Patterns of Patterns III

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Building on earlier installments, this paper re-examines the PLACARD pattern. We report on a series of workshops where PLACARD was used to scaffold collaborative reflection, speculative inquiry, and stimulate design pattern generation. These accounts are enriched by a comparison case: virtual workshops carried out with simple AI-based chatbots. We discuss limitations and lessons learned from both the human and multi-agent settings. We conclude by outlining a future development strategy at the intersection of AI agents, design patterns, and institutional governance.

1 INTRODUCTION

In an era of increasing global interconnectivity, effective collaboration across cultural, geographical, technical, and disciplinary boundaries is essential. Traditional methods often falter when addressing the intricate layers of context inherent in distributed collaboration. To address these concerns, we have been exploring a re-theorisation of design patterns using the tools of social intelligence. First introduced in our paper "Patterns of Patterns: A Methodological Reflection on the Future of Design Pattern Methods" (PoP), the PLACARD pattern was tested in five U.S. and U.K. workshops as detailed in the sequel "Patterns of Patterns II" (PoPII) [Corneli et al. 2023, 2021]. To support that work, PLACARD was elaborated into a design pattern language. It has since been adapted to additional localized settings, engaging diverse participants in hybrid and in-person formats. These sessions leveraged PLACARD to bridge perspectives and envision future modes of collaboration in rapid prototyping sessions. We have also been interested in how PLACARD can be used at a slower pace, and in distributed contexts—for example, to scaffold learning in a long-running seminar series—or even more widely, across different spheres of engagement that we have described in this series of papers. In this paper, we establish another use case, by using PLACARD patterns with virtual artificial intelligence (AI) agents. We show that design pattern thinking is well-suited to use in developing epistemic AI, by which we understand artificial

intelligence systems that model and manage uncertainty, provide explanations, engage in meta-cognition, and facilitate human-AI collaboration. By working between human and computer contexts, we are able to improve our understanding of the underlying patterns of knowledge acquisition, representation, and utilization. Generative AI tools contributed in other ways to this paper, by helping us make the first draft based on their analysis of the two initial papers in this series and our three summary reports. We then took the baton and revised the writing over many subsequent versions to arrive at the cohesive work you are now reading.

2 PATTERNS IN USE

2.1 Background

In its basic design pattern format, PLACARD combines three complementary approaches for collective learning and design.

PAR (Project Action Review) – A reflective process assessing intentions, actions, and outcomes to learn from experience.

CLA (Causal Layered Analysis) – A futures studies technique analyzing issues across multiple layers—the familiar litany of well-known problems, the systems that underpin them, along with the prevailing worldviews, and deeper myths that constitute the root causes of these problems, along with the possibility of developing alternative perspectives.

DPL (Design Pattern Language) – A framework for capturing and sharing reusable solutions in a structured Context-Problem-Solution format (or similar), further structured by links between such elements.

By combining these approaches, PLACARD enables teams to cycle through reflection, deep analysis, and pattern creation. However, this is not necessarily a serial process or a fixed cycle. For instance, the generation, use, and analysis patterns may be ongoing. In our work a PAR is typically conducted after a period of work, to reflect on progress made, however it also serves as an intention-setting exercises might happen before the next phase begins. The nominal function of a CLA is to analyze a situation, but just as often they are used to describe how that situation can change.

The three papers in the series to date can be brought into schematic alignment with these methods.

(PoP ≈ CLA)	We used CLA to think about the pattern literature as a whole and to retheorise its workings.
(PoPII ≈ DPL)	We elaborated PLACARD into a pattern language.
(PoPIII ≈ PAR)	We take a deep look at how these patterns have been used in practice, and take stock of potential next steps in the overall trajectory of research.

Thinking about patterns in pattern-theoretic terms, we uncovered PLACARD's modularity. Methods that achieve the same function as one of its components can be swapped in and out, without undermining the integrity of the whole. For example, PAR could be replaced with the US Army's After Action Review [US Army 1993]—which inspired its basic format in the first place—or by the Feedback Wheel devised by Janet Hurley [Real 2008]. CLA could be replaced by Triple-Loop Learning [Tosey et al. 2012] or Ecological Systems Theory [Bronfenbrenner 2000]. DPL could be replaced by Elinor Ostrom's institutions [Ostrom 1990], or by a catalogue of literary tropes, and so on. Each such selection comes with its own ideological orientation, and typical domain of application.

2.2 Implementation

We implemented PLACARD in multiple settings, tailoring our approach to each context:

AsianPLoP 2024 (Fujisawa, Japan) Our "PLACARD Workshop" [Danoff et al. 2024] was a hybrid focus group with one onsite and two remote facilitators (via Jitsi). Participants conducted meta-analysis on the

conference itself using CLA and DPL to uncover underlying challenges, identify linguistic barriers and explore growth opportunities. One challenge discussed was how to be more inclusive of countries across the Asian continent. The conference organizers took a positive step by holding the 2025 event in Taiwan, but we cannot state that location decision was influenced by our Focus Group. In 2024, onsite attendees helped overcome barriers by clarifying for confused participants in Japanese. This was the only event in this paper conducted in multiple languages. A growth opportunity discussed that learning and networking does not need to stop when the conference itself ends. It can continue afterwards as attendees cross-pollinate pattern design collectively. The PAR was then applied to close the Focus Group and capture the results. During the evening conference recap ceremony there was one summary delivered in English by a paper author and another in Japanese by an attendee.

EuroPLoP 2024 (Irsee, Germany) A hybrid session titled "AI Future Envisioning with PLACARD" [Tedeschi et al. 2024] with one onsite and three remote facilitators. Participants employed the Transfeminist Tech Oracle card game as a creative prompt, then used CLA and PAR in tandem to explore speculative AI futures. Due to time constraints and abstraction load, some participants expressed confusion about the method structure, prompting later pattern refinement. A post-session PAR survey was used for reflection after the event.

