

Article

Product Attributes, Evaluability, and Consumer Satisfaction

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Abstract: We studied the determinants of consumer satisfaction with mobile phones on the basis of their perceived product attribute performance, and the disconfirmation of product attribute expectations. Disconfirmation refers to the discrepancy between the prior expectation about the performance of a product's attributes, and its perceived realizations after purchase. Evaluability theory assumes that the perceived attribute performance has a larger effect on consumer satisfaction for easy-to-evaluate than for difficult-to-evaluate attributes, after product acquisition. Furthermore, we used predictions of the asymmetric evaluations of gains (product performs better than expected) and losses (product performs worse than expected) from prospect theory, in combination with evaluability theory. We studied how evaluability influences the effects of the asymmetric evaluations of both positive and negative disconfirmation of product attribute expectations on consumer satisfaction. Our empirical study included 3099 participants of Amazon Mechanical Turk. We found that negative attribute disconfirmation had a larger effect on satisfaction than positive attribute disconfirmation, which is in line with loss aversion theory. Although the perceived product attribute performance positively influenced satisfaction, we found little support for the effects of perceived attribute performance being influenced by attribute evaluability. However, our findings indicated that negative attribute disconfirmation influenced satisfaction to a greater extent for relatively difficult-to-evaluate attributes than for relatively easy-to-evaluate attributes. We discuss both theoretical and managerial implications of our findings.



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1. Introduction

Consumer satisfaction is considered essential to long-term business success [1,2]. Organizations have a need to produce products and services that yield highly satisfied and loyal consumers [3]. Having loyal consumers reduces the costs for firms, since the expenses for acquiring new consumers are much higher than those for keeping existing ones [4]. Studying the factors that determine consumer satisfaction is of vital importance for a company, as consumer satisfaction has been described as the best indicator of a company's future profits [5]. In addition, several studies have indicated that there are positive effects of consumer satisfaction on overall brand equity and its different aspects [6], i.e., retailer awareness, retailer associations, the retailers' perceived quality, and retailer loyalty [7,8].

Most studies of consumer satisfaction have been based on the overall satisfaction with a product as a whole [5,9], while only a few have related consumer satisfaction to the performance of product attributes [10]. Gustafsson and Johnson [11] noted that service quality attributes are critical to a company's efforts for quality improvement. We aimed to study which type of product attribute leads to the most satisfaction, thus providing clues for providers to improve their products. We focused on attribute evaluability [12] and analyzed the ease or difficulty in evaluating a product's attribute [13]. This was assumed to be related to consumer satisfaction [14]. Although evaluability has usually been manipulated experimentally, we studied evaluability as a consumer's perceptions of product attributes.

We aimed to show the effects of attribute evaluability on consumer satisfaction outside of the laboratory context, in a real consumer setting. This aim matched the endeavor in research to study the scaling-up of small-scale laboratory findings to larger markets and settings, as advocated by List [15]. Rather than conducting large-scale experiments to study scalability, we employed direct measures of attribute evaluability from a large sample of consumers to study the effects on consumer satisfaction. Similar attempts to study the scalability of laboratory findings were from De Baets and Buelens [16] who employed a verbal questionnaire to relate loss aversion to the respondents' age and education; Blais and Weber [17] related verbal risk preference scales to both the participants' gender and engagement in risky behaviors; Joireman et al. [18] related verbal time orientation scales to behaviors with delayed consequences; Murphy et al. [19] and Offerman et al. [20] related participants' social preferences to behaviors that are associated with public goods and donations; Antonides et al. [21] and Olsen et al. [22] related mental accounting measures to financial behaviors.

Another basic process in the formation of consumer satisfaction is a judgment of product performance that is relative to the reference point of the product's performance expectations [23]. In general, the positive disconfirmation of expectations (the perceived realizations of performance exceeding expectations) will lead to consumer satisfaction, whereas negative disconfirmation (the perceived realizations of performance falling short of expectations) induces dissatisfaction. From prospect theory, it is known that negative deviations from a reference point are judged more negatively than their commensurate positive deviations are judged positively [24], thus indicating asymmetric effects of product evaluations. Mittal et al. [10] found that the participants' dissatisfaction was higher after the negative disconfirmation of a product's attribute expectations than their satisfaction was after positive disconfirmation. However, they did not study whether these asymmetric effects differed across attribute types. A hitherto under-researched topic is whether consumer satisfaction differs when it is due to an attribute expectation disconfirmation of easy-to-evaluate versus difficult-to-evaluate attributes. This topic is theoretically interesting, because such differences may be driven by different psychological processes. Also, it is of practical significance, because it provides a clue to providers in regard to the type of product attributes for which negative expectation disconfirmation needs to be avoided. We consider attribute evaluability as a factor that moderates the effects of attribute disconfirmation on consumer satisfaction.

Here we focused on both the attribute evaluability and asymmetric evaluation of various mobile phone attributes, through the use of a consumer survey. The survey used mTurk participants from the U.S. and included the owners of newly acquired, refurbished, and second-hand phones. To the extent that satisfaction increases the remaining value of such durable goods to their owners, it may also increase their lifetime, which implies a decrease in the use of natural resource in the production of these goods [25].

2. Theory

2.1. Satisfaction

In the expectancy–disconfirmation model [26], the main antecedents of consumer satisfaction are product expectations, perceived performance, and the resultant disconfirmation [26,27]. Perceived performance is a consumer's perception of a product's performance, and their opinion about the product's fulfilment of their needs, wants, and desires [28]. If the perceived performance matches the expectations, confirmation results. Disconfirmation, on the other hand, results when the perceived performance does not match the expectations. Negative disconfirmation occurs if the performance is lower than expected, while positive disconfirmation occurs if the performance exceeds expectations. Hence, the gap between actual performance and prior expectations is called expectancy disconfirmation [26,27], which is assumed to determine consumer satisfaction [27,29]. Here, we applied the expectancy–disconfirmation model to specific product attributes in relation to the participants' overall satisfaction with a product. We believe that such an application

will inform specific product improvements and marketing communications, rather than global product communications.

