

An Investigation on the Gender Differences of Taiwanese Youths and Middle Ages in Evaluating Motorcycle Appearance and Use

Ching Yang¹, Chia-Sheng Chen²

¹ *Department and Graduate School of Industrial Design, National Yunlin University of Science & Technology, Taiwan, R.O.C. yangj@yuntech.edu.tw*

² *Department and Graduate School of Industrial Design, National Yunlin University of Science & Technology, Taiwan, R.O.C. applerocket@hotmail.com*

Abstract: This study mainly used viewpoint of Kansei engineering to conduct survey of motorcycle shape cognition and usage evaluation among young (20-35 years) and middle-aged (35-55 years) males and females in Taiwan. Firstly, field observations and interviews were adopted to perform on-site shooting and recording of brand, model, purchase motivation, intended use, males and females' dressing style, etc. of 96 samples of 100-150CC motorcycle so as to know popularity of motorcycle in Taiwan and differences between generations and genders. Then, 10 representative motorcycle samples were selected. SD (Method of Semantic Differential) was used for shape cognition and usage evaluation survey among 114 interviewees and SPSS statistical software was used for factor analysis in order to understand young and middle-aged groups' relevance and gender difference in terms of motorcycle shape and usage evaluation.

Results of this study show young and middle-aged generations mainly consider factors such as brand, appearance, lightness, convenience and price when choosing motorcycle. Males and females purchase suitable brand and model as per personal height, body size, preference for shape, etc. Females mostly select light model of 100~115c.c and are in favor of relatively low horsepower and compact shape; males prefer to choose 125-150c.c sport motorcycle with strong horsepower and huge size. Factor analysis results of shape cognition and usage evaluation can be divided into three factors: (1) appearance, (2) sense of design, (3) operability. 125c.c models generally show a huge and steady sense while 100c.c ones feel small and light. Simple arc appearance looks natural

while complex and sharp appearances makes people feel unique. Curved design and small volume are suitable for females. These findings can provide a reference for subsequent relevant research development and future design development.

Keywords: Motorcycle, Generation Difference, Gender Difference, Semantic Differential method, Usage Evaluation

1. INTRODUCTION

1.1. Research background

Between 1930s and 1950s, motorcycle was a luxury for a few people. In 1960s, it evolved a function of transporting goods and making money. In 1970s, along with rapid development of Taiwanese economy, motorcycles were put into mass production and price was reduced. Students, office workers and housewives all streets and lanes ride motorcycles on streets and lanes. At that time, motorcycle became the most popular vehicle in Taiwan.

In Taiwan, popularity of motorcycle has lasted for more than half a century. Different groups have respective preferences for brands, types and styles. Generally, males and females are influenced by body size, physiological response and control abilities, fashion, etc when selecting and purchasing motorcycles. Also, people of different ages always choose types and styles suitable for them pursuant to various factors including intended purposes, operating requirements and use experiences. For example, among young populations, males tend to buy motorcycles featuring streamline and scientific sense while females prefer round and compact construction. Middle-aged men show a decreased demand on motorcycle and mostly of them own cars, so they generally choose cheap and simple-operation motorcycles. As a response to needs of shopping and picking up children, middle-aged women mainly select models with large storage space or comprehensive functions. Therefore, investigating differences or relevance between “different genders or generations” and “perception of motorcycle appearance design and evaluation of usage” is indeed an issue worth studying for industrial design field.

1.2. Research objectives

This study adopted cognitive evaluation viewpoint of Kansei engineering to implement survey of motorcycle shape cognition appraisal among young (18-35 years) and middle-aged (36-55 years) people from northern, central and southern parts of Taiwan. Firstly, individual interviews with 96 young and middle-aged males and females were accomplished to know consumers' perceptions of motorcycle shape, brand preference and use demands as well as generalize and analyze young and middle-aged people's generation and gender factors that influence motorcycle evaluation. Secondly, data about motorcycle quantity, brand and model were collected from five parking lots in northern, middle and southern Taiwan, popularizing rates were summarized for a subsequent cross contrast with sales ranking list, and 10 representative models were selected. 114 shape cognition and evaluation questionnaires of SD method were sent out for a survey. Through statistical analysis

and line chart and spatial distribution plotting, differences in shape cognition and usage evaluation caused by young and middle-aged people's different generations and genders were investigated. Results of this study will provide references for subsequent research development and designers' new product development in the future.

2. LITERATURE REVIEW LITERATURE REVIEW

2.1. Development and current condition of motorcycles in Taiwan

In 1930s, Taiwan introduced motorcycle from Japan. History of Taiwanese motorcycle development lasts 80 years and can be divided into three phases.

1. **Rarity phase (1930-1963):** during this phase, motorcycles were all imported and owned by wealthy people or male elites. Only a few females had the chance of riding on the motorcycle.
2. **Transformation phase (1964-1976):** in 1962, SYM cooperated with Japanese "Honda Motor Co., Ltd." to initiate motorcycle industry of Taiwan. Motorcycle riders gradually transformed from upper-level elites into lower and middle classes. For job and housework, more and more females became motorcycle users.
3. **Popularity phase (1977-now):** due to quick development of motorcycle industry, motorcycle popularizing rate goes up rapidly (Guan-Hong Lok, 2005). According to statistical data published by Ministry of Communications at the end of December 2012, number of motorcycles in Taiwan is 15,143,434. Top three manufacturers in terms of market share are KYMCO, YAMAHA and SYM in order, which collectively account for about 90% of total sales. In present Taiwan, owning a motorcycle is an easy and common phenomenon. Motorcycle is an indispensable vehicle for people to go working, relaxing and shopping.

2.2. Gender difference

Traditionally, males possess instrumental features: target-oriented, logical and aggressive. Females have emotional traits: tender, sympathetic and caring (Hort, Fagot, & Leinbach, 1990). Gender consciousness means: observe society, politics, economy, culture and environment from gender perspectives, perform gender analysis and planning, and thus prevent and overcome modes and measures bad for development of both genders (Ya-Hui Tang, 2000).

