Longitudinal Shifts in the Drivers of Satisfaction with Product Quality: The Role of Attribute Resolvability

REBECCA J. SLOTEGRAAF and J. JEFFREY INMAN*

Research on customer equity has reemphasized the value of understanding the factors that influence satisfaction and quality. Although research has shown that many factors influence perceptions of satisfaction and quality, it has failed to consider the potential for asymmetric effects that shift over time and are based on the attributes used to form such perceptions. Using automobile ownership experiences during the manufacturer warranty period, the authors show that as consumers approach the end of their product's warranty period, satisfaction with attributes that can be remedied (“resolvable” attributes) declines at a greater rate, yet its effect on satisfaction with product quality intensifies. In contrast, satisfaction with attributes that cannot be remedied (“irresolvable” attributes) declines at a lesser rate, and its effect on satisfaction with product quality weakens over time. The authors also discuss implications for research and customer relationship management programs.

Longitudinal Shifts in the Drivers of Satisfaction with Product Quality: The Role of Attribute Resolvability

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Recent advances in customer equity research have rekindled the importance of understanding how customers form perceptions of satisfaction and quality. In particular, the long-term value of a firm is often tied to its underlying customer equity (Blattberg and Deighton 1996), and customer perceptions of quality are a fundamental priority that not only drive customer equity (Rust, Zeithaml, and Lemon 2000) but also influence a firm’s stock returns (Aaker and Jacobson 1994). These findings for long-term firm performance create an impetus to understand the drivers of satisfaction and quality throughout the ownership experience.

In the marketing literature, research has shown that quality perceptions may be influenced by several factors, such as price (e.g., Rao and Monroe 1989), advertising (e.g., Kopalle and Lehmann 1995), and brand name (e.g., Janiszewski and van Osselaer 2000). The research in this domain has provided valuable insights into how customers form such perceptions. However, two important facets of the ownership experience have received little attention: (1) that the ownership experience can unfold over a considerable amount of time and (2) that the drivers of satisfaction with product quality may shift over time.¹

¹Throughout the article, we use the term “product” to refer to the physical product.

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perceptions early in the ownership experience become less important (or vice versa) over time.\(^2\)

In this article, we argue that as part of the product ownership experience, the drivers of satisfaction with product quality shift over time in different ways based on the nature of the attribute used to form satisfaction with product quality. Our argument for this longitudinal, asymmetric shift stems from the organizational theory and social psychology literature, which shows that people behave differently depending on whether something can be done in a particular situation (e.g., Adams 1965; Folkman and Lazarus 1980). We extend this literature into the postpurchase domain, exploring the role of various product attributes and of ancillary service experience on satisfaction with product quality.

We argue that shifts in attribute-level effects on satisfaction with product quality depend on the attribute’s resolvability. \(\text{Resolvable attributes}\) are attributes that can be repaired and are covered under the product’s warranty. Examples include defective or faulty parts, such as the hard drive in a personal computer or the drive train in an automobile. When a resolvable attribute breaks, the owner has the option of having the manufacturer repair the attribute under the product warranty. \(\text{Irresolvable attributes}\) are attributes that cannot be fixed or changed, regardless of warranty coverage, without the purchase of a new product. For example, the size of a personal computer monitor and the gas mileage in an automobile are product attributes that cannot be repaired or fixed, even if an owner experiences dissatisfaction with them.

We expect that when an owner perceives a product attribute as resolvable, he or she responds differently than when he or she perceives a product attribute or service experience as irreparable. More specifically, we expect that satisfaction with resolvable attributes declines over time at a greater rate than does satisfaction with irresolveable attributes. Furthermore, we expect that the effects on satisfaction with product quality shift asymmetrically over time during the product warranty period, and the effect strengthens over time for resolvable attributes and weakens over time for irresolveable attributes and ancillary services.

In the next section, we present our conceptual framework of the effects of attribute type on attribute satisfaction and satisfaction with product quality over time. We then test our predictions by focusing on automobile owners over a period of three years (i.e., the length of the product’s warranty), using a two-stage, sequentially estimated, hierarchical regression approach. We report evidence from a study of automobile owners that supports our assertions that an asymmetric shift in effects occurs over time on the basis of type of attribute, and intensifies for resolvable product attributes and weakens for irresolveable product attributes and ancillary service experiences. We conclude with theoretical implications both for the marketing strategy literature on customer equity and for the consumer behavior literature on perceived quality, as well as pragmatic customer relationship management implications for managers. Overall, our research illustrates the complex nature of the product-quality assessment process and points to the need to address the stages of ownership strategically in different ways.