PLoP 2024 (Washington, USA) An in-person "Imagination Run Wild" workshop, with three onsite facilitators. Participants were invited to "Envision the Future of Collaboration" [Ayloo et al. 2024], using the same card game and CLA. Another post-session PAR survey was used for reflection after the event.

Experts Among Us 2025 (Keene, New Hampshire, USA) A stand-alone meeting in-person that gave an opportunity to play the same card game with one facilitator. In advance we practiced the card game and the facilitator then preselected the cards for participants. Attendees were not part of the patterns community. This session actually facilitated a group discussion and demonstrated collaboration. We learned that we had to explain the rules and definitions prior to playing the game.

A common challenge for all of these workshops is rapid skill acquisition. We plan to continue this workshop series, for instance with a EuroPLoP 2025 workshop session. As mentioned above, this is a good time to take stock of what we've learned so far.

2.3 Reflexive Analysis Using the PLACARD Pattern Catalogue

To analyze the workshops beyond surface-level outcomes, we applied a reflexive methodology grounded in the PLACARD pattern catalogue, presented in PoPII. This catalogue is structured into three interlinked categories:

A. Identifying Themes ("sensory")   **B.** Organizing Structure ("cognitive")   **C.** Making It Actionable ("motor")

For each workshop, in this paper we use the **A/B/C** structure to retrospectively assess:

- Which patterns were implicitly or explicitly activated,
- Where breakdowns in understanding or facilitation could be explained by missing or misapplied patterns, and
- Where new patterns could be introduced to resolve to unanticipated tensions.

A brief summary is given in Section 3 of this paper. This reflexive approach helped us make sense of divergent workshop dynamics, and the possibility for further patterns that could help make the workshops more rewarding in general. For example, Name the Frame was identified in hindsight as something that could have improved onboarding. Likewise, HARVEST BEFORE YOU CLOSE was seen as a missing step in several sessions, and this pattern would address missed opportunities for extemporaneous pattern generation.

Rather than enforcing a rigid rubric, the catalogue functioned as a scaffold for learning from variation. It allowed us to compare facilitation dynamics, participant responses, and methodological adaptations across sites—and, crucially, to refine the catalogue itself through lived experience.

2.4 A Note on Notation

As above, we will use all-caps (like PLACARD) for patterns introduced in other sources, and small-caps (like Name the Frame) for patterns introduced in this paper, details of which are in the Appendix.

2.5 Empirical and Design-Based Development of New Patterns

Across the 2024 and 2025 events, new patterns did not emerge fully formed. Indeed, only one new pattern surfaced and named explicitly during the workshops:

> Have Multiple Leaders Onsite – prompted by the hybrid setup at EuroPLoP, where limited physical facilitation led to friction. The pattern proposes distributed facilitation roles to support hybrid presence, reduce coordination load, and maintain session energy.

Other new proto patterns crystallized in our retrospective analysis. For example:

> Name the Frame – (a further specification of CONTEXT SETTING from PoPII) this pattern emerged from repeated facilitator observations that participants struggled to orient themselves without a clear method overview.
> Borrow the Situation – inferred from participant improvisation in choosing and reinterpreting prompts when predefined situations felt mismatched or abstract.
> Start with Sense – (generalizing DÉRIVE COMIX from PoPII) builds on the observation that embodied play or metaphorical framing was often the key to unlocking participation

In sum, while few patterns emerged as polished artifacts within the workshop frame, the pattern language itself evolved through encounter. The workshops provided empirical grounding for evaluating utility, exposing limits, and highlighting latent needs. This iterative, design-based process parallels how pattern languages grow in living communities—not through top-down invention, but through grounded, reflective refinement.

2.6 Developing a comparison case: Working with patterns computationally

We noticed that it is possible to ask ChatGPT to run simple multi-agent "virtual" workshops. These can be compared with the in-person workshops. Below are two lightly edited example prompts that were used for setting up these simulations.

> **Prompt 1 Given to Generative AI Program**
> I want you to create a multi-agent system with 15 different ChatGPT-based agents. I want you to assign each of them the name of a distinct animal, and each of the agents will have some of the typical characteristics of the animal it is named for. Then I want you to walk through the 30 "Peeragogical Exercises for a Seminar on Epistemic AI" [elided] in a virtual seminar. The final exam is a dialogue between these animals, about the following prompts. Please have as much discussion as you'd like among the agents before you give me their final team presentation answering the questions.
> What is epistemic AI?
> How does mathematics relate to this vision?
> What does 'peeragogy' mean, and how does it relate to this vision?
> What kind of multi-agent has created this answer?
> Why is this virtual seminar of historical importance?

Prompt 2 Given to Generative AI Program

Remember how we did some simple multi-agent workshops before? Let's simulate the architecture described the paper with some ChatGPT-based agents. This time, rather than basing them on animals, we are going to base the agents on a diverse group of Research Fellows in AI. Let's only consider 10 such agents. Please include the "Ant" role from the workshop with animals, she will record what happens in which workshop session. Please also include the "Dog" role from the animal workshop, who will act as a primary reporter. The Fellows will be set the task of designing a series of workshops using the PLACARD method and associated patterns, and the outcome of the series should be a detailed plan of work for a research project on epistemic AI. You should do deep research to make sure that the discussions are plausible.

