

A Bird's-Eye View on Pattern Research

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Abstract:

This paper draws an overall picture of the new scientific field that can be defined as having its roots in the lifework of Christopher Alexander. It is a large field, spanning many disciplines and containing many profound concepts. A map might be useful but we currently have none. An intermediate step towards a map is to increase our distance from the field by stepping back and describing its overall structures. Such a bird's eye view should be seen as a simplified construction. Therefore, one can expect controversial discussions about what it has to say, especially at the upcoming PURPLSOC workshop and conference. My hope is that these discussions will contribute to the development of the scientific field, even if there should be no general agreement on some of the issues at the end of the conference.

Keywords:

Christopher Alexander; design pattern; pattern research, pattern language; Lebendigkeit science

Method

To accomplish the goal of this paper, I go beyond a hermeneutic approach which would take up too much space and would also be too limiting in scope. One can compare my method to the act of looking at the pieces of a partially complete mosaic and then stepping back to see the overall picture more clearly. It is also similar to holography: each individual fragment holds more than just local information and thus partly reveals the whole. The *References* section shows the essential pieces I consider relevant for the process.

The first set of sources used in this investigation are the set of 14 main books that Alexander has authored or co-authored to date (Alexander, 1964-2012). I also include the book *Christopher Alexander: A New Paradigm in Architecture* (Grabow, 1983), which contains about 80 pages of original Alexander text, transcribed from over 100 hours of audio interviews.

The second set of sources used are the many patterns, pattern languages and pattern collections that have been published as books or papers over the years, which are in the explicit tradition of Alexander. My main interest in selecting from these sources is to show the variety of fields and applications that take Alexander's work as their basis. With respect to software, where there is a particularly large literature, I include here only the most important books.

The third set of sources are my own research and teaching materials. As far as concrete pattern authoring is concerned, most of it is not yet formally published, but has only been published informally on the internet. I refer here to a number of my own publications which has sought to bring Christopher Alexander to a wider audience (Leitner, 2007, 2013, 2014, and 2015). In a sense these works were stepping stones leading up to this paper.

Observations

1. **A New Kind of Science.** The lifework of Christopher Alexander is rich in profound concepts. Although Alexander was best known for the pattern concept and his pattern languages, he himself did not see them as his main focus. He was more interested in the structure and quality of what he designed, in developing a generative process that could improve that quality, and in developing a kind of new science that would let us understand all of this. The science that Alexander called for, especially in the four books of *The Nature of Order* (Alexander, 2002-2005), is neither identical to natural science nor is it a sub-discipline of it. Alexander made this clear by openly criticizing the kind of thinking that characterizes the natural sciences – their mechanistic approach that uses the machine as a model and the subject-object gap – in short: a great deal of what Descartes stands for as a defining figure of natural science. On the other hand, Alexander did not define his new science in a positive sense – neither did he state what it exactly is, nor did he name it. For the purpose of this paper I have chosen the term *Pattern Research* as a surrogate or a least common denominator, a substitute that fellow researchers will not completely reject.

2. **The Variety and Unity of Pattern Research.** The architecture book *A Pattern Language* had large effects in many other disciplines. Non-architects were fascinated by how an architect could open the world of architecture to them and enable them to see the world through his eyes. They also saw many parallels between his work and their own design fields which opened up new opportunities to use the same concepts in similar ways. So they started collecting patterns and authoring pattern languages: in software development (Gamma et al., 1994), organizational development (Rising & Manns, 2004) and interaction design (Borchers, 2001), just to name a few more general ones – and in text authoring (Gabriel, 2002), school architecture (Nair et al., 2005), fire-fighting (Denef, 2012), and movie production (Fließner, 2012), to name a few more specific ones (see Figure 1). There seem to be innumerable domains which can make good use of the concepts of the *pattern* and the *pattern language*.

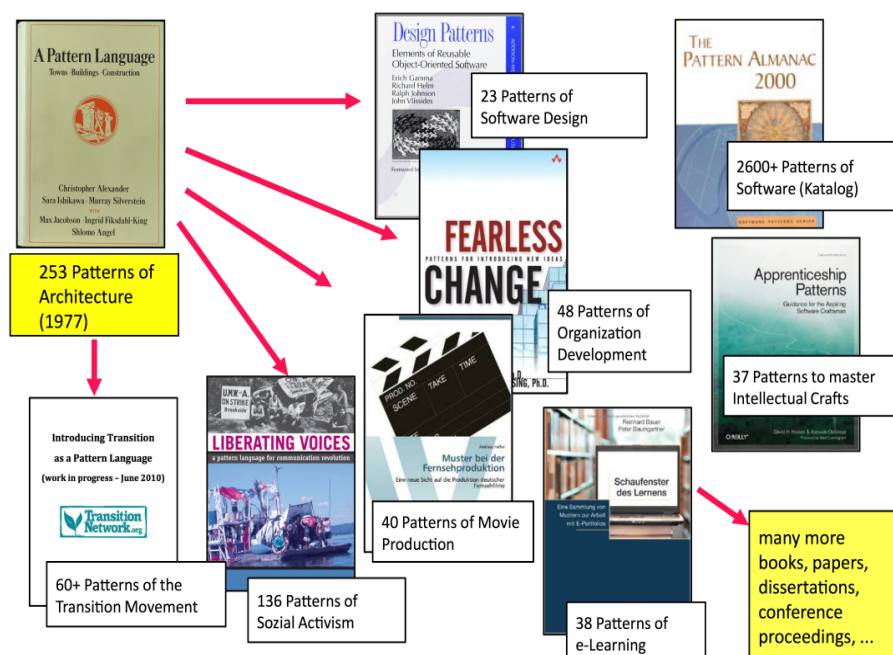


Figure 1: Some books standing for many that followed the example of “A Pattern Language”

