DESIGN FOR INTERACTION
RUIHUA CHEN 2022

APPENDICES

NAVIGATING PATTERN LANGAGE

— A PRACTITIONERS' GUIDE TO DECIDE ON THEIR APPROACH ON PATTERN LANGUAGE THEORY FOR COMPLEX PROBLEMS

Table of Contents

A. Reviewed Cases

46 cases of applying the pattern language theory from various domains were reviewed in the literature review (Chapter 2) and integrative literature review (Chapter 3).

	Title	Reference	Domain	Type
1	The Oregon Experiment	Alexander, 1975	Urban planning	Book
2	Modeling Trust in Enterprise Architecture: A Pattern Language for ArchiMate	Amaral et al., 2020, November	Enterprise architecture; trust	Paper
3	Towards an interaction pattern language for human machine cooperation and cooperative movement	Arcaini et al., 2020	Software system engineering	Paper.
4	Enterprise Architecture Function-A Pattern Language for Planning, Design and Execution	Arnold, 2022	Enterprise architecture	Book
5	Multidisciplinary Team Dynamics in Service Design- The Facilitating Role of Pattern Language	Athavankar et al., 2014	service design	Paper
6	Exploring Cards for Patterns to Support Pattern Language Comprehension and Application in Service Design	Athavankar et al., 2014, December	Service design	Paper
7	Putting it All Together	Bayle et al, 1998	interaction design	Paper
8	A Pattern Approach to Interaction Design	Borchers, 2008	Interdisciplinary design; education	Paper
9	A pattern language for business resource management	Braga, Germano & Masiero, 1999, August	Business; management	Paper
10	Coding Engines in Participatory Social Housing Design—A Case to Revisit Pattern Languages	Bukovszki, Dóci & Reith, 2021	social housing design; community decision-making	Paper
11	TOWARDS A PATTERN LANGUAGE APPROACH TO ESTABLISHING PERSONAL AUTHORING ENVIRONMENTS IN E-LEARNING	Chen et al., 2007	human computer interaction	Paper
12	Leadlets: towards a pattern language for leadership development of human and AI agents	De Vreede, 2020, January	design	Paper
13	Capturing a community's vision as a pattern language: Case study of the Mooiplaas community in Great Kei Municipality, South Africa	Eglin, 2020	Community policy-making	Paper
14	Design Patterns: Elements of Reusable Object-oriented Software	Gamma et al., 1995	software design	Book
15	A Pattern Language for Social: Field Shifts Cultivating Embodied and Perceptual Capacities of Social Groups through Aesthetics and Social Field Archetypes	Gonçalves & Hayashi, 2021	awareness-based action; social arts; theatering	Paper
16	Using pattern languages to mediate theory–praxis conversations in design for networked learning	Goodyear, de Laat & Lally, 2006	networked learning; education	Paper
17	Towards a pattern language for information-centred business change	Hinton, 2002	organisational change	Paper
18	Patterns for Building Customer Relationships in a Pattern Language for Value-Creation Marketing	Iba et al., 2020, July	Business	Paper
19	SPEAKING IN TEAMS: MOTIVATING A PATTERN LANGUAGE FOR COLLABORATION	Johnston & Hicks, 2004	communication; community decision-making	Paper
20	Promoting and Supporting Biodiversity Conservation Activities with the Pattern Language Approach: A Pattern Language for Collaborative Activities for Biodiversity Conservation	Kamada et al., 2019	Biodiversity conversation	Book
21	A Case Study in Participatory Service Design for Rural Healthcare System in India using a Pattern Language	Khambete et al., 2015	service design	Paper
22	Designing Desirable Service Experience: A Pattern Language Framework from Touch Point Ecosystem Perspective	Khambete, 2013	service design	Thesis
23	Towards a pattern language for smart personal assistants	Knote, Söllner & Leimeister, 2018	Software development	Paper
24	Teachers' Collaborative Pattern Language Design	Knutsson & Ramberg, 2018	Design for learning; participatory design	Paper

	Title	Reference	Domain	Type
25	Towards a Pattern Language for Hybrid Education	Köppe et al., 2017	Education	Paper
26	The Pattern Language of Incremental Grading	Köppe, Manns & Middelkoop, 2019	Education; grading system	Paper
27	A Pattern Language Based Learning Design Studio for an Analytics Informed Inter-Professional Design Community	Law et al., 2017	design education; design	Paper
28	KNOWLEDGE MANAGEMENT WITH PATTERNS	May & Taylor, 2003	Knowledge management	Paper
29	SUSTAINABLE DESIGN PATTERN LANGUAGE FOR CSUN'S STUDENT HOUSING	Moftakha, 2013	Participatory design	Thesis
30	DESIGNING CHILD CARE CENTERS USING THE CHILDREN'S ENVIRONMENTS' PATTERN LANGUAGE: THE NORTHERN MICHIGAN UNIVERSITY CHILDREN'S CENTER	Moore, Piwoni & Kennedy, 1989	architecture; urban planning	Paper
31	Particpatory design in open education: a workshop model for developing a pattern language	Mor & Winters, 2008	education	Paper
32	Towards a Pattern Language for Object Oriented Design	Noble, 1998	software design	Paper
33	Patterns for Parallel software design	Ortega-Arjona, 2010	Software design	Book
34	Co-producing, curating and reconfiguring dwelling patterns: A design anthropological approach for sustainable dwelling futures in residential suburbs	Palmieri et al., 2021	policy making	Paper
35	A Pattern Language for Class Responsibility Assignment for Business Applications	Park, 2021	Business; analysis	Paper

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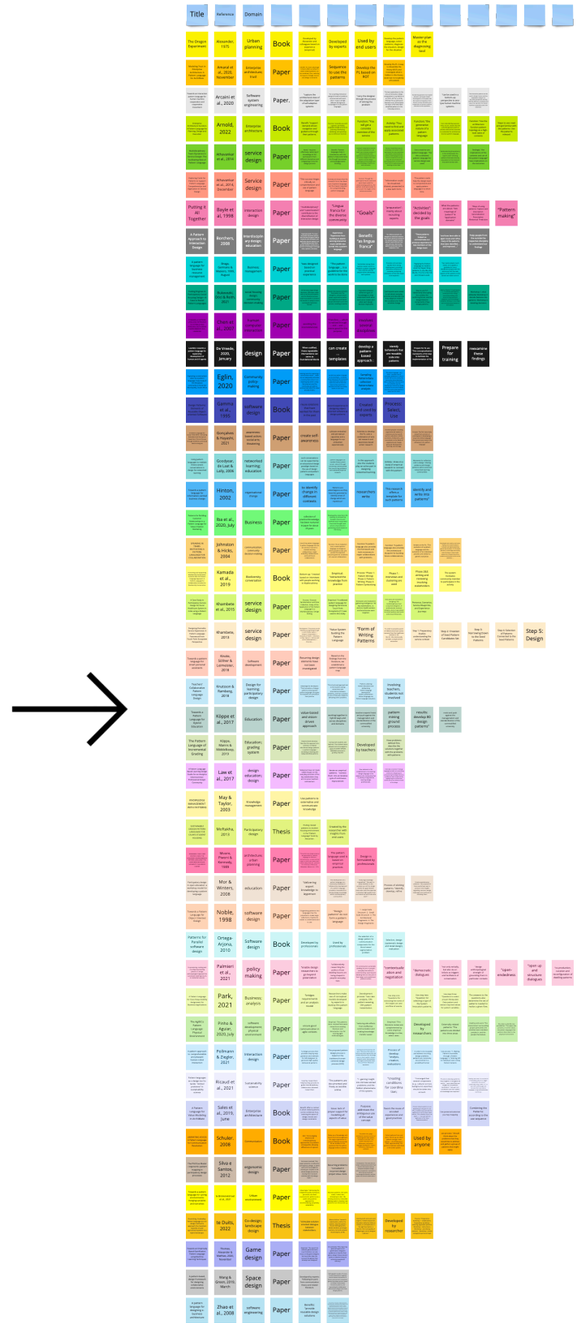
36	The AgilECo Pattern Language: Physical Environment	Pinho & Aguiar, 2020, July	software development; physical environment	Paper
37	A pattern approach to comprehensible and pleasant human–robot interaction	Pollmann & Ziegler, 2021	Interaction design	Paper
38	Pattern languages as a design tool to tackle "wicked problems" in sustainability science	Ricaud et al., 2021	Sustainability science	Paper
39	A Pattern Language for Value Modeling in ArchiMate	Sales et al., 2019, June	Enterprise architecture	Book
40	LIBERATING VOICES A Pattern Language for Communication Revolution	Schuler. 2008	Communication	Book
41	The PhOCoe Model – ergonomic pattern mapping in participatory design processes	Silva e Santos, 2012	ergonomic design	Paper
42	Towards a pattern language for cycling environments: merging variables and narratives	te Brömmelstroet et al., 2021	Urban environment	Paper
43	Flourishing Foodvalley Pattern language as a co-design method to approach the transition towards circular agricultural systems in a hybrid landscape.	te Duits, 2022	Co-design; landscape design	Thesis
44	Towards an Empirically Based Gamification Pattern Language using Machine Learning Techniques	Thomas, Alexander & Mathias, 2020, November	Game design	Paper
45	A pattern-based, design framework for designing collaborative environments	Wang & Green, 2019, March	Space design	Paper
46	A pattern language for designing e-business architecture	Zhao et al., 2008	software engineering	Paper

