

# Patterns of Patterns

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The purpose of this paper is to show how we can combine and adapt methods from elite training, future studies, and collaborative design, and apply them to address significant problems in social networks. We focus on three such methods: we use Action Reviews to implement social perception, Causal Layered Analysis to implement social cognition, and Design Pattern Languages to implement social action. We present the results of two studies: firstly, we use Causal Layered Analysis to explore the ways in which the design pattern discourse has been evolving. Secondly, to illustrate the three methods in combination, we develop a case study, showing how we applied the methods to bootstrap a distributed cross-disciplinary research seminar. Building on these analyses, we elaborate several scenarios for the future use of design patterns in large-scale distributed collaboration. Our case study suggests ways in which progress could be made towards realizing these scenarios. We conclude that the combination of methods is robust to uncertainty, insofar as they support adaptations as circumstances change, and incorporate diverse perspectives. In particular, we show how methods drawn from other domains enrich and are enriched by design patterns; we believe the analysis will be of interest to all of the communities whose methods we draw upon.

CCS Concepts: • **Social and professional topics**; • **Software and its engineering** → *Designing software*; *Open source model*; • **Applied computing** → *Operations research*; • **Computing methodologies** → *Modeling and simulation*;

Additional Key Words and Phrases: Design Patterns, Pattern Languages, Action Reviews, Futures Studies, Causal Layered Analysis, Emacs, Free Software, Peeragogy, Climate Change, Innovation, Anticipation

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*'Sire, know that while wandering through the forest I saw an ancient path, an ancient road travelled upon by people in the past. I followed it and saw an ancient city, an ancient capital that had been inhabited by people in the past, with parks, groves, ponds, and ramparts, a delightful place. Renovate that city, sire!'*

Saṃyutta Nikāya Connected Discourses on Causation 12.65.

## 1 INTRODUCTION

In 1999, the architect Christopher Alexander discussed the future of design patterns with an audience of programmers [4]. We revisit this topic, aided by a method from the field of future studies. We use this method to analyze design pattern literature and practices, and, additionally, present a practical case study in which we deploy design patterns together with futuring and distributed project management methods. Building on these explorations, we develop several scenarios characterizing potential directions for the development of design pattern methods. The contribution of the paper is simultaneously theoretical and practical. Towards realizing the promise of design patterns, we aim for an excavation and reworking of the theory.

We begin by recalling that Christopher Alexander thought about patterns in both a fundamental and a methodological sense.

*As an element in the world*, each pattern is a relationship between a certain context, a certain system of forces which occurs repeatedly in that context, and a certain spatial configuration which allows these forces to resolve themselves.

*As an element of language*, a pattern is an instruction, which shows how this spatial configuration can be used, over and over again, to resolve the given system of forces, wherever the context makes it relevant. [2, p. 247] (our emphasis)

Patterns in the first sense are basically physical in nature. *Design* comes into play with the second sense. Leitner summarized how this is meant to work: “Patterns are shared as complete methodic descriptions intended for practical use by experts and non-experts” [53].

Already there are a number of practical texts that use patterns (in the second sense) to talk about patterns (again in the second sense): they share methods that aid in discovery, writing, workshopping, and the broader application of design patterns. By contrast we develop a more fundamental analysis, and use this to work towards a new level of practicality. Granted, the relevant forces are no longer simply physical, but are socially distributed and culturally determined. Architects, computer scientists, and institutional designers have all had very different things to say about design patterns. We will, additionally, combine design patterns with methods that originate in future studies and elite training. We will suggest that these methods can be used together to tackle problems both big and small.

### Outline of Methods

We detail three methods which can help a community carry out self-evaluation and peer learning. Each has natural use-cases when considered in isolation. When combined, the methods provide a more holistic mixed pattern. Our focus is on scaffolding social perception, cognition, and action (Table 1). The tripartite division here mirrors classical psychology [39], and continues to be relevant in contemporary neuroscience [30, 85].

*Project Action Review (PAR) is the sensory element: systematically gathering and verifying observational data.* The Project Action Review is structured around five questions which members of a community discuss and answer together. This practice generates a record of an event, as seen through the eyes of the participants. In the moment, the PAR allows us to draw out views which might have gone unstated otherwise. Over time,

<i>Key verbs:</i>	perceive	think	act
<i>Scientists refer to:</i>	“sensory”	“cognitive”	“motor” systems
<i>Our implementation:</i>	<b>Project</b>	<b>Causal</b>	<b>Design</b>
	<b>Action</b>	<b>Layered</b>	<b>Pattern</b>
	<b>Review</b>	<b>Analysis</b>	<b>Languages</b>

Table 1. Three acronyms used in this paper: PAR, CLA, and DPL

projects which use PARs improve their chances of staying grounded in reality as circumstances evolve. We can additionally use PARs to help check how effectively we are using other methods.

*Causal Layered Analysis (CLA) is the cognitive element: giving organization and depth to the enterprise.* The goal of this methodology is to achieve a deep and inclusive understanding by integrating empiricist, interpretative, critical, and actionable knowledge surrounding a topic of concern. Without an integrated understanding, a group runs the risk of getting lost in a muddle of details. CLA can pull together information logged in PARs into a coherent body of self-knowledge. It can also help to surface concerns that might remain implicit in pattern language: for example, CLA could help us understand why we had prized a technological solution to what, upon consideration, turned out to be a fundamentally social issue (or vice-versa).

*Design Pattern Language (DPL) is the motor element: orchestrating and scaffolding action.* Having carefully analyzed the situation and identified possible solution pathways, we must plot a course of action that accounts for the complexities of the situation. Individual design patterns present solutions to recurring problems: they can be combined with other patterns and adapted to different situations. A DPL is a common language which a community can use to discuss matters of design; it serves as a repository of shared knowledge. The flexibility of DPLs allows the structure to be customized to our particular circumstances as they evolve.

### Summary of Findings

- We used Causal Layered Analysis to describe the evolution of Design Pattern Language methods in response to criticism, innovation, technical developments, and long-term cultural change. We additionally surface some of the forces and tensions in the discourse.
- We used Design Pattern Language methods, together with Project Action Reviews and Causal Layered Analysis, to organize a research seminar. Our case study shows how the methods can be fruitfully combined, and suggests how others might take up the combined methods.
- We reflect on these processes to scaffold our discussion of the future of design patterns.

### Supplementary Material

In order to support a concise treatment of our core findings, we supply details of our Analysis and Case Study in Appendix A and Appendix B, respectively. Our methods are further illustrated in additional supplements. Appendix C contains a sample Project Action Review. Appendix D contains a short story that can be used to become acquainted with Causal Layered Analysis. Several patterns in Appendix E are referred to by name in the text. Henceforth, text in SMALL CAPS references external patterns, whereas ALL-CAPS references patterns listed in this paper and the Appendix. Lastly, Appendix F contains a workshop design that accompanies the paper and makes some of the ideas within it interactive.

## 2 BACKGROUND

Perception, cognition, and action are necessary functions for all living beings, and even for robots [14]. Some of this thinking can be applied to organizations, as in the work of Stafford Beer [8]. However, it is harder to say what it means to be a well-functioning society; and what it means to be a good member of a society in a time of crisis is a longstanding question. Alexander’s hopeful stance on “the generation of a living world” [4] currently comes up against complex global crises. How are we to understand design patterns in this context? Stephen Batchelor writes: “If I am to take this crisis with the seriousness I feel it deserves, then I need to align my thoughts and actions. I require a coherent worldview to provide a rational and ethical foundation for my behavior” [7].

Perhaps pattern methods could fill part of this need. A simplistic view of design patterns would see in them only evidence of a “technical mindset” (*ibid.*), embodied in a growing repository of technical fixes. However, thinking at a deeper level, pattern methods also suggest themselves as a methodology that can help “imagine how human communities might come to flourish in a radically changed world” and articulate “forms of collective action that can respond to the climate emergency that threatens life on Earth” (*ibid.*). It is useful to juxtapose our exploration of patterns against a macro-historical scale.

For Sarkar, there have been four historical ways humans have dealt with their physical and social environment: either by being dominated by it, by dominating it through the body, dominating it through the mind, or dominating it through the environment itself. [43]

We emphasise that design patterns have been deployed in various ways in the real world: they tangle with all of these complexities. Whereas science fiction can provide a ‘thinking machine’ [24], it cannot by itself provide historically robust alternatives to the global crises that we face. For that, we need a concrete, testable, and adaptable approach that integrates thinking with awareness and action, and that works across scales: from individual agents to distributed networks.

## 3 METHODS

In Section 1 we briefly summarized the methods we use in this paper. Subsections 3.1, 3.2 and 3.3 describe the Project Action Review, Causal Layered Analysis, and Design Pattern Languages methods in further detail. Subsection 3.4 pulls these methods together as a design pattern.

At a higher level, our research employed these three methods within two studies which were carried out using well known, but more abstract methodologies. One study develops a primarily literature-based analysis, while the other deployed a form of Participatory Action Research.<sup>1</sup>

### 3.1 Project Action Review

The US Army developed a methodology called the *After Action Review* or AAR, which they use in training elite soldiers [92]. AARs can be used to assign responsibility when things go wrong in training activities, and can help people figure out how to do better next time. The method has also been used effectively in business settings [20]. As such, After Action Review shares common ground with the DAILY SCRUM and SPRINT RETROSPECTIVE [82] patterns from Scrum. However, it does not have the product orientation of Scrum. In a distributed peer-to-peer collaboration, we wanted an adaptation of the AAR that would make it more open ended and horizontal in nature. We came up with the following template:

- (1) Review the intention: what do we expect to learn or make together?
- (2) Establish what is happening: what and how are we learning?
- (3) What are some different perspectives on what’s happening?

<sup>1</sup>Not to be confused with the acronym PAR used in this paper.

- (4) What did we learn or change?
- (5) What else should we change going forward?

When we fill in the template, we call it “doing a *PAR*.” A real-world example is provided in Appendix C. As an acronym, “PAR” has stood for various things over the years—Paragogical Action Review,<sup>2</sup> Peeragogical Action Review,<sup>3</sup> Project Action Review—but we like PAR as a stand-alone term. Allusively, it brings to mind the corresponding concept of *par* in golf, and helps give us a sense of how we are doing at any given point in time.<sup>4,5</sup> Like the Army, we typically use PARs retrospectively (“what *did* we expect to learn or make together?”). However, PARs can also be applied to look forward, proactively, as a way to scaffold anticipation by “remembering the future” [6]. In that case, item (5) can be expanded to include a number of different forward-looking scenarios.

### 3.2 Causal Layered Analysis

Sohail Inayatullah developed Causal Layered Analysis (CLA) [42, 44] as a research methodology for examining a topic of concern at four layers that he refers to as the *litany*, *system*, *worldview* and *myth*. Part of the reason to carry out such an analysis is that there are different kinds of causes, ranging from immediate events to deep-seated cultural beliefs. Inayatullah’s work draws on his scholarship of P. R. Sarkar [43].

This perspective is derived from Indian philosophical thought...which asserts that the mind is constituted in shells or kosas. Moving up and down the shells is a process of moral and spiritual enlightenment. Going deeper into the mind is an inward process through which truths are realized.<sup>6</sup>

In developing a CLA, none of the four layers is privileged over the others, nor are they examined in isolation. Rather, one moves between them, examining how they relate to one another. One can then integrate these insights to form a more comprehensive basis for understanding what is happening in the present and for anticipating the future. Table 2 describes each of the four layers according to the following schema:

- **Contents:** *What is found in this layer?*
- **Analysis:** *Techniques for analysis of this layer.*
- **Literature:** *Instances of texts which are typically operative at this layer.*

To further illustrate the four layers and show how such an analysis might proceed, Appendix D introduces a CLA analysis of a fictional mom-and-pop pizza shop.

