Examining the "Later Wow" through Operating a Metaphorical Product

Ming Huang Lin and Shih Hung Cheng*

Institute of Applied Arts, National Chiao Tung University, Hsinchu, Taiwan

Japanese designer Naoto Fukasawa coined the term "later wow" to describe a kind of emotional response to using a product—a sort of deferred surprise. The "first wow," on the other hand, is associated with the first impression of an object, mostly based on its appearance. To study the "later wow" phenomenon—especially as it occurs in the domain of metaphorical products with various modes of operation—we first propose three interaction modes as the framework by integrating concepts from narrative grammar, an interaction protocol from product semantics, and incongruity–resolution theory in humor perception. Following a pilot study to verify that user surprise shifts significantly in the different operational steps, we conducted in-depth interviews to investigate users' responses during actual product operation, especially in relation to unexpected pleasure. We found that the "later wow" is certainly related to clarifying confusion caused by the referential quality of the product, and is triggered initially by the discovery of unexpected qualities that are solved through operation.

Keywords **–** Case Study, Design Strategy, Later Wow, Psychology of Design, Unexpected Operation.

Relevance to Design Practice **–** This article introduces incongruity–resolution theory to explore the characteristics of the "later wow," to offer designers new insights into designs with semantic and emotional qualities.

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Introduction

Many product designers nowadays try to create products with appearances that can both attract consumers' attention and arouse their emotion. Because the first impression usually comes from appearance, such as with most of Philippe Starck's works, the approach of provoking a "first wow," a term coined by well-known Japanese designer Naoto Fukasawa (Goto, Sasaki, & Fukasawa, 2004), has become many designers' goal. However, some designs do not stop at the "first wow" level. If we carefully examine Rexite's tape dispenser, designed by Julian Brown, and Alessi's Anna G corkscrew, designed by Alessandro Mendini, we are not only initially amazed by their fascinating and interpretive form, but also captivated by certain characteristics that emerge through operation. In recent decades, Naoto Fukasawa has tried to embody the sophisticated relations among product, user, and environment through his elegant and refined designs. His design strategy seems to dim the first impression of the product's appearance while enlarging the later effect after operation through visual clues. He has advocated several influential concepts of product design through exhibitions and publications, such as "without thought," "activity memory," "found object," and "later wow" (Goto, Sasaki, & Fukasawa, 2004). Among them, "later wow," the concept directly involved in emotional responses, refers to the late recognition and appreciation of a novelty that arises when a product is being used or after it has been used (Fukasawa, 2002; Goto, Sasaki, & Fukasawa, 2004; Szita, 2006). This new term in design practice has inspired us to take a more careful research approach to further understand and clarify its links to his other concepts.

Figure 1. MUJI CD player. (Designed by Naoto Fukasawa. Copyright: Ryohin Keikaku Co., Ltd. Reprinted with permission.)

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Corresponding Author: achille.shc@gmail.com.

Fukasawa (2002) has used his CD player design (see Figure 1) as an example to illustrate his concept of the later wow:

> In contrast with the "First Wow," which is the immediate surprise you get upon seeing something, "Later Wow" is the kind of surprise that sneaks up on you. I think that a feeling that gradually spreads out has greater value and brings greater joy than something that just makes you say "Wow!" in the beginning but then goes nowhere fast.… That part of CD is the visual "First Wow." The "Later Wow" happens when the user puts in a CD and pulls the cord, thereby producing a sound like a rotating ventilation fan (p. 57).

By "matching things with different actions" (Fukasawa, 2007, p. 42), the later wow can occur at the moment the user understands the designer's ideas behind the product by means of the object's various characteristic actions (Fukasawa, 2007, p. 42; Goto, Sasaki, & Fukasawa, 2004). This kind of later wow design may be seen as an interpretive design of operation, somewhat related to "reflective design" as termed by Norman (1988), especially with regard to the meaning of the operation. We wish to know exactly when and how this second or later impression is aroused during the process of operating a metaphorical product. Will the interaction process be divided into sequential steps for detecting the crucial factor? Will users' responses be similar to one another if the results of the operations are beyond their expectations? Does the first wow, concerned with the product's form, have to be reduced to produce a stronger later wow? After a related theoretical survey, preliminary analysis, material gathering, and a simple quantitative pilot study, in this study we conducted in-depth interviews to investigate users' responses during actual product operation, especially in relation to unexpected pleasant surprise.

Theoretical Framework and Hypothesis

When metaphorical designs are mentioned, we inevitably recall the issue of product semantics in the 1980s. Product semantics as an interpretive approach offers designers unprecedented freedom of expression. Multilayered visual references provided by metaphors, similes, and analogies were applied in student designs at the Cranbrook Academy of Art (these designs deserve much credit for their exploration of the first wow, as the term is used in this paper) and even received worldwide attention (McCoy, 1990). Even Klaus Krippendorff, the original advocate of product semantics, emphasized that "styling" had nothing to do with the core of his intentions; rather, his interest was in understanding, which does not stop at the visual boundary (Krippendorff, 1990). However, with the success of products like those of Alessi and Philips in the postmodern era, that sensibility has overwhelmed the senses. This is the trend that emphasizes emotion in product design.

We adopt several theories to clarify the framework of the later wow produced by interaction with a metaphorical product. First, we try to clarify the definition of "wow" related to surprise and pleasant response. Then, we borrow from the theory of humor perception to explain how the later wow occurs in the interaction. The following introduction to Krippendorff's interaction protocol uses the theory of narrative order in linguistics to address different content during various interaction steps.

Wow and Surprise

According to Mann (2002), anything that excites users can make them go "Wow!" He gave three examples concerning the wow: it can be elicited by jokes, things you've never seen before, and unexpected freebies, which are all related to unexpected attributes and solving contradictions (Mann, 2002). Desmet, Porcelijn, and van Dijk (2007) claimed that the wow arises from a combination of pleasant surprise, fascination, and desire. Surprise is a neutral emotional response that plays an important role in user satisfaction (Vanhamme & Snelders, 2001), and the essence of surprise is the separation between the observations made before and after an unexpected transformation (Norman, 2004, p. 106). Surprise is often a "first-time-only" emotion. Any product that falls outside the boundaries of our expectations and experiences is likely to be appraised as novel; that is the attribute that provides surprise and makes us go "Wow!" (Desmet, 2002, p. 117). Thus, it is unexpected and unfamiliar attributes that are able to elicit the "wow" experience.

Desmet (2002) argued that surprise will no longer be aroused once users have become familiar with a product's attributes. While this argument has not been seriously examined, it does remind us that time is an important factor that affects our perception. Regarding the scale of time, this study assumes that the first wow occurs the first time we see the product, and the later wow occurs during the period of operation. Unlike the first wow, the later wow is the embodiment of a pleasant surprise that occurs through interacting with the product. We believe this slightly later emotion can be caused not only by new comprehension through operation but also by the resolving of a contradiction between perceptions and sensations. Ludden, Schifferstein, and Hekkert's (2008) research, which focused on surprise resulting from visual–tactual incongruities, is a good example. The novel characteristics can be visualized in the beginning or be hidden at first and then be uncovered through interaction. The incongruity between what users see and expect to touch and what they actually do touch can give rise to the later wow. In addition, the sensation

Dr. **Ming Huang Lin** is a Professor and Chair of the Institute of Applied Arts (IAA), National Chiao Tung University (NCTU), Taiwan. He received his PhD from the Royal College of Art (RCA) in 1999. He supervises doctoral and master's students in the Program of Industrial Design at the Institute of Applied Arts. Lin is interested in the semiotics of design, applications of new materials, production technologies, and various quantitative and qualitative research methods. Recently, he has had many papers published that are related to or integrated with different "exotic design research tools," such as event-related potential (ERP), eye tracking, grounded theory for design cognitive research, and digital generative design software for design practice.

Dr. **Shih Hung Cheng** is a Postdoctoral Fellow at the Institute of Applied Arts, National Chiao Tung University. His design practice and research areas are in metaphorical design, product emotion, embodied experiences, and human–product interaction. Cheng's master's degree related to the applications of archetype and metaphor to product form. This paper, drawn from his doctoral research, focuses on interaction with a metaphorical product and users' emotional responses. He is also involved in innovative research in neuroscience to try to bridge the gap between cognition research and design practice.

of products is not about visual perception only; information from the cutaneous, auditory, or olfactory senses also has an effect. It is also possible that designers purposely incorporate a conflict condition among the ideas of sensations to elicit the later wow. The later wow arises from operation of the item, which may include changes in appearance that are contrary to the user's expectation, which initially stemmed from an appraisal of the form. The shifts during users' experiences with an object are seen as the breeding ground for the emotional responses in the different stages of interaction that result in a later wow. These designs usually confuse users at first glance, become puzzles to be deciphered, and, finally, become objects of delight.

The Process of Incongruity–Resolution

If a design makes sense, users find it easier to retrieve knowledge to understand the new material (Norman, 1988). What if it does not? Mann (2002) has also stated that design for the wow is contradiction elimination. With jokes, for example, the joke teller often sends listeners in one direction, while the punchline lies in another. Listeners feel the wow after resolving the seeming contradiction and shifting directions. In metaphorical product design, there are always different levels of confusion. The function of symbolization inevitably carries another unintended group of attributes that cause the incongruity and more or less puzzle users for a while. Thus, in the use metaphor, there is a prerequisite that the contradiction between sensations and ideas must be resolved before ending the interaction. In the metaphorical context, the later wow may be elicited by a later unexpected, but reasonable, attribute or contradiction elimination that makes the context clear.

We have borrowed the key elements of incongruity–resolution theory (Suls, 1972) in humor perception to apprehend the cognitive process (Fang, Lin, & Liao, 2006). "Incongruity" results when a conventional characteristic of a product is replaced by a new but irrelevant attribute offered by a signifier. Take Fukasawa's CD player (see Figure 1) as an example: users may wonder at first why it looks like a box hung on the wall and has a cord (possibly there is no first wow in this case)—an appearance highly incongruent with a typical CD player. "Resolution" refers to the discovery of a reasonable connection between signifier and signified. After trial use, users will comprehend that the cord is the power switch and that it is easy to associate the CD with fan blades and its dulcet music with a slight breeze. The process of incongruity resolution is very much like puzzle solving, and the moment of solving the puzzle elicits an element of cheer or joy owing to the satisfaction of resolution. It seems that this cognitive process in our minds during the interaction between our hands and the products provides a platform for further study.