B. Deconstruction — Coding Process

The codes generated in the deconstruction process are documented in an excel as below. Then the codes are transferred to a Miro board for the clustering process in Appendix C.

	Title	Reference	Domain									
	The Oregon Experiment	Alexander, 1975	Urban planning	Book	Developed by Alexander and colleagues based on experience (empirical)	Developed by experts	Used by end users	Develop the pattern language, select patterns, diagnose the situation, design for the situation	Master plan as the diagnosing tool			
	Modeling Trust in Enterprise Architecture: A Pattern Language for ArchiMate	Amaral et al., 2020, November	Enterprise architecture; trust	Paper	benefit: “its main advantage is that it offers a context in which related patterns can be combined, thus, reducing the space of design choices and design constraints	Sequence to use the patterns	Develop the PL based on ROT	Develop the PL: A way to dissemble the theory (ROT) and investigate what is hidden in this theory (exist but not explicitly articulated)				
	Towards an interaction pattern language for human machine cooperation and cooperative movement	Arcaini et al., 2020	Software system engineering	Paper.	“capture the architectural view of the adaptation layer of self-adaptive systems	“for a working interaction design all need to be able to communicate with each other. A way to bridge different background knowledge is to use pattern languages.	"carry the designer through the process of solving the problem	“Former explorations in the area of interaction design using patterns, e.g. Baltzer et al. (2015, 2017a, b, 2018), Altendorf et al. (2016) and Flemisch et al. (2016) builds the basis of the described simplified patterns in the following sections.	Transferring patterns from related domains, and made simpler: “Starting point of this paper was the transfer of inspiration from human–human interaction and cooperation to human–machine interaction and cooperation.	“can be used in a bottom–up perspective to ana- lyse human machine systems.	“the interaction patterns can be used to design human machine cooperation using it in a top–down perspective starting with the definition of relevant use cases that represent the human machine cooperation prob- lem statement.	
	Enterprise Architecture Function-A Pattern Language for Planning, Design and Execution	Arnold, 2022	Enterprise architecture	Book	Benefit: “support demand-driven navigation and guidance through their patterns.	Function: “provides you with a generic yet flexibly adaptable design process for planning, developing, validating, and operating your architecture function.	Function: “You will get a concrete overview of the service	Activity: “You need to find and apply associated patterns	Function; “the generative nature of a pattern language	Use is decided by purpose: “This, in turn, means that the concrete goal you want to achieve determines how best to customize the architecture function pattern language.	Function: “Use the architecture function pattern topology as a high-level table of contents	Steps to use: read and get familiar with the patterns. Use the patterns relevant

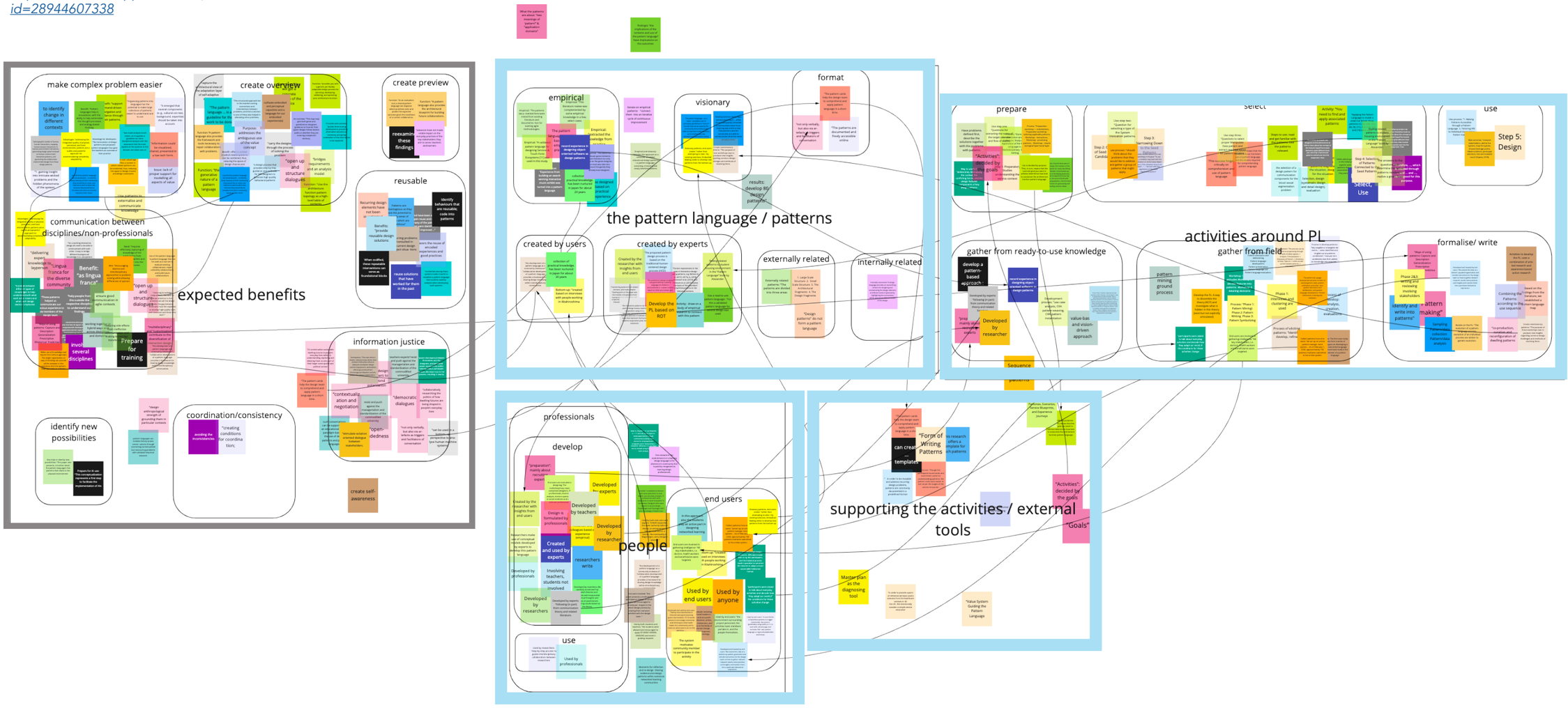
Part of the coding excel details
The complete excel can be seen in
https://miro.com/app/board/uXjVO4ab0bs=/?share_link_id=28944607338



C. Deconstruction — Clustering Process

The codes generated in Appendix B are clustered into themes as below. The grey box contains the expected benefits of PLT in the reviewed cases. The four pink boxes are the four components of PLT approaches.

