The attributes of Thai product quality, measurement, and validity

Pajaree Ackaradejruangsri
Ritsumeikan Asia Pacific University
Beppu, Oita, Japan
pajaree.ack@gmail.com

ABSTRACT

Product quality is subjective, 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. This research proposes new product attributes particularly for measuring Thai product quality in three different product categories: electronics/IT products, automobile, and home appliance; and test for its validity. This research applies content analysis and statistics test by converting 86 of those three product categories reviewed from Thailand’s well-known public brands into a 5-point scale on overall product quality and 11-point scale on the proposed product attributes. These attributes are “Function”, “Ease of Use”, “Reliability”, “Durability”, “Design”, “Eco-Friendliness”, “Customer Satisfaction”, “Support Service”, “Value for Money”, and “Adaptability”. The results show high correlations and significant effects of attributes on overall Thai product quality, especially on automobile and electronics/IT products. Moreover, these proposed attributes also test the validity measurements of similar types of products.

JEL Classification: L1, L15

Keywords: product quality, attribute, public reviews, content analysis

INTRODUCTION

In many economics and marketing models, a product is usually described in a simple dimension of “quality”, and according to many studies, consumers are willing to pay for those premiums when a product is perceived as having “high quality” (Maynes, 1976; Olson, 1977). However, there is a research gap on aggregation and differentiation whether the product is of high quality or low quality, and its corresponding measurement methodology.

Since the 1950s, Leavitt (1954) examined the relevance of price on product quality. His study was one of the earliest to indicate that consumers were likely inclined to use price as an indicator. Accordingly, numerous studies also tried to examine the correlation between price and product quality in various statistical tests. Many qualitative reviews suggest that there is a positive relationship or high correlation between price and perceptions of 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 confirmed that besides price, brand and store name also have statistically significant positive relationship with consumers’ perceptions of product quality. However, are price, brand name, and store name the only measures of product quality? Is there an alternative measurement in evaluating product quality? Are there underlying attributes that validly explain product quality measurement? These remain to be answered in this paper.

I suggest a simple and practical method in measuring product quality and aim to answer the following: What are the product quality attributes in Thailand? How are these measured? Are these product quality attributes measurable and validly applicable to various types of product categories?

This research examines previous empirical studies to see what were attributes scholars and researchers used for measuring product quality. Based on that, I propose the attributes specifically for Thailand. Moreover, I assess the country’s top and most reliable public reviews in three product categories: electronics & IT products, automobile, and home appliances. The product quality review scores are then converted into an 11-point scale to test and verify the relationship between the proposed attributes and product quality. The results show the effects of attributes on Thai product quality, measurement and its validity. This research will be a useful guideline for applying product quality measurement and evaluation method to benefit similar Asian products.

**REVIEW OF RELATED LITERATURE**

**Relative Importance of Previous Studies**

Perception of product quality is undeniably difficult to define and measure. Under the hedonic view, there is no such measurement of product quality, since it is rather inconsistent to directly combine and pull the various elements and characteristics together (Triplett, 1976). However, many economists deemed that measuring product quality can be done through a process comparable to how Gross National Product (GNP) is measured, in which apples and oranges (attributes of product quality) can be combined into an aggregate notion called “fruit” (product quality). It is, therefore, rational to physically value individual fruit (attributes) and aggregate it as the overall evaluation and measurement of real GNP of fruits (product quality measurement). Hence, by combining various attributes, product quality could be ideally aggregated and measured.

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 ratified that product quality could be assessed for a variety of a product combinations, when the characteristics of a seller is taken into consideration. In addition, Olson (1973) revealed that normative consumers use a variety of cues to infer product quality. These include extrinsic cues such as price, brand name, and store name as well as intrinsic cues such as utilities or abilities of a product. In my previous study on Thai consumers’ perception, **Defining Thai Product Quality in**
the 21st Century, I detailed the composite product attributes, i.e. function, ease of use, reliability, durability, and many related attribution factors that have positive influence on buying decisions (Ackaradejruangsri, 2012).

Therefore, as numerous product quality perceptions findings uphold the view, product quality may be considered as a multidimensional construct and the use of multiple attributes as independent variables is feasible and essential for this empirical test.