### 3.3 Design Pattern Languages

The two senses of ‘pattern’ mentioned above—‘As an element in the *world...*’ and ‘As an element of *language...*’—are mirrored within the concept of a design pattern. Like an ellipse, the design pattern has two main foci: context and community.

- *Context* shapes and constrains the type of activity which is being considered, be it designing a building, writing software, or something else.
- *Community* encompasses the stakeholders—experts and non-experts alike—who are involved with or otherwise affected by a particular project.

Integral to the basic concept of a design pattern is a third feature that describes the interaction of the community and the context. The community uses the pattern to overcome some real or potential *conflict* that they experience within this context. It bears emphasis that the community is not assumed to be homogeneous, and,

<sup>2</sup>[http://ceur-ws.org/Vol-739/paper\\_5.pdf](http://ceur-ws.org/Vol-739/paper_5.pdf) (p. 5) and *Peeragogy Handbook* v3, p. 134

<sup>3</sup><https://github.com/Peeragogy/Peeragogy.github.io/wiki/Monthly-Wrap-March-2020>

<sup>4</sup>“In golf, *par* is the predetermined number of strokes that a proficient golfer should require to complete a hole, a round (the sum of the pars of the played holes), or a tournament (the sum of the pars of each round).”—Wikipedia

<sup>5</sup><https://web.archive.org/web/20150909224638/http://metameso.org/~joe/docs/The-Paragogical-Action-Review.pdf>

<sup>6</sup><https://proutglobe.org/2013/06/the-further-reaches-of-policy-making-cla/>

<b>Litany</b>
<b>Contents:</b> Observable facts, events, and quantitative trends.
<b>Analysis:</b> Minimal processing of data.
<b>Literature:</b> News reports, tax filings, chit-chat.
<b>System</b>
<b>Contents:</b> The social, economic, political, and historical forces which shape events.
<b>Analysis:</b> Technical explanations and interpretation of data within a given paradigm.
<b>Literature:</b> Editorials and policy institute reports.
<b>Worldview</b>
<b>Contents:</b> Core values and attitudes which motivate choices and actions.
<b>Analysis:</b> Uncover deep assumptions and study the mental and linguistic constructs which undergird how people interact with each other and their surroundings. Compare and critique paradigms and discourses.
<b>Literature:</b> Works of philosophy and critical theory.
<b>Myth</b>
<b>Contents:</b> The symbols and tales which give meaning to life.
<b>Analysis:</b> Study symbols and narratives, and the myths and rituals within which they participate.
<b>Literature:</b> Poetry, art, anthropology, Jungian analysis.

Table 2. Overview of the layers in Causal Layered Analysis

indeed, this may be part of how the conflict is experienced; i.e., it need not be the case that all members of the community share the same experience or view of the context, nor that they are all uniformly affected by the circumstances arising therein. The conflict is also referred to as a *problem*; its resolution is described as a *solution*. Alexander and Poyner emphasized that ‘design’ is not needed when the conflict can be resolved in an obvious or straightforward manner. For example, you typically would not need a design process surrounding *sitting in a chair*, because “under normal conditions each one of the tendencies which arises in this situation can take care of itself” [5, p. 311].

We might say that the design pattern carries with it a fragment of irreducible complexity. This perspective may or may not be surprising. Early on, Alexander described the need for patterns when things get complex [1]. He specifically focuses on what could be called “horizontal” complexity, a situation where there are a lot of moving parts and relations between them. Methodologically this is elaborated with the notion of a *pattern language*. Pattern languages have a property of unfolding, from more general to more specific. However, they do not necessarily cover deeper forms of “vertical” complexity, where there are deep historical or ontogenetic causes, feedback loops, or complex conceptual issues which are not readily expressible in design-pattern-theoretic terms. Let’s have another look at these issues by way of two contrasting metaphors.

The first metaphor comes from Christian Kohls, who proposed to treat each design pattern as a journey: “a path as a solution to reach a goal” [48]. In this metaphor, design patterns are understood to have an initial condition and an end condition, defined within some context. The context also associates a cost to traversals of paths. There are several associated problems: the elementary problem is to traverse the terrain and travel from the start state to the end state. The next problem is to do this at low cost. The third problem is to find a reliably repeatable way to do this. A fourth problem is to describe the process in such a way that the path can be traversed by others.

The second metaphor comes from Joseph Campbell, who described an “archetypal pattern” [77], one that can be found embedded in myths and stories across diverse cultures and historical periods. The “hero’s journey” is

also described with a path [13], however, in this case the path runs in a circle, and the journey focuses on the transformations of the hero who traverses it. Although an account of the journey can be shared, traversal is effectively single-use. The cost is typically “high.” Nevertheless, once a myth or metaphor is established in a shared narrative, the journey can be reenacted through ritual or engaged with in other ways that solve a range of social problems [34]. In short, the difference between these two traversal stories suggests that the process of finding “the path that is capable of leading to a good structure” [4] may contain irreducible complexity—even when sharing the information about the path is relatively simple.

### 3.4 PLACARD: A Synthesis of PAR, CLA, and DPL

We are now in a position to explain how PAR, CLA, and DPL combine into one holistic pattern, in Leitner’s sense of a complete methodic description [53]. We will write this down using the classical DPL format: describing the associated *context*, the *problem* denoting a conflict, together with a *solution*. As it happens, the three acronyms introduced earlier can be combined and remixed to provide a title for this pattern.

$$\text{PAR} + \text{CLA} + \text{DPL} = \text{PLACARD}$$

This accurately suggests that the methods need not be run in a fixed order, but are interwoven together.

#### PLACARD.

- **Context:** In the course of working on a project: *we use the PAR to get a sense of our working context.*
- **Problem:** Although we may encounter many difficulties in this context, our effort to understand them faces a central **challenge**, namely the fact that the problems span different layers and scales of complexity, so it can be hard to understand where the difficulties actually come from: accordingly, *we use the CLA to understand and frame the problems and their interconnections.*
- **Solution:** Once we have grasped the problem, we need to elaborate an actionable solution that remains adaptable to ongoing changes in the context: *we use DPL to elaborate the solution.*



Fig. 1. Mnemonic illustration of the PLACARD pattern

Figure 1 provides a mnemonic.<sup>7</sup> The main thing to notice is that using the three methods together can help make the design pattern method practicable. We can use the PAR to move from a context to a “Context”, established and written down. We can use CLA to move from a situation of concern to a situation in which the core “Problem” or “Problems” can be thought about. However, the fact that DPL shows up inside of PLACARD without further elaboration may be somewhat concerning. The reader may be wondering: “I think I can see how the methods that have been discussed could help in understanding the **context** and the **problem**, but is there anything here that actually helps with formulating **solutions**?” This is certainly a worthy concern, and something we will come back to after considering an example of the PLACARD pattern in use.

<sup>7</sup>For French speakers, *placard* means ‘cupboard’, and there is an idiom, *placardisé*, which refers to an employee whose tasks all have been reassigned to others; the import is similar to the English idiom ‘put to pasture’. While it is not the case that PLACARD reassigns all DPL functions to other methods, the French idiom is potentially suggestive as another mnemonic.

## 4 CONTEXT OF THE RESEARCH

We applied Causal Layered Analysis in two different contexts, traversing different scales. At the larger scale, we applied CLA to the design pattern literature and practices, with the purpose of scaffolding an examination of the future of the design pattern theory. At the smaller scale, we made practical use of CLA alongside the PAR and DPL methods within a case study of a distributed research seminar. Details of these analyzes are presented in Appendix A and Appendix B, respectively, henceforth referred to here as the **Analysis** and **Case Study**.

### 4.1 Design Pattern Language literature and practices

In this study we examined DPL literature in the form of books, articles and conferences. In order to counterbalance the coverage, we included dissenting and critical voices. Here we did not have PARs at our disposal, so the sensory element was provided by the views expressed by the authors.

In précis, we were interested in the following topics:

- Queries raised by Alexander and his collaborator Bryant, along with a systematic analysis of criticisms of pattern methods collected by Dawes and Ostwald.
- Issues related to how people share and discuss patterns, as well as the changing way in which these discussions have been framed at PLoP.
- The worldview linked with patterns through the lens of mob software and its critiques.
- Symbols and philosophical traditions that enrich our understanding of the context in which Alexander developed his methods.

Taking a deep dive into DPL via CLA allowed us to gain perspectives on how design patterns work. In particular, we have illustrated the complexity that underpins the model. Alexander expands on his metaphysical considerations in his multi-volume work, *The Nature of Order (TNO)*. Our Analysis shows how some of these more ephemeral-seeming factors are ramified across various layers of the pattern theory.

In particular, working from the myth layer towards the more surface layers: we show that the notion of *wholeness* that Alexander deploys is complex, and that the corresponding theory of emergent order based on this concept is similarly complex and linked to “a tension between independent and conforming tendencies” [93]. This tension has—only partially—resolved into a dichotomous relationship between *users* and *designers* of patterns and pattern-linked artifacts. There are however many remaining points of friction, as users of pattern methods run into difficulties [21], and designers are not entirely clear on how to improve the situation.

### 4.2 Emacs Research Group

The Emacs Research Group (ERG) is a transdisciplinary seminar organized around the theme of research in, on, with, and about the Emacs computer program.<sup>8</sup> Although Emacs is best known as a text editor, its extensibility and self-documenting nature make it a more general platform for dealing with symbolic content, and a vibrant site for research into writing and programming. ERG aims to explore topics such as the following:

- How is Emacs *used* to help conduct research in various disciplines?
- What is the *user experience* with Emacs and what is the user community?
- How could the Emacs system *interoperate* with other computer programs?
- How might the *communities* affiliated with Emacs interact with other communities of software users and developers?
- What new *functionalities* would broaden the applicability of Emacs?

ERG meets approximately weekly, sometimes inviting guest speakers. After each meeting, the participants summarize their experience in a PAR. This serves to surface matters of concern and highlights in each session of the

<sup>8</sup><https://www.gnu.org/software/emacs/>

seminar. Every six meetings, the techniques of CLA were used to organize and condense the PARs into a coherent statement of purpose. Finally, Peeragogy design patterns are used to formulate a plan of action informed by this analysis. Thus, all three methods are combined in line with the PLACARD pattern introduced above.

In précis, in this study, we were interested in the following topics:

- Emacs has a variety of constituents and stakeholders—old users, new users, developers—who have differing needs and desiderata. How can we better understand the community of people interested *in* Emacs?
- The methods, workflows, and tools we are developing help us carry out our own activities thoroughly and efficiently, and could be of interest outside the group. How might similar processes be useful to others who interact *with* Emacs?
- We want to be aware of activities going on elsewhere, learn from them, and mesh with them. How can we think *about* Emacs with reference to this context?
- We want to encapsulate what we learn in new actionable and deliverable designs for software. What experiments can we do *on* Emacs itself that might improve it?

## 5 RESULTS

Looking across the Analysis and Case Study suggests several useful points of comparison. Firstly, we stopped short of developing a DPL breakdown of our Analysis, whereas we provide one in the Case Study. However, the two studies together have given rise to an informal description of scenarios (presented in the following section) which could be further broken down to frame subsequent work, using the Case Study as a model.