3. Pattern Theory. I got involved with patterns when I became a member of the *Portland Pattern Repository* (aka *Wiki Wiki Web*) in the year 2000. Five years later I began to work on a German book *Mustertheorie* (Leitner, 2007) to disseminate knowledge about Christopher Alexander in the German-speaking world. My main message was that Alexander is *important far beyond the realm of architecture* because his opus is so useful as a systems theory in many fields of application. I needed a term for those of Alexander's concepts that were independent of architecture and began to use the term *pattern theory*. I also chose this term for the title of my book. The book was widely read by the German audience, and got a great deal of positive feedback. However, the term *pattern theory* was adopted only slowly. I think it is precise and useful but not all-encompassing Alexander's science because it focuses on the abstract, multi-disciplinary insights. For example, it does not encompass the concrete patterns and pattern languages that have arisen out of various fields of application. I think pattern theory is a part of pattern research in the sense that a scientist can do pattern research by collecting and describing patterns in his field of application without being concerned with pattern theory per se. He need not research how the principles of his field can be used – as general principles – for other fields of application and vice versa.

4. What is the New Paradigm? Grabow (1983) saw Alexander's work as a possible new science with a new paradigm, applying Thomas Kuhn's concept of the paradigm shift (Kuhn, 1962). Kuhn used the word *paradigm* in a number of distinct ways, but two stand out. The first important meaning of *paradigm* is that of a fundamental *core idea* that changes our way of thinking. The idea that the *earth revolves around the sun*, instead of vice versa is an example of a shift in paradigm. The second important meaning of the word *paradigm* is that of a *research example*, usually in the form of a canonical textbook, that shows scientists how exactly to use the new idea to produce scientific output. If we look at the main effects of Christopher Alexander's work, we could think of the concept of the *pattern language* as a core idea, and *A Pattern Language* as its canonical research example – but Alexander did not in fact see it this way. Alexander and Grabow, thinking together in Grabow's book (1983), focus on the *generative process* and *wholeness* (a term that replaced the *Quality without a Name* in many situations over time) and newer insights from the *The Nature of Order*, which already existed as a draft in 1983. But they didn't get clearer on the nature of the paradigmatic shift, on the core idea in question.

5. A Pyramid of Pattern Research. I suggest that there are *four* separate new paradigms (core ideas) that form the backbone of Alexander's work. These are: (1) the pattern, (2) the pattern language, (3) the creative cycle and (4) the quality of living systems. Although one might consider these four paradigms separately in an abstract way, I prefer to visualize them as one building on the other, spatially represented as four levels of a pyramid (see Figure 2).

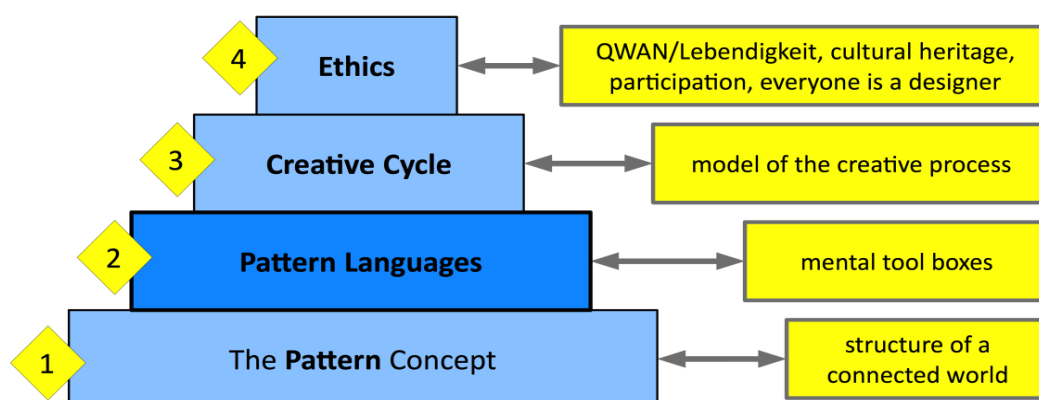


Figure 2: The four new paradigms of pattern research arranged as a pyramid

This pyramid of four paradigms explains why some people have difficulties in adopting all of Alexander's thinking. It is difficult enough to swallow even one new paradigm, but four are obviously that much more difficult. It also explains why different application fields, responding to different problem situations, focus on different paradigms (pyramid levels), and therefore seem to implement only a partial or different understanding. We can even see this positively, as a stepwise process of development, a discipline moving through the various pyramid levels as need grows.

6. Paradigm 1: The Pattern Concept. Level one of the pyramid, the pattern concept, is typically taken for granted, based on one of the canonical quotations around Alexander's original concept of the three-part-rule: "a pattern is a solution to a problem in a context". There is little debate about what patterns really are among those who work with patterns but there are many people who experience big problems. I think this is easy to understand, when we face the tautological nature of the pattern concept. Each and every thing that is part of a living system – that humans have created as an artifact in their culture, or that has evolved as part of biological evolution – can be thought as solving a problem, as having a function, as making sense, at least in some way or other. So from a philosophical perspective, to do pattern research means to change the way we organize our knowledge of the world.

The Thinking in Categories - Aristotle ~ 330 B.C.