Heterogeneity of Tastes, Imperfect Information, and Reviewed Quality

Many researchers and marketers strongly assert that consumers have different preferences and diverse tastes, at various dimensions (Hjorth-Annderson, 1984; Kamakura et al. 1988). Researchers and marketers assume 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 capture all consumers for a wide array of products. Consider two individual consumers (I and II) who are asked to choose between two different features (A and B) of a product, which has 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. Eventually, there is no ultimate explanation why individual I prefer A than B, and the same thing for individual II, unless interpersonal comparisons and in-depth analysis were made. This kind of consumers’ differences in taste additionally makes consistent product quality measurement much more complicated.

In addition under an efficient market, several evidences suggest that consumers are imperfectly informed of product quality and cannot assess product quality review immediately (Nelson, 1970; Tellis & Wernerfelt, 1987). Different markets across all ranges of products 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.

Relative Importance of Attribute Dimensions of Product Quality

Research on valid multiple attributes of product quality in marketing and product engineering rarely exists, but there is one that has a great impact on a product’s success in the marketplace - the eight dimensions proposed by Garvin (1984). His study suggests 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, and could be ranked as high or low. Moreover, several marketing research and studies, including Tellis and Johnson (2007), commonly applied these similar terms and dimensions of product quality on capturing and rating products. However, there is no definite composite attributes of product quality that is applicable to all. In general, when referring to technology-based products, i.e. IT products, automobiles, as well as electronic appliances, the most important attributes
regarding quality would commonly be utility, usability, reliability, durability, feature, and value for money.

In technology-based products, firms are continuously and competitively introducing new products into the market. However, consumers do not purchase new products immediately. They initially compare existing products and do a cost-benefit analysis before making their final buying decision. At this 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 advancements in technology; they often come with unfamiliar and complex parts that are not user friendly. Consumers need time to explore and figure out the way to use the product. Thus, user friendliness is a very important dimension of product quality. Third, as there are varieties of new generation products offered by many producers in the market, there is intense competition and pressure among firms to deliver new products in a short time span. Even if new products proliferate in the market, consumers are still concerned about reliability and durability which are important product quality attributes. They most likely prefer to buy products from a reliable maker and these should be durable over a long period of time. Fourth, firms recently pay high attention not only in software but also in hardware; the new products come out in many varieties and creative designs. It is undeniable that the first impression on product appearance somehow has an influence on consumer decision. Therefore, feature is an important attribute for consumer evaluation on product quality. Fifth, many empirical studies suggested consumers more likely use price as an indicator of product quality. Furthermore, other dimensions such as energy efficiency or eco-friendliness, especially for cars and electronic devices, support service, adaptability, and even overall satisfaction are also important dimensions that are widely used by consumers in evaluating product quality (Ackaradejruangsri, 2012).

Literature points that utility, usability, reliability, durability, feature, value for money, eco-friendliness, overall satisfaction, support service, and adaptability are generally used and are proven to be feasible measures of attributes of product quality. For the purpose of this research, those dimensions and terms have been revised. Thus, the proposed composite attributes particularly for Thai products and consumers would be function, ease of use, reliability, durability, design, eco-friendliness, customer satisfaction, support service, value for money, and adaptability. These attributes are described in Appendix A.

METHODOLOGY

Hypothesis

According to literature, suppose that consumers differ in tastes and there is imperfect information, then a measurement of composite product quality would have no particular relationship to any underlying attributes of product quality reviewed. Therefore, the following is our null hypothesis:
**Hypothesis H₀:** 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 attributes.

If the above null hypothesis is true, then the underlying proposed product quality attributes could not represent and cannot be the determinant for measuring Thai product quality. It might also be invalid to measure general product quality.

However, there are strong arguments that in such event, experts who have specialty knowledge with explicit resources could sample products, give personal evaluations based on valid and various dimensions, and publish reviews before consumers could actually assess the products. Henceforth, the previous uninformed consumers are now informed, and to some extent rely their purchasing decision on those public reviews. 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, suggests that such public reviews and ratings employ relatively significant influence on the market values (Mayzlin, 2006; Moorman et al. 2005; Eliashberg & Shugan, 1997). If the above argument is valid, the alternative hypothesis against H₀ is:

**Hypothesis H₁₀:** A composite measurement of product quality (Thai product quality) obtained from public reviews of new launching product will have a positive relationship to the underlying proposed product quality attributes.