Gender viewpoint, based on cognition of gender consciousness, proposes statements on interpretation of tradition for traditional gender issues. Different genders play different roles. Gender role means individuals are taught to form values and behavioral norms suitable for their genders during their growth. Through role classification and setting, a person becomes a member of a category and presents a kind of role behavior, which should be proper and meet social expectations. These learning mechanisms include family, education, religion, society and all cultural communications (Mei-Hui You, 2001). This paper will find out differences through research and generalize elements that can provide design references.

2.3. Generation difference and cognition

Young generation refers to 18-35 years old teenagers who define “who I am” by joining in or identifying subculture or groups. If they fail to find acceptable subculture or group, they will feel like getting lost due to role confusion. Therefore, definite self-identification helps them blend in with social group to increase “sense of belonging”. Proper role confusion can establish personal “uniqueness” and thus enhance sense of presence.

Middle-aged generation refers to 36-50 years old adults featured by pursuing peak of achievement, career performance, social status and economic status. With long-term experiences, adults know more definite direction and development of life goal, become stable in work and social relationship, present better self-worth, esteem and creativity ability through well-established support network with colleagues and friends, and have a place in the society (Mei-Jun Wang, 2000). This definition is suitable for inter-generation differences in motorcycle use cognition and evaluation of this study.

2.4. Semantic differential method

Semantic differential method utilizes bipolar scale constituted by a pair of opposite adjectives to appraise product, brand, company or any concept. Two opposite adjectives of bipolar scale are often separated by a continuous set that is divided into 7 segments (or 5 or 11 segments) (Chun-Ying Huang, 1999), illustrates two common forms of semantic differential method. This study adopted a 5-segment scale, carried out word evaluation from -2 to 2, simplified data into explanatory factors by means of SPSS factor analysis and drew line chart and space coordinates, in order to know whether people of different genders and generations are different in cognition and evaluation of industrial products (Ching Yang, 2004) .

3. RESEARCH METHODS

3.1. Field observation and interview records

From 20 October 2014 till 22 November 2013, this study performed field observations and questionnaire interviews among different-gender young and middle-aged groups from five areas of Taiwan-Taipei and Miaoli in the north, Taichung and Yunlin in the middle and Kaohsiung in the south. On-site shooting was done to record information about 100-150c.c motorcycles such as brand, model, purchase motivation and males and females’ dressing style, so as to know popular phenomena among Taiwan motorcycle groups as well as generation and gender differences. Representative cases of young and middle-aged males and females were extracted from 96 samples as listed in table 1. According to results of interviews, youth’s primary use demand is for going to work; males mostly consider performance and distinctive appearance; females pay attention to light weight and storage space; middle-aged people use motorcycle for short distance, with males’ focus on price and brand trust and females’ emphasis on picking up children and storage space.

Table 1: Representative case of field observation and interview records

Gender	male			Female		
	Number	Age	type	Number	Age	type
Young Generation	B14	21-25	GP 125	B19	26-30	RS-Z 100
						
Middle-aged generation	A01	41-45	Jeckey 125	B04	36-40	Smile 125
						

3.2. Survey of motorcycle popularizing rate in Taiwan

Between 9 November 2013 and 21 November 2013, this study investigated motorcycle popularity rate by means of shooting at motorcycle parking lots of New Taipei City Hongshulin MRT Station, Miaoli County Houlong Railway Station, Taichung Dacing Railway Station, Carrefour Douliu store (Yunlin County) and Carrefour Dingshan store (Kaohsiung City). A total of 622 motorcycles of 62 models were recorded and statistical results are shown in table 2.

3.3. Extraction of representative motorcycle models

A cross contrast was made between statistical results of popularity rate in table2 and sales data of January 2013 (www.eprice.com.tw, 2013). 4 models of 100c.c motorcycles and 6 models of 125c.c. motorcycles were selected from top three domestic manufacturers and other factories and SD method was used for cognition evaluation of motorcycle samples. Numbers of questionnaire samples were arranged randomly as listed in table 3.

Table 2: Statistical sheet of motorcycle popularizing rate in Taiwan

No	Brand	Model	Quantity	Percentage	No	Brand	Model	Quantity	Percentage
1	KYMCO	Jockey125	44	7.07	32	KYMCO	CHERRY100	6	0.96
2	YAMAHA	JOG 100	34	5.46	33	PGO	BUBU	5	0.80
3	SYM	DUKE 125	31	4.98	34	KYMCO	Going 100	5	0.80
4	YAMAHA	CUXI	30	4.82	35	YAMAHA	CIAO115	5	0.80
5	KYMCO	EASY 100	29	4.66	36	SYM	TINI-100	5	0.80
6	YAMAHA	Forte 125	28	4.55	37	SYM	R1 125	5	0.80
7	SYM	X'pro 125	27	4.34	38	SUZUKI	Crystal 100	4	0.64
8	YAMAHA	CygnusX 125	21	3.37	39	SYM	JET-Power	4	0.64
9	KYMCO	GP 125	20	3.21	40	SYM	PARTY	4	0.64
10	KYMCO	Freeway 125	20	3.21	41	SYM	GR125	4	0.64
11	KYMCO	MANY	20	3.21	42	YAMAHA	BWS125	4	0.64
12	YAMAHA	RS-100	20	3.21	43	KYMCO	Herself125	4	0.64
13	SYM	GT125	18	2.89	44	KYMCO	CANDY	4	0.64
14	YAMAHA	Breeze 125	18	2.89	45	YAMAHA	Majesty125	3	0.48
15	SYM	SMILE100	15	2.41	46	PGO	X-HOT	2	0.32
16	SYM	Wind 100	15	2.41	47	SYM	x'pro 150	2	0.32
17	SYM	ATTILA 125	15	2.41	48	SYM	Wind 125	2	0.32
18	YAMAHA	GTR-125	14	2.25	49	SYM	MIO	2	0.32
19	KYMCO	G5	13	2.09	50	YAMAHA	FANCY100	2	0.32
20	YAMAHA	SV-MAX125	12	1.92	51	KYMCO	VP 125	2	0.32
21	KYMCO	SR125	10	1.60	52	KYMCO	Pentium 150	2	0.32
22	SYM	RX110	9	1.44	53	SUZUKI	DAO100	2	0.32
23	YAMAHA	FUZZY 125	9	1.44	54	SUZUKI	Address 125	2	0.32
24	KYMCO	VJR110	8	1.28	55	SUZUKI	Swing 125	2	0.32
25	KYMCO	JR100	8	1.28	56	YAMAHA	Techno 150	1	0.16
26	KYMCO	KIWI	8	1.28	57	SYM	MII	1	0.16
27	KYMCO	Movie 125	8	1.28	58	SYM	Z1 125	1	0.16
28	SYM	Fighter150	8	1.28	59	SYM	IRX115	1	0.16
29	SUZUKI	GSR125	7	1.12	60	SUZUKI	XR125	1	0.16
30	YAMAHA	VINO100	7	1.12	61	PGO	I Charge125	1	0.16
31	KYMCO	RACING150	7	1.12	62	Hartford	MIGIC 125	1	0.16
Total								622	100.00