Semantic Interaction Protocol

Krippendorff and Butter (1984) argued that the meaning of something does not lie on the surface but emerges from its use. Developing this assertion, Krippendorff (2006) proposed an interaction protocol (see Figure 2) to illustrate an interaction sequence. The logic of each interaction step, with subdivisions observed from the outside world, might help us penetrate users' inner perceptions. In the diagram, there is a "floating" interface followed by different stages of action and product feedback or subtle changes in appearance. In this protocol, users first sense the initial appearance (s_1), which might evoke the memory and meaning of a product (m_1), which will then trigger their first action (a_1), finally resulting in feedback (s_2). This triplet includes sensing the present state (s_t), acting with input (a_t), and sensing the next state (s_{t+1}). After that, users may initiate the next triplet for the next stage, or they may operate it in reverse for recovery. If we regard this diagram from the perspective of puzzle solving when a product is unfamiliar to users, we can see that it may correspond to the process of sensing incongruity, detecting it, and resolving it by sensing its interval responses (including feedback or function). At any stage of this protocol, different sensations constitute the range of presumable actions and senses, and are related to expectations or unexpected operations, followed by feedback, step by step. In this protocol, we can also observe the emotional response in each step to see the interval interaction and product feedback (including appearance and function) related to later wow; it also allows us to investigate their sophisticated relationship using metaphorical products.

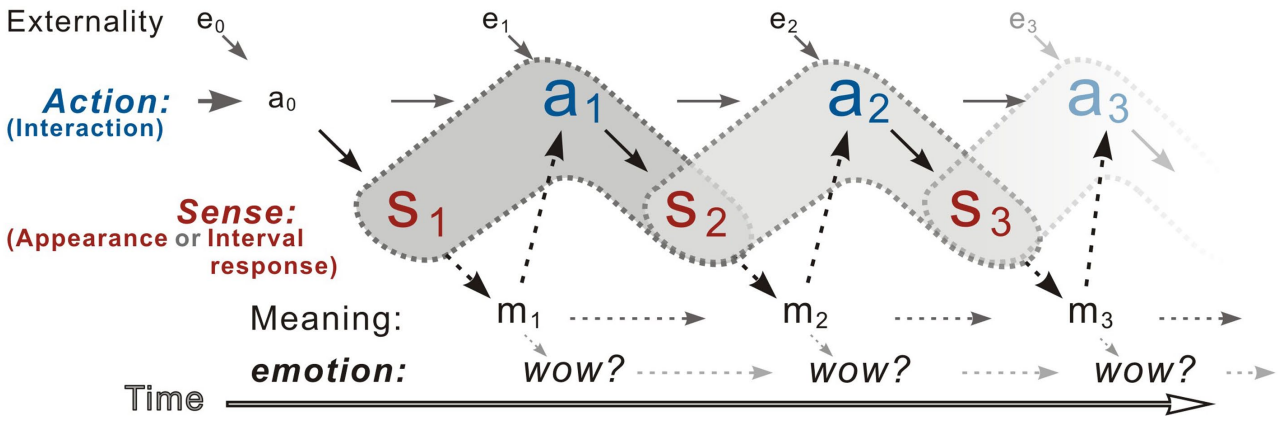

Figure 2. Interaction protocol (originated by Krippendorff, 2006).
Solid arrows delineate the product mechanism; dotted arrows signify what users embody.

Narrative Order

The concept of metaphor comes from linguistics. When a user’s interaction is related to a metaphorical context, seeing how to deploy the context—the narrative order—could be helpful for categorizing the expressions of interaction. In addition, experiencing a metaphorical design has also been compared to encountering a poem or stage play. Similar to listening to or reading a story, audiences or readers are first mainly stimulated by structure and expression (Cpuchik & Hilscher, 2008). By referencing their own experiences, they project themselves into the scenario during a play or narrative—or in an interaction, as in our case. Krippendorff also pointed out that simple narrative and design both involve cooperative figures (teller–listeners and designer–users, 2006) and that they have similar constructions (subject–verb–object and actor–action–target, 1990).

According to the theory of narrative by Todorov (1981), a structuralist and follower of Roland Barthes, an ideal narrative comprises five propositions: a stable original situation, a perturbing force, a disequilibrium, a force in a converse direction, and a reestablished equilibrium. These five steps can be analogized as a sequence consisting of seeing an appearance (or a regular motion), interacting, sensing feedback (function), interacting again, and recovering the original appearance or motion (see Figure 3). The relations among these propositions can be of three types (Todorov, 1969, 1975, 1977): first, the temporal relation exists, in which events follow one another in an imaginable way, although it may be so conventional that causality is easily ignored. Second, the logical relation emphasizes that narratives are guided by presuppositions to particular results. These two relations exist between the semantic concepts carried by inner propositions and shift to the background to disappear. The third is the spatial relation, in which propositions are juxtaposed—because of their similarities—to constitute an easily recognizable structure, or in which there is some shift of semantic concepts without internal exposition of the causal connections (Todorov, 1977, 1981). It is obvious that these grammatical typologies consist of sequences in time, space, and logic (see Figure 3).

The temporal relation is represented by a plus sign (+) (Todorov, 1969; Danove, 1993). If the internal causality is ambiguous and difficult to define, only the temporal relation remains between propositions, such as “He cut down the cherry tree. He was sworn in as president.” This relation could be noted as “A + B.” Todorov (1981) noted that it is easy to confuse the temporal relation with the logical because, whereas the causal narrative also has a temporal attribute, people rarely perceive this attribute because of its conventionality. The logical relation is represented by an arrow (→). This example—“He dialed a telephone number. The train blew up”—leads us to imagine that a terrorist caused the explosion (Krippendorff, 2006, p. 172). In such a case, this relation could be noted as “A → B.” However, Todorov makes no note of spatial relation (Danove, 1993), which is a fundamental principle of poetry, in which it is more widespread than in prose. A poem by George Herbert (see Figure 4) is an example of Todorov’s (1981) definition of spatial order as “the existence of a certain regular disposition of the units of the text” (p. 46).

Further, spatial order may also be applied to wordplays, most of which are classified as puzzles. An anagram represents such a wordplay, in which the letters of a word or words may be reordered to create a space on the level of the signifier that

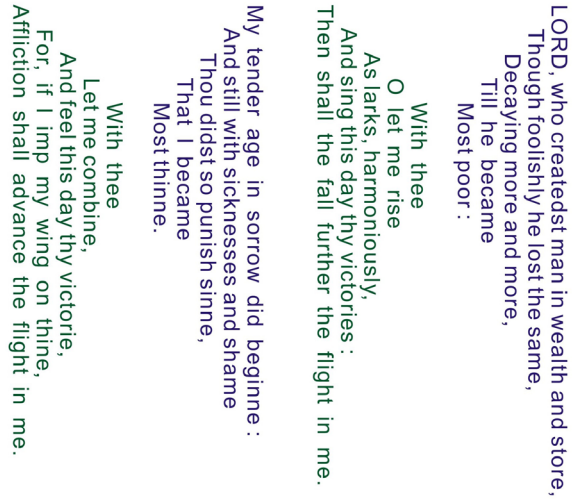

Figure 4. “Easter Wings,” by George Herbert (1593–1633) (Herbert, 1857, p. 49).

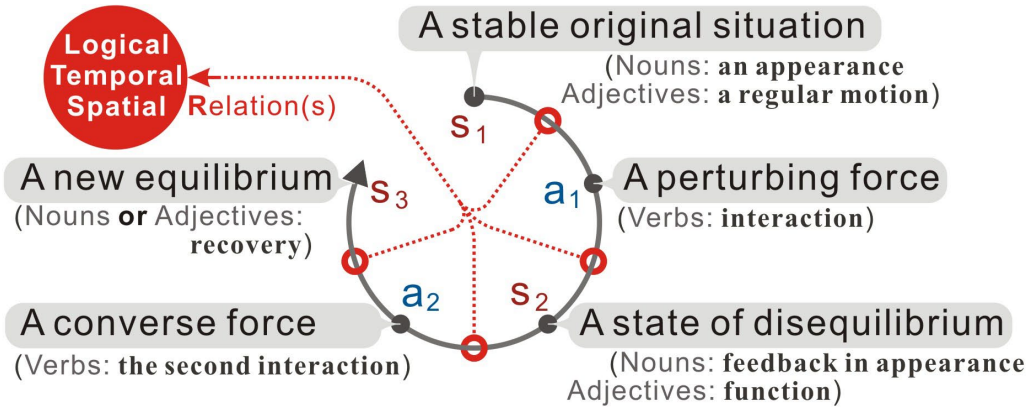

Figure 3. Todorov’s (1969, 1975, 1977, 1981) **ideal narrative model.**
The concepts of s_1, a_1, s_2, a_2, and s_3 are adapted from Krippendorff’s interaction protocol to integrate the two models.

indicates either similar or opposite meanings. The wavy equals sign (≈) between the original and the reset designs expresses their approximation but signals their differences. For example, "Astronomer ≈ Moon Starer" offers a partial explanation of what an astronomer does; however, "Mother-in-law ≈ Woman Hitler," while it distorts the meaning of the original, may represent the truth in some cases, and "teaching ≈ cheating" completely subverts the meaning of the original. In these cases, their semantic concepts are shifted from the literal meaning to the punch line, and the results are likely to surprise readers and even elicit laughter. Riddle makers and designers generally hide a key that enables solvers to reset these units and discover the hidden meanings. Because of these characteristics, we believe that these relationships with words provide a useful supplement to this study.

Interaction Sequences

To apply the three relations mentioned above to product interaction, we infer initially that the temporal relation (+) may represent what we call "consecutive interaction" and refers to the notion that meanings are typical and conventional. Users normally ignore the inner causality, probably because they are familiar with operation and consequential feedback or because the process essentially is too normal to arouse users' curiosities. Second, the logical relation (→), which is based on consequence, refers to user operations according to indexical, iconic, and symbolic clues from the product's appearance. Accordingly, such operations could be called "clued interactions." Third, the spatial relation (≈) interprets the concept of juxtaposition, in which a similar but different operation is executed to expose an unexpected image or hidden function as if it were superimposed on the original one. Thus we name it a "juxtaposed interaction." After gathering and examining 100 figurative products (objects with various qualities of iconic reference), we chose some typical cases to explain how these three relations influence the making of the interaction sequence. Before illustrating the application to product interaction, we clarify in advance that there is likely more than one type of relation among the steps of interacting with a product, and we classify metaphorical products mainly according to the relationship between the original state and the first operation. Furthermore, the purpose is not to identify to which type of interaction a product belongs but to select various products for testing later.

Consecutive Interaction (+)

The main characteristic of the consecutive interaction sequence is that users carry out the typical operations by following conventions, even unconsciously. "TikTikTik" (see Figure 5) is an example consisting of a typical lampshade and a pull-cord switch resembling a tape measure. This cord provides a strong clue in the form of an invitation to pull it down, by which the lamp is turned on. When one pulls the cord, the switch becomes elongated, and the light comes on. Then, the length of the tape measure is gradually retracted. During this time the light becomes dimmer, until the lamp turns itself off. After experiencing the process several times, the user will realize that the length to which the tape measure is pulled relates to the recovery time. We believe that the design of the pull cord as a tape measure is the key to understanding that the lamp has a timer function by which the lamp will turn itself off. The second example, Smile (see Figure 6), is a switch with a crescent-moon-like LED indicator on the bottom. The decoration with two dots makes this concept design look like a smile when it is turned off, but it changes to an unfriendly facial expression to remind us to save energy when it is turned on. The usual switch operation functions as a clue with its changing face in order to convey the designer's idea.

