brand (1994)

Shearing layer	Time span	Examples of elements
Site	eternal	geographical location
		urban location
		legally defined lot
Structure	30–300 years	foundation
		load-bearing elements
Skin	30 years	exterior surfaces
Services	7–15 years	wiring
		plumbing
		heating, ventilation and air conditioning
		moving parts
Space plan	3–30 years	interior layout
Personal stuff	daily to monthly	chairs
		desks
		phones
		pictures
		kitchen appliances
		lamps

In terms of a communication tool, the terminology used in Brand's framework to describe the environment is easily understandable and sufficiently precise. Shearing layers should therefore be understandable by researchers both with or without a background in spatial disciplines.

In terms of a research tool, the framework is primarily aimed at understanding the evolution of buildings through time. Nevertheless, abstracting a building into these categories also opens up ways of understanding how a building interacts with different categories of users. We can draw a parallel between the size of a shearing layer and the size of the social constellations they influence. While personal stuff is closely related to individuals, as the scale of a layer increases, so does the scale of social constellations with which they interact.[17] Personal stuff interacts with individual residents and space plans with residents' groups as a whole, and the skin of the building is in dialogue with the general public, consisting (from the residents' point of view) mostly of unknown individuals. Therefore, the shearing layers contain the potential for being used as a theoretical framework guiding empirical research.

Housing Design: A manual by Leupen and Mooij (2011)

Housing Design: A manual is a handbook aimed at supporting the practice of designing housing.[18] Bernard Leupen and Harald Mooij have a background in architectural research, with a focus on design methodology. Their book concentrates mainly on collective housing as opposed to individual housing. This not only fits in with Dutch housing culture, but also responds to a more general need for housing densification, one of the critical urban challenges of modern times. The chapters of this book are organised around typological elements of the residential environment which is a combination of the framework introduced by Argan in 1964[19] and that introduced by Stewart Brand in 1994 (see above). The authors combine and adapt Argan's and Brand's frameworks according to the specific complexity

of residential buildings, resulting in the framework presented in Table 2. The typological categories are arranged by scale from large to small. They range from the context, representing broad elements that influence housing designs, to tectonics, representing the material properties of the dwelling.

Table 2. Typological framework from *Housing Design: A manual* by Leupen and Mooij (2011)

Chapter (1st level)	Subchapter (2nd level)
Context	substratum and geology
	network and links
	settlement and built development
	climate
	political context
	cultural context
Urban ensemble	–
Residential building	linking and stacking
	dwelling access
Dwellings	spatial organisation of the dwelling
	form of the dwelling
Tectonics	structure
	skin
	scenery
	services

In terms of the physical scope, *Housing Design: A manual* offers an extensive overview of the typological elements of the residential environment. This environment is not merely the result of architectural design but exists within a larger context of both tangible and intangible influences. These are included as context. On the other side of the spectrum, we can find the smallest elements of the residential environment – tectonics – which is based on the reframing of the shearing layers of Brand. Tectonics in this case refers to the material composition of architectural elements of buildings.

In terms of a communication tool, the categories of the environment are organised in a two-level hierarchy. In doing so, the authors can strike a balance between complexity and understandability. However, while the terminology might be intuitive for designers, it could be complicated for researchers without a background in spatial disciplines.

In terms of a research tool, the framework is conceptualised to be broadly applicable by architectural and urban designers. Therefore, it does not actively seek to make theoretical links with social science disciplines. However, the clear distinction between typological elements and their organisation into a hierarchical structure opens up the potential for the framework to serve as a tool for researchers interested in studying the socio-spatial environment.

A Pattern Language by Alexander et al. (1977)

A Pattern Language by Christopher Alexander et al. is the result of the authors' typological understanding of the physical environment. The language emerges out of interconnected patterns, which can be seen as problems that regularly occur in our environment.[20] An overview of all patterns is given in the introductory section of the book; referred to as a summary of the language, it organises the 253 patterns into 36 groups. Each of these 36 groups contains between four and 10 individual patterns, as shown in Table 3.

