THE ATTRIBUTES OF PRODUCT QUALITY: AN ANALYSIS OF THAI PRODUCT QUALITY

by

ACKARADEJRUANGSRI Pajaree

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Recently, global markets have become borderless, and business conditions have turned very competitive. Today's consumers are very demanding and differ in preferences across cultures. These caused the market to re-examine the quality of product as a means to achieve competitive advantage. Despite extensive research, there are relatively a small number of research which has an updated definition and evaluation of product quality. In this research, "The Attributes of Product Quality: An Analysis of Thai Product Quality", the author has investigated the understanding of product quality from various perspectives to determine "product quality definition" and to propose "product quality attribute dimensions" that are valid and could be used in measuring various types of product quality, particularly in the case of Thailand and in three product categories of electronics/IT product, automobile, and home appliance. Through interviews with government officials, product producers, intermediate sellers, and administering of questionnaires to consumers, the research was able to state "being good in all aspects and fitness with intended use" as product quality definition, representing the three perspectives of the regulators, market suppliers, and consumers, as well as propose the composite attribute dimensions, including "function", "ease of use", "reliability", "design", "durability", "eco-friendliness", "customer satisfaction", "support service", "value for money" and "adaptability", for product quality evaluation/measurement. In addition, by applying content analysis and statistical tests, the results verified that the proposed product quality attribute dimensions prove to be one of valid measurements in assessing various types of Thai product quality, specifically automobile and electronics/IT

product. Understanding this up-to-date product quality definition and valid product quality attribute dimensions is an essential tool that could benefit many sectors, especially businesses in developing their products and deciding their marketing strategies.

CHAPTER 1: INTRODUCTION

"Imagine, when you want to buy a product, what are the things that you are looking for? What are the criteria that come to mind? Aren't they 'Good feature', 'Excellent function', 'High quality', 'Technology resolution', 'Reasonable price', 'Well-known brand', 'Durability', 'After sale service' or 'User-friendly'?" These are the common criteria that consumers always point out when they think of buying a product, especially for normal goods."

This chapter presents the background of the study, research aims and objectives, research questions, the methodologies and data collection, as well as the significance, and the organization of the research.

1. Background of the Study

Right after the end of World War II, there was a tremendous demand for durable and non-durable goods, services, or anything that the markets could think of and industries were capable to produce (Academic American, 2010). Corresponding to that, the main goal of businesses at that time was mass production, in which large amounts of goods/products were produced at a time, and the only thing that consumers needed to do was to keep consuming (Mello, 2003). Although industries, markets, and businesses enjoyed skyrocket digits in sales and production volumes, that joyful moment could not be sustained and made to last for long. The markets were flooded with the overproduced products and the consumers started to realize that many products were not good enough and unable

to fulfill their wants. As a result, in the late 1950s through the beginning of 1960s, many businesses and companies tried to improve their performances through optimizing their resources allocation and implementing strategic plans to respond to those changes in consumer preference and demand, as well as unstable economic condition, and intense market competition. To cope with those changes, many businesses shifted their strategic focus to customer satisfaction through the development of product quality (Garvin, 1984; Phillips, Chang, & Buzzell, 1983; Reich, 1980).

By pursuing customer satisfaction, a number of businesses, especially manufacturing companies, started to improve their products through implementing quality management systems, such as total quality management (TQM), just-in-time (JIT) manufacturing, autonomation, six-sigma, zero defects, or lean manufacturing, to enhance their product quality level and optimize their operational efficiency (Anh & Matsui, 2006; Choi & Liker, 1995; Ishikawa, 1985; Kozo, 2012). By doing so, many companies in various industries could position themselves in profitable strategic places. A good evidence for this success was the stories of Japanese industries and "Made in Japan", by which the country has grown from producing poor quality to world-class products (Schonberger, 1986; Tatsuno, 1990). Since then, the quality management systems and quality related terms have made a wake up call to the world of production and consumption, and became one of the top priorities in academic and business. However, before utilizing such quality management systems or techniques, the definition of

product quality should be established and product quality criteria that affects on consumers' satisfaction or buying decision should be highlighted. The current line up of research rarely emphasized these two issues.

In the new era of marketing and management, "quality" or "product quality" has played a major role in consumer buying decisions (Keillor, 2007). It is very important to understand how the market defines and treats the term. Giving this renewed interest in product quality, there is an ongoing discussion and debate on what product quality really means and to some extent what could be used in evaluating or measuring product quality. So far, relatively few research have directly addressed these product quality issues. Therefore, this research *"The Attributes of Product Quality: An Analyis of Thai Product Quality"* focuses on "the definition of Thai product quality in the 21st century" and "the attribute dimensions of Thai product quality, the measurement, and its validity".

1.1. Quality/Product Quality and Its Definitions At Glance

Year after year, managers and researchers have been trying to search for the definition of "quality" or "product quality", but no one could decide on one definition. As several forces drive the market to change, the characteristics of product quality has to change accordingly. For this reason, there is no universal agreement on what quality/product quality means. Different people view quality/product quality differently and they employ their own terminology and analytical framework.

According to Tellis and Johnson in 2007, quality has been studied diversely in several academic paradigms, including engineering excellence (Avery & Zabel, 1997), perceived quality (Dodds, Monroe, & Greval, 1991), reviewed quality (Tellis & Wernerfelt, 1987), self-reported quality (Tellis & Fornell, 1988), consumer satisfaction (Rust, Inmaw, Jia, & Zahoric, 1999), and brand loyalty (Aaker, 1995). In addition, for economists, they focused quality on profit maximization and market equilibrium. For marketers, quality was used to determine customer behavior and customer satisfaction. For operations managers, quality was applied on engineering practices and manufacturing control. For engineers, quality is seen as product integrity and a way of reducing cost. For philosophers, quality was studied in terms of conceptual matters.

Furthermore, many experts in various disciplines also gave their thoughts on defining quality/product quality. Phillip B. Crosby (1979) defined quality/product quality as "conformance to requirements". Robert M. Pirsig explored the quality concept as "the result of care" (Pirsig, 1974). W. Edward Deming stated, "quality in customers' perception is the only thing that matters" (Deming & Walton, 1988). While Peter Drucker (1985) said, "quality is not what the supplier puts in, it is what the customer gets out and willing to pay for". In Merriam and Webster, "the degree of excellence" was the quality/product quality definition (Webster, 1984). "Best for certain conditions…(a) the actual use and (b) the selling price" was Armand Feigenbaum's quality/product quality definition (Feigenbaum, 1983), and

"fitness for intended use" was defined by Joseph M. Juran (Juran, Gryna, & Bingham, 1974).

Moreover, quality/product quality can also be expressed in a form of equation, in which quality/product quality is equivalent to goods and services performance attributes, divided by costs (Quality Digest, 2001):

$$\text{Quality/Product Quality} = \frac{\text{Goods and Services Performance Attributes}}{\text{Costs}}$$

Defining quality/product quality has become much more complicated when perceived from different perspectives. In product-based view, quality/product quality is referred to as "the amount of the un-priced attributes contained in each unit of the priced attributed" (Leffler, 1982), while for in demand-based, quality/product quality denotes "the degree to which specific product satisfies the wants of specific consumer" (Gilmore, 1974) or "quality of product depends on how well it fits patterns of consumer preferences" (Kuehn & Day, 1962). In manufacturing/supply-based perspective, quality/product quality is mentioned as "the degree to which a specific product conforms to a design or specification" (Gilmore, 1976), while in value-based view, quality/product quality is referred to as "the degree of excellence at an acceptable price and the control of variability at an acceptable cost" (Broh, 1982).

All in all, there have been a variety definitions of "quality" or "product quality" and the term itself seems to be very complex than it appears without yet taking

other related quality terms into consideration, such as quality of design, quality of conformance, quality of assurance, quality control, quality management and so on. Despite the variability and due to difficulty, there exists no research giving which defines product quality that could be used as unanimously or by all sectors and for a specific country or region (Avery & Zabel, 1997).

1.2. Quality/Product Quality and Its Competitive Advantages

According to Drucker (1985), *"the abilities to grow sales, stay ahead of the competition, increase market share, increase profitability, enhance ROI, grow shareholder value, and pursue many other worthwhile business goals, begin with innovation through successful product development."* Meanwhile, Mello (2003) asserted that *"the key to effective product development must come from good product definition and right product decision."*

For decades, there have been many debates going on whether or not product quality could directly enhance and contribute to firms' competitive advantage. In 1999, Kroll, Wright, and Heiens explained that there is a positive relationship between product quality and market share, and between product quality and returns. According to their study, firms with superior product quality proved to have a healthier financial performance, better business opportunity, and stronger competitive position against threats from the rivals and macroeconomic forces. In addition, the study also suggested that relatively high quality product tends to indirectly lower the variance in returns but enhances returns through market share

and direct costs, which in the end, are the firm's competitive advantage that help the firm to outperform competitors.

Similar to Kroll et al. (1999), other studies done by McGuire, Schneeweis, and Branch (1990), and Powell (1995) also held the same evidences. Both studies revealed that a business unit which provides high quality products might experience an increase in demand. This increase in demand may result to a larger market share and provide economies of scale that permits lower per-unit costs in purchasing, manufacturing, financing, research and development, as well as in marketing. Moreover, superior product quality tends to increase customer loyalty, advantages of which are customers would likely be insensitive to the price changes and would also cost less to serve (Reicheld & Sasser, 1990; Rust, Zahorik, & Keimingham, 1995). Owing to this high product quality, the firm could expect more sales, less in total transaction costs, and foreseeable outcomes.

Besides the empirical research, the 2008 survey reviewed by Grant Thornton at privately-held business in many leading economies indicated that product/service quality was ranked as the highest and the main source of competitive advantage among the 10 factors: product/service quality, brand strength, ethical business practices, workforce skills, staff retention, cost management, innovation, pricing policy, economies of scale, and international market links (Grant Thornton, 2008). However, there are exception in two nations, China and India. These two

countries did not see product/service quality as the most important source of competitive advantage.

Therefore, the findings from theoretical research, empirical studies, and opinion surveys agreed and strongly supported that higher product quality tends to produce favorable economic values and contribute many competitive advantage to the firm. It is very important for managers, businesses, and even policy makers as well as researchers to understand what is quality/product quality and what are the consumer's needs and wants. Once they clearly understand, they could ensure that those needs and wants can be fulfilled by offering excellent product quality. Understanding product quality, then, becomes an imperative tool that could assist every sector, specifically the firms, to penetrate into today's market.

1.3. Quality/Product Quality and Its Measurements

Good marketing contributes to product success. However, the right product quality attributes can sometimes be considered as more influential to product success than to good marketing. It is very common to hear the statement *"this product is very popular because of its useful functions and unique design"* rather than *"this product is very popular because it is heavily promoted and advertised"*.

Aside from the difficulty in defining quality/product quality, measuring quality/product quality is also troublesome. According to Tellis and Johnson's study in 2007 "The Value of Quality", quality was defined as a composite of

attributes of which all consumers prefer more to less. These attribute dimensions are “stability”, “compatibility”, “ease of use”, “reliability”, “utility of secondary feature”, “intrinsic performance”, and “user friendly design” (Tellis & Johnson, 2007). To measure product quality, the study applied a statistical test by converting 733 reviews of electronics and software products by Walter Mossberg in Thursday issues of Wall Street Journal from 1991-2001 into a score of 11-point scale (0-10) and transformed the overall product quality score on those dimensions through the following model:

$$\text{Quality}_i = \gamma_0 + \gamma_s \text{ Stability}_i + \gamma_c \text{ Compatability}_i + \gamma_e \text{ Ease-of-use}_i + \gamma_r \text{ Reliabilty}_i + \gamma_u \text{ Utility}_i + \gamma_p \text{ Performance}_i + \gamma_d \text{ Design}_i + \mu_i,$$

Where the γs are coefficients to be estimated for each of the corresponding dimensions of quality and the μ_is are error terms initially assumed to identically and independently follow a normal distribution.

As a result, the study showed that most of the proposed individual attribute dimensions have a strong and significantly positive effect on overall product quality. The compatibility, intrinsic performance, ease of use, and utility of secondary features are particularly important, whereas reliability, design, and stability are relatively less important in measuring quality.

In addition, quality/product quality can also be measured by profitability, forecasted opportunity, and customer satisfaction (Quality Digest, 2001). To measure product quality by forecasted opportunity and customer satisfaction,

there posed many limitations, including difficulty in accessing data, complexity in making accurate evaluation, and complication in interpreting the data into numerical figures. For those reasons, there were only few studies on both of these product quality measurements. On the other hand, to measure product quality by profitability, the abnormal returns, price of stocks and numbers of shares were widely utilized. Since this kind of information is publicly available in the market and very suitable for statistical tests, many studies and research, such as those conducted by Kroll et al. (1999) and Tellis and Johnson (2007), used profitability as product quality measurements. For instance, Tellis and Johnson's study in 2007 assessed the abnormal returns of the parent firms whose returns were affected by those product quality reviews to see how the stock normally relates to the market as quality information reaches the market (abnormal returns are the differences between a single stock or portfolio's performance and the expected return over a period of time). In their study, they divided the event into three periods: five days before the event, the day that reviews were announced or the event day, and five days after the event. After the event periods end, the study applied those returns into the following formula and made a statistical comparison test:

$$Rit = \alpha i + \beta i * Rmt + \varepsilon it$$

Where Rit = Returns per unit time at period t

Rmt = Market rate of return, i.e., the average return on New York Stock Exchange (NYSE) or Standard & Poor 500 at month t

αi = The time invariant idiosyncratic effect of firm i on its own return

βi	=	Effect of the entire market on the return of firm i
εit	=	Statistical errors
t	=	For the event period

Based on their result, they found that cumulative abnormal returns for all new products are strongly affected by the reviews from the Wall Street Journal. Firms with poor quality reviews suffer a drop in returns five days after the review appears. In contrast, firms with good quality reviews enjoy a gain over the same period. Furthermore, the product quality attribute dimensions that have relatively the strongest effects on abnormal returns (in terms of coefficients or t-values) are the utility of features, ease of use, and compatibility. Overall, Tellis and Johnson's study seemed to be one of the most up-to-date studies in measuring product quality by profit, but still there are some limitations. These include, first, the event period is too short that might lead to biased results; second the increase or decrease in abnormal returns might have been affected by the reputation of the firm itself or by the trends in the market not solely because of the quality reviews; and third, their study considered only electronic products and software, results of which might not be applicable to other types of product category.

Even though there are existing studies on product quality measurement, no single study can possibly rate the quality of product unambiguously. As time changes, consumer preferences and trends also change. Moreover, product quality is a multidimensional construct according to consumer preference, trend, and time

(Curry & Fauld, 1986; Kopalle & Hoffman, 1992). Thus, using only those attribute dimensions and the studies on both product quality definition and evaluation mentioned previously could not effectively define and measure product quality over a period of time. Therefore, the search for Thai product quality including the definition, attribute dimensions, and measurement is expected to yield many fruitful results.

2. Research Aims and Objectives

During the past 10 years, many journals and articles have been principally focusing on the usability and value of quality management systems and practices, such as TQM, JIT, and six-sigma, in both theoretical and practical terms. But the questions of what is product quality, especially in the 21st century, what could be used in evaluating product quality, and how to define and measure product quality, these kinds of notions have not received much attention or precisely reviewed in the business management field. This research *"The Attributes of Product Quality: An Analyis of Thai Product Quality"* aimed to examine and review previous empirical studies to see what scholars and other researchers had defined, credited, and how product quality had been measured so far. Learning from that, the research applied several research methods to deliver a more up-to-date definition of Thai product quality and proposed a more valid composite product quality attribute dimensions in measuring various types of today's Thai product quality and testing for its validity.

In brief, the main purposes or specific objectives of this research were:

- To understand overall product quality characteristics and to determine a more precise definition of Thai product quality in the 21st century;
- To propose a composite product quality attribute dimensions for Thai product quality that can be applied across various types of product category;
- To measure product quality through the proposed product quality attribute dimensions;
- To test for the proposed product quality attribute dimensions' validity across various types of product category.

3. Research Questions

Corresponding to the research background and research aims and objectives already stated, the following research questions have been posted:

- What could be the definition of Thai product quality in the 21st century?
- What could be the product quality attribute dimensions in the case of Thailand?
- How will product quality be measured through the proposed attribute dimensions?
- Are these proposed product quality attribute dimensions and measurement applicable to and valid for various types of product category?

4. Research Methodologies and Data Collection

So far, there have been a number of studies which have assessed stock market

returns on new product introduction, new product pre-announcement, use of brand value, and applied product price in assessing the product quality data.

This research suggested simple but effective methods to define, measure, and evaluate the product quality, specifically in the 21st century and in the case of Thailand. Principally, the hybrids between primary data and secondary data research methods as well as the good combinations between qualitative and quantitative research methods have also been applied throughout the research.

The following three subsections introduce various research methods and approaches that have been utilized in this research. These subsections are first, selecting and identifying research scopes; second, defining Thai product quality in the 21st century; and third, verifying the attribute dimensions and measuring Thai product quality.

4.1. Selecting and Identifying Research Scopes

To clarify the reasons why this research selected and focused on Thai product quality, particularly in the three product categories of electronics and IT product, automobile, and home appliance, the research applied secondary data research method of examining literature reviews, including regional, national, and provincial level in a variety of related determinants, the consumer culture, and behavior, as well as the market/industry and product characteristics to select and assess the right research scopes of the market and product selection and

identification.

By analyzing Thai market and Thai industry, many essential facts and important data, such as the characteristics and competitive advantage of Thai market/industry were revealed. For instance, in terms of market/industry performance, Thailand is considered to be one of the fastest growing markets in the region (Overseas Economic Cooperative Development [OECD], 2013). Many foreign direct investments (FDI) and world leading manufacturers take advantage of zero defect, high industry incentives, accessibility to global supply chain, and decide to operate their factories and manufacturing facilities in Thailand (BOI, 2009). Moreover, through exploring Thai consumer culture, behavior, and their bargaining power, the results could be a good evidence for the neighboring countries, especially in Southeast Asian countries, whose consumers share similar characteristics, trends, and tastes as Thai consumers (Shavitt, Lee, & Johnson, 2007). In addition, through studying and emphasizing on specific product categories, the results of the research aimed to diminish the limitations of previous studies.

Owing to the selecting, identifying, and assessing the right market with the right products, the definition and measurement of product quality from the Thai context are believed to be a good case study that is valid and applicable to many Asian product qualities.

4.2. Defining Thai Product Quality in the 21st Century

To determine the most up-to-date and the most appropriate definition of Thai product quality, the literature review from existing studies and interviews with the government officials, producers of a product, intermediate sellers, as well as questionnaire administration to Thai consumers in the three product categories were utilized as parts of secondary and primary sources of data.

By reviewing existing studies, it showed the timelines, trends, developments, and some obsolescence in the previous product quality definitions. As a result, the general understanding of product quality and its characteristics could be realized.

Moreover, by interviewing the government officials, producers of a product, and intermediate sellers and by administering a questionnaire with the consumers, the three perspectives from regulator/policy maker, market supplier, and consumers would generate many important ideas and reveal loopholes in determining Thai product quality definition.

For the interview, three governments officials who represent the central and local governments, four different product producers who manufacture products in the categories of electronics and IT product, automobile, and home appliance, and eleven intermediate sellers who are the sales agancies for these three product catagories, were interviewed about their opinions and thoughts regarding product quality issues. Some examples of interview questions are: "*In your opinion …*

- *What are the factors that influence customer's decision in buying a product?*
- *What is/are other factor(s) that can be used to evaluate product quality?*
- *What is your definition of product quality?*
- *What could be the differences in today's product quality and the next 5(10) years' product quality? and "Why do you think that?"*

The first two interview questions aimed to identify the possible set of product quality attribute dimensions that influence consumer buying decision. The latter two interview questions, meanwhile, aimed to identify the possible definition of Thai product quality.

For the questionnaire, approximately 500 Thai consumers who have different backgrounds were asked at the point of sale (POS) about their opinions and perceptions toward their understanding of product quality issues. Similar to the interview questions, the questionnaire applied comparable and identical set of questions with the interview. However to be more purposive, the questionnaire had supplemental questions to obtain the background of the respondents, such as gender, age, education, and monthly income, so that the results of these differences in demographic determinants would lead to discovering the distinctive effects on overall consumer buying decision and product quality attribute dimensions.

Based on the literature review, interviews, and questionnaires, the definition of Thai product quality in the 21st century could optimize and meet the requirements, expectations, needs and wants of the regulators, profit providers, and profit seekers.

4.3. Verifying the Attribute Dimensions and Measuring Thai Product Quality

To create a valid set of Thai product quality attribute dimensions, measure Thai product quality, and to test for validity, the statistical model derived from Tellis and Johnson's study in 2007 "The Value of Quality" was applied as model. Tellis and Johnson (2007) applied statistical test by converting product reviews into a score of 11-point scale (0-10) and transformed those product quality scores into their quality dimensions and made a statistics test in measuring product quality. In line with that, this research also assessed the product reviews and applied content analysis and regressed those scores through the statistical test. However, the previous seven quality/product quality attribute dimensions of Tellis and Johnson (2007) were re-defined into the new terms for better understanding, clarity, and appropriateness with the Thai context. These re-defined and proposed product quality attribute dimensions for measuring Thai product quality are "function", "ease of use", "reliability", "durability", "design", "eco-friendliness", and "customer satisfaction". The terms and definitions of the proposed product quality attribute dimensions were originally developed from the literature review. Each of these terms and definitions of the proposed product quality attribute dimensions

are clarified as follows:

Function	The ability, utility, and performance of a product compared to previous version or similar type of product, e.g., speed, intelligibility, technology, etc.
Ease of use	The charecter by which a product can be utilized by general consumer without any difficulties and problems.
Reliability	The property of a product being creditable, reliable, e.g., market recognition, brand awareness, safety, etc.
Durability	The ability of a product that is able to perform over a long period of time without technical error and physical breakdown.
Design	The total outlook and feature of a product, e.g., color, size, weight, etc.
Eco-friendliness	A product that is free from chemicals and is harmless to the environment, e.g., green material, recyclable, energy saving, carbon credit, related to green concept, etc.
Customer Satisfaction	The overall feeling and perception of a consumer on a product, compared to consumer's expectation and/or previous experience in using a similar brand product or from the same company.

Note that in Tellis and Johnson's study, the term "function" referred to "compatibility", "utility of secondary features" and "intrinsic performance", even as "durability" referred to "stability" The quality attribute dimensions "ease of use", "reliability" and "design" eventually used the same terms. On the other hand, the other two attribute dimensions of "eco-friendliness" and "customer

satisfaction" were the new terms particularly proposed for the Thai product quality attribute dimensions, the measurement, and its validity test.

In addition, as the results of interview with government officials, product producers, intermediate sellers, and questionairre responses of consumers, additional attribute dimensions would be added for measuring and evaluating Thai product quality.

Thus, in accordance with the research's model and the proposed product quality attribute dimensions, the null hypothesis for this research is:

Hypothesis H_0: *A composite measurement of Thai product quality obtained from public reviews of new launching product will bear no relationship to the underlying proposed Thai product quality attribute dimensions.*

If the null hypothesis were true, then the underlying Thai product quality attribute dimensions could not represent and be the determinants for Thai product quality in the 21st century. It might also be invalid for measuring product quality. However, if the null hypothesis tests to be false, the underlying Thai product quality attribute dimensions would become the most up-to-date and the most appropriate attribute dimensions in measuring today's Thai product quality. Thus, a challenging hypothesis against H_0 is:

Hypothesis H_0: *A composite measurement of Thai product quality obtained from*

public reviews of new launching product will have a positive relationship to the underlying proposed Thai product quality attribute dimensions.

To see the relationship between the overall product quality and the proposed product quality attribute dimensions and to measure and test for validity, the research applied an 11-point scale, rating from 0-10. Specifically, the research converted the reviews of new product from the Thai public reviews into a score on an 11-point scale of the relevant attribute dimensions. Similar to Tellis and Johnson's study, for those reviews that do not mention the proposed attribute dimensions, the research substituted a value at the average scale of 5 to avoid many 0s. Then, the research regressed the product quality score on the proposed product quality dimensions into the following model:

$$\text{Product Quality}_i = \gamma_0 + \gamma_f \text{ Function}_i + \gamma_{ea} \text{ Ease-of-use}_i + \gamma_r \text{ Reliability}_i + \gamma_{du} \text{ Durability}_i + \gamma_{de} \text{ Design}_i + \gamma_{eco} \text{ Eco-friendly}_i + \gamma_c \text{ Customer satisfaction}_i + \gamma_x \text{ XXX}_i + \gamma_y \text{ YYY}_i + \gamma_z \text{ ZZZ}_i + \mu_i$$

Where the γs are coefficients to be estimated for each of the corresponding attribute dimensions of product quality, while the μ_is are error terms initially assumed to identically and independently follow a normal distribution, and XXX, YYY, and ZZZ are the additional attribute dimensions resulting from the interview and questionnaire.

Furthermore, for the context of the sample and sample size, the research assessed 86 product quality reviews from the nation's three most well-known public sources in three different product categories of electronics and IT product, automobile, and home appliance: 38 reviews are the new electronics and IT products (mobile phone, laptop, and tablet); 30 reviews, new model of cars; and 18 reviews, new home appliance products (television, refrigerator, washing machine, and air conditioner). The research assessed these three sample groups for the same period of time, from January 2011 to December 2012. Rationally, these three sample groups of electronics/IT product, automobile, and home appliance significantly represented three different phases of useful product lifecycle: short lifecycle product, medium lifecycle product, and long lifecycle product.

Therefore, with reliable sources and wider ranges of product categories, the results of this statistical test would indicate whether or not the proposed product quality attribute dimensions are the valid attribute dimensions that could be used in measuring and evaluating product quality, particularly in the case of Thailand.

5. Significance of the Research

There are many factors that influence effective product quality development, but one of the biggest factors in product failure is the poor product (quality) definition (Mello, 2003). Product (quality) definition, in turn, directly links to the company's ability to discover and synchronize its own core competencies, the product

characteristics (attribute dimensions), and the market and consumer's requirements and expectations. The company often fails to define and evaluate its own product and could not deliver or could not even convince the consumer to buy.

The results of this research are expected to be significant in three major areas. First, the research would generate a more up-to-date product quality definition in the 21st century, particularly in the case of Thailand. With a more up-to-date product quality definition, it would certainly benefit all the sectors: the regulator, producer of a product, intermediate seller, as well as consumer or user. It would guide and assist all the sectors to understand the product quality definition and its condition in the parallel direction. In addition, it would pave way for a new product to develop in the best direction and condition. For example, the regulator could ensure that the market supplier, in other words, producer of a product and intermediate seller, would perform accordingly to the requirement. The producer and seller would benefit from its efficient performance because it is assured that the product is of high quality. In turn, the consumer or the user would finally be satisfied and delighted in consuming the new product. Second, the research would propose new and valid product quality attribute dimensions, which radically contribute to more accurate outcomes in measuring and evaluating today's Thai product quality. Furthermore, this would also extend the results of previous studies and diminish the prior limitation of a tool for measure applicable only to electronics and software products. Hence, the proposed composite product quality

attribute dimensions would be seen to be more valid and could apply and measure product quality in many and across product categories. Third, the research would project the results to relatively benefit many neighboring Southeast Asian countries, whose market, product, and consumer have similar and comparable characteristics in defining and measuring their own product quality.

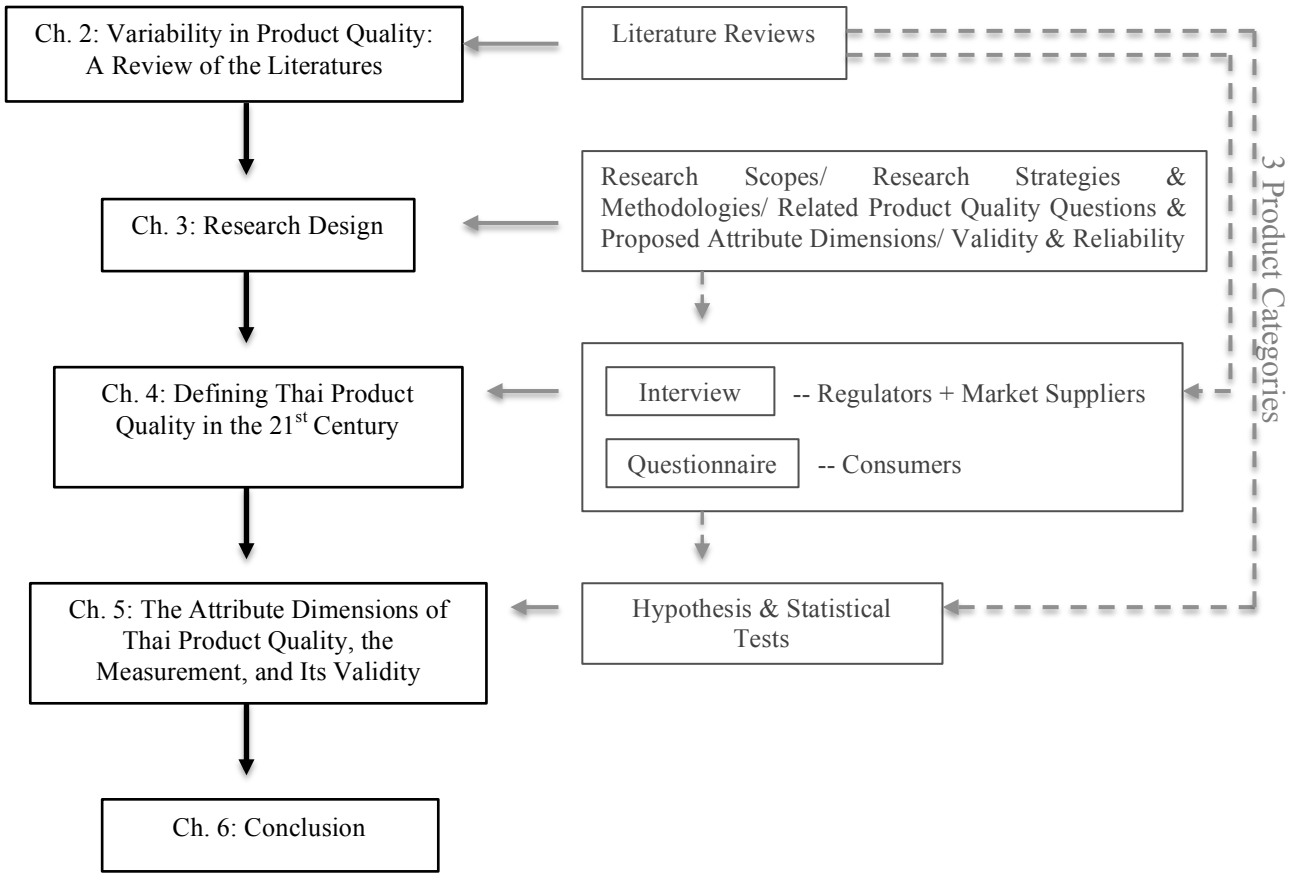
Overall, *"The Attributes of Product Quality: An Analyis of Thai Product Quality"* would create more precise and up-to-date definition and more valid attribute dimensions of Thai product quality, which the manager, producer of a product, intermediate seller, marketer, consumer, as well as philosopher and regulator, could use as a guideline in understanding and evaluating product quality in the 21st century, not limited to Thai product quality only.

6. Organization of the Research

This research focuses on the precise and more up-to-date definition, attribute dimensions, and measurement of Thai product quality, specifically in the 21st century. To learn from the previous studies, in the next chapter, the research first reviewed the variability of product quality literature in which other researchers and scholars have been defining and crediting, and establishing measures for evaluating product quality so far. Learning from that, Chapter 3 presented the design of this research, including the research scopes of market and product selection and identification, the research strategies and methodologies, the interview and questionnaire questions on Thai product quality and the initially

proposed Thai product quality attribute dimensions, as well as the validity and reliability of this research. Then Chapter 4 presented an exclusive analysis and the results of interview and questionnaire with the four sectors: government officials, producers of a product, intermediate sellers, and consumers about their opinions and thoughts regarding Thai product quality's definition. Moreover in Chapter 5, the research proposed a composite product quality attribute dimensions and tested for validity through measuring the three product quality categories of electronics and IT product, automobile, and home appliance. Finally, Chapter 6 highlighted all the findings, limitations, prospect for future study, and made the final conclusion for "The Attributes of Product Quality: An Analyis of Thai Product Quality." Figure 1.1 presents an overview of the research structure.

Figure 1.1: Research structure



CHAPTER 2: VARIABILITY IN PRODUCT QUALITY: A REVIEW OF THE LITERATURE

In this chapter, the author highlights and gives a review on *what*, *when*, *why*, and *how* of product quality relative concepts based on the previous outcomes of empirical studies. First, "*What is product quality?"* - the varying definitions of product quality from philosophy, economics, marketing, and operational management perspectives are discussed. With questions *"When product quality is brought into light?* and *"Why understanding product quality is important?"* the research explores the competitive advantage and the preceding experiential significance of product quality, such as superior product quality leads to better performances, positive returns, increase number of customer loyalty and so on. In addition, with *"How the markets and other researchers have been measuring product quality so far?"* and *"How product quality has been constructed on multi-attribute dimensions?"* the research also extends and further addresses these issues. Last but not least, an interrelated subject of the differences of consumer preferences in evaluating product quality is additionally reviewed in this chapter.

1. Introduction

As global markets have been growing and rapidly emerging, existing markets increasingly develop along the globalization process and move towards the so-called global product standard. For market efficiency and effectiveness, where maximum opportunities exist to both sellers and buyers at minimum cost, information must be collected on the buying behavior of consumers as they may

have different values and use diverse methods for product quality evaluation. This issue has recently attracted the attention of many researchers from various disciplines. While the concept of product quality has become a well-liked topic among researchers and business practitioners in recent years, only a few research have touched on the attribute dimensions of product quality that directly have an affect on consumers' buying decisions (Avery & Zabel, 1997).

Before proceeding to the significance, attribute dimensions and measurements of product quality, this section would give empirical reviews on the root of each term, the relative definition of product, quality, and product quality.

2. Tracing Product Quality Definition

2.1. What is Product?

In a market led by mass production and consumption, most people seem to have a clear image in mind when referring to a "product". However, when questioned about the definition or a short explanation of product, most of the time people hesitate and could not give an answer right away. So, what does product really mean?

According to business dictionary, in general, a product is first referred to as "goods, idea, method, information, object, or service created as a result of a process and served a need or satisfied a want. It has a combination of tangible and intangible attributes, such as benefits, features, functions, and usages, which a

seller offers a buyer for purchase." Second, a product defined by law denotes "a commercially distributed goods that is: (a) tangible personal property; (b) output or result of fabrication, manufacturing, or production process; and (c) passes through a distribution channel before being consumed or used." Third, a product in marketing is commonly referred to "goods or service that most closely meets the requirements of a particular market and yields enough profit to justify its continued existence". For example, as long as cars are still in need by the markets, companies such as Toyota, Mercedes, and BMW which produce cars and supply auto parts, will enjoy their roles in filling the needs in the market and continue gaining profit.

Moreover to simplify what a product is, Kotler, Armstrong, Brown and Adam (2006) defined it in relation to marketing as "anything that can be offered to a market that might satisfy a need or want." Furthermore, a product has been accorded various meanings in different fields. For instance, in retailing, a product is called merchandise, while in manufacturing, a product is bought as raw material and sold as finished goods. In project management, a product is the formal definition of the project deliverable that creates and contributes to fulfill the objectives of the project, whereas in a special field like insurance, insurance policies are considered to be a product offered for sale by the company. In economics and commerce, a product refers to a broader category of goods and commodities (Encyclopedia, 2013).

In addition, many researchers also defined a product variedly but in somewhat related contexts. The study by Chamberlin in 1953 explained a product as “an economic variable”, of which custom, standard, and profit maximization are the three main determinants. Correspondingly, several marketing studies in the following period also regarded product as “marketing invention”, which arises when a product is created at the onset of new technology and intersects with perceived market opportunity. Likewise, Maynes (1976) defined product as “the set of goods, which assuming perfect information regarding their characteristics and money prices, would in the consumer’s judgment serve the same general purpose for some maximum outlay.”

The definition of product has continued to be rehashed in various terms, but in general, a product is often described as an object, service, or even digital/software from which consumer gets direct utility with additional benefits from the product’s attributes, such as services and perceptions, that make the product useful, desirable, and convenient.

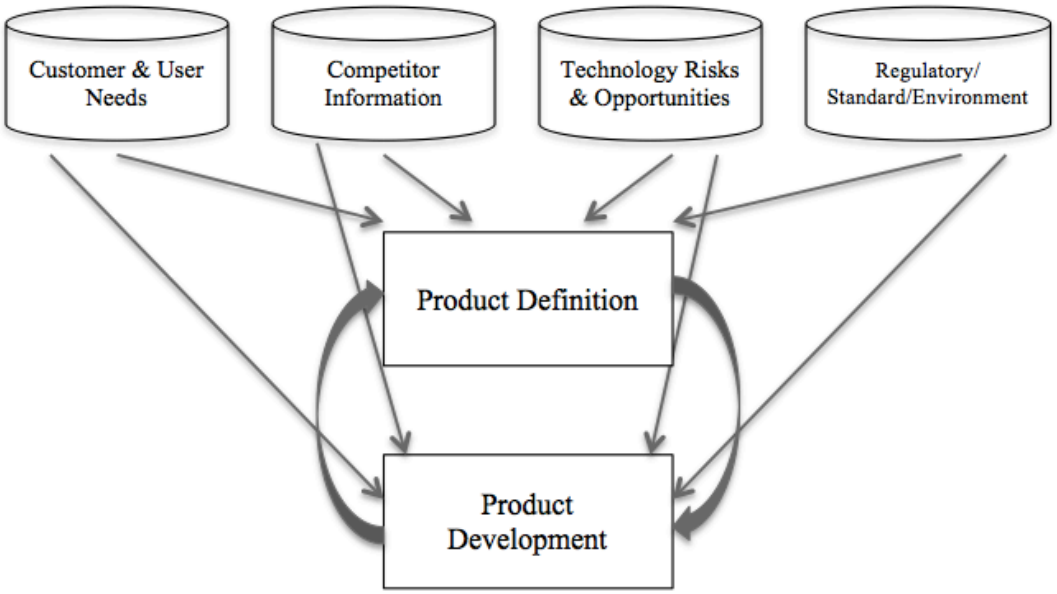
At this point, the word product and service have been repeated many times. In fact these two terms are closely aligned, such that product has an element of service inherent in its definition. Imagine when ordering a pizza, for example, there always comes a bundle of service benefits and offers, including free drink, free delivery, or discount coupon for the next order. These kinds of service are additional to the tangible components of the pizza and it makes added value.

There are substantial differences between product and service, like product is mostly tangible and could be inspected before purchase, and service, on the other hand, is the production of an essentially intangible benefit, which always comes in a form of experience. Product is concrete, while service is an activity or process; or product is homogeneous which could be standardized, while service is heterogeneous and mostly customized. Product can be stored, whereas it is very difficult or impossible to store service (Meghanabhadauria, 2007). Nowadays, these two terms are wisely used and interconnected, mainly because the market is driven towards integration and the consumer expects to see service as a complement or added value of a product.

Thus far, the product definition has long been set in many dimensions and broadly used in many disciplines. A creation of product definition also involves various assessments, such as customer and user needs, competitor offerings, technological risks and opportunities, and the regulatory environment in which the product will be delivered. The study by Bacon, Glenn, Beckman, Mower, and Wilson in 1994 showed that the creation of a robust product definition typically requires information and feedback from a number of corporate and divisional functions, including engineering, research and development, marketing, quality function deployment (QFD), and manufacturing. Success in identifying a decent product definition would result to a good guideline on the design, prospective product features, functions, markets, and prior establishment of its competitive advantage.

Figure 2.1 demonstrates the basic creation and the subsequent management of a product definition within the product development cycle.

Figure 2.1: Product definition process



Source: Bacon et al., 1994. Managing Product Definition in High-Technology Industries: A Pilot Study. *California Management Review*, Spring, 32-56.

As product definition process is a multidivisional looping process that involves many activities, to come up with the ultimate output of product definition, conventionally there are many factors involved such as strategic alignment, use of a priority criteria list, selection of market channel, project resources, and so on. (Wilson, 1990) and indeed, this is also an ongoing process (see Appendix I for product definition activities diagram).

There have been a variety definitions of product and delivering the right one is a

vital process to business success (Kalyanaram & Krishnan, 1997). However, changes in customer needs, competitive offerings, available technology, regulatory standards, as well as market environment, always evolve after the establishment of the initial product definition. This has been a complexity of the product definition activity and a burden for the product development team in monitoring these parameters, keeping up with the transformations, and making adjustments as needed in time for the product definition and specifications. There have also been numerous important product relative concepts, such as product design, product pricing, product differentiation, and product positioning that will be implemented in the subsequent step of product development process.

2.2. What is Quality?

Back in the 1950s, only one third of the U.S. Navy's electronic devices worked properly (Garvin, 1987). A consequent study by the Rand Corporation estimated that every vacuum tube out of 10 the military used or ordered needed to be sent back for repair. This kind of stress was then challenged by reliability engineering, which later on was addressed as a quality problem. But what is quality?

In 1951, Joseph Juran tackled this question in the first edition of "Quality Control Handbook", a publication that since then has been quality's bible for quality management and engineering. In his book, Juran observed that quality could be understood in terms of "avoidable and unavoidable costs", where the former resulted from defects and product failures like scrapped materials or labor hours

required for rework, repair, and complaint processing, whereas the latter were associated with prevention, i.e., inspection, sampling, sorting, and other quality control initiatives (Juran, 1951, 1974; Juran & Gryna, 1988; Juran, Seder & Gryna, 1982).

Furthermore, quality may be described as the characteristics of a product or service that can contribute to the fulfillment of stated or implied customer needs and wants (Garvin, 1984**,** 1988; Pirsig, 1974; Reeves & Bednar, 1994). This statement was supported by Oakland and Porter (2003), which in their study revealed that quality started with understanding customer needs and ended when those needs are satisfied. Quality also referred to "conformance to requirements" (Crosby, 1979), or "the degree of excellence at an acceptable price and the control of variability at an acceptable cost" (Broh, 1982).

Over the years, quality has been defined in various terms and there have been arguments over quality definitions. However in 1984, Garvin's study identified the five major approaches that can be used in defining quality, and these are the transcendent approach of philosophy, the product based approach of economics, the user-based approach of economics, marketing, and operations management, the manufacturing based, and value based approaches of operations management. The following table presents some examples of quality definition approaches.