We can also reflect that the focal communities in the two CLAs—namely, the Pattern Languages of Programs conference, and the Emacs Research Group—are both projects within the larger system of contemporary computing, which is organized with various loose hierarchical structures. Accordingly, both projects inherit attributes from the larger communities/networks and histories to which they are heirs. Taken together the two studies offer a nuanced perspective on contemporary computer programming culture.

Thus, the Emacs Research Group is a small subcommunity of the larger Emacs community, and inherits two core tenets at the *worldview* level:

- A preference for Free/Libre/Open-Source Software, as defined by the “four freedoms” at the core of the GNU project.<sup>9</sup>
- Enthusiasm for the features and affordances of Emacs: an extensible, customizable, and self-documenting editor [81].

Both of these points have their origins in the worldviews and myths of the hacker culture. Whereas Emacs is primarily associated with functional programming methods, applications of design patterns in computing have often been more closely associated with the Object Oriented (OO) programming style. For example, the c2 pattern wiki was primarily linked with OO traditions.<sup>10</sup> The members of these communities were not always in direct contact.

On c2, “openness” was a key value at the worldview level: specifically, the emphasis was on *in situ* editability and community effort. With Emacs and the broader GNU project, the emphasis extends beyond the availability of source code to encompass the right to share and reuse it. A third perspective on openness comes from Gene Demby and Ashe Dryden, who, along with others, have pointed out that the open source community may not be so open, in practical terms, to newcomers from all genders and ethnic backgrounds.<sup>11,12</sup>

<sup>9</sup><https://www.gnu.org/philosophy/free-sw.en.html#four-freedoms>

<sup>10</sup><https://wiki.c2.com/?DesignPatterns>

<sup>11</sup><https://www.npr.org/sections/codeswitch/2013/12/05/248791579/why-isnt-open-source-a-gateway-for-coders-of-color>

<sup>12</sup><https://www.ashedryden.com/blog/the-ethics-of-unpaid-labor-and-the-oss-community>

Meanwhile, the theme of *openness* appears, with variations, at all levels of our Analysis. It can now be seen as manifold openness *to*:

- *criticism* (Dawes and Ostwald [21]),
- *interpretation* (Dawes and Ostwald again [22])
- *failure* (Gabriel [31]), as well as
- *the sky and the world* (Alexander of *A Pattern Language (APL)*, as seen from the dual vantage points of *the hearth* and *the gateway* [9]; cf. *THE FIRE* (pattern #181) and *MAIN GATEWAY* (pattern #53)).

Bringing these varied perspectives together affords a more comprehensive understanding of the concept of openness—along with its relationship to other linked concepts like freedom, rights, and ethics—as well as contemporary realities surrounding carbon emissions, migration, and systems design. Recentering the pattern theory as a theory of the *open whole*, we can more thoroughly explore dialectic tensions among stakeholders, and potentially initiate dialogue between disparate communities whose work touches on aspects of this theory.

Meanwhile, our Case Study shows, in practical terms, how the CLA of DPL literature and practices in the Analysis could be developed further. The Case Study applied the PLACARD method within the Emacs Research Group (ERG), which held regular meetings following EmacsConf 2020 until a recess for the 2021 summer holidays.<sup>13</sup> Using the PLACARD pattern allowed us to develop a trajectory for our research. As a broader point of reflection, the case study shows how mixing the three methods gives us more than the sum of the parts.

The Case Study also serves to contextualize the work of the Emacs Research Group relative to the PLoP and Peeragogy communities. Over the 25 sessions of ERG seminar, we used CLA in combination with PARs to address the question ‘What is our vision for change and how is progress measurable?’. We foresee the PAR→CLA→DPL workflow to be iterative, assisted by bidirectional links between patterns and next steps, and additionally assisted by software tools. Our current prototypes could certainly be improved. These prototypes are based on Emacs’s built-in Org Mode (a tool for managing information structured in outlines), Org Roam<sup>14</sup> (an Emacs package layered on Org Mode and used for creating zettelkasten, which are, essentially, wikis), and Org Roam Server (a further layer for visualisation of the resulting network structures). These tools have some deficiencies when it comes to interlinking varied contents—such as patterns and next steps—particularly when these originate from distributed sources, such as the Peeragogy project on the one hand and the Emacs Research Group on the other. In short, we need to keep improving our tools in order to effectively manage growing distributed, interlinked, collections of PARs, CLAs, and DPLs, alongside other scientific and technical corpora. Federated Wikis are another area of work where similar concerns are being addressed [19, 26].

With reference to the Case Study, we can now outline an answer to the concern raised at the end of Section 3, namely how do the PLACARD methods help, concretely, to develop solutions? Broadly, a solution process can often be decomposed into interrelated subtasks [1, 69, 70]. A standard problem-solving methodology is to understand the (sub-)context and (sub-)problems in detail—along with their relationships to other parts of the developing decomposition—and on this basis make predictions about the way an intervention could change the overall system. As we will revisit again in Section 6.5, there are “two different forms of information processing (bottom-up and top-down)” [85]. CLA can help with both, and in so doing can indeed assist with solution-development. Nominally, CLA is an analytic tool that decomposes a problematic situation into *layers*, and *causes* operating at and between these layers. In this sense it functions top-down. However, CLA also plays a synthesis role. Whereas we could compare the PAR to a tangent vector or derivative that gives a momentary reading of how things are going at a given point in time, CLA can be used to integrate these observations into a plan.

<sup>13</sup><https://emacsconf.org/2020/>; the conference took place November 28th and 29th of 2020.

<sup>14</sup><https://www.orgroam.com/>

## 6 DISCUSSION

Informed by the two analyzes described above, we would like to reflect on why putting the CLA and DPL methods together can make a big difference in practical terms. To do this, we begin by examining a specific problem domain to which CLA and DPL have been applied separately.

Anthropogenic climate change is a situation of major global concern in the early 21st Century. It comes as no surprise that it has been examined separately by proponents of both CLA and DPL. We use this recent history to frame future work building on the case study and analysis developed above.

In an overview of their work on the Cooling the Commons pattern language, Cameron Tonkinwise and Abby Mellick Lopes write:

A design pattern is first an observation: “People in that kind of designed situation tend to do this sort of thing”. It is then possible to design an intervention that redirects those tendencies. If that intervention succeeds, it can become a recommended pattern to help other designers: “If you encounter this kind of situation, try to make these kinds of interventions” [89].

They amplify the ‘ethical’ aspect of their thinking:

... the patterns we are talking about, context-specific interactions between people and things, are more like habits. They are tendencies that lead to repeated actions.

The 41 patterns they have developed include examples like THE NIGHT-TIME COMMONS,<sup>15</sup> which:

... might shift daytime activities into cooler night times. Some places already have these patterns: night markets and night-time use of outdoor spaces. If locally adapted versions of these patterns encourage people to adopt new habits, other patterns will be needed. These will include, for example, ways to remind those cooling off outdoors in the evening that others might be trying to sleep with their naturally ventilating windows open. Such interlinked patterns point to the way pattern thinking moves from the big scale to the small.

Reading this, we were concerned that, while the Cooling the Commons patterns do acknowledge “horizontal complexity”—namely, through interlinked patterns—the process does not deal with the “vertical complexity” coming from the fact that diurnal rhythms are deeply embedded in biology and culture. People have cultural beliefs about the activities that are appropriate for different times of day. Public and domestic rituals are organized about the daily cycle. Times of day have symbolic associations. As far as we could tell, these authors focused on more or less technical issues at the systems level, and did not acknowledge these issues at the world-view and myth levels. A more comprehensive approach might, for instance, re-examine rituals to see which of them relate to the phenomenon of sunrise versus the act of getting up and starting the day, and then figuring out how to adapt these rituals to a new schedule. A suitable research strategy might be to study how practices changed in the past, as with the introduction of industrialization and its clockwork regimentation of the day.

Meanwhile, Heinonen and coauthors [36] describe a CLA game that explored four different scenarios in small groups. The four scenarios were “Radical Startups”, “Value-Driven Techemoths”, “Green DIY Engineers” and “New Consciousness”. As groups worked through the CLA for each scenario, they developed a range of new ideas. We wondered, how might these CLA-linked reflections collate against the Cooling the Commons patterns? Might players of the CLA game have spotted ways in which the patterns would conflict with deeper values—or ways in which they might be exploited to cause chaos [29]?

Broadening our exploration of how design patterns relate to futures studies, we note that Schwartz [75] (Appendix, pp. 241-248, viz., his “Steps to Developing Scenarios”) described a process that follows an outline that is strikingly similar to a design pattern template. Both Alexander and Schwartz advocate the identification of driving forces in a context. However, unlike Alexander, Schwartz does not intend to resolve conflicts between

<sup>15</sup><https://www.coolingthecommons.com/pattern%20deck/>

the forces within a harmonizing design. On the contrary, the aim in the scenario development method is to understand how these forces might evolve and lead to the further diversification of scenarios. We think that design patterns can be useful inside scenarios, and also used to scaffold the design and evolution of scenarios.

With these reflections in mind, here are four scenarios that will be of interest to DPL practitioners, roughly pegged to the four layers of CLA. We emphasize that these scenarios are not mutually exclusive.

### 6.1 Scenario I. Patterns become explicitly computational

Patterns have been discussed in explicitly computational terms—however, that direction of work so far remains mostly at the level of a proposal [4, 61], with only limited discipline-specific uptake (e.g., [46], [67], [83]). Could this change, to generalize the kinds of patterns that can be computed with, and make them interoperable? Polya had already been writing about patterns of plausible inference the year that Alexander started his undergraduate degree in Cambridge [70]; four years later Polya’s student Allen Newell was beginning to think about how to model the inference process computationally [62, 79]. In the domain of economics, Ostrom-style institutions are analogous to design patterns [66] (p. 11). Recent work looks at how description of such institutions can be extracted from text [72]. Could this line of thinking be extended, so that other similar kinds of patterns could be recognized where they appear? Could the extracted descriptions be used directly in computations? One fruitful strategy might be to think of design patterns as conceptual blends [18], which can be given a computational interpretation [74]. For example, the Cooling the Commons pattern language includes COMMUNITY LIBRARY as one of its patterns; the pattern blends a learning space with a cool refuge, and must balance these provisions against cost and effort. If the library was additionally blended with a WRITERS WORKSHOP, it could become a place for the community to generate knowledge about new adaptive strategies. However, this might conflict with the notion of library contents as being read-only, or with the view that libraries should be silent study spaces. Could these ideas and complexities be reasoned about computationally?

### 6.2 Scenario II. Pattern language authoring communities move to free/libre/open source licensing

In the field of policy, *resilience* describes a society’s ability to recover after a shock; whereas *adaptive capacity* describes its ability to move to a new state [54, 87]. This ability is, in turn, linked with the health and adaptivity of the society’s institutions [28]. Free/Libre/Open Source licensing is one possible institutional innovation in the way design patterns are used that could support social learning, and, in turn, boost adaptive capacity [86]. As an example of work heading in this direction, Mehaffy and coauthors collaborated with Ward Cunningham to make their book *A New Pattern Language for Growing Regions* [57] into a wiki, npl.wiki, which is licensed under CC BY-SA 4.0. Will other pattern developers follow suit and move to open licensing—and suitable infrastructures for working with open contents? We can also ask: what of the other kinds and qualities of openness that we surfaced in Section 5? Using a ‘copyleft’ license is not a panacea for all ills [51], and would not on its own make the pattern theory and methods fully open in all the ways that matter. Nevertheless, grappling with the challenges around licensing and related considerations could serve as rallying point for the pattern community.

