

Investigating the Relationship of Products Gestalt in Their Sales by Kansei Engineering; A Case Study in Top 10 Best-Sellers in Electronic Products in 2020

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Abstract

There is a powerful and inverse relationship between the aesthetics of products and the price sensitivity of buying them. When designing a product is effective, it is less sensitive for people to pay attention to the cost. The purpose of this study was to investigate the effect of product Gestalt on the sales rate. Research methods have been developed through the study in two steps. At first, after studying products Gestalt, out of the 100 best sellers in electronic products in 2020 on the Amazon site, ten products were selected based on their form characteristics for maximum application of Gestalt design. The selected products were studied according to the seven Gestalt design laws. In the second phase, 40 undergraduate students in industrial design participated in the study using a cluster sampling method in which the aesthetic characteristics of the selected products were investigated with a Kansei engineering questionnaire. The data were analyzed using SPSS software. The cluster analysis results of PAHs showed a good efficiency for some of the products regarding their desirability for customers and showed that the principle of proximity and equilibrium had the highest and closure had the lowest percentage among Gestalt design laws in selected products. All the best seller products had an acceptable level of compliance with Gestalt principles (81.52-62.4%). Thus, it can be stated that there is a significant relationship between Gestalt design and the product sales rate, and customers decide to buy, reject or accept products depending on the emotional impact they get.

Keywords

Gestalt, Kansei Engineering, Sale Rate, Aesthetics.

Introduction

It has been proven that when exploring the emotional state of a design, aesthetics is considered to be the most proprietary term that can dominate the emotional state of products. So, designers try to think about perceiving the emotional state and create a favorable product (Urgen, 2006). Of course, there is a strong inverse relationship between the aesthetics and the price sensitivity of the products (Semih Kimzan, 2015). Many products are now released with similar functionalities and the only way to stand out from competitors is through offering the consumer an added value in the sense of aesthetic appeal or emotional attachment. The response to aesthetics is rapid, involuntary and can be biased positively or negatively (Perrez Marta et al., 2013). Demand for an industrial product is the most important issue in maintaining and prospering its market in today's society (Lugo et al., 2016).

Consumers decide whether to buy, reject, or accept the products by getting the emotional impact of products. The appearance features of products include materials, color, proportion, ornamentation, shape, size and reflectivity (Brunel & Kumar, 2007) and in the right combination can provide pleasure from the sensory system regarding a physical object (Hekkert, 2006). Aesthetics also give a sense of quality to a product because attractive things do not occur at random, it takes time to make them look appealing (Perrez Marta et al., 2013). Manufacturers should, therefore, seek to deliver products that influence customers' emotions and interests. In today's saturated market, there is a lot of competition between different products. Emotional design, aesthetic elements and Kansei engineering which are developed as consumer-oriented technologies for new product developments, are tools increasingly used to promote a product compared with those of competitors (Bongard & Bouchard, 2014).

Gestalt Design Fundamentals

In psychology knowledge, Gestalt deals with the truth of the matter rather than examining the question of micro or minor elements (Petermann, 1933). The laws of visual perception of *Gestalt* are named after a group of German psychologists who worked in the 1920s, 30s and 40s (Koffka, 1935). While in Germany Gestalt means *form and design*, in psychology it is a holistic vision and interpretation of the process of perception and recognition according to the laws of holism; the whole is more than a set of components (Shapourian, 2007). The aim of CLASSICAL METHODS OF GESTALTUNG, contemporary theory created on the basis of the German scientist's research, is to explain how complex scenes can be reduced to more simple shapes (Malinauskas, 2018).

According to Gestalt psychologists, human vision is apt to see some particular patterns (Baxter, 1985). In his 1923 essay *Form Theory* which became known as the *Point Treatise*, Wermer Timmer stated the first principles of Gestalt. Accordingly, different Gestalts are based on our inherent tendency to group or interdependently see similar elements (similarity grouping), which are closely related (proximity grouping) or have structural saving. Gestalt principles represent how the user perceives their surroundings, which can be derived from the environment in an auditory, quality, and visual way. The ability to perceive visually allows the user to communicate between components in a cohesive manner. Applying Gestalt principles in product design enables the audience to have a faster and more effective understanding of their environment and products (Koffka, 1935).