Table 3: Motorcycle samples of SD-method cognition evaluation

Sample	1	2	3	4	5
Model	Jockey125	.Many110	Jog 100	Duke 125	BuBu 100
Picture					
Sample	6	7	8	9	10
Model	GP 125	GyugnsX 125	RS-Z 100	Attila 125	X-Hot 125
Picture					

3.4. Questionnaire design and SD word extraction

Based on common people's cognition and evaluation of motorcycles summarized from field observation and interview data as well as a reference to literatures A Study of the Images of the Relation between Women Consumer's Pleasure and Motorbike Product Design(Yu-Lin Shen, 2007), this study generalized words in regard to physical property, psychology and motorcycle appearance, performance, operation and function as shown in table 3. Then, 14 pairs of words were extracted from 56 pairs of opposite words. 10 representative models were listed in the questionnaire along with 45-degree-angle pictures of front motorcycle body and corresponding pairs of words. These words were divided into five levels from -2 to +2; testees were asked to look at pictures and then check words shown in figure 1 in accordance with their feelings.

	-2	-1	0	+1	+2	
Cheap	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Expensive
Poor-appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Good-looking
Uncomfortable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comfortable
Difficult-to-operate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Easy-to-operate
Dull	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Flexible
Compact	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Huge
Gas-guzzling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fuel-efficient
Low performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	High performance
Common	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Unique
Female	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Male
Simple	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fancy
Light	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Steady
Submissive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Firm
Small storage space	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Large storage space

Figure 1: SD word extraction

4. DESIGN AND IMPLEMENTATION OF QUESTIONNAIRE SURVEY

4.1. Contents of questionnaire survey

Questionnaire survey of this study was aimed at knowing different genders and different generations' differences in motorcycle shape cognition and usage evaluation in Taiwan. Contents of the questionnaire were composed of four parts: (1)basic information (6 items): to be used for statistics of variable data; (2) motorcycle purchase and usage (6 items): to know owners' purchase motivations and priorities when buying motorcycles, as well as their current evaluations of motorcycle usage; (3) lifestyle AIOs scale(23 items): to investigate lifestyles of motorcycle groups;(4)cognition and perceptions of motorcycle (10 items): use SD method to know interviewees' perceptions and feelings of shapes of different models.

4.2. Implementation of questionnaire survey

From December 2013 to January 2014, questionnaires in the form of online edition and paper version were sent out to 18-55 years old males and females in Taiwan Online questionnaires were published on social-networking sites and related forums. Paper questionnaires were delivered to

friends, relatives and family members, who filled in on site. There were 114 questionnaires totally, including 99 online questionnaires and 15 paper ones.

4.3. Interviewees' basic information

Interviewees' basic data of this study are summarized in table 4. With respect of sex ratio, males and females account for 49% and 51% respectively. Interviewees' ages are classified into 18-25 (18.4%), 25-30 (24.5%) and 31-35 (20.1%). In terms of education background, university (36.8%) and "above graduate school" (32.4%) show high proportions. Top three occupations are professional technician (19.2%), student (13.1) and office personnel (13.1%). With regard to revenue, 21-30 thousand (21.0%) and 31-40 thousand (24.5%) are at high proportion. In addition, most interviewees reside in Taichung, Changhua, Yunlin & Nantou (46.4%) and New Taipei, Taipei & Keelung (27.1%).

Table 4: Interviewees' basic information

Item	Content	times	percentage
Gender	Males	56	49.1
	Females	58	50.9
Age	18-25 years old	21	18.4
	26-30 years old	28	24.5
	31-35 years old	23	20.1
	36-40 years old	13	11.4
	41-45 years old	16	14.0
	46-50 years old	8	7.0
	51-55 years old	5	4.3
Educational Background	Junior	3	2.6
	Highschool(grades)	9	7.8
	Specialist graduates	23	20.1
	Graduate	42	36.8
	Graduate	37	32.4
Occupation	Student	15	13.1
	Civil servants and teachers	14	12.2
	professional technicians	22	19.2
	business personnel	15	13.1
	Housewife	3	2.6
	Since business	6	5.2
	Production operator	6	5.2
	Service workers	25	21.9
	Other	8	7.0
Income	Ten thousand or less	13	11.4
	11-20 thousand	12	10.5
	21 -30 thousand	24	21.0
	31-40 thousand	28	24.5
	41-55 thousand	22	19.2
	56-70 thousand	7	6.1
	70 thousand or more	6	5.2
	Other	2	1.7
Total		114	100.0

4.4. Motorcycle purchase and use conditions

Table5 lists top three brands owned by interviewees of this study are KYMCO (35%), Yamaha (28.9%) and SYM (26.3%), and these data are similar with results of popularity rate survey. With regard to conditions of motorcycles purchased, old and new motorcycles make up 52.7% and 47.3%

respectively. Concerning price, 30-45 thousand (27.1%) and 46-55 thousand (26.3%) are the top two. Top two in terms of engine displacement are 125c.c (49.1%) and 100c.c (28.9%). In respect of service time, 4-6 years (36.8%) and 1-3 years (23.6%) account for larger proportions as shown in table 5. Main purposes are as below in order: going to work (32.5%), going to restaurant or shopping (25.9%), recreation & journey (14.8%) and picking up family members (11.5%). The most satisfactory conditions for users are as below in sequence: reasonable price (14.2%), easy-to-operate (13.4%), brand trust (11.1%) and low fuel consumption (11.6%).