**CONCEPTUAL FRAMEWORK**

To assess owners’ perceptions of the product over time, we focus on their satisfaction with product quality. Satisfaction with product quality reflects a global assessment of the features and characteristics of the product (Oliver 1997). In examining product quality, research has established that perceptions of quality are formed by perceptions of both the physical product and the related service (e.g., Kordupleski, Rust, and Zahorik 1993) and that asymmetric effects exist for the role of dissatisfaction over satisfaction (e.g., Anderson and Sullivan 1993; Gomez, McLaughlin, and Wittink 2003; Rust et al. 1999). Our conceptual framework builds on this theoretical foundation to investigate how effects shift over time; we focus on an asymmetric longitudinal shift based on the resolvability of the attribute. To explicate our framework, we begin by reviewing the literature on the effects of attributes on perceptions of quality. Following this, we argue that the effects shift over time as a function of attribute type.

**The Effect of Attributes on Quality Perceptions**

Research has long established that perceptions of product quality can be influenced by various attributes, such as brand name (e.g., Dawar and Parker 1994; Dodds, Monroe, and Grewal 1991), price (e.g., Dodds, Monroe, and Grewal 1991; Rao and Monroe 1989), and product appearance (Dawar and Parker 1994). In addition to product-specific attributes, service is a substantial component that, for many offerings, can also affect product perceptions (Kordupleski, Rust, and Zahorik 1993) and success (Sousa and Hambrick 1989). For example, research shows that satisfaction with ancillary services can generate future product sales for consumer durables (Mittal, Kumar, and Tsirios 1999) and industrial products (Smith 1998).

In forming assessments of satisfaction with product quality, research further points to the strength of negative affect over positive affect. In particular, prospect theory (Kahneman and Tversky 1979) predicts that people place greater weight on negative deviations than on positive deviations, thereby suggesting that perceived losses loom larger than gains. In the marketing literature, research provides support for this theory in several domains. For example, research shows that attribute dissatisfaction has a stronger effect than attribute satisfaction on overall satisfaction (e.g., Anderson and Sullivan 1993; Rust et al. 1999) and repurchase intentions (Mittal, Ross, and Baldasare 1998). Similarly, research on postchoice valuation shows the strength of disappointment and regret over that of elation and rejoicing (Inman, Dyer, and Jia 1997).

Although prior research has shown the effects of product and service attributes as well as a negative asymmetric effect, it reveals little about how the effects may shift over time.\(^3\) However, because an ownership experience often

\(^2\)In examining owners’ perceptions of product quality, we focused on satisfaction with product quality due to the nature of our data. Specifically, we used data from a survey developed and administered by an independent party, which measured owners’ perceived quality as satisfaction with vehicle quality. Therefore, we were limited to examining satisfaction with product quality.

\(^3\)The negative asymmetric effect over time is important, because much of the variation in satisfaction items results from dissatisfaction. That is, because our satisfaction responses are highly skewed (most responses are at the high end of the satisfaction scale), variation is driven by dissatisfaction with the attribute.
unfolds over several years, it is important to understand how such perceptions may evolve; we turn to this now.

**Longitudinal Shifts in Effects Due to Attribute Resolvability**

Theory suggests that people change their beliefs in reaction to successive experiences (Hogarth and Einhorn 1992). For example, Mittal, Katrichis, and Kumar (2001) report a longitudinal shift in the effects of attribute satisfaction on product satisfaction, and Mittal, Kumar, and Tsiros (1999) report a shift in the effects of product satisfaction on intended loyalty. Consistent with this perspective, we expect that the effect of product attributes and service experience on satisfaction with product quality evolves. However, we expect that the nature of the shift varies on the basis of whether attributes are resolvable or irresolvable.

On the basis of inherent differences between resolvable and irresolvable attributes, we predict that attribute satisfaction decreases at a greater rate for resolvable attributes than for irresolvable attributes. Beyond this effect, we also predict that the effect of attribute satisfaction on satisfaction with product quality strengthens over time for resolvable attributes and weakens over time for irresolvable attributes and ancillary services.

