Grounded patterns: creating a socio-spatial language for residents' participation in cohousing landscapes.

Ms Aimee Louise Felstead[1], Dr Kevin Thwaites[1]

[1] Department of Landscape Architecture, Faculty of Social Sciences, University of Sheffield, UK.

Abstract

Since 'A Pattern Language' was published in 1977, it has inspired students, practitioners and communities to create places that reflect a timeless human quality. The purpose of a pattern is to succinctly document, communicate, and implement commonly occurring and well-functioning ideas in a particular setting, to offer anyone the ability to replicate them in their everyday environment. Despite this, methods for identifying patterns and collating them into a language remain ambiguous. This paper advances a grounded approach to identifying patterns and collating them into a language through the study of cohousing residents' participation in shared outdoor spaces. As well as outlining a grounded pattern methodology, the research aims to test the pattern language as a collaborative tool for residential communities and design practitioners and explore the wider contribution to urban theory.

Keyword: pattern languages, grounded theory, residential landscapes, cohousing, community participation

Introduction

This paper progresses a methodology for identifying patterns and collating them into a language with the study of cohousing residents' participation in shared outdoor spaces. The grounded approach to making a pattern language offers a way of capturing the relations between people and form in urban places from real-world examples. The pattern language produced is intended as a collaborative tool for residential communities and design practitioners involved in shared residential landscapes.

Jane Jacob's critique of modern urban planning (1961) emphasises the complexity of human life in the city and has since been acknowledged as integral to our understanding and delivery of urban places (Habraken, 1998; Gehl, 2010; Sim, 2019). Building on this idea, several urban theorists suggest cities can be thought of as 'assemblages'—dynamic arrangements of interconnected components and processes (Dovey, 2010; McFarlane, 2011; Kamalipour and Peimani, 2015). This viewpoint emphasises urban place as complex wholes, emerging from the dynamic interactions between its parts, and therefore, cannot be wholly understood when broken-up or reduced to separate parts. This paper is founded on the argument that a holistic understanding of urban form requires a methodology that captures the relations between space and the social patterns of behaviour that contribute to its making, use and adaption. Pattern languages are a useful urban design and research tool (Deming and Swaffield, 2011; Leitner, 2015) with the potential to capture the relationships between space and people within urban form. Although cartographic methods (see Hillier and Hanson, 1984; Whitehand, 2001) can be used to analyse spatial morphology to explain,

predict or reveal social behaviours (Lilley, 2009), pattern languages offer a way to recognise, depict and then apply commonly occurring relations between people and space in everyday settings (Alexander *et al.*, 1977). However, to apply pattern languages as a research method for urban theory, further methodological clarity and rigour are needed.

The following sections add to a growing body of pattern-orientated research by outlining a grounded pattern methodology and applying it to the study of residents' participation in cohousing landscapes. This is followed by a discussion of the type of data produced, its contribution to urban theory and potential for future testing and application in the context of community-led housing.

Background

Pattern Language Methodologies

'Patterns' document commonly occurring, problem-solving ideas in an easy-to-understand format, so that when they are collated and related to each other they form a 'language' that can be used and applied by people in their everyday surroundings (Alexander *et al.*, 1977). Pattern languages are useful because *"used in combination, patterns can create complex forms and typologies"* and *"are independent of materials, so they can be interpreted freely and adapted as needed for costs or culture"* Deming & Swaffield (2011, pp. 232–233). Patterns have potential application in the study and application of urban form as a complex assemblage because they: i) capture solutions that combine spatial form with social events; ii) document relationships between patterns; iii) can be modified to suit the local conditions; iv) transfer design knowledge between laypeople and professionals; and v) can be improved and added to by the people who use them (Alexander *et al.*, 1977; Alexander, 1979; Erickson, 2000; Jessop, 2004; Helfrich, 2015; Leitner, 2015).

Although pattern languages provide a useful tool for design students, practitioners and communities, further methodological refinement is required to develop a systematic way of using pattern languages for urban research. Since Alexander *et al.* (1977) identified and documented the first pattern language, consisting of 253 architectural patterns, the approach to intuitively assess a 'quality without a name' within spaces (Alexander, 1979) has received criticism for a lack of theoretical underpinning, rigour and objective evidence-base (Dawes and Ostwald, 2017). Despite this, pattern languages have been adopted as a research approach across a range of disciplines, including architecture (e.g. Bukovszki, Dóci and Reith, 2021), urban design (Park, 2015; te Brömmelstroet *et al.*, 2021), education and learning (e.g. Yinger and Hendricks-Lee, 1992; Ellaway and Bates, 2015; Knutsson and Ramberg, 2018; Rooij and van Dorst, 2020), healthcare (e.g. Roze Des Ordons *et al.*, 2019) and software design (e.g. Timpka et al., 2008; Pauwels, 2012). These studies typically use a variety of qualitative methods to discover patterns in empirical data and often include or follow up with participatory methods to further identify or test patterns. Although the diversity of pattern studies suggests there is no single method best suited to generating and applying

pattern languages in research, several authors outline similar multi-stage approaches (Schuler, 2002; Iba, Sakamoto and Miyake, 2011; Fehling *et al.*, 2014). These are outlined and compared in Figure 1.