**Research Context**

Firms typically do not rate or release their product quality information to the market because it is inappropriate to judge products from the producers’ perspective. To avoid this bias, a possible solution is to assess public reviews. There are numerous public reviews available in the market, mostly in electronics and IT products, automobile, and in small home appliances. In Thailand, product reviews are regularly subscribed as a part or a sub-section in magazines, periodicals, or in business journals. They issue weekly, monthly, or quarterly editions in print and online. As Thai consumers become more informed with new product releases, there is growing demand for information.

This research focuses on three product categories; electronics & IT products, automobiles, and home appliances. Electronics & IT products are limited to mobile phones, computers, laptops, and tablets, while home appliances are limited to televisions, refrigerators, washing machines, and air conditioners. For this research, the samples consist of product quality reviews in the three product categories: electronics & IT products quality in PC Today, automobile in Headlight Magazine, and home appliance in CE Mart. The reviews were assessed from January 2011 to December 2012. All the issues are collected in relation to the three product categories. No single review has been omitted, unless the reviews were out of the research focus.

**Measuring Product Quality Data**
To verify the relationship between the proposed attributes and Thai product quality, I collected product quality reviews and converted them into a product quality score and the proposed product quality attributes. Since most of the public reviews, including *PC Today*, *Headlight Magazine*, and *CE Mart*, do not publish their product quality reviews in numbers, I applied a content analysis by Tellis et al. (2007) with some adjustments.

Applying a content analysis of product quality reviews, I converted the concluding remark of each review into numerical scores. I initially developed a set of terms that reviewers use to describe these products; electronics & IT products, automobile, and home appliance, then grouped these terms into a 5-point scale, ranging from 1 to 5, with 1 as the lowest score represented by “unacceptable”; and 5 as the highest score represented by “excellent”. The content analysis outline for grading overall of product quality reviews from public reviews is described in Appendix B.

To further verify, I also converted the product quality data (the descriptive of product quality reviews) from three public sources into an 11-point scale, rating from 0 to 10, which 0 is the lowest score represented “completely dissatisfied” and 10 is the highest score represented “completely satisfied”, into the proposed attributes. Appendix C illustrates the guideline for grading product quality reviews from the public reviews into each attribute.

Note that to avoid many 0s from product reviews when reviewers did not mention these attributes, I substituted that value with the average scale at 5 point, with neither satisfied nor dissatisfied. Hence, after obtaining the scores, the following regression model was developed:

\[
\text{Product Quality}_i = \gamma_0 + \gamma_{\text{Fuction}_i} + \gamma_{\text{Ease of Use}_i} + \gamma_{\text{Reliability}_i} + \gamma_{\text{Durability}_i} + \gamma_{\text{Design}_i} + \gamma_{\text{Eco-friendy}_i} + \gamma_{\text{Satisfaction}_i} + \gamma_{\text{Service}_i} + \gamma_{\text{Money}_i} + \gamma_{\text{Adaptability}_i} + \mu_i
\]

Where the \(\gamma\)s are coefficients to be estimated for each of corresponding attributes of product quality, the \(\mu\)s are error terms principally assumed to be identical and independent following a normal distribution.

By regressing the overall product quality scores on the proposed attributes, I expected to see a high or low correlation that would clarify the relationship and the effect of attributes on Thai product quality.

**RESULTS AND DATA ANALYSIS**

86 product quality reviews were identified and broken down into 38 reviews in electronic/IT products, 30 reviews in automobile, and 18 reviews in home appliance.

Recall that the measurement of these product quality reviews is coded through a 5-point scale for overall product quality and 11-point scale for

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1 Content analysis or textual analysis is a methodology in the social sciences for studying the content of communication. This research technique intends to use for making inferences by systematically and objectively identifying specified characteristics within text (Neuendorf, 2002).
attributes. The results of the three categories of product quality and their regressions are presented as follows.

**Table 1:** Regression of overall electronics / IT product quality on its attribute

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

**Note:** $R = 0.98$; $R^2$ = 0.96; Std. error = 0.07; n = 38

The results in Table 1 show that the correlation coefficient or $R$ for the 38 reviews of electronics/IT products is 0.98, and the coefficient of determination or $R^2$ is 0.96. This very high $R^2$ points that the total attributes could vividly explain the linear relationship with the overall electronics & IT product quality. Moreover, most of the attributes establishes significant effects on overall electronics & IT product quality. Two out of ten attributes, which seemingly are *ease of use* and *customer satisfaction*, have strong coefficients at 0.07 and 0.14 with seemingly perfect effects of $p$-value at 0.00. Other attributes including *function*, *reliability*, and *design* also have substantial effects with strong coefficients at 0.10, 0.07, and 0.06 respectively on overall electronics/IT product quality. However, *adaptability*, *eco-friendliness*, and particularly *durability* and *support service* attributes to some extent have less effects and have relatively weak/negative coefficients with overall electronics/IT product quality.