Table 3. The sequence of 36 steps represents the typological framework of *A Pattern Language* by Alexander et al. (1977)

Book section	Pattern group	Patterns included
Towns and communities	1. independent regions	pattern 1
	2. regional policies	patterns 2–7
	3. city structures	patterns 8–11
	4. self-governing communities	patterns 12–15
	5. networks	patterns 16–20
	6. community policy	patterns 21–27
	7. local centres	patterns 28–34
	8. housing clusters	patterns 35–40
	9. work communities	patterns 41–48
	10. road and path network	patterns 49–57
	11. public open land	patterns 58–66
	12. smaller bits of common land	patterns 67–74
	13. the family	patterns 75–79
	14. workgroups	patterns 80–86
	15. local shops and gathering places	patterns 87–94
Buildings	16. building groups	patterns 95–103
	17. building position	patterns 104–109
	18. building wings	patterns 110–118
	19. path and squares between buildings	patterns 119–126
	20. gradients of space	patterns 127–135
	21. a house	patterns 136–145
	22. offices, workshops and public building	patterns 146–152
	23. small outbuildings	patterns 153–158
	24. edge between the inside and outside	patterns 159–168
	25. gardens	patterns 169–178
	26. minor rooms and alcoves	patterns 179–189
	27. shape and size of rooms	patterns 190–196
	28. wall depth	patterns 197–204
Construction	29. philosophy of structure	patterns 205–208
	30. structural layout	patterns 209–213
	31. main frame	patterns 214–220
	32. doors and windows	patterns 221–225
	33. subsidiary patterns	patterns 226–233
	34. surfaces and indoor details	patterns 234–240
	35. outdoor details	patterns 241–248
	36. ornament, light, colour and your things	patterns 249–253

In terms of its physical scope, *A Pattern Language* presents a holistic understanding of the physical environment while remaining systematic. It follows the principle that all patterns are organised from large to small. The large number of patterns illustrates the continuous nature of the physical environment and emphasises how smaller-scale environments are always embedded within a larger-scale context. Although the book does not focus specifically on the residential environment, explicit attention is given to housing and dwellings in several sections of the book. Furthermore, *A Pattern Language* offers

insight into larger-scale levels of the socio-physical environment, while the smallest pattern confirms the importance of personal stuff as part of the physical environment, in line with Brand's shearing layers.

In terms of being a communication tool, attention has been given to using understandable terminology. The book is not just aimed at architects, it could also be used as a tool for auto-construction. The authors explicitly encourage readers to adapt the pattern language presented in the book to create their own pattern language. Therefore, the terminology should be understandable by researchers without a background in architecture.

In terms of being a research tool, while the 253 patterns present a holistic understanding of the physical environment, the large number of patterns makes it difficult to directly translate the framework into a research tool. Therefore, to fit this goal, the 253 patterns would need to be simplified into fewer categories. Furthermore, each pattern is elaborated in a concise format that describes the empirical background and the physical and social context of the pattern. The framework makes explicit references to knowledge from social science disciplines.

Assessment results

Assessing these frameworks, shearing layers offer a clear and understandable typology of building components; Brand's focus is on detailing the elements that compose buildings, with larger aspects that go beyond the building playing a secondary role. The typological framework found in *Housing Design: A manual* then combines shearing layers with another framework by Argan. In doing so, the authors elaborate the scope of shearing layers into a more expansive framework for understanding the residential environment where more large-scale elements are added. This goes beyond the scope of the building in the form of urban ensembles or building blocks and contextual elements. In relation to these, *A Pattern Language* offers the most extensive examination of the residential environment. The large number of patterns emphasises the continuous nature and interconnectedness of the different elements of the physical environment on different scales. Additionally, it explicitly seeks to connect spatial aspects of the residential environment with its social aspects by providing empirical evidence in the description of the patterns.

