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A grounded pattern language: testing a methodology for exploring cohousing residents' involvement in shared outdoor spaces

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ABSTRACT

This paper presents a 'grounded pattern language' developed from a study on cohousing residents' participation in shared landscapes. Pattern languages are recognised in the fields of architecture and urban design as useful tools for documenting commonplace problem-solving ideas in an easy-to-understand format. Since their initiation by Christopher Alexander in 1977, researchers across a wide range of disciplines have adopted the use of pattern languages in research as a way of engaging participants and creating succinct, implementable outputs. However, further methodological refinement for developing a pattern language is required to address criticisms around rigour and transparency. By combining previously adopted pattern language development stages with those of grounded theory, this paper outlines a grounded pattern methodology and its application in the study of cohousing residents' participation in shared landscapes. The paper discusses the benefits and limitations of the grounded pattern methodology as a participatory research, design and theory building tool observed during its initial testing as a card game.

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1. Introduction and literature review

Resident participation in the development and management of the site, including the shared outdoor spaces, is a common feature of cohousing development (McCamant, Durett, and Hertzman 1994). As well as giving residents the opportunity to shape the spaces they live in, involvement in decision-making can contribute to social processes of getting to know each other, dealing with conflict and establishing ways of working together (Ruiu 2016). However, negotiating multiple voices can result in intensive and long-winded decision-making processes for residents (Jarvis 2015), presenting challenges in communicating, and then realising, shared design visions. For design practitioners, this can make it difficult to determine a cohesive design brief and ensure that 'everyone is on the same page' when making key decisions. As a developing sector in the UK, community-led housing has so far followed a predominantly bottom-up approach to

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development, with limited opportunities for groups to share and learn from each other, resulting in communities ‘reinventing the wheel’ (Jarvis et al. 2016). These challenges point towards a need for a mode of communication that can capture and share solutions commonly used by cohousing groups and that can assist in prompting a discussion around design within the group.

Pattern languages are drawn upon in this research as a methodological tool for capturing commonly used solutions within an easy-to-understand and actionable format. Since the original ‘A pattern language’ was published (Alexander et al. 1977), new pattern languages have been developed on different topics from research across a range of disciplines, including education, healthcare and software design. Despite this, ‘A pattern language’ has attracted criticism around its subjectivity, tone, and format. This paper addresses some of these criticisms by drawing upon well-recognised and rigorous principles of grounded theory to underpin pattern language development with a clear chain of empirical evidence.

The application of the grounded pattern methodology to the study of cohousing residents’ involvement in shared outdoor spaces, demonstrates the potential of pattern languages as a participatory research, collaborative design and theory building tool. The paper builds upon previous work (Felstead and Thwaites 2021), by discussing the outcomes of testing the pattern language card game format in a series of workshops. This work is of significance to researchers, community groups, organisations and practitioners seeking a method for engaging communities in design, documenting commonly used solutions in accessible formats and developing concepts and theories from empirical research.

The paper begins by briefly describing pattern languages and their limitations as a methodological tool. Next, approaches to pattern language development used by other researchers are reviewed and combined with core principles of grounded theory to address some of these limitations. This is followed by a step-by-step description of how the grounded pattern methodology was applied to the study of residents’ participation in cohousing landscapes, including testing of the pattern language through workshops. In conclusion, this paper discusses what was learnt by applying the pattern language methodology in this context and the findings from initial testing of the pattern language in these workshops.

1.1. Pattern languages as a research methodology

The original pattern language was introduced by Christopher Alexander as an instructional tool for engaging people in the built environment to create places that feel ‘*alive*’ and ‘*whole*’. The book ‘*A pattern language*’ (Alexander et al. 1977), succinctly captures frequently occurring built environment forms and solutions as replicable design templates, known as ‘patterns’¹. 253 patterns are collated into a collection organised by scale, from ‘regional’ to ‘personal’. This collection acts as a ‘language’ from which multiple patterns can be combined into more complex design ideas, like words can be combined into longer sentences and narratives.

Patterns are standardised templates that capture solutions that are commonly used to deal with challenges and problems in the built environment.¹ The template is designed in such a way to ensure the solution is documented in an

accessible, easy-to-understand and actionable format. Patterns are highly interrelated and are both defined by and reliant upon one or more others. In ‘A Pattern Language’, patterns are organised by scale (Alexander et al. 1977), with larger scale patterns providing the context within which smaller scale patterns operate and provide the detail required to complete larger patterns. A pattern language, therefore, refers to a collection of interrelated solutions that can be selected and combined in infinite ways to create more complex and customisable design solutions.

