Service Systems Thinking, with Generative Pattern Language

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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*

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Publications

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Publication Date	Publication Title	Author(s)	Form
October 2016	"Pattern Manual for Service Systems Thinking: A proposal for discussion" [view abstract and article]	David Ing	article in review for Pr the 2016 Internationa Conference
October 2016	"Curriculum Making for Trito Learning: Wayfaring along a meshwork of systems thinking" [view abstract and presentation slides]	David Ing	presentation at RSD5 Relating Systems Thir Design
	"Service Systems and the Systems Sciences"		presentation at Wuha

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2016/10/28 Pattern Manual for Service Systems Thinking

Submitted by daviding on Thu, 09/29/2016 - 21:00

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Content

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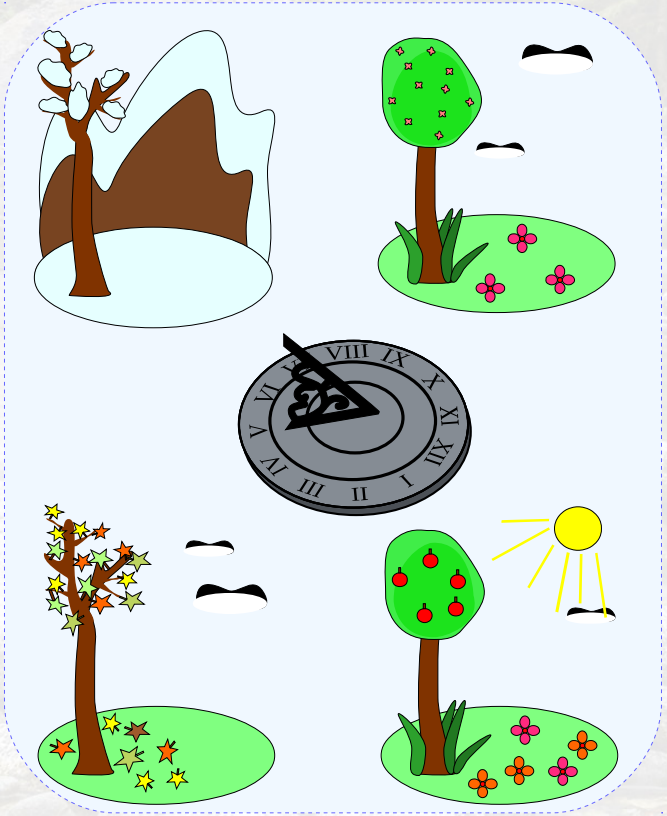
- [view/download article as PDF] (2.2 MB)

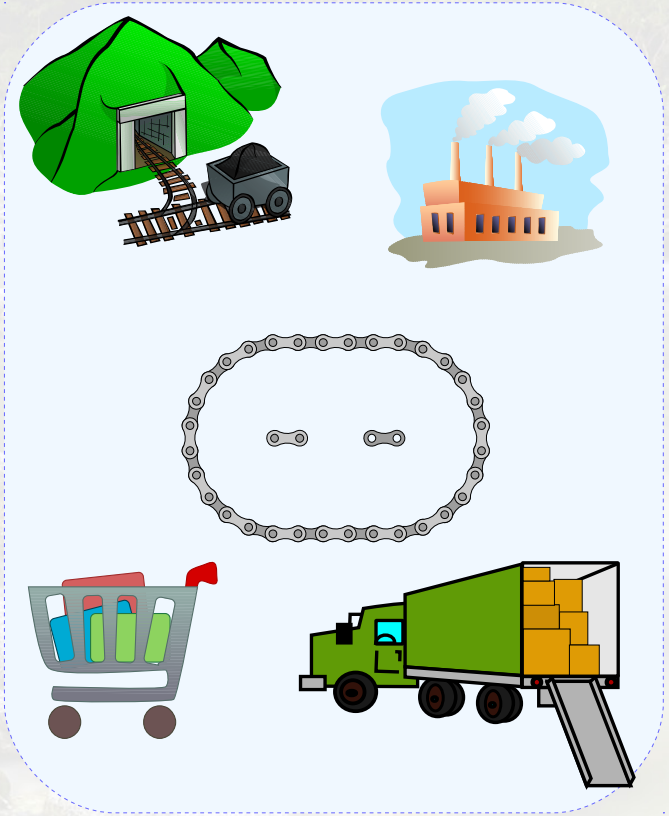
Agenda

1. Architecting versus designing
2. Alexandrian example → services
3. Exercise: trying out pattern language
4. Systems thinking + service systems
5. Ignorance and errors

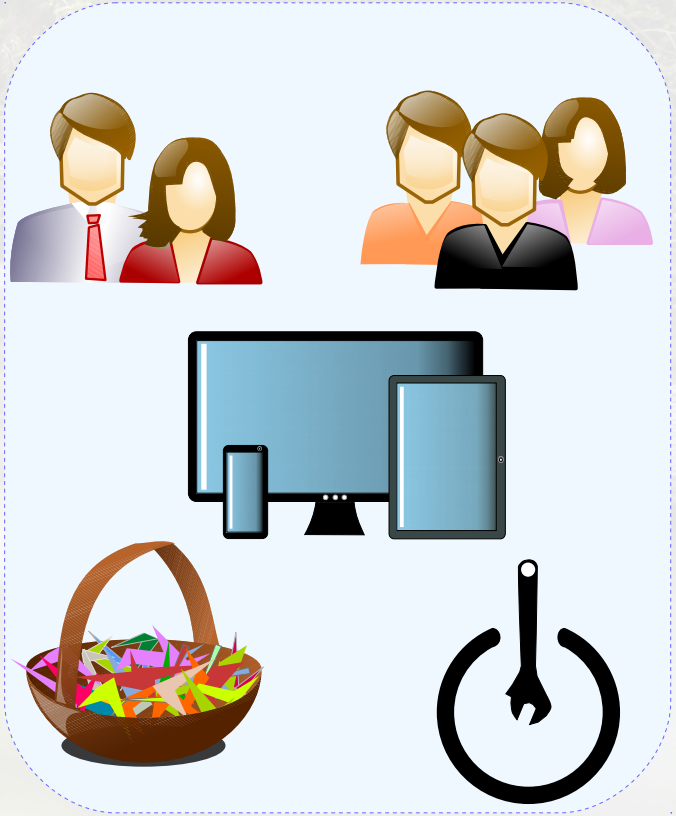
Is thinking different across agricultural systems, industrial systems, and service systems?