The expectancy–disconfirmation model is dominant in satisfaction research [30] and has been applied to various domains, including the financial sector [31], the public domain [32–34], negotiation settings [35], the tourism industry [36], and online consumption settings [37]. Other satisfaction models are the SERVQUAL model, which links consumer expectations and perceptions to producer services [38], attribution theory, which focuses on whether the outcome of consumption is considered a success or failure [39], and equity theory, which focuses on whether the consumer is better off than others [23].

In addition to brand equity and consumer loyalty, several other consequences of consumer satisfaction exist. Szymanski and Henard [40] found evidence for the effects of consumer satisfaction on complaining behaviors, word-of-mouth, and repeat purchasing. They also pointed to possible negative relationships between repeat purchasing and either complaining behaviors or negative word-of-mouth. Additionally, several economic effects have been found. Fornell et al. [41] demonstrated the presence of positive relationships between changes in the American Customer Satisfaction Index (ACSI) and changes in consumer spending. Fornell et al. [42] found the presence of positive effects on stock prices for firms scoring highly on the ACSI. Anderson et al. [43] found the presence of higher shareholder values for firms with higher ACSIs.

However, the research on consumer satisfaction with (new) technologies is rather scarce, especially in the phone industry. Woo and Fock [44] examined consumer satisfaction in the Hong Kong mobile phone industry, but mainly focused on aspects of the network providers, such as transmission quality and network coverage. Chitturi et al. [45] showed that cell phones with hedonic features (e.g., an oyster flip feature) influenced consumer emotions, word-of-mouth, and repurchase intentions to a greater extent than phones with utilitarian features (e.g., network coverage). Here, we focused on the effect of an ease of product attribute evaluations on consumer satisfaction with their mobile phones.

2.2. Evaluability

The concept of evaluability has been defined as: “the extent to which a person has relevant reference information to gauge the desirability of target values and map them onto evaluation” [14] (pp. 344, 345). Hence, for attributes that are considered to be difficult to evaluate, this means that the decision maker lacks knowledge or information to adequately judge the given value of the attribute. For easy-to-evaluate attributes, on the other hand, this means that the decision maker is able to judge how good an attribute is relative to other attribute values, based on prior experience and knowledge [46].

The concept of evaluability was illustrated by Hsee [13], who showed that an object will be evaluated differently when it is considered in isolation (separate evaluation, SE) than when evaluated jointly. In one study, the participants were exposed to two dictionaries (A vs. B). The dictionaries had the same year of publication but differed in the number of entries (10,000 vs. 20,000), as well as their condition (like new vs. having a torn cover). During the joint evaluation (JE), the participants were shown both dictionaries together and asked to indicate their willingness to pay (WTP) for each dictionary. During the SE, the participants were shown only one dictionary and were asked how much they were willing to pay for it. Hsee [13] showed that in the JE, dictionary B had higher WTP values, whereas dictionary A had higher WTP values in SE. The evaluability hypothesis implies that difficult-to-evaluate attributes generally carry more weight under JE conditions than easy-to-evaluate attributes, whereas the reverse is true under SE conditions, thus leading to preference reversals [13]. Furthermore, evaluability is assumed to be related to the evaluator’s knowledge about the attributes [14].

The concept of evaluability is relevant to consumer satisfaction, since satisfaction has been described as an “isolated evaluation” after acquisition that is separated from the acquisition situation [12]. Yang et al. [47] showed that consumers reported higher feelings of happiness after their choice if they had chosen a picture frame (with easy-to-evaluate

attractiveness) under SE than if they had chosen a picture (with difficult-to-evaluate picture resolution) under JE. Therefore, we hypothesized that easier-to-evaluate attributes in isolation would be more important than difficult-to-evaluate attributes in isolation for determining consumer satisfaction [12,14,48]. The relationship between evaluability and consumer satisfaction has been previously investigated by manipulating attribute evaluability, mostly in the health care [49,50] and service quality domains [46]. However, to our knowledge, evaluability has never been assessed by direct measurements taken from consumers.

Since evaluability has been defined as an individual's ability to judge the desirability of product attributes, it is not directly applicable to consumer satisfaction based on expectation disconfirmation, which results from a comparison of product performance after acquisition and expectations held before acquisition. According to the evaluability hypothesis, the perception of difficult-to-evaluate attributes may be important in a consumer's choice under joint evaluation (before acquisition) conditions, whereas the evaluation of the same attributes' performance after acquisition (a separate evaluation) would be less important in generating satisfaction. For easy-to-evaluate attributes, the reverse would be true. Difficult-to-evaluate attributes may lead to unrealistic expectations about those attributes that are either too high or too low, with subsequent implications for consumer satisfaction. It is not clear, theoretically, whether the expectation disconfirmation of difficult-to-evaluate attributes would contribute more or less to product satisfaction than the disconfirmation of easy-to-evaluate attributes. Therefore, we studied evaluability empirically, in this respect.

In contrast with prior experimental studies, which typically focus on product differences which concern two different attributes (e.g., the cover and the number of entries of a dictionary), our study investigated the perceived evaluability of a larger number of attributes. Additionally, since the evaluability was not manipulated, the perceived evaluability in our study may have less variation, and may be less extreme, than that observed in previous, experimental studies. However, we believe that our method captures the consumer's evaluation process in a more realistic way than the experimental laboratory approach.

2.3. Satisfaction and Loss Aversion

Loss aversion refers to the asymmetric evaluation of positive and negative changes with respect to a reference point, for example ownership [24]. The well-known endowment effect—a higher reluctance to give up a good than the willingness to acquire that good—is an example of loss aversion [51,52]. With respect to satisfaction, these changes do not refer to changes in ownership (acquisition or forfeiture), but rather to changes in the perceived quality of product attributes when compared with previously held expectations. Brenner et al. [53] refer to such changes as valence gains and valence losses, with consequent asymmetric evaluations.