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3 PATTERNS AS TECHNICAL, EPISTEMIC, AND REFLECTIVE INFRASTRUCTURE

3.1 Reframing Patterns as Sense-Making Scaffolds

Patterns are often described in instrumental terms: reusable solutions to recurring problems in context. As we look into how they work, we see there's more to it. One aspect of this is the use-versus-mention distinction: clearly, a physical alcove is not the same as Christopher Alexander's "ALCOVES" pattern [Alexander et al. 1977]. And at both levels, there's a degree of explicitness. When does an indentation become an alcove? When does a pattern become part of a language?

The START WITH SENSE pattern characterizes various ways of inviting participants to begin inquiry with embodied, perceptual, or intuitive grounding. This creates conditions under which problems and possibilities become intelligible.

Across the A/B/C catalogue, many patterns introduced earlier and from the Appendix operate similarly:

> NAME THE FRAME helps surface the underlying structure of an activity or method.
> BORROW THE SITUATION allows participants to reinterpret or co-create the context of inquiry.
> META-REFLECTION LOOP supports collective understanding of what just happened and why.

These are cognitive footholds, ways of managing ambiguity and distributing attention. They help groups compose a shared reality, especially when dealing with complex or unfamiliar material.

From this perspective, the value of a pattern lies not just in its repeatability but in its sensitivity to situated meaning-making. A good pattern doesn't just say "do this"; it says "look here, attend to this tension, notice this affordance." It invites participants to see the world in terms of actionable differences.

Reframing patterns this way brings PLACARD into closer dialogue with traditions such as:

- Phenomenology—emphasis on situated perception [Moran 2000]
- Participatory design—emphasis on co-articulation of problems [Spinuzzi 2005]
- Grounded theory—emphasis on emergent categorization [Glaser 1992]

It also prepares the ground for computational application. For artificial agents, much as for humans, sense-making begins with activation of relevance—the ability to determine what matters in a given context. In PLACARD, patterns serve as activation scaffolds: semi-formal cues that guide what should be noticed, named, or negotiated. Each of its layers—A/B/C—corresponds to a distinct mode of learning. Crucially, design patterns—or, indeed, any substitute schema that plays the same role—achieve the function of linking these modes, enabling transitions between experience, inquiry, and abstraction.

We propose that patterns support at least three interdependent forms of learning:

(1) Reflective Learning [Boyd and Fales 1983]: Patterns such as PROJECT ACTION REVIEW and META-REFLECTION LOOP support meaning-making after action. They help participants surface experiences, identify what shifted, and consider next steps. This mode is retrospective and grounded in collective memory and sense-making.

(2) Design Learning [Burdick 2012]: Patterns like Borrow the Situation or Pattern the Play create scaffolds for reimagining problems, proposing alternatives, and testing ideas. Design learning is generative, situated in ambiguity. Patterns here serve as framing devices that guide creativity while constraining chaos.

(3) Model Learning: Patterns like Name the Frame and Harvest Before You Close deploy abstraction—capturing structural insights from activity. This form of learning supports knowledge representation and the translation of local insights into portable conceptual tools (e.g., [Ariyaratne 1977]).

Patterns enable movement between these modes. For example:

- A reflection may generate a design insight that prompts reframing.
- A design intervention may require formal modeling to share or extend.
- A model may provoke a return to embodied or emotional grounding.

3.2 Summary of the evidence base from our in-person workshops

Table 1 summarizes the use of PoPII patterns in our workshops. Further details are the Appendix.

Category/Patterns Used Well	Needs Refinement
A./DÉRIVE COMIX, DO YOUR RESEARCH, CONTEXT SETTING, PAR	⚠️ **Overrun** — PAR provides shared cohesion, when used; our PAR-inspired survey has a different feel. Context-setting could also be more cohesive: Name the Frame. Explore more creative, embodied PAR.
B./GOING META, FACILITATOR and FUNCTIONAL ROLES	⚠️ **Mixed** — time + onboarding were limits. Introduce meta-language tools earlier and more clearly. Test whether embodied cues help people get to worldview/myth.
C./REINFUSE EXPERTISE	⚠️ **Implicit** — patterns used, not made. Stronger follow-through on actionable steps; Harvest Before You Close. Explicitly support pattern emergence from cards/music activities.

Table 1. Summary of patterns used in workshops and potential for improvement

4 DESIGN PATTERNS FOR PATTERN-COMPETENT AGENTS

The PLACARD methodology, as developed and refined across multiple participatory workshops, demonstrates the power of design patterns not only as tools for structuring action, but also as scaffolds for shared sense-making and reflection. Building on this foundation, we now consider a forward-looking design space: the development of pattern-competent artificial agents capable of engaging with design patterns as part of collaborative inquiry. These agents would be expected to:

- Recognize situations where a pattern might apply,
- Use flexiformal representations of pattern logic,
- Operate as a collective, i.e., to form multi-agent systems (MAS)
- Participate in reflection loops that evolve the infrastructure itself.

4.1 Recognizing Pattern-Relevant Situations

The capacity to recognize situations where a pattern might apply lies at the heart of pattern competence. This is not a trivial matching task. It requires the ability to perceive and interpret contextual cues, to identify when a

recurring structure or problem-type is emerging, and to discern salience: which aspects of a situation matter, and why. In participatory settings, such recognition is informed by experience, tacit knowledge, and social interaction. When developing artificial agents, the challenge is to develop mechanisms—symbolic, statistical, or hybrid—that allow for similarly situated recognition. Here's an example showing how this might work for today's computer systems:

> *Example:* A chatbot trained to handle customer service inquiries recognizes that a user is "frustrated," even if the words don't match prior examples exactly—but the tone, pacing, and word choice are similar to previously tagged "frustrated" interactions.
> *Mechanism:* A statistical similarity model (e.g., embedding distance + fine-tuned classifier) matches this new situation to prior ones and adjusts the agent's response accordingly (e.g., a more empathetic tone or an escalation offer).