Phases of Pattern Language Generation	Schuler's (2002) six steps	Fehling et al.'s (2014) three phases	Iba et al.'s (2011) five phases
Problem-solution mining	1. 'Pattern collecting'	1. 'Pattern identification'	1. 'Pattern mining'
Pattern clustering	2. 'Pattern discussion & deliberation' 3. 'Pattern language development'		
Pattern writing		2. 'Pattern authoring'	2. 'Pattern prototyping' 3. 'Pattern writing'
Pattern cataloguing	4. 'Pattern presentation'		4. 'Language organising'
Pattern language testing	5. 'Pattern use' 6. 'Pattern evaluation'	3. 'Pattern application'	5. 'Catalogue editing'

Figure 1. *A table comparing three multi-stage pattern language methodologies.*

By rationalising the above approaches identified in the literature review, a methodological framework for developing a pattern language can be presented as the following five phases:

1. *Problem-solution mining:* identifying and naming problems and solutions within empirical data.

2. *Pattern clustering:* identifying core patterns by clustering similar problem and solutions together.

3. *Pattern writing:* writing up patterns using a standardised template.

4. *Pattern language cataloguing:* organising, mapping and presenting patterns in an accessible way.

5. *Pattern testing:* testing the pattern language with the intended audience.

Grounded Theory

The above phased methodological framework can be expanded upon or combined with established research approaches to provide a systematic approach to generating pattern languages for research.

Grounded Theory (GT) is a widely recognised methodology in the social sciences with the potential to operationalise the five-phased methodological framework to build new urban theory. GT describes an inductive method of research that generates new theory from empirical data (Glaser and Strauss, 1999). It involves an open and explorative research design that rejects preconceived theories or hypotheses; empirical data that is iteratively collected alongside analysis to enable sampling of further relevant data; breaking data down into smaller components and coded with phrases that accurately portray its meaning; constantly comparing, grouping and linking codes together to form concepts and categories; and generating hypotheses and theories through memo writing, a process of refining and tracking ideas and relationships that emerge during the analytical process (Sbaraini et al., 2011).

Table 1. Comparison between the stages of a pattern language methodology and grounded theory.

Pattern Language Methodology	Grounded Theory
Problem-solution mining	Theoretical sampling and open coding of empirical data
Pattern clustering	Grouping similar codes into concepts and categories through constant comparison
Pattern writing	Writing memos to refine and track emerging concepts, categories and links
Pattern cataloguing	Finding links between concepts and categories to develop theory
Pattern language testing	Action research (Denef, Oppermann and Keyson, 2011)

Several researchers highlight the similarities between pattern language development and GT (Denef, Oppermann and Keyson, 2011; Hentrich *et al.*, 2015). In this research similar comparisons are made between GT and the phased methodological framework in Table 1. Denef *et al.* (2011) suggest participatory action research can be adopted for the final phase, *pattern language testing*, as this does not typically occur in GT. This paper uses the principles of GT to further substantiate and operationalise the five phases for developing a pattern language derived from previous studies to propose a grounded pattern methodology.

Applying a Grounded Pattern Methodology in Cohousing landscapes

The following section outlines how the grounded pattern methodology was applied in the study of residents' collective involvement in cohousing landscapes. The aims of the study were to 1) document and communicate existing solutions for residents' involvement in shared landscapes, 2) provide a collaborative tool to implement those ideas, and 3) understand and theorise urban placemaking.

Community participation in cohousing landscapes.

Urban Cohousing developments in the UK were selected as cases to identify patterns of residents' collective participation in shared landscapes. Cohousing is an alternative housing model integrating smaller-than-average private homes with communal spaces, such as a 'common house', laundry facilities and shared gardens (McCamant, Durett and Hertzman, 1994; Meltzer, 2001; Jarvis, 2011; Ruiu, 2014). Cohousing layouts typically follow key design principles to promote social interaction (Williams, 2005; Ruiu, 2014) such as inward-facing groups of houses, pedestrianised shared landscapes and central communal facilities (McCamant, Durett and Hertzman, 1994; Williams, 2005). The communities within cohousing typically form from grassroots groups and are highly involved in the purchasing, design, management and maintenance of the site (Chiodelli and Baglione, 2014; Ruiu, 2014; Jarvis, 2015). It is common for communities to partner with housing associations, non-profit organisations, design professionals and project managers, to deal with the complexity and risks involved in housing development (Lietaert, 2010; Arrigoitia and Tummers, 2019).

