

Shikake Trigger Categories

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Abstract

A shikake is a physical and/or psychological trigger for behavior change. In this paper, we present our preliminary consideration on the triggers that best describe shikake specifications. After reviewing previous studies on both physical and psychological triggers for behavior change, we carefully construct shikake trigger categories for systematically describing shikake triggers. On the basis of these categories, we annotate categories for 120 shikake cases. We show the statistics of 19 categories as well as patterns of triggers frequently used together to explore rules of thumb.

Introduction

It is often the case that a small trigger can change our behavior and result in a big social impact (Andrews 2010). One famous example is fly targets etched on urinals in men's restrooms at Schiphol Airport in Amsterdam. When people are faced with the fly target, their behavior is expected to change due to the temptation that men feel to aim at the fly. The fly target in urinals is a small trigger that causes a slight behavior change, but it is reported that spillage was reduced 80 percent (Thaler and Sunstein 2009). This eventually reduces cleaning expenses as well as water usage. Due to the effectiveness of the idea and the simplicity of implementation, various urinal target stickers, such as butterflies, bees, ladybirds, targets, soccer balls, and basketballs, are used world-wide. There are many other examples of "a small trigger causes a big difference" phenomena from the personal level such as more exercise, healthier eating, and more eco-conscious behavior to the governmental level such as reducing garbage, waste foods, traffic accidents, and crime.

The methodology for designing such "triggers" for behavior change has depended on sophisticated designers and/or engineers, preventing ordinary people from inventing triggers for making the world better. If we could make triggers by ourselves, more and more personal and social issues would be solved. For one approach to realize this vision, we are focusing on a shikake, an embodied trigger for behavior change (Matsumura 2013). A shikake is a specific type of trigger based on physical and psychological triggers. The

physical trigger is used to ignite the psychological trigger, and the psychological trigger works as a driving force for changing behavior. A shikake is not a trap to force or trick people, but a way to encourage people to change behavior by presenting them with possible alternative behaviors in an attractive way. The fly target is an example of a shikake because the trigger is embodied as a "fly target" and people can choose to aim at it or not.

We are collecting hundreds of shikake cases to understand the mechanisms and planning to use the mechanism for designing new shikakes in the future. In terms of reusability, merely picking up the elements from shikake is not enough because this does not consider practicality. A shikake is like cooking. Understanding cooking is not the same as listing the ingredients, seasonings, and cooking devices. To be good at cooking, the best combination of ingredients, seasoning, and food preparation methods must be understood. The same thing can be said about a shikake. The mechanism should be understood as the best combination of the fundamental elements. We consider that the mechanism could be automatically extracted from the best practices as a "pattern" of elements once we construct a database of shikakes with elements. However, the list of elements is not defined yet. In this paper, we present our preliminary consideration on the elements that best describe shikake specifications.

Patterns of Best Practices

Utility of Patterns

Lessons from best practices could be a promising approach for success or reducing the risk of failure because it gives us the cues for future prediction as well as estimation of necessary efforts. Of course, best practices depend on the situations, and the identical practice cannot be applied to other situations. However, it might be applicable to similar situations if the pattern can be generalized and applicable to wider situations. Patterns are also used to bridge the gap between people in various domains. Common knowledge for an expert in one domain is unknown to people in other domains. A pattern is considered as a simple expression of essential knowledge in a specific domain and allows people to share it.

Patterns, which are obtained from knowledge and procedures of best practices, are used to increase the utility of

people's activities. In the following, we briefly review the ideas of useful patterns in practice in both cases.

