



The PLAST Project
Pattern Languages for Systemic Transformations

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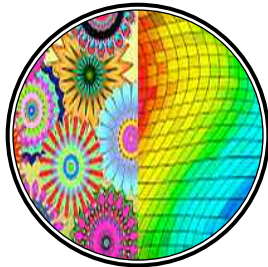
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THE PLAST PROJECT: PATTERN LANGUAGES FOR SYSTEMIC TRANSFORMATION



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FOREWORD

THIS ARTICLE IS AN ABSTRACT OF THE PROPOSAL recently submitted to the EU HORIZON 2020/CAPS program. The CAPS program aims to support the piloting of Collective Awareness Platforms for Sustainability and Social Innovation. The authors, part of the project consortium members organizations and their close partners involved in the call, came together around the idea of connecting sustainability and social change praxis and related pattern languages within a commons pattern repository, via a systemic pattern language. Each brings a building block of what is needed to create a sustainable and scalable platform for collective awareness and exchange of tacit knowledge on sustainability challenges and solutions oriented towards systemic change. Helene Finidori, Sayfan Borghini, Kurt Laitner, and Takashi Iba are coordinating the concept from a theory to application perspective. Tom Henfrey, Nadia McLaren and Helmut Leitner are involved in the practical aspects of pattern language praxis, working with practitioners and those who drive change on the ground. Martin Pruvost-Beaurain and Vincent Puig are bringing to the mix exploration of possibilities and the semantic and hermeneutic inquiry that help to organize documented knowledge and discussions related to it. They ensure the liaison between the non-digital world of practice, the IT

that ‘tools’ it, and the philosophical-ethical approach that ensures a critical questioning of the categorization of knowledge. This approach is supported by the work of René Reiners on pattern evaluation and evolution, based on a long experience in the design and assessment of human-computer-interaction concepts, accompanied by the work on pattern repositories by Frank Leymann and Michael Falkenthal.

INTRODUCTION

A central problem of our time is the separation of knowledge cultures into isolated islands. These knowledge islands typically have an excess of relevant information at their disposal from other islands, but do not leverage this knowledge effectively. This isolation has many causes: academic specializations, ideological polarizations and competing interests among grassroots movements, or simple separation in space, time, natural language or culture. Just as importantly, knowledge tends to be disconnected from praxis. The combined effect is to hinder the expansion of collective intelligence and fragment the systemic impact of sustainability and social change initiatives.

When attempting to intervene in a complex system, it is essential to assess the systemic implications of actions and to be aware of other actors in the system and their concurrent interventions. Isolated solutions can create new problems or be mysteriously ineffectual. Systemic change requires multiple interventions and an understanding of how they interact to produce desired outcomes, the discipline to monitor outcomes against intentions in a reflective way, and a willingness to change course where necessary, to mitigate the risk of unintended consequences.

The purpose of PLAST (Pattern Languages for Systemic Transformation) is to produce an open knowledge repository of sustainability and social innovation practices, leveraging pattern languages to make knowledge accessible, reusable across domains and actionable, turning knowledge into shared and accessible ‘know-how’. The key to success is making communities of practice aware of each other’s achievements in a language that is understandable, so that successes can be re-contextualized, applied, and evaluated for

effectiveness in other domains. The dynamic repository structure aims to promote the creation of meaningful relationships among different pattern languages using ‘Systemic Patterns’ as a novel form of meta-language.

The project balances this theoretical convergence by capturing the practical usage of patterns in new contexts, partnering and working with communities while prototyping and building the platform and allowing discussions and deliberations about patterns’ success and suitability to be included. Practice will thus inform theory which will guide practice in a virtuous cycle. In this way the PLAST will support collaborative creation, maturation, discussion, and refinement of knowledge and ‘know-how’ about sustainability practices and new ways of being and catalyse the social innovation required to find them.

The overarching objective of PLAST is to transcend boundaries among knowledge islands by creating a strong communication attractor for sustainability knowledge and thus to make sustainability-related knowledge more effective, connectable and ‘actionable’. This involves developing new digital tools and associated processes for the innovation of practice that builds upon, rather than rediscovers, established knowledge.

In particular PLAST is working to:

- ~ Provide a platform on which to share knowledge and know-how (in the form of Patterns and Pattern Languages) as ‘shared social objects’¹, subject to discussion, deliberation and transformation.
- ~ Actively make communities aware of one another’s solutions through a coherent model of meaningful relationships and ‘systemic patterns’, providing the structure to allow inquiry and analysis through discovery and exploration.
- ~ Provide multiple entry points, (by problem, by solution, by systemic pattern, by context, by category etc.), and pathways, (guided tours, use before/after, etc.), through the collected solutions and practices.
- ~ Provide the means to re-contextualise solutions and practices into new domains and communities, and the ability to monitor, track, evaluate, deliberate and discuss the results.
- ~ Support the analysis of the process of transformation (categorizing discussion, deliberation, and transitions to understand tipping points, phase changes, and leverage points), creating the opportunity to design transitional strategies that are systemically assessed.
- ~ Allow participants to understand the full lifecycle of patterns in practice, from problem identification to pattern application, iterative reuse, maturity, adaptation, refinement and re-evaluation.

We expect this to:

- ~ Accelerate the circulation of domain-specific knowledge.
- ~ Improve the effectiveness of this knowledge and its applications.
- ~ Bridge ‘isolation’ gaps by connecting and making this knowledge ‘interoperable’.
- ~ Ultimately, keep knowledge dynamic as a living resource that embeds its on-going creation.

SUSTAINABILITY: THE QUALITY OF A (RE)GENERATIVE SYSTEM

We adopt in this project a broad definition of sustainability as a quality of a generative system able to regenerate and perpetuate itself in a way that allows flourishing of both the system as a whole and all its constituent parts. This systemic perspective can encompass multiple narrower definitions and forms of action: whether focused on the environment, lifestyles and behaviours, organizational forms, cultural norms and habits, power relationships, governance, equity and justice, technologies, or human relationships. This aligns itself with efforts to characterise trajectories towards making the world a better place in terms of essential qualities rather than precise definitions. There exist many definitions of the “vector” that makes the world a better place, and many who seek to uncover its essence and systemic characteristics.