**Table 2:** Regression of overall automobile product quality on its attributes

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Std. error</th>
<th>p-value</th>
<th>$H_0$ (5%) reject?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-0.4</td>
<td>0.18</td>
<td>0.04</td>
<td>Yes</td>
</tr>
<tr>
<td>Function</td>
<td>0.03</td>
<td>0.03</td>
<td>0.21</td>
<td>No</td>
</tr>
<tr>
<td>Ease of use</td>
<td>0.07</td>
<td>0.02</td>
<td>0.00</td>
<td>Yes</td>
</tr>
<tr>
<td>Reliability</td>
<td>0.10</td>
<td>0.02</td>
<td>0.00</td>
<td>Yes</td>
</tr>
<tr>
<td>Durability</td>
<td>0.02</td>
<td>0.02</td>
<td>0.44</td>
<td>No</td>
</tr>
<tr>
<td>Design</td>
<td>0.04</td>
<td>0.01</td>
<td>0.01</td>
<td>Yes</td>
</tr>
<tr>
<td>Eco-friendliness</td>
<td>0.06</td>
<td>0.01</td>
<td>0.00</td>
<td>Yes</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>0.14</td>
<td>0.03</td>
<td>0.00</td>
<td>Yes</td>
</tr>
<tr>
<td>Support service</td>
<td>0.00</td>
<td>0.01</td>
<td>0.46</td>
<td>No</td>
</tr>
<tr>
<td>Value for money</td>
<td>0.07</td>
<td>0.01</td>
<td>0.00</td>
<td>Yes</td>
</tr>
<tr>
<td>Adaptability</td>
<td>0.00</td>
<td>0.01</td>
<td>0.71</td>
<td>No</td>
</tr>
</tbody>
</table>

**Note:** $R = 0.99$; $R^2$ = 0.99; Std. error = 0.03; n = 30

In the foregoing, the results in Table 2 also show comparable significant results. The correlation coefficient or $R$ for the 30 reviews of automobile product quality is 0.99, and the coefficient of determination or $R^2$ is at 0.99. Again, this is a
very high $R^2$ which significantly implies that 99 percent of the total attributes of automobile product quality can be strongly explained by the linear relationship between them. Furthermore, almost all of the attributes appear to have significant effects on automobile product quality. To clarify, five out of ten attributes, which are ease of use, reliability, eco-friendliness, customer satisfaction, and value for money have 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 has a very strong effect on automobile quality with its coefficient relatively high at 0.04 and its $p$-value significant at 0.01. Nonetheless, the other four attributes including function, durability, support service, and adaptability are proven to have somewhat less effects and low coefficients on automobile product quality.

Table 3: Regression of overall home appliance product quality on its attributes

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

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

As expected, the result in Table 3 also illustrates compatible outcomes with the previous two product qualities’ regressions. The correlation coefficient or $R$ for the 18 reviews of home appliance product quality is 0.98, and the coefficient of determination or $R^2$ is 0.96. Although, $R^2$ is very significant at 96 percent, the correlation between the total attributes and overall home appliance product quality appears to be relatively insignificant due to relatively high $p$-values of many attributes. Only three attributes of reliability, design, and customer satisfaction have strong effects with high coefficients at 0.24, 0.13, and 0.43 respectively on home appliance quality, whereas, the other seven of attributes, including function, durability, eco-friendliness, value for money, adaptability, and particularly ease of use and support service have comparatively weak effects and mostly negative coefficients with high $p$-values on home appliance product quality.

However, the overall results of the simple regression at the confidence level or $\alpha$ at 0.05 evidences that there are strongly positive and significant relationships of the proposed attributes on the overall of product quality of electronics & IT products, automobile, and home appliance. To probe further, I applied the multiple regressions on these three product categories, and the results such as the sizes and significances of correlation coefficient and coefficient of determination of the multiple regression are very similar and do not change much from the simple regression. This clearly identifies and confirms that there is
high correlation between the proposed attributes on the three focused product quality. It signifies the proposed ten attributes represent relatively independent aspects of the overall of product quality, remarkably in automobile and electronics/IT products. Furthermore, the reviewers in three leading public reviews; PC Today, Headlight Magazine, and CE Mart, have been able to evaluate the products independently on each attribute with less halo and bias.

