Pattern Manual for Service Systems Thinking: A proposal for discussion

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Abstract:

What is properly required to take the learning on generative pattern languages from the built environment and software development communities, to a world of service system thinking?

This position paper winds back to early days of Center for Environmental Studies, and presents an alternative view on the 1968 Multi-Service Center work, informed by 21st century developments in service systems science. The conventional format for a pattern language has settled into a three-part rule of relations between context, problem and solution. An alternative format of (i) voices on issues (who + what), (ii) affording value(s) (how + why), and (iii) spatio-temporal frames (where + when) is proposed, with a straw man example.

Methods from the 1985 Eishin campus project, published in 2012, are compared against practices that have become common in agile development.

The conceptual shifts from built environment to service systems thinking are expressed as (i) amplifications, (ii) rephilosophizations, and (iii) reinterpretations. The generation and legitimization of pattern languages is considered across a community, with a shift from publishing in books on paper to collaborating with online technologies such as wiki.

At the 2014 PLoP and the 2015 PURPLSOC conferences, the idea of extending the pattern language for environment structure into a new domain of service systems thinking was introduced. In 2016, this idea has been further developed as a baseline for further discussion.

Keywords: *service systems; systems thinking; issue-seeking; interactive value; wayfaring*

1. Introduction

As an architect of built environments, Christopher Alexander's responsibilities were mostly for the production of physical structures. In (at least) two cases, his work was part of larger transformations in service systems. Coming from a systems thinking perspective, in which ways can service systems thinkers learn from the doxa (i.e. conventional beliefs) of pattern language experiences to date, and where do domain differences call for adjustments?

At the chartering of the Center for Environment Studies in 1967, the outline of a pattern format described in *Pattern Manual* was:

… intended to establish a single format for stating ideas about the physical structure of the environment. With such a format ideas will become comparable, and any individual will be able to criticize and modify ideas he has reason to disagree with. We call these ideas patterns. [….]

The idea of a pattern format common to every idea concering the physical structure of the environment raises an immediate problem. On the one hand, no one wants a straightjacket on his ideas; no one likes formats that a forced or boring. On the other hand, we want our ideas to improve under public scrutiny, and we want our good ideas to be potentially combined with other good ideas. [….]

A minimal format must bring out and emphasize only these parts of ideas that can grow and improve under public scrutiny. It must dramatize the fact that each idea is formulation within a general language, a language that consistently talks about the structure of the environment. Once we are agreed upon such a format, everything else can be left to individual style. [….]

The format described in this manual is intended to solve this problem. We begin with the following hypothesis: Every time a designer creates a pattern (or, for that matter, entertains any idea about the physical environment), he essentially goes through a three-step process. He considers a PROBLEM, invents a PATTERN to solve the problem, and makes mental note of the range of CONTEXTS where the pattern will solve the problem. [….]

The format says that whenever a certain CONTEXT exists, a certain PROBLEM will arise; the stated PATTERN will solve the PROBLEM and there should be provided in the CONTEXT. While it is not claimed that the PATTERN specified is the only solution to the PROBLEM, it is implied that unless the PATTERN or an equivalent is provided, the PROBLEM will go unsolved (Alexander, Ishikawa, & Silverstein, 1967, pp. 1–4).

While this pattern format would subsequently evolve subtlely, the intent of problem solving in context in physical environments would persist. For a new domain of service systems, a new pattern format is proposed for the intent of exploring *voices on issues*, considering *affording value(s),* in ranges of *spatio-temporal frames*. With the original pattern format as a reference, this new pattern format is presented with concrete examples, associated methods and comparisons, for discussion.

A service system can be defined as "a dynamic value-cocreation configuration of resources, including people, organizations, shared information (language, laws, measures, methods), and technology, all connected internally and externally to other service systems by value propositions" (Maglio, Vargo, Caswell, & Spohrer, 2009, p. 399).

The smallest service system centers on an individual as he or she interacts with others, and the largest service system comprises the global economy. Cities, city departments, businesses, business departments, nations, and government agencies are all service systems. Every service system is both a provider and client of service that is connected by value propositions in value chains, value networks, or value-creating system (Normann, 2001). (Maglio & Spohrer, 2008, p. 18)

Possibilities to reorient generative pattern language from environmental structure to service systems thinking have been explored in prior conferences (Ing, 2015).

In section 2, a documented project – the Hunts Point Multi-Service Center (MSC) of 1968 – is (i) reviewed with the original purpose of producing buildings, and then (ii) extended to suggest the way in which a service system perspective is different. This straw man example is not extensively developed, and has instead been lightly sketched to ground critical discussion. A mapping from the Alexandrian format to the proposed service systems thinking format is provided to sharpen the discussion.

In section 3, the methods of pattern language thinking shown in the Eishin campus project circa 1983-1985, which included the techniques published in *The Nature of Order*, are outlined. The parallelism with methods associated with the Agile Manifesto of 2001 is outlined in the context of the rise of service systems and service science that rose after 2006.

In section 4, a critical assessment of using a pattern language approach for service systems thinking is presented. Some features from the doxa are amplified; some reshapings for philosophical differences are suggested; and some reinterpretations of applications beyond Alexander's team are challenged.

Section 5 closes the proposal with on ways in which pattern language knowledge is generated and legitimized within a community of practice, an exploration of modes of inquiry and enabling online technologies.

2. Extending an Alexandrian example to services illustrates differences

In 1968, 64 patterns and "Eight buildings generated by the pattern language" were published. While this work was shortly after the 1967 founding of the Center for Environmental Structure at Berkeley, it presents coherent work foreshadowing *A Pattern Language* 9 years later, and *The Timeless Way of Building* 11 years later.

2.1. Alexandrian format follows context, system of forces, configuration

The presentation of a pattern as initially presented as two parts, with an additional breakdown:

… each pattern has two parts: the PATTERN statement itself, and a PROBLEM statement. The PATTERN state is itself broken down into two further parts, an IF part and a THEN part. In full, the statement of each pattern reads like this:

IF:X THEN:Z / PROBLEM:Y

X defines a set of conditions. Y defines some problem which is always liable to to occur under conditions X. Z defines some abstract spatial relation which needs to be present under the conditions X, in order to solve the problem Y.

In short, IF the conditions X occur, THEN we should do Z, in order to solve the PROBLEM Y (Alexander, Ishikawa, & Silverstein, 1968, p. 15).

This definition takes a highly prescriptive stance. The 64 publlished patterns were to be used to define a prototype building, and were expected to be criticized and improved.

The definition of a pattern was refined by 1979, with a description of the most concise version for “the structure of single pattern” as:

Each pattern is a three-part rule, which expresses a relation between a certain context, a problem, and a solution (Alexander, 1979, p. 247).

While this minimal description is similar to that in 1968, a fuller expansion appears a few pages later.

We see, in summary, that every pattern we define must be formulated in the form of a rule which establishes a relationship between a context, a system of forces which arises in that context, and a configuration which allows those forces to resolve themselves in that context.

It has the following generic form:

Context → System of forces → Configuration (Alexander 1979, 253)

The Multi-Service Center patterns each ranged in length from 2 pages to 10 pages. Synthesizing across the 1968 and 1979 definitions, three sample patterns are excerpted in Table 1. This tabular form aims to give more structure to the more free-flowing text written by Alexander’s team

Table 1: Excerpts from three sample patterns for Multi-Service Centers

(i) Pattern name (plus headline)	21. Self-service **The waiting area contains a self-service facility, where job listing, welfare rights information and other do-it-yourself services are open, without restriction, to the public.**	28. The intake position **Intake procedures are informally handled by field workers, in a lounge setting, near the major entrance.**	32. Child-care position **The child care station is visible along the path from the entrance to the services.**
(ii) Completions of larger patterns	14. Free waiting	7. Entrance locations 10. Open to street	7. Entrance locations 10. Open to street
	◊ ◊ ◊	◊ ◊ ◊	◊ ◊ ◊
(iii) Range of contexts (physical feature, set of conditions)	Any multi-service center.	A multi-service center with field workers (block workers, contact workers, community organisers, etc.)	A child care station in any building where mothers have prolonged business (multi-service center, supermarket, etc.)

(iv) Problem to be solved (system of forces that arises)	Most service programs today effectively perpetuate the structural assymmetry of the dole …. If service programs ever hope to break the chain of poverty, this structural assymmetry … must be destoyed ….	Many existing centers create the feeling that people coming to the center are being processed, like cattle, by receptionists and intake workers. … the "intake function" will be handled on an informal basis by community organisers and contact workers ...	When small children are left off at care centers they are often extremely anxious; they feel deserted … … create circumstances under which the child decides, of his own accord, that wants to play in the center.
(v) Solution (configuration of abstract spatial relational forces)	**1. The MSC contains a *self-service area*.** **2. … contains all of the basic information required by people who need help.** **3. … in both languages.** **4. … visible from all points in the waiting area.** **5. … contiguous … with service area.** **6. … no receptionists or intake workers located at entrance ...** **7. … advice area contains at least one easily accessible assistant ...**	**… no formal intake process …** **1. … field workers, in rotation … in a conversation and interview area.** **2. The intake area should be … next to the main entrance(s) … no receptionists.** **3. … should contain one or more open alcoves, at least 7 feet in diameter, and furnished with comfortable seats.**	**The child care station should be on the path from the building entrance to the place of business, and visible from this path; and … it looks into the child care station for roughly 20 feet along its length.**
	◊ ◊ ◊	◊ ◊ ◊	◊ ◊ ◊
(vi) Completions to smaller patterns	27. Self-service progression	43. Sleeping OK	57. Child care contents

The patterns (#21, #28, #32) appeared as part of a cluster "given over to core services and those things that need to placed along the line of entry" (Alexander et al., 1968, p. 22). Since our focus on is the format rather than the content, let's discuss the meaning of the rows.

(I) Pattern name is typically a noun, or an adjective and noun that represents a place or spatial feature. The headline, in bold type, "gives the essence of the problem in one or two sentences" (Alexander, Ishikawa, & Silverstein, 1977, p. xi).

(ii) Completions of larger patterns lists connections from other patterns at larger scales, that are generally ordered preceding this level. A pattern exists in the world only to the extent that it is embedded in larger patterns. "*[… Autonomous] creation of the parts, if taken by itself, will produce chaos*. The parts will not form any larger whole, unless the individual adaptation of the parts is under some sort of deeper regulation, which guarantees that the local process of adaptation will not only make the local part truly adapted to its own processes, but that it will also be shaped to form a larger whole" (Alexander, 1979, pp. 164–165).

(iii) Range of contexts describes physical features and/or sets of conditions under which the relation between problem and solution become invariant. "To make the pattern really useful, we must define the exact range of contexts where the stated problem occurs, and where this particular solution to the problem is appropriate" (Alexander, 1979, p. 253). The range of contexts is where the pattern makes sense.

(iv) Problem to be solved is a system of forces that arises in shaping the built environment. In *Notes on the Synthesis of Form*, Alexander brings the idea of forces from physical matter shaped by varieties of energy (e.g. mechanical, electrical): "Now the state, including the shape or form, of a portion of matter is the resultant of a number of forces, which represent or symbolize the manifestations of various kinds of energy; and it is obvious, accordingly that a great part of physical science must be understood or taken for granted as the necessary preliminary to the discussion on which we are engaged" (Thompson, 1942, p. 11).

In *The Timeless Way of Building*, types of forces include erosion, gravity, "forces of law", and inner "psychic" forces. Placing a table in a garden where birds can find food in winter has been expressed in terms of forces: "Most of the places where I put the table actually don't work. I slowly learn that blackbirds have a million subtle forces guiding their behavior. If I don't understand these forces, there is simply nothing I can do to make the table come to life. So long as the placing of the table is inexact, my image of the blackbirds flocked around the table eating, is just wishful thinking. To make the table live, I must take these forces seriously, and place the table in a position which is perfectly exact" (Alexander, 1979, p. 35).

(v) Solution is a configuration of abstract spatial relational forces, given in a general and abstract way so that an individual can adapt it for local conditions. "Most people say that they don't like the fact that a pattern gives 'one solution' to a problem. This is a serious misunderstanding. Of course, there a thousands, millions, in fact, an infinite number of solutions to any given problem. There is, of course, no way of capturing the details of all these solutions into a single statement. It is always up to the creative imagination of the designer to find a new solution to the problem, which fits his particular solution. But when it is properly expressed, a pattern defines an invariant field which captures all the possible solutions to a problem given, in the stated range of contexts" (Alexander, 1979, pp. 260–261).

vi) Completions to smaller patterns list connections to patterns at smaller scales, once this level is in place. "*When every pattern has its principal components given by the smaller patterns which lie immediately below it in the language, then the language is complete*. [… Each] pattern itself gives birth to smaller patterns which, once again, through forces which must also be in harmony, gives birth to smaller patterns again created by the conditions which put the lower level forces into harmony" (Alexander, 1979, p. 322).

From 1968, this pattern language approach was applied on prototypes of multi-service center buildings.