Social activist Tom Atlee calls it Goodness². Physicist David Bohm referred to it as Wholeness³; cultural theorist Jean Gebser as Diaphaneity⁴; Gregory Bateson as ‘The Pattern that Connects’⁵. Architect Christopher Alexander best conveys, and most fully articulates, this idea of something desirable, ineffable yet readily perceivable with high levels of intersubjective agreement. Alexander refers to it as the ‘quality without a name’: “*There is a central quality which is the root criterion of life and spirit in a man, a town, a building, or a wilderness. This quality is objective and precise, but it cannot be named.*”⁶

He goes on to elaborate on its context-dependence [...] “[I]t is never twice the same, because it always takes its shape from the particular place in which it occurs.”⁷ and later on the conditions for its arising: “*This quality [...] cannot be made, but only generated, indirectly, by the ordinary actions of the people, just as a flower cannot be made, but only generated from the seed.*”⁸

Alexander’s holistic and pluralistic treatment prefigures the PLAST approach of providing tools for change agents, wherever they may be located and whatever their core areas of interest, to identify their own

goals and design their own preferred pathways towards them. PLAST thus aims to nurture, collectively, a range of diverse, complementary solutions that create opportunities for learning and collaboration and possibilities for mutually supportive action and synergistic outcomes.

We see current sustainability challenges as like the elephant in the ancient Hindu fable of the blind men. Although all are touching the same beast, each blind man only perceives a small part of it, and thinks he touches something different from the rest, none able to see the complete picture. Similarly, change agents involved in sustainability and social innovation may intervene in different domains, but all are ultimately addressing parts of the same challenge. PLAST's main ambition is to make the elephant – the bigger picture – clearly visible to change agents in all domains, allowing them to understand and take into account linkages among perceptions, interpretations and representations

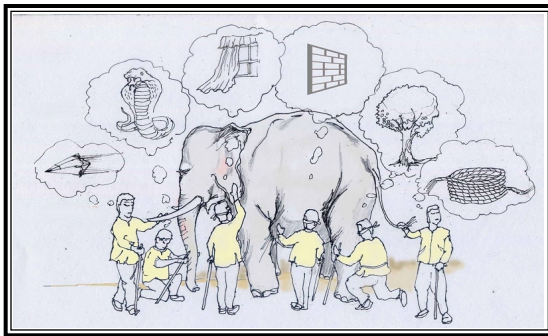


FIGURE 1 - *The Ancient Indian Fable of the Blind Men and the Elephant*⁹.

Edgar Morin describes this multiplicity of pathways in *La Voie (the Way)*: “*On each continent and in each nation one can find creative bubbling, a multitude of political initiatives in the direction of economic, social, political, cognitive, educational, ethical or existential regeneration. But everything that must be connected is yet dispersed, compartmented, separated. These initiatives are not aware of each other, no institution enumerates them, and no one is familiar with them. They are nonetheless the livestock for the future. It is now a matter of recognizing, aggregating, enlisting them in order to open up transformational paths. These multiple paths, jointly developing, will intermesh to form a new Path which will decompose into the paths each of us will follow and which will guide us toward the still invisible and inconceivable metamorphosis.*”¹⁰

In growing trends towards peer production, increasing numbers of people are seeking to create their own goods, tools, concepts and knowledge, often within local systems of production, use and

exchange¹¹. The challenge this raises is how to equip communities with skills and technical capacities to capture their experiences of peer production and the tacit knowledges developed in doing so, and reproduce and build upon this learning so that future action is more effective. A related challenge is how to support learning across communities that can support more effective local co-creation, bridging islands of engagement, language and experience without diluting diversity into uniformity¹².

We believe this can be achieved through systemic investigation via a hermeneutic approach of observation, hypothesis formation, selection of methods, and interpretation. This will provide the ontological and epistemological threads that can reveal and activate potential connections among different sustainability initiatives. By encouraging change agents to creatively focus their attention on the tacit knowledge they have developed through experience in their own domains, and on the underlying dynamics of the sustainability challenges they engage, PLAST will support them to enhance the effectiveness of their interactions with peers in their own domains and create and strengthen connections to other domains.

At the centre of PLAST is the concept of the *design pattern*, as a mechanism for connecting different kinds of people with different kinds of experiences. The design pattern is a unit of knowledge that can circulate - can be exchanged or transferred. Patterns, in use, are connected to other design patterns to form a web of action-oriented knowledge within a defined domain of operation, called a *pattern language*.

PLAST will provide a systemic thread through which diverse capacities and potentials become interrelated within an emergent ecosystem or network of possibilities. Within this ecosystem, collective awareness builds up as sustainability domains open up to each other and connect through webs of interrelated patterns, unleashing all sorts of possibilities for participation, collaboration, innovation and action.

In the following sections, we distil elements of concept and show how each will be approached and operationalized, and we conclude with the overall technical design approach of the project.

WICKED PROBLEMS: THE SYSTEMIC NATURE OF SUSTAINABILITY ISSUES

Most sustainability issues are systemic in nature. They are emergent on complex dynamic processes affected by the aggregated behaviours of multiple

agents (human and non-human): behaviours that are shaped by the rules, structures and automated systems we humans put in place, which arise from the paradigms we hold. Donella Meadows summarises this situation in her characterisation of Points of Intervention in a System (see figure below)¹³. Often these dynamics manifest at levels other than those at which they originate: a common property of complex adaptive systems. They may over time gather momentum and become self-reinforcing, and in turn become structural features that shape the available choices and hence behaviour of agents in the system. This creates situations of lock-in to highly undesirable states - such as the linked technological, institutional and political barriers to decarbonisation of industrialised economies¹⁴ – and likelihoods that these propagate as path dependencies built in to new or rapidly changing systems¹⁵. Lacking simple resolution or even problem definition, most complex sustainability issues take the form of ‘wicked problems’, intractable to causal analysis and impervious to concrete remedies¹⁶.

theory have identified many common systemic patterns of this type, but often represent them in different ways. We will identify these recurring patterns across disciplines and research fields and their contexts of manifestation and forms of expression in different domains of sustainability and under diverse conditions. This will improve general understanding of system dynamics and their relation to sustainability, and help bridge languages across sustainability domains by providing a common ontological and epistemological thread. The objective is to produce a systemic pattern language that will be tested, refined and connected to the knowledge of communities of practice, and operationalised in the digital platform.