The study was conducted between summer 2019 and summer 2020 across four cohousing sites with shared residential landscapes and located within a city or town in the UK. I conducted 13 overt observational visits as a volunteer during workdays or as a guest at events, 10 interviews with residents (8 of which while walking around the site) and 3 interviews with design practitioners. This was supported by 3 videos made by residents during the pandemic, photos and sketches taken during site visits and other relevant documents. The above data was compiled into de-identified, multi-modal field notes and transcripts.

Phase 1: Problem-solution mining

Each transcript was prepared and analysed as soon as possible so that data collection and analysis could occur simultaneously, allowing interview questions, methods and recruitment to be adjusted in response to emergent findings. Using NVivo software, transcripts were 'open coded' by breaking down and summarising each sentence's meaning within a short phrase or 'code', reflecting a case-specific context, problem or solution related to residents' involvement in the shared landscape. For example the quote *"everyone has got a balcony or a private garden, small space, small garden, so if you didn't want to be sociable you could use those"* was open coded to 'a small private garden to be alone'. This produced a mass of detailed and unstructured codes allowing further codes to emerge without the prompt of a framework.

Phase 2: Pattern clustering

After several transcripts were coded, the large number of codes were repeatedly rationalised by comparing and combining similar or equivalent codes into core problem or solutions. Although most of the coding was undertaken in NVivo, intermittently printing the codes onto paper, cutting them up and grouping them by hand was easier. After most of the transcripts were open coded, the core problem and solution codes were

further clustered and refined into concepts or prototype patterns. For example, the open code 'a small private garden to be alone' was combined with other open codes referring to small private spaces such as balconies and allotment plots to form the prototype pattern 'Small private plot'.

Phase 3: Pattern writing

DESIGN OF SPACES
58. Small private plot

A small area of space that a resident can look after and use as their own. In cohousing, all the outdoor spaces are often collectively owned and shared [7]. However, residents often want to be able to control and look after the spaces closest to their homes. A private garden, patio, or balcony provides greater opportunities for residents to maintain [20], personalise [36] and be alone [35] in spaces close to their homes. Private allotment plots also gives residents additional space to grow things they like if they don't have their own garden. Keep private spaces small with permeable boundaries [59] to encourage residents to still use and interact with the shared spaces.

58   *see also*   (7) (20) (35) (36) (59)

Figure 2. *Pattern '58. Small private plot' written up in the playing card template*

Writing up the patterns required comparing and summarising case-specific examples into core problems and solutions. Case study reports were written as a form of memo writing to structure the detailed qualitative data under the patterns headings so that comparisons could easily be made between cases. A matrix grid summarised the evidence from the case studies against each pattern, helping to confirm commonly occurring patterns. For example, the pattern 'Small private plot' occurred within three out of four cases in various forms including small gardens, patios, balconies or allotments. Commonly occurring or otherwise significant patterns were then written within a standardised playing card template (Figure 2) consisting of the pattern category, number and name, sketch, summary sentence, description, instructions, examples, and other relevant patterns.

Phase 4: Pattern cataloguing

To identify the relationships between patterns, they were exploratively mapped in multiple ways. First, by thematic categories to provide an initial logical way of organising, numbering and navigating the set of 72 patterns, and then, by mapping how many cases the patterns occurred in, the network of relationships between them, the type of data captured, the relation to stakeholder relationships and cohousing morphology, and finally into broader theoretical themes. Such exploratory mappings helped develop new ways of navigating the patterns and make new connections between emergent concepts in a way that could build new urban theory, including how cohousing communities negotiate both top-down and bottom-up approaches to urban design through their connections with stakeholders (see Figure 3).

Phase 5: Pattern testing

The pattern language was presented in a playing card format to be used as a participatory tool between cohousing communities, practitioners or other partnering organisations to support collective involvement in shared spaces. The next stage of the research is planned to test the pattern language playing cards using interactive card games.

Results and Discussions

The 72 patterns of resident participation in cohousing landscapes organised by thematic categories are displayed in Table 2, followed by a sample of three patterns presented as a playing card format in Figure 2.

Table 2. Table of patterns of resident participation in cohousing landscapes.