A multi-service center is a community facility, which provides a variety of special services to citizens. It is intended especially to help solve some of the problems of low income communities. [….] Our report deals chiefly with the spatial organization; but since human and spatial organization cannot be separated, many of the specifications given in this report, go deeply into questions of human organization as well (Alexander et al., 1968, p. 1).

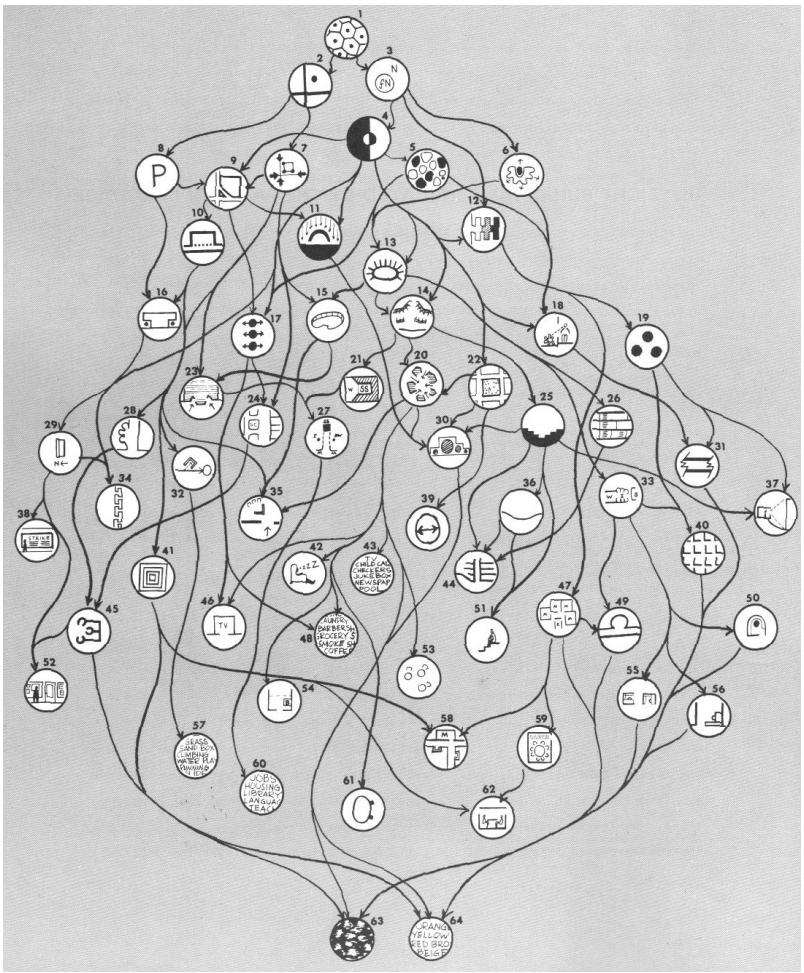
To design the building, the pattern language was intended to give the designer three types of help:

1. It gives him the opportunity to use the patterns in the way which pays full respect to the unique features of each special building: the local peculiarities of the community, its special needs …

2. It tells him which patterns to consider first, and which ones to consider later. Obviously he wants to consider the biggest ones … before he considers the details.

3. It tells him which patterns "go together" … so that he knows which ones to think about at the same time, and which ones separately (Alexander et al., 1968, pp. 17–19).

Figure 1: Pattern language cascade (Alexander et al., 1968, p. 18)



The hypothetical community for Hunts Point was described as: 40,000 people; strong community corporation; large block worker program; 9 to 12 services; site open to three sides; near major intersection and transit station.

From the 64 patterns published in the book, the Hunts Point prototype focused on 29, presented in seven clusters:

A, descending from 1. *Small target areas*;
B, as *16. Necklace*;
C, descending from 4. *Community territory*;
D, descending from *12. Locked and unlocked*;
E, descending from *10. Open to street*;
F, descending from 19. *Core service agencies;* and
G, descending from *20. Activity pockets*.

This pattern language format has been applied in towns, buildings and construction. Variations of this format have also been applied in the architecture and design of software.

2.2. Try services as voices on issues, affording value(s), spatio-temporal frames

Let's shift our orientation from production systems where a provider produces outputs and outcomes, i.e. de-emphasizing the builders of a multi-service center in 1968, and the organization that has delivered services for decades following. As an alternative, taking the service systems perspective elevates the roles of clients, beneficiaries and other

stakeholders. As a simile, let's reorient from the dominance of *push*, rebalancing towards *pull*.

In addition, let's bring the multi-service center offerings into the 21st century by assuming that features may be accessible not only in physical space, but possibly also as electronic offerings over the Internet. Table 2 lists three straw man proto-patterns that illustrate ways in which a pattern might be oriented differently.

Table 2: Straw man proto-patterns, oriented towards service systems

(i) Pattern label	Tapping into the grapevine	Signing in for services	Minding children
	◊ ◊ ◊	◊ ◊ ◊	◊ ◊ ◊
(ii) Voices on issues (who and what)	(a) For a client, what jobs and training are available? (b) For a neighbour, in what ways can we share and update community news?	(a) For a client, what services are available to me, now and on appointment? (b) For a parent, what do I do with my kids while I'm busy? (c) For a child, what can I do while my parent is at the MSC?	
(iii) Affording value(s) (how and why)	Displaying up-to-date news and local information, so that individuals can know ways to independently act. Adding, revising and moderating community contributions so that individual and authoritative viewpoints are balanced.	Matching client needs with MSC resources, so that holistic treatments are received. Triaging and scheduling so that urgent cases are prioritized, and wait times are tolerable	Leaving a child at a supervised play area so that whereabouts are known. Availing distractions for toddlers through teens, so that coming with parents is less of a chore
(iv) Spatio-temporal frames (where and when)	Access to information onsite MSC for clients who don't have devices, and on the open Internet for the public	On demand lookups of trending and prior MSC busy and slow periods transparently visibie onsite and on the Internet, enabling clients to adjust and/or rebook	Facilities and programs are known both to children and parents in advance of appointments
	◊ ◊ ◊	◊ ◊ ◊	◊ ◊ ◊
(v) Containing systems (slower and larger)	For municipal, regional and national agencies, are community health and social services in their jurisdictions well provide?		For extended family, schools and community workers, what personal responsibilities inhibit service engagement?
vi) Contained systems (faster and smaller)	For neighbours in mutual support, friends and family ties, who should know about news?	For friends or assistants speaking on behalf or interpreting for a client, is the situation understood?	For other parents at the MSC at the same time, would you look after my kids like I look after yours?

These three patterns were inspired as a reorientation from those in Table 1. Pattern 21 "Self-service" becomes "Tapping into the grapevine". Pattern 28 "The intake position" becomes "Signing in for service". Pattern 32 "Child care position" becomes "Minding children". While

the proposed row headings are compared to the Alexandrian counterparts more deeply in Section 2.3, let's first get a feel for their meaning through the straw man content.

(i) Pattern label sees a shift in language from nouns conventionally used in the pattern language doxa to active participles oriented towards action. This can be seen as a parallel with the field of industrial design emerging a new paradigm of interaction design, from the Dynabook vision of Alan Kay from 1972, the coining of the term by Bill Moggridge in the mid-1980s and the rise of academic programs in the 1990s.

(ii) Voices on issues surface the *who* and *what* of the pattern. In a service system, the most prominent voices are with clients and stakeholders external to the provider, who influence the organizational direction.

Voice and ongoing dialogue are a foundation in any social relation, with exit as the breakdown alternative. Voice can be defined as "any attempt at all to change, rather than to escape from, an objectionable state of affairs, whether through individual or collective petition to the management directly in charge, through appeal to a higher authority with the intention of forcing a change in management, or through various types of actions and protests, including those that are meant to mobilize public opinion" (Hirschman, 1970, p. 30). In Quality Function Deployment (QFD), the "voice of the customer" identifies, structures and prioritizes customer needs (Griffin & Hauser, 1993, pp. 3–5).

Issues surface during discourses on unstructured problem areas (topics), where parties take different positions. In an issue-based information system, they have the properties that (i) issues take the form of questions; (ii) issues originate from controversial statements; (iii) issues are specific to particular situations; and (iv) issues are raised, argument, settled, dodged or substituted (Kunz & Rittel, 1970, pp. 3–4).

In the straw man of Table 2, an issue can span multiple patterns at the same level of analysis. "Signing in for services" might or might not be independent of "Minding children", depending on the client.

(iii) Affording value(s) are modes of action enabled through objects and/or events, expressed through *how* and *why*. Nuances of this perspective are involved with ecological psychology and phenomenological philosophy.

Affording an action possibility is based on individuals having perceptions attuned to pick up salient aspects of an environment. Learning is an "education of attention" so that objects or events may or may not show up, depending on prior experiences gained either personally, or through social engagement in a culture (Ingold, 2000a, pp. 166–167). "[… The] environment *affords* animals, mentioning the terrain, shelters, water, fire, objects, tools, other animals, and human displays. [….] The *affordances* of the environment are what it *offers* the animal, which it *provides* or *furnishes*, either for good or ill" (Gibson, 1979, p. 127).

How and why an action takes place can be described in the sense of equipment and being-in-the-world. "[… Our] use of equipment makes sense because our activity has a point. Thus, besides the 'in-order-to' that assigns equipment to an equipmental whole, … the use of equipment exhibits a 'where-in' (or practical context), a 'with-which' (of item of equipment), a 'towards-which' (or goal), and a 'for-the-sake-of-which' (or final point)" (Dreyfus, 1990, p. 92). *How* can be described with 'where-in' and 'with-which'. *Why* can be described with 'towards-which' and 'for-the-sake-of-which'.

(iv) The spatio-temporal frames for the pattern demarcate occasions at which the *where* and *when* of dwelling in issues and affordances are salient and at hand. The *where* is in a landscape, as "the world as it is known to those who dwell therein, who inhabit its places and journey along the paths connecting them" (Ingold, 2000b, p. 193). A landscape is neither land nor space, as dwelling is experienced on on a landscape, as contrasted to mapping a territory as an abstract representation. The *when* is in a taskscape, where "every tasks takes its meaning from its position within an ensemble of tasks, performed in series or in parallel, and usually by many people working together" (Ingold, 2000b, p. 195). This practice-based perspective on time contrasts to the chronology (a regular system of dated time intervals) and history (a series of events dated in time).

(v) Containing systems for the pattern are at a larger scale and slower pace. Multiple patterns can exist as the same levels of scale and pace, within an panarchical adaptive cycle of accumulation and transformation of resources in four phases: exploitation (r), conservation (K), release (Ω) and reorganization (α) (Holling, 2001, p. 394). At times of change and renewal, the "remember" cross-scale interaction from larger and slower levels helps to regenerate an ecosystem: "Once a catastrophe is triggered at one level, the opportunities for, or constraints against, the renewal of the cycle are strongly influenced by the K phase of the next slower and larger level. [….] It is as if this connection draws on the accumulated wisdom and experiences of maturity; hence, the word "remember" (Holling, 2001, p. 398). In forests, the containing biotic legacies include seeds and surviving species. Insights from the shearing layers in buildings (Brand, 1994) have evolved to be portrayed as fast and slow pacing layers for society as a whole (Brand, 1999; Em, 2015).

In the straw man of Table 2, a containing system may include multiple patterns at the same level.

(vi) Contained systems for the pattern are at a smaller scale and faster pace. "When a level in the panarchy enters its Ω phase of creative destruction, the collapse can cascade to the next larger and slower level by triggering a crisis. Such an event is most likely if the slower level is at its K phase, because at this point the resilience is low and the level is particularly vulnerable. The 'revolt' arrow … suggests this effect, one where fast and small events overwhelm slow and large ones. Once triggered, the effect can cascade to still higher, slower levels, particularly if those levels have also accumulated vulnerabilities and rigidities" (Holling, 2001, p. 398). A small ground fire can grow to consume a stand of trees. Local activists can ignite a change in regional policy.

Moving up from this analytic perspective, let's resurface to the holistic perspective for the initiative. From the 1960s, Hunts Point was known as the the worst slum in New York City.

Its buildings are jammed together endlessly down narrow streets. There's scarcely a tree, or a push, or a patch of grass in the whole area. …. Hunt's Point is a teeming barrio – 50 per cent Puerto Rican, 40 percent black, 90 percent white.

City official estimate that 90 per cent of its residents are on welfare, a large percentage of them living in fatherless homes. Of its 204,000 residents, 25 percent are "certified, acknowledged" drug addicts, and estimates of the percentage of drug users in the total population range up to 50 per cent, health officials say. With the highest narcotics addition rate in the city, it has no drug treatment center. With thousands of mothers wanting to work, it has no child day care center (Leith, 1970).

Hunts Point Multi Service Center Inc. was founded in the South Bronx in 1967, by Ramon Santiago Velez. With a $50,000 grant through Lyndon Johnson's *War on Poverty* and *Great Society* funding, the corporation ran programs focused on the elderly, housing, health care and substance abuse. Between 1965 and 2005, Velez is estimated to have won $300 million in bids, largely in government health-care grants (Opie, 2015, p. 108). The Hunts Point Multi-Service Centre building at 630 Jackson Avenue was constructed in 1972. Velez gained political power as a "poverty-crat" and "machine politician" with control over community and ethnic groups (Sánchez, 1994, p. 117).