In Oliver's model [23], the reference points that are used to evaluate product performance are referred to as expectations. Expectations can be either holistic—those which refer to the product as a whole—or differentiated—those referring to product attributes. An example of the use of holistic expectations is by Yan and Bao [54], who studied dwellers' opinions about housing after their relocation as a global evaluation. Worse-than-expected outcomes had a larger negative effect on housing satisfaction than the positive effects of better-than-expected outcomes, thus indicating an asymmetry of valence gains and valence losses. Mittal et al. [10] were the first to examine positive and negative disconfirmation in regard to car attributes in a consumer survey. In their study, the asymmetric effect of disconfirmation—which was measured as a car's performance being better, the same or worse than expected—on satisfaction with the car was confirmed for each of the car attributes. However, they did not classify their attributes into meaningful categories. Although this research showed that positive attribute expectation disconfirmation has different effects on consumer satisfaction than negative disconfirmation, the differences in size between the asymmetric effects across the product attributes were left unexplained. Mittal

et al. [10] concluded that there is a need to develop an attribute typology that explains the asymmetry between the effects of gains and losses on consumer satisfaction, which was also the aim of our study. More specifically, we assumed that an attribute's evaluability moderates the effects of that perceived attribute's performance, as well as the attribute's expectation disconfirmation. Moreover, we expected that these moderating effects would be different for positive and negative attribute disconfirmation.

Figure 1 shows a summary of the expected theoretical relationships. Perceived attribute performance has a positive effect on consumer satisfaction, which is moderated by attribute evaluability, such that performance has a more positive effect for easy-to-evaluate attributes than for difficult-to-evaluate attributes. Positive (negative) attribute expectation disconfirmation has a positive (negative) effect on consumer satisfaction, with the moderating effects of evaluability being unknown.

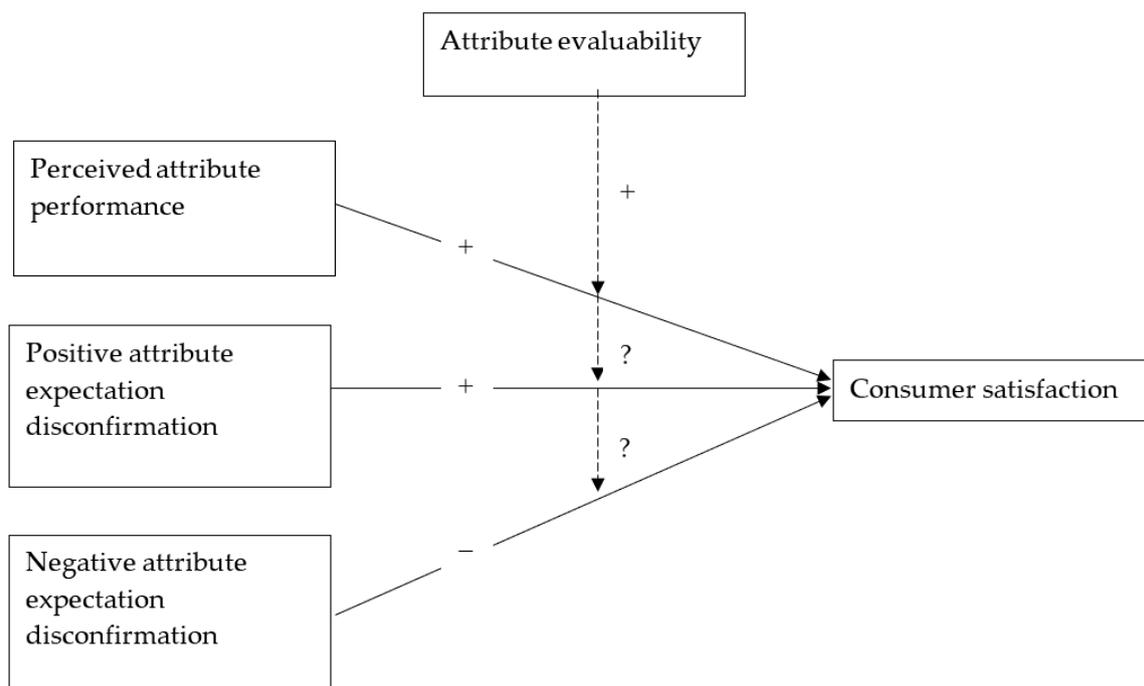


Figure 1. Theoretical effects of attribute perceptions on consumer satisfaction moderated by attribute evaluability (+ and – indicating positive and negative effects, respectively). The question marks denote theoretically unknown moderation effects).

2.4. Other Factors Influencing Consumer Satisfaction

Attribute evaluability is just one attribute characteristic that may influence consumer evaluations. The literature includes studies that describe a variety of other attribute characteristics that are possibly related to satisfaction, which will be considered next.

Chitturi et al. [45] showed that a positive product experience, in regard to hedonic benefits, caused a greater amount of promotion-focused emotions such as delight and satisfaction, and less prevention-focused emotions such as security and confidence. In contrast, positive experiences that concerned utilitarian benefits caused a greater number of prevention-focused emotions and fewer promotion-focused emotions. This research shows that the experiences concerning different product attribute types may lead to qualitatively different types of emotions; this is possibly related to consumer satisfaction.

Slotegraaf and Inman [55] found that consumer satisfaction with a number of car attributes was relatively low for resolvable attributes, that is, attributes that might be fixed or changed without buying a new product, such as the operation of the brakes. In contrast, consumer satisfaction was relatively high for irresolvable attributes—attributes that cannot be fixed—such as interior roominess. This difference was assumed to be due to the attribution of any dissatisfaction to either the inherent nature of the vehicle

(irresolvable) or to a fault of the manufacturer (resolvable). Apparently, resolvable and unresolvable attributes may be differentially related to consumer satisfaction.

Lee and Choi [56] assessed the relationships between consumers' specific shopping tourism experiences and their shopping destination satisfaction. Depending on the type of relationship, they classified shopping experience attributes as either a dissatisfier (e.g., the appearance of store staff), a delighter (e.g., ease of communication with store staff in a foreign language), a satisfier (e.g., an attractive promotional campaign), a hybrid (equal strength in causing either dissatisfaction or delight), or a frustrater (e.g., unreasonably priced merchandise). Their study showed that different shopping experience attributes are associated with qualitatively different types of satisfaction. In addition to the attribute characteristics that are associated with consumer satisfaction, product-related factors, such as the price of the product, as well as the product ownership experience, such as the duration of ownership, may influence the satisfaction with a product.

Nelson [57], as well as Maute and Forrester [58], distinguished between search attributes (which can be evaluated easily before acquisition), experience attributes (which can be evaluated only after acquisition), and credence attributes (which are difficult to evaluate, even after acquisition). Although search attributes may be easier to evaluate than experience and credence attributes, it is not clear whether they are qualitatively and empirically the same as the evaluability categories.