Patterns from Knowledge

Christopher Alexander et al. coined the term "Pattern Language" to express a new methodology where a pattern as an unit of best practice is combined with other patterns for designing architecture and surroundings (Alexander, Ishikawa, and Silverstein 1977). Pattern Language is described in a unified format, such as pattern name, picture or sketch, explanation, and relations with other patterns. Alexander made 253 patterns for describing good design practices and applied them to various design projects. Erich Gamma et al. proposed "Design Patterns" as a programming approach based on the elements of reusable object-oriented codes (Gamma et al. 1994). They proposed 23 patterns of codes as a general reusable solution. By combining the patterns, the manners of code are formalized and the generated code becomes more efficient and readable. A pattern language works as a common terminology between people in an interdisciplinary field. Jan Brochers presents an approach for applying pattern language to interaction design in order for developers and domain experts to cooperate (Brochers 2008). The pattern language obtained from good practices can also be used to teach Human Computer Interaction. User interface patterns are widely used on websites or desktop applications (Tidwell 2011). Software libraries for designing user interfaces are provided as a toolkit, making it possible to reuse the best practices of user interface for solving design problems. Content management systems such as WordPress or Wiki are also considered as applications of user interface patterns because they publish contents with a standardized format based on the patterns of best practices. Yotaro Hatamura studied the causes of failure cases in industries to avoid the repetition of failure (Hatamura 2008). Hatamura collected more than 1000 failure cases, classified the cases from various points of view, and discovered that the failure cases can be classified into a limited number of essential patterns. These patterns can be used to describe the failure cases as well as to transfer the failure knowledge to others. The database has been released on the Web so everyone can see the details.

Patterns from Procedures

User Centered Design (UCD) is a standardized methodology for designing products in order to reflect what users can use, want, or need (ISO9241-210 2010). The process includes not only designing a product but also validating the usage in a real situation and is identified as an iterative cycles of four steps: 1) Specify the context of use, 2) specify requirements, 3) create design solution, and 4) evaluate design. IDEO, a company renowned for the user-centered design of products, services, and environments, proposes the concept of design thinking. The creative methodology is crystallized as IDEO Method Cards, which are 51 cards from four categories: Learn, Look, Ask, and Try (IDEO 2003). David Kelley, the founder of IDEO, has been teaching design thinking at Stanford design school where the processes of design thinking are designed as five iterative steps: empathize,

define, ideate, prototype, and test. In these processes, making rapid prototyping plays an important role in driving this cycle. A manual is a structurally composed pattern of best practices. In the case of customer service for example, the words and their order of the contact person is carefully determined by a manual. By following the manual, necessary information is collected efficiently and reasonably regardless of the skills of performance of contact persons. Design patterns are the patterns for codes, whereas the pattern of practices in programming software is also known as extreme programming (XP) (Beck and Andres 2004). The patterns of XP are defined as 19 practices classified in four types of basic activities (coding, testing, listening, and designing) under five values (communication, simplicity, feedback, courage, and respect).

Shikake Triggers

Shikakes as Patterns

As we described in the previous section, a pattern is an essential representation of knowledge and procedures due to its generalized simplicity. So far, shikakes are mainly designed by teams of expert engineers and/or designers. By applying shikake patterns in design, not only experts but also ordinary people might be able to make new shikakes.

A shikake is realized as the combination of physical and psychological triggers. Therefore, a pattern of shikake should be described by the combination of the triggers. Also, a shikake is designed to induce specific behavior that results in solving a specific issue. To reflect these causalities in design, shikake patterns must not only include triggers but also induce behavior to solve an issue. The triggers, behaviors, and purposes of shikake cases are not well defined yet. In this paper, as a first step, we consider "categories" for representing shikake triggers.

The physical and psychological triggers have been studied in various fields. The triggers can be classified into hierarchical categories, but the categories and structures change depending on the viewpoint for the target phenomena. For example, categories for persuasion and nudges are different. In this paper, we consider the hierarchical categories of triggers from the viewpoint of shikake. In the following, we first describe the concepts to which we refer for shikake triggers. We then present preliminary shikake triggers that we constructed.

Trigger Elements

The design of an artifact not only gives us an aesthetic impression but also tells us the function. Donald Norman described everyday things of good design and bad design and considered the importance of usability and visibility in usage and comprehension from psychological and cognitive points of view (Norman 2002). Perceived features of something, named "affordances" or "signifiers", become powerful triggers to induce specific behavior (Norman 2010).