The corporation ran for 45 years, with the center eventually losing its funding from the city and programs taken over by the state (Hirsch, 2012). "The War on Poverty programs, like the PRCDP [Puerto Rican Community Development Project:] did little to change the poor conditions in which Puerto Ricans lived. [….] [… Dependent] on government funds, many groups grew more conservative as their fortunes became increasingly tied to the political power structure" (Sánchez, 1994, p. 117).

A *production system* can be described as "make-and-sell" system (Haeckel, 1999). A bus system operates on a schedule, even if there are no passengers on board. A *service system* can be described as a "sense-and-respond" system. A taxi doesn't transport passengers or packages towards a destination without the driver first asking about the client's wishes.

2.3. The Alexandrian and proposed formats can be mapped for comparison

Since this proposed pattern format is new, and the Alexandrian format has a 50-year tradition, let's compare how they line up to each other. Table 3 maps from the Alexandrian format to the proposed service systems thinking format.

Table 3: From Alexandrian format, mapped to proposed service systems thinking

Alexandrian format (for production systems)			Proposed format for service systems thinking	
(i) Pattern name (plus headline)	A place or spatial feature, phrased as noun or adjective-noun, headlined with essence of the problem		(i) Pattern label	An interaction phrased as a present participle
(ii) Completions of larger patterns	Introductory context for the pattern, explaining how it helps to to complete certain larger patterns.		(v) Containing systems (slower and larger)	Constraining conditions in which the pattern operates, potentially where multi-issue messes are dissolved
	◊ ◊ ◊			
(iii) Range of contexts (physical feature, set of conditions)	Where this pattern is applicable, the range in which the system of forces can be brought into balance with physical relationships.		(iv) Spatio-temporal frames (where and when)	Occasions at which dwelling in issues and affordances are salient and at hand
(iv) Problem to be solved (system of forces)	Empirical background, evidence for validity, range of ways the pattern can be manifested.		(ii) Voices on issues (who and what)	Archetypal roles of stakeholders, with concerns and interests posed as questions

(v) Solution (configuration of forces)	**The field of physical and social relationships which are required to solve the stated problem in the stated context.**	(iii) Affording value(s) (how and why)	Objects and/or events that enable modes of practised capacities for independent or mutual action
	◊ ◊ ◊		
(vi) Completions to smaller patterns	Ties from pattern to smaller patterns in the language	(vi) Contained systems (faster and smaller)	Opportunistic conditions which the pattern contains, potentially allowing ad hoc resolving of a specific issue at hand

Let's detail the formats, ordered from the new (on the right) to the tradition (on the left).

(i) Pattern label c.f. Alexandrian pattern name: A service system involves an interaction – minimally between a beneficiary and a provider – and thus can be expressed as a present participle. Attaching an "-ing" suffix to a verb in English changes it to a continuous form. For conciseness, a participial phrase with a noun suffices (and a longer expression draws risks of a dangling participle). Alexandrian pattern names are typically nouns, or adjective-nouns describing a place or a spatial feature.

(ii) Voices on issues c.f. Alexandrian problem to be solved: A service system introduces human perspectives into a pattern, adding a *who* to the *what* that an Alexandrian problem expresses. Voices are heard (or not heard) from archetypal roles of stakeholders. Stakeholders of a service system could include not only beneficiaries, sponsors and funders, but also neighbours and regulatory bodies seeking constraints on impacts (sometimes called externalities). Expressing issues as questions, rather than problem as statements, can serve as checklist for determining whether an issue has been dealt with, or at least acknowledged.

Types of issues (independently of voices) have been categorized for argumentative planning information systems.

Corresponding to the four types of knowledge, there are four types of ignorances, coresponding to four types of issues:

- *F-issues: "What is/was/will be the case with X?"*
- *D-issues: "What ought to be/become the case with X?"*
- *E-issues: "Why is/was/will be Y the case with X?"*
- *I-issues: "What are the possibilities to accomplish X?" (Rittel, 1980, p. 12)*

F-issues relate to factual knowledge, what is, was, or will become the case, more or less certainly. D-issues relate to deontic knowledge, describing what out to be or become the case. E-issues relate to explanatory knowledge, describing why something was, is or will become the case, pushing the search for resolution a step further. I-issues related to instrumental knowledge, "know how" pertaining to potential action, manipulating the world of facts to arrive at an executable plan.

A problem exists when F-knowledge (factuals) contradict D-knowledge (deontics), i.e. something is not as it ought to be. "Of course, all knowledge is always somebody's knowledge; and different persons may contribute contradictory answers to the same

question" (Rittel, 1980, p. 12). Extending issues to explicitly identify voices recognizes personas or roles with collective or individualistic perspectives.

In the Alexandrian format, the range of contexts precedes the problem to be solved. In a critical realist philosophy (Aligica, 2011), forces would be seen as existing, even if they are unobserved by human beings. This represents one side of the "if a tree falls in a forest and no one is around to hear it, does it make a sound?" thought experiment. On the other side, since a service system definitionally include human beings, voices that have issues associated with qualities of services that are absent will still have their lives impacted by others making decisions on their behalf. For a pattern language format for service systems thinking, ordering *voices on issues* first precedes decisions about resulting action (or inaction).

An issue for a service system could be expressed as a one-to-many relation. An Alexandrian pattern is expressed as a relation of one context to one problem to one solution.

(iii) Affording value(s) c.f. Alexandrian solution: Affording an action possibility with value for a service system under specified conditions is neither necessary nor sufficient to resolve an issue. With an affordance, an object or event becomes available for an individual or a group to use in practice. An Alexandrian solution is a configuration of (physical and social) forces necessary to resolve the problem within the range of contexts, and sufficient when the larger patterns and smaller patterns are also completed.

In comparing service systems to built environments, the distinction between affording an action possibility for value and requiring a specific configuration of forces inserts details about human will into the faithfulness of a normative model to its reality-in-creation. If we consider service systems such as banking and mail delivery, "the map is the territory" could be functional in way that "the map is not the territory" exactly specified blueprint is not. Customer-facing representatives of banks and post offices may be encouraged to be friendly to customers, but their behaviours are constrained and closely audited for their adherence to standard business processes. The "map becomes the territory" as a source of order – potentially constructively or destructively – in underorganized systems. "In a socially constructed world, the map creates and labels the territory, which means the map also prefigures action and perception and encourages self-fulfilling prophecies" (Weick, 1989, p. 249). In periods of high uncertainty, service systems could perhaps maintain some coherence organizing around a cartographic myth:

[A cartographic myth is called] in honor of the wonderful story in which a Hungarian army unit, lost in the Alps, finds a map, and follows it to safety only to discover that it is a map of the Pyrennes and not a map of the Alps. The heart of a cartographic myth is the belief that whatever map one has in hand or in mind, is a sufficiently credible version of the territory, that one can act intentionally. The important feature of any map is that it leads people to anticipate some order "out there". It matters less what particular order is portrayed than that an order of some kind is portrayed (Weick, 1989, p. 244).

The cartographic myth affords an action possibility for a group that might otherwise be directionless. This is in contrast to the Alexandrian prescriptions about completeness in a pattern language.

A pattern only works, fully, when it deals with all the forces that actually present in the situation. *….] When we do find a pattern which does bring forces into balance, then this*

pattern will of course begin to generate the quality without a name … because it will contribute to that process in which the forces forces of the world run free. On the other hand, a pattern always lack this quality if it resolves some forces at the expense of others which it leaves unresolved. […]

The difficulty is that we have no reliable way of knowing just exactly what the forces in the situation are. *The pattern is merely a mental image, which can help to predict those situations where forces will be in harmony, and those in which they won't. But the actual forces which will occur in a real situation, although objectively present there, are, in the end, unpredictable, because each situation is so complex, and forces may grow, or die, according to subtle variations of circumstance* (Alexander, 1979, pp. 285–286).

Service systems thinking can benefit from self-reflections within the work of architects on shifting from behaviourist to interactionalist orientations. While functionalism was common in early 20th century Europe, architecture rose as a field after WWII, with logical analysis as the primary tool.

The new architects submitted blindly to an architectural belief system which stated that there was a manipulable relationship between behavior and environment. "Behavior" mean defined activities as eating, sleeping and cooking: "environment" meant the physical environment. […]

Evidence of the pervasiveness of the behaviorist creed can be seen in all corners of the field. Housing research is still concentrating on "user needs" in a persistent search for a complete understanding of human behavior. The goal of behaviorism is to develop "design criteria" that will result in the perfect fit between people and their personal setting (Lerup, 1977, p. 18).

As an alternative to focusing on behaviours, the interactionalist perspective observes how dwellers occupy buildings.

… people are not ***responding organisms*** *but* ***active individuals*** *who in their approach to things produce meaning. […] Behavior from our vantage point is no longer reaction but interaction (based on self-reflection and interpretation), which causes the meaning of the physical setting to become highly unpredictable and profoundly affects the attempt to form a perspective of the relation between people and architecture. […]*

Human action, in the perspective of interaction, is a complicated matrix with unknown combinations – the result of which is considerable unpredictability, a marvelous unfinishedness and openness. […]

… one sees that the designer must learn how to live comfortably with the imprecisions of our understanding of human behavior. And since design projects and proposals will become even more vulnerable to criticism when the dweller learns about the shaky basis for design, the designer must also relinquish control of the meaning making to the dwellers themselves, and realize that the built setting is only one aspect of the semantic of space (Lerup, 1977, pp. 20–21).

For a pattern language to serve an interactionalist perspective, that data collection would be done through participant observation. A dweller is – or group of dwellers are – observed living in the built environment. A pattern language that does not include dwellers within description is incomplete.

(iv) Spatio-temporal frames c.f. Alexandrian range of contexts: The when and where of affording value(s) is socially negotiated between a client and a service provider, compared to the Alexandrian range of contexts based in physical space.

While the description of patterns has evolved over time, the originating description clearly specified the range of context ins physical space:

We begin with the following hypothesis: Every time a designer creates a pattern (or, for that matter, entertains <u>any</u> idea about the physical environment), he essentially goes through a three step process. He considers a PROBLEM, invents a PATTERN to solve the problem, and makes a mental note of the range of CONTEXTS where the pattern will solve the problem. For example, a designer considering the problem of traffic congestion and pedestrian access around central shopping districts might come up with the pattern, "Linear pedestrian malls bounded on both sides by rows of shops; parking lots strung along, behind the shops." He would then make a mental note of the kinds of place where this pattern is useful: "Commercial districts serving 300,000 people, where existing streets can be closed or paved, with car access evenly distributed behind the stores." This three-step process may be characterized most simply as WHAT (mall between shops, parking behind), WHERE (commercial area serving 300,000), and WHY (ease traffic congestion, create pedestrian access) (Alexander et al., 1967, pp. 2–3).

As a service system that electronically provides an affordance for routing around traffic congestion, consider the when and where of (i) a dedicated GPS navigation device and (ii) a mapping app on a smartphone. For the features of aided routing for either a driver or a pedestrian, the service provider must have already mapped that territory before the client encounters that place. For the driver or pedestrian, a smartphone app normally requires an active wireless Internet service, while the GPS doesn't. A "solution" would normally suggest that the mapping be completely accurate and up-to-date, while service system providing an "affordance" would presumes that a person has eyesight and would not autonomically navigate himself or herself into a ditch.

(v) Containing systems versus Alexandrian completion of larger patterns: Authentic systems thinking starts from containing whole.

In systems thinking, there are … three steps:

1. *Identify a containing whole (system) of which the thing to be explained is a part.*
2. *Explain the behavior or property of the containing whole.*
3. *Then explain the behavior or properties of the thing to be explained in terms of its* ***roles(s) or function(s)*** *within its containing whole.*

Note that in this sequence, synthesis precedes analysis (Ackoff, 1981, pp. 16–17).

This general definition of systems thinking applies to service systems. A client of a service system is typically defined as being outside its systems boundaries, and therefore part of the containing whole. In situations where the a client is not merely a consumer, but instead a coproducer, the definition of the system changes. "Value co-produced by two or more actors, with and for each other, with and for yet other actors, invites us to rethink organizational structures and managerial arrangements for value creation inherited from the industrial era" (Ramírez, 1999, p. 49).

Alexander's early writing also suggests systems thinking. "When the elements of a set belong together because they co-operate or work together somehow, we call the set of

elements a system" (Alexander, 1966, p. 48). However, the problem is seen as designers working primarily in physical space: "Too many designers today seem to be yearning for the physical and plastic characteristics of the past, instead of searching for the abstract ordering principle which the towns of the past happened to have, and which our modern conceptions of the city have not yet found. These designers fail to put new life into the city, because they merely imitate the appearance of the old, its concrete substance: they fail to unearth its inner nature" (Alexander, 1966, p. 47). The ordering principle works from larger scales to smaller scales.