3. Methods

3.1. Sample

A pilot study was conducted in fall of 2018 with a Dutch convenience sample ($n = 204$), to study the effects of evaluability and attribute disconfirmation on satisfaction for the ten most important features of mobile phones. The pilot was then further used to test measures of perceived attribute performance, attribute expectation disconfirmation, evaluability, and satisfaction. Since the pilot study comprised a small sample, and yielded a substantial non-response, the main study was conducted on a larger sample from Amazon Mechanical Turk (mTurk) in the fall of 2020.

mTurk is becoming increasingly popular in research which is being reported in the consumer and management literature [59]. We believed that mTurk was appropriate for our study, because mobile phones are commonly used in the U.S. population, including among mTurkers, and no sensitive questions were asked in the questionnaire. We first tested our questionnaire in an mTurk pilot study involving 200 respondents. The average time spent on the questionnaire was 5.5 min. We used Qualtrics to implement our questions into an easy-to-use format. We then recruited 3099 respondents from the U.S. participants of mTurk who had a 90% approval rating. This criterion was set to facilitate good-quality responses, while avoiding sampling only the most sophisticated mTurk participants. We paid \$0.90 for each completed response. After checking for duplicate mTurk IDs, 30 cases with duplicate or missing IDs were deleted from the dataset. All these measures have been recommended to increase the validity of mTurk responses [59]. The sample size was comparable to studies reported in Coppock et al. [60].

3.2. Measures

The satisfaction scales were adapted from the American Customer Satisfaction Index [61] and comprised the following questions.

- Taken everything together, to what extent has your current phone fallen short of your expectations or exceeded your expectations? Answers ranged from 1 (this phone has definitely fallen short of my expectations) to 7 (this phone has far exceeded my expectations).
- To what extent are you satisfied with your phone? Answers ranged from 1 (extremely dissatisfied) to 7 (extremely satisfied).

- Please, imagine an ideal phone. How well do you think your phone compares with that ideal phone? Answers ranged from 1 (my phone is very far from the ideal phone) to 7 (my phone is very close to the ideal phone).

The Cronbach's alpha of the satisfaction scale was 0.782, which could not be improved by omitting one of the questions.

Evaluability has been defined as the degree of perceived ease of evaluating an attribute's quality [5]. In order to measure how easy or difficult it was for respondents to evaluate the aspects of their phone, the following question was asked: "How was evaluating the following aspects of your phone for you? (1) very difficult–(7) very easy."

To control for sociodemographic variation, the respondents reported their gender, year of birth, and highest level of educational attainment. In order to be able to control for the price of one's phone, we asked: "What was the price of your current phone at the moment of purchase?" (€0–300; €301–600; more than €600). To be able to control for the duration of ownership, we asked: "When did you buy your current phone?" (less than 6 months ago; 6–12 months ago; more than 12 months ago). In addition, the brand of the phone was reported.

The following 15 phone attributes were taken both from the pilot study and from ACSI [62].

- Price: the price paid for the smartphone;
- Features of the phone: e.g., the camera of the phone, whether the phone is water-resistant or not, and other functionalities;
- Ease of text messaging;
- Ease of phone calling;
- Ease of navigating phone menus and settings;
- Ease of using phone operating system and software;
- Video quality;
- Audio quality;
- Battery: the quality of the phone's battery;
- Storage capacity: the phone's amount of memory capacity;
- Availability: the ease of purchasing the phone;
- Service: the service that came with the phone, e.g., contact with the supplier and easiness of repair;
- Warranty: the warranty that came with the phone;
- Durability: the phone's lifetime;
- Design/appearance of the phone: how the phone looked, including its size, weight, screen size.

Two common approaches for measuring disconfirmation exist: (1) directly measuring the perceived gap between performance and expectation, and (2) subtracting the retrospective expectation from the perceived current performance [28]. Here, we focused on the direct measures of disconfirmation in our survey. Based on Oliver [26], we asked: "How have the following aspects of your phone performed in comparison to your expectations?" A 7-point scale ranging from 1 (much worse than you thought) to 7 (much better than you thought) was used to indicate the disconfirmation for each of the aspects of the mobile phone; the neutral midpoint was 4 (the same as you expected). Positive disconfirmation was classified as scale values above 4, and negative disconfirmation as scale values below 4. At the scale value of 4, both positive and negative disconfirmation were set equal to 0. This procedure resulted in scales of the same length.

As recommended by Oliver [63], the questions regarding satisfaction were posed at the end of the survey to avoid an effect of these questions on the questions about expectations and performance. In order to measure consumer satisfaction, Oliver [63] suggested asking about whether the object has met one's expectations or not, and whether one is content or not with the object. We asked: "To what extent has your current phone met your expectations? (1) this phone has not met my expectations at all–(7) this phone

has completely exceeded my expectations,” and “To what extent are you content with your phone? (1) I am not at all content with my phone–(7) I am really content with my phone.”

The attributes were presented in a random order in each of the series of questions that concerned the perceived attribute performance, expectation disconfirmation, and evaluability. In addition to the information about the type of phone (brand, new/refurbished/second-hand), the respondents’ characteristics of gender, age, education, and income were questioned.