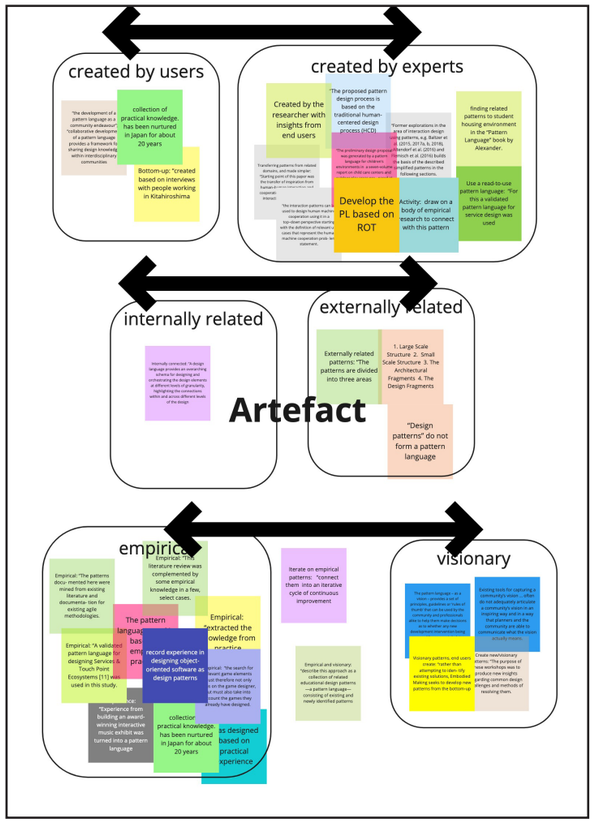
The complete clustering results can be seen in https://miro.com/app/board/uXjVO4ab0bs=/?share_link_id=28944607338

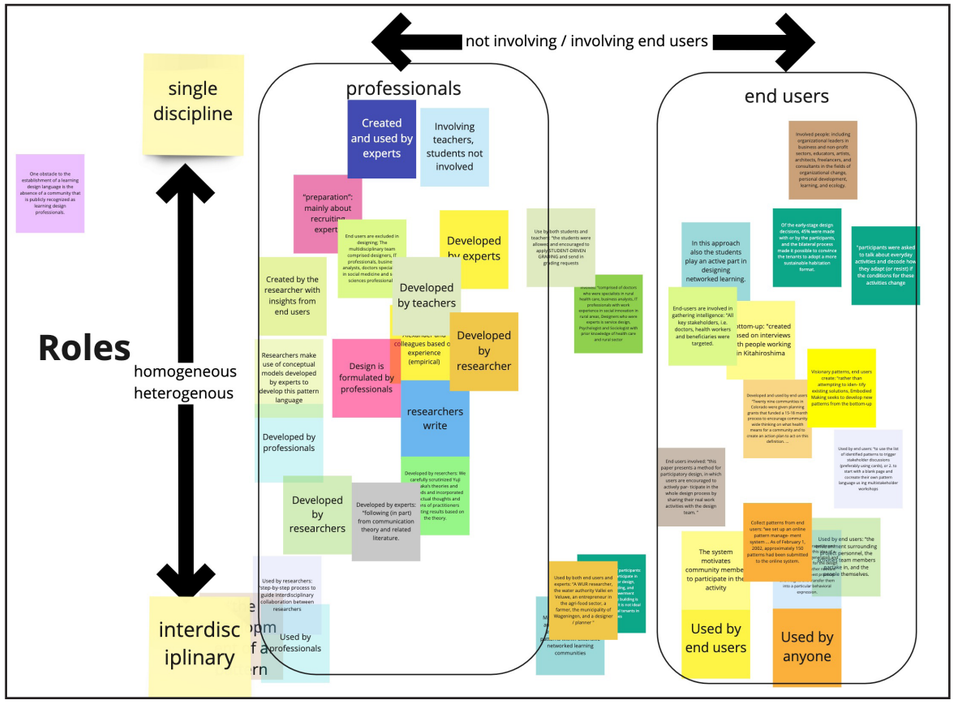


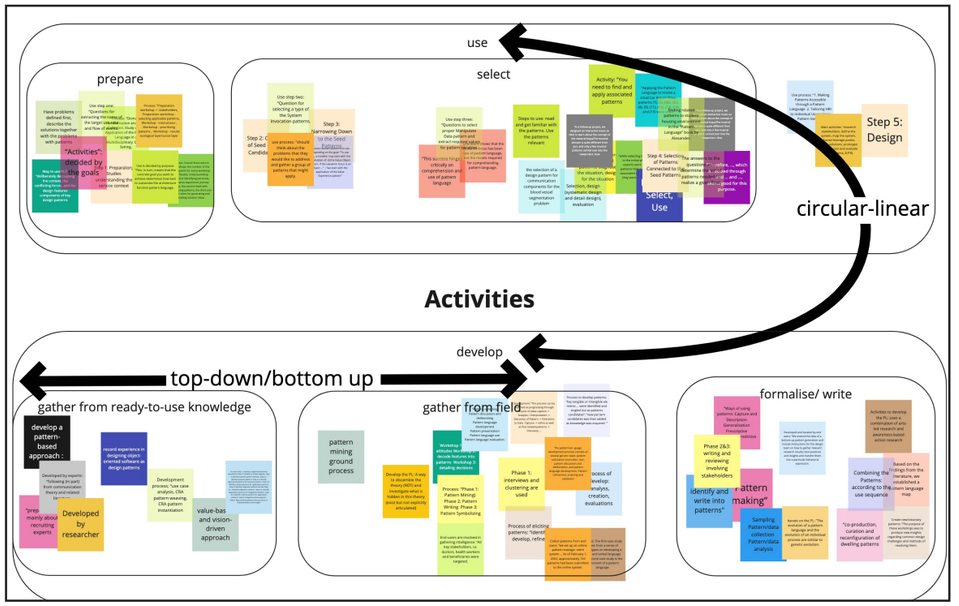
D. Identifying Process

The clustering process to generate the seven dimensions is as below.

The black arrows represent the dimensions identified in this process. The details can be seen in https://miro.com/app/board/uXjVO4ab0bs=/?share_link_id=28944607338