(vi) Contained systems c.f. Alexandrian completions to smaller patterns: From panarchy theory, smaller and faster systems can "revolt" to change the system of interest. In service systems, this is typically demonstrated by a segment of clients voicing shared concerns resulting in a response by the provider, or exit from that relationship to other alternatives. The Alexandrian view of a semi-lattice does reflect that structure, as connections of patterns, need are not tree-like. "To have structure, you must have the right overlap, and this is for us almost certainly different from the old overlap which we observe in historic cities. As the relationships between functions change, so the systems which need to overlap in order to receive these, relationships must also change. The recreation of old kinds of overlap will be inappropriate, and chaotic instead of structured' (Alexander, 1966, p. 55). However, the orientation still has larger patterns containing smaller patterns, rather than larger systems that might be forced to transform as smaller systems "revolt".

The pattern language format described for service systems thinking, above, is still nascent. What are the implications on how such a pattern language would be applied? In the next section, the movement towards agile development in software development is compared to Alexandrian methods.

3. Methods associated with pattern language have clarified since 1973

In original master planning document for the University of Oregon circa 1973, Alexander took the challenge of problem solving in an organismic way:

In short, the original global form of the organism comes from the very same process of diagnosis and repair which keeps it stable once it matures. We propose to solve the problem of global order in the university by means of a very similar process of diagnosis and repair. […] Once a set of patterns has been adopted by the university, it is therefore possible to loo at the environment and mark the places where the patterns have broken down (Alexander, Silverstein, Angel, Ishikawa, & Abrams, 1975, pp. 150–151).

The trajectory of this thinking can be traced explicitly into the Eishin campus project circa 1983-1985. It also influenced methods which have become known as agile development.

3.1. Alexandrian methods include pattern language, budget and reality of the land

The formal description of the Eishin campus project was not published until almost 30 years after its first drafts.

Between 1968 and 1981, my CES colleagues and I had already worked out most of the techniques …. The foundations of these unifying techniques were ultimately set forth in the four volumes of ***The Nature of Order,*** *published 2001-2005. However, the four books were already circulating, in draft form for fifteen years before the actual start of the Eishin project. Furthermore, the entire effort of our layout, planning, building design, construction, overall*

conduct of the project, and day-to-day practical administration – all of this was governed by the teachings described at length in the 2000 pages of ***The Nature of Order*** (Alexander, 2012, pp. 16–17).

This project is illuminating as an experience report from initial conception of a campus, through to its inhabitation as a living built environment today. It is unique an in-depth reflection of the putting pattern languages and generative sequences together in practice. An outline of the steps described in bringing the Eishin campus to reality is listed in Table 4.

Table 4: Alexandrian methods at the Eishin campus (Alexander, 2012, Chapters 8–11)

Alexandrian method for built environments	
(i) Pattern language for the community	(a) Interviewing on hopes and dreams (b) Making a first sketch of a patttern languages (c) Making a first draft pattern language from teachers‘ comments (d) Checking seven principles for completeness of the languages (e) Refining the language (f) Creating pattern language as a list of key centers
(ii) Construction budget	(a) Making a record of all of the spaces and areas which were defined by the pattern languages (b) Trimming all space to available budget, as an average percentage reduction for all items of interior space, and then exterior space (c) Asking faculty to re-allocate the spaces, keeping the same trimmed totals, conforming with the available resources
(iii) Reality of the land	(a) Laying out the site plan on the ground (b) Finding the two fundamental systems of centers, and combine them (c) Visualizing the evolving site plan with marks on the land (e.g. flags) (d) Fixing first hardline drawings of detailed positions on the site (position, orientation, dimension) (e) Judging detailed building positions on the land (with flags) (f) Recording the site plan on paper

This outline reveals that a generative pattern language is just the beginning of the project, and realization of the construction is possible.

(i) Pattern language for the community shows that representatives of future occupants of the building are co-creators of a vision. Work-in-progress is retained in rough form (e.g. hand-drawn sketches, not computer-modeled blueprints) to encourage further participation and revision. The identification of key centers enables structures at large scales to be prioritized, leaving details to be worked out later.

(ii) Construction budget grounds the initial vision into a practical context. By having participants in groups discussing the trade-offs of the most essential features against less-preferred options, the priorities for construction are clarified.

(iii) Reality of the land defers abstraction into blueprints so that subtle perceptual judgements can be discussed amongst the project team. Lining up the system of centers in the land, and the system of centers in the buildings recognizes the different levels of scale that are at play.

The strong positions of System-A "concerned with the well-being of the land, the integrity, the well-being of the people and plants and animals who inhabit the land", as compared to System-B "concerned with efficiency, with money, with power and control" (Alexander, 2012,

p. 11) portrays philosophical differences. An approach based on service systems thinking might come to the same conclusion about the institutions at play, but could potentially bring some light into appreciating why these systems continue to persist.

3.2. Try services with user stories, scoping, reviewing iteratively

The spirit of service systems thinking is often reflected in agile methods, with the former more recent than the latter. Many of the leading thinkers who were involved with bringing pattern language to software development have been active in the agile movement. The traditional approach of waterfall methods – sequential steps of system requirements, software requirements, analysis, program design, coding, testing and operations – evolved during the planning of spacecraft missions (Royce, 1970). In 2001, a group of respected software methodologists came together to discuss an alternative to the overly formal waterfall approach, that was not resulting in successful projects. The 17 signatories agreed on the 4 values and 12 principles as the Manifesto for Agile Software Development, reflecting a common underlying basis of the way they were working (Cockburn, 2011). The values included:

- *Individuals and interactions* over processes and tools
- *Working software* over comprehensive documentation
- *Customer collaboration* over contract negotiation
- *Responding to change* over following a plan

Ten years later, these values had become well-known in industry, and a revisiting the manifesto did not call for a major revision (Ambler, 2011). Some of the practices currently used every day by many software developers are outlined in Table 5.

Table 5: Agile methods include user stories, scoping and reviewing iteratively

Agile methods originating from software development (e.g. scrum)	
(i) Writing user stories (with Behavior Driven Development)	(a) Card (new capability on front side): As a [role], I want to [action/function] so that [value] (b) Conversation: Details as conditions of satisfaction (represented by product owner) (c) Confirmation (acceptance tests, on back side): Given [some initial context], when [an event occurs], then [ensure some outcomes]
(ii) Scoping; estimating value, costs and dates	(a) Scoping projects (i.e. portfolio, solutions, releases) (b) Estimating size (e.g. story points), derive duration (aggregating into themes, splitting epics) (c) Identifying risks (e.g. technical, organizational, delivery)
(iii) Reviewing iteratively; tracking work item backlogs	(a) Demonstrating iterations to stakeholders, conducting retrospective reviews (b) Tracking sprint velocity (though kanban, backlog, burn-down) (c) Coordinating daily for blockers (e.g. Scrum stand-up)

Agile methodologies includes (i) management techniques (e.g. Scrum), (ii) development processes (e.g. XP (Extreme Programming)), and (iii) coordination tools (e.g. kanban, backlog management). These practices have applied on with small teams, and scaled up to enterprise systems (Ambler & Lines, 2012).

(i) Writing user stories departs from the "requirements" and "analysis" phases of the waterfall approach. The goal is to move away from written specifications, and to encourage ongoing

conversations with between clients and developers through memorable narratives. To encourage informality, the format of a user story has three parts: the front of card with (a) the new capability desired, and (b) the conversation about conditions of satisfaction; and the back of the card with (c) confirmation acceptance tests. The practice evolved from TDD (test-driven development) intended to ensure code works, to BDD (behavior-driven development) where scenario descriptions from clients could be executable for acceptance (North, 2006).

(ii) Scoping is conducted interactively between the client (product owner) and development leaders. Instead planning out on a horizon of years, interim deliverables are staged in months, weeks or days. User stories are grouped or broken down, and relative values and efforts are negotiated e.g. as points rather than person-hours. One technique called planning poker sets up discussions on why one party would see a value or effort so much differently from the other party. Risks can also identified, and reassessed in subsequent meetings.

(iii) Reviewing iteratively is a practice where a project is not allowed to continue for long periods of time without feedback. Demonstrations are normally scheduled every few weeks with stakeholders to validate progress (or modification) of user stories. At the end of each sprint, developers have a retrospective to review immediate experiences. Progress on completing work items in backlog are tracked for velocity, to improve the ability to better estimate effort. Short stand-up meetings in agile teams are run daily, so that blockers are taken as team issues, and mutual aid amongst peers can be coordinated.

The largest mindshift from waterfall methods to agile development is admitting that estimates are truly projections with some variability. Plans are a resource to coordinate action, and commitments should naturally change when uncertainty is high.

Outside of software development, Scrum has been used in product development, operations, research and development, sales and marketing, finance and accounting, and human resources (Scrum Alliance, 2015, p. 2).

3.3. The challenge of System-B to System-A is similar to waterfall to agile

The shift from System-B to System-A production has some parallels to the shift from waterfall methods to agile. These are outlined in Table 6.

Table 6: From System-B to System A, c.f. from waterfall to agile

From System-B to System-A		From waterfall methods to agile	
(i) Pattern language for the community	From preprogrammed assembly to local adaptation with feedback and correction	(i) Writing user stories	From detailing specifications to conversing on narratives
(ii) Construction budget	From overemphasizing tangible aspects to negotiating collective feelings	(ii) Scoping; estimating value, costs and dates	From projecting and committing to converging on estimates
(iii) Reality of the land	From drawing abstract layout plans to adjusting the wholeness on the real site	(iii) Reviewing iteratively; tracking work item backlogs	From dividing-and-conquering to collaborating for learning

The methods have not isomorphic from built environments to service systems, but these parallels line up roughly to life cycle stages.

(i) Pattern language for the community c.f. Writing user stories: Both System-B and agile methods discourage detailed abstracting into specifications. Interactive engagements between future occupant-dwellers and builder-developers enable an intuitive appreciation of desired collective directions and constraints.

(ii) Construction budget c.f. Scoping: When constraints force decisions, rationality and concreteness are more difficult to argue than intuitions and ambiguities. Both System-B and agile methods attempt to surface more holistic perspectives, as an alternative to reducing to the lowest common denominator. Negotiating may lead to more creative options than bargaining as a zero-sum game.

(iii) Reality of the land c.f. Reviewing iteratively: While sketches and mockups can aid in describing a future outcome, the average layman tends the visualize a creation yet-to-be only as extensions from his or her personal experience. Both System-B and agile methods encourage building a little bit, and then evaluating the progress to date critically for implications yet to come. Piecemeal development makes small corrections along the way easier, and reduces the cost should the situation call for a reversion to fix a error or defect.

Since many service systems have significant software components, agile methods are not a foreign idea for a project. While the waterfall approach originated for mission-critical spacecraft mission where human lives would be at risk, the typical service system development project faces the risks of failure to deliver, either in scope or in time.

4. A new format amplifies, rephilosophizes and reinterprets prior doxa

Proposing a pattern language for service systems thinking attempts to take some of the best aspects of Christopher Alexander's work, reorient it from its original physical domain towards services, and then deprecates some presumptions in the doxa. These are outlined below as amplifications, rephilosophizations and reinterpretations.

4.1. Amplifications include shared meaning, systems thinking, method + process

Many book lovers have *A Pattern Language* on the shelves of their personal libraries. Fewer have *The Timeless Way of Building*. Most are too intimidated by the bulk and length of the four volumes of *The Nature of Order* to add those to the collection. Applications of an Alexandrian approach in new domains can attempt to retain the features that have resonated well in built environments.

4.1.1. Shared meaning on the situated

One of the challenges in a new field of service systems (science) is that definitional work can be abstract. Being able to dialogue about aspects of a service system amongst providers, beneficiaries and funders encourages appreciation and coherence of the whole.

So long as the people of society are separated from the language which is being used to shape their buildings, the buildings cannot be alive. *If we want a language which is deep and powerful, we can only have it under conditions where thousands of people are using the same language, exploring it, making it deeper all the time* (Alexander, 1979, pp. 241–241).

Towards trying to establish a deeper shared meaning, working on the concrete situation improves that ability to make decisions not only on rational facts, but also intuitive judgements. Abstracting choices into words and drawings can add to ambiguity.

The pattern is merely a mental image, which can help to predict those situations where forces will be in harmony, and those in which they won't. But the actual forces which will occur in a real situation, although objectively present there, are, in the end unpredictable, because each situation is so complex, and forces may grow, or die, according to subtle variations of circumstance (Alexander, 1979, pp. 285–286).

In interaction design, pattern language has been proposed as a lingua franca – actually multiple linguae franca (common languages) each used in a domain .