In the interaction between consumers and products, aesthetics play an important role in the evaluation of products as it is the first interaction consumers have with objects (Perez Marta et al., 2016). The core of Gestalt psychology is to find the simplest and most direct way to unscramble the incomplete visual information. It emphasizes that the perception in visual thinking has the ability to understand, and can choose, simplify, abstract, analyze and synthesize activities (Liang, 2018).

The Relationship between Gestalt Laws and Product Design

In today's world, from consumers to governments, all people consider interface design as a way to add value without changing the technical performance of a product. It is not necessary for the interface design to be glamorous, sophisticated or expensive, or to be labeled by a celebrity. The interface design of the product seeks to create a visual appeal for ordinary products (Baxter, 1995). Effective integration of product components or features can be achieved through Gestalt laws. Using these rules, one can integrate product features that are functionally interrelated into one group and by the interface design of products, the clarity and transparency of the overall body of products can be promoted (Lo, 2018). Gestalt laws tell us how to create instant visual perceptions of objects and determine the immediate visual impact of the product in the first encounter and it is necessary to use them as far as possible in the interface design of objects (Baxter, 1995). Breach of Gestalt laws can easily create a feeling of inadequacy in the product.

Kansei Engineering

Nowadays, product design and development has become more complex and quick-change. According to product design and development, Kansei engineering is known to be an integrated manufacturing system and product development tool used to determine the type of user's internal reaction to a product (Cheng et al., 2017). This helps the product design process to utilize features that have a favorable reaction from users (Rosen et al., 2016). This method has the ability to test different feelings and shows their relation with characteristics of real production requirements. In the Kansei engineering process, firstly, one should define the domain and collect the products, ideas and samples as much as possible. The main purpose of Kansei engineering is to identify the user's emotional needs, to analyze the relationship between the qualitative characteristics of human emotions and the quantitative characteristics of design and to transform them into physical features of the product. Kansei's goal is to systematize users' emotional needs and to intervene in product design. Designing in the Kansei method takes the pleasure and satisfaction of the user into account and there appears a good relationship between the appearance and functional features of the product. The formal features include shape, color, matter, texture and the like, and functional features include the feeling the product creates in the user, such as the user's perception of the product and how to use it (Koleini Mamaghani & Ebrahimi, 2017).

Kansei brings about a strong link between designer, product, and consumer (Bagheri & Shahroodi, 2015). Successful experiences have shown well that the sensations and emotional needs of consumers are recognized as definitive values in product design (Koleini Mamaghani & Ebrahimi, 2017). The individual is attracted to unusual objects and tends to seize them. Next, with the experience obtained, the individual seeks to buy a commodity that is more in tune with one's emotions, moods, and Kansei (Koleini Mamaghani & Ebrahimi, 2017).

Psychologically considered, human emotions towards products are divided into five functional, aesthetic, social, fascinating and appealing levels. This study focuses on emotions related to the aesthetic level. The product that suits one's aesthetic attitudes and tastes will create a sense of attraction and the product that is inconsistent with one's attitudes, creates disinterestedness. At this level of product emotion, referred to as aesthetic product emotion, issues such as shape, color, matter and style of the product are considered (Koleini Mamaghani & Ebrahimi, 2017).

Methodology

The aim of this research was to investigate the relationship between the aesthetics of products and the price sensitivity of buying them. Hence, it was necessary to identify which aspects of the form of a product evoke feelings on consumers. The case study is based on best-selling products of 2020 in the field of electronics. The reason for selecting electronic products was that they are products with clear functions and simple forms in which it is well possible to study the Gestalt laws.

This is a deductive mixing method study that created links between qualitative and quantitative issues. The current study was conducted in two general stages. In the first stage, Gestalt of products have been reviewed, out of the 100 best-selling electronic products in 2020 on the Amazon site, ten products were selected for the research, regarding their formal features in terms of maximum application of Gestalt design principles (Table 1).

Table 1: 10 best-selling electronic products, taken from the Amazon site.