ESTABLISHING A VISION	25. Rewilding the garden	DESIGN OF SPACES
1. Shared intentions	26. An allocated budget	49. Living in the city
2. An evolving vision	27. A cottage industry	50. Housing cluster
3. Value in diversity	28. Growing produce	51. Restricting cars
4. Self-selecting group	29. Composting	52. Central green
5. A 'steady core'	OCCUPYING SPACES	53. Central utilities & storage
6. A manifesto	30. The unwritten rules	54. Shared landmarks
7. Policies & agreements	31. Creative play	55. Commonhouse spill out
8. Picture in many ways	32. Celebrations & traditions	56. Open gateway
MAKING DECISIONS	33. A shared meal	57. Public access
9. Signposting	34. Connecting to nature	58. Small private plot
10. Open channels	35. Being alone	59. Permeable buffers
11. Whole group consensus	36. Personalise	60. Leftover space
12. Smaller working groups	WORKING WITH OTHERS	61. Wilderness
13. Having a say	37. Hubs & networks	62. Pocket retreat
14. Communication training	38. Online platforms	63. Dedicated play space
15. Decision logging	39. Learning from peers	64. Moveable furniture
CREATING RESOURCES	40. Family & friends	65. The noticeboard
16. A learning project	41. Good neighbours	66. Signs, instructions & labels
17. Pooling resources	42. Point of contact	FOR PRACTITIONERS
18. Communal workdays	43. Hiring out	67. Getting to know the group
19. Individual knowhow	44. Resident – experts	68. Expanded scope
20. Solo enterprise	45. Open days	69. Technical advisor
21. Self-build in stages	46. Neighbourhood events	70. Group facilitator
22. Quick fixes	47. Hosting	71. Go-between
23. Trial-runs & mock-ups	48. Taking part in research	72. Design for adaption
24. Reuse & repurpose		

Multi-faceted and human-scale solutions

A breadth of solutions for residents' involvement in shared landscapes is captured across 72 patterns, many of which portray the overlap between social, spatial and organisational of urban place at a human scale. For example, pattern '50. Restricting cars' describes a solution to minimise cars on-site by spatially locating car parking towards the edge of the site, establishing social norms for reducing car use, and organising policies on car-sharing and ownership. This was achieved by employing multiple qualitative methods that captured different types of data within multi-modal transcripts, allowing the researcher to *"gather and examine the relationships between the multiple modes"* (Antoniadou, 2017, p. 438). Patterns grounded in empirical data captures a multi-faceted picture of urban place useful for understanding urban morphology at the human-scale where people directly interact, adapt and respond to space.

Interconnected wholes

The grounded pattern methodology allows the relations between emergent patterns to be established and documented. For example, pattern '62. A pocket retreat' is connected to patterns '30. The unwritten rules', '34. Connecting to nature','35. Being alone', '58. Small private plot', '61. Wilderness' and '63. Dedicated play space' because they support their core solution create quiet spaces to spend some time alone outdoors. Documenting the connections between patterns within the cards aims to help users of the pattern language select and implement a group of patterns. In additi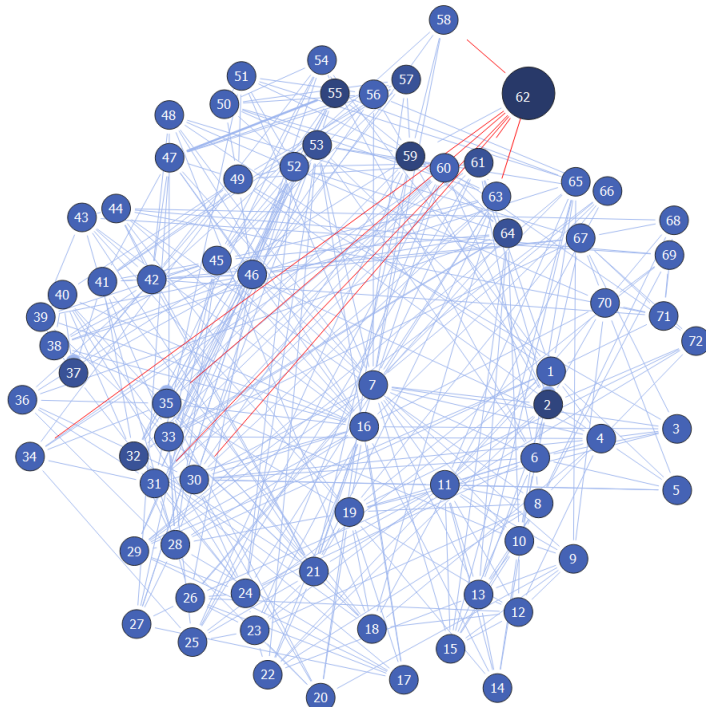on, visualising the connections between patterns (Figure 3) highlights the interconnectedness of the language. Although patterns were initially grouped by theme to make them easier to navigate, the semantic relations between patterns are highly networked. Iba and Isaku (2016) describe the organic structure of pattern languages as consisting of "horizontal" relations, in contrast with "vertical" structures of ordered categories designed to help readers navigate the pattern language. Pattern languages, therefore, can be used for multiple purposes; as an ordered structure so that they are easier to understand, or as a whole network to convey the complex relationships between multiple aspects of place.