### 6.3 Scenario III. PLACARD scaffolds new literacies of collaboration

As we’ve seen in our work with Emacs and Peeragogy (and previously with the online community PlanetMath [15, 52]) projects need more than simply access to source code in order to thrive. We see a link to the topic of reproducible research. Above and beyond the immediate technical considerations [73], the process of doing science is “reproducible” if the methods are teachable to others. The Literate Programming paradigm can help with this.<sup>16</sup> At the same time, collaboration across different skill sets is challenging; large scale problems like adapting to climate change seem to require such collaboration, and almost certainly won’t be solved if we carry

<sup>16</sup>For notes on doing reproducible research with Emacs, see <https://emacsny.org/2014/11/03/org-mode-for-reproducible-research.html>

on doing business as usual. In the Minnesota 2050 project, participants were selected from a variety of professions and leadership roles to produce scenarios for energy and land use, and combined modeling with scenario planning [65]. Actually solving large-scale problems in interdisciplinary teams will require new thinking and additional tools: to bridge between the viewpoints of, e.g., professional futurists, programmers, data scientists, local farmers—and to draw on the insights of citizen scientists [96].

#### 6.4 Scenario IV. Patterns eat Big Tech

Reflecting on the increasingly contextual and transdisciplinary nature of the discussions at PLoP and other venues, along with the other points above, brings to mind Hesse’s *The Glass Bead Game*. In his novel, Hesse describes a society in which the community of scholars studying abstract patterns forms a strong hierarchy, which, however, is out of touch with practical realities experienced by outsiders. This suggests to proceed with caution. When reflecting on futures-oriented discourses, Slaughter described a spectrum: “participatory and open at one pole and closed (or professionalised) at the other” [80]. Access to meaningful participation is a serious matter of concern in our current technological culture [91]. Does our experience of unequal access reappear in the future cultures we envision? With due care, patterns might become the basis of widespread technical literacies, not only for an elite group of hackers or for a few highly-paid rockstars, but for everyone. Patterns have been used to describe soft skills that are useful for aspiring programming professionals [40], however this falls far short of reforming the sector. In order to reform the sector, we would need to study the forces that make it how it is today.

#### 6.5 Related Work

The individual methods we described have various analogies (e.g., between PAR and AAR, or DAILY SCRUM, as noted above; one could also point to Architectural Decision Records<sup>17</sup> and other review tools). PLACARD as a whole is somewhat similar to a method called Causal Layered Synthesis developed by Paul Wildman [95]. Seamon [76] develops an analysis of Christopher Alexander’s work with some parallels to our analysis of DPL via CLA. The patterns collected in *Fearless Change* [56] may be useful for negotiating uptake and development of the scenarios outlined above.

#### 6.6 Criticisms

Some prominent critical voices have been introduced in our Analysis: Dawes and Ostwald provided a comprehensive view of criticisms of DPL; Tidwell questioned the non-user-centeredness of much DPL discourse; VanDrunen focused on potential friction or incompatibilities at the worldview level between mob software and other cultures; Demby and Dryden explain that the openness of FLOSS isn’t actually open to all in the same way by default. We can broaden out somewhat further, to reveal further tensions.

- Shaw and Hill [78] talk about how commons-based peer production is not necessarily egalitarian, so, even if DPL was to move to FLOSS model, we would expect to see cultural winners and losers.
- In a related critique, our collaborator Paola Ricaurte pointed out that an approach to peer production that centers European and North American designers, while ignoring local communities and relationships, is potentially just another form of rehashed colonialism [71].

To expand on this: we take a counterposition to Kostakis et al. [50] who argued for a development model based on “thinking global and producing local.” At the center of their vision is a global pool of designs, which are put into production in local Fab Lab facilities. By contrast, the PLACARD pattern centers local circumstances and histories (via PARs, CLA-linked methods like GENEALOGY, and the context-specific information embedded in DPL). We would expect to see varied knowledge bases develop, that are rich with cultural diversity and human

<sup>17</sup><https://adr.github.io/>

relationships. PLACARD methods could flip the Kostakis et al. formula on its head: patterns are primarily tools for thinking locally about particular contexts, individual relationships, conflicts and circumstances; CLA puts them in context, and PAR keeps this system up to date. Only secondarily and potentially does this lead to any shared global resource. More likely, the methods we've described would simply strengthen local forms of resilience and better identify healthy futures.

### 6.7 How PLACARD relates to Alexander's broader programme

We draw the reader's attention to two diagrams from Alexander's *Notes on the Synthesis of Form (NSF)* recopied here as Figure 2. Parts A.-C. of this figure have two columns corresponding to "context" and "form" (the latter being analogous to what we have been calling a *solution* in this paper). These component figures have one, two, or three rows, with labels "actual world", "mental picture" and "formal picture". A creative problem is posed at the level of the *actual world*, say, "build a house atop this hill" or "make a celebration song".

The problem can, however, be addressed at any one of the three levels. The most direct approach is to work in the actual world. For instance, a musician might pick up an instrument, start playing something, try out different possibilities, modify notes or phrasings to make it sound better, and so come up with a song.

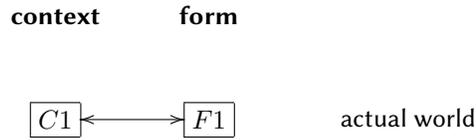
At the level of *mental picture*, a designer receives design requirements which describe the problem, and produces a plan which describes a solution. For instance, the host of the party might make a request "Write a joyous song for alto voice accompanied by flute and trumpet to celebrate the acceptance of our paper into the conference." A composer might then sit down at a desk, away from any instruments, and write out a score which would later be handed to the singer and instrumentalists for performance. Alexander points out that there is a danger in this process: the composer would no longer have the immediate feedback which comes from working directly in the actual world. Accordingly, the result might be a song that matches the description, but doesn't match the mood of the event.

Alexander's proposed solution is to produce a *formal picture* of the mental picture, and instead work with that formal picture. For our example, this might take the form of a suitably elaborate music theory, one that includes concepts like '*ballabile*' (to indicate that the song should be danceable). More generally, we employ a suitable metalanguage to reason about the mental representation; this process of reasoning can then take the place of feedback from the actual world in guiding and evaluating our designs. In *NSF* this consists of a set-theoretic formalization of design requirements and potential misfits.

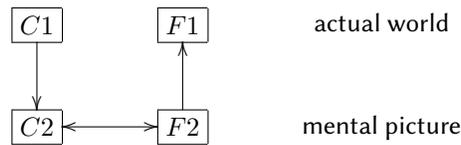
Figure 2D. refers to the process of design once we have arrived at the "formal picture" level. The left panel represents the analytic process in which a design problem is decomposed into subproblems; the right panel represents the complementary synthetic process which successively combines solutions to subproblems to arrive at a solution to the original problem. In *NSF*, Alexander proposed a maximum entropy method for carrying out the analysis and, in later works, introduced design patterns for use in the synthesis; and ultimately, described 15 principles that could guide a design at an even more abstract level.

As we move from the actual world to the formal picture, the content of the mental process becomes more detached from the context and is more widely shareable among a community who is conversant with the formal language. There are trade-offs involved: the shared formal language may not always capture the intricacy of local relationships.

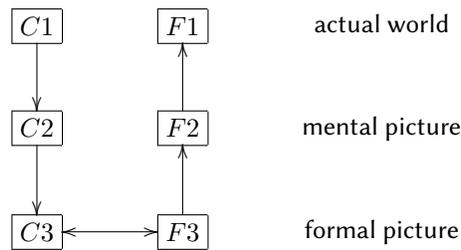
In this paper, we have considered the problems faced by groups of people organizing their activities, often in distributed networks. The naive "actual world" approach (Figure 2A.) would be when a group takes a "seat of the pants" approach to dealing with issues as they come up in the course of work. Moreover, they may not communicate with others elsewhere as the work develops. PAR can help to sketch a "mental picture" which can be readily shared with people who were not in attendance, and which can also be referred to later as a source of partially processed data. CLA and DPL can then be used to formulate a "formal picture": as in our Case



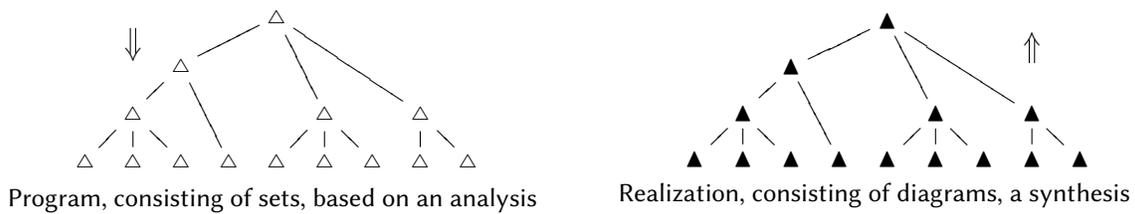
A. As a base case for creative work, there is a close relationship between content and form, and they evolve together. Alexander calls this *unselfconscious*: people do things by tradition, trial, and error, rather than by design.



B. Here, we add a mental picture that abstracts from the context (e.g., design requirements) and the form (e.g., plans). In short, now work takes place mediated by a design process. This allows specialization of labor, but there is no longer a direct unmediated link between C1 and F1.



C. Now we add a meta-language: the formal picture (e.g., a pattern language) corresponding to the mental picture.



D. At this level we have methods for actually doing the programming.

Fig. 2. Diagrams from *Synthesis of Form*

Study, where we moved from informal PARs, via a CLA, to next steps linked with design patterns. Once this has been done, we arrive at a stage where we can use DPL to synthesize solutions, much as Alexander envisioned; PLACARD would additionally suggest to return to the other methods as needed.

Thanks to CLA, we have also gained a further understanding of some meta-level issues that can arise when applying DPL. Our analysis and scenarios point to a range of social and cultural issues—such as varied notions of openness, the complex relationship between diversity and hierarchy, the tensions between innovation and efficiency, and the interaction of formal and informal reasoning—which can round out the already well-recognized “concerns for pedagogy, efficiency, flexibility, and convincing argument” [64] embraced by pattern authors. Just as even a talented musician without a solid grasp of music theory would be hard pressed to compose an augmentation canon or symphony, so too we suggest that a group which faces complex challenges may want to consider these meta-level issues together with PLACARD when orchestrating their activities. In sum, the methods we’ve discussed can be used to operationalize a strategy that is at the heart of Christopher Alexander’s oeuvre. In future work, it would be interesting to look further at how this relates to program- and programming-specific design considerations, as described, e.g., by Felleisen et al. [27].

## 7 CONCLUSION

In 1999, the architect Christopher Alexander discussed the future of design patterns with an audience of programmers. We revisited this topic, aided by a method from the field of future studies. We developed a practical case study, an analysis of the design pattern discourse, as well as several scenarios that members of the design pattern community may wish to consider as they give shape to this community’s future development.

Our vision for change is that the four scenarios we developed (“Patterns become explicitly computational”, “Pattern language authoring communities move to free/libre/open source licensing”, “PLACARD scaffolds new literacies of collaboration”, “Patterns eat Big Tech”) will be given serious thought by other members of the patterns community. Our Case Study suggests ways in which progress could be made towards realizing these scenarios. Progress will become measurable through markers of debate and dialogue between the different communities whose work we have drawn upon, and perhaps through trial-and-error uptake or adaptation of the methods we’ve described. Key next steps for us will be outreach to the communities familiar with CLA and Action Reviews, as we have done here with the patterns community.

We are certainly not the only people to think about systems and futures: what is distinctive about this paper is that we’ve connected these domains with the design pattern terminology and methods. We began by thinking about patterns from a fundamental perspective: *patterns as elements in the world*.