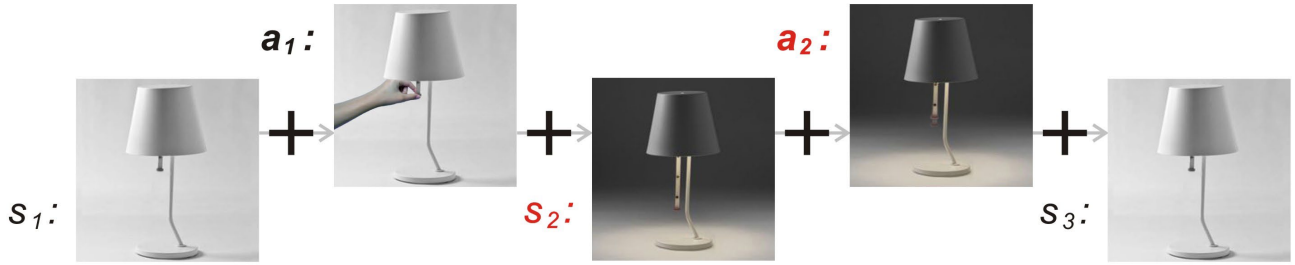

Figure 5. TikTikTik lamp. (Copyright: bitplay. Reprinted with permission.)

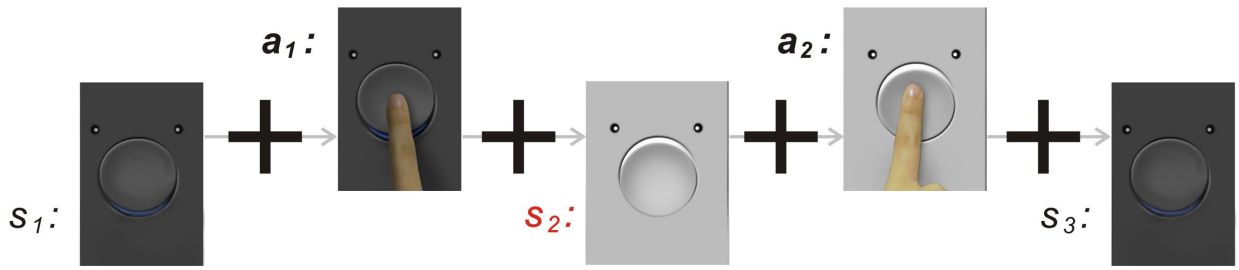

Figure 6. Smile. (Copyright: Chou, Mo, Zhou, & Liu. Reprinted with permission.)

The “Pouring Light” (see Figure 7) is another example that employs an everyday operation to create a later wow. The shade resembles a cup, and the stand looks like water spilling out of the cup. Although its form may be confusing at first glance, users can readily find and then flip the switch on the top of the lampshade. The first flip turns it on, the light looking as if it is water being poured out of a cup. The location and operation of the switch offer the user a chance to make sense of the borrowed shape. Flipping the switch again will turn the light off, although that action does not really imply that the “water” can be retrieved and put back into the cup.

Clued Interaction (→)

The clued interaction sequence accentuates causality, by which users can get a decisive clue from the shape for operating the object. Feedback may help users solve the puzzle of why the designer chose an atypical form to provoke a unique operation. Fukasawa’s CD player (see Figure 8) is an example. It mimics a ventilation fan: the spinning of the CD it plays is exposed, and the chain used to turn it on is the most decisive attribute in terms of evoking the memory of operating such a fan. It is also easy to associate the CD with fan blades and its dulcet music with a slight breeze. However, once users become more familiar with this product, they will more and more ignore its inner causality and consider it as the convention. Therefore, the plus signs (+) will gradually replace the arrow (→), which represents the logical relation in sequence.

The operation of “BANG!” (see Figure 9) is also easily guided by its visual clue, a gun-like remote control. When a person aims it at the lamp and pulls the trigger, the light tilts to an upright position and turns on. Users may hesitate over the relation between the shot and the light when they see this feedback (s_2). The puzzle is not entirely solved until users pull the trigger again and see that the lamp turns off rapidly and the shade tilts realistically as well, as though the lamp has been hit. Its producer, bitplay Inc., was most concerned to offer the sense of surprise after the first triggering. Thus, bitplay added a toggle switch on the cord that needs to be switched on first and makes owners see the feedback (s_2). Then, owners will get the key point of this design from the first triggering without the puzzle mentioned above. The “Criminal” lamp (see Figure 10) has an oblique hat-like lampshade that “floats” because of its foot-like forked stand. With the hint of the stick attached to the hat, the user will probably try to touch it and will discover that when it is lifted up, the lamp is turned on. To turn the lamp off, the user would retrace the path and, by instinct, tilt the hat down. The lamp is designed to memorialize the “King of Pop,” Michael Jackson. The unique form evokes his famous dancing gestures in his song “Smooth Criminal.” The inspiration came from his hat, which was

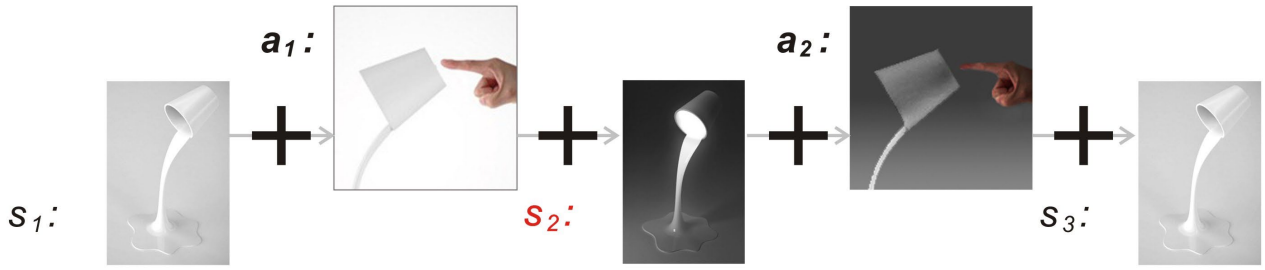

Figure 7. Pouring Light. (Copyright: Yeongwoo Kim. Reprinted with permission.)

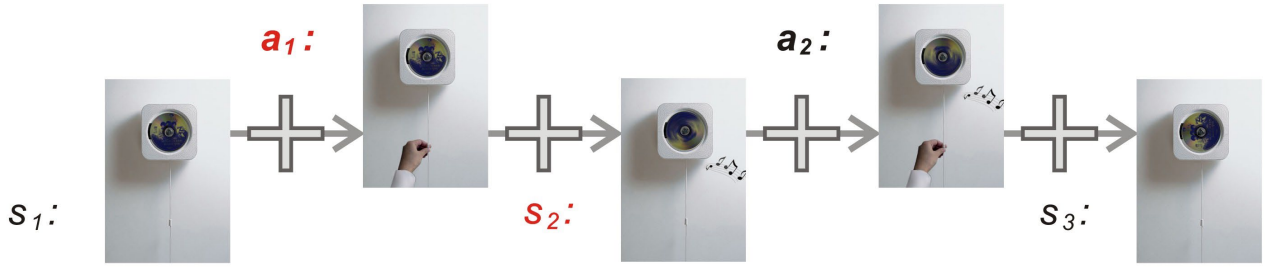

Figure 8. MUJI CD player. (Copyright: Ryohin Keikaku Co., Ltd. Reprinted with permission.)

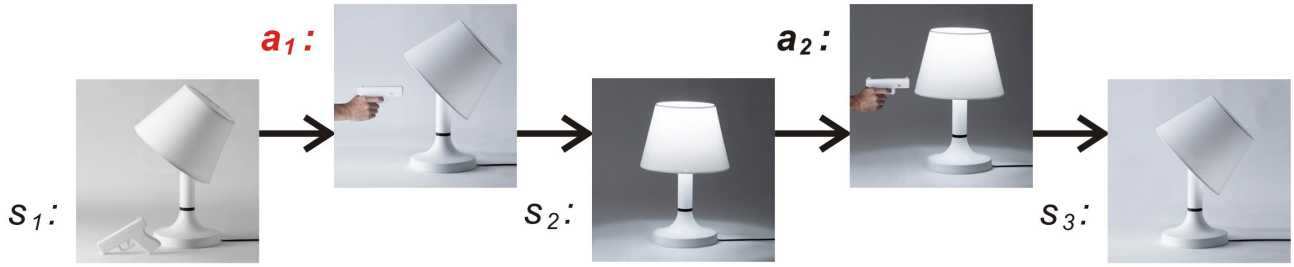

Figure 9. BANG! (Copyright: bitplay. Reprinted with permission.)

decorated with a black strip, along with his gestures, including closing his feet, inclining his body by 45 degrees, and holding the hat. His dress (form) and gestures (action) were to be interpreted as a part of the overall design. Because the form of the lamp, when it is turned on, evokes Michael Jackson dancing in the spotlight, users may thereby understand the designer's concept.

Juxtaposed Interaction (≈)

It may happen that two visual references exist in one design and replace each other during interaction. As soon as one operation takes place, the second image or function may be revealed, along with a shifting semantic connotation. This trick is similar to joke-telling, which usually delivers the punch line in a paradoxical and unexpected way. The "Cupid" lamp is a good example (see Figure 11) of such an interrelationship: at the beginning, it looks like a large baby formula bottle. However, because of its semi-transparent material and power cord, users realize that it is actually a mood lamp. In an attempt to find out how to turn it on, users may shake the bottle, press or suck the nipple, or try to twist off the ring. They finally discover that the ring can only be pushed down vertically to turn on the light, by which the lamp is immediately "turned into" a condom. This shift in shape makes us think of the connection between the two connected activities evoked by these visual references: feeding a baby (evoked by the formula bottle image) and sexual activity (i.e., taking off or putting on a condom). In this design the original appearance (s_1) provides a paradoxical clue to orient the available operation component such that it can be operated in an unexpected way (a_1). The resetting of the ring reveals another unanticipated image (s_2) as a new signifier and leads users to work out the riddle that the designer proposed.

The design of a clock called "Time is up!" is another example of this kind: it has a countdown timer that looks like a normal clock pendulum (see Figure 12). The timer does not function unless one attempts to swing its pendulum, just out of curiosity, and accidentally pulls it down to discover that the pendulum functions as a weight at the same time. After the pendulum has retracted completely, an alarm goes off to remind the user that "time is up." This design is inspired by musical mobiles for cribs. The designer has juxtaposed pulling the handle ring with the countdown of a clock, and its pendulum with the timer on a musical bed mobile. The original function is recognized as that of a normal clock, whereas the second function, elicited by pulling down the pendulum, is unrecognized. The key to solving the riddle entirely is not revealed until the pendulum has recovered its original position and the alarm goes off.