Agricultural Systems



Industrial Systems



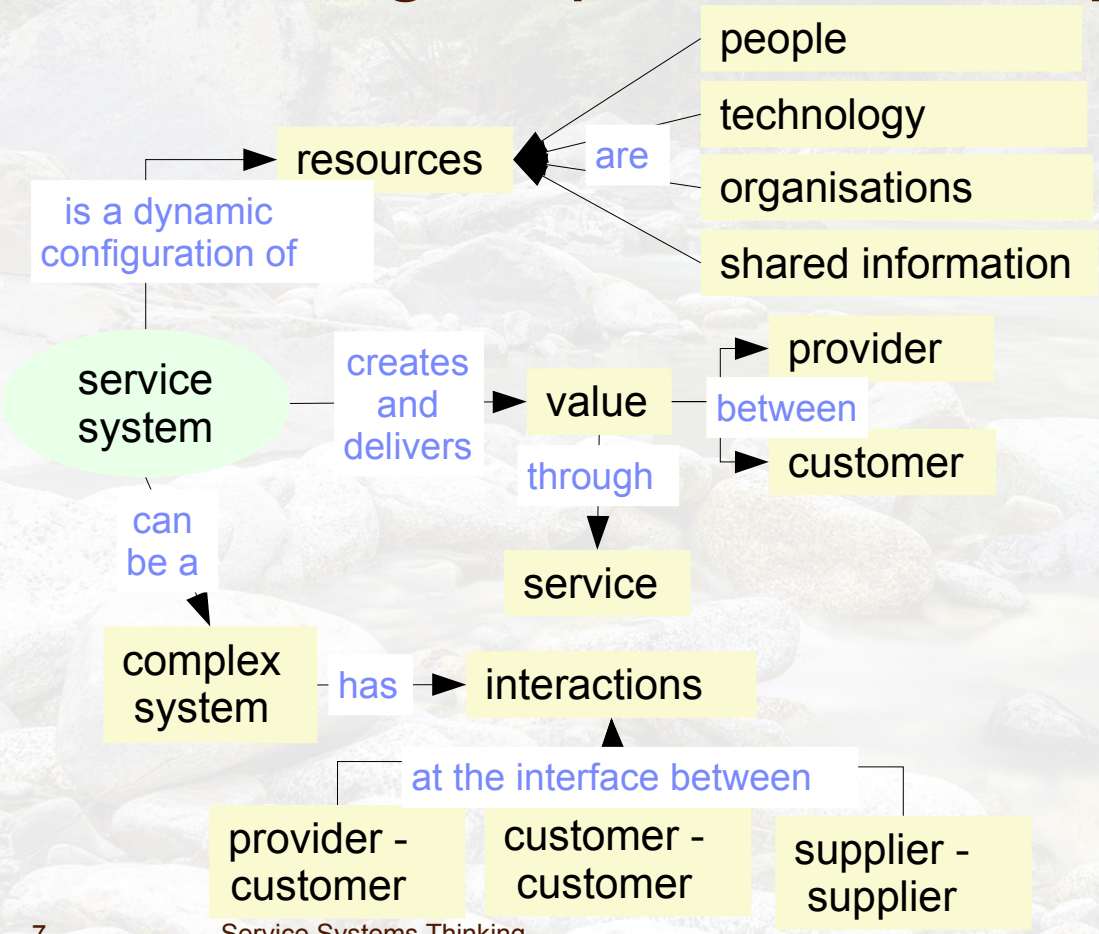
Service Systems(?)

Service systems in our society can be ranked from concrete to abstract, as subjects for schoolchildren

Systems that move, store, harvest, process	• Transportation	K
	• Water and waste management	1
	• Food and global supply chain	2
	• Energy and energy grid	3
	• Information + communications (ICT) infrastructure	4
Systems that enable healthy, wealthy and wise people	• Building and construction	5
	• Banking and finance	6
	• Retail and hospitality	7
	• Healthcare	8
	• Education (including universities)	9
Systems that govern	• Government (cities)	10
	• Government (regions / states)	11
	• Government (nations)	12

Source: Spohrer, James C., and Paul P. Maglio. 2010. "Toward a Science of Service Systems: Value and Symbols." In Service Science: Research and Innovations in the Service Economy, edited by Paul P. Maglio, Cheryl A. Kieliszewski, and James C. Spohrer, 157–94. 10.1007/978-1-4419-1628-0_9

After 2007, service systems have been recognized as the largest part of developed economies globally



A service system can be defined as a dynamic configuration of resources (people, technology, organisations and shared information) that creates and delivers value between the provider and the customer through service.