Over time, we expect that, in general, satisfaction declines and that the rate of decline is determined by attribute type. In particular, as the ownership cycle evolves, it is likely that a general decline in attribute satisfaction occurs as the initial new product elation diminishes. Research on health care encounters shows a general tendency for satisfaction to decline over time (Bendall-Lyon and Powers 2002; Fisk et al. 1990). Similarly, we expect that attribute satisfaction declines over the ownership period; however, we expect that the rate of satisfaction decline varies depending on the attribute type. Specifically, we predict that satisfaction declines at a greater rate for resolvable attributes than for irresolvable attributes. When owners experience dissatisfaction, it can be perceived as a negative situation that either can be changed or must be endured. To offer insight into the underlying mechanisms that may drive the predicted effects, we draw from research in organizational theory and social psychology.

From the organizational theory literature, research on equity theory indicates that when people perceive a situation as unfair, they tend to display negative affect and subsequently redress the perceived inequity. An approach is to react behaviorally, such as by modifying efforts or inducing others to increase their effort (Adams 1965; Greenberg 1989). Another approach is cognitive distortion, which involves a perceptual shift in the perceived importance of the outcome (Adams 1965; Folger and Cropanzano 1998).

The social psychology literature on coping strategies also offers insight. Coping refers to people’s cognitive and/or behavioral response to situations that they perceive as taxing to their resources (Folkman et al. 1986). Problem-focused coping is aimed at somehow altering the source of the stress, and it tends to occur when people believe that something constructive can be done (Folkman and Lazarus 1980), such as taking direct action (Carver, Scheier, and Weintraub 1989). In contrast, emotion-focused coping tends to predominate when people believe that the stressor must be endured (Folkman and Lazarus 1980), which often involves a reinterpretation of events aimed at reducing the emotional distress associated with the situation.

Extension of these theories to an ownership experience context suggests that when consumers face a negative ownership event (e.g., dissatisfaction with a product attribute or service experience), they are likely to react in different ways depending on whether something can be done to remedy the situation. Because resolvable attributes can be remedied, owners are likely to believe that something constructive can be done to resolve dissatisfaction with the attributes. Both equity theory and coping theory suggest that an action-based approach is likely to occur to redress the dissatisfaction. Research shows that when owners experience product problems, they are likely to blame the manufacturer (Folkes and Kotos 1986). Because resolvable attributes can be fixed, when consumers are dissatisfied with such attributes, they are likely to blame the manufacturer for not doing a better job, which will likely intensify the dissatisfaction.

In contrast, irresolvable attributes cannot be remedied, so owners who experience any dissatisfaction with such attributes are less likely to believe that something can be done to resolve the dissatisfaction. In this situation, consumers may attribute their dissatisfaction to the inherent nature of the vehicle rather than to any fault of the manufacturer, and equity and coping theories suggest that owners cognitively reinterpret the dissatisfaction (i.e., they learn to live with the problem). As a result of the cognitive reinterpretation, dissatisfaction with irresolvable attributes is likely to attenuate over time. Therefore, in addition to a general decline in attribute satisfaction over time, we also expect that the level of satisfaction with resolvable attributes decreases at a greater rate than it does for irresolvable attributes.

H1: Product attribute satisfaction declines over time.

H2: The level of satisfaction with resolvable attributes declines at a greater rate over time during the warranty period than does the level of satisfaction with irresolvable attributes.

In addition to the direct effect of resolvability on product attribute satisfaction, and on the basis of the resolvability of the product attribute and that of the service experience, we expect asymmetric shifts in the effect of attribute satisfaction on satisfaction with product quality.

For resolvable attributes, we argue that the effect of attribute satisfaction on satisfaction with product quality strengthens over time during the warranty period. If concerns arise about resolvable attributes before warranty expiration, the owner has the option of having the attribute fixed or repaired. As we previously mentioned, because resolvable attributes can be fixed, owners are likely to blame the service provider. Although this is likely to affect customers’ satisfaction with resovable attributes, it is also likely to heighten the salience of such attributes when customers assess the quality produced by the manufacturer and, consequently, the satisfaction with product quality. Research from equity and coping theories also suggests that action is likely to occur because dissatisfaction can potentially be redressed. In particular, research indicates that direct action is useful for the removal of stressful events that can be changed (Carver, Scheier, and Weintraub 1989). For example, consumers are more likely to complain if they believe that voicing their concerns will be effective (Stephens and Gwinner 1998).