3.3. Estimation Strategy

We estimated the effects of attribute performance, attribute expectation disconfirmation and attribute evaluability by an ordinary least squares regression, as follows: In Equation (1), y_i denotes our measure of satisfaction for an individual i ; the variables x_{ij} denote our measure of performance or expectation disconfirmation of attribute j for the individual, i (J being the number of attributes); x_{ik} denotes the telephone type and sociodemographic variables for an individual, i (K being the number of variables); the coefficients α and β show the effects of the variables x on y , respectively; ε_i is a normally distributed error term. Equation (1) implies a linear model, which relates the perceived attribute performance or attribute disconfirmation, to satisfaction. This linear model has been applied previously in attribute utility models [64–66]. This linear model has been shown to be robust, and to give a good approximation of alternative, nonlinear specifications [67], although it may result in negative coefficients, in the case of multicollinearity among the attributes [11]. Multicollinearity was diagnosed by Variance Inflation Factors (VIF) in the empirical analysis.

$$y_i = \alpha_0 + \sum_{j=1}^J \alpha_j x_{ij} + \sum_{k=1}^K \beta_k x_{ik} + \varepsilon_i \quad (1)$$

The regression model estimates the regression weights for the attributes by minimizing the squared sum of the error terms. Alternatively, the weights may be assessed directly, by asking consumers to indicate the importance of each attribute in contributing to their satisfaction [11]. Here, we assumed that the effects of attribute performance, resp. disconfirmation, were moderated by the evaluability of the attributes. More specifically, we assumed that the weights α_j were a linear function of evaluability e , i.e., $\alpha_j = b_0 + b_1 e_j$. A similar specification was used by Lew and Whitehead [68], in which the weights were modeled as a linear function of attention paid to the attributes. Again, this linear relationship is convenient, and may be considered as a first approximation to possibly more complex relationships. Hence, through substitution of the evaluability function for α_j , and rearrangement of the terms, Equation (1) is written as:

$$y_i = \gamma_0 + \gamma_0 \sum_{j=1}^J x_{ij} + \gamma_1 \sum_{j=1}^J e_{ij} x_{ij} + \sum_{k=1}^K \beta_k x_{ik} + \varepsilon_i \quad (2)$$

In the case of disconfirmation, the coefficients γ_0 and γ_1 in Equation (2) were estimated separately for positive and negative disconfirmation to account for asymmetric effects. Thus, a statistically significant coefficient γ_1 would indicate the moderating effect of evaluability. Different coefficients γ_1 for positive and negative disconfirmation would indicate asymmetric moderating effects.

4. Results

After deleting respondents with duplicate or missing mTurk IDs, 3069 respondents were eligible for analysis. In this sample there were, at most, 20 missing responses to the attribute evaluability, perceived performance and disconfirmation questions, and the education, income, gender, and age questions. The sample distribution is shown in Table A1 of Appendix A. The distribution of sociodemographic characteristics was similar to that found by Chandler et al. [69], who also reported a relatively low representation of

low educational attainment in an mTurk survey. The low number of missing responses indicated that the questionnaire was easy to complete.

4.1. Evaluability

Table 1 shows the average reported ease of evaluating the phones' attributes. Attribute evaluability was rated at the higher end of the seven-point scale, whereas service, warranty, battery quality, and durability ranked relatively low. These attributes are important in determining the lifetime of mobile phones, and are indirectly related to sustainability issues.

Table 1. Distribution of attribute evaluability scores.

	Mean	SE
Design/appearance of the phone: including its size and weight	5.93	0.021
Availability: the ease of purchasing the phone	5.89	0.022
Ease of text messaging	5.86	0.022
Ease of phone calling	5.83	0.023
Storage capacity: the phone's amount of memory capacity	5.78	0.023
Features of the phone: e.g., the camera of the phone, whether the phone is water-resistant or not, and other functionalities	5.72	0.022
Ease of using phone operating system and software	5.68	0.023
Video quality	5.67	0.024
Price: the price paid for the smartphone	5.67	0.024
Ease of navigating phone menus and settings	5.66	0.023
Audio quality	5.54	0.025
The service that came with the phone, e.g., contact with the supplier and easiness of repair	5.50	0.024
Warranty: the warranty that came with the phone	5.46	0.024
Battery: the quality of the phone's battery	5.42	0.026
Durability: the phone's lifetime	5.31	0.027

4.2. Satisfaction, Perceived Performance, and Expectation Disconfirmation

Table A2 in Appendix A shows the regressions of satisfaction on perceived performance and expectation disconfirmation, concerning all the phone attributes. These regressions show that the relatively difficult-to-evaluate attributes, such as the service, warranty, battery, and durability had relatively large effects on satisfaction, whereas relatively easy-to-evaluate attributes, such as the design and storage had relatively small effects. The VIFs for the attributes in these regressions were relatively low (highest value of 2.3, resp. 2.6), which indicated that multicollinearity was not a problem.

Here, we focused on the moderating effect of evaluability on these effects by applying Equation (2). Table 2 shows a significant effect of the overall perceived attribute performance (0.052), but no significant evaluability moderation effect (0.000). Both Apple and Samsung phones were perceived as having a better performance than those of other phone brands, and a higher purchase price led to higher satisfaction. Surprisingly, both refurbished and second-hand phones led to higher satisfaction than new phones, given the other characteristics.

In regard to expectation disconfirmation, negative disconfirmation (0.178) had a much stronger effect on satisfaction than positive disconfirmation (0.030) ($p < 0.001$), which indicated asymmetric evaluation. The moderating effect of evaluability was not significant for positive disconfirmation (0.000) but was strongly negative for negative disconfirmation (-0.015) (significant difference at $p < 0.001$). The latter result indicates that the negative disconfirmation of more difficult-to-evaluate attributes had a stronger effect on satisfaction than the negative disconfirmation of more easy-to-evaluate attributes. These results held up when the perceived performance and expectation disconfirmation were combined into one regression. The latter results are presented in Figure 2, including the standardized regression coefficients (not shown in Table 2).

Table 2. Regression of satisfaction on moderated attribute performance evaluations and attribute disconfirmation.