(Isagoge of Porphyrius; canonical introduction to the complete works to Aristotle)

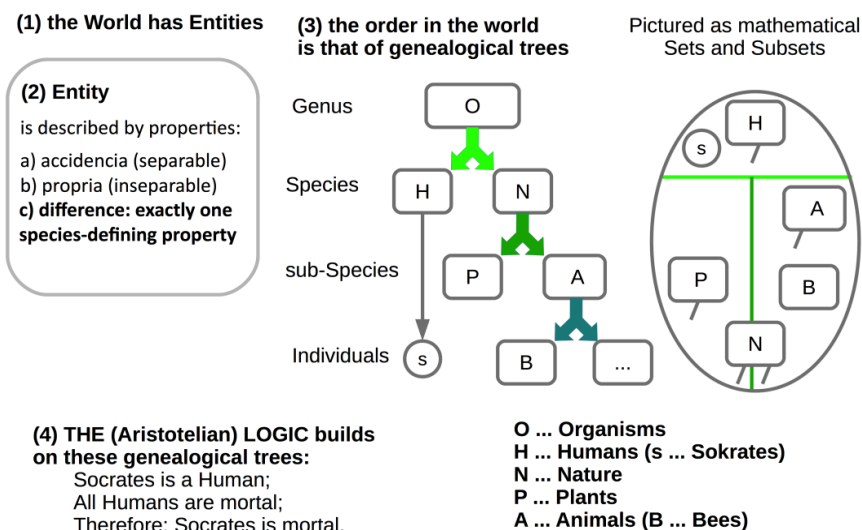
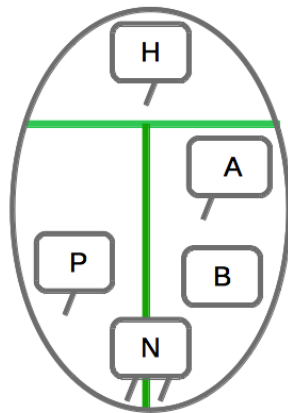


Figure 3: Categorical thinking and its concepts and two possible displays shown using a simple example

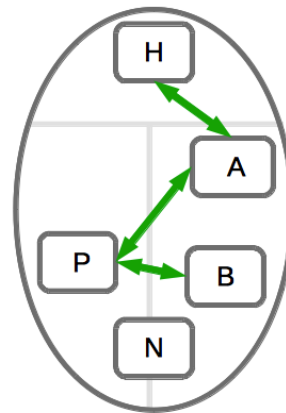
When we use the old paradigm of the *category*, we think with categorial concepts organized in genealogical trees of species, sub-species and individuals. We describe them in terms of their properties, and separate them by one single sub-species-defining property, originally known as the *difference* (see Figure 3). The new paradigm of the *pattern* removes itself almost entirely from any concern about properties and puts its priority on a pattern's functional connections to other patterns. All the aspects of the pattern description – the problem, the solution, the set of forces, etc. – focus on how the pattern connects to its environment of other patterns (see Figure 4). The act of focussing on patterns instead of categories as the means to ordering the world, focussing primarily on connections instead of differences, effectively overturns a 2300 year old intellectual tradition. It can be considered the implementation of the long awaited change from a linear to a systemic, non-linear, cybernetic way of thinking. This explains the difficulties of this endeavor.

Thinking in Categories



Priority: Differences
Aristotelian Logic
 perception of properties
 few differences
 (simple)

Thinking in Patterns



Priority: Connections
Alexandrian Logic
 understanding of connections
 many connections
 (complex)

„If the bee disappeared off the surface of the globe then man would only have four years of life left. No more bees, no more pollination, no more plants, no more animals, no more man.“ -- attributed to Albert Einstein

Figure 4: A side-by-side comparison of “thinking in categories” vs. “thinking in patterns”

7. The Advantage of Thinking in Categories. The Western habit of thinking in categories was successful and simple: one simple property makes the difference between two species or – more general – two concepts. All other properties are inherited in the categorial tree, forming the basis of Aristotelian logic. But after 2300 years, this method has been pushed to its limits, and its potential seems to be exhausted.

8. The Advantage of Thinking in Patterns. While the practice of thinking in patterns needs more information to be done effectively – in principle it requires a holistic view of the system as well as its fields and forces – it actually reduces complexity. It lets us ask the right questions and select the relevant information needed for effective pattern descriptions. Using pattern thinking, complex systems can suddenly be understood positively as living systems. Pattern thinking also has the potential to close the gap between subject and object – a gap that exists only within the framework of categorial thinking. Therefore, pattern thinking has also the potential to close the gap between Eastern and Western world views.

9. Paradigm 2: Pattern Languages. Whatever differences exist between the various fields in which patterns are applied, the common element that all researchers and practitioners share is the *pattern language*, or more humbly the *pattern collection* (see Figure 5).