Robert Cialdini discussed how behavior is influenced by the contents, the timing, or the situation of a received message (Cialdini 2006). He classified six factors that influence people's behavior: reciprocity, liking, social proof, authority,

scarcity, and commitment and consistency. Lots of previous studies on this have since been done (Goldstein, Martin, and Cialdini 2009). We consider these factors as candidates of psychological triggers of a shikake.

We constantly make decisions without thinking consciously, without even knowing that the decisions might be controlled by others. Richard Thaler and Cass Sunstein proposed the concept of Nudge Theory, where choices are designed on the basis of the principle of libertarian paternalism (Thaler and Sunstein 2009). Thaler and Sunstein described six principles of good choice architecture: incentives, understanding mappings, defaults, give feedback, expect error, and structure complex choices. These principles are also considered as candidates for the triggers of a shikake.

Gamification is a general framework used for encouraging people involved in a challenge. Each of its principles has been studied mainly in psychological fields, but they have been put into practice in a field of social games on the internet and have achieved great success. Gabe Zichermann summarized the key factors used in social games: reward, status, achievement, self-expression, competition, and altruism (Zichermann 2011). These factors are also useful when designing triggers of a shikake.

Volkswagen introduced the concept “Fun can change behavior for the better” for various products that change behavior to solve social issues. For example, The World’s Deepest Bin makes a long falling sound as if the bottom of the bin were deep underground when garbage is thrown into it (Volkswagen 2009). The sound attracts people’s attention, and as a result, more garbage is expected to be collected. The concept of The Fun Theory insists that “fun” is the most powerful driving force to change behavior for the better, an idea with which we totally agree. However, “fun” has mixed aspects. We break down the aspects of fun into expectation, challenge, and feedback.

Shikake Triggers

Based on these previous studies and practices, we carefully constructed shikake trigger categories for systematically describing physical and psychological triggers as shown in Figure 1. The hierarchical relations between categories are created on the basis of our considerations, although interpretations might differ if based on different viewpoints. Under the top-level category “Trigger” in Figure 1, we put “Physical trigger” and “Psychological trigger” as first-level categories to reflect the idea that a shikake is composed of both physical and psychological triggers. In the following, we explain our considerations by explaining each of these categories.

Physical Triggers The “Physical trigger” category shows the influence realized by a perceivable artifact. Under this category, we assigned second-level categories: Feedback and Feedforward. These categories are described as follows.

The Feedback category describes the stimulus received from a shikake in the course of interaction between people and a shikake. The feedback is important to make people understand the progress and achievement, enjoy the interactive process, and behave mindfully rather than mindlessly. The

information obtained by the feedback is classified into four categories: Haptic, Scent, Sound, and Visual.

- The “Haptic” category represents the effect of stimulus given by forces, vibrations, temperature, and/or motions to feed back the situation of targets. For example, when a car runs over a rumble strip (or a rugged line) on the road, the driver is alerted by the tactile vibration and audible rumbling. The direct feedback works immediately without needing careful consideration.
- The “Scent” category represents the effect of the power of scent that influences people’s behavior. For example, the city gas in Japan was originally scent-free, but a stinky onion scent was purposely added to make people notice gas leaks. Also, smell is strongly associated with our experience of everyday living and can be used as a trigger to set a mood. The scent of fresh waffles, for example, stimulates passersby’s appetite to make them purchase the waffles.
- The “Sound” category represents the effect of situation change expressed by the types and rhythms of sound. Also, sound has a compelling force to attract people instantly. As we already described, The World’s Deepest Bin makes a longer-than expected falling sound to attract people’s attention (Volkswagen 2009).
- The “Visual” category represents the effect of visualization to make people aware of visible or invisible information. For example, visualization of the number of steps counted by a pedometer becomes a trigger to encourage people to exercise more. If people set a goal as 10,000 steps/day and they have achieved 7,000 steps, they might push themselves to walk another 3,000 steps.