1	<i>BEBONCOOL PS4 Controller Charger</i>		Wireless and simultaneous charging of two handsets simultaneously with wireless charging status indicator on the screen, charging via USB and pc ports, minimum space occupancy, safe.
2	<i>Mp3 player</i>		Features 16GB memory with Bluetooth, capable of playing FM radio, audio recording, video playback, file browser, able to perform sports on-the-go exercise, equipped with seven highly sensitive touch buttons, minimal use of energy (chargeable for 55 hours).
3	<i>Fire TV Stick</i>		Ability to control the volume of music, audiobooks, weather checking, answering questions, setting alarms, communicate with other people with similar systems, connect via Bluetooth or audio cable, controlling smart homes through this product.
4	<i>Echo Dot (3rd Gen)</i>		Ability to control the volume of music, audiobooks, weather checking, answering questions, setting alarms, communicate with other people with similar systems, connect via Bluetooth or audio cable, controlling smart homes through this product.
5	<i>Ring Wi-Fi</i>		Motion detection, visibility, installation with or without wires, infrared vision, ability to see people behind the door on a mobile screen, free product replacement by the manufacturer in case of theft.
6	<i>NOAA Emergency Weather Alert Radio</i>		Warning radio in adverse weather conditions such as hurricanes, tornadoes, etc. Alarms both by sound and by LED lamps, with clock settings.
7	<i>Panasonic RF-2400D AM / FM Radio</i>		High quality sound system, high precision radio frequency adjustment, larger speaker size than similar specimens in this dimension.
8	<i>Yuwiss Bluetooth</i>		Features 720 hours of standby time and 24 hours of continuous talk time per charging cycle, advanced design of volume controls and track switching, ability to remove background noise, be able to answer or reject calls by saying YES or NO, Ergonomic design less than 0.5 mm in diameter, in three different sizes, compatible with all smartphones.
9	<i>Wi-Fi Home Security Camera</i>		Wireless Home Security Camera, Remote Cell Phone Support, Night Vision, Object Motion Detection Sensor, Encryption Technology.
10	<i>Solar Emergency NOAA Weather Radio</i>		solar radio alerting in case of bad weather, with three LED lights and solar cells, compact, lightweight and comfortable to carry, a live finder kit when the cellphone is off and the person is in an accident.

Then, the selected products were studied according to the Gestalt design laws, including the following ones, and their compatibility with Gestalt design principles was examined (Table 2). Gestalt psychology puts basic principles of perception based on people’s psychological model (Liang, 2018).

CLASSICAL METHODS OF GESTALTUNG explains the ways, which people unconsciously use to connect and link design elements. There are 7 acknowledged basic principles of visual perception (Malinauskas, 2018);

- Closure Law: Since our mind tends to reduce the gap between components and complete semi-finished forms, a non-coherent object is not well understood by the viewer (Fisher & Smith-Gratto, 1999). The viewer is confronted with disrupted components that he will not be able to communicate effectively with, leading to his confusion.
- Proximity Law: Components that are at a relatively small distance to each other are understood as a set. Audiences instinctively analyze closely related components as linked and distantly related entities as non-linked (Fisher & Smith-Gratto, 1999).
- Similarity law: According to the law of similarity, objects with identical shapes and forms are seen as patterns (Baxter, 1995). Similar objects are quickly visualized as a group and the application of this principle can result in audiences' attention in a shorter length of time.
- Continuity law: The continuity in the design forces the eye to follow a path. Good continuity law states that patterns are understood on the basis of continuity, trajectory or vector of their components (Baxter, 1995).
- Equilibrium and symmetry Law: Probably the strongest Gestalt law is the law of symmetry. We are capable of recognizing symmetry in complex shapes, natural shapes with incomplete symmetry, and even objects whose symmetry is fundamentally disorganized (Baxter, 1995). If the forms of the objects seem to be visually unbalanced and symmetrical, they are incomplete (Fisher & Smith-Gratto, 1999).
- Synchrony law: Components moving in the same direction are better understood than those moving in different directions.