Table 5: Statistical table of motorcycle purchase and use conditions

Item	Content	times	percentage
Brand	KYMCO	40	35.0
	YAMAHA	33	26.3
	SYM	30	26.3
	SUZUKI	5	4.3
	PGO	2	1.7
	Other	3	2.6
Purchase condition	New	54	47.3
	Used	60	52.7
purchase price	Ten thousand or less	3	2.6
	10-29 thousand	19	16.6
	30-45 thousand	31	27.1
	46-55 thousand	30	26.3
	56-65 thousand	11	9.6
	66-80 thousand	14	12.2
	80 thousand or more	5	4.3
exhaust volume	100 C.C	33	28.9
	110-115 C.C	13	11.4
	125 C.C	56	49.1
	150 C.C	12	10.5
Use Year	1-3 years	27	23.6
	4-6 years	42	36.8
	7-10 years	22	19.2
	11-15 years	13	11.4
	15 years or more	10	8.7
Total		114	100.0

5. STATISTICAL RESULTS OF SD EVALUATION OF MOTORCYCLE

5.1. Average values and line chart of 100C.C motorcycle

This study provided interviewees 14 pairs of words to know their shape cognition and usage evaluation of four motorcycles. Statistical results of average values are listed in table 6. With regard to appearance-related psychological factors-“cheap-expensive”, “tacky-elegant”, “common-unique” and “simple-fancy”, all models except Jog 100 obtain evaluations above average value. Jog is positioned as an economical model. In terms of compact-huge, low performance-high performance, female-male, light-steady and submissive-firm, motorcycles are divided into two groups: RS-Z 100 and BUBU 100 show a sense of high performance and being firm while Jog100 and Many110 look submissive and female-like. As illustrated in figure 2, four models are not significantly different in operation: uncomfortable-comfortable, difficult-to-operate and easy-to-operate, dull-flexible and gas-guzzling & fuel-efficient.

Table 6: Statistical results of 100C.C. evaluation

Semantic \ Model	many110		jog 100		BUBU 100		RS-Z	
	A*	S**	A	S	A	S	A	S
1. Cheap - Expensive	3.54	1.04	2.57	1.04	3.92	0.91	4.04	0.94
2. Poor-appearance - Good-looking	3.31	1.15	2.74	1.02	3.28	0.89	3.43	0.90
3. Uncomfortable - Comfortable	3.41	1.05	3.15	0.88	3.41	0.88	3.50	0.90
4. Difficult-to-operate - Easy-to-operate	3.73	0.89	3.61	0.88	3.63	0.93	3.53	0.93
5. Dull - Flexible	3.81	0.93	3.48	0.99	3.64	0.82	3.57	0.89
6. Compact - Huge	2.08	0.99	2.38	0.93	3.32	0.98	3.51	1.15
7. Gas-guzzling - Fuel-efficient	3.38	0.94	3.34	0.94	3.00	1.00	2.91	1.01
8. Low performance - High performance	2.89	0.90	2.87	0.90	3.61	0.82	3.57	0.87
9. Common - Unique	3.38	0.94	2.47	0.97	3.41	0.88	3.55	0.92
10. Female - Male	1.80	0.94	2.54	0.99	3.55	1.05	3.70	0.93
11. Simple - Fancy	3.50	1.07	2.35	0.89	3.45	0.94	3.21	1.00
12. Light - Steady	2.15	0.95	2.41	0.92	3.29	0.89	3.48	0.99
13. Submissive - Firm	2.13	0.85	2.56	0.96	3.48	0.90	3.58	0.91
14. Small storage space - Large storage space	2.50	1.16	2.43	1.07	3.23	.97	3.33	1.14

*A: Average **S: Standard deviation

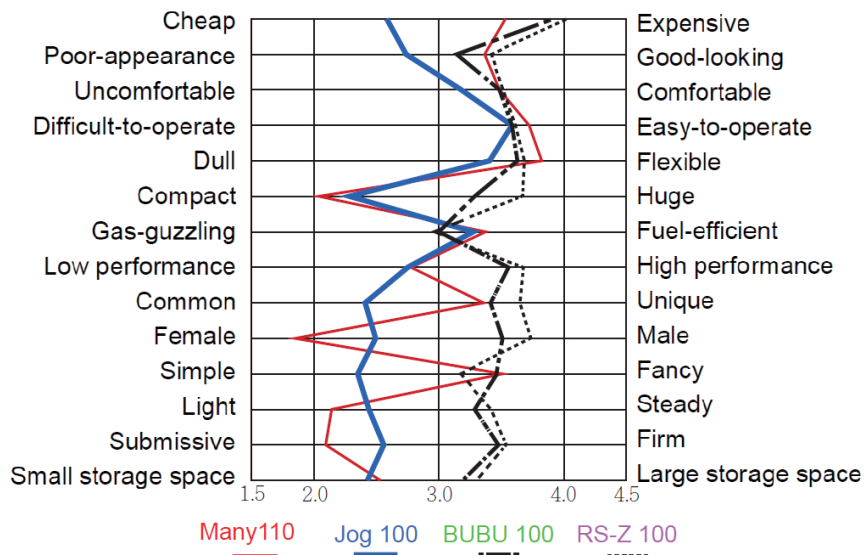


Figure 2: Line chart of 100C.C analysis

5.2. Average values and line chart of 125C.C motorcycle

Table 7 lists statistical results for average values of shape cognition and usage evaluations of six motorcycles in 125C.C group. Results of “cheap-expensive”, “common-unique” and “simple-fancy” are classified into two groups. Cheapness of motorcycle is positively related with “common” and “simple”. Expensive motorcycles look unique and fancy. All models have results obviously higher than average value in terms of “female-male”, “light-steady” and “submissive-firm”. It can be inferred that 125C.C motorcycles are perceived as “high-performance”, “steady” and “suitable for male”. All models show no significant difference in “uncomfortable-comfortable”, “difficult-to-operate & easy-to-operate”, “compact-huge”, “gas-guzzling & fuel-efficient and “low-performance & high-performance” as illustrated in figure 3.