Next-generation systems might deal with the same scenario in more flexible ways, for instance, not only on the basis of stimulus-response pairs, but more fluidly—for instance, understanding how it was that the customer became frustrated and initiating changes to the company policy accordingly. This more meaningful form of 'pattern recognition' requires readiness to see and make sense of structure, and to reframe experience in meaningful, actionable terms — rather than to set data aside as a block, or (which is much the same) to cope with it in a purely reactive way.

4.2   Flexiformal Representation of Pattern Logic

To support agent-based reasoning, patterns must be expressed in a format that is both structured and open-ended. Drawing on the modified pattern structure used in PLACARD—**Context**... **If** ... (**But**)... **Then**...**Because**...—each clause can be understood as a layer of scoping and activation:

Context: a broad frame (task domain, discourse setting) that activates relevant subsystems,
If condition: a salient event or state within that frame,
But: a tension or constraint that introduces conflict,
Then: a candidate action or communicative move.
Because: While logic and reasoning have been core topics in computer science from its outset [Sowa 1999], further research is needed to determine what sorts of reasoning—clearly combining abductive, deductive, inductive, and analogical modes—and what types of logic—classical, fuzzy, modal, monotonic, non-monotonic—are used by humans to think about patterns.

For now, we refer to the overall approach as "flexiformal" [Kohlhase 2012], because this leaves the door open to combining different formal systems in a suitably flexible fashion. Simply adding more patterns won't be enough to implement human-like reasoning in pattern-capable systems. For one thing, the patterns need to be used to dynamically allocate cognitive resources.

4.3   Reflection Loops and the Evolution of Epistemic Infrastructure

To sustain meaningful pattern use, agents must also be able to reflect. This means embedding meta-level structures like the PAR into the environment itself. Reflection loops should support the capture of learning, the revision of pattern catalogues, and the emergence of new design insights.

In future architectures, agents and humans alike can annotate, revise, and remix patterns, and participate in the shared cultivation of 'living' knowledge systems, in which patterns are part of a generative infrastructure for collective intelligence. We've previously imagined patterns being used within a "Discovery Machine" [Tedeschi et al. 2024].

4.4 Rethinking the Pattern Catalogue

The PLACARD A/B/C pattern catalogue was created with human participants in mind. It emphasizes social affordances, embodied prompts, and facilitation moves. While some of these translate readily into multi-agent contexts—e.g., "Meta-Reflection Loop" or "Pattern the Play"—others rely on human sensory input or informal framing strategies that are not directly available to AI systems.

Thus, we propose a tripartite model of pattern types needed for pattern-competent agents, generalizing the layers we used previously.

1. Interactional Patterns (generalizing the sensory layer, e.g., PAR). PAR structures collaborative reflection and coordination. Interactional patterns in general guide agents in playing roles, reflecting, and negotiating meaning in collaborative settings—essentially the micro-level behaviors that mirror PAR's inquiry loop. Examples include:

Role Reveal: Adopt explicit roles in multi-agent dialogue.
Meta-Reflection Loop: Periodically engage in structured self-review.
Timebox the Core: Manage resource allocation and attention windows.

These patterns require some translation to make it understandable to the machine, e.g., encoding roles as functions in MAS architectures or structuring turn-taking rules.

2. Cognitive Patterns (expanding upon the existing cognitive layer, e.g., CLA). CLA unpacks multiple layers of meaning—litany, system, worldview, myth. These cognitive patterns help agents reason across contexts and detect tensions, embedding depth and nuance in internal reasoning. They are interpretive structures, supporting internal reasoning and pattern use:

Pattern Activation: Given a context and goal, retrieve applicable patterns.
Tension Detection: Use heuristics to identify contradictions or bottlenecks.
Candidate Move Generation: Translate pattern suggestions into operational plans.

3. Infrastructural Patterns (generalizing the motor layer, e.g., DPL). DPL captures reusable structures for action. These infrastructural patterns define persistent templates and system-wide protocols that support reuse, feedback, and evolution of the broader system design. For example these are 3 meta-patterns that could enable engagement with patterns:

Shared Memory Architecture: Persistent storage of pattern use and modification. Putting patterns where people can get them, like the catalogue, akin to the SCRAPBOOK from Patterns of Peeragogy [Corneli et al. 2015]
Feedback Rhythms: Protocols for scheduling reflection and pattern revision.
Pattern Diffusion: Mechanisms for propagating new or adapted patterns across agent collectives.

They govern the architecture of the agent system much like DPL governs the architecture of human practice.

4.5 Desiging Environments for pattern-competent MAS

In addition to broader contextual information, relevant multi-agent system (MAS) environments would include the social and cognitive dynamics of inquiry: coordination, negotiation, reflection. Such environments have the capacity to support multiple, interacting Baldwin effects—individual learning loops that influence each other over time as the agents and their interactions evolve [Red'ko et al. 2005]. This distributed adaptation mirrors cultural evolution: strategies become shared, revised, and recontextualized. Rather than simply evaluating *success* in terms of task completion or efficiency, MAS environments invite questions about "how" solutions are created.

This reflection constitutes suggests a key amendment to PLACARD. Whereas PLACARD was described in classic psychological terms [Hilgard 1980] — which are also taken over by roboticists [Cassimatis et al. 2004] — it does not specifically talk about the environment in which the agents it considers would be situated. In robot

terms, for example, we would expect an undersea robot and a Mars rover to have very different functionality, even if they have the same theoretical underpinning. This way of thinking suggests that the PLACARD pattern language should be extended to be an "**A**/**B**/**C**/**D** catalogue", where the fourth section contains *environmental* or *developmental* patterns. With this in mind, in addition to further detail on the candidate patterns for pattern-competent agents — as outlined above — the appendix also includes some patterns that would guide the design of their working environments.

