

A Study of the Factors Affecting Product Values and Preferences – Using Vacuum Cleaner as an Example

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Abstract. In an era of advanced technology and information, products change rapidly and manufacturing techniques continuously improve, thus, consumers have more options when purchasing goods and competition among brands becomes severe. In the market, there are various brands of vacuum cleaners. It is important for the products of different brands with similar functions to stand out in order to attract consumers. If they can have attractive appearance and provide consumers with visual differences, they will trigger consumers' purchase desire. This study treats vacuum cleaners as examples in order to determine the correlation between the actual prices of goods in the market and values and preferences of goods to the participants, as well as the relation between values and preferences according to questionnaire survey. Through in-depth interview, the participants suggested the factors of rising and falling ranks of values and preferences, in comparison to actual prices. Research findings will serve as reference for the development of product design. Several important conclusions are found as reference for the industry and designers.

Keywords: vacuum machine, perceived value, preference, rank difference.

1 Introduction

In an era of advanced technology and information, products change rapidly and manufacturing techniques continuously improve, thus, consumers have more options when purchasing goods and competition among brands becomes severe. In the market, there are various brands of vacuum cleaners. It is important for the products of different brands with similar functions to stand out in order to attract consumers. If they can have attractive appearance and provide consumers with visual differences, they will trigger consumers' purchase desire.

Yutani (1989) suggested that product purchase does not depend on the intrinsic value of goods, but is based on presentation value that shows the intrinsic value. "Intrinsic value" means the value of product life measure. In terms of material goods, it means product value. Intrinsic value can be classified into two parts: material value and function value. "Presentation value" is also called form value. Presentation value includes linguistic and non-linguistic presentation values. Linguistic presentation value includes value of nominal presentation (goods change value by names), value of descriptive presentation (linguistic description of goods, instruction of content, and

description of expression). Non-linguistic presentation value means the value produced by elements controlled by vision, hearing, and touch. From the perspective of product design, it means the appearance of goods and modeling elements controlled by designers, which includes size value (units of vision, hearing, and touch), form value, and design value. Sasaki (1991) indicated that most of the value of artificial goods is between Use value and Esteem value. Baxter (1998) proposed that when consumers find products that are highly homogeneous and have similar functions, the value of the goods is the key factor of purchase. Value refers to perceived value, and perception is measured by the degree of value. Industrial designers transform non-linguistic presentation into modeling of products, while function is transformed into structure and interface. Consumers have evaluation of the presentation and form of the cognitive value of goods. An impression of “high-quality goods” or “cheap goods” means the value of product performance for individuals (Liang, 1992). Baxter (1998) suggested that visual modeling of goods is the most basic condition of attraction; in other words, to draw consumers’ attention, appearance the products will be the key.

Most people suggest that in the market, regardless of product efficacy or brand, more expensive goods are attractive to consumers by their unique appearance. On the contrary, for cheaper goods, consumers usually have low cognition of appearance value. Hence, in order to explore reality, this study treats vacuum cleaners as examples in order to determine the correlation between the actual prices of goods in the market and values and preferences of goods to the participants, as well as the relation between values and preferences according to questionnaire survey. Through in-depth interview, the participants suggested the factors of rising and falling ranks of values and preferences, in comparison to actual prices. Research findings will serve as reference for the development of product design.

2 Research Method

The study includes two stages: questionnaire survey and in-depth interview.

2.1 Questionnaire Survey

Questionnaire survey steps include the collection of data related to vacuum cleaners, ranking of selling prices of products from top to bottom, screening of questionnaire samples, questionnaire design, and questionnaire survey.

Collection of Data Related to Vacuum Cleaners. First, the researcher collected the data of vacuum cleaners for 18 foreign and domestic brands sold in the market of Taiwan, including Canister, Stick, Upright, and Handy vacuum cleaners. Functions, power, sizes, and prices of goods were collected.

Screening of Questionnaire Samples. 5 samples were screened from each type of vacuum cleaner. The screening principle was that the main functions of products must be completely the same. Vacuum cleaners with similar functions, power, appearance,

and size, were classified into high-price and low-price goods. In each category, the price difference between high-price and low-price goods should be at least NTD 5000. The selected samples were the products of 12 brands in the market, with a total of 20 tested samples. Pictures of samples include front view, perspective drawing, and actual pictures of goods for the participants to carefully observe the details of goods. In order to avoid the inference of brand factor in participant testing, LOGO pictures of samples were removed.

Ranking of Selling Prices of Goods from Top to Bottom. Ranking of suggested selling prices of samples was listed from the highest to the lowest, as shown in Table 1. Selling prices were based on suggested selling prices, as shown on the official websites of brands in 2011. When prices were not indicated on the websites, the researcher selected the lowest prices shown on two major online shopping malls in Taiwan.

Questionnaire Design. The questionnaire is divided into two parts. Part 1 is the participants' basic information, including gender, age, and educational level. Part 2 is the pictures and numbers of the tested samples. Prices of goods are not indicated. Pictures of tested samples include front view, perspective drawing, and actual pictures of goods, as shown in Table 2 for Canister vacuum cleaners. After careful observation, the participants are expected to develop ranking according to the values of the tested samples, as well as ranking of preferences regarding to the whole, forms, colors, and materials of the tested samples.

Questionnaire Survey. A questionnaire survey was conducted on 20 males and 20 females, aged 22-31. Their educational level was university and graduate school. Regarding occupation, they were mostly students and office workers. In the questionnaire survey, the researcher explained to the participants face-to-face and obtained 40 valid questionnaires.

2.2 In-Depth Interview

According to questionnaire survey results, the researcher found the samples with different rankings of product values and preferences from actual prices to conduct in-depth interviews and explore the difference factors. Through leading questions, the participants could specifically express their feelings about each sample, and the factors of rising or falling of preferences and values. Thus, the researcher could recognize consumers' preferences regarding form, color, and materials of vacuum cleaners. In the interview, the researcher explained the questions to the participants face-to-face. Each interview lasted for 120 minutes. Pictures of samples were magnified on A4 paper, with front view, perspective drawing, and actual pictures of goods for participants' careful observations.

The participants were selected from those in the first stage of the questionnaire survey, of which there were 10, including 5 males and 5 females, aged 23-26. Regarding educational level, two were graduated from universities and 8 were graduated from graduate schools or above. Regarding occupation, 4 were students and 6 were office workers, and 10 had design backgrounds.

Table 1. Ranking of actual prices of four types of vacuum cleaner

Stick Vacuum Cleaners				
S1	S2	S3	S4	S5
				
NT.8590	NT.3980	NT.3600	NT.2090	NT.1290
Canister vacuum cleaners				
C1	C2	C3	C4	C5
				
NT.32900	NT.23900	NT.9990	NT.5290	NT.4990
Handy vacuum cleaners				
H1	H2	H3	H4	H5
				
NT.9900	NT.2990	NT.2780	NT.2190	NT.1290
Upright vacuum cleaners				
U1	U2	U3	U4	U5
				
NT.21500	NT.11990	NT.9990	NT.4990	NT.3990

3 Results Analysis

3.1 Ranking of Actual Prices of Goods, Values, and Preferences

The statistics of the questionnaire survey on the participants' ranking of values and preferences for the four types of vacuum cleaners are as shown in Table 3. According to Table 3, the participants' ranking of product values is similar to the actual selling price, with the exception of C3, which shows that ranking of actual prices is third and value is the fifth. The ranking gap between values and actual prices is (-2). However,

Table 2. Pictures of tested samples for Canister vacuum cleaners

臥式吸塵器-C 樣本		
C1	C2	C3
		
C4		C5
		

rise or fall of 2 in the ranking gap between preferences and actual prices is common, which demonstrates that preferences for more expensive products are not necessarily high.

3.2 Correlation between Values and Preferences of Products

Based on the results of the questionnaire survey and general rating, and regarding the correlation of participants' product values and preferences, by Pearson Product-Moment Correlation coefficient, correlation coefficient is ± 1 . When correlation coefficient is close to ± 1 , it means correlation is more significant, where (+) means positive correlation and (-) means negative correlation. According to the figures of correlation definitions of Product-Moment Correlation, when the correlation coefficient is 1, it means total correlation, 0.7-0.99 means high correlation, 0.4-0.69 means medium correlation, 0.1-0.39 means low correlation, and below 0.1 means extremely low correlation (Lee, 2008). The research shows a test result of a significance level of correlation coefficient by P. When P is lower than α 0.05, it means it reaches the significance level. Test results (see Table 4) demonstrate that most have medium positive correlation. Hence, the participants' preferences are influenced by products with value.

Table 3. Ranking of actual prices, values, and preferences, as well as a comparison of the difference

Canister vacuum cleaners					
code name	(C1)	(C2)	(C3)	(C4)	(C5)
Ranking of actual price (expensive-cheap)					
Ranking of value	(C2)	(C1)	(C4)	(C5)	(C3)
Difference of value ranking	-1	+1	-2	+1	+1
Ranking of preference	(C2)	(C4)	(C1)	(C3)	(C5)
Difference of preference ranking	-2	+1	-1	+2	0
Stick vacuum cleaners					
code name	(S1)	(S2)	(S3)	(S4)	(S5)
Ranking of actual price (expensive-cheap)					
Ranking of value	(S1)	(S2)	(S3)	(S4)	(S5)
Difference of value ranking	0	0	0	0	0
Ranking of preference	(S3)	(S1)	(S4)	(S2)	(S5)
Difference of preference ranking	-1	-2	+2	+1	0
Upright vacuum cleaners					
code name	(U1)	(U2)	(U3)	(U4)	(U5)
Ranking of actual price (expensive-cheap)					
Ranking of value	(U1)	(U2)	(U3)	(U4)	(U5)
Difference of value ranking	0	0	0	0	0
Ranking of preference	(U3)	(U1)	(U4)	(U2)	(U5)
Difference of preference ranking	-1	-2	+2	+1	0
Handy vacuum cleaners					
code name	(H1)	(H2)	(H3)	(H4)	(H5)
Ranking of actual price (expensive-cheap)					
Ranking of value	(H1)	(H2)	(H3)	(H4)	(H5)
Difference of value ranking	0	0	0	0	0
Ranking of preference	(H2)	(H4)	(H3)	(H1)	(H5)
Difference of preference ranking	-3	+1	0	+2	0

Table 4. Test results of correlation analysis of product values and preferences

Types of products	Pearson correlation coefficient (r)	Significance (two-tailed)	Correlation definitions
Canister vacuum cleaner	0.688	0.000**	Medium positive correlation
Stick vacuum cleaner	0.645	0.000**	Medium positive correlation
Upright vacuum cleaner	0.438	0.000**	Medium positive correlation
Handy vacuum cleaner	0.358	0.000**	Low positive correlation

**When significance level is 0.01 (two-tailed), correlation is significant.

* When significance level is 0.05 (two-tailed), correlation is significant.

3.3 Study on the Factors of Rising or Falling Ranks of Product Values and Preferences, in Comparison to Actual Prices

As show in Table 3, the rankings of preferences of many samples are different from the actual prices. For instance, in a canister vacuum cleaner, the ranking of C1 actual prices is first. However, values fall to the second and preferences fall to the third. The ranking of C2 actual prices is second, and values and preferences rise to the first. The ranking of C3 actual prices is the third. However, values fall to the fifth and preferences fall to the fourth. The ranking of C4 actual prices is fourth. Values rise to the third and preferences rise to the second. The ranking of C5 actual prices is fifth. However, values rise to the fourth, while preference is the same. Therefore, the researcher conducts in-depth interview on samples with different rankings of product values and preferences in order to determine the factors. For instance, why do the product values of the C1 vacuum cleaner fall to second, while preferences fall to third? According to results of in-depth interviews, form factors include the following: (1) because of transparent materials, goods are transparent inside and the appearance becomes too complicated; (2) modeling is round; (3) appearance is normal and not creative. Regarding colors: (1) the color is too normal (blue and white) and not attractive; (2) color is too bright; however, the vacuum cleaner should present a sense of stability; (3) the color is feminine; (4) color distribution is inappropriate. Blue part is in a large area and a transparent material, it looks cheap. Regarding materials: the percentage of transparent acrylic material is inappropriate, it is large, and made of plastic. Table 5, 6, 7 show the in-depth interview results of the four types of vacuum cleaners.

According to Table 5, regarding the factors of the rise of the ranking of product values and preferences, the forms should present the following: (1) modeling key words: simple, neat, streamlined, modernity, and consistent form; (2) sophisticated design of details; (3) different from normal vacuum cleaner form in the market and appearance is attractive; (4) vacuum cleaner is based on human factor design. For instance, it has comfortable handgrip, retractable cord or storage function; buttons are at convenient positions for users; (5) vacuum cleaners are commonly used by women.

Thus, feminine design will enhance preferences for goods. Regarding color (see Table 6): (1) key words of color: fashionable, technological, luxurious, soft, and comfortable; (2) decorated by bright color; (3) cold tone: it is more stable; (4) light color: volume of upright vacuum cleaner is larger than other types of vacuum cleaner. Hence, with light colors, users will feel it is easy to pull the vacuum cleaner while using. Handy vacuum cleaner is held by hand. With light colors, it looks less heavy for users. Regarding material (see Table 7): (1) various kinds of surface treatments: silvering, metal baking, and unique paints (such as leather paint, rubber paint, etc.), sandblasting treatment; (2) use of different materials: soft rubber material and colored acrylic.

Table 5. The factors of the rise and the fall in terms of form

Types of products	Ranking	Factor generalization	General generalization
Canister vacuum cleaner	Rise	<ul style="list-style-type: none"> · Simple and detailed · It is different from normal vacuum cleaner forms in the market and it is more special · Modernity 	<p>Rise factors:</p> <ol style="list-style-type: none"> 1. Simple and neat 2. Modernity 3. It is different from normal vacuum cleaner forms 4. Streamlined 5. Human factor design 6. Consistent modeling 7. Sense of design (sophisticated design of details) 8. Feminine design <p>Fall factors:</p> <ol style="list-style-type: none"> 1. Normal, conservative and not special 2. Simple, without detail 3. Complicated modeling 4. Mechanical 5. Industrial 6. Heavy
	Fall	<ul style="list-style-type: none"> · Modeling is normal, conservative, and not creative · Form is too simple without details 	
Stick vacuum cleaner	Rise	<ul style="list-style-type: none"> · Streamlined · Modernity · Human factor design · Consistent scale 	
	Fall	<ul style="list-style-type: none"> · Overall modeling is inconsistent · Complicated lines of appearance 	
Upright vacuum cleaner	Rise	<ul style="list-style-type: none"> · Simple and detailed · Feminine design 	
	Fall	<ul style="list-style-type: none"> · Mechanical · Industrial · Heavy 	
Handy vacuum cleaner	Rise	<ul style="list-style-type: none"> · Streamlined · Sense of design (sophisticated design of details) · Simple and neat 	
	Fall	<ul style="list-style-type: none"> · Complicated modeling · Industrial 	

Table 5 also shows that, regarding the falling factors of rankings for product values and preferences, forms are presented, as follows: (1) the following modeling key words should be avoided: too simple, without details, complicated modeling, and heavy; (2) it is similar to modeling of vacuum cleaners in the market, and it is not creative; (3) mechanical and industrial. Regarding color (see Table6): (1) the following key words of color should be avoided: old-fashioned and cheap, conservative and safe color (such as light blue), heavy color, and undefined color; (2) inappropriate color scale. Regarding materials (see Table 7): (1) single material or single surface treatment; (2) inappropriate percentage of material, such as over use of certain materials; (3) without special surface treatment or rough surface treatment.

Table 6. The factors of the rise and the fall in terms of color

Types of products	Ranking	Factor generalization	General generalization
Canister vacuum cleaner	Rise	<ul style="list-style-type: none"> · Fashionable (black and silver) · Technological (black and silver) · Metal color · Decoration of bright colors on products · Unique and new color (bright green) different from normal vacuum cleaner 	<ol style="list-style-type: none"> 1. Fashionable and technological 2. Metal color 3. Decoration of bright colors 4. Luxurious 5. Cold tone 6. Light color 7. Soft and comfortable <p>Fall factors:</p> <ol style="list-style-type: none"> 1. Old-fashioned and cheap 2. Safe and conservative 3. The color cannot be defined and is not pure 4. Color scale is inappropriate 5. Too heavy
	Fall	<ul style="list-style-type: none"> · Old-fashioned and cheap looking (red and white) 	
Stick vacuum cleaner	Rise	<ul style="list-style-type: none"> · Luxurious (metal color) · Cold tone and more stable 	
	Fall	<ul style="list-style-type: none"> · Safe and conservative colors · The color cannot be defined and is not pure 	
Upright vacuum cleaner	Rise	<ul style="list-style-type: none"> · Light color 	
	Fall	<ul style="list-style-type: none"> · Too many dark colors and it is heavy · Colors that are not suitable for household electric appliances (brown) 	
Handy vacuum cleaner	Rise	<ul style="list-style-type: none"> · Soft and comfortable 	

Table 7. The factors of the rise and the fall in terms of material

Types of products	Ranking	Factor generalization	General generalization
Canister vacuum cleaner	Rise	<ul style="list-style-type: none"> · Silvering material · Multi-level material · Sophisticated surface treatment (baking) · Decoration of little colored acrylic · Appropriate percentage of materials 	<p>Rise factors:</p> <ol style="list-style-type: none"> 1. Silvering material 2. Sophisticated surface treatment <ul style="list-style-type: none"> · Metal baking · Rubber paint · Leather paint · Matted surface sandblasting · Flash finishing paint <ol style="list-style-type: none"> 3. Decoration of proper colored acrylic 4. Various material <p>Fall factors:</p> <ol style="list-style-type: none"> 1. Too much transparent acrylic 2. Without special surface treatment 3. Single material 4. Single surface treatment 5. Rough surface treatment 6. Total transparent acrylic
	Fall	<ul style="list-style-type: none"> · Too many transparent materials · Without special surface treatment · Single material and too plastic · Rough surface treatment · Inappropriate percentages of materials 	
Stick vacuum cleaner	Rise	<ul style="list-style-type: none"> · White, bright and clean plastic 	
Upright vacuum cleaner	Rise	<ul style="list-style-type: none"> · Various materials · Sophisticated surface baking 	
Handy vacuum cleaner	Rise	<ul style="list-style-type: none"> · Sophisticated surface baking · Levels increased by different kinds of surface treatments (matted surface sandblasting) 	

4 Conclusions

Conclusions are shown below as reference for the industry and designers.

1. Ranking of values is close to actual prices. In other words, more expensive goods have higher product values. Ranking of product preferences and actual prices is different. It means that more expensive products do not necessarily have higher ranking of preference.
2. There is medium positive correlation between value and preference.
3. Rising factors of value and preference in various forms: (1) the following modeling key words: simple, neat, streamlined, modernity, and unified form; (2) sophisticated design of details; (3) vacuum cleaner form different from those in the market,

- and the appearance is attractive; (4) vacuum cleaner has human factor design, such as comfortable handgrip, retracting cord or storage function, buttons are at convenient positions for users; (5) vacuum cleaners are commonly used by women, thus, feminine design will enhance product preference. Regarding color: (1) the following key words of color: fashionable, technological, luxurious, soft, and comfortable; (2) decorated by bright colors; (3) cold tone: it is more stable; (4) light color: volume of upright vacuum cleaner is larger than other types of vacuum cleaners. With light color, users will feel it will be less difficult to pull the vacuum cleaner while using. Handy vacuum cleaners should be hand-held. With light color, it looks less heavy to users. Regarding material: (1) various kinds of surface treatments: silvering, metal baking, or unique paint (leather paint, rubber paint, etc.), sandblasting treatment; (2) Use of different materials: soft rubber material and colored acrylic.
4. Falling factors of value and preference in forms: (1) the following modeling key words should be avoided: too simple and without details, complicated modeling and heavy; (2) it is similar to the modeling of vacuum cleaners in the market, and is not creative; (3) mechanical and industrial. Regarding color: (1) the following key words of color should be avoided: old-fashioned and cheap, conservative and safe color (such as light blue), heavy color and undefined color; (2) inappropriate color percentage. Regarding material: (1) single material or single surface treatment; (2) inappropriate percentage of materials, such as over use of certain material; (3) without special surface treatment or rough surface treatment.

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