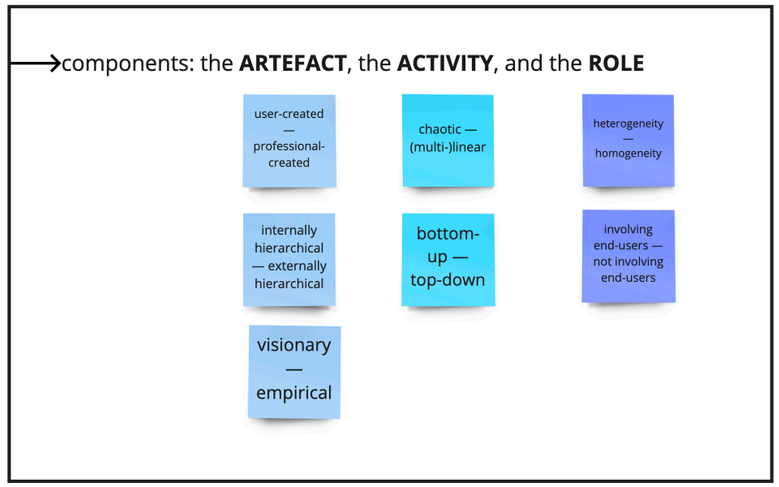




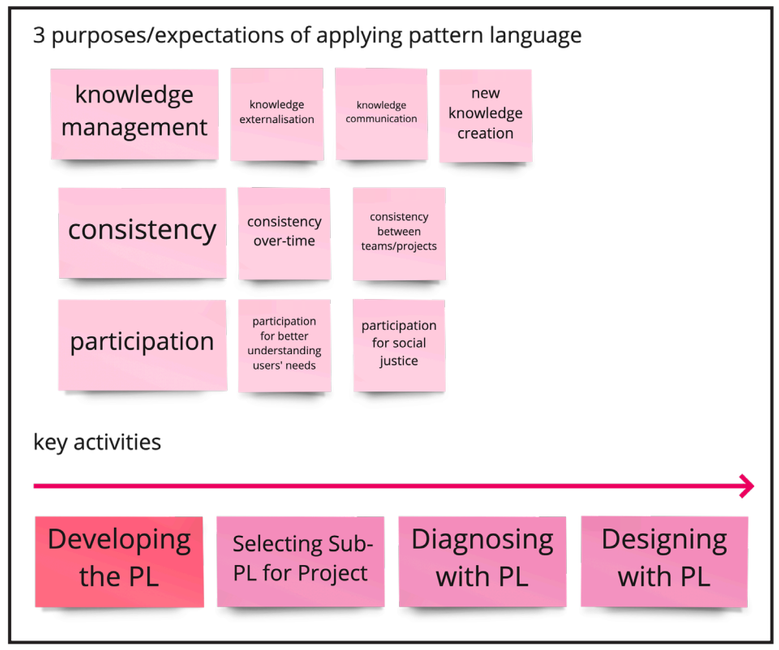


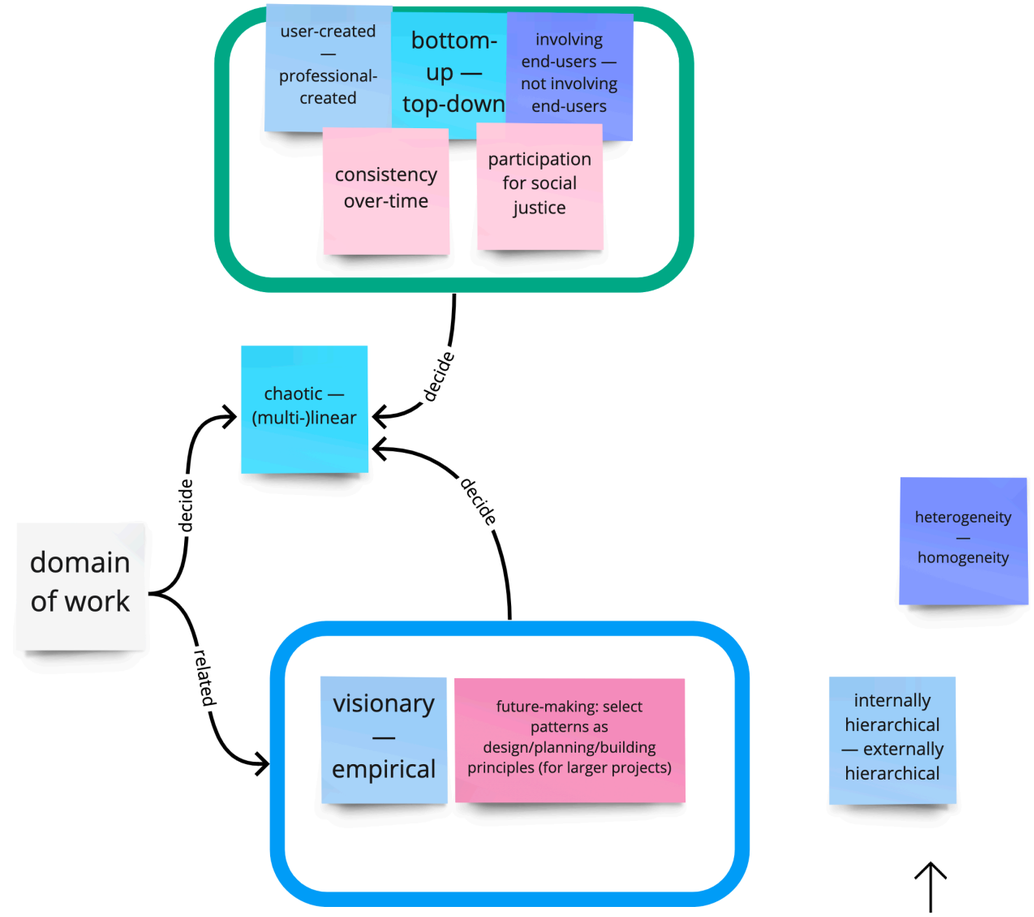
E. Reconstruction Process

More codes were added in a deductive approach to the four components.



The seven dimensions (as above) are clustered into two higher-level groups (green and blue rounded rectangles) as on the right page. The two groups are later related to the benefits, activities (as below) and practitioners' values.





These two dimensions are left out for they are not much related to the two higher-level groups.

F. The Four Tools

The tools generated in Chapter 3.

Approach Axes

Axis of Change-making Direction

Bottom-up ← - - - - - → **Top-down**

change led by end-users — change led by experts

External Characteristics

common expressions	*end-users*, *individual*, *participatory*, *engagement*, *ownership*, *social*, *political*, *depolarise*, ...	might mention *participation of experts* from multiple disciplines, rather than *the participation of end-users*
key user of PL	user-designer	professional designer
source of patterns	user-designer	professional designer

Internal Values

expected benefits specific to this dimension	participation	
key value	**egalitarian** social justice	**mastery** efficiency

Axis of Innovation

Decision-making ← - - - - - → **Vision-making**

reusing good solutions — seeking transformation

External Characteristics

common expressions	*solving recurring problems*, *learning from existing experiences*	*visionary*, *predictive*, *transformative*
key activity	1. Diagnosing with PL 2. Designing with PL	1. Developing the PL 2. Selecting Sub-PL for Project
source of patterns	by extracting from experience	by envisioning

Internal Values

expected benefits specific to this dimension	consistency between teams/projects	consistency over-time
key value	**reusing known solutions**	**industry transformation**

Navigation Panel

Top-down
involving end-users

D
Let experts do it.

B
Let experts envision the future.

Decision-making
reusing extant solutions

Vision-making
seeking for industry transformation

C
Let's do it.

A
Let's envision the future.