With all these significant results, the null hypothesis can be rejected. On the other hand, these positive correlations notably support an opposite argument and hold hypothesis $A_0$, which is “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 attributes”.

**DISCUSSION**

The search for the effects of attributes on Thai product quality yields significant results. This research suggests an alternative metric by assessing product quality reviews from public sources, which can be a useful method to obtain independently product quality attribute data.

When product quality data translate into a suitable quantitative scale and at a right composite attribute, the results show that the individual attributes of product quality have strong and significantly positive effects on overall product quality.

In general, the attributes that have the strongest effects on three categories of product quality are reliability, design, and customer satisfaction. The possible reasons for these three attributes could be Thai consumers are very brand conscious, and rely their purchasing decisions largely on reputable producers. Intuitively, a product made by a well-known manufacturer automatically translates as good quality product as perceived by consumers. Moreover, the design or feature of a product is also very important and has a big influence on Thai consumers’ perceptions. Consumers could easily switch their purchasing decisions and perceptions from one product to another product, simply because of a better product design. Reliability, design, and other attributes are also important in evaluating product quality. However, all of these attributes would be meaningless if a product does not satisfy consumers' needs and wants. Therefore, it is logical that customer satisfaction attribute has a positive significant effect on the overall for product quality. On the contrary, support service, adaptability, and surprisingly durability seem to have less effect on three categories of product quality than the other attributes. The feasible reason for these latter three attributes could be the imperfect availability of information on product quality reviews published in public sources. They do not elaborate or give reviews much on these three related views. Nevertheless, the results suggest that support service, adaptability and durability appear to have less effect on the three categories of product quality. These do not imply that support service, adaptability, and durability are not important attributes. These are important attributes but happen to have less correlation on the focused product quality reviewed.
Considering electronics & IT products alone, the regression results indicate that ease of use and customer satisfaction are particularly important attributes that have the greatest effects on product quality. Furthermore, function, reliability, design, and value for money are also relatively important attributes that also have substantial and significant effects on the overall for electronics & IT product quality; whereas, durability, eco-friendliness, support service, and adaptability have the least effects. The probable reasons for this could be, with more frequency and availability of new electronics & IT products in the market, Thai consumers are ensured that the products perform well, exhibit user-friendliness, provide compatibility with the old version, and suit their needs. 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, consumers do not also consider energy efficiency and eco-friendliness important when buying a new mobile phone, tablet, or computer. Thus, durability, eco-friendliness, support service, and adaptability seem to have relatively less significance on electronics & IT product quality.

For automobile, the results of regression indicate that ease of use, reliability, eco-friendliness, customer satisfaction, value for money and design are particularly important attributes that have the greatest effects on automobile product quality. On the other hand, function, durability, support service, and adaptability have the least effects. When Thai consumers consider buying normal goods, especially cars, they instinctively take many aspects into consideration, which include credit from the car maker, energy saving matters, ease of use, reasonable price, elegant features, as well as the utility or performance of the car. However, the results of this regression suggest that function attribute has less effect on the overall for automobile product quality. This high p-value or relatively low correlation might be an indirect effect of public reviews, in which they often evaluate new automobiles under the real market value.

For home appliances, the results of regression indicate that customer satisfaction, reliability, and design are important attributes that have significant effects on home appliance product quality. Whereas, function, ease of use, durability, eco-friendliness, support service, value for money and adaptability are relatively less important attributes that have the least effect on home appliance product quality. These unfavorable results of many attributes have comparatively low correlations could possibly be due to the small sample size or the diverse characteristics of examined home appliance products (television, refrigerator, washing machine, and air conditioner). The proposed attributes may be inappropriate and unsuited to generalize and capture home appliance characters. A search for more appropriate of composite attributes for evaluating home appliance product quality is suggested.

All the research results generally provide a means for managers to identify important attributes that should be emphasized more when producing a quality product for Thai market. By highlighting these attributes, firms could improve their product quality, consequentially reduce their production costs and ultimately provide a higher and better product quality to the market.

In summary, with significance in correlation coefficients and p-values, the results of this research verify that there are positive and significant effects of the
proposed attributes on Thai product quality, particularly on automobile and electronics & IT products quality. Furthermore, the results also provide evidence that the proposed attributes are valid, uphold the hypothesis $A_0$, and can be used in measuring various types of product quality, particularly in the case of Thailand.