Towards a residential socio-physical framework

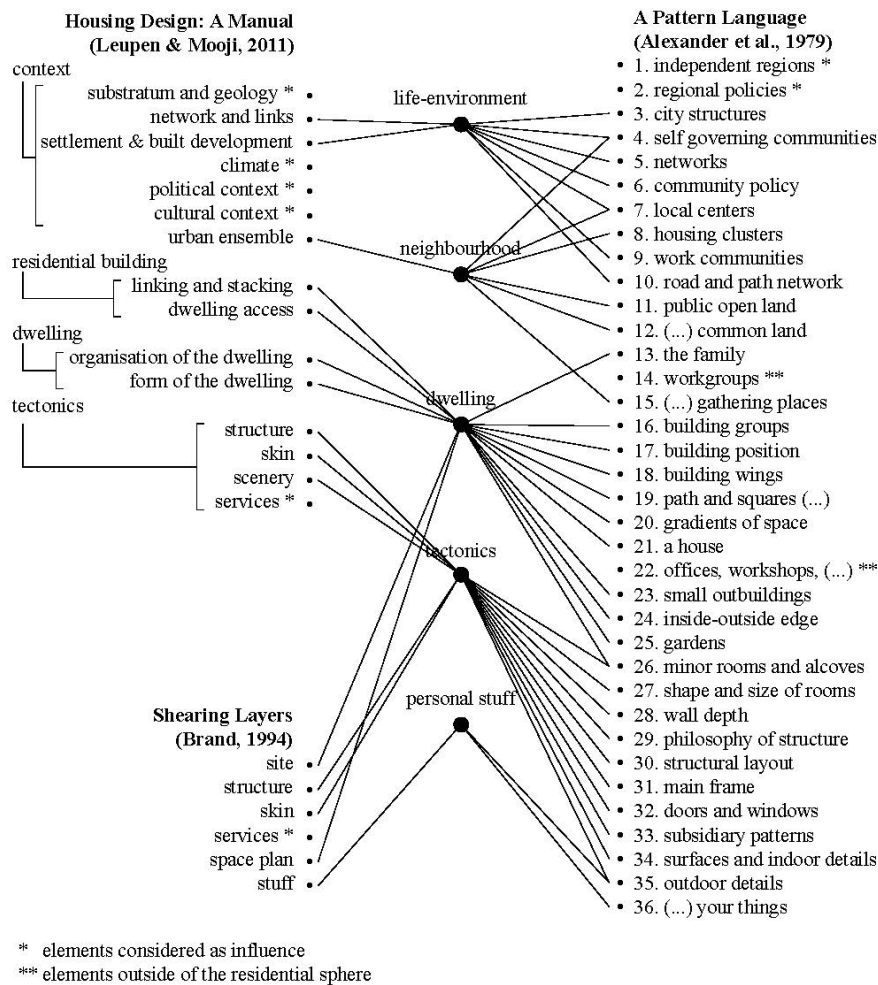## Physical framework

These three frameworks can be combined to derive a possible new group of categories of the residential environment. Figure 1 shows the constituent elements of each framework, which are then systematically interpreted against one of three positions. Each element is judged to be directly relevant and included in our proposed framework (as shown with a line), considered as an influence (as shown with a single asterisk) or considered to fall outside the residential sphere (as shown with a double asterisk) and therefore is not included in the proposed framework.

As a result, five distinct categories emerge that can be considered typological categories of the residential environment: life-environment, neighbourhood, dwelling, tectonics and personal stuff. By basing these categories on existing architectural frameworks, we ensure that they are rooted in existing knowledge of architectural typology. It is important to take this newly developed framework of typological categories and measure it against the same criteria used to evaluate the previous frameworks.

In terms of physical scope, the overlap of the three frameworks endows the new one with broad, holistic coverage of the residential environment. The dwelling can be found at the core of the new typological framework with two smaller categories – tectonics and personal stuff – and two larger categories – neighbourhood and life-environment. Nevertheless, there are some elements that do not fall exactly into one of the five derived categories. These include abstract processes that influence housing in indirect ways and are difficult to associate with a specific architectural scope, and are considered to be influences. We note that 'technology', which can be traced in the evaluated frameworks in the form of 'services', is also considered to be an influence. While technology plays an important role in contemporary housing, the way it is experienced by a resident can usually be traced back to the five defined physical categories. In addition, there are elements from the three examined frameworks that fall outside the residential sphere,[21] which are not included in our residential framework.