TAKING A HACKER’S
APPROACH TO
SUSTAINABILITY
CHALLENGES

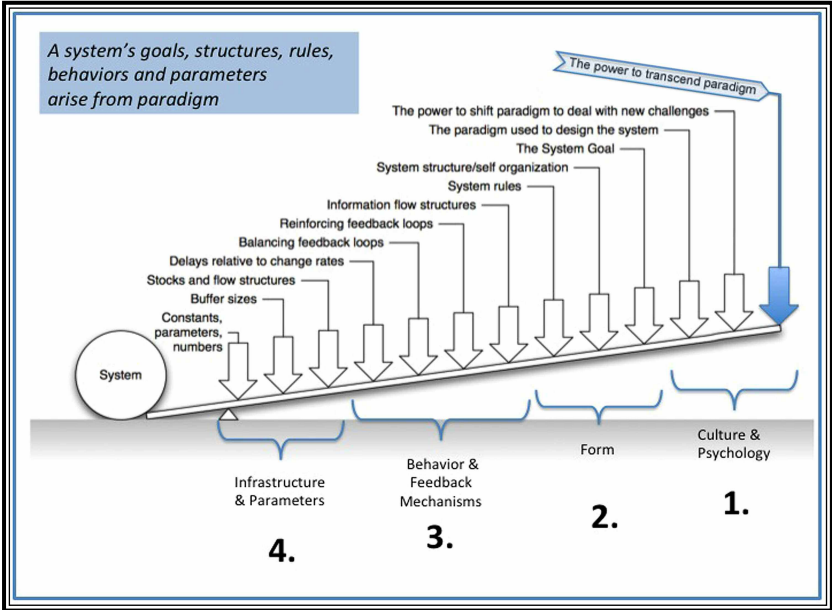


FIGURE 2 - Donella Meadow’s leverage points for systemic change.

PLAST addresses this by bringing together scientists from many different fields of systems research to explore, discover and capture common patterns of systemic behaviour. A pattern in a system is here broadly referred to as ‘a common feature, system behaviour, structure or function [...] that can be observed across multiple contexts¹⁷ and can be used for revealing information on processes¹⁸. Research areas such as digital studies, cognitive technologies, social and cultural studies, game theory, complexity theory and resilience

A simple summary of our core approach is that it is about learning to take things apart in order to understand the relationships between components and build something new. This is the essence of a hacker’s approach:

“The large part of the complexity and opacity we are faced with is that it neutralises political action. There is [...] a large diffuse body of people who can’t really articulate what they don’t like about the [financial] system and how to change it [...] I used the hacker ethics analogy and framework [...] It involves exploring something to see it not as a

thing, but as a set of interacting components. Hacking is figuring out the internal impulse of things to figure them out. But the important question with the hacker approach is what are you aiming to achieve with this impulse.”¹⁹

Here we take a similar approach, identifying systemic patterns that capture perceived relationships and behaviour and linking them to design patterns that communicate possible courses of concrete action in specific contexts. Design patterns, especially when located in networks of inter-relationships as pattern languages,

can efficiently capture interacting components of situations, practices or systems and their underlying dynamics. Use of pattern languages has become standard practice in object-oriented programming, where patterns are a format for exchange and reproduction of building blocks among experts²⁰. They are now increasingly used by communities for collaborative creation, as a medium of narrative and conversation based on observation and experience that encourages creative thinking and creative action²¹.

The value of using patterns as units of knowledge and pattern languages to describe their contexts of application is manifold, as they:

- Reveal domain specific tacit knowledge, allowing it to be understood, unpacked, and recomposed to address specific challenges and needs.
- Build a language format upon which communities of practice can share experience.
- Facilitate the socialization and recombination of knowledge (ultimately resulting in hyper-productive, learning and knowledge-creating communities).
- Provide a conduit to externalise tacit knowledge enabling translation and transfers between domains of action and the circulation of knowledge across domains.
- Provide a web of 'readable' possibilities people can explore.
- Allow knowledge to be stored and retrieved, and for this reason extend collective intelligence.
- Articulate fundamental design principles to guide holistic/life-serving applications in a given domain (such as systemic transformation and sustainability), with each principle able to be manifested in diverse ways.
- Structure educational curricula (in this case for systemic transformation and sustainability).

Pattern languages are emancipatory tools, in other words, because they bring to light knowledge and understanding about the system that is normally hidden from view and which, when consciously articulated, allows people to propose and act upon ways to transform their situation²². We will support the communities involved in our use cases to 'hack' or decode sustainability issues and alternative practices in their domains of action, using the systemic patterns produced in the theoretical foundations research part of the project, and to encode these issues and practices into patterns (connectable, exchangeable formats) themselves. This will provide users with the capacity to explore, share and compare patterns and pattern languages (i.e. codified tacit knowledge) from a variety

of sustainability domains. These capacities will in turn be enounced in the platform objectives and built into the platform.

IDENTIFYING UNDERLYING SYSTEMS DYNAMICS IN SUSTAINABILITY DOMAINS

The community-based research part of the project will focus on various application domains and subdomains to record and analyse communities' creative and discovery processes, in order to answer the following questions:

- How do communities of practice apprehend and talk about systemic phenomena (the sustainability challenges they face or the underlying dynamics they identify) in their domain? How do they observe, interpret observations and make hypotheses?
- How do they explore and design solutions to address these problems in their respective domains and how do they document both problems and solutions?
- What are the systemic invariants and their manifestation/expression in the various domains?
- What socio-cognitive and contextual heuristic variables and operators can be drawn from the study of domain and subdomains exploration and design processes?
- What lies at the intersections among domains and among modes of exploration and perception?

We will derive from these data a semantic structure and a pattern language structure that will accommodate existing pattern languages and enable operationalization of exploration of possibilities, systemic inquiry and collective interpretation into a digital tool, which will be modelled into a semantic and system inquiry tool.