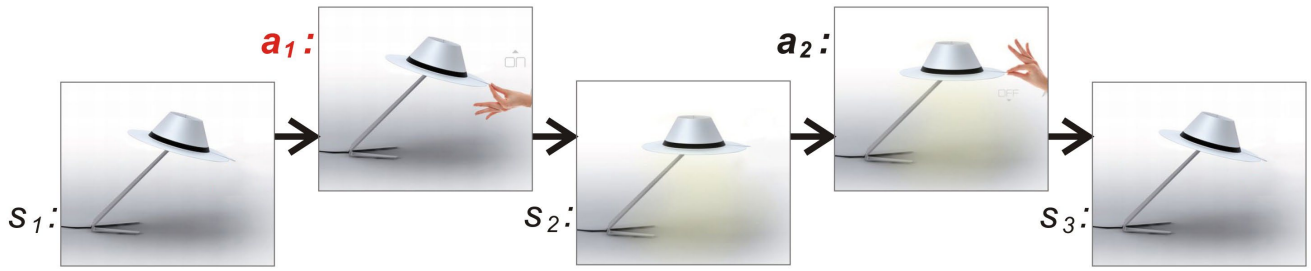

Figure 10. Criminal. (Copyright: Sebastien Maleville. Reprinted with permission.)

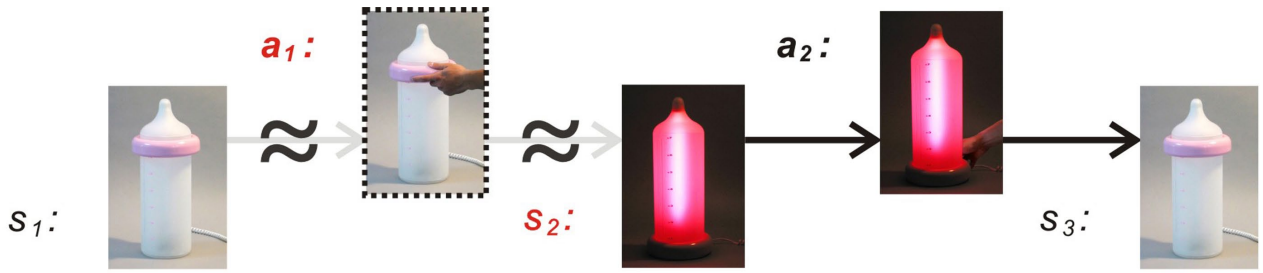

Figure 11. Cupid. (Copyright: Shih-hung Cheng. Reprinted with permission.) The causality among the first three steps is so vague that the approximately equals sign replaces the arrow to express the characteristic of juxtaposition.

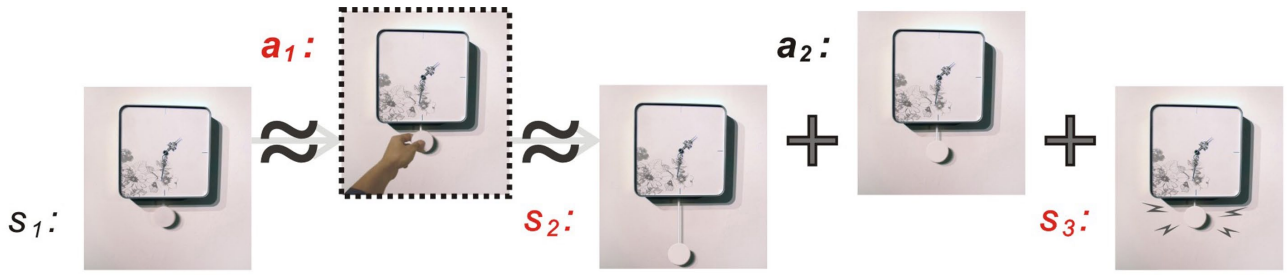

Figure 12. Time is up! (Copyright: Chih-Wei Huang. Reprinted with permission.) Due to the autorecovery and functioning without interaction after step s_2, the last two relations are noted with plus signs.

Pilot Study

According to the theories and analysis above, interaction sequences can be divided into several steps. A pilot study was initially conducted to see whether the differences between the emotional responses elicited by each step could be detected. Participants were guided to watch the pictures of the interactions frame by frame; thus we initially assumed they were immersed in the intermediate phases and were capable of making an emotional response at each step. The Semantic Differential (SD), a method widely employed in Kansei engineering (e.g., Chen & Chuang, 2008; Chuang & Ma, 2001), was applied to measure emotional nuances and to understand users' responses in general within the standard interaction frame sequence.

Procedure

Six lamps and two products triggered by pulling something (see Figures 5–12) were chosen and photographed at each interaction step as stimuli, all of them possessing a five-step interaction and representing three types of sequence—consecutive, cued, and juxtaposed. Each set of five interaction steps corresponds to the steps s_1, a_1, s_2, a_2, and s_3 in Krippendorff's (2006) model. Additionally, to eliminate bias, six other products were chosen as distractors. All 14 stimulus sets, in which each picture was 20 cm tall, were displayed in a random sequence on a 17-inch monitor. Participants were asked to report their degree of surprise and pleasure in each step, representing arousal and valence during product experience (Desmet & Hekkert, 2007), on a seven-point Likert scale. Fifty-eight participants were recruited from northern Taiwan. Data from 10 participants were excluded because of a lack of attention. The final sample consisted of 48 participants (26 females with an average age of 25.6, range 16–38; 22 males with an average age of 27.7, range 22–41).

Initial Results

The results of this early study revealed that the emotional responses elicited from each step could be significantly separated. These eight products elicited different surprise and pleasure effects (surprise: F = 22.786, sig. = 0.000; pleasure: F = 15.480, sig. = 0.000). However, the five steps were significant only for surprise (surprise: F = 5.464, sig. = 0.000; pleasure: F = 1.329, sig. = 0.257). Further, there was a moderate to high correlation between surprise and pleasure (Pearson's correlation = 0.697, sig. = 0.00) revealing that these products were able to arouse a surprise that elicited a "wow" (pleasant surprise) from the users.

The initial results are shown in Table 1. If we see step s_1 (the first impression) as playing the role of the first wow, then the most decisive steps related to the later wow (that is, the later recognition and appreciation of novelty) may be located in steps a_1, s_2, a_2, or s_3 (see Table 1). In addition, the MUJI CD player, like Criminal and BANG!, represents one type of later wow, which mainly elicited a high degree of surprise through its unique operation (a_1), while the others did not. This shows that there are ways to reach later wow that differ from Fukasawa's "design strategy." The consecutive, cued, and juxtaposed interactions here are not applied to generalize all interactive sequences but to enrich the possible conditions for comparison. However, in this pilot study we were unable to observe differences between the MUJI CD player and Criminal and BANG!, especially at a_1. This demands further real-world investigation to examine the inferences.

Interview

To gather knowledge about what indicates users' interactions, what puzzles users in each step, and how the later wow can sneak up on users in real interactions, interviews using real objects and operations, widely employed in appraisal of patterns of emotions (e.g., Demir, Desmet, & Hekkert, 2009), were carried out to identify patterns of later wow.

Stimuli

Five metaphorical products belonging to three types of interaction sequence according to the previous definition were chosen as stimuli (see Table 2). BANG! and Cupid both afford participants unique ways to switch the objects on and off. The anthropomorphic corkscrew "Anna G" could be operated to take the cork out of the bottle in an imaginable way and then out of the screw in an elaborate and unexpected manner, in that the user can hold its "skirt" and "arms" in one hand, and use the other hand

Table 1. SNK results for surprise.

Type	Product	SNK test	s_1	a_1	s_2	a_2	s_3
+	TikTikTik	Not significant	3.25 (5th)	3.31 (4th)	3.79 (2nd)	3.94 (1st)	3.65 (3rd)
+	Smile	Subset 1	4.46 (2nd)	4.21 (3rd)	4.60 (1st)		4.02 (4th)
		Subset 2		4.21 (3rd)		3.65 (5th)	4.02 (4th)
+	Pouring Light	Subset 1	5.06 (2nd)		5.10 (1st)		
		Subset 2		4.35 (3rd)		3.90 (5th)	4.13 (4th)
→	MUJI CD Player	Not significant	4.65 (3rd)	4.69 (1st)	4.67 (2nd)	4.33 (4th)	4.17 (5th)
→	Criminal	Not significant	4.44 (2nd)	4.63 (1st)	4.42 (3rd)	3.96 (5th)	4.10 (4th)
→	BANG!	Not significant	4.96 (2nd)	5.21 (1st)	4.63 (5th)	4.83 (4th)	4.96 (2nd)
≈	Cupid	Subset 1			5.56 (1st)		
		Subset 2	4.58 (5th)	4.94 (2nd)		4.77 (4th)	4.81 (3rd)
≈	Time is up!	Not significant	3.65 (5th)	4.42 (2nd)	4.15 (3rd)	3.98 (4th)	4.44 (1st)

Table 2. Stimuli of interview.

Name	BANG!	Magic Bunny	Cupid	Anna G	Alessi 9091
Picture					
Type of Sequence	→ (clued type)	→ (clued type)	≈ (juxtaposed type)	+ (consecutive type)	+ (consecutive type)

to rotate its "head" anticlockwise. Magic Bunny can be pulled to reveal the hidden toothpicks in the hat-shaped holder. The Alessi kettle "9091" provides a different sense with its brass whistle pipes that produce two notes, "mi" and "ti," when steam blows through them.

Procedure

All five stimuli were placed on the table and covered in advance by five opaque paper bags. Next, they were revealed to the interviewees individually, ordered according to the type of interaction sequence: BANG! (→), Cupid (≈), Anna G (+), Magic Bunny (→), and Alessi kettle "9091" (+). Interviewees were asked what they were looking at, thinking of, doing, and feeling before, during, and after their interactions with each stimulus. If they didn't respond sufficiently with their feelings and comments, the interviewers would submit questions previously prepared for guiding them at different steps of the interaction protocol (see Table 3). Eight Taiwanese subjects were recruited to operate these real objects; four (with backgrounds in design) had known about these five stimuli but had never used them, while the others (without design backgrounds) had never seen them before (see Table 4). Each interviewee could play with one product several times and rest for about three minutes before the next. On average, interviewees spent about 9.5 minutes on each product and a total of 60 minutes on the whole process. The processes were recorded by video camera, and 40 video clips were gathered. Their oral comments during the interactions were transcribed into text files, and their facial expressions and behavioral responses were observed and compared. The duration of each interview and the number of words spoken are also displayed in Table 4.

Analysis Method

All 40 text files were imported into the qualitative research software QSR NVivo 8. These interview scripts were first reorganized into the same order (as in Table 3) in preparation for using "Auto Code," which organizes relevant sentences into groups under the structured interview heading. Then, NVivo's flexible option of "Free Nodes" was used to conduct open coding, followed by rearranging the "Free Nodes" into "Tree Nodes" for axial coding. We separated and carefully located the sentences in the corresponding steps with the contents (see Figure 13). The steps related to senses (s_1, s_2, s_3, and s_n) and operations (a_1, a_2, and a_3) were interwoven as a protocol. Except for Anna G and the Alessi kettle 9091, which had continuous operations in a_3, the three other stimuli returned to their original appearance after step s_3, after which the interviewees completed the interaction processes and expressed their expected feelings over time (s_n). These expressions of sensation (or function) and interaction (or operation) were organized into a hierarchy, according to Hallnäs's (2011) concept of form and expression. Finally, the "Matrix Coding Query" was used to check the degree of overlapping between crucial "Free Nodes," which is helpful for proceeding with the final selective coding process in grounded theory (Strauss & Corbin, 1990; Glaser & Strauss, 1999). The initial qualitative analysis took more than 30 working days (eight to 10 hours per day) followed by three rounds of discussion between two experts on protocol analysis, which took another 30 working days, to refine the results.

