

Extracting and Writing Key Elements in Pattern Mining

Takashi Iba

Yuya Oka

Haruka Kimura

Erika Inoue

Faculty of Policy Management, Keio University

Abstract

In this paper, we present a new method of pattern mining by extracting and writing key elements. The sources for writing patterns would be dialogue with people who have experienced good practices in the target domain, introspection of pattern writer's own experiences, and literature and case studies. In the conventional creation process we proposed before, the pieces of information from multiple cases are processed with a clustering method using sticky notes, which is called as the KJ method. In contrast, the new method presented in this paper has the advantage of being able to obtain pattern seeds from a small number of cases, and of being suitable for collaborative work in an online environment. This paper introduces how to extract and write key elements and show examples of key element written by following the method.

1. Introduction

In the creation of pattern language for human actions, pattern writers conduct dialogical mining with people who have experienced good practices in the target domain, mining by reflecting on their own experiences, or mining from literature and case studies to grasp the information for pattern writing. Based on this information through the mining process, they make pattern seeds, and then after the systematization, pattern writing begins.

In the conventional creation process we have proposed and practiced so far, pattern seeds were created by clustering the information obtained from the mining sources (Iba and Isaku, 2012; Iba *et.al.*, 2017), which includes using KJ method proposed by Jiro Kawakita (Kawakita, 1967); bring sticky notes with similar contents closer to each other. While this method has an advantage of making it easy to discover common terms among multiple cases, it has the premise that a certain amount of mining information would be required. This creation process and method has been used to create pattern language at the Iba Lab, where nearly 2,000 patterns have been written in about 10 years, and other pattern writers have also utilized it to create pattern language (Reznik *et. al.*, 2020).

With this background, we have developed a new method, actually used it, and confirmed its effectiveness from 2020 to early 2021. In this method, instead of clustering using sticky notes, we extract what we call "key elements" from the mining data and write them. This made it possible to extract the essence from a small number of cases and carry properly that information to pattern writing. In addition, the method is suitable for remote online work by distant members, and allows asynchronous parallel work, making it easy to implement even in COVID-19 situations. Note that Key Element Writing, presented in

this paper, is carried out in the process of pattern language creation, which we developed and improved, as shown in Figure 1.

In this paper, we present the new method to transform mining data to pattern seeds. In the following, the method is first described, followed by a concrete example, and then a comparison to the conventional clustering method using sticky notes is discussed.