Pattern languages are already in use in many different areas of sustainability, including bioregional development²³, community action on climate change²⁴, the Transition movement of community-based sustainability initiatives²⁵, permaculture's approach to designing sustainable human habitats²⁶, as well as other human interaction and action domains such as learning, collaboration, co-creation, innovation, and conflict resolution²⁷. The PLAST pattern data structure will bring together these different languages, mediate among them, and help create new ones. In this way, it will reveal how sustainability domains can act as intersecting clusters of closely related languages, forming an ecosystem of ideas and where agents complement each other in generating societal change. The domains and subdomains of application we will work with as use cases will act like vectors into the diverse semantic spaces of action for sustainability

and social change. This will allow connections to manifest, usage of the tool to spread, and ultimately support localised (spatially and/or conceptually) efforts to coalesce into emergent systemic effects at higher levels.

Use case collaborations will operate in four domains, and at their areas of intersection and overlap:

- 1 ~ TECHNO-SOCIAL
- 2 ~ SOCIO-ECONOMIC
- 3 ~ SOCIO-ENVIRONMENTAL
- 4 ~ STIGMERGETIC

TECHNO-SOCIAL

In the techno-social domain, circulation of knowledge is essential for individuation, empowering individuals, building capacity and promoting collective intelligence²⁸. The network effect has the potential to accelerate the circulation of knowledge and the expression of collective intelligence for the benefit of society as a whole. Conversely, in certain configurations it leads to monopoly formation and the capture of collective intelligence by commercial interests. In such environments, conformist pressures are enhanced by algorithms that influence choice and may undermine behavioural diversity²⁹. Algorithms play an increasingly significant role in shaping human behaviour and system dynamics, and their effects must be monitored³⁰. PLAST can help communities identify those configurations and better prevent the threats they may entail.

In this domain, we will follow the work of Antoinette Rouvroy on algorithm intentionality and governance^{31,32} and explore the structures and dynamics affecting choice and agency in the digital space. Key use case partners in this domain are Ars Industrialis, a community of citizens interested in industrial policy and technologies of the mind and matters related to the future of the web in conjunction with the “web we want” W3C initiative, and the Digital DIY H2020 project focusing on the transformations generated by the increasing social adoption of atoms-bits convergence, and its implications on ethics and the legal system. The goal is to work with the technology community to develop annotation capability, protocols for categorizing intentions, and learning material on technosocial implications of algorithmic computations and their dysfunctional effects in order to help generate positive dynamics.

SOCIO-ECONOMIC

In the socio-economic domain, business and governance structures and models have various impacts: on the circulation and accumulation of resources, money and intangible values; on forms of

work and realization of individual and collective potential; and on the capacity for people and communities to generate livelihoods. For example, combination of decentralised energy generation with distributed monitoring and control via ‘smart grid’ technology may be the technological basis for an ‘energy commons’ under the control of citizen producer-consumers, or it may entrench the power of large market players with vested interests in the status quo³³. The two may look and sound similar in their natural language description, but have quite different impacts on empowerment, revenue retention, and other factors affecting the long term sustainability of the community. PLAST will help communities evaluate possible outcomes and the likelihood of a model to achieve its intents.

Key use case partners in this domain are the P2P Foundation, a global network of researchers and activists focusing on peer production and participatory modes of governance, and members of the ECOLISE network of community-based sustainability initiatives active at policy level. They will create patterns for policy and activity models oriented towards commoning, transitions to sustainability, commons based peer production, and sustainable living. The goal is to provide policy makers and social entrepreneurs with the building blocks, pathways to generative sustainable systems, and related inquiry approaches that will help them identify and share knowledge to design game changing policy and organizational models.

SOCIO-ENVIRONMENTAL

In the socio-environmental domain, the choices people make in terms of lifestyles, production and consumption (food, energy, other resources) affect environmental footprints, resilience and thriving, and ultimately human prosperity, relationships and well-being. PLAST will support community-scale inquiry into relationships among these choices and their effects, for example to identify how to balance efficiency and resilience and so access the ‘window of viability’ of a solution³⁴. This can help communities address sustainability issues and make informed trade-offs without getting stuck in polarised positions and other unproductive social patterns.

In this domain, we will work with projects and initiatives of members of ECOLISE, the network of European Community-Led Initiatives for a Sustainable Europe; sustainability education initiatives involving Global Action Plan International (GAP) and other sustainability education organisations; and Initiative Homes, a social enterprise supporting community-led housing initiatives that emphasise sustainability and social justice goals. The goal is to support processes of collective learning at

community levels that can support meaningful action for social change, via education, awareness-raising, and reconfiguration of basic structures for production and consumption to satisfy human and environmental needs. Potential use cases within the ECOLISE include its policy-level activity (intersecting with the socio-economic domain), its internal operations as a network (such as communication mechanisms and decision-making processes), specific projects of member initiatives (such as the Italian national Transition Hub), and educational projects in which several member organisations are already using pattern languages (Global Ecovillage Network, Gaia University, and the German Permaculture Institute).

STIGMERGETIC DOMAINS

Commons based peer production projects involve a mechanism of indirect coordination between agents or actions, which is stigmergetic by nature. The principle of stigmergy is that the trace left in the environment by an action stimulates the performance of a next action, by the same or a different agent³⁵. In that way, subsequent actions tend to reinforce and build on each other, leading to the spontaneous emergence of coherent activity. This is how open source production operates, with the common co-produced artefact openly accessible for peers to further build on³⁶. Stigmergetic projects require both the whole (the commons being developed) and the ‘traces’ (new contributions, needs or opportunities) to be made accessible, visible, intelligible and actionable at the collective as well as the individual level so that people can engage in an optimal way³⁷.

We will work with the Digital DIY project involved in studying the impacts of the digital do-it-yourself socio-technological phenomenon on open design and hardware communities, the P2P foundation, the Open Knowledge Foundation and more to build a pattern portfolio on peer production and digital commons that will help communities make their open and commons-based peer production projects more effective.