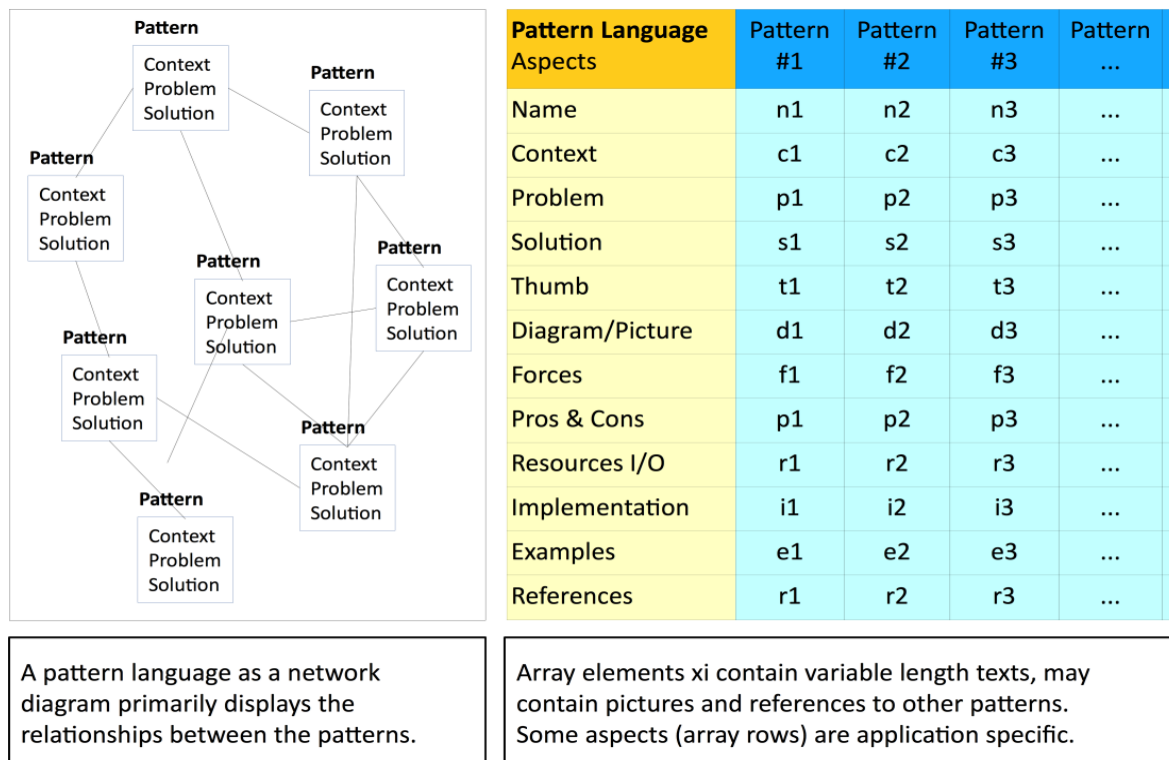


Figure 5: Two possible ways to represent the overall structure of a pattern language

10. Estimating the Number of Patterns and Pattern Languages. In 2009 I started a research repository for patterns and pattern languages, and by 2013 I had collected more than 5,000 wiki pages of raw material for more than 200 pattern languages. Based on this unpublished material I estimated the total number of patterns that exist in human culture to be at least 500,000. By comparing this estimation to the developed field of software patterns, I changed to a simpler calculation of this estimation: In software we have at least 300 pattern languages and 5,000 patterns; assuming the existence of 100 application fields of similar richness, we can estimate a minimum of 30,000 Pattern Languages and 500,000 patterns. This is a conservative lower estimation – in reality there may be even ten times that many patterns and pattern languages. As of the year 2014, only a few hundred pattern languages and about 5,000-10,000 patterns have been documented. This is only 1-2 percent of the numbers I estimated. A rich harvest of productive scientific work waits for pattern researchers while most of the theoretical work has already been done.

11. Examples for Pattern Application Fields. These are some of the 100 postulated pattern application fields: agriculture, architecture, civil society, community building, creative writing, democracy, design, economy, education & learning & teaching, games, jurisdiction, language & thinking, machine engineering, management & leadership, media & communication, medicine & healing & therapy, mind & consciousness, music composition & performance, nature relationship & protection, organization development, personal development & learning & relationships, philosophy & discourse, scientific work & knowledge production, society, software development, sports, strategy & war & peace, theology & religion, and the visual arts.

12. Paradigm 3: The Creative Cycle. Alexander always connects living systems with their corresponding living processes of creation, design or unfolding. When he integrates this into design considerations he primarily uses the term *generative process* which he explains as a process of stepwise unfolding, always based on the current system configuration. Drawing on my earlier work (Leitner, 2014) I picture this as a creative cycle, moving through 6 sectors: 1. perception of the system

in a holistic sense, 2. searching for a starting-point – one of the existing or latent centers – for the next transformation, 3. selecting a pattern to solve the problem at hand, 4. adapting the pattern to the forces of the system configuration, 5. evaluating the resulting system configuration, and 6. undoing or accepting the resulting system change (see Figure 6).

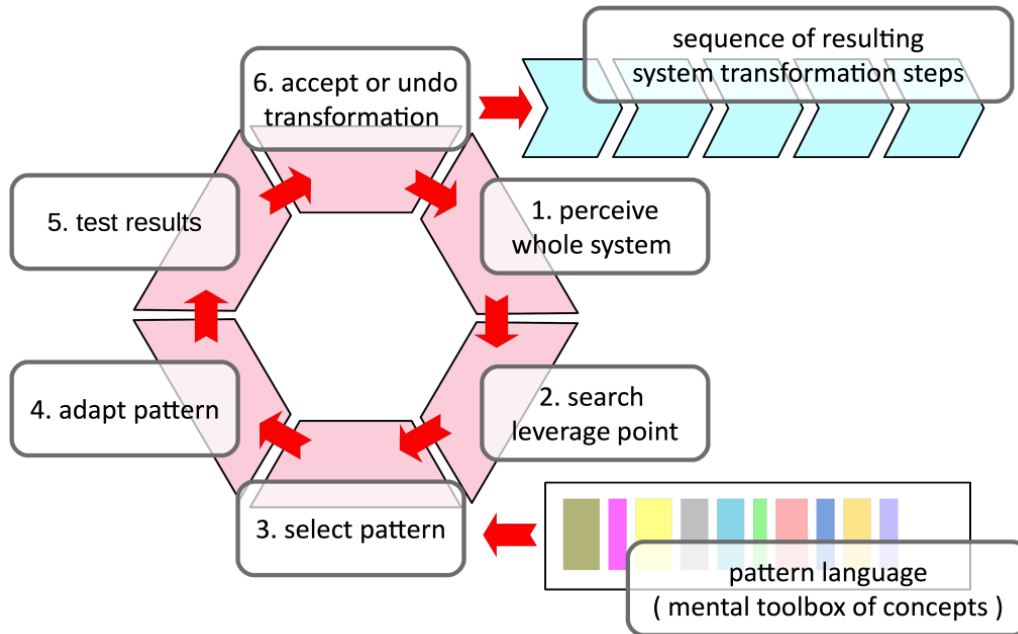


Figure 6: A simplified scheme for the creative circle (aka “generative process”)

This picture is somewhat simplified for teaching it. For example, it should also contain a *pattern sequence*, which often helps with the selection of a pattern in sector 3. Furthermore, as Thomas Schlechte has correctly noted, the cycle doesn’t return to the same system configuration from which it originated; thus the process would be better represented by a spiral that moves the system nearer to a final state with each revolution. I think these are details that should be added in the future, with this to be considered as a first draft. The important thing is the overall picture, namely that Alexander suggests an ideal-typical model for the creative process and thus de-mystifies creativity making it attainable to “non-creative” people like perhaps you and me. It’s a big paradigmatic step forward to see creativity as a detailed, rational, and sharable process and not as an irrational process that is given to the artist by something mystical.