Bottom-up
not involving end-users

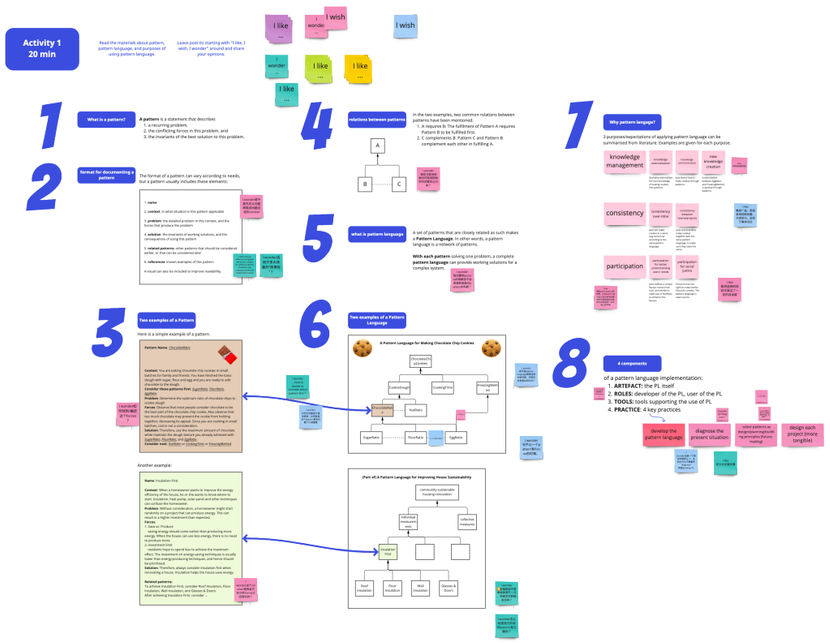
Approach Detail Table

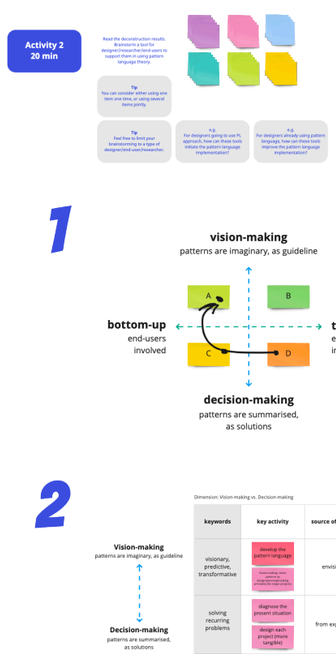
		A bottom-up vision-making	B top-down vision-making	C bottom-up decision-making	D top-down decision-making
internal values	**Value**	1. social justice 2. transformation	1. transformation	1. social justice 2. mastery of immediate problem	1. mastery of immediate problem
	special purpose	1. participation 2. consistency over time	consistency over time	1. participation 2. consistency between teams/projects	consistency between teams/projects
slogan		Let's envision the future.	Let experts envision the future.	Let's do it.	Let experts do it.
external characteristics	**User of PL**	user designer	professional designer	user designer	professional designer
	Developer of PL	**user-designer**	**professional designer**	**user-designer** by empirical experience	**professional designer** by empirical experience
	Innovativeness	envision new possibilities	envision new possibilities	reuse existing solutions	reuse existing solutions
Example cases		te Duits, 2022	Köppe et al., 2017	Silva e Santos, 2012	Noble, 1998; Zhao et al., 2007

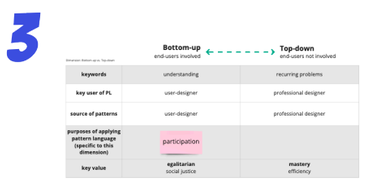
G. Workshop Materials & Outputs

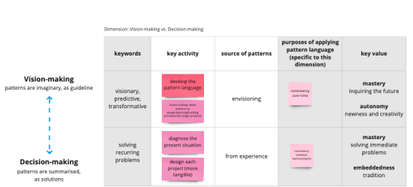
The materials used in the workshops (Chapter 4) and the workshop results are presented in this Appendix. The details can be seen in *https://miro.com/app/board/uXjVO4ab0bs=/?share_link_id=28944607338*

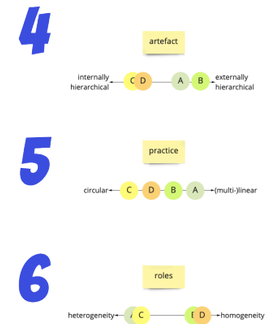
WORKSHOP 1: Materials and Participants' post-its











1 CONCEPT

A pattern is a statement that describes the *invariants** in the *best solution* to a *recurring problem*.

* things that do not change or always exist

2

This statement — the pattern — can be formatted into a **card** consisting these elements:

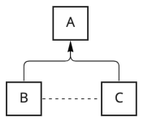
1. **name**
2. **context**
3. **problem**
4. **solution**
5. **related patterns**
6. **references**

3

Look at the 5th element: **related patterns**. This element signifies the interrelations between individual patterns.

Two common relations are:

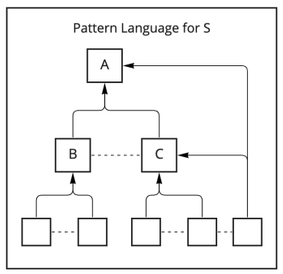
1. **A requires B**: To fulfil Pattern A, Pattern B needs to be fulfilled first.
2. **C complements B**: Pattern C and Pattern B complement each other (in fulfilling Pattern A).



4

A series of patterns that are related in such ways makes a **Pattern Language**. In other words, *a pattern language is a network of patterns*.

With each pattern solving one problem, a complete **pattern language** can solve a series of recurring problems in a complex system S.



5 AN EXAMPLE

Jane wants to make chocolate chip cookies. When making the dough, she is not sure how much chocolate to add.

After researching, she found this a *recurring problem* for many new cookie makers.

In addition, although the solutions given by her mom and her dad are different, they share some invariants: they try to remain the texture of the basic dough when adding chocolate.

Therefore, she documents the invariants into a pattern **(figure 1)** for this problem.

6

In making this pattern, Jane found several other problems related to it. Each problem requires another pattern.

These patterns together connect into a network, aiming at making good chocolate chip cookies.

Pattern Name: *ChocolateRatio*

Context: You are baking chocolate chip cookies in small batches for family and friends. You have finished the basic dough with sugar, flour and egg and you are ready to add chocolate to the dough.
Consider these patterns first: *SugarRatio*, *FlourRatio*, *EggRatio*
Problem: Determine the optimum ratio of chocolate chips to cookie dough
Forces: Most people consider chocolate to be the best part of the chocolate chip cookie. Also that too much chocolate may prevent the cookie from holding together, decreasing its appeal. Since you are cooking in small batches, cost is not a consideration.
Solution: Therefore, use the maximum amount of chocolate while maintain the dough texture you already achieved with *SugarRatio*, *FlourRatio*, and *EggRatio*.
Consider next: *NutRatio* or *CookingTime* or *FreezingMethod*

figure 1. pattern Chocolate Ratio

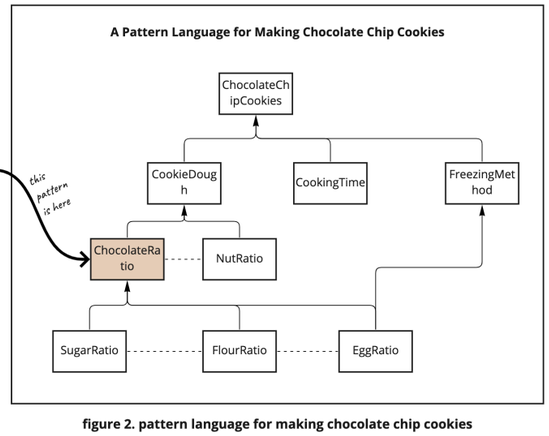


figure 2. pattern language for making chocolate chip cookies

7 BENEFITS

Jane found the pattern language beneficial.

1. Knowledge Management

knowledge externalisation	Grandma can externalise her tacit knowledge of making cookies into tangible patterns.
knowledge communication	Jane and Grandma can easily exchange insights on how to make cookies through patterns.
new knowledge creation	A new relation between EggRatio and FreezingMethod can be easily spotted when visualised with cards (patterns).

2. consistency

consistency over-time	Jane can make cookies in a same way tomorrow according to the same pattern language.
consistency between teams/projects	Jane and Grandma make cookies together with the same pattern language, to make sure they taste the same.

3. participation

participation for better understanding users' needs	Jane realises a unique flavour comes from nuts, and decide to make use of NutRatio to enhance this flavour.
participation for social justice	Everyone has the right to make his/her favourite cookies. The pattern language is open-source.

8 FOUR COMPONENTS OF PATTERN LANGUAGE

Four components make pattern language theory function.

ARTEFACT
the pattern language (PL) itself

PRACTICE
4 main activities around the pattern language

ROLES
3 roles that may get involved in the practice

TOOLS
the tools that support pattern language application

1. Developing the PL
Externalising knowledge, experience, and/or visions for a domain into patterns, and connecting patterns into a pattern language.

2. Selecting Sub-PL for Project
Select from the domain pattern language to build a sub-pattern language for a project in this domain.

3. Diagnosing with PL
Compare the situation with the sub-pattern language, to diagnose existing problems or evaluating the design.

4. Designing with PL
Generating design solutions and detailing the solutions with pattern language.

1. Experts
The ***pioneers*** of pattern language theory in a *system,* usually researchers.
e.g. ***Jane*** in *cookie making*
researchers in *education*
Alexander Christopher in *construction*
researchers in *service design*

2. Professional Designers
The traditional ***designers*** of a *system*.
e.g. ***pastry baker*** in *cookie making*
teachers in *education*
architects in *construction*
service designers in *service design*

3. User-Designers
The traditional ***users*** of a *system*.
e.g. ***tasters*** in *cookie making*
students in *education*
habitants in *construction*
service users in *service design*

9 IDEATION

Now consider using pattern language for your stinky fish. How would you do that?