Table 7: Statistical results of 125C.C. evaluation

Semantic \ Model	jockey 125		duke 125		GP 125	
	A*	S**	A	S	A	S
1. Cheap - Expensive	3.13	1.14	2.46	1.06	3.92	0.91
2. Poor-appearance - Good-looking	2.92	1.02	2.15	0.95	3.28	0.89
3. Uncomfortable - Comfortable	3.38	0.96	2.97	0.95	3.41	0.88
4. Difficult-to-operate - Easy-to-operate	3.57	1.02	3.17	1.03	3.63	0.93
5. Dull - Flexible	3.33	1.01	2.64	1.01	3.64	0.82
6. Compact - Huge	3.42	0.95	3.71	0.92	3.32	0.98
7. Gas-guzzling - Fuel-efficient	2.99	0.86	2.81	1.00	3.00	1.00
8. Low performance - High performance	3.38	0.94	3.03	0.93	3.61	0.82
9. Common - Unique	2.77	1.03	2.32	0.93	3.41	0.88
10. Female - Male	3.60	0.98	3.65	0.92	3.55	1.05
11. Simple - Fancy	2.48	1.02	2.11	0.96	3.45	0.94
12. Light - Steady	3.46	1.00	3.62	0.96	3.29	0.89
13. Submissive - Firm	3.53	0.89	3.54	1.03	3.48	0.90
14. Small storage space - Large storage space	3.35	1.00	3.13	1.04	3.23	0.97

Semantic \ Model	CygnusX 125		Attila 125		X-hot 125	
	A	S	A	S	A	S
1. Cheap - Expensive	4.36	0.86	2.66	1.10	4.18	0.95
2. Poor-appearance - Good-looking	3.37	0.95	2.68	1.08	2.78	1.05
3. Uncomfortable - Comfortable	3.79	0.91	3.07	0.96	2.99	1.08
4. Difficult-to-operate - Easy-to-operate	3.49	0.97	3.36	1.00	3.04	1.10
5. Dull - Flexible	3.37	1.07	2.96	1.02	3.13	1.08
6. Compact - Huge	4.11	0.89	3.52	1.00	4.07	0.98
7. Gas-guzzling - Fuel-efficient	2.84	1.09	2.87	0.89	2.45	1.04
8. Low performance - High performance	3.84	1.00	3.11	0.88	3.67	1.06
9. Common - Unique	3.68	1.03	2.59	0.98	3.92	1.09
10. Female - Male	4.13	0.89	3.55	0.89	4.27	0.85
11. Simple - Fancy	3.27	0.94	2.39	0.95	3.68	1.07
12. Light - Steady	3.98	0.94	3.42	1.03	3.86	0.95
13. Submissive - Firm	4.08	0.93	3.15	1.04	4.20	1.00
14. Small storage space - Large storage space	3.80	1.05	3.21	0.94	3.34	1.23

*A: Average **S: Standard deviation

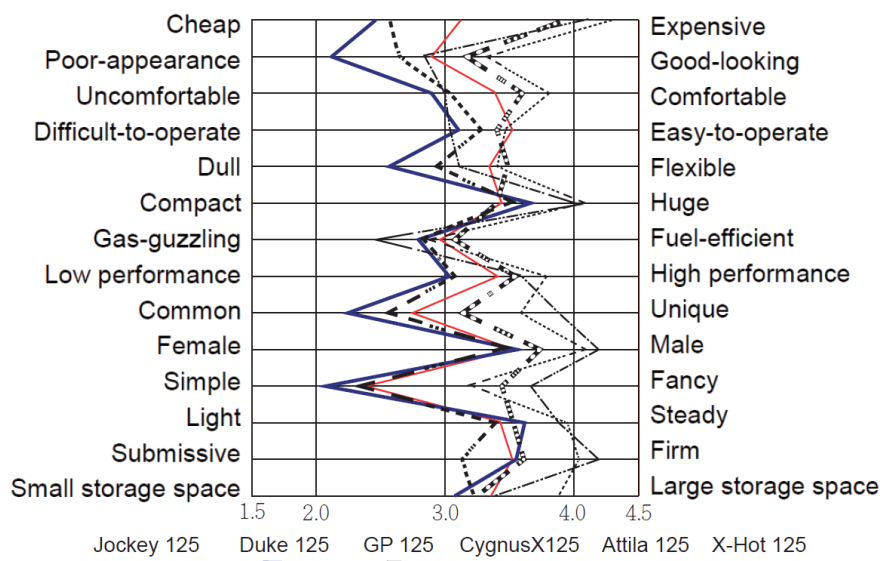


Figure 3: Line chart of 125C.C analysis

5.3. Average values and line chart for males and females' evaluations of motorcycle

Table 8 lists male and female samples' evaluations of all motorcycles are summarized. From line chart we can see males and females don't have significant difference in "tacky-elegant", "difficult-to-operate and easy-to-operate", "gas-guzzling and fuel-efficient" and "simple-fancy". Significant perceptive differences are in "compact-huge", "low-performance & high-performance", "male-female" and "light-steady". It's apparent that males and females have different demands and evaluations of operation due to physiological diversities as shown in figure 4.

Table 8: Statistics of male and females' evaluations

Semantic \ Model	Male		Female	
	A*	S**	A	S
1. Cheap - Expensive	3.27	1.31	3.59	1.09
2. Poor-appearance - Good-looking	2.93	1.07	3.03	1.09
3. Uncomfortable - Comfortable	3.16	0.92	3.41	1.02
4. Difficult-to-operate - Easy-to-operate	3.48	0.96	3.43	1.01
5. Dull - Flexible	3.32	1.03	3.33	1.03
6. Compact - Huge	3.12	1.16	3.43	1.18
7. Gas-guzzling - Fuel-efficient	3.01	0.99	2.95	0.99
8. Low performance - High performance	3.13	0.97	3.47	0.97
9. Common - Unique	3.08	1.10	3.20	1.13
10. Female - Male	3.20	1.15	3.50	1.22
11. Simple - Fancy	2.96	1.10	2.98	1.15
12. Light - Steady	3.08	1.09	3.40	1.13
13. Submissive - Firm	3.17	1.10	3.43	1.15
14. Small storage space - Large storage space	2.88	1.07	3.33	1.15