Note that at this point, as you look at this ideal-typical model of the creative process of searching and optimization, the value function that governs the creative process is not yet decided upon. Also note the similarity in the intention between that of Christopher Alexander and of Karl Popper who defined the ideal-typical process for natural science research (Popper, 1959).

13. Paradigm 4: Ethics of Design – QWAN/Lebendigkeit. According to Alexander, the creative process – as pictured in the ideal-typical model of the creative cycle – works only well when it is governed by certain values and attitudes. This is represented by level 4 of the pyramid which I have labeled *Ethics*. The paradigmatic core idea is clearly the concept QWAN or Lebendigkeit (loosely translatable as “liveliness”) but it turns up in different places and forms. In the process of designing, the designer should leave any remote position outside the system and should become a part of the local system, perceiving it, interacting with it and building it. But even this is not enough. He needs to involve the people who live in the system, educating and enabling them so that they understand the

design process and its options and can participate in it. Between the lines of Alexander we can read the message “*Everybody is a designer*”. To achieve this the formal “architect” needs to have the attitude that the patterns involved in the project do not belong to him, that it is not somehow his secret knowledge, but rather that the patterns are a *cultural heritage* and a *common good* and should be shared freely in the interest of all humanity.

Finally, all adaptations of patterns should be done under the regime of improving QWAN/Lebendigkeit and following a kind of *creative imperative*: “Design to support people and life and not to maximize profit”. Note that these ethical aspects do not come from a purely moral viewpoint but from the rational understanding of the master designer who shares his insight: to follow these ethical considerations is the best way – the timeless way – to achieve outstanding design results (see Figure 7).

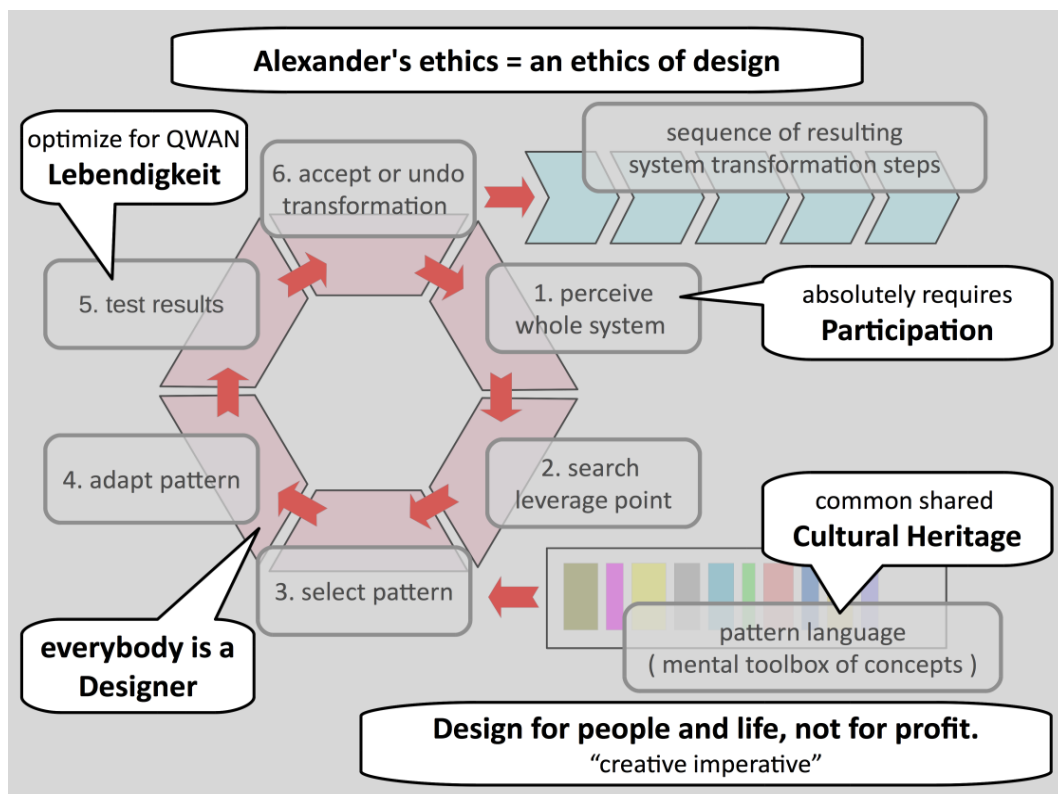


Figure 7: The creative cycle augmented by its ethical aspects

14. The Role of Mathematics. It is interesting that up to now mathematics has played no role in pattern research, even though Alexander and Nikos Salingaros (one of Alexander’s close colleagues) are both mathematicians. There have been a number of attempts to introduce mathematics into it. Not the least, the *Notes on the Synthesis of Form* can be seen as an attempt to bring mathematical rigor to the fields of design and architecture, by establishing a network of requirements (forces). In *The Nature of Order: Book One* (Alexander, 2002) Alexander tries to reproduce the perceived QWAN of 8-bit-example strips from the number of computable sub-symmetries. He calls this attempt difficult but promising. Much more work needs to be done here, if mathematics is meant to enter the picture of pattern research.

15. U-Shape of Pattern Mining and Pattern Publishing. While it is possible to author a pattern language book or pattern language paper like a fictional text from direct inspiration, this is not the typical way that it is done. Alexander himself had a work-group which considered a lot more patterns, over the course of many years, than actually entered the final version of *A Pattern Language* (Grabow,

1983). It may be easier for somebody at the start to imagine multiple concrete steps that lead from the project idea (e. g. to author a pattern language) to the final product (e. g. a written pattern language that is published and put to practical use). I've found that a U-Shape fits the workflow (see Figure 8).