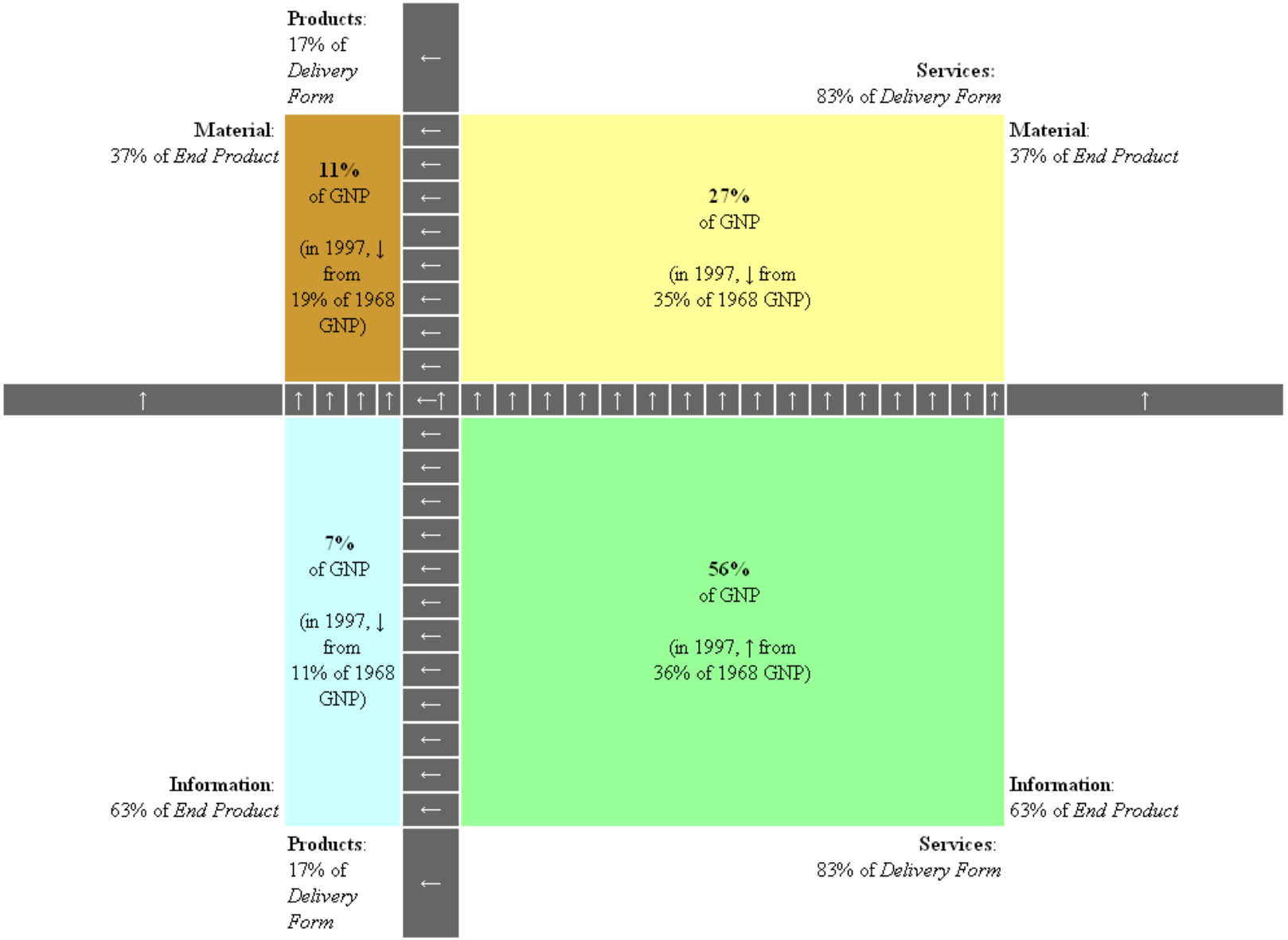
In many cases, a service system is a complex system in that configurations of resources interact in a non-linear way.

Primary interactions take place at the interface between the provider and the customer.

However, with the advent of ICT, customer-to-customer and supplier-to-supplier interactions have also become prevalent.

These complex interactions createa system whose behaviour is difficult to explain and predict.

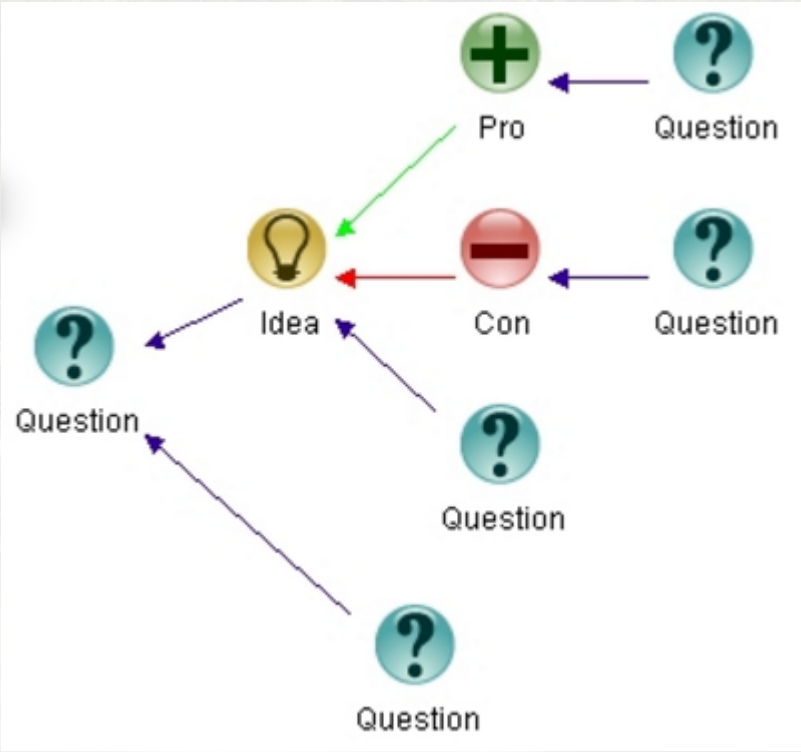
(IfM and IBM, 2008, p. 6)



Uday M. Apte, Uday S. Karmarkar and Hiranya K Nath, "Information Services in the US Economy: Value, Jobs and Management", *Business and Information Technologies (BIT) Project*, Anderson School of Management at UCLA, June 2007