Table 2.1: Quality's definitions in Garvin's five approaches

I. Transcendent definition:
- "Quality is neither mind nor matter, but a third entity independent of the two… even though quality cannot be defined, you know what it is" (Pirsig, 1974)
- "… a condition of excellence implying fine quality as distant from poor quality… Quality is achieving or reaching for the highest standards as against being satisfied with the sloppy or fraudulent." (Tuchman, 1980)
II. Product-based definition:
- "Differences in quality amount to differences in the quantity of some desired ingredient or attribute." (Abbott, 1955)
- "Quality refers to the amounts of the unpriced attributes contained in each unit of the priced attribute." (Leffler, 1982)
III. User-based definition:
- "Quality consists of the capacity to satisfy wants…" (Edwards, 1968)
- "Quality is the degree to which a specific product satisfies the wants of a specific consumer." (Gilmore, 1974)
- "Quality is any aspect of a product, including the services included in the contract of sales, which influences the demand curve." (Dorfman & Steiner, 1954)
- "In the final analysis of the market place, the quality of a product depends on how well it fits patterns of consumer preferences." (Kuehn & Day, 1962)
- "Quality consists of the extent to which a specimen (a product brand model seller combination) possesses the service characteristics you desire." (Maynes, 1976)
- "Quality is fitness for use." (Juran, 1988)
IV. Manufacturing-based definition:
- "Quality (means) conformance to requirements." (Crosby, 1979)
- "Quality is the degree to which a specific product conforms to a design or specification." (Gilmore, 1974)

V. Value-based definition:

- "Quality is the degree of excellence at an acceptable price and the control of variability at an acceptable cost," (Broh, 1982)
- "Quality means best for certain customer conditions. These conditions are (a) the actual use and (b) the selling price of the product." (Feigenbaum, 1961, 1983)

Source: Garvin, D. A. 1984. What Does Product Quality Really Mean? *Sloan Management Review*, Fall, 26.

To further clarify the five definitions or approaches of quality, let us start with the first approach of the transcendent. According to the original transcendent view, quality is synonymous with innate excellence (Pirsig, 1974; Tuchman, 1980). It is both absolute and universally recognized, a mark of uncompromising standards and high achievement. However, there are opponents of this view who claim that quality is a complex subject and cannot be defined precisely; it is a multifaceted and un-analyzable property that could be learned and recognized only through experience. This kind of challenge directly gets an influence from Plato's famous discussion of beauty (Buchanen, 1948; Dickie, 1971). In essence, he argued that beauty is one of the platonic forms, which therefore, a definite beauty cannot be defined. Similarly to such definition of beauty, quality perhaps could be understood and realized only after one is exposed to a succession of real characteristics of an object.

Meanwhile in the product-based approach, the definitions of quality are quite different from the previous approach. In this view, the economists and engineers

define quality as a precise and measurable variable, differences of which lie in the quantity of some ingredients or attributes possessed by a product (Abbott, 1955; Grilliches, 1971; Lancaster, 1971; Leffler, 1982). This kind of approach leads to an extreme of vertical or hierarchical dimension of quality, therefore, products or goods could be ranked according to the amount of the desired attribute that these possess. However, an unambiguous ranking is possible, only if under the supposition that the attributes in question are considered to be preferable by the majority of all buyers (Lancaster, 1979).

In the user-based approach, the quality definition starts from the basis that quality lies variedly in the eyes of the beholder. It simply means that every individual consumer is assumed to have different preferences in needs and wants, and those goods that best satisfy those needs and wants are the ones regarded as having the highest quality (Edwards, 1968; Kuehn & Day, 1962). According to marketing literature, this statement has led to the notion of an ideal point, which is a set of precise combinations of product attributes expected to provide the greatest satisfaction to a specified consumer (Johnson, 1971; Kotler, 1971; Ratchford, 1975). In addition and related to the economics literature, the user-based approach could be explained by a shift in a product's demand curve (Chamberlin, 1953; Dorfman & Steiner, 1954; White, 1972). Likewise, the renowned concept of "fitness for use" (Juran, 1974) in the operations management literature is also another good reference. However, each of these concepts faces two problems. The first one is how virtually quality could be aggregated under the varying

differences in individual preferences, and the second is how consistently quality could be distinguished if there are variances in product attributes. Although there are several controversies under this approach, still the user-based quality definitions are often utilized among marketers.

The manufacturing-based approach emphasizes the supply side of the equation, in contrast to the user-based definition which focuses on demand. Based on the manufacturing approach, quality frequently identifies as "conformance to requirements" (Crosby, 1979). Once the required specifications have been established, deviation in any of these implies a reduction in the quality level. Being able to meet the specifications, on the contrary, implies excellence in quality. By applying the definition of quality in manufacturing-based approach, it simplifies many manufacturing and engineering tasks that led to an improvement in production control. Improving in quality is equivalent to reducing the number of deviations and ending in cost reduction (Feigenbaum, 1961; Juran & Gryna, 1980).

The value-based approach, in this final definition, actually define quality in terms of costs and prices. Conferring to this point, the study by Broh (1982) and Feigenbaum (1961) publicized that a quality product is one that provides performance at an acceptable price or conformance at an acceptable cost. In relation to this, a survey on consumer perceptions of 28 product quality categories done by the Consumer Network, Inc. suggested that the value-based view is becoming more predominant, where the consumer identified more on benefits and

costs, even as they saw ingredients and materials as the key to quality indicators in many product categories. As a result, the consumer increasingly evaluates and perceives quality towards a relationship with price. Quality, as being equal to value, is likely to be a measurement of (product/ service) excellence.

Hence far, quality has been defined variedly and has become synonymous to excellence, precision, satisfaction, compliance, and cost control throughout these recent years. As a consequence of excessive focusing on internal capability and execution, quality has chiefly developed as an operational tool for control and improvement in the materials and information supply chains. Many related and technical concepts of quality, such as perceived quality, reviewed quality, quality control, quality of design, quality of conformance and so on also play crucial roles in shifting strategic management, helping to deliver ahead of agenda, and speeding up the learning curve to realize higher performance. Therefore, understanding these changing roles and perceptions of quality are, in fact, very important for every organization.

2.3. What is Product Quality?

Designing and introducing a new product into the market requires identification of the product's key benefits to the consumer. These include the determination of product quality attributes that are based on customer needs, the definition of product quality's functions and specifications, and the realization of the product quality in a form that meets those specifications and fulfills those benefits for higher returns (Urban & Hauser 1993). However, the terms and concepts at the

functional and technical levels for a product quality definition so far have attracted little research to date.

As prior sections of this chapter have been introducing and reviewing, the variability of product and quality definitions, there seems to be affiliated relationships of and significance to these two terms.

Combining the varying "product" definitions and "quality" definitions together delivers the fundamental roots of "product quality" definitions. As an affiliated concept, product quality can be defined as the tangible and intangible attributes of a goods or service that create and perform "excellence" (Pirsig, 1974; Tuchman, 1980), "value" (Abbott, 1955; Feigenbaum, 1951), "conformance to specifications" (Gilmore, 1974; Levitt, 1972)/ "conformance to requirements" (Crosby, 1979), "fitness for use" (Juran, 1974, 1988), "loss avoidance" (Taguchi, 1995), as well as "serve a need or satisfy a want of a holder" (Gronroos, 1990; Parasuraman, Zeithaml, & Berry, 1985). Regardless of the time or context in which product quality is examined, the product quality concept has several and multiple definitions, which have been applied to describe a wide variety of phenomena.

To start with, product quality is equivalent to "excellence", a definition initially connoted by Plato, Aristotle, and many Greek philosophers. Back in ancient times, the ideal of the Greeks was considered an object/substance as *arête,* which means excellence. Originally, the definition of *arête* is also varied by its context. For

instance, for a racehorse, *arête* referred to speed; for a cart, *arête* meant strength; and for a man, *arête* connoted excellence in the ways a man can be outstanding, such as morally, intellectually, physically, and practically (Kitto, 1951).

However, the practice of defining product quality as excellence was called into question during the mid-17th century when Western businessmen began to target a wider market and expanded their businesses for commercial goods. At that time, product quality started to be defined as "value" with the belief that "the consumer was the ultimate arbiter of trade, and that business flourished by serving consumer interests rather than guild interests. . . the market was the final judge" (Johnson, 1988, p. 286). In addition, Feigenbaum (1951), who has well and long been famous for total quality control, supported this view in his study; he supposed that the notion of value had to be included in any (product) quality definition. Feigenbaum also reinforced that (product) quality does not have the popular meaning of the "best" in any absolute sense, rather a quality (product) means "best for certain customer condition", under which context the conditions are: (a) the actual use, and (b) the selling price of the product. However, product quality cannot be separated from product cost.

Another definition of product quality refers to "conformance to specifications." The contents in Shewhart's "Economic Control of Quality of Manufactured Product" provided a good foundation for many of today's product quality principles, particularly product quality viewed as "conformance to specifications".

According to Shewhart (1931), we must define quality of product in such a way that the numerical measure of this quality serves the following two purposes: first, to make it possible for one to see whether or not the quality of a product for a given period of time differs from that for some other period taken as a basis for comparison; and second, to make the comparison of quality of product possible for two or more periods of time in order to determine whether or not the differences are greater than the one that could be left for. Technically, subjective product quality is important, in which standards should be established and performances should be quantitatively. Owing to that, the tasks for the manufacturing and engineering for "conformance to specifications" are to translate consumer wants into the physical characteristics of the product and to set up ways and means of obtaining product quality which will differ from the arbitrarily set standards for these quality characteristics by no more than that could be left for chance (Shewhart, 1931). This definition of product quality as "conformance to specifications" led to the development and the use of process utilized specifically by the suppliers.

Product quality that is "fitness for use" would optimize in "meeting and satisfying the user's needs and wants" (Juran, 1974, 1988; Gilmore, 1974). In 1974, Juran introduced a broadly used definition of (product) quality, "fitness for use", which he described as the extent to which the quality characteristics of a product successfully serve the purposes of the users (p. 2). Moreover, as the definition of product quality increasingly received the important role and grew out of its

original scope toward the services marketing and the consumer-based (Lovelock, 1981; Normann, 1984; Shostack, 1977; Zeithaml, 1981), Juran added that component to the definition of product quality as a product or service that meets and/or exceeds customer's expectations for a related and extended version to reflect the change (Buzzell & Gale, 1987; Gronroos, 1990; Zeithaml, Parasuraman, & Berry, 1990). Going along with Juran's definition, Feigenbaum in the first edition of "Total Quality Control", similarly defined (product) quality as "best for certain customer conditions" which included the end use and of course the price (Feigenbaum, 1951, p. 10). In his second edition, Feigenbaum repeated the best for certain customer conditions definition but added that product quality can be defined as "the composite of product characteristics of engineering and manufacturing that determines the degree to which the product in use will meet the expectations of the customer" (Feigenbaum, 1961, p. 13). In his third edition, Feigenbaum (1983) explicitly recognized the importance of services and added these to the product quality definition. After many years of studies, Feigenbaum finally concluded and emphasized that "product and service quality can be defined as the total composite product and service characteristics of marketing, engineering, manufacturing, and maintenance through which the product and service in use will meet the expectations of the customer" (Feigenbaum, 1983, p. 7). Nowadays, these two comparable product quality definitions have established the standards practiced by many industries, including in the economics.

The definition of product quality in the economics is a good integration of the aforementioned definitions, which refers to "the characteristics of a product or service that satisfy the consumer's needs and wants in exchange for monetary considerations" (Economic Glossary, n.d.). If the consumer is satisfied with what he/she had under a fair exchange for a paid price, then the quality of that product or service is considered to be acceptable. This kind of perception of high quality product/service, which meets the satisfaction or above expectation, could help the firm create high brand loyalty as well as brand equity. For example, when customers make a subsequent purchase of Tag Heuer due to the exceptional performance of the watch or service, this could be a result of high level of the product, which helped create its high-end brand image and fostered brand loyalty.

Aside from that, product quality may be assessed for either "a variety of a product/service combination, when the characteristics of a seller are also taken into account and for a specimen" as well (Maynes, 1976). In Maynes' study "Concept and Measurement of Product Quality", product quality of a specimen was defined as "the subjectively weighted average of characteristics", while the characteristics were, in turn, defined as the "services giving rise to utility", which include safety, durability, and beauty. Comparable to Maynes' product quality concept, Adelman and Grilliches (1961) proposed that the quality of a commodity (goods/service) be regarded as "a composite of different characteristics." However, their concept of characteristics could be compared to the analogy of Lancaster's theory of consumer demand (Lancaster, 1966, 1971), in which the

characteristics are based on two propositions: (a) all goods possess objective characteristics relevant to the choice which people make among different collections of goods, and the relationship between goods and the characteristics which it possesses essentially a technical relationship, depending on the objective characteristics of the goods; (b) individuals differ in their reaction to different characteristics, rather than in their assessments of the characteristics… and it is these characteristics in which consumers are interested… the various characteristics can be viewed… as each helping to satisfy some kind of "want".

In addition, product quality was also defined in very related terms as "a function of underlying dimensions that characterize the product" (Curry & Fauld, 1986; Kopalle & Hoffman, 1992), and "a composite of attributes of which all consumers prefer more or less" (Tellis & Johnson, 2007). Examples of such attributes are ease of use, reliability, speed, high resolution, and so on. Several studies in marketing have used such definitions in determining product quality (e.g., Archibald, Haulman, & Moody, 1983; Ratchford, 1980; Tellis & Wernerfelt, 1987).

Overall, product quality has been defined in many ways and applied in many disciplines. However, there are useful points and limitations of each product quality definition in relation to measurement and generalizability, managerial usefulness, and perception of relevance. For example, an automobile's product quality definition based on manufacturing perspective may refer to one that has no

defects and works exactly as the manufacturer expects. Such a definition would fit with "conformance to specifications" by Gilmore (1974) and Levitt (1972) or "conformance to requirements" defined by Crosby (1979), but still there are some drawbacks in these definitions from a consumer point of view. These might not satisfy in terms of economic value, or might not meet consumer's needs and wants.

As the term "product" and "quality" mean differently in different contexts, consequently, the definition of "product quality" would also vary for different people. Therefore, to identify a widely-used definition of product quality is an ongoing effort, and its definition should be carefully written in detail for specific product (category) that could be validly used and applied across diverse phenomena.

3. When and Why is Product Quality Important?

During the 1950s, the role of product quality began to appear in economics theory. Abbott (1955) argued that by solely focusing on price competition, the economists and the firms seem to ignore quality, a critical component of a consumer's decision processes. However, in order to be competitive in an open market, considering both price and quality, are decisively essential. Indeed, when price tags are attached to the designs of product or service, only the best offer at the best bargain would typically win. How good that offer or bargain is largely depends on the conditions of both price and quality, and for a competitive

determination, these two elements should compound together for better evaluation and advantage over other opponents in the marketplace (Abbott, 1955). Agreeing with Abbott's view, Feigenbaum also asserted that the differences in levels of price, quality, as well as value, are important influences on a consumer's decision. Only when the differences in product/service quality could be eliminated by revolution of standardization, the cheapest and the best in value for that particular period of time might have the utmost effect on consumer's decision; so far, this is very difficult and still idealistic. Product/service quality has long played a significant role in consumer's decision and the importance of quality product or quality service in today's business is manifestly paramount (Russell & Taylor, 1995).

In later years, when the strategic aspects of quality were broadly recognized in the 1970s and 1980s, most of the top managers in different industries began to link quality to the firms' performance and included any related quality notions, such as product quality, service quality, quality control, and so on, in a strategic planning process as a means to sustain and enhance business competitive advantage. Such competitive advantage could be regarded as higher performance, positive market share, better return on investment (ROI), progress in growth and profitability (Buzzell & Gale, 1987; Phillips et al., 1983; Schoeffler, Buzzell, & Heany, 1974). According to this, quality, especially product/service quality, is still and will continue to be the most important factor in the success of products and the market performance of competing goods, including brands (Tellis & Golder, 2001).

Nevertheless, it appears that many firms systematically undervalued the importance and significance of product/service quality (Tellis & Johnson, 2007).

Many research conducted in economics, marketing, consumer behavior, and management indicated that superior product/service quality leads to higher performance (Metrick & Zeckhauser, 1998; Shaked & Sutton, 1983; Sutton, 1986), particularly the studies in marketing which showed that composite attributions of many product quality categories exert a significant positive influence on market share (Buzzell & Wiersema, 1981; Jacobson & Aaker, 1987; Kordupleski, Rust, & Zahorik, 1993; Phillips et al., 1983), positive relationship with higher return on investment (ROI) (Buzzell, Gale, & Sultan, 1975; Phillips et al., 1983), as well as positive correlation with price (Phillips et al., 1983; Tellis & Wernerfelt, 1987). In addition, superior product/service quality also positively stimulates growth, affects innovativeness that drive profitability, and ultimately results in higher market value (Cho & Pucik, 2005).

Kroll et al. (1999) conjectured that product quality positively enhances competitive advantage, increases returns, but inversely reduces variance in returns. Their study "Contribution of Product Quality to Competitive Advantage: Impacts on Systematic Variance and Unexpected Variance in Returns" showed evidence that a positive relationship could be predicted between relative product quality and relative market share, and between relative product quality and returns. However, this relative product quality could be expected to indirectly lower the

variance in returns, but conversely enhance the returns through the link among product quality, market share, and direct costs. Referring to that, superior product quality may reinforce relative market share and returns but may lower both of the risk components. These risk components, according to Kroll et al. (1999) are systematic risks that vary with macroeconomic forces and unsystematic risks that vary with firms' and industries' specific factors. Furthermore, a better product quality may also indirectly enhance returns and lower risks through the link among product quality, market share, and direct costs, and the consequences of a product quality systematic risk linkage, including systematic variance in returns, may be significant, especially for business owners as well as other stakeholders. In addition, the results of their findings also showed that lower levels of variance in returns tend to reduce systematic risks of the firm's cost of capital, even as these drive up the stock price, which in turn benefit the firm by better performance, if all other things are being considered equal (see Appendix II for the results of the structural equations model of the relationships among product quality, market share, direct costs, returns, and risk). Moreover, their results further asserted that many customer-oriented firms with superior product quality not only realize important competitive advantage and expand the returns, but also better uplift the firms' performance, secure the market and protect against the threat of rivals in any uncertainty changes in macroeconomic environment. More specifically, competitive advantage based on superior product quality tend to increase customer loyalty and decrease firms' vulnerability to the aggressive price war. A business unit's capability to capture customer loyalty during economic

regression can be considered as one key to success. Repeat business may contribute to earnings maintenance, and loyal customers may cost much less to serve than new customers. Likewise, a small percentage in customer retention can make a difference in a firm's cost reduction (Reichheld & Sasser, 1990**;** Rust et al., 1995).

Moreover, empirical studies which applied the Profit Impact of Marketing Strategies (PIMS) database approach additionally confirmed this strong positive relationship between product quality and profitability: a high quality product has been proven to generate a higher return on investment (ROI) for any given market share (Philips et al., 1983; Schoeffler et al., 1974). For instance, in the study by Schoeffler et al. (1974) of inferior product quality through the PIMS approach, the result yielded a return of an average of 4.5 percent for ROI, while the result for moderate product quality yielded a higher return on an average of 10.4 percent for ROI. For those superior in product quality, the result yielded the highest return with an average of 17.4 percent for ROI. This kind of product quality improvement, besides increases in ROI, also leads to aggregate in market share, cost savings, and further gain in profitability (Buzzell & Wiersema, 1981; Phillips et al., 1983).

Figure 2.2 below shows the relationship between product quality and profitability in two alternatives, in which the improvements in product quality prospectively lead to higher profitability. The first route is through the market: the

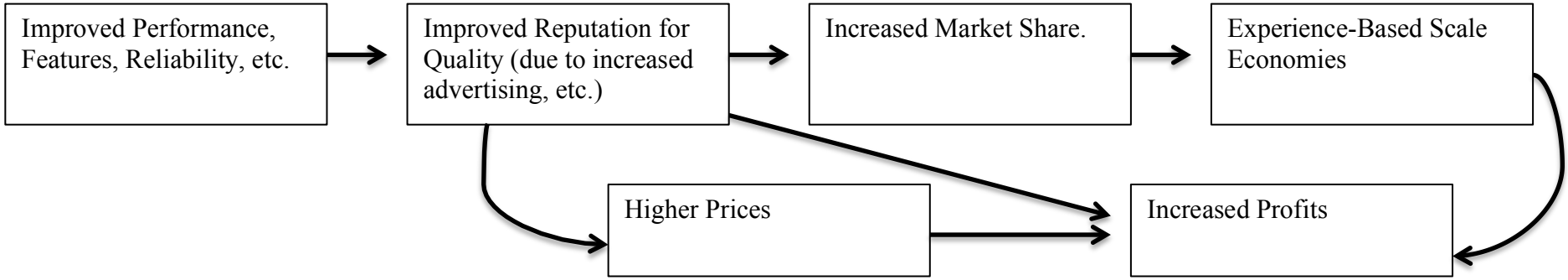
improvements in performance, features, or other dimensions of product quality lead to the improvement in product quality reputation, that subsequently results in increase in sales, larger market shares, or otherwise lead to less elastic demand and higher prices, and if the cost of achieving these gains is outweighed by the increase in these contributions, the initial improvement in product quality finally results in higher profitability. Comparably to that, the second route of this relationship, the improvement in reliability or conformance of product quality may also affect profitability through the cost side: fewer defects or field failures result in lower manufacturing and service costs. As long as these gains exceed any increase in expenditures on defect prevention, profitability predictably to be remained (Chamberlin, 1953; Dorfman & Steiner, 1954).

Moreover, other experimental studies by Chaney et al. in 1991, and Tellis and Johnson in 2007, also supported that the differences in levels of product quality may affect the differences in degree of abnormal returns and this depends on the firm's sizes as well: inferior product quality appeared to lead to more negative abnormal returns for large firms than for small firms, whereas superior product quality appeared to lead to more positive abnormal returns for small firms than large firms. More precisely, Chaney et al. (1991) found that cumulative abnormal returns for all studied reviews of new products were on an average of 0.82 percent one day after its official launching announcement in the Wall Street Journal. However, five days after the reviews appeared in the Wall Street Journal, firms with poor product quality reviews suffered a drop in ACAR (Average Cumulative

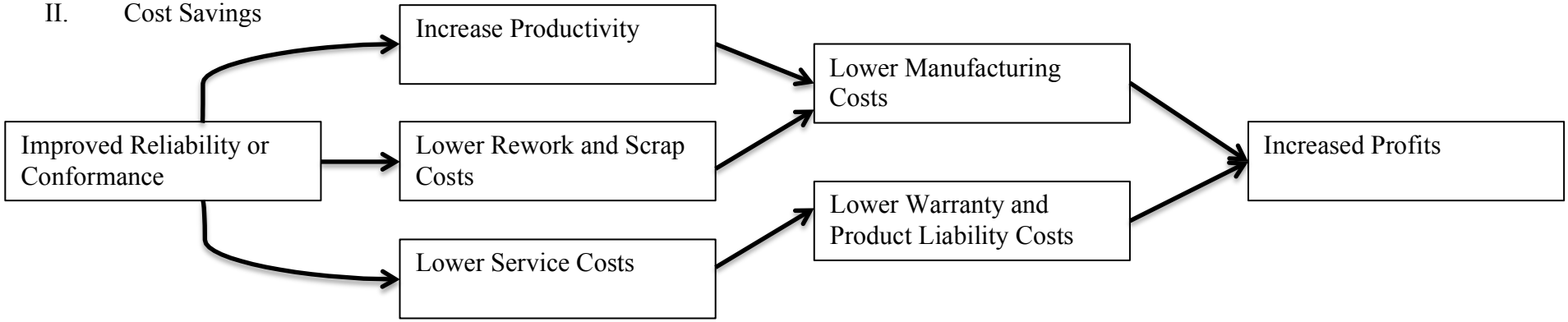
Abnormal Return) of about 5 percent, while firms with good product quality reviews in contrast enjoyed a gain of about 10 percent over these same periods of time. Hence, there seemed to be incentives for good product quality and penalties for poor product quality, and the sizes of incentives were several times greater than that of the penalties on an average of new product announcements.

Figure 2.2: Product quality and profitability relations

I. Market Gains



II. Cost Savings



Source: Garvin, D. A. 1984. What Does Product Quality Really Mean?. *Sloan Management Review*. Fall, 37.

In addition, during the Internet emerging market, there are debates over an optimal way to plan and execute strategies for superior firm performance, these qualified strategies being the first through innovation versus being the best through superior product/service quality (Cooper, 1990**;** Cooper & Brentani, 1991; Cooper & Kleinschmidt, 1995, 1996). According to Cooper and his colleagues' studies, in order to succeed in the market, a justified and optimal way for new product or service should carry out through superior in product/service quality. This implies that there is relative and positive effect of product quality on the relationship between innovativeness and success in the marketplace.

Moreover, product quality also has an intermediate relationship with demand. A business unit which provides high quality products or high quality services tends to experience an increase in demand for its products (McGuire et al., 1990; Powell, 1995), and such an increase in demand may result in a larger market share, and provide economies of scale that permit lower per unit costs in purchasing, manufacturing, financing, research and development, and marketing. Correspondingly, these result in higher profitability which ultimately mean business success. Therefore, understanding the nature and concepts of product quality are very beneficial and helpful for both normatively and positively: firms could easily deal with consumer diversity in consumption selective choices, as well as strategically tackle suppliers, competitors, and changes in the market where there are differences in product quality needed.

All in all, numerous findings have reiterated the significance of product quality and have provided a growing body of evidence on the relationship between product quality and firm performance. Regardless of the diversity in evaluation and measurement methods, either by business returns, market shares, customer satisfaction, or perceived product quality, the results share similar favorable conclusion that there is a strong positive relationship between product quality and all those mentioned competitive elements (Bharadwaj & Menon, 1993; Buzzell & Gale, 1987**;** Hendricks & Singhal, 1996; Kuzma & Shanklin, 1992; Powell, 1995). Thus, achieving higher product quality is one of the absolutely and important keys in penetrating into today's market.

4. Previous Studies on Product Quality Measurement

There are times when the consumer needs special assessment in determining and making their purchasing decisions, especially when buying a quality product. Predominantly, such special assessments are intensely needed when (a) there is a need to reduce the perceived risk of purchase (Jacoby, Olson, & Haddock, 1971; Olson, 1977); (b) the consumer lacks expertise and consequently has less or no chance to assess quality (Rao & Monroe, 1988); (c) the consumer involvement is very low (Celsi & Olson, 1988), (d) the objective product quality is too complex for the consumer to assess (Allison & Uhl, 1964; Hoch & Ha, 1986), or (e) there is an information search preference and extra information is still needed (Nelson 1970, 1974, 1978).

From a theoretical point of view, several signals and product-related cues could serve as assessment tools in measuring and evaluating product quality. Such common signals are brand name or brand advertising (Akerlof, 1970; Darby & Kami, 1973; Milgrom & Roberts, 1986; Olson, 1977; Ross, 1988), product feature or appearance (Nelson, 1970; Olson, 1977), price (Leavitt, 1954; Milgrom & Roberts, 1986; Olson, 1973, 1977; Rao & Monroe, 1989; Scitovsky, 1945; Wolinsky, 1983), and product/retail reputation, store name, warranty, and guarantee (Cooper & Ross, 1985; Emons, 1988; Olson, 1977; Rao & Monroe, 1989).

As stated in marketing and economics literature, product can be perceived as an array of many product related cues (Darwar & Parker, 1994; Jacoby et al., 1971; Richardson, Dick & Jain, 1994; Zeithaml, 1988), and these cues are commonly used in measuring product quality. In product perception, cues are viewed as complex information processing. It involves a process of making inferences about product from information and related facts that are available in the sales outlet and the marketplace. Such cues that signal product quality are intrinsic cues and extrinsic cues. Intrinsic cues involve the characteristics of a product that tangibly are parts of the physical product, and which cannot be changed without changing the physical product itself (Olson, 1977; Olson & Jacoby, 1972). For instance, flavor, color, texture, and degree of freshness are examples of attribute of intrinsic cues that could be used in evaluating food quality. Meanwhile, extrinsic cues involve characteristics that are related to the product, but are not physically parts

of it (Olson, 1977), which by the definition mean, outside of a product itself. Price, brand name, country of origin, type of outlet, presentation of a product, influence of store personnel, promotion, packaging, advertising, are the examples of extrinsic cues (Steenkamp, 1989).

Multiple research have been devoted to the relations between intrinsic cues/ extrinsic cues and product quality evaluation (Holbrook & Corfirian, 1985; Nowlis & Simonson, 1996). Price, brand name, store name, and the country of origin as parts of extrinsic cues have been particularly highlighted as product quality indicators. Many research have investigated the effect of price on product quality and showed that consumers generally use price to infer product quality when price is the only source or cue that is available and accessible. In addition, several research also found that price is often used as a means of product quality evaluation specifically when brand name and store name are unfamiliar to consumers.

In 1945, a study by Scitovsky insisted that such behavior by which consumer may judge product quality by using price is not irrational. Indeed, this can simply be explained by the system of supply and demand, in which at a certain point of sale and purchase of a product, consumers likely make their purchasing decision relatively based on a price scale.

The often-heard statement “you get what you pay for” implies a strong positive relationship between product quality ranking and price paid: a higher priced

product is likely to be perceived as being of higher quality and a cheaper priced a product is likewise to be perceived as being of lower quality. The result of Maynes' study in 1976 and Rao and Monroe's study in 1989 evidently showed that the greater the ratio between the highest and lowest investigated prices, the greater the price is being perceived as higher product quality; the greater the difference in these price treatments, the more likely an individual/consumer perceives and begins to make a higher or lower product quality ranking preference. Due to some complications, the effect of consumer's knowledge, expectation, and experience of a product may restrain the perception of product quality based on price.

Moreover, Gabor, Andre, and Granger (1966) found that when the retail price of a product becomes too low or put below a minimum threshold less than its expected price, the majority of consumer may be reluctant to purchase that product, and the consumer would suspect that the product might be inferior in quality and might not perform well. Therefore, putting the right price range might have large significant effect on consumer perceived in product quality.

Consistent with another significant statistical test by Cohen (1977), his study showed that the effect of price on consumer perception of product quality is relatively large and statistically significant. By applying both multi-cue and single-cue studies, the main results of a price-perceived product quality relationship revealed that the multi-cues yield a slightly larger effect than single-

cue study. In his study, the price effect on perceived quality for consumer products was at 0.12 (covariance), while the effect of brand name on perceived consumer product quality was slightly larger at 0.14; however, the effect of store name on perceived consumer product quality was smallest among these three indicators at 0.05. Although these results were not extremely and statistically significant, by using additional statistical test in multi-cues studies, the additional results generated a larger effect at 0.124, a better result than single-cue studies at 0.115. By combining these together, the results suggested a price and brand name perceived product quality from multi-cues study conclusively generate a slightly larger effect than that from a single-cue study. These findings were strongly supported by many of earlier studies, such as Maynes (1976) and Monroe and Krishnan (1985). Thus, either using multi-cue, or single-cue, or price, brand name, or store name, or other related cues as indicator of product quality, these statistical results reinforced that all of these cues could be consistently used as signals in perceiving product quality.

Although price, brand name, and store name as extrinsic cues are widely used in signaling product quality, a study by Jacoby et al. (1971) demonstrated that under certain conditions, intrinsic cues are more important and have larger effects than extrinsic cues in determining judgment of product quality. Recall that those intrinsic cues are various characteristics or multiple attributes of a product, such as size, color, design, function, flavor, performance and so on. A single-attribute analysis could be useful in a situation where that product attribute could

identically represent the main characteristic among those different products, or when the consumer could correspondingly share similar preference for all different attributes, in which case the attributes could be aggregated. However in real practice, those two situations rarely occur. Thus, a product is generally described with multiple attributes or a variety of characteristics for which consumer may exhibit a heterogeneous preference structure (Maynes, 1976).

The studies by Fiore and Damhorst (1992) and Zeithaml (1988) clearly indicated that product quality is a multidimensional construct that is difficult and cannot be equivalent to or measured by a single cue or only one attribute.

For many years, there have been several measurements of product quality attributes proposed based on the various dimensions and ratios of different geometric parameters. One of the most well known multiple attributes/dimensions was the Eight Dimensions of Quality by David A. Garvin.

In 1987, Garvin proposed the eight essential and usable dimensions of quality that have been widely used as framework for product (service) quality strategic measurement and evaluation. These eight dimensions of product quality are performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality. Garvin (1987) defined these terms as follows:

Performance: It refers to the primary operating characteristics of a product or service. In terms of an automobile, for example, performance would include acceleration, speed, handling, and comfort; for a television set, clarity of sound and picture, color, and the ability to receive distant channels; and for an air conditioner, coolness, freshness or cleanliness of air, and the quietness when the air conditioner is operating. In addition, in a service business like fast food and airline services, performance would usually mean promptness of service or readiness to serve.

Feature: This is the "bell and whistle" of a product or service, the role of which is to supplement the basic functions of a product/service. Feature also directly affects and creates the first impression. Examples of feature are free drinks on a plane, one-year warranty on vacuum cleaner, and automatic tuners on an audio set. However, the characteristics of feature and performance are very much similar, but still there is a thin line separating primary performance characteristics from secondary features. In other words, features largely involve objective and measureable attributes, while performance hardly does.

Reliability: This dimension represents the probability of a product malfunctioning or failing within a specified period of time. The mean time to its first failure, the mean time between failures, and the failure rate per unit time are the three most common measurements of reliability product quality. Since this type of measurement requires a product to be in use for a specified period of time, hence,

reliability is a more custom and relevant dimension among durable goods than the products and services that are instantly consumed in everyday life.

Conformance: “Conformance to specifications” (Gilmore, 1974; Levitt, 1972) or “conformance to requirements” (Crosby, 1979) have been mentioned many times in a prior section, so it is fairly rational that conformance should be one of the eight product quality dimensions. By definition, conformance means the degree to which a product’s design and operating characteristics meet established standards. For a long time, this conformance dimension has earned the most usage by the traditional product quality experts and pioneers like Juran. As its validity and usage ability, a more integrated approach to conformance has emerged. This is associated with successful Japanese manufacturers and the work of Genichi Taguchi, a prize-winning Japanese statistician who mentioned “quality is loss avoidance”. In the recent integration, the two most common measures of failure in conformance are the use of defect rates in the factory and the incidence and the number of received service calls once a product is in consumer’s hands.

Durability: Durability or a measurement of product life primarily has both technical and economics dimensions. For technical dimension, durability can be defined as the amount of use one gets from a product before it deteriorates; for example, after many hours of light bulb usage, the light bulb burns up and needs a new replacement. Since the cost of repair is much higher than a replacement or sometime repair is impossible, here is where the economics definition of

durability arises. For economics dimension, durability can be defined as the amount of use one gets from a product before it breaks down and replacement is preferable to a continued repair. This kind of economics approach of durability has two important implications. First, it simply suggests that durability and reliability are closely related. A product that often fails is more likely to be scrapped earlier than the one that is more reliable, or a repair cost will be correspondingly higher and a purchase of a competitive brand or producer will look much more beneficial and desirable. As a result, many companies try to reassure their consumers by offering lifetime warranties on their products. Second, this economics approach indirectly implies that durability should be interpreted with care, which means an increase in product life may not solely be the result of technical improvements or the longer-lasting material advancements, but rather, other factors such as the underlying external environment may have changed and affected the product life.

Serviceability: The sixth dimension refers to the speed, courtesy, competence, and ease of repair of a product. Nowadays, consumers are not only concerned about the physical aspect of or the performance of a product alone, but also about time before services are restored, timeliness with which service appointments are kept, the nature of dealing with service personnel, and the frequency with which service calls or repairs fail to correct or fix problem.

Aesthetics: This refers to how a product looks, feels, sounds, tastes, or smells to a product holder. This dimension is noticeably a matter of personal judgment and depends on a reflection of individual preference. Thus far, aesthetics seems to be more subjective than any of the previous mentioned dimensions.

Perceived quality: Beside aesthetics, perceived quality is another subjective and complicated view of defining product quality dimension. As a consumer does not always have complete information about a product's or service's attributes, such relative measurements like comparing brands, store names, or reputations may be the basis for product quality evaluation. These are the primary elements of perceived quality. In early 2007, Apple Inc. introduced a new line of smartphone called iPhone. Needless to say, salespeople and consumer immediately perceived iPhone as a high performance and a reliable smartphone, even though these are not yet proven. But due to its previous success and reputation in iOS system, including Macbook and iPod, the iPhone is automatically perceived as a product of good quality. However, since perceived quality largely depends on an individual's perception, personal knowledge and experience, interpreting perceived quality might vary among various people.

Although multiple-cues, intrinsic cues, extrinsic cues, and the eight dimensions of quality proposed by Garvin (1987) have played a crucial role in product quality measurement as product quality indicator, there still lie inadequacies more or less obvious ways in each of these methods. Some approaches are too vague or too

limited: these fail to capture various aspects of product quality that are very important for the aggressive competitive success.

5. Previous Studies on Product Quality Attribute Dimensions

As product quality is a multi-dimensional construct (Maynes, 1976), there have long been endeavored efforts in rating product quality on various relative product attribute dimensions. Way before World War II, the Customer Research Department of General Motors (GM) Corporation initially asked various groups of customers to appraise and evaluate their perceptions on the relative importance of GM car attributes. At that time, dependability, safety, performance, and styling were the selected list of attributes for the GM research. As a result, dependability and safety attributes were largely rated with high evaluations, whereas styling was rated lower, and price was rated somewhere in between. Subsequently, those marks were published and used as the insights attribute information for GM car quality improvement (Semon, 1969). Thus, product quality attribute dimension is evidently not a totally new notion.

By definition, quality attribute or product quality attribute means the cues that could be used by consumers to infer product experienced quality and product expected quality, in which product experienced quality means the result of sensory evaluation of the product at the moment of experiencing, utilizing, or consuming, while product expected quality happens at the point of purchase and before consumers experience or consume that product. Although product

experienced quality and product expected quality are two different terms, however, due to their relating usage in perceiving different levels of product quality through both intrinsic cues and extrinsic cues, hence, these are somewhat correlated and often used for the visual impressions of product quality attribute valuations (Acebron & Dopico, 1999).

Product quality attributes, also called product quality criteria by Grunert, Baadsgaard, Larsen, and Madsen (1996), and similar to the previous definition, further refer to the functional and psychological benefits provided by a product (Steenkamp, 1990), and these attributes are hardly observable prior to consumption. As the consumption happens prior to consumption, benefits are unclear and sometimes even unknown. For this reason, consumers would likely use many cues in comparing among those available alternatives to evaluate the various but relative product quality attribute dimensions in making the purchase or consumption decision (Steenkamp, 1989, 1990). Because of that, firms would often modify their product attributes. Moreover, other factors such as diversities in consumer preferences, advances in technological capabilities, changes in manufacturing costs, and competitions among the brands also drive the firms to modify and improve their product quality attributes to be at a more competitive position (Ofek & Srinivasan, 2002).

Several research on the relative importance of various attribute dimensions of product quality have been extensively studied in marketing research. Those

relative studies were conducted by Garvin (1984, 1987), Kano et al. (1984), Makgopa (2005), Maynes (1976), or Tellis and Johnson (2007).

According to the definition proposed by Kano et al. (1984), product quality attributes could be divided into five classifications in accordance to customer satisfaction. These are attractive product quality attributes, one-dimension product quality attributes, must-be product quality attributes, indifferent product quality attributes, and reverse product quality attributes. Each of these five-product quality attributes classification is explained further. First, Kano et al. (1984) discussed attractive product quality attributes as attributes that give satisfaction to the consumers if these are present, and generate no dissatisfaction if absent. In other words, attractive product quality attributes exemplify surprise and delight attributes, and provide satisfaction when they fully perform their abilities/functions but do not cause any dissatisfaction when they only partially perform. Second, one-dimensional product quality attributes refer to the product quality attributes that are positively correlated with consumer satisfaction, that is, the greater the degree of product quality attributes fulfillment, so the greater is the degree of customer satisfaction. Third, must-be product quality attributes denote the quality attributes of a product which when absent results in customer dissatisfaction, but on the contrary, when those attributes are present, these do not significantly contribute to customer satisfaction. Simply said, must-be product quality attributes having the opposite characteristics of attractive product quality attributes. Fourth, indifferent quality attributes refer to quality attributes which

when either present or absent do not cause or contribute to any customer satisfaction or dissatisfaction. Fifth, reverse product quality attributes signify the quality attributes which when present cause customer dissatisfaction, and when absent, lead to customer satisfaction.

Indeed, Kano et al.'s product quality attribute classification is generally used in various product industries and research, but there seems to be some drawbacks and limitations. There is no room in this model that would let firms precisely evaluate the influences of product quality attributes on different dimensions of product quality measurement, besides customer satisfaction. In addition, it also fails to take different degrees and importance of product quality attributes in terms of variability cues into consideration (Yang, 2011). The influence in and importance of various product quality attribute dimensions on more specific characteristics and cues therefore play a significant role in product quality evaluation.

To further consider and minimize the previous limitations in Kano et al.'s model, these combined product quality attributes may be considered (Makgopa, 2005):

- Functional attribute: refers to the performance factors and the abilities of a product that perform certainly and accordingly to its functions;
- Financial attribute: refers to the relative cost and price or affordability of a product in both short term and long term perspectives, including purchasing price, running or operating cost, as well as maintenance cost;

- Durability attribute: refers to the quality characteristics of a product that potentially performs and gives its service life up until it needs a new replacement;
- Status attribute: refers to class or positioning characteristics of a product that may indicate to the status or the prestige of a product, such as brand name, store name, and price (Hawkins, Hulse, Wilkinson, Hodson, & Gibson, 2001);
- Aesthetical attribute: refers to the style and attractiveness of a product that is placed, promoted, advertised, and which makes a consumer feel noteworthy. A dining table, for example, is placed and decorated together with kitchenware, candles, and flowers, which makes the consumer appreciate aesthetics and willing to buy the dining table.

Similar to the Makgopa's five product quality attribute combinations but more precise and detailed in coverage, Garvin's study (1984, 1987) expanded his product quality attributes and classified these into eight product quality attributes or dimensions. These very well-known and practical product quality attributes/dimensions are performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality.

Some of these attributes have already been discussed in the preceding section. To reiterate Garvin's dimensions, the following is a short description. Performance attribute basically refers to a product's primary operating characteristics that

include the efficiency of a product to achieve its intended purpose. Features attribute is the product's "bell and whistles" that supplement the performance attribute. Identical to its term, reliability attribute reflects the probability of a product failing within a specified period of time and the prospect of a product to perform consistently over its designated useful life. Conformance attribute refers to the degree to which a product's design/operation function corresponding to or match with its established requirements and standards. Durability attribute refers to the measurement or the length of a product's life that is technically un-repairable when durability of a product reaches its limit, however, economically a product is repairable when durability is realized before its break down. Serviceability attribute generally refers to speed, courtesy, and competence of complementary service added to the subjective and objective characteristics of a product. Aesthetics attribute refers to the look, feel, sound, taste, or smell of a product; and lastly, perceived quality attribute refers to the perception and feeling of the consumers toward an experience or expectation of a product.

Because of the comprehensiveness and diversity of this Garvin's eight product quality dimensions, these directly help explain the differences among the five traditional approaches in defining product quality. Those five traditional approaches of Garvin (1984, 1987) are transcendent, product-based, user-based, manufacturing-based, and value-based. For instance, performance attribute, features attribute, and durability attribute are largely focused on the product-based approach; while aesthetics attribute and perceived quality attribute are

predominantly focused on the user-based approach. Meanwhile, conformance attribute and reliability attribute are mainly focused on manufacturing-based approach.

Due to their significance, the eight product quality dimensions proposed by Garvin are used industry-wide and among various practitioners and across product categories as general criteria for product quality attribute/dimension.