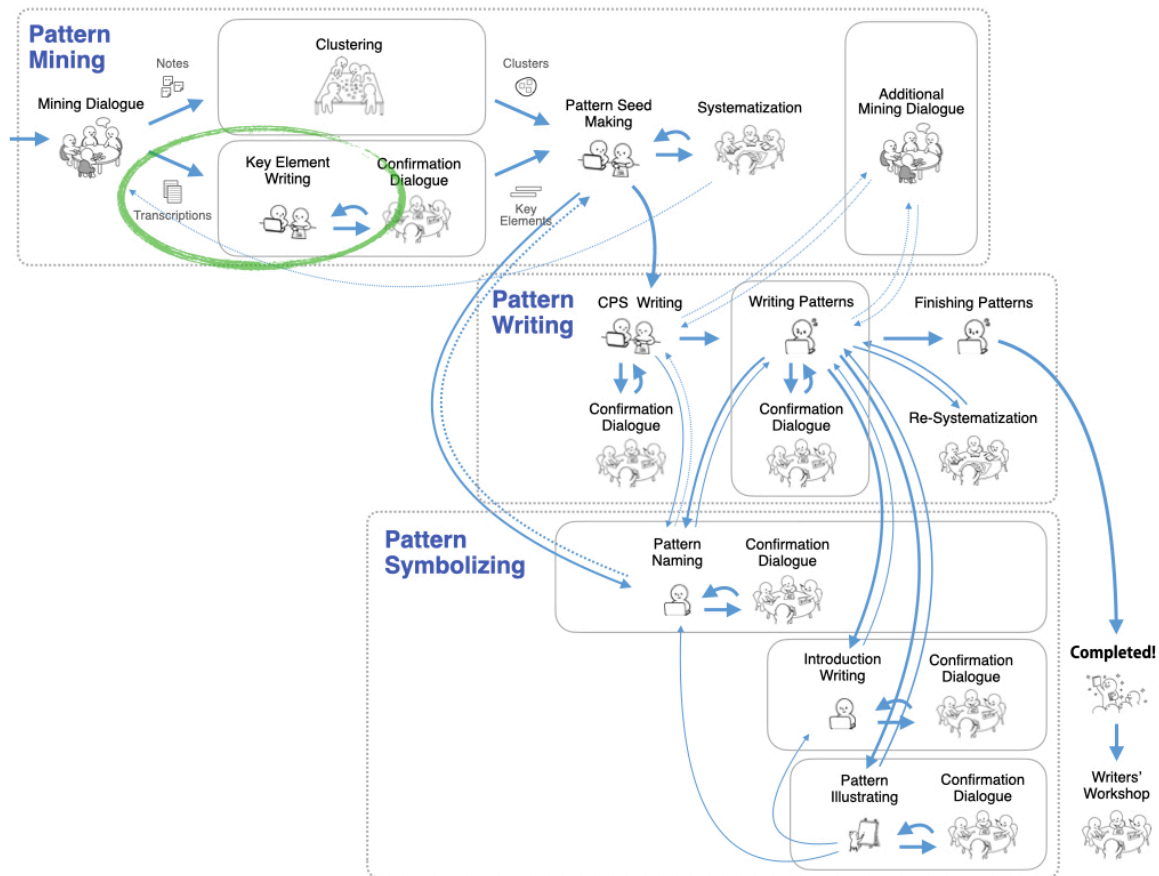


Figure 1: Key Element Writing in the Process of Pattern Language Creation

2. Making Pattern Seeds by Extracting and Writing Key Elements

In the method with key elements, the first step is to prepare textual data as a source for mining. In the case of dialogical mining with people who have experienced good practices in the target domain, the text is transcribed from video or audio recording. As for introspection and case studies, it requires the textual description of these, and for literature, it requires the textual data of those.

Subsequently, through reading the source data, there are certain parts that talk about *what* is an important thing to do in design or practice to produce good quality in the target domain. Then, around that area, there would be *how* the important things can be achieved and *why* it is important. Figure 2 shows the triangle of *What*, *How*, and *Why* as key information of a pattern, which is proposed in Iba (2013). Note that the *what*, *how*, and *why* component are used as key information to write a pattern in the format of

Context/Problem/Solution/Consequence (Figure 3), as Iba (2021) presents how to write a pattern with these information.

Christopher Alexander, who proposed the concept of pattern language, explain how to mine the pattern from observation as follows:

“Let us start with a very simple commonsense example. Suppose that we are in a place. We have a general sense that something is ‘right’ there; something is working; something feels good; and we want to identify this ‘something’ concretely so that we can share it with someone else, and use it over and over again.” (Alexander, 1979, p.249)

Then, he emphasizes that it is required to first identify “What, exactly, is this something?” (Alexander, 1979, p.249; underlined by the quoter). He also said about patterns like this:

“The pattern is, in short, at the same time a thing, which happens in the world, and the rule which tells us how to create that thing, and when we must create it.” (Alexander, 1979, p.247; underlined by the quoter)

In addition, one must think “Why is it a good idea?” (Alexander, 1979, p.251; underlined by the quoter), namely “what is the problem” (Alexander, 1979, p.251) to overcome with the idea. Thus, if you want to identify a pattern embedded within a good design or practice, you need to identify *What*, *How*, and *Why*.

Once the *what*, *how*, *why* are obtained, one can write *key elements* (Figure 4). A key element consists of a key sentence and the supplementary information, which were extracted from the mining source data. A key sentence consists of *what* is important and *how* it can be achieved. The supplementary information includes information such as *why* it is important and typical examples obtained through mining. Thus, a key element is composed as shown in the Figure 5.