Alexander's pattern language has a number of attributes that make it suitable for generating ***lingua francas****.*

- ***Concrete Prototypes****. Alexandrian patterns are embodied as concrete prototypes rather than abstract principles. Every pattern comes with a name (often sufficient to evoke animage), a picture of an archetype of the pattern, and a diagram of how it is implemented. [….] Whereas abstract principles require users of the principles to understand some conceptual framework, and to be able to map the principles onto their domain of concern, the concrete prototypes in pattern languages make direct contact with users' experiences. Anyone who has experience with the situation can begin to understand, discuss, and contest Alexandrian patterns.*

- ***Grounded in the Social****. Another characteristic is that the patterns tend to focus on the interactions between the physical form of the built environment and the way in which that inhibits or facilitates various sorts of behavior within it. [….] This linkage between the components of design and everyday activity reinforces the concrete, grounded nature of the pattern language.*

- ***Expresses Values****. Alexander's Pattern Language is not value neutral. [….] While this aspect of* ***A Pattern Language*** *can alarm those who view it as prescriptive—that is, who think it is intended to be* ***The*** *pattern language — I see its ability to clearly and explicitly express values as part of its representational power, and as yet another way the language becomes grounded for its users.*

- ***Supports Piecemeal Use****. Finally, pattern languages are amenable to gradual, piecemeal use. If a pattern language exists for a particular domain, users can begin with just a few patterns and work out from there. If a pattern language is being developed from scratch, it feels natural to start with particular cases and to identify patterns which recur from one case to another. It is easy to imagine identifying a few basic patterns, and then testing and re-testing them as new cases are encountered, creating more general patterns, and defining more particular ones as appropriate* (Erickson, 2000, pp. 362–363).

In the above described explorations for interaction design, it was thought that a pattern language "should probably emerge from practice, rather than being imposed from the top down". Accordingly, developing a pattern language for service systems thinking would emphasize inductive approaches over deductive approaches.

4.1.2. Systems thinking and complexity

Research into a science of service systems (or service systems science) has a nuanced difference as compared to service science. All service systems science is service science; but not all service science is service systems science. Christopher Alexander brought

systems thinking early into his body of work, and embedded the foundations throughout his career.

At the dawn of the work on pattern language, Alexander established the idea of "Systems Generating Systems" that would later be adopted in computational design thinking.

*1. There are two ideas hidden in the word system: the **idea of a system as a whole** and the idea of a **generating system**.*

*2. A **system as a whole** is not an object but a way of looking at an object. It focuses on some holistic property which can only be understood as a product of interaction among parts.*

*3. A **generating system** is not a view of a single thing. It is a kit of parts, with rules about the way these parts may be combined.*

4. Almost every 'system as a whole' is generated by a 'generating system'. If we wish to make things which function as 'wholes' we shall have to invent generating systems to create them.

In a properly functioning building, the building and the people in it together form a whole: a social, human whole. The building systems which have so far been created do not in this sense generate wholes at all (Alexander, 1968, p. 605).

In cross-appropriating pattern language over into software development, the systems thinking foundations of Alexander's work became one of the six main tenets of the culture that the early Hillside Group community laid down as the foundations of the pattern discipline.

The fourth principle is systems thinking. [….] Alexander believed in the importance of the Whole, but that a sense of the Whole should come from within ourselves and from experience. We should always be aware of the Whole on which we are working; but we should not project that Whole too far into the future (Coplien, 2004, p. 10).

These system ideas would later be extended in the writing of *The Nature of Order*, with the turn-of-the-century additional research into complexity science.

In a good system, we would expect to find the following conditions: Any identifiable subsystems, we would hope, would be well — that is to say, in good condition. And we would hope that the larger world outside the complex system is also in good order, and well. Thus, the mark of a good system would be that it helps both the systems around it and those which it contains. And the goodness and helping towards goodness is, in our ideal complex system, also reciprocal. That is, our good system, will turn out to be not only helping other systems to become good, but also, in turn, helped by the goodness of the larger systems around it and by the goodness of the smaller ones which it contains (Alexander, 2003, p. 6).

Approaching services from a perspective of systems thinking brings not only concept of boundary and levels with isomorphies across physical, biological, social and ecological domains, but traditions of interplay between them.

4.1.3. Method content + development process

Service systems thinking can learn not only from the more famous of Alexander's works in *A Pattern Language*, but also the overlooked Volume 1 from the Center for Environmental Structure that was described as the first sentences of the book.

Volume 1, The Timeless Way of Building [TWB], and Volume 2, A Pattern Language [APL], are two halves of a single work. This book [APL] provides a language, for building and planning; the other book [TWB] provides the theory and instructions for the sue of the language. This book [APL] describes the detailed patterns for towns and neighbourhoods, houses, gardens and rooms. The other book [TWB] explains the discipline which makes it possible to use these patterns to create a building or a town. This book [APL] is the sourcebook of the timeless way; the other [TWB] is its practice and its origin (Alexander et al., 1977, p. ix).

In professional services, this separation of (i) *method content* from (ii) *development process* was reflected in way that the IBM Global Services Method separates (i) Work Product Descriptions from (ii) Work Breakdown Structures.

The process framework scheme used by IBM has four main components:

- *Work Product Descriptions, classified by subject matter, with associated dependency diagrams, as described here.*
- *Work Breakdown Structures (WBS) describe the temporal structure of a project. A WBS is a skeleton plan, which divides the project into a hierarchical structure of major and minor checkpoints each with exit criteria and a description of the work needed to reach the checkpoint.*
- *Roles describe sets of skills. They are associated with WPDs and with elements in the WBS.*
- *Techniques are used for detailed guidance on building a work product or group of work products, when the terse summary in the Development Approach section of the WPD is not sufficient. They can differentiate the use of the same WPD in different contexts.*

Within IBM the term "engagement model" is used for all the material needed to describe a certain class of project. An engagement model consists of a set of WPDs, a WBS, a set of role descriptions, and a set of techniques. [...]

Configuration plays a central role in methods based on WPDs. This represents a psychological shift in the role of method. All too often, deviation from a standard methodology is seen as an imperfection, as an unwelcome compromise (despite the fact it always happens!). This attitude is sometimes encouraged by methodologists who, as a group, are not noted for their flexibility. Instead, adapting to particular circumstances should be the norm, and should be an integral part of any method and of the way it is taught (Cameron, 2002, p. 74).

Work product description were rationalized across service lines, so that outputs from management consulting engagements (e.g. on strategy and organization) did not have to be recreated in services delivery engagements (e.g. context and analysis).

These methods and processes later became supported with tools. The design of the Rational Method Composer (RMC) product by IBM enabled two purposes:

1. To provide for development practitioners a knowledge base of intellectual capital that allows them to browse, manage, and deploy content. This content can be licensed, acquired, and, more importantly, accommodates your own content consisting of, for example, method definitions, whitepapers, guidelines, templates, principles, best practices, internal procedures and regulations, training material, and any other general descriptions of how to develop software. This knowledge base can be used for reference and education and forms the basis for developing processes (the second purpose). [….]

2. To provide process engineering capabilities by supporting process engineers and project managers in selecting, tailoring, and rapidly assembling processes for their concrete development projects. RMC provides catalogs of predefined processes for typical project situations that can be adapted to individual needs. It also provides process building blocks called capability patterns that represent best development practices for specific disciplines, technologies, or development styles. These building blocks form a toolkit for quickly assembling processes based on project-specific needs ….

Method content versus process

The most fundamental principle in RMC is the separation of reusable core method content from its application in processes. This directly relates to the two purposes of RMC described in the previous section. Almost all of RMC's other concepts are categorized along this separation, …. Method content describes what is to be produced, the necessary skills required, and the step-by-step explanation describing how specific development goals are achieved. These method content descriptions are independent of a development lifecycle. Processes describe the development lifecycle. They take the method content elements and relate them into semi-ordered sequences that are customized to specific types of projects. (Haumer, 2005)

IBM donated software assets to be relicensed as open sourcing with the Eclipse Process Framework (EPF) Composer. The EPF Approach had four parts: (i) standardize representation and manage libraries of reusable *method content*; (ii) develop and manage *processes* for performing projects; (iii) *configure* a cohesive process framework customized for my project needs; and (iv) create project plan templates for *enactment* of process in the context of my project (Haumer, 2007). This would be useful to a service provider who could reuse intellectual capital, rather than reinventing for each new engagement.

Within the pattern language community, the distinction has been clearer between (i) a pattern language generic in a domain, and (ii) the configuring and enactment as project language.

Although the pattern language based on typical and common patterns can be used as an approximate solution, a gap occurs between special environment and subject (lack of wholeness). *….] In order to make a project language, use the form of patterns and pattern languages that contains the sets of a name, context, problem, and the solution. By using pattern structure, the ideas of participants can be captured and conveyed clearly and usefully. On one hand, the main purpose of a pattern and a pattern language is sharing an expert's success experience as a common language of a domain. On the other hand, the purpose of a project language is not to share an expert's success experience, but is producing one's own language and designing one's own subject. [… Project] languages can*

capture and nest – along with borrowed expert patterns – to express the concerns of participants and their understanding of their environment (Motohashi, Hanyuda, & Nakano, 2013, pp. 2–3).

A generic pattern language within a domain is equivalent to the catalog of Work Product Descriptions or method content provided as resources for action. When a development processes includes an initiation with configuration step, a project language becomes an enactment for a specific engagement.

4.2. Rephilosophizations include alternative stable states, journeying and meshwork

A service system could be completely intangible (e.g. an Internet service), so the physicality of Alexander's philosophy may not always be appropriate. Three shifts in philosophy can manifest to dramatically different ways of thinking about the format of a pattern language for a service system.

4.2.1. From structuralism to alternative stable states

Service systems thinking can benefit from evolutionary concepts from biology, as did some of Alexander's ideas on the synthesis of form.

18. [….] The language, like a seed, is the genetic system which gives our millions of small acts the power to form a whole.

19. Within this process, every individual act of building is a process in which space gets differentiated. It is not a process of addition, in which preformed parts are combined to create a whole, but a process of unfolding, like the evolution of an embryo, in which the whole precedes the parts, and actually gives birth to them, by splitting.

20. The process of unfolding goes step by step, one pattern at a time. Each step brings just one pattern to life; and the intensity of the result depends on the intensity of each one of these individual steps.

21. From the sequence of these individual patterns, whole buildings with the character of nature will form themselves within your thoughts, as easily as sentences (Alexander, 1979, pp. xiii–iv).

Alexander was a structuralist, but not an idealist, extended from mereology (the philosophy of parts and wholes) while working in phenomenology.

… parts are to some important extent part of a previous whole, and their progression to the new whole is not a mere re-assembly but a kind of transformation, that preserves at least a part of the previous structure.

This was Alexander's concept of what he termed "structure-preserving transformations," a process that creates differentiations and new structures, but that in an important sense, also preserves the structure of the whole that came before (Mehaffy, 2010, p. 24).

The language of biological systems reapplied into urban development brought with it characteristics of living systems.

The fact is, that the creation of a town, and the creation of the individuals buildings in a town, is fundamentally a genetic process. *No amount of planning or design can replace*

this genetic process. And no amount of personal genius can replace it either (Alexander, 1979, p. 240).

Over 25 years, Alexander's thinking on pattern language matured from description, through sequencing and unfolding, to codes for implementation.

PATTERN LANGUAGES CAME FIRST, about 1967. There were many pattern languages of various kinds, published. Each pattern language contained a number of patterns, in a rough order going from the largest patterns to the smallest. The pattern language gave a descripiton of a certain kind of environment, by displaying the functional barebones, so that one could be sure that buildings or other environments would at least respond adequately, through their geometry, to the functional needs which were identified in the patterns.

MORPHOGENETIC SEQUENCES, also known just as SEQUENCES CAME SECOND, about 1990. A sequence is a pattern language which places emphasis on the order of unfolding, and gives much more importance to the orderly unfolding, so that by applying the steps in the sequence, in the order specified, a coherent geometric order will unfold, which also contains the patterns and is therefore well behaved as an environment.

GENERATIVE CODES CAME THIRD, and most recently, about 2002. A generative code includes all the information needed for practical implementation: thus it not only describes the order in which decisions must be made, to generate coherent form but in addition describes all the human interactions, and practical and legal and procedural details, to get an actual living neighborhood to appear on the ground, as a result of interactions among the people who live and work there.

ALL THREE TYPES MAY BE VIEWED AS GENERATIVE SEQUENCES, but pattern languages and morphogenetic sequences lack essential features of a generative code, and therefore cannot get the practical work done successfully. Human interactions, human relationships, and the roles people need to play together when building a neighborhood, are missing. Yet these are needed to form viable living structure *(Alexander, 2006).*

Christopher Alexander cites David Bohm's *Wholeness and the Implicate Order* in shaping his work, and had a meeting with Bohm in 1986. On reviewing the conclusion to the four books, "A Modified Structure of the University", Alexander recalls that Bohm "declared that in his view this material was the most interesting. ... somehow he thought the conception of matter contained here was the most significant aspect of these books. It came closer, perhaps, to providing a complement to his own views" (Alexander, 2004, p. 336).

Alexander's "generative code" addresses not physical parameters of the built environment, but steps that the participants should take together in laying out and detailing a given structure. Alexander likens it to a recipe, or a medical procedure, in which the steps always follow a logically similar pattern, but the actual actions continuously adapt to the context – the taste and texture of the food in the case of a recipe, or the condition of the patient's tissues in a medical procedure. But in this case, the "recipe"' or the "procedure"' guides the unfolding of environmental form (Mehaffy, 2008, p. 69).