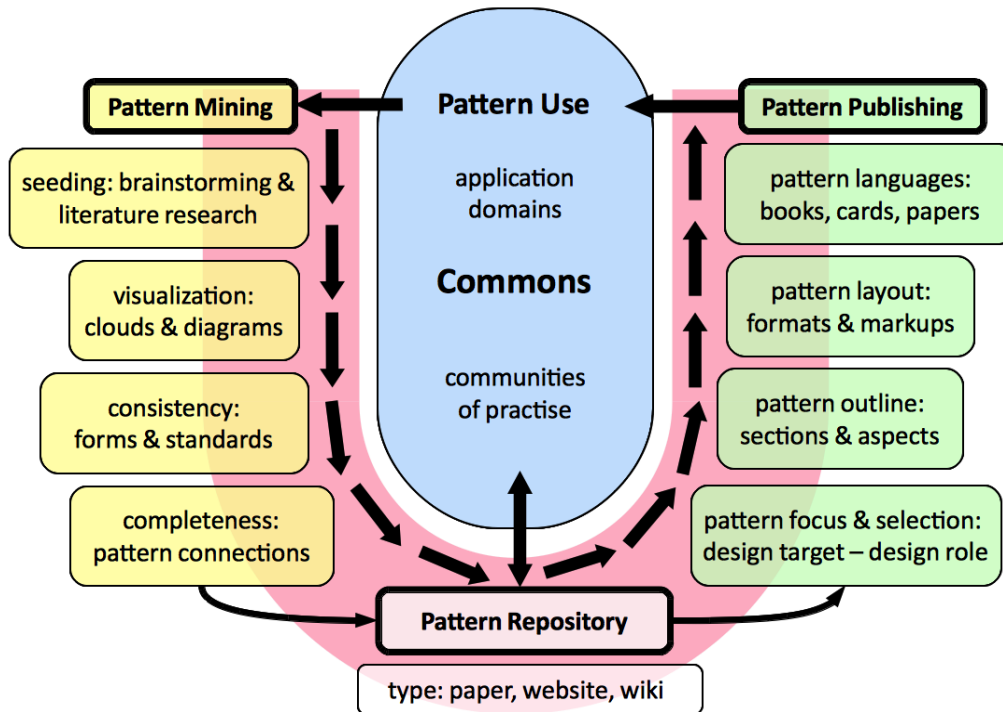


Figure 8: The whole process of pattern mining, storage, and publishing

16. Pattern Repository. The process suggests an intermediate *Pattern Repository* as a research and collaboration tool, a repository that is expected to hold not only perfect pattern information but also rudimentary information and drafts that won't pass the final quality control or pattern selection process for one reason or another. Only if you have such a content-tolerant repository, then you can let your work and the work of all contributors develop freely. Doug Schuler, for example, used a website for his community of 100+ academic authors to collect 300+ pattern drafts; finally they selected 136 mature patterns for the book *Liberating Voices* (Schuler, 2008).

17. Pattern Mining: Creating a Pattern Repository from Experiential Knowledge. This is often a group process that starts with *brainstorming* and *searching* for pattern candidates. A typical intermediate product is a *pattern cloud*, which brings together all the concepts on a table or pin board, to sort them out, combine them, group them and name them. Working on the concepts in-depth, adding detail and refining them, getting clear about outlining the various pattern aspects as a *pattern form*, putting them into a form that is accessible to all and can be refined step by step – this is the dynamic reality of a *pattern repository*.

18. Pattern Publishing: from the Pattern Repository to a Pattern Format. With a specific goal in mind, researchers envision a target group, select a format (see below), select a sub-set of patterns, select a sub-set of available aspects, decide on the outline of the patterns they wish to present, and finally decide on the layout in which to publish their pattern collection or pattern language. Often there

is an additional structure (top-down, from-large-to-small, or project-stage) that helps to group the patterns. There may be insightful *pattern stories* from projects, or even *pattern sequences* that hold valuable information. A *pattern organigram* often provides an additional overview.

19. Format One: Pattern Language Books. The book *A Pattern Language* (Alexander, 1977) has inspired many authors to copy its structure and intent and has led them to produce similar books. This has the potential to create “bibles of the application field” where there currently are none. We can compare this to fields like cooking, which typically saw the publication of some famous first cookbook – each country has at least one – that described all its fundamental concepts and generic recipes. Only on this basis, when the fundamental knowledge is disseminated, the lower grade recipe books can grow.

20. Format Two: The Pattern Project Book. Alexander has also given another example through some of his books, that describe complete design processes of real projects and the patterns and pattern language involved in it. *The Linz Café* (Alexander, 1981) describes an exhibition building project in Linz, Austria. *The Production of Houses* (Alexander, 1985) describes a social building project in Mexicali, Mexico. *The Battle for the Life and Beauty of the Earth* (Alexander, 2012) describes the Eishin Campus project near Tokyo, Japan. These are all extremely instructive examples that serve to inspire people to follow up with similar books in their respective domains.

21. Format Three: The Pattern Language Paper; the PLoP style Writers’ Workshops. In the field of software development, many pattern language books have been published. Some outstanding examples have been already been cited here. But not every pattern language justifies the effort to write and publish a book, and not every software pattern researcher wants to become a book author. So a pretty clever scheme has been created by people around *The Hillside Group* involving a *pattern language paper* format, an adapted PLoP conference format and Richard Gabriel’s congenial adaptation of writer’s workshop from fictional writing to pattern authoring (Gabriel, 2002). The typical Pattern Language Paper is only 5-15 pages long, focuses on describing the central patterns in its language only and provides only *pattern thumbs* – i.e. short pattern summaries – for the rest of the patterns. More than 60 conferences on all continents have produced hundreds of pattern language papers describing thousand of patterns. The PLoP conferences are reasonably open, so you should try to join them with your topic. If an application field doesn’t fit into the PLoP program or outgrows PLoP’s infrastructure, then it can still build on PLoP’s proven example and implement its own conferences and publishing traditions.

