International Journal of Organizational Innovation

THE INFLUENCE OF RHYTHM IN PRODUCT EXPERIENCE: USER PERCEPTION ON INNOVATION DESIGN

Yung-Chin Tsao
Professor, The Graduate Institute of Design Science
Tatung University, Taiwan, R.O.C.
tsao@ttu.edu.tw

Shih-Yin Huang
The Graduate Institute of Design Science,
Tatung University, Taipei 104, Taiwan, R.O.C.
chopin0806@gmail.com

Shiao-Wen Wang
Department of Industrial Design,
Tatung University, Taipei 104, Taiwan, R.O.C.

Abstract

The research is a study on the factor of "rhythm", to investigate its influence on the expected perception of the process of using products. In order to have a better understanding, the research was divided in 2 parts. The first part is based on the "The Expected Perception in the Process on Using Products" (Chen 2006), collect specific examples of rhythm on using product, and then use cluster analysis to sort out 4 different types of using rhythm which include 16 design methods. Secondly, according to n the theory "Labanotation", collect specific examples of rhythm contrast, then use cluster analysis to sort out 3 different types of rhythm contrast to examine the correlation between product of different using rhythm contrast and expected perception.

The result shows that the perception of the using rhythm contrast of products could be derived from the "ambiguously sudden – ordered clearly" factor which describes changes in the rhythm of using process, and the "eagerness – depressed" factor which describes psychological response to expected results. "No rhythm contrast factor in using process" is easier to anticipate outcome, which gives people a feeling of "ordered clearly" and "depressed".

The aim of this study is that significant differences are found in the speed and momentum of using rhythm. However, design methods of using rhythm do not incorporate all types of speed and momentum existed, there might be other design methods out there. Therefore, take speed, momentum and other variables of rhythm to be used in conjunction with other design methods of using rhythm, and examine the effect of such interaction would facilitate further understanding of the influence of using rhythm on expected perception.

Key words: user perception, product experience, product rhythm, innovation design

Research Background and Motives

In consumer product design, emotional factors are increasingly weighed in as they are now important elements to be considered. Studies have confirmed that emotions greatly affect consumer satisfaction, product usability, and even consumer's willingness to purchase (Chaudhuri, 1998; Khalid, 2006; Phillips and Baumgartner,2002; Sauer and Sonderegger, 2009; Westbrook and Oliver, 1991). For this reason, exploring product attributes that would arouse specific emotional responses and using the concept in product design becomes one of the vital tasks for product designers (Hsiao and Chen, 2006; Seva et al., 2007)

Chen (2007) used action of user operation, feedback from product in combination of the different rhythm in using process made up by waiting time during using process to transform the using process into expected perception. Contrast is a method that to put difference things together to let people remember things impressively. Kuo (2007) said that "alternating between fast and slow" approach for speed of using rhythm and "alternating between strong and weak" approach for momentum in using rhythm would make products more "expectancy" and "love to use" with users. "Alternating between fast and slow"

approach for speed and "alternating between strong and weak" approach for momentum in using rhythm are some kinds of rhythm contrasts. Expected feedback is generated by user while waiting during using process.

This study hypothesized that product design could take the factor of "using rhythm" into consideration, it would bring added benefits to the product itself, the research is focus on the factor of "rhythm contrast", to investigate "alternating between operation and feedback" influence on the expected perception of the process of using products.

This research is divided into two parts. First, collect specific examples, and then use cluster analysis to sort out 4 different types of using rhythm which include 16 design methods. According to analysis obtained for the conceptual structure of using rhythm, analyze corresponding method for using rhythm of products. Secondly, conceptual structure of using rhythm contrast product and conduct tests on samples of expected perception of different way to using rhythm contrast of products, investigate the influence on expected perception of different using rhythm contrast.

86

Literature Review

Rhythm

Definition of "rhythm" in "Longman dictionary" is "regular repetitions of sound or action; the 2 definitions in Chinese dictionary are, one is regular recurrence of strong or weak, beat or pulse in alternating sequence of music, and the other is progress with regular sequence." According to the Webster's Dictionary, "rhythm" means (1) an ordered recurrent alternation of strong and weak elements in the flow of sound and silence in speech; (2) the aspect of music comprising all the elements(as accent, meter, and tempo) that relate to forward movement; (3) movement, fluctuation, or variation marked by the regular recurrence or natural flow of related elements; (4) a regularly recurrent quantitative change in a variable biological process; (5) the effect created by the elements in a play, movie, or novel that relate to the temporal development of the action. Rhythm is widely applied in music, language, films, drama, dancing, martial arts, architecture and paintings, description of each field is as follows:

(1) Rhythm in music

According to the definition in "Encyclopedia Americana", in music, "rhythm" means the relation between time and basic elements such as flow, pattern of sounds. Rhythm is an intricate arrangement of beat or pulse, accent, strong or weak in sounds.

(2) Rhythm in language

Wording in a language, could also become rhythm of the same form. Eurhythmics practice proposed in the Dalcroze Eurhythmics and Orff Schulwerk approach of teaching music is a teaching method derived from the rhythmic nature of language.

(3) Rhythm in films

Bordwell in the book "Film art: an introduction" believed the concept of rhythm includes beat or pulse, accent or stress, tempo or pace. Rhythm of film and scoring, is a concept generated during movement of time (Bordwel, 2001).

(4) Rhythm in drama

George in "Rhythm in drama" mentioned "alternating stress and relaxation is the foundation of rhythm (Catherine George,1992).

(5) Rhythm in dancing

Rhythm in dancing means the period of time occupied by dance movements in progress, long or short, strong or weak motions and relations with each other.

(6) Rhythm in martial arts

Rhythm in "Judging method of martial art choreography" means changes in time of maneuvers, handling techniques of motion or stillness, fast or slow. Rhythm in martial art maneuvers consists mainly of motion or stillness, fast or slow, abstract or concrete, tough or grace, contract or extend.

(7) Rhythm in architecture

Rasmussen in the book "Experiencing architecture" states, rhythm consists not only the distinctive cadence of architectural exterior, but also the cadence generated from the contrast between the interior space and those in motion (Rasmussen, 1974).

(8) Rhythm in paintings

Rhythm in paintings is the dynamics of paintings, which could be divided into: homogenous rhythm, chronological rhythm and contrasted rhythm. (Wang, 1975)

Relation Between Expected Perception, Using Process and Rhythm

Expected perception in the process of using products are composed of "curious- emotionless" representing the psychological state of using process, and "haphazard- ordered" representing the rhythm of using process (Chen, 2006). Therefore, a psychological state of expectation is created by users during the process of using products.

Hsiung and Tsao believed that when a user is presented with a certain device, the person not only becomes aware of the property of "subject matter" but also comes to realize its inherent "functions". Function is made up by a series of action or behavior (Tsao & Hsiung, 2000). Rhythm is a form of dynamic existence of subject matter in time, it is a process and sequence represented by changes in movement. Using process is made up by a series of motions, the time and movements take place during the course could become rhythm of using process.

Methods

This section explains the methodology used in this study, the content is comprises two main parts so that the full process. First, specific examples of rhythm on using product, and then use cluster analysis to sort out 4 different types of using rhythm which include 16 design methods. Secondly, according to n the theory "Labanotation", collect specific examples of rhythm contrast, then use cluster analysis to sort out 3 different types of rhythm contrast to examine the correlation between product of different using rhythm contrast and expected perception.

Investigation and Analysis of Using Process

The study "the expected perception in the process of using products" (Chen, 2006) concludes various techniques of forming expected perception. 4 major using rhythm related categories, namely "using steps with a fixed sequence", "unceasing repeated steps with the same action", "a series of using processes", "using step with speedy and fast pace", have been renamed after delphi method to have better suited descriptions of each. The new names, in respective order, are: "must be used in a fixed sequence to obtain outcome", "go through constant repeated actions to obtain outcome", "go through quick succession of actions to obtain outcome", "go through continuous rapid actions to obtain outcome".

Investigation and Analysis of Using Rhythm

Laban Effort- Shape classified 5 major using rhythm contrasts related categories. After Delphi method to have better suited descriptions, these five major using rhythm contrasts have been reduced and renamed to three types of using rhythm contrasts. The new names, in respective order, are as follows.
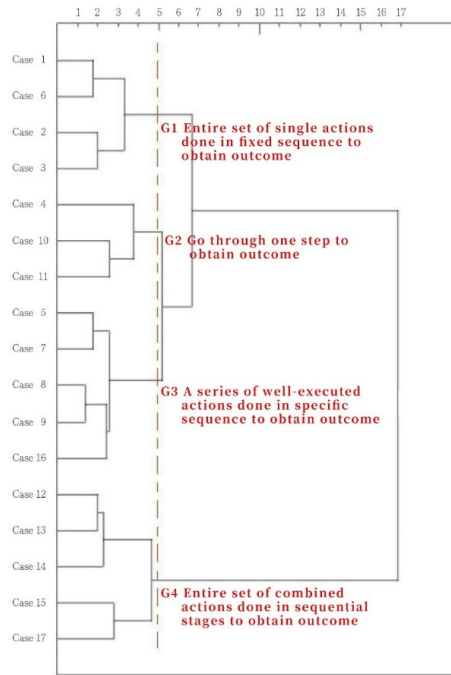
88

Figure 1. Sub- concepts of (I) must be used in a fixed sequence to obtain outcome.
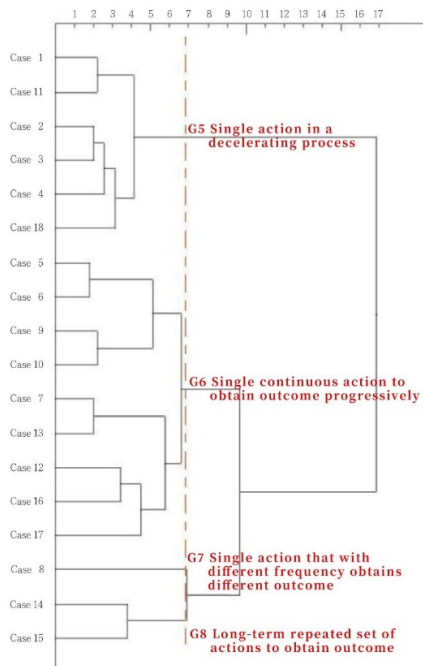

Figure 1a. Sub- concepts of (II) go through constant repeated actions to obtain outcome.
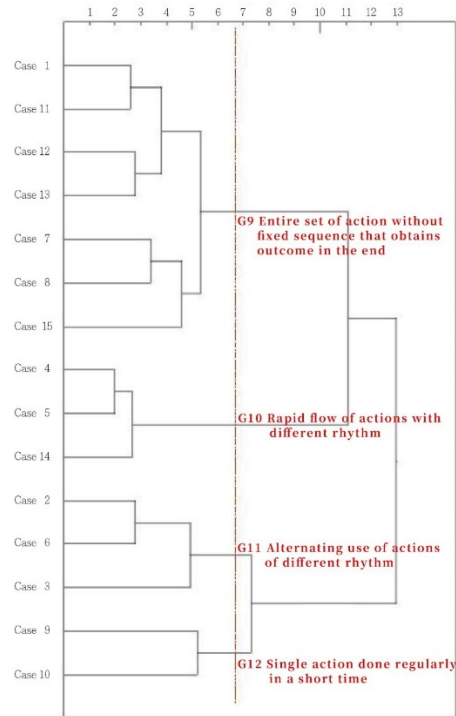
89

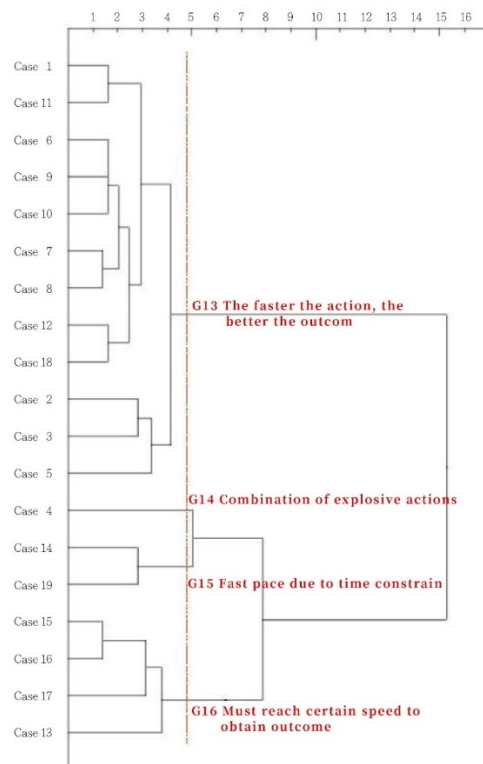Figure 2. Sub- concepts of (III) go through quick succession of actions to obtain outcome.

Figure 3. Sub- concepts of (IV) go through continuous rapid actions to obtain outcome.

90

Table 1. Rhythm Analysis of Methods of Using Rhythm

| Method of Rhythm in the Process of Using Products		Must be used in a fixed sequence to obtain outcome				Go through constant repeated actions to obtain outcome				Go through quick succession of actions to obtain outcome				Go through continuous rapid actions to obtain outcome			
No.		G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16
Form of rhythm in the process of using products		Entire set of single actions done in fixed sequence to obtain outcome	Go through one step to obtain outcome	A series of well- executed actions done in specific sequence to obtain outcome	Entire set of combined actions done in sequential stages to obtain outcome	Single action in a decelerating process	Single continuous action to obtain outcome progressively	Single action that with different frequency obtains different outcome	Long- term repeated set of actions to obtain outcome	Entire set of action without fixed sequence that obtains outcome in the end	Rapid flow of actions with different rhythm	Alternating use of actions of different rhythm	Single action done regularly in a short time	The faster the action, the better the outcome	Combination of explosive actions	Fast pace due to time constraint	Must reach certain speed to obtain outcome
Speed	Fast							●			●				●	●	
	Slow	●	●	●	●		●			●	●		●				
	Accelerating														●		
	Decelerating					●											
	Alternating between fast and slow												●				●
Continuity	Intermittent	●			●		●	●	●	●		●	●				
	Continuous		●	●		●					●			●	●	●	●
Timing	Long				●	●			●	●	●	●					
	Short	●	●	●			●	●					●	●	●	●	●
Momentum	Instantaneous							●							●		
	Constant	●	●	●	●		●		●	●			●			●	
	Change gradually					●									●		
	Alternating between strong and weak										●	●					●

1. "A rhythm transforms to another rhythm suddenly."

2. "A rhythm transforms to another rhythm suddenly and then returns to previous rhythm."

3. "Two types of rhythms almost proceed in the same time."
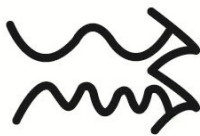
Collect specific examples, conceptual Structure of Formation of Using Rhythm Contrasts

To understand details of the 3 major formations of speed in using rhythm contrasts, extensive investigation and analysis are conducted on examples of the 3 major formations of speed in using rhythm contrasts in an effort to acquire possible design factors. 11industrial designers are asked to rate the level of likeness for each method of speed in using rhythm contrasts (1 being most unlike; 10 being most alike), then analyze the data with Ward's method, the result is illustrated in Table 2 for the conceptual structure of each formation in using rhythm contrasts.

Dendrogram using Ward Method

```
Rescaled Distance Cluster Combine

C A S E        0     5     10    15    20    25
Label    Num   +-----+-----+-----+-----+-----+

Case  17
Case  18
Case   6
Case   1                    Rhythm G1
Case  16
Case   4
Case   5                    Rhythm G2
Case   3
Case  13
Case   7
Case   9                    Rhythm G3
Case  11
Case   8
Case  15
Case   2
Case  10
Case  14
```
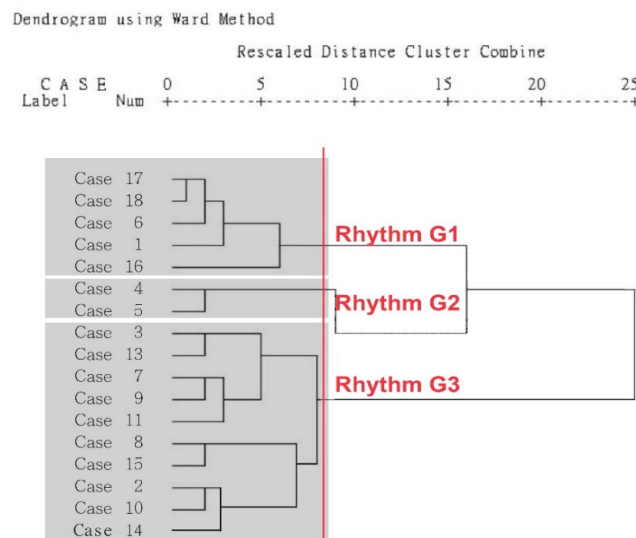
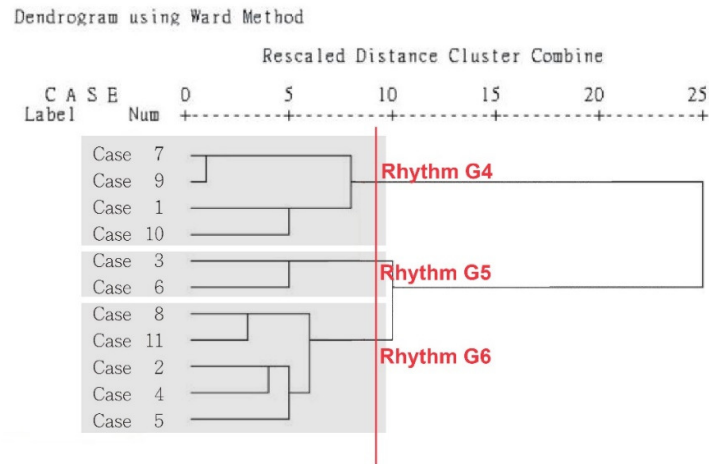Figure 4. Sub- concepts of "A rhythm transforms to another rhythm suddenly."

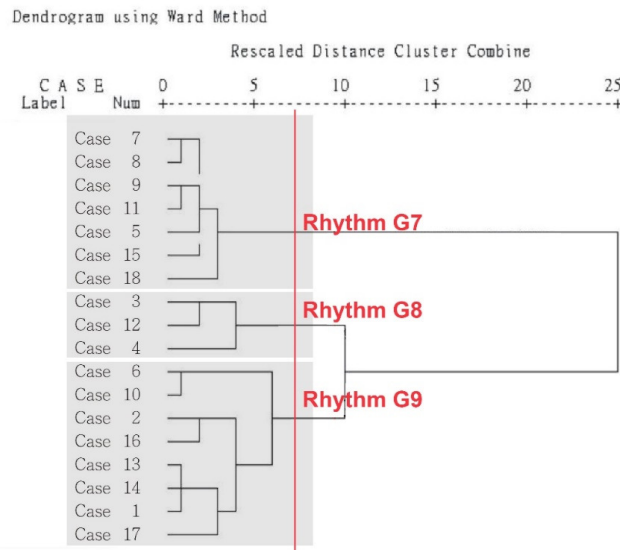Figure 5. Sub- concepts of "A rhythm transforms to another rhythm suddenly and then returns to previous rhythm."

Figure 6. Sub- concepts of "Two types of rhythms almost proceed in the same time."

Table 2. Conceptual Structure of Design Methods of Using Rhythm Contrast

Rhythm contrast	Type	Forms of rhythm contrast in the process of using products
(I) A rhythm transforms to another rhythm suddenly.	Rhythm G1	To operate product in a slow rhythm, then feedback appears and disappears suddenly

	Rhythm G 2	After a short operation, product gives a quick rhythm of feedback to obtain outcome
	Rhythm G 3	To do accelerating or decelerating operation rhythm, then feedback gives an opposite rhythm.
(II) A rhythm transforms to another rhythm suddenly and then returns to previous rhythm.	Rhythm G 4	To operate product in a slow rhythm, then feedback suddenly appears and disappears, and then returns to previous operation rhythm to obtain outcome.
	Rhythm G 5	To operate product in a slow rhythm, then feedback makes the operation rhythm quickly, and then returns to previous operation rhythm to obtain outcome.
	Rhythm G 6	To operate product in a quickly rhythm, then feedback makes the operation rhythm slowly, and then returns to previous operation rhythm to obtain outcome. Long- term repeated set of actions to obtain outcome
(III) Two types of rhythms almost proceed in the same time.	Rhythm G 7	Entire set of action without fixed sequence that obtains outcome in the end
	Rhythm G 8	Rapid flow of actions with different rhythm
	Rhythm G9	Alternating use of actions of different rhythm Single action done regularly in a short time

Rhythm Contrasts Analysis of Each Design Method of Using Rhythm

Using SD method, and we would investigate three parts of Expected Perception that is "the final "expected" feeling in a using process", " the "expected" feeling on the product operation" and "the expected feeling on the product feedback".

Modifiers of Expected Perception

(1)   The final "expected" perception in a using process

The terms used for expected perception is based on the top 10 modifiers of expressing emotion of expectation from the investigation, plus synthesized evaluation terms "interesting- boring", ,"expected- haphazard", "love to use- hate to use", the combination makes up the 13 pairs of modifiers for testing purpose.

(2)   The product operation expected perception

A total of 30 participants (male: 15; female: 15; age: 20- 40) completed the questionnaires for this study, the combination makes up the 8 pairs of modifiers for testing purpose (Table 3.).

Table 3. Modifiers of "The Product Operation "of Expected Perception Used for Testing Purpose

Modifiers of "The Product Operation "of Expected Perception	Promising - Disappointed
	Surprised - Predictable
	Thirsty - Rejected

94

	Innovative - Antiquated
	Unknown - Known
	Exciting - Insipid
	Mutable - Fixed
	Ordered - Sudden

Implementation of Testing on Examples of Expected Perception

The Perception test's participant: 32 (male: 16; female: 16, age: 20- 45). During the experiment, participants ware simulated the usage of the concept product, and respect to the sentiment of each step and overall experience, tested subjects were asked to evaluate the extent of the 7 stages of expected perception.

Regarding the construct of the expect perception of the contrast rhythm of product use, a Principle Component Analysis was used on the "expect perception of product use", "the expect perception of operation" and "the expect perception of feedback" (Table 4.- 6.).
(1)   Result from main element analysis on" the expect perception of product use"

Principle component 1 comprises of representative perception like "Exciting - Insipid", "Unknown - Known" that express changes in the rhythm of the process of using products, which could

be interpreted as "ambiguously sudden – ordered clearly"; Principle component 2 comprises of representative perception like "Thirsty - Rejected", "Clear - Vague" that describe the psychological response to expected results, which could be interpreted as "eagerness – depressed".

(2)   Result from main element analysis on "the expect perception of operation"

Principle component 1 comprises of representative perception like "Thirsty operation – Rejected operation", "Promising operation – Disappointed operation" that describe the psychological response to expected results, which could be interpreted as "eagerness operation – depressed operation"; Principle component 2 comprises of representative perception like "Ordered operation – Sudden operation", "Changeable operation – Fixed operation" that express changes in the rhythm of the process of using products, which could be interpreted as "Sudden operation – Ordered operation".

Table 4. The principal component analysis of expect perception of product use

Modifiers	Factor Loading	
	Principle Component 1	Principle Component 2
Exciting - Insipid	0.910	0.229
Unknown - Known	0.901	

Mutable - Fixed	0.895	
Surprised - Predictable	0.861	0.376
Innovative - Antiquated	0.829	0.297
Passionate - Indifferent	0.762	0.212
Ordered - Sudden	- 0.743	0.362
Thirsty - Rejected	0.336	0.916
Clear - Vague	- 0.198	0.897
Promising - Disappointed	0.668	0.724
Eigenvalue	6.058	2.178
Variance (%)	56.005	26.365
Cumulative (%)	56.005	*82.370*

Table 5. The principal component analysis of "the expect perception of operation"

Modifiers	Factor Loading	
	Principle Component 1	Principle Component 2
Thirsty - Rejected	0.969	.107
Promising - Disappointed	0.943	
Innovative - Antiquated	0.876	.380
Surprised - Predictable	0.801	.493
Ordered - Sudden		- 0.936
Mutable - Fixed	0.371	0.841
Exciting - Insipid	0.584	0.692
Unknown - Known	0.602	0.633
Eigenvalue	4.084	2.869
Variance (%)	51.056	35.867
Cumulative (%)	51.056	*86.923*

(3)   Result from main element analysis on "the expect perception of feedback"

Principle component 1 comprises of representative perception like "Thirsty feedback – Rejected feedback", "Promising feedback – Disappointed feedback" that describe the psychological response to expected results, which could be interpreted as "eagerness feedback – depressed feedback"; Principle component 2 comprises of representative perception like "ordered feedback – sudden feedback", "Changeable feedback – Fixed feedback" that express changes in the rhythm of the process of using products, which could be interpreted as "Sudden feedback – Ordered feedback".

96

Table 6. The principal component analysis of "the expect perception of feedback"

Modifiers	Factor Loading	
	Principle Component 1	Principle Component 2
Thirsty - Rejected	0.963	
Promising - Disappointed	0.957	0.190
Surprised - Predictable	0.916	0.345
Innovative - Antiquated	0.898	0.340
Exciting - Insipid	0.793	0.541
Unknown - Known	0.707	0.631
Ordered - Sudden		- 0.947
Mutable - Fixed	0.454	0.803
Eigenvalue	4.825	2.504
Variance (%)	60.312	31.303
Cumulative (%)	60.312	*91.614*
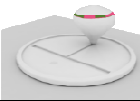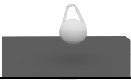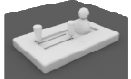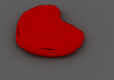
(4) Design and Production of Samples of Using Rhythm Contrast

This study has used 3D modeling software to create concept design product to understand what if people would expect and prefer products with rhythm contrast factor, we design and product 18 experimental samples and 3 control samples (Table 7.).

Table 7. Descriptions for Each Design Method of Using Rhythm Contrast

Sample No.	Sample Photo	Description
1		A drink machine. People can hit the color buttons to mix all kinds of drink.
2		A game machine tests people's reaction. When light turns on, people need to press the button immediately. At the beginning, the light feedback rhythm is slow, then it would be quickly to let the operation rhythm quickly, and it would return to previous rhythm to let people obtain outcome.
3		A funny light. To turn around the towel in a slow rhythm, the towel suddenly return to previous shape in a quickly shape and light up.
4		A funny light. To press the light in a slow rhythm, then the light becomes to a ball shape to light up.
5		To throw the product on the floor, if both of them are light up, then combine them together to get a system of divination outcome.

6		To turn around the top quickly, then hit the plan in a hurry to let the top into the hole, and the light turns on.
7		To turn on the light by lengthening it.
8		To lift the ball and to hit it to turn on the light.
9		To swing the light in different direction by see the feedback direction.
10		People need to let the different color of the light become to the same color, and would wait for the feedback in a while.
11		To take off the doll's clothes to let the doll turn around and light up.
12		To hit the product in a slow rhythm, the feedback would give a quickly rhythm, vice versa.
13		To swing the product, then the fruits would full down and light up.
14		To swing the stick to turn on the light.
15		A funny light. To touch the tab in a slow rhythm, the light turn on in a quick rhythm.
16		To swing the arms quickly, then the doll would become small in final.
17		The operation rhythm is quickly, and the feedback would glitter more quickly than the operation rhythm.
18		The product would give people a direction to fold itself, then would direct next action quickly to obtain outcome.
19		To turn around the flower bud to let it open and light up.
20		To open the box, then the transformer appear suddenly.
21		Put water on the sponge in a slow rhythm, then sponge suddenly expands and becomes a card.

Principle component of each sample of using rhythm contrast is scattered around the imaginary space made up by the 2 axes of respective principle components in connection with the 5 groups sorted out by group analysis. The position of each sample group in the imaginary space is illustrated (Figure 8.). The following is a discussion on the correlations between character of sample groups and expected perception.
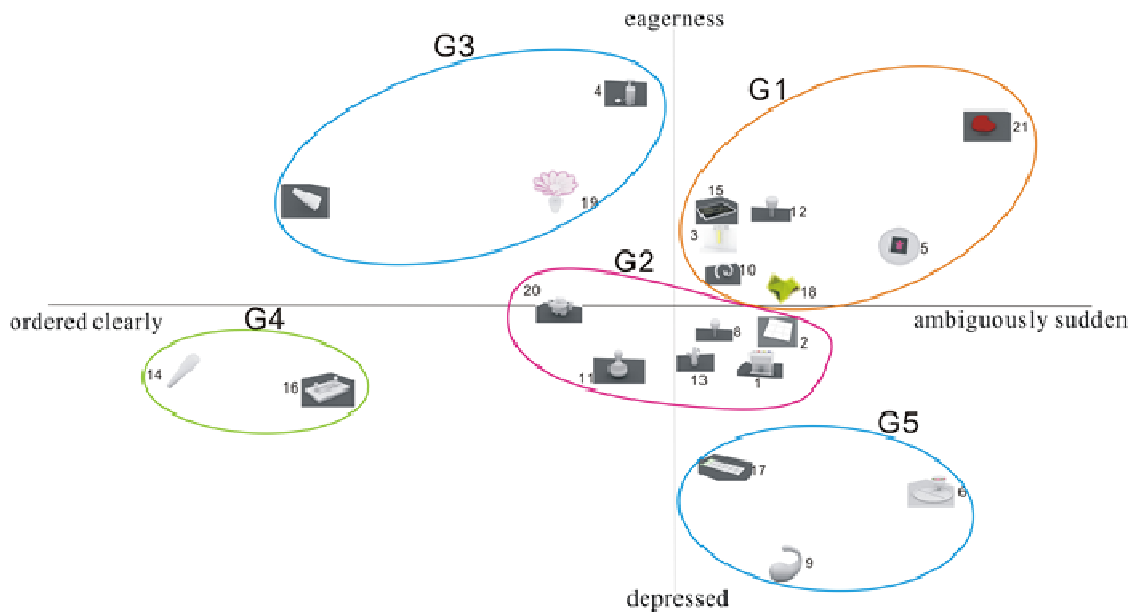
Figure 8. Distribution Map of the Sample Group of Using Rhythm Contrast in an Imaginary Space

Generally speaking, the high drop height of rhythm contrast presents a feeling of "ambiguously sudden". On the contrary, no rhythm contrast factor with repeated actions in using product gives a feeling of "ordered clearly". As for using process without any pleasant surprise, doesn't bring expected level of using rhythm contrast induces a feeling of "depressed". On the other hand, using process that is unique and surpasses expected extent of using rhythm contrast induces a feeling of "eagerness". Characteristics of the 5 groups (G1 – G5) and respective expected perception are illustrated in Table 8.

Table 8. 5 Groups and Respective Expected Perception

Type	Characteritics of using rhythm contrast	Expected Perception Induced
G1	The drop height of using rhythm contrast is more than 40 M.M.	Induces feeling of "ambiguously sudden"

G2	The operation rhythm is very quickly (up to 80M.M.) , but people need to wait up to one second to obtain outcome	Induces feeling of a little of "ambiguously sudden" and a little of "eagerness"
G3	The quickly operation rhythm (up to 80M.M.) with changeable shape	Induces feeling of "eagerness"
G4	no rhythm contrast factor in using process	Induces feeling of "ordered clearly"
G5	Both operation rhythm and feedback rhythm are accelerating or decelerating	Induces feeling of "depressed"

Results

In order to have a better understanding on the perception construct, a Multiple Regression Analysis was used on the testing result data, the modifiers as the independent variables, "interesting - boring"; "expect - haphazard" and "love to use – hate to use" are the dependent variables. The importance of each perception variable affecting the expectation evaluation can be known from the Beta value (standardized partial regression coefficient). The result of multiple regression analysis as show as Table 9.

As the result shows, the element af-

fect the "interesting- boring" are the "surprised - predictable", "promising - disappointed" and "exciting - insipid" perception. According to the different cognition about the rhythm, the user feeling "surprised", "promising" and "exciting"; the element affect the "expected - haphazard" and " love to use – hate to use" is the "promising - disappointed".

Following is causal relation among the expected perception of each type of using rhythm and "interesting", "expectancy", "love to use", plus respective synthesized evaluation, please refer to Table 10- 12 for illustration.

Table 3. The multiple regression analysis result on the modifiers

Interesting - Boring		Expected - Haphazard		Love to use - Hate to use	
	Standardized Coefficients Beta		Standardized Coefficients Beta		Standardized Coefficients Beta
(Constant)		(Constant)		(Constant)	
Surprised - predictable	.421	Promising - Disappointed	.913	Promising - Disappointed	.924
Promising - disappointed	.328				

Exciting - insipid	.306				

Table 10. Relation of Each Sample Group and Synthesized Evaluation of "Interesting"

Type	Form of Using Rhythm Contrast	Influence on rating of expectation	Description	Rating order
G1	The drop height of using rhythm contrast is more than 40 M.M.	Thirsty - Rejected	It has diffrent rhythm obviously between operation and feedback, which gives people a feeling of "ordered"; it also has "creative" using process.	1
G2	The operation rhythm is very quickly (up to 80M.M.), but people need to wait up to one second to obtain outcome	Promising - Disappointed	When people use this type of product in a long time, they would predict the feedback so as to induce a feeling of "promising".	2
G3	The quickly operation rhythm (up to 80M.M.) with changeable shape	Exciting - Insipid Creative - Old fashioned	Action is too fast and shape is changeable, so it tends to be more "exciting", and "creative".	3
G4	no rhythm contrast factor in using process	Ordered – Sudden	There is no rhythm contrast in using process, so it tends to be ordered.	5
G5	Both operation rhythm and feedback rhythm are accelerating or decelerating	Thirsty - Rejected Passionate - Indifferent	The rhythm are changeable in using process, so as to induce a feeling of "thirsty", and "passionate."	4

Table 4. Relation of Each Sample Group and Synthesized Evaluation of "expectancy"

Type	Form of Using Rhythm	Influence on rating of expectation	Description	Rating order
G1	The drop height of using rhythm contrast is more than 40 M.M.	Thirsty – Rejected Sudden - Ordered	People can't predict the rhythm in using process so as to induce a feeling of "thirsty", and "sudden."	1
G2	The operation rhythm is very quickly (up to 80M.M.), but people need to wait up to one	known- unknown	People need to wait for a feedback in a long time so as to induce a feeling of "unknown".	3

Type	Form of Using Rhythm	Influence on rating of expectation	Description	Rating order
	second to obtain outcome			
G3	The quickly operation rhythm (up to 80M.M.) with changeable shape	Thirsty - Rejected Passionate - Indifferent	People can't predict the rhythm in using process ,and the operation rhythm is quickly with changeable shape so as to induce a feeling of "thirsty", and "passionate".	2
G4	no rhythm contrast factor in using process	Passionate - Indifferent	Alternating action to obtain outcome brings a feeling of "passionate".	5
G5	Both operation rhythm and feedback rhythm are accelerating or decelerating	Thirsty - Rejected Passionate - Indifferent	The rhythm are changeable in using process, so as to induce a feeling of "thirsty", and "passionate."	4

Table 5. Relation of Each Sample Group and Synthesized Evaluation of "love to use"

Type	Form of Using Rhythm	Influence on rating of expectation	Description	Rating order
G1	The drop height of using rhythm contrast is more than 40 M.M.	Pleasantly surprised – Mediocre	Because of the high drop height of the rhythm and the sudden feedback is more "pleasantly; and this appeals to people's likings.	1
G2	The operation rhythm is very quickly (up to 80M.M.), but people need to wait up to one second to obtain outcome	Promising - Disappointed	When people use this type of product in a long time, they would predict the feedback so as to induce a feeling of "promising".	3
G3	The quickly operation rhythm (up to 80M.M.) with changeable shape	Known- unknown Passionate - Indifferent	People can't predict the rhythm in using process, and the operation rhythm is quickly with changeable shape so as to induce a feeling of "unknown", and "passionate".	2
G4	no rhythm contrast factor in using process	Promising - Disappointed	Steady action to obtain outcome brings a feeling of "promising"; this appeals to people's likings.	5
G5	Both operation rhythm and feedback rhythm are accelerating or decelerating	Thirsty - Rejected Passionate - Indifferent	The rhythm are changeable in using process, so as to induce a feeling of "thirsty", and "passionate."; this appeals to people's likings.	4

102

"The drop height of using rhythm contrast is more than 40 M.M." receives the highest rating of "Interesting", "expectancy", and "love to use". In other words, if the drop height of using rhythm contrast of products is more than 40 M.M., it would create a level of expectancy and appeal to the likings of people.

Conclusion

The aim of this study is to investigate the influence of the rhythm in the process of using products on the expected perception of using process.

Influence of Using Rhythm on Expected Perception

1. Perception of the using rhythm of products could be derived from the "ambiguously sudden – ordered clearly" factor which describes changes in the rhythm of using process, and the "eagerness – depressed" factor which describes psychological response to expected results. "Slow, intermittent, repeated single action" is easier to anticipate outcome, which gives people a feeling of "ordered clearly" and "depressed". "Instantaneous, continuous action" means short period of time that passes by quickly, and it gives people a feeling of "ambiguously sudden". "Continuously alternating or repeated action" gradually induces the outcome, and gives a feeling of "eagerness".

2. Influence of using steps of each sample group of using rhythm on expected Perception "Expectancy" rating of repeated action could get lower as time progresses; instantaneous, alternating action or outcome that would stir up anticipation could boost the "expectancy" rating of products.

3. "Alternating between strong and weak" approach for momentum in using rhythm would create a level of "expectancy" among users, and "instantaneous" using rhythm would make users more "love to use". "Alternating between fast and slow" approach for speed of using rhythm would make products more "expectancy" and "love to use" with users.

4. Perception of the using rhythm contrast of products could be derived from the "ambiguously sudden – ordered clearly" factor which describes changes in the rhythm of using process, and the "eagerness – depressed" factor which describes psychological response to expected results. The common perception influencing "interesting" is "thirsty". The common perception influencing "expectancy" is "thirsty" and "sudden". The common perception influencing "like to use" is "pleasantly surprised".

Generally speaking, using rhythm could influence the expected perception of using products; however, different using rhythm of products would give people different expected perceptions. If designer could include the factor of using rhythm in product design, it would create different expectancy for products in addition to making them more fun to use.

Reference

Bordwell, D., & Thompson, K., & Smith, J., (2001). Film art: an introduction. McGraw- Hill Education Press.

Chaudhuri, A. (1998). Product class effects on perceived risk: the role of emotion. International Journal of Research in Marketing, 15(2).

Chen, S.- y. (2006). "The Expected Image in the Process on Using Products." Thesis for Master of Science Department of Industrial Design Tatung University.

George, C., (1992). Brazilian Enchantment. Harlequin Press.

Hsiao, K.A., & Chen, L.L., (2006). Fundamental dimensions of affective responses to product shapes. International Journal of Industrial Ergonomics, 36(6).

Khalid, H.M., (2006). Embracing diversity in user needs for affective design. Appl. Ergon.

Kuo, C., (2007).The Influence of Rhythm in the Process of Using Products on Expected Image. Thesis for Master of Science Department of Industrial Design Tatung University.

Liu, Y., (2003). Engineering aesthetics and aesthetic ergonomics: theoretical foundations and a dual- process methodology. Ergonomics, 46(13-14).

Nagamachi, M., (1995). Kansei engineering: a new ergonomic consumer- oriented technology for product development. International Journal of Industrial Ergonomics, 15(1).

Nagamachi, M., (2002). Kansei engineering as a powerful consumer- oriented technology for product development. Applied Ergonomics, 33(3).

Phillips, D.M., & Baumgartner, H., (2002). The role of consumption emotions in the satisfaction response. Journal of Consumer Psychology, 12(3).

Rasmussen, S., E., (1974). Experiencing architecture. The MIT Press.

Sauer, J., & Sonderegger, A., (2009). The influence of prototype fidelity and aesthetics of design in usability tests: effects on user behavior, subjective evaluation and emotion. Applied Ergonomics, 40(4).

Seva, R.R., Duh, H.B., & Helander, M.G., (2007). The marketing implications of affective product design. Applied Ergonomics, 38(6).

Tsao, Y.C., & Hsiung, C.C., (2000). Relationship between the adverbial images of complex actions in using utensils and the forms of the utensils. In: Proceedings of the 5th Annual International Conference on Industrial Engineering e Theory, Applications.

Wang, H.- H., (1975). Psychology of art: creation, vision and shape psychology. Sanxin Press.

Westbrook, R.A., & Oliver, R.L., (1991). The dimensionality of consumption emotion patterns and consumer satisfaction. Journal of Consumer Research, 18(1).

104