TAKE A MOMENT TO THINK ...

1. Which problem you want to solve with PL?
2. Which activity(s) should you do?
3. Who will be involved in the activity?
4. ...

take notes here

10 THE TOOLS

Do you meet any problem in the ideation? The following pages are tools I developed through research.

Please read them and continue considering your application of pattern language. You can take note of your ideation process. Here are some questions that may inspire you:

1. what problems do you meet in planning using pattern language?
2. which tools can support you to solve this problem?
3. how do you use them?
4. ...

take notes here

1 PATTERN

A pattern is a statement that describes the *invariants** in the *best solution* to a *recurring problem*.

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2 FORMAT

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3 RELATIONS

Look at the 5th element: **related patterns**. This element signifies the interrelations between individual patterns.

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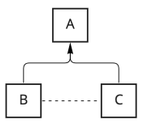

4 PATTERN LANGUAGE

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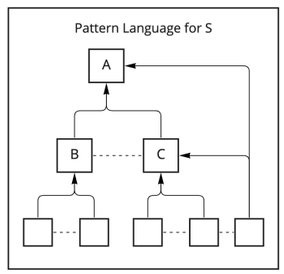

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figure 1. pattern Chocolate Ratio

6 In making this pattern, Jane found several other problems related to it. Each problem requires another pattern. These patterns together connect into a pattern language for making good chocolate chip cookies **(figure 2)**.

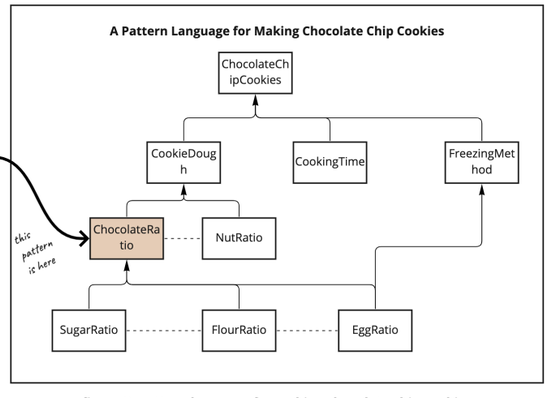


figure 2. pattern language for making chocolate chip cookies

IDEATION (A)

Consider what can Pattern Language Theory (PLT) do for your fish. How would you use it?

IDEATION (B)

Now refer to **page 4** and continue to consider or reflect on your stinky fish.

IDEATION (C)

Now refer to **pages 5-11** and continue to consider or reflect on your stinky fish.

1. What do you want to achieve with PL?

Knowledge Management	Consistency	Participation	
1. knowledge externalisation 2. knowledge communication 3. new knowledge creation	1. consistency over-time 2. consistency between teams/projects	1. participation for better understanding users' needs 2. participation for social justice	*... or what else?*

2. What would be the name of PL you want to use/develop? What search terms may you use to find possible relevant PL(s)?

e.g. a pattern language for software development, a pattern language for UX design, ...

3. What is your situation and which activities do you need?

Developing the PL	**Using the PL**		
	Selecting Sub-PL for Project	Diagnosing with PL	Designing with PL
Examples: *"No existing pattern language can be referred to. I want to write patterns from existing solutions and build a PL for this new domain."*	*"Stakeholders cannot communicate effectively. I need to select patterns from existing PLs to support their participation."*	*"I don't know what to expect for a new area, and need an overview of possible problems."*	*"I have met a problem and there might already be a solution. I want to find it."*

4.Who will be involved in each activity?
If you want to develop new patterns or a new PL, who will be the source of your patterns (the recurring problems and solutions)?

Experts	Professional Designers	User-Designers
The ***pioneers*** of PLT in a *system*. e.g. ***Jane*** in *cookie making* ***researchers*** in *education* ***Alexander Christopher*** in *construction* ***researchers*** in *service design*	The traditional ***designers*** of a *system*. e.g. ***pastry baker*** in *cookie making* ***teachers*** in *education* ***architects*** in *construction* ***service designers*** in *service design*	The traditional ***users*** of a *system*. e.g. ***tasters*** in *cookie making* ***students*** in *education* ***habitants*** in *construction* ***service users*** in *service design*

Workshop Results: Qualitative Codes

- purpose 1
  - reflection-or-evaluation 1
- realise-intersection-of-multiple-domains 1
- slogans-helpful 1
- spend-time-on-concept 1
- srarting-a-PL-is-hard-but-using-existing-one-can-be-accepted 1
- the-order-of-presenting-need-adjustment 1
- three-complementary-unclear 1
- to-read 1
- trapped-in-developing-PL 1
- use-and-contribute-to-at-the-same-time 1
- use-the-panel-to-align-team-values 1
- want-examples-starting-from-bottom-up 1
- what-if-many-solutions-exist-for-a-problem 1
- what-if-there-are-different-ways-to-build-structure-for-a-same-domain 1
- whole-panel-first 2
- wonder-how-a-pattern-is-derived 1
- wonder-what-is-invariant 1
- writing-name-help-consider-generality 1

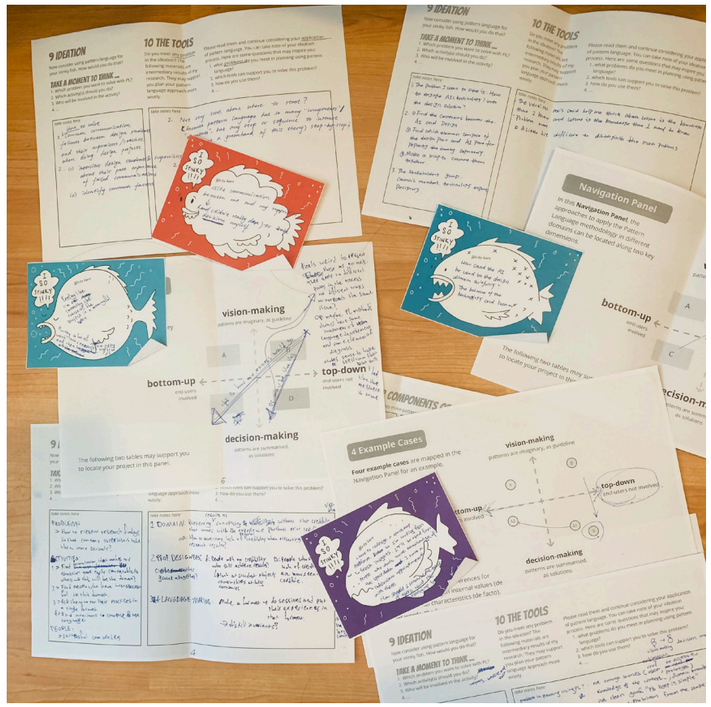
- align-with-other-stakeholders 1
  - vision-or-decision 1
- chronological 1
- communication-needed-when-learning-plt 1
- community-decision 1
  - multifamily-building 1
- confused 2
  - how-to-write 1
  - relations 1
- example-details 3
  - hard-to-read 1
  - how-to-use 1
  - who-will-read 1
- hard 4
  - understand-relation-between-patterns 1
    - use-the-analogy-of-research-question 1
  - whole-structure 3
    - at-once 1

- interaction 1
  - modify-existing-patterns 1
    - to-better-suit-specific-problem 1
- introduction-to-navigation-panel-needed 1
- learning 1
  - more-interactions-available 1
- linking-can-make-it-more-understandable 1
- make-examples-easier-to-understand 1
- material 1
  - about-searching-pl 1
- maybe-no-need-to-know-the-concept 2
  - skip-the-term-navigation-panel-and-directly-locate-the-project 1
- need-a-list-of-usable-PLs 1
- need-examples-for-each-pattern 1
- need-explanation-to-both-dimensions 1
- normal-designers-also-try-to-find-existing-patterns 1
- page4-helpful 1
  - step-back 1
- purpose 1
  - reflection-or-evaluation 1
- realise-intersection-of-multiple-domains 1
- slogans-helpful 1
- spend-time-on-concept 1
- srarting-a-PL-is-hard-but-using-existing-one-can-be-accepted 1

- hesitation 5
  - generality 1
  - is-my-problem-too-specific 4
- household_factor 2
  - age 1
  - income 1
- how-to-part-not-obvious 1

the number on the right is the appearance frequency of the codes

Workshop 2&3 Results: Participants' Ideation Results



H. Interview Codes & Clustering

The codes generated from the intervews with GORS2025 members.