To be more specific and to narrow down the product categories as well as product quality attributes' scope, Tellis and Johnson's study in 2007 identified the seven product quality dimensions as stability, compatibility, ease of use, reliability, utility of secondary features, intrinsic performance, and user-friendly design in assessing IT product quality.

In Tellis and Johnson's study, stability attribute means crash proofness; compatibility attribute, the ability of a product that is comparable and compatible with earlier versions of that product or with other brands; ease of use attribute, easy to use; reliability attribute, freedom from physical breakdowns; utility of secondary features attribute, the usefulness of its features; intrinsic performance attribute, speed, clarity, resolution, and so on; and user friendly design attribute, simplicity, unity, and parsimony.

Furthermore, to assess a second type of product quality categories, automobile product, besides those attributes that the Customer Research Department of General Motors Corporation used in improving GM car quality as mentioned earlier, the study by Maynes (1976) also suggested the nine distinctive characteristics of automobile product quality, including economic durability, comfort, performance, convenience, safety, aesthetics, status, carrying capacity, and pollution effect.

Maynes (1976) explained economic durability attribute as operating costs, capital costs, and warranty, in which operating costs include gasoline cost, repairing cost, or insurance cost, and capital costs include those depreciation cost or expected loss of market value due to its obsolescence. For comfort attribute, it includes temperature control and ventilation, noise level, riding space and legroom, and seating adjustability characters. For performance attribute, it includes acceleration, controlling and shifting speed, and maneuverability performances. For convenience attribute, it includes ease and precision of steering, ease of entry and exit from a car, ease of cleaning, ease of starting and parking, ease of storage, and accessibility of controls. For safety attribute, it includes collision absorption, visibility of any forward, side, backward angles, break security, and rigidity or strength of car body structure. For aesthetics attribute, it includes those lines, colors, and finished designs of a car. For status attribute, it includes technical virtuosity, opulence, or scarcity in different car classes. For carrying capacity attribute, it includes the number of passengers that could be contained within a car,

the usability cubic footage, the flexibility for carrying odd shapes, and the effect on handling both things and people (passengers). Finally, for pollution effect attribute, it includes noises and those exhaust fumes.

In addition, to assess a third type of product quality categories, home appliance, guarantee, retailers reputation, brand names, price (Makgopa, 2005), service reliability, energy efficiency, and warranty (Gordon, 1990) are the home appliance attributes/dimensions that have been used in measuring various types of so called white goods quality, including refrigerators, room air conditioners, washing machines, and television.

Moreover, besides these tangible products of IT products, automobiles, and home appliances for which product quality are widely assessed through quality attributes, the intangible products such as service based software and banking systems, their quality levels could also be assessed and measured through quality attributes.

According to ISO/IEC 9126, the standards identified categorized software quality into six different characteristics/attributes of functionality, reliability, usability, efficiency, maintainability, and portability.

- Functionality attributes: refer to a set of attributes that bear on the existence of a set of factions and their specified properties, which when functioning satisfies wants or implied needs. Suitability, accuracy, interoperability,

security, and functionality compliance are the sub-characteristics of functionality attributes.

- Reliability attributes: refer to a set of attributes that bear on the capability of software to maintain its level of performance under stated conditions for a prescribed period of time. There are four important sub-characteristics of reliability attributes, and these are maturity, fault tolerance, recoverability, and reliability compliance.
- Usability attributes: refer to a set of attributes that bear on the efforts needed for use, and on the individual assessment of such use, by a stated or implied users. Understandability, learnability, operability, attractiveness, and usability compliance are the sub-characteristics of usability attributes.
- Efficiency attributes: efficiency attributes refer to a set of attributes that bear on the relationship between the level of performance of the software and the amount of resources used, under stated conditions. Time behavior, resource utilization, and efficiency compliance are the sub-characteristics of efficiency attributes.
- Maintainability attributes: refer to a set of attributes that bear on the effort needed to make specified modifications, these include analyzability, changeability, stability, testability, and maintainability compliance as the important sub-characteristics of maintainability attributes.
- Portability attributes: portability attributes refer to a set of attributes that bear on the ability of software to be transferred from one environment or one holder to another. Adaptability, installability, co-existence,

replaceability, and portability compliance are the sub-characteristics of portability attributes.

Comparatively in banking systems, a different set of quality attributes, namely courtesy, speed, and accuracy, are the banking service quality attributes extensively used in measuring and assisting in banking quality systems (Day & Castleberry, 1986).

Thus far, numerous and diverse product categories have measured product quality through various sets of product quality attributes: the five general product quality classifications based on customer satisfaction by Kano et al. (1984); the five product quality attributes combination by Makgopa (2005); the eight product quality dimensions by Garvin (1984, 1987); the seven IT product quality attributes by Tellis and Johnson (2007); or the nine distinctive characteristics of automobile product quality by Maynes (1976). Since there is variability in different perceived perspectives within the same or among different product categories, ambiguity appears to be one of the most problematic issues. Furthermore, several studies also suggested that the roles of product quality attributes are conceptually changing over a period of time (Kano, 2001). Therefore, identifying a complete list of product quality attributes that could be collectively used in product quality evaluation is a challenging subject and the search for valid multiple attributes in different product categories still continues.

6. Consumers Differ in Preferences, Tastes, and Evaluation of Product Quality

Rationally, assessing or evaluating product quality is knowledge based and experience dependent in several respects. In the first place the weights, assigned to product characteristics/attributes will depend upon the knowledge ability as well as the previous experiences of the assessor. For instance, at the fruits section of a supermarket, the assessor who has experience(s) and background(s) in shopping for fresh fruits likely assigns a larger weight on freshness, smell, color, and cleanliness of the fruit-storing place than the assessor who does not have experience(s) or has less knowledge about assessing overall fruit quality. Secondly, the knowledge ability and experiences of the assessor likely affects the allocation of characteristics/attributes scores in both direct and indirect product quality evaluation. For example, the assessor of characteristics/attributes of an automobile who is familiar with the performance of the Toyota motor likely has a higher reference of performance standards for a Toyota car than the assessor who is not. Henceforth, the assessment of which characteristics/attributes for a product score vary and differ between these two and more assessors. Moreover in some cases, an ordinary assessor may neglect several characteristics/attributes of a product, which he or she believes may be irrelevant to a product. That is, the assessor likely assigns a zero value to that neglected characteristic/attribute, if he or she has been asked to evaluate or assign the scores. This kind of omitting a possible relevant characteristic/attribute of a product causes errors and difficulties in assigning product quality scores among assessors. Thirdly, assessor may not

well be aware of the existence of relevant and influential factors such as brands, models, or sellers who are relatively part of a product evaluation. Such an omission might create errors and variability in product quality valuation (Maynes, 1976). Since the state of knowledge and experiences vary over time, the practical use of product quality measurement may also change and adjust to the time and altering environment.

In economics, a consumer is considered to be the basic economic unit that determines which commodities to purchase and at what quantities to maximize and satisfy his or her needs and wants. However, what could guide these individual consumer decisions? Or why does one consumer purchase some commodities and the others do not? The economic theories of consumer demand, consumer behavior, consumer preferences, and consumer choice, those relating to utility concepts, indifference curves, and budget constraints may answer these questions.

According to the theory of consumer demand, consumer choice relates to consumer preferences in both consumption of goods and services and towards consumption expenditures that yield consumer demand curves. The link among this consumer choice, preferences, consumption, and demand curve is a way of analyzing how consumer as individual may realize at equilibrium point between his or her preferences and expenditures through maximizing utility as subject to

his or her budget constraints. Utility means the property of goods enable to satisfy human wants.

In order to achieve equilibrium, consumer preferences must be realized and consumer choice must be made. Consumer preferences are subject to individual tastes or desires for the consumption of goods and services that translate into consumer choice based on consumer's time, income and/or price of goods/product. Note that consumer preferences are independent of income and price, unlike the consumer choice that relates and is determined by income and price. For example, one can have a preference for Porsche over Ford, but due to financial constraints, one has to narrow the consumption choice down to Ford. This kind of ability to purchase goods/product does not ultimately determine consumer's like or dislike of a product.

Consumer preferences or consumer tastes could be explained by indifference curves. An indifference curve shows the previous combinations of two goods/products that give the consumer equal utility or satisfaction. A higher indifference curve refers to a higher level of consumer's satisfaction, and vice versa for lower indifference curve which refers to a lesser level of consumer's satisfaction. That is, different indifference curves simply provide an ordering or ranking of the individual's preference in different satisfaction levels: one could prefer goods/product of A to B, while another could prefer B to A, and these kinds of preferences likely change over time (Salvatore, 2008).

As economic theorems affirmed, change in time, personal income, and product price may result in a corresponding change in consumer choices, therefore, consumer preferences and tastes; consumer demands also alter over different periods of time. Corresponding to this, an important question emerges, to what extent do these different individuals make different quality assessments over identical sets of products? The economists could not precisely respond to this question, but related principles used in psychology and sociology could give possible clues.

According to psychology, sociology, marketing and consumer behavior studies, the individual consumer has a set of preferences and values determination of which are outside of the economics realm. These are evidently dependent upon culture, education, experience, and individual tastes among varieties of other factors (Hofstede, 1984; McCort & Malhotra, 1993; Soares, Farhangmehr, & Shoham, 2006).

Many consumer research have shown that consumers make their purchasing decisions based on different information cues (Akerlof, 1970; Cooper & Ross, 1985; Darby & Kami, 1973; Emons, 1988; Leavitt, 1954; Milgrom & Roberts, 1986; Olson, 1977; Rao & Monroe, 1989; Ross, 1988; Scitovsky, 1945; Wolinsky, 1983). Consumers generally use both intrinsic and extrinsic cues to evaluate products, but extrinsic cues are widely used in the event that consumers lack product knowledge and experiences in judging intrinsic cues (Chu & Chu, 1994; Saeed, 1994).

Consumers with limited product-related knowledge and experiences could refer to extrinsic cues such as brand, store image, salesperson, advertisements, price, country of origins, or even colleagues and friends as source of information to make their purchasing decisions (Cambitzi, 1991; Day & Castleberry, 1986; Dodds & Lewis, 1995; Erasmus, 1996; Gerstner, 1985; Saeed, 1994; Terblanche & Borhoff, 2001; Thorelli, Lim, & Ye, 1988).

Furthermore, inferring product quality from others' decision-making is another source of extrinsic cues, which relates to the observational learning literature. Observational learning means learning the fundamental value of an object, in this case, product quality by observing others' decision-makings (Miklos-Thal & Zhang, 2013). Such references to others' purchasing decisions influentially affect the private final purchasing decision. For example, through reading of Consumer Reports or listening to the news or product reviews effectively reflect and change one's perception on a particular product quality evaluation.

The studies by Banerjee (1992) and Bikhchandani, Hirshleifer, and Welch (1992) suggested that with the consistent observation of peer decisions, it might lead to uniform choices within a society. However, to achieve that identical evaluation point, important criteria need to be noted. The observation should be a reliable source and that product or service should, in fact, achieve unanimous approval of complying with quality standard. However, this is still irregular; the observation only plays a supporting activity in consumers' purchasing decision-making.

Multiple factors, including economic criteria such as time, income, and price, or psychology and sociology criteria such as culture, education, experience, individual tastes, and observation learning, affect and influence consumers' perceptions. Thus, consumers generally view products of equal quality differently, and in turn, these differences and varieties in perceived product quality would affect variability of consumers' purchasing behaviors.

All in all, consumer preference is the complex issue that warrants differences in choices and tastes, which creates difficulty and variability in product quality valuation.

7. Discussion

Thus far, much of the literature on product quality has exhibited that for centuries, product quality has been the subject of debate and ongoing research as regards to the meanings, significance, and evaluations/measurements of its varied terms and conditions.

The review on the literature has indicated that depending on different academic disciplines, orientations, and various perspectives, the variability of definitions and attribute dimensions of product quality have diversely been emphasized over the years. However, there seems to be no universal or all-encompassing product quality's definitions and attribute dimensions existing so far.

In addition, heterogeneous customer preferences structure further create inconsistency and difficulty in defining product quality's definitions and assessing product quality valuations.

However, there is no single definition and measurement of product quality that could apply to all products or all services in all industries. Therefore, by doing comparative and cumulative research on product quality through focusing on the fundamental definitions and characteristics of specific perspectives and products, such as at a particular national case with some focused product categories, this potentially delivers significant research results that might surpass all the previous research outcomes.

CHAPTER 3: RESEARCH DESIGN

This chapter provides an overview of conceptual framework, (re)states research questions, defines research scopes, clarifies research strategies and methodologies, identifies related interview and questionnaire questions on product quality and proposed product quality attribute dimensions, and concludes by verifying the validity and reliability of these research methods.

1. Introduction

With more rapid and costless communication and more facile and frequent travel, the world of consumption has become convergent and even more accelerated than before. This has greatly expanded the arrays of consumer choices and forced producers to think and act in terms of global production and do global marketing in order to maintain their competitiveness in today's market. Trends and tastes in the West, especially in the United States, positively influence the trends and tastes in the East and around the world. In fact, it is very common to see Onitsuka Tiger sneakers and Samsung Galaxy Tab on New York streetwalkers. Meanwhile it is also very usual to see the streetwalkers in Shanghai or even in New Delhi put on Nike sneakers and have iPads on their hands. This is the beginning and the result of globalization where the trends and tastes around the world influence the trends and tastes on consumer consumptions and behaviors across countries. Responding to that, consumers are seeking for convenient, affordable, and quality value in standardized products (Levitt, 1983). But as long as there are still differences in cultures, social status, and education backgrounds, the differences in tastes and

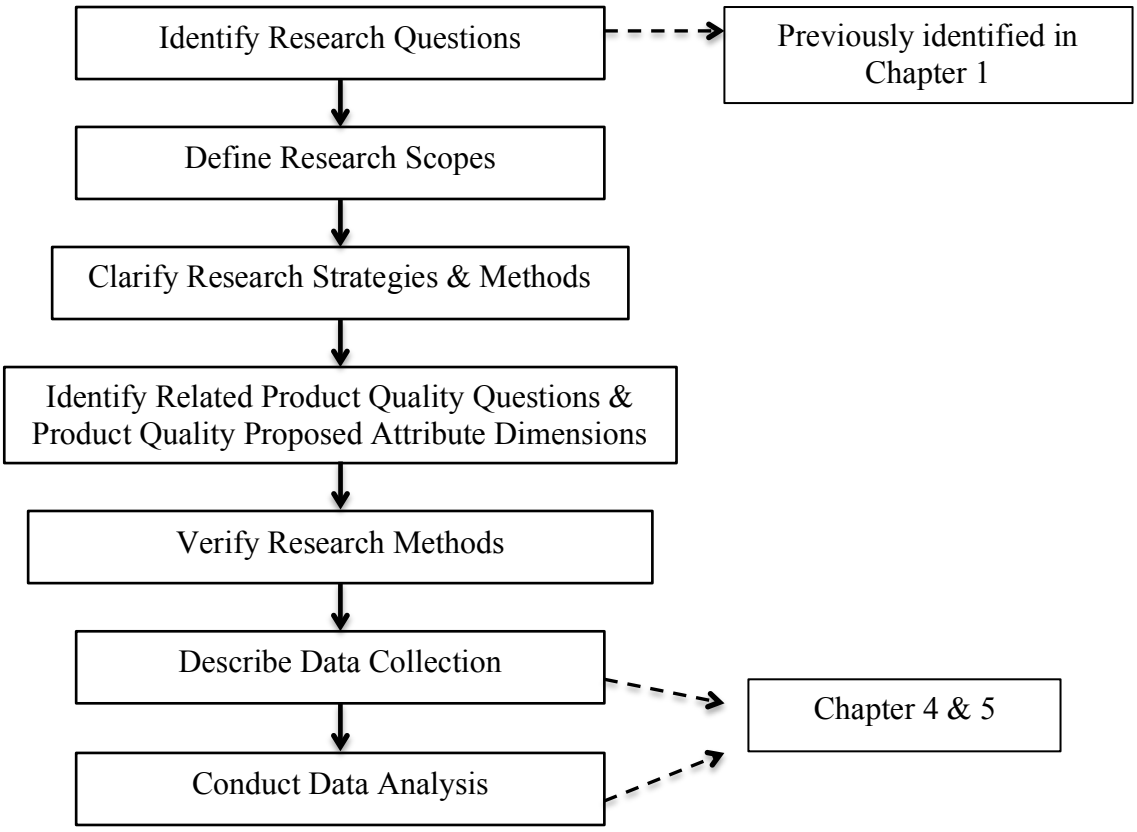
preferences will always exist and remain among consumers. Therefore, it is very important to define these similarities and differences so that product producers, intermediate sellers, policy makers, and consumers are at least able to understand their multifaceted tastes and expectations towards the variety of products and services.

Recall that this research aims to understand the overall product quality characteristics and tries to identify a more precise definition of Thai product quality, particularly in the 21st century. In addition, learning from the previous studies, literature reviews, and combining with the significant results of this research, the study ultimately aims to propose a more up-to-date and valid set of product quality attribute dimensions that could be used in measuring various types of today's Thai product quality.

Figure 3.1 presents an outlook of this research's conceptual framework, which is organized as follow: first, (re)states the research questions; second, identifies the research scopes by explaining why the research chose Thailand and Chonburi Province as case study, then why focused on these three product categories of electronics/IT product, automobile, and home appliance, and what it implied by saying Thai product quality; third, clarifies the research strategies and methodologies regarding why the research applied the interview research method with three different sectors of government, product producers and intermediate sellers, likewise why distributed questionnaires to consumers, and assessed the

public reviews, used the contents analysis, and regressed the results into multiple statistical tests; fourth, identifies related product quality questions and the proposed seven product quality attribute dimensions that were used in the primary part of this research; and fifth, verifies the validity and reliability of this research questions as well as methodologies. However, for the last two steps of data collection and data analysis in this conceptual framework, the discussions in detail are presented in succeeding chapters.

Figure 3.1: Conceptual framework



2. Research Questions

Based on the research aims and research objectives that previously introduced in Chapter 1, the research questions for this research are:

- What could be the definition of Thai product quality in the 21st century?
- What could be the product quality attribute dimensions in the case of Thailand?
- How will product quality be measured through the proposed attribute dimensions?
- Are these proposed product quality attribute dimensions and measurement applicable and valid to various types of product category?

In order to realize these research questions, it requires the research to narrow its scope down to national level and select number of product categories as case study.

3. Research Scopes

3.1. Market Selection and Identification: *Why Thailand? Why Chonburi?*

Bags and shoes, electronics/IT devices, home furniture, auto parts, fashion apparels, preserved foods, home appliances, and personal care products; more than half of world's production of these goods are in Asia region. China, Japan, Korean, Vietnam, Indonesia, and Thailand are the important destinations for the world's manufacturing and production plants (UNIDO Statistics, 2013).

As advanced economies continue to recover from recession, home to nearly 9 percent of the world's population, land for a large pool of labor at low cost but high skill, Southeast Asia is the world's rising star, the recent emerging market, and the important powerhouse for manufacturing and production. These growing and emerging industrial economies are Malaysia, Thailand, Indonesia, the Philippines, and Vietnam (PwC, 2012).

In 2010, the growth rate of Foreign Direct Investment (FDI) inflows into Southeast Asia has outperformed that of China (UNCTAD, 2012. Many multinational corporations and global enterprises have moved their operating plants into this emerging region. As export driven growth and industrialization continue increasing in FDI, the Southeast Asian economies and the well-being of household incomes have been rapidly improving. For instance, the average economic growth rate of the fastest among the five countries is projected to reach an average of 5.5 percent annually from 2013-2017 (OECD, 2013), and within the next decade, around 50 percent of the households in Southeast Asia region are expected to have annual disposable income between USD 5,000 and USD 15,000 (PwC, 2012). Hence, as the growth across Southeast Asia opens opportunities for the middle class enriching the quality of life, this directly increases the consumer expenditures on/from foods and clothes to technology devices and luxury goods and gradually demands for more advancement in high quality products and services.

Moreover in term of social context, Southeast Asia is also diverse in both cultural and non-cultural aspects. Each country embraces long histories, speaks different languages, and practices multiple integrated business traditions. With these variances existing and spreading across the region, Southeast Asia appears to be an interesting site for the skillful product producers, multicultural environments, as well as for booming and diverse consumption in the emerging markets led by industrialization and mass-customized consumption.

To further consider at national level, Thailand is the second largest economy in Southeast Asia, the newly industrialized economy, the export dependent, and the Detroit of Asia. According to the country's National Economic and Social Development Board (NESDB), Thailand's gross domestic product (GDP) climbed up to as much as 18.9 percent in the final three months of 2012 with the GDP current markets prices of USD 366 billion, which was ahead of the analysis estimation. The overall Thai economy also expanded approximately 3.6 percent and was expected to grow in the range of 4.2 percent to 5.2 percent in 2013. The country's private consumption, exports, and private investment all expanded by double digits, and surprisingly manufacturing activity steadily increased 44 percent, particularly in automobile production, hard disk drives manufacturing, and electronic parts and devices manufacturing. Furthermore, the household consumption and investment had been forecasted to grow by 3.5 percent and 8.9 percent, respectively in 2013.

In addition, in term of Thai consumer culture, it is geared toward collectivist than individualist culture. Under collectivist culture, Thai consumers tend to prefer interdependent relationships with others and lower or subsume their individual goals to those of their in-groups, such as families and working societies (Hofstede, 1984 2001; Triandis, 1993. Since Thai consumers are collectivist and group oriented, they very much rely on soft sell which the information contents, the advertisements, brands, store names, country of origins, as well as promotions have relatively high effect on their perceptions toward product evaluations. Similarly, most of Southeast Asian and many Asian consumers also belong to this collectivist culture group (Shavitt et al., 2007). Thus, understanding Thai and Asian culture is a beneficial approach that contributes to better understanding many Asian consumers' cultures and behaviors.

Therefore, being a part of emerging market, the world and the region competent in product producers, prominent destination for FDI, increasing middle class income and consumption demand, and comparative collectivist consumer culture, Thailand was selected as the national case that might be well representing the future competitive market in producing, selling, and consuming products. Besides that, to further power future growth, the country must not only rely on exports alone, but rather focus and develop on domestic demand. This is one of the important forces driving growth that many countries and markets have overlooked, and by taking Thailand as a case study, this proposes to be a good model.

Narrowing the scope down to city level, Chonburi province seemed to be a suitable choice. Geographically, Chonburi province is located on the eastern coast of Thailand, neighboring to Chachoengsao province, Chanthaburi province, and Rayong province, and only one-hour drive or 80 kilometers away from the capital city Bangkok.

According to Chonburi Province Administration, the province had a total population of 1.3 million and ranked 13th out of 76th in country population density in 2012. The distribution of sociodemographic characteristics, such as gender, mean age, literacy rate, and religion are well proportionate and very much comparable with the country's distributions. As of 2012, there were 646,300 male population and 669,993 female population or 49.1 percent and 50.9 percent, respectively residing in Chonburi Province. Among those residents, their age average was 34.5 years old which was slightly equivalent to the country's age average of 35.1 years old. The literacy rate of those whose age were 15 years old and over who are able to read and write was slightly higher in Chonburi province at 97.11 percent (2007). Nearly 97 percent of the province residents are Buddhist. Table 3.1 indicates the statistical comparison between Chonburi province and Thailand.

In term of economics, the GDP per capita of Chonburi was 441,062 baht, or the 5th highest in Thailand, with the estimation of real GDP growth rate at 3.5 percent in 2013. Although, the average monthly household income and expenditures as

well as urbanization rates were somewhat higher than the country's averages, statistics of Chonburi much better represented the country's averages than Bangkok's statistics (The average monthly household income and expenditures in Bangkok are 35,007 baht and 28,055 baht ,respectively (32 baht is equivalent to 1 USD as of August 2013). The urbanization rate was estimated to be more than 80 percent, which is the most urbanized area in the country. Bangkok's distribution rates both in economic and sociodemographic related charecteristics were much higher and superior than any parts of the country's distribution. This moderately implied that the preferences, experiences, and expectations of Bangkok consumers are estimated to be higher and greater than the average normative of Thai consumers).

Table 3.1: Economic and sociodemographic related characteristics of expected respondents

Characteristics	**Chonburi Province**		**Thailand**	
Total Population	1,316,293	(2012)	67,448,120	(2013 est)
Gender				
Male	49.1%		49.8%	
Female	50.9%		50.2%	
Mean Age	34.5	years	35.1	years
Literacy Rate*	97.11%	(2007)	92.6%	(2010)
Religion (Buddhist)	96.9%		94.6%	
Household Income/month	฿ 22,286		฿ 18,660	
Household Expenditures/month	฿ 15,614		฿ 14,820	
Unemployment Rate	0.5%	(2012)	0.71%	(Q1 2013)

Urbanization**	0.5%	(2010)	0.77%	(Q1 2013)
GDP per capita (PPP)	฿ 441,062		฿ 178,458	
Economic Growth Rate (Real GDP growth rate)	3.5%	(2013 est)	4.5%	(2013 est)

Source: National Statistics Office (NSO)/ CIA the World Factbook/ Chonburi Province Administration, 2013

Note: *Literacy Rate: Age 15 & over can read and write

**Urbanization: Residents in municipal areas which earning more than 15,000 baht income per month

Chonburi is also home to 3,841 factory sites, operating in five major industrial estates, mainly in auto parts production and electronics manufacturing. There are 738,803 daily workers. Furthermore, Chonburi is also the location for Laem Chabang Port, the world-class harbor and the 20th busiest port in the world. The province is also one of the most popular and attractive destinations for international tourists. Each year, Chonburi approximately earns 76.5 billion baht in tourism income. This amount accounts for 10.4 percent of national annual tourism income (Chonburi Province Administration, 2013).

Owing to heavy industrialization, underpinned by shipping transportation, tourism activities, and manufacturing factories, all these contributed to the large portion of Chonburi's economic output and drove the province to become the center of

industry, tourism, as well as business commerce, gathering a heterogeneous of Thai population together.

Therefore, with the availability of job opportunities, population diversity, and similarity of economic and sociodemographic related characteristics of expected respondents compatible with the country level, Chonburi respondents appear to better represent the similarities and differences of Thai consumer tastes and behaviors. Selecting Chonburi province as site might yield appropriate results that well signify the real product valuations from overall Thai consumers' perceptions.

3.2. Product Selection and Identification: Why Electronics/IT Product, Automobile, and Home Appliance?

Over decades, the search for product quality has yielded little consensus on the magnitude, generalizability, or universal significance. However, the literature has considered whether these kinds of signals would be the fundamental elements of the market and could be used at similar degree by consumers who share similar cultures in evaluating various types of products. What attributes or factors could serve as signals or what degrees of statistical significance could be used as general indicators by which product could be classified as high or low in quality.

There were four principles that guided the product categories selection and identification in this research. First, the product should exhibit a strong demand in the marketplace that prior evaluations strongly influence on consumer purchasing

decision. Second, the product should be appropriate for signifying comparative product characteristics but different in product categories. By doing so, the results of this research would extend the application to more than one type of product. Third, the product should well match and associate with the characteristics of market selection; and fourth, the product should have the availability and accessibility in both primary data and secondary data sources. Corresponding to these four guiding principles, three product categories, particularly electronics/IT product, automobile, and home appliance, were selected.

The technology-based products are strongly in demand and public reviews of these products play important role on consumer purchasing decision. Managing a line of products on a speedily developing innovative technology is extremely challenging, since there are numerous decisions that need to be made (Bridges, Coughlan, & Kalish, 1991). With rapidly changing environments, managers must quickly respond and make an immediate decision under dynamic conditions which technological features and attributions should be included in each product.

Since the industrialization, the manufacturing industry has continued growing ever since. Every household in every corner around the world at least has an access to the basic electronics and electrical appliances, or even transport technology creation like cars.

In the 20th century, the electronics industry, especially the electronics and information technology (IT) industry, has emerged and is currently worth billions of dollars. According to the Electro World Solution (2013), the global consumer of electronics and IT market is anticipated to grow at a Compound Annual Growth Rate (CARG) of over 10 percent from 2012 to 2015. The market outlook for electronics and IT product is expecting consecutive growth for the next few years. As reported in the electronics analyses, the electronics industry is now entering into the age of convergence, where information technology integrates and merges throughout the industry and makes a shifting into many high electronics products, led by smartphone, tablet, personal computer, and digital camera. With this integrated electronics and IT industry driven by the global needs resulting in more advanced in electronics and IT products at smaller size, lighter weight, multi-functions, and less-consuming energy, experts predict that the worldwide electronics and IT products market will grow to USD 250 billion by 2025 and will direct the consumer inclination towards electronics and IT products as well as services (Wipro Insights, 2013).

The automotive industry is also one of the competitive industries in the world. In 2007, there were roughly 806 million cars and light trucks plying the road, consuming over 260 billion gallons or 980 million m^3 of fuels in that year (Plunkett Research Ltd., 2008). From then and since, the number of cars/automobiles in emerging and developing economies have remarkably continued to grow approximately 30 percent from 1995 to 2005, and by 2050, the

world's automotive industry is expected to increase by 1.9 billion units of cars, bringing the total estimation of automobiles to nearly three billion units around the world (OICA, 2012). Dr. Sean McAlinden, Cars Executive Vice President of Research and Chief Economist at North American Automotive Annual Conference, remarked "the automotive industry will continue profits and growths with sustainability… there are still plenty of rooms for us to grow and going green is one of our solutions…"

During the world economic recession triggered in the United States in 2008-2009, the global electrical/home appliances industry suffered the steep fall in sales and profit margins by 8 percent across countries: US, Canada, Europe, and Japan (Bodimeade, 2012). However, with innovative market penetration of newly-developed displays, touch panels, variable speed and voice controls, and captivating innovation through high technology systems, the home appliance market was revived and expected to grow over USD 1.5 billion by the end of 2013 (IMS Research, 2009). In addition, the global home appliances market has been projected to continue its growth to 1.25 billion in shipments within the next five years (2018), boosted by the developing economies in the Asia Pacific region, the emergence of smart appliances, and the increasing demand for energy-efficient products (Bodimeade, 2012).

While these three technology-based products/industries are enjoying their key profits in global markets, on the demand side, consumers are also making

purchasing decisions based on multiple information channels. Product reviews in consumer reports, magazines, journals, as well as social networks and blogs, sale volumes information, together with related news, are some of the multi-information channels that have great influences on consumer purchasing decision (AYTM Market Research, 2012; Gesenhues, 2013; Shores, 2012). To illustrate, by using popular search engines such as Google, Bing, or Yahoo! Search, more than thousands of online and publication sources have become available giving in-depth reviews from technology to commodity products, but the most widespread reviews of products are on smartphones, personal computers, tablets, new models of cars, and household appliances. These product reviews frequently circulate in weekly, monthly, and quarterly basis, in both national and international publications.

Relative product characteristics among three product categories in three different ages of product lifecycle. The literature review in previous chapter on product quality attribute dimensions showed that indeed different products have different product characteristics/attribute dimensions. However, despite the diversity in product categories, to some extent, these seemed to share comparable product characteristics/attribute dimensions, particularly among electronics/IT product, automobile, and to a certain extent, home appliance. These relative product characteristics/attribute dimensions are performance, reliability, and durability. Moreover, in term of product lifecycle, each of these product categories connoted three different ages/phases of product lifecycle: short lifecycle, medium lifecycle,

and long lifecycle. Electronics/IT product signifies short lifecycle, in which consumer tastes and expectations toward electronics/IT product are changing rapidly. The sale numbers of electronics/IT product are also affect by a high degree of technology competition and electronics/IT products, specifically smartphone and tablet, which are considered to be fashionable gadgets that likely to be replaced by newly-launched gadgets in no time. Because of these, the lifecycles of electronics/IT products are considered to be short-life or that which typically obsoletes within two years (Recon Analytics, 2011). On the other hand, the product lifecycle of automobile measures to have medium lifecycle, in which a firsthand car intends to serve between 7 and 10 years and could run for 200,000 miles (Volpato & Stocchetti, 2008). However, the useful life of a new car introduced during the past 10 years has been reduced to 4 to 6 years or approximately could run for 100,000 miles; this is mainly due to the quality problem (Ford, 2012). Unlike the previous two product categories, the lifecycle of home appliance is relatively varied, in which some appliances could be used for over 15 years and some could not last longer than 10 years. Nevertheless in general, the lifecycle of home appliance product implies long lifecycle. For instance, according to the study by Association of Home Appliance Manufacturers (AHAM), the National Association of Home Builders (NAHB), and the California Energy Commission, the result showed that the average washing machine could wash, rinse, and spin for 10 to 14 years, while the average refrigerator could keep the food cool and fresh for nearly 20 years. The average television could play images and transmit signals for about 4 to 8 years. Thus,

different products have different characteristics at different stages of useful life, but beyond those differences, there are similarities and significance that are very interesting to study.

Thailand as manufacturing hub and consumption heart of the region. For decades, Thailand has become a global production powerhouse. manufacturing all ranges of supplies and exporting a variety of finished goods to many nations worldwide.

According to the Board of Investment (BOI), Thailand's electronics industry has been experiencing a strong and steady growth for more than 25 years, and has played a significant role in the country's export values. In 2008, Thailand's overall electronics/IT products trade was worth approximately USD 51 billion, an increase of 63 percent from 2003, in which hard disk drives (HDD) and integrated circuits (IC) were the main exports. Furthermore, as the world demand for computers, tablet, and mobile phones has continued growing, so too the value of Thailand's electronics/IT product exports. The total value of the country's exports of electronics/IT product, excluding HDD and IC, was approximately USD 29 billion in 2008. The primary markets for these electronics/IT devices were China, the European Union, the United States, ASEAN, Japan, and the Middle East. Presently, many multinational electronics companies, such as Fujitsu and Panasonic from Japan, Seagate from the United States, Philips Electronics from the Netherlands, and LG Electronics from Korea, have established their

production plants, assembly lines, and research and development (R&D) facilities in Thailand.

Along with the rise of electronics/IT product supply lines, the demand side also increased correspondingly. For the mobile phones market, smartphone had been expected to make up almost half of all mobile phones sold in Thailand by 2013. In 2012, the smartphone sales grew by 115 percent and had been forcasted to grow steadily by 110 percent or nearly 7.5 million units sold by the end of 2013 (Bangkok Post Business, 2013). Besides that, as the popularity of smartphones, heavy media and advertisements, as well as availability of 3G services, these have made the smart devices market become very exciting, especially the tablet and computer markets. Domestic tablet market alone had been projected to grow by 110 percent to 115 percent with total sales of 3.5 million units in 2013 (IDC, 2013).

In the automotive industry, Thailand has positioned itself as automotive center, the largest hub of automobile production in the Southeast Asia region and among the top 10 largest manufacturers in the world (Chiasakul, 2004; WTO, 2012). Each year, the industry has annual outputs of nearly 1.5 million cars (OICA, 2012). NESDB statistics data reinforced that possibly the largest new investment in Thai market in 2013 would come from automotive industry. For example, a new Honda plant worth USD 570 million plans to establish in Thailand. Moreover, Toyota, the country's largest and the world leader in automaking, also projects to

invest USD 402 million for creating a new eco-car segment for the domestic market. By the end of 2013, Toyota had expected to sell 900,000 units of cars, of which more than 50 percent of the cars produced in Thailand would sell locally and the remaining would be exported to the rest of the region (Hans, 2013). Since the first-time-car-buyer scheme was enacted in September 2011, domestic cars consumption has grown by 312.9 percent and had been anticipated to continually increase until the end of 2013, as reported by NESDB (2013).

Thailand is also the largest electrical/home appliance production base in the region, the world's second largest producer of air conditioners and the world's fourth largest producer of refrigerators (EEI, 2012). Currently, the country's home appliance industry is comprised of 807 factories, of which approximately 43 percent of the total companies are Japanese manufactures, including Sony, Hitachi, Mitsubishi, and Panasonic, while 57 percent are the world-class electrical/home appliance manufacturers, such as Electrolux, Schneider Electric, Honeywell Electronic Materials, Emerson Electric, Carrier, LG, and Samsung. These foreign manufactures have been using Thailand as their international production base for many years (BOI, 2009). Moreover, in term of export values, Thailand's home appliance exports were valued at USD 17.8 billion in 2008, roughly 9 percent higher than the previous year (BOI, 2009). In addition, as the world gradually expands in household expenditures as well as technology improvement in energy efficiency, these kinds of market expansion and product development have an impact on the world and the region of home appliance manufacturers and

consumptions, in which the home appliance manufacturing and selling in Thailand are expected to grow at this similar stable rate for the next few years (NESDB, 2013).

Availability and accessibility of primary and secondary data. Out of hundreds of manufactured products, electronics/IT product, automobile, and home appliance have been the three most popular products for various disciplines in numerous research and studies (Makgopa, 2005). There are large pools of secondary data sources available in both academics and marketplaces, and to access primary data sources is also very practical and feasible. Primary data on electronics/IT product, automobile, and home appliance could feasibly be collected through interview, questionnaire, observation, and survey.

Therefore, with strong demand, public reviews influencing consumer purchasing decision, home for world-class producers, land for emergent consumers, and availability and accessibility of primary and secondary data sources, the electronics/IT product, automobile, and home appliance are considered to be the three most appropriate products for this research.

Note that this research has narrowed down the scope of electronics/IT product to mobile phone, computer, laptop, and tablet, and of home appliance to television, refrigerator, washing machine, and air conditioner, in order to enhance the significance of this research's results.

3.3. Scope of "Thai Product Quality" Identification

Toyota cars, smart iPhone, Samsung Galaxy Tab, Electrolux washing machine, Nikon camera, Panasonics television and home appliances are some of the familiar names of quality products surrounding Thai people in everyday life. But what does this research imply when it says "Thai Product Quality". Under this research context, Thai product quality refers to the attributes or values of any product, specifically under these three product categories of electronics/IT product, automobile, and home appliance, that retails and sells in Thailand. Thai product quality could also either be produced in Thailand or anywhere else in the world, but importantly are being sold, purchased, consumed, or perceived by Thai consumers.

4. Research Strategies and Methodologies on Data Collection and Evaluation

In order to make valid and significant research, researchers must have access to the right information/data source(s) and evaluate these with the right method(s).

To access the right information/data source(s), researchers typically make use of different data collection strategies. These could be either primary data collection or secondary data collection, or both.

Academically, primary data are those collected for the specific research problem(s) at hand. Such primary data collection techniques are questionnaires, psychological tools including in-depth interviews or participant observations, and

mechanical devices like barcodes scanners or people meters. On the other hand, secondary data are those originally created and collected beforehand by other researchers for different research purposes, and made available for reuse by other researchers. Literature review, case studies, publications, journals, and articles are the common sources for secondary data (Kotler, 2003).

Since this research *"The Attributes of Product Quality: An Analyis of Thai Product Quality"* has three main research purposes, the research decided to apply both primary data collection of interview and, as well as secondary data collection of literature review, journal, article, and public review to make the best access to the right data sources. The rationale for applying interview and questionnaire research methods and with whom, as well as secondary data research methods, are given in the succeeding paragraphs.

4.1. Multiple Data Collection Methods: Interview vs. Questionnaire vs. Literature Review

Interview research method is principally a conversation between two or more people, in which questions are asked by the interviewer while facts and opinions are shared and responded to by the interviewee(s)/interview participant(s). Although interview is commonly seen as part of the work of journalists and media reporters; however, interview is also a very useful tool for researchers, results of which would further support and lead to the use of other research methodologies. There are three fundamental types of research interviews, which are structured,

semi-structured, and unstructured (Hox & Boeije, 2005). To define Thai product quality in the 21st century and the product quality attribute dimensions, the reserch decided to apply semi-structured research interview for collecting in-depth data. By applying semi-structured research interview, it allowed both interviewer and interviewees, who are government officials, producers of a product, and intermediate sellers, to flexibly exchange, pursue, and explore the key and related research questions in more detail. During the interview, the interviewer could explain more and make the questions clearer to the interviewees when they need extra clarification. Moreover, the interviewer could also record additional observations such as body language, voice, and intonation of/among different interviewees, and this helps the interviewer to understand the interviewees' real intentions. All in all, by doing interview, this permitted insight information, interrelatedness of response in time, recognition of different interviewees' real intentions, and constraint of difficulties and errors in Thai product quality data interpretation.

Unlike the interview, *questionnaire research method* consists of a set of questions prepared and then presented to the respondents. As questionnaire has an advantage of being very practical, in which large amounts of information/data could be collected at a time, fairly cost effective, and the result could easily be quantified, by far the questionnaire is one of the most common methods generally used to collect primary data (Hox & Boeije, 2005). However, still there are some disadvantages. Questionnaire is sharply limited by the validity of the respondents

and relatively difficult to control for errors while respondents are answering questionnaires. Therefore, researchers need to carefully develop, test, and debug questions before the respondents are actually administered the questionnaire. Furthermore, questionnaire is also best for studying people's knowledge, beliefs, preferences, tastes, and level of satisfaction. Hence, to conceptualize the product quality definition and the product quality attribute dimensions, particularly in the case of Thailand and in the overall Thai consumers perception, this research decided to explore this information/data through a questionnaire.

The research also applied secondary data research method of reviewing *literature, journals, and articles*. In fact, there are many advantages of accessing these secondary data sources, such as it is more economical and convenient to obtain the information/data than the two previous primary data research methods. More importantly, by reviewing literature and other related studies including journals and articles (public reviews to be discussed later in this subsequent section), it significantly helps improve the understanding of this research topic, provides a basis for comparison of the information/data/previous research results that are collected by other researchers, and reveals the gaps and deficiencies as to what additional information/data needs to be collected to validate and make this research become more significant.

By doing interview, distributing questionnaire, and reviewing secondary data, the research would be able to access and collect the right information/data sources that lead to more accurate research results.

4.2. Selecting Interview Participants and Questionnaire Respondents

Not all participants and respondents can provide equal quality research results. To test for marketing universal or nationwide conception, essentially it requires a good and matched representative of both participants and respondents.

Selecting the right participants for interview and respondents for questionnaires, particularly for country-wide definition and attribute dimensions on Thai product quality was absolutely not an easy task. Both participants and respondents should have enough information or expertise to answer the product quality related questions. They should represent the general Thai population's perceptions and at the right proportions. According to these guidelines, the research applied two sampling methods of "purposive" and "probability" for selecting the most appropriate participants for interview and respondents for questionnaire.

For interview participants, the research applied purposive sampling method, by which the research chose to interview government officials, product producers, and intermediate sellers of these three studied product categories to represent the standpoints and opinions from policy makers/regulators and market suppliers. With the differences in authority, expertise and technical skill, these respondents

would provide the insight information/data on different perspectives toward Thai product quality.

For questionnaire respondents, the research applied probability sampling method, by which all three products' consumers at the point of sale (POS) would have equal chance of being selected as participants. With the differences in economic and sociodemographic backgrounds, including diversity in economic status, education background, gender, and age, these would provide general but real information/data from actual consumers' perceptions on Thai product quality.

Overall, by applying both purposive and probability sampling methods in interview and questionnaire, it assisted this research to overcome some of the limitations in each sampling method and disclosed the general and complete perceptions as well as revealed hidden misunderstandings on Thai product quality from the country policy makers, product producers, market sellers, to the end consumers. Thus, by selecting the right participants and respondents at the right proportions and with the right methods, the results of interview and questionnaire were expected to be very fruitful.