Furthermore, research also indicates that owners react much differently when something breaks just before the end
of the warranty period than when it breaks long before the warranty expires (Meyers-Levy and Maheswaran 1992). As a result, concerns with resolvable attributes are likely to stand out or become more salient, which in turn intensifies their influence on different judgments (e.g., Fiske and Taylor 1991). Therefore, as warranty expiration approaches, the effect of resolvable attribute satisfaction on satisfaction with product quality is likely to strengthen as the attributes become more salient.

H3: During the warranty period, the effect of resolvable product attribute satisfaction on satisfaction with product quality strengthens over time.

For irresolvable attributes, we expect that the effect of attribute satisfaction on satisfaction with product quality weakens over time as a result of accommodation. Because irresolvable attributes cannot be altered or fixed, research suggests that any concerns that arise about them must be endured. Specifically, equity theory indicates that when people perceive inequity and recognize a situation as unalterable, they are likely to engage in cognitive distortion by placing less importance on the perceived inequity (e.g., Greenberg 1989). For example, Greenberg (1989) shows that employees who are financially underpaid reestablish a perception of equity by placing less importance on their wages and greater importance on features of their work environment. Similarly, coping theory indicates that when people perceive an outcome as unalterable, they tend to detach themselves from the situation (e.g., Collins, Baum, and Singer 1983; Folkman et al. 1986). In this case, an owner may adopt an acceptance approach by recognizing that the situation cannot be changed and by learning to live with it (Carver, Scheier, and Weintraub 1989).

Therefore, as ownership progresses, dissatisfaction with irresolvable attributes is likely to trigger an owner to engage in cognitive distortion or detachment that lessens the importance of any dissatisfaction. In turn, when owners evaluate product quality, they place less importance on irresolvable attributes as time passes. As a result, the effect of irresolvable attribute satisfaction on satisfaction with product quality is likely to become weaker as ownership evolves through the product warranty period.

H4: During the warranty period, the effect of irresolvable product attribute satisfaction on satisfaction with product quality weakens over time.

Ancillary service encounters are the services that customers experience as part of their product ownership. Focusing on the product’s warranty period, we expect that the effect of postpurchase service satisfaction on satisfaction with product quality weakens over time. This focus on the warranty period is important because ancillary services that occur during the warranty period are usually returned to the selling dealer, because some manufacturers strongly recommend specific retailers for ancillary service work. We expect this weakening effect from ancillary services for two key reasons.

First, research on the assessment of service quality indicates that people place greater weight on prior assessments of service quality and less weight on new information from a service encounter (e.g., Bolton 1998; Boulding, Kalra, and Staelin 1999; Rust et al. 1999). This suggests that the more experience a person has with a service encounter, the less effect any subsequent service encounters have on overall satisfaction with product quality. Consequently, we expect that the effect of postpurchase service satisfaction on satisfaction with product quality weakens over time as the end of the warranty period approaches.

Second, consumers are likely to view dissatisfaction with an ancillary service encounter as a situation that must be endured at least until the warranty expires, because the location for the service work is often dictated by the warranty. Therefore, drawing on coping and equity theories, we expect that people in such a situation engage either in an acceptance coping strategy or in cognitive distortion to redress the dissatisfaction. In turn, this reduces the effect of ancillary service satisfaction on satisfaction with product quality, thereby producing a weakening effect over the warranty period as the owner learns to live with the situation.

H5: During the warranty period, the effect of overall ancillary service satisfaction on satisfaction with product quality weakens over time.

METHODOLOGY

To test our predictions, we used longitudinal data from the automotive industry, focusing on owners’ experiences at three intervals in the warranty period. The automotive industry provides a good setting to test our predictions for several reasons. First, an automobile is consumed over an extended period and therefore allows for the examination of ownership experience over time. Second, an automobile is a product that is integrally linked to postpurchase service experiences, which therefore allows for the investigation of the predicted effects of ancillary services. Third, a focus on automobiles enables the examination of consumption in a specified warranty period, during which people are typically aware of the length and coverage of their automobile’s warranty. In this research, the manufacturer specified a three-year warranty period. To better control for extraneous effects of other product-related quality cues (e.g., price, brand name), we focused on owners of one automotive brand.