LEVERAGING THE EFFECTIVENESS OF PATTERN LANGUAGES AS NETWORKS OF IDENTIFIABLE AND TRANSFERABLE ELEMENTS OF DESIGN

At the conceptual level, PLAST draws significantly upon the pattern language approach pioneered by Christopher Alexander, which integrates concepts and approaches from a variety of fields including systems thinking, design thinking, and action research. It consists of a methodology to generate Alexander’s ‘quality without a name’, based on the

generation and use of patterns as generic, flexible encodings of possible desirable transformations in a system, and pattern languages as systematically organized collections of all patterns relevant to a particular domain. As dynamic entities that support on-going exploration of generative possibilities, patterns and pattern languages are not fixed but constantly reinvented through use in practical contexts, leaving space for interpretation and discovery of new patterns and relationships and emergence of co-created solutions³⁸. They thus fit the need for a more dynamic, process-oriented ‘Transition Design’ approach consistent with the wicked nature of sustainability problems³⁹.

Alexander, the first to formalize the concept of pattern language, sought to understand how design forms arise as solutions adapted to specific configurations of problems, which can then be generalized for other similar uses. He observed that complex systems could be partly decomposed into recognizable subsystems bound by strong forces (the systemic patterns) inter-related through weaker links, which could be treated as recombinable units (the design pattern) within design models, following grammar-like rules⁴⁰. By making visible previously covert processes and the tacit knowledge that underlies them, a pattern language provides a common vocabulary for design, bringing communication on designing into existence and opening up new channels of communication and understanding⁴¹.

In practical terms, Alexander defines a pattern as a three part construct. First comes the ‘context’, the conditions under which the pattern holds. Next is a ‘system of forces’. In many ways it is natural to think of this as the ‘problem’ or ‘goal’. The third part is the ‘solution’; a configuration that balances the system of forces or solves the problems presented. This definition⁴² reinforces the distinction between the ‘system as a whole’ – a holistic description of a concrete phenomenon in relation to its emergent properties - described by design patterns – and the ‘generative system’, or set of organic processes out of which any phenomenon emerges, described by systemic patterns⁴³. PLAST will make explicit and examine the relationships among systemic patterns, the focus of its theoretical foundation research, and the design patterns revealed and generated in community-based research, which will be built into the platform design.

AN HERMENEUTIC APPROACH TO SYSTEMIC INQUIRY: PATTERNS AND PATTERN LANGUAGES AS REPRESENTATION AND INTERPRETATION MEDIA

PLAST seeks to tool the praxis and evolution of collective sense-making and action towards sustainable

design within a knowledge ecosystem that includes diverse logics of understanding and engagement, each with its own languages and cognitive preferences. It recognises that this diversity is not only inevitable, and desirable for its own sake⁴⁴: it understands plurality of outlook and action as vital for addressing complex sustainability issues. However, it also recognises that not all outlooks and actions are equally true, valid, morally sound, or effective. By making use of patterns and pattern languages as media of interpretation, it will seek to reconcile difference with interconnection, inclusiveness with discernment, and so help activate collective awareness to its fullest potential, not reduce it to its lowest common denominator.

PLAST therefore adopts a hermeneutic approach to observation/representation, interpretation, design and action. A hermeneutic approach seeks to understand rather than explain. It acknowledges the situated nature of all interpretations and therefore accepts and values a plurality of perspectives on and points of entry into a topic. It recognizes that language and history both allow and limit understanding (see the pharmacological approach below), views interpretation as conversation, and is comfortable with ambiguity. Project partner IRI's approach to hermeneutic inquiry facilitates discussion and seeks to record points of divergence from and convergence towards categories and networks of categories in scientific disciplines. PLAST will extend this to analysis of conceptual models and the ways they are reflected in patterns and pattern languages. In this way, it will make it applicable to grassroots design and action, extending hermeneutics from the conceptual to the phenomenological and performative domains, furthering the work of the Digital Studies Network⁴⁵.

The wicked and multifaceted nature of most sustainability challenges lends itself to a hermeneutic approach⁴⁶. Their complexity often entertains ambiguity, preventing the adoption of clear-cut problem-solution approaches: trade-offs must be made, and any course of action monitored for unforeseen effects. A solution in one context can turn out to be a problem in a different context, or become a problem as conditions change⁴⁷. Economic growth, for example, reliably contributes to improved standards of well-being in a context of poverty, but beyond a certain level of material affluence drives increasing depletion of environmental resources for no discernible benefit⁴⁸. A network effect empowering participatory dynamics may become lock-in to proprietary platforms in the context of the web⁴⁹. A solution or practice that is desirable and sustainable at moderate levels may become a problem at higher intensities. For example AirBnB – an apparent success in the sharing economy that contributes to

diversification of individual incomes – has also inflated local property prices and costs of staple goods, making life unaffordable for residents of popular city centre destinations⁵⁰. Similar forms of context-dependence can also be seen in relation to points of view, interpretations of a situation, and approaches to action.

Hermeneutics enables multi-level inquiry through which this context-dependence can be understood and assessed. It allows the phenomenon under investigation (a situation, a practice, an alternative, a pattern...) to be evaluated in two main ways: in relation to its systemic features and their consequences, and in relation to its maturity. Such evaluation allows categorization of the phenomenon and its properties in terms of attributed status or quality (problem/solution, desirable/undesirable, functional/dysfunctional...).

Systemic evaluation focuses on the systemic characteristics of the pattern, changes in its configuration, and anticipated effects under designated conditions. These identify how sustainable or how functional/dysfunctional it may be or become – as illustrated in the examples described above. To accommodate this type of inquiry, the PLAST pattern language structure and ontology will support scenarios to allow evaluation of a pattern in terms of its sustainability under various conditions and in diverse contexts. PLAST will assist change agents in communities to decode (interpret and/or articulate) and encode (model and prototype) systemic phenomena and possibilities into patterns. This will operationalize Bernard Stiegler's concept of *Pharmakon* (the technique or solution being at the same time a cure and a poison, meaning that for problem solving to be effective it must take the form of an ongoing reflexive inquiry)⁵¹.