The “Feedforward” category describes the effect of the perceived characteristics of availability, functionality, and usability acquired from an artifact. The effect becomes a trigger to induce specific behavior either directly or indirectly. The characteristics are realized from the shapes and features of an artifact or the association of our past experience. This third-level category includes “Default option”, “Metaphor”, and “Signifier”.

- The “Default option”, one of the six categories of Nudge Theory, is an option based on the principle of libertarian paternalism (Thaler and Sunstein 2009). The default option will be chosen by those who are not thinking about the choice as much as they should be. The default option is designed to make people behave better than they would do otherwise. In the context of a shikake, default options are realized by removing, replacing, redesigning, or realigning existing physical artifacts, not by adding new artifacts.
- The “Metaphor” category involves the use of association of well-known artifacts in a different context or situations for making people imagine how to use something or what might happen. For example, a small tiny shrine gate makes people think of an actual shrine gate, gives people the impression of the surrounding area being holy, and eventually makes them hesitate to litter there.

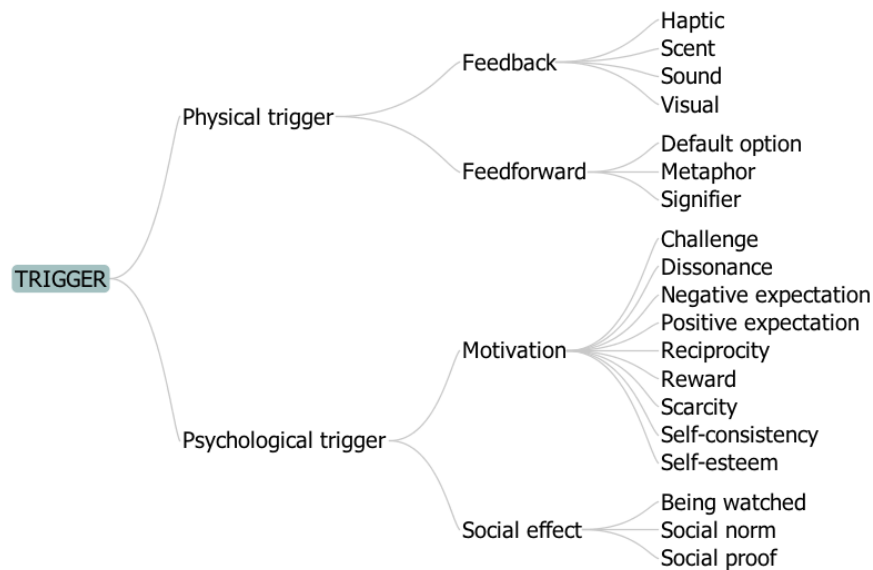


Figure 1: Shikake trigger categories.

- The “Signifier” category represents the perceived affordance by which people can easily understand how to use an artifact or how to behave in a situation (Norman 2010). The signifier is a clue to be interpreted meaningfully whether or not it is incidental or deliberate. For example, the shape of a door handle gives people the understanding of how to use it, or lines on a parking area make people park their bikes between or along the lines.

Psychological Triggers Under the “Psychological trigger” category, we put two subsidiary categories, “Motivation” and “Social effect”, as second-level categories. These categories describe the following reactions.

The “Motivation” category refers to the trigger that directly arouses positive or negative impulse. Under the “Motivation” category, we put nine third-level categories from extrinsic to intrinsic triggers. Each of these categories describes the following reactions.

- The “Challenge” category describes the trigger that sets an unwritten goal in people’s minds. The challenge urges people to become involved although they do not have to. A fly target in a urinal offers a challenge to hit it, and men do not easily escape this temptation.
- The “Dissonance” category shows that people tend to avoid dissonance. If there is a consecutive picture on the spine of a series of books, people feel like putting the books in order to see the picture correctly. Conversely, we do not care about this if there is no consecutive picture.
- The “Negative expectation” category directly works on our instinct for survival to avoid risk, fear, pain, and displeasure. The category is realized by a trigger that makes people perceive negative feelings. For example, a speed bump on a road makes drivers slow down to reduce the shock of impact.