Alexander's orientation towards sequences and processes is generally counter to a prevailing philosophy of teleology, the explanation of natural phenomena by their end or purpose. Of Aristotle's four causes, teleology emphasizes final cause (Falcon, 2012).

Putting human will into the foreground, human systems can be described at teleological, with purposeful systems as ideal-seeking and purposive systems as goal-seeking (Ackoff & Emery, 1972). From a broader perspective of living systems, however, teleology has been criticized for an inference that the organism would be cognizant of its end design at some future time beyond the foresight horizon (Mayr, 1988a).

Theories of biological evolution recognize three types of change: (i) environmental change; (ii) somatic (cellular) change; and (iii) genotypic change (Bateson, 1963). These three types are illustrated in an example of a person accustomed to sea level atmospheres being moved up to high altitudes, resulting in an elevated heart rate and panting. An environmental change would see the person descending from altitude, so that symptoms of stress would immediately reverse. A somatic change would see the person's body acclimatizing to the thinner atmosphere, with multiple organs attaining homoeostasis by responding to or increasing the overall flexibility of the organism. A genotypic change could occur over generations of people living at high altitudes, where natural selection assimilates acquired characteristics.

Teleonomy has been defined specifically for goal-directed processes in organisms. A teleonomic process or behavior is one which owes its goal-directedness to the operation of a program (Mayr, 1988b). Goal direction is implied, but with a dynamic process rather than a static condition. The program may originate through lucky macromutation, a slow process of gradual selection, or even through individual learning or condition as in open programs. A program might be defined as coded or prearranged information that controls a process (or behavior) leading it toward a given end. Teleonomic processes can be controlled by closed programs (e.g. in the DNA of the genotype) or open programs (e.g. incorporating additional information acquired through learning, conditioning, or experiences).

Service systems are interactive between providers and customers, with the relation changing over time in their mutual environment. The shared direction(s) may be better represented by a theory of alternative stable states. Research into regime shifts have been influenced by two heritage research streams from ecology (Beisner, Haydon, & Cuddington, 2003).

Ecosystem ecologists commonly depict stable states with ball-in-cup diagrams, where (at least) two basins are available in which the ball can rest. A small perturbation may move the ball within the basin, retaining its current stable state. A large perturbation may move the ball out into another basin, into a new stable state. Having become stable in the new state, a reverse perturbation may or may not result in a return to the original stable state.

Community ecologists focus on changes in state variables (e.g. population densities). As an example in fish population, there may be one stable state where harvesting is supported by a high birth rate, and then an alternative stable state where harvesting is not supported due to the dominant death rate. There's a boundary middle ground where the state is not stable.

The theory of alternative stable states is a foundation for panarchy and resilience science. In panarchy, social ecological systems exist and function at multiple scales of time, space and social organization in nested hierarchies. Resilience science is associated with adaptive capacity in the ecosystem to deal (or not deal) with changes in the environment. With alternative stable states, research into regime shifts – as large, abrupt, persistent changes in the structure and function of system – is being conducted on a wide variety of domains.

Service systems are generally associated with relations between parties persisting over time. While a service could be provided transactionally on an instance-by-instance basis, establishing trust amongst parties reduces search effort and cost. Thus, relations in a market (or business ecosystem) is likely to remain stable over some periods, until a change in the shared environment or the internals of one party leads to a regime shift.

4.2.2. From dwelling to journeying

The experience of a service system and the experience of a built environment can both be approached phenomenologically. Compatibility has been been observed in Martin Heidegger's notion of dwelling with subsequent work of Christopher Alexander and Thomas Thiis-Evensen.

*In "Building Dwelling Thinking," Heidegger's major means of investigation is etymological: what is the word history of "to build" ("**bauen**") and its links to dwelling? **Bauen**, says Heidegger, relates to nearness and neighborliness and also implies "to cherish and protect, to preserve and care for" .... **Bauen** also relates to the old High German word for building, "**baun**," which means "to dwell" in the sense of remaining or staying in place.*

In emphasizing this link to place, Heidegger suggests that building relates to dwelling, which therefore can be said to involve a sense of continuity, community, and at-homeness .... The crux of dwelling, Heidegger argues, is sparing and preserving – the kindly concern for land, things, creatures, and people as they are and as they can become …. As human beings, we cannot fail to dwell, for dwelling, ultimately, is the essential existential core of human being-in-the-world from which there is no escape. [….]

This reconciliation between people and their built world is also a major aim in the research and design of American architect Christopher Alexander, though he works at a different experiential scale than Thiis-Evensen, who largely emphasizes lived qualities of individual buildings. Alexander is more concerned with architecture in its larger environmental context. In other words, how can activities, buildings, spaces, and landscapes be designed in an integrated, coherent way to create places that are coherent, beautiful, and alive for their residents and users? In short, the aim is place making that sustains dwelling (Seamon, 1998, paras. 2, 3, 15).

Although Alexander seems to have not specifically cite Heidegger in his writings, a collaborator confirms that influence.

*Alexander writes at great length, and sometimes quite movingly, about our basic human need to belong to a space, to be 'not-separate' from our surrounds. Although Alexander certainly knew of Goethe, Heidegger and Merleau-Ponty, in the years that I spent working with him, readings and discussions did not go in that direction. As far as I can recall, no mention of authors dealing with place was ever made. Only recently, through conversations with David Seamon, have the writings of Edward Relph been brought to my attention. [….] Relph's now classic (1976) book, **Place and Placelessness**, develops a coherent conceptual framework that provides an excellent backbone for Alexander's poetic prose and for reviewing more profoundly human responses to geometries in the built environment.*

*Relph's structure is based on dialectical oppositions and covers a very wide and refined range of relationships with the built environment. Alexander's work is really concerned with only two of them. One is existential insideness (belonging, attachment), the state of unself-conscious being-in (Heidegger's **da-sein**) as opposed to existential outsideness, the*

experience of alienation from one's surroundings. The other is the scale between authentic and unauthentic. Authentic refers to the genuine experience and creation of a place of identity. The relationship is direct. Unauthentic involves the mediation of symbols, icons, fashion, kitsch and conventional stereotypes (Quillien, 2008, p. 85).

Dasein can be translated as being there or existence. Being-in-the-world also includes availableness (also known as ready-to-hand) and occurrentness (also known as present-at-hand).

Early Heidegger … is interested only in the ahistorical structure of being-in-the-world, which in ***Being and Time*** *he equates with Dasein's taking as stand on itself and significance. Dasein's consequent familiarity with the three basic ways of being – existence, availableness and occurrentness – he equates with Dasein's understanding of being in general (Dreyfus, 1990, p. 192).*

To be at home in the world, Heidegger denies being-amidst (also translated as being-alongside or side-by-sideness) in favour of dwelling.

What Heidgger is getting at is a mode of being-in we might call "inhabiting". When we inhabit something, it is no longer an object for us but becomes part of us and pervades our relation to other objects in the world. Both Heidegger and Michael Polanyi call this way of being-in "dwelling". Polanyi points out that we dwell in our language; we feel at home in it and relate to objects and other people through it. Heidegger says the same for the world. Dwelling is Dasein's basic way of being-in-the-world. The relation between me and what I inhabit cannot be understood on the model of the relation between subject and object (Dreyfus, 1990, p. 45).

When we think about a service system rather than a built environment, however, should the nature of being served over a period of time be considering a journey, rather than the dwelling in a moment in time? Since Alexander didn't cite Heidegger or write specifically about place, he might also have had issues with these philosophical details. This distinction between dwelling and journeying shows up in a criticism of Relph, but is rooted in the understanding of temporality in *Being and Time*.

Another concern that some critics voiced regarding ***Place and Placelessness*** *is that it favors home, center, and dwelling over horizon, periphery, and journey …. As Relph (1996) says in his twentieth-anniversary commentary, he was accused of emphasizing the positive qualities of place and ignoring or minimizing negative qualities—e.g., the possibility that place can generate parochialism, xenophobia, and narrow-mindedness .... Again, a close reading of the book reveals a flexibility of expression—a recognition that an excess of place can lead to a provincialism and callousness for outsiders just as an excess of journey can lead to a loss of identity or an impartial relativity that allows for commitment to nothing. The broader point is that, in the book's lived dialectics (center/horizon, place/placelessness, and so forth), there is a wonderful resilience of conceptual interrelationship that is another hallmark of the best phenomenology. [….]*

This criticism, of course, ignores a central conclusion of ***Place and Placelessness****: that regardless of the historical time or the geographical, technological, and social situation, people will always need place because having and identifying with place are integral to what and who we are as human beings .... [….]*

Instead, the crucial question that both theory and practice should ask is how a "progressive" sense of place and insideness can be made even in the context of our relativist, constantly-changing postmodern world ... (Seamon & Sowers, 2008, pp. 48–49).

In last quarter of *Being and Time*, Heidegger deepens his analysis of human existence with interpreting the structures of Dasein as modes of temporality.

Heidegger distinguishes, in fact, two sorts of everyday time, ***world-time*** *and* ***time as ordinarily conceived****. Time as we ordinarily* ***conceive*** *it (****der vulgäre Zeitbegriff****) is time as the pure container of events. Heidegger may well build the term "conceive" into its name, because he wants to emphasize that when we disengage from our ordinary experience and talk about and contemplate time as such, we typically interpret time as such a pure container, as the continuous medium of natural change. When we are pre-theoretically engaged with time, however, we experience it as* ***world-time****. World-time is the sequence of meaningfully articulated, everyday times: dinner time, bed time, rush hour, the Great Depression, the Cold War Era, the 1960s, and the like.*

World-time differs from ordinary time in that the times of world-time are overtly defined in terms of their relation to human interests, whereas ordinary times are conceptualized as independent of human interests (Blattner, 2005, p. 316).

Thus, *now* is not an isolated moment in time, but instead coupled in a past-present-and-future temporality.

*This abstraction of the now, however, should not be thought of on the model of the medieval conception of the standing now (****nunc stans****). The world-time now is not disconnected from its own past and future, i.e. from other world-time nows. The standing now was conceived as a now, a moment of time, with no past and no future, a singular, isolated moment of time. The world-time now, as Heidegger conceives it, is isolated from the* ***originary*** *past and future, but not from the world-time past and future. The world-time now is one now in a sequence of nows; world-time is a succession of nows. The world-time now is intrinsically spanned from a world-time past (no-longer-now) to a world-time future (not-yet-now). It is thus spanned, Heidegger argues, because it is a significant now, a now defined by the relations implied in the in-order-to (Blattner, 2005, p. 320).*

In the ecological anthropology of Tim Ingold, place is not seen as a point in time, but in movement.

… places do not have locations but histories. Bound together by the itineraries of their inhabitants, places exist not in space but as nodes in a matrix of movement. I shall call this matrix a 'region'. It is the knowledge of the region, and with it the ability to situate one's current position within the historical context of journeys previously made – journeys to, from and around places – that distinguishes the countryman from the stranger (Ingold, 2000c, p. 219).

Service systems would then be better expressed in a simile of walking, rather than a static conception of dwelling in an unchanging place.

… in real life, for the most part, we do not perceive things from a single vantage point, but rather by walking around them. As the founder of ecological psychology, James Gibson, argued in his classic work on visual perception, the forms of the objects we see are specified by transformations in the pattern of reflected light reaching our eyes as we move about in

their vicinity. We perceive, in short, not from a fixed point but along what Gibson calls a 'path of observation', a continuous itinerary of movement …. But if perception is thus a function of movement, then what we perceive must, at least in part, depend on how we move. Locomotion, not cognition, must be the starting point for the study of perceptual activity .... Or more strictly, cognition should not be set off from locomotion, along the lines of a division between head and heels, since walking is itself a form of circumambulatory knowing. Once this is recognised, a whole new field of inquiry is opened up, concerning the ways in which our knowledge of the environment is altered by techniques of footwork and by the many and varied devices that we attach to the feet in order to enhance their effectiveness in specific tasks and conditions (Ingold, 2011b, pp. 45–46).

A pattern language for service systems thinking is thus better founded on a conception of journeying that includes movement of time, rather than dwelling in a single place and time. This refinement of understanding dwelling was not explicitly expressed by Alexander, but his omission on writing about place is compatible with journeying. At the root of this issue may not be philosophies of either Alexander or Heidegger, but incomplete appreciations in subsequent interpretations.

4.2.3. From semi-lattice to meshwork

The semi-lattice foundational to Alexander's thinking may be limiting for service systems thinking. Certainly, a service system, like a built environment, isn't well represented as a tree. In describing a newsrack at a street corner in Berkeley, "A City is Not a Tree" focuses on the physical invariants.

From the designer's point of view, the physically unchanging part of this system is of special interest. The newsrack, the traffic light and the sidewalk between them, related as they are, form the fixed part of the system. It is te unchanging receptacle in which the changing parts of the system – people, newspapers, money and electrical impulses - can work together. I define this fixed part as a unit of the city. It derives its coherence as a unit both from the forces which hold its own elements together and from the dynamic coherence of the larger living system which includes it as a fixed invariant part.

Of the many, many fixed concrete subsets of the city which are the receptacles for its systems and can therefore be thought of as significant physical units, we usually single out a few for special consideration. In fact, I claim that whatever picture of the city someone has is defined precisely by the subsets he sees as units (Alexander, 1966, p. 48).