Evaluation of the 'maturity' of a pattern might address the completeness of its analysis, interpretation, description, understanding, design, or applicability (as Wikipedia does for its pages, for example). Does the content of the pattern reflect and empower a meaningful systemic inquiry and interpretation of a situation, practice, alternative? Does it accommodate sufficient perspectives or points of view for the design to 'stabilize' and evolve in an appropriate manner, and for people to expand the horizons of their exploration and understanding? Have points of convergence and divergence relevant to making trade-offs or understanding relational dynamics been identified?

PLAST will undertake such an hermeneutic enquiry in order to capture multiple perspectives and scenarios. Outcomes from this, along with new observations from further research or experience over the course of the project, will feed back into pattern design and eventually into the pattern structure and ontology.

These feedback loops will be maintained throughout the project and built into the on-going operation of the platform beyond the funded period, as an inbuilt mechanism for incremental evolution of patterns. PLAST will thus, as one of its major features, initiate an autopoietic approach, driving learning and expansion of collective awareness through an on-going design approach that perpetually regenerates the conditions for its own continuation⁵². Methodologies for collaboratively identifying and formulating patterns, the structure of patterns, and their inter-relationships within pattern languages (semantic organization) will derive from community-based research on the use case topics detailed above, and will be modelled for its operationalization in the platform.

A hermeneutic approach to support exploration and development of patterns and pattern languages will achieve the following:

- Provide users with the capacity to interpret, discuss and articulate sustainability challenges and sustainable practices in systemic and dynamic terms.
- Allow assessment of the 'systemic' sustainability of practices and perceived dynamics.
- Support documentation and reprocessing of discussions and field experience to keep the data alive and grow the commons of sustainability knowledge as the 'memory' of collective intelligence in action.

FOSTERING
EXPLORATION
AND DISCOVERY
BY MODELLING
CREATIVE
DESIGN
PROCESSES:
PATTERNS AND
PATTERN
LANGUAGES AS
DISCOVERY
MEDIA

PLAST seeks to provide a tool for the exploration of the social change possibility space, taking advantage of the dual status of pattern languages as media for both communication and discovery. If communication is essential to the formation of understanding, discovery is essential to the formation of awareness. In this sense we can see the PLAST platform as an Internet of actionable knowledge for awareness, decision-making and action on sustainability, enabling navigation among patterns

and pattern languages across domains and so fostering discovery. A user should be able to enter the system at any point and from there explore it, discovering new possibilities and moving from familiar domains of practice to new territories of understanding and action. In order to ensure this, community-based research focuses on modelling creative design processes in order to build the findings into the design of the platform.

The creative process consists of a sequence of discoveries; it includes observation, interpretation, hypothesis formation, method selection, problem identification, problem solving, and ultimately innovation and action. Discoveries result from associations of ideas. Collaboration thus drives creativity by encouraging generation of a sequence of new associations and therefore discoveries beyond those accessible to the individual mind working in isolation. The creative processes underlying innovation and novel action are thus structurally coupled with processes of individual development of consciousness and awareness (psychology), and processes of communication within and among groups (sociology)⁵³.

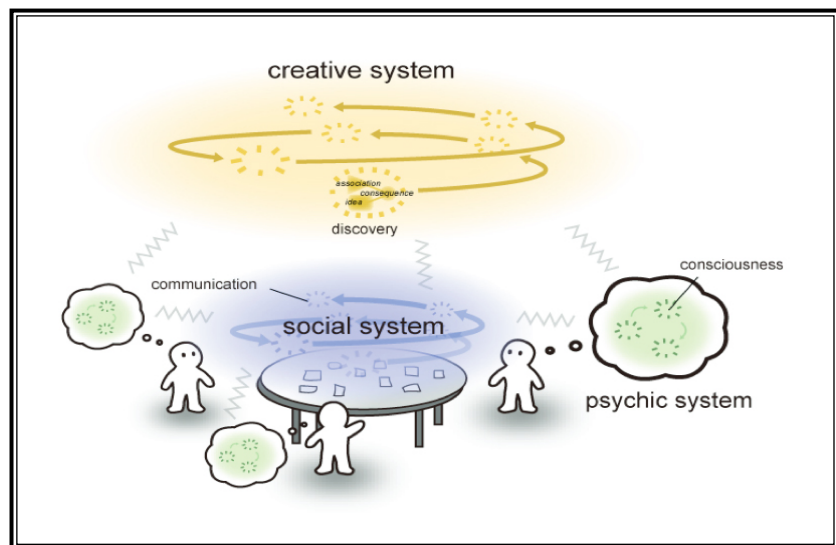


FIGURE 3 - Coupling of creative, psychic, and social systems⁵⁴.

Connections beyond individual minds, such as those enabled by the Internet and the hyperlink, have exponentially increased the potential for discovery of ideas and knowledge. In a similar way, by facilitating creation and use of design patterns that encapsulate tacit knowledge in interoperable formats, supported by insights on systemic consequences, PLAST, focusing on the ergonomics of the technical tools that will accompany the practitioners and their practice, will

generate added potential for discovery of actionable knowledge and therefore for action.

When change agents analyse situations and co-create solutions in real world contexts, each stage of the co-modelling process involves questioning and draws on multiple modes of perception and exploration. During the research phase, we will document and model collaborative processes of pattern interpretation (decoding of perceived patterns) and design (encoding of pattern representation). We will analyse and evaluate several facilitation methodologies and human action pattern languages⁵⁵. On this basis, we will create prototype workshop formats, to be piloted during the project and employed thereafter. Workshops will both facilitate the research process and allow documentation of the various processes through which groups explore possibilities and co-create new ideas. This will inform the design of a semantic structure and an orientation engine in the platform's user interface that will include query, visualization and navigation features that enable exploration and discovery.