Wicked problems ↔ IBIS: Issues-Based Information Systems

1. There is no definitive formulation of a wicked problem.
2. Wicked problems have no stopping rule.
3. Solutions to wicked problems are not true-or-false, but good or bad.
4. There is no immediate and no ultimate test of a solution to a wicked problem.
5. Every solution to a wicked problem is a "one-shot operation"; because there is no opportunity to learn by trial and error, every attempt counts significantly.
6. Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan.
7. Every wicked problem is essentially unique.
8. Every wicked problem can be considered to be a symptom of another problem.
9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution.
10. The social planner has no right to be wrong (i.e., planners are liable for the consequences of the actions they generate). (Rittel & Weber, 1973)

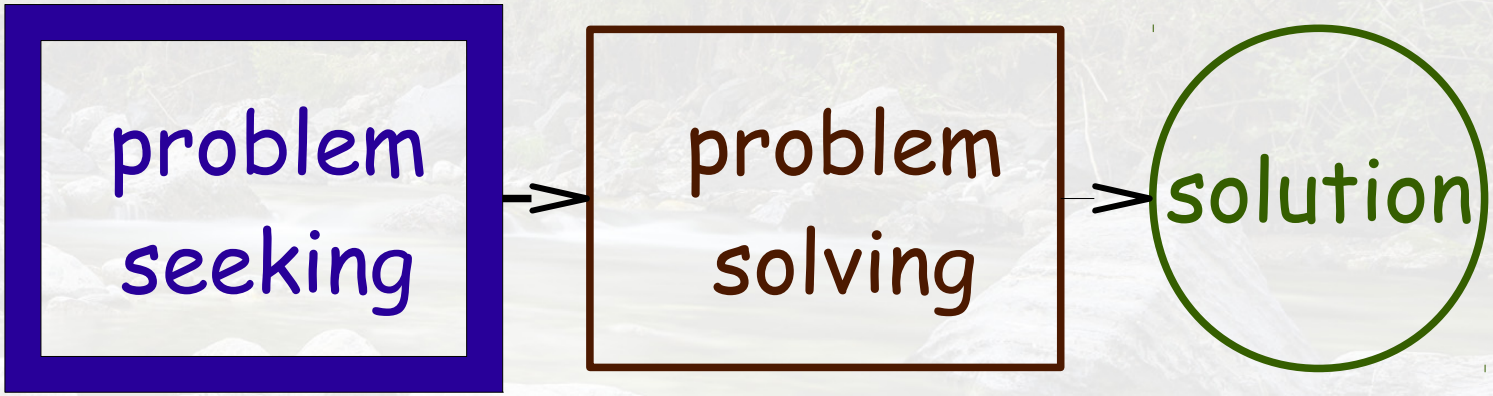


...type of information system meant to support the work of cooperatives like governmental or administrative agencies or committees, planning groups, etc., that are confronted with a problem complex in order to arrive at a plan for decision… (Kunz & Rittel, 1970)

In 1969, problem seeking was *architectural programming*, and problem solving was *design*

Programming is a specialized and often misunderstood term. It is "*a statement of an architectural problem* and the requirements to be met in offering a solution. While the term is used with other descriptive adjectives such as *computer* programming, *educational* programming, *functional* programming, etc., in this report, programming is used to refer only to architectural programming.

Why programming? The client has a project with many unidentified sub-problems. The architect must define the client's total problem.



Design is problem solving; programming is problem seeking. The end of the programming process is a statement of the total problem; such a statement is the element that joins programming and design. The "total problem" then serves to point up constituent problems, in terms of four considerations, those of form, function, economy and time. The aim of the programming is to provide a sound basis for effective design. The State of the Problem represents the essense and the uniqueness of the project. Furthermore, it suggests the solution to the problem by defining the main issues and giving direction to the designer (Pena and Focke 1969, 3).

All architecture is design, but not all design is architecture

Architectural thinking as
shaping the structure of the environment ...

Living systems are *autopoietic*,
self-organizing and self-generating;

assembly lines are *allopoietic*,
externally-organizing and externally-generating.

Design thinking as
divergent steps (i.e. creating choices) and
convergent steps (i.e. making choices)

Pacing layers emphasize coevolution and learning

SITE

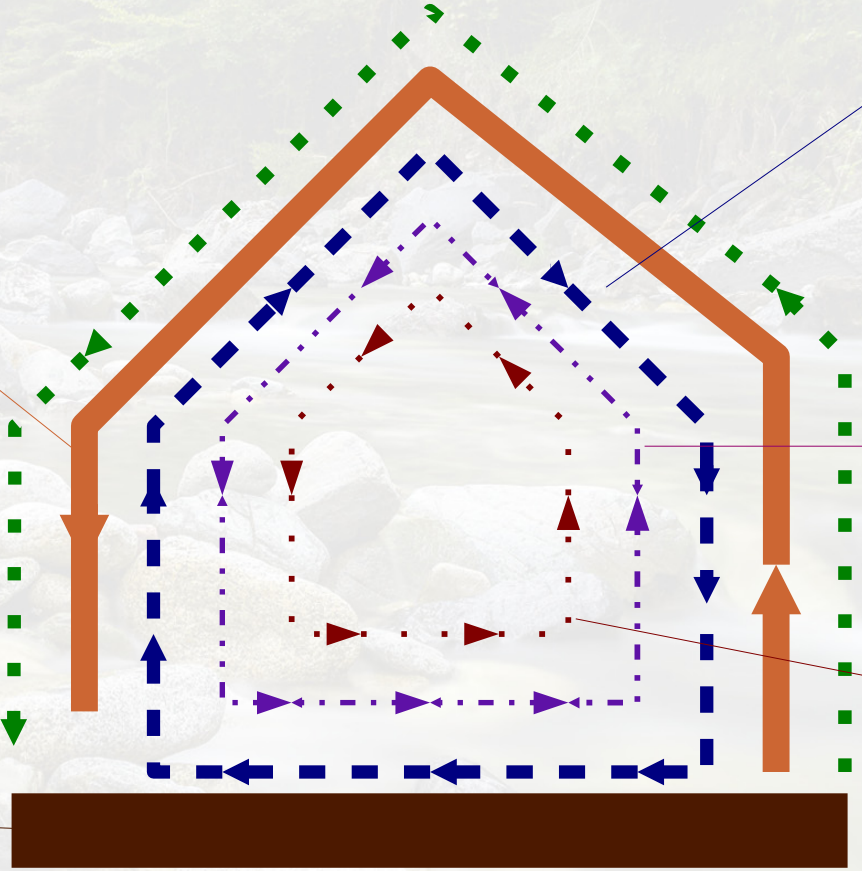
This is the geographical setting, the urban location, and the legally defined lot, whose boundaries outlast generations of ephemeral buildings. "Site is eternal", Duffy agrees.