**LIMITATIONS AND FUTURE STUDY**

This research only identifies the effect of attributes on product quality but do not identify the causality between attributes and product quality. It would be very interesting to see the causality between them. The assessments of product quality are knowledge-dependent and based on various aspects. To translate and grade product quality scores and attributes scores by only one assessor, the results might be bias and differ from other assessors. If product quality were to be assessed by two or more assessors, the results could be remarkable. Finally, the sample size of this research is rather small, specifically in home appliance. By examining bigger sample size, more significant research result could be delivered.

**REFERENCES**


APPENDICES

Appendix A: The definitions of the proposed ten attribute / dimensions

**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 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 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.

**Customer Satisfaction**  
The overall feeling and perception of a consumer on a product, compared to consumer’s expectation and/or previous experience usage of a same brand product or from the same company.

**Support Service**  
Additional and intangible value(s) that 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 the brands or different producers.

Appendix B: The content analysis outline for grading overall product quality reviews from public reviews

**Excellent – 5 point:** A market leader that offers exceptional performance; **willing to buy**
- It is considered the most powerful product available at that specific period of time.
- This product is the big winner.
- 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.
- 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 product that does everything right.
• It is an outstanding performer that excels in every aspect.

(1) **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.

(2) **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.

(3) **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.

(4) **Unacceptable – 1 point:** Missing necessary features; *avoid to buy*
• It scored the lowest in overall satisfaction.
• It occupied the lowest spot and ranked at the bottom among its competitors.
• It performs poorly and most of its features do not meet the standard.
• Definitely avoid/ do not buy.

**Appendix C: The content analysis outline for grading product quality reviews from public reviews into each attribute**

(1) **Completely Satisfied – 10 point: Extremely excellent on particular dimension**
• The product is considered to be the most outstanding in that particular attribute in the market (market leader) and among the competitors.
• This attribute is the utmost strength and the best selling point of the product.
• This attribute 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 is clearly the most powerful among other attribute dimensions.
• This attribute makes a product to be/offer the best among its competitors.
• This attribute 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 in the market and for its class.
• This attribute is one of the strengths of a product and potentially is one of the selling points.
• This attribute is excellent, somewhat beyond the expectation and slightly above the standard.
• This attribute receives high scores from the Editor/Reviewer and it is very worthwhile to buy.
• This attribute 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 in the market and for its class.
• This attribute could probably be one of the strengths of a product and one of the selling points.
• This attribute is very good, meets the expectation, and qualifies for the standard.
• This attribute is an attractive alternative; it makes a product very reasonable to buy.
• There is high opportunity and room for this attribute for the improvement to become a top class.
• This attribute 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 is considered to be good, meets the expectation, and achieves the standard.
• There are rooms for this attribute for further improvement.
• It is obviously not the best in that particular attribute, but it is comparatively reasonable to buy.

(5) Somewhat Satisfied – 6 point: Somewhat good product quality on particular dimension
• This attribute is considered to be somewhat good, somewhat meets the expectation, and somewhat achieves required standard.
• There is much room for this attribute for improvement.
• Taking other factors into consideration, this attribute 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 in the market and for its class.
• This attribute is considered to be acceptable, nearly meets the expectation, and somewhat achieve required standard.
• To be more competitive, this attribute needs many improvements.
• This attribute makes a product a moderate choice to buy.

(7) **Somewhat Dissatisfied – 4 point:** *Somewhat poor* product quality on particular dimension
• This attribute is considered to be somewhat poor, could not meet the expectation, and could not achieve required standard.
• This attribute 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 is considered to be poor, somewhat a disappointment, and substandard.
• This attribute makes a product outdistanced by its competitors.
• This attribute performs somewhat unsatisfactory, maintain previous weaknesses, and do not develop much from the past.
• This attribute 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 is considered to be very poor, disappointment, and behind substandard.
• This attribute is the weakness of a product, makes a product look dim, unattractive, and unable to compete with competitors.
• This attribute 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 in the market and among its class.
• This attribute is unacceptable, very disappointing, and much behind substandard.
• This attribute is the threat of a product.
• This attribute receives very low scores from the Editor/Reviewer.
• This attribute performs badly and it is quite pointless to improve.
• Avoid to buy.

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

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