	Perceived Performance	Positive vs. Negative Disconfirmation	Perceived Performance and Positive vs. Negative Disconfirmation
Constant	0.679 *** (0.174)	4.942 *** (0.097)	2.048 *** (0.183)
Sum of attribute performance perceptions	0.052 *** (0.003)		0.035 *** (0.003)
Sum of attribute performance perceptions × evaluability	0.000 (0.000)		0.000 (0.000)
Sum of positive attribute disconfirmations		0.030 *** (0.002)	0.020 *** (0.002)
Sum of positive attribute disconfirmations × evaluability		0.000 (0.000)	0.000 (0.000)
Sum of negative attribute disconfirmations		0.178 *** (0.012)	0.089 *** (0.012)
Sum of negative attribute disconfirmations × evaluability		−0.015 *** (0.003)	−0.007 ** (0.003)
Apple ^a	0.133 ** (0.043)	0.183 *** (0.044)	0.152 *** (0.040)
Samsung ^a	0.238 *** (0.041)	0.135 *** (0.042)	0.164 *** (0.038)
6–12 months ^b	−0.011 ** (0.042)	−0.083 (0.043)	−0.052 (0.039)
1–3 years ^b	−0.122 ** (0.043)	−0.066 (0.044)	−0.068 (0.040)
3+ years ^b	−0.130 (0.067)	−0.090 (0.069)	−0.054 (0.062)
Price \$301–600 ^c	0.114 ** (0.042)	0.115 ** (0.043)	0.077 * (0.039)
Price \$601–1000 ^c	0.221 *** (0.042)	0.243 *** (0.043)	0.198 *** (0.039)
Price \$1000+ ^c	0.379 *** (0.051)	0.280 *** (0.052)	0.276 *** (0.048)
Refurbished ^d	0.133 *** (0.038)	−0.090 * (0.039)	0.037 (0.036)
Second-hand ^d	0.160 * (0.063)	0.003 (0.065)	0.108 (0.059)
Unknown ^d	−0.100 (0.164)	−0.342 * (0.166)	−0.144 (0.152)
Female	−0.057 (0.028)	0.005 (0.028)	−0.037 (0.026)
Age	−0.005 *** (0.001)	−0.002 (0.001)	−0.004 *** (0.001)
Some college ^e	−0.203 *** (0.060)	−0.153 * (0.061)	−0.167 ** (0.056)
College ^e	0.103 (0.055)	−0.101 (0.056)	−0.017 (0.051)
Post-college ^e	0.163 ** (0.061)	−0.063 (0.063)	0.018 (0.057)
High income	−0.070 * (0.029)	0.054 (0.030)	−0.002 (0.028)
#Observations	3048	3048	3048
Adjusted R ²	0.468	0.449	0.544

Note: ^a Default is other brands; ^b default is less than 6 months ownership; ^c default is low price; ^d default is new phone; ^e default is low education. × denotes the moderation operator. * significant at 5%; ** significant at 1%; *** significant at 0.1%. Values in parentheses are standard errors.

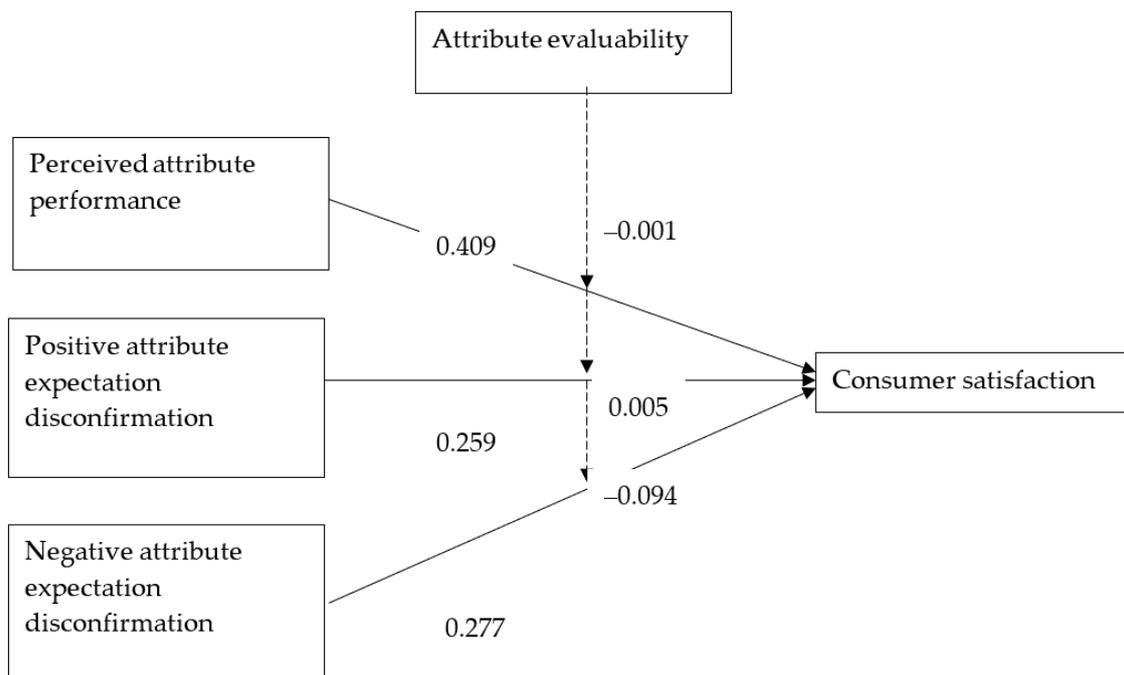


Figure 2. Empirical effects of attribute perceptions on consumer satisfaction, moderated by attribute evaluability (coefficients are standardized regression coefficients).

Table A3 in Appendix A shows a regression of satisfaction on the positive and negative disconfirmation for each attribute. Although a number of coefficients were not significant, the significant coefficients for negative disconfirmation were typically two to three times higher than those for positive disconfirmation, which indicates an asymmetric evaluation effect at the attribute level.

5. Discussion

We aimed to study the effects of the asymmetric disconfirmation of mobile phone attributes, as well as the moderating effect of attribute evaluability on consumer satisfaction. Although we found perceived attribute performance to be significantly associated with consumer satisfaction, we found no support for the perceived performance of relatively easy-to-evaluate attributes to be more strongly associated with consumer satisfaction than the perceived performance of relatively difficult-to-evaluate attributes, unlike the predictions from evaluability theory [48]. Previous experiments have used quite striking differences between easy- and difficult-to-evaluate attributes, such as a torn cover versus the number of entries in a dictionary, or an overfilled, small ice-cream versus an underfilled, large ice-cream. In actual practice, the differences between easy- and difficult-to-evaluate attributes are smaller, thus possibly explaining the lack of effect concerning consumer satisfaction in the actual consumer context. Furthermore, we included 15 attributes, whereas earlier experiments usually employed only two attributes.

We found significant effects of expectation disconfirmation on consumer satisfaction, despite the possible effects of cognitive dissonance reduction [70], or the possible distortion of facts to the advantage of the mobile phone that was in use after acquisition [71]. The latter effects would tend to mitigate the effects of disconfirmation after one becomes accustomed to using the mobile phone, but the disconfirmation effects were still significant here.