5 VIRTUAL MULTI-AGENT WORKSHOPS IN THE SPIRIT OF PLACARD

To explore the idea of pattern-competent agents developed Section 4, we conducted a series of virtual workshops using fictional agents within ChatGPT. Using the PLACARD method, those agents rotated through breakout sessions, engaged in pattern-guided inquiry, and made use of a curated and emergent pattern catalogue. It is worth emphasizing that the workshops were computer-aided design fictions (we have previously explored this way of working "by hand" [Danoff et al. 2019], and we're aware that fictional works can have unexpected real-world ramifications, e.g., [Wikipedia contributors 2025]). ChatGPT can simulate plausible dialogues, behaviors, and reflective loops based on design patterns, but it cannot build and run custom agent architectures. All 'agents' were textual personas that were simulated by one model. The agents were plausibly able to discuss the design patterns and employ them in light-weight design exercises. Below is an excerpt from one such workshop, in which several virtual agents begin collaboratively applying the PLACARD methodology to plan a research project on epistemic AI. The agents have somewhat stereotyped fictional biographies which to some extent shape their responses (e.g., "Carlos – Epistemology & Systems Philosophy"; "Mei – Participatory Design & Feminist STS").

Excerpt: PLACARD Planning Dialogue on Epistemic AI

Carlos: I propose we begin with CONTEXT SETTING. If we're designing a research project on epistemic AI, we need a shared sense of what "epistemic" means in our context.

Priya: Agreed. For me, it's about how agents—human or artificial—come to know, not just calculate. So I'd emphasize design patterns that support interpretive, situated reasoning.

Raj: Right. Maybe we could use BORROW THE SITUATION—look at real-world cases of failure or success in knowledge systems. Misinformation management? Scientific discovery pipelines?

Sofia: I think we need to NAME THE FRAME explicitly. Are we researching tools for knowledge validation? Or institutional models for human-AI epistemic partnerships?

Mei: Maybe both. What if we used PATTERN THE PLAY to design speculative workshop sessions? Each session could simulate a different epistemic tension—uncertainty, disagreement, novelty—and trial agent responses.

Yuki: And we need some kind of META-REFLECTION LOOP. A structure where, after each workshop, we reflect not just on what we learned, but how the patterns performed. This could feed into our developmental arc.

Carlos: So the goal of the series isn't just content generation—it's to test, refine, and expand the pattern catalogue itself?

Sofia: Exactly. And that aligns with the DO YOUR RESEARCH pattern: we're generating grounded material and modeling the tools that structure knowledge formation.

Raj: We'll need a pattern-aware toolchain too—maybe a PATTERN KNOWLEDGE REPOSITORY that evolves with each workshop. Otherwise we lose coherence.

Priya: Let's add a TIMEBOX THE CORE phase to every session. This gives us just enough structure to avoid sprawling, without over-engineering.

Mei: I'll draft a plan using PLACARD as a scaffolding template. We can each take ownership of one layer—PAR, CLA, DPL—and develop sub-patterns and protocols that fit.

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6 DISCUSSION

6.1 Limitations and Lessons Learned

While the outcomes of our PLACARD-based workshops (both in-person and simulated) were promising, several limitations emerged that highlight areas for refinement—both in the method itself and in our implementation of it. Generally, these limitations correspond to lessons that could be applied in future work.

Limitation	Lessons Learned
Cognitive demands of CLA: The abstraction and depth of Causal Layered Analysis (CLA) often overwhelmed participants, especially when scaffolding was limited.	Provide lightweight onboarding tools—such as mini-patterns, worked examples, or scenario walkthroughs—to ease entry into layered analysis.
Short workshop windows (60–90 mins): Limited time forced trade-offs, with later phases (e.g., PAR) often rushed or skipped.	Recognize TIMEBOX THE CORE as a necessary pattern—but pair it with mechanisms for asynchronous reflection or follow-up synthesis.
Challenges in hybrid facilitation: Remote facilitators struggled to engage with group energy and activities; in-person facilitators were overburdened.	Adopt and refine the pattern HAVE MULTIPLE LEADERS ONSITE, and explore interactional choreography to balance facilitation across modalities.
Sequential framing constrained emergent inquiry: Participants sometimes forced their intuitive insights into retroactive justifications.	Allow more modular, remixable process designs. Embed "IMPROVISE TO TEST" and "PATTERN THE PLAY" to legitimize non-linear sense-making.
Deliberative bias limits affective and tacit knowledge: Structured methods sometimes crowded out emotional or disruptive forms of insight.	Integrate methods or prompts that scaffold expressive, intuitive, and affective contributions—e.g., through metaphor, narrative, or art-based reflection.
Risk of premature formalism: Design patterns encouraged generalization at the expense of context specificity.	Emphasize pattern annotations and situated stories. Use pattern revision cycles to adapt and diversify rather than standardize.
Logistical overhead of documentation: Without dedicated roles or tooling, PLACARD's emphasis on shared surfaces was burdensome.	Support tool development and role formalization (e.g., for pattern capture). Design light-touch alternatives for low-resource contexts.
Simulated agents were archetypal, not adaptive: The multi-agent models lacked real-time learning or memory; they played out scripted reasoning paths.	Treat the current set of simulations as design probes rather than predictive models. Use them to explore design space and pattern viability, not behavioral realism.
Idealized dialogues lacked messiness: No true misalignment, conflict, or unresolved disagreement appeared in the simulations.	Future work should inject structured friction—conflicting goals, values, or timing—to better stress-test interactional patterns.
No persistent identity or memory across sessions: Agents did not evolve across workshops, limiting insight into long-term learning.	Incorporate persistent memory structures and episodic traces to study cumulative reflection, pattern evolution, and institutionalization.
Language model constraints shaped outcomes: Agent behaviors emerged from a coherence-biased generative system, not open-ended cognition.	Simulations must be interpreted with epistemic humility. Their role is speculative, not definitive—ideal for surfacing design tensions, not modeling reality.