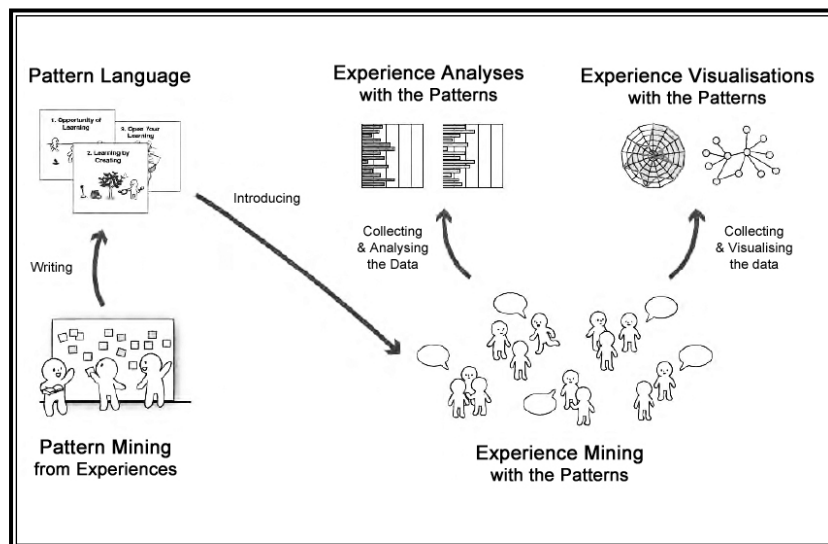


FIGURE 4 - The overview of experience mining, experience analyses, and experience visualisation with patterns⁵⁶.

The goal is to enable users to navigate in the creative environment: query, explore, and play with elements forming structure, space and movement, and so explore perspectives, limits and boundaries through inquiry. The whole process enables the appreciation of multiple pathways and co-created solutions while ensuring systemic coherence and allowing systematic organization of knowledge in the pattern repository. PLAST will provide users with the capacity to make connections among patterns and navigate across domains within the sustainability space. The network formed through the common underlying

dynamics that connect patterns will enable users to explore possibilities and cross-pollination opportunities, bringing to life the ‘adjacent possible’ proposed by Stuart Kauffman: “*The strange and beautiful truth about the adjacent possible is that its boundaries grow as you explore them. Each new combination opens up the possibility of other new combinations. Think of it as a house that magically expands with each door you open. You begin in a room with four doors, each leading to a new room that you haven’t visited yet. Once you open one of those doors and stroll into that room, three new doors appear, each leading to a brand-new room that you couldn’t have reached from your original starting point. Keep opening new doors and eventually you’ll have built a palace.*”⁵⁷

The Johari Window⁵⁸ (FIGURE 5) opens up on self-awareness and shared discovery of the unknown, to expand the boundaries of our perception. Discussions generated in the process of taking ‘the system’ apart to better understand interactions and their combined effects help gain a better view of the whole. An approach akin to cartography where one explorer sets the contours of a new continent for others to discover and more finely describe.

To sum up, at the conceptual level, PLAST bridges the systemic/experiential/action sphere (the dynamics at play; the structures, agents, relationships involved) and the semantic/conceptual/psycho-cognitive sphere (how we talk about these dynamics

and co-create solutions across boundaries), with the technics (tools that will help people find the right information, co-create and exchange knowledge, better understand each other’s language and learn about systemic phenomena) in a reflexive manner. In this way, it will increase problem solving capability and the scope for dissemination of new concepts and practices. In other words, PLAST provides interpretation tools and interoperability across sustainability areas to allow groups with different outlooks, languages and goals to explore the possibility space and describe systemic phenomena in a mutually comprehensible way. Shared understanding allows reflection upon solutions and

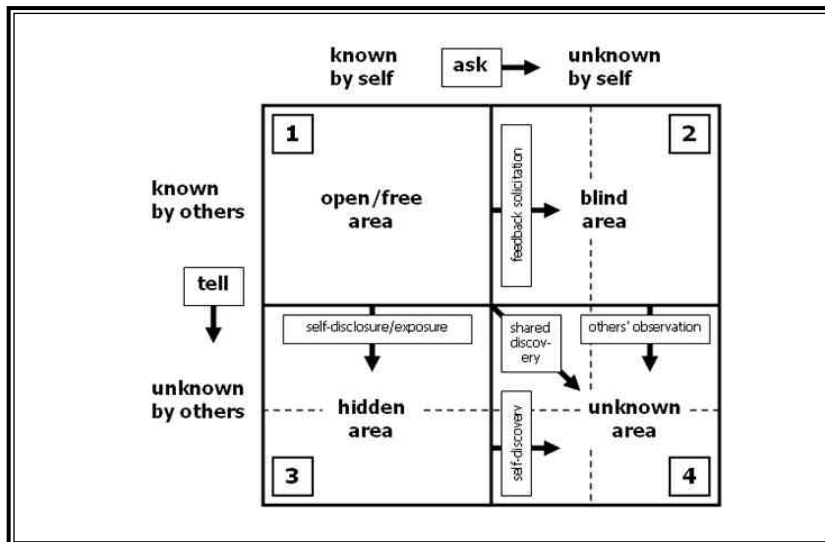


FIGURE 5 - *The Johari Window*⁵⁹.

the prototyping, sharing, reproduction, maintenance and on-going development of effective practice across domains, supporting the design, learning and dissemination goals of change agents within communities of practice on the ground.

DESIGNING THE PLATFORM FOR SUSTAINABILITY

The platform will be designed to enable the formulation, management and development of patterns and pattern languages by the user communities who authored them. It will incorporate a contributory model, whereby different user communities will have their own local pattern repositories, integrated into a commons repository. Other communities will be able to work on copies of patterns transferred from the commons repository and later propose that their changes be re-incorporated into the commons repository. An evaluation and validation process will determine the criteria (based on pattern maturity) for inclusion of patterns in the commons repository and modalities for their merging and categorization. The evaluation tool and its user interface will be a key feature of PLAST. Governance of the processes for assessing pattern maturity and adding new patterns to the repository will be agreed with user communities.

The project will build on existing software to produce a pilot that can incrementally develop, scale and synthesize collective experiences of solutioning processes as catalysts of collective awareness.

The PatternPedia system⁶⁰ for authoring patterns and pattern languages of Stuttgart University's

Institute of Architecture of Application Systems is the basis for the development of the PLAST pattern repository. PatternPedia is built on the MediaWiki platform using semantic extensions, and is configured to provide an extensible set of semantic relationships between patterns. The platform will hold a scalable number of domains and support multiple perspectives, formalizations, logics, vocabularies and ontologies, to maximise contact and cross-pollination among disciplines.