- The “Positive expectation” category is a trigger that arouses people’s curiosity by using a shikake to make people imagine what will happen. For example, footprint marks on the ground imply something exists at the end of the footprints and arouse people’s expectations. This category is the source of the positive feelings of pleasure, fun, and hope. The placebo effect, where people believe a pseudo utility or function, is also included in this category. A shikake with a placebo effect causes nothing, but it changes people’s attitudes, resulting in changing behavior. For example, many of the push buttons at pedestrian crossings actually have no effect. Many of the traffic signals are controlled automatically to maximize the efficiency of traffic flow. However, by pushing the button, the stress of people waiting is relieved, and people can wait until the signal turns to “walk”. The positive expectation is caused by the placebo effect.
- The “Reciprocity” category means that people tend to return good for good. People are implicitly obligated to repay for what others has provided. Cialdini showed various examples of reciprocity triggering behavior change (Cialdini 2006). The category is one of the most potent weapons for behavior change, and we have to use it in morally desirable ways because it is often abused for bad purposes.
- The “Reward” category is a straightforward approach of providing something valuable in order to encourage people to change their behavior willingly. For example, a campaign of free coffee to police officers will increase their visits and eventually improve the security of the establishment. Benefits like discounts and bonus points are also considered as rewards.
- The “Scarcity” category follows the simple principle that limited availability increases value. For example, lim-

ited sale of items, such as “one item per person” or “time sale”, induces excessive purchasing behavior. Cialdini explained many examples regarding scarcity (Cialdini 2006).

- The “Self-consistency” category is based on the fact people tend to adhere to what they have said or declared because it is commonly thought as desirable in terms of logic, rationality, stability, and honesty. For example, people who declare their private decisions, such as stopping smoking or losing weight, to their friends perform better than those who do not. Cialdini also described various examples regarding consistency (Cialdini 2006).
- The “Self-esteem” category represents people’s desire to be accepted by others (Maslow 1943). Self-esteem works as a powerful trigger to encourage people to participate. For example, leader boards in Social Games are widely used to make people become involved. Also, a mirror at an elevator hall relieves the stress of people waiting because people can use the waiting time to increase their self-esteem by checking their appearances.

The “Social effect” category describes the influence regarding our social aspects among others and of the environments. As we are collaborating, cooperating, and competing with others, we are inherently sensitive to social codes in order not to deviate from them. Under this category we put three third-level categories: “Being watched”, “Social norm”, and “Social proof”.

- The “Being watched” category describes the feeling of people’s eyes being fixed on oneself. Detecting eyespots is an innate ability we acquired to survive in the wild, and it can become a powerful trigger to influence people’s behavior. In modern times, good behavior is induced by the desire to live peacefully. In addition to eyespots, we feel like we are being watched due to changes in the environment.
- The “Social norm” category represents the effect of implicitly required standards, manners, or morals from which people are compelled not to deviate. For example, littering in a public space is undesirable behavior that goes against a social norm.
- The “Social proof” category describes the effect by which people assume others’ behavior as the correct behavior. As the effect is prominent especially in ambiguous situations, people follow the same behavior as others in order to conform to the social proof. The effect also induces what we call the “snowball effect” phenomenon, where a small trigger causes a big change, like a snowball becoming bigger as it rolls down a hill. The same phenomenon is true for people’s behavior: a person’s behavior change causes others’ behavior changes. For example, a long waiting line in a shop becomes a social proof that the shop is popular, and so more customers join the line.

Preliminary Statistics

Category Distributions

We have been collected hundreds of shikake cases, and we annotated some of them tentatively with categories in Fig-

Table 1: Category statistics for 120 shikake cases.