6.2   Related Work

Looking forward, the next phase of PLACARD's evolution could be a platform for cultivating design-pattern-capable agents, communities, and learning environments. PLACARD should be understood not as a finished method but as a generative infrastructure: a living commons of epistemic tools, shaped by their user communities. These insights can be combined with Elinor Ostrom's Design Principles for Governing a Commons to serve as a lens for evaluating and extending PLACARD, beyond the "agent" level to the "environment" level. On this point, we can point to some work: Pitt et al. [2012] explore how institutions can self-organize by formalizing socio-economic principles that guide agent behavior within Multi-Agent Systems (MAS). Drawing inspiration from Elinor Ostrom's work, they propose an axiomatic design approach that captures principles such as proportionality, accountability, and collective choice in a machine-interpretable form. Where Pitt et al. emphasize axioms as foundational building blocks, our PLACARD-based approach leverages design patterns as intermediate representations that bridge human practice and machine reasoning. In a more recent paper, Mertzani and Pitt [2024] present a methodological framework for integrating power sensitivity into the design of cyber-physical systems by drawing on second- and third-order cybernetics. They propose pattern-based design methods that foreground the observer's position, across different layes of embeddedness—with beneficial applications of technology ranging from "Saves Physical and Cognitive Resources" to "Solves Complex Problems" to "Deals with Social Constructions" to "Mitigates Existential Crises".

7   CONCLUSION

Looking back over the limitations and lessons learned, it's worth drawing out one top-level remork. ChatGPT is adept at text processing, and we have put it to use significantly in our work on this paper. It was able to generate and discuss design patterns that would describe pattern-capable agents. However, it was not able to actually use these patterns to build and run pattern-capable agents. We hope others will be interested in using LLMs to work with design patterns—but we also hope that such usage will serve as a landmark rather than a destination.

Including a computational use case within the paper suggested a key amendment to PLACARD: adding a fourth environment dimension to the pattern catalogue . Human-facing and Human-Computer Interface-facing patterns should eventually be extended similarly.

For now, to close this paper, we put forward the following CLA, which brings together the "human" and "AI" use cases and outlines a trajectory of future work. In the context of this paper, the CLA layers can aligned with the expanded view of PLACARD that we have discussed—encompassing *sensory* (litany), *cognitive* (system), *motor* (worldview), and *environment* (myth) dimensions.

☀ Litany: Known Problems and Existing Solutions

These are the most visible and widely discussed elements of current AI discourse: the promise and perils of large language models (LLMs) and the early success of LLM-associated code-writing agents.

Language Model Substrate. These foundational models (e.g., GPT-4) provide generative capabilities, statistical reasoning, and natural language interfaces. However, they lack structure, grounding, and memory.

Code-Writing & Execution Agents. Many simple agents today (e.g., auto-scripting agents, plugin interfaces) use LLMs to write and execute code or perform isolated tasks. These are effective but brittle, with limited reasoning transparency or contextual learning.

⚙ Systemic Layer: Epistemic Infrastructure via Patterns

To move beyond isolated capabilities, we introduce pattern-based epistemic scaffolding for multi-agent collaboration. This makes the system reflexive, composable, and governed by design principles.

Pattern-Aware Dialogue Agents. Agents trained to recognize and apply design patterns (from the PLACARD catalogue) in their interactions. They exhibit situated competence and can engage in structured reasoning, scenario exploration, and inquiry.

Pattern-Reflective Meta-Agents. These agents do not just use patterns—they also monitor, revise, and propose new ones, participating in iterative design and reflective cycles. They enable epistemic learning at the system level, coordinating multi-agent behavior across contexts.

🌎 Worldview Layer: Institutional Design through MAS

Inspired by Elinor Ostrom's principles for governing commons, we treat the MAS as a social-technological institution that evolves through interaction.

Multi-Agent Institution Designers. This layer operationalizes developmental patterns that support reflexivity, feedback, nested structures, and shared norm evolution across MAS environments. These agents co-design systems of engagement, monitor norm congruence, and resolve governance disputes—just as human institutions do. They instantiate a worldview in which intelligence is not just personal or cognitive, but systemic and collective.

🕊️ Myth Layer: Human Institutions as Living Models

Beyond technical systems, our proposal invites reflection on how real-world institutions—academic, policy, scientific—can themselves become more adaptive, transparent, and pattern-literate through interaction with these tools.

Real-World Interface. This is the last layer because it is grounded in recursive reform. Humans build tools to simulate and improve human institutions—not to replace them, but to co-evolve. This layer anchors the entire architecture in civic legitimacy, ethical accountability, and reflective participation. Our claim is not merely that we can control the system, but that we can use it to help re-pattern the world we inhabit. By working with agents that are both pattern- and institution-capable, we gain assurances not only about avoiding "run-away AI" scenarios, but about avoiding other tragedies of the commons.

8 ACKNOWLEDGEMENTS

APPENDIX

This appendix supports the analysis in the paper. It contains:

(1) A pattern-based analysis of the 2024 workshops, using the patterns from PoPII, and exploring the extent to which these patterns were used (implicitly or explicitly). A summary appears in Table 1 in Section 3.2.
(2) Potential new PLACARD patterns, mentioned in the paper.
(3) Candidate Patterns for Pattern-competent agents.
(4) Candidate Patterns for Pattern-competent Agent Environments.