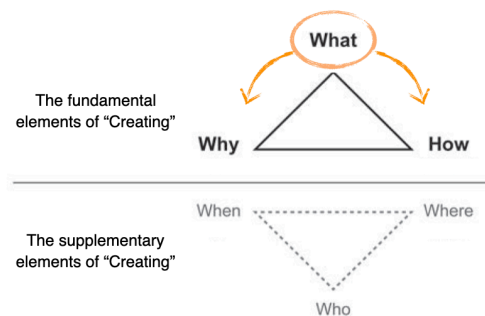


Figure 2: In the mining phase, the writer must first identify the *what* component (what is an important thing to do in design or practice to produce good quality), then associate the *how* component (how it can be achieved) and *why* component (why it is important) is associated with *what* component.

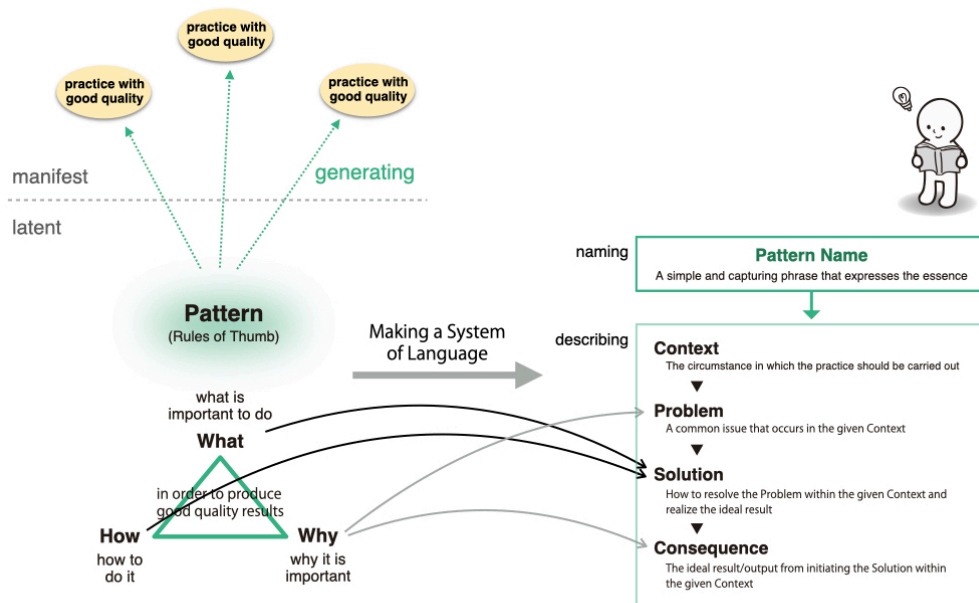


Figure 3: In the pattern writing process, the *what*, *how*, and *why* components are used as key information to write a pattern in the format of Context/Problem/Solution/Consequence