Some patterns repeat in space, some in time, some in both space and time; think of a tiling, a beat, a wave. However, patterns cannot repeat exactly or forever: their elements are subject to spatial or temporal displacement, and other forms of variation. We need suitable abilities—and methods—to perceive and work with patterns. The methods we used in the paper were the Project Action Review (PAR), Causal Layered Analysis (CLA), and Design Pattern Languages (DPL)—though other methods that fulfill the same basic purpose could be used without significantly changing the overall import of what we say here.

- By using the PAR (or another sensory method), we are able to identify recurring themes.
- Then, by using the CLA (or another cognitive method), we are able to organize these repeating themes in a structure that exposes the underlying trends, causes, and potential terminating states.
- With DPL (or another motor method) we can make what we have learned actionable.

The methods can be interwoven, as we illustrated by combining PAR, CLA, and DPL into the PLACARD pattern.

The limitations of the research presented will be clear. Our case study examined a small and well-integrated population, which is moreover, a subset of the authors of the present paper. While the case study provides a proof of concept for the applicability of the methods, in other settings, some or all of the methods might

not be needed, or accepted. Nevertheless, from a modeling perspective, PLACARD could potentially be used to make sense of even very different collaboration patterns—so long as they have sensory, cognitive, and action components. Despite the limitations of this study when it comes to scale, evidence to support the use of the integrated PLACARD pattern may accumulate rapidly, if the method proves useful for bringing training, futures, and design communities together, in the first instance, and if this makes their work demonstrably more robust (which we hypothesize that it would).

As a way forward, we can imagine these methods being readily applied in workshop settings. For example, if we were to gather a group of citizens, experts, and other stakeholders to talk together about the city, they could use the methods we've described to surface issues, rehash concerns, and sensemake together. "Anticipatory Social Science" is a broader term for this kind of work. Moreover, working with methods that distribute perception, cognition, and action, we may become more comfortable with uncertainty, and better able to support innovation.<sup>18</sup> Especially when we think about contemporary problems like climate change, it is not enough to think about the past; ultimately, we need to develop a transformative set of tools and methods [60]; and beyond this, a coherent worldview, and even new myths. Citizen science has a potentially important role to play here [96], alongside new forms of literature; the methods described may help to support widespread engagement. Appendix F contains a workshop proposal that we have submitted to PLoP 2021 alongside this paper. In the workshop, we hope to explore the biome of concepts and techniques that can help to build adaptivity in groups. If the workshop goes well, it could be repeated with variations to explore other topics, such as food security, the design of urban spaces, or, indeed, the future of design patterns.

Our paper reflects on several domains in which design patterns have been used. Alongside the broader transdisciplinary contribution, we have started to develop a set of requirements for software that can help people work with these methods. As Alan Turing said regarding the future of computing machinery and intelligence, we can see plenty that needs to be done.

Lastly, as regards Alexander's visionary question: perhaps the 'Chartres of programming' has been hidden in plain view all along. Alejandro Jodorowsky refers to the Marseilles Tarot as a "nomadic cathedral" [47] (p. 10). Are pattern languages the same sort of thing? Consider that cathedrals are not just a place to pray or to do private inward contemplation; they also have meaningful overall designs, and are accompanied by beautiful images in the form of stained glass windows to support people in understanding bible stories and otherwise create an appropriate environment to inspire devotion. Similarly, design patterns typically come with images, and through venues like PLoP, are associated with spaces of congregation. With PLACARD, we have discovered a nexus that could bring wider communities together.

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The image appearing in Figure 1 was made available under the terms of CC Zero by Lapsed Pacifist at [https://commons.wikimedia.org/wiki/File:Shell\\_to\\_Sea\\_placard.jpg](https://commons.wikimedia.org/wiki/File:Shell_to_Sea_placard.jpg).

<sup>18</sup>As Nietzsche said, "the more affects we are able to put into words about a thing, the more eyes, different eyes, we can use to observe one thing, the more complete will our 'concept' of this thing" [63], p. 128.

## A SUPPLEMENT: ANALYSIS: CLA APPLIED TO DESIGN PATTERN LANGUAGE LITERATURE AND PRACTICES

### A.1 Litany: Understanding data, headlines, empirical world (short term change)

The first layer in CLA is the **litany layer**: it describes the problems that people are well familiar with. In the case of the design patterns discourse, this level includes—in particular—the familiar kinds of conflict-based problems that are described in patterns and discussed at PLoP, along with higher-order problems of application, and debates about these (e.g., ranging from Christopher Alexander’s “ENTRYWAY TRANSITION” pattern to his remarks about how people who attempted to apply his methods ended up placing “alcoves everywhere”, etc.). This layer is sometimes also referred to as the **problem level**: in the patterns discourse, problems abound. Indeed, one of the core attributes of the pattern community is that it is not only comfortable with problems but that it actively seeks them out with a ‘problematizing’ discourse.

Not all of the well-known and discussed problems have been solved. For example, ‘Alexander’s Problem’, as described by his collaborator Greg Bryant, is that:

... despite all of the tools he created, his penetrating research, his many well-wrought projects, and his excellent writing, he did not manage to grant, to his readers, the core sensibility that drove the work. He also did not organize the continuance of the research program that revolves around this sensibility. [12]

Attempts to work out a practical solution to this problem are developing.<sup>19</sup> Coming at the same basic issue from a more visionary standpoint, Alexander framed this query for the programmers who were using pattern methods at the turn of the millennium:

What is the Chartres of programming? What task is at a high enough level to inspire people writing programs, to reach for the stars? [4]

More recently, Dawes and Ostwald [21] develop an elegant taxonomy of criticisms of the pattern method. In outline, their taxonomy covers criticisms at the following three layers:

- Conceptualization** Ontology, Epistemology  
(e.g., “Rejecting pluralistic values confuses subjective and objective phenomena”)
- Development and documentation** Reasoning, Testing, Scholarship  
(e.g., “The definitions of ‘patterns’ and ‘forces’ are inexplicit”)
- Implementation and outcomes** Controlling, Flawed, Unsuccessful  
(e.g., “Patterns disallow radical solutions”)

By showing how the criticisms relate to one another, Dawes and Ostwald begin to develop a GENEALOGY at the level of critical perspectives. The critiques they examine show that there is not just one pattern discourse, but many. In a parallel work the same authors analyze the structure of Alexander’s classic text, *A Pattern Language (APL)* and develop three alternative perspectives on *APL*’s contents, which they refer to as the **generalized**, **creator**, and **user** perspectives [22]. These perspectives amount to different techniques for REORDERING KNOWLEDGE. We will elaborate at the next level.

### A.2 System: Systemic approaches and solutions (social system)

The **system** layer is typically understood in terms of the **social phenomena** that cause the problems at the litany layer to emerge (along with their familiar solutions). In the original setting in which patterns developed, this layer would have included causes such as more people living in cities, combined with the possibility of

<sup>19</sup><https://www.buildingbeauty.org/> and <https://www.buildingbeauty.org/beautiful-software>

developing a more community-driven approach to design using contemporary technologies. In short, at this level, we examine where the familiar problems come from.

Dawes and Ostwald's [22] central finding is that many patterns in which Alexander had medium or low confidence in fact occupy a relatively central position in *APL*'s graph:

... the patterns which are most likely to be encountered by designers – are most easily accessed, or provide greatest access to other patterns – might be those which Alexander acknowledged were incapable of providing fundamental solutions to the problems they addressed.

This means that novice users could be expected to encounter problems in application of *APL*'s patterns: “despite its often authoritative and dogmatic tone, Alexander’s text was framed as a work in progress, rather than a definitive design guide” (p. 22). Dawes and Ostwald suggest that their analysis could point to “prime opportunities to continue the development of *A Pattern Language*” (p. 21).

Here, a range of media issues begin to crop up. Broadly put: there have been some attempts at creating systematic archives of patterns [45, 49], but these efforts haven't always garnered significant buy-in. Importantly, the first-ever Wiki was developed in connection with a platform for developing, sharing, and revising pattern languages [19].<sup>20,21</sup> However, there was a distinction between the discussions and the finished patterns. In the 2013 retrospective, Ward Cunningham and coauthor Michael Mehaffy write:

The original wiki technology functioned in a direct open-source mode, which allowed individuals to contribute small pieces to incrementally improve the whole. (*ibid.*)

This is true if by “open source” we understand what you see when you click Edit—but the statement could be misleading relative to contemporary usage, which is often linked with the Open Source Initiative's definition, which centers on the premise that “Open source doesn't just mean access to the source code.”<sup>22</sup> On the c2 wiki, licensing was restrictive. Discussions were to take place in “letters and replies” rather than revision or annotation of the published patterns; rights associated with the finished patterns were closely guarded.<sup>23,24</sup>

Although Wiki technology could in principle have been a site for ongoing DECONSTRUCTION of patterns, this hadn't happened on c2. This is itself interesting and worth deconstructing a bit. Notably, there were only *four* published “letters and replies”.<sup>25</sup> Unfortunately, we could not find a public archive of the design patterns mailing list where further discussions took place. This suggests certain factors of contingency in the development of the discourse. Over the years, some of these concerns have been addressed—e.g., through the introduction of Federated Wikis and new licensing models—and other issues and concerns came to the fore.

Dawes and Ostwald's [22] remarks on multiple perspectives on pattern languages resonate Jenifer Tidwell's charges against the Gang of Four:

... the reality of a software artifact that the developer sees is not the only one that's important. What about the user's reality? Why has that been ignored in all the software patterns work that's been done? Isn't the user's experience the ultimate reason for designing a building or a piece of software? If that's not taken into account, how can we say our building – or our software – is “good”? — “The Gang of Four Are Guilty”<sup>26</sup>

Notice that the *user* of the designed artifact has entered the story as a different figure from the user of the pattern language, whom we met above. Tidwell's critique suggests at least a couple ALTERNATIVE PASTS AND

<sup>20</sup> <http://wiki.c2.com/?PeopleProjectsAndPatterns>

<sup>21</sup> <http://c2.com/ppr/>

<sup>22</sup> <https://opensource.org/osd>

<sup>23</sup> <http://c2.com/ppr/titles.html>

<sup>24</sup> <http://c2.com/ppr/about/copyright.html>

<sup>25</sup> <http://c2.com/ppr/letters/index.html>

<sup>26</sup> [http://www.mit.edu/~jtidwell/gof\\_are\\_guilty.html](http://www.mit.edu/~jtidwell/gof_are_guilty.html)

FUTURES: e.g., what if the end-user had been placed at the center the whole time? Alternatively, what if the primary focus of patterns was to facilitate interaction between different stakeholders? The fact that Tidwell’s book [88] and an essay by Jans Borchers [11] which drew inspiration from her critique both have over 1000 citations on Google Scholar shows that Tidwell’s perspective has been impactful. To get a sense of how the pattern community may have been informed by this critique—alongside other related trends and concerns—we can look at how the Writers Workshops at PLoP have evolved over time. In Table 3, a selection of titles of workshop sessions show how the focus of PLoP evolved from primarily ‘programming’ oriented to a much broader contextual view over time. Indeed, by 2019, the focus is almost exclusively ‘contextual’. The way the themes under discussion have evolved brings to mind the layers of CLA.

Table 3. Evolution of PLoP Writers Workshop topics in selected years: CLA in the wild?