We confirmed the predictions from behavioral-economic theory, with respect to the asymmetric evaluation of gains and losses [24], and from previous research [10], in our findings of the stronger effects of negative rather than positive expectation disconfirmation on consumer satisfaction. Since evaluability theory has no predictions which regard the effects of expectation disconfirmation on consumer satisfaction, we studied these effects in an exploratory way. Our findings indicate a significant moderating effect of

attribute evaluability on consumer satisfaction for negative disconfirmation, but not for positive disconfirmation. This might be due to unrealistic (i.e., too high) expectations about the difficult-to-evaluate attributes prior to the product's acquisition, which leads to disappointment if the product's performance is relatively low. We think of evaluability theory as a refinement of asymmetric evaluation theory regarding product attribute effects on consumer satisfaction.

As noted by others [10,72,73], the asymmetric effects of gains and losses on consumer satisfaction may have implications for product improvements by manufacturers. In general, it may be more efficient to prevent negative disconfirmation than stimulate positive disconfirmation. This may be accomplished by either providing information to manage expectations, or by improving product features frequently, which could lead to positive disconfirmation. Our study shows that there are significant effects of negative disconfirmation in the cases of difficult-to-evaluate attributes. One way to overcome these effects is to simplify the information that concerns a product's difficult-to-evaluate attributes (for example, by showing customer reviews for such attributes), or to change the conditions of a warranty in case of deterioration or defects (for example, by offering guaranteed product performance for five years). Avoiding negative disconfirmation for difficult-to-evaluate product attributes may result in a higher overall customer satisfaction, as well as increased brand equity, without considerable investment into attributes which result in positive disconfirmation.

In addition to the product type and asymmetric gain–loss evaluations, other factors that are related to loss-aversion effects in consumer choices have been found [74]. One relevant finding is that the asymmetric evaluation appeared to be larger for durable products than for nondurable products and services, which possibly limits the generalization of our results to the category of durable goods. Additionally, Johnson [75] suggested that the effects of expectations on satisfaction may be weaker for services than for products. Furthermore, since mobile phones share many characteristics with other durable consumer products, for example, photographic equipment, wearables, and computers, our findings concerning satisfaction with mobile phones may be generalized to those markets. However, the effects' sizes may be different. On the other hand, several mobile phone features are connected to provider attributes, for example, the speed of data processing, data storage, and warranty, which makes the generalization of these results to other products' markets difficult. Related to this, other products, including household equipment or services, contain even more attribute types, thus generalizing our results to these markets is even more difficult still. Nevertheless, we believe that the notion of evaluability may still be relevant in other markets, although future research is necessary to confirm its effects on satisfaction.

Rather than focusing on isolated product attributes, we studied differences in the ease of an attribute's evaluability. These differences are somehow similar, but not equal, to the well-known differences between search, experience, and credence attributes within marketing [76,77]. Search attributes can be evaluated from external information, without the necessity to buy the product [57], and may be either easy (e.g., product design) or difficult to evaluate (e.g., memory storage), depending on the knowledge of the consumer. Experience attributes can be evaluated only after a product's consumption, hence are impossible to evaluate before acquisition. Credence attributes are the most difficult to evaluate, even after consumption (e.g., durability, since one will never know how long a product will last, for example, after repair).

Since most studies on evaluability have been conducted in the laboratory, our field study is relatively unique in showing its effects on consumer satisfaction in real life [54,78]. Hence, our findings have implications for consumer product manufacturers, at least in the case of mobile phones. It appeared that attributes such as the service, battery quality, and durability of the phones were relatively difficult to evaluate for consumers, and negative disconfirmation concerning these attributes negatively affected satisfaction. Both product experiences and marketing activities may shape consumer expectations [79]. For example, bad consumer experiences may lead to low expectations at the time of repurchasing,

whereas advertising and word-of-mouth might change these expectations, even after a bad product experience. With the current ability of companies and consumer agencies to analyze large datasets, it might even be possible to manage expectations based on consumer experiences. For example, consumers who report a defect in a product might be given information about the new model which does not have that defect. In our survey, durability seemed to be the most difficult-to-evaluate attribute. At least some information about the durability of a product may be made available, for example, that which concerns the statistical distribution of ownership time before product replacement. Such information could be easily gathered and estimated from consumer surveys [25]. With more accurate information about durability, consumers may be able to make better decisions concerning the lifetime of their mobile phones, which could reduce negative expectation disconfirmation, and possibly contribute to more sustainable mobile phone acquisitions.

Although consumer satisfaction is related to brand equity and its different aspects, this may only be true up to a certain level of satisfaction. Since consumer satisfaction may contribute to only one type of shareholder value (i.e., value for consumers), other shareholder values (e.g., the investors) may be negatively affected by too-high levels of consumer satisfaction, because it might signal too much spending on product improvement [8]. Furthermore, reverse causal effects may exist, such that some aspects of brand equity may increase consumer satisfaction [80,81]. Future research could focus on whether high (low) brand equity may induce too-high (low) consumer expectations concerning product attributes.

Our study used cross-sectional data, in which expectations had been formed before the survey took place. Although several other studies have compared current performance with previous expectations in retrospect, stronger evidence may be obtained in a longitudinal study that elicits consumer expectations before the acquisition of a product, and measures disconfirmation after acquisition. Another interesting topic of study would be to relate evaluability to different dimensions of attribute categorizations, such as search versus experience attributes, and tangible versus intangible attributes, as indicated above. Then, the effects of expectation disconfirmation for such attributes could be compared across different attribute categories. We leave these study topics for future research.

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Appendix A

Table A1. Sample distribution (percentages).

Gender	
Male	55.0
Female	44.6
Missing	0.4
Highest level of educational attainment	
Lower (less than high school)	0.5
Intermediate (high school or some college)	24.5
Higher (college degree)	55.3
Higher (postcollege degree)	19.3
Missing	0.4
Income	
Less than \$60,000	57.3
\$60,000 or more	42.2
Missing	0.4
Age	
15–29 years	22.7
30–39 years	38.6
40–59 years	32.0
60+ years	6.0
Missing	0.7
Phone brand	
Apple	37.2
Samsung	44.9
Other	17.5
Missing	0.4
Type of phone	
New	77.1
Refurbished	16.7
Second-hand	5.2
Unknown	0.7
Missing	0.4
Price of phone	
\$0–\$300	19.1
\$301–\$600	28.8
\$601–\$1000	35.1
More than \$1000	14.5
Unknown	2.2
Missing	0.4
Duration of ownership	
Less than 6 months	14.3
6–12 months	44.4
1–3 years	35.0
More than 3 years	6.0
Missing	0.4
Average satisfaction ^a	5.41 (0.02)
Number of observations	3069

Note: ^a Mean (standard error of the mean).