22. Format Four: The Pattern Card Deck. Bringing patterns into a seminar card format was pioneered by the *group works pattern project* (Groupworks, 2012). Further examples are the patterns and pattern languages by Doug Schuler (Schuler, 2014). Takashi Iba’s work with one-page pattern descriptions – using mostly pictures and very little text – works along the same lines (Iba et al., 2011). I followed the Groupworks example with my *64 Concepts of Pattern Theory* card deck (Leitner, 2013).

23. A Card Deck Example: 64 Concepts of Pattern Theory. Implemented as a card deck (Leitner 2013), these cards serve me well for teaching the thinking of Christopher Alexander and the basics of pattern theory and pattern research. In the context of developing a system I also use them as *An Implementation of the Glass Bead Game*, providing 64 perspectives on the system and 64 dimensions of its development. In a general design context I have started using them as *An Alphabet of Design*. Christopher Alexander’s thinking is profound enough to support all this easily. The card deck is licensed CC BY SA, which means that it is free to print and use. I invite you to use it and give me feedback on it to further improve it.

24. The 15 Properties Relative to the 4-Level-Pyramid. While most of the process principles are intrinsic to the *creative cycle* picture, the way in which the 15 properties are used is not so obvious. Therefore, I mention them here, together with a set of visualizing diagrams which I have developed (see Figure 9). They belong to level 3 of the Pattern Research Pyramid. I have also added to their descriptions – see the additions in parentheses – in order to make them more generally applicable and easier to understand. The properties serve the creative process: First, (sub-step 1) they let us perceive a system in a way that is independent from immediately understanding its semantic and functional content, which is covered by the patterns. Second, they offer initial points of reference, as existing or latent centers, to apply transformations. Third, they serve as morphogenetic dimensions, letting us think about how to strengthen the system by increasing or decreasing the presence of that property. Fourth, and last but not least, by understanding these properties as constitutive of living systems, we understand that they are in principle positive features that can not be criticized *per se*.

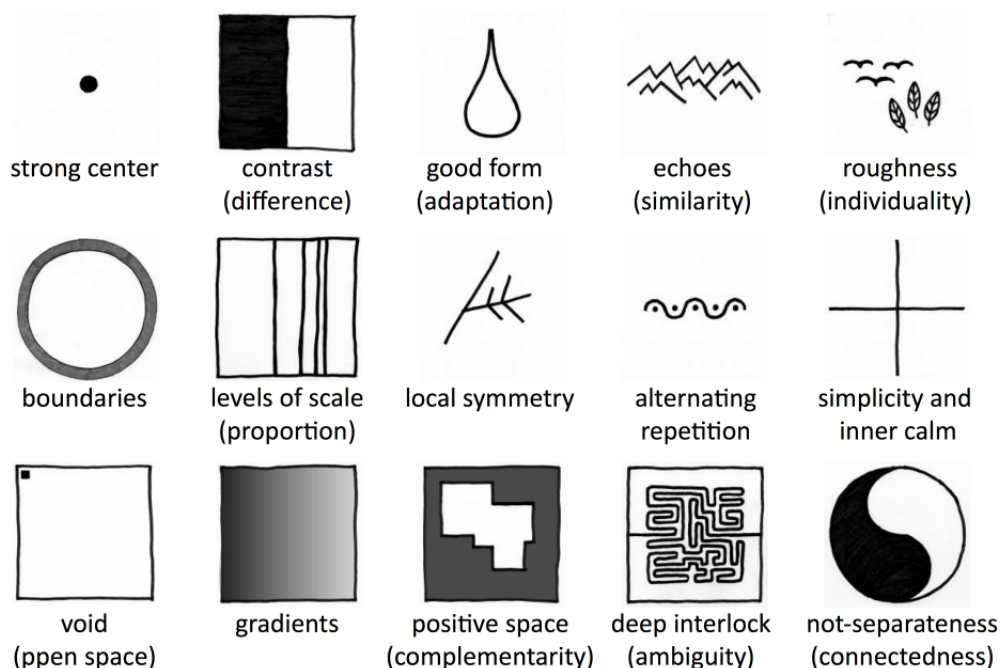


Figure 9: Diagrams for Alexander's fifteen properties of living structures

Every now and then I meet researchers who feel that the list of properties is incomplete or that the descriptions are not perfect. I therefore also suggest the completeness of the set of the 15 properties as an open research question.

25. Interpretations of the 15 Properties. There are a number of different interpretations of the fifteen properties. Alexander numbered and named them in *The Nature of Order – Book One* (Alexander, 2002) and explained them as characteristic of living structures. In other places Alexander talks about them as morphological generators (Hopkins, 2010). In addition, I believe the fifteen properties have something to do with our cognitive system. We probably can't describe systems without referring to differences, boundaries, and most of the other properties. So I suggest another favorable interpretation of the 15 properties as *categories of form*. If this interpretation of his work is accepted by philosophers, then Alexander belongs with Aristotle and Kant to a small group of thinkers who enumerated fundamental categories.

26. Tacit Knowledge: the 16th Property. Between the lines of Alexander there is a 16th property of living structures. It is the property that all living structures – whether they are modeled as organisms or as ecospheres – have: to be continuously in transformation. We could name this property with the concept cluster *changeability* { changeability, adaptability, flexibility, movability, fluidity }.

27. Tacit Knowledge: The 15 Properties as contradicting concepts. The 15 properties are not all simultaneously present in every single living system because they partially contradict each other. Furthermore, they cannot be designed blindly into a system in the sense of “the more, the better”. It all depends on the interaction of the properties, their quality, and how their contradictions are resolved in the field of centers. The concept of *The Right Measure* that was very dominant in ancient Greek philosophy (most prominent in Aristotle’s *Nicomachean Ethics*) and that is now largely forgotten or disregarded. Paracelsus (16th century) is attributed the medical insight that any substance may act as poison or medicine, depending on the dose. The concept of *The Right Measure* may offer a useful perspective on the problem of contradicting properties.