1997	2011	2015	2019
Architecture	Architecture	Pattern Writing	Group Architecture
Roles and Analysis	Design	Software Architecture & Process	Culture
People and Process	Information	Cloud & Security	Meta
Domain Specific Techniques	People	Innovation & Analysis	Education
OO Techniques	Pedagogy	People & Education	
Non-OO Techniques			

### A.3 Worldview: ways of knowing and alternative discourse

The next layer comprises **worldviews** (e.g., Alexander’s view that “There is a central quality which is the root criterion of life and spirit in a man, a town, a building, or a wilderness”).

The situation with licensing on c2 is particularly interesting in light of Alexander’s perspective that *APL* was a “living language”. In principle, Wiki technology might have presented the opportunity to realize this vision fully for the first time, in a virtual setting. Wiki technology did become widely influential when it was combined with a free content license on Wikipedia (originally GNU FDL, later CC-BY-SA).

Fast-forwarding to the present day, Christopher Alexander’s website [patternlanguage.com](http://patternlanguage.com) writes about The Struggle for People to be Free—but it is not referencing freedom in the GNU sense.

In 1979 he was concerned: “Instead of being widely shared, the pattern languages which determine how a town gets made becomes specialized and private.” In 2021, *APL* itself is only legally available for subscribers or for people who purchase a paper copy of the book. (Or through a library!) Of course, like many famous texts it can also be obtained extra-legally for download as a PDF: but that format does not afford downstream users the opportunity to collaborate on the text’s further development.

Gabriel and Goldman talk about sharing and gift culture in their essay *Mob Software: The Erotic Life of Code*.<sup>27</sup> This reference suggests another reason why sharing knowledge in non-editable formats can be problematic. Their primary source on gift culture is Hyde [41], who talks about what happens when exchange items are taken out of the gift exchange culture and put in a museum:

A commodity is truly “used up” when it is sold because nothing about the exchange assures its return. The visiting sea captain may pay handsomely for a Kula necklace, but because the sale removes it from the circle, it wastes it, no matter the price. Gifts that remain gifts can support an affluence of satisfaction, even without numerical abundance. (*ibid.*, Chapter 1, p. 29)

<sup>27</sup>Notably, this essay was presented as a keynote talk at the same programming conference where Alexander had delivered his keynote, [4], four years previously.

Gabriel and Goldman reference the open source community—but not the free software community, so we will follow their usage here—as the origin of Mob Software.

Because the open source proposition asked the crucial first question, I include it in what I am calling “mob software,” but mob software goes way beyond what open source is up to today. [32]

That question is: “What if what once was scarce is now abundant?” It is well known that the PLoP conference series builds on this idea: it includes shepherding and workshops [31] as well as games, informal gifts, and other measures that aim to create a sense of psychological safety: all features that make PLoP a space where ‘failure’ is OK and even celebrated, as per Mob Software. The essay develops its own criticisms of open source, e.g., “the open-source community is extremely conservative” and forking happens rarely. (Five years later, with the creation of Git, a certain form of forking became more typical.) Resonating with Tidwell’s critique from above:

One difference between open source and mob software is that open source topoi are technological while mob software topoi are people centered.

On a technical basis, Gabriel’s vision sounds a lot like today’s world of *microservices*. While his vision hasn’t fully come to pass—for example there are still many services with proprietary source code—nowadays many big companies are also big proponents of open source. Here we can notice that Gabriel was employing a technique of imagining ALTERNATIVE PASTS AND FUTURES, e.g., he imagined a future in which:

Mentoring circles and other forms of workshop are the mainstay of software development education. There are hundreds of millions of programmers.

We would like to dig somewhat deeper into the foundations of the worldview that Gabriel puts forth in this essay. Usefully, an article by VanDrunen “traces the source of Gabriel’s ideas by examining the authorities he cites and how he uses them and evaluates their validity on their own terms” [93]. VanDrunen’s critique functions as a (detailed) DECONSTRUCTION of the thinking behind Gabriel’s essay. Some key excerpts appear in Table 4. It is worth noting that this is by no means a complete critique. As an example of one direction that we will not have time and space to develop here, some applications of the concept of ‘gift culture’ have been criticized as hegemonic in nature [55]: should we expect pattern-theoretic, mob, or free/libre/open source software culture to be immune from such concerns? VanDrunen’s critique is useful for our purposes not because they provide the last word, but because this criticism points to the importance of considering the deeper layers in developing a concept or approach. There may also be conflicts at these deeper layers.

It is also worth noting that mob software is but one of many diverse visions of the future of programming [64]. An embrace of diverse perspectives seems to be a fundamental part of the associated worldview. After all, the primary theoretical model of a computer is termed “universal”. Perhaps there is a bit of a paradox or double bind here, insofar as we embrace diverse perspectives just as long as they are compatible with our core tenets. For at least some pattern authors, these include “their love of programs and programming” (*ibid.*). (On this last point, both VanDrunen and Gabriel seem to agree.)

#### A.4 Myths: metaphors and narratives (longer term change)

Lastly, there are **myths or metaphors** (e.g., Alexander’s idea that the architect’s work is done ‘for the glory of God’ (see Galle [33]) or his conception that ‘primitive’ dwellings contain more life). To emphasize, CLA does not dismiss myths in the slightest: on the contrary, they are what drive the other layers. Another term that is used to characterize this layer is **narratives**. VanDrunen surfaced various concepts in Gabriel’s essay that would be at home at this level, for example, the concept of *duende* that Gabriel takes over from Garcia Lorca originally derives from *dueño de casa*, the name of a certain kind of household spirit. However, myth here does not just refer to such entities, but to the most deeply held beliefs and concepts that underlie worldviews.

Table 4. Key observations from VanDrunen’s critique of Gabriel’s “Mob Software” essay

“Kauffman’s work is about a rediscovery of the sacred, and it amounts to a proposal of the laws of self-organization as a new deity”
“One thing we find in common with Lewis Thomas’s ants, Kauffman’s autocatalytic sets of proteins, and the agents inhabiting Sugarscape is that they all lack intelligence.”
“In other words, the rules given by Gabriel describe only the conforming aspect of group behavior. In reality, there is a tension between independent and conforming tendencies, and the flock patterns emerge from the interaction between the two.”
“His examples of ‘mob activity’... the making of the Oxford English Dictionary, cathedral-building, and open source software discussed later—all had oversight, master-planning of some sort.”
“There are several distinct senses of ‘gift’ that lie behind these ideas, but common to each of them is the notation that a gift is a thing we do not get by our own efforts.” [Quoting Hyde [41].]
“Certainly proprietary code is shared property among those working in a corporate development team, but it is not common to the larger community of software developers and users.”
“A computer program is not like a poem or a dance in this way; if the programmer is not able to produce something parsable in the programming language or cannot fit the instructions together in a logical way, the program simply will not work.”
“Gabriel’s own experience may color his perception. He founded a software company that produced programs for Lisp development and which went bankrupt after 10 years.”
“Moreover, if Gabriel means to suggest that these programming languages or models could have made programming more accessible to the masses lacking technical skill, it is quite a dubious claim”

One important narrative for the pattern discourse is in plain view within the terminology of problems and solutions, which come from mathematics and physics. Alexander worked *at the level of narrative* to connect the patterns discourse to a scientific worldview, seeking a sense of objectivity. For example, in “The Atoms of Environmental Structure”:

most designers ... say that the environment cannot be right or wrong in any objective sense but that it can only be judged according to criteria, or goals, or policies, or values, which have themselves been arbitrarily chosen. We believe this point of view is mistaken.

Notice that, here, the discourse is positioned as different from the mainstream of architecture. The key differentiator is not the language of problems and solutions, which would be familiar to anyone with an engineering background; rather, but in a certain notion of *wholeness*. Which notion of wholeness remains to be surfaced. Quoting, again, from “The Atoms of Environmental Structure”, we get some relevant background:

We believe that all values can be replaced by one basic value: everything desirable in life can be described in terms of freedom of people’s underlying tendencies. ... The environment should give free rein to all tendencies; conflicts between people’s tendencies must be eliminated.

Historically, there are at least two major varieties of wholeness: one that is based on progressive differentiation (e.g., unfolding from substance, per Spinoza), and the other generated by interaction between components (e.g., mutually reflecting monads, per Leibniz). In support of these allusions, a quote of Alexander from *The Nature of Order (TNO)*: it “may be best if we redefine the concept of God in a way that is more directly linked to the concept of ‘the whole.’” This sounds a lot like Spinoza! Indeed, the pattern discourse appears to draw from *both* major traditions of wholeness, while also seeking to unite them. We get the idea of unfolding in *APL* and other pattern languages that work in a top-down manner: however, we also get the notion of patterns and principles that are generative of emergent phenomena.

At this level, architecture and programming were seen, by Alexander [4], to unite: his questions for the computer scientists to whom he was speaking point in the direction of bio-hacking and nanotechnology (e.g., for molecular self-assembly)—at least at the allusive level. The following quote suggests we have embarked on a fruitful track by attempting to think at the deeper layers of the pattern discourse:

Generative patterns work indirectly; they work on the underlying structure of a problem (which may not be manifest in the problem) rather than attacking the problem directly.<sup>28</sup>

Clearly, another key metaphor—which also has a generative aspect—is the metaphor of *language*. The prominence of linguistic metaphors within DPL reminds us that Alexander’s architectural oeuvre contains many traces of symbols associated with Hermes: a deity associated with communication and mediation. Through these reflections we gain some useful DISTANCE.

In the house, [Hermes’] place is at the door, protecting the threshold... He could be found around city gates, intersections, state borders, and tombs (the gateways to the other world). [9]

At the time when Hermes was actively embraced as a deity, in some traditions he was paired with Hestia, the goddess of the hearth, whose “domain was internal, the closed, the fixed, the inward” (*ibid.*, here and in quotes later in this paragraph). The discourse around patterns contains some aspects that move towards foundations (e.g., in the form of fundamental principles, per *TNO*). Such foundations could be associated with Hestia, whereas Hermes would be on the side of generativity and mutation. The dichotomy seems to repeat itself within the *TNO* principles themselves: recalling that “focus” is the Latin term for the hearth, Strong Centers would align with Hestia, whereas Hermes would align more with Deep Interlock and Ambiguity. The resolution of the two forces within pattern language—as a form—seems to be a variation of these Nietzschean lines: “anything that is becoming returns” (i.e., is discussable as pattern), and, “contingency resolves itself into necessity” (i.e., the wholeness of generativity ultimately recovers the wholeness of unfolding).

Our task in this section has been to situate Alexander’s thought relative to the myths and symbols of wholeness; we’ve surfaced some of the tensions and dynamics that exist at this level. Relationships to some other contemporary thinkers are discussed by Elsheshtawy [25], in particular, a relationship to Piaget’s conception of operational wholeness is developed. Alexander, for his part, professed ignorance of French Structuralist theory (quoted at *ibid.*)—in particular, of Barthes and Foucault, whom Inayatullah draws upon—and he tags Nietzsche as a nihilist, while distinguishing his own work as comparatively hopeful [3]. For further reflections on Nietzsche and wholeness, see [10]. For more on Hestia and Hermes in an architectural context, see [68].

## B SUPPLEMENT: CASE STUDY: PLANNING “SEASON 1” FOR THE EMACS RESEARCH GROUP

We did a PAR at the end of every (approximately weekly, two-hour) session.<sup>29</sup> This allowed us to track progress, and to surface key issues and concerns. For example, bootstrapping needs related to scheduling and collaboration tools, along with persistent questions about how best to go public, are documented in our first PAR (reproduced in Appendix C). Every six weeks or so, we merged selected bullet-points from our PARs into the CLA outline in an intuitive way, depending on which section they seemed to fit best. We elaborated those bullet points into a narrative form, which we jointly revised to accommodate new data as time went on. We also began to develop TODO items that would make the next steps for this seminar group both actionable and meaningful. Additionally, we connected these TODO items to design patterns collected in the *Peeragogy Handbook* [17] (with ongoing work appearing at [peeragogy.org](https://peeragogy.org)). The TODO items typically are not concrete objectives, but are, rather, descriptions of anticipated patterns of behavior—here linked to *bona fide* design patterns. To refine these items into tasks that are concretely doable will require further breakdown and elaboration.