Figure 3. *A diagram of the relations between patterns. Pattern 62 is connection to 30, 34, 35, 58, 61, and 63.*

Mapping out and building theory

Diagramming patterns and their relations can help to identify broader ways of explaining how cities work
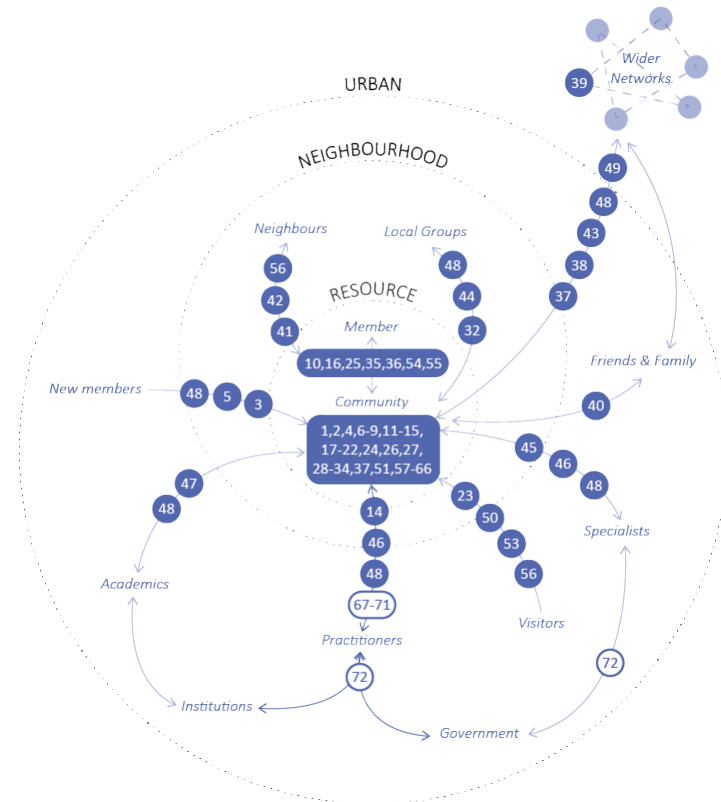

Figure 4. A diagram of patterns used by cohousing communities to negotiate the relationships between individual members, the whole group, and with a range of stakeholders.

spatially and socially (Kamalipour and Peimani, 2015). Another way patterns can be mapped is by their role in facilitating relationships between individual residents, the community and wider stakeholders. The patterns mapped in Figure 4 outline solutions that help residents' mediate relations across multiple scales, including between the individual and the group, within the community and with external stakeholders. For example, building networks of useful contacts [patterns 37-40], adaptive access for the public and visitors [patterns 42-44, 48, 53, 56] and collaboration with design practitioners [patterns 14, 46, 48, 67-72]. Such strategies may be relevant for other types of community-led placemaking and thus make potentially useful contributions to urban theory.