*A: Average **S: Standard deviation

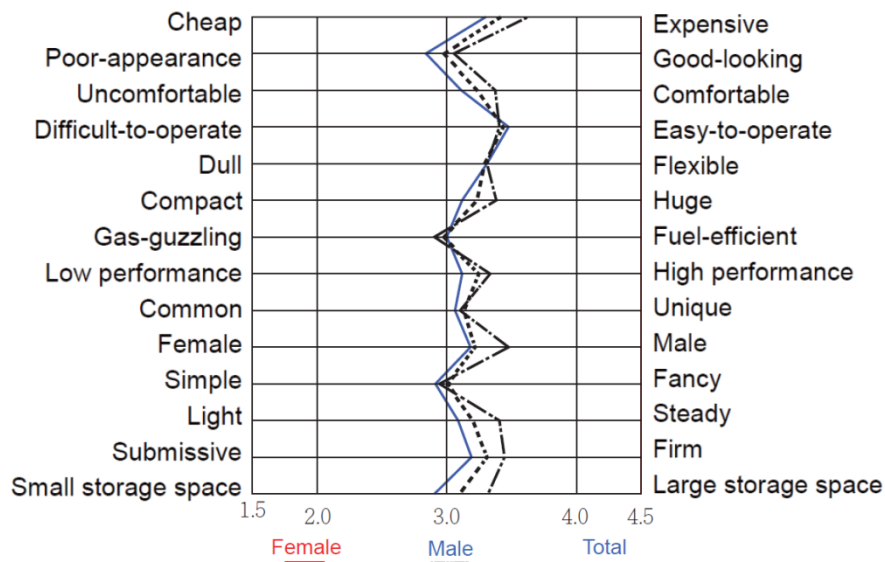


Figure 4: Line chart of male and female differential analysis

5.4. Average values and line chart for young and middle-aged generations' evaluations of motorcycle

Table 9 lists statistical analysis of young (18-35years) and middle-aged (36-55 years) groups' evaluations of all motorcycles show that middle-aged people's evaluations of each item are higher than youths. The two groups are significantly different in cheap-expensive, common-unique, compact-huge and low-performance-high-performance. Young people pursue cool appearance,

think such motorcycle has high value and thus form a perception of low price. They also make refitting because motorcycles are not unique. Middle-aged people think motorcycle has sufficient performance because their physiological responses are slow; this group focuses on convenience and believes motorcycle should have a large volume. As illustrated in figure 5, males and females have no significant difference in operation and dull-flexible.

Table 9: Statistics of young and middle-aged generations' evaluations

Semantic \ Model	Young Generation		Middle-aged generation	
	A*	S**	A	S
1. Cheap - Expensive	3.33	1.25	3.61	1.12
2. Poor-appearance - Good-looking	2.94	1.13	3.05	1.01
3. Uncomfortable - Comfortable	3.25	1.01	3.35	0.92
4. Difficult-to-operate - Easy-to-operate	3.45	1.00	3.47	0.95
5. Dull - Flexible	3.31	1.07	3.35	0.95
6. Compact - Huge	3.23	1.24	3.36	1.07
7. Gas-guzzling - Fuel-efficient	2.98	1.03	2.99	0.93
8. Low performance - High performance	3.22	1.00	3.45	0.92
9. Common - Unique	3.05	1.18	3.29	0.98
10. Female - Male	3.35	1.19	3.36	1.22
11. Simple - Fancy	2.92	1.18	3.07	1.03
12. Light - Steady	3.20	1.18	3.31	1.01
13. Submissive - Firm	3.25	1.17	3.39	1.07
14. Small storage space - Large storage space	3.06	1.17	3.19	1.06

*A: Average **S: Standard deviation

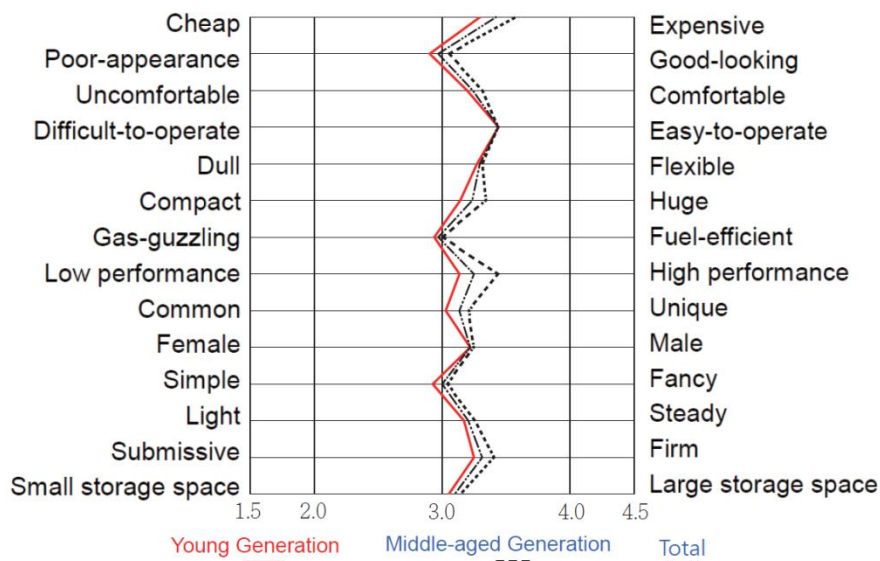


Figure 5: Line chart of generation difference analysis

6. FACTOR ANALYSIS AND SPACE COORDINATES DISTRIBUTION

6.1. Statistical results of factor analysis

This study utilizes factor analysis to reduce semantic spatial dimension and obtain proper number of factor dimensions and number of factors. SPSS software is used for statistical analysis and extracting factors with eigenvalue above 1. Through scree plot, three factors are determined and respectively named as Appearance factor, Design factor and Operability factor as listed in table 10.