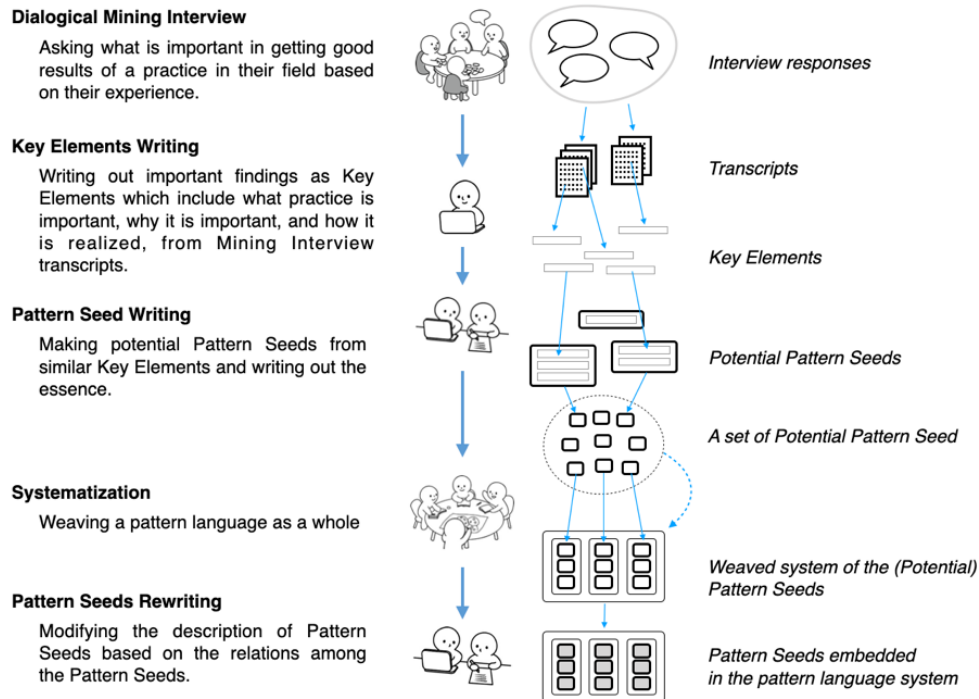


Figure 4: Process of pattern mining by extracting and writing key elements

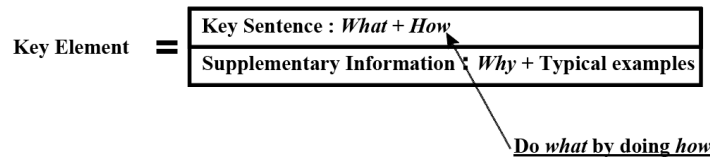


Figure 5: Basic composition of key elements

An example of a key element in the *Online Education Patterns* (Shibata *et.al.*, 2021) is as follows.

Create an opportunity for students to get to know and interact with each other, by having a free time after class where students can chat casually.

In a classroom, students can talk with people nearby after class, or while they are leaving. On the other hands, when students take classes online, they are disconnected from the class instantly. It was a hidden function that the campus location had. Some people stay for an hour or so for this free time.

Once the key element is obtained, one can make pattern seeds based on them. A pattern seed can be created from several similar key elements, or a single key element. When gathering multiple key elements together, it is better to base on the proximity of their contents, while also considering their balance as a whole. In this way, the hypothetically constructed pattern seeds are systematized (Iba *et.al.*, 2021a) and positioned in the overall pattern language system, which determine the core essence and scope of each pattern seed.

3. Examples of Key Element Writing

In this section, we would like to introduce an actual case study to fully illustrate the extraction and documentation of key elements from transcriptions. In this paper, we use a pattern language for the “Pattern Language” class of the Faculty of Environment and Information Studies & Faculty of Policy Management at Keio University in 2021. In this class, we created a *pattern language for generators nurturing playful community and places* (for details of the class, see Iba *et. al.*, 2021b). In the process of creating this pattern language, we conducted dialogical mining to Akira Tsukakoshi, the representative of “Harappa University”, who is working to create a place where playfulness of adults and children naturally awake in nature.

3.1 Half-informed Creation

The first key element is extracted from the Mr. Tsukakoshi’s narrative: “When trying out a new play, instead of doing it after knowing how to do it completely, do it with unsatisfactory information.” The narrative in the dialogical mining transcript is as follows.

Tsukakoshi: Of course, the environment between the U.S. and Japan is different, and my English is not that good, I can't understand it completely. So, I start creating with that half-formed information. When I do that, there is a room for me to experience trial and error, and it's interesting. That's how I tend to get started. But gradually, I'm getting more and more better at manufacturing, and I'm already

working with steel, wood, and FRP (fiber-reinforced plastic). So, when someone says, “I want this,” I tend to say, “Hmm, I wonder how to do that. I am not sure...”

Iba: Wow, that's interesting. I liked the fact that you only know how to do it roughly from YouTube, and I thought that this is an important point for a play. If it was like assembling IKEA furniture, and there was a whole process written down, it wouldn't be a play anymore.