Adaptive and implementable hypotheses

The methodology produces solutions grounded in real-world examples, abstracted to a central idea. Pattern writing aims to generalise a pattern no further than is needed to convey a core solution so that it can be adapted to suit the context it is being applied in (Rising, 2007). Limiting pattern abstraction to its lowest level ensures patterns remain intelligible to the reader but loose enough to be adapted to different contexts. Figure 5 demonstrates one example of how spatially oriented patterns could take form in a 'typical' cohousing development. For example, '62. Pocket retreat', a 'semi-enclosed spaces towards the edges of the site', is depicted in Figure 5 as a bench beneath a pergola, but could also be interpreted as a small patio space or fenced-off kitchen garden to suit the conditions of the site and community. Patterns, therefore, function as intelligible, yet highly adaptable social-spatial morphologies.
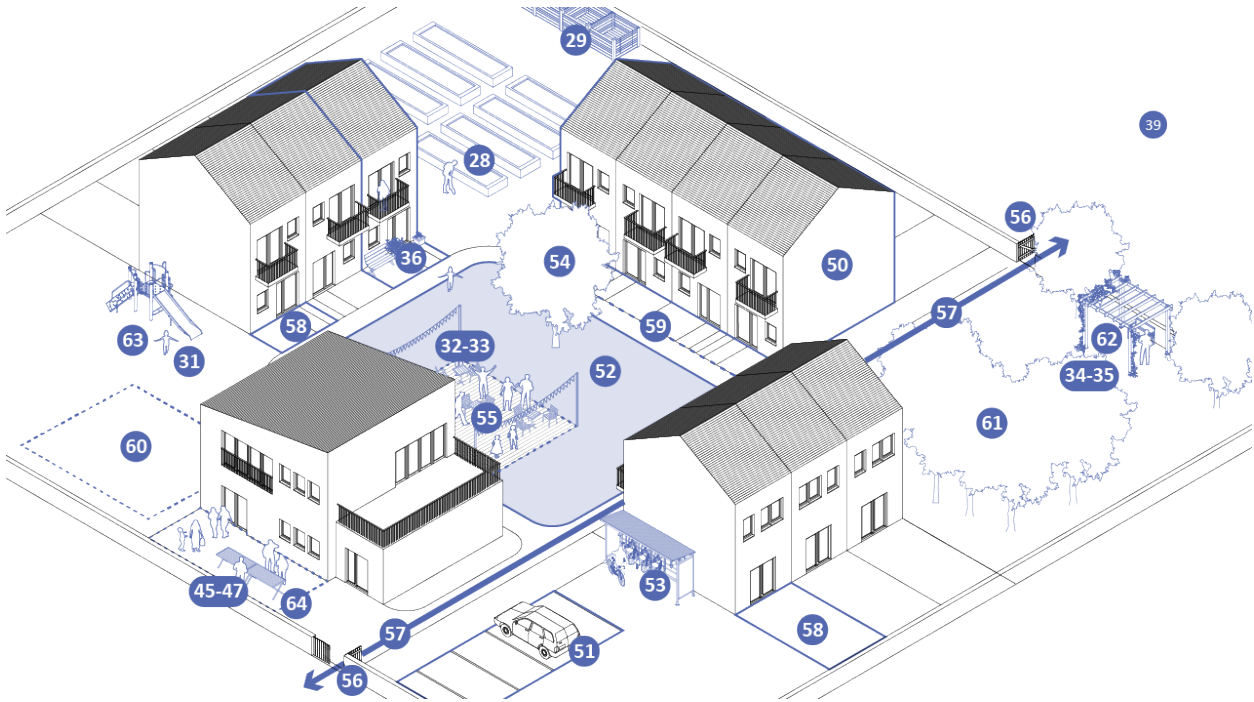
Figure 5. *Spatial patterns of resident participation mapped onto a diagram of a typical cohousing development.*

Next steps

Although informal feedback from participating residents suggests patterns help to give a name to communicate to others what is otherwise an abstract idea, further work is required to understand how residents can navigate and recognise solutions appropriate to the problems and challenges they are facing. Further testing of the pattern language is required to evaluate how the patterns function as a card game (Figure 5) in cohousing communities and whether it can be applied in other community placemaking contexts.

Conclusions

The grounded pattern methodology presents a holistic approach to studying urban morphology that recognises its assemblage of social and spatial parts. Using GT to substantiate previous approaches to developing a pattern language outlines a way of building theory from interconnected patterns grounded in real-world examples. This method may be of interest to researchers studying place-making, community participation or other aspects of urban form at the human scale, as well as those interested in approaches to pattern research more generally. The pattern language itself is intended to be used as a collaborative tool by cohousing or other community-led housing groups and collaborating design practitioners. Further research by *pattern testing* such as participatory workshops and design games will help to verify and improve the patterns and evaluate the accessibility and effectiveness of the pattern language.

Acknowledgements

References

1. Alexander, C. (1979) *The Timeless Way of Building*. New York, USA: Oxford University Press.

2. Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I. and Angel, S. (1977) *A Pattern Language*. 38th edn. New York, USA: Oxford University Press.

3. Antoniadou, V. (2017) 'Collecting, organizing and analyzing multimodal data sets: the contributions of CAQDAS', in Moore, E. and Dooly, M. (eds) *Qualitative approaches to research on plurilingual education*. Research-publishing.net, pp. 435–450. doi: 10.14705/rpnet.2017.emmd2016.640.

4. Arrigoitia, M. F. and Tummers, L. (2019) 'Cohousing Professionals as "Middle-Agents": Perspectives from the UK, USA and the Netherlands', *Built Environment*, 45(3), pp. 346–363. doi: 10.2148/benv.45.3.346.