The PLAST platform will also support the hermeneutic process of pattern formulation and evaluation, to assess the maturity of a pattern and lead to 'meta-stabilisation' of collective points of view forming one or more cohesive bodies of theoretical data, with tools and practices enabling 'traceability' of interpretations. The hermeneutic pattern formulation and evaluation tool will integrate adaptations of Fraunhofer's pattern evolution system, such as implemented in the BRIDGE FP7 project⁶¹, and IRI's 'categorisation' process, such as implemented in the Polemic Tweet tool to reveal controversies around events on Twitter⁶². The hermeneutic pattern formulation and evaluation tool should enable a change agent or community to design patterns and pattern languages from their own practice and to put them up for discussion, allowing comparison with similarly designed patterns, and with patterns and pattern languages in other domains of practice. The tool will allow tracking of the pattern inquiry and interpretation discussions in real time using supporting visualization of controversies and discussions that can be traced in a platform similar to Wikipedia's (versioning and history of exchanges)⁶³.

It is essential to design the platform to reflect users' practices and fit their operational needs. To achieve this goal, we will co-design the tools with user communities in a LEAN/AGILE approach and integrate their feedback, stressing cognitive ergonomics and ease of use in order to empower the practitioners and not add technical constraints. The needs and findings uncovered in the course of the user-centred research, which can not be entirely foreseen, will drive the IT pilot's development in an agile manner. Requirements concerning federation of patterns from several repository instances have to reconcile governance of knowledge in the

common and integrated repository and the need for data autonomy in the federated repositories. So development is tightly coupled with user communities' needs, implemented iteratively and responsive to user feedback.

To ensure the sustainability of the PLAST platform beyond the project's duration its development and utilization have to take into account the following points⁶⁴:

1 ~ The PLAST platform is generative of knowledge.

To ensure that the PLAST platform is used beyond the duration of the PLAST project it has to accrue significant visibility and volume of content during the project phase. It has to enable generation and derivation of new knowledge based on the hosted patterns, pattern languages and debates, and to ensure that user communities can maintain this knowledge.

2 ~ PLAST platform is generative of an open source ecosystem.

To ensure the sustainability of the PLAST platform from the technical and development perspective the project aims to attract a community of developers, in particular those who tool communities of social change, in order to create a whole ecosystem of features besides maintenance of the platform and contributions to the contents. Therefore, we will involve open source developers very early in the project, provide the platform as open source, and present it at computer science research conferences and hackathons to raise its profile among open source developers. By these means developers interested in the platform will be invited to contribute to its development or to create new features to extend its capabilities in order to support community specific functionality, with possibilities to spread the use of the platform to other communities. This follows the example of Wikipedia, where editors work in collaboration with open source Wikimedia developers to provide increasingly effective editing capability.

3 ~ The PLAST platform is generative of livelihood.

The PLAST platform has to maintain high levels of activity among users and producers of its content in order to ensure positive feedbacks between content generation and successful applications in practice, and eventual escalation to a point at which it can support new roles and practices that generate revenue. Thus, the PLAST platform seeks to establish a lively community to develop and refine its content further. The paragons for this aspect are open source movements such as Linux coupled with Git, which shows how federated work can be integrated into a powerful system generative of livelihood.

CONCLUSION

PLAST advances systemic transformation in the following areas:

- ~ CONCEPTUAL: PLAST defines and operationalizes 'sustainability' using systemic patterns and hermeneutic supports that accommodate and integrate diverse perspectives from multiple sustainability domains and communities of practice, providing tools that allow these perspectives to operate coherently, synergistically and systemically.
- ~ INTELLECTUAL: PLAST supports collaboration among diverse scientific fields and areas of practical application to provide new interdisciplinary and transdisciplinary perspectives.
- ~ KNOWLEDGE PRODUCTION, COLLECTION AND CIRCULATION: PLAST leverages pattern languages as a format and protocol for the exchange of sustainability knowledge and practical know-how between and amongst theoreticians and practitioners by providing tools for documenting, compiling, evaluating, revising, integrating, synthesising, applying and sharing knowledge from different areas and across different fields of application. PLAST semantically structures patterns using concepts from systems theory to create opportunities for cross domain engagement, surpassing existing tools for activating and developing collective knowledge and capacity for action.
- ~ PROCESS AND CONTINUITY: PLAST's transdisciplinary action learning approach, using intentions and monitoring outcomes, allows more on-going/thorough/systematic testing of patterns and pattern languages than before. Embedding PLAST in communities of practice and providing operational data to theoreticians ensures its continuity beyond the lifetime of the funded project.
- ~ RESOURCES: PLAST leverages knowledge, resources and capacities across domains of action creating a novel ecosystem of navigable, evidence based, practical applications of theoretical knowledge which in turn becomes informed by and evolves with practice. Patterns, pattern languages, relationships and categories all become shared resources, subject to debate and evolution. The debates and discussion are also categorized, becoming a resource in their own right for the development of the pattern languages and theories of change
- ~ CONNECTING PRACTICE DOMAINS: PLAST brings together and activates wide communities of practice: local communities, social change activists, knowledge managers, sustainability educators, policy makers, and practitioners of pattern languages, systems thinking and organizational change, to create a knowledge commons upon which to build practice.

The platform will structurally support a systemic, pluralistic view of challenges, conditions and solutions, and support operationalisations that embed observation, orientation, monitoring and discussion in pathways to action. It draws upon the direct engagement of diverse communities of practice in assembling its elements via collaborative processes that will embed systemic cross-domain connections in its framework in a way that makes them accessible to users. This allows the transfer of practices across contexts and maintains active flows of knowledge, reinforcing and modulating relationships, directly affecting awareness, engagement and action. The result will be a genuine knowledge commons⁶⁵: a dynamic set of openly accessible knowledge and associated practices that support the activities of user communities, who in the course of their use collaboratively maintain and develop both its content and its technical features, bringing about systemic change in practice.



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