From this transcription, the following key element obtained.

Create a room for trial and error to make creating games more interesting, by starting to create with only half-formed information.

When you are starting to make something, instead of getting a perfect manual and trying to follow it, start with a certain amount of information. For example, when you watch foreign YouTube videos that are not in your native language, you cannot do the same thing because you cannot understand the language well enough, and the materials and environment are different.

This key element eventually became the pattern seed as shown below.

When adopting someone's ways of creating or playing, start with only a general grasp of the information to create room for play that allows for your own trial and error.

3.2 Creating Roles for Adults

The second example is about preparing roles for adults, where Mr. Tsukakoshi said the following.

Tsukakoshi: But still, adults must have some kind of purpose, right? As Mr. Iba said, bonfires last until around 12 pm, and then adults start asking, "What are we going to do after that?". So, it's very important for adults to have a role to play or there is something to do. For them, it is more comfortable to be who they are with some roles. That's why I prepare something like a plan. For example, we have plans like a day to build a secret base, a day to build the *Jomon* pit dwelling, a day to build a raft, and a day to make *Nagashi Somen*. It's not so much for children as it is to create a place for adults, and there are a lot of things that adults would want to participate in if they could, because those projects sounds interesting. But it's not a workshop, so it's very important that you can choose to join or not to join the event. In that way, there are cases where the initial plan doesn't go well at all, and there are also cases where things get exciting from there. While we are working on this project, someone else could start something else that actually get things going, and everyone's attention become focused on that. There are about three of these little events, and each of them is active in their own way. That's what I mean by it's really up to people on the site. When the staff can sense that no one is left behind and that adults and children are having a good time in each place, I feel that good place became true.

From this transcript, the following key element was extracted and written.

Create a place where adults can be themselves and be natural, by creating some roles for the new adult participants, such as having them carry out the planning together.

Examples of projects include bonfires, secret base building, *Nagashi Somen*, pit houses, etc.

From this key element, the following pattern seed was made.

Create a place where adults can easily participate and belong by setting up projects in which adults play some roles.

3.3 Involving Participants

The third example relates to how to involve participants: Mr. Tsukakoshi's narrative was as follows.

Tsukakoshi: I think it's a place where things are variable. We, the staff, are constantly being tested, and if we fix the place, we lose in a sense that the place dies. We are constantly being challenged how much we can entrust ourselves to that place. Of course, we ask the adults and the children to create the place as the staff do, and in that sense, everyone is complicit metaphorically, and the place is created by an equal relationship.

...

Tsukakoshi: In the past, when we first came to the "Harappa University", there were no toilets. So, we asked the participants to build toilets. Once every six months, we would store the feces in a compost heap. We also asked the participants to scrub out the feces mixed with the stored feces. I remember thinking it was a compliment when participants said, "We're paying you to do your job". I don't know if it's ok to take it as a compliment, but it's like they are paying to buy a relationship that isn't the usual capitalist relationship of paying to receive a service.

From this transcript, the following key element was extracted.

Make participants able to create some games with their own initiative rather than beneficiaries, by involving the participants as accomplices (metaphorically) in the work of creating a place together.

- In the beginning, there were no toilets in the "Harappa University," so we asked participants to build toilets.

- Many adults are fed up with the cycle of paying money and receiving service, so a system that allows them to pay as an active participant is attractive to adults.

From this key element, the following pattern seed was obtained.

Participants can behave as persons with their own initiative rather than beneficiaries, by making participants be able to involved in the "work" of creating the place together.

4. Comparison with Conventional Method

The conventional method: clustering using sticky notes follows the steps shown in the Figure 6. This method of obtaining pattern seeds involves clustering the information from mining sources, using Jiro Kawakita's KJ method, which is bringing sticky notes with similar contents closer to each other.