Figure 1. Physical categories of the residential environment emerge by overlapping the previously examined architectural frameworks

Housing Design: A Manual
(Leupen & Mooji, 2011)

context
substratum and geology *
network and links
settlement & built development
climate *
political context *
cultural context *
urban ensemble

residential building
linking and stacking
dwelling access

dwelling
organisation of the dwelling
form of the dwelling

tectonics
structure
skin
scenery
services *

life-environment

neighbourhood

dwelling

tectonics

personal stuff

Shearing Layers
(Brand, 1994)
site
structure
skin
services *
space plan
stuff

A Pattern Language
(Alexander et al., 1979)
• 1. independent regions *
• 2. regional policies *
• 3. city structures
• 4. self governing communities
• 5. networks
• 6. community policy
• 7. local centers
• 8. housing clusters
• 9. work communities
• 10. road and path network
• 11. public open land
• 12. (...) common land
• 13. the family
• 14. workgroups **
• 15. (...) gathering places
• 16. building groups
• 17. building position
• 18. building wings
• 19. path and squares (...)
• 20. gradients of space
• 21. a house
• 22. offices, workshops, (...) **
• 23. small outbuildings
• 24. inside-outside edge
• 25. gardens
• 26. minor rooms and alcoves
• 27. shape and size of rooms
• 28. wall depth
• 29. philosophy of structure
• 30. structural layout
• 31. main frame
• 32. doors and windows
• 33. subsidiary patterns
• 34. surfaces and indoor details
• 35. outdoor details
• 36. (...) your things

* elements considered as influence
** elements outside of the residential sphere

In terms of the framework as a communication tool, our proposed framework is composed of five clearly separate typological categories. Attention has been given to using a limited number of categories to accommodate communication. However, some elements inevitably fall in between certain categories. These elements can differ depending on context. For example, in urban environments, it can be argued that housing is organised more collectively, with dwellings taking the form of apartments within a large building. Here residents share collective spaces such as hallways, lifts and storage spaces. Alternatively, in rural contexts, it could be argued that dwellings often take up an entire building, which is situated on a site. The site in this case, in the form of private exterior space transitioning into public space, can be considered part of the dwelling. Therefore, we encourage the adaptation of the framework according to the specific research scope, if necessary. During the development of this framework, careful attention has been given to using lay terminology. While most of the categories presented seem to translate their meaning directly, the term 'tectonics' is the most demanding of prior knowledge as it stems from architectural theory. Here, the term is understood to indicate the essence of architectural expression as the result of structure, construction and space. We argue that, because of its precise meaning, it is more difficult to find a simpler synonym.

In terms of the framework acting as a research tool, it is possible that this proposed framework could serve as a basis for the analysis of research data. It could be argued that the social scope of the framework is focused on individual inhabitants rather than larger social groups such as communities. At the same time, its spatial scope is centred on the building or the scale of architecture rather than on the scale of urbanism or territories. We encourage researchers to adapt the framework to fit the specific

scope of their research project if necessary. Nevertheless, we argue that the framework offers a way to relate social knowledge to the physical context of the residential environment.

Socio-physical framework

We have examined existing typological frameworks of architecture and overlapped these to propose a new framework that is specifically tailored for the residential environment. By overlapping these frameworks, we have made the links to existing knowledge in architectural typology explicit. We hypothesise that, by proposing a typological framework, we can offer a way of explicitly understanding knowledge from social research within the field of architecture, essentially giving these forms of knowledge an inherently spatial characteristic, as shown in Figure 2. In this section, we will test this hypothesis by coupling research on residential experiences to specific spatial categories. A brief literature review reveals that it is possible to make explicit links between physical environments and findings from psycho-social experiences linked to dwellings.