4.3. Assessing Public Reviews: *Three Public Reviews in Thailand*

For many years, published quality ratings have great influence on academic research. In 1986, the study by Curry and Faulds identified that, so far, more than 30 studies have used objective quality ratings in public reviews as qualified data

for their studies, predominantly in marketing and consumer products. In 2007 Tellis and Johnson used the electronics and software product reviews in Wall Street Journal as their main source of data, and the results of their study on the "Value of Quality" was extensively credited by many researchers (Luo, 2010; Tellis, Yin, & Niraj, 2008; Zhang, Wu, Li, & Ogihara2009).

In addition, product reviews in public reviews such as consumer reports and magazines have also been widely used among consumers. With an increase in mass media marketing competition, consumers are seeking for reliable sources of product information to distinguish between hypes and facts. Corresponding to that, public reviews appear to be a fair and reliable source by which consumers likely make their purchasing decisions accordingly to the reviews (Kelley, 2010).

Nowadays, there are thousands of public reviews offered worldwide that assess various types of products including cars, appliances, and other consumer products, and give reviews in weekly, monthly, periodical basis, and using many criteria, such as value, performance, and technical. Therefore, using public reviews for assessing product information provides both researchers and consumers a valid source to assess the appropriate product information/data when considering a chosen product.

In Thailand public reviews, Thai consumers also consult the reviews in magazines before purchasing a product, especially a new technology based product (Bangkok

Post, 2011). According to the Magazine Association of Thailand (TMAT), as of June 2013, there were 31 categories of magazines and more than 300 magazines available in Thai magazine markets. Of the 31 categories and more than 300 magazines, On Camera, Camerart, Phone, T3, RC Action, R.C. Flying, On Mobile, First Mobile, Brandage, I3 Techguide, Stuff, ET, GM 2000, MM Gold, PC World, Computer Today, E-Commerce, DL, and PC Today are the 19 popular electronics and IT magazines for technology gadgets followers; while Auto Build, GM Car, Grand Prix, CAR, Superbike Magazine, Bestcar Kodansha Thailand, ARC Magazine, Motocross Magazine, Autocar Thailand, FOC, Eurotuner, Today's Motor Car Magazine, Off Road, Top Gear, and Headlight Magazine are the 15 popular automobile magazines available for cars readers. Despite a variety of Thai magazine categories and more than hundreds of magazines available in market, currently there is no particular magazine giving reviews exclusively on home appliance products. However, from time to time televisions, washing machines, air conditioners, and refrigerators are being reviewed and rated in CE Mart Magazine.

Among the 19 popular electronics and IT magazines, PC Today claimed itself to be the country's number one in IT magazines, in which every month PC Today publishes insight reviews, news, and tips right to the consumer's demands on hot IT items. Owing to that, PC Today has consecutively received the IT Pop Star Magazine Award for many years and has become the country's leading IT magazine (pctodaythailand.com). For automobile magazines, although there are

many popular automobile magazines available in the market, Headlight Magazine has risen to the top of its ranks with expertise in automotive field and fancy reviewing style by J!mmy. Over a short period of time, Headlight Magazine has becomes the top automobile magazine for Thais, and has a big influence on cars readers (see Appendix III for J!mmy - the famous cars reviewers).

With the availability and reliability of data and popularity among Thai magazines readers, the research decided to assess product reviews in *PC Today* for electronics/IT product, *Headlight Magazine* for automobile, and *CE Mart* for home appliance in obtaining product quality data in public reviews.

4.4. Multiple Data Evaluation Methods: Content Analysis vs. Regression vs. Correlation

After the research selected interview, questionnaire, literature reviews, and public reviews as multiple data collection methods, the research then required to translate/analyze those collected product quality data through multiple data evaluation methods. These relevant methods of data evaluations are content analysis, statistics regression and correlation.

Since most of the product reviews in Thai magazines provide descriptive data, thus, it was necessary for this research to transcribe those descriptive product reviews into constructed and measurable contents, so that later on the research could make comparative statistical evaluation. One of the replicable data

evaluation methods is content analysis. Content analysis or textual analysis is a systematic social science method for studying and compressing many words of text into fewer content categories based on explicit rules of coding (Berelson, 1952). In simple words, content analysis is a methodology for structuring non-structured information into structured information (GAO, 1989). To conduct content analysis, the research primarily made non-structured data into structured data by creating relative content categories and numerical codes/scales that cover the studied product reviews. The research, then, transcribed those non-structured descriptive product reviews into these constructed categories and numerical code/scale. In fact, by applying content analysis evaluation method, it allowed this research to generalize and translate qualitative data into quantitative data and make the descriptive product reviews evaluation become possible. However, the research still had to pay careful attention to consistency in transcribing and coding these data. It was very important for the research that different assessors would transcribe the same text into the same constructed codes. For more details of content analysis and coding, a discussion is available in Chapter 5.

Regression and correlation analysis are interrelating statistics evaluation methods often applied in statistical tests. These are related in the sense that both methods deal with relationships among variables. Regression analysis involves identifying the relationship between a dependent variable and one or more independent variables, while correlation analysis tests for interdependence of the variables (Howell, 2010). For example, in this research, the dependent variable in

regression analysis was the overall product quality values in three different product categories and the independent variables were the proposed product quality attribute dimensions; likewise in correlation analysis, the variables were the proposed product quality attribute dimensions. By applying regression analysis, the research was able to determine and see how strong/weak each/multiple proposed product quality attribute dimension(s) has/have on reviewing/perceiving overall Thai product quality in the three product categories. Besides that, by applying correlation analysis, this research further verified how well each proposed product attribute dimension correlate or has more or less influence/relationship on the other proposed product quality attribute dimensions. However, both regression and correlation analyses could only indicate how well and what extent the variables are associated with other variables; neither of these statistical analysis methods could be interpreted as the cause nor the effect among the variables. This issue needs to be addressed.

Thus far throughout this section, different research strategies and methods for data collections and evaluations have been discussed. In the next section, how to come up with interview and questionnaire questions and what would be the initial proposed product quality attribute dimensions are described.

5. Related Interview and Questionnaire Questions on Product Quality and Product Quality Proposed Attribute Dimensions

5.1. Developing Interview & Questionnaire Questions

5.1.1. Interview Questions

In semi-structured interview, the interview is conducted with a fairly open framework, which allows the research to focus and converse in a two-way communication. As aforementioned, this research applied the semi-structured interview method, in which the framework of the interview is designed prior and parts of the main questions are prepared before time. Recall that the aims and objectives of this research are to define a more up-to-date definition of Thai product quality and to verify the valid set of attribute dimensions that could be used in measuring various types of product, particularly in the case of Thailand. Corresponding to that, the interview questions were developed in such a way to achieve these research aims. Hence, the main interview questions were *"what are the factors that influence customer's decision in buying a product?"*, *"what is/are other factor(s) that can be used to evaluate product quality?"*, *"what is your definition of product quality?"*, "*what could be the differences in today's product quality and the next 5(10) years' product quality?"* and *"why do you think that?"*. Since semi-structured interview allows both interviewer and participants to have flexible conversation, several relevant questions regarding Thai product quality could possibly be raised during the interview.

Note that before conducting the interview, all the interview participants including government officials, producers of a product, and intermediate sellers were fully informed about the research purposes. The interviewer had to have a pre-research on the general information of the interview participants, such as name, present position, and responsibility of the participants in the organization/company, so that the interview could be carried out in a smooth and appropriate manner.

During the interview, the research first started with some general questions. These questions were *"what is your present position and main responsibility in this organization/company?"*, *"during the past fiscal year, what type of product(s) that (Thailand/Toyota/Honda/Panasonics/Apple…) produces the most and/or make the most sales?"*, *"why do you think are the consumers willing to buy that?"* or *"what are the key success factors?"*. By starting with these general questions, it was projected to create a light atmosphere between interviewer and the participants, and that would allow the interviewer to understand more about the participants' roles, responsibilities, and their organizations/companies. In addition, many important product success factors were also pointed out and these might be very useful in determining the Thai product quality definition and identifying the product quality attribute dimensions in the latter part of the interview.

Second to respond to the research aim of verifying the valid set of attribute dimensions, the research developed the other two interview questions. These were *"as government official/QC manager/intermediate seller, in your opinion, what*

are the factors that influence customer's decision in buying a product?" and *"besides those factors, what is/are other factor(s) that can be used to evaluate product quality?"* Regarding the interview question *"what factors influence customer's decision in buying a product"*, the research decided to apply the ranking technique and ask the participants to rank their preferences in accordance to the seven given attribute factors/dimensions, which are "function", "ease of use", "reliability", "durability", "design", "eco-friendliness", and "customer satisfaction". For details of each of the proposed product quality attribute factors/dimensions, an explanation is available in the section with the same label. Furthermore, through this ranking, the research was able to identify the differences in perceptions as well as the missing gaps on the factors that influence Thai customer's decision in buying a product. For instance, government officials might see and rank reliability attribute dimension as of higher influence than product producers and intermediate sellers on Thai customer's decision in buying a product. Moreover by asking *"what is/are other factor(s) that can be used to evaluate product quality?",* it was foreseen to provide additional factor(s) that can be added to the initial proposed product quality attribute dimensions and enhance the attribute dimensions to be much more applicable to evaluate various types of product.

Third, in order to identify a more up-to-date product quality definition, the research created two more interview questions, which were *"what is your definition of product quality?"* and *"what could be the differences in today's*

product quality and the next 5(10) years' product quality and why do you think that?" Although the latter questions aimed to expose the participants' expectation toward product quality, the answers to these would indirectly lead to a more inclusive definition of product quality, which distinguishes not only the differences in perspectives, but also in the product quality expectations. For the list of interview questions in both English and Thai, see Appendix IV and V.

Overall, through asking these interview questions, the research projects the results of interviews with regulators, product producers, and market sellers would yield an insight and very useful information on Thai product quality definition as well as product quality attribute dimensions.

5.1.2. Developing Questionnaire Questions

Distributing questionnaire at the point of sale (POS) was another data collection method that helped this research capture the consumers' perceptions at real time. Similar to the interview questions, the contents of the questionnaire were carefully developed, with the research objectives translated into information requirements then structured into different questions in the questionnaire.

To develop the questions, the research applied both open-ended and close-ended techniques, noting the words and the contents of all questions had to be short, precise, simple, and appropriate to get the needed information from the consumers. According to these outlines, the research divided the questionnaire into three main

parts: background of the respondent, attribute dimensions of product quality, and definition of product quality. In addition to these key questions, a short description about this research was also attached to explain the questionnaire's purposes.

For part one of the questionnaire, four close-ended questions were created to obtain the respondents' personal data/information, including gender, age, education, and monthly income (see Appendix VI and VII for customer opinion questionnaire on product quality in both English and Thai). In each of these close-ended questions, the questionnaire asked the respondents to select one choice among several given options that is most appropriate to them. For example, in education question, there were three alternative choices of "under bachelor's degree", "bachelor degree's", and "above bachelor's degree", to which respondents were requested to choose one that is most relevant to their background. Through these close-ended questions on respondents' backgrounds, the research was able to gather some essential data that would reveal the differences in demographic determinants as well as lead to the distinctive effects on overall consumer buying decision and product quality attribute dimensions. Furthermore by applying close-ended questions, this was also very convenient for respondents especially at the point of sale to answer questions that require less effort and time, and the results would become relatively easy to analyze.

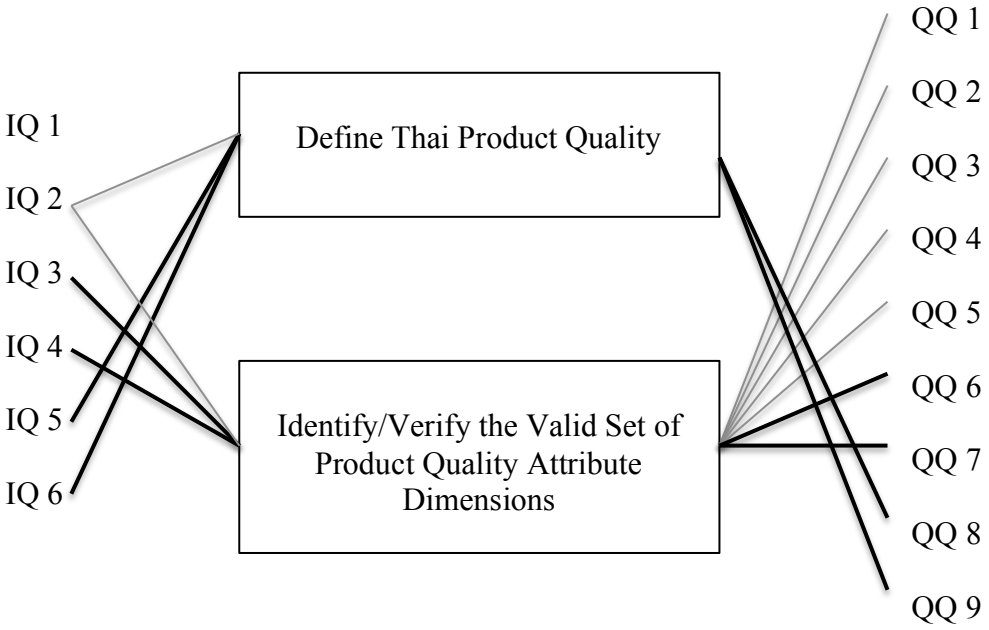
In part two of the questionnaire, the research formulated the other three questions to obtain the respondents' behaviors and choice of factors that influence their buying decisions in the three identified product categories, in which *"what kind of product(s) did you buy today?"* and *"according to what you just buy, what factor(s) influence your decision in buying a product?"* were the closed-ended questions with given answer choices, and *"besides those factors, in your opinion, what is/are other factor(s) that can be used to evaluate product quality?"* was the open-ended question. Compared to the interview question of *"what are the factors that influence customer's decision in buying a product"*, the respondents were also asked to rank their preferences of given attribute factors in "*what are the factor(s) that influence your decision in buying a product?"*. Furthermore, in the question "*what is/are other factor(s) that can be used to evaluate product quality?"*, the open-ended technique allowed the respondents to freely express their perceptions on this question.

In the third and final part of the questionnaire, the two open-ended questions *"what is your definition of product quality"* and *"what could be the differences in today's product quality and the next 5 years product quality? and why do you think that?"*, were formulated to attain product quality definition. By leaving some room for the respondents to answer, the research expected that the responses would present the actual understandings and the real expectations of the consumers toward defining product quality.

All in all, the questionnaire questions have been purposively designed in response to the research aims and objectives. The words were carefully formulated and kept short and simple so that the difficulties in understanding the questions were reduced. The alternative choices in each closed-ended questions were systematically formed under supervision of specialists, and pre-test of the questionnaire conducted on 15 Thai consumers helped debug it before actual administration. Furthermore, it was fairly noticeable that the contents of all questionnaire questions were very similar with the interview questions. In fact, this was an intention of the research to make both interview and questionnaire questions compatible and identical, so the results of each method would also be analytically comparable. Owing to that, the results of both interview and questionnaire prospectively signified perspectives from these market players: regulators, product producers, market sellers, and consumers.

Figure 3.2 shows the design of interview and questionnaire questions related to the research aims and objectives, in which IQ stands for interview question and QQ stands for questionnaire question. Since there were six questions in the interview, these were labeled as IQ1, IQ2, IQ3, … and IQ6. Likewise, there were nine questions in the questionnaire, and these were labeled as QQ1, QQ2, QQ3, … and QQ9. For details of each interview and questionnaire question see the note below Figure 3.2. In addition, the thick and dark line in this Figure indicates a direct/strong relationship with the research aim(s)/objective(s), whereas the thin and gray line indicates an indirect/weak relationship.

Figure 3.2: The design of interview and questionnaire questions related to the research aims



Note that

IQ 1: What is your present position and responsibility?

IQ 2: During the past fiscal year, what type of product(s) that (Thailand/Toyota/Honda/Panasonics/Apple…) produced the most and/or make the most sales?, why do you think the consumers willing to buy that? or what are the key success factors?

IQ 3: What are the factors that influence customer's decision in buying a product? (ranking preferences)

IQ 4: What is/are other factor(s) that can be used to evaluate product quality?

IQ 5: What is your definition of product quality?

IQ 6: What could be the differences in today's product quality and the next 5(10) years' product quality? and why do you think that?

QQ 1: Close-ended question with choices for Gender

QQ 2: Close-ended question with choices for Age

QQ 3: Close-ended question with choices for Education

QQ 4: Close-ended question with choices for Monthly Income

QQ 5: What kind of product(s) did you buy today?

QQ 6: According to what you just bought, what factor(s) influence your decision in buying a product? (ranking preferences)

QQ 7: Besides those factors, in your opinion, what is/are other factor(s) that can be used to evaluate product quality?

QQ 8: What is your definition of product quality?

QQ 9: What could be the differences in today's product quality and the next 5 years' product quality? and why do you think that?

5.2. Proposing Product Quality Attribute Dimensions: Related Concept of Product Characteristics

Product quality has been defined and measured in a variety of ways in the literature. As earlier reviewed in the previous chapter, consumers tend to make their buying decisions as well as evaluate product quality based on their experiences and/or expectations on both intrinsic cues and extrinsic cues of various product characteristics or attributes (Acebron, Mangin, & Dopico, 2000). Such intrinsic and extrinsic cues of product attributes are price, brand name, store image, market share, product features, country of origin (Lambert, 1980), services (Dorfnan & Steiner, 1954), reliability (Juran, 1978), durability (Garvin, 1984), and warranty (Feldman, 1976; Shimp & Bearden, 1982).

In addition, according to the most famous and cited works of Garvin's study in 1984 and 1987, Garvin combined and classified all those related cues and attributes into eight general attribute dimensions, including performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality, in signaling and assessing product quality. Corresponding to that 30 years later, the study by Tellis and Johnson in 2007 relatively identified seven similar attribute dimensions of stability, compatibility, ease of use, reliability, utility of secondary features, intrinsic performance, and user-friendly design, in evaluating and assessing IT product quality. Moreover, other studies on product quality attribute dimensions, including Maynes' study in 1976, which suggested nine attribute dimensions of economic durability, comfort, performance, convenience,

safety, aesthetics, status, carrying capacity, and pollution effect in assessing car's quality, or Magkopa's study in 2005 and Gordon's study in 1990, in which guarantee, retailer's reputation, brand names, price, service reliability, energy efficiency, and warranty were used as attribute dimensions in evaluating various types of home appliances' quality. Despite the differences in product categories, attributes' terms and time, there seemed to be similarities among a variety of attribute dimensions commonly used in evaluating and assessing across types of product quality, particularly in the technology-based products. These identical attribute dimensions are utility/performance, usability/convenience, reliability, durability, and feature.

Developing from that, this research proposed first the inclusion of five product quality attribute dimensions of *"function", "ease of use", "reliability", "durability",* and *"design"* that have been repeatedly studied in many marketing and academic literatures and in the aforementioned studies, and second the addition of two product quality attribute dimensions of *"eco-friendliness"* and *"customer satisfaction"* as the initial proposed seven product quality attribute dimensions in evaluating electronics/IT product, automobile, and home appliance. Note that the results of interview and questionnaire, specifically on the question of *"what is/are other factor(s) that can be used to evaluate product quality"* would further add potential attribute dimensions to this initial set of proposed product quality attribute dimensions, which later on would be used in evaluating and measuring the three product quality categories in Chapter 5.

The terms and definitions of each of the proposed product quality attribute dimensions are written in Table 3.2.

Table 3.2: The proposed product quality attribute dimensions' terms and definitions

Attribute Dimensions	Terms and Definitions
Function	The ability, utility, and performance of a product compared to previous version or similar type of product, e.g., speed, intelligibility, technology, etc.
Ease of use	The charecter by which a product can be utilized by general consumer without any difficulties and problems.
Reliability	The property of a product being creditable, reliable, e.g., market recognition, brand awareness, safety, etc.
Durability	The ability of a product that is able to perform over a long period of time without technical error and physical breakdown.
Design	The total outlook and feature of a product, e.g., color, size, weight, etc.
Eco-friendliness	A product that is free from chemicals and is harmless to the environment, e.g., green material, recyclable, energy saving, carbon credit, related to green concept, etc.
Customer satisfaction	The overall feeling and perception of a consumer on a product, compared to consumer's expectation and/or previous experience in using a similar brand product or from the same company.

"Function", the term and definition of *"function"* attribute dimension is derived from joint elements of "performance" attribute dimension (Garvin, 1984,1987; Maynes, 1976) and "compatibility" attribute dimension (Tellis & Johnson, 2007). By combining both essence of "performance" and "compatibility" attribute

dimensions together, the research developed the first attribute dimension of *"function"*, which refers to the ability, utility, and performance of a product compared to previous version or similar type of product, such as speed of a car, intelligibility vision and sound of LCD television, and technology resolution in smartphone and tablet.

In the same line with that, the second attribute dimension of *"ease of use"* or the character by which a product can be utilized by general consumer without any difficulties and problems, was developed on the grounds of Maynes' product attribute of "convenience" and Tellis and Johnson's product attribute of "ease of use". According to Maynes (1976) and Tellis and Johnson (2007), their studies showed that it is very important for a product to be user friendly, that is, convenient and easy for a product holder to use. Furthermore, with many failures of newly-launched products that offer complex applications, this also highlighted usability with user friendliness as still highly appreciated by the market.

Somewhat different from the first two proposed product quality attribute dimensions, *"reliability"* attribute dimension had to combine the traditional term and definition of reliability with the term and definition of creditability and trustworthiness, including market recognition as well as country of origin, brand awareness, and safety. To come up with this adjusted term and definition, the research defined *"reliability"* based on Thai consumers' perceptions and understanding toward the reliability term. Since reliability generally means

"ความน่าเชื่อถือ" in Thai, hence, *"reliability"* under this research context refers to the property of a product being creditable, reliable, and trustable.

Fourth, the term and definition of *"durability"* was basically derived from Garvin (1984, 1987) and Makgopa's studies (2005), in which the *"durability"* attribute refers to the measurement or the length of product's useful life. Comparable to that, in this research *"durability"* is re-defined as the ability of a product that is able to perform over a long period of time without technical error and physical breakdown.

Fifth, the *"design"* attribute dimension simply refers to the total outlook and feature of a product such as color, size, and weight in this research context. The term and definition of *"design"* mainly developed from the term and definition of "feature" identified by Garvin (1984, 1987), "user friendly design" identified by Tellis and Johnson (2007), and partly "aesthetics" identified by Garvin (1984, 1987), Makgopa (2005), and Maynes (1976).

What is more, the last two proposed product quality attribute dimensions of *"eco-friendliness"* and *"customer satisfaction"*, were originally developed specifically for this research, in which *"eco-friendliness"* represents "pollution effect" and "energy efficiency" attribute dimensions in Maynes (1976) and Gordon (1990). Meanwhile, *"customer satisfaction"* represents overall parts of "perceived quality"

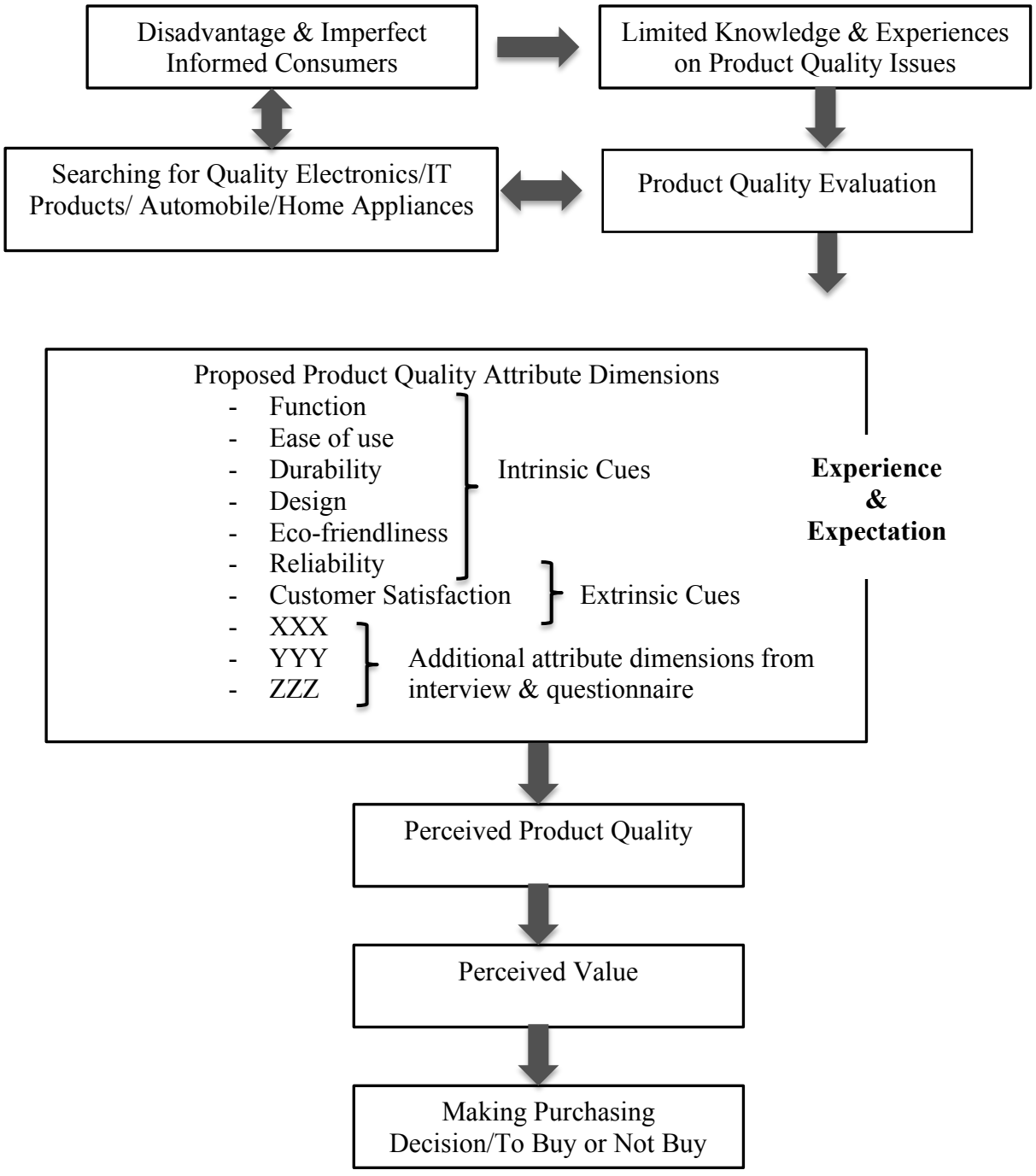
attribute dimension in Garvin (1984, 1987) as well as "aesthetics" attribute dimension in Garvin (1984, 1987), Makgopa (2005), and Maynes (1976).

In fact, *"eco-friendliness"* and *"customer satisfaction"* were not utterly new among the product quality attribute dimensions. However, by redefining their terms into *"eco-friendliness"* and *"customer satisfaction"* attribute dimensions, in which *"eco-friendliness"* refers to a product that is free from chemicals and is harmless to the environment, e.g. green material, recyclable, energy saving, carbon credit, related to green concept, etc., and *"customer satisfaction"* refers to the overall feeling and perception of a consumer on a product, compared to consumer's expectation and/or previous experience of using a similar brand product or from the same company, this appeared to complete and associate with the literature review that consumers tend to make their buying decisions as well as evaluate product quality based on their experiences and/or expectations on both intrinsic cues and extrinsic cues of various product attributes/characteristics, in addition to the go green trend of environmental and social concerns (Bonini & Patience, 2011; McKinsy & Company, 2010; Sheridan, 2010).

Therefore, *"function", "ease of use", "reliability", "durability", "design", "eco-friendliness"* and *"customer satisfaction"* were the seven product quality attribute dimension that the research proposed for evaluating and measuring variety types of product quality category, particularly electronics/IT product, automobile, and home appliance in the case of Thailand.

Figure 3.3 demonstrates the overall structure between consumer's purchasing decision and product quality proposed attribute dimensions, which could help a consumer in evaluating product quality. Note that before when a consumer had limited knowledge and/or lacked experience, they had to rely on perceived product quality and value to help them decide whether or not to buy a product. Attributes *"function", "ease of use", "durability", "design",* and *"eco-friendliness"* attribute dimensions are parts of intrinsic cues, while *"customer satisfaction"* attribute dimension is part of extrinsic cues, and *"reliability"* attribute dimension is integrated into both parts of intrinsic and extrinsic cues. The research expects that by applying this structure, Thai consumers could effectively judge and make their buying decision through the proposed product quality attribute dimensions, and to some extent, and that different product categories could embody and be measured by the specified product attribute dimensions/characteristics.

Figure 3.3: Consumer's purchasing decision and the purposed product quality attribute dimensions



6.Validity and Reliability of the Research Methods

There are several limitations that many studies, particularly marketing and consumer behavior on product quality, fail to perform. These are the validity and reliability of participants or respondents and the contents of the interview/ questionnaire questions. Very often, the studies on merchandising of retail products are faced with participants/respondents who are highly abstract, avoid revealing their real attitudes, respond with unrealistic behaviors, or appear to be irrelevant participants/respondents; for example, participants/respondents have to judge a new line of fashion clothes and evaluate using some sketched pictures or oral presentations, without having a chance to examine the actual clothes. A part from that, it is relatively common to see parts of the interview/questionnaire questions happen to be leading, as if suggesting the preferred answers. To limit such errors that lead to biased results, necessary steps have to be implemented to certify the validity and reliability of the research methods.

6.1. Theoretical Validity

In this research, terms and definitions as well as concepts relating to product quality, including the definition, attribute dimensions, and measurement of Thai product quality, were carefully designed through a comprehensive review of literature and across the research structure. Before finalizing the contents and choices of questions in the interview and questionnaire as well as contexts and scales in the content analysis, several techniques and under specialists' supervision have been employed to double-check the concepts, wordings,

measuring scales, and alignment with the aims and objectives of this research. Several denominators and different levels of measuring scales were also included to cross check the responses as well as to increase the validity. For instance, the questionnaire respondents were asked to specify their demographic backgrounds and the type of product that they just bought, or in the latter part, the research applied the 5-point scale and 11-point scale of content analysis in assessing the product quality reviews. Moreover, to come up with the seven proposed product quality attribute dimensions, the research theoretically developed from the validity of previous studies on product quality attribute dimensions.

6.2. Construct Validity

Construct validity in this research refers to the extent in which the designs of interview, questionnaire, and content analysis were well performed according to the research design. As already mentioned, the questions of interview and questionnaire were pre-checked by specialists, who are professors and practitioners in the marketing and product development fields. The interview questions were approved by practitioners and questionnaire questions were thereafter pretested on 15 respondents in Chonburi province. By doing so, unclear texts have been revised, the numbers of questions have been shortened, and the overall contents have been improved for ease of understanding to ensure that these covered all the scopes of the problems. In addition, the scales in content analysis were carefully designed and converted back and forward, so that the errors and mis-scaling in converting the product quality reviews could be limited.

6.3. Representativeness

To ensure that the research samples (interview participants, questionnaire respondents, and numbers of product reviews assessed in public reviews) provided valid information/data and represented general population, a specific country, geographical area, and focused on product categories in Thailand at Chonburi province on electronics/IT product, automobile, and home appliance were selected for this research project. They were selected by the means of purposive and probability sampling using pre-determined criteria. Government officials, product producers, and intermediate sellers who specialized in these fields were interviewed, and only willing respondents or consumers at the point of sale (POS) were questioned in order to enhance the interview and questionnaire results. Furthermore, the assessed product reviews in with content analysis were selected based on the availability, reliability, and popularity of the data.

6.4. Reliability

There were several sources of noise that research might confront during the data collection, such as the environment in which the research conducts the interview and administers the questionnaire. To reduce the noise, the research allowed the participants to freely decide the place and time that most convenient for them to participate in the interview. Furthermore, the researcher only approached prospective respondents who are willing to take the questionnaire at the point of sale (POS). Since interview and questionnaire were conducted in a flexible and comfortable atmosphere and structure, both participants and respondents felt at

ease and relaxed, and this optimistically promoted honest responses. Moreover, the reliability of this research was also enhanced by a good combination of data collection, in which the questions in the interview and questionnaire were identically designed and aligned with the research purposes.

Therefore, through implementing these steps, the research expected that some errors could be limited and several biases could be avoid, and that ultimately increased the validity and reliability in determining product quality definition as well as verifying the proposed attribute dimensions in measuring product quality, specifically in the 21st century and in the case of Thailand.

The research presented the literature reviews in the previous chapter, the conceptual framework, selection and identification of research scopes, variety in research strategies and methodologies, development of interview, questionnaire, the proposed product quality attribute dimensions, and validity and reliability of the research methods in this chapter. For the inclusive details of data collection and data analysis on defining Thai product quality in the 21st century and the attribute dimensions of Thai product quality, the measurement, and the validity are further explained in Chapter 4 and Chapter 5.

CHAPTER 4: DEFINING THAI PRODUCT QUALITY IN THE 21st CENTURY

There is no single universal definition of product quality. Different people view product quality differently and this makes product quality extremely difficult to define. In this chapter, the research takes Thailand as a case study, by examining four different key sectors through interviews and questionnaires, shares the opinions and thoughts they have on Thai product quality, specifically on three product categories: electronics/IT product, automobile, and home appliance. As a result, the research proposes a more precise and updated definition of Thai product quality from regulators, market suppliers, as well as consumers' perspectives. These definitions are associated with significant product values for Thai people, in which *"reliability"*, *"function"*, and *"durability"* are evaluated as the most influential attribute dimensions on consumer buying decision. Furthermore, *"support service"*, *"value for money"*, and *"adaptability"* are other important attribute dimensions that Thai people also use in evaluating Thai product quality.

1. Introduction

In the midst of high competition in an open market, to win, sometimes maintain, and miserably even survive, firms need to come up with strategies that exploit the market, shape consumer preferences, deliver un-expectation, and in return, be rewarded with a dominant market share (Carpenter & Nakamoto, 1989; Kalyanaram, Robinson, & Urban, 1995; Robinson & Fornell 1985). Winning the

market through innovation by launching a new product is one of the most common strategies that firms use. However, compelling evidence and some studies noted that by only introducing new product and becoming the first movers in the market may not guarantee advantage or success (Golder & Tellis, 1993; Shankar, 1999; Zhang & Narasimhan, 2000). Many of the recent and new developing gadgets evidently demonstrated countless failures. In fact, simply delivering superior product quality might be the important key in appealing to today's market (Tellis & Golder, 2001).

Everyone sensibly understands what product quality is, however, no one could give a universal definition of it. *Why is that?* There are several reasons supporting why no one could come up with a definite definition. First, the term "quality" is very difficult to define, measure, and assess unambiguously; and second, the character of quality is also changing over time (Curry & Fauld, 1986). Accordingly, when it comes to product quality, it is challenging to agree on one absolute definition on what product quality means. This also includes looking from what perspectives and what academic paradigms.

Therefore, the research question I ask here for this chapter is the definition of product quality, especially *"what could be the definition of product quality in the 21st century and in the case of Thailand?* Up to now, there is no single research giving product quality definition on one specific country or region yet.

This research examined and reviewed the previous empirical studies to see how experts and scholars have defined product quality so far. Along with that, this research took place in Thailand and applied executive (semi-structured) interviews with government officials, product producers or manufacturers of a product, and intermediate sellers, as well as distributed customer opinion-based questionnaires at point of sale (POS). As a result, the research presented the effects of attributes on Thai consumer buying decision, the prospects of Thai product quality and finally, proposed a more up-to-date definition of product quality, specifically for the case of Thailand, in three product categories: electronics/IT product, automobile, and home appliance. Furthermore, the research outcomes, thoughts, and views from four different sectors revealed the missing gaps among the regulators, market suppliers and consumers' opinions on product quality and this might improve the product quality in Thailand as a whole.

The principles, methodology, results and data analysis, and discussion are explained in the next four sections.

2. Principles and Previous Studies on Product Quality Definition

This section briefly explains the principles and the previous studies on how experts and scholars have defined product quality so far. Learning from that, it then elucidates the timeline, similarities and transformations on product quality characteristics and definitions.

Besides the definitions that have been mentioned in Chapter 2, the word *"Quality"* in literal term, was derived from an Old French word "*Qualite"* and "*Qualitas"* in Latin; this term originally referred to "character disposition" and "particular property or feature" (Baldick, 2008). However, the definitions of quality in current practice dictionaries, as stated in the Merriam-Webster Dictionary, means an intelligible feature by which a thing may be identified, or degree of excellence, or superiority in kind. In Cambridge Advance Learning Dictionary, quality means how good or bad something is, or a characteristic or feature of something. Indeed, these dictionary definitions are usually adequate to help the general audience understand basic concept of quality. But in terms of management and business practice, these quality definitions are inadequate. For many years, many quality management experts and scholars tried to define quality/product quality in various contexts. Differences in perspectives and academic paradigms were the basis for delivering a variety of quality/product quality definitions. Are there any similarities among these definitions? Are any of these definitions right or wrong? There have been long discussion, and still the debate on these questions is ongoing.

Quality Digest, the leading magazine that covers a wide range of general interest on quality issues, asked their readers in December 1999 to send their definitions of quality. As a result, more than 80 readers sent their quality definitions, which were then posted on the *Quality Digest Online*[1]. Many readers came up with

[1] See
Quality How Do You Define It? (1999). Retrieved 4 20, 2012 from Quality Digest:

interesting definitions, such as “quality is the expression of human excellence”, “quality is clean, precise, and flawless”, “quality is meeting the customer’s needs in a way that exceeds the customer’s expectations” or “quality is the best value for money”. In addition, many also quoted numerous famous definitions from quality experts/gurus: Philip B. Crosby, A.V. Feigenbaum, Peter Drucker, W. Edward Deming, Joseph M. Juran, Genichi Taguchi, Subir Chowdhury and so on. Some of these quality definitions and interpretations are given in Table 4.1.

Table 4.1: Some famous definitions of quality offered by the related experts and scholars

“Quality is conformance to requirements.”	(Crosby, 1979)
“Quality is the total composite product and service characteristics of marketing, engineering, manufacturing and maintenance through which the product and service in use will meet the expectations of the customer.”	(Feigenbaum, 1983)
“Quality in a product/service is not what the supplier puts in. It is what the customer gets out and is willing to pay for.”	(Drucker, 1985)
“Quality in customers’ perception is the only thing that matters.”	(Deming, 1986)
“Quality is those features of products which meet customer needs and thereby provide customer satisfaction.” “Quality is freedom from deficiencies”, and “Quality is a	(Juran, 1988)

http://www.qualitydigest.com/html/qualitydef.html

fitness for use”	
“Quality is loss avoidance”	(Taguchi, 1995)
“Quality combines people power and process power”	(Chowdhury, 2005)

Other quality-oriented professional groups, for instance, the American Society for Quality (ASQ), ISO 8402:1994 and ISO 9000:2005 have also developed their quality vocabulary for standard. For the American Society for Quality (ASQ), quality refers to the characteristics of a product or service that bears on its ability to satisfy the stated or implied needs, and being free of deficiencies. For ISO 8402:1994, quality is the total of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs, while quality in ISO 9000:2005 means the degree to which a set of inherent characteristics fulfills requirements.

Defining product quality becomes much more complicated when we look at different perspectives and academic paradigms.

Similar to Garvin’s five approaches, in manufacturing/supply base, producers define product quality as the degree to which the product was produced correctly and conformingly to the requirements. On the other hand, in user/demand base, consumers focus on product quality over specifications in which the product satisfies consumers’ needs and wants. Furthermore, in product base, which considers the product alone, product quality puts more emphasis on measurable

variables; the differences in product quality may also reflect the differences in product quantity. In term of value base, product quality is evaluated as acceptable costs and acceptable prices.

Quality/product quality is also defined differently in various academic paradigms. In engineering excellence, quality is seen as product integrity and a way to reduce cost. In perceived quality, quality is referred to as consumer's perception of overall product quality with respect to intended purpose and relative alternatives. Moreover, in reviewed quality, the terms quality assurance and quality control are often used to verify and confirm that all criteria meet the requirements.

Indeed, there are a numbers of product quality definitions, however, there is no single national or universal definition. To summarize, here are the common definitions of product quality shared among various perspectives and academic paradigms:

- *Conformance to specifications* means how well a product meets the targets, free from errors and tolerances determined by its designers.
- *Fitness for use* focuses on how well a product performs for its intended function or use. This also essentially means *meeting consumer needs and exceeding consumer expectations.*
- *Value for price paid* refers to how well a product quality is worth in comparison to its price as well as economic value.

As quality/product quality is a perception, depending on the conditions and subjective attributes, to decide which definition is more correct and appropriate to all is a difficult task and a very challenging job. A search for valid definition of product quality in regard to perception and time is ongoing.

3. Methodology

This section describes two primary data collection methods, the interview and questionnaire, which were applied as tools in conducting this research.

3.1. Interview

In February and March 2012, executive (semi-structured) interviews were carried out with government officials, product producers/manufacturers of products, and intermediate sellers in Thailand. The conversations/interviews were administered in Thai, recorded, transcribed, and translated.

All three different sectors of participants were asked with the same set of questions:

In your opinion…*"what are the factors that influence customer's decision in buying a product?"*, *"what is/are other factor(s) that can be used to evaluate product quality?"*, *"what is your definition of product quality?"*, *"what could be the differences in today's product quality and the next 5(10) years' product quality?"* and *"Why do you think that?"*

Regarding the first interview question, *"what are the factors that influence customer's decision in buying a product?"*, the participants were requested to rank their preferences in seven given attribute dimensions, which are "function", "ease of use", "reliability", "durability", "design", "eco-friendliness", and "customer satisfaction" (see Appendix IV & V for a list of interview questions in English and Thai). These seven attribute dimensions were delivered as a result of research design and identified as follows:

Function	The ability, utility, and performance of a product compared to previous version or similar type of product, e.g., speed, intelligibility, technology, etc.
Ease of use	The charecter by which a product can be utilized by general consumer without any difficulties and problems.
Reliability	The property of a product being creditable, reliable, e.g., market recognition, brand awareness, safety, etc.
Durability	The ability of a product that is able to perform over a long period of time without technical error and physical breakdown.
Design	The total outlook and feature of a product, e.g., color, size, weight, etc.
Eco-friendliness	A product that is free from chemicals and is harmless to the environment, e.g., green material, recyclable, energy saving, carbon credit, related to green concept, etc.
Customer Satisfaction	The overall feeling and perception of a consumer on a product, compared to consumer's expectation and/or previous experience of using a similar brand product or from the same company.

The three different sectors of participants included government officials, producers/manufactures of a product, and intermediate sellers. The ethical issues of this study were taken into consideration; all interviewees for this research were provided an informed consent for the use of their feedback information on product quality for research purposes only. No specific names of person and corporation were mentioned in the main context and the position of the individuals is only revealed in an academic context with no intention of using for promotion or any other possible non-academic purposes. This research has used the collected data with the consent of the interviewees and only in an academic perspective, particularly in regard to the concept of Thai product quality.