A focus group of 2 faculty members in the field of industrial design, 2 faculty members of graphic design and 1 senior designer of various companies was formed. Research scenario for analyzing products gestalt was described for the focus group and then the points were discussed by the group. Then, the Gestalt laws in product were compared. The results of each degree of adaptability were entered into the checklist. The reason for inviting industrial design experts to this phase was that they tend to have more experience with and be more sensitive to product forms, which covers a broad range of consumer tastes before beginning the selection process. Gestalt laws were explained to the focus group.

Table 2: Compatibility of the selected product form with the Gestalt laws. Green and red colors indicate the existence and inexistence of those properties for each product, respectively.

	Similarity shape, size, color	Continuity	Closure	Symmetry	Proximity	Synchrony	Equilibrium
Product 1	Green	Green	Red	Green	Green	Green	Green
Product 2	Green	Green	Red	Green	Green	Red	Green
Product 3	Green	Red	Red	Green	Green	Red	Green
Product 4	Green	Green	Red	Green	Red	Red	Green
Product 5	Red	Green	Red	Green	Red	Red	Green
Product 6	Green	Red	Green	Green	Red	Green	Green
Product 7	Green	Red	Red	Red	Green	Red	Green
Product 8	Green	Red	Red	Green	Red	Red	Green
Product 9	Green	Green	Red	Red	Red	Green	Red
Product 10	Green	Red	Red	Green	Green	Green	Green

According to [Figure 1](#), the principle of proximity and equilibrium had the highest and the confinement principle had one of the lowest percentages among Gestalt design rules in selected products.

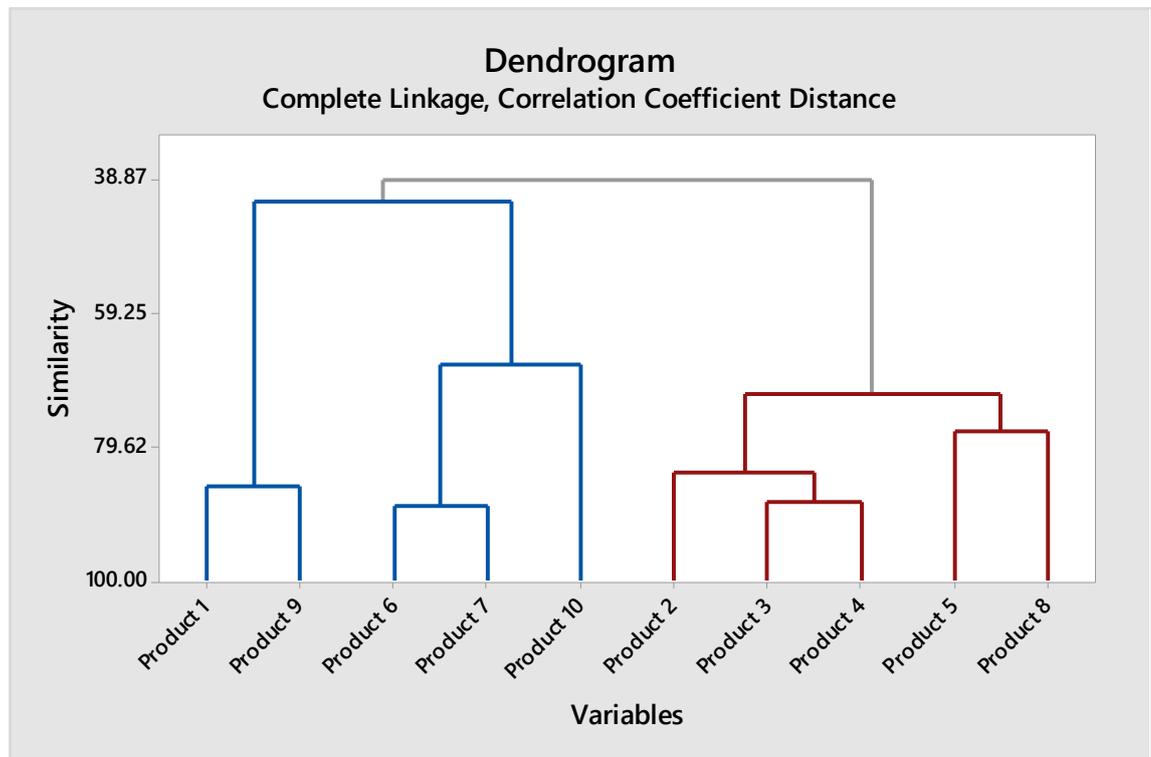


Figure 1: Hierarchical dendrogram for 10 products represented by three variables obtained by Ward's hierarchical clustering method. The numbers represent the same individual products as in [Table 1](#).