Table A2. Regression of satisfaction on attribute performance evaluations and attribute disconfirmation.

	Perceived Performance	Expectation Disconfirmation
Constant	0.796 *** (0.133)	2.073 *** (0.123)
Design/appearance	0.034 * (0.017)	0.039 * (0.018)
Availability	−0.019 (0.014)	−0.019 (0.017)
Text messaging	−0.035 (0.017)	−0.021 (0.018)
Phone calling	0.031 (0.018)	−0.047 * (0.018)
Storage capacity	0.021 (0.013)	0.038 * (0.016)
Features of the phone	0.096 *** (0.016)	0.105 *** (0.017)
Phone operating system	0.059 *** (0.017)	0.018 (0.018)
Video quality	0.079 *** (0.016)	0.084 *** (0.017)
Price	0.071 *** (0.012)	0.039 ** (0.015)
Navigating phone menus and settings	0.011 (0.017)	0.033 (0.018)
Audio quality	0.062 *** (0.016)	0.074 *** (0.017)
Service	0.083 *** (0.014)	0.073 *** (0.017)
Warranty	0.070 *** (0.013)	−0.006 (0.017)
Battery	0.132 *** (0.013)	0.134 *** (0.014)
Durability	0.100 *** (0.015)	0.078 *** (0.016)
Apple ^a	0.156 *** (0.043)	0.187 *** (0.046)
Samsung ^a	0.209 *** (0.040)	0.111 ** (0.043)
6–12 months ^b	−0.016 (0.041)	−0.041 (0.044)
1–3 years ^b	−0.086 (0.043)	−0.012 (0.046)
3+ years ^b	−0.069 (0.067)	−0.016 (0.072)
Price \$301–\$600 ^c	0.089 ** (0.041)	0.098 * (0.044)
Price \$601–\$1000 ^c	0.199 *** (0.042)	0.206 *** (0.045)
Price \$1000+ ^c	0.324 *** (0.051)	0.243 *** (0.054)
Refurbished ^d	0.095 ** (0.038)	−0.110 ** (0.040)
Second-hand ^d	0.149 ** (0.062)	−0.057 (0.067)
Unknown ^d	−0.127 (0.160)	−0.467 ** (0.171)
Female	−0.026 * (0.027)	0.021 (0.029)

Table A2. *Cont.*

	Perceived Performance	Expectation Disconfirmation
Age	−0.004 *** (0.001)	−0.001 (0.001)
Some college ^e	−0.169 ** (0.059)	−0.125 * (0.063)
College ^e	0.071 (0.053)	−0.081 (0.057)
Post-college ^e	0.138 * (0.060)	−0.038 (0.064)
High income	−0.036 (0.029)	0.075 * (0.031)
#Observations	3048	3048
Adjusted R ²	0.495	0.418

Note: ^a Default is other brands; ^b default is less than 6 months ownership; ^c default is less than \$300; ^d default is new phone; ^e default is low education. * significant at 5%; ** significant at 1%; *** significant at 0.1%. Values in parentheses are standard errors.

Table A3. Regression of satisfaction on positive and negative attribute disconfirmation.

	Positive Disconfirmation	Negative Disconfirmation	Diff ⁶
Design/appearance	0.050 * (0.020)	0.107 (0.054)	
Availability	0.019 (0.019)	0.009 (0.051)	
Text messaging	0.001 (0.020)	0.037 (0.051)	
Phone calling	−0.068 *** (0.020)	0.215 *** (0.055)	***
Storage capacity	−0.003 (0.019)	0.202 *** (0.036)	***
Features of the phone	0.096 *** (0.020)	0.184 *** (0.050)	
Phone operating system	0.014 (0.021)	0.081 (0.054)	
Video quality	0.076 *** (0.020)	0.119 ** (0.045)	
Price	0.033 (0.0180)	0.048 (0.032)	
Navigating phone menus	0.033 (0.021)	0.000 (0.048)	
Audio quality	0.043 * (0.021)	0.165 *** (0.042)	*
Service	0.021 (0.020)	0.155 *** (0.038)	**
Warranty	0.011 (0.020)	−0.008 (0.039)	
Battery	0.074 *** (0.018)	0.230 *** (0.029)	***
Durability	0.065 *** (0.018)	0.175 *** (0.043)	*
Constant	4.920 *** (0.097)		
Apple ¹	0.170 *** (0.044)		
Samsung ¹	0.119 ** (0.041)		

Table A3. Cont.

	Positive Disconfirmation	Negative Disconfirmation	Diff ⁶
6–12 months ²	−0.054 (0.043)		
1–3 years ²	−0.025 (0.044)		
3+ years ²	−0.017 (0.069)		
Price \$301–\$600 ³	0.099 * (0.042)		
Price \$601–\$1000 ³	0.208 *** (0.043)		
Price \$1000+ ³	0.259 *** (0.052)		
Refurbished ⁴	−0.056 (0.039)		
Second-hand ⁴	0.008 (0.0640)		
Unknown ⁴	−0.337 * (0.165)		
Female	0.017 (0.028)		
Age	−0.002 (0.001)		
Some college ⁵	−0.138 * (0.060)		
College ⁵	−0.098 (0.055)		
Post-college ⁵	−0.056 (0.062)		
High income	0.053 (0.030)		
#Observations		3048	
Adjusted R ²		0.468	

¹ Default is other brands; ² default is less than 6 months ownership; ³ default is less than \$300; ⁴ default is new phone; ⁵ default is low education; ⁶ diff indicates significance of difference between positive and negative disconfirmation for each attribute. * significant at 5%; ** significant at 1%; *** significant at 0.1%. Values in parentheses are standard errors.

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