This perspective on the physical world is then applied to social structures, concluding that a semi-lattice is a better description.

In a traditional society, if we ask a man to name his best friends and then ask each of these in turn to name their best friends, they will all name each other so that they form a closed group. A village is made up of a number of separate closed groups of this kind.

But today's social structure is utterly different. If we ask a man to name his friends and then ask them in turn to name their friends, they will all name different people, very likely unknown to the first person; these people would again name others, and so on outwards. There are virtually no closed groups of people in modern society. The reality of today's social structure is thick with overlap - the systems of friends and acquaintances form a semilattice, not a tree (Alexander, 1966, p. 51).

If, however, we think that friends are not fixed invariants – i.e. a person can gain and lose social relations with others – we add the dimension of movement and time. We can think of each person not as a point, but as a line.

The animic world is in perpetual flux, as the beings that participate in it go their various ways. These beings do not exist at locations, they occur along paths. Among the Inuit of the Canadian Arctic, for example, ... as soon as a person moves he or she becomes a line. People are known and recognised by the trails they leave behind them .... Animals, likewise, are distinguished by characteristic patterns of activity or movement signatures, and to perceive an animal is to witness this activity going on, or to hear it. [….] The names of animals are not nouns but verbs (Ingold, 2011d, p. 72).

Instead of depicting each person as an organism (within a system boundary) within its environment (outside a system boundary), we can orient towards the person with the environment.

In the science of mind, the absoluteness of the boundary between organism and environment has not gone unquestioned. Thus in a lecture delivered in 1970 the anthropologist Gregory Bateson declared that 'the mental world – the mind – the world of information processing – is not limited by the skin' .... His point was that the processing loops involved in perception and action are not interior to the creature whose mind we are talking about, whether human or non-human, nor can that creature's activity be understood as the merely mechanical output of one or more cognitive devices located in the head. Rather, such activity has to be understood as one aspect of the unfolding of a total system of relations comprised by the creature's embodied presence in a specific environment (Ingold, 2011c, p. 86).

If each person is represented by a line of movement, then he or she intersects with others in a meshwork.

… there is a trail of movement or growth. Every such trail discloses a relation. But the relation is not between one thing and another – between the organism 'here' and the environment 'there'. It is rather a trail along which life is lived. Neither beginning here and ending there, nor vice versa, the trail winds through or amidst like the root of a plant or a stream between its banks. Each such trail is but one strand in a tissue of trails that together …. The meshwork comprise the texture of the lifeworld. This texture is what I mean when I speak of organisms being constituted within a relational field. It is a field not of interconnected points but of interwoven lines; not a network but a meshwork …. [….]

… the lives of organisms generally extend along not one but multiple trails, issuing from a source. 'To live', as the philosopher of biology Georges Canguilhem wrote in his Knowledge of Life of 1952, 'is to radiate; it is to organise the milieu from and around a centre of reference' …. (Ingold, 2011d, pp. 69–70)

The term meshwork was originally borrowed from Henri Lefebvre (Ingold, 2007b, p. 83). It makes adjustments to the ecological approach to perception of J.J. Gibson, biosemiotics from Jakob von Uxekull, being-in-the-world of Martin Heidegger via Hubert Dreyfus, the haeccity of Gilles Deleuze, and embodied presence in environment of Gregory Bateson (Ingold, 2011c, pp. 77–86).

Service systems thinking that puts human beings as the centre of focus may be better served by framing individuals as lines who intersect in meshworks, rather than the hierarchical orientation of a semi-lattice.

4.3. Reinterpretations include issue-seeking, interactive value and wayfaring

Moving forward with service systems thinking based on pattern language suggests some three departures from the doxa for built environments. These subtle differences can manifest as big impacts on theorizing and guiding pattern authoring in a new domain.

4.3.1. From problem-solving to issue-seeking

Alexander's three part rule describes a pattern as a relation between (i) a certain context, (ii) a problem, and (iii) a solution. This simplification (i.e. without the discussion of forces) orients thinking towards problem-solving rather issue-seeking. Issue-seeking is surfaced here as a recognition of (i) the original motivation for architectural programming, and (ii) the issues-based information systems approach of Horst Rittel, towards handling wicked problems.

Architectural programming originated as a process for client engagement in the post-war boom of new elementary schools. "Architectural Analysis" described in 1959 became "Problem Seeking" by 1969 (Schermer, 2015). About the same time that Alexander was founding the Center for Environmental Structure at Berkeley, architectural programming came to be seen as a problem-seeking inquiry, distinct from design as a problem-solving synthesis of facts.

Design is problem-solving; programming is problem-seeking. [....] the aim of programming is to provide a sound basis for effective design. The Statement of the Problem represents the essense and the uniqueness of the project. Futhermore, it suggests the solution to the problem by defining the main issues and giving direction to the designer (Peña & Focke, 1969, p. 4).

Problem definition is contrasted from problem solving, requiring a different attitude and different capabilities.

An *issues* orientation by Rittel was developed concurrently across campus in Berkeley with Alexander's pattern language. The issues-based approach came from an appreciation of how values influence and impact defining problems.

*We have been learning to ask whether what we are doing is the **right** thing to do. That is to say, we have been learning to ask questions about the **outputs** of actions and to pose problem statements in valuative frameworks. [... It] has become less apparent where problem centers lie, and less apparent where and how we should intervene even if we do happen to know what aims we seek. [….]*

By now we are all beginning to realize that one of the most intractable problems is that of defining problems (of knowing what distinguishes an observed condition from a desired condition) and of locating problems (finding where in the complex causal networks the trouble really lies). In turn, and equally intractable, is the problem of identifying the actions that might effectively narrow the gap between what-is and what-ought-to-be (Rittel & Webber, 1973, p. 159).

This description of wicked problems from Horst Rittel came concurrently with research into IBIS (issue-based information systems) (Kunz & Rittel, 1970). In the 1960s and 1970s, academic heretics from planning, philosophy, design methods, operations research, management and leadership pioneered different approaches in the "hippie" era, shown in Table 7 (Culmsee & Awati, 2013, p. 108).

Table 7: Problem category names, and the people who coined them

Hippie	*Left Extreme*	*Right Extreme*
Rittel/Webber	Tame problem	Wicked problem
Simon	Programmed decision	Non Programmed decision
Ackoff	Problem	Mess
Ravetz	Technical Problem	Practical Problem
Heifetz	Technical Problem	Adaptive Problem
Checkland	Hard Systems	Soft Systems
Johnson	Problems to solve	Polarities to manage

Retrospectively, "hard systems" approaches presuming rationality in decision making were came under attack, particularly in OR (Operations Research).

The internal crisis of OR which took place mostly during the 1970s and 1980s was not expressed in these terms, although it can be mapped on to them. Rather the debate was cast in terms of OR's techniques and methodology. Critics such as Ackoff (1979), Checkland (1983) and Churchman (1967) noted the assumption behind standard OR techniques that relevant factors, constraints and the objective function are both established in advance and consensual. Likewise standard formulations of OR methodology (eg: formulate, model, test, solve, implement) took as their foundation the possibility of a single uncontested representation, that of the legitimate decision maker, of the problem situation under consideration. This approach, it has been widely argued, does not prepare OR analysts well for the complexities of the 'swamp' (Schon, 1987).

Traditional OR analysis works well when

- *the client organization is structured as a tight hierarchy,*
- *few of its members are analytically sophisticated,*
- *the organization or relevant unit performs a well-defined repetitive task generating reliable data,*
- *there is general consensus on priorities (Greenberger et al, 1976).*

These conditions describe reasonably well the circumstances in which decisions need to be taken at middle management levels in many large work organizations, where unilateral control is exercised over uncontentious activities (Rosenhead, 2006, p. 761).

The variety of methods to deal with alternative conditions of complexity have become known in the OR community as Problem Structuring Methods.

… PSMs are appropriate for situations characterized by multiple actors, differing perspectives, partially conflicting interests, signifi- cant intangibles and perplexing uncertainties. They can operate in such contexts because they

- *are designed for deployment in a group format,*

- *permit the simultaneous consideration of alternative perspectives,*
- *are participative in nature, with interaction among participants, and between participant and facilitator(s),*
- *iterate between analysis of judgmental inputs and the application of judgement to analytic outputs,*
- *allow closure when participants are satisfied with the progress achieved, rather than requiring commitment to a comprehensive solution of all the interacting strands that make up the problematic situation.*

Evidently, methods like this can only work if those people who must in some way take responsibility for acting on the commitments reached (whether to implement particular aspects of an agreed scheme of action, or to recommend them to the relevant decision makers) are willing to invest very substantial amounts of their time. The dynamics of group decision-making is such that with a problem of any complexity and a group of non-trivial size it will be unusual to reach closure in under a full day (Rosenhead, 2006, p. 762).

One approach coming from OR/MS (Operations Research / Management Science) has been to use Problem Structuring Methods. However, attempts to structuring problems as recurring patterns that are invariant lead to challenges similar as with structuring solutions. For a solution to a problem to be repeatable, the context would also have to be recur exactly. Thus, problem structuring methods (PSMs) can be criticized as unresponsive to variances in context in the real world.

In the human tribe, a single logic only occasionally rules, and multiple ways of seeing any situation exist, not one of which is unequivocally prime unless power structures (foolishly) make it so. This was the milieu in which 'problem structuring methods' emerged (… a misleading phrase since SSM, SC and SODA are all focussed on 'action to improve' not simply on structuring). All three treat models only as intellectual devices ... and put emphasis on intellectual processes in which a group of people will use the devices to help with sense-making in the search for action. It is this emphasis on process ... that has resulted in SSM, SCA and SODA being deemed 'soft' approaches as compared with the 'hard' approaches of the 1950s and 1960s where process is relatively neglected. [….] Thus, in an SSM study, the practitioner-group can decide: 'In this situation, with this group, in this organiz tion with its history, now, useful action would be to engineer a system to do X'. (Checkland, 2006, p. 770).

While architects and designer can be seen as practising an art, soft OR (operations research) approaches introduce methods associated informed by social systems science. Soft Systems Methodology (SSM) extends systems engineering approach divergent views about the definition of problems in complex situations (Checkland & Poulter, 2010). The Strategic Choice Approach (SCA) uses face-to-face workshops to balance decisions on flexibility and commitment, recognizing uncertainties (i) in the working environment, (ii) with guiding values, and (iii) related choices (Friend, 2006). Strategic Options Development and Analysis (SODA) enables a group to create a graphical representation (i.e. causal map) to explore options and explore ramifications in a complex set of goals or objectives (Ackermann & Eden, 2010).

Service systems thinking leads the definition of stakeholders who will and will not be served, and how well they will be served. Each stakeholder will come to a provider with a different set of issues, some that can be predicted and routinely handled, while other unanticipated requests require special attention. Consciously deciding on the scale, scope and speed of

offerings available to stakeholders reflects an attitude expansive to issue-seeking, rather than an attitude reductive to problem-solving.

4.3.2. From quality-wholeness to interactive value

With pattern language as a means, it's hard to argue with nobility of an ends pursuing quality. However, questions rapidly surface. What is meant by quality? Is quality something that can be built into a thing itself, or is it dependent on the interaction? Here is a major distinction between the practicality of (i) quality in a built environment, and (ii) quality in a service system.

Quality in a built environment, from Alexander's philosophy, is something that can be generated with the pattern language into the physical structure. At the publication of *The Timeless Way of Building*, "quality without a name" could be summarized as "an objective quality that things like buildings and places can possess that makes them good places or beautiful places. Buildings and towns with this quality are habitable and alive" (Gabriel, 1996, p. 34). Alternative words of alive, whole, comfortable, free, exact, egoless and external were proposed by Alexander, with "quality without a name" becoming the key label. "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' (Alexander, 1979, p. ix). In reconsidering a quality without a name in software development, the challenge of separating fact from value (and science from philosophy) in the 17th and 18th centuries was being reversed: "Alexander stepped forward and tried to reverse the separation of fact from value. His program was not only to find patterns that explain the existence of the quality without a name but also to find patterns that generate objects with that quality. Furthermore, the patterns themselves must demonstrate the same quality" (Gabriel, 1996, p. 39).

A program could therefore be seen as either quality-generating with a positive effect, or quality-degenerating with a negative effect. Within this paradigm, an objective meaning for quality should coincide with a common appreciation, either favourable or unfavourable, across casual visitors, inhabitants and craftsmen. This phenomenological view of quality, for the craftsman, occurs with the practice of poiesis.

Until about a hundred years ago, the cultivating and nurturing practices of poiesis organized a central way things mattered. The poietic style manifested itself, among other places, in the craftsman's skills for bringing things out at their best. [....] This cultivating, craftsman-like, poietic understanding of how to bring out meanings at their best was alive and well into the late nineteenth century, but it is under attack in our technological age (Dreyfus & Kelly, 2011, p. 206).