As for ***Government Officials,*** three government officials, including two chief central government officials and one district executive government official, participated in the interview. The Permanent Secretary of the Ministry of Industry of Thailand, and the Director of One Stop Export Service Center represented the opinions of the central government, whereas the Executive Chairman of Industrial Promotion of Region 9[2], represented the local government views. The three government officials shared their opinions and thoughts on the mentioned product quality questions, and the questions were intended for an understanding of their perception regarding overall product quality.

[2] Industrial Promotion of Region 9 is operating directly under Ministry of Industry of Thailand. Since its establishment, the Industrial Promotion of Region 9 is the biggest and most profitable industrial region of the country. The operation areas covers six major industrial provinces, which are Rayong, Chanthaburi, Trat, Chonburi, Samut Prakan, and Chachoengsao, see www.dip.go.th.

As for ***Product Producers/Manufacturers,*** four different product producers/ manufacturers in three distinctive product categories participated in this interview. From electronics or IT products, including mobile phone, computer, laptop, and tablet, the general manager of Chonburi branch of a very famous smart phone and tablet company shared his opinions on electronics/IT product quality subjects. From the automobile industry, the general manager and customer quality-engineering department of a large Japanese carmaker, and the department manager of another famous Japanese carmaker took part in the interview. From the home appliances sector, including television, refrigerator, washing machine, and air conditioner, the deputy general manager and quality assurance department of a well-known Japanese maker of home appliances shared his points and visions on home appliances product quality issues.

As for ***Intermediate Sellers,*** 11 executive interviews were made with intermediate sellers in Chonburi Province. Four store managers/salespersons in the areas of mobile phones and other electronics represented electronics and IT products sector. Four general managers of local branches in Chonburi of four major Japanese carmakers and sellers represented automobiles sector, and three store general managers in a home appliances market represented the home appliances sector (see Appendix VIII for the list and detail of all interviewed participants).

Table 4.2 lists the interviewed participants of three sectors and their opinions level on product quality.

Table 4.2: Interview participants' product quality opinion level list in three different sectors

Sectors	Participants	Product Quality's Opinion Levels			
		General	IT	Auto.	Home App.
Government Officials (Regulators)	Permanent Secretary of the Ministry of Industry of Thailand	✔			
	Director of One Stop Export Service Center	✔			
	Executive Chairman of Industrial Promotion of Region 9	✔			
Producers/ Manufacturers	General Manager of famous smartphone and tablet company		✔		
	General Manager & Customer Quality-Engineering Department of a large Japanese carmaker			✔	
	Department Manager of another famous Japanese carmaker			✔	
	Deputy General Manager & Quality Assurance Department of a well-known Japanese home appliances maker				✔

Intermediate Sellers	Salesperson of electronics and IT product store A		✔		
	Store Manager of electronics and IT product store B		✔		
	Salesperson of electronics and IT product store C		✔		
	Salesperson of electronics and IT product store D		✔		
	General Manager of Japanese carmaker and seller branch E			✔	
	General Manager of Japanese carmaker and seller branch F			✔	
	General Manager of Japanese carmaker and seller branch G			✔	
	General Manager of Japanese carmaker and sellers branch H			✔	
	General Manager of home appliances store I				✔
	General Manager of home appliances store J				✔
	General Manager of home appliances store K				✔

All interviewed participants had duties and responsibilities aligned with product quality, for which they were purposively selected. For instance, among government officials, the Permanent Secretary of the Ministry of Industry of Thailand is responsible for the promotion and regulation of all industries, including regulation and standard of quality control and quality assurance, while

the Executive Chairman of Industrial Promotion of Region 9 is responsible for monitoring and administering local business/manufacturing operations in six of Thailand's top industrial provinces (Rayong, Chanthaburi, Trat, Chonburi, Samut Prakan, and Chachoengsao) to ensure that all activities are aligned with the central government regulation as well as international standards. In addition, the interviews with general managers/department managers, particularly on product quality assurance/engineering at manufacturing level together with managers/salespersons at local sales centers, were made with the leading manufacturer companies in three different industries, including electronics/IT product, automobile (local sales branches of Japanese brand automobile companies), and home appliance.

Despite difficulties in accessing participants in these participant sectors, their inputs were very significant. The research was able to obtain some in-depths information, true opinions, and outlook towards product quality issues.

3.2. Questionnaire

Through March 2012, customer opinion-based questionnaire on product quality were distributed to those three consumer target groups at various stores and shopping malls in Chonburi province.

Considering a fast growing and yet already becoming a Thai industry and manufacturing center, a region midpoint for business commerce, destination for

tourists, availability of job opportunities, Chonburi province is very diverse and a good sampling site where validly represents the country's dynamic population.

In order to capture consumer's real perception at real time, 500 questionnaires were distributed to the consumers at point of sale (POS), (electronics and IT products store A, B, C, D at Central Department Store Chonburi; Japanese carmakers and sellers branch E, F, G, H at their individual branch in Chonburi, home appliances store I at its first branch in Chonburi, home appliances store J at Big C Chonburi, and home appliances store H at Central Department Store Chonburi). (See Appendix VIII for the list of electronics and IT product stores/ automobile branches/ home appliance stores in which the questionnaires were administered).

Right after their purchases, consumers were asked to fill out and answer the following questions:

"What kind of product(s) did you buy today?", "what factors influence your decision in buying a product?", "what is/are other factor(s) that can be used to evaluate product quality?", "what is your definition of product quality?", "what could be the differences in today's product quality and the next 5 years' product quality? And why do you think that?"

Similar to executive interview, for the second question of *"what are the factors that influence customer's decision in buying a product?"*, the respondents were requested to rank their preferences in seven given attribute dimensions. Moreover, in order to make the results comparable across sectors, the research applied a similar set of close-ended and open-ended questions to those three target consumer groups who had just bought mobile phone, computer, laptop, tablet, car, television, refrigerator, washing machine, and air conditioner (see Appendix VI & VII for the list of customer opinion-based questionnaire in English and Thai).

Even though there were difficulties in approaching and convincing consumers to fill out the questionnaires and some interpreting complications, in the end, the research was able to use 308 filled out questionnaires and applied these as study sample.

4. Results and Data Analysis

This section presents the results and data analysis in three subsections: effects of attribute dimensions on consumer buying decision, prospects of product quality, and product quality definition.

4.1. Effects of Attribute Dimensions on Consumer Buying Decision

The attribute dimensions that were used in exposing the effect and influence on consumer buying decision included *function* (the ability, utility, and performance of a product compared to previous version or similar type of product, e.g., speed,

intelligibility, technology, etc.), *ease of use* (the charecter by which a product can be utilized by general consumer without any difficulties and problems), *reliability* (the property of a product being creditable, reliable, e.g., market recognition, brand awareness, safety, etc.), *durability* (the ability of a product that is able to perform over a long period of time without technical error and physical breakdown), *design* (the total outlook and feature of a product, e.g., color, size, weight, etc.), *eco-friendliness* (a product that is free from chemicals and is harmless to environment, e.g., green material, recyclable, energy saving, carbon credit, related to green concept, etc.), and *customer satisfaction* (the overall feeling and perception of a consumer on a product, compared to consumer's expectation and/or previous experience of using a similar brand product or from the same company).

For questions *"what factors influence customer's decision in buying a product?"* and *"what is/are other factor(s) that can be used to evaluate product quality?"*, the results of interviews and questionnaires regarding these two questions are analyzed as follows:

Interview Results. All three government officials gave a perfect score of 7 and agreed to rank "function" as number one with the most influence on consumer buying decision, followed by "ease of use", "reliability" and "durability", "design" and "customer satisfaction", while "eco-friendliness" was ranked last. On the other hand, producers/manufacturers said that "reliability" should have the

most influence, whereas “function”, “durability”, “customer satisfaction”, “ease of use”, “design”, and “eco-friendliness” had less influence. Comparably, intermediate sellers also upheld that “reliability” have the most influence over the other attributes of “function”, “design”, “customer satisfaction”, “durability”, “ease of use”, and “eco-friendliness” on consumer buying decision. The interview result on the effect of attributes on consumer buying decision by ranking is illustrated in Table 4.3.

Table 4.3: Ranking the attribute dimensions on consumer buying decision by government, producer/manufacturer, and intermediate seller sectors

Participants	**Ranking Attribute Dimensions**						
	Function	**Ease of Use**	**Reliability**	**Durability**	**Design**	**Eco-friendliness**	**Satisfaction**
Gov.	1	2	3	3	5	7	5
Producers	2	5	1	3	6	7	4
Int. sellers	2	6	1	5	3	7	4

Note that 1 means the attribute dimension received the greatest scores on ranking and assumed to have the most influence on consumer buying decision and 7 is vice versa. Equally ranked numbers by each sector mean those attribute dimensions were placed exactly with the same total scores.

In addition, in term of average (mean), the result of average for each attribute on consumer buying decision varied among these three sectors. Table 4.4 indicated the average for each attribute as evaluated by government sector,

producers/manufacturers, and intermediate sellers.

Table 4.4: Average of attribute dimensions on consumer buying decision by government, producer/manufacturer, and intermediate seller sectors

Participants	Average of Attribute Dimensions						
	Function	**Ease of Use**	**Reliability**	**Durability**	**Design**	**Eco-friendliness**	**Satisfaction**
Gov.	7.0	5.3	4.7	4.7	2.7	1.0	2.7
Producer	4.75	3.5	6.75	4.5	3.25	1.25	4
Int. seller	6.42	3.58	7.00	4.25	6.08	2.08	5.58

Note that the average point of 7 means the attribute dimension received the perfect/greatest score and assumed to have the most influence on consumer buying decision and 1 is the vice versa. In addition, equally evaluated at the same average by each sector means those attribute dimensions were placed exactly with the same total scores.

The governments and producers/manufacturers valued “function”, “reliability”, and “durability” as the most influential attributes on consumer buying decision, whereas intermediate sellers appraised “reliability”, “function”, and “design” as the most influential attributes. However, all three sectors agreed to evaluate “eco-friendliness” as the least influential one. Besides that, the governments also ranked “function” and “eco friendliness” with an absolute average point of 7 and 1, and many of attribute dimensions were evaluated at the same average points. These could imply that some of attributes evaluated by governments have

somewhat identical significance; unlike producers/manufacturers and intermediate sellers, they evaluated each attribute distinctively. These could denote that each attribute has a diverse significance. In other words, the average of attribute dimensions evaluated by the latter two sectors (producers/manufacturers and intermediate sellers) had smaller variance; the variance of governments is 4.04, producers/manufacturers, 2.79, and intermediate sellers, 3.10. Variance, "the average of the squared differences from the mean", in this study refers to "the average of the squared differences from the average point of attribute dimension".

In fact, the results in Table 4.3 and Table 4.4 show that the governments, producers/manufacturers, and intermediate sellers strongly suppose "reliability" and "function" to have the utmost effect on overall consumer buying decision; in contrast, eco-friendliness attribute dimension would be the least influential one.

For the second question, *"what is/are other factor(s) that can be used to evaluate product quality?"*, all three sectors similarly pointed out that "support service", "value for money", and "adaptability" could be the possible attribute dimensions in evaluating product quality.

The three sectors referred the term "support service" as the support and service attached to a product from the time the consumer walks into the store, makes a decision to buy or even not to buy, and after a product is bought, or in simple words, the "support service" is all types of services performed and provided by

product producer and intermediate seller/store which add extra value to a product that lead to increasing the chance of sale. These include product guarantee/warranty, seller courtesy, accessibility/availability of retail store, and so on. Although the support service is mostly intangible and consumer hardly owns it, they still can see and feel the services. This kind of perception might have a strong impact on consumer decision and evaluation of product quality. Furthermore, as Thai consumers are very price sensitive (Pecotich & Shultz, 2006), the possible attribute dimension that possibly fit with today's economics could be "value for money"; this includes the original price compared to that of other brands or companies which provide a similar type of product, the price of repairing parts, and the price of reselling as secondhand. Finally, "adaptability" basically means that a product should be usable with similar and adjustable to a product of a different brand and company. For instance, a keyboard of company X should be compatible and workable with a computer of company Y. Adaptability could be one of the potential attribute dimensions that consumers might consider when they consider buying a quality product, especially during an economic depression.

Questionnaire Results. Out of 308 respondents, 144 were consumers of electronics and IT product consumers; 77, automobiles; and 87, home appliances. For electronics/IT product's respondents alone, "function" played the most influential role on their buying decision, followed by "reliability", "design", "durability", "ease of use", "customer satisfaction", and "eco-friendliness".

Meanwhile, automobile product respondents gave a slightly different evaluation. For them, “durability” had the most effect on their purchasing decision, but durability did not have a much larger weight effect than other attributes of “reliability”, “eco-friendliness”, “design”, “customer satisfaction”, “function” and “ease of use”. These attributes’ scores were insignificantly greater or lesser than one another. Similarly, “durability” and “reliability” were judged as the first and the second influential attributes by home appliance respondents, then “function” and “ease of use”, “eco-friendliness”, “design”, and lastly “customer satisfaction”. Table 4.5 shows the attribute dimensions on consumer buying decision ranking by three different categories of products.

Table 4.5: Ranking attribute dimensions on consumer buying decision by consumers of electronics/IT product, automobile, and home appliance

Respondents	**Ranking Attribute Dimensions**						
	Function	**Ease of Use**	**Reliability**	**Durability**	**Design**	**Eco-friendliness**	**Satisfaction**
Electronics/IT	1	5	2	4	3	7	6
Automobile	6	7	2	1	4	3	5
Home Appliance	3	3	2	1	6	5	7

A mean score of 1 meant that the attribute dimension received the highest ranking and assumed to have the most influence on consumer buying decision and 7 would be the vice versa. In addition, equally ranked number by each product respondent meant those attribute dimensions were placed exactly with the same

total scores.

Moreover, in term of average (mean), the result of average for each attribute on consumer buying decision was slightly different among these three products consumers. Table 4.6 shows the average for each attribute as evaluated by consumers of electronics/IT product, automobile, and home appliance.

Table 4.6: Average of attribute dimensions on consumer buying decision by consumers of electronics/IT product, automobile, and home appliance

Respondents	Average of Attribute Dimensions						
	Function	**Ease of Use**	**Reliability**	**Durability**	**Design**	**Eco-friendliness**	**Satisfaction**
Electronics/IT	5.47	3.92	4.39	3.94	4.19	2.26	3.84
Automobile	3.62	3.38	4.40	4.48	4.17	4.21	3.74
Home Appliance	4.16	4.16	4.36	4.75	3.56	3.61	3.46

An average point of 7 meant that the attribute dimension received the greatest scores and assumed to have the most influence on consumer buying decision and 1 would be its vice versa. Equally evaluated at the same average by each product respondent meant those attribute dimensions were placed exactly with the same total scores.

For electronics/IT product, consumers agreed that “function” was the most important attribute at the average of 5.47. This very high average point meant the

majority of electronics/IT product respondents favorably gave 5 and above points (6,7) to the "function" attribute. Contrary to automobile and home appliance products, the consumers viewed "durability" as their first influential factor; however, the average of these two respondents were not greater than the other six attributes. Instead, all seven attributes were evaluated to have nearly the same weight. Furthermore, the variances of electronics/IT product, automobile, and home appliance respondents were 0.9, 0.17, and 0.23, respectively. The attribute dimensions evaluated by respondents in three product categories proved to have roughly equal significance and influence on consumers' buying decision.

The results in Table 4.5 and Table 4.6 indicate that consumer-purchasing (attribute) influence factors are varied and depend on each product category. However, there was substantial evidence that "reliability" and "durability" were the most influential attribute dimensions on consumer buying decision; unexpectedly, "customer satisfaction" was the least influential one.

Demographic determinants such as gender, age, education, and monthly income of three different respondents of electronics/IT product, automobile, and home appliance, also have some important effects on consumer buying decision and seven attribute dimensions.

As for ***gender,*** the majority of the respondents was Gender 2, which represents female. The greater numbers of Gender 2 meant that female respondents spent

more in total for the three product categories, except automobile, than male respondents. To elaborate, Gender 1 or male respondents saw “function”, “reliability”, “durability”, and “design” as their most important attribute dimensions in the three product categories. Likewise, Gender 2 or female respondents also gave “function”, “reliability”, “durability” and “design” as their top four influential attributes; however, the “ease of use” attribute had slightly greater effect on female than male buying decision. Besides that, in terms of general effects of attributes on their buying decision by product categories, the result of their ranking was fairly similar, for which both male and female respondents evaluated “function”, “reliability”, and “design” as their most influential attribute dimensions for buying electronics/IT product; “durability”, “reliability”, and “eco-friendliness” for automobile; and “durability”, “reliability”, and “ease of use” for home appliance.

Moreover, by looking at the average /mean, both male and female respondents agreed at high average scores of 5.42 and 5.51 that “function” was the most influential factor on their electronics/IT product buying decision, while the average of attributes on their buying decision for automobile and home appliance were rather different. For automobile, male respondents gave “reliability” an average of 4.73, whereas their female counterparts gave “eco-friendliness” an average of 4.58 as their highest average scores. For home appliance, male respondents gave “function” an average of 4.67, while female respondents gave “durability” an average point of 5.00 as their highest average scores. In addition,

by taking the squared of averages of the two genders, the variance of electronics/IT product is the biggest among three product categories, 0.87 for male and 0.95 for female, compared to the variances of 0.24, 0.21, and 0.16, 0.38 for male and female and in both automobile and home appliance, respectively. This slightly bigger in variance indirectly implied that both male and female consumers evaluated the seven-attribute dimensions more diversely from 7 to 1 in electronics/IT product than in automobile and home appliance. Table 4.7 shows the result of gender effects of attributes on consumer buying decision.

Table 4.7: Effects of attributes on consumer buying decision by gender

		Gender 1 (Male)				Gender 2 (Female)				All Genders		
		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance
N		62	40	33	135	82	36	53	171	144	76	86
Sum	Function	336	137	154	627	452	141	201	794	788	278	355
	Ease of use	242	139	125	506	323	119	231	673	565	258	356
	Reliability	268	189	139	596	364	143	238	745	632	332	377
	Durability	258	176	144	578	309	163	265	737	567	339	409
	Design	254	172	123	549	349	146	186	681	603	318	309
	Eco-friendliness	140	154	120	414	185	165	189	539	325	319	309
	Customer Satisfaction	239	153	121	513	314	131	177	622	553	284	298
Rank	Function	1	7	1	1	1	5	4	1	1	6	4
	Ease of use	5	6	4	6	4	7	3	5	5	7	3
	Reliability	2	1	3	2	2	4	2	2	2	2	2
	Durability	3	2	2	3	6	2	1	3	4	1	1
	Design	4	3	5	4	3	3	6	4	3	4	5
	Eco-friendliness	7	4	7	7	7	1	5	7	7	3	5
	Customer Satisfaction	6	5	6	5	5	6	7	6	6	5	7
Mean	Function	5.42	3.43	4.67	4.64	5.51	3.92	3.79	4.64	5.47	3.66	4.13
	Ease of use	3.9	3.48	3.79	3.75	3.94	3.31	4.36	3.94	3.92	3.39	4.14
	Reliability	4.32	4.73	4.21	4.41	4.44	3.97	4.49	4.36	4.39	4.37	4.38
	Durability	4.16	4.4	4.36	4.28	3.77	4.53	5	4.31	3.93	4.46	4.76

		Gender 1 (Male)				Gender 2 (Female)				All Genders		
		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance
	Design	4.1	4.3	3.72	4.07	4.26	4.06	3.51	3.98	4.19	4.18	3.6
	Eco-friendliness	2.26	3.85	3.63	3.07	2.26	4.58	3.57	3.15	2.26	4.2	3.6
	Customer Satisfaction	3.85	3.83	3.67	3.8	3.83	3.64	3.33	3.63	3.84	3.74	3.47
Mode	Function	7	2	7	7	7	5	4	7	7	5	4
	Ease of use	4	3	3	3	5	3	6	3	5	3	3
	Reliability	6	7	4	6	3	2	3	6	3	7	6
	Durability	5	7	7	5	4	4	5	4	4	4	7
	Design	5	5	3	5	3	4	3	3	5	6	3
	Eco-friendliness	1	1	1	1	1	6	1	1	1	7	1
	Customer Satisfaction	2	4	1	1	2	1	1	1	2	1	1
Variance		0.87	0.24	0.16	0.27	0.95	0.21	0.38	0.25	0.90	0.26	0.23

Note: Gender 1 represents male and Gender 2 represents female, whereas N is the total number of respondents in each product category. Sum is the total scores that respondents gave by ranking out of 7 to 1, in which 7 means the attribute dimension received the greatest scores and assumed to have the most influence on consumer buying decision and 1 is vice versa. Rank is by ranking the Sum values of each attribute dimension, which the highest sum will be ranked as 1 and 7 is vise versa. Mean is the average point of respondents' evaluating values of 7 to 1 in each product category and seven attribute dimensions. Mode is the value that respondents appeared to most often rank, and variance is the average of the squared differences from the average (mean) of attribute dimension.

As for ***age,*** the study divided the respondents into eight separate age groups, in which Age 1 represents the respondents who are under 20 years old, Age 2 between 21-25 years old, Age 3 between 26-30 years old, Age 4 between 31-35 years old, Age 5 between 36-40 years old, Age 6 between 41-45 years old, Age 7 between 46-50 years old, and Age 8 or 51 years old and above. Results showed that Age 4 and Age 3 or the respondents whose ages were between 31-35 and 26-30 years old appeared to be the target consumers doing the most purchasing in these three product categories.

For Age 1 or respondents under 20 years old, they valued "function", "design", and "reliability" as their most important factors on their overall buying decision. Indeed, this was predominantly resulting from electronics/IT product evaluations; the effect of attributes on automobile buying decision was slightly different in which the respondents appraised "design", "reliability", and "ease of use" as their foremost important attribute dimensions, and there was no respondent record for home appliance.

For Age 2 or respondents between 21-25 years old, the overall evaluations and effects on the respondents' buying decision were comparable and similar to that of Age 1. However, besides the influential factors of "function", "design", and "reliability", the 21-25 year-old respondents also saw "durability" attribute as the most influential factor in evaluating automobile and home appliance.

For Age 3 or respondents between 26-30 years old, the effects of attributes on the respondents' buying decisions were varied. They ranked "function", "ease of use", and "durability" as their top three attribute dimensions on buying electronics/IT product; "reliability", "durability", and "design" for automobile; "durability", "ease of use", and "reliability" for home appliance. To be more precise, in this age group, the respondents started to take the "ease of use" factor into consideration when deciding to buy the products. But "function", "reliability", and "durability" were nevertheless still the most influential attribute dimensions on Age 3 overall buying decision.

For Age 4 or respondents between 31-35 years old, the effects of attributes on their buying decisions were also varied and depended on each product category. Compatible with previous age groups, the overall effects of attributes on 31-35 year-old respondents were "function", "durability", and "reliability" as well.

For Age 5 or respondents between 36-40 years old, the respondents started to weigh "eco-friendliness" as the second important attribute dimensions on their buying decision, especially on automobile and home appliance. However in terms of overall effects on attributes in three product categories, "function", "reliability", and "durability" were still the most dominant attribute dimensions on their buying decision.

For Age 6 or respondents between 41-45 years old, "reliability", "customer satisfaction", and "function" were the most influential attribute dimensions on

their overall buying decision. Specifically in this age group, “customer satisfaction” was firstly raised and ranked as the second influential attribute dimension in both electronics/IT product and automobile. Furthermore, “reliability” was also equally ranked as the most influential attribute dimension in all product categories.

For Age 7 and Age 8 or respondents between 46-50 years old and 51 years old and above, the effects of attributes on their buying decision were very much alike, especially in electronics/IT product. In these age groups, the respondents evaluated “function”, “reliability”, and “design” as their most influential attribute dimensions in buying electronics/IT product, however, the effects of attributes for automobile and home appliance were rather different. The first group of respondents whose ages were between 46-50 years old saw “eco-friendliness”, “customer satisfaction”, and “durability” as their most important attributes when making a decision to buy car, whereas “function”, “ease of use”, and “reliability” were the leading attributes that had the most influence on their home appliance buying decision. On the other hand, the latter group of respondents had distinct effects of attributes on both automobile and home appliance. The 51 year-old and above respondents agreed to rank “reliability”, “durability”, and “ease of use” as their most influential attribute dimensions in buying automobile and home appliance.

In terms of average /mean, when considering each individual product category, the attribute “function” received the highest average score at above 5 points in nearly all age groups, except in Age 6 and Age 7, on electronics/IT product buying decision. This parallel evaluation resulted from the majority of respondents giving “function” a minimum of 5 and above points as their most influential attributes in buying electronics/IT product. Correspondingly, most of respondents across all age groups also agreed to rank “durability” attribute as their most influential factor at the highest average score of around 4.7 for their home appliance buying decision. However, unlike electronics and home appliance’s average evaluation, the result for automobile was different and varied in different age groups. In the young age groups, the respondents frequently valued “design” as their most influential attribute, whereas in their older age groups, “durability”, “reliability”, and “eco-friendliness” attributes were somewhat upheld at the highest average score.

Furthermore, by taking the squared of averages, the variance of attributes in each product category as well as in various age groups also supported the overall ranking and average /mean findings. In general, the variances of three product categories in young age groups were higher than the latter age groups. This higher in variance meant that the consumers at younger ages simply took several mutual aspects/attribute dimensions into their consideration when buying from these three product categories and vice versa for the older one. In addition, the smaller variance, predominantly in home appliance, also implied that the consumers

evenly ranked and evaluated these seven attribute dimensions near to its average/mean.

Even though differences in age groups yielded different effects of attributes on consumer buying decision, there were still similarities and significance that the study could draw into three common trends, which are young age group, middle age group, and older age group. For the first trend of young age group, including Age 1 and Age 2, this group represented respondents/consumers who are young and fresh, naturally fascinated and responsive to new gadgets in the market. Accordingly, it is obvious in the result that "design" and "reliability", were valued and placed at the top of their buying decision. However for middle age group, including Age 3, Age 4, as well as Age 5, the trend for this group represented the respondents/consumers who have contemporary and casual lifestyle, and who commonly like modern-ness, but nonetheless who seek a simple and stress-free life. Therefore, respondents/consumers in this middle age group recognized and evaluated "ease of use" and "eco-friendliness" and still appraised "design" and "reliability" as the most influential factors on their buying decision. Last but not least for older age group, including Age 6, Age 7, and Age 8, this group represented the matured respondents/consumers who generally make their buying decision according to their past usage, expectations, and overall perceptions. Hence, the trend for older age group would possibly take many attributes into consideration and their satisfaction or "customer satisfaction" attribute would also

play a major role on their buying decision. Table 4.8 shows the age effects of attributes on consumer buying decision.

Table 4.8: Effects of attributes on consumer buying decision by age

		Age 1 (≤20)				Age 2 (21-25)				Age 3 (26-30)			
		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall
N		10	1	0	11	23	3	16	42	27	16	9	52
Sum	Function	62	4	0	66	129	8	61	198	158	60	37	255
	Ease of use	37	5	0	40	74	12	64	150	123	57	41	221
	Reliability	40	6	0	42	105	11	63	179	113	74	41	228
	Durability	36	3	0	41	82	19	78	179	116	68	42	226
	Design	50	7	0	51	109	18	69	196	105	65	33	203
	Eco-friendliness	19	1	0	26	47	8	64	119	61	64	32	157
	Customer Satisfaction	36	2	0	42	98	8	52	158	80	60	26	166
Rank	Function	1	4	0	1	1	5	6	1	1	5	4	1
	Ease of use	4	3	0	6	6	3	3	6	2	7	2	4
	Reliability	3	2	0	3	3	4	5	3	4	1	2	2
	Durability	5	5	0	5	5	1	1	3	3	2	1	3
	Design	2	1	0	2	2	2	2	2	5	3	5	5
	Eco-friendliness	7	7	0	7	7	5	3	7	7	4	6	7
	Customer Satisfaction	5	6	0	3	4	5	7	5	6	5	7	6
Mean	Function	6.2	4	0	6	5.61	2.67	3.81	4.71	5.85	3.75	4.11	4.9
	Ease of use	3.7	5	0	3.63	3.22	4	4	3.57	4.56	3.56	4.56	4.25
	Reliability	4	6	0	3.81	4.57	3.67	3.93	4.26	4.19	4.62	4.56	4.38
	Durability	3.6	3	0	3.72	3.57	6.33	4.87	4.26	4.3	4.25	4.67	4.35

		Age 1 (≤20)				Age 2 (20-25)				Age 3 (26-30)			
		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall
	Design	5	7	0	4.63	4.74	6	4.31	4.67	3.89	4.06	3.67	3.9
	Eco-friendliness	1.9	1	0	2.36	2.04	2.67	4	2.83	2.26	4	3.56	3.02
	Customer Satisfaction	3.6	2	0	3.82	4.26	2.67	3.25	3.76	2.97	3.75	2.89	3.19
Mode	Function	7	N/A	0	7	7	N/A	5	7	7	5	7	7
	Ease of use	3	N/A	0	3	2	N/A	3	2	5	4	6	5
	Reliability	3	N/A	0	3	6	2	4	6	5	6	5	5
	Durability	4	N/A	0	4	4	7	7	2	4	5	7	5
	Design	5	N/A	0	5	7	6	6	6	4	4	3	4
	Eco-friendliness	1	N/A	0	1	1	N/A	5	1	1	7	1	1
	Customer Satisfaction	2	N/A	0	2	5	N/A	1	1	1	2	1	1
Variance		1.77	4.66	N/A	1.23	1.36	2.48	0.24	0.45	1.33	0.13	0.44	0.46

		Age 4 (31-35)				Age 5 (36-40)				Age 6 (41-45)			
		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall
N		30	16	19	65	19	10	14	43	18	7	12	37
Sum	Function	176	52	80	308	101	40	58	199	82	28	50	160
	Ease of use	119	56	81	256	76	33	54	163	74	18	47	139
	Reliability	117	71	78	266	91	47	58	196	87	37	58	182
	Durability	115	73	100	288	81	45	63	189	77	28	51	156
	Design	116	74	67	257	74	44	54	172	64	33	33	130
	Eco-friendliness	79	55	62	196	42	45	60	147	36	33	40	109
	Customer Satisfaction	119	67	64	250	67	26	47	140	84	19	57	160
Rank	Function	1	7	3	1	1	5	3	1	3	4	4	2
	Ease of use	2	5	2	5	4	6	5	5	5	7	5	5
	Reliability	4	3	4	3	2	1	3	2	1	1	1	1
	Durability	6	2	1	2	3	2	1	3	4	4	3	4
	Design	5	1	5	4	5	4	5	4	6	2	7	6
	Eco-friendliness	7	6	7	7	7	2	2	6	7	2	6	7
	Customer Satisfaction	2	4	6	6	6	7	7	7	2	6	2	2
Mean	Function	5.87	3.25	4.21	4.74	5.32	4	4.14	4.63	4.56	4	4.17	4.32
	Ease of use	3.97	3.5	4.26	3.94	4	3.3	3.86	3.79	4.11	2.57	3.92	3.76
	Reliability	3.9	4.44	4.11	4.09	4.79	4.7	4.14	4.56	4.83	5.29	4.83	4.92
	Durability	3.83	4.56	5.26	4.43	4.26	4.5	4.5	4.4	4.28	4	4.25	4.22
	Design	3.87	4.63	3.53	3.95	3.9	4.4	3.86	4	3.56	4.71	2.75	3.51

		Age 4 (31-35)				Age 5 (36-40)				Age 6 (41-45)			
		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall
	Eco-friendliness	2.63	3.44	3.26	3.02	2.21	4.5	4.29	3.42	2	4.71	3.33	2.95
	Customer Satisfaction	3.97	4.19	3.37	3.85	3.53	2.6	3.36	3.26	4.67	2.71	4.75	4.32
Mode	Function	7	2	7	7	7	5	2	7	7	5	4	4
	Ease of use	6	3	4	5	4	3	2	4	5	2	3	3
	Reliability	3	6	5	6	4	7	3	7	7	7	7	7
	Durability	4	4	7	4	5	4	4	4	4	4	7	4
	Design	3	5	3	3	7	6	5	5	5	7	2	2
	Eco-friendliness	1	1	1	1	1	7	7	1	1	7	1	1
	Customer Satisfaction	2	7	2	2	2	1	4	1	6	1	7	6
Variance		0.90	0.34	0.48	0.29	0.98	0.60	0.14	0.30	0.95	1.06	0.56	0.42

		Age 7 (46-50)				Age 8 (≥51)				All Ages		
		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance
N		11	13	7	31	6	11	10	27	144	77	87
Sum	Function	52	50	39	141	28	37	37	102	788	279	362
	Ease of use	41	37	35	113	21	44	40	105	565	260	362
	Reliability	52	44	33	129	27	53	48	128	632	339	379
	Durability	38	50	32	120	22	57	47	126	567	345	413
	Design	59	48	18	125	26	38	36	100	603	321	310
	Eco-friendliness	23	71	22	116	18	41	34	93	325	324	314
	Customer Satisfaction	43	64	17	124	26	38	38	102	553	288	301
Rank	Function	2	3	1	1	1	7	5	4	1	6	3
	Ease of use	5	7	2	7	6	3	3	3	5	7	3
	Reliability	2	6	3	2	2	2	1	1	2	2	2
	Durability	6	3	4	5	5	1	2	2	4	1	1
	Design	1	5	6	3	3	5	6	6	3	4	6
	Eco-friendliness	7	1	5	6	7	4	7	7	7	3	5
	Customer Satisfaction	4	2	7	4	3	5	4	4	6	5	7
Mean	Function	4.72	3.85	5.57	4.55	4.67	3.36	3.7	3.78	5.47	3.62	4.16
	Ease of use	3.72	2.85	5	3.65	3.5	4	4	3.89	3.92	3.38	4.16
	Reliability	4.72	3.38	4.71	4.16	4.5	4.81	4.8	4.74	4.38	4.4	4.36
	Durability	3.45	3.85	4.57	3.87	3.67	5.18	4.7	4.67	3.93	4.48	4.75
	Design	5.36	3.7	2.27	4.03	4.33	3.45	3.6	3.7	4.19	4.17	3.56
		Age 7 (46-50)				Age 8 (≥51)				All Ages		

		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance
	Eco-friendliness	2.09	5.46	3.14	3.74	3	3.72	3.4	3.44	2.26	4.2	3.61
	Customer Satisfaction	3.9	4.92	2.43	4	4.33	3.45	3.8	3.78	3.84	3.74	3.46
Mode	Function	7	2	7	7	7	2	4	4	7	5	4
	Ease of use	3	3	7	3	N/A	3	3	3	5	3	3
	Reliability	7	4	6	4	5	7	2	7	3	7	6
	Durability	5	5	5	5	3	7	5	3	4	4	7
	Design	6	5	1	4	2	6	2	2	5	6	3
	Eco-friendliness	1	6	3	1	1	2	1	1	1	7	1
	Customer Satisfaction	2	7	1	7	6	1	7	1	2	1	1
Variance		1.16	0.81	1.59	0.09	0.38	0.52	0.30	0.25	0.90	0.18	0.23

Note: Age 1 represents the respondents who are ≤ 20 years old, Age 2 represents 21-25, Age 3 represents 26-30, Age 4 represents 31-35, Age 5 represents 36-40, Age 6 represents 41-45, Age 7 represents 46-50, and Age 8 represents ≥ 51, whereas N is the total number of respondents in each product category. Sum is the total scores that respondents gave by ranking 7 to 1. Rank is by ranking the Sum values of each attribute dimension, which the highest sum will be ranked as 1 and 7 is the opposite. Mean is the average point of respondents' evaluating values out of 7 to 1 in each product category and seven attribute dimensions. Mode is the value that respondents appeared to most often rank, and variance is the average of the squared differences from the average point (mean) of attribute dimension.

As for ***education***, the study divided the respondents into three education groups, in which Education 1 represents the respondents who do not hold bachelor's degree, Education 2 represents those who hold bachelor's degree, and Education 3 represents those who hold above bachelor's degree. As a result, Education 2 or those respondents who have bachelor's degree appeared to be the likely consumers who often bought from these three product categories.

For Education 1 or respondents who do not hold bachelor's degree, they gave "function", "reliability", and "design" the top dimensions in their electronics/IT product buying decision. However, "reliability", "durability", and "design" were the most important attributes for automobile, while "reliability", "durability", and "design" were the most important attributes for home appliance.

For Education 2 or respondents who hold bachelor's degree, the result of effects of attributes on their buying decision was significant and similar to Education 1, particularly in electronics/IT product and automobile. However, the respondents who have bachelor's degree valued "reliability" factor at more weight than "function" in making home appliance buying decision.

For Education 3 or those who hold bachelor's degree or higher, the result of effects of attributes on their buying decision was mixed between Education 1 and Education 2. In addition to the previous education groups, the above bachelor's degree respondents also ranked "function", "design", and "reliability" as their

most influential attribute dimensions on their electronics/IT product buying decision, while the result for home appliance was similar to Education 1. However, for the effects of attributes on automobile, the finding was unique, in which Education 3's respondents strongly evaluated "eco-friendliness" as the most influential factor on their buying decision.

Furthermore, in term of average /mean, the result was meaningful, in which "function" received the highest average scores of 5.94, 5.43, and 4.96 for electronics/IT product in all three education groups. Moreover, "reliability" also received the highest average score on evaluating automobile, and "durability" on evaluating home appliance, however, these facts were correct only on Education 1 and Education 2. For Education 3, "eco-friendliness" received the highest average score of 5.07 on automobile buying decision, while "reliability" received the highest average score of 4.73 on home appliance buying decision.

In addition, the smaller variances of all education groups in three product categories indicated that the overall effects of attributes on consumer buying decision by education were comparable across all educations. This simply meant that regardless of education level, "function", "reliability", and "design" attributes tended to have the most effects on consumer buying electronics/IT product decision, while "durability", "reliability", and "eco-friendliness" had the most influential attribute dimensions on automobile buying decision, and finally "durability", "reliability", and "function" were prospectively the most important

attribute dimensions on home appliance. Nevertheless, there was a visible trend that by separating respondents into different education level, the respondents with higher education would possibly regard the “eco-friendliness” attribute as one of the most influential attribute dimensions on their buying decision, especially in automobile. Table 4.9 shows the education effects of attributes on consumer buying decision.

Table 4.9: Effects of attributes on consumer buying decision by education

		Education 1 (< Bachelor's)				Education 2 (Bachelor's)				Education 3 (> Bachelor's)			
		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall
N		35	25	26	86	83	37	46	166	26	15	15	56
Sum	Function	208	83	113	404	451	138	177	766	129	58	72	259
	Ease of use	141	80	107	328	328	128	200	656	96	52	55	203
	Reliability	150	114	106	370	363	175	202	740	119	50	71	240
	Durability	124	114	124	362	333	170	228	731	110	61	61	232
	Design	147	109	95	351	336	149	163	648	120	63	52	235
	Eco-friendliness	83	106	86	275	188	142	174	504	54	76	54	184
	Customer Satisfaction	128	94	101	323	325	134	145	604	100	60	55	215
Rank	Function	1	6	2	1	1	5	4	1	1	5	1	1
	Ease of use	4	7	3	5	5	7	3	4	6	6	4	6
	Reliability	2	1	4	2	2	1	2	2	3	7	2	2
	Durability	6	1	1	3	4	2	1	3	4	3	3	4
	Design	3	3	6	4	3	3	6	5	2	2	7	3
	Eco-friendliness	7	4	7	7	7	4	5	7	7	1	6	7
	Customer Satisfaction	5	5	5	6	6	6	7	6	5	4	4	5
Mean	Function	5.94	3.32	4.35	4.7	5.43	3.73	3.85	4.61	4.96	3.87	4.8	4.63
	Ease of use	4.03	3.2	4.12	3.81	3.95	3.46	4.35	3.95	3.7	3.47	3.67	3.63
	Reliability	4.29	4.56	4.08	4.3	4.37	4.73	4.39	4.46	4.58	3.33	4.73	4.29
	Durability	3.54	4.46	4.77	4.2	4.01	4.6	4.96	4.4	4.23	4.07	4.07	4.14
		Education 1 (< Bachelor's)				Education 2 (Bachelor's)				Education 3 (> Bachelor's)			

		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall
	Design	4.2	4.36	3.65	4.08	4.05	4.02	3.54	3.90	4.62	4.20	3.47	4.10
	Eco-friendliness	2.37	4.24	3.01	3.2	2.27	3.83	3.78	3.04	2.08	5.07	3.6	3.29
	Customer Satisfaction	3.66	3.76	3.88	3.76	3.92	3.62	3.15	3.64	3.85	4	3.67	3.84
Mode	Function	7	2	7	7	7	5	3	7	7	2	4	7
	Ease of use	6	3	3	3	5	3	6	3	4	3	3	3
	Reliability	3	7	4	6	6	7	3	6	7	1	7	7
	Durability	2	6	7	4	4	7	6	4	5	4	3	4
	Design	5	5	3	5	3	6	3	3	6	2	2	2
	Eco-friendliness	1	7	1	1	1	1	1	1	1	6	1	1
	Customer Satisfaction	2	1	2	2	1	1	1	1	2	1	1	1
Variance		1.15	0.33	0.22	0.23	0.87	0.24	0.36	0.30	0.92	0.32	0.31	0.20

		All Educations Levels		
		IT	Automobile	Home Appliance
N		144	77	87
Sum	Function	788	279	362
	Ease of use	565	260	362
	Reliability	632	339	379
	Durability	567	345	413
	Design	603	321	310
	Eco-friendliness	325	324	314
	Customer Satisfaction	553	288	301
Rank	Function	1	6	3
	Ease of use	5	7	3
	Reliability	2	2	2
	Durability	4	1	1
	Design	3	4	6
	Eco-friendliness	7	3	5
	Customer Satisfaction	6	5	7
Mean	Function	5.47	3.62	4.16
	Ease of use	3.92	3.38	4.16
	Reliability	4.39	4.4	4.36
	Durability	3.94	4.48	4.75
	Design	4.19	4.17	3.56
	Eco-friendliness	2.26	4.2	3.61
	Customer Satisfaction	3.84	3.74	3.46
Mode	Function	7	5	7
	Ease of use	5	3	3
	Reliability	3	7	6

		All Education Levels		
		IT	Automobile	Home Appliance
	Durability	4	4	7
	Design	5	5	3
	Eco-friendliness	1	7	1
	Customer Satisfaction	2	1	1
Variance		0.90	0.17	0.23

Note: Education 1 represents the respondents who do not hold bachelor's degree, Education 2 represents those who have bachelor's degree, Education 3 represents respondents who have above bachelor's degree, whereas N is the total number of respondents in each product category. Sum is the total scores that respondents gave by ranking out of 7 to 1. Rank is by ranking the Sum values of each attribute dimension, in which the highest sum will be ranked as 1 and 7 as vise versa. Mean is the average point of respondents' evaluating values out of 7 to 1 in each product category and seven attribute dimensions. Mode is the value that respondents appeared to most often rank, and variance is the average of the squared differences from the average point (mean) of attribute dimension.