Table 10: Factor analysis of evaluation words

Content	Factor 1	Factor 2	Factor 3
12. Light - Steady	.853	.043	-.057
06. Compact - Huge	.838	.080	-.124
13. Submissive - Firm	.825	.162	-.031
10. Female - Male	.824	.105	-.076
14. Small storage space -Large storage space	.735	.101	.115
08. Low performance - High performance	.557	.410	.359
09. Common - Unique	.188	.825	.147
11. Simple - Fancy	.012	.823	-.027
01. Cheap-Expensive	.327	.731	.087
02. Poor-appearance - Good-looking	.016	.615	.339
04. Difficult-to-operate - Easy-to-operate	.018	.039	.820
05. Dull - Flexible	-.099	.342	.726
03. Uncomfortable -Comfortable	.282	.199	.679
07. Gas-guzzling -Fuel-efficient	-.254	-.028	.643
Feature value	4.669	2.892	1.418
Explained variance %	28.12	18.96	17.05
Cumulative variance %	28.12	47.08	64.14
Factor denomination	appearance	design	Operability

6.2. Explanation of factor analysis naming

1. Factor 1-appearance: explained variance of this factor is 28.12%. There're six pairs of words, most of which evaluate overall appearance and volume of product, such as light-steady and compact-huge. Therefore, this type is named appearance factor with "compact & light-huge & steady" as spatial scale sample.
2. Factor 2-design: explained variance of this factor is 18.96%. Four pairs of words mainly describe people's feeling of the product like quality and distinctiveness , e.g common-unique and simple-fancy. These evaluations result from design of motorcycle model, so this factor is named as design factor. "Common & simple-unique & fancy" is the spatial scale sample.
3. Factor 3-operability: explained variance of this factor is 17.05%. Four pairs of words are all related to motorcycle operability such as "difficult-to-operate and easy-to-operate", "dull-flexible". Therefore, it is named "operability factor" with "dull-flexible operation" as spatial scale sample.

6.3. Coordinate space analysis for cognition and evaluation of motorcycle

This study extracts three typical factors from cognition and evaluations of 10 motorcycle models, and scores of these three factors are listed in table 11. Then, two-dimensional coordinate is used to present the ten models' distribution conditions of two image space coordinates-"appearance and design" and "appearance and operability".

6.3.1. Appearance and design factors

Figure 6 illustrates cognition-evaluation coordinate distribution of appearance and design factors. In the first quadrant there are CygnusX 125, X-Hot125, GP 125, RS-Z 100 and BUBU100, all

belonging to high-price and sport-style models. “Many” in the second quadrant is a preppy-look model more suitable for females. Jog in the third quadrant features reasonable price, submissive property and being economical. In the fourth quadrant, Jockey is a major economical model of KYMCO while Attila125 and Duke 125 are early-stage models in conformity with a fact that motorcycles of that time are generally cheap. From coordinate space we can see 125cc models are usually huge and steady while 100cc models are compact and light.

Table 11: Motorcycle evaluation factor score

Product\factor score	Factor 1 appearance	Factor 2 design	Factor 3 operability
1. Jockey 125	0.46	-0.20	0.33
2. Many110	-0.79	0.43	0.59
3. Jog 100	-0.49	-0.49	0.40
4. Duke 125	0.47	-0.74	-0.10
5. BUBU 100	0.40	0.51	0.43
6. GP 125	0.53	0.49	0.45
7. CygnusX 125	1.00	0.66	0.38
8. RS-Z 100	0.52	0.55	0.39
9. Attila 125	0.34	-0.43	0.07
10. X-hot 125	0.92	0.68	-0.09

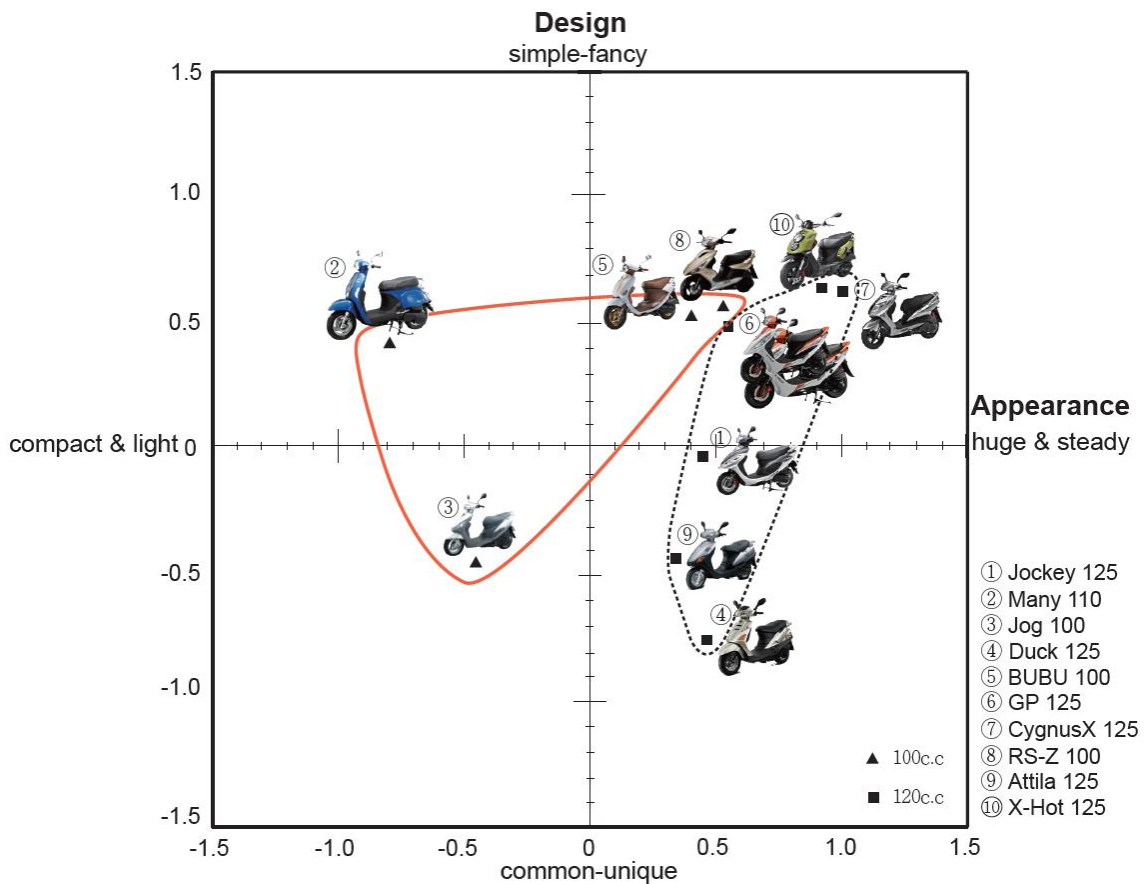


Figure 6: Coordinate spaces of appearance and design factors

6.3.2. Appearance and operability factors

With respect to distribution of cognition-evaluation coordinate constituted by appearance and operability factors, the first quadrant includes six models: CygnusX 125, GP 125, Attila125, RS-Z 100 and BUBU100. There are only two models in the second quadrant: Many110 and Jog 100. In the fourth quadrant we can find Duke 125 and X-Hot 125. It's clear that 100cc models are generally considered as "easy-to-use". The reason is probably that the compact and flexible characteristics meet users' needs. Particularly, X-Hot is evaluated as "unique" and "fancy" in terms of design, but "dull" and "difficult-to-operate" in terms of usage. It is might because this model is positioned as "personalized".