Table 3. The questions for the semi-structured interview.

No.	*Question*	*Target*	*No.*	*Question*	*Target*
1	Have you ever seen it before?	a_0 *	7	What do you think of the way it operates?	$a_1 + a_2$ *
2	What is it?	m_1 **	8	Does its feedback surprise you? (1–7 points)	$s_2 + s_3$ ***
3	What do you think of its appearance?	$s_1 + m_1$ **	9	Do you like its feedback? (1–7 points)	$s_2 + s_3$ ***
4	How much do you like it? (1–7 points)	s_1 ***	10	Do you think the feedback has any meaning?	$m_2 + m_3$ **
5	How much are you surprised? (1–7 points)	s_1 ***	11	Do you think there is anything special about this object?	Not designated
6	Do you think you know how to use it?	$a_1 + a_2$ *	12	Any other comments?	Not designated

* a_0, a_1, and a_2 represent the user's action in different steps of Krippendorff's (2006) interaction protocol (see Figure 2).

** m_1, m_2, and m_3 are the outputs in the level of "meaning."

*** s_1, s_2, and s_3 are what users can sense in the different interaction steps.

Table 4. Identity of participants and raw data.

Participant	*P1*	*P2*	*P3*	*P4*	*P5*	*P6*	*P7*	*P8*	*Average*
Gender (Age)	M (23)	M (25)	F (22)	F (31)	M (21)	M (32)	F (22)	F (36)	(26.5)
Attribute	Had seen but never interacted with stimuli				Had never seen the stimuli before				Even
Duration*	49'19"	53'17"	43'53"	42'52"	34'56"	60'57"	58'24"	27'53"	46'27"
BANG!	9'11"	9'24"	6'14"	8'14"	6'15"	10'37"	8'26"	4'26"	7'51"
Magic Bunny	6'51"	10'12"	8'15"	7'26"	4'54"	7'59"	9'57"	5'03"	7'35"
Cupid	10'01"	7'16”	7'12"	9'51"	8'54"	9'49"	12'48"	7'01"	9'07"
Anna G	10'53"	9'42"	8'48"	8'20"	7'48"	14'22"	11'38"	5'22"	9'37"
Alessi 9091	12'23"	16'43"	13'24"	9'01"	7'05"	18'10"	15'35"	6'01"	12'17"
Number of words Average**	828	848	924	960	705	1094	963	605	866
BANG!	867	900	709	997	663	967	770	524	800
Magic Bunny	654	809	947	906	569	666	843	480	734
Cupid	750	659	658	1107	833	1155	1052	875	886
Anna G	659	762	804	1015	703	1290	1062	506	850
Alessi 9091	1211	1111	1503	776	759	1393	1089	640	1060

* Total duration, not including rest time.

** The number of Chinese words in what the interviewees said.

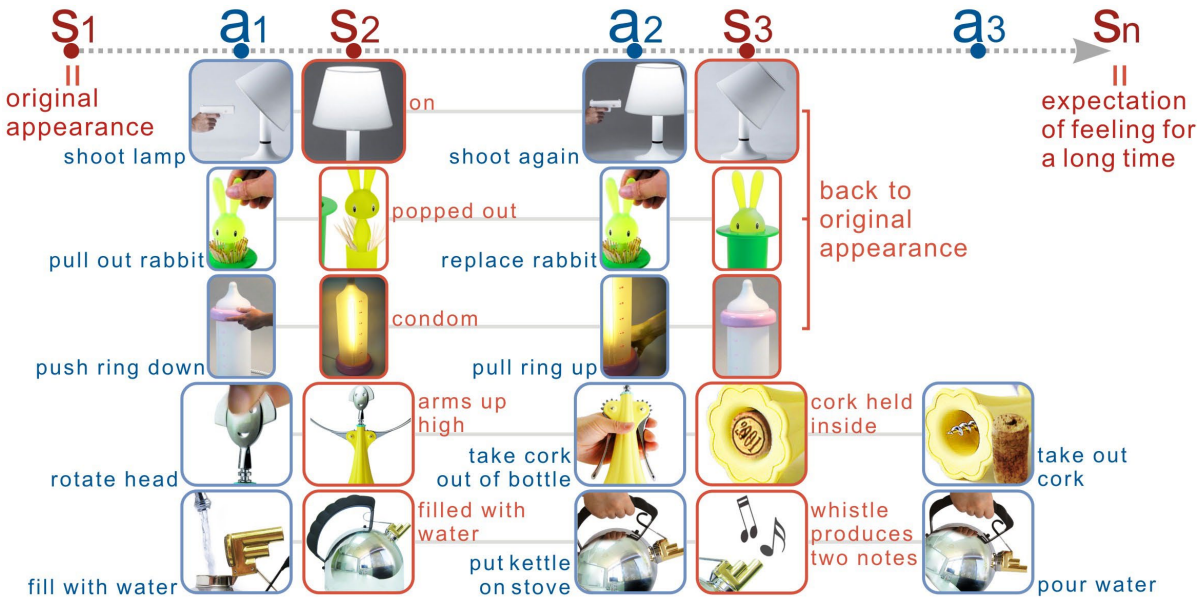

Figure 13. The content of each interaction step.
These definitions were used to separate the sentences into different steps after using “Auto Code.”

Results

General Response

“Auto Code” provides an easy way to check whether participants had similar responses to the questions of “surprise” and “like.” First of all, four interviewees—who had never seen the stimuli before—stated in seven of the product interviews (out of a total of 20 product interviews) that they were unable to enter a score on the Likert scale for the question about surprise before interacting with the products (see Table 5). They explained that they were not surprised merely by the product’s appearance and that an evaluation of surprise should be postponed to later steps. They gave such answers as “I cannot decide until I use it” (P7: BANG!), and “The level of surprise depends on what it actually is, as well as the difference compared with my expectation” (P6: Anna G). Although four interviewees who had seen all the stimuli before agreed that there was a feeling of surprise, the average (3.71) is not high. Additionally, in terms of deriving pleasure from the original appearance, the averaged value of the four interviewees

who had seen the objects is higher (4.65 > 4.08). After operation, the averaged value for the participants who had never seen the objects increased to the same level (5.33 ≈ 5.34) as that of the other group. The result shows that interviewees' emotional responses after operation were similar, whether they had seen the stimuli before or not.

Table 5. The emotional response of interviewees.

Emotion	Surprise		Liking	
Stage	Before interaction	After interaction	Before interaction	After interaction
Had seen	3.71	5.11	4.65	5.33
Never seen	4.31 (no answer in 7 interviews)	5.23	4.08	5.34

Identifying the Circular Perception Pattern

During the "Free Nodes" process, the code of an encoded sentence was integrated with similar codes of sentences and given a name abstracted from the comments. For example, an answer like "It is somewhat illogical that a lamp turns on by being shot" (P1: BANG!) was coded as "illogical," and one such as "It is strange that the first shot seems to revive it rather than kill it" (P7: BANG!) was coded as "shooting seems not to kill it but to revive it." Both answers were then integrated to form a new code category, "illogical feedback." After the open codes were revised, 220 coding categories were deduced from 1404 sentence references. Then, similar open codes were grouped and turned into axis codes using the logic of building "Tree Nodes." During the development of axial coding, we found that it was approximately similar to, though slightly different from, Krippendorff's interaction protocol. A circular pattern, inspired partly by Krippendorff and drawn partly from the similarities among the data for each step, became clear and identifiable in the following order: (A) retrieving past experience, (B) experiencing, (C) evaluating product attributes, (D) emotional response, and (E) giving extended ideas (see Figure 14). Phase (A) concerns past experience and memory retrieved after seeing the object and its function (in steps s_1, s_2, and s_3) or interacting with the object (in steps a_1, a_2, and a_3). Phase (B) involves sensing appearance and function or interacting. Phase (C) concerns evaluating the implementation of sense and action as well as the meaning emphasized in Krippendorff's model. Phase (D) involves emotional responses, including the later wow that we want to examine. Phase (E) concerns giving suggestions for the characteristics that emerged in that step, or predicting the following action or its feedback in the next step.

In addition, we found that the interviewees expressed some things about expected behaviors and feelings over a long period of time (s_n). These comments can also be classified into five phases. For example, two interviewees said they would buy the designs (in the future) if they were not too expensive compared to past purchasing experience (Code s_n-A-1 in the Appendix). Two said the designs had durable styles that they would continue to enjoy over time (Code s_n-B-1). Some said functionality is more important in the long term (Code s_n-C-1). Others thought they would feel no surprise at all for a long time (Code s_n-D-1). Two interviewees reflected on how to maintain the products after long-term use (Code s_n-E-1).

Based on the data calculated and illustrated in Figure 15, it is clear that the numbers for the coding references in each step are different, and the number of references in the earlier steps is much higher. The number for (A), retrieving past experience, is the lowest among all five phases. The number of codes in (B), for actual experience, is much higher and peaks in a_1 as the "detecting and experiencing" group, consisting of "predicting how to operate," "the process of detection," and "experiencing operation" (Codes a_1-B-$_1$, 2, and 3). The number of codes in (C), evaluating product attributes, is also rather high and peaks

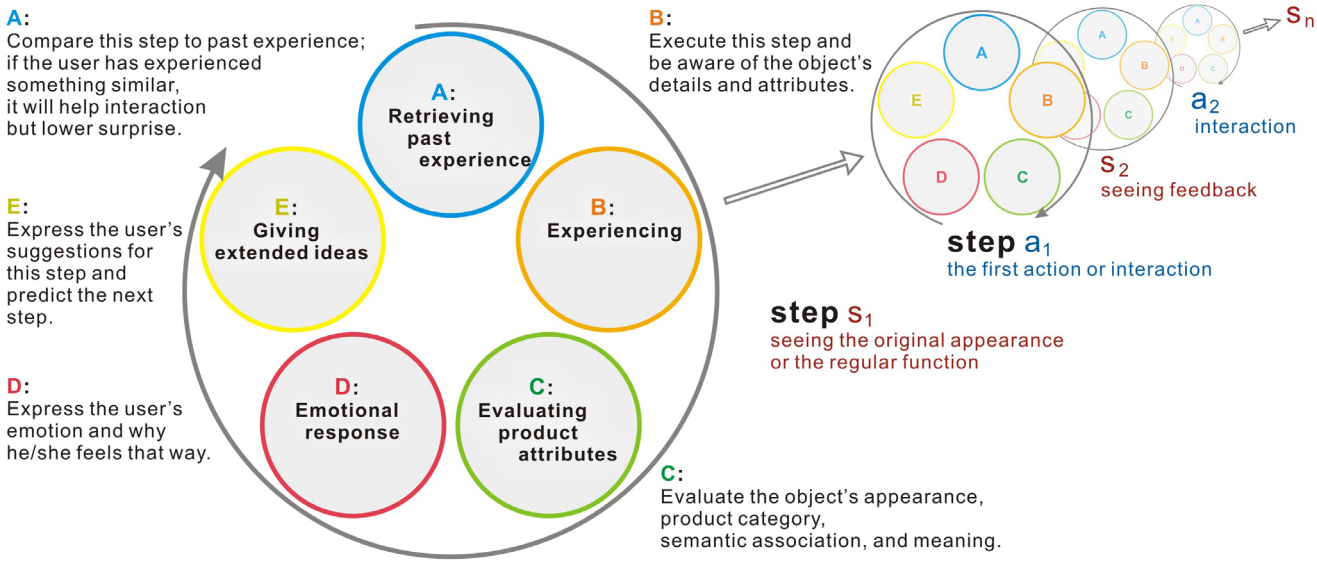

Figure 14. The circular interaction model.