Hierarchy	Category	# of cases
First	Physical trigger	121
	Psychological trigger	160
Second	Feedback	56
	Feedforward	65
	Motivation	127
	Social effect	33
Third	Haptic	6
	Scent	1
	Sound	18
	Visual	31
	Default option	5
	Metaphor	27
	Signifier	33
	Dissonance	17
	Challenge	19
	Negative expectation	12
	Positive expectation	41
	Reciprocity	3
	Reward	17
	Scarcity	2
	Self-consistency	3
	Self-esteem	13
	Being watched	15
	Social norm	4
	Social proof	14

ure 1. The statistics of annotated categories for 120 shikake cases are shown in Table 1. Note that the sum of the number of cases is not equal to the number of shikake cases because each Shikake case is assigned to as many categories as possible in order to capture the features of a shikake composed of multiple triggers. The shikake cases annotated here are selected at random, and the categories annotated are based on our considerations and interpretations. We cannot create a strict discussion because the distribution of the number of cases over categories might not reflect the representative samples of shikakes. However, let us overview the preliminary results for our trial because the purpose of this paper is to give readers some insights into shikake.

Looking at the first hierarchy in Table 1, we can see that both physical triggers and psychological triggers are used in a good mixture. On average, one shikake includes 1.01 physical triggers and 1.33 psychological triggers. For the second hierarchy of physical triggers, both “Feedback” and “Feedforward” seems to be used about the same amount. For the second hierarchy of psychological triggers, “Motivation” is obviously the predominant psychological trigger, occupying 79 percent of all the psychological triggers. “Social effect” is also often used. As for the third hierarchy of physical triggers, the feedback triggers of “Sound” and “Visual” and the feedforward triggers of “Metaphor” and “Signifier” are more dominant than other triggers. These results imply the high availability and implementability as a shikake. In the third hierarchy of psychological triggers, the motivation trigger of

Table 2: Top 10 co-occurrence patterns of triggers.

No.	Co-occurrence pattern	# of freq
1.	Metaphor & Positive expectation	13
2.	Positive expectation & Sound	11
3.	Positive expectation & Signifier	9
4.	Challenge & Visual	9
5.	Signifier & Social proof	8
6.	Being watched & Self-esteem	8
7.	Positive expectation & Reward	7
8.	Positive expectation & Social proof	7
9.	Negative expectation & Signifier	6
10.	Positive expectation & Visual	6

“Positive expectation” is used the most, followed by “Challenge”. “Dissonance”, “Reward”, “Being watched”, “Social proof”, etc. are used for various triggers. Over viewing these results, we can conclude that a shikake can be implemented in various ways.

Co-occurrence Patterns

Triggers are often used in combination. If there are patterns of triggers frequently used together, this could be useful knowledge as a rule of thumb when designing a new shikake or predicting the likelihood of success. As we have constructed 19 categories as shikake triggers in Figure 1, there could be up to 171 ($=_{19}C_2$) patterns of a pair of triggers. However, not every pattern works well as a shikake trigger. To uncover the existence of patters, we count the number of trigger pairs for the same 120 shikake cases. Table 2 shows the top 10 frequent patterns of pairs of triggers. For example, the pattern of “Metaphor” and “Positive expectation” co-occurred in 13 shikake cases, and this gives us a promising rule of thumb that is expected to work well in a new shikake. We obtained 72 out of a possible 342 patters. The small number of shikake cases in our preliminary experiment is not enough to draw definite conclusions, but it suggests the existence of frequent patterns that may be obtained as rules of thumb.

Conclusion

In this paper, we proposed shikake trigger categories to describe the physical and psychological triggers for shikake specification systematically. We also showed our preliminary results for 120 annotated shikake cases to overview the distribution of the usage as well as the co-occurrence patterns to explore rules of thumb.

Our final goal is to make a framework where people can create new shikakes. We believe that the shikake trigger categories proposed in this paper will contribute for designing a shikake, although it is not enough. A shikake is designed to induce a specific behavior to solve issues (Matsumura 2013). To describe the shikake specifications, we need to consider not only “triggers” but also “behaviors” to be induced and “issues” to be solved. We are currently working on constructing hierarchical categories for behavior and issues that will be useful to describe shikake specifications in

more detail. We will continue this work and hope to publish more about it in the near future.

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