As for ***income***, the study divided respondents into five different income groups, in which Income 1 represented respondents who have average monthly income lesser or equal to 15,000 baht; Income 2, 15,001-25,000 baht; Income 3, 25,001-35,000 baht; Income 4, 35,001-45,000 baht; and Income 5,average monthly income of more than 45,000 baht (As of August 2013, 32 baht is equivalent to 1 USD). Accordingly to the result of the study, Income 2 and Income 1 or the respondents who have average monthly income between 15,001-25,000 baht and 15,000 baht or less were the two potential consumer groups who most frequently spent on these three product categories.

For Income 1 or respondents who have an average monthly income of lesser or equal to 15,000 baht, they evaluated the effects of attributes on their buying decision diversely in three product categories. First, for electronics/IT product, the respondents ranked "function", "reliability", and "design" at the top influential factors of their buying decision. However, for the second product category automobile, the respondents evaluated the seven attributes differently, in which they ranked "reliability", "durability", and "design" as the most important attribute dimensions on their buying decision. Third, for home appliance, the respondents gave "durability", "design", and "eco-friendliness" as the most influential attribute dimensions on their buying decision. Although the results of effects of attributes were varied among these three product categories, but to some extent, "design" seemed to be one of the top three important attribute dimensions on their buying decision in all three product categories.

For Income 2 or those earning an average monthly income of 15,001-25,000 baht: "function", "durability", and "reliability" were strongly praised as the most influential attribute dimensions on their overall buying decision. Indeed, the respondents evaluated "function", "reliability", and "ease of use" as their most important factors on their electronics/IT product buying decision. In addition, "durability", "reliability", and "eco-friendliness" ranked at the top in purchasing automobile, while "durability", "function", and "ease of use" placed as the most influential factors on home appliance.

For Income 3 or respondents earning an average monthly income of 25,001-35,000 baht, the overall effect of attributes on their buying decision in the three product categories were mixed between Income 1 and Income 2, but still "reliability", "durability", and "function" were the most important attribute dimensions on their overall buying decision. However, the respondents in this income group started to factor in their satisfaction or in other words "customer satisfaction" into their buying decision, specifically when they buy electronics/IT product.

For Income 4 and Income 5 or respondents earning an average monthly income of 35,001 – 45,000 baht and above, the result of effects of attributes on their buying decision was a good combination of all previous income groups. In fact, the respondents in both Income 4 and Income 5 took various attributes into consideration in making their purchasing decision, particularly "eco-friendliness"

and their overall satisfaction/ “customer satisfaction”. All in all, “reliability” and “durability” were still the two most influential attribute dimensions on their buying decision in all and across three product categories.

By looking at the average/mean, with the high average score of 5 and above points in all incomes, except Income 4, “function” proved to be one of the most influential factors that had the most effect on electronics/IT product buying decision. Furthermore, as for automobile and home appliance, the highest average of these two product categories were not as high as the electronics/IT product, but it was apparent that either “reliability” or “durability”, and somewhat “design” in Income 3 and “eco-friendliness” in Income 4 would receive the highest average score on making these either two product categories buying decisions.

However, by taking the squared of averages, the variances of electronics/IT product were the highest among three product categories. These higher in variances indirectly implied that the seven attribute dimensions ranked by respondents/consumers in electronics/IT product were distributed far from its average /mean, compared to the other two product categories. Thus, a higher variance also referred to a wider range of evaluation by each income group on the seven attribute dimensions in electronics/IT product. Table 4.10 shows the income effects of attributes on consumer buying decision.

Table 4.10: Effects of attributes on consumer buying decision by income

		Income 1 (<15,000 THB)				Income 2 (15,001 – 25,000 THB)				Income 3 (25,001 – 35,000 THB)			
		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall
N		60	12	28	100	42	26	33	101	16	22	13	51
Sum	Function	332	42	108	482	245	89	152	486	81	90	50	221
	Ease of use	232	38	109	379	172	88	150	410	59	74	48	181
	Reliability	265	53	114	432	176	117	130	423	71	97	75	243
	Durability	234	52	127	413	157	122	166	445	60	97	65	222
	Design	264	52	117	433	158	102	110	370	70	104	42	216
	Eco-friendliness	129	50	115	294	109	109	105	323	33	89	42	164
	Customer Satisfaction	225	49	97	371	159	101	113	373	74	65	42	181
Rank	Function	1	6	6	1	1	6	2	1	1	4	3	3
	Ease of use	5	7	5	5	3	7	3	4	6	6	4	5
	Reliability	2	1	4	3	2	2	4	3	3	2	1	1
	Durability	4	2	1	4	6	1	1	2	5	2	2	2
	Design	3	2	2	2	5	4	6	6	4	1	5	4
	Eco-friendliness	7	4	3	7	7	3	7	7	7	5	5	7
	Customer Satisfaction	6	5	7	6	4	5	5	5	2	7	5	5
Mean	Function	5.53	3.50	3.86	4.82	5.83	3.42	4.61	4.81	5.06	4.09	3.85	4.33
	Ease of use	3.87	3.17	3.89	3.79	4.10	3.39	4.55	4.06	3.69	3.36	3.69	3.55
	Reliability	4.42	4.42	4.07	4.32	4.19	4.50	3.94	4.19	4.43	4.41	5.77	4.76
	Durability	3.90	4.33	4.54	4.13	3.74	4.69	5.03	4.41	3.75	4.41	5	4.35

		Income 1 (≤15,000 THB)				Income 2 (15,001 – 25,000 THB)				Income 3 (25,001 – 35,000 THB)			
		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall
	Design	4.40	4.33	4.18	4.33	3.76	3.92	3.33	3.66	4.38	4.72	3.23	4.24
	Eco-friendliness	2.15	4.17	4.11	2.94	2.60	4.19	3.18	3.20	2.06	4.05	3.23	3.22
	Customer Satisfaction	3.75	4.08	3.46	3.71	3.79	3.89	3.42	3.69	4.63	2.95	3.23	3.55
Mode	Function	7	5	1	7	7	5	7	7	7	4	4	4
	Ease of use	4	3	6	3	5	3	6	2	5	3	2	3
	Reliability	6	7	4	4	3	7	3	3	4	6	7	6
	Durability	4	7	7	7	4	6	5	4	5	4	6	4
	Design	5	6	3	5	4	4	1	4	7	5	2	5
	Eco-friendliness	1	6	1	1	1	7	1	1	1	1	1	1
	Customer Satisfaction	1	1	1	1	2	1	2	2	6	1	1	1
Variance		1.03	0.23	0.11	0.36	0.92	0.25	0.53	0.29	0.96	0.40	1.00	0.32

		Income 4 (35,001 – 45,000 THB)				Income 5 (> 45,000 THB)				All Incomes		
		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance
N		6	9	6	21	20	8	7	35	144	77	87
Sum	Function	21	35	29	85	109	22	23	154	788	279	362
	Ease of use	21	36	25	82	81	24	30	135	565	260	362
	Reliability	32	39	27	98	88	38	33	159	632	339	379
	Durability	32	33	27	92	84	41	28	153	567	345	413
	Design	21	29	21	71	90	24	20	134	603	321	310
	Eco-friendliness	10	44	16	70	44	28	36	108	325	324	314
	Customer Satisfaction	31	36	23	90	64	37	26	127	553	288	301
Rank	Function	4	5	1	4	1	7	6	2	1	6	3
	Ease of use	4	3	4	5	5	5	3	4	5	7	3
	Reliability	1	2	2	1	3	2	2	1	2	2	2
	Durability	1	6	2	2	4	1	4	3	4	1	1
	Design	4	7	6	6	2	5	7	5	3	4	6
	Eco-friendliness	7	1	7	7	7	4	1	7	7	3	5
	Customer Satisfaction	3	3	5	3	6	3	5	6	6	5	7
Mean	Function	3.5	3.89	4.83	4.05	5.45	2.75	3.29	4.4	5.47	3.62	4.16
	Ease of use	3.5	4	4.17	3.9	4.05	3	4.29	3.86	3.92	3.38	4.16
	Reliability	5.33	4.33	4.5	4.67	4.4	4.75	4.71	4.54	4.39	4.4	4.36
	Durability	5.33	3.67	4.5	4.38	4.2	5.125	4	4.37	3.93	4.48	4.75
	Design	3.5	3.22	3.5	3.38	4.5	4.25	2.86	4.11	4.19	4.17	3.56

		Income 4 (35,001 – 45,000 THB)				Income 5 (> 45,000 THB)				All Incomes		
		IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance	Overall	IT	Automobile	Home Appliance
	Eco-friendliness	1.67	4.89	2.67	3.33	2.2	3.5	5.14	3.09	2.26	4.21	3.61
	Customer Satisfaction	5.17	4	3.83	4.28	3.2	4.625	3.71	3.63	3.84	3.74	3.46
Mode	Function	3	1	4	4	7	2	1	7	7	5	4
	Ease of use	N/A	5	7	3	4	3	4	4	5	3	3
	Reliability	4	2	3	4	3	4	7	6	3	7	6
	Durability	5	3	6	5	4	5	3	5	4	4	7
	Design	4	2	N/A	4	5	6	2	5	5	6	3
	Eco-friendliness	1	6	2	1	1	1	7	1	1	7	1
	Customer Satisfaction	7	6	7	7	2	1	4	2	2	1	1
Variance		1.85	0.27	0.55	0.25	1.07	0.85	0.63	0.27	0.90	0.18	0.23

Note: Income 1 represents the respondents who earn a monthly income ≤ 15,000 baht; Income 2, 15,001-25,000 baht; Income 3, 25,001-35,000 baht; Income 4, 35,001-45,000 baht; and Income 5, >45,000 baht, whereas N is the total number of respondents in each product category. Sum is the total scores that respondents gave by ranking out of 7 to 1. Rank is by ranking the Sum values of each attribute dimension, in which the highest sum will be ranked as 1 and 7 as vise versa. Mean is the average of respondents' evaluating values out of 7 to 1 in each product category and seven attribute dimensions. Mode is the value that respondents appeared to most often rank and variance is the average of the squared differences from the average point (mean) of attribute dimension.

All in all, results from Table 4.7 to Table 4.10 clearly indicated that the different demographic determinants, including gender, age, education, and income, certainly have some significant effects and substantial influences on the seven attribute dimensions on consumer buying decision and among three product categories. In addition, "reliability", "function", and "durability" also proved to have the most effects on consumer buying decision in various demographic determinants across electronic/IT product, automobile, and home appliance.

"What is/are other factor(s) that can be used to evaluate product quality?" Regarding the second question, 177 consumers answered this question. Similarly to the first three sectors' opinions (government officials, producers/manufacturers of a product, and intermediate sellers), the respondents specified that "support service" and "value for money" were the two most recorded factors that could be used in evaluating product quality. In addition, other potential factors included "product guarantee", "feedback and review from previous users", "product description", "net sales in the market", "advertisement", as well as "adaptability". To be more specific, both male and female respondents at age 31-35 and 36-40 years old who hold bachelor's degree and have an average monthly income of 25,000 baht or less mostly mentioned "support service" as one of the factors in evaluating product quality. Furthermore, the majority of female respondents at the age of 26-30 years old who mostly hold bachelor's degree and have an average monthly income of 25,000 baht or less believed that "value for money" certainly has some influential effects on product quality evaluation and their final buying

decision. Likewise, “adaptability” was generally mentioned for inclusion and use in evaluating product quality by male respondents, especially at age 26-30 years old, who hold bachelor’s degree and have an average monthly income of 15,001-25,000 baht. Meanwhile, female respondents at various ages who either hold or do not hold bachelor’s degree and have an average monthly income of 25,000 baht or less likely used “advertisement”, and “review from previous users” in evaluating product quality. Therefore, these in-depth respondents/consumers’ opinions revealed that “support service”, “value for money”, “adaptability” and secondary data such as feedbacks and reviews, performance of a product in the market, and advertisement, to some extent, had certain significance on their perception, decision, and product quality evaluation.

4.2. Prospects of Product Quality

The question *“what would product quality be in the next 5 years?”*, had all interview participants and questionnaire respondents share parallel thoughts and ideas on this question.

The government representative, the Permanent Secretary of the Ministry of Industry of Thailand, said things around us are changing over the time and the needs of human being will certainly change accordingly. Consumers would definitely ask for more superior quality, quantity, usability, accessibility, and a product with longer shelf life. Things would get more complicated as there would

be many more players in the market. The market would open more to free competitions, and many crises would await all-around.

In addition, the general manager and customer quality-engineering department of a large Japanese carmaker added that besides the improvement in product quality, the quality of people, including the quality of consumers, product producers/ manufacturers, and all stakeholders, would also improve. In a few years, the production process in all industries would require high technology, more creativity, and flexibility, and would necessitate readiness for the changes. The producers/manufacturers would have to fight in order to keep their costs down, enhance their services, and focus not only on the outcome but also pay attention more to the society. These are the key activities that would increase their product quality as well as productivity, maintain the profits, and sustain position, even as they still could comply with the laws and regulations.

Moreover, the store general manager of an electronics store in Chonburi, specified that a new generation product should satisfy overall market and consumer's expectations. Many aspects/factors would be taken into consideration and have effect on consumer buying decision. One of those would be service, in which a business that gives better services will survive in a market. Interestingly the point that he and many intermediate sellers mentioned is a bit in contradiction with product development; a new breed product might not last long, as a product is composed of many parts and this is also a result of keeping the price down.

Last but not least, the consumers' opinion toward the prospects of product quality is very simple. It is mainly dealing with their feelings/perceptions of expectation, experience, and satisfaction. They expect a better and higher product quality that answers their needs and fulfills their wants.

All opinions being considered, in the next 5 years, the market may become very competitive; it may be flooded with numerous innovative products, better designs, and high technology resolutions at competitive price in various accessible channels. Thus, consumers would become more selective and more concerned with details. They would expect to see more improvement and additional value to product quality. Therefore many interview participants and questionnaire respondents believed that in the next 5 years, product quality will develop in various aspects; sophisticated in both hardware and software, safe for human life, achieving international standard, delivering superior services, going toward green concepts, higher in efficiency with long term usability, and above all, answering consumers' needs and exceeding consumers' expectations. Moreover, the future scope of product quality is not restricted to the final or ready to use outcome, but product quality should be better in all and improve throughout the processes. It should be a fair game that is good for producer, buyer, user, society, and the ecosystem. These were their common views.

However, besides those views, there were several arguments among sectors' opinions. Some participants and respondents argued that as product quality

becomes more advanced by adding new technologies, offering in smaller size and lighter weight, containing many tiny chips and parts, product quality in the next five years, in terms of durability and lifecycle, might become shorter. Furthermore, quality itself might not develop as much as the market expects; this is mainly due to an aggressive price war, reduction in production cost, and an increase in sale turnover rate.

All in all, product quality will unquestionably differ from today and vary in many aspects, and certainly it will somehow uphold on extension path. However, how far and how long will this continue or how deep it may fall, the future of product quality depends largely on all players.

4.3. Product Quality Definition

Different people view product quality differently so what could be a definition of product quality. The government officials (regulators), producers/manufacturers of a product and intermediate sellers (market suppliers), and consumers gave their thoughts and opinions on this. Their precise product quality definitions are summarized.

Regulators. To meet the standard, accomplish all requirements, follow rules and regulations, be harmless and fit with intended use, are the basis for the meaning of product quality as defined by government officials. However, only by meeting and achieving these fundamentals the country's economy and manufacturing industry

could not develop or initiate any growth. Firms could possibly lose competitiveness, or there could be less value added to a product as well as to consumers. Therefore, government officials believed a good definition of product quality should comprise and outperform all those mentioned essence as well as generate additional value.

Market Suppliers. To deliver a product at the right "SPECCC" (safety, good performance, eco-friendliness, comfort in all aspects, consistency, and continuous improvement), and respond to consumer needs in time would be producers/ manufacturers and intermediate sellers' definition of product quality. However, as consumers value product quality and decide their purchasing more based on their feelings and perceptions, the two sectors agreed that attached support services would be another important component on the definition. Thus, a definition of product quality would be "SPECCC+RS" (Safety, good Performance, Eco-friendliness, Comfort in all aspects, Consistency, Continuous improvement, plus Respond to needs in time, and support Service).

Consumers. Meeting their needs and exceeding their wants, value for money, excellence in both hardware and software, and brand recognition, were the important attribute dimensions and this was the definition of product quality given by Thai consumers.

Indeed, the regulator's product quality definition is an outline that guides how market suppliers should perform and what should be delivered to the consumers. Correspondingly, the market supplier's definition is meeting up the requirements and delivering the expectations. Last but not least, the consumer's definition is as simple as meeting their needs and satisfying their wants.

5. Discussion

A search for product quality definition in the case of Thailand has yielded significant results. First, *reliability*, *function*, and *durability* were the three most important attribute dimensions that have the most influences and effects on Thai consumers' buying decision. From the consumers' perspective, all the seven attribute dimensions had approximately comparable weight and influence on Thai consumer buying decision. *Eco-friendliness* also had more impact on Thai consumer buying decision than on regulators and market suppliers. Second, *support service*, *value for money*, and *adaptability* were additional attribute dimensions, which all sectors believed could be applied and have an effect on evaluating Thai product quality. Third, the differences in demographic determinants including gender, age, education, and income also had some substantial effects of attributes on Thai consumer buying decision. Fourth, in the near future, all sectors believed that product quality would develop and enhance in various aspects, however, how far the product quality could improve and how long the next product generation could last, all sectors are still questioned about these. Fifth, *to meet quality standards and requirements*, *excellence in both*

hardware and software, *supplement support service*, *continuous improvement*, *fitness with intended use*, *be economic and environment friendly, satisfy consumer needs/wants and exceed consumer expectations* were the common definitions of product quality defined by Thai regulators, producers/manufacturers of the products, intermediate sellers, and consumers. In accordance to these findings and common product quality definitions, here I proposed a more precise definition of product quality in the 21st century in the case of Thailand as *"being good in all aspects and fitness with intended use"* where *good in all aspects* implies good in both hardware and software, expectation and experience, economically and environmentally, while *fitness with intended use* signifies the use in regulator's perspective, a use in manufacturer's perspective, a use in seller's perspective, and a use in user's perspective. By implementing the proposed product quality definition, regulators could ensure that market supplier performs accordingly to the requirements as well as deliver additional value to fulfill the expectations that finally satisfy consumers' needs and wants, and create new experiences for the market and the consumer. Last but not least, the results of this study evidently upheld that product quality is unquestionably related to perceptions, depending on the conditions as well as subjective attributes. However, with the significant results of ranking, high values in average /means, and small gaps in variances, it was apparent that these seven attribute dimensions of *"function"*, *"ease of use"*, *"reliability"*, *"design"*, *"durability"*, *"eco-friendliness"*, and *"customer satisfaction"*, plus three additional attributes of *"support service"*, *"value for money"*, and *"adaptability"*, could potentially be valid attribute dimensions

which could be foreseen to be used in evaluating and defining Thai product quality, particularly in the three product categories and in the case of Thailand.

CHAPTER 5: THE ATTRIBUTE DIMENSIONS OF PRODUCT QUALITY, THE MEASUREMENT, AND ITS VALIDITY

As mentioned earlier in the previous chapters, product quality is subjectively a perception, very difficult to define and fairly undervalued by firms. This is mainly because there are very few studies about appropriate measurements and applicable methods in evaluating various types of product quality. In this chapter, the research proposes new product quality attribute dimensions, particularly for measuring Thai product quality in three different product categories: electronics/IT product, automobile, and home appliance, and test for validity. To verify, the research applies content analysis with multiple statistical tests by converting 86 of those three product categories' reviews from the country's most well-known public sources into a 5-point scale on overall product quality and 11-point scale on the proposed attribute dimensions. The proposed attribute dimensions are *"function", "ease of use", "reliability", "durability", "design", "eco-friendliness", "customer satisfaction", "support service", "value for money",* and *"adaptability"*. As a result, there are high correlations that prove to have significant effects of attribute dimensions on overall Thai product quality, especially automobile and electronics/IT products. Moreover, the proposed attribute dimensions also test to be one of the valid measurements that can be used in measuring various types of today's Thai product quality.

1. Introduction

In many economics and marketing models, a product is usually described in a one simple dimension called *"quality"*, and according to many studies, consumers are willing to pay for those premiums when a product is so-called of *"high quality"* (Maynes, 1976; Olson, 1977). However, how could one come up with an aggregate and differentiate whether the product is of high quality or low quality, and what would be a common methodology in measuring product quality.

Since the 1950s, the study by Leavitt (1954) examined the meaning of price on product quality. His study was one of the earliest to indicate that consumers are likely inclined to use price as an indicator of product quality. Accordingly, numerous studies also tried to examine the correlation between price and quality/product quality in various statistical tests. As a result, many qualitative reviews strongly endorsed that there is a positive relationship or high correlation between price and perceptions of quality/product quality for certain products and within certain price ranges (Monroe, 1973, 1977; Monroe & Dodds, 1988; Monroe & Krishnan, 1985; Olson, 1977; Peterson & Wilson, 1985; Rao & Monroe, 1988; Zeithaml, 1988). In addition, the result of Rao and Monroe's study in 1989 also upheld that besides price, brand name and store name also have positive and statistically significant relationship on consumer's perceptions of product quality. However, could price, brand name, and store name alone be used in measuring product quality? Is there another reasonable measurement in evaluating product quality? Are there any underlying attribute dimensions that are

valid to explain the product quality measurement? These questions have been raised and still remained unclear.

Thus, this chapter suggested a simple and practical method in measuring product quality, particularly product quality in the case of Thailand. Thereby, here are my research questions for this chapter: *What could be the product quality attribute dimensions in the case of Thailand?*; *How will product quality be measured through the proposed attribute dimensions?*; and *Are these proposed product quality attribute dimensions and measurement valid and applicable to various types of product category?*

In this chapter, the research also examined and reviewed the previous empirical studies to see what attribute dimensions scholars and researchers have used for measuring product quality so far. Learning from that, the research combined the results from Chapter 4 and developed a null hypothesis and proposed the attribute dimensions specifically for the case of Thailand. Then, the research assessed the country's (Thailand) top and most reliable public reviews in three product categories: electronics/IT product, automobile, and home appliance, and converted the product quality review scores into an 11-point scale to test and verify the relationship between the proposed attribute dimensions and product quality. As a result, the research presented the effects of attribute dimensions on Thai product quality, the measurement, and its validity. The use of this research outcomes is expected to be a helpful guideline and applicable product quality

measurement and evaluation method to benefit but not limit to Thai product quality only, but also other similar characteristics of Asian product qualities as well.

The previous studies, methodology, results and data analysis, and discussion are explained in the succeeding four sections.

2. Related Product Quality Findings and Previous Studies of Attribute Dimensions on Product Quality Measurement

This section briefly reviews related findings of product quality and explains the principles of previous studies of attribute dimensions on product quality. It then develops a null hypothesis as well as a composite attribute dimensions for Thailand case.

2.1. Relative Importance of Previous Studies

As quality/product quality is a perception, depending on the conditions and subjective perspectives, it is undeniable that quality/product quality is very difficult to define and measure. Under the hedonic view, there is no such measurement of quality/product quality, since it is rather inconsistent to directly combine and pull the various elements of product quality characteristics together (Triplett, 1976). However, many economists argued, if a measurement of quality/product quality can be created by a process comparable to the construction

of GNP (Gross National Product) [3] , in which apples and oranges (characteristics/attribute dimensions of product quality) can be combined into an aggregate notion called "fruit" (quality/product quality), therefore, it is rational enough to physically value individual fruit (characteristics/ attribute dimensions) and aggregate it as the overall evaluation and measurement of real GNP of fruits (quality/product quality measurement). Hence, by combining various characteristics/attribute dimensions of product quality, ideally the product quality could be aggregated and measured. Many studies also shared similar views, which support the aforementioned statement.

In 1961, Adelman and Griliches proposed "the quality of a commodity be regarded as a composite of different characteristics". The characteristics in their context were referred to as "durability", "reliability", "workmanship", and other utilities that give multiple benefits to a commodity. Furthermore, Maynes (1976) also asserted that product quality could be assessed for either a variety of a product combinations, when the characteristics of a seller are also taken into consideration, including a specimen. A specimen was defined as "the subjectively weighted average of characteristics", and in turn characteristics were defined as the "services giving rise to utility", for instance "safety", "durability", and "beauty". In addition, another study of Olson (1973) revealed that normative consumers use a variety of cues to infer product quality. These cues include extrinsic cues such as price, brand name, and store name as well as intrinsic cues

[3] GNP or Gross National Product is the market value of all products and services produced in one year by labor and property supplied by the residents of a country (see Brezina, 2012).

such as utilities or abilities of a product. Correspondingly with the previous results in Chapter 4, this is also true and applicable with Thai consumers perception toward product quality, in which composite attribute dimensions such as “function”, “ease of use”, “reliability”, “durability”, and many related attribute dimensions have positive influence on Thai consumers’ buying decision on certain products (Ackaradejruangsri, 2012, 2013).

Thus, as numerous cues affect product quality perceptions and various studies’ findings uphold the view, it was unanimous that product quality is a multidimensional construct and the use of multiple attribute dimensions as independent variables could be feasible and essential for this empirical test.

2.2. Heterogeneity of Tastes, Imperfect Information, and Reviewed Quality

Many researchers and marketers strongly asserted that consumers are different on their preferences, diverse in tastes, and at various dimensions (Hjorth-Annderson, 1984; Kamakura et al. 1988). Such researchers and marketers assumed that there is no single expert who could possibly grade the quality of products with no ambiguity, since he or she would not be able to come up with a valid scale that could appeal to all consumers and for many types of product. To elaborate, consider two individual consumers (I and II) who are asked to choose between two different features (A and B) of a product, which have only two characteristics (x and y). Assume further that the proportions of characteristics x and y in feature A are different from the combination of x and y found in feature B, yet both A

and B are offered at the same price, and other characteristics and conditions other than x and y are identical. After individual evaluation, individual I prefers A to B, while individual II prefers B to A. Under this supposition and from individual consumer's point, I evaluated feature A at higher quality/satisfaction than feature B, while II evaluated feature B at higher quality/satisfaction than A. Thus, there is no ultimate explanation why I prefer A than B, and or else for II, unless interpersonal comparisons and in-depth analysis were made. This kind of consumers' differences in taste additionally makes consistent product quality measurement become much more complicated,

In addition, under an efficient market, several evidences suggested that consumers are imperfectly informed of product quality and cannot assess product quality immediately (Nelson, 1970; Tellis & Wernerfelt, 1987). Different markets and across all ranges of product have different speeds of product take off (Tellis & Chandrasekaran, 2008). Compellingly, the information about a new product will also take some time to reach a market before it will be ready for selling.

Suppose that was a case in which consumers differ in tastes and there is imperfect information, then a measurement of composite product quality would have no particular relationship to any underlying dimensions of product quality reviews. Therefore, the following is a null hypothesis for this study:

Hypothesis H_0: *A composite measurement of product quality (Thai product quality) obtained from public reviews of new launching product will bear no relationship to the underlying proposed product quality attribute dimensions.*

If the said null hypothesis were true, then the underlying proposed product quality attribute dimensions could not represent and cannot be the determinant for measuring Thai product quality. It might also be invalid for measuring general product quality.

However, there are strong arguments that in such event, experts who have specialty knowledge and explicit resources could sample products, give personal evaluations based on valid and various dimensions, and publish the reviews before the consumers could actually assess products. Henceforth, the previous uninformed consumers become informed, and could now weigh, and to some extent, rely on those public reviews for their prchasing. This kind of extensive demand for public reviews and ratings of products, especially electronic products in computer and IT magazines as well as on the internet, is proof to the market that such public reviews and rates employ relatively significant influence on the market values (Eliashberg & Shugan, 1997; Mayzlin, 2006; Moorman, Du, & Mela, 2005).

If the said argument is valid and it tests to contradict the aforementioned null hypothesis, then the underlying proposed attribute dimensions would become the

most up-to-date and appropriate product quality dimensions that could be used in measuring today's Thai product quality. Thus, a challenging hypothesis against H_0 is:

Hypothesis H_{A0}: *A composite measurement of product quality (Thai product quality) obtained from public reviews of new launching product will have positive relationship to the underlying proposed product quality attribute dimensions.*

2.3. Relative Importance of Attribute Dimensions of Product Quality

Research on valid multiple attribute dimensions of product quality in marketing and product engineering rarely exists, but there is one that had great impact on product's success in the marketplace: eight dimensions proposed by Garvin (1984). His study suggested eight dimensions, which are "performance", "feature", "reliability", "conformance", "durability", "serviceability", "aesthetics", and "perceived quality", as the basic elements of product quality. Each of these dimensions is independent as well as distinct, in which one dimension could be ranked as high, whereas other could be ranked as low. Moreover, several marketing research and studies, including Tellis and Johnson (2007), commonly applied these similar terms and dimensions of product quality in capturing and rating products. However, there are no definite composite attribute dimensions of product quality practical to all. But in general, when referring to technology-based products, including IT products, automobiles, as well as home appliances, the

most important attribute dimensions regarding quality would commonly be “utility”, “usability”, “reliability”, “durability”, “feature”, and “value for money”.

In technology-based product, firms continuously and competitively introduce new products into the market. However, consumers hardly purchase new products in an instant; indeed, they make a comparison among the existing products, do beneficial valuation before making their final buying decision. At that point, the cognitive analysis of utility, performance, and compatibility among the new, old, and current product is important for consumers. Second, new products tend to develop through further advanced technologies; frequently these often come with unfamiliar parts, that are always complex and not user friendly. Consumers need time to explore and figure out how to use these. Thus, usability or user friendliness is a very important dimension of product quality for consumers. Third, as there are a variety of new generation products offered by many producers in the market, these create high competition and pressure for firms to deliver new products in a shorter time. Even though, availability of new products are abundant, consumers are still concerned about reliability and durability as important product quality dimensions. They would most likely prefer to buy a product from a reliable maker and one that could be used for a long period of time. Fourth, recently firms pay high attention not only to software but also to hardware. New products lately come out in many shapes, various shades, with creative designs. It is undeniable that the first impression on product appearance somewhat has influence on consumer’s decision. Therefore, feature is an important attribute

dimension for consumer evaluation on product quality as well. Fifth, as it has been mentioned earlier that many empirical studies suggested consumers more likely use price as an indicator of product quality, relatively for expensive products, value for money becomes one of important attribute dimensions for consumers. Furthermore, other dimensions such as "energy saving" or "eco-friendliness", especially for cars and electronic devices, "support service", "adaptability", and even "overall satisfaction" have become important dimensions widely used by consumers in evaluating product quality. The results of "*Defining Thai Product Quality in the 21st Century"* in the previous chapter support this remark (Ackaradejruangsri, 2012, 2013).

There have been evidence to show that "utility", "usability", "reliability", "durability", "feature", "value for money", "eco-friendliness", "overall satisfaction", "support service", and "adaptability" are generally used and proved to be feasible for attribute dimensions of technology-based product quality. For the appropriateness and suitability with the purpose of this research, those dimensions and terms have been revised. Thus, the proposed composite attribute dimensions particularly for Thai products and Thai consumers would be "*function*", "*ease of use*", "*reliability*", "*durability*", "*design*", "*eco-friendliness*", "*customer satisfaction*", "*support service*", "*value for money*", and "*adaptability*". Each attribute dimension's description is explained in the succeeding section.

3. Methodology

This section first describes the context or the focus for this chapter. It then explains how to assess product quality data and convert the obtained data into the composite proposed product quality attribute dimensions.

3.1. Context

Systematically, firms typically do not rate or release their product quality information to the market. This is mainly because it is inappropriate to judge the products from one side, especially from the producer of a product. So to avoid this bias, one possible solution is to assess through public reviews. Providentially, there are a numbers of public reviews available in today's market, mostly in electronics and IT products, automobile, and a small portion in home appliances. In the Thai market, product reviews are regularly published as a part or a subsection in magazines, periodicals, or in business journals. These are issued on weekly, monthly, or quarterly basis, and both in paperback as well as online. As Thai consumers are becoming more alert with upcoming products, there is high demand for new product information.

This research focused only on three product categories: electronics/IT product, automobile, and home appliance. Recall that electronics/IT product was limited to mobile phone, computer, laptop, and tablet; and home appliance, television, refrigerator, washing machine, and air conditioner.

During the past five years, Thai consumers increasingly relied on the country's leading media and public reviews for their decisions (Bangkok Post, 2011). The *PC Today* is Thailand's number one in IT magazine. Since 2004, it has published insight reviews, news and tips on hot items on electronics/IT products and gadgets. Every month, there are thousands and thousands of IT fans who wait to read the reviews. Meanwhile, the monthly exclusive reviews of new cars worldwide and in Thailand by J!mmy[4] shot *Headlight Magazine* to the top and earned very high credit and applause from car maniacs, Headlight Magazine is young in automobile magazine industry and started publication in 2009. Unlike the two product categories' which enjoy exclusive public reviews, the home appliance product category does not have a publication conducting official or exclusive public reviews. However, a small section in *CE Mart*, comes out monthly and publishes some reviews of home appliances such as television, refrigerator, washing machine, and many more.

For this particular research, the samples of the data analysis consisted of product quality reviews in these three product categories, in which electronics/IT products quality are reviewed in the *PC Today*[5], automobile in the *Headlight Magazine*[6], and home appliance in the *CE Mart*[7]. All of the reviews were gathered from January 2011 to December 2012 and assessed if the reviews were related to the

[4] For many years, J!mmy has been reviewing more than hundred of cars in Thai Driver, Pantip, Car Online, Headlight Magazine, and many leading automobile magazines in Thailand. He is the professional for car testing, review writing, and a guru in cars. Many editors in car magazines said his reviews have big influence on Thai readers (see Pantip, 2006).

[5] *PC Today*: Vol. 7 Issue 95 (January 2011) to Vol. 9 Issue 118 (December 2012)

[6] *Headlight Magazine*: Vol. 25 (January 2011) to Vol. 48 (December 2012)

[7] *CE Mart*: Vol. 210 (January 2011 to Vol. 233 (December 2012)

three product categories. No single review has been omitted, unless the reviews were out of the research focus. After the product quality reviews were collected, the research converted those reviews into a product quality score and the proposed product quality attribute dimensions. For detail of how the reviews were to transcribed and used measure product quality data, explanation is available in the succeeding section.

3.2. Measuring Product Quality Data

In this research, "product quality" was defined as *"being good in all aspects and fitness with intended use"*. To realize this statement, a product quality would have to comprise of a composite attribute dimensions in which each/multiple attribute dimension(s) deliver more or less satisfaction to consumers. These attribute dimensions are *"function"*, *"ease of use"*, *"reliability"*, *"durability"*, *"design"*, *"eco-friendliness"*, *"customer satisfaction"*, *"support service"*, *"value for money"*, and *"adaptability"*. All these ten attribute dimensions were principally derived from significant effects of attributes on Thai consumer buying decision (Ackaradejruangsri, 2012, 2013).

To verify the relationship between the proposed attribute dimensions and Thai product quality, the research had to grade the overall scores of product quality. The research applied overall view of public reviews as the overall product quality scores. However, since most of the public reviews, including the *PC Today*, *Headlight Magazine*, and *CE Mart*, do not publish their product quality reviews in

numbers, thus, this research applied a content analysis[8] by initially used by Tellis et al. (2007) but with some adjustments.

Applying content analysis of product quality reviews, the research converted the concluding remark of each review into numerical scores. For this content analysis, the research initially developed a set of terms that reviewers use to describe these products: electronics/IT product, automobile, and home appliance, then grouped these terms into a 5-point scale, ranging from 1 to 5, in which 1 was the lowest score and represented "unacceptable" and 5 was the highest score and represented "excellent". The following is the content analysis outline for grading overall of product quality from the public reviews:

(1) **Excellent – 5 point:** A market leader that offers exceptional performance; *willing to buy*

- It is considered to be the most powerful product available at that specific period of time.
- This product is the big winner.
- It is the editor/reviewer's choice.
- This product is excellent.
- This product could be one of those milestones that change the way the consumers use that particular product.
- It is unquestionably the most powerful product you can buy.

[8] Content analysis or textual analysis is a methodology in the social sciences for studying the content of communication. This research technique intends to make inferences by systematically and objectively identifying specified characteristics within text (see Neuendorf, 2002).

- It is miles ahead of the competitors.
- The product stands at the top.
- It is the very best product of the year.
- This product has a very good chance of establishing a new standard.
- It is one of the products that does everything right.
- It is an outstanding performer that excels in every aspect.

(2) Good – 4 point: Excels in many areas; *good to buy*

- This product is an attractive alternative.
- This product is a good choice to buy.
- This product is a serious threat to the current standard.
- It is an impressive product.
- It is a richer product than its principal competitors.
- It is best in many aspects, but still there is a little weakness.

(3) Acceptable – 3 point: Average for its class; *justifiable to buy*

- The product is well thought out and yet it is a strong competitor to its rivals, nevertheless there are a few problems in it.
- It is obviously not the best product, but it is economical and a reasonable choice to buy.
- It is a fairly good performer that meets the required standard.
- It is a product that consumers decide to buy, but it may not fully satisfy.

(4) Poor – 2 point: Substandard; positives offset by more negative features; *buy with conditions*

- The product has been outdistanced by its competitors.
- It looks dim and unattractive beside its competition.
- In many areas, it still maintains major weaknesses and does not develop much from the past.
- It performs unsatisfactorily and parts of its features do not meet the standard.
- If there is no other alternative, it is not that bad choice to buy.

(5) Unacceptable – 1 point: Missing necessary features; *avoid to buy*

- It scores the lowest in overall satisfaction.
- It occupies the lowest spot and ranked at the bottom among its competitors.
- It performs poorly and most of it features do not meet the standard.
- Definitely avoid/ do not buy.

To further verify, the research converted the product quality data (the descriptive of product quality reviews) into the proposed attribute dimensions from three public sources and into an 11-point scale, rating from 0 to 10, in which 0 was the lowest score and represented “completely dissatisfied”, and 10 was the highest score and represented “completely satisfied”,.

The following is the guideline for grading product quality reviews into each attribute dimension:

(1) Completely Satisfied – 10 point: *Extremely excellent* on particular dimension

- The product is considered to be the most outstanding in that particular attribute dimension in the market (market leader) and among the competitors.
- This attribute dimension is the utmost strength and the best selling point of the product.
- This attribute dimension is extremely excellent, much beyond the expectation and very much above the standard.
- This attribute dimension receives the highest scores from the editor/reviewer and it is extremely recommended to buy.
- This attribute dimension is clearly the most powerful among other attribute dimensions.
- This attribute dimension makes a product to be the best among its competitors.
- This attribute dimension has a very good chance of establishing a new standard.

(2) Very Satisfied – 9 point: *Excellent* product quality on particular dimension

- The product is considered to be outstanding in that particular attribute dimension in the market and for its class.

- This attribute dimension is one of the strengths of a product and potentially is one of the selling points.
- This attribute dimension is excellent, somewhat beyond the expectation and slightly above the standard.
- This attribute dimension receives high scores from the editor/reviewer and it is very worthwhile to buy.
- This attribute dimension is one of the best among competitors and it is very appealing and attractive in the market.

(3) Moderately Satisfied – 8 point: *Very good* product quality on particular dimension

- The product is considered to be great in that particular attribute dimension in the market and for its class.
- This attribute dimension could probably be one of the strengths of a product and one of the selling points.
- This attribute dimension is very good, meets the expectation, and qualifies for the standard.
- This attribute dimension is an attractive alternative; it makes a product very reasonable to buy.
- There is high opportunity and room for this attribute dimension for the improvement to become a top class.
- This attribute dimension is not the best among the competitors but it is still competitive in the market.

(4) Satisfied – 7 point: *Good* product quality on particular dimension

- This attribute dimension is considered to be good, meets the expectation, and achieves the standard.
- There are rooms for this attribute dimension for further improvement.
- It is obviously not the best in that particular attribute dimension, but it is comparatively reasonable to buy.

(5) Somewhat Satisfied – 6 point: *Somewhat good* product quality on particular dimension

- This attribute dimension is considered to be somewhat good, somewhat meets the expectation, and somewhat achieves required standard.
- There is much room for this attribute dimension for improvement.
- Taking other factors into consideration, this attribute dimension still and somewhat makes a product economical and reasonable to buy.

(6) Neither Satisfied nor Dissatisfied – 5 point: *Acceptable* product quality on particular dimension

- The product is considered to be an average in that particular attribute dimension in the market and for its class.
- This attribute dimension is considered to be acceptable, nearly meets the expectation, and somewhat achieves required standard.

- To be more competitive, this attribute dimension needs many improvements.
- This attribute dimension makes a product a moderate choice to buy.

(7) Somewhat Dissatisfied – 4 point: *Somewhat poor* product quality on particular dimension

- This attribute dimension is considered to be somewhat poor, could not meet the expectation, and could not achieve required standard.
- This attribute dimension still can be improved, and it needs somewhat advanced improvement in order to achieved required standard.
- If there is no other alternative, it is not that bad choice to buy.

(8) Dissatisfied – 3 point: *Poor* product quality on particular dimension

- This attribute dimension is considered to be poor, somewhat a disappointment, and substandard.
- This attribute dimension makes a product outdistanced by its competitors.
- This attribute dimension performs somewhat unsatisfactory, maintain previous weaknesses, and do not develop much from the past.
- This attribute dimension seriously needs advanced improvement.
- If there is no other alternative, buy with conditions.

(9) **Moderately Dissatisfied – 2 point:** *Very poor product quality* on particular dimension

- This attribute dimension is considered to be very poor, a disappointment, and behind substandard.
- This attribute dimension is the weakness of a product, makes a product look dim, unattractive, and unable to compete with competitors.
- This attribute dimension performs unsatisfactorily, maintains major flaws, and does not develop from the past at all.
- Not recommended to buy.

(10) **Very Dissatisfied – 1 point:** *Unacceptable* product quality on particular dimension

- The product is considered to be miserable in that particular attribute dimension in the market and among its class.
- This attribute dimension is unacceptable, very disappointing, and much behind substandard.
- This attribute dimension is the threat of a product.
- This attribute dimension receives very low scores from the editor/reviewer.
- This attribute dimension performs badly and it is quite pointless to improve.
- Avoid to buy.

(11) Completely Dissatisfied – 0 point: *Extremely unacceptable* product quality on particular dimension

- The product is considered to be the most miserable in that particular attribute dimension in the market and among the competitors.
- This attribute dimension is extremely unacceptable, totally a disappointment, and substandard.
- This attribute dimension is obviously the threats of a product that could possibly turn a product into a dead product.
- This attribute dimension receives the lowest scores from the editor/reviewer and ranks at the bottom among competitors.
- This attribute dimension performs very badly and it is ultimately pointless to improve.
- Do not buy at any conditions.

Furthermore, the research identified the proposed ten attribute dimensions as:

Function	The ability, utility, and performance of a product compared to previous version or similar type of product, e.g., speed, intelligibility, technology, etc.
Ease of use	The charecter by which a product can be utilized by general consumer without any difficulties and problems.
Reliability	The property of a product being creditable, reliable, e.g., market recognition, brand awareness, safety, etc.
Durability	The ability of a product that is able to perform over a long period of time without technical error and physical breakdown.