Pattern analysis of the 2024 workshops

One immediate result was the identification of of a proto-pattern, "Have Multiple Leaders Onsite," addressing challenges in hybrid-facilitated events:

Context: Interactive conference workshops with both in-person and remote participants.
Problem: A single onsite facilitator struggles to manage breakout groups, technology, and overall flow, leading to gaps in support and reduced engagement (especially for remote attendees).
Solution: Deploy multiple co-facilitators physically onsite to coordinate activities, handle logistics, and engage with participants. Onsite leaders can divide roles (e.g., one per breakout table or task), ensuring better guidance and responsiveness, while remote facilitators focus on online participants.

A. Identifying Themes.

DÉRIVE COMIX. **Application:** Participants used cards (object, value, body/territory, situation) as interpretive prompts to spark imagination—mirroring urban dérive in a conceptual sense. **Observation:** The card game facilitated divergent thinking akin to exploring unfamiliar terrain.

CONTEXT SETTING. **Application:** Early slides and explanations introduced key concepts (e.g., design patterns, CLA). **Opportunity:** Participant feedback highlighted a need for clearer upfront orientation. Improved alignment with this pattern could increase accessibility.

DO YOUR RESEARCH. **Application:** Past workshop experiences were integrated into the design; earlier uses of CLA and PAR informed this session. **Example:** Reference to Anticipation 2019 and prior events illustrates "pre-research" informing present design.

B. Organizing Structure.

GOING META. **Application:** The project itself exemplifies recursive methodology—using PLACARD to refine PLACARD. **Highlight:** Participants were prompted to reflect on and imagine both the methodology and the subject (AI futures).

PATTERN LANGUAGE COMPONENTS. **Partial:** The workshop design showcases layering (CLA + DPL + PAR) but participants struggled to parse the conceptual load quickly. **Recommendation:** Use lighter keywords (HOWEVER, BECAUSE, SPECIFICALLY) to scaffold understanding incrementally.

FACILITATOR ROLES / FUNCTIONAL ROLES. **Application:** Hybrid facilitation with distinct roles (onsite leader, remote supporters) models distributed facilitation. **Opportunity:** Could be made more explicit—e.g., naming "Linker," "Reflector," or "Wrinkler" roles to participants.

C. Making it Actionable.

THE FUTURE BEGINS NOW. **Application:** The card game generated imagined futures that participants shared and developed. **Gap:** While creative ideas emerged, follow-through actions or small-scale pilots were not described. An actionable step could have enhanced continuity.

PROJECT ACTION REVIEW (PAR). **Application:** Strong use of the PAR pattern at the end of the session to reflect, share learnings, and gather insights. **Insight:** Participants gained confidence and intended to reuse techniques—an indicator of success.

REINFUSE EXPERTISE. **Application:** Participants brought diverse professional and cultural perspectives. Expertise was implicitly reintegrated via the shared reflection on AI futures and governance. **Suggestion:** A more explicit arc—temporarily setting aside expertise to foster common ground—could enrich this pattern's application.

Potential new PLACARD patterns

A. IDENTIFYING THEMES.

Start with Sense. **Context:** You are facilitating a workshop intended to generate new ideas or shared understanding. **If:** You want to activate creativity and presence, **But:** participants arrive cold or disconnected from each other and the topic, **Then:** Begin with a sensory or embodied activity (e.g., rhythm, image-based storytelling, gesture) that creates shared energy and primes pattern recognition. **Evidence base from related literature:** Techniques such as "story circles" (participatory arts), embodied methods in design ethnography, and rhythm-based facilitation in music education all affirm the value of grounding group attention through shared sensory engagement. These strategies mirror the function of PAR alternatives that aim to surface and align affective states as a precondition for inquiry.

Name the Frame. **Context:** You are introducing participants to a method that is unfamiliar or complex (like PLACARD). **If:** You want them to participate actively, **But:** the framing is opaque or abstract, **Then:** Explicitly describe the method, its purpose, and how today's session fits into the broader picture. **Evidence base from related literature:** This mirrors practices from facilitation toolkits like Liberating Structures (e.g., "Purpose-to-Practice") and the role of explicit framing in adult learning theory, where naming the structure of engagement is key to building learner autonomy and motivation.

Borrow the Situation. **Context:** You are using prompts (cards, challenges, scenarios) to guide group inquiry. **If:** You offer a situation that feels flat or generic, **But:** participants want something meaningful to anchor their play, **Then:** Invite participants to select, remix, or define their own situation to explore. **Evidence base from related literature:** User-centered design emphasizes co-defining the design challenge. Futures methods such as the "Futures Triangle" and participatory foresight often encourage the co-creation of situational prompts to enhance contextual fit and participant investment.

B. Organizing Structure.

Pattern Priming. **Context:** You are working with participants who may be new to design patterns. **If:** You want people to identify and name patterns, **But:** the idea of a "pattern" is still abstract, **Then:** Seed early examples or light prompts ("What did you do just now that worked?") to build fluency. **Evidence base from related literature:** This aligns with double-loop learning (Argyris and Schön), where patterns of thought and action are surfaced through inquiry. It's also reinforced in cognitive apprenticeship, which models strategies before expecting learners to apply them.

Timebox the Core. **Context:** You have a limited workshop time (e.g., 60–120 minutes). **If:** You want to run through all three PLACARD components, **But:** you risk running out of time or overwhelming participants, **Then:** Identify and focus on a minimal viable loop (e.g. Situation → Scenario → Reflection) and simplify supporting activities. **Evidence base from related literature:** Agile retrospectives and timeboxing practices in design sprints demonstrate how temporal constraints support clarity, focus, and iterative learning without requiring completion of all intended steps.