Figure 2. Physical and psycho-social elements of the residential environment
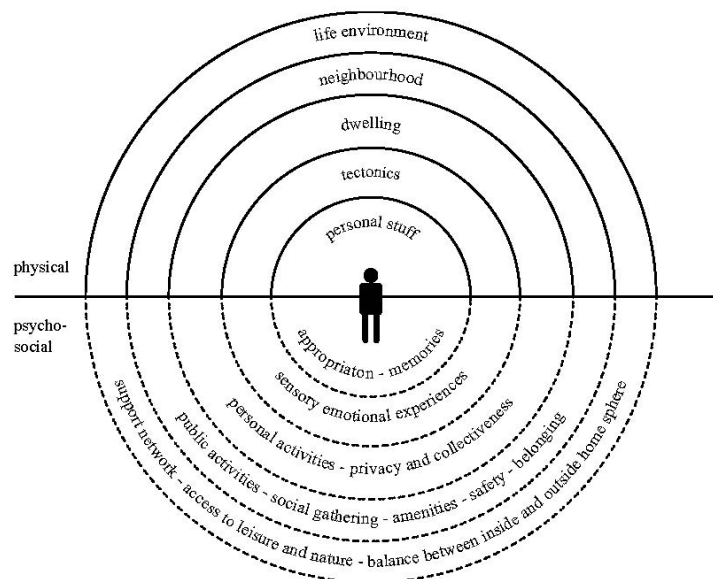
Life environment

Housing experiences do not exist on their own, but should be considered in relation to other parts of life that take place outside the home, such as the public or the work spheres. Spatially, life-environment describes the physical relationship or distance between one's dwelling and places outside it where the resident spends time. Not only can distance be measured physically, it can also indicate feeling distant. Therefore, psycho-socially, the life environment influences the relationship between one's dwelling and access to support,[22] leisure activities[23] and nature.[24] The composition of these elements in one's life, and consequently the relationship to one's dwelling, is dependent on socio-demographic factors such as age, cultural background and personal interests. Furthermore, the organisation of life outside the home is influenced by cultural and technological evolution. For example, while the Industrial Revolution introduced a separation between productive (work) and reproductive (domestic) activities,[25] the Covid-19 pandemic forced the work sphere to infiltrate the home environment again.[26]

Neighbourhood

The neighbourhood relates to the public spaces around the dwelling that are shared with people outside the household. Spatially, the neighbourhood differs from the life environment in the sense that the proximity of the neighbourhood comprises the direct context of the dwelling. In addition,

the neighbourhood is also experienced as an environment in itself. The role and importance of neighbourhoods to housing experiences differ depending on geographical contexts such as living in an urban or rural environment. Psycho-socially, the neighbourhood provides a place for public activities to take place and regulates access to public areas such as green spaces, social gathering spaces and amenities. Furthermore, the characteristics of the neighbourhood influence feelings of safety[27] and comfort.[28] Ultimately, the neighbourhood plays a significant role in providing residents with the feeling that they belong to a place.[29]

Dwelling

The dwelling consists of the whole of the interior and exterior spaces that make up the private spaces of a group of inhabitants. Spatially, a dwelling is usually part of a building that is, in turn, situated on a site. It is important to make a distinction in cases where the building is made up of a single dwelling (such as single-family housing) and buildings that contain multiple dwellings (such as apartment buildings). In the latter case, several collective spaces are usually part of the building.[30] The category of dwelling also encapsulates the specific building type, the functions of rooms and their spatial organisation within the space. These spatial dwelling elements influence psycho-social processes such as the possibility of engaging in personal or social activities,[31] balancing experiences of privacy[32] and communality,[33] and giving the residents control of their exposure to the public sphere.[34]