Design	The total outlook and feature of a product, e.g., color, size, weight, etc.
Eco-friendliness	A product that is free from chemicals and is harmless to the environment, e.g., green material, recyclable, energy saving, carbon credit, related to green concept, etc.
Customer Satisfaction	The overall feeling and perception of a consumer on a product, compared to consumer's expectation and/or previous experience of using a similar brand product or from the same company.
Support Service	Additional and intangible value(s) attached to a product, e.g. product guarantee/warranty, seller courtesy, accessibility and availability of retail store, etc.
Value for Money	The consumer's perception in terms of economic value of a product, e.g., actual price, price of repairing parts, price as a secondhand product, etc.
Adaptability	The ability of a product that is workable and adjustable among brands or different producers.

Note that to avoid many 0s from product reviews should reviewers not mention these attribute dimensions, the research substituted that value with the average scale of 5 point of neither satisfied nor dissatisfied.

After the research has assessed overall product quality reviews and product quality data on each attribute dimension in numerical scores, the research then regressed those overall quality scores on the proposed attribute dimesions, by using the following model:

$$\text{Product Quality}_i = \gamma_0 + \gamma_f \text{ Function}_i + \gamma_e \text{ Ease of Use}_i + \gamma_r \text{ Reliabilty}_i + \gamma_{du} \text{ Durability}_i + \gamma_{de} \text{ Design}_i + \gamma_{eco} \text{ Eco-friendliness}_i + \gamma_s \text{ Satisfaction}_i + \gamma_{sv} \text{ Support Service}_i + \gamma_m \text{ Value for Money}_i + \gamma_a \text{ Adaptability}_i + \mu_i,$$

Where the γs are coefficients to be estimated for each of the corresponding attribute dimensions of product quality, while the μ_is are error terms initially assumed to identically and independently follow a normal distribution.

By regressing the overall of product quality scores on the proposed attribute dimensions, the research expected to see a high or low/ strong or weak correlation that would clarify the relationship and the influence/effect of attribute dimensions on Thai product quality.

4. Results and Data Analysis

This section presents the results and data analysis of the effects of attribute dimensions on Thai product quality and the testing of null hypothesis's validation.

After several months of data collection and interpretation of product quality reviews (August 2012 to January 2013), in the end, the research was able to identify 86 product quality reviews and used these total samples for this research, which 38 reviews were on electronic/IT products; 30, automobile; and 18, home appliance.

The measurement of these product quality reviews were coded through a five-point scale on overall product quality and 11-point scale on attribute dimensions. The results of the three categories of product quality and their regressions are presented in Table 5.1.

Table 5.1: Regression of overall electronics/IT product quality on its attribute dimensions

Variables	Coefficients	Std. error	*p*-value	H_0 (5%) reject?
Intercept	-0.22	0.35	0.54	No
Function	0.10	0.04	0.02	Yes
Ease of use	0.07	0.02	0.00	Yes
Reliability	0.07	0.03	0.03	Yes
Durability	0.03	0.05	0.54	No
Design	0.06	0.03	0.04	Yes
Eco-friendliness	-0.06	0.05	0.25	No
Customer satisfaction	0.14	0.04	0.00	Yes
Support service	-0.02	0.06	0.71	No
Value for money	0.05	0.02	0.04	Yes
Adaptability	0.05	0.02	0.07	No

Note: $R = 0.98$; R-square = 0.96; Std. error = 0.07; n = 38

The result in Table 5.1 shows that the correlation coefficient or R for the 38 reviews of electronics/IT products is 0.98, and the coefficient of determinant or R^2 is 0.96. This very high value of R^2 implied that there is a substantial portion at 96 percent of the total attribute dimensions that could be vividly explained by a linear relationship with the overall electronics/IT product quality. Moreover, most of the attribute dimensions proved to have significant effects on overall electronics/IT product quality. Two out of ten attribute dimensions, which are *"ease of use"* and *"customer satisfaction"*, had strong coefficients at 0.07 and 0.14 with perfect

effects of *p*-value at 0.00. Other attribute dimensions including *"function"*, *"reliability"*, *"design"*, and *"value for money"* also had substantial effects with strong coefficients at 0.10, 0.07, 0.06, and 0.05, respectively on overall electronics/IT product quality. However, *"adaptability"*, *"eco-friendliness"*, and particularly *"durability"* and *"support service"* attribute dimensions, to some extent, had less effects and relatively weak/negative coefficients with overall electronics/IT product quality. As defined in Table 5.1, the following is overall estimated electronics/IT product quality regression model:

$$\text{Electronics/IT Quality}_i = -0.22 + 0.10\ \text{Function}_{0.04} + 0.07\ \text{Ease of Use}_{0.02} + 0.07\ \text{Reliabilty}_{0.03} + 0.03\ \text{Durability}_{0.05} + 0.06\ \text{Design}_{0.03} - 0.06\ \text{Eco-friendliness}_{0.05} + 0.14\ \text{Satisfaction}_{0.04} - 0.02\ \text{Support Service}_{0.06} + 0.05\ \text{Value for Money}_{0.02} + 0.05\ \text{Adaptability}_{0.02} + 0.35$$

Table 5.2: Regression of overall automobile product quality on its attribute dimensions

Variables	Coefficients	Std. error	*p*-value	H_0 (5%) reject?
Intercept	-0.40	0.18	0.04	Yes
Function	0.03	0.03	0.21	No
Ease of use	0.07	0.02	0.00	Yes
Reliability	0.10	0.02	0.00	Yes
Durability	0.02	0.02	0.44	No
Design	0.04	0.01	0.01	Yes
Eco-friendliness	0.06	0.01	0.00	Yes
Customer satisfaction	0.14	0.03	0.00	Yes
Support service	0.00	0.01	0.46	No
Value for money	0.07	0.01	0.00	Yes
Adaptability	0.00	0.01	0.71	No

Note: R = 0.99; R-square = 0.99; Std. error = 0.03; n = 30

Along with previous findings, the result in Table 5.2 also showed comparable significant result. The correlation coefficient or R for the 30 reviews of automobile product quality was 0.99, and the coefficient of determinant or R^2 was equally at 0.99. Again, this very high value of R^2 significantly implied that 99% of the total attribute dimensions of overall automobile product quality could strongly explain the linear relationship between them. Furthermore, almost all of the attribute dimensions proved to have significant effects on overall automobile product quality. To clarify, five out of ten attribute dimensions, which are *"ease of use"*, *"reliability"*, *"eco-friendliness"*, *"customer satisfaction"*, and *"value for money"* had perfect effects that are significantly different from 0 (p-value = 0) with high coefficients at 0.07, 0.10, 0.06, 0.14, and 0.07, respectively. In addition, *"design"* attribute dimension had very strong effect on overall automobile quality as well, in which its coefficient was relatively high at 0.04 and its p-value was significant at 0.01. Nonetheless, the other four attribute dimensions including *"function"*, *"durability"*, *"support service"*, and *"adaptability"* proved to have somewhat less effects and low coefficients on overall automobile product quality. As defined in Table 5.2, the following is overall estimated automobile quality regression model:

$$\text{Automobile Quality}_i = -0.40 + 0.03\ \text{Function}_{0.03} + 0.07\ \text{Ease of Use}_{0.02} + 0.10\ \text{Reliabilty}_{0.02} + 0.02\ \text{Durability}_{0.02} + 0.04\ \text{Design}_{0.01} + 0.06\ \text{Eco-friendliness}_{0.01} + 0.14\ \text{Satisfaction}_{0.03} + 0$$

Support Service$_{0.01}$ + 0.07 Value for Money$_{0.01}$ + 0 Adaptability$_{0.01}$ + 0.18

Table 5.3: Regression of overall home appliance product quality on its attribute dimensions

Variables	Coefficients	Std. error	*p*-value	H_0 (5%) reject?
Intercept	0.37	0.76	0.64	No
Function	-0.05	0.09	0.59	No
Ease of use	-0.01	0.16	0.94	No
Reliability	0.24	0.10	0.05	Yes
Durability	-0.08	0.09	0.38	No
Design	0.13	0.05	0.05	Yes
Eco-friendliness	-0.04	0.03	0.27	No
Customer satisfaction	0.43	0.15	0.03	Yes
Support service	0.00	0.06	0.97	No
Value for money	-0.12	0.13	0.39	No
Adaptability	-0.04	0.03	0.24	No

Note: R = 0.98; R-square = 0.96; Std. error = 0.08; n = 18

The result in Table 5.3 also shared compatible result with the previous two product qualities' regressions. The correlation coefficient or R for the 18 reviews of home appliance product quality was 0.98, and the coefficient of determinant or R^2 was 0.96. Although the result of R^2 was very significant at 96%, however, with relatively high *p*-values of many attribute dimensions, the correlation between the total attribute dimensions and overall home appliance product quality relatively proved to be relatively insignificant. Only three attribute dimensions of *"reliability"*, *"design"*, and *"customer satisfaction"* had strong effects with high coefficients at 0.24, 0.13, and 0.43, respectively on home appliance quality, whereas, the other seven attribute dimensions, including *"function"*, *"durability"*,

"eco-friendliness", *"value for money"*, *"adaptability"*, and particularly *"ease of use"* and *"support service"* had comparatively weak effects and mostly negative coefficients with high *p*-values on home appliance product quality. As defined in Table 5.3, the following is overall estimated home appliance quality regression model:

$$\text{Home Appliance Quality}_i = 0.37 - 0.05\,\text{Function}_{0.09} - 0.01\,\text{Ease of Use}_{0.16} + 0.24\,\text{Reliabilty}_{0.10} - 0.08\,\text{Durability}_{0.09} + 0.13\,\text{Design}_{0.05} - 0.04\,\text{Eco-friendliness}_{0..03} + 0.43\,\text{Satisfaction}_{0.15} + 0\,\text{Support Service}_{0.06} - 0.12\,\text{Value for Money}_{0.13} - 0.04\,\text{Adaptability}_{0.03} + 0.76$$

In general, the overall results of simple regression at confidence level or α at 0.05 showed evidence that there are strongly positive and significant relationships between the proposed attribute dimensions on the overall product quality of electronics/IT products, automobile, and somewhat home appliance. To further verify, the research also applied multiple regression on these three product categories, and the results such as the sizes and significance of correlation coefficient and coefficient of determinant of the multiple regression were very similar and did not change much from the simple regression. See Table 5.4-5.6. This clearly identified and confirmed that there is high correlation between the proposed attribute dimensions on the three focused product quality categories. In other words, it signified that the proposed ten attribute dimensions represent relatively independent aspects of the overall product quality, remarkably in

automobile and electronics/IT products. Furthermore, it could be said that the reviewers in three leading public reviews: *PC Today*, *Headlight Magazine*, and *CE Mart*, were able to evaluate the products independently of each attribute dimension with less halo and bias from one and other dimensions.

Table 5.4: Multiple regression of overall electronics/IT product quality on its attribute dimensions

Variables	Coefficients	Std. error	*p*-value	H_0 (5%) reject?
Intercept	-0.16	0.33	0.63	No
Function	0.12	0.03	0.00	Yes
Ease of use	0.08	0.02	0.00	Yes
Reliability	0.05	0.02	0.04	Yes
Durability	0.05	0.05	0.36	No
Design	0.06	0.03	0.04	Yes
Eco-friendliness	-0.09	0.04	0.04	Yes
Customer satisfaction	0.14	0.04	0.00	Yes
Support service	-0.03	0.05	0.54	No
Value for money	0.05	0.02	0.05	Yes
Adaptability	0.05	0.02	0.07	No

Note: *Multiple R* = 0.98; *R*-square = 0.96; Std. error = 0.07; n = 38

In the multiple regression of overall electronics/IT product quality, the result of *"function"* attribute dimension yielded somewhat higher coefficient at 0.12, and this led to a significant effect of *p*-value at 0.00, a stronger evidence in H_0 or null hypothesis rejection. Unlike the result in simple regression, the *"eco-friendliness"* attribute dimension happened to have a higher negative coefficient at -0.09, and to some extent, this made its *p*-value significant at 0.04, which proved to be another

attribute dimension that adds to a significant effect on overall electronics/IT product quality.

Table 5.5: Multiple regression of overall automobile product quality on its attribute dimensions

Variables	Coefficients	Std. error	*p*-value	H_0 (5%) reject?
Intercept	-0.41	0.17	0.02	Yes
Function	0.04	0.02	0.06	No
Ease of use	0.07	0.02	0.00	Yes
Reliability	0.10	0.02	0.00	Yes
Durability	0.02	0.02	0.49	No
Design	0.04	0.01	0.01	Yes
Eco-friendliness	0.06	0.01	0.00	Yes
Customer satisfaction	0.14	0.02	0.00	Yes
Support service	0.00	0.01	0.47	No
Value for money	0.07	0.01	0.00	Yes
Adaptability	0.00	0.01	0.83	No

Note: *Multiple R* = 0.99; *R*-square = 0.99; Std. error = 0.03; n = 30

In the multiple regression of overall automobile product quality, the result was very similar to the previous simple regression, in which *"ease of use"*, *"reliability"*, *"eco-friendliness"*, *"customer satisfaction"*, and *"value for money"* attribute dimensions, comparably and strongly proved to have significant effects and high correlations on overall automobile product quality.

Table 5.6: Multiple regression of overall home appliance product quality on its attribute dimensions

Variables	Coefficients	Std. error	*p*-value	H_0 (5%) reject?
Intercept	0.44	0.68	0.54	No
Function	-0.06	0.08	0.47	No
Ease of use	-0.03	0.15	0.86	No
Reliability	0.25	0.08	0.02	Yes
Durability	-0.09	0.08	0.34	No
Design	0.12	0.04	0.03	Yes
Eco-friendliness	-0.04	0.03	0.26	No
Customer satisfaction	0.45	0.13	0.01	Yes
Support service	0.00	0.05	0.99	No
Value for money	-0.13	0.11	0.30	No
Adaptability	-0.04	0.03	0.17	No

Note: *Multiple R* = 0.98; *R*-square = 0.96; Std. error = 0.07; n = 18

In the multiple regression of overall home appliance product quality, the result in Table 5.7 showed that there are slight improvements of *p*-values, especially in those three attribute dimensions of *"reliability"*, *"design"*, and *"customer satisfaction"*, with strong support for positive correlations at significant values on overall home appliance product quality.

In addition, to further verify how well each attribute dimension (variable) correlate or has more or less influence/effect on other attribute dimensions (variables), the research also examined the coefficient of multiple correlation, measured by the coefficient of determinant denoted as R^2 in the tables, in these three product categories. The results of multiple correlation among the ten

attribute dimensions on each overall product quality category is present in Table 5.7.

Table 5.7: Multiple correlation matrix among the 10 attribute dimensions on overall electronics/IT product quality

	Func	Ease	Rely	Durable	Design	Eco	Satisfac	Service	Value	Adapt
Function	1.00	0.37	0.73	0.38	0.57	0.32	0.48	0.33	0.18	0.16
Ease of Use	0.37	1.00	0.44	0.05	0.26	0.41	0.33	0.13	-0.26	0.50
Reliability	0.73	0.44	1.00	0.71	0.77	0.39	0.65	0.03	0.33	-0.05
Durability	0.38	0.05	0.71	1.00	0.62	0.01	0.28	0.10	0.34	-0.27
Design	0.57	0.26	0.77	0.62	1.00	0.34	0.66	-0.13	0.48	-0.14
Eco-friendly	0.32	0.41	0.39	0.01	0.34	1.00	0.37	-0.03	0.13	-0.07
Customer Satisfaction	0.48	0.33	0.65	0.28	0.66	0.37	1.00	-0.39	0.61	0.09
Support Service	0.33	0.13	0.03	0.10	-0.13	-0.03	-0.39	1.00	-0.25	0.15
Value for Money	0.18	-0.26	0.33	0.34	0.48	0.13	0.61	-0.25	1.00	-0.45
Adaptability	0.16	0.50	-0.05	-0.27	-0.14	-0.07	0.09	0.15	-0.45	1.00

The result in Table 5.7 showed the correlation coefficients of multiple attribute dimensions (variables) ranging from -0.27 to +1.00 of 38 reviews in electronics/IT products, in which a value of 1.00 here implied the perfect direct variation relationship between one attribute dimension *(x)* and another attribute dimension *(y)* on overall electronics/IT product quality linear equation: *y* increases as *x* increases. On the contrary, a value of -0.27 here implied that all data points lying on this overall electronics/IT product quality line have the inverse variation relationship between attribute dimensions, in which a decrease in *y* causes an

increase in *x*. To clarify, considering *"function"* attribute dimension as dependent variable *(y)*, and the other nine attribute dimensions as independent variables *(x_1, x_2, …, x_9)*, the result showed a direct variation relationship among them, in which *"function"* attribute dimension has a strong correlation with *"reliability"*, *"design"*, and *"customer satisfaction"* attribute dimensions at 0.73, 0.57, and 0.48, respectively, whereas *"value for money"* and *"adaptability"* have less or the least correlation. To simplify, the editor/reviewer in the field of electronics/IT product tended to evaluate these three attribute dimensions of *"reliability"*, *"design"*, and *"customer satisfaction"* at positive and higher values than the other attribute dimensions when focusing on *"function"* on overall electronics/IT product quality, and vice versa for *"value for money"* and *"adaptability"*. Furthermore, by taking *"ease of use"* attribute dimension as dependent variable, the result of multiple correlation was slightly different, in which *"ease of use"* tends to have positive relationship and strong influence/effect particularly on *"adaptability"*, *"reliability"*, and *"eco-friendliness"* on reviewing overall electronics/IT product quality, while *"value for money"* was the only attribute dimension that has a negative degree of relationship. This means *"ease of use"* and *"value for money"* attribute dimensions have the inverse correlation among them: a higher evaluation in *"ease of use"* possibly causes a lower evaluation in *"value for money"* on reviewing overall electronics/IT product quality. Similarly, if editor/reviewer focused on *"reliability"*, *"durability"*, *"design"*, or *"eco-friendliness"* attribute dimensions as dependent variables, they prospectively evaluated *"adaptability"* attribute dimension as the lowest value or had

negative/inverse effect on overall electronics/IT product quality. Moreover, if editor/reviewer further emphasized on *"support service"* as dependent variable and the remaining attribute dimensions as independent variables, the *"design"*, *"eco-friendliness"*, *"customer satisfaction"*, and *"value for money"* attribute dimensions were also predicted to have negative/inverse relationships among them. However, the results of multiple correlation between *"reliability"* as well as *"durability"*, *"design"*, *"eco-friendliness"*, or *"support service"*, and the rest of attribute dimensions, other than those inverse correlated attribute dimensions, still shared very similar of positive trends. For instance, *"reliability"* has high and strong degree of relationship with *"function"*, *"durability"*, *"design"*, and *"customer satisfaction"* attribute dimensions; or *"durability"* has high and strong degree of relationship with *"reliability"* and *"design"* attribute dimensions; or *"design"* has high and strong degree of relationship with *"reliability"*, *"durability"*, and *"customer satisfaction"* attribute dimensions; or *"eco friendliness"* has fairly high and strong degree of relationship with *"ease of use"*, *"customer satisfaction"*, and *"design"* attribute dimensions; or *"support service"* has relatively high and strong degree of relationship with *"reliability"* attribute dimension. By looking at these results of multiple correlation among the ten attribute dimensions on overall electronics/IT product quality, these apparently restated and supported the previous results of simple/multiple regression that many attribute dimensions especially *"function"*, and *"reliability"*, as well as *"design"*, and *"customer satisfaction"*, proved to have positive and strong correlations among attribute dimensions on reviewing overall electronics/IT

product quality, as there are many positive linear relationships, in which their multiple correlations are closer to 1. On the contrary, other attribute dimensions such as *"adaptability"* and *"support service"* proved to have inverse/negative relationships among attribute dimensions on reviewing the overall electronics/IT product quality. This could also indirectly imply that *"adaptability"* and *"support service"* predictable to have less influence/effect on reviewing overall electronics/IT product quality and to a certain extent accept the H_0 or null hypothesis.

Table 5.8: Multiple correlation matrix among the 10 attribute dimensions on overall automobile product quality

	Func	Ease	Rely	Durable	Design	Eco	Satisfac	Service	Value	Adapt
Function	1.00	0.61	0.65	0.74	0.64	0.70	0.87	0.47	0.40	-0.24
Ease of Use	0.61	1.00	0.39	0.62	0.55	0.60	0.61	0.27	0.35	-0.22
Reliability	0.65	0.39	1.00	0.70	0.50	0.51	0.55	0.59	0.01	-0.06
Durability	0.74	0.62	0.70	1.00	0.50	0.61	0.72	0.45	0.45	-0.18
Design	0.64	0.55	0.50	0.50	1.00	0.40	0.56	0.41	0.15	-0.37
Eco-friendly	0.70	0.60	0.51	0.61	0.40	1.00	0.77	0.41	0.32	0.07
Customer Satisfaction	0.87	0.61	0.55	0.72	0.56	0.77	1.00	0.48	0.47	-0.08
Support Service	0.47	0.27	0.59	0.45	0.41	0.41	0.48	1.00	-0.12	0.14
Value for Money	0.40	0.35	0.01	0.45	0.15	0.32	0.47	-0.12	1.00	-0.19
Adaptability	-0.24	-0.22	-0.06	-0.18	-0.37	0.07	-0.08	0.14	-0.19	1.00

Comparable to the above findings for electronics/IT products, Table 5.8 showed the results of correlation coefficients of multiple attribute dimensions (variables), which range from -0.37 to +1.00 of 30 reviews in automobile products. Again, a

value of 1.00 indicated that a linear equation describes the relationship between one attribute dimension *(x)* and another attribute dimension *(y)* perfectly, in which all data points lying on this overall automobile product quality line represent *y* increases as a result of *x* increases, or else, a reverse effect from inverse variation relationship represent the negative correlation between attribute dimensions. To illustrate, assuming *"function"* attribute dimension as dependent variable, and the other nine attribute dimensions as independent variables, the result showed a direct variation relationship with high correlations on many attribute dimensions, except *"adaptability"* attribute dimension, in which *"function"* and *"durability"/ "eco-friendliness"/ "customer satisfaction"* have high and strong correlations at 0.74, 0.70, 0.80, respectively, while *"function"* and *"adaptability"* have a negative correlation at -0.024. These positive and negative correlation could be clarified as, for positive correlations, the editor/reviewer evaluating these three attribute dimensions of *"durability"*, *"eco-friendliness"*, and *"customer satisfaction"* at positive and higher values than the other attribute dimensions when focusing on *"function"* on overall automobile product quality, and on the other hand for negative correlations, the editor/reviewer evaluating *"adaptability"* at lower value when focusing on *"function"* on overall automobile product quality. Other attribute dimensions such as *"durability"* and *"customer satisfaction"* also had similar results of correlations between multiple attribute dimensions when considering them as dependent variables. Now assuming that *"reliability"* is the dependent variable and the rest of attribute dimensions are independent variables, although *"reliability"* has high correlation or strong degree of relationship with

"durability" attribute dimension, however, the result in the table also suggested that there is roughly non-linear relationship between *"reliability"* and *"value for money"* attribute dimensions, in which their correlations equal to 0.01. This simply meant that regardless of high or low evaluation on reviewing *"reliability"* on overall automobile product quality, this kind of evaluation has nearly no influence/effect on reviewing *"value for money"* attribute dimension. Then, let's further take *"eco-friendliness"* attribute dimension as dependent variable and the remaining attribute dimensions as independent variables, *"eco-friendliness"* appeared to have positive and direct influence/effect on all of attribute dimensions. This implied that when editor/reviewer gives a review on overall quality of automobile, possibly eco-car, editor/reviewer tends to give favorable values on all of attribute dimensions, particularly on *"function"* and *"customer satisfaction"*; if a car is predominant and outstanding in *"eco-friendliness"*, that car likely receives the highest evaluations on *"function"* as well as *"customer satisfaction"* among the ten attribute dimensions. However, bear in mind that *"adaptability"* was the only attribute dimension that has an inverse variation relationship with most of the studied attribute dimensions on reviewing overall automobile product quality, except *"eco-friendliness"* and *"support service"*. These negative correlations also signified an expectable less influence/effect of *"adaptability"* on other attribute dimensions when reviewing the overall automobile product quality. Overall, the result of multiple correlation between the attribute dimensions remarkably strengthened the previous findings on overall automobile product quality's simple/multiple regression.

Table 5.9: Multiple correlation matrix among the 10 attribute dimensions on overall home appliance product quality

	Func	Ease	Rely	Durable	Design	Eco	Satisfac	Service	Value	Adapt
Function	1.00	0.30	0.54	0.45	0.52	0.44	0.74	0.46	0.25	0.14
Ease of Use	0.30	1.00	0.67	0.72	0.40	0.07	0.59	0.29	0.71	0.08
Reliability	0.54	0.67	1.00	0.72	0.37	0.19	0.46	0.41	0.40	0.32
Durability	0.45	0.72	0.72	1.00	0.32	0.18	0.56	0.35	0.38	0.02
Design	0.52	0.40	0.37	0.32	1.00	0.38	0.70	0.38	0.53	0.22
Eco-friendly	0.44	0.07	0.19	0.18	0.38	1.00	0.50	0.27	0.16	0.07
Customer Satisfaction	0.74	0.59	0.46	0.56	0.70	0.50	1.00	0.40	0.65	0.03
Support Service	0.46	0.29	0.41	0.35	0.38	0.27	0.40	1.00	-0.08	0.79
Value for Money	0.25	0.71	0.40	0.38	0.53	0.16	0.65	-0.08	1.00	-0.20
Adaptability	0.14	0.08	0.32	0.02	0.22	0.07	0.03	0.79	-0.20	1.00

The result in Table 5.9 showed the correlation coefficients of multiple attribute dimensions (variables) range from -0.20 to +1.00 of 18 reviews in home appliance products. Unlike the previous two product categories and their multiple correlations, the result of multiple correlation showed mostly positive correlations and direct variation relationships among the ten attribute dimensions on overall home appliance product quality at various degrees. However, still there are two events of inverse variation relationship, which *"support service"* as dependent variable had somewhat negative correlation with *"value for money"* attribute dimension (independent variable), and again *"adaptability"* as dependent variable had negative correlation with *"value for money"* attribute dimension (independent variable). These negative correlations basically implied that the editor/reviewer tends to evaluate *"value for money"* at lower value when focusing on *"support*

service" and *"adaptability"* on reviewing overall home appliance product quality, and vice versa for a higher evaluation on *"value for money"* attribute dimension. Furthermore, the result of multiple correlation of *"adaptability"* as dependent variable proved to have relatively positive correlations with many attribute dimensions, specifically with *"support service"* at very high and strong degree of correlation at 0.79. Again, these positive correlations indicated a direct variation, in which a higher evaluation on *"adaptability"* on reviewing overall home appliance product quality directly causes a higher evaluation in those positive correlated attribute dimensions, especially in *"support service"*. What's more, to further consider *"customer satisfaction"* as dependent variable and the rest of the attribute dimensions as independent variables, the result showed a direct and strong variation relationship among all of attribute dimensions, in which *"customer satisfaction"* attribute dimension has the strongest correlation with *"function"*, *"design"*, and *"value for money"* attribute dimensions at 0.74, 0.70, and 0.65, respectively, and comparatively high and strong degree of correlations with *"ease of use"*, *"reliability"*, *"durability"*, *"eco-friendliness"*, and *"support service"*, except *"adaptability"*. Even though the sample size of home appliance product quality reviewed was rather small compared to the previous two product categories, overall, these fairly high and positive correlations at various degrees among the ten attribute dimensions, particularly a significant evidence of a very high and strong degree of direct relationship between *"customer satisfaction"* and the rest of the attribute dimensions, proved to have favorable and mostly positive influence/effect on evaluating overall of home appliance product quality.

All in all, the results of positive and negative multiple correlations among the ten attribute dimensions on each overall product quality category have clearly verified how strong or weak each attribute dimension (variable) correlate or predictably to have more or less influence/effect on other attribute dimensions (variables).

Therefore with all these significant results of R^2, P values, and correlation coefficients from simple regression, multiple regression, as well as multiple correlation, these clearly identified and confirmed that there are generally high/strong correlations among the proposed attribute dimensions on the three focused product quality categories. The closer the overall product quality regression/correlation is to one, the higher the likelihood that the overall product quality could be explained by the ten attribute dimensions. Thus, it could be said that these positive results from multiple statistics tests notably prove to reject the null hypothesis, but on the contrary, vividly support an opposite argument and uphold the hypothesis$_{A0}$ of "*A composite measurement of product quality (Thai product quality) obtained from public reviews of new launching product will have positive relationship to the underlying proposed product quality attribute dimensions"*.

5. Discussion

The search for the effects of attribute dimensions on Thai product quality yielded significant results. First, the research suggested an alternative metric by which

assessing product quality reviews published in public sources could be one of the useful methods to obtain product quality data.

Second, when product quality data translate into a suitable quantitative scale and at right composite attribute dimensions, the results showed that the individual attribute dimension of product quality predictably has strong, significant, and positive influence/effect on overall product quality.

Third, in general, the attribute dimensions foreseen to have relative strongest influence/effect on three categories of product quality are *"reliability"*, *"design"*, and *"customer satisfaction"*. The possible reasons for these three attribute dimensions could be that Thai consumers have been market-wised, aware of brand recognition, and depend a large portion of their purchasing decisions on reliable producers. Intuitively, a product produced by a well-known maker is automatically perceived as good quality product by Thai consumers. Moreover, the design or feature of a product is also very important and has great influence on Thai consumers' perceptions as well. The consumers could easily switch their purchasing decisions/perceptions from one product to another product, simply because of better product design. All in all, reliability, design, and many other studied attribute dimensions were very important in evaluating product quality, however, all of these attribute dimensions would prove meaningless if a product could not satisfy consumers' needs and wants. Thus, it is very reasonable that attribute dimension of customer satisfaction has positive significant effect on

overall product quality. On the contrary, *"support service"*, *"adaptability"*, and surprisingly *"durability"* seemed to have less effect on three categories of product quality than the other attribute dimensions. The feasible reason for these latter three attribute dimensions could be lack of available information of product quality reviews published in public sources, and if these do get published, these do not elaborate or give many reviews on these three related views/attributes. Even though the results suggested that *"support service"*, *"adaptability"* and *"durability"* appear to have less influence/effect on overall of three categories of product quality, these do not directly imply that *"support service"*, *"adaptability"*, and *"durability"* are not important attribute dimensions; indeed, they are somewhat important attribute dimensions but happen to have less linear correlation on the focused product quality reviewed.

Fourth, considering electronics/IT products alone, the results of regressions indicated that *"ease of use"* and *"customer satisfaction"* are particularly important attribute dimensions that have the greatest influence/effect on overall electronics/IT product quality. Furthermore, *"function"*, *"reliability"*, *"design"*, and *"value for money"* are also relatively important attribute dimensions that have substantial and significant influence/effect on overall electronics/IT product quality, whereas, *"durability"*, *"eco-friendliness"*, *"support service"*, and *"adaptability"* have the least effect. The probable reasons for this could be, with more frequency and availability of new electronics/IT products in the market, Thai consumers ensure that the new products perform well and easy to use,

compatible with the old version, as well as suit well with their needs and worth for their payment. Likewise, Thai consumers often replace their old electronics products and IT gadgets with the latest version before the gadgets actually break down or run out of warranty. In addition, Thai consumer also do not seriously factor in energy saving or eco-friendliness matter into their decisions when buying a new mobile phone, tablet, or computer. Thus, *"durability", "eco-friendliness", "support service", and "adaptability"* seemed to have relatively less significance on overall of electronics/IT product quality.

Fifth, considering automobile alone, the results of regressions indicated that *"ease of use"*, *"reliability"*, *"eco-friendliness", "customer satisfaction", "value for money"* and *"design"* are particularly important attribute dimensions that have the greatest influence/effect on overall automobile product quality. While *"function"*, *"durability"*, *"support service"*, and *"adaptability"* seemed to have the least influence/effect ones. The supportive reason for this could be that when Thai consumers consider buying normal goods, especially cars, they instinctively take many aspects and related matters into consideration, which include the credit of car maker, energy saving matter, ease of use, reasonable price, elegant feature, as well as the utility or performance of the car. However, the results in both simple and multiple regression suggested that *"function"* attribute dimension has less effect on overall automobile product quality. Indeed, this result of high *p*-value or relatively low correlation on overall automobile product quality might be

an indirect effect of the public reviews, in which the reviewer, J!mmy, often evaluates new automobiles at under the real market value.

Sixth, considering home appliance alone, the results of regressions indicated that *"customer satisfaction"*, *"reliability",* and *"design"* are the most important attribute dimensions that have significant influence/effect on overall home appliance product quality, whereas *"function"*, *"ease of use"*, *"durability"*, *"eco-friendliness"*, *"support service"*, *"value for money"* and *"adaptability"* are relatively less important attribute dimensions that have the least influence/effect on overall of home appliance product quality. This unfavorable results of many attribute dimensions having comparatively low correlations on overall home appliance product quality could possibly be attributed to the sample size being too small (only 18 home appliance product reviews), the characteristics of examined home appliance products, which are television, refrigerator, washing machine, and air conditioner, are too diverse among each and one another, or that the proposed attribute dimensions are inappropriate and unsuitable with home appliance products' characters. A search for a more appropriate composite attribute dimensions for evaluating home appliance product quality shall be continued.

Seventh, the overall results of multiple correlation in three product categories also suggested and further signified the previous results of regressions that each individual of the attribute dimensions proves to have mostly positive and direct variation relationships or more influences/effects at various degrees among the

attribute dimensions on overall three product quality categories, and relatively few negative inverse variation relationships or less influences/effects of *"adaptability"* attribute dimension among the rest of attribute dimensions on reviewing these overall three product quality categories. With many strong and high correlations among the attribute dimensions, these evidentially explained the very high values of coefficient of determinants or R^2 as well as correlation coefficients or R on regressing overall electronics/IT product, automobile, and home appliance product quality, in which a strong and high correlation between attribute dimensions generally implied how strong that attribute dimension correlate and prospectively has more or less influence/effect on other attribute dimensions, and yet how well it could be explained by the linear relationship on the overall product quality equation.

Eighth, it is noticeable that the results of coefficient of determinants or R^2 and correlation coefficients or R are very high. Other factors besides the favorable results of the correlation coefficients of multiple attribute dimensions, including the restrained of overall product quality evaluation scales of 5-point scale, the choice of editor/product reviews published in Thai publications, the use of substitute value at the average scale of 5 point to avoid many 0s, and the compound of multiple independent variables (attribute dimensions), to a certain extent, also had some effects on these very high values. As the research applied content analysis and converted overall of product quality reviews into a 5-point scale, ranging from 1 to 5, with these limitation of scales and integer numbers,

part of the transcribed results might be over grouped and evaluated. For instance, when the editor/reviewer gives a review of a product as *"this product is an attractive alternative and a good choice to buy, but nevertheless there are some issues and problems that still need to be improved"*. Moderately, this product should be evaluated between *"Good"* and *"Average"* or scored between 3 to 4 point, but according to the terms and guidelines of content analysis in this study, the overall of this product quality was transcribed into a round up number of 4 or *"Good"* on overall product quality evaluation. These kinds of integer numbers and limitation of scales could lead to the over evaluation and somewhat result in high values of R^2 and R. Moreover, the second aspect of choice of product reviewed might also have some effects on these high values. In fact, since there is pre-screening of what product is expected to make a big noise in the market for which criteria that product will likely be reviewed by an editor, a chance of *"poor"* or *"unacceptable"* evaluation on overall product quality becomes relatively low. Almost all of overall product quality scores in this study ranged between 3 to 5 point, there is no *"poor"* or *"unacceptable"* evaluation or 1 or 2 point transcribed on overall product quality evaluation (See Appendix IX-XI for statistics summary on the overall of the three product quality categories and scores on the proposed attribute dimensions). In addition, another possible aspect that might have caused very high value in R^2 and R was giving a substitute value at the average scale of 5 point of neither satisfied nor dissatisfied in the event that reviewers did not mention those attribute dimensions and to avoid many 0s from product reviews. This kind of substitute might have somewhat caused and contributed to higher

values of R^2 and R. Last but not least in statistics, the highly correlated independent variables (attribute dimensions) can have strong effect of causing a higher value of R^2 and R. By adding more independent variables (attribute dimensions), this could simply lead to an increase of R^2 and R, although those independent variables (attribute dimensions) do not assist in explaining the variation of the dependent variable (overall product quality) at all. Therefore, the very high values of R^2 and R are not the results of miscalculation, rather they are valid by the effects of these explained reasons.

All in all, with significance in correlation coefficients, p-values, and multiple correlations, the results of this chapter verified that there are positive and significant influence/effect of the proposed attribute dimensions on Thai product quality, particularly on automobile and electronics/IT product quality. Furthermore, the results also showed that the proposed attribute dimensions prove to be valid, uphold the hypothesis$_{A0}$, and can be used in measuring various types of product quality, particularly in the case of Thailand.

CHAPTER 6: CONCLUSION

In this research "*The Attributes of Product Quality: An Analyis of Thai Product Quality*" has four objectives, which are; to understand overall product quality characteristics and to identify a more precise definition of Thai product quality in the 21st century, to propose a composite product quality attribute dimensions for Thai product quality that can be applied across various types of product category, to measure product quality through the proposed product quality attribute dimensions, and to test for its validity.

In order to achieve these objectives, the research conducted a review of literature in Chapter 2, presented research design and described research scopes in Chapter 3, defined a more precise and up-to-date definition of Thai product quality and proposed a composite product quality attribute dimensions, specifically on the three product categories of electronics/IT product, automobile, and home appliance through interview and questionnaire in Chapter 4, and finally measured these three product quality categories through the proposed product quality attribute dimensions and tested for its validity through content analysis and multiple statistics tests in Chapter 5.

The summary of these research findings, implications, and limitations and future studies is emphasized in the following sections.

1. Research Findings

1.1. Defining Thai Product Quality in the 21st Century and Proposing a Composite Product Quality Attribute Dimensions

Through data collection methods of interview and questionnaire, the research has identified a more precise definition of Thai product quality on various perspectives, including the perspectives from regulators, market suppliers, and consumers, and has proposed a composite product quality attribute dimensions that have influence/effect on Thai consumer buying decision, which could be used in evaluating Thai product quality, particularly in the electronics/IT product (mobile phone, computer, laptop, tablet), automobile, and home appliance (refrigerator, washing machine, and air conditioner).

Results showed that product quality is a complex subject and a multi-dimensional constructed concept in which a number of factors, such as intrinsic cues and extrinsic cues, knowledge and background of assessor, as well as individual preference, have somewhat exerted an influence/effect at different degrees on defining and evaluating Thai product quality.

The regulators or the government officials said “to meet the standard, accomplish all requirements, follow rules and regulations, be harmless, fit with intended use, and create additional values” are the foundations and shall be included in the Thai product quality definition.

The market suppliers or the producers of a product and the intermediate sellers have defined product quality as "to deliver a product at the right 'SPECCC+RS'", of which they believed Safety, good Performance, Eco-friendliness, Comfort in all aspects, Consistency, Continuous improvement, Respond to needs in time, and support Services are the key success factors to the quality product.

Moreover, "to meet the needs and exceed the wants, value for money, excellence in both hardware and software, and brand recognition" was the definition of product quality defined by the majority of Thai consumers.

Although different sectors view and define the definitions of product quality differently, there were connections and relationships among these differences in product quality definitions. The research has combined the essence of each of these product quality definitions and decisively proposed *"being good in all aspects and fitness with intended use"* as a more precise and the most up-to-date definition of Thai product quality in the 21st century. Under this research context, "*good in all aspects"* implied good in both hardware and software, good in expectation and experience, and good in economically and environment friendly, while "*fitness with intended use"* signified fitness with the use in regulator's perspective, fitness with the use in product producer/manufacturer's perspective, fitness with the use in seller's perspective, and fitness with the use in user's perspective. Prospectively, by implementing the proposed product quality definition, the regulators can ensure that the market suppliers perform according

to the laws and requirements, as well as deliver additional value to fulfill the expectations that ultimately satisfy consumers' needs and wants, create new experiences for the markets, which finally generate a profits back to the product producers and the sellers.

In addition, the root of this proposed Thai product quality definition also emphasized and extended some of the renowned quality/product quality definitions. These definitions are "excellence" (Pirsig, 1974; Tuchman, 1980); "value" (Abbott, 1955; Feigenbaum, 1951); "conformance to specifications" (Gilmore, 1974; Levitt, 1972)/ "conformance to requirements" (Crosby, 1979); "fitness for use" (Juran, 1974, 1988); and "serves a need or satisfies a want of a holder" (Gronroos, 1990; Parasuraman et al., 1985). Through combining all the core of these definitions together, this research would be the very first that has fruitfully defined product quality definition from numerous cognitive points of view and at the national level.

Since the proposed Thai product quality definition is well derived from various perspectives, including the regulators, producers of a product, intermediate sellers, and consumers, therefore, *"being good in all aspects and fitness with intended use"* has satisfactorily represented the transcendent definition, product-based definition, user-based definition, manufacturing-based definition and value-based definition of the Garvin's (1984) five approaches in defining quality definition, and

remarkably eliminated the previous limitation that most of the former definitions have only defined from one or two perspectives with restricted dimensions.

Furthermore, the other parts of interview and questionnaire results, especially in the ranking factors section, showed that the given seven product quality attribute dimensions of *"function"*, *"ease of use"*, *"reliability"*, *"durability"*, *"design"*, *"eco-friendliness"*, and *"customer satisfaction",* plus the additional three product quality attribute dimensions from the latter part of interview and questionnaire, including *"support service"*, *"value for money"*, and *"adaptability"*, proved to have certain influences and effects on Thai consumer buying decision, particularly in the three product categories. Later on, these 10 product quality attribute dimensions would form part of the proposed attribute dimensions that would be used in evaluating/measuring Thai product quality.

Note that "function" refers to the ability, utility, and performance of a product compared to previous version or similar type of product, e.g., speed, intelligibility, technology, etc.; "ease of use" refers to the character by which a product can be utilized by general consumer without any difficulties and problems; "reliability" refers to the property of a product being creditable, reliable, e.g., market recognition, brand awareness, safety, etc.; "durability" refers to the ability of a product that is able to perform over a long period of time without technical error and physical breakdown; "design" refers to the total outlook and feature of a product, e.g., color, size, weight, etc.; "eco-friendliness" refers to a product that is

free from chemicals and is harmless to environment, e.g., green material, recyclable, energy saving, carbon credit, related to green concept, etc.; "customer satisfaction" refers to the overall feeling and perception of a consumer on a product, compared to consumer's expectation and/or previous experience of using a similar brand product or from the same company; "support service" refers to the additional and intangible value(s) attached to a product, e.g., product guarantee/warranty, seller courtesy, accessibility and availability of retail store, etc.; "value for money" refers to the consumer's perception in terms of economic value of a product e.g., actual price, price of repairing parts, price as a secondhand product, etc.; and "adaptability" refers to the ability of a product that is workable and adjustable among brands or different producers.

In fact, different product quality attribute dimensions have different weights of influences and effects on Thai consumer buying decision, and these also depend on the product categories and the demographic determinants such as gender, age, education, and monthly income of the consumers or the product assessors.