5. te Brömmelstroet, M., Nello-Deakin, S., Quillien, J. and Bhattacharya, I. (2021) 'Towards a pattern language for cycling environments: merging variables and narratives', *Applied Mobilities*, 6(1), pp. 35–53. doi: 10.1080/23800127.2018.1505261.

6. Bukovszki, V., Dóci, G. and Reith, A. (2021) 'Coding engines in participatory social housing design—a case to revisit pattern languages', *Sustainability*, 13(6). doi: 10.3390/su13063367.

7. Chiodelli, F. and Baglione, V. (2014) 'Living together privately: for a cautious reading of cohousing', *Urban Research and Practice*, 7(1), pp. 20–34. doi: 10.1080/17535069.2013.827905.

8. Dawes, M. J. and Ostwald, M. J. (2017) 'Christopher Alexander's A Pattern Language: analysing, mapping and classifying the critical response', *City, Territory and Architecture*, 4(1), pp. 1–14. doi: 10.1186/s40410-017-0073-1.

9. Deming, M. E. and Swaffield, S. R. (2011) *Landscape Architectural Research: Inquiry, Strategy, Design*. Hoboken, NJ, USA: Wiley.

10. Denef, S., Oppermann, R. and Keyson, D. V. (2011) 'Designing for social configurations: Pattern languages to inform the design of ubiquitous computing', *International Journal of Design*, 5(3), pp. 49–65.

11. Dovey, K. (2010) 'Chapter 2: Place as Assemblage', *Becoming Places*, (1987), pp. 13–30.

12. Ellaway, R. H. and Bates, J. (2015) 'Exploring patterns and pattern languages of medical education', *Medical Education*, 49(12), pp. 1189–1196. doi: 10.1111/medu.12836.

13. Erickson, T. (2000) 'Lingua francas for design: Sacred places and pattern languages', in *DIS '00 3rd Conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques, August*, pp. 357–368. doi: 10.1145/347642.347794.

14. Fehling, C., Barzen, J., Breitenbücher, U. and Leymann, F. (2014) 'A process for pattern identification, authoring, and application', in *EuroPLoP '14, Irsee, Germany, 9-13 July*. ACM. doi: 10.1145/2721956.2721976.

15. Gehl, J. (2010) *Cities for People*. Washington, USA: Island Press.

16. Glaser, B. G. and Strauss, A. L. (1999) *Discovery of Grounded Theory: Strategies for Qualitative Research*. Somerset, UK: Taylor & Francis Group.

17. Habraken, N. J. (1998) *The Structure of the Ordinary: Form and Control in the Built Environment*. London, England: MIT Press.

18. Helfrich, S. (2015) 'Patterns of Commoning: How We Can Bring About a Language of Commoning', in Bollier, D. and Helfrich, S. (eds) *Patterns of Commoning*. Amherst, United States: Levellers Press.

19. Hentrich, C., Zdun, U. W. E., Hlupic, V. and Dotsika, F. (2015) 'An Approach for Supporting Pattern Mining and Validation through Grounded Theory and its Applications to Process- Driven SOA Patterns ', in *EuroPLoP '13, Irsee, Germany, 10-14 July*. ACM, p. 16. doi: 10.1145/2739011/2739020.

20. Hillier, B. and Hanson, J. (1984) *The Social Logic of Space*. Cambridge, UK: Cambridge University Press.

21. Iba, T. and Isaku, T. (2016) 'A Pattern Language for Creating Pattern Languages: 364 Patterns for Pattern Mining, Writing, and Symbolizing', in *23rd Conference on Pattern Language Programs PLoP'16, Monticello, Illinois, USA, 24-26 October.* ACM, pp. 1–63.

22. Iba, T., Sakamoto, M. and Miyake, T. (2011) 'How to Write Tacit Knowledge as a Pattern Language: Media Design for Spontaneous and Collaborative Communities', *Procedia - Social and Behavioral Sciences*, 26, pp. 46–54. doi: 10.1016/j.sbspro.2011.10.561.

23. Jacobs, J. (1961) *The Death and Life of Great American Cities*. New York, USA: Random House.

24. Jarvis, H. (2011) 'Saving space, sharing time: Integrated infrastructures of daily life in cohousing', *Environment and Planning A*, 43(3), pp. 560–577. doi: 10.1068/a43296.

25. Jarvis, H. (2015) 'Towards a deeper understanding of the social architecture of co-housing: Evidence from the UK, USA and Australia', *Urban Research and Practice*. Routledge, 8(1), pp. 93–105. doi: 10.1080/17535069.2015.1011429.

26. Jessop, A. (2004) 'Pattern language: A framework for learning', *European Journal of Operational Research*, 153(2), pp. 457–465. doi: 10.1016/S0377-2217(03)00165-6.