Tectonics

Tectonics refers to the physical elements with which a dwelling is constructed together with the spatial emptiness between these physical elements. In this sense, physical elements can be understood as (1) the structural elements that are needed to carry a building, and (2) the elements that may or may not be used to finish both the exterior and interior structure of the building. These physical elements contain material qualities which include, for example, texture, colour and weight. Alternatively, spatial elements in this context can also be understood as the void that exists in between the physical components of a building, giving rise to qualities such as the shape and dimensions of spaces, the ceiling height or the depth of a room. It is the composition of these elements that ultimately makes up the appearance of the building. Tectonics has been the focus of several architectural theorists, mainly within a phenomenological approach to architecture.[35] The inhabitants perceive the tectonics of dwellings sensorially.[36] Therefore, psycho-social processes related to bodily experience are closely linked to the tectonics of a residential environment. The tectonic composition determines the acoustic, haptic, visual or spatial-emotional experience of inhabitants as a reaction to the materials of the environment.[37] Furthermore, a sense of place and attachment to the local environment can be established through the use of local materials.[38]

Personal stuff

A dwelling's architectural frame is ultimately filled with personal objects belonging to its inhabitants. Physically, personal stuff can be described as objects of any size that are not part of the building or the site itself. They originate from the specific inhabitant and are usually replaced when an inhabitant moves out of the dwelling. In terms of the related psycho-social experience, decorating one's home with personal stuff gives residents the possibility of appropriating their environment by choosing objects that reflect their own symbolic values.[39] Furthermore, objects are often linked to specific memories and become physical artefacts of one's life story.[40]

Conclusion

This article responds to the need for a common language within the research field of residential environments. We hypothesise that knowledge from both the social sciences and spatial disciplines can be combined through the concept of typology in architecture, which serves to categorise the physical environment into clearly distinct elements, usually organised according to scale. By examining and overlapping existing typological frameworks in architecture, a new physical framework is proposed that is tailored specifically to the residential environment. Our proposed framework identifies five categories

of the residential environment: life environment, neighbourhood, dwelling, tectonics and personal stuff, as shown in Figure 3. We demonstrate how this framework can be used to explicitly locate psycho-social processes within the spatial character of the residential environment. Our goal is to provide a framework that will explicitly situate research in physical space, through thinking according to specific scale levels.

Figure 3. Illustration of the different categories of the framework, based on a fictional apartment dwelling
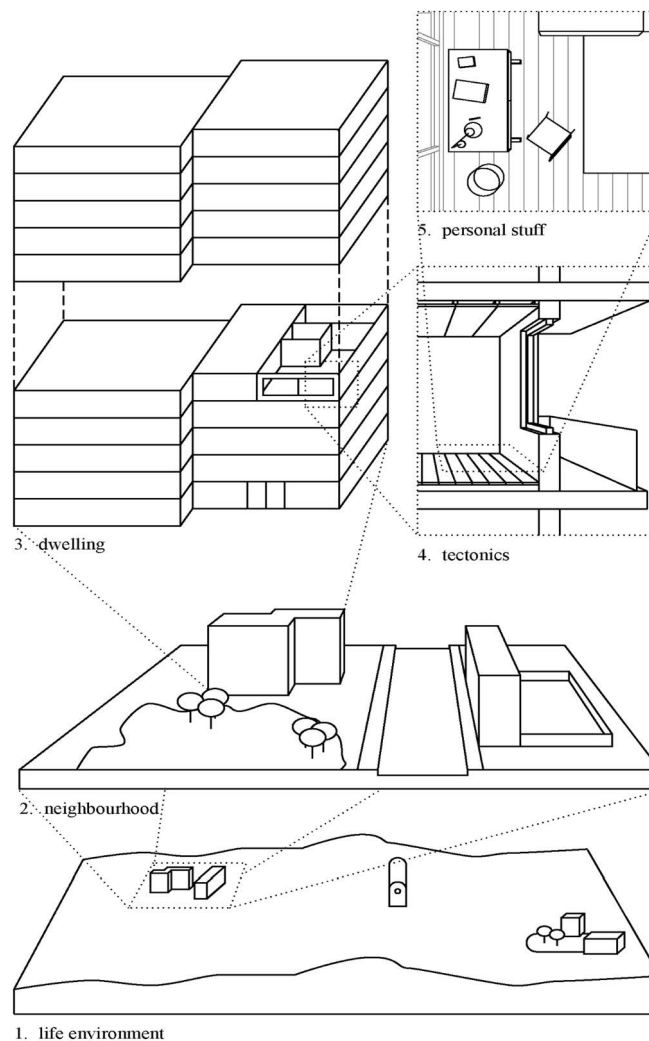
At the core of the proposed framework lies the dwelling and tectonics. We argue that for researchers with a background in architecture the added value is specifically located at these scale levels, exploring the complex relations between the spatial and material composition of the dwelling and psycho-social processes such as experiences of privacy, communality and sensory experiences. Combining these different approaches to the residential environment implies combining insights and methods stemming from social science research, with visual research methods stemming from design sciences.