- learn 1
  - technique-feasibility 1
  - learn-from-academia 2
    - new-ideas 1
    - whether-an-approach-is-feasible 1
  - learn-from-people 1
    - their-reaction 1
  - to-study 1
    - whether-subsidies-for-collective-and-individual-are-almost-same 1
  - transmit-information-to-local-government 1
- organisation 5
  - a-team-wtih-different-expertises 1
  - having-common-interest-with-a-larger-majority 1
  - open-to-new-mindset 2
  - refuse-dictatorship 1

- history 7
  - homeowners-agree-to-use-the-same-panels 1
  - more-urgent-because-of-the-war 1
  - old-committee-did-not-allow-solar-panels-for-aesthetics 1
  - popularity-of-energy-saving-facilities-are-rising 1
  - sustainability-becomes-more-urgent 1
  - time 1
  - VvE-confronts-homeowners-for-individual-measures 1
- homeowner 10
  - need-knowledge 2
    - finance-calculation 1
    - knowledge-on-technology-or-workable-options 1
  - value 7
    - aesthetics 1
    - architecture-important-but-less 1
    - comfort 1
    - cost 1
    - feeling-good-to-be-neutral 1
    - independent-decision 1
    - sustainability 1

- people-knowledge-about-subsidies 1
- what-collectively-what-individually 1
- why-people-prefer-individual 1
- VvE 30
  - goal 10
    - achieve-some-common-understanding 1
    - agreement-is-not-expected-at-once 1
    - any-reaction-is-good 2
    - change-is-a-long-term-thing 1
    - create-awareness 1
    - even-negative-feedback-is-good 1
    - start-small-to-bring-more-people-on-board 3
  - job 15
    - aware-people 2
      - insulation-is-most-urgent 2
    - communicate-among-stakeholders 1
    - inform-people 5
      - of-VvE-progress 1
      - the-options 2
      - the-possibilities 1
    - keep-reminding-people 1

- to-interview 6
  - how-is-the-situation-different-from-social-housing 1
  - is-aqua-approach-better-than-heat-pump-in-technology 1
  - tenant-benefit-from-the-renovation-so-payment-needs-to-be-decided 1
  - the-role-of-financial-company-and-when-it-starts-working 1
  - which-measure-causes-dependence-on-single-source-of-energy 1
  - why-people-agree-to-use-the-same-panels 1
- to-survey 11
  - are-elder-people-moving-out 1
  - are-new-residents-more-active-in-renovation 1
  - are-people-open-to-collective-measure 1
  - current-energy-label 1
  - do-they-like-collective-measures 1
  - how-long-would-some-people-like-to-wait-until-collective-measures 1
  - is-material-considered-important 1
  - other-forms-of-collective-measure 1
    - lower-price-when-more-people-buy 1

- collective-measure 10
  - can-use-old-systems 1
  - influencing-the-life-of-a-lot-of-people 2
  - initial-investment-is-higher 1
  - land-rent-will-rise 1
  - less-mental-effort 1
  - make-use-of-local-condition 1
  - may-cost-more 1
  - need-permission-from-80percent 1
  - will-dig-roads 1
- future-consideration 2
  - bring-in-more-younger-families 1
  - enlarge-the-house-space 1
    - architecture-renewal 1

- who-have-done-individual-measure-do-not-want-to-pay-for-collective-measure 1
- individual-measure 5
  - can-be-aligned-to-preserve-aesthetics 1
  - indepent-from-others 1
  - less-mental-effort-for-themselves 1
  - takes-up-some-personal-space 1
  - with-technology-developing-noise-is-not-an-issue 1
- other-stakeholder 7
  - bank-or-energy-company-invest 1
  - company-doing-calculation-for-the-project 1
  - government-provide-subsidy-for-sustainable-renovation 1
  - policy-is-important-force-for-changing 1
  - regulations-force-people-to-take-actions 1
  - technicians-inform-ways-of-improvement 1
  - the-scale-of-numansgors-not-big-enough-to-profit 1

I. The Activity Kit

See a separate document.

J. Survey Raw Data

The raw data from the questionnaires are presented in an excel. The details can be seen in *https://miro.com/app/board/uXjVO4ab0bs=/?share_link_id=28944607338*

K. Proposal Brief

Pattern Language in Communal Housing Renovation: Process & Content — project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 21 - 02 - 2022 — 11 - 07 - 2022 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

CONTEXT & STAKEHOLDERS

- Numansgors was built by architectural bureau Van der Broek & Bakema as a luxury holiday destination. Since 2013, it has become a permanent residence. To meet current energy requirements, the Association of Owners (VvE) aims to make the village more sustainable. The Wageningen Science Shop is involved to help with this progress.
- Two main stakeholders are the Association of Owners (VvE) of Numansgors and the residents. The VvE is composed of local residents. Despite the willingness to involve residents, VvE wants to avoid aesthetic fragmentation and to enable joint opportunities for, for example, collective energy storage. The residents are the homeowners of Numansgors. According to the VvE and the Wageningen Science Shop, the residents have divided expectations of how to take measures for their diverse socio-financial interests and expect some forms of individual rights in this process.

CHALLENGE & OPPORTUNITY

- Community Housing Renovation (CHR) involves multiple stakeholders with sometimes divergent requirements and needs. Collaboration and participative processes are essential to ensuring an appropriate value for users is delivered through CHR. Taking Numansgors renewal, two challenges can be expected in this participatory approach.
- First, ineffective communication will hinder participation. For example, the VvE and residents hold conflicting attitudes towards individual measures and cannot come to a consensus. However, upon closer examination, the actual need of VvE is to avoid aesthetic fragmentation, which does not necessarily oppose the autonomy value of residents. In addition to such value communication failures, knowledge communication can also be problematic in such a multidisciplinary setting.
- Second, without a coordinated order, participation will be inefficient. For example, the same problem may recur in several houses. If each homeowner conducts a similar process on their own, they will be doing redundant work and the cost for decision-making will be multiplied. Worse even, if each home decides to build an energy storage device respectively, these devices might not fit with each other on the same site. Therefore, for a favourable participation, a coordination should be achieved.

- Pattern language is a bottom-up methodology originated from urban planning where experts, institutes, and end-users collaborate to develop innovative solutions in real-life environments. A pattern is a statement of the best practice to a recurring problem. Multiple single patterns with a structure make up a pattern language [1].
- Here is a simple example by Alexander. “[T]he length [of a barn should be] at least 3x, where x is the number of cows the barn has to hold.” [1] This is a pattern presenting a piece of building knowledge in an accessible way. Several patterns like this can form a pattern language for building a barn. With this pattern language, anyone can design a barn that is consistent with the other barns in the village, without doing repetitive calculations.
- Although pattern language has been successfully applied in participatory project contexts, such us medical service system design, scarce research exists on how pattern language may support CHR process,. In addition, there is a need to explore what sources for the contents of a pattern language can be expected in this context. This graduation project will address these gaps in the application of pattern language in CHR through field research and literature research. A value framework can be used in field research for value identification among stakeholders [2].

1. Alexander, C. (1979). The timeless way of building (Vol. 1). New york: Oxford university press.
2. Bos-de Vos, M. (2020). A framework for designing for divergent values. In DRS 2020 International Conference, Held online: Synergy (pp. 39-53). Design Research Society.