In the second phase, the aesthetic characteristics of the selected products were investigated using the Kansei engineering method. In order to obtain a complete set of words, all available resources including Gestalt books and articles, aesthetics, and product form design in recent years were studied. In the first step, 100 words were collected and in the next step, the Kansei terminology was manually summarized and sorted according to preferences and needs so that similar vocabularies were separated and all 20 pairs of 23 bipolar pair words describing the aesthetic characteristics of the product based on the Gestalt principles were adjusted using the semantic differential method. In measuring customer Kansei or the impression of products researches, semantic differential method (SD method) ([Osgood et al., 1967](#)) was widely used. SD method scores the impression that a customer receives from products using adjective pairs of opposite meanings named *Kansei words*. In this study, a questionnaire with a Likert scale was designed.

The Likert scale comprised scores:

1. Very Negative
2. Negative
3. Neutral
4. Positive
5. Very Positive,

which are defined according to users' feedbacks (Table 3).

Table 3: 20 attribute pairs selected for Kansei engineering.

Twenty Pairs of Attributes Selected		
<i>Regular-disturbed</i>	Pleasant-boring	<i>Intricate-rough</i>
<i>Attractive-non-attractive</i>	Simple-complex	<i>Effective-neutral</i>
<i>Modern-traditional</i>	Memorable-Forgettable	<i>Powerful-weak</i>
<i>Simple-luxurious</i>	Valuable- Unvaluable	<i>Integrated form- disturbed form</i>
<i>Creative-repetitive</i>	Good form- Bad form	<i>Comfortable performance-difficult performance</i>
<i>Pretty-ugly</i>	Balanced-Unbalanced	<i>Clear-confusing</i>
<i>Easy perception- difficult perception</i>	Trustable-Untrustable	

Result

The questionnaire was distributed to 40 sixth-semester undergraduate students of industrial design — students were selected according to passing the basics of industrial design 1 and 2 and familiarity with the principles of aesthetics and form design—. They were asked to mark the bipolar attributes in the questionnaire. By analyzing the data using SPSS software, it was possible to determine the relationship between adhering to the principles of aesthetics and Gestalt in form and rate of sales, and by drawing charts and graphs the results were quantified — Figure 2 for the sake of ease, evaluation has been placed on both sides of the semantic differentiation scale—.

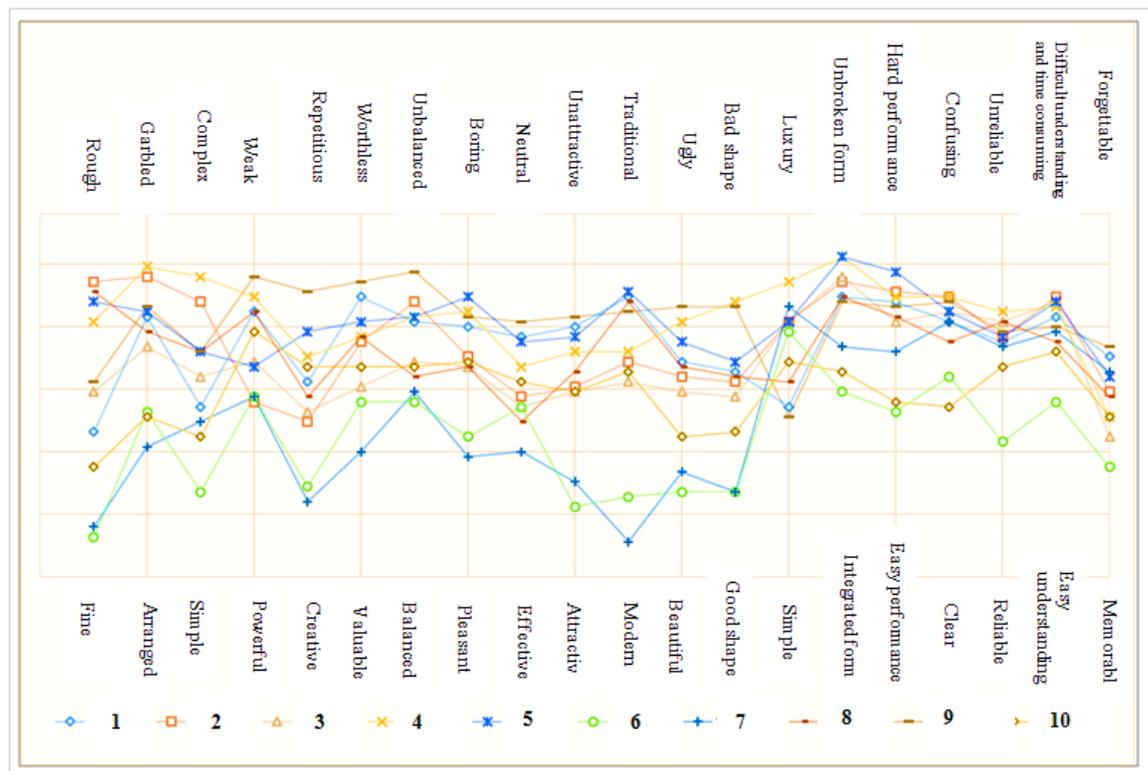


Figure 2: Comparison of mean Kansei terminology in assessing 10 best-selling products in 2020.

As the semantic differentiation scale is presented in a spectrum, the spectrum graph is also used in this section for a more complete analysis. Thus, according to the respondents’ opinions on each twenty surveyed indices, and given the positive or negative loads considered for each index, the products were scored from one to one hundred and the results were presented in spectral graphs to determine to what extent each product can meet user expectations in different aesthetic dimensions.

To evaluate the analytical data, Principal Component Analysis (PCA) and correlation analysis were used in an attempt to determine the relationships between Kansei Terminology of 10 studied products which are known to have an influence on the desirability of products. The PCA was carried out on the correlation matrices of the data using the Minitab — computer software package for statistical analysis— (version 18). In a final summary, respondents' views on the best-selling products in 2020 can be displayed to determine their satisfaction with Gestalt of products (Figure 3).

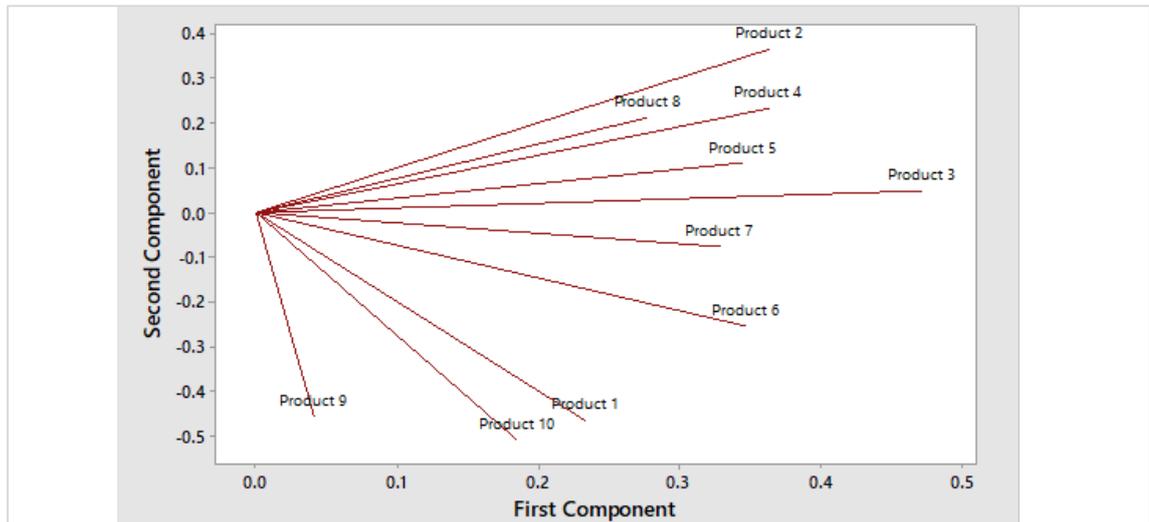


Figure 3: Score plot of PC1 vs. PC2 illustrating the distribution of individual products in Kansei Terminology.

The total variance shows the significant factors and the percent of variance explained by each variable before undergoing rotation which accounted for 80.0% of the total variance for 3 first principal components (Table 4). The first step in the multivariate statistical analysis was the application of PCA to group the individual product components by the loading plots for 20 Kansei Terminology. The cluster analysis results — hierarchical clustering, applying Pearson correlation— of PAHs showed a good efficiency for some of the products regarding their desirability for customers. For example, there are two important clusters including products 2, 3 and 4 with approximately 85% of similarity. Product 10 did not have similarities with other products in this classification. The PCA calculation for 10 PAHs with 20 evaluated properties resulted in two PCs described in Figure 3.

Table 4: Factor loadings for three principal components (PCs) for 10 different products in this study.

<i>Eigenvalue</i>	4.1597	2.2341	1.6401	0.6205	0.5068	0.4179	0.1848	0.1255	0.0877	0.0229
<i>Proportion</i>	0.416	0.23	0.164	0.062	0.051	0.042	0.018	0.013	0.009	0.002
<i>Cumulative</i>	0.416	0.639	0.803	0.865	0.916	0.958	0.976	0.989	0.998	1
Eigenvectors										
<i>Variable</i>	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10
<i>Product 1</i>	0.234	-0.466	0.326	-0.031	0.274	-0.23	-0.128	-0.527	-0.424	0.139
<i>Product 2</i>	0.364	0.365	0.058	0.043	0.387	-0.033	-0.297	0.519	-0.466	-0.061
<i>Product 3</i>	0.471	0.049	-0.073	0.009	-0.112	-0.014	0.472	-0.164	-0.086	-0.707
<i>Product 4</i>	0.363	0.231	0.012	0.536	-0.362	0.426	-0.008	-0.239	-0.126	0.378
<i>Product 5</i>	0.345	0.109	0.316	-0.551	0.26	0.419	0.213	-0.021	0.337	0.253
<i>Product 6</i>	0.347	-0.255	-0.388	0.038	0.122	0.149	-0.625	-0.108	0.423	-0.212
<i>Product 7</i>	0.329	-0.077	-0.486	0.095	0.192	-0.466	0.381	0.111	0.157	0.453
<i>Product 8</i>	0.277	0.21	0.445	-0.07	-0.449	-0.565	-0.244	0.049	0.305	0.023
<i>Product 9</i>	0.042	-0.456	0.431	0.522	0.178	0.091	0.177	0.418	0.281	-0.085
<i>Product 10</i>	0.185	-0.509	-0.125	-0.346	-0.528	0.15	-0.013	0.41	-0.301	0.11

Discussion and Conclusion

Undoubtedly, there are many factors affecting the sales of a product, such as meeting the users' needs, the product's performance, the physical relationship with the user, the materials and methods of manufacture, the final price, etc., but since Gestalt rules are widely adopted at the formal design of products, designers can be more confident in designing the size, shape, details and color of the product while applying these rules. In this study, this relationship was evaluated only from the aesthetics point of view. The results of this study in both product compliance with Gestalt law and understanding and analysis of Gestalt of products by users through Kansei engineering showed that all users' best-selling products had acceptable levels of adherence to Gestalt principles (62.04 and 81.52%) while products No. 4, 5 and 9 were more accepted than other products. Products No. 6, 7 and 10, all three different types of radio, received the lowest scores — the form design in all three models of this product is similar to common ones that were previously marketed and lacked innovation. The purchase of these products are mostly based on their performance—and products No.1, 2, 3 and 8 are rated at average. Therefore, it can be stated that there is a significant relationship between observance of Gestalt design principles and the rate of product sales. In other words, customers decide to buy, reject or accept the products based on the emotional impact of the products they get.

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