STRUCTURE

The foundation and load-bearing elements are perilous and expensive to change, so people don't. These are the building. Structural life ranges from 30 to 300 years (but few buildings make it past 60, for other reasons).

SKIN

Exterior surfaces now change every 20 years or so, to keep up with fashion or technology, or for wholesale repair. Recent focus on energy costs has led to re-engineered Skins that are air-tight and better-insulated.



SERVICES

These are the working guts of a building: communications wiring, electrical wiring, plumbing, sprinkler system, HVAC (heating, ventilation, and air conditioning), and moving parts like elevators and escalators. They wear out or obsolesce every 7 to 15 years. Many buildings are demolished early if their outdated systems are too deeply embedded to replace easily.

SPACE PLAN

The interior layout, where walls, ceilings, floors, and doors go. Turbulent commercial space can change every 3 years; exceptionally quiet homes might wait 30 years.

STUFF

Chairs, desks, phones, pictures; kitchen appliances, lamps, hair brushes; all the things that twitch around daily to monthly. Furniture is called mobilia in Italian for good reason.

Source: Stewart Brand. 1994. *How Buildings Learn: What Happens after They're Built*. New York: Viking.

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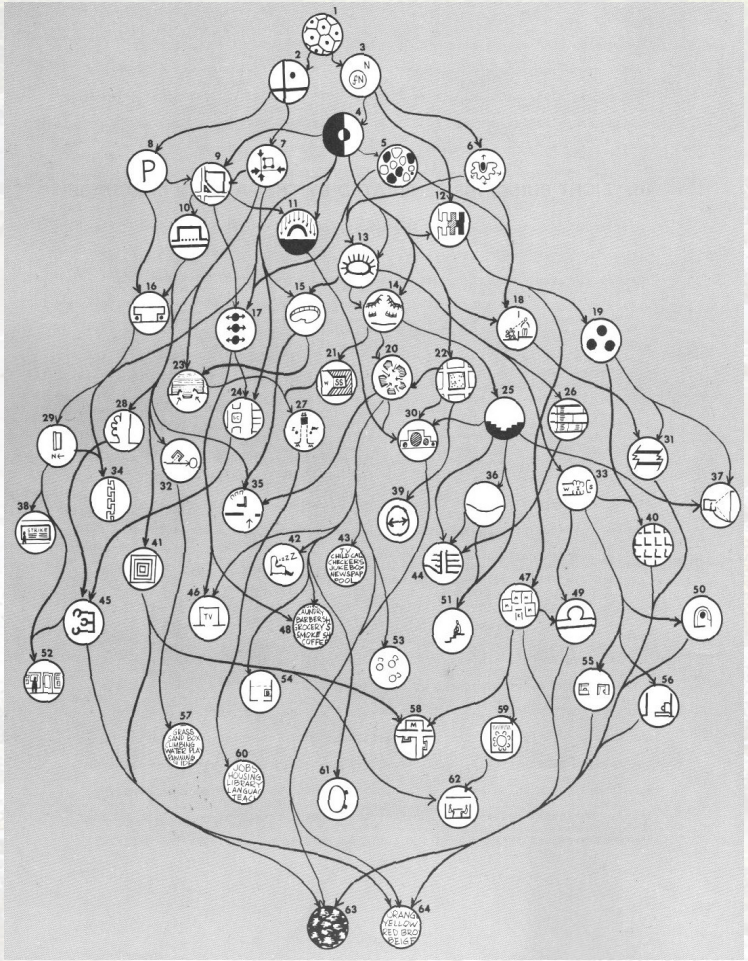
Pattern language intends to give 3 types of help



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).

Try who+what, how+why, where+when, containing, contained

(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?

Minding children: who+what, how+why, where+when, containing, contained

(i) Pattern label	Minding children
	◊ ◊ ◊
(ii) Voices on issues (who and what)	(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)	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
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(v) Containing systems (slower and larger)	For extended family, schools and community workers, what personal responsibilities inhibit service engagement?
(vi) Contained systems (faster and smaller)	For other parents at the MSC at the same time, would you look after my kids like I look after yours?