7. CONCLUSIONS AND SUGGESTIONS

This study conducts three-stage survey-field observation & interview, questionnaire and SD cognition evaluation-among young and middle-aged males and females in Taiwan. Then, evaluation factors are extracted after SPSS statistical analysis of survey results and space coordinate analysis is performed. Finally, following conclusions are drawn:

1. When purchasing motorcycle, young-generation males mainly consider acceleration performance and appearance style while females focus on light weight, small size, easy operation and large storage space. Middle-aged males' primary considerations include reasonable price and brand trust while females pay attention to conditions such as picking up children and shopping.
2. Young people are common in going to work or class. With respect of other purposes, proportion of leisure and recreation is higher in males. Common use for middle-aged people is "vehicle for short distance"; males mostly ride motorcycle for going to restaurant and shopping and females use motorcycle for picking up family members more frequently.
3. Statistical results of average values of SD-method cognition evaluation show 125c.c models make people feel expensive, steady, "large in storage space", firm, simple and suitable for male; 100c.c models provide senses of easy operation, comfort, soft shape and femininity. With regard to factor analysis results, three factors are extracted: appearance,
4. Results of spatial distribution of shape evaluation coordinate show that eight of ten samples are distributed in the first and fourth quadrants, indicating appearance of the motorcycle is large and steady. Such result is in agreement with the feature that motorcycle is a mechanical structural product full of weight sense. Next, six models distributed in the first and second quadrants receive a comment of distinctive and fancy shape; these motorcycles, expensive new patterns launched in recent three years, are favored by young generations. Four models distributed in the third and fourth quadrants are old motorcycles with an age of more than three years; with simple and ordinary appearance as well as firm and durable image, they are popular among middle-aged generations.

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REFERENCES

- Aeon, website (2013): <http://www.aeonmotor.com/home.php>.
- Chun-Ying Huang. (1999), Multivariate analysis, Hwa-tai Publishing Co. Ltd, Taipei.p307.
- Ching Yang & Yuan-Zhi Peng & Feng-Kue Chen. (1999), The Behaviors Of Purchasing And Using Sneakers Of The X And Y Generations In Taiwan And Their Life Styles, Science and Technology, 8,4,321-332.
- Ching Yang. (2004), The Image Evaluation On Long-Life Products Used In Daily Life Of Taiwanese Families , Science and Technology, 13, 4, 295-304.
- Ching Yang & Ya-Ping Chen. (2013), The Investigation of the Young Gender Differences and the Mode of Automobile Usage in Taiwan, IASDR 2013, 5, 1780-2.
- Directorate General of Budget, Accounting and Statistics, Executive Yuan, (2013) :<http://www.dgbas.gov.tw/mp.asp?mp=1>.
- Eprice, website (2013):<http://www.eprice.com.tw/>.
- Guan Hong Lok. (2005), Riding a half-century: Taiwan motorcycle gender cultural history, 1930s-2007, Master Thesis, Gender Institute of Kaohsiung Medical University.
- Hort, B., Fagot, B., & Leinbach, M. (1990). Are peoples' actions of maleness more stereotyped framed than their notions of femaleness?. *Sex Roles*, 2303-4, 197-212.
- KYMCO, website (2013):<http://www.kymco.com.tw>.
- Meng-Hsuan Lin. (2005). Study of influences of gender difference and lifestyle on online game users' consumption behaviors. Master thesis, Institute of Advertisement, National Chengchi University.
- Mei-Hui You,(2002), 身體、性別與性教育：女性主義的觀點[Body, Gender and Sex Education]:*女學學誌：婦女與性別研究*, 14, 81-117.
- Mei-Jun Wang. (2000). Psychological development of adolescence, adulthood and post adolescence <http://www.healthcity.net.tw/kung/book011.asp>.
- Ministry of Communications, Executive Yuan, website (2013): <http://www.motc.gov.tw>.
- PGO, website (2013): <http://www.pgo.com.tw>.
- SUZUKI, website (2013): <http://www.suzukimotor.com.tw>.
- SYM, website (2013):<http://tw.sym-global.com>.
- Ru-Xuan Wang and Yan-Rong Lee. (2007) 大不同－性別主流化與性別平等[Great differences between male and female-gender mainstreaming and gender equality], *研習論壇月刊*, 2007, 76.
- Ya-Hui Tang. (2000), 性別意識與婦女地位[Gender consciousness and women status], *中華女子學院學報*, 4.
- YAMAHA, website (2013):<http://www.yamaha-motor.com.tw>.
- Yu Lin Shen. (2007). Research form image of female sexual pleasure and motorcycle consumer products. Master thesis, Institute of Product Design, Ming Chuan University.

BIOGRAPHY

Ching Yang¹

Ching Yang is the professor of the Department of Industrial Design, National Yunlin University of Science and Technology, Taiwan. She graduated from National Taiwan College of Arts (now, National Taiwan University of Arts) in 1977. 1984-2012, she respectively obtained a Bachelor's (1984), master's (1986) and PhD (2012) degree from the University of Tsukuba in Japan. Her main areas of research include the Kansei Engineering, product design and evaluation, and the Taiwan handicraft and industrial design history.

Chia-Sheng Chen²

Chia-Sheng Chen is studying in the Graduate School of Industrial Design, National Yunlin University of Science and Technology, Taiwan. He graduated from Department of Mechanical Engineering, National Formosa University in 2012. His main expertise motorcycle design and mechanical engineering.