28. Timeless versus New. Although many of Alexander’s concepts are new, other concepts claim to be *timeless* and known for ages. There is a big difference between (a) only *having* a valuable tool and (b) having a valuable tool and using it effectively. The concept of *The Right Measure* may serve as another example of *timeless* knowledge that could be valued in many situations. Traditions and especially the humanities offer rich fields to be revisited.

29. Tacit Knowledge: Alexander’s post-capitalistic position. Alexander is a strong critic of the contemporary building industry and its architecture that works under the regime of profit-maximization. In his own projects Alexander cleverly takes the overall profit-motive out of the equations by always working within fixed budgets. In his book *The Battle for the Life and Beauty of the Earth: A Struggle between Two World-Systems* (Alexander, 2012) Alexander seems to go as far as he can – embedded as he is in US culture – to criticize the capitalist attitude. I think it is obvious, reading between all Alexander’s lines, that his message is post-capitalistic.

30. QWAN as a concept cluster. Alexander refrained for a long time from using the term beauty. He functionally replaces the term beauty with the *quality without a name* – for short, QWAN – in its role as a design goal and he claims an objective feeling for QWAN that wouldn’t have been plausible for beauty. But it is also clear that these terms overlap and correlate. It is remarkable that Alexander returns to the term *beauty* in his latest book *The Battle for the Life and Beauty of the Earth* (Alexander, 2012). On the other hand, the friction between Alexander and the software pattern movement may be explained by the software’s need for *viability* in the market, comparable to the viability of biological organisms in their biosphere. Therefore, in the end, we may see this quality as a concept cluster QWAN/Lebendigkeit { beauty, viability, vibrancy, vitality, sustainability, resilience, ... } whose inner relations, correlations and overlaps form *just another* research target.

31. Possible names for the „Quality Without A Name“. While Alexander wrote in *The Timeless Way of Building* (Alexander, 1979) about the *quality without a name*, which has often abbreviated to QWAN, various names or terms have been used by Alexander and other authors. I want to note that the “quality without a name *in English*” would have been more precise, because German has a word – *Lebendigkeit* (*literally, living-ness, or liveliness*)– that exactly fits to Alexander’s concept. Probably other languages have also words that fit. Thus one might look for a foreign-language word to introduce it to English. Alexander and his colleagues have also frequently used the term *quality of living systems* and the word *wholeness*. The first phrase seems too complicated in many language situations, the second seems to deviate slightly in meaning, although it sounds good and profound to many people’s ears. Probably this point needs more discussion.

32. An Age of Enlivenment. The essay *Enlivenment* (Weber, 2013), by the German theoretical biologist Andreas Weber, former student and colleague of Francisco Varela, points to the German cultural scientist Hildegard Kurt who envisions the upcoming of a new era which will follow the *Age of Enlightenment* – a kind of Enlightenment 2.0. He calls this the era of *Enlivenment*. At the core of this intellectual movement should be the phenomenon of life and the living system, and their fundamental quality QWAN/Lebendigkeit.

33. Characteristics of the New Science. For the purpose of this paragraph I have named the new science as *lebendigkeit science* and created a side-by-side comparison to *natural science* (see Figure 10).

	René Descartes Natural science	Christopher Alexander Lebendigkeit science
model	machine	organism & biosphere
model expectation	functioning	evolving
order principle	category	pattern
order aspects	property & difference	function & connection
working hypothesis	general causality	specific contingency
science goal	prediction of system	enabling of systems unfolding, designers & design quality
method	analysis & control mathematical formula	synthesis & support pattern language literature
logic	difference logic	connectedness logic
conception of the human being	biological robot	free designer
value	value free	life supporting, Lebendigkeit

Figure 10: Side-by-side comparison of Cartesian and Alexandrian concepts of science

It seems to me that the differences are extreme but that they still need not be seen as simple contradictions. Of course, lebendigkeit science builds on natural science – nobody would deny the fact that the achievements of categorial thinking and the scientific method have brought us to the position where we are now. But it would also be disastrous to ignore the limits of these analytic methods with regard to complex systems, and to ignore their inability to deal sufficiently with our contemporary world problems and crises.

In response to discussions at the PURPLSOC 2014 workshop I want to emphasize once more that Alexander's new Lebendigkeit science should *not* be seen as a mere sub-discipline like – for example – computer science is a sub-discipline of natural science. Lebendigkeit science appears to be a completely new type of science with four new paradigms and a completely new methodology. It represents, in my opinion, *a new way of thinking* in the tradition of the Russell-Einstein Manifesto of 1955 and the Potsdam Manifesto of 2005.

34. **Possible names for the New Science.** As I have mentioned already, Alexander didn't name the science that he called for, but sooner or later there must be a name found for it so that it can be perceived by the scientific community and reflected in its institutions. What options do we have? The new science could be named a *systems science* but this name is already taken and the relationship of the new science in question to other schools of systems thinking is not yet clear. It could be named *pattern science*, but the term pattern seems not specific enough. It could also be named *design science* but this addresses only its superficial manifestation and not its deeper content. It could be named *enlivenment science* but there is no analog called *enlightenment science*. Finally, it could be named *lebendigkeit science* if the English scientific community agrees to adopting the German word. More discussion on this is needed.

Summary

This paper attempts a bird's-eye view on pattern research, mapping, visualizing, and listing its central concepts and ideas. Most of the hypotheses examined and questions asked should mean something to most pattern researchers, quite independently of the specific application field in which they work in or with which they identify. This indicates a unity of the field, a fact which supports the main claim of this paper, that the field of pattern science – whatever it may be called – actually exists, and has sufficient foundations to constitute its own scientific community.

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