Alexandrian format mapped to proposed service systems thinking

Format for service systems thinking	
(i) Pattern label	An interaction phrased as a present participle
(ii) Voices on issues (who and what)	Archetypal roles of stakeholders, with concerns and interests posed as questions
(iii) Affording value(s) (how and why)	Objects and/or events that enable modes of practised capacities for independent or mutual action
(iv) Spatio-temporal frames (where and when)	Occasions at which dwelling in issues and affordances are salient and at hand
(v) Containing systems (slower and larger)	Constraining conditions in which the pattern operates, potentially where multi-issue messes are dissolved
(vi) Contained systems (faster and smaller)	Opportunistic conditions which the pattern contains, potentially allowing ad hoc resolving of a specific issue at hand

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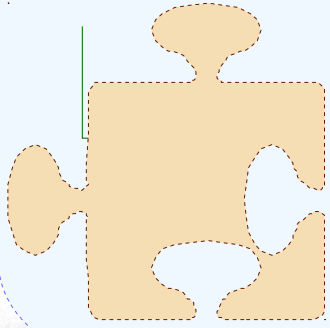
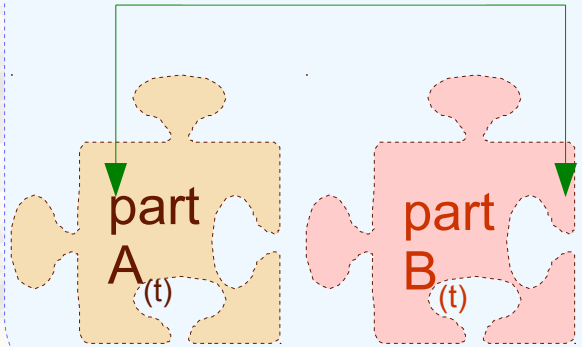
Systems thinking is a perspective on wholes, parts and their relations

containing whole

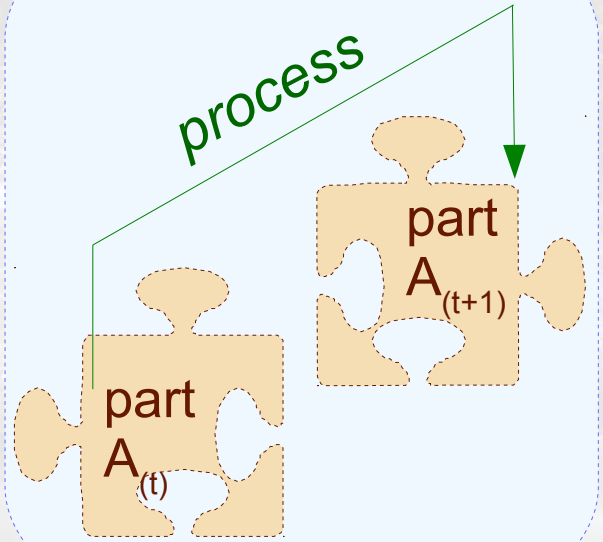
Function (non-living) or role (living)



structure



process



Function
"contribution of the part to the whole"

Structure
"arrangement in space"

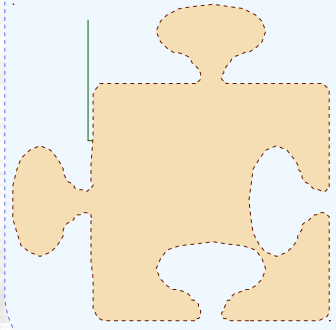
Process
"arrangement in time"

Source: Ing, David. 2013. "Rethinking Systems Thinking: Learning and Coevolving with the World." *Systems Research and Behavioral Science* 30 (5): 527–47. doi:10.1002/sres.2229. Gharajedaghi, Jamshid. 1999. *Systems Thinking: Managing Chaos and Complexity : A Platform for Designing Business Architecture*. Elsevier. http://books.google.ca/books?id=7N-sFxFntakC .

In authentic systems thinking, synthesis precedes analysis and the containing whole is appreciated

containing whole

Function (non-living) or role (living)



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

Source: Ackoff, Russell L. 1981. *Creating the Corporate Future: Plan or Be Planned For. New York:* John Wiley and Sons. http://books.google.com/books?id=8EEO2L4cApsC.

Panarchy theory and resilience science see system connections to larger-slower levels, and smaller-faster levels

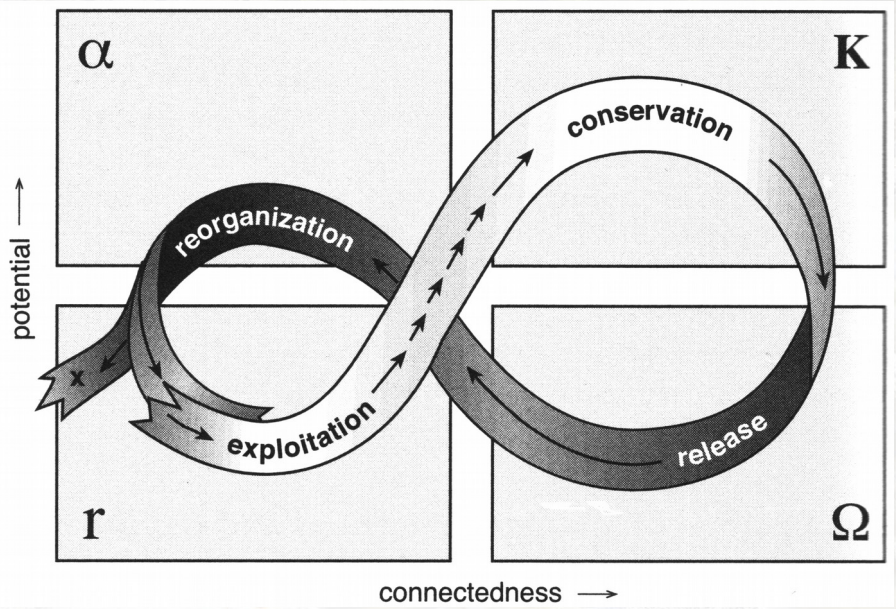
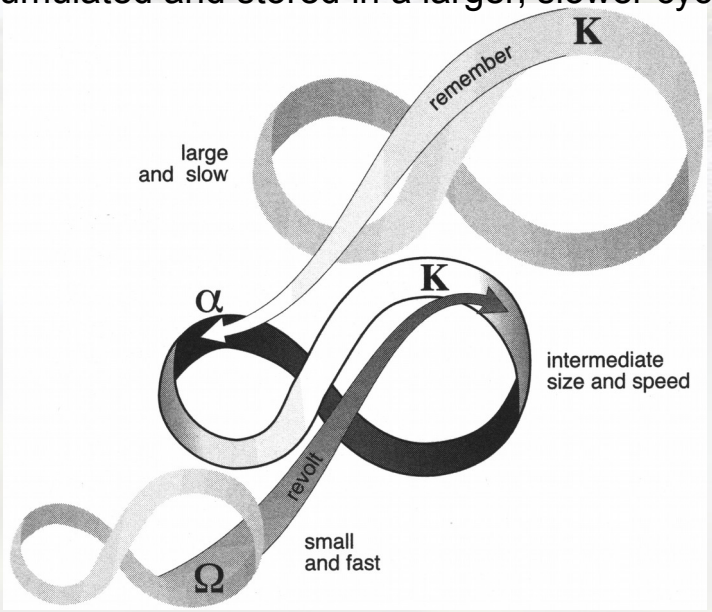