27. Kamalipour, H. and Peimani, N. (2015) 'Assemblage Thinking and the City: Implications for Urban Studies', *Current Urban Studies*, 3, pp. 402–408. doi: 10.4236/cus.2015.34031.

28. Knutsson, O. and Ramberg, R. (2018) 'Teachers' Collaborative Pattern Language Design', *Designs for Learning*, 10(1), pp. 1–17. doi: 10.16993/dfl.76.

29. Leitner, H. (2015) 'Working with Patterns : An Introduction', in Bollier, D. and Helfrich, S. (eds) *Patterns of Commoning*. Amherst, USA: Levellers Press, pp. 15–25.

30. Lietaert, M. (2010) 'Cohousing's relevance to degrowth theories', *Journal of Cleaner Production*, 18(6), pp. 576–580. doi: 10.1016/j.jclepro.2009.11.016.

31. Lilley, K. D. (2009) 'Urban Morphology', *International Encyclopedia of Human Geography*, pp. 66–69. doi: 10.1016/B978-008044910-4.01093-2.

32. McCamant, K., Durett, C. and Hertzman, E. (1994) *Cohousing: A contemporary approach to housing ourselves*. 2nd edn. Berkeley, USA: Habitat Press/Ten Speed Press.

33. McFarlane, C. (2011) 'Assemblage and critical urbanism', *City*, 15(2), pp. 204–224. doi: 10.1080/13604813.2011.568715.

34. Meltzer, G. (2001) 'Co-housing bringing communalism to the world?', in *7th International Communal Studies Conference, Belzig, Germany, 25-27 June*.

35. Park, Y. (2015) 'The network of patterns: creating a design guide using Christopher Alexander's pattern language', *Environment and Planning B: Planning and Design*, 42(4), pp. 593–614. doi: 10.1068/b130011p.

36. Pauwels, L. (2012) 'Contemplating the state of visual research: an assessment of obstacles and opportunities.', in Pink, S. (ed.) *Advances in Visual Methodology*. London: SAGE Publications Ltd., pp. 248–264. doi: 10.4135/9781446250921.

37. Rising, L. (2007) 'Understanding the Power of Abstraction in Patterns', *IEEE Software*, 24(4), pp. 46–51.

38. Rooij, R. and van Dorst, M. (2020) 'A Pattern Language Approach to Learning in Planning', *Urban Planning*, 5(1), pp. 58–64. doi: 10.17645/up.v5i1.2961.

39. Roze Des Ordons, A. L., MacIsaac, L., Everson, J., Hui, J. and Ellaway, R. H. (2019) 'A pattern language of compassion in intensive care and palliative care contexts', *BMC Palliative Care*, 18(1), pp. 1–9. doi: 10.1186/s12904-019-0402-0.

40. Ruiu, M. L. (2014) 'Differences between Cohousing and Gated Communities. A Literature Review', *Sociological Inquiry*, 84(2), pp. 316–335. doi: 10.1111/soin.12031.

41. Sbaraini, A., Carter, S. M., Evans, R. and Blinkhorn, A. (2011) 'How to do a grounded theory study: A worked example of a study of dental practices', *BMC Medical Research Methodology*, 11(128). doi: 10.1186/1471-2288-11-128.

42. Schuler, D. (2002) 'A Pattern Language for Living Communication: A Global Participatory Project', in Binder, T., Gregory, J., and Wagner, I. (eds) *PDC 02 Participatory Design Conference, Malmö, Sweden, 23-25 June*. Malmo, Sweden, pp. 52–61.

43. Sim, D. (2019) *Soft City: Building Density for Everyday Life*. Washington DC, USA: Island Press.

44. Timpka, T., Eriksson, H., Ludvigsson, J., Ekberg, J., Nordfeldt, S. and Hanberger, L. (2008) 'Web 2.0 systems supporting childhood chronic disease management: A pattern language representation of a general architecture', *BMC Medical Informatics and Decision Making*, 8(54), pp. 1–11. doi: 10.1186/1472-6947-8-54.

45. Whitehand, J. W. R. (2001) 'British urban morphology: The Conzenian tradition', *Urban Morphology*, 5(2), pp. 103–109.

46. Williams, J. (2005) 'Designing neighbourhoods for social interaction: The case of cohousing', *Journal of Urban*

Design, 10(2), pp. 195–227. doi: 10.1080/13574800500086998.

47. Yinger, R. J. and Hendricks-Lee, M. S. (1992) 'A pattern language for teacher education', *Journal of Teacher Education*, 43(5), pp. 367–375.