Description of Data Set

The data set comprises automobile ownership experiences at different stages during the manufacturer warranty period. We obtained the data from a U.S. automotive manufacturer that conducts tracking studies of its customers’ experiences and uses extensive pretesting to ensure appropriate measures and sample representation. Administration of the survey was conducted by an independent party, and participants included owners who purchased their vehicles between 1992 and 1996. The survey process is intended to capture information from owners at several points during the warranty period of their ownership experience. Specifically, the data set contains survey results just after the vehicle purchase solely for the purpose of investigating the effect of owners’ satisfaction with their purchase experience. It is important to note that the data set also contains survey results from three subsequent periods: 9 months, 21 months, and 33 months. Thus, the data capture satisfaction after owning the vehicle for 9 months (i.e., the first year of ownership), one year later (at 21 months of ownership), and two years later (at 33 months of ownership). For our sample, characteristics across survey periods show that the
Satisfaction with Product Quality

demographic composition is remarkably stable (see Table 1). Specifically, approximately 60% of the owners are male, nearly 75% are married, and approximately 65% are age 50 or older. Furthermore, approximately 67% of respondents have at least some college education, and nearly 67% do not have children living in the household.

In each of the three survey periods, owners were asked to rate their satisfaction with nine product attributes, their most recent service experience, and the quality of their vehicle (for all measures, see the Appendix). Our measure of satisfaction with product quality is based on the owner’s satisfaction with vehicle quality on a ten-point scale. Wittink and Bayer (1994) compare an overall satisfaction measure using a ten-point scale with one measured on a five-point scale; they find that the ten-point measure is superior in terms of (1) the sample size needed to deliver an equivalent standard deviation, (2) the power to detect changes in average satisfaction, and (3) the likelihood of ceiling effects. Although we recognize that quality and satisfaction are theoretically distinct constructs (e.g., Oliver 1997), it is difficult to disentangle the two in practice (e.g., Bolton and Drew 1991). Specifically, researchers have found that the correlation between overall satisfaction and service quality can be greater than .85 (e.g., Biter and Hubbert 1994; Cronin and Taylor 1992; Gottlieb, Grewal, and Brown 1994). Thus, we believe that satisfaction with product quality is adequate for our purpose of examining longitudinal shifts, because any measurement error will presumably be relatively constant over time.

To examine the role of product attribute satisfaction, we investigated satisfaction with all nine attributes included in the database: smoothness of transmission, operation of brakes, operation of accessories, quietness, power and pickup, interior roominess, driver’s seat comfort, riding comfort, and handling. We measured all nine product attributes on a ten-point satisfaction scale (10 = “completely satisfied,” and 1 = “very dissatisfied”). To examine the role of ancillary service experience, we measured satisfaction with the most recent service experience for the vehicle on the same ten-point satisfaction scale.

For the resolvability of the product attributes, we anticipated that smoothness of transmission, operation of brakes and accessories, and quietness would be considered resolvable. To test this, we performed a pretest among 68 vehicle owners.4 In the pretest, owners were given the list of all nine product attributes and asked to indicate on a ten-point scale (where 1 indicated that the owner would have to learn to live with it, and 10 indicated that the owner would get the dealer to fix it) how they would respond if they were unhappy with any of the attributes. The results indicate a strong dichotomy between the attributes. In particular, four of the product attributes—operation of brakes (9.50), operation of accessories (8.75), smoothness of transmission (7.45), and quietness (6.96)—received high values, which indicates that owners believed that the dealer could fix these attributes.5 The other five product attributes—interior roominess (1.87), driver’s seat comfort (3.47), riding comfort (3.93), handling (4.51), and power and pickup (4.78)—received much lower values, which indicates that owners perceived these attributes as ones they would have to live with if they were unhappy with them. A Tukey multiple comparison test reveals that the perceived resolvability ratings of all four resolvable attributes (smoothness of transmission, operation of brakes, operation of accessories, and quietness) were significantly higher than the ratings of all five irresolvable attributes (power and pickup, interior roominess, driver’s seat comfort, riding comfort, and handling) at p < .01.