Figure 4. A stylized representation of the four ecosystem functions (r, K, Ω, α) and the flow of events among them.

Figure 7. Panarchical connections. [....] the "revolt" connection ...can cause a critical change in one cycle to cascade up to a vulnerable stage in a larger and slower one. The ... "remember" connection ... facilitates renewal by drawing on the potential that has been accumulated and stored in a larger, slower cycle.



Source: C. S. Holling 2001. "Understanding the Complexity of Economic, Ecological, and Social Systems." *Ecosystems* 4 (5): 390–405. doi:10.1007/s10021-001-0101-5. http://dx.doi.org/10.1007/s10021-001-0101-5.

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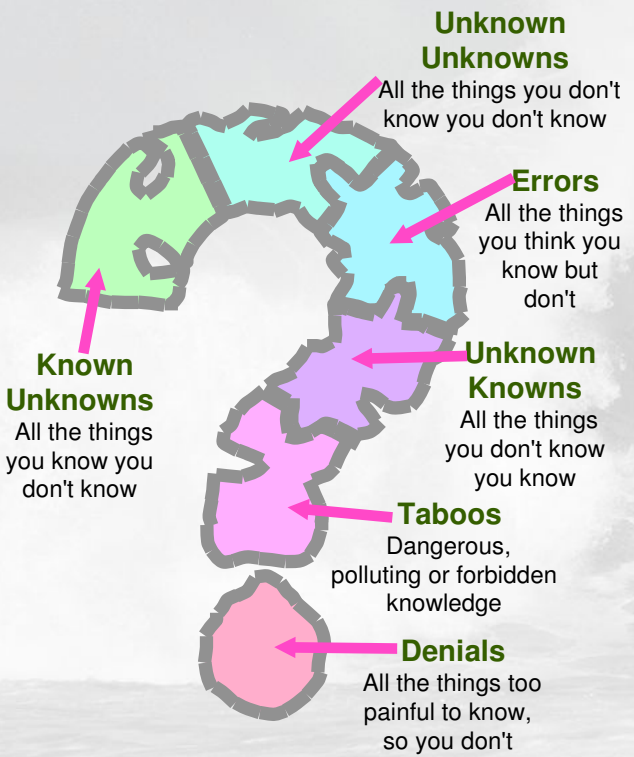
With known knowns in science eroding by systemic world changes, collective learning on why, how + when-where-whom gains value



Colloquial description:	**Learning why**	**Learning how**	**Learning when, learning where, learning whom**
Pursuits:	Uncovering universal truths	Instrumental rationality towards a conscious goal	Values in practice based on judgement and experience
Primary intellectual virtue:	**Episteme**	**Techne**	**Phronesis**
Translation / interpretation:	Science (viz. epistemology)	Craft (viz. technique)	Prudence, common sense
Type of virtue:	Analytic scientific knowledge	Technical knowledge	Practical ethics
Orientation:	Research	Production	Action
Nature:	Universal	Pragmatic	Pragmatic
	Invariable (in time and space)	Variable (in time and space)	Variable (in time and space)
	Context-independent	Context-dependent	Context-dependent

[1] Ing, David, Minna Takala, and Ian Simmonds. 2003. “Anticipating Organizational Competences for Development through the Disclosing of Ignorance.” In Proceedings of the 47th Annual Meeting of the International Society for the System Sciences. Hersonissos, Crete. http://systemicbusiness.org/pubs/2003_ISSS_47th_Ing_Takala_Simmonds.html

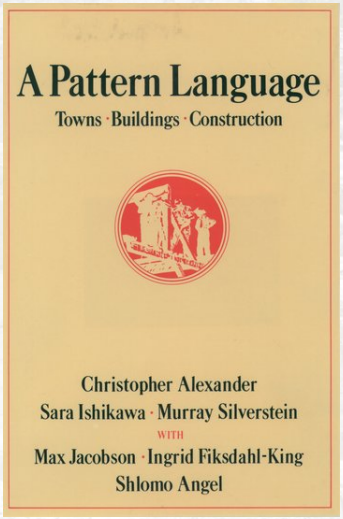
[2] Ing, David. 2013. “Rethinking Systems Thinking: Learning and Coevolving with the World.” *Systems Research and Behavioral Science* 30 (5): 527–47. doi:10.1002/sres.2229.