Pattern languages present a practical design and research tool, which have several characteristics that make them suited to the study of places where end-users are actively involved in its making. This includes the potential for pattern languages to capture both spatial forms and social events, transfer knowledge between professionals and laypersons, be adapted and combined to suit local conditions, and allow users to improve upon and contribute their own solutions (Helfrich 2015; Jessop 2004; Leitner 2015). Therefore, as a research method, pattern languages have potential for capturing multifaceted data on urban places, producing accessible research outputs and engaging participants in research.

While many find pattern languages to be an engaging and impactful approach to researching urban environments, a review of the critical responses to ‘A pattern language’ draws attention to several limitations. These include a lack of objective evidence base underpinning its development, dogmatic tone and fixed format (Dawes and Ostwald 2017). Therefore, when applying pattern languages as a methodology, it is important that any potential limitations around rigour, bias and accessibility are addressed. This includes consideration of accessible, participatory formats and methods and clear and rigorous documentation of evidence underpinning the patterns – the latter point being crucial for the development of concepts and theory building.

1.2. Pattern language methodologies

A review of papers (Supplement 1) using methodologies to develop new pattern languages demonstrates that this approach has been adopted across a range of disciplines, including healthcare (Roze Des Ordonis et al. 2019), education (Iba, Sakamoto, and Miyake 2011), information technology (Fehling et al. 2014; Hentrich et al. 2015) and sociology (Schuler 2002). These papers draw upon a wide variety of qualitative methods, chosen to suit the discipline, context, and topic of study. Although there is no definitive method, or set of methods, most suited to the development of pattern languages, three papers are explicit in describing an overarching phased approach to pattern language development. Schuler (2002), Fehling *et al.* (2014) and Iba *et al.* (2011) all use similar and overlapping phases in the pattern language development process, outlined, and compared in Table 1.

In comparing the pattern language methodologies in Table 1, the pattern language development process has been rationalised into the following five phases:

- (1) *Problem-solution mining*. Identifying frequently occurring solutions to common problems within a set of data collected within a given context.

Table 1. A comparison table of three pattern language methodologies rationalised into five pattern language development phases (adapted from Felstead and Thwaites 2021).

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

- (2) *Pattern clustering.* Grouping together comparable solutions and problems under categories or themes to abstract case-specific solutions towards a general but implementable pattern.
- (3) *Pattern writing.* Drafting a prototype pattern name and description within a consistent template and using clear instructional language. Draft patterns are then continually tested and improved.
- (4) *Pattern cataloguing.* Documenting the relationships between patterns, organising them within an overall structure, and creating the final format of the pattern language.
- (5) *Language testing.* Gaining feedback from end users' application of draft patterns to confirm and improve the pattern language. The content and structure of the language can be added to and improved upon, as an iterative process. (Felstead and Thwaites 2021)

These papers build upon Alexander's original pattern language with variations in pattern templates and language formats, which include a deck of cards (Iba and Utsumiya 2018), and online databases (Schuler 2002). Some studies also adopt different ways of structuring the language, using themes and categories (Hentrich *et al.* 2015; Iba, Sakamoto, and Miyake 2011) or network diagrams (Schuler 2002), reflecting Alexander's argument that '[s]ince the language is in truth a network, there is no one sequence which perfectly captures it' (1977, 18). Although Roze Des Ordon *et al.* (2019) draw upon existing concepts and theories to explain and categorise the pattern findings, none of the literature reviewed used pattern

languages as emergent concepts to develop new theory. The following section will explore how grounded theory can be used to reinforce the methodological phases outlined above and provide a route to building theory from pattern languages.

1.3. A grounded pattern methodology

The proposed Grounded Pattern Methodology draws upon Grounded Theory as a complementary methodology that can provide additional rigour in operationalising the above outlined pattern language phases. Grounded Theory is an open and inductive research approach that discards predetermined theories and concepts in favour of generating new theory from empirical data (Glaser and Strauss 1999). The principles and techniques central to a Grounded Theory approach include openness, immediate analysis, coding and comparing, memo-writing, theoretical sampling, theoretical saturation, and theory building (Sbaraini et al. 2011).

Both Grounded Theory and pattern language development share an inductive analytical approach, focusing initially on the particularities of real-world examples to draw out more abstracted findings. As others have highlighted (Hentrich et al. 2015; Sebastian, Oppermann, and Keyson 2011), the fundamental principles of Grounded Theory broadly align with the phases of pattern language development. In this way, Grounded Theory can provide complementary procedures for establishing greater clarity and rigour in linking empirical evidence with the pattern language research output. Table 2 illustrates how Grounded Theory principles integrate with the five phases of pattern language development to substantiate and operationalise the Grounded Pattern methodology.

A grounded pattern methodology can be summarised through the following iterative and inductive process outlined in Table 2. Firstly, problems and solutions are mined from empirical data using *openness* in the coding approach, and *immediate analysis* during data collection to allow for subsequent *theoretical sampling* of data. This is followed by 'pattern clustering', grouping of similar codes into broader concepts and categories through the *coding and comparing* of data. Next, 'pattern writing' documents common solutions within set pattern templates, treated as a form of *memo-writing* during the analytical process to

Table 2. A table aligning the pattern language development phases with the key principles of grounded theory as outlined by Sbaraini et al. (2011).

Pattern Language Development Phases	Key Grounded Theory Principles	Description
(1) <i>Problem-solution mining</i>	<i>Openness</i> <i>Theoretical sampling</i>	An open approach that rejects preconceived ideas in favour of emergent areas of importance using inductive analysis. Findings, relationships, and gaps arising from analysis that inform changes to data collection or participant selection.
(2) <i>Pattern Clustering</i>	<i>Immediate analysis</i> <i>Coding and comparing</i>	Analysing at the same time as or shortly after data collection. Breaking down data under labelled 'codes', while comparing between data and gradually combining into categories.
(3) <i>Pattern Writing</i>	<i>Memo-writing</i>	Notes written during the research to note concepts and relations emerging from the comparison of data.
(4) <i>Pattern Cataloguing</i>	<i>Theory building</i>	A set of related concepts grounded in the data, (emerging from the memo-writing and code comparison) that form a cohesive theory.
(5) <i>Language Testing</i>	<i>Theoretical saturation</i>	Continuation of data collection and analysis until all emerging concepts are fully comprehended and demonstrated.

identify and refine emerging patterns and their relationships. 'Pattern cataloguing' then allows for further comparison of the relationships between concepts to develop broader organisational categories or sequences. These categories or sequences can be used to help organise the patterns, enabling the effective navigation and identification of relevant patterns by uses, but also to further group and link similar patterns into concepts to support *theory building*. Finally, 'language testing', something which is more closely aligned with action research than Grounded Theory (Sebastian, Oppermann, and Keyson 2011), provides further opportunity to gather data to confirm findings and move towards *theoretical saturation*. Finally, each phase of a grounded pattern methodology can be applied iteratively, as the researcher may need to repeatedly return to previous phases to inform and refine the process in response to emerging findings.

2. Applying the grounded pattern methodology

The Grounded Pattern methodology was applied to a study aiming to develop a pattern language for community involvement in residential landscapes. Cohousing developments in the UK were selected as a useful context to identify patterns of community participation in shared residential landscapes, because they combine private homes with communal shared spaces (McCamant, Durett, and Hertzman 1994) and residents are highly involved in the acquisition, design, management and maintenance of these shared spaces (Jarvis 2015; Ruiu 2016). Four cohousing developments in the UK that met the selection criteria for the study (occupied cohousing developments, with shared outdoor spaces, located in an urban area) agreed to take part in the research. Multiple qualitative methods were adopted to allow for the collection of different types of data and the relations between spatial form, social activities and relations. This included 13 site visits, 8 walking-tour interviews with residents, and 3 interviews with design practitioners (architects and landscape architects) who took part in the design of the site. During the pandemic the methods were adapted to include 2 online or phone interviews with residents and 3 resident video diaries to allow for the collection of the remaining data remotely. The observations and questions asked during the data collection focused on the solutions and challenges of participation in shared spaces, covering topics of design, maintenance, governance, social relations, decision making, roles and wider networks. The study was approved by The University of Sheffield Landscape Research Ethics Committee.

2.1. Problem-solution mining

Prior to data collection the participant and researcher reviewed the participant information sheets and signed a consent form. Following data collection, the data was documented as multi-modal transcripts – a combination of written transcriptions, images, documents, and notes – and then 'open coded' using NVivo CAQDAS software. Coding the data involved identifying case-specific contexts, problems and solutions in the data relating to residents' involvement in the shared landscape and allocating them to appropriately named 'codes'. For example, descriptions and observations of the outdoor spaces being used by and maintained

Table 3. Examples of quotes open coded to specific context, problem or solution codes.

Empirical data	Code Type	Open code
<i>"Essentially as soon as you step outside your door, you're in a shared territory, so you don't own that ..."</i>	Context	[Most outdoor space is shared]
<i>"Where we were round the back [of residents' homes] there, that's everybody's area, but at the same time, that's next to their house. People would feel a bit odd just going and sitting around there".</i>	Problem	[Shared spaces close to homes are not used]
<i>"... from [this resident's] point of view, putting up the fence and feeling like [they] want that bit of private space. Whether that's an illustration of a human need, we need a bit of [space] ..."</i>	Problem	[A need for individual ownership space]
<i>"Everyone has got a balcony or a private garden ... small garden. If you didn't want to be sociable you could use those".</i>	Solution	[Small private garden to be alone]
<i>"... some small patio spaces had been built in discrete locations outside each house so that there is a small space to put plant pots and chairs".</i>	Solution	[Small patio to personalize]
<i>"So we've got a balcony which we can go and have a look at if you wanted, it's got some pots and stuff up there and things ..."</i>	Solution	[Balconies for flats to personalize]
<i>"And the vision here was productive gardens, so every household has their own small allotment"</i>	Solution	[Small allotment plot to grow food]

by the whole group were allocated to the 'context' code [Most outdoor space is shared]. A lack of outdoor space in which individuals could find privacy, personalise, or otherwise exert control over were allocated to suitably labelled 'problem' codes. The allocation of small gardens, patios, balconies, or allotment plots as individual spaces were similarly allocated under suitably labelled 'solution' codes, as shown in Table 3.

2.2. Pattern clustering

Once several transcripts had been analysed, a substantial number of case-specific open codes were produced. Similar codes were then combined and rationalised into core context-specific problem-solution codes, which were then further clustered under potential patterns. This process, shown in Table 4, helped to ground emerging patterns, as a more general solution, within case-specific examples and document the trail of empirical evidence underpinning each pattern.

2.3. Pattern writing

Once all the data was coded, a summary of all the data for each pattern was written up as a case study report, and then summarised within a coding matrix to allow for easy comparisons between the cases. The coding matrix helped to clearly identify solutions occurring across multiple cases, as patterns (Table 5).

Commonly occurring and significant patterns were written up into a standardised playing card template (Figure 1) containing a category, number and name, sketch or diagram, summary, instructional description and list of related patterns. A card game format was chosen to develop new insights and a common knowledge between participants to shape design practices (Brandt 2006) providing an accessible and engaging format for pattern languages to be applied in practice.

Table 4. Examples of similar case-specific open codes, clustered under core context- problem-solution relations, and then labelled as a potential pattern name.

Empirical data	Case-specific open code	Core context- problem-solution	Potential pattern
<i>"Essentially as soon as you step outside your door, you're in a shared territory, you don't own that ..."</i>	Context: [Most outdoor space is shared]	A small private space for residents to retreat away from the shared outdoor spaces when needed and to personalise as they wish	Small private plots
<i>"Where we were round the back [of residents' homes] there, that's everybody's area, but at the same time, that's next to their house. People would feel a bit odd just going and sitting around there".</i>	Problem: [Shared spaces close to homes are not used]		
<i>"... from [this resident's] point of view, putting up the fence and feeling like [they] want that bit of private space. Whether that's an illustration of a human need, we need a bit of [space] ..."</i>	Problem: [Need for individual ownership space]		
<i>"Everyone has got a balcony or a private garden ... small garden. If you didn't want to be sociable you could use those".</i>	Solution: [Small private garden to be alone]		
<i>"... some small patio spaces had been built in discrete locations outside each house so that there is a small space to put plant pots and chairs".</i>	Solution: [Small patio to personalize]		
<i>"So we've got a balcony which we can go and have a look at if you wanted, it's got some pots and stuff up there and things ..."</i>	Solution: [Balconies for flats to personalize]		
<i>"And the vision here was productive gardens, so every household has their own small allotment"</i>	Solution: [Small allotment plot to grow food]		
<i>case-specific examples</i>	<i>open coding</i>	<i>general solution</i>	

Table 5. Extract of pattern 58. 'Small private plot' from the coding matrix.

Pattern No. & Name	Case Study 1 Evidence	Case Study 2 Evidence	Case Study 3 Evidence	Case Study 4 Evidence
58. <i>Small private plot</i>	There are currently no private outdoor spaces on the site, all the outdoor spaces are collectively owned. This is a tension within the community.	Most residents have a private balcony or patio space. Two residents do not have a private space.	All residents have a private back garden or a private balcony if they live in a first floor flat. All residents are given a private allotment plot.	There are a mix of patio spaces, narrow front gardens, and balconies. Not officially private but used as private spaces.

2.4. Pattern cataloguing

The application of the previous grounded pattern phases uncovered 72 prototype patterns for getting residents involved in shared outdoor spaces.

The patterns were structured thematically, rather than by scale, as a way of arranging and navigating the patterns as a language (Table 6) including more socially-focused patterns that lacked qualities relating to scale. The categories were named according to the type of involvement in shared outdoor spaces – including 'establishing a vision', 'making decisions', 'creating resources', 'using spaces', 'working with others', 'design of spaces' and 'for practitioners'. To further explore the links between



Figure 1. Pattern 58. ‘Small private plot’ written into the playing card template.

the patterns, they were exploratorily mapped in different ways, including by scale, stakeholder relationship, and tensions experienced by communities (Figure 2). The latter revealed how patterns were employed by residents to negotiate five underlying tensions within cohousing landscapes—‘private and shared’, ‘autonomy and organisation’, ‘DIY and expertise’, ‘insider and outsider’, ‘uncertain and fixed’. This process led to the development of new concepts, backed up with existing literature, to substantiate and build new theory.

2.5. Language testing

The pattern language was produced as a deck of 72 cards organised by themes (similar to suits in traditional playing cards). The cards acted as tangible pieces that provide ‘things-to-think with’, and like a traditional set of playing cards, can be played in several different ways to suit ‘the scope, the participants to be involved and available resources’ (Brandt 2006, 65).

Table 6. A table of the 72 patterns grouped into seven thematic categories.

<p>Establishing a vision</p> <ol style="list-style-type: none"> 1. Shared intentions 2. An evolving vision 3. Value in diversity 4. Self-selecting group 5. A 'steady core' 6. A manifesto 7. Policies & agreements 8. Picture in many ways <p>Making Decisions</p> <ol style="list-style-type: none"> 9. Signposting 10. Open channels 11. Whole group consensus 12. Smaller working groups 13. Having a say 14. Communication training 15. Decision logging <p>Creating resources</p> <ol style="list-style-type: none"> 16. A learning project 17. Pooling resources 18. Communal workdays 19. Individual knowhow 20. Solo enterprise 21. Self-build in stages 22. Quick fixes 23. Trial-runs & mock-ups 24. Reuse & repurpose 	<ol style="list-style-type: none"> 25. Rewilding the garden 26. An allocated budget 27. A cottage industry 28. Growing produce 29. Composting <p>Using spaces</p> <ol style="list-style-type: none"> 30. The unwritten rules 31. Creative play 32. Celebrations & traditions 33. A shared meal 34. Connecting to nature 35. Being alone 36. Personalise <p>Working with others</p> <ol style="list-style-type: none"> 37. Networks & hubs 38. Online platforms 39. Learning from peers 40. Family & friends 41. Good neighbours 42. Point of contact 43. Hiring out 44. Resident – experts 45. Open days 46. Neighbourhood events 47. Hosting 48. Taking part in research 	<p>Design of spaces</p> <ol style="list-style-type: none"> 49. Living in the city 50. Housing cluster 51. Restricting cars 52. Central green 53. Central utilities & storage 54. Shared landmarks 55. Commonhouse spill out 56. Open gateways 57. Public access 58. Small private plot 59. Permeable buffers 60. Leftover space 61. Wilderness 62. Pocket retreat 63. Dedicated play area 64. Moveable furniture 65. The noticeboard 66. Signs, instructions & labels <p>For practitioners</p> <ol style="list-style-type: none"> 67. Get to know the group 68. Expanded scope 69. Technical advisor 70. Group facilitator 71. Go-between 72. Design for adaption
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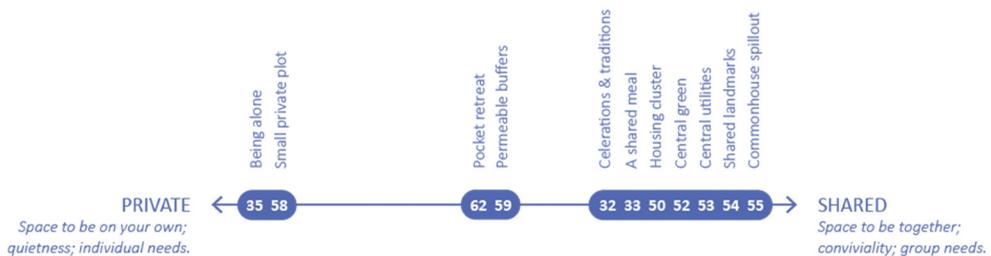


Figure 2. Example of the mapping patterns along a spectrum according to the level of 'privacy' or 'sharing' they afford.

In this research the pattern language was tested using (A) an online presentation and feedback session with a small group of cohousing residents, (B) an on-site problem-solving workshop with cohousing residents and (C) a future scenario building workshop with undergraduate design students (see Table 7). A problem-solving game (see Game #1, Figure 3) was played by residents from Case Study 2 to develop shared ideas for solving issues that had arose in the shared spaces since they had moved in. Residents used and combined the patterns dealt to them to suggest a solution to previously identified challenges. A scenario-based game was played by students to imagine how a hypothetical housing design might be used and adapted by residents in the future and what they could do to facilitate participation as a practitioner. Here students used their dealt hand of pattern cards to prompt ideas

Table 7. A description of the activities held to test the pattern language.

Format	Participants	Focus & Activities	Output(s)
(A) Presentation (online)	<10 cohousing residents from Case Study 4	Present card game and get feedback. 1. Presentation of findings 2. Discussion and feedback session.	Verbal feedback and follow up emails from residents
(B) Problem-solving Workshop (on-site)	~15 cohousing residents from Case Study 2 (3 small groups)	Identify and solve challenges in shared landscape. 1. Write individual visions on post it notes 2. Identify shared interests and visions as a group 3. Discuss challenges and problems of vision 4. Deal out and play cards that can solve problem	Reflective notes by the researcher and photos of workshop notes by residents
(C) Scenario building Workshop (classroom)	~30 students (6 small groups)	Develop ideas for future resident participation. 1. Discuss characteristics of imagined community 2. Build future scenarios from delt cards 3. Use cards to prompt design of space	Questionnaires filled in by students

for how residents would use, adapt, and participate in the spaces within their designs. The workshops provided initial feedback on the validity of the patterns, the practicality of the format, and applicability of the language. The outputs from these workshops included verbal and written feedback, observational photos (for example [Figure 4](#)) and reflective notes, from which a content analysis was used to identify the lessons learnt.

3. Discussion

The Grounded Pattern Methodology applied to the study of UK cohousing cases produced 72 patterns for getting residents involved in shared landscapes, a pattern language card game and five conceptual themes. Reflections on applying the grounded pattern methodology and testing the pattern language card game output revealed several benefits and limitations to using this approach. In particular, the study highlighted the versatility of the grounded pattern methodology in producing an output that can simultaneously act as a participatory research tool, problem-solving design prompt and pathway for building new theory from empirical data. The benefits and limitations of these varying facets of the grounded pattern methodology are discussed in the following sections.

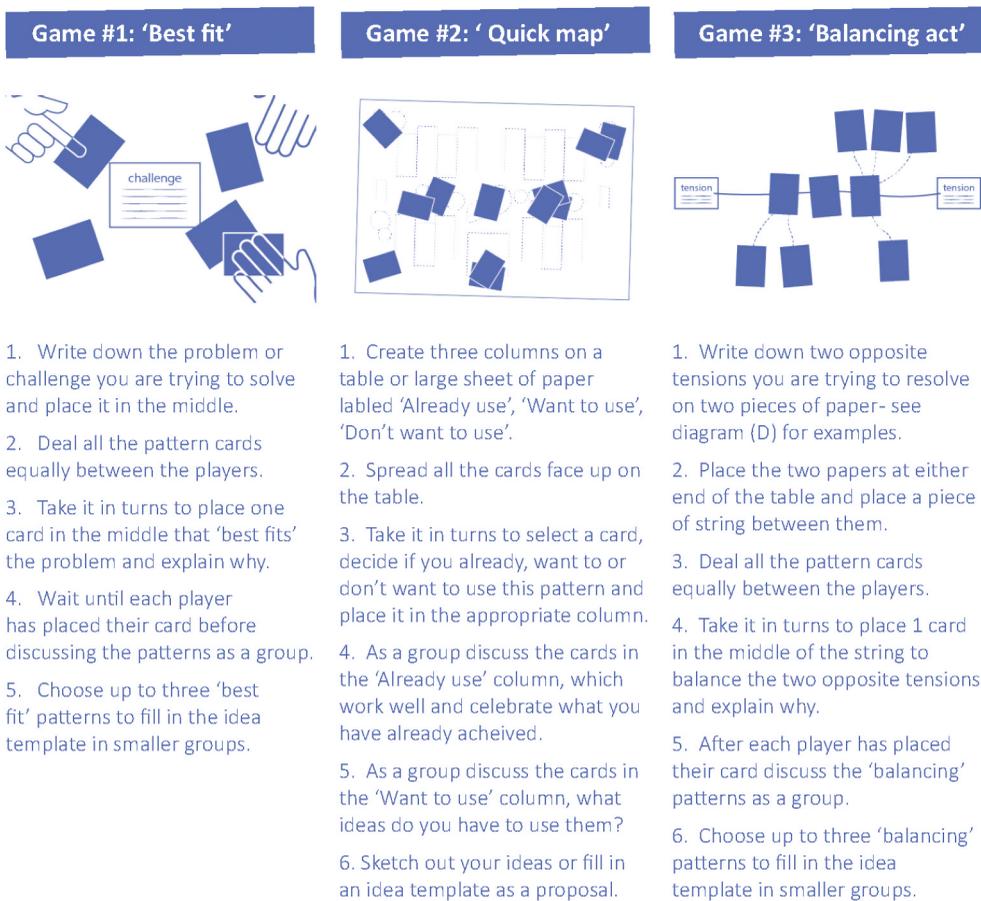


Figure 3. Extract of instructions given to participants of different ways of using the card game.

3.1. Pattern languages as a participatory research tool

The pattern language card game produced from the grounded pattern methodology, provided a research output that was useful as a tool for sharing the research findings, and gaining feedback from participants. The in-person workshops were successful at engaging residents in reading the pattern cards and taking part in the card game activities. The card format provided an output that was both mobile and interactive in community or educational settings, prompting dialogue and feedback between residents. For example, during the 'problem-solving workshop 1', the cards prompted a resident to talk about their recognition of the pattern '54. Central Landmarks' as a prominent central tree on their site, confirming observations made during the data collection stages of the research. The workshop also revealed further data on spaces that had yet to be built, such as residents' wish for an outdoor shelter to allow for activities to be held outdoors in all weathers due to the COVID-19 pandemic. This highlighted a need for a feedback mechanism for users to contribute new patterns to the language over time.

The pattern language was useful in providing residents with a shared vocabulary to describe and discuss hard-to-articulate ideas relating to the design of



Figure 4. Photo of a workshop held with a cohousing community to reimagine new solutions to the challenges they faced in their shared outdoor spaces.

shared outdoor spaces. In the study it was noted in feedback from one cohousing community where several members had floated the idea of having a quiet space to sit alone outside, and subsequently borrowed the pattern name '62. Pocket retreat' to describe and share the idea with the rest of the group. For the cohousing residents, the card game provided some relief from the more time-consuming and conflicting group decision making processes, by creating 'a more informal atmosphere' (Brandt 2006, 65) for communicating design ideas. This reinforces what has been described previously about pattern languages as being useful to 'communicate common ideas about complex relationships more easily' (Leitner 2015, 15), 'share opinions beyond one's specialities' (Iba and Utsunomiya 2018, 233) or express ideas that 'have not yet been made visible and explicit' (Helfrich 2015, 33). The card game format, therefore, reinforces the benefits of pattern languages by enabling a fun and informal method of applying the patterns to the design of space.

Although the card game worked well for engaging participants in person, it was more difficult to translate this experience into an online format. The online workshop was not as successful in engaging those who attended and gaining feedback through this event. Further to this, the printed version of the card game afforded little opportunity for residents to edit, add to or revise the patterns from their own experience, a key aspect underpinning the original ethos of a pattern language (Alexander et al. 1977; Helfrich 2015).

3.2. Pattern languages as a problem-solving design tool

The card game is primarily designed to be used by residential communities to assist in identifying and resolving problems related to shared outdoor spaces, and for practitioners working with residents who want to be more involved in the design process. The pattern language was successful in prompting the imagining of future scenarios and new ideas for residents' involvement. For cohousing residents, the game prompted new ideas around building a covered terrace to host family and friends, options for reducing car use, a giant waterproof blackboard to share information and making annual traditions. For students, the card game was useful for generating socially focused scenarios that could occur in a housing design project overtime, including ideas around temporary events and activities, long-term adaptations to the site, community rules and organisation, and utilising residents' skills and knowledge. This suggested that both residents and students were able to understand and interpret the patterns to prompt ideas for getting residents involved in shared outdoor spaces.

Although the pattern language card game was found to be useful in prompting new ideas, there were limitations in how useful it was for design implementation. Requests for photos of what 'pocket retreats' might look like from residents and a lack of spatial articulation of students' design ideas in the workshops and questionnaire, suggested both residents and students struggled to transform their ideas into physical forms. This may have been due to the short duration of the workshops in which 1–2 hours was not enough time to effectively explore these ideas spatially. Alexander envisioned pattern languages would transfer design expertise to people and empower them to create their own buildings and spaces without the help of architects. However, this research found that although the pattern language card game was a useful tool for communication and for generating new design ideas, it did not transfer the design skills required to transform those ideas into a site-responsive spatial form. This echoes findings from others who describe pattern languages as a useful starting point for the design process but they can't 'prescribe [...] exactly "what" to do' (Hentrich et al. 2015, 4) when resolving a design problem. Therefore, there remains an important role for design practitioners to facilitate the transformation of pattern-induced ideas into a spatially resolved form.

3.3. Pattern languages as a theory building tool

The grounded pattern methodology had multiple benefits as a research tool. Firstly, it was able to capture socio-spatial solutions within complex, multi-faceted data documented from 'live' settings (Felstead and Thwaites 2021). Secondly, as has been outlined in detail in the previous section, incorporating methodological procedures commonly used in grounded theory, helped to document a clear chain of evidence between the empirical data and research findings, which has been previously criticised in the original 'A pattern language'. Finally, the grounded approach allowed for patterns to be treated as theoretical building blocks from which broader concepts and theories are developed.

The patterns were mapped along a series of thematic spectrums, differing from the original pattern language which was organised by scale. The decision to explore the relationships between patterns along a spectrum of opposing ideas was prompted by

resident feedback that the patterns were overly solution-oriented and didn't convey the tensions residents experienced. Mapping the patterns along different types of conflicting issues that the solutions within the patterns were attempting to resolve (Figure 2), demonstrated more clearly the tensions that cohousing residents experienced when getting residents involved in shared outdoor spaces. These 'tension spectrums' became a useful conceptual framework for which to discuss the findings of the research with participants and draw upon wider literature to further reinforce or explain these ideas. In this way, the grounded pattern methodology allowed for the case-specific findings from cohousing to be abstracted towards more theoretical findings with potential wider relevance to other types of community-led placemaking.

Building theory from pattern languages wasn't commonly undertaken in previous studies. Therefore, the grounded pattern methodology helps to operationalise what Leitner describes as the potential for pattern languages 'to seamlessly combine theoretical research with its practical application' (Leitner 2015, 15) '... like a building block for learning about and designing very different projects and processes' (Leitner 2015, 17). The emergent concepts and theories produced from grounded theory research are considered hypotheses (Sbaraini et al. 2011), the same term with which Alexander uses to describe patterns (Alexander et al. 1977). Therefore, the pattern language should be considered an unfinished product ideally undergoing a longterm process of testing and amendment overtime.

4. Conclusion

This paper presents a phase-by-phase description of the grounded pattern methodology and its application to the study of cohousing residents' involvement in shared outdoor spaces. Reflections on the application of this method draws attention to the versatility of the grounded pattern methodology, as well as its benefits, limitations, and future research.

As a participatory research method, the grounded pattern methodology enables ease of communicating and validating research findings to participants in an accessible and interactive way. This research explored the use of a card game format, which was successful as an interactive way of engaging groups of residents in-person, but less so in engaging residents online. This will be of interest to researchers and practitioners in landscape architecture looking to engage communities in research and produce accessible and implementable research outputs. Future research and development of the methodology could explore 'editable' online and digital formats that allow end users to add to and amend the pattern language, so that it can evolve over time.

As a design tool, the grounded pattern methodology produces a common language that aids the communication of socio-spatial solutions and idea generation between different members of a group. However, this research found that patterns do not necessarily transfer the technical skillset required to adapt the more generic solution provided by the pattern into a site-specific design resolution. Some authors, such as Palmieri et al. (2021) have explored how patterns can be co-produced, adapted and reconfigured by residents. This demonstrates the potential for pattern languages to be used in combination with other participatory design methods, such as co-mapping and -modelling, to transfer the vision or solutions prompted by the pattern language into

a spatial form. Further research is required to explore the role of design practitioners in facilitating the implementation of the pattern language to allow participants to engage more confidently in the design process. In addition, exploration of how the pattern language may be used by a wider range of stakeholders and other types of residential contexts would be beneficial.

As a theoretical research tool, the grounded pattern methodology identifies common problems and solutions within complex, ‘live’ environments and provides a clear link between empirical evidence, patterns, and broader concepts. In this study, the methodology produced a rich mass of empirical data, providing case-specific examples to underpin more general patterns and concepts. Researchers and practitioners looking to use this method should be aware that implementing the phases of this methodology can be time consuming and, therefore, limit the number of cases that can be studied. Exploration of methods that can capture ‘big data’, affording both breadth and depth, to derive patterns from, or scaling up the testing of pattern languages is welcomed.

Footnotes

1. Examples of patterns from ‘A pattern language’ (Alexander et al. 1977) ranging in scale from regional to neighbourhood and detailed: 16. Web of public transportation – ‘The system of public transportation . . . can only work if all the parts are well connected’ (1977, 92); 45. Necklace of community projects – ‘Allow the growth of shop-size spaces around the local town hall, and any other appropriate community building’ (1977, 244); and 167. Six-Foot Balcony – ‘Whenever you build a balcony . . . always make it at least six feet deep’ (1977, 784).

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