ANALYSIS AND RESULTS

Because attribute satisfaction over time may affect the extent to which attribute satisfaction influences satisfaction with product quality over time, we use a two-stage, sequential, hierarchical regression model.6 In the first stage, we examine the direct effects of resolvability on satisfaction over time with Equation 1. In the second stage, we analyze the effects of attribute satisfaction on satisfaction with product quality with Equation 2, using only the portion of attribute satisfaction that is unexplained by the time-specific effects from Equation 1. This approach enables us to examine the effects of attribute satisfaction on satisfaction with product quality over time that are not explained by a general trend in attribute satisfaction; the approach is similar to the one Slotegraaf, Moorman, and Inman (2003) recently used.

Longitudinal Effects of Resolvability on Attribute Satisfaction

To assess the effect of resolvability on attribute satisfaction over time, we estimated an unconstrained regression model that incorporates multiple indicator variables to account for whether the attribute under investigation is considered a resolvable or an irresolvable attribute. To examine whether resolvable attributes have a stronger negative effect on satisfaction over time, we estimated the interaction

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4 Respondents in our pretest were MBA students at a mid-Atlantic university who currently own an automobile.

5 Note that typical wear and tear on brakes is not covered by a manufacturer’s warranty, but the general operation of brakes is. We confirmed this with the manufacturer.

6 Unfortunately, there is little overlap in the sample across periods, because none of the owners completed all three of the 9-, 21-, and 33-month surveys. Otherwise, we could have used a generalized least squares approach to capture the within-owner error and to increase the efficiency of our estimates (Greene 1993). We conducted ancillary analyses among respondents who completed two surveys. The results from the restricted models show substantively identical patterns to the full models, which lead us to conclude that the respondents who participated twice do not differ significantly from respondents who participated only once.
between the resolvability indicators and the time indicators. For both resolvability and time indicators, we used a contrast-coding approach, because it allows for not only orthogonal comparisons but also direct comparisons (Cohen and Cohen 1983). For resolvability, the approach allows for a comparison between resolvable and irresolvable attribute effects while including ancillary services in the single equation. For time, a contrast-coding specification enables us to construct a contrast (1) between 21 months and 9 months and (2) between 33 months and the mean across the two prior periods (i.e., 9 months and 21 months). Therefore, to examine the longitudinal effect of resolvability on attribute satisfaction, we estimated Equation 1:

\[
S_{ijt} = b_{0j} + b_{1j}R_{1j} + b_{2j}R_{2j} + b_{3j}Y_{2t} + b_{4j}Y_{3t} + b_{5j}R_{1j}Y_{2t} + b_{6j}R_{1j}Y_{3t} + b_{7j}R_{2j}Y_{2t} + b_{8j}R_{2j}Y_{3t} + \varepsilon_{ijt},
\]

where

\[
\begin{align*}
S_{ijt} &= \text{satisfaction of owner } i \text{ with attribute } j \text{ at time } t, \\
R_{1j} &= \text{resolvability of attribute } j \text{ (1 for resolvable attributes, 0 for ancillary service)}, \\
R_{2j} &= \text{resolvability of attribute } j \text{ (–1/2 for resolvable attributes, –1/2 for irresolvable attributes, 1 for ancillary service)}, \\
Y_{2t} &= \text{ownership time (1 if } t = 21 \text{ months, 0 if } t = 33 \text{ months, –1 if } t = 9 \text{ months),} \\
Y_{3t} &= \text{ownership time (1 if } t = 33 \text{ months, –1/2 if } t = 21 \text{ months, –1/2 if } t = 9 \text{ months),} \\
b &= \text{response parameter, and} \\
\varepsilon_{ijt} &= \text{disturbance term.}
\end{align*}
\]

We estimated Equation 1 both without (Model 1) and with (Model 2) the interaction effects to examine their specific influence (see Table 2). We did not mean-center variables before constructing their interaction. Results from Equation 1 indicate that time has a significant, negative effect on attribute satisfaction (\(b_3 = –.16, p < .01\); \(b_4 = –.19, p < .01\)). Thus, the results support \(H_1\): There is a general decline in overall attribute satisfaction over time.

Regarding our prediction that resolvable attributes will show a greater decrease in satisfaction over time than will irresolvable attributes, the results from an incremental F-test show a significant effect of including the interaction terms in the model (\(F = 43.57, p < .01\)). More specifically, resolvability has a negative effect on attribute satisfaction (\(b_1 = –.24, p < .01\) in Model 1; \(b_1 = –.25\) in Model 2), and the interactions between resolvability and time are statistically significant (\(b_5 = –.04, p < .01\); \(b_6 = –.05, p < .01\)). Overall, the results suggest that the level of satisfaction declines at a greater rate for resolvable attributes than for irresolvable attributes, which offers strong support for \(H_2\).