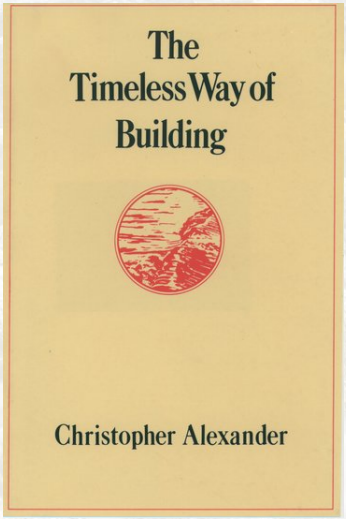
If they can get you asking the wrong questions, they don't have to worry about answers (Thomas Pynchon)

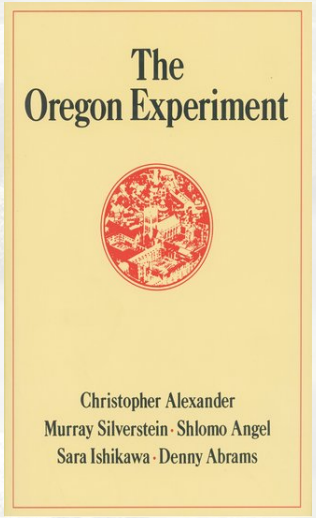
Type **1** error	**False positive**: finding a (statistical) relation that isn't real
Type **2** error	**False negative**: missing a (statistical) relation that is real
Type **3** error	**Tricking ourselves**: Unintentional error of solving wrong problems precisely (through ignorance, faulty education or unreflective practice)
Type **4** error	**Tricking others**: Intentional error of solving wrong problems (through malice, ideology, overzealousness, self-righteousness, wrongdoing)

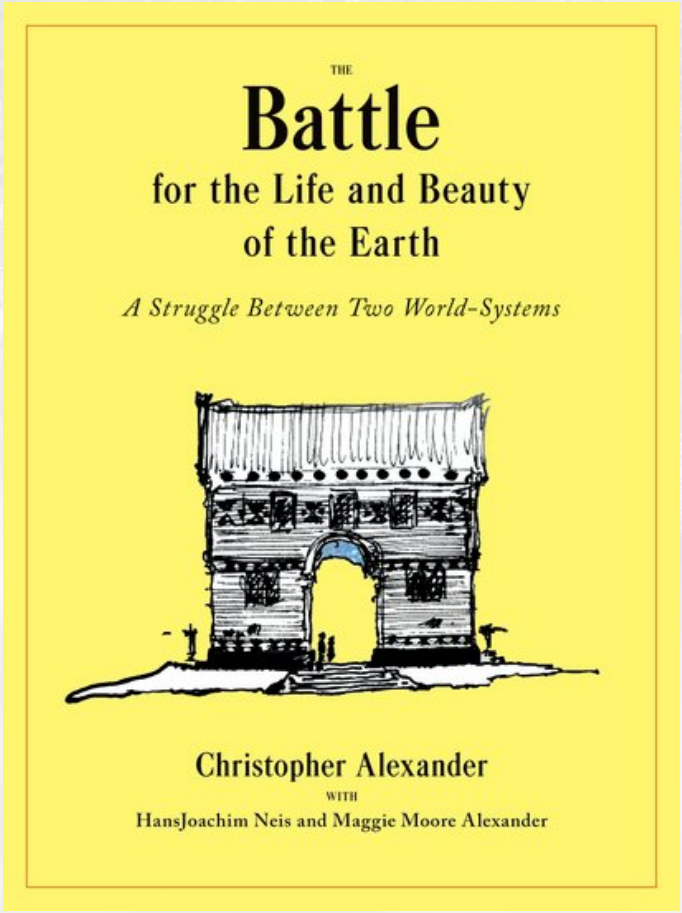
Ian I. Mitroff and Abraham Silvers. 2010. *Dirty Rotten Strategies: How We Trick Ourselves and Others into Solving the Wrong Problems Precisely.* Stanford University Press.

The writing of 1975-1979 by Alexander was prescriptive; the 2012 is reflections on practice









Pattern manual as an initial position for a community of practice

A Pattern Language • The original 253 patterns in effect became frozen in time • The publisher has not released the content of the patterns into the public domain • A severe constraint on the further use, modification and addition to pattern languages (Cunningham & Mehaffy, 2013, p. 6)	→	• Federated wiki?

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

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

Amplifications from Alexandrian to service systems thinking

1.	Shared meaning on the situated	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).
2.	Systems thinking and complexity	Systems generating systems 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).
3.	Method content + development process	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).

Rephilosophizations from Alexandrian to service systems thinking

1.	From structuralism to alternative stable states	• Criticism of teleology • Three types of change in biological evolution: (I) environmental change; (ii) somatic (cellular) change; and (iii) genotypic change (Bateson 1963) • Teleonomic processes through closed programs or open programs • Regime shifts (ecosystem ecology, community ecology)
2.	From dwelling to journeying	• Being served over a period of time (a journey) rather than in a moment of time (dwelling)? • Heidegger world-time and time-as-ordinarily-conceived • Places existing not in space, but as nodes in a matrix of movement (Ingold 2000)
3.	From semi-lattice to meshwork	• "A City is Not a Tree" focuses on physical invariants • Social relations with movement and time (e.g. gaining and losing friends) • Each person not as a point, but as a line (Ingold 2011) • Meshworks as trails of movements or growth

Reinterpretations from Alexandrian to service systems thinking

1.	From problem-solving to issue-seeking	• Design is problem-solving; [architectural] programming is problem-seeking (Peña & Focke, 1969, p. 4). • Issues-based approach appreciating how values influence and impact defining problems (Rittel & Webber, 1973, p. 159). • Problem Structuring Methods (e.g. Soft Systems Methodology, Strategic Choice Approach, Strategic Optoins Development and Analysis)
2.	From quality-wholeness to interactive value	• "Quality without a name" – “an objective quality that things ... can possess that makes them good places or beautiful places. (Gabriel 1996) • 15 geometric invariants, mutually-reinforcing centers • Services separating value from the outcome • Interactive value: enjoyment takes place over time • Outcomes of service systems: use-value, exchange value
3.	From anti-patterns to wayfaring	• Dead patterns leak out, infect other patterns (Alexander 1979) • Anti-patterns as non-solutions; to be coupled with patterns in pairs (towards problem-solving) • Wayfaring more equivalent to piecemail growth (than transport from origin to destination)

Agenda

1. Architecting versus designing
2. Alexandrian example → services
3. Exercise: trying out pattern language
4. Systems thinking + service systems
5. Ignorance and errors

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