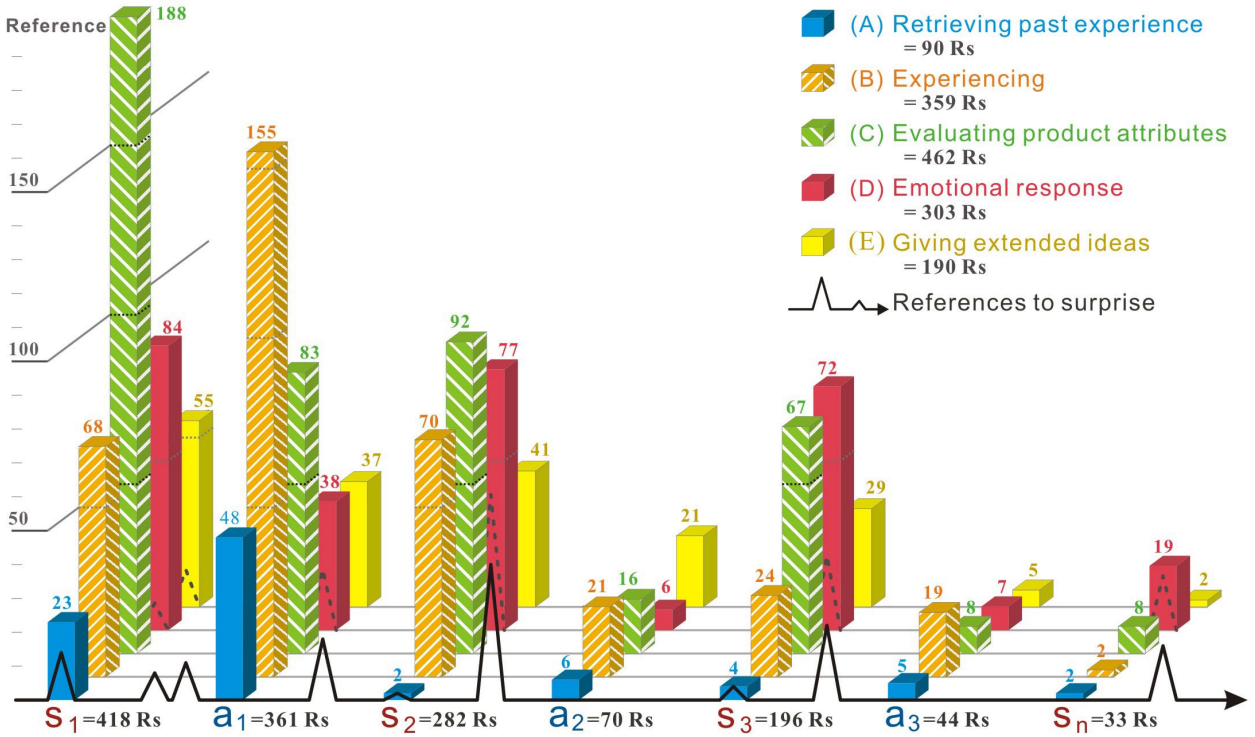

Figure 15. Distribution of all sentence references.

in s_1 as the “evaluation of appearance” group, which consists of “what it is,” “what it looks like,” “users and environment,” and “semantic association” (Codes s_1-C-1,…4). The number of codes in (D), emotional response, is distributed equally among s_1, s_2, and s_3 (sensing appearances, feedback, and functions) and less so in $a1$, a_2, and a_3 (being aware of operations and interaction). Finally, the number of coding references in (E), extended ideas, is higher only than (A), retrieving past experience; additionally, it falls off increasingly after the beginning of the interaction.

Examining the Surprise by Interaction Steps

For the purpose of this study, the “Matrix Coding Query” in Nvivo was applied to find other codes having the same references as sentences with *surprise-related codes*. Consequently, concepts expressing “out of expectation” emerge. For example, a comparison between “surprised by operation” (Code a_1-D-1 in the Appendix) and “experiencing operation” (Code a_1-B-3) indicates that surprise is elicited by atypical or unexpected operation (there are seven sentences involved with both codes). Comparing “being surprised by feedback” (Code s_2-D-1) with “feedback outside of expectation” (Code s_2-B-3) reveals that surprise is caused by unexpected appearance changes (nine sentence references). This initial result suggests that atypical operation (interaction) and unexpected feedback (function) in phase (B) are the key elements.

Because we focused on metaphorical products for discussing the later wow, we also selected *semantics-related codes* to execute the selective coding. The complete result is shown in Figure 16, and each step is examined one by one and listed as follows:

In step s_1, surprise is based on (1) whether the user has experienced this product (Code s_1-A-3 in the Appendix) and (2) whether users were able to guess its product category from its appearance and an unusual size or shape (Code s_1-D-1). However, some people preferred to respond not in this stage but in the following stage, based on real interaction (Code s_1-E-1).

In step a_1, surprise is triggered by (1) the way the product is operated, and timely feedback on the shape (Code a_1-D-1), (2) the natural response to experiencing its operation (Code a_1-B-3), and (3) evaluating (and understanding) the semantic association of the operation (Code a_1-C-4) accompanied by suggestions for refining the operation (Code a_1-E-1).

In step s_2, surprise is due to the object being experienced for the first time (Code s_2-A-1), or is based on awareness of the object’s feedback (Code s_2-D-1); this includes ensuring that users can predict feedback successfully and be aware of unexpected and sudden feedback.

In step a_2, no code is related to surprise. It is possible that because participants had predicted the manner of the second operation and because there was no new association from the operation, surprise is greatly diminished. There are similar results and potential reasons for step a_3.

In step s_3, surprise is aroused by (1) completing a new experience (Code s_3-A-2), (2) experiencing the whistle (Code s_3-B-3), and (3) its transition (Code s_3-D-1).

Finally, in step *sn*, the surprise is related only to showing off to friends (Code s_n-D-2), and people may feel bored (Code s_n-D-1). This suggests that people welcome its effect but wonder about its permanence.

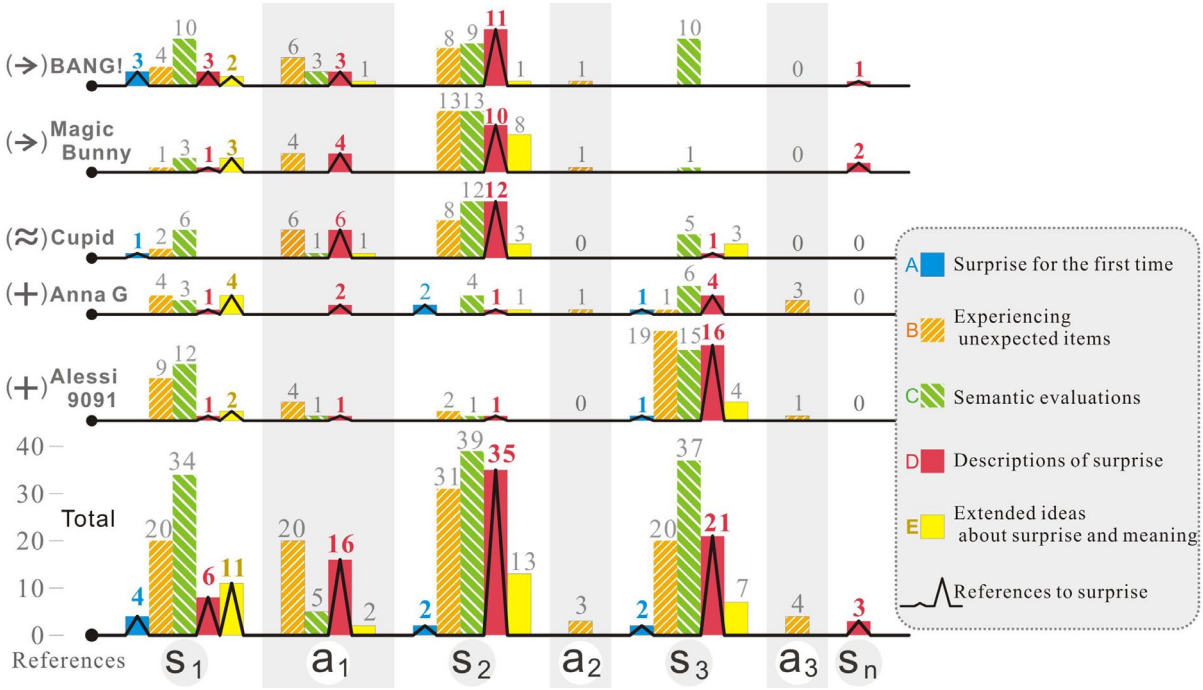

Figure 16. Distribution of selective codes.

Observing the Unexpected Attribute and Semantic Evaluation

When we observed the other factors related to surprise by individual design, the result of the clued interaction, including both BANG! and Magic Bunny, reveals that surprise follows the unexpected attributes of interaction but does not necessarily follow the evaluation of the semantic association and context (e.g., a_1 of Magic Bunny). However, the sentence references concerning semantic evaluation and suggestion occur largely in step s_2, suggesting that surprise occurs mainly after the first instance of feedback (or function in s_2). Concerning BANG!, the semantic conflict that emerges in step s_2 may be confusing (i.e., how can one shoot to make something "live"?). The semantic evaluation can be made in step s_3 to solve the puzzle after the gun has been fired twice. This means that the later wow can also be aroused by deciphering the metaphorical meaning of context in the later step. A similar situation also holds true for Magic Bunny. After interviewees realized that the object functions as a toothpick holder (s_2), the confusion caused by its shape and function was cleared up, and they even made suggestions for other designs (e.g., cotton swabs and floss sticks). In addition, the interviewees had a clearer understanding of the relationship between interaction (pulling out the rabbit) and function after seeing the toothpicks popping out. For the juxtaposed interaction, this phenomenon is similar for Cupid, except that the semantic evaluation and suggestions for Cupid were spread over steps s_2 and s_3; thus, the incongruity–resolution process is not completed in step s_2. In terms of consecutive interaction, the surprise in relation to Anna G is spread over different steps and is slightly increased in step s_3 because the cork popping sound was louder than expected (interestingly, these young Taiwanese interviewees were not familiar with the action of pulling a cork). For Alessi 9091, unexpected attributes, evaluating semantic association, and experiencing surprise all happened in step s_3. The kettle's special gun-shaped whistle and the relation between its function and cockerel-like shape (s_1) somewhat confused the interviewees so that the puzzles were not solved until they heard the sound of the whistle (function), which made them suddenly realize the answer.