Overall, the results suggest that the level of satisfaction declines at a greater rate for resolvable attributes than for irresolvable attributes, which offers strong support for \(H_2\). This effect is also revealed in Figure 1, which illustrates the trend of satisfaction with resolvable and irresolvable product attributes as well as of satisfaction with ancillary services across the three time periods.

Longitudinal Attribute Effects on Satisfaction with Product Quality

To estimate the effects of attribute satisfaction on satisfaction with product quality, we used the residuals from Equation 1 because they represent the attribute satisfaction levels that are not accounted for by the general satisfaction decline that occurs over consumption. We also controlled for potential extraneous effects on perceived product quality by including satisfaction with the purchase experience and other demographic owner characteristics because they may influence attribute satisfaction and assessments of vehicle quality.

In this second stage of the hierarchical regression, we estimated the effects on satisfaction with product quality using three different equations. Specifically, we used an overall measure for resolvable attributes and irresolvable attributes in Equations 2 and 3. We then examined the effects of attribute satisfaction on satisfaction with product quality, using the nine individual attributes with Equation 4.

Table 2

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Hypothesized Satisfaction</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1: Resolvability of attributes</td>
<td>–.24*</td>
<td>–.25*</td>
<td></td>
</tr>
<tr>
<td>R2: Service attribute comparison</td>
<td>–.16*</td>
<td>–.16*</td>
<td></td>
</tr>
<tr>
<td>Y2</td>
<td>–.19*</td>
<td>–.16*</td>
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<tr>
<td>Y3</td>
<td>–.04*</td>
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<tr>
<td>R1 × Y2</td>
<td>–.01</td>
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<tr>
<td>R1 × Y3</td>
<td>–.04*</td>
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<td>R2 × Y2</td>
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<td>Overall Model</td>
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<td>.03</td>
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<tr>
<td>Incremental F</td>
<td>43.57*</td>
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*p < .01.

Figure 1

SATISFACTION OVER TIME

<table>
<thead>
<tr>
<th>Time of Ownership (in Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
</tr>
<tr>
<td>21</td>
</tr>
<tr>
<td>33</td>
</tr>
</tbody>
</table>

- Resolvable product attributes
- Irresolvable product attributes
- Ancillary service encounter
In estimating the overall effects in Equations 2 and 3, we relied on two different approaches to test sensitivity of effects. In both approaches, we relied on the results from the pretest to separate the nine product attributes into resolvable and irresolvable attributes.

In Equation 2, we computed a simple mean based on the product attributes. For example, the average resolvable attribute score is based on the average satisfaction with smoothness of transmission, operation of brakes, operation of accessories, and quietness. In Equation 3, we computed a weighted sum; the weights were based on the standardized factor loadings from a confirmatory factor analysis for resolvable and irresolvable attributes. In Equation 4, we estimated a model that contained all nine product attributes. In each of Equations 2–4, we estimated an unrestricted model that used the satisfaction residuals from Equation 1 and a contrast-coding specification for time-specific effects.

\[
(2) \quad SPQ_{it} = \gamma_0 + \gamma_1 R_{it} + \gamma_2 T_{it} + \gamma_3 AS_{it} + \gamma_4 Y_2 t + \gamma_5 Y_3 t + \gamma_6 R_{it} Y_2 t + \gamma_7 T_{it} Y_2 t + \gamma_8 R_{it} Y_3 t + \gamma_9 T_{it} Y_3 t + \gamma_{10} AS_{it} Y_2 t + \gamma_{11} AS_{it} Y_3 t + \sum_{k=1}^{6} \alpha_k C_{kit} + u_{it},
\]

\[
(3) \quad SPQ_{it} = \lambda_0 + \lambda_1 RF_{it} + \lambda_2 IF_{it} + \lambda_3 AS_{it} + \lambda_4 Y_2 t + \lambda_5 Y_3 t + \lambda_6 IF_{it} Y_3 t + \lambda_7 IF_{it} Y_2 t + \lambda_8 IF_{it} AS_{it} Y_2 t + \lambda_9 IF_{it} AS_{it} Y_3 t + \sum_{k=1}^{6} \alpha_k C_{kit} + v_{it},
\]