<sup>28</sup><https://wiki.c2.com/?GenerativePattern>

<sup>29</sup>Data archived at <https://github.com/exp2exp/exp2exp.github.io>, with meeting notes and PARs indexed and viewable on the web at <https://exp2exp.github.io/erg>.

Paragraphs summarising the CLA are augmented with representative data from the seminar sessions, and further broken down into next steps which are cross-referenced with peeragogy design patterns, like ROADMAP [17].<sup>30</sup> We include data points supporting the CLA from the PARs carried out in our 1<sup>st</sup>, 10<sup>th</sup>, and 18<sup>th</sup> sessions (marked with ①, ⑩, and ⑳ below). By the time of our fourth iteration of the larger PAR → CLA cycle, each section had accumulated around 20-30 bullet points of supporting data at a similar level of granularity.

### B.1 Understanding data, headlines, empirical world (short term change)

We've made progress since we started with the raw themes of **Research on/in/with Emacs** back in December 2020. We've met almost every week since then, and interviewed some interesting and varied guests. We have a clearer idea of what we want to talk about at the next EmacsConf, and how we can be of service to researchers and Emacs users. We have been using a workflow that helps us carefully review progress, diagnose issues, and manage our energy. The next phase of this project is to “go public” and mesh with ongoing related activities elsewhere, including by getting some training events up and running.

#### *Representative supporting data.*

- ① *Everyone shared a brief intro and ideas so we got to know each other*
- ⑩ *We've brainstormed a couple of options for getting out there: White-papers, Grants, Journal papers (very concrete)*
- ⑳ *Alex: My major intention was to meet you guys and learn something, wanting to reinforce existing knowledge of emacs and develop it further*

#### *Next Steps.*

Maintain plans for the next six months	ROADMAP
Keep doing PARs and CLAs	ASSESSMENT
Mesh with other ongoing activities elsewhere	COOPERATION
New user workshops: “Zero to Org Roam”	NEWCOMER
Come up with a categorical treatment of todo-categories	FORMAL PATTERNS

### B.2 Systemic approaches and solutions (social system)

If we tackle big enough projects, it will bring with it the need for collaboration. We like to create tangible deliverables (e.g. journal articles). However, “If we knew what the outcome was, it wouldn't be research”—therefore, we're focusing initially on research methods and design documents. That may result in a longer time to write initial papers, but when something is released it is more thoroughly prepared. Meanwhile, we keep our skills sharp by fixing bugs, improving our own workflows, and actively exploring the landscape. All these activities are part of the system we implement regularly, which minimizes technical debt and allows space for serendipity to occur.

#### *Representative supporting data.*

- ① *Part of a greater sense of trying to do something with EmacsConf to federate the community*
- ① *Joe: Leo did an amazing job facilitating the meeting*
- ① *Public Policy conference: (How to get a grant?)*
- ⑩ *Potential interview with Leo & Jethro Kuan (co-maintainers of org-roam)*
- ⑳ *Leo did a nice job of intervening*

<sup>30</sup>See <http://peeragogy.org/top> for a reworking of the *Peeragogy Handbook* as a unified pattern language, which extends the earlier presentation in [16].

*Next Steps.*

Identify potential stakeholders in Emacs Research	COMMUNITY
Identify stakeholders in the kind of activities we can support	A SPECIFIC PROJECT
Identify venues where we can reach these different stakeholders	WRAPPER
Create some publication to plant a flag for our group	PAPER
Keep exploring!	SERENDIPITY

## B.3 Worldview, ways of knowing and alternative discourse

We have looked at RStudio and Roam Research as models of (some of) the kinds of things we think Emacs can learn from and eventually improve upon. ‘Practice’ and ‘method’ keep coming up in our discussions as, respectively, ‘more bottom up’ and ‘more top down’ ways of actualizing things. Concretely, we’ve been studying our own processes and looking for the tools and settings that are the most conducive to the work we want to do. For example, instead of having a single Org Roam directory shared via Git, what if we had ways of managing sharing of notes across ‘graphs’?

Collaboration is familiar to teams across all domains. Even authors working alone will collaborate with their past and future selves. What is common for all collaborators is that the transfer of information must be uninhibited. If we all had our slipboxes online, we could interlink them.<sup>31</sup> This would generalize **ORCID**, and allow people to reference processes that are undergoing evolution. Maybe a service like this would turn into a ‘Tinder for academics’—helping to match people based on their interests (or similar people in different fields). So, what’s the price point? Instead of paying money to go to conferences, now we can spontaneously make conferences and workshops. As a guess, \$750.0 per user per year might be a fair price—for those who can afford to pay it—if the service helps people to do better research and saves a bunch of travel. We could also set up a pricing model proportional to each country’s carbon emissions or something like that.

*Representative supporting data.*

- ① *Wonderful outcome from attending EmacsConf 2020!*
- ⑩ *Anthropology + Psychology is a special nightmare for reproducibility*
- ⑩ *Maybe the ERG could contribute further patterns?*
- ⑱ *But there’s a problem with Emacs, which is that there isn’t proper intro*

*Next Steps.*

Spec out the Emacs based ‘answer’ to RStudio, Roam Research	COMMUNITY
Develop our own intention-based workflow	FORUM
Continue to develop and refine our methods	ASSESSMENT
Product and business development plans for a multigraph interlinking service	WEBSITE
A tool to find and match peers/content	RECOMMENDER

## B.4 Myths, metaphors and narratives: imagined (longer term change)

In our concrete methods, we have aligned ourselves with the ‘long-term perspective’. This includes both retrospective and prospective thinking. For example, the things that were timely 7 years ago might not be so timely now; in many cases the relevance of a given innovation goes down over time. However, Emacs has an evolutionary character that has allowed it to keep up with the times—becoming more relevant and useful ever since Steele and Stallman started to systematize Editor MACroS for the Text Editor and Corrector (TECO) program.

<sup>31</sup>The zettelkasten (German for “slip box”, plural zettelkästen) is a method of note-taking and personal knowledge management used in research and study. (Wikipedia)

Not only has the technology evolved, but so has the social setting in which this work is done. Whereas the concepts underlying the free software movement were based on “communal sharing” of source code, these methods can be extended and allow us to synthesize new relationships within broader semiotic commons. Emacs can become part of a system for addressing large-scale existential problems, by expanding the frontier of what’s possible for human beings.

*Representative supporting data.*

- ① *We generally agreed that we want to make something that exposes intrinsic value of using these tools*
- ⑩ [None recorded at this level from this PAR.]
- ⑲ *But there was no such guidance; you were in the middle of an alien playground. “But I just wanted to do my Clojure stuff.”*

*Next Steps.*

Survey related work	CONTEXT
Assess what we’re learning	ASSESSMENT
Think about how we can help improve gender balance in Free Software	DIVERSITY

## C APPENDIX: EXAMPLE PAR: EMACS RESEARCH GROUP, DECEMBER 2, 2020

The Emacs Research Group maintained a practice of carrying out a PAR at the end of each meeting.<sup>32</sup> This is the first of those PARs.

- (1) **Review the intention: what do we expect to learn or make together?**
  - Joe Noorah and Leo wanted to convene a meeting with interested parties in Emacs+Research
  - Address longstanding worry about “wait until next year”
  - Part of a greater sense of trying to do something with EmacsConf to federate the community
- (2) **Establish what is happening: what and how are we learning?**
  - Met for an initial 70 minute meeting (via Zoom)
  - Everyone shared a brief intro and ideas so we got to know each other
  - Joe took notes via screenshare... we all took notes (as academics)
- (3) **What are some different perspectives on what’s happening?**
  - Cameron: We are meeting for the first time so there’s a lot of intro information
  - We generally agreed that we want to make something that exposes intrinsic value of using these tools
  - Vaguely agreed on follow-up directions, this seems to be a general consensus, often with full agreement (e.g., on testing and making a collaborative Org Roam work, to further cement as tool for collective thinking in combination w/ individual)
  - David: there are ways I could help out with extra elisp, helping figure out a package, intro elisp workshop
  - Joe: Leo did an amazing job facilitating the meeting
  - Ray: I was impressed by the diversity of the group in background & levels of use
- (4) **What did we learn or change?**
  - We can do this!
  - We feel empowered
  - Wonderful outcome from attending EmacsConf 2020!
  - Public Policy conference: (How to get a grant?)
- (5) **What else should we change going forward?**
  - Ongoing dialogue
  - Maybe with breakout groups

<sup>32</sup>Data archived at <https://github.com/exp2exp/exp2exp.github.io>.

- Need for governance for this; getting public, taking time we need going forward
- Many actions need to be taken forward but we have too many right now: maybe this should be the next objective to pick a good viable project to go after now
- Can set up a shared Org Roam + Firm instance: do we want to use this?
- Can work have something similar w/in Org Roam
- Someone to schedule the next meeting... accommodate UTC+8, maybe use BBB; Leo will publish scheduler

## D APPENDIX: LE QUATTRO STAGIONI, A CLA SHORT STORY

### D.1 🍕 Example, Litany Layer

Imagine a couple who on some of their first dates enjoy going out for pizza. They like different toppings, but that doesn't particularly matter, because each of them orders their own perfectly sized Neapolitan-style pizza, and eats it with gusto. Indeed, it turns out they like pizza so much that they would like to have it several nights a week. Going out that frequently would be expensive, so they erect a brick oven in their backyard and get good at making their own pizzas at home: selecting good ingredients, fermenting the dough, and baking at a high temperature. After some time goes by, they have gotten really good at this, and they daydream about opening their own restaurant. They look into some available practical guidance and adapt it for their use case. After a lot of planning and a whole lot of work, they get their new pizza restaurant up and running, and they are doing good business. However, as more time goes by, they begin to notice some stress.

### D.2 🍕 Example, System Layer

Mom has practical experience of how restaurants operate coming from summers she spent working in a diner. Pop is handy with tools, so he can set up and maintain restaurant equipment. The policies of the town are favorable to small businesses. The demographics of the town include a number of busy families with children who form a reliable customer base for the pizzeria. As the pace of economic recovery picks up, townspeople have more money and less time, so they frequent restaurants and order takeout more frequently. The restaurant maintains good connections with local suppliers, and Mom and Pop are proud of the high quality and affordable dining experience they can offer. However, they are very, very, busy.

### D.3 🍕 Example, Worldview Layer

Pop values self-reliance and self-cultivation. For him, the worth of a person is determined not by possessions, external circumstances, or social status, but by character and accomplishments. He believes that every person has an inner purpose and that the surest way to be happy and useful to society is to follow one's inner voice and encourage others to do the same. Mom values relationships and community. Her goal in life is to make the world a better place by bringing people together and slowing down the pace of life at least long enough to let neighbors chat and get to know each other. Pop, inspired by historical figures like Thoreau, sees living "off-grid" as an ideal: a way to be independent from modern civilization, and more in touch with nature. It can be hard for him to reconcile his community spirit with his individualism. Mom, on the other hand, envisions an ideal community where healthy relationships are facilitated over good meals. She sees the restaurant as a way to build relationships with diners and others in the food supply chain and local community.