This Dreyfus-Kelly view departs from in *Zen and the Art of Motorcycle Maintenance* (Pirsig, 1974) and the *Shop Class as Soulcraft* (Crawford, 2009) philosophies, although they also have skill associated with meaning. In a footnote:

xiv. [....] We are sympathetic with all of these writers, but they remain firmly entrenched in the monotheistic philosophical tradition. Pirsig, like Plato, finds an abstract source of meaning in what he calls 'Quality'. Crawford, like Aristotle, reacts by emphasizing the hands-on, concrete, socially embedded sources of meaning. We go beyond them both in the details of our treatment of poietic skill and also in identifying poiesis as one among several ways the world can be (Dreyfus & Kelly, 2011, p. 243).

Nearly 30 years later, Alexander would evolve "quality without a name" with "life" and "wholeness" in *The Nature of Order*:, and subsequent empirical findings:

1. A previously unknown phenomenon that may be called "life" or "wholeness" has been observed in artifacts. This quality has been noticed in certain works of art, buildings, public space, parts of buildings, and in a wide range of other humanmade things. [….]

3. This quality of life seems to be correlated with the repeated appearance of 15 geometric properties—or geometrical invariants—that appear throughout the object's configuration. (demonstrated) (Alexander, 2007).

Quality-strengthening sequencing provides a progressive differentiation of space through a mindful ordering of decisions to be made. The strengthening of quality may be exhibited through the preserving of wholeness across a field of mutually reinforcing centers. For a generative sequence, centers have to be laid down in an orderly form. An unfolding that preserves wholeness from one stage to the next may not be known in advanced, so experimenting and/or testing may be done to identify good sequences and preclude backtracking to recover from bad subsequences. Taking a scientific foundation to architecting has led to a position emerging "objective measures of coherence in complex systems, and the unavoidable relationship between structure, fact, and beauty" (Alexander, 2003, pp. 8–9).

Quality in a service system may not be best expressed as geometric invariants. In contrast, the doxa on service systems typically separates value from the outcome. Interactive value is depicted as a process where enjoyment takes place over a period of time, as compared to the value in exchange that occurs at only a point in time. In the larger service system, independent transactions are de-emphasized relative to the ongoing relationship in the context of mutually changing environments.

From [the] value constellation perspective, value is co-produced by actors who interface with each other. They allocate the tasks involved in value creation among themselves and to others, in time and space, explicitly or implicitly. This opens up many opportunities for defining relationships between actors and reassigning activities. If we look at a single relationship in a co-productive system (for example, that between customer and supplier) this view implies that the customer is not only a passive orderer / buyer / user of the offering, but also participates in many other ways of consuming it, for instance in its delivery. Etymologically, consumption means value creation, not value destruction; this sense of consumption is inherent in the "value constellation" point of view. Furthermore, as actors participate in ways that vary from one offering to the next, and from one customer / supplier relationship to the next, it is not possible to take given characteristics for granted: co-producers constantly reassess each other, and reallocate tasks according to their new values of the comparative advantage each other to have (Normann & Ramirez, 1994, p. 54).

With foundations in systems theory, coproduction is a concept that can be appreciated across disciplines -- of science, management, engineering and design -- as a common foundation for service systems thinking. The most rigourous formalism related to coproduction takes 5 pages to build up the following definition:

2.31. Coproducers: two or more objects, properties and/or environments that are producers of the same product.

*Since no producer is ever sufficient for its product, every producer has at least one coproducer. The set of all coproducers of a product **y** is the cause of **y**, since the set is sufficient as well as necessary for **y**. (Ackoff & Emery, 1972, p. 23)*

At the most basic level, a service system can't have just a provider. A service system has to have a coproducer, i.e. a customer or a stakeholder who participates in the outcome.

The outcome produced by a (service) system has been recognized to have value in two ways: use-value (alias value-in-use) and exchange value (alias value-in-exchange). With the rise of service-dominant logic, the concept of value as evolved into an understanding that it is phenomenological and uniquely co-created between an offering (the firm's value proposition) and an individual or actor. In addition, such a value being created may sit in different types of consciousness at different times, i.e.:

… consciousness as being of two types – phenomenal consciousness (P-consciousness) and access consciousness (A-consciousness). P-consciousness is the raw experience of movement, forms, sounds, sensations, emotions and feelings, while A-consciousness is perception, introspection, reflection, in a sense, a more heightened awareness of a phenomenon. This suggests that if we understand value creation as creating something 'good' as an outcome, the consciousness of that goodness during the phenomenological experience may be different from the consciousness of that goodness imagined before, or evaluated after, the phenomenon. One can even argue that within the phenomenon, the actor is merely 'in practice' of resource integrating, with a lower level consciousness of what is 'good', or what is of 'value', from the resources being integrated within the value-creating phenomenon. In other words, even if value is uniquely created within a phenomenon, there could possibly be two levels of consciousness of that value that could exist at different times: P-consciousness of value (P-C-value) or A-consciousness of value (A-C-value) (Ng & Smith, 2012, pp. 227–228).

An offering has a tangible and/or intangible nature, affording an actor to perform an action on it, in a variety of contexts through situational skills and competencies. The value (i) *before* the experience with the offering (i.e. A-C-value ex-ante on expected P-C-value) can be separated from the value (ii) *during* the experience (i.e. perceived P-C-value), and the value (iii) *after* experience (i.e. A-C-value ex-post evaluation on P-C-value). Coveting an iPhone before purchase, using the iPhone in service, and putting an iPhone in a pocket after a call each have different assessments of value.

Service systems thinking is based on interactive value with parties in active ongoing engagement. Only with the advent of "smart" technologies have built environments such as buildings and/or physical infrastructure been considered to be interactive.

4.3.3. From anti-patterns to wayfaring

For built environments, a pattern can be described as "relatively more alive, or more dead" and "relatively stable, and self-sustaining – or it is relatively unstable and self-destroying".

Each of these "dead" patterns is incapable of containing its own forces, and keeping them in balance. What happens then, is that these forces leak out, beyond the confines of the pattern where they occur, and start to infect the other patterns (Alexander, 1979, p. 127).

In the end, the whole system must collapse. The slight stress caused by the overflow of forces from these first unstable patterns spreads first to nearby patterns – and then then

spreads still further, since these nearby patterns become unstable and destructive, too (Alexander, 1979, p. 130).

The source of the *anti-patterns* idea originated not from architecting built environments, but instead from a software developer outside of the core community cataloguing new patterns.

This suggestion is inspired by a story told about Thomas Edison. While he was trying to build the first electric light, he tried hundreds of possible materials for filaments. Every experiment came out a failure. At some point, someone remarked to him that all those must be discouraging. He responded that he was not discouraged – after all, he now knew hundreds of things that didn't work.

If one does not know how to solve a problem, it must nevertheless be useful to know about likely blind alleys. This is particularly true when something appears at first to be a solution but further analysis proves it is not. Even if one knows the right answer, however, it may be important to point out particular hazards associated with that answer or seemingly trivial variations of that answer that turns solutions into non-solutions.

*I have coined the term **antipattern** to refer to such non-solutions. An antipattern is just like a pattern, except that instead of a solution it gives something that looks superficially like a solution but isn't one. If an antipattern is coupled with a pattern, it might be tempting to think of it as a pattern-antipattern pair. That would impart a certain energy to the solution (Koenig, 1998, p. 387).*

This description of anti-pattern orients towards a problem-solving orientation. Bounded problem-solving distracts explorers from appreciating contexts, e.g. a filament that fails to perform under one set of circumstances may turn out to the ultimately best material in a reframed set of circumstances. Further, an anti-pattern was originally envisioned in a dialectic with a pattern, combining fruitful and fruitless paths towards generating better patterns.

Pursuing improvement of an end (i.e. quality without a name, life or wholeness) can be seen more as a journey, and less as rush from origin to destination. Piecemeal development can be better described as *wayfaring*, and less as *transport*:

… I have established a contrast between two modalities of travel, namely wayfaring and transport. Like the line that goes out for a walk, the path of the wayfarer wends hither and thither, and may even pause here and there before moving on. But it has no beginning or end. While on the trail the wayfarer is always somewhere, yet every 'somewhere' is on the way to somewhere else. The inhabited world is a reticulate meshwork of such trails that is continually being woven as life goes on along them. Transport, by contrast, is tied to specific locations. Every move serves the purpose of relocating persons and their effects, and is oriented to a specific destination. The traveller who departs from one location and arrives at another is, in between, nowhere at all. Taken together, the lines of transport comprise a network of point-to-point connections. In the colonial project of occupation, this network spreads across the territory, overriding the tangled trails of inhabitants (Ingold, 2006, pp. 26–27).

Wayfaring is an embodied experience of living not inside places, but through, around, to and from them, from and to places elsewhere. A line of travel is an ongoing process of growth

and development, or self-renewal. Wayfinding has a temporal character, unfolding over time rather than space (Ingold, 2000c, p. 238).

In [a fleeting moment in a never-ending process] is compressed the movement of the past that brought it about, and in the tension of that compression lies the force that will propel it into the future. It is this enfolding of a generative past and a future potential in the present moment, and not the location of that moment in any abstract chronology, which makes it historical (Ingold, 2011a, pp. 26–27).

Navigating a maze reflects a problem-solving orientation. A maze presents the challenge of finding a way out of the multicursal puzzle with many branches, choices of path, and dead ends. A labyrinth, however, is a unicursal puzzle with a single non-branching path, so there's only one entrance and one exit. Navigating a labyrinth holds few perils of getting lost, so the journey is attentional in nature, rather than intentional (Ingold, 2007a, pp. 52–57).

Service systems evolve over time, so wayfaring can lead to discovery of new modes of value for stakeholders and/or providers on an ongoing basis, or in an incidental situation. A path which is seen as an anti-pattern in one context could be a positive feature in another context. Considering alternative spatio-temporal frames could be more productive than narrowing to a single frame and labelling an antipattern.

The amplifications, rephilosophizations and reinterpretations of a new pattern format for service systems thinking doesn't invalidate the usefulness of pattern languages already developed for built environments. Outside of built environments, however, the presumptive doxa might be re-examined.

5. Pattern languages are generated and legitimized in communities

This pattern manual for service systems thinking is proposed as an initial position for discussion amongst a new community of practice (Wenger, 1999). At this point, the thinking is less refined than the charter published by Alexander in Berkeley in 1967. Ongoing discussion should reshape some of the concepts, terminology and format.

Since the original 1977 and 1979 books predate the invention of the World Wide Web in 1989, the technology – as well as copyright conventions predating open source licensing beginning 1998 – of that time limited collaboration evolution of the content.

*In fact the introductory section of **A Pattern Language**, "Using This Book," states, "In this book, we present one possible pattern language, of the kind called for in **The Timeless Way**." This suggests that many more patterns and pattern languages would be written, and that the existing patterns might well be re-used, modified, or even largely discarded.*

But this is not what happened. In part because the book was such a successful complete piece of literature, the original 253 patterns in effect became frozen in time. Patterns and parts of patterns that even the original authors now repudiate have remained unchanged, and no published patterns have been added to this original corpus.

Also contrary to the initial intention ..., the publisher has not released the content of the patterns into the public domain, and several websites that tried to reproduce the content have received warnings of copyright infringement. This represents a severe constraint on the further use, modification and addition to pattern languages in architecture. [….]

Still another limitation of the dominant form of architectural pattern languages is in their basis on paper. Alexander has created a website that uses the hyperlink function, but it requires a subscription payment, and the patterns cannot be modified or added to (Cunningham & Mehaffy, 2013, p. 6).

Wiki was invented in March 1995 by Ward Cunningham (Cunningham, 1995). The Hillside Group formed in August 1993 organized the first PLoP (Pattern Languages of Programs) conference in August 1994. In March 1995, an invitation was sent to the Patterns mailing list to collaborate on the Portland Pattern Repository. The feature of hyperlinking within the wiki complemented the cross-referencing nature of pattern language.

As a technology, it would take another decade for wiki to become popular. Wikipedia was founded in 2001, and the word "wiki" would only enter the Oxford English Dictionary in 2007. Few pattern communities have taken advantage of wiki technology since the Portland Pattern Repository. The ScrumPLoP community is an exception, with online content since 2008.

The wiki of 20th century unfortunately only supports well objective modes of inquiry, through inductive consensual or analytic deductive ways of knowing (Churchman, 1971). Alternative designs, shows in Table 8, should also support multiple realities and dialectic, potentially leading to a systems approach.

Table 8: The design of inquiring systems

Way of knowing	*Inquiring System*	*Philosopher*
First	Inductive Consensual (agreement)	John Locke
Second	Analytic Deductive (fact nets)	Gotfried Wilhelm Leibniz
Third	Multiple Realities (representations)	Immanuel Kant
Fourth	Dialectic (conflict)	Georg Wilhelm Friedrich Hegel
Fifth	Systems Approach (progress, sweeping in)	Edgar Arthur Singer; C. West Churchman

These additional subjective modes of inquiry are being pioneered on federated wiki technology initiated by Cunningham (Finley, 2012). Ongoing development is following a pace of piecemeal growth, with feature enhancement requests welcomed and openly discussed.

Discussion on creating a new pattern language for service systems thinking is welcomed.

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