Limitations and future research

The work presented in this article is based on theoretical reflections mainly in the field of architecture theory. The proposed framework could be further developed using empirical data and possible connections, together with theoretical frameworks from the field of social sciences. Furthermore, this article is primarily aimed at academic researchers. The potential value for professional stakeholders

who are active in the housing sector, such as housing developers, policy professionals, consultants or architects, could be an opportunity for future research.

Notes

1. Brasche and Bischof, 'Daily time spent indoors'; Matz et al., 'Effects of age'; Bassett et al., 'Trends in physical activity'.
2. Pommer, Otto and Harrington, *Weissenhof 1927*.
3. Kallis, 'Minimum dwelling'.
4. Heynen, 'Architecture between modernity and dwelling'.
5. Heidegger, *Poetry, Language, Thought*.
6. Bachelard, *La poétique de l'espace*.
7. Lefebvre, 'La production de l'espace'.
8. Norberg-Schulz, *Genius Loci*; Norberg-Schulz, *Concept of Dwelling*.
9. Frampton, 'Critical regionalism'.
10. Fisher et al., 'Community'.
11. Bick, Blandin and Mertens, 'Work from home'.
12. Silberberger et al., *Against and for method*; Heynen, 'Space as receptor'.
13. The first author of this article is part of the HOUSE research project as a researcher with a background in architecture.
14. Duffy, 'Measuring building performance'.
15. Brand, *How buildings learn*, 12–13.
16. Brand, *How buildings learn*, 12–13.
17. Brand, *How buildings learn*, 12–13.
18. Leupen and Mooij, *Housing Design*.
19. Argan, 'On the typology of architecture'.
20. Alexander et al., *A Pattern Language*, 41.
21. The most common elements in this category are spaces related to work rather than residential spaces.
22. Golden et al., 'Loneliness'.
23. Gabriel and Bowling, 'Quality of life'.
24. Andreucci, Russo and Olszewska-Guizzo, 'Designing urban green blue infrastructure'.
25. Dogma and Tattara, *Living and Working*.
26. Schieman et al., 'Work-life conflict'.
27. Alaazi et al., 'Our home'.
28. Nieboer and Cramm, 'Age-friendly communities'.
29. Kearns and Parkinson, 'The significance of neighbourhood', 2103.
30. Leupen and Mooij, *Housing Design*.
31. Rice, 'A health map for architecture'.
32. De Macedo, Ornstein and Elali, 'Privacy and housing'.
33. Marco et al., 'Architects'.
34. Morin et al., 'Signification du chez-soi'; Rice, 'A health map for architecture', 169.
35. Norberg-Schulz, *Genius Loci;* Frampton, 'Critical regionalism'; Pallasmaa, *Eyes of the Skin*, 3; Zumthor, *Atmospheres*.
36. Picon, *Materiality of Architecture*.
37. Al-Alwan and Mahmood, 'Connotation of tectonics'.
38. Norberg-Schulz, *Concept of Dwelling,* 31.
39. Pinson, 'L'habitat'.
40. Cassaigne, 'Habiter'.

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