Role Reveal. **Context:** You're running a hybrid or multi-facilitator session. **If:** Facilitation roles are unclear, **But:** smooth coordination is needed to support the flow, **Then:** Make the roles explicit (e.g., LINKER, REFLECTOR)

and let participants know who does what. **Evidence base from related literature:** In distributed team management and collaborative learning, named roles (e.g., Scrum Master, Scribe) are shown to enhance group performance and task clarity. This also connects to facilitation protocols in online and hybrid pedagogies.

C. Making it Actionable.

HARVEST BEFORE YOU CLOSE. **Context:** You're running an engaging session. **If:** Participants have surfaced great insights, **But:** waiting until the end to name patterns might mean running out of time, **Then:** Add a short mid-session or pre-wrap-up step to ask: "What's something you did or saw that could be reused elsewhere?" **Evidence base from related literature:** After Action Reviews (military, management), Feedback Wheels (relationship therapy), and Agile retrospectives all highlight the value of capturing learning as it emerges—not merely as a concluding gesture.

PATTERN THE PLAY. **Context:** You're using creative methods (cards, music, improv) as part of your workshop. **If:** These are treated as energizers or tangents, **But:** you also want them to inform the core inquiry, **Then:** Treat playful activities as valid epistemic inputs. Ask: "what design moves or values emerged here?" **Evidence base from related literature:** Design ethnography, improv for innovation, and serious games scholarship all provide grounding for the idea that nonverbal, embodied, and affective practices contribute directly to sense-making and design thinking.

META-REFLECTION LOOP. **Context:** You're using a structured method like PLACARD itself. **If:** You reflect only on the topic (e.g., music and AI), **But:** you find yourself neglecting the method, **Then:** Add a closing question or section to reflect on the method's affordances, limits, and what to revise. **Evidence base from related literature:** This is consistent with reflective practice (Schön), meta-evaluation in participatory action research, and "method feedback" sessions used in critical design studies. It also draws from Buddhist and contemplative traditions of meta-awareness and iterative refinement (e.g., Dependent Origination).

Candidate Patterns for Pattern-competent agents

PATTERN ACTIVATION. **Context:** An agent receives a new task or encounters a novel situation. **If:** The system has access to a pattern catalogue relevant to the domain, **But:** Not all patterns are applicable or salient, **Then:** Retrieve candidate patterns using contextual filters (e.g., task type, known tensions) to prime downstream reasoning.

TENSION DETECTION. **Context:** An agent is assessing a situation, proposal, or evolving dialogue. **If:** Indicators suggest divergence, contradiction, or friction, **But:** These tensions remain unmarked and unresolved, **Then:** Flag the tension explicitly and propose an exploratory frame (e.g., apply CLA or consult conflict-resolution patterns) to surface underlying issues.

CANDIDATE MOVE GENERATION. **Context:** An agent has identified a situation in which one or more patterns apply. **If:** The context supports multiple interpretations or strategies, **But:** There's uncertainty about how to instantiate the pattern concretely, **Then:** Generate a set of plausible candidate actions based on pattern logic, rank or cluster them using salience heuristics, and propose next steps.

SHARED MEMORY ARCHITECTURE. **Context:** Multiple agents operate in a dynamic environment over time. **If:** Patterns are used, modified, or co-created through interaction, **But:** There is no mechanism for recording or retrieving this history, **Then:** Store pattern instances, adaptations, and usage contexts in a persistent shared memory, enabling learning and reuse.

FEEDBACK RHYTHMS. **Context:** A system includes agents collaborating over long timeframes or iterations. **If:** Patterns and strategies become outdated or misaligned, **But:** There is no regular cadence for reviewing or

revising them, **Then:** Schedule periodic feedback sessions or checkpoints where agents reflect on outcomes, revise patterns, and tune system-wide epistemic strategies.

PATTERN DIFFUSION. **Context:** A new pattern proves effective within a local agent subgroup. **If:** Other agents face similar challenges or tasks, **But:** There's no pathway for knowledge transfer or generalization, **Then:** Broadcast the pattern across the system with metadata (e.g., domain, confidence score, context) to allow others to trial, adapt, or contest it.

Candidate Patterns for Pattern-competent Agent Environments

INSTITUTIONAL DRIFT. **Context:** Repeated MAS sessions produce cumulative outcomes. **If:** Pattern use becomes routinized, **But:** Changing contexts or challenges are not reflected in pattern updates, **Then:** Trigger a meta-level PAR to recontextualize relevance. **Because:** Institutions require periodic re-grounding to avoid ossification.

NORM SEED. **Context:** A new MAS instance is initiated. **If:** There are no agreed-upon norms, **But:** Some agents possess relevant precedents or analogues, **Then:** Seed group interaction with foundational mini-patterns. **Because:** Initial framing influences long-term behavior and coherence.

BOUNDARY OSCILLATION. **Context:** MAS agents engage across different domains or networks. **If:** Norms, roles, or goals diverge significantly, **But:** Agents have memory of shared pattern lineage, **Then:** Engage a boundary negotiation pattern to recalibrate alignment. **Because:** Distributed epistemic systems must periodically reconverge.

REFLECTION SCAFFOLD UPGRADE. **Context:** Existing reflection protocols underperform in capturing learning. **If:** Meta-cognition fails to yield new patterns, **But:** System logs or feedback signals suggest deeper insight is possible, **Then:** Introduce upgraded reflection scaffolds (e.g., layered PAR, narrative loops). **Because:** Developmental learning depends on scaffolding that evolves with system maturity

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