\[
(4) \quad SPQ_{it} = \zeta_0 + \sum_{n=1}^{9} \zeta_n S_{nit} + \zeta_{10} AS_{it} + \zeta_{11} Y_2 t + \zeta_{12} Y_3 t + \sum_{n=13}^{21} \zeta_n S_{nit} Y_2 t + \sum_{n=22}^{30} \zeta_n S_{nit} Y_3 t + \zeta_{31} AS_{it} Y_2 t + \zeta_{32} AS_{it} Y_3 t + \sum_{k=1}^{6} \alpha_k C_{kit} + w_{it},
\]

where

\[
SPQ_{it} = \text{satisfaction with product quality of owner } i \text{ at time } t;
\]

\[
\gamma, \lambda, \zeta, \alpha = \text{response parameters;}
\]

\[
\bar{R}_{it} = \text{mean of resolvable attribute satisfaction of owner } i \text{ at time } t, \text{ based on the satisfaction residuals from Equation 1 for all four resolvable attributes;}
\]

\[
\bar{I}_{it} = \text{mean of irresolvable attribute satisfaction of owner } i \text{ at time } t, \text{ based on the satisfaction residuals from Equation 1 for all five irresolvable attributes;}
\]

\[
RF_{it} = \text{factor-weighted sum of resolvable attribute satisfaction of owner } i \text{ at time } t, \text{ based on residuals from Equation 1 for all four resolvable attributes;}
\]

\[
IF_{it} = \text{factor-weighted sum of irresolvable attribute satisfaction of owner } i \text{ at time } t, \text{ based on residuals from Equation 1 for all five irresolvable attributes;}
\]

\[
AS_{it} = \text{ancillary service satisfaction level of owner } i \text{ at time } t, \text{ based on the residuals from Equation 1;}
\]

\[
Y_{2t} = \text{ownership time (1 if } t = 21 \text{ months, 0 if } t = 33 \text{ months, } -1/2 \text{ if } t = 9 \text{ months);}
\]

\[
Y_{3t} = \text{ownership time (1 if } t = 33 \text{ months, } -1/2 \text{ if } t = 21 \text{ months, } -1/2 \text{ if } t = 9 \text{ months);}
\]

\[
C_{kit} = \text{covariate } k \text{ for owner } i \text{ at time } t, \text{ specifically,}
\]

\[
\text{SALESAT}_{it} = \text{overall satisfaction with the purchase experience of owner } i,\]

\[
\text{MALE}_{it} = \text{sex of owner } i \text{ (male } = 1, \text{ female } = 0),\]

\[
\text{MARRIED}_{it} = \text{marital status of owner } i \text{ (married } = 1, \text{ not married } = 0) \text{ at time } t,\]

\[
\text{AGE}_{it} = \text{age of owner } i \text{ (age 50 or older } = 1, \text{ age 49 or younger } = 0) \text{ at time } t,\]

\[
\text{EDUC}_{it} = \text{educational status of owner } i \text{ (some college education or more } = 1, \text{ high school graduate or less } = 0) \text{ at time } t,\]

\[
\text{CHILD}_{it} = \text{whether owner } i \text{ has any children living in the household (1 } = \text{ no children, } 0 = \text{ at least one child) at time } t, \text{ and}
\]

\[
u_{it}, v_{it}, w_{it} = \text{normally distributed error terms.}
\]

Note that the only difference across Equations 2–4 is the specification of resolvable and irresolvable attributes. The results from Equations 2 and 3 are presented in Table 3, and the results from Equation 4 are presented in Table 4. Across Equations 2–4, the results from Equation 4 appear to offer the most explanatory power (Bayesian information criterion = 710.71) because of the estimation of the separate product attributes. In general, the results from Equations 2–4 illustrate quite robust effects and offer support for the prediction that the effects on satisfaction with product quality strengthen over time for resolvable attributes and weaken over time for irresolvable attributes and ancillary services. Foremost, the results indicate that even with the removal of the general satisfaction decline over time from Equation
1, attribute satisfaction continues to play a significant role on satisfaction with product quality (see Tables 3 and 4), and satisfaction with ancillary services also has a strong, positive effect on satisfaction with product quality ($\gamma_3 = .08, p < .01; \lambda_1 = .07, p < .01; