

CHAPTER 1 INTRODUCTION

1.1 Research Motivation

This is the age of consumers. The advanced technology and global resource allocation enable manufacturers to produce products with good performance and better functions at lower manufacturing cost. Not only sufficient products are supplied to consumers, but banks also supply the consumers with varieties of loans so that luxurious and expensive products like automobiles become affordable.

Automobiles were invented to bring more convenience into people's life in the beginning. Since its production, people no longer need to worry about the inconvenience caused by the long commuting time. At the early time, automobiles were regarded as deluxe products that only the rich could afford. Afterwards, mass production made automobile more prevalent in the market and more consumers were able to buy the car. With over one-hundred-year manufacturing history, now automobile manufacturers can produce quality automobiles with safety guarantee and lower cost, which provides consumers with affordable prices. Moreover, there are plenty of automobiles with various functionalities, such as recreational vehicles, sedans and sports cars in the market for consumers to select. Yet design has been recognized as an important element to enhance added value of products. *Purple Cow* (2003) stresses that products should be self-expressive and distinguishable. This

discloses the significance of design that has been widely adopted in the automobile industry.

With regard to automobile design, a lifestyle survey conducted in 2000 indicates that consumers have taken the factors of both functionality and exterior styling into consideration when buying a car. The survey reveals three factors consumers in Taiwan concern when buying a car: the country of origin, safety and functionality and the exterior styling. J.D. Power and Associates Report in 2003 also points out that car models that inspire positive or negative perception in terms of styling often have a sales advantage. Furthermore, a survey conducted in 2004 by *AXIS*, an organization of lifestyle investigation, mentions that Japanese consumers rank automobiles as the top two products, the design of which is the main value. All these prove the importance of automobile design.

1.2 Research Background

Creusen and Schoormans (1998) mention that design would become increasingly important as an opportunity to differentiate a product in the marketplace because other marketing tools have become more expensive and the difference in technology between products become smaller. Veryzer also suggests that product design is emerging as a key marketing element, which is a growing recognition (1995). In brief, design is regarded as a new and emerging marketing tool to differentiate the

product from others that have similar functions or performance. Take exterior design of the automobile as an example; the book *Purple Cow* mentions that although advertisement brings excellent sales for the old Beetle, the new Beetle succeeds for its brilliant styling and quality. The design of the new Beetle impresses consumers every time they see the new Beetle running on the street. The design makes itself so unique that consumers can hardly forget the new Beetle. Therefore, a good product design attracts and impresses consumers, which may influence the consumers to buy the product in the end (Creusen and Schoormans, 1998).

Besides the importance of product design, concerning consumer perception, Eckman and Wagner (1994) mention that consumer's judgment is affected by visual attributes or configurations of visual attributes. Product design affects how consumers perceive the product. Perception is subjective and powerful, and the perception may differ from the reality. For example, people may believe a good-looking salesman with better sales skill even though in reality the salesman might not have brilliant contribution to his company. Likewise, consumers may have varied perceptions about product design and these perceptions include both cognitive and affective responses. In terms of cognitive side, product form may shape or influence beliefs pertaining to characteristics such as durability, dollar value, technical sophistication, ease of use, sex role appropriateness, and prestige, and affective response include attention,

positive perception or vice versa (Bitner, 1992). Therefore, consumers may have different perceptions about the same product design, which includes automobile design.

To sum up, with mature manufacturing techniques and intense competition in the marketplace, car manufacturers have recognized the importance of automobile design, through which their cars could be differentiated from competitors and attract more consumers. However, design may convey different messages to consumers as each person has different perceptions about the same product design due to individual uniqueness. These perceptions may be cognitive or affective. Sometimes, the latter has more influences on consumers' purchase decision.

1.3 Research Objective

Product design is frequently discussed and is defined as a number of elements chosen and blended into a whole to achieve a particular sensory effect (Block 1995). These design elements include shape, color, ornamentation, texture, etc. The survey conducted by AXIS in 2004 about the relationship between the general public and product design defines product design from three aspects: “shape, color, and ornamentation” as the first group, “function, ease-of-use, and architecture” as the second group, and “development idea and concept” as the third group. It is known that design not only means a unique combination of visual elements, but also could refer

to a practical or conceptual aspect that consumers think of. Although many elements can be designed into a product, this research will only focus on visual elements.

According to AXIS survey, design is highly rated by women and younger generation. Regarding the definition of product design, younger groups have different translation from older groups. While the young regard product design as “shape, color, and ornamentation,” the older generations tend to view design as “function and ease-of-use. In terms of consumers’ attitude towards design, it is learned that attitude can be divided into five parts: interest/concern, desire, purchase selection, satisfaction, and self expression but there is no difference between consumers with different groups in having different attitude towards design. However, the survey indicates that younger consumers prefer innovative and distinct products, while older groups like intimate products. Although the survey is conducted in Japan, it is realized that consumers with different genders and ages have different viewpoints on product design. Automobile design is with no exception.

This research is aimed to understand the relationship between automobile design and consumer perception. Exterior design of the automobile will be mainly focused. Several questions will be studied:

- (1) How do consumers with demographic differences evaluate automobile design?
- (2) What factors do consumers take into account when purchasing?

(3) How do consumers perceive visual stimuli of automobile design and which sensory adjectives they use to describe the automobile design?

1.4 Theoretical Framework

Besides sex and age groups, other characteristics, including level of income, level of education, and buying experience, would be studied further to understand their relationship with automobile design, Agarwal and Ratchford (1980) stated that consumers with different education levels, rather than with different income levels, have a difference in paying attention to car attributes. Moreover, purchasing an automobile is a complex buying behavior (Kolter, 2003) so consumers who have bought an automobile at least once are assumed to have different beliefs, attitudes and purchase decisions than consumers who have never bought an automobile.

However, making a final purchasing decision is complicated and may be influenced by the factors beyond the five demographic variables in this research. This research only studies these five demographic variables and does not involve whether their perception will further affect the final purchase decision. The theoretical framework is generated in Figure 1:

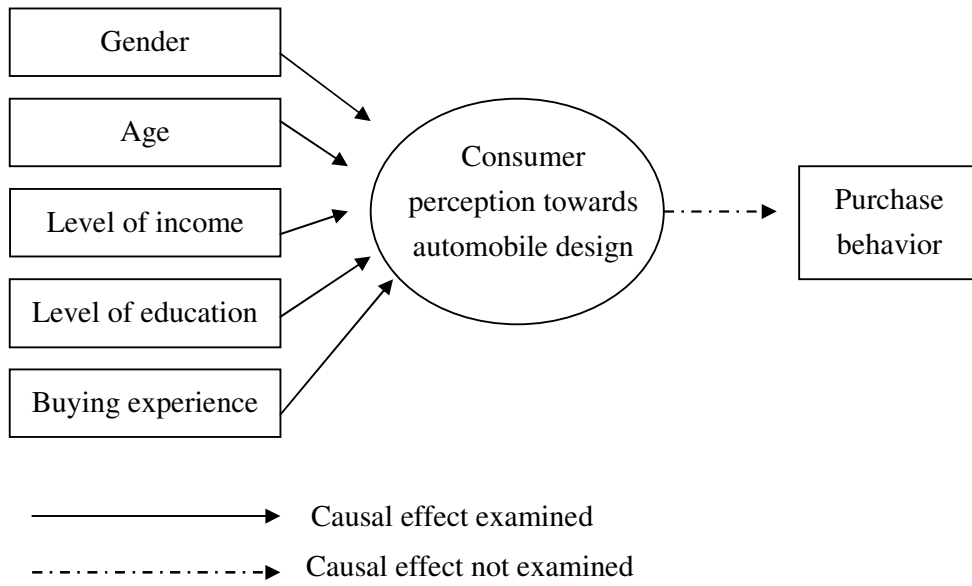
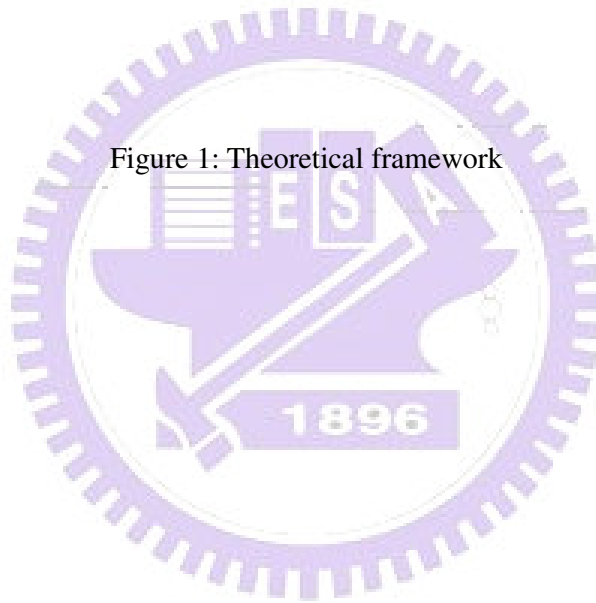


Figure 1: Theoretical framework



CHAPTER 2 LITERATURE REVIEW

2.1 Consumer Perception

Consumer perception is a process by which stimuli are selected, organized, and interpreted. These stimuli include sights, sounds, smells, tastes, and textures, and they evoke consumers' responses and determine how consumers respond to products (Solomon, 1996). Schiffman and Kanuk (2000) defined perception process as an individual selects, organizes, and interprets stimuli into a meaningful and coherent picture of the world. Figure 2 explains Solomon's consumer perception process for readers' reference:

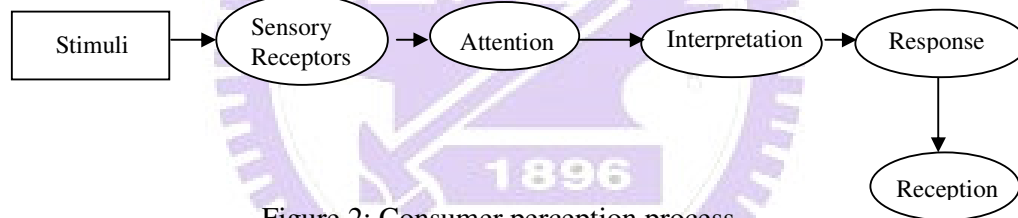


Figure 2: Consumer perception process

Assael (1998) indicated that consumers' interest and involvement with the stimulus is reflected in the level of attention they devote to it. Consumers organize various stimuli they receive into a meaningful whole to comprehend it better and to act on it. These principles have been derived from Gestalt psychology that explains that people organize perceptions to form a complete picture of an object. Thus, perceptual integration is a process of consolidating many disparate stimuli into an organized whole.

Sight is one of the sensory stimuli. Through the sights, consumers interpret the visual stimuli they perceive. Moreover, most person-product relationships begin with the perception of a product's appearance (Izzi and Caplan, 1972). Professor Lin (2001) described that the visual stimuli for products predominates include color, shape, and size. Other scholars suggested that the marketing meanings of products are communicated visually through the size, styling, brightness, package, contents, physical properties, and are distinctiveness from competitors' products (Assael 1998; Solomon 1996).

Since consumers receive so many visual stimuli every day, how do they respond to these stimuli? Can products exactly convey the message that manufacturers want to deliver to consumers? As a matter of fact, visual attributes of products influence consumers' perception and the consumers hence have emotional responses to the product (Solomon, 1996). For example, a single color may have different meanings for different cultures, and can affect people's perception toward products. Regarding the product appearance, Apple's i-Mac has changed consumers' image of a personal computer from coldness and clumsiness to decorativeness and stylishness. Consequently, consumers are subject to many influential factors that tend to distort their perceptions, especially visual attributes. Related studies have found out that attractive models are more persuasive and have a more positive influence on

consumer attitudes and behavior than average-looking models (Schiffman and Kanuk, 2000).

However, consumers' perception is not always true with the reality. The characteristics of the stimuli, and consumers' ability to perceive the stimuli determine which stimuli consumers will perceive eventually and how they will interpret them (Assael 1998). Assael pointed out that each individual may perceive the identical stimulus differently due to different needs, attitudes, experiences, and personal characteristics such as sex, age and involvement. In addition, Eckman and Wagner (1994) mentioned that judgments of attractiveness differed among ages, with older consumers evaluating visual attributes differently from younger consumers. Furthermore, some visual attributes are more influential than others in terms of how consumers evaluate product design, even though the rules of visual communication are not as well-defined as those of verbal communication.

Many factors, especially requiring making a difficult perceptual judgment, may tend to distort consumers' perception, and irrelevant cues are one of these factors (Schiffman and Kanuk, 2000). Consumers would rather evaluate the product quality through the intrinsic cues such as size, color, or aroma of the product because the cues enable consumers to justify their product decisions to be either positive or negative. Therefore, from the process that consumers receive the sensory stimuli, to the process

that they interpret their perception, there exist many factors that affect consumers' perception, especially visual stimuli.

2.2 Product Design

Product is one of the typical four P's, and Bloch (1995) said that the most basic characteristic of a product is the exterior form or design. A product's design represents a number of elements chosen and blended into a whole by the design team to achieve a particular sensory effect. Designers make choices for characteristics such as shape, scale, tempo, proportion, materials, color, reflectiveness, ornamentation, and texture. According to Eckman and Wagner (1994), product design is a unique combination of visual elements - line, space, shape, light, color and pattern. Moreover, Veryzer (1995) explained that design elements are line, plane, and color, and the design principles are unity, contrast, balance, and proportion. Furthermore, Bloch elaborates how product form influences consumers' responses and minds (Figure 3).

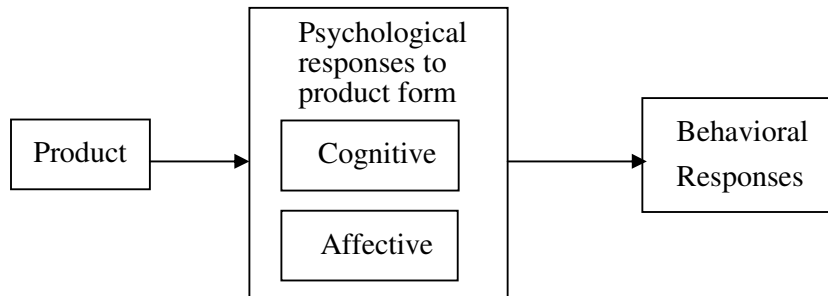


Figure 3: A model of consumers' response to product form (Block, 1995)

According to Block (1995), a product design influences consumers' perception in both cognitive and affective ways and consumers choose to either approach or avoid the product based on the result of their psychological responses. In cognitive aspect, the product design affects consumers' belief. These beliefs include durability, dollar value, technical sophistication, ease of use, sex role appropriateness, and prestige. Moreover, product design helps consumers make categorizations for similar products. On the other hand, in affective aspect, product design provokes consumers' either positive or negative responses. Consumers may simply like the product due to their strong attention or involvement for the product design, or consumers may dislike the product due to bad Gestalt processing (objects are perceived as a whole) or disfavored individual design elements.

Veryzer mentioned (1995) that product design can deliver the aesthetic aspect of the object, and Creusen and Schoormans (1998) also stated that hedonic value, or aesthetic aspect of product design give consumers good feeling. But in addition to the aesthetic role, product design brings other roles such as easiness to categorize and basis for the formation of beliefs about practical, ergonomic, hedonic and symbolic product value. Symbolic and hedonic values tend to be judged holistically, while practical and ergonomic aspects tend to be judged analytically. The authors also find out that expressive aspects, namely hedonic and symbolic sides, play an important

role in the preference no matter the observation time for a product is short or long. However, consumers form the utilitarian feeling to the product based on the salient characteristics such as color, size; or depending on the overall impression, e.g. with a more professional look and thus generating higher quality.

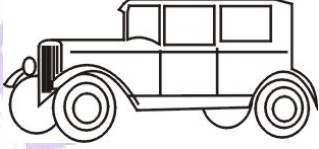


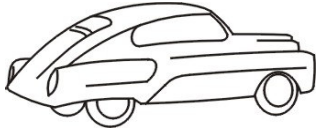

Veryzer (1995) also pointed out other aspects such as functional and communicative roles of product design. These roles connect consumers with the product and thus may affect consumer behaviors such as comprehension, categorization, aesthetic response, preference, choice, use and performance. The functional aspect refers to engineering design, while the communicative aspect involves visual and iconic cues. These aspects may affect how consumers perceive and categorize a product class or its complexity level, influence their attitude toward its easy or difficult use, and shape their perception of the risks involved in purchasing the product. Therefore, design assists interpretation and enhances person-product interaction. People's interactions with product designs involve multiple design considerations, which further brings a number of different reactions into the product. The role of the package or product appearance is thus considered as consumer product evaluation or choice (Creusen and Schoormans, 1998).

2.3 Automobile Design

Since the first automobile was invented, automobile industry has been

developed for more than one hundred years, and the change of the automobile design has been persisting. At the very beginning, the automobile was produced without a roof and imitated the design of carriages. Afterwards, the automobile with roof was made to withstand rain and wind, but it was still weak to wind resistance that drivers were unable to drive fast. Mass production of Ford' T model was a milestone in the automobile industry that could be divided into five phases (see Table 1).

Table 1: The evolution of automobile design (Wang, 2003)

1	Boxy	In 1908 Typical: Ford Model T Automobile marched the milestone of mass production	
2	Beetle	In 1934 Typical: Chrysler The old Beetle was mass- produced	
3	Boat-like	In 1949 Typical: Ford Model V8 A breakthrough of ergonomics and mechanism	
4	Fishy	In 1952 Typical: Buick Decrease of eddy	
5	Wedge	In 1963 till now Modern cars	

From the automobile history, it is interesting to know that unlike the modern automobiles with diversified designs, at the early time automobile had similar yet

clumsy appearance due to the mechanical constraints and immature manufacturing skill. However, after a century, the advanced manufacturing technique has overcome the mechanical constraints. Consequently, automobile appearance is turned into be more diversified undoubtedly and could either emphasize the design innovation or meet certain requirements. For example, the exterior design of Smart is modern but ultra compact. Its design idea stemmed from bringing convenience for drivers to solve problems of finding a parking lot in the hustling big cities. Suzuki Solio is featured with colorful boxy design and looks like a recreational vehicle, but actually it belongs to small cars and is affordable as a substitute for consumers who have dreamed for a real recreational vehicle.

Hsiao's research in 1997 stated that factors of both form and color relating to the image sensation a person has toward a car are regarded essential by consumers. Hsiao selected several groups of automobiles sharing similar form or design as the defined automobile taxonomies in his surveys. The nine automobile taxonomies defined in his study is based on the dimension, the lines, the respective shape of the head, of the tail, and of the whole body, the car light shape and etc. Baxter (1995) stated that people firstly receive visual stimuli as a whole, and then start to notice the single characteristics of the object afterwards. That is, consumers firstly evaluate the automobile design as a whole instead of separate parts, and they pay attention to if the

whole configuration is harmonious and meaningful. Tsai (1993) embraced that consumers have two ways to recognize the product: one is the whole image, and the other one is feature image. Ma (1995) consolidated the whole image and the specific feature images of an automobile as shown in Table 2. The table indicates how consumers pay attention to automobile design. His research also found out that the whole image and the head are what consumers rank as the first two priorities. To sum up, Ma concluded that automobile design is composed of three parts: head, body and tail.

Table 2: The configuration of automobile design (Ma, 1995)

Whole image on a car	Proportion, color, line
Front Part	The design of front lights, engine cover, the size of air inlet and windshield.
Back Part	The design of back lights, back windshield and the design of luggage chest.
Side Part	Side lines, car doors, car window and the lines

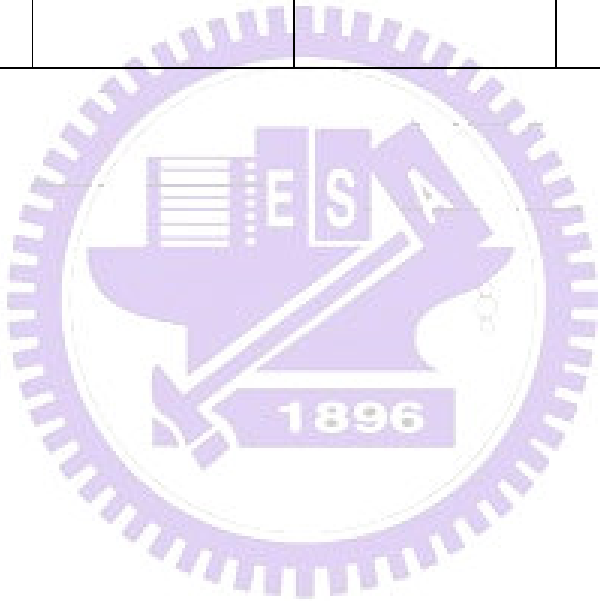
2.4 Words to Describe Perception

People are usually accustomed to use an adjectival word to specify feelings and overall impression for an object or a product (Creusen and Schoormans, 1998; Hsiao, 1994). The adjectives frequently used include “old fashioned,” “modern,” “sleekness,” “awkwardness,” “refined,” “elegant,” “simple,” “fullness,”

“deluxe-looking,” and etc (Veryzer,1993). Moreover, general terms such as “shape” and “design”, are often used in the statements such as “I liked this design” and “I didn’t like the square shapes because they looked old fashioned.” This reveals that people tend to describe their feelings in sensational terms and use these adjectives to describe their positive or negative feeling about the objects or products. There are many secondary data pertaining to the adjectives to describe consumer perception about product design. Table 3 shown as follows extracts the adjectives frequently used to describe how consumers perceive the automobile design (Hsiao, 1994; Wang, 2003). The table figures out that some adjectives have sequential relation such as static-dynamic-streamline and tradition-modern-future. Some adjectives are also discovered to be synonym-antonym relationship such as feminine versus masculine, modern versus old fashioned, simple versus complicated, rational versus sensational, comfortable versus uncomfortable, lovely versus unlovely and dazzling versus ordinary.

Table 3: Adjectives to describe automobile design

Dignified	Streamlined	Advanced	Grand
Dynamic	Future	Steady	Ingenious
Interesting	Elegant	Old-fashioned	Static
Feminine	Masculine	Mature	Immature
Modern	Complicated	Simple	Rational
Sensational	Traditional	Clumsy	Lovely
Unlovely	Comfortable	Uncomfortable	Dazzling
Ordinary			



CHAPTER 3 METHODOLOGY

3.1 Research Hypotheses

Gestalt psychology embraces that an object is perceived as a whole. When applying this theory to the automobile design, consumers are supposed to perceive it and then form a whole image of the car. However, in Ma's research in 1995, he concluded that consumers are inclined to evaluate the whole automobile design and the car head particularly, which is not exactly the same with Gestalt psychology. This arouses an interest in verification that if consumers are subject to Gestalt psychology when they evaluate automobile design. Moreover, "automobile design" has been one of the top three important factors consumers in Taiwan take into account when purchasing a car (*Life style photo gallery*, 2000). Whether automobile design has become the most important factor for consumers deserves further study because researchers claimed that other marketing tools do not have a significant effect on drawing consumers' attention on products (Creusen and Schoormans, 1998).

Furthermore, the report conducted by JD Power Association in 2003 indicated that car styling inspires consumers' positive or negative perception about the car. Positive perception certainly has a sales advantage. The result is similar to what Block (1995) mentioned that the stronger the positive psychological responses to a product's form, the greater the propensity to approach the product and vice versa. Therefore,

can it say that concerning automobile design consumers never consider buying certain types of cars after they have a negative perception about its design? Or they may still choose certain types of automobile designs due to some reason such as limited budget even though they have negative perception about the design? With regard to consumer perception about automobile design, visual stimuli of automobile design, including size, shape, and color, can influence consumer perception. According to Bell (1914), the interaction of line and color determines a significant visual form that people find attractive. In Hsiao's (1997) research, he also concluded that the mental impression a person has of a car is influenced by the car's form and color simultaneously. Thus this research will also verify if the two elements - line and color - remain highlighted by consumers than other design elements.

With regard to the automobile size, big, compact and subcompact automobiles are frequently seen in the market. For the past few years, small sizes of cars made by different manufacturers have been launched into the market. Masatsugu Arimoto mentioned in the AXIS magazine (2004) that young generation likes subcompacts. Likewise, to male and female consumers, the general public believes that female consumers prefer small automobile size than male consumers. Therefore, small automobile size particularly appeals to consumers by different ages and genders will be studied in this research. On the other hand, product lines, shape, square, oblong,

and hexagon are objects with angles and to form masculine, professional, calm, rational, technological, and static image, while circle and oval shape present feminine, warm, young, soft, and sensational image (Wang, 1997). If the former statement is true, does it mean that male consumers of different ages and genders still evaluate automobile shape differently? Or the difference also occurs to consumers by other demographic characteristics? Few automobile shapes that will be studied later in this research will be used to understand the difference in perception and evaluation of automobile shape by consumers with different demographic characteristics. Regarding color, it is one important yet subjective one among the visual stimuli. Many products, including clothes, shoes, accessories, timepieces, and even the consumer electronics such as digital cameras, targeted to female consumers are colorful. Nowadays, some cars in diversified colors such as pink, light blue, light green and purple have been launched into the market. Cars in mustard or lavender color are widely sold to female consumers even though the colors are uncommon. In this research color will also be another variable to be verified to understand if there is difference between consumers with different demographic characteristics.

Old consumers have different feelings about a product design from that of young consumers (Morris B, 1986). Moreover, according to the research made by Agarwal and Ratchford (1980) willingness to pay for car attributes is related to

education, not income. Consumers with higher educations are unwilling to pay for car attributes because they are more careful shoppers and they do comparisons among alternative cars. Furthermore, Kolter (2003) mentioned that purchasing an automobile is a complex buying behavior because it requires developing beliefs about the product firstly, developing attitudes about the product secondly, and making a thoughtful purchase decision finally. Consumers who have bought an automobile at least once are assumed to have different beliefs, attitudes and purchase decisions than consumers who have never bought an automobile. In this research demographic characteristics refer to gender, age, income, education, and car-purchasing experience, and based on the five demographic variables, five hypotheses are proposed, to understand how consumers with different demographic characteristics evaluate and perceive automobile design. Table 4 describes the five hypotheses.

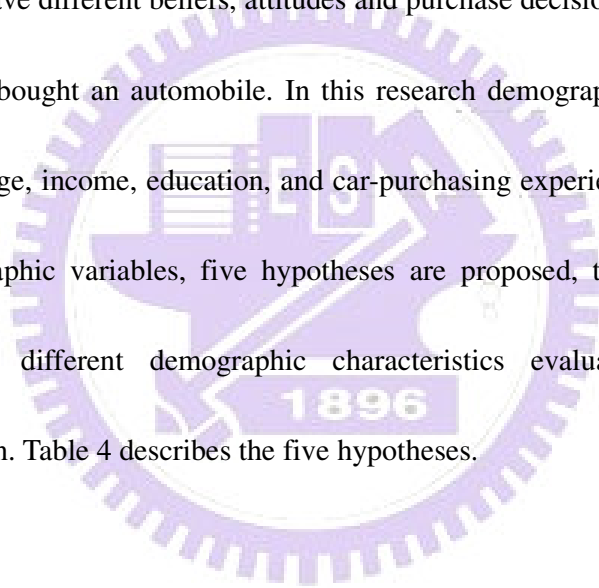


Table 4: The five hypotheses to be verified in this research

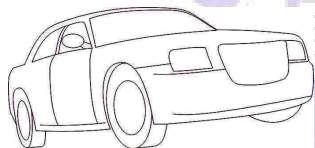
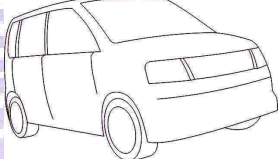
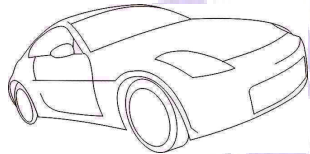
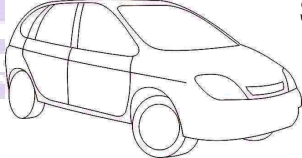
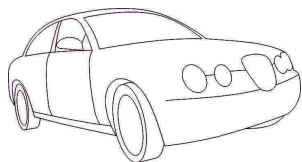
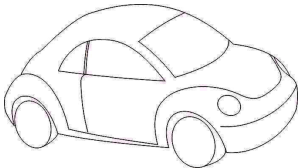
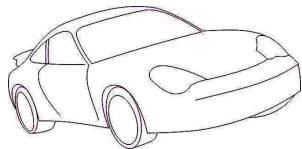
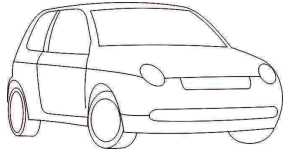
Hypothesis 1	Gender has an effect on the evaluation and perception of automobile design
Hypothesis 2	Age has an effect on the evaluation and perception of automobile design
Hypothesis 3	Level of education has an effect on the evaluation and perception of automobile design
Hypothesis 4	Level of income has an effect on the evaluation and perception of automobile design
Hypothesis 5	Car purchasing experience has an effect on the evaluation and perception of automobile design

3.2 Automobile Taxonomies

To better understand how consumers evaluate and perceive different automobile shapes, there will be some automobile shapes were selected to be studied in this research. However, as there are more than hundreds of automobiles launched into the market each year, it is difficult to test each of them to understand consumers' perception. Therefore, it is essential to categorize current automobiles in the market into some groups based on similar shapes. The first step is to scrutinize all the automobiles either posted in the magazines or on the websites. Since the configuration of an automobile is made of head, body and back (Ma, 1995; Hsiao, 1994 & 1997), the shapes of the selected automobiles were categorized based on this configuration. Automobiles with salient characteristics of design configuration such as similar head,

body, and tail were categorized in the same group. The second step of categorization was conducted based on whether the automobile shape is with or without salient luggage chest. The third step was conducted based on whether the automobile heads and bodies have similar lines.. Boxy or round Lines were the criteria to categorize the automobile shape in this research. Totally, eight automobile shapes were categorized in this research (Table 5).

Table 5: The eight taxonomies of automobile shape in this research

Automobile shape – boxy lines of head, with or without salient luggage chest and with similar configuration	
 <p>Style A</p>	 <p>Style E</p>
 <p>Style C</p>	 <p>Style G</p>
Automobile shape – round lines of head, with or without salient luggage chest and with similar configuration und head	
 <p>Style B</p>	 <p>Style E</p>
 <p>Style D</p>	 <p>Style H</p>

3.3 Research Framework

This research is to understand how consumers with different demographic characteristics evaluate automobile design and how they perceive the design in terms of the automobile size, color and shape. Shapes of automobiles, which are selected from the current market, are categorized into eight taxonomies to test how consumers with different demographic characteristics evaluate and perceive them. Moreover, adjectives from the literature reviews are listed in the questionnaire. The respondents had to select at least one they think suitable to describe the automobile shapes and sizes. The questionnaire is thus designed based on five hypotheses, eight automobile shapes, and relevant adjectives. After statistical analysis, the results will indicate if the hypotheses are confirmed or rejected, through which way the relationship between consumer perception and automobile design will be revealed.

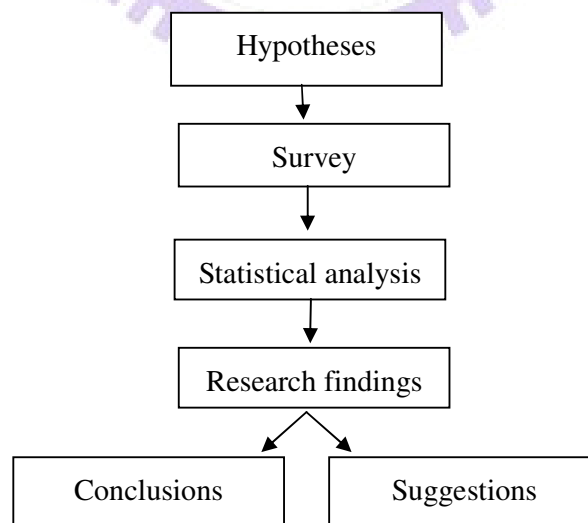


Figure 4: Research framework

3.4 Sample Frame

A questionnaire was designed and used to verify the five hypotheses, and it was conducted in Taipei city only because almost all kinds of automobiles are offered in this city where consumers can access to new information easily. Totally, one hundred respondents answered the questionnaire and the number of respondents followed normal distribution to validate the statistical analysis. To understand the difference between younger and older consumers, the present research selected respondents with age ranging from twenty to fifty five and above. Besides, all the respondents had a job to make a living and the respondents selected included those who have car-buying experience at least once and those who do not have any car-buying experience in order to understand if there is difference in evaluating and perceiving automobile design between these two groups of people.

3.5 Methodology

The research used SPSS 11.0 as the statistic software to analyze the data that are collected from the questionnaires answered by the respondents. The main statistical method to analyze the data is the chi-square test. Chi-square test is a statistics often used in cross tabulations to test if row and column variables are independent or not. However, the chi-square statistic does not measure the strength of a relationship; instead, it measures whether a relationship is likely generated due

to chance. Regarding the cross tabulation, if the probability of a chi-square test is 0.05 or less, it is usually small enough to determine that the distribution does not result from chance. When the chi-square is significant, a posterior comparison is required to find out which variables have significant difference. In this research, independent sample T test was further used to find out which two cells cause significance in the crosstabulation of the chi-square test. If the significance is less than 0.05, it can be concluded that the differences in the observed averages are not due to chance; rather, they reflect real population differences.

3.6 Research Limit

Chi-square test is required when each cell is large enough for the expected value more than 5. If expected counts are less than 5, the statistical results of chi-square test will be invalid. Yet the sample number could not be increased too much because the χ^2 will increase as well and make it easier to reject null hypothesis.

CHAPTER 4 RESULTS AND FINDINGS

4.1 Respondent Structure

One hundred respondents, including sixty-one males and thirty-nine females, answered the questionnaire in this research. In the questionnaire the demographic variables to be studied include gender, age, income, education, and car-buying experience. Consumers aged between twenty and twenty five account for fourteen percents of the total one hundred respondents; consumers aged between twenty six and thirty account for thirty four percents; consumers aged between thirty one and thirty five account for twenty two percents; consumers aged thirty six and forty account for fifteen percents; consumers aged between forty one and forty five account for seven percents; consumers aged between forty six and fifty account for two percents; consumers age between fifty one and fifty five account for five percents, and there is only one percent of consumers at age of fifty six and above. All of the respondents have a job to make a living. Eighteen percents of the respondents earn NTD \$20,000 to \$30,000 a month; forty three percents of them earn NTD \$30,000 to \$40,000 a month; sixteen percents of them earn NTD \$40,000 to 50,000 a month; eleven percents of them earn NTD \$50,000 to \$60,000 a month; twelve percents of them earn more than NTD \$60,000 a month. Regarding the level of education, forty-two percents of the respondents have a Bachelor degree, the percentage of

which is the highest. Thirty-five percents of the respondents have a junior college diploma, and nine percents of them have a high school diploma. Respondents who attain a Master or a doctorate account for fourteen percents. As for car-buying experience, fifty-one percents of the respondents have car-buying experience at least once, and forty-nine percents of the respondents do not have any car-buying experience before. Table 6 describes the respondents' background.

Table 6: Respondents' background

Gender	Male: 61%; female: 39%
Age	Age 20 to 25: 14%; Age 26 to 30: 34%; Age 31 to 35: 22%; Age 36 to 40: 15%; Age 41 to 45: 7%; Age 46 to 50: 2%; Age 51 to 55: 5%; Age 56 and above: 1%
Income	NTD \$20,000 to \$30,000: 18%; NTD\$30,000 to \$40,000: 43%; NTD \$40,000 to 50,000: 16%; NTD \$50,000 to 60,000: 11%; NTD \$60,000 and above: 12%
Education	High school or under: 9%; Junior college: 35%; College: 42%; Graduate-Master's: 13%; Graduate-Doctoral : 1%
Car-buying experience	Once at least: 51%; None: 49%

4.2 Statistical Analyses

Chi-square test will be used to run the statistical analyses for the research and the confidence interval is α 0.05. The questionnaire will be analyzed from three aspects: How do consumers generally evaluate the factors of automobile design? How

do consumers evaluate and prefer the appearance of automobile design particularly in terms of shape and size? What adjectives do they think most appropriate and thus to describe automobile size and shapes? The statistical results will be run based on five demographic variables, which are gender, age, level of income, level of education and car-buying experience. Moreover, based on the chi-square tests with significant results, independent sample T test will be further used to find out which two cells result in the significant difference in the chi-square analysis.

4.2.1 The effect of gender on evaluation and perception of automobile design

The first section is to understand if there is any difference between male and female consumers on evaluating automobile design, and the statistical result shows that there is one significant difference in perceiving gasoline-saving factor important among all the purchasing factors ($\chi^2=4.422$, $P<0.05$). The percentage of female consumers who regard gasoline-saving factor important is more than that of male consumers (see Table 7).

Table 7: Gender difference in regarding importance of gasoline-saving

Gender		Select	Not select	Total
Male	Count	6.00	55.00	61
	Expected count	9.76	51.24	61
	% within gender	9.84	90.16	100
	% within gasoline-saving factor	37.50	65.48	61
	% of total	6.00	55.00	61
Female	Count	10.00	29.00	39
	Expected count	6.24	32.76	39
	% within gender	25.64	74.36	100
	% within gasoline-saving factor	62.50	34.52	39
	% of total	10.00	29.00	39
Total	Count	16.00	84.00	100

The second section is to understand if genders have an effect on different perceptions about automobile shape, size and color. The statistical results show that there is no significant difference in terms of gender characteristics in selecting automobile size and color. However, male and female consumers differently prefer some automobile shapes, which are categorized and studied in this research. The significant difference between male and female consumers is about preferring style C ($\chi^2=12.642$, $P<0.05$) and style D ($\chi^2= 14.330$, $P<0.05$) and as for the statistics of T test, the P value of style C is 0.001, and that of style D is 0.000. Therefore, the percentage of male consumers who like style C and style D is more than that of female consumers (see Tables 8 to 10).

Table 8: Gender difference in preferring style C

Gender		Dislike the most	Dislike	Neutral	Like	Like the most	Total
Male	Count	1	17	13	26	4	61
	Expected count	1.83	20.74	16.47	19.52	2.44	61
	% within gender	1.64	27.87	21.31	42.62	6.56	100
	% within style C	33.33	50.00	48.15	81.25	100.00	61
	% of total	1	17	13	26	4	61
Female	Count	2	17	14	6	0	39
	Expected count	1.17	13.26	10.53	12.48	1.56	39
	% within gender	5.13	43.59	35.90	15.38	0.00	100
	% within style C	66.67	50.00	51.85	18.75	0.00	39
	% of total	2	17	14	6	0	39
Total	Count	3	34	27	32	4	100

Table 9: Gender difference in preferring style D

Gender		Dislike the most	Dislike	Neutral	Like	Like the most	Total
Male	Count	1	12	12	27	9	61
	Expected count	1.22	18.91	13.42	21.35	6.1	61
	% within gender	1.64	19.67	19.67	44.26	14.75	100
	% within style D	50.00	38.71	54.55	77.14	90.00	61
	% of total	1	12	12	27	9	61
Female	Count	1	19	10	8	1	39
	Expected count	0.78	12.09	8.58	13.65	3.9	39
	% within gender	2.56	48.72	25.64	20.51	2.56	100
	% within style D	50.00	61.29	45.45	22.86	10.00	39
	% of total	1	19	10	8	1	39
Total	Count	2	31	22	35	10	100

Table 10: T test for gender difference in preferring style C & style D

Shape	Gender	Mean	S. D.	T value	P value
Style C	Male	3.246	0.994	3.311	0.001
	Female	2.615	0.815		
Style D	Male	3.508	1.027	3.912	0.000
	Female	2.718	0.916		

The third section is to understand if consumers with gender characteristics use different adjectives to describe automobile design in terms of size and shape. The results show that for big cars, more female consumers use “modern” as the adjective more frequently than male consumers do ($\chi^2=7.331$, $P<0.05$). However, as for small cars, more male consumers use the adjective “streamlined” ($\chi^2=5.058$, $P<0.05$), while more female consumers tend to use “feminine” ($\chi^2=4.738$, $P<0.05$) and lovely ($\chi^2= 4.022$, $P<0.05$). The statistics are explained in Tables 11, 12, 13 and 14.

Table 11: Gender difference in using “modern” to describe big car

Gender		Select	Not select	Total
Male	Count	9	52	61
	Expected count	14.64	46.36	61
	% within gender	14.75	85.25	100
	% within using “modern”	37.50	68.42	61
	% of total	9	52	61
Female	Count	15	24	39
	Expected count	9.36	29.64	39
	% within gender	38.46	61.54	100
	% within using “modern”	62.50	31.58	39
	% of total	15	24	39
Total	Count	24	76	100

Table 12: Gender difference in using “streamline” to describe small car

Gender		Select	Not select	Total
Male	Count	20.00	41.00	61
	Expected count	15.25	45.75	61
	% within gender	32.79	67.21	100
	% within using “streamlined”	80.00	54.67	61
	% of total	20.00	41.00	61
Female	Count	5.00	34.00	39
	Expected count	9.75	29.25	39
	% within gender	12.82	87.18	100
	% within using “streamlined”	20.00	45.33	39
	% of total	5.00	34.00	39
Total	Count	25	75	100

Table 13: Gender difference in using “feminine” to describe small car

Gender		Select	Not select	Total
Male	Count	14	47	61
	Expected count	18.91	42.09	61
	% within gender	22.95	77.05	100
	% within using “feminine”	45.16	68.12	61
	% of total	14	47	61
Female	Count	17	22	39
	Expected count	12.09	26.91	39
	% within gender	43.59	56.41	100
	% within using “feminine”	54.84	31.88	39
	% of total	17	22	39
Total	Count	31	69	100

Table 14: Gender difference in using “lovely” to describe small car

Gender		Select	Not select	Total
Male	Count	25	36	61
	Expected count	29.89	31.11	61
	% within gender	40.98	59.02	100
	% within using “lovely”	51.02	70.59	61
	% of total	25	36	61
Female	Count	24	15	39
	Expected count	19.11	19.89	39
	% within gender	61.54	38.46	100
	% within using “lovely”	48.98	29.41	39
	% of total	24	15	39
Total		49	51	100

Regarding the question of whether male and female consumers use different adjectives to describe style A to style H, the statistical results indicate that as for style B, more female consumers consider it modern than male consumers do ($\chi^2=4.786$, $P<0.05$). The percentage of female consumers who think style C masculine is more than that of male consumers ($\chi^2= 8.435$, $P<0.05$), and more male consumers think style D dynamic than female consumers do ($\chi^2= 3.752$, $P<0.05$). The number of female consumers who regard style E simple is more than that of male consumers ($\chi^2= 4.738$, $P<0.05$), and the number of female consumers who think style F feminine is more than that of male consumers do ($\chi^2= 4.209$, $P<0.05$). Please see the following tables (see Tables 15 to 19).

Table 15: Gender difference in using “modern” to describe style B

Gender		Select	Not select	Total
Male	Count	9	52	61
	Expected count	13.42	47.58	61
	% within gender	14.75	85.25	100
	% within using “modern”	40.91	66.67	61
	% of total	9.00	52.00	61
Female	Count	13	26	39
	Expected count	8.58	30.42	39
	% within gender	33.33	66.67	100
	% within using “modern”	59.09	33.33	39
	% of total	13.00	26.00	39
Total	Count	22	78	100

Table 16: Gender difference in using “masculine” to describe style C

Gender		Select	Not Select	Total
Male	Count	21	40	61
	Expected count	28.06	32.94	61
	% within gender	34.43	65.57	100
	% within using “masculine”	45.65	74.07	61
	% of total	21.00	40.00	61
Female	Count	25	14	39
	Expected count	17.94	21.06	39
	% within gender	64.10	35.90	100
	% within using “masculine”	54.35	25.93	39
	% of total	25.00	14.00	39
Total	Count	46	54	100

Table 17: Gender difference in using “dynamic” to describe style D

Gender		Select	Not select	Total
Male	Count	34	27	61
	Expected count	29.28	31.72	61
	% within gender	55.74	44.26	100
	% within using “dynamic”	70.83	51.92	61
	% of total	34.00	27.00	61
Female	Count	14	25	39
	Expected count	18.72	20.28	39
	% within gender	35.90	64.10	100
	% within using “dynamic”	29.17	48.08	39
	% of total	14.00	25.00	39
Total	Count	48	52	100

Table 18: Gender difference in using “simple” to describe style E

Gender		Select	Not select	Total
Male	Count	14	47	61
	Expected count	18.91	42.09	61
	% within gender	22.95	77.05	100
	% within using “simple”	45.16	68.12	61
	% of total	14.00	47.00	61
Female	Count	17	22	39
	Expected count	12.09	26.91	39
	% within gender	43.59	56.41	100
	% within using “simple”	54.84	31.88	39
	% of total	17.00	22.00	39
Total	Count	31	69	100

Table 19: Gender difference in using “feminine” to describe style F

Gender		Select	Not select	Total
Male	Count	16	45	61
	Expected count	20.74	40.26	61
	% within gender	26.23	73.77	100
	% within using “feminine”	47.06	68.18	61
	% of total	16.00	45.00	61
Female	Count	18	21	39
	Expected count	13.26	25.74	39
	% within gender	46.15	53.85	100
	% within using “feminine”	52.94	31.82	39
	% of total	18.00	21.00	39
Total	Count	34	66	100

To sum up, male and female consumers evaluate and perceive automobile design differently in terms of selecting purchasing factor, preferring automobile shapes and using adjectives to describe automobile size and shape. Therefore, hypothesis one is supportive that consumers with different genders evaluate and perceive automobile design differently.

4.2.2 The effect of age on evaluation and perception of automobile design

Likewise, the first section is to understand if consumers with age characteristics evaluate automobile design differently. Like the statistical results of consumers with gender characteristics, there is no significant difference between younger and older consumers except for the after-sale service factor ($\chi^2 = 17.594$, $P < 0.05$). After running the independent sample T test, it is known that the P value is 0.004 and the difference is between the consumers aged between 26 and 30 and the consumers aged between 31 and 35. The consumers aged between 26 and 30 highlight after-sale

service factor than the consumers aged between 31 and 35. Tables 20 and 21 elaborate the statistical results.

Table 20: Age difference in regarding importance of after-sale service

Age		Select	Not select	Total
20 ~25	Count	4	10	14
	Expected count	6.02	7.98	14
	% within age	28.57	71.43	100
	% within after-sale service factor	9.30	17.54	14
	% of total	4.00	10.00	14
26~30	Count	21	13	34
	Expected count	14.62	19.38	34
	% within age	61.76	38.24	100
	% within after-sale service factor	48.84	22.81	34
	% of total	21.00	13.00	34
31~35	Count	5	17	22
	Expected count	9.46	12.54	22
	% within age	22.73	77.27	100
	% within after-sale service factor	11.63	29.82	22
	% of total	5.00	17.00	22
36~40	Count	4	11	15
	Expected count	6.45	8.55	15
	% within age	26.67	73.33	100
	% within after-sale service factor	9.30	19.30	15
	% of total	4.00	11.00	15
41~45	Count	3	4	7
	Expected count	3.01	3.99	7
	% within age	42.86	57.14	100
	% within after-sale service factor	6.98	7.02	7
	% of total	3.00	4.00	7
46~50	Count	2	0	2
	Expected count	0.86	1.14	2
	% within age	100.00	0.00	100
	% within after-sale service factor	4.65	0.00	2
	% of total	2.00	0.00	2

Table 20: Age difference in regarding importance of after-sale service (cont.)

Age		Select	Not select	Total
51~55	Count	4	1	5
	Expected count	2.15	2.85	5
	% within age	80.00	20.00	100
	% within after-sale service factor	9.30	1.75	5
	% of total	4.00	1.00	5
56 and above	Count	0	1	1
	Expected count	0.43	0.57	1
	% within age	0.00	100.00	100
	% within after-sale service factor	0.00	1.75	1
	% of total	0.00	1.00	1
Total	Count	43	57	100

Table 21: T test for age difference in regarding importance of after-sale service

Purchasing factor	Age	Mean	S. D.	T value	P value
After-sale service	26~30	0.618	0.493	3.040	0.004
	31~35	0.227	0.429		

The rest of the results do not reveal any significant difference. The only difference is that consumers aged between 26 and 30 and those aged between 31 and 35 perceive big cars differently. The chi-square result shows that there is significant difference between consumers with age characteristics using “masculine” to describe big cars ($\chi^2 = 16.539$, $P < 0.05$). The T test indicates that the significant difference comes from consumers aged between 26 and 30 and those aged between 31 and 35 ($P < 0.05$). Consumers aged between 31 and 35 regard big cars masculine than those aged between 26 and 30. Please see Tables 22 and 23.

Table 22: Age difference in using “masculine” to describe big car

Age		Select	Not select	Total
20 ~25	Count	3	11	14
	Expected count	4.34	9.66	14
	% within age	21.43	78.57	100
	% within using “masculine”	9.68	15.94	14
	% of total	3.00	11.00	14
26~30	Count	4	30	34
	Expected count	10.54	23.46	34
	% within age	11.76	88.24	100
	% within using “masculine”	12.90	43.48	34
	% of total	4.00	30.00	34
31~35	Count	9	13	22
	Expected count	6.82	15.18	22
	% within age	40.91	59.09	100
	% within using “masculine”	29.03	18.84	22
	% of total	9.00	13.00	22
36~40	Count	8	7	15
	Expected count	4.65	10.35	15
	% within age	53.33	46.67	100
	% within using “masculine”	25.81	10.14	15
	% of total	8.00	7.00	15
41~45	Count	4	3	7
	Expected count	2.17	4.83	7
	% within age	57.14	42.86	100
	% within using “masculine”	12.90	4.35	7
	% of total	4.00	3.00	7
46~50	Count	0	2	2
	Expected count	0.62	1.38	2
	% within age	0.00	100.00	100
	% within using “masculine”	0.00	2.90	2
	% of total	0.00	2.00	2
51~55	Count	3	2	5
	Expected count	1.55	3.45	5
	% within age	60.00	40.00	100
	% within using “masculine”	9.68	2.90	5
	% of total	3.00	2.00	5

Table 22: Age difference in using “masculine” to describe big car (cont.)

Age		Select	Not select	Total
56 and above	Count	0	1	1
	Expected count	0.31	0.69	1
	% within age	0.00	100.00	100
	% within using “masculine”	0.00	1.45	1
	% of total	0.00	1.00	1
Total	Count	31.000	69.000	100

Table 23: T test for age difference in using “masculine” to describe big car

Perception word	Age	Mean	S. D.	T value	P value
Masculine	26~30	0.118	0.327	-2.631	0.011
	31~35	0.409	0.503		

In sum, consumers with age characteristics evaluate and perceive automobile design similarly. The exception is that the difference between consumers aged between 26 and 30 and consumers aged between 31 and 35 in considering the after-sale service factor important, and in using “masculine” to describe big cars. The majority of the consumers with age characteristics do not have significant difference. As a result, hypothesis two is mostly rejected.

4.2.3 The effect of income on evaluation and perception of automobile design

Consumers with different incomes have significant difference in showing their inclination to purchase a car even though they do not like the design ($\chi^2 = 17.087$, $P < 0.05$). The t test results indicate that there is significant difference between consumers who earns NTD \$20,000 to \$30,000 a month and consumers who earn NTD \$60,000 and above a month ($P < 0.05$). Consumers who make NTD \$60,000 and

above a month do not buy a car with the design they dislike, but consumers who earn NTD \$20,000 to \$30,000 a month still depend on the situation. Moreover, there is also a significant difference between the consumers who earn NTD \$20,000 to \$30,000 a month and the consumers who earn NTD \$40,000 to \$50,000 a month ($P < 0.05$). Compared to the consumers who earn NTD \$40,000 to \$50,000 a month, consumers who earn NTD \$20,000 to \$30,000 a month tend to depend on the situation to buy a car with the design they dislike. Furthermore, the consumers who earn NT\$30,000 to \$40,000 a month would still depend on the situation to buy a car with the design they dislike compared to the consumers who make NT\$40,000 to \$50,000 a month ($P < 0.05$). On the contrary, the statistical result also shows that consumers who earn NT\$50,000 to 60,000 depend on the situation than the consumers who earn NT\$40,000 to \$50,000 a month ($P < 0.05$).

Table 24: Income difference in inclination to buy a car with disliked design

Income per month		Yes	No	It depends	Total
NT\$20,000 to \$30,000	Count	0	8	10	18
	Expected count	1.08	11.16	5.76	18
	% within income	0.00	44.44	55.56	100
	% within inclination	0.00	12.90	31.25	18
	% of total	0.00	8.00	10.00	18
NT\$30,000 to \$40,000	Count	2	27	14	43
	Expected count	2.58	26.66	13.76	43
	% within income	4.65	62.79	32.56	100
	% within inclination	33.33	43.55	43.75	43
	% of total	2.00	27.00	14.00	43
NT\$40,000 to \$50,000	Count	3	12	1	16
	Expected count	0.96	9.92	5.12	16
	% within income	18.75	75.00	6.25	100
	% within inclination	50.00	19.35	3.13	16
	% of total	3.00	12.00	1.00	16
NT\$50,000 to 60,000	Count	1	5	5	11
	Expected count	0.66	6.82	3.52	11
	% within income	9.09	45.45	45.45	100
	% within inclination	16.67	8.06	15.63	11
	% of total	1.00	5.00	5.00	11
NT\$60,000 and above	Count	0	10	2	12
	Expected count	0.72	7.44	3.84	12
	% within income	0.00	83.33	16.67	100
	% within inclination	0.00	16.13	6.25	12
	% of total	0.00	10.00	2.00	12
Total	Count	6.00	62.00	32	100

Table 25: T test for income difference in buying a car with disliked design

Decision	Level of income	Mean	S.D.	T value	P value
Not to buy a car in disliked design	NT\$20,000 to \$30,000	2.556	0.511	2.234	0.034
	NT\$60,000 and above	2.167	0.389		
	NT\$20,000 to \$30,000	2.556	0.511	3.914	0.000
	NT\$40,000 to \$50,000	1.875	0.500		
	NT\$30,000 to \$40,000	2.279	0.549	2.572	0.013
	NT\$40,000 to \$50,000	1.875	0.500		
	NT\$40,000 to \$50,000	1.875	0.500	-2.166	0.040
	NT\$50,000 to 60,000	2.364	0.674		

Consumers with income characteristics only have a difference in preferring style C ($\chi^2 = 29.251$, $P < 0.05$). From the t test statistic, it is known that consumers who earn NT\$40,000 to \$50,000 a month prefer style C than consumers who earn NT\$20,000 to \$30,000 a month ($P < 0.05$; see Tables 26 and 27).

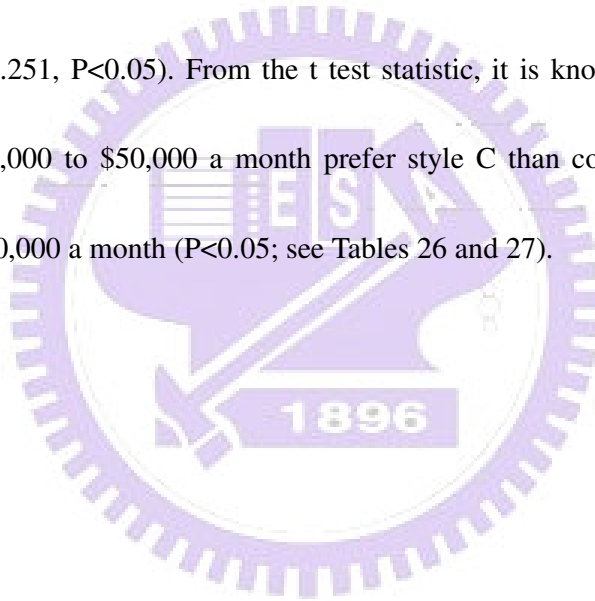


Table 26: Income Difference in preferring style C

Level of income		Dislike the most	Dislike	Neutral	Like	Like the most	Total
NT\$20,000 to \$30,000	Count	2	5	9	2	0	18
	Expected count	0.54	6.12	4.86	5.76	0.72	18
	% within income	11.11	27.78	50.00	11.11	0.00	100
	% within style C	66.67	14.71	33.33	6.25	0.00	18
	% of total	2.00	5.00	9.00	2.00	0.00	18
NT\$30,000 to \$40,000	Count	0	14	12	13	4	43
	Expected count	1.29	14.62	11.61	13.76	1.72	43
	% within income	0.00	32.56	27.91	30.23	9.30	100
	% within style C	0.00	41.18	44.44	40.63	100.00	43
	% of total	0.00	14.00	12.00	13.00	4.00	43
NT\$40,000 to \$50,000	Count	0	5	6	5	0	16
	Expected count	0.48	5.44	4.32	5.12	0.64	16
	% within income	0.00	31.25	37.50	31.25	0.00	100
	% within style C	0.00	14.71	22.22	15.63	0.00	16
	% of total	0.00	5.00	6.00	5.00	0.00	16
NT\$50,000 to 60,000	Count	0	5	0	6	0	11
	Expected count	0.33	3.74	2.97	3.52	0.44	11
	% within income	0.00	45.45	0.00	54.55	0.00	100
	% within style C	0.00	14.71	0.00	18.75	0.00	11
	% of total	0.00	5.00	0.00	6.00	0.00	11
NT\$60,000 and above	Count	1	5	0	6	0	12
	Expected count	0.36	4.08	3.24	3.84	0.48	12
	% within income	8.33	41.67	0.00	50.00	0.00	100
	% within style C	33.33	14.71	0.00	18.75	0.00	12
	% of total	1.00	5.00	0.00	6.00	0.00	12
Total	Count	3	34	27	32	4	100

Table 27: T test for income difference in preferring style C

Shape	Income per month	Mean	S. D.	T value	P value
Style C	NT\$20,000 to \$30,000	2.611	0.850	-2.051	0.045
	NT\$40,000 to \$50,000	3.163	0.998		

Concerning the adjectives consumers with income characteristics use to describe automobile design, it is found out that they have significant difference in perceiving automobile design of style C ($\chi^2 = 12.996$, $P < 0.05$). The t test statistics show that consumers who earn NTD \$30,000 to \$40,000 a month regard style C streamlined than consumers who earn NTD \$20,000 to \$30,000 a month ($P < 0.05$), and consumers who earn NT\$30,000 to \$40,000 a month also regard style C streamlined than consumers who earn NT\$40,000 to \$50,000 ($P < 0.05$). Besides, consumers who earn NT\$50,000 to 60,000 a month think style C streamlined than consumers who earn NT\$40,000 to \$50,000 a month ($P < 0.05$). All the related statistical results are shown in Tables 28 and 29.

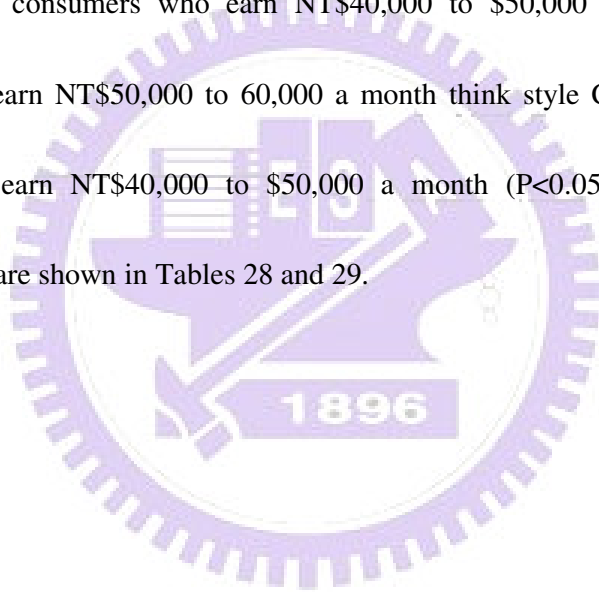


Table 28: Income difference in using “streamlined” to describe style C

Level of income		Select	Not select	Total
NT\$20,000 to \$30,000	Count	8	10	18
	Expected count	10.44	7.56	18
	% within income	44.44	55.56	100
	% within using “streamlined”	13.79	23.81	18
	% of total	8.00	10.00	18
NT\$30,000 to \$40,000	Count	31	12	43
	Expected count	24.94	18.06	43
	% within income	72.09	27.91	100
	% within using “streamlined”	53.45	28.57	43
	% of total	31.00	12.00	43
NT\$40,000 to \$50,000	Count	4	12	16
	Expected count	9.28	6.72	16
	% within income	25.00	75.00	100
	% within using “streamlined”	6.90	28.57	16
	% of total	4.00	12.00	16
NT\$50,000 to 60,000	Count	8	3	11
	Expected count	6.38	4.62	11
	% within income	72.73	27.27	100
	% within using “streamlined”	13.79	7.14	11
	% of total	8.00	3.00	11
NT\$60,000 and above	Count	7	5	12
	Expected count	6.96	5.04	12
	% within income	58.33	41.67	100
	% within using “streamlined”	12.07	11.90	12
	% of total	7.00	5.00	12
Total	Count	58	42	100

Table 29: T test for income difference in using “streamlined” to describe style C

Perception word	Level of income	Mean	S. D.	T value	P value
Streamlined	NT\$20,000 to \$30,000	0.444	0.511	-2.090	0.041
	NT\$30,000 to \$40,000	0.721	0.454		
	NT\$30,000 to \$40,000	0.721	0.454	3.557	0.001
	NT\$40,000 to \$50,000	0.250	0.447		
	NT\$40,000 to \$50,000	0.250	0.447	-2.677	0.013
	NT\$50,000 to 60,000	0.727	0.467		

To sum up, even though consumers have significant difference in depending on the situation to buy a car with the design they dislike, the majority of the consumers with different incomes do not evaluate and perceive automobile design differently. As a result, hypothesis three is mostly rejected.

4.2.4 The effect of education on evaluation and perception of automobile design

Regarding consumers with education characteristics, the statistical result shows that there is a difference between the consumers who have a junior college diploma and the consumers who have a bachelor’s degree ($\chi^2 = 21.344$, $P < 0.05$). The t test indicates that compared to consumers with a bachelor’s degree, none of the consumers with a junior college diploma consider the gasoline-saving factor important ($P < 0.05$; see Tables 30 to 31).

Table 30: Education difference in regarding importance of gasoline-saving factor

Level of education		Select	Not select	Total
High school or under	Count	3	6	9
	Expected count	1.44	7.56	9
	% within education	33.33	66.67	100
	% within gasoline-saving factor	18.75	7.14	9
	% of total	3.00	6.00	9
Junior college	Count	0	35	35
	Expected count	5.60	29.40	35
	% within education	0.00	100.00	100
	% within gasoline-saving factor	0.00	41.67	35
	% of total	0.00	35.00	35
College	Count	12	30	42
	Expected count	6.72	35.28	42
	% within education	28.57	71.43	100
	% within gasoline-saving factor	75.00	35.71	42
	% of total	12.00	30.00	42
Graduate-Master's	Count	0	13	13
	Expected count	2.08	10.92	13
	% within education	0.00	100.00	100
	% within gasoline-saving factor	0.00	15.48	13
	% of total	0.00	13.00	13
Graduate-Doctoral	Count	1	0	1
	Expected count	0.16	0.84	1
	% within education	100.00	0.00	100
	% within gasoline-saving factor	6.25	0.00	1
	% of total	1	0.00	1
Total	Count	16	84.00	100

Table 31: Education difference in regarding importance of gasoline-saving

Purchasing factor	Level of education	Mean	S.D.	T value	P value
Gasoline-saving	Junior college	0.000	0.000	-3.693	0.000
	College	0.286	0.457		

The chi-square statistic also states that there is a significant difference between consumers with education characteristics in perceiving small cars ($\chi^2 = 14.322$,

$P < 0.05$). The t test result reveals that consumers with a bachelor's degree tend to use "lovely" to describe small cars than consumers who have a junior college diploma ($P < 0.05$). Likewise, consumers who have a bachelor's degree tend to use "lovely" to describe small cars than consumers with a master 's degree ($P < 0.05$). Please see Tables 32 and 33.

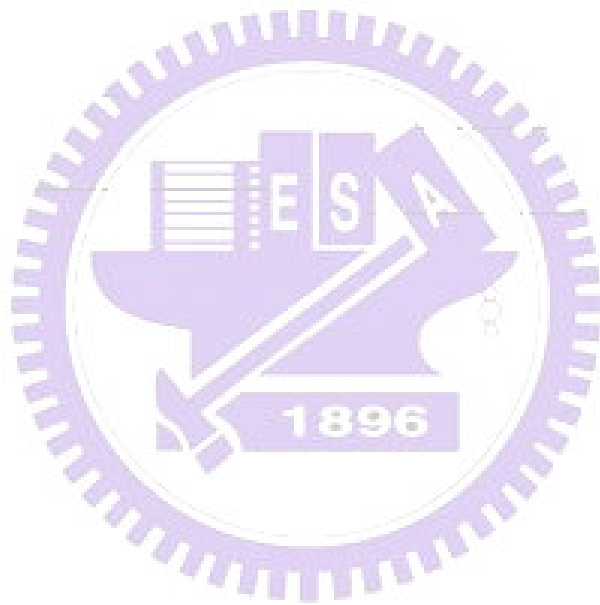


Table 32: Education difference in using “lovely” to describe small car

Level of education		Select	Not select	Total
High school or under	Count	2	7	9
	Expected count	4.41	4.59	9
	% within education	22.22	77.78	100
	% within using “lovely”	4.08	13.73	9
	% of total	2.00	7.00	9
Junior college	Count	15	20	35
	Expected count	17.15	17.85	35
	% within education	42.86	57.14	100
	% within using “lovely”	30.61	39.22	35
	% of total	15.00	20.00	35
College	Count	29	13	42
	Expected count	20.58	21.42	42
	% within education	69.05	30.95	100
	% within using “lovely”	59.18	25.49	42
	% of total	29.00	13.00	42
Graduate-Master’s	Count	3	10	13
	Expected count	6.37	6.63	13
	% within education	23.08	76.92	100
	% within using “lovely”	6.12	19.61	13
	% of total	3.00	10.00	13
Graduate-Doctoral	Count	0	1	1
	Expected count	0.49	0.51	1
	% within education	0.00	100.00	100
	% within using “lovely”	0.00	1.96	1
	% of total	0.00	1.00	1
Total	Count	49	51	100

Table 33: T test for education difference in using “lovely” to describe small car

Perception word	Level of education	Mean	S.D.	T value	P value
Lovely	Junior college a	0.429	0.502	-2.366	0.021
	College	0.690	0.468		
	College	0.690	0.468	3.139	0.003
	Graduate-Master’s	0.231	0.439		

Given that consumers with education characteristics perceive automobile shapes differently, the chi-square result shows that there is only a difference between consumers with a junior college diploma and consumers with a bachelor's degree in using "comfortable" to describe style G ($\chi^2 = 15.081$, $P < 0.05$). The t test result shows that consumers with a junior college diploma tend to use "comfortable" to describe style G than consumers with a bachelor's degree ($P < 0.05$: see Tables 34 and 35).

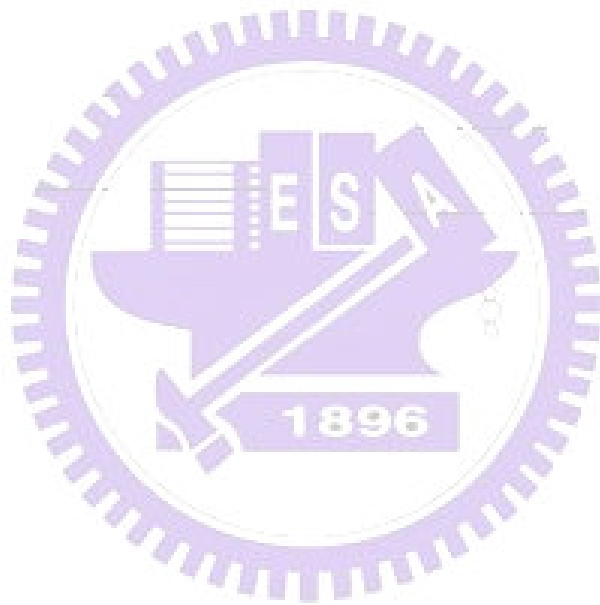


Table 34: Education difference in using “comfortable” to describe Style G

Level of education		Select	Not select	Total
High school or under	Count	0	9	9
	Expected count	3.51	5.49	9
	% within education	0.00	100.00	100
	% within using “comfortable”	0.00	14.75	9
	% of total	0.00	9.00	9
Junior college	Count	21	14	35
	Expected count	13.65	21.35	35
	% within education	60.00	40.00	100
	% within using “comfortable”	53.85	22.95	35
	% of total	21.00	14.00	35
College	Count	12	30	42
	Expected count	16.38	25.62	42
	% within education	28.57	71.43	100
	% within using “comfortable”	30.77	49.18	42
	% of total	12.00	30.00	42
Graduate-Master’s	Count	6	7	13
	Expected count	5.07	7.93	13
	% within education	46.15	53.85	100
	% within using “comfortable”	15.38	11.48	13
	% of total	6.00	7.00	13
Graduate-Doctoral	Count	0	1	1
	Expected count	0.39	0.61	1
	% within education	0.00	100.00	100
	% within using “comfortable”	0.00	1.64	1
	% of total	0.00	1.00	1
Total	Count	39	61	100

Table 35: T test for education difference in using “comfortable” to describe style G

Perception word	Level of education	Mean	S.D.	T value	P value
Comfortable	Junior college	0.600	0.497	2.887	0.005
	College	0.286	0.457		

In summary, even though there are significant differences between consumers with education characteristics in considering gasoline-saving factor important, and in using adjectives to describe small cars and style G, most consumers with different level of educations do not evaluate and perceive automobile design differently. As a result, hypothesis four is not supported.

4.2.5 The effect of experience on evaluation and perception of automobile design

The statistical results show that there are no significant differences between consumers with car-buying experience characteristics to evaluate automobile design. However, there are differences in using adjectives to describe the automobile size and two types of automobile shapes. The chi-square tests shown below explain that consumers without any car-buying experience tend to use “modern” to describe big cars than consumers with car-buying experience at least once ($\chi^2= 6.024$, $P<0.05$). Moreover, consumers with car-buying experience at least once regard small cars dynamic than consumers without any car-buying experience ($\chi^2= 4.830$, $P<0.05$). Furthermore, consumers with car-buying experience at least once use “dazzling” to describe style C than consumers without any car-buying experience ($\chi^2=5.317$, $P<0.05$), and consumers with car-buying experience at least once use “streamlined” to describe style G than consumers without any car-buying experience ($\chi^2=4.952$, $P<0.05$). Please see Tables 36 to 39.

Table 36: Experience difference in using “modern” to describe big car

Experience		Select	Not select	Total
Once at least	Count	7	44	51
	Expected count	12.24	38.76	51
	% within car-buying experience	13.73	86.27	100
	% within using “modern”	29.17	57.89	51
	% of total	7.00	44.00	51
None	Count	17	32	49
	Expected count	11.76	37.24	49
	% within car-buying experience	34.69	65.31	100
	% within using “modern”	70.83	42.11	49
	% of total	17.00	32.00	49
Total	Count	24	76	100

Table 37: Experience difference in using “dynamic” to describe small car

Experience		Select	Not select	Total
Once at least	Count	14.00	37.00	51
	Expected count	9.69	41.31	51
	% within car-buying experience	27.45	72.55	100
	% within using “dynamic”	73.68	45.68	51
	% of total	14.00	37.00	51
None	Count	5.00	44.00	49
	Expected count	9.31	39.69	49
	% within car-buying experience	10.20	89.80	100
	% within using “dynamic”	26.32	54.32	49
	% of total	5.00	44.00	49
Total	Count	19	81	100

Table 38: Experience difference in using “dazzling” to describe style C

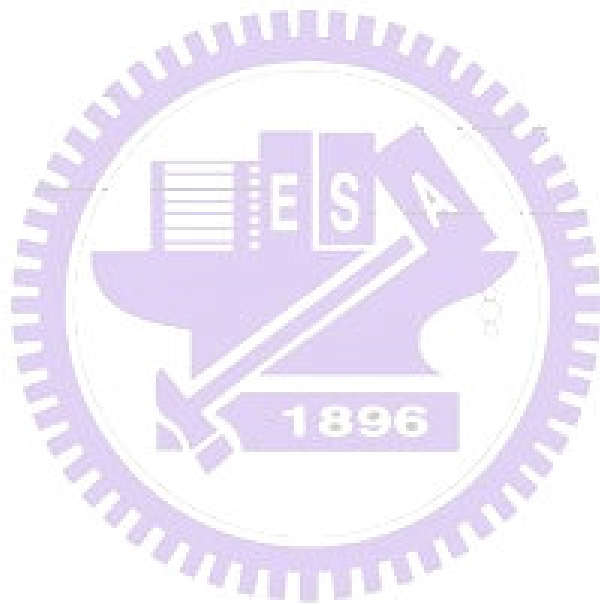
Experience		Select	Not select	Total
Once at least	Count	13	38	51
	Expected count	8.67	42.33	51
	% within car-buying experience	25.49	74.51	100
	% within using “dazzling”	76.47	45.78	51
	% of total	13.00	38.00	51
None	Count	4	45	49
	Expected count	8.33	40.67	49
	% within car-buying experience	8.16	91.84	100
	% within using “dazzling”	23.53	54.22	49
	% of total	4.00	45.00	49
Total	Count	17.00	83.00	100

Table 39: Experience difference in using “streamlined” to describe style G

Experience		Select	Not select	Total
Once at least	Count	11.00	40.00	51
	Expected Count	7.14	43.86	51
	% within car-buying experience	21.57	78.43	100
	% within using “streamlined”	78.57	46.51	51
	% of Total	11.00	40.00	51
None	Count	3.00	46.00	49
	Expected Count	6.86	42.14	49
	% within car-buying experience	6.12	93.88	100
	% within using “streamlined”	21.43	53.49	49
	% of total	3.00	46.00	49
Total	Count	14	86	100

To sum up, even though consumers with car-buying experience characteristics have differences in using adjectives to describe the automobile size and the two automobile shapes (style C and style G), there are very few differences between consumers with car-buying experience at least once and consumers without any car-buying experience in terms of evaluating and perceiving the automobile design.

As a result, hypothesis five is mostly rejected.



CHAPTER 5 CONCLUSION AND SUGGESTION

5.1 Conclusions

This research studies the relation between consumer perception and automobile design through a questionnaire. The statistical analyses reveal how consumers with demographic characteristics including gender, age, income, education and car-buying experience perceive automobile design and the significant differences within each group. The statistical results find out that only gender variable has an effect on evaluation and perception of automobile design, especially for its exterior design. For instance, female consumers consider gasoline-saving factor important than male consumers. Male consumers prefer automobile shape of style C and style D than female consumers. They also use different sensory adjectives to describe automobile sizes and shapes. Female consumers regard small car lovely and feminine while male consumers think small car streamlined. However, besides gender variable, there are few differences between other demographic variables such as age, level of income, level of education, and car-buying experience. Table 40 summarizes whether each hypothesis is supported or rejected after statistical analyses.

Table 40: Summary of hypotheses tested after statistical analyses

Hypothesis 1	Gender has an effect on evaluation and perception of automobile design	Supported
Hypothesis 2	Age has an effect on evaluation and perception of automobile design	Mostly rejected
Hypothesis 3	Level of education has an effect on evaluation and perception of automobile design	Mostly rejected
Hypothesis 4	Level of income has an effect on evaluation and perception of automobile design	Mostly rejected
Hypothesis 5	Car purchasing experience has an effect on evaluation and perception of automobile design	Mostly rejected

This research indicates that automobile design has been recognized by the general public as a very important factor they take into consideration. Other factors such as price and after-sales service are also regarded important to the general public. Unlike the factors consumers valued a decade ago, in the past consumers highlighted quality, steering and functionality, but now the purchasing factors consumers value have been changed to price, after-sale service and automobile design. The change may reflect a fact that automobile is not an inaccessible product anymore because the way consumers evaluate it is similar to other consumer electronics: when manufacturers are able to make products of good quality and performance, consumers turns to pay attention to other features such as design, price and service to increase extra value of the purchased automobile.

To general public, exterior design of the automobile simply refers to size, color and shape even though the design elements are more than these three and in fact consumers usually use these three elements to evaluate the design and then form their image of the automobile. For some products, size may be a criterion for consumers to measure whether there is an extra value to buy them, especially when consumers buy products with bigger size or larger volume but at the same price, among other similar products. The extra value of an automobile does not come from size because consumers like both big and small automobiles so the extra value comes from other factors: Automobile design is to increase positive perceptions towards the automobiles such as a high-value image, and through design consumers know whether the automobile can fit their preference. Regarding automobile color, due to personality, everyone has different color preferences but female consumers have a more salient attitude towards color selections. Unlike males, females are more open to automobile in various colors. Male consumers, on the contrary, have more conservative color selection and particularly draw their attention to automobile shape of sports car and tend to use “streamlined” or “dazzling” to describe automobile shapes, which preference may reflect that sports car is the desired car to most of male consumers who wish to have a car with such streamlined shape to drive fast and to have such a car which can catch people’s eye. Automobile design can reflect consumers’

personality and their preference.

Concerning demographic segmentations, gender characteristic plays an important role to influence the evaluation and perception of automobile. The reasons why other demographic characteristics such as age, income, education and car-buying experience do not have effects might be assumed as follows:

(1) Positive or negative perception towards automobile design is relating to personality, not to age. Liking or dislike certain type of exterior design is subjective and it is determined by individual preference and value judgment that were formed at the early age and do not change dramatically with time passing by.

(2) Despite price range, automobiles offered now are designed aesthetically so consumers still can buy an inexpensive car with the exterior design they prefer or they accept. In other words, automobiles designed aesthetically have been recognized by the automobile manufacturers and this recognition has been carried out. Moreover, loans are commonly offered so consumers can afford to buy the car they prefer even though the price may be a little bit higher.

(3) The reason why education level and car-buying experience have no effect on perception of exterior design of the automobile may result from the affective response to product form. In terms of cognitive response, education and car-buying experience may have effect on evaluation and perception of automobile design.

Lastly, the adjectives consumers usually use to describe their sensory perception towards automobile design could be simply divided into three categories: the first category is related to styling such as modern, dynamic, streamlined, dazzling, the second one is about gender characteristic such as masculine or feminine, and the third one is pertaining to practicability such as comfortable and simple. As a result, a preliminary image consumers have towards automobile design is gender-oriented and function oriented. Consumers use simple perception to make categorization for exterior design of the automobile.

5.2 Managerial Application

Automobile design is important to consumers who have different preference due to gender characteristics. This research finds out that male's preference for automobile shape is different from female's, and they tend to use different adjectives to describe the same design. In this research, it is known that female consumers regarded small car feminine and lovely while male consumers think small car streamlined. This difference is contrasting and it infers that the difference may result from the growing background of both two gender groups, which forms different personality and usage habit. As female consumers are regarded as more potential and powerful buyers, the difference in gender characteristic could be considered into automobile design to attract female consumers and thus to increase sales revenue.

Understanding what female consumers want and need for an automobile and the difference between male and female consumers, an aesthetic and identified automobile design might fascinate them to buy the car. Product dedicatedly designed for females is an emerging trend that a corporation needs to be aware of, take counter actions on and undoubtedly has no excuse to ignore.

5.3 Suggestions

This is only an explorative research. Even though total one hundred of respondents answer the questionnaire, it happens that in some chi-square analyses the expected value is less than 5, which is too small to analyze. Hence it is suggested to enlarge the number of the respondents for future research. Moreover, in this research there are only eight automobile taxonomies categorized by shape for research purpose, but in fact categorization could be more than eight types because hundreds of automobiles are sold in the markets and automobile shapes could be more than just eight if more detailed lines are considered. Furthermore, visual aid to present the color mentioning in the questionnaire can be used for future research so that respondents are able to understand exactly what color is asked.

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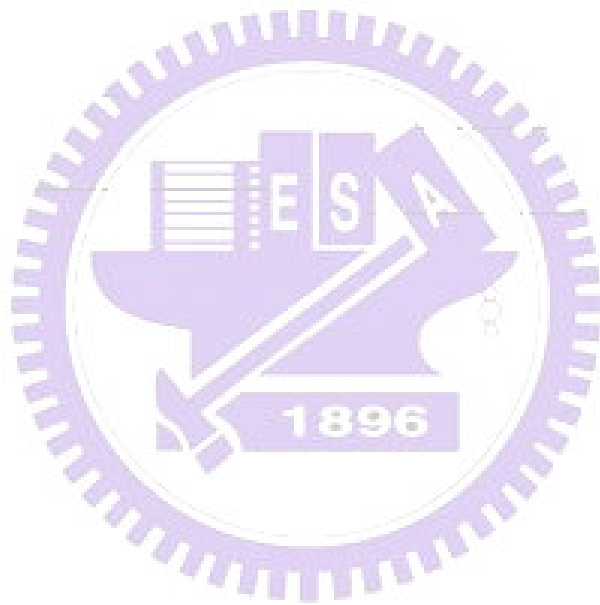
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