Excluding the additional three-product quality attribute dimensions, *"reliability"*, "*function"*, and "*durability"* were the most important attribute dimensions that have the most influence/effect on the general three product categories on Thai consumer buying decision. Unexpectedly, "eco-friendliness" and "customer satisfaction" were the least influential attributes. To be more precise, from the government officials, product producers, and intermediate sellers' perspectives,

the government officials and product producers valued “function”, “reliability”, and “durability” as the most influential attribute dimensions on consumer buying decision, while intermediate sellers evaluated “reliability”, “function”, and “design” as the most influential attribute dimensions. On the other hand, from the Thai consumers’ perspective and in each of the three product categories, for example in electronics/IT product, “function” played the most influential role on consumer buying decision, followed by “reliability”, “design”, “durability”, “ease of use”, “customer satisfaction”, and “eco-friendliness”. In automobile, “durability” had the largest influence/effect on Thai consumer buying decision, followed by “reliability”, “eco-friendliness”, “design”, “customer satisfaction”, “function” and “ease of use”, and while in home appliance, “durability” and “reliability” were the first and second most influential attribute dimensions, followed by “function”, “ease of use”, “eco-friendliness”, “design”, and “customer satisfaction”. In terms of differences in demographic determinants, for instance, in older age group, the consumers who are mature or age 41 years old and above generally made their buying decision according to their experiences of usage, expectations, and overall perceptions. They likely took many attribute dimensions, especially “customer satisfaction”, as the leading attribute dimension in making their buying decision. Likewise, those with higher degree of education, evaluated “eco-friendliness”as the most influential factor in consumer buying decision, especially for automobile.

Besides defining Thai product quality in the 21st century and proposing product quality attribute dimension, the results of interview and questionnaire also revealed the relative prospects of Thai product quality in the next 5 years, in which all sectors (regulators, market suppliers, and consumers) believed the markets will become very competitive and the consumer will become more selective with more concern in product quality. In response to that, the next generation of Thai product quality will develop in various aspects that the future scope of Thai product quality would not only be restricted to the final product, but the product would rather improve in many attributes and get better in all processes, which is good for product producer, seller, buyer, user, society, and the ecosystem. However, still there are several drawbacks that all sectors were questioning. Durability and quality of a product might not develop as much as the markets expect. These might be due to technology development limitations and production cost reductions that would result in product lifecycle constraint or shortening a durability attribute and somewhat leading to a drop in quality.

With the results of interview and questionnaire, including the prospects of Thai product quality, and the reviews of the literature, the research upheld that the proposed Thai product quality definition of *"being good in all aspects and fitness with intended use"* is a valid product quality definition that fruitfully represents the Thailand case, and the proposed 10 product quality attribute dimensions of *"function"*, *"ease of use"*, *"reliability"*, *"durability"*, *"design"*, *"eco-friendliness"*, *"customer satisfaction", "support service"*, *"value for money"*,

and *"adaptability"* could potentially be a valid set of attributes in evaluating/measuring product quality, particularly the electronics/IT product, automobile, and home appliance.

1.2. Measuring Product Quality through the Proposed Product Quality Attribute Dimensions and Testing for Its Validity

Product quality is a multidimensional construct that is difficult and cannot be equivalent to or measured by single cue or only one attribute, which heterogeneous preferences and a number of factors proved to have substantial influences on product quality evaluation. The findings in the preceding section have demonstrated this.

To measure product quality and verify the relationship between the proposed product quality attribute dimensions and Thai product quality, the research applied content analysis by converting the public reviews of electronics/IT product, automobile, and home appliance into a 5-point scale on overall of each product quality category and 11-point scale on the proposed ten attribute dimensions, and verified these through multiple statistical tests of regressions and correlations.

At confidence level or α at 0.05 both in simple and multiple regressions, the results showed that overall in three categories of product quality, the correlation coefficients or R were 0.98 and 0.99, and the coefficient of determinants or R^2

were 0.96 and above. These very high values of R and R^2 significantly implied that there is a strong linear relationship between the proposed product quality attribute dimensions and the overall product quality in the three product categories, and it obviously could be explained through this research's statistics model:

$$\text{Product Quality}_i = \gamma_0 + \gamma_f \text{Function}_i + \gamma_e \text{Ease of Use}_i + \gamma_r \text{Reliabilty}_i + \gamma_{du} \text{Durability}_i + \gamma_{de} \text{Design}_i + \gamma_{eco} \text{Eco-friendliness}_i + \gamma_s \text{Satisfaction}_i + \gamma_{sv} \text{Support Service}_i + \gamma_m \text{Value for Money}_i + \gamma_a \text{Adaptability}_i + \mu_i,$$

where the γs are coefficients to be estimated for each of the corresponding attribute dimensions of product quality, while the μ_is are error terms initially assumed to identically and independently follow a normal distribution. Indeed "*reliability"*, *"design"*, and *"customer satisfaction"* had high coefficients with perfect effects of *p*-value at 0.00 or less than 0.05 resulting in strong influence/effect on the overall three product quality categories, whereas, *"support service"*, *"adaptability"*, and surprisingly *"durability"* had relatively low coefficients with high *p*-value at greater than 0.05 resulting in weak influence/effect on the overall three product quality categories.

Considered further, taking simple and multiple regressions in electronics/IT product alone, the results indicated that *"ease of use"* and *"customer satisfaction"* are particularly important attribute dimensions that have the greatest influence/effect on overall electronics/IT product quality. Furthermore, *"function"*, *"reliability"*, *"design"*, and *"value for money"* were also relatively

important attribute dimensions that also have substantial and significant influence/effect on overall electronics/IT product quality, whereas *"durability"*, *"eco-friendliness"*, *"support service"*, and *"adaptability"* had the least effect. Comparably in automobile, the results of regressions indicated that *"ease of use"*, *"reliability"*, *"eco-friendliness", "customer satisfaction", "value for money"* and *"design"* are particularly important attribute dimensions that have the greatest influence/effect on overall automobile product quality. Product quality dimensions *"function"*, *"durability"*, *"support service"*, and *"adaptability"* seemed to have the least influence/effect on overall of automobile product quality. Unlike in home appliance, the results of regressions indicated that *"customer satisfaction"*, *"reliability",* and *"design"* are the most important attribute dimensions that have significant influence/effect on overall home appliance product quality. Meanwhile, *"function"*, *"ease of use"*, *"durability"*, *"eco-friendliness"*, *"support service"*, *"value for money"* and *"adaptability"* were relatively less important attribute dimensions that have the least influence/effect on overall of home appliance product quality.

In addition, the overall results of multiple correlations in the three product categories also suggested and further signified the aforementioned results of regressions that each of these proposed attribute dimensions proves to have mostly positive and direct variation relationships or more influences/effects at various degrees among the attribute dimensions on overall of three product quality categories (the closer the correlation coefficient is to the value of 1, the higher the

likelihood that the overall product quality could be explained by that attribute dimension), except *"adaptability"* which mostly had negative inverse variation relationships or less influences/effect with the rest of attribute dimensions on overall of three product quality categories. Since the results of multiple correlations showed many strong and high correlations among the proposed attribute dimensions, these also supported the very high values of coefficient of determinants or R^2 as well as correlation coefficients or R of the previous regressions' findings.

Therefore, with statistical significant values of R, R^2, and P value in simple/multiple regressions as well as multiple correlations, the findings verified that there are positive and substantial influence/effect of the proposed attribute dimensions on Thai product quality, particularly on automobile and electronics/IT product quality categories. Moreover, the findings also indicated that the proposed attribute dimensions prove to be valid, uphold the hypothesis$_{A0}$ of "*A composite measurement of product quality (Thai product quality) obtained from public reviews of new launching product will have positive relationship to the underlying proposed product quality attribute dimensions"*, that could be used in measuring various types of Thai product quality. This part of research finding has extended the previous study by Tellis and Johnson in 2007.

Besides that, by comparing the results of interview and questionnaire with the results of content analysis, and multiple statistical tests, findings showed that there

are differences in expectation, perception, and evaluation among sectors. This significantly implied that there is room for the related sectors, especially product producers or manufacturers, to improve the quality of their products in these evaluated attribute dimensions in order to meet the requirements and exceed expectations.

All in all, the research has defined *"being good in all aspects and fitness with intended use"* as the most up-to-date definition of Thai product quality in the 21st century and has proved that various types of (Thai) product quality, particularly electronics/IT product, automobile, and somewhat home appliance, could be evaluated/measured through the proposed product quality attribute dimensions of *"function"*, *"ease of use"*, *"reliability"*, *"durability"*, *"design"*, *"eco-friendliness"*, *"customer satisfaction", "support service"*, *"value for money"*, and *"adaptability"*.

2. Implications

With reliable and valid sources of data, data collection methods, and data analysis, the results of this research have provided some insights on Thai product quality and related issues that prospectively benefit many sectors in a number of ways.

First, this research contributes to the development of product quality notions, specifically the definition and the methodology in evaluating product quality. It is an early effort in defining product quality from various perspectives and

evaluating many categories of product quality through attribute dimensions at a national level, Thailand. Through integrating knowledge, experience of usage, expectation, perception, and statistical assessment driving improvements in product quality definition and evaluation, the policy maker, product development planner, manufacturer, marketer, as well as consumer would generally and positively benefit from this research findings.

Second, it helps to explain the long-debated views in product quality definitions held by a number of research. For example, marketers typically take user-based or product-based approach to define product quality, in which they often see the consumer as the end arbitrator of product quality and higher in product quality simply means better in product performance/enhanced features that lead to increase in sales. They rarely see the development in production or what happens behind the story as one of the approaches in defining product quality. On the other hand, manufacturers commonly take the manufacturing-based approach of conformance to requirements and conformance to specifications to define their product quality. They hardly see other approaches as equally important in defining product quality. Hence by the output of this research, it certainly provides a comprehensive understanding of defining product quality from various points of view, so that all sectors could share a compatible definition of product quality and develop a new product of better condition. Regulators could act as the inspector providing general guideline, monitoring quality level, production processes, and educating all players in the market; manufacturers could

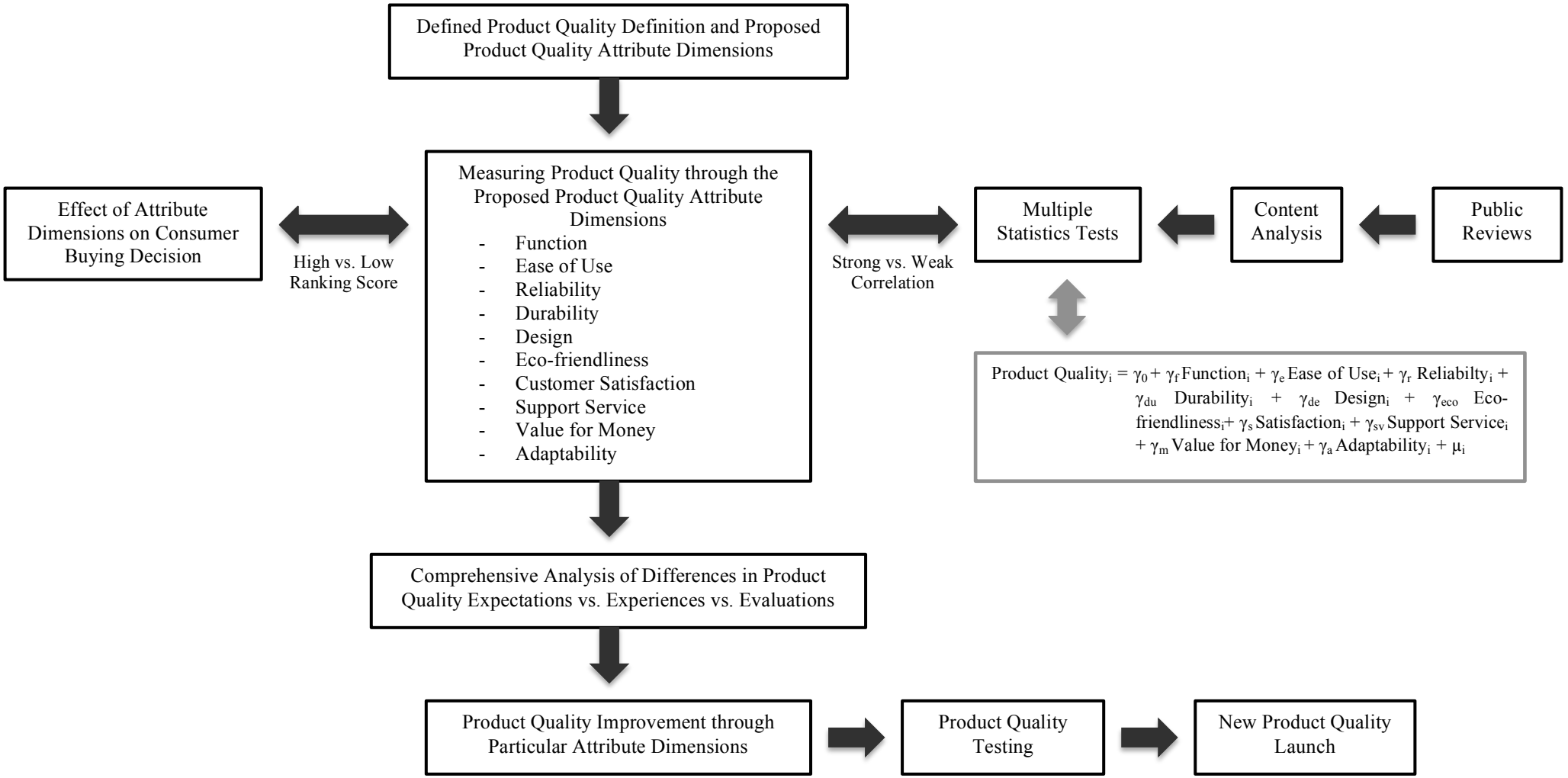
continuously improve product quality as well as processes to meet consumer needs, deliver additional value, and create new experiences for the market. Firms/intermediate sellers, on the other hand, could cultivate the changing consumer/market's expectations, apply evaluation tools in assessing product quality, and responsively reflect back to the manufacturers; likewise, consumers could consume product with care and reveal their real perceptions for further development. Understanding product quality from different perspectives lead to better performance and higher level of product quality.

Third, the research suggests a possible method in evaluating/measuring various types of product quality particularly technology-based products through composite attribute dimensions and content analysis technique. It is a useful tool for manufacturers and the firms to evaluate their products, identify important attribute dimensions that are worthwhile for emphasis or for input as to what should be improved, as well as develop a strategic plan when producing a quality product, especially for Thai market. For instance, based on the results of questionnaire, consumers ranked *"durability" "reliability"* and *"function"* as the most important attribute dimensions on their buying decision in home appliance products, however, the results of content analysis and multiple statistics tests presented that the actual two leading attribute dimensions of "durability" and "function" from ranking somewhat have comparatively weak effects on the current overall home appliance product quality and still behind expectation. By highlighting these attribute dimensions, manufacturers and firms could possibly

improve their product quality, and consequentially reduce their production costs that ultimately deliver a higher and better product quality and finally lead to many competitive advantage. Figure 6.1 demonstrates the strategic plan for product quality development and how manufacturers and business sectors could benefit from the proposed product quality attribute dimensions and its evaluations.

Last but not least, since this research is more exploratory rather than confirmatory, thus, “The Attributes of Product Quality: An Analyis of Thai Product Quality” is a generalization of one specific nation on product quality definition and evaluation through attribute dimensions, and this may lead to a modification and advancement of product quality definition and product quality evaluation in other countries and product categories.

Figure 6.1: Strategic planning for product quality development and the proposed product quality attribute dimensions and its evaluations



3. Limitations and Future Studies

This research has several limitations, some of which could serve as possible areas for future studies. First, the research interprets only three executive interviews with government officials, four executive interviews with producers/ manufacturers, and eleven executive interviews with intermediate sellers, and considers them as overall three sectors' opinions. These limited numbers of participant may not be large enough to represent all three sectors population. Second, the research takes three technology-based products of electronics/IT product, automobile, home appliance as the case study. It would be meaningful to promote and extend the research into other product categories. Third, the research only identifies the influence/effect of attribute dimensions on overall product quality but does not identify the causality between attribute dimensions and product quality. It would be very interesting to see the causality between them, by taking the unfavorable attribute dimensions (variables) out, and repeat these multiple statistical tests with factor analysis. Fourth, the assessments of product quality are the knowledge-dependent based on various aspects. To translate and grade product quality scores and attribute dimensions scores by only one assessor, the results may be biased and differ from two and more assessors. If the assessments of product quality could be assessed and regressed by two and more assessors, the research results would be more remarkable. Fifth, the sample size of assessing public reviews for content analysis is rather small, specifically in home appliance. By examining a bigger sample size, this may contribute to more significant research results and eliminate the limitation. Last but not least, this

research is restricted only to Thailand case. It would be very interesting and fruitful to apply similar research methods in other countries, so that the comprehensive studies and the results could be comparatively extended.

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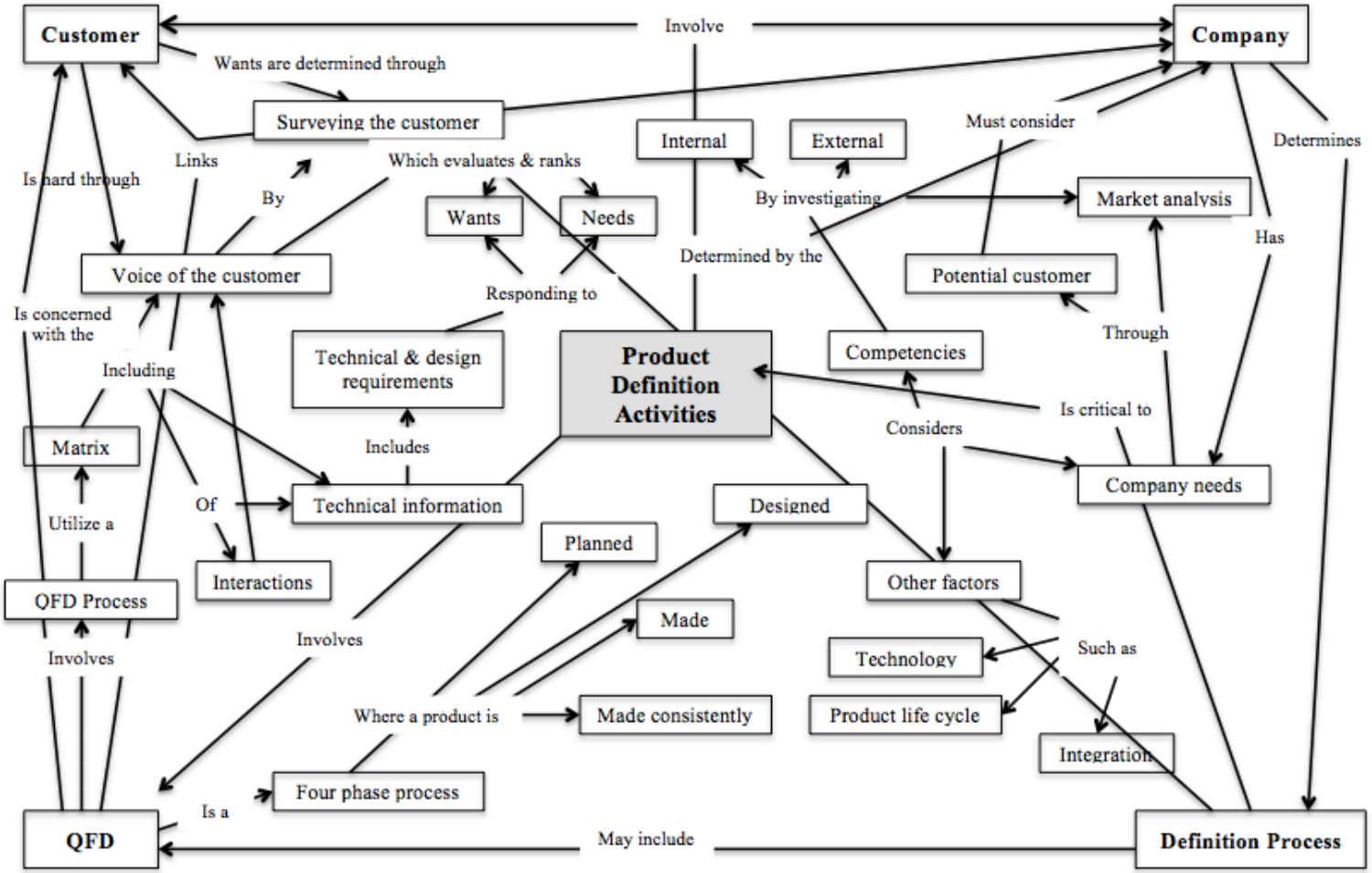
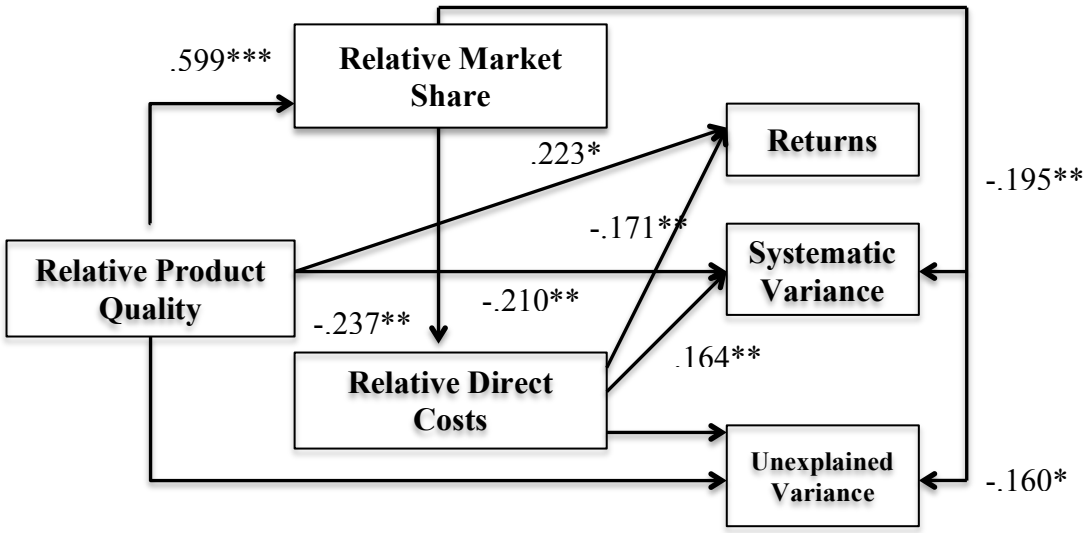
APPENDICES

Appendix I: Product Definition Activities Diagram



Source: Vanderbilt, 2007. *Product Quality*

Appendix II: The Results of the Structural Equations Model of the Relationships between Product Quality, Market Share, Direct Costs, Returns, and Risk



Measures of Fit		
Root Mean Square Residual	**.021**	*** T value significant at .10**
Bentler & Bonett's NFI	**.97**	**** T value significant at .05**
Goodness of Fit Index	**.99**	***** T value significant at .01**
Goodness of Fit Index adjusted for d.f.	**.98**	

Source: Kroll et al., (1999). The contribution of product quality to competitive advantage: Impacts on systematic variance and unexplained variance in returns. *Strategic Management Journal*, *20*(4), 381.

Appendix III: J!mmy - the Famous Car Reviewer in Thai Automobile Magazine

This article was originally posted in Thai language on November 22, 2006, by a Pantip subscriber who was questioning about J!mmy's profile and his work experiences in automobile industry. The subject received top views within a short time and responded to by many readers, one of those was the actual Mr. J!mmy, see *"topicstock.pantip.com/ratchada/topicstock/2006/11/V4899334/V4899334.html"* for original text. Below are the translations:

"Comment No. 41:

As many people have been asking about who am I for countless times, I really want to put this as my FAQ. In the past, I did not think that I will answer this, because personally I do not think this is a big deal and do not want to make it to be serious. Most of the time, I was making fun of it.

But today, I decide to give my general profile of who am I, and when did I start my work as cars reviewer to all of you. So I hope, this will at least answer your question.

Well, I am the kind of person that has many hats.

The first hat I wear is when I am sitting down at home and writing car reviews for one Magazine called TD (Thai Drive). I start doing this job about 8 years ago, and my first car review was with GM Car Magazine. The person who introduced me into this industry is now retired and comfortably operating his own business.

The second hat I wear is when I am doing a radio program. Well! If you ask what radio channel is it, I would say AM 1269 at 15:00-17:00 pm, on every Monday, Tuesday, Friday, and Saturday, and FM 89.5 at 23:30 pm-00.30am on every day. Although, not many audiences really know that J!mmy and that radio reporter is the same person, but only few already make me happy. A talk on new cars, used cars, or any related topics on cars are freely discussed during my on-air time.

The third hat I wear is when I am driving, testing a new car and writing reviews for all of you here. As you know, all my reviews are very straight forward, if it's good, I will say it's quite good, but if it's bad, I will definitely highlight all the bad points, and what I think need to be improved. You can get all the facts and very sincere of car reviews from me. Well, many people said most of the car reviewers in Thailand have been bought by many big

automobile companies, I am not one of that, and what many people said might not be true.

The fourth hat I wear is when I am working for many automobile companies. These companies have many good ideas that many people really want to do but I get these opportunities, such as writing scripts for the pretties for the Motor Show or Motor Expo, or organizing a trip, riding on a new car, and reviewing that car into their web boards, or sometime even writing a sale guide of a car for the car sellers. Some of these jobs take times like a month to complete, but some finish within over night.

So in general, I am pretty much work like a freelance, very dependent and based on myself. I am free to talk and express my opinion, both on my reviews and even on radio airtime.

Thus, nothing can buy me. I am not that type of person.

Even though, they hire me for a job, for example writing car reviews, they still don't have a power over me. I am very straight and sincere in my words and opinions. So if they cannot accept this, well! I am sorry that we cannot work together. Or if they are not satisfied with my work, they can stop hiring me as well, I do not really care, since I also have my family business. I will work as I feel like to and say what I really feel.

The next hat that I wear is when I am working at home for my family business. Sometimes, I act as an accountant, collecting the bills, or sometime I am a personal driver, driving my father to the hospital.

Last but not least, the final hat I used to wear, but not anymore, is when I am playing a music band in a club. Once in a while when I feel good, who know I might wear this hat again.

This is all about me. Hope you all enjoy my story."

J!mmy, November 23, 2006

Currently, J!mmy is still doing many things and wearing many hats, and one of that is writing a monthly review for *Headlight Magazine*. With many years of experiences and hands on this field, plus his writing style of very straight forward and very informative, his reviews receive big applauds and is very popular among many automobile readers.

Appendix IV: The List of Interview Questions (in English)

- What is your present position and main responsibility in this organization/company?

Considering domestic market only:

- During the past fiscal year, what type of products that (Thailand/Toyota/Honda/Panasonics/Apple…) produces the most and/or makes the most sales? Why do you think the customers willing to buy that? What are the key success factors?
- As (Government official/QC manager/intermediate seller…), in your opinion what are the factor(s) that influence(s) customer's decision in buying a product? (please rank your preferences; 7 is the most important and 1 is the least important)

……. *Function*	The ability, utility, and performance of a product compared to previous version or similar type of product, e.g., speed, intelligibility, technology, etc.
……. *Ease of use*	The character which a product can be utilized by general consumer without any difficulties and problems
……. *Reliability*	The property of a product being creditable, reliable, e.g., market recognition, brand awareness, safety, etc.
……. *Durability*	The ability of a product that is able to perform over a long period of time without technical error and physical breakdown.
……. *Design*	The total outlook and feature of a product, e.g., color, size, weight, etc.
……. *Eco-friendlines*	A product that is free from chemicals and is harmless to the environment, e.g., green material, recyclable, energy saving, carbon credit, related to green concept, etc.
……. *Customer Satisfaction*	The overall feeling and perception of a consumer on a product, compared to consumer's expectation and/or previous experience of using a similar brand product or from the same company.

- Besides factors which already stated in previous question, in your opinion, what is/are other factor(s) that can be used to evaluate product quality?
- What is your definition of product quality?
- What could be the differences in today's product quality and the next 5(10) years' product quality? and Why do you think that?

Appendix V: The List of Interview Questions (in Thai)

บทสัมภาษณ์

1. ตำแหน่งปัจจุบันและความรับผิดชอบของท่านคือ

พิจารณาเฉพาะตลาดในประเทศไทย

2. ในช่วงปีงบประมาณที่ผ่านมา สินค้าประเภทไหนของ (ประเทศไทย/ Toyota/ Honda/ Panasonics/ Apple...) ผลิตมากที่สุดและ/หรือขายได้มากที่สุดและปัจจัยอะไรที่ทำให้ท่านคิดว่า ผู้บริโภค/ลูกค้าตัดสินใจซื้อสินค้า หรือปัจจัยอะไรที่ทำให้สินค้าชนิดนั้นประสบความสำเร็จ

3. ในความคิดของท่าน ปัจจัยอะไรที่มีอิทธิพลต่อการตัดสินใจซื้อสินค้าของลูกค้า (กรุณาเรียงลำดับความสำคัญ: 7 มีอิทธิพลต่อการตัดสินใจของท่านมากที่สุด และ1 น้อยที่สุด)

- …… ฟังก์ชั่น (ความสามารถและประสิทธิภาพของสินค้าเมื่อเปรียบเทียบกับสินค้ารุ่นก่อน หรือสินค้าประเภทเดียวกันแต่คนละผู้ผลิต)
- …… ง่ายต่อการใช้งาน
- …… ความน่าเชื่อถือของตัวสินค้าหรือผู้ผลิต ความปลอดภัย
- …… ความคงทน
- …… ดีไซน์ รูปแบบ ลวดลาย สี ขนาด น้ำหนักของสินค้า เป็นต้น
- …… เป็นมิตรต่อสิ่งแวดล้อม ใช้วัตถุดิบที่สามารถนำกลับมาใช้ได้ใหม่ ประหยัดไฟฟ้า และพลังงานเป็นต้น
- …… เคยมีประสบการณ์ที่ดีหรือความพึงพอใจในการใช้สินค้าที่ผลิตโดยบริษัทเดียวกัน

4. นอกเหนือจากปัจจัยที่กล่าวข้างต้นในข้อ 6 ในความคิดเห็นของท่านปัยจัยที่สามารถใช้ในการประเมินคุณภาพของสินค้าได้คือ

……
……

5. คำจัดความของสินค้า "สินค้าที่มีคุณภาพ" ในความคิดของท่านคือ

……
……

6. ในความคิดของท่าน ความแตกต่างของคุณภาพของสินค้าในวันนี้และคุณภาพของสินค้าในอีก 5 ปีข้างหน้าคือ

……
……

Appendix VI: Customer Opinion Questionnaire on Product Quality (in English)

Thank you for taking your time to fill in this questionnaire. Your participation will be highly appreciated. Please note that this questionnaire is a part of PhD. research on Thai customer opinion toward product quality. Your personal information will be confidential and used for this research only.

Please answer the following questions;

Q1. Gender: …… Male …… Female

Q2. Age: …… below 20 …… 20 – 25 …… 26 – 30
…… 31 - 35 …… 36 - 40 …… 41 – 45
…… 46 – 50 …… above 51

Q3. Education: …… Under bachelor's degree
…… Bachelor's degree
…… Above bachelor's degree

Q4. Monthly Income: …… less than 15,000 baht
…… 15,001 – 25,000 baht
…… 25,001 – 35,000 baht
..... 35,001 – 45,000 baht
…… above 45,000 baht

Q5. What kind of product(s) did you buy today? (can answer more than one)

…… Electronics device
…… Mobile phone (brand……)
…… Computer, laptop, tablet (brand ……)
…… Camera, digital camera (brand …….)
…… Other (…….brand…….....)

…… Automobile
…… Family car (brand……)
…… City car/ Eco car (brand……)
…… SUV (brand……)

…… Sport car (brand……)

…… Truck (brand……)

…… Electric car (brand……)

…… Home appliance

…… TV, plasma TV, LCD TV (brand……)

…… Refrigerator (brand……)

…… Washing machine (brand……)

…… Air conditioning, electric fan (brand……)

…… Home theater (brand……)

…… DVD player (brand……)

…… Other (……brand..……)

Q6. According to what you just bought, what factor(s) influence your decision in buying a product? (please rank your preferences; 7 is the most important and 1 is the least important)

……. *Function*	The ability, utility, and performance of a product compared to previous version or similar type of product, e.g., speed, intelligibility, technology, etc.
……. *Ease of use*	The character which a product can be utilized by general consumer without any difficulties and problems.
……. *Reliability*	The property of a product being creditable, reliable, e.g., market recognition, brand awareness, safety, etc.
……. *Durability*	The ability of a product that is able to perform over a long period of time without technical error and physical breakdown.
……. *Design*	The total outlook and feature of a product, e.g., color, size, weight, etc.
……. *Eco-friendlines*	A product that is free from chemicals and is harmless to the environment, e.g., green material, recyclable, energy saving, carbon credit, related to green concept, etc.
……. *Customer Satisfaction*	The overall feeling and perception of a consumer on a product, compared to consumer's expectation and/or previous experience of using a similar brand product or from the same company.

Q7. Besides factors which already stated in Q5, in your opinion, what is/are other factor(s) that can be used to evaluate product quality? (if any)

……..

……..

Q8. What is your definition of product quality?

……..

……..

Q9. What could be the differences in today's product quality and the next 5 years' product quality? And why do you think that?

……..

……..

Thank you very much for your cooperation

Appendix VII: Customer Opinion Questionnaire on Product Quality (in Thai)

แบบสอบถามเรื่องความคิดเห็นของลูกค้าต่อคุณภาพสินค้า

แบบสอบถามนี้เป็นส่วนหนึ่งของงานวิจัยระดับปริญญาเอก สาขา Asia Pacific Studies มหาวิทยาลัย Ritsumeikan Asia Pacific University เรื่อง "The Attributes of Product Quality: An Analysis of Thai Product Quality" โดยมีจุดประสงค์เพื่อวิเคราะห์ความคิดเห็นของลูกค้าต่อคุณภาพสินค้า ข้อมูลส่วนตัวของท่านจะถูกเก็บเป็นความลับและใช้สำหรับงานวิจัยในครั้งนี้เท่านั้นเพื่อให้การวิจัยดำเนินไปด้วยความแม่นยำถูกต้อง ผู้วิจัยใคร่ขอความอนุเคราะห์จากท่านโปรดตอบแบบสอบถามตามความเป็นจริง

ปาจรีย์ อัครเดชเรืองศรี (ผู้วิจัย)

กรุณากากบาทหรือเติมคำในช่องว่าง

1. เพศ: .....ชาย .....หญิง

2. อายุ: ..... น้อยกว่า 20 ปี 20-25 26-30
..... 31-35 ..... 36-40 41-45
..... 46-50 .....มากกว่า51ปี

3. วุฒิการศึกษา: ..... ต่ำกว่าปริญญาตรี
..... ปริญญาตรี
..... สูงกว่าปริญญาตรี

4. รายได้เฉลี่ยต่อเดือน: ..... น้อยกว่า15, 000 บาท
..... 15,001-25,000 บาท
..... 25,001-35,000 บาท
..... 35,001-45,000 บาท
..... มากกว่า 45,001 บาท

5. สินค้าประเภทไหนที่คุณได้ตัดสินใจซื้อในวันนี้

..... อุปกรณ์เครื่องใช้ไฟฟ้า
..... โทรศัพท์มือถือ (ยี่ห้อ.....)
..... คอมพิวเตอร์, tablet (ยี่ห้อ.....)
..... กล้องถ่ายรูป (ยี่ห้อ.....)

…… อื่นๆ (……ยี่ห้อ……)

…… รถยนต์

…… รถยนต์เอนกประสงค์ (Compact car) (ยี่ห้อ……)

…… รถยนต์อเนกประสงค์ ขนากเล็ก ซิตี้คาร์ (ยี่ห้อ……)

…… รถ SUV (ยี่ห้อ……)

…… รถสปอร์ต (ยี่ห้อ……)

…… รถกระบรถปิกอัพ (ยี่ห้อ……)

…… รถไฮบริค รถยนต์ขับเคลื่อนพลังไฟฟ้า (ยี่ห้อ……)

…… เครื่องใช้ไฟฟ้าภายในบ้าน

…… โทรทัศน์ (ยี่ห้อ……)

…… ตู้เย็น เรื่องทำความเย็น (ยี่ห้อ……)

…… เครื่องซักผ้า (ยี่ห้อ……)

…… เครื่องปรับอากาศ พัดลม (ยี่ห้อ……)

…… เครื่องเสียง (ยี่ห้อ……)

…… เครื่องเล่น DVD VCD (ยี่ห้อ……)

…… อื่นๆ (……ยี่ห้อ……)

6. ปัจจัยอะไรที่มีอิทธิพลต่อการตัดสินใจซื้อสินค้าของท่านในวันนี้ (กรุณาเรียงลำดับความสำคัญ: 7 มีอิทธิพลต่อการตัดสินใจของท่านมากที่สุด และ1 น้อยที่สุด)

…… ฟังก์ชั่น (ความสามารถและประสิทธิภาพของสินค้าเมื่อเปรียบเทียบกับสินค้ารุ่นก่อน หรือสินค้าประเภทเดียวกันแต่คนละผู้ผลิต)

…… ง่ายต่อการใช้งาน

…… ความน่าเชื่อถือของตัวสินค้าหรือผู้ผลิต ความปลอดภัย

…… ความคงทน

…… ดีไซน์ รูปแบบ ลวดลาย สี ขนาด น้ำหนักของสินค้า เป็นต้น

…… เป็นมิตรต่อสิ่งแวดล้อม ใช้วัตถุดิบที่สามารถนำกลับมาใช้ได้ใหม่ ประหยัดไฟฟ้าและพลังงานเป็นต้น

…… เคยมีประสบการณ์ที่ดีหรือความพึงพอใจในการใช้สินค้าที่ผลิตโดยบริษัทเดียวกัน

7. นอกเหนือจากปัจจัยที่กล่าวข้างต้นในข้อ 6 ในความคิดเห็นของท่านปัยจัยที่สามารถใช้ในการประเมินคุณภาพของสินค้าได้คือ

……
……

8. คำจัดความของสินค้า "สินค้าที่มีคุณภาพ" ในความคิดของท่านคือ

……
……

9. ในความคิดของท่าน ความแตกต่างของคุณภาพของสินค้าในวันนี้และคุณภาพของสินค้าในอีก 5 ปีข้างหน้าคือ

……
……

ขอขอบพระคุณเป็นอย่างสูง

Appendix VIII: Lists of Interviewed Participants from Three Sectors

Government Officers

- Permanent Secretary of the Ministry of Industry of Thailand, Mr. Witoon Simachokdee
- Director of One Stop Export Service Center, Mrs. Wandee Thanalertvisut
- Executive Chairman of Industrial Promotion of Region 9, Mr. Prayoch Atthathorn

Producers/Manufacturers of a Product

- General Manager of Apple Thailand Inc., Chonburi branch, Mr. Nipon Sinsomboon
- General Manager and Customer Quality-Engineering Department, Toyota Motor Thailand Co., Ltd., Automobile, Mr. Praisont Yupuang
- Department Manager, Honda Automobile Thailand Co. Ltd., Ms. Rachanee Jirathawonkul
- Deputy General Manager and Quality Assurance Department, Panasonics Management (Thailand) Co. Ltd., Mr. Phansa Thongsingklee

Intermediate Sellers

Electronics and IT Products:

- Salesperson of AIS store at Central Department Store Chonburi, Mrs. Benchamas Bawornpinichakul
- Salesperson of i-mobile store at Central Department Store Chonburi, Mrs. Chanthima Tienpan
- Salesperson of GPlus store at Central Department Store Chonburi, Mrs. Sirirat Gogfai
- Salesperson of Winner store at Central Department Store Chonburi, Mr. Channarong Mongkol.

Automobile:

- General Manager of Thaiyont Chonburi Toyota's Dealer Co., Ltd., Mr. Thanakrit Chantharasiriporn
- General Manager of Chonburi Honda Cars Co., Ltd., Mr. Nutthapol Thepsorn
- General Manager of Siam Nissan Chonburi Co., Ltd., Mr. Winit Witchuwongse,

- General Manager of Chonburi Izusu Group, Mr. Somsak Thaipakdee.

Home Appliance:

- General Manager of Kachorn Electronics at the first branch, Mr. Tachakorn Kachonkertthikhun
- General Manager of Home Pro-The Power at Big C Chonburi, Mr. Choomsak Intusopon
- General Manager of Power Buy at Central Department Store Chonburi, Mr. Jakpech Phoolphiphat.

Appendix IX: Statistics Summary on the Overall Electronics/IT Product Quality Scores on the Proposed Attribute Dimensions

Observations	**Variable (y_n)**	**Minimum (y_n)**	**Maximum (y_n)**	**Mean (y_n)**	**Std. deviation (y_n)**	**Variable (x_n)**	**Minimum (x_n)**	**Maximum (x_n)**	**Mean (x_n)**	**Std. deviation (x_n)**
38	Overall of Electronics/ IT Product Quality Scores	3	5	3.93	0.31	Function	7	10	8.64	0.71
						Ease of Use	7	10	7.81	0.90
						Reliability	7	10	8.38	0.69
						Durability	5	10	7.96	0.93
						Design	7	10	8.54	0.72
						Eco-friendliness	5	7	5.05	0.32
						Customer Satisfaction	6	10	8.34	0.76
						Support Service	4	6	5.05	0.32
						Value for Money	5	9	8.18	1.04
						Adaptability	5	8	5.31	0.74

Appendix X: Statistics Summary on the Overall Automobile Product Quality Scores on the Proposed Attribute Dimensions

Observations	**Variable (y_n)**	**Minimum (y_n)**	**Maximum (y_n)**	**Mean (y_n)**	**Std. deviation (y_n)**	**Variable (x_n)**	**Minimum (x_n)**	**Maximum (x_n)**	**Mean (x_n)**	**Std. deviation (x_n)**
30	Overall of Automobile Product Quality Scores	3	5	4.15	0.24	Function	7	10	8.50	0.63
						Ease of Use	7	9	8.27	0.52
						Reliability	8	9	8.55	0.40
						Durability	7	9	8.33	0.46
						Design	7	9	8.15	0.60
						Eco-friendliness	7	10	8.40	0.70
						Customer Satisfaction	7	9	8.38	0.54
						Support Service	4	8	6.18	1.16
						Value for Money	6	9	8.12	0.68
						Adaptability	5	7	5.32	0.69

Appendix XI: Statistics Summary on the Overall Home Appliance Product Quality Scores on the Proposed Attribute Dimensions

Observations	**Variable (y_n)**	**Minimum (y_n)**	**Maximum (y_n)**	**Mean (y_n)**	**Std. deviation (y_n)**	**Variable (x_n)**	**Minimum (x_n)**	**Maximum (x_n)**	**Mean (x_n)**	**Std. deviation (x_n)**
18	Overall of Home Appliance Product Quality Scores	3	5	4.07	0.22	Function	7	9	8.29	0.50
						Ease of Use	7	8	8.36	0.29
						Reliability	7	9	8.36	0.51
						Durability	7	9	8.33	0.45
						Design	7	10	8.14	0.63
						Eco-friendliness	6	9	8.11	0.78
						Customer Satisfaction	7	9	8.10	0.42
						Support Service	5	8	6.44	0.95
						Value for Money	7	9	8.10	0.39
						Adaptability	5	9	6.79	1.59