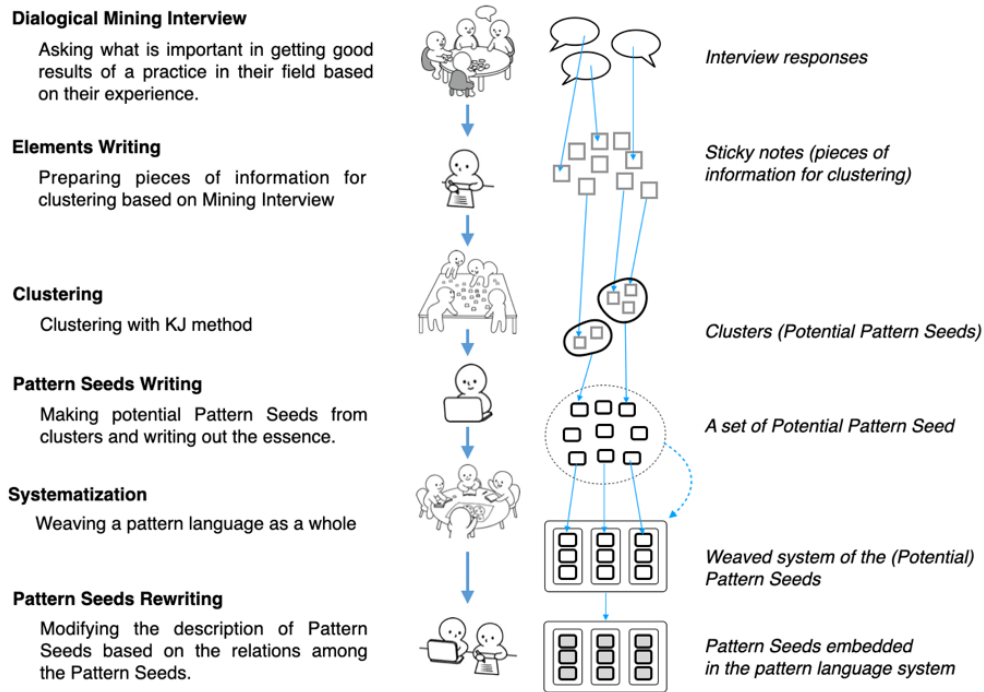


Figure 6: Mining process by clustering with sticky notes, following the conventional method

This clustering method has the advantage that it is easy to find common elements among multiple cases, but it also requires a certain amount of mining information. On the other hand, the method based on key elements proposed in this paper makes it possible to extract the essence from a small number of cases and properly carry the information to pattern writing.

In PLoP, it has been stated that the “rule of three,” which recommend authors to gather multiple cases for each case. Although it is good criteria for beginners of pattern writing, Alexander, who proposed pattern language, does not claim that a pattern always necessarily requires commonality to multiple cases to be a pattern. In fact, *A Pattern Language* (Alexander, 1977) included theoretically derived patterns without any actual cases (Alexander, 1979).

In addition, in the light of our recent *Phenomenological Philosophical Reflections* (Iba and Munakata, 2021), it has been clear that commonality with multiple cases is not a prerequisite for writing patterns, although it must be a consequential. This is because it is essential for a pattern to capture the essence with universality that can become a common understanding that others can be sure of.

Moreover, this method based on key elements is suitable for remote work by distant members in the online environment. The method doesn't require frequent communication that can be possible in a large space as the conventional sticky note clustering method does. Also, asynchronous parallel work is possible, which makes the method easy to put into practice even under COVID-19 conditions (of course, This method is not specific to those conditions. Thus, it is still effective even after COVID-19).

For these reasons, although the conventional method of clustering by sticky notes is not denied, the method by key elements, which can write pattern seeds from a small number of cases, is suitable for online use and opens new possibilities in pattern mining.

5. Conclusion

In this paper, we presented a new method of pattern mining by extracting and writing key elements to write pattern seeds. Creating a pattern language by following the method presented in this paper is already supported by the Qualitative-Data-Based Pattern Language Creation System, “Pattern Language Online” (Kawabe and Iba, 2021). We hope that this method, and also the system, will help people to create pattern languages in the future.

Acknowledgement

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