Discussion

From the comparisons and analyses above, several points become clear. First, we had supposed that the first strong impression, including style, parts, color, material, and size, might cause the first wow. However, users did not necessarily feel surprise in the first impression (i.e., in seven out of the 20 interviews), but did feel surprise in the later steps. Second, the surprise that emerged from the steps that followed sensing the original appearance can represent the later wow discussed in this study. We had originally thought that a design with unexpected attributes and conditions might bring about a later wow before, during, and after operation. We clarified the ambiguous concept of the origin of the later wow and replaced it with (1) *atypical or unexpected interactions (or operations)*, (2) *unexpected functions (including appearance changes)*, and (3) *evaluations of the semantic association* during the "incongruity–resolution" process. In this study, such elements could emerge one after another at different steps to elicit the later wow, which is not regarded as a prolonged first wow. Third, whenever surprise occurred in any step of the process (s_1, a_1, s_2, a_2, s_3, a_3, s_n), the interviewees would go through a circular cognitive pattern: (A) *retrieving the past experience*, (B) *experiencing*, (C) *evaluating product attributes*, (D) *emotional response*, and (E) *giving extended ideas* (see Figure 17). Additionally, the surprise being deferred to the steps after s_1 can represent the later wow discussed in this study.

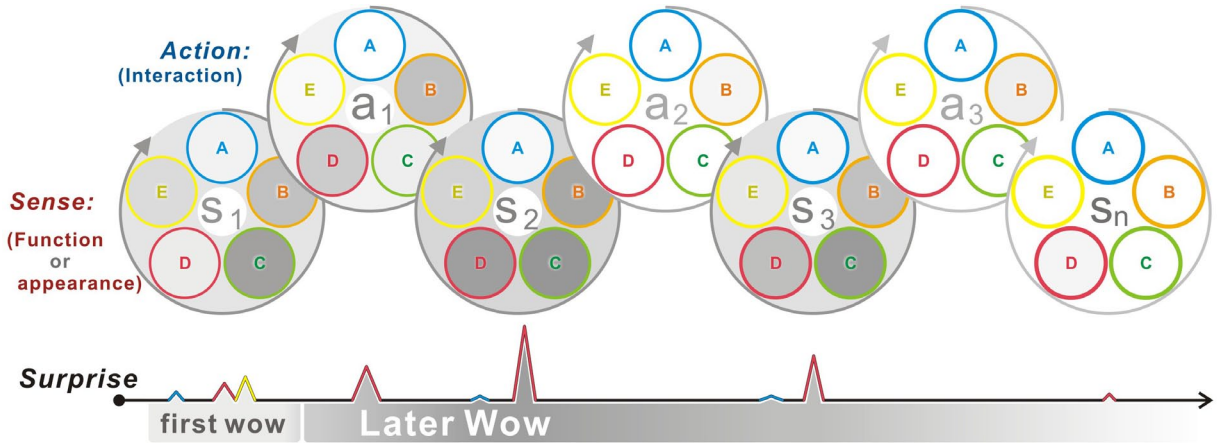

Figure 17. The circular cognitive pattern of experiencing the later wow.
The depth of the grayscale in A, B, C, D, and E is in accordance with the relative numbers of surprise-related codes shown in Figure 15. When the circle is darker, it represents more surprise-related codes.

Conclusion

This study derived inspiration from the way Fukasawa has explained his designs, which explore the sophisticated relations among product, user, and environment. According to his description, the concept of the later wow, seen as a “popping out” emotion that occurs during interaction with an object, usually arises “without thought,” and is accompanied by “activity memory,” and a “found object.” “Without thought” involves subconscious or unconscious intuitive behavior constrained by environment, “activity memory” has to do with unconscious memory or body memory, and “found object” involves exploring the further application of the archetypal object. However, our investigation showed that the later wow does not occur only as a result of a product exploiting these three characteristics. Of course, the novel characteristics can be hidden at first by way of a “found object” that appears “normal.” Operation is designed to be instinctive (“without thought”), and the final discovery produces a pleasant surprise as the later wow, which strives to recognize what has been stored in our unconscious action as “activity memory.” It is clear that Fukasawa’s approach is to simply withhold the metaphor prior to operation.

Nevertheless, the results of our pilot study and interviews show that the later wow can be elicited at different steps with various patterns, mainly by way of the following three factors: atypical interaction, unexpected function, and pleasant metaphor. These factors closely correspond to Mann’s (2002) idea about resolving apparent contradictions; this model seems much clearer than Fukasawa’s formulation. In metaphorical product design, there are always different levels of confusion and different processes for solving puzzles. When people face a new design with a referential quality, the iconic, indexical, and symbolic signs can function in different degrees at different times to provide access to novelty, which arouses the popping-out surprise that occurs during interaction.

To explore cognitive patterns related to the later wow in experiencing metaphorical designs through operation, many concepts were introduced and integrated, some of which may have seemed initially ambiguous. The incongruity–resolution process helps explain the phenomenon by which the later wow emerges from solving puzzles in the recognition process. The semantic interaction protocol of external observation provides a step-by-step process for examining internal perceptive patterns. Further, the three types of interaction sequence derived from narrative order help to categorize and illustrate typical cases of interaction. The evidence supports the use of these models. However, the methodology applied in this study was unable to test the long-term effect of the later wow. Do people become bored after using a product many times? Or, contrary to Desmet and some of the interviewees, is there a “long-term wow” effect rooted in our memory due to the earlier pleasant experience? Building on the findings of this study, further investigations in the near future into learning, memory, and familiarization could provide some answers.

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Appendix

Axial coding was arranged by applying "Tree Nodes" in Nvivo to outline the process of interaction with five metaphorical products. This initial result was derived from 40 interview scripts transcribed from video recordings. In the following table, the results can be divided into three layers: seven steps, five phases, and the lowest layer of codes. In the lowest layer, each code was named according to the terms in the selected sentences. The number of reference sentences and the average "coverage" are also noted after each code, followed by examples from the selected sentences and scripts the sentences came from ("coverage" represents the percentage of the referenced content in the script in Chinese).

Results of axial coding.

Code. Name (References: average coverage)	Example sentences (interviewee: stimulus)
s_1-A. Compared to the past experience	
s_1-A-1. Having experienced it or not (8 Rs: 1.30%)	I have seen it on the Internet, but it looks somewhat different now. (P1: BANG!)
s_1-A-2. Asking for good-looking shape (1 R: 0.66%)	People notice merely whether its shape is good-looking or not. (P6: Anna G)
s_1-A-3. Past experience lowers surprise (14 Rs: 2.02%)	I have seen it before… not so surprised. (P2: Magic Bunny)
s_1-B. First detecting and experiencing	
s_1-B-1. Aware of the whole figure (15 Rs: 1.81%)	Although it's simpler, it seems to be well designed. (P2: BANG!)
s_1-B-2. Aware of the colors (4 Rs: 2.28%)	Why is it white with a small black ring? (P8: BANG!)
s_1-B-3. Aware of the parts (34 Rs: 2.20%)	This ring is pretty special. (P6: Cupid)
s_1-B-4. Aware of the size and materials (15 Rs: 1.67%)	I thought at first glance that it was a little bigger than it really is. (P6: Anna G)
s_1-C. Evaluation of appearance	
s_1-C-1. What it is (73 Rs: 1.60%)	It's very easy to recognize it as a corkscrew from the gears. (P7: Anna G)
s_1-C-2. What it looks like (58 Rs: 2.07%)	Despite a formula bottle-like shape, it looks pretty much like a condom in the whole shape. (P4: Cupid)
s_1-C-3. Users and environment (23 Rs: 1.96%)	Parents may choose it due to its image that babies are familiar with. (P6: Cupid)
$_1$-C-4. Semantic association (34 Rs: 2.64%)	The figure of her skirt seems to be made from the pouring of red wine. (P1: Anna G)
s_1-D. Emotional responses	
s_1-D-1. Reason for being surprised (8 Rs: 2.23%)	Due to its distinctive shape. (P7: 9091)
s_1-D-2. Prefer the whole shape (42 Rs: 1.60%)	Once it changes its figure, I'll feel surprised and then like it much more. (P2: Anna G)
s_1-D-3. Responses to color (7 Rs: 2.21%)	It's pretty cute, especially its pink color. (P4: Cupid)
s_1-D-4. Responses to parts (14 Rs: 2.16%)	It's very interesting that the gears become one part of its whole shape. (P4: Anna G)
s_1-D-5. Responses to size and material (13 Rs: 2.41%)	Her neck is too long and somewhat ugly. (P2: Anna G)
s_1-E. Extended ideas	
s_1-E-1. Emotional responses should be postponed to the next step (12 Rs: 2.30%)	I cannot decide until I use it. (P7: BANG!)
s_1-E-2. Predicting the next step (23 Rs: 2.23%)	I wonder very much what this gun can do. (P6: BANG!)
s_1-E-3. Suggestion (20 Rs: 3.49%)	The color of wine is quite suitable for her skirt (P1: Anna G)
a_1-A. Past experience	
a_1-A-1. Having experienced or not (40 Rs: 1.57%)	I have never opened a bottle of wine before. (P3: Anna G)
a_1-A-2. Curiosity and desire to operate (8 Rs: 1.29%)	I would try to pull the metal stick and be curious where its intake is. (P1: 9091)
a_1-B. Detecting and experiencing	
a_1-B-1. Predicting how to operate (81 Rs: 2.63%)	There are a scale and something like a track, and it should be pushed down. (P6: Cupid)
a_1-B-2. The process of detection (41 Rs: 3.41%)	If her arms were not rising, I would check the length of her neck. (P1: Anna G)
a_1-B-3. Experiencing operation (33 Rs: 2.39%)	… too heavy… It's not good to use. (P4: 9091)
a_1-C. Evaluation	
a_1-C-1. What operation looks like (22 Rs: 2.04%)	This operation resembles the motion of putting on a condom. (P5: Cupid)
a_1-C-2. The attributes of operation (13 Rs: 2.02%)	There seems to be an LED in the ring, like an infrared ray sensor. (P7: BANG!)
a_1-C-3. Convenience (43 Rs: 2.55%)	It's too dangerous that it must be tilted to refill. Too heavy! (P4: 9091)
a_1-C-4. Semantic association with operation (5 Rs: 2.13%)	To rotate and push its ring down, like putting on a condom, have totally different meanings. (P5: Cupid)
a_1-D. Emotional responses	
a_1-D-1. Surprised by operation (18 Rs: 3.23%)	Surprise! Because it's outside of my expectations. (P4: BANG!)
a_1-D-2. Like it due to operation (15 Rs: 1.89%)	Interesting! Because this operation is special. (P3: Cupid)
a_1-D-3. Responses to sense of touch (5 Rs: 2.11%)	I like the feel of this gun. (P4: BANG!)
a_1-E. Extended ideas	
a_1-E-1. Suggestion (16 Rs: 2.85%)	If its nipple could be squeezed as a switch, it would be pretty interesting. (P7: Cupid)
a_1-E-2. Predicting the next step (21 Rs: 2.20%)	I thought the toothpicks would be messed up after the rabbit is pulled out. (P2: Magic Bunny)
s_2-A. Past experience	
s_2-A-1. Being surprised at a new experience (2 Rs: 2.04%)	The reason I'm surprised is probably because it's my first time to open a wine bottle. (P7: Anna G)

Results of axial coding.