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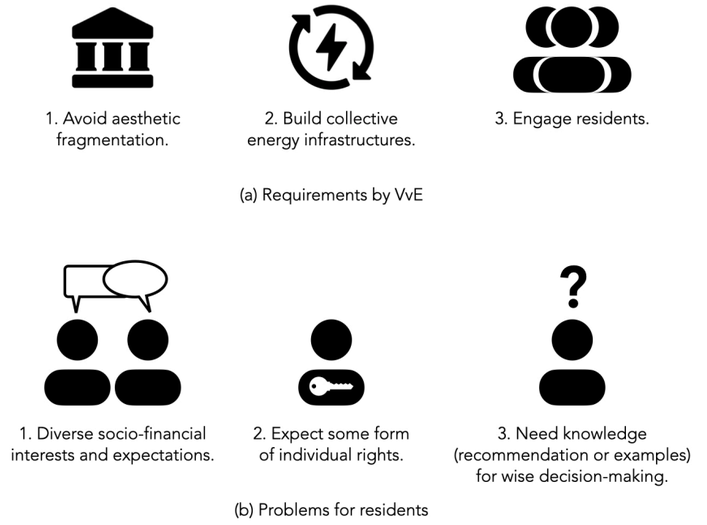

image / figure 1: known needs of two main stakeholders

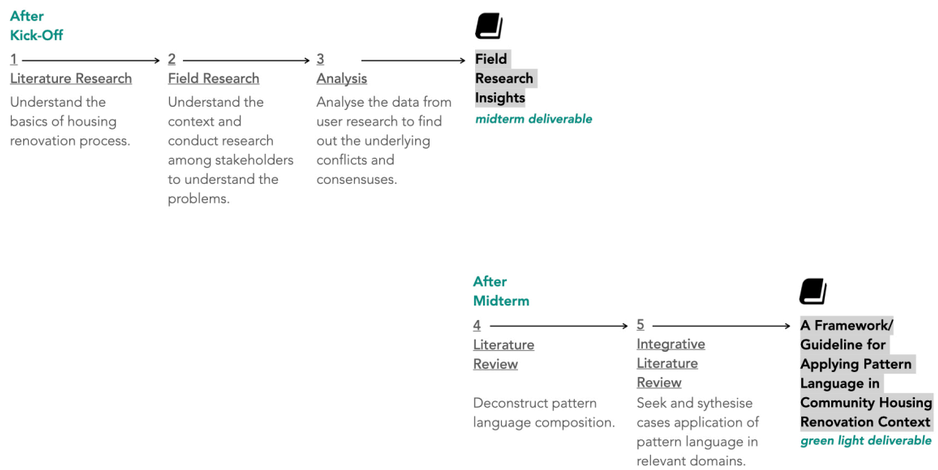

image / figure 2: project process overview

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

The objective of this research project is: to find out how pattern language, as a design tool, might help with the alignment of stakeholders in the context of community housing renovation. Two sub-objectives are: recommending the source of contents and recommending the implementation process.

A literature review on pattern language provides an overview of the topic. One research question is answered:
(1) What is pattern language? What benefits can it bring to complex decision-making processes?

Taking the case of Numangors, field research will be performed to better investigate the context and existing problems. Two main research questions and relevant sub-questions will be answered:
(2) What is community sustainable housing renovation like?
- a. What is the specific situation in Numansgors?
- b. Who are the main stakeholders?
- c. What are the needs of different stakeholders?

(3) What challenge in aligning stakeholders exists/have existed?
- a. What causes/caused the challenge?
- b. What measures have been taken? How is/was the outcome?

An integrative literature review [3] will be performed to synthesise the pattern language implementation in related domains. One research question and its sub-questions are:
(4) How can pattern language be implemented in aligning stakeholders?
- a. What process of applying pattern language is followed?
- b. What are the potential sources of contents of patterns?

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

This project focuses on how pattern language, as a design tool, can be applied to promote alignment between stakeholders in a new context of community housing renovation. The final research output will be an implementation guideline. Research methods involve literature review, interview, survey, and integrative literature review.

In this graduation project, the researcher focuses on the implementation

Expected deliverables involve:
(1) The origin, benefits and components of pattern language generated from a literature review.
(2) An overview of the values and knowledge needs of different stakeholders, with the conflicts, mismatches, and consensuses signified through interview and survey.
(3) A deconstruction of pattern language implementation cases in related domains through an integrative literature review.
(4) A pattern language implementation guideline: including recommendations to support the initiation and development of pattern language to align the stakeholders in community housing renovation context. The limitation and challenges if applied in the Numansgors project will also be elaborated.

[3] Torraco, R. J. (2005). Writing Integrative Literature Reviews: Guidelines and Examples. Human Resource Development Review, 4(3), 356–367. https://doi.org/10.1177/1534484305278283

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 21 - 2 - 2022 11 - 7 - 2022 end date

Important Dates	Kick-off									Midterm							Green Light							Graduation			
Project Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Monday	21/Feb	28	7/Mar	14	21	28	4/Apr	11	18	25	2/May	9	16	23	30	6/Jun	13	20	27	4/Jul	11
Study The Context																					
Literature Review On housing renovation																					
Interview VvE																					
Interview Experts																					
Survey Homeowners																					
Interview Homeowners that have taken measures																					
Interview Homeowners that haven't taken measures																					
Analysis Understand the challenge and underlying rationales																					
Study Pattern Language																					
Literature Review Deconstruct pattern language.																					
Integrative Literature Review Analyse cases application of pattern language.																					
Framework Development Sythesising findings from literature reviews.																					
Synthesising & Writing																					

FIELD RESEARCH
Field research will take place at the earlier stage of the project to understand the context and challenges.
(1) Interview VvE: understand their role, working approach, needs, and expectations.
(2) Interview Experts: improve researchers' understanding of renovation knowledge.
(3) Survey: to get an overview of homeowners' socio-economic background types and proportions, general need inventory (not limited to renovation/energy), priority, expectation of plan-making process, and get contact information of the ones willing to be interviewed.
(4) Interview Homeowners that have taken measures: learn about their changes and learnings after taking measures.
(4) Interview Homeowners that are reluctant to take measures: understand homeowners' needs and values.

DESK RESEARCH
Desk research including literature review and an integrative literature review will be conducted.
(1) Literature Review: learn about the origin and deconstruct the composition of pattern language.
(2) Integrative Literature Review: seek and sythesise the cases of applying pattern language. Summarise the rationales enabling a successful application.

FRAMEWORK DEVELOPMENT
Develop a framework/guideline for designers by sythesising findings from field research and desk research.

SYNTHESISING & WRITING
The research process and generated knowledge will be documented.

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

For this graduation project, I want to utilise the knowledge and skills from both Dfl and my bachelor degree in architecture. This is also a chance to commence my career in design for sustainability and meta-design.

First, the most important skill in the master stage for me is to build and refine my methodology through practice. For example, in UXAD 2021, we tried to summarise how to design for confidence. Based on user research and two iterations, we found that a metaphorical interface and a visible backup shortcut can both enhance users' self-assurance. Although the insights still need refinement, the ability to generalise replicable knowledge can benefit my career.

Second, this graduation topic allows me to combine multidisciplinary skills and knowledge. For the participation of different stakeholders, I can use my skills in contextmapping, interviewing, and co-creation workshop organisation. Knowledge of psychological, sociological and geographical theories, plus culture-sensitive lens can assist me to analyse the research findings in a more unbiased manner. To communicate with ecology and landscape design fellows, my trans-disciplinary experience will also be helpful.

For my career prospect, this project meets my interest in sustainability and design research. With a global trend towards carbon neutrality, much knowledge in pro-environmental city renewal is needed. With the development of open sources and decentralised industries, I believe participatory design will become commonplace. Therefore, designing for participation in a sustainability-oriented project is aligned with my motivation.

This graduation makes a perfect chance for my aim to utilise and further develop these skills and knowledge and broaden my knowledge on more domains. My learning objectives are as follows:
(1) To apply and improve my methodology of user research gained from master courses.
(2) To get familiar with the operational nature of meta-design, and learn how to translate theories into practical tools.
(3) To gain a better understanding of the global sustainability challenge and the potential stances taken by designers.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.