### D.4 🍕 Example, Myth Layer

Pop looks up to Thoreau and Emerson as personal heroes, and knows *Walden* and *Self-Reliance* backwards and forwards. Mom has fond childhood memories of parents who loved cooking together, and her memories evoke

an age of innocence. For her, the circle is a powerful symbol of wholeness and community: when she brings a pizza to children at the round tables of the restaurant, she feels like a mystagogue initiating the next generation.

## D.5 Potential Dénouement

Innovation at the myth layer supports an adapted worldview that introduces new patterns into Mom and Pop's daily and weekly rituals, along with new sources of meaning. Firstly, they focus on improving the quality of the food they serve, and receive rave reviews from food critics. This exercises their creativity and ultimately changes the whole approach: "Innovation foils attempts to be consistent and efficient" [84] (p. 12). Additionally, Mom and Pop decide to close the shop Monday through Wednesday, to spend some time away from the business, as part of a new weekly cycle that mirrors the seasons.

## E APPENDIX: PATTERNS

E.1-E.5 are direct adaptations of Inayatullah's Poststructural Futures Toolkit [42] to the pattern format. E.6-E.9 elaborate new patterns surfaced by ERG for inclusion in the Peeragogy Handbook. The patterns are referred to within the text using all-caps.

### E.1 DECONSTRUCTION

- **Context:** A text: here meaning anything that can be critiqued—a movie, a book, a worldview, a person—something or someone that can be read. (*NB.*, every text has a *context*: much like every pattern has a context.)
- **Problem:** The existence of a 'text' suggests a **conflict** between (1) the notion of truth embedded in that text, and (2) the text itself as historically situated or positioned within relationships of power.
- **Solution:** We break apart the text's components, asking what is visible and what is invisible? Who or what is privileged within or by the text? Which assumptions does the text make preferable? How is 'truth' produced within the text? Who is silenced? In this way, we 'deconstruct' the universality of the text and show its contingent nature.

### E.2 GENEALOGY

- **Context:** History is not just the passage of time, but an unfolding of different positions. We consider a *concept* or *idea* to be historically situated in this sense.
- **Problem:** Within history, certain discourses have been hegemonic. A given term or concept will have developed through varied discourses: this observation **conflicts** with a naive notion of terms or concepts as simply 'given' or universally true.
- **Solution:** One takes a word or concept, looks at the way it has been understood and interpreted in different eras, and how these different understandings came about. We ask: which discourses have been victorious in constituting the present? How have they travelled through history? What have been the points in which the issues have become important or contentious? By tracing the evolution of a given term or concept through periods of identity or sameness, and through periods of difference or divergence, we come face-to-face with its generative potential.

### E.3 DISTANCE

- **Context:** The present.
- **Problem:** The present seems 'normal', but this **conflicts** with any impetus to change.
- **Solution:** We ask: which scenarios make the present remarkable? Make it unfamiliar? Denaturalize it? Where are these scenarios, e.g., are they in historical space—the futures that could have been—or in

present or future space? By establishing a sense of distance from the present, we can return to explore the present from a different point of view. We are more likely to see the ever-changing character of the present, points of leverage, and how to use them.

#### E.4 ALTERNATIVE PASTS AND FUTURES

- **Context:** The past that we see as truth is in fact the particular writing of history: it is a text amenable to DECONSTRUCTION. The futures that we are ‘given’ are, similarly, only some of the ones that are in-principle-possible due to the evolutionary nature of concepts exposed by their GENEALOGY.
- **Problem:** The past and future are put to use within discourse, resulting in some winners and some losers. The results we see may **conflict** with our sense of what we would prefer to have happen.
- **Solution:** With this technique, one notes how and why some interpretations of the past and visions of the future have been promoted whilst others have been suppressed. We ask: which interpretation of the past is valorized? What histories make the present problematic? Which vision of the future is used to maintain the present? Alternatively, which visions undo the unity of the present?

#### E.5 REORDERING KNOWLEDGE

- **Context:** Trends and problems are emergent, historical, and political: they are embedded in complex webs of becoming.
- **Problem:** It’s not always obvious how to move *between* the ‘layers’ mentioned above. This **conflicts** with any given effort to empower oneself with a deeper understanding of the situation.
- **Solution:** We ask: how does the ordering of knowledge differ across civilization, gender and episteme? What or Who is othered? How does it denaturalize current orderings, making them peculiar instead of universal? What tools can we use to reorder knowledge, to make it available in new forms without necessarily requiring the same historical baggage?

#### E.6 FORMAL PATTERNS

- **Context:** Working with project- and change-management TECHNOLOGIES across a distributed COMMUNITY.
- **Problem:** Using patterns, todo items, CLA, and PARs in an intuitive manner is clearly workable at a small scale, but could become chaotic when we scale up; this **conflicts** with our perspective that these methods can be applied broadly.
- **Solution:** Can we develop a more mathematically precise way to describe this set of tools? We might build on the earlier work of Corneli et al. [18] which describes patterns as *conceptual blends*.

#### E.7 SERENDIPITY

- **Context:** Within an ongoing research and development project.
- **Problem:** The idea of planning **conflicts** with our experience that reliance on plans can produce rigid behavior and a corresponding brittleness.
- **Solution:** We adapt our plans to increase our *general* preparedness, and adapt our strategy to decrease our reliance on accurate *forecasting*. This operationalizes the ‘serendipity pattern’ described by Merton.<sup>33</sup>

#### E.8 RECOMMENDER

- **Context:** Within our use of TECHNOLOGIES and materials we could REDUCE, REUSE, RECYCLE.

<sup>33</sup>“The serendipity pattern refers to the fairly common experience of observing an unanticipated, anomalous and strategic datum which becomes the occasion for developing a new theory or for extending an existing theory...” [58], reprinted in [59].

- **Problem:** As the body of content grows, it can be harder to find relevant material or the best collaborators in a global pool: this **conflicts** with our desire to achieve excellence.
- **Solution:** New software that can help surface relevant material and opportunities would be useful. Existing implementations include “scrobbling” audio tracks to Last.fm, or buying recommended products on Amazon. The same ideas can be adapted to FLOSS, research, learning, and other domains.

## E.9 DIVERSITY

- **Context:** Within a PROJECT.
- **Problem:** If we only collaborate within a relatively homogeneous population of people who think like us this **conflicts** with our desire to find new ideas and new solutions, and to do widely relevant work.
- **Solution:** Look out for different contexts in which we can collaborate with different people; they don’t all have to work on the same project. We recognize that collaboration is easier when we share similar languages and literacies. In cases where collaboration needs to be made tighter, prefer ways of exchanging information and expertise with NEWCOMERS that makes the relationship one of peers rather than a one-way hierarchy. Understand the historical landscape through techniques like ALTERNATIVE PASTS AND FUTURES. At the same time, by inviting people who were not closely connected or emotionally invested in your project, you can get the advantages of DISTANCE, at least vicariously. Diversity may be absent for contingent historical reasons, rather than as a design principle, e.g., within free software only about 5% of the participants are female, whereas women occupy around 25% of computing occupations [94].

## F APPENDIX: FLAWS OF THE COOL CITY WORKSHOP

Our workshop explores the interaction between Design Pattern Languages and Causal Layered Analysis (CLA) in the context of a cooperative game. It also introduces attendees to these methods, assuming no previous background. The theme of the workshop is amelioration of and adaptation to climate change in an urban setting. Since cities account for more than 70% of global CO2 emissions, the workshop will help participants engage with a crucial challenge of our time. The hoped for outcome of the workshop would be that attendees would go on to make more informed decisions about this complex problem.

The workshop will combine material from several existing sources:

- Neo-Carbon Energy Scenarios [35, 37, 38]
- Cooling the Commons [90]
- Flaws of the Smart City [23]
- Causal Layered Analysis [42]

CLA is a research methodology for examining a topic of concern and forming a plan of response that takes into account different kinds of causes, ranging from immediate events to deep-seated cultural beliefs. CLA has previously been applied in a workshop setting to analyze the four neo-carbon scenarios: “Radical Startups”, “Value-Driven Techemoths”, “Green DIY Engineers”, and “New Consciousness”. To make these scenarios tangible to participants, we will draw on existing published descriptions of earlier workshops.

In our workshop we will then explore the scenarios further by using **Cooling** cards, based on the 41 patterns from the Cooling the Commons pattern language. We will use the interactive game Flaws of the Smart City to structure game play.

### Training phase (45 minutes)

The workshop involves different roles, and participants will be briefed on these roles in separate groups, along with a short general introduction. The four roles are linked with the four resources mentioned above:

- **Historian** (briefed on the Neo-Carbon Energy Scenarios)

- **Designer** (briefed on the Cooling the Commons cards and pattern methods)
- **Kaijū Communicator** (briefed on Flaws of the Smart City)
- **Analyst** (briefed on CLA)

Players will be asked to define their role via the four CLA layers of *litany*, *system*, *worldview*, and *myth*. I.e., the participants will be asked to describe their problems, social context, worldview, and narratives via a quick Q&A process.

In the general introduction we will give this example: the Cooling the Commons pattern language includes the pattern THE NIGHT-TIME COMMONS. This pattern proposes to move many daytime activities to the night. If we examine this pattern via CLA, we can see some potential problems:

**Litany** The concern arises that diurnal rhythms are deeply embedded in biology and culture: waking up at a non-standard time could be difficult for many people, interrupting their habits and their coordination with other people.

**System** People have cultural beliefs about the activities that are appropriate for different times of day.

**Worldview** Public and domestic rituals are organized about the daily cycle. People may have self-identity views of who they are relative to clock time, like “early bird gets the worm”.

**Myth** Times of day have symbolic associations.

#### Part one (1 hour)

We will divide participants into four groups (or fewer; so long as there are at least four persons per group, representing the four roles). Each group will be embedded within a scenario. Basic game play will be roughly as per Flaws of the Smart City: a turn consists of a randomized selection of a **Rule**, **Action**, **Place**, and **Issue** card. Following the selected **Rule** (e.g., to play as an Evil Genius or Guardian Angel) or elaborating an answer from the point of view of one the roles assigned in the Training phase, participants will discuss how the **Cooling** cards can be employed to respond to the other cards that were drawn. At the end of each turn, participants will be asked to align the **Action**, **Place**, **Issue**, and selected **Cooling** card(s) with the four layers of the CLA.

Participants will be asked to annotate each layer, and in addition, make note of any adapted, related, or new design patterns that would be relevant at each level. They will additionally be asked to make note of how these selected cards fit into the scenario’s historical development. Participants will be asked to explain their choices based on thinking about a realistic story for their role or combination of roles.

#### Part two (45 minutes)

The resulting tableaux will then be shared back with the larger group in a short presentation. An example tableau appears below:

Litany	<b>Shopping Street</b>	STREET PARTIES & FÊTES
System	<b>Gamify</b>	OUTDOOR COOKING
Worldview	<b>Historian</b>	OUTDOOR PLAY AREAS
Myth	<b>Loss Of Privacy</b>	SIGNAGE

This might be narrated as follows:

Suppose there is a monthly event that encourages people to get to know the local shops. This happens in the evening and into the night, which allows people to stay cool while socializing outside. From a business standpoint, engagement might be gamified with an incentive: perhaps shops would stamp a card, and enough stamps would entitle the bearer to a free meal. Families might want to bring their kids and have them entertained. Companies might like to take this as an opportunity to push some of their messaging. However, it is possible that any targeted messaging at or after the event would compromise the sense of community.

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