Code. Name (References: average coverage)	Example sentences (interviewee: stimulus)
s_2-B. Detecting and experiencing	
s_2-B-1. The moment of experiencing feedback (16 Rs: 1.44%)	It seems unable to be fastened… (it is suddenly fastened) Wow! (P7: 9091)
s_2-B-2. The detail of feedback (23 Rs: 2.24)	The red LED turns off after I [pull the] trigger. (P1: BANG!)
s_2-B-3. Feedback outside of expectation (31 Rs: 2.90%)	I wouldn't have expected that the shape of a condom would be used for the design of a lamp. (P1: Cupid)
s_2-C. Evaluation	
s_2-C-1. What it looks like (24 Rs: 2.15%)	It's like the rabbit runs out of the haystack (P3: Magic Bunny)
s_2-C-2. Users and environment (19 Rs: 2.18%)	It's really a remote control just as expected. (P6: BANG!)
s_2-C-3. Practicality (10 Rs: 1.56%)	It seems to not be able to contain many toothpicks. Not very practical. (P4: Magic Bunny)
s_2-C-4. Evaluating the semantic rationality (39 Rs: 3.06%)	Condom and formula bottle can switch between each other, but neither of them is relevant to lamp design. (P4: Cupid)
s_2-D. Emotional responses	
s_2-D-1. Being surprised by feedback (40 Rs: 2.45%)	The whole operation and feedback is outside of my expectation. I'm really so surprised after it turns on. (P3: Cupid)
s_2-D-2. Appreciate feedback or not (20 Rs: 2.02%)	It looks good when it turns on. (P3: Cupid)
s_2-D-3. Responses to the sense of feedback (17 Rs: 3.23%)	I think my emotional response could be divided into several steps. (P1: Cupid)
s_2-E. Extended ideas	
s_2-E-1. Suggestion for feedback (24 Rs: 2.98%)	Maybe some slogans could be added, like "No safe way, no way." (P6: Cupid)
s_2-E-2. Suggestion for design application (13 Rs: 3.53%)	In addition to toothpicks and cotton swabs, it could contain anything able to be drawn out. (P5: Magic Bunny)
s_2-E-3. Guessing the next function (4 Rs: 3.01%)	The hat is somewhat similar to a trash can, so it could contain used toothpicks. (P3: Magic Bunny)
a_2-A. Past experience	
a_2-A-1. Not knowing how to operate (5Rs: 2.30%)	I don't know how to operate this stick. (P6: 9091)
a_2-A-2. Operation desire comes from above feedback (1R: 1.03%)	Her arms begin to rise up, and it makes me think of pushing them down. (P4: Anna G)
a_2-B. Detecting and experiencing	
a_2-B-1. Predicting how to operate (4 Rs: 2.69%)	When I try to take out the cork, I'm thinking about how to do it. (P1: Anna G)
a_2-B-2. The process of operation (14 Rs: 2.38%)	… just a little water, but it's so heavy. If it filled up, I would be very angry. (P3: 9091)
a_2-B-3. Operation outside of expectation (3 Rs: 1.8%)	It's different from what I imagined. The toothpicks are spread out perfectly and are easy to pick out. (P7: Magic Bunny)
a_2-C. Evaluation	
a_2-C-1. What operation looks like (3Rs: 2.65%)	Like taking the condom off? (P7: Cupid)
a_2-C-2. Usual operation (1R: 0.59%)	This operation is not quite different enough. (P4: Anna G)
a_2-C-3. Operation is very convenient (12Rs: 1.68%)	I find that the bigger size is chosen for good ergonomic setting. (P6: Anna G)
a_2-D. Emotional responses	
a_2-D-1. Does not operate smoothly; lowers preference (2Rs: 3.77%)	Its operation is not smooth enough, and it lowers my preference. (P2: Cupid)
a_2-D-2. Good impression of operation (4Rs: 2.29%)	The operation of shooting a lamp with a gun is pretty interesting. (P5: BANG!)
a_2-E. Extended ideas (predicting)	
a_2-E-1. Predicting the consequent function of parts (2Rs: 1.79%)	The hook can make me avoid touching the whistle directly and scalding myself. (P2: 9091)
a_2-E-2. Predicting the sound of feedback (19Rs: 1.68%)	The whistle of a ship or train? (P3: 9091)
s_3-A. Past experience	
s_3-A-1. Having known this feedback or not (2 Rs: 2.96%)	… associate it with the condom mainly because I have known its concept. (P3: Cupid)
s_3-A-2. Being surprised to complete a new experience (2 Rs: 2.69%)	I'm surprised by its whistle because it's my first time to hear it. (P7: 9091)
s_3-B. Detecting and experiencing	
s_3-B-1. Accomplishing a new experience (2 Rs: 1.67%)	Knowing how to open it is a whole new experience for me. (P1: Anna G)
s_3-B-2. Detecting the detail of feedback (1 R: 2.48%)	The cork is hidden inside. (P2: Anna G)
s_3-B-3. The gradation of sound (19 Rs: 2.59%)	It has the gradation of sound, two notes. (P4: 9091)
s_3-B-4. Being aware of the ignored detail (2 Rs: 2.58%)	Until now I have never heard the gun shot except the sound made by the tilting of its lampshade. (P7: BANG!)
s_3-C. Evaluation	
s_3-C-1. What the key point is (5 Rs: 2.35%)	A sweet whistle is not my concern. (P5: 9091)
s_3-C-2. Functionality (21 Rs: 2.58%)	The lower tone means it is going to boil, and the higher tone means I can turn the heat off. (P7: 9091)
s_3-C-3. Users and environment (4 Rs: 1.70%)	I image that it's a scene of a boiling market by the side of a canal. (P3: 9091)
s_3-C-4. Semantic association (37 Rs: 2.44%)	It's the relation between sex and having a baby. (P3: Cupid)

Results of axial coding.

Code. Name (References: average coverage)	Example sentences (interviewee: stimulus)
s_3-D. Emotional responses	
s_3-D-1. Being surprised by feedback (22 Rs: 2.29%)	At the moment I realized why its sound is said to be like the whistle of a ship, I was surprised suddenly (P1: 9091)
s_3-D-2. Appreciating feedback or not (37 Rs: 2.03%)	After hearing about the designer’s concept, I have a better impression about its sophisticated details. (P8: Anna G)
s_3-D-3. Other emotional responses (13 Rs: 1.84%)	Oh…I broke the cork. That sucks! I’m so embarrassed. (P3: Anna G)
s_3-E. Extended ideas	
s_3-E-1. Suggestion (18 Rs: 3.27%)	It would be good to add some function that would extend people’s expectation. (P6: BANG!)
s_3-E-2. Interpreting the design thinking (11 Rs: 2.37%)	It seems that being a toothpick holder is not its first design purpose. (P4: Magic Bunny)
a_3-A. Past experience	
a_3-A-1. Not recognizing operation (5 Rs: 1.33%)	I don’t know how to take cork out of the bottle (P3: Anna G)
a_3-B. Detecting and experiencing	
a_3-B-1. Predicting how to operate (7 Rs: 2.65%)	Will it whistle when the water is poured directly? (P3: 9091)
a_3-B-2. Experiencing operation (8 Rs: 2.82%)	There seem to be four ribbed plates. And they make the cork able to be taken out. (P6: Anna G)
a_3-B-3. Operation outside of expectation (4 Rs: 1.80%)	I cannot guess how to take it off of the screw. (P2: Anna G)
a_3-C. Evaluation of convenience	
a_3-C-1. Operation is smart but not easy to recognize (1 R: 3.51%)	I don’t know what to do next because no one has taught me. (P3: Anna G)
a_3-C-2. Operation is very easy (4 Rs: 1.35%)	I did not imagine that it would be so simple and easy to take the cork out of screw. (P7: Anna G)
a_3-C-3. Inconvenient size of parts (2 Rs: 1.35%)	It’s really bad to use. Its spout is too short. (P3: 9091)
a_3-C-4. Operation is more distinctive (1 R: 0.83%)	The operation is more distinctive than the shape. (P2: Anna G)
a_3-D. Feedback about pleasure	
a_3-D-1. Not satisfied with interaction (2 Rs: 4.24%)	Why can’t it pour out the water directly? (P1: 9091)
a_3-D-2. Lacking a sense of safety lowers preference (2 Rs: 2.46%)	Its drawback is that this hook is a little bit hot after the water is boiling. (P6: 9091)
a_3-D-3. Appreciating its operation (3 Rs: 1.97%)	It’s easy to take the cork out of the screw in this way. Definitely wonderful! (P6: Anna G)
a_3-E. Extended ideas	
a_3-E-1. A sophisticated design (5 Rs: 2.47%)	It has many well-designed details of operation. (P2: Anna G)
s_n-A. Past experience	
s_n-A-1. Desire to buy for its fun (2Rs: 1.78%)	I want to buy it, if it isn’t very expensive (P8: Magic Bunny)
s_n-B. Experiencing	
s_n-B-1. Durable styling (2Rs: 3.06%)	Abstract shapes command durable appreciation more easily and offer more for the imagination. (P2: 9091)
s_n-C. Evaluation	
s_n-C-1. Asking for functionality after all (6Rs: 2.10%)	I think functionality is still more important over the long term. (P6: BANG!)
s_n-C-2. Scared it will break down after using multiple times (2Rs: 3.35%)	It seems likely to be broken after using multiple times because it always tilts to the same side. (P3: BANG!)
s_n-D. Emotional responses	
s_n-D-1. Getting more and more boring (14Rs: 2.33%)	You’ll be surprised at the first and second times, but I think not at all later. (P8: BANG!)
s_n-D-2. Show off one’s surprise (2 Rs: 2.39%)	I may say “Look! It’s a toothpick holder!” A sense of showing off. (P8: Magic Bunny)
s_n-D-3. Not liking because it whistles for too long a time (3 Rs: 1.11%)	I felt surprised just at the moment it began to whistle, and now I feel it whistles too long and too noisily. (P1: 9091)
s_n-E. Extended ideas	
s_n-E-1. Not easy to clean (2 Rs: 3.62%)	How do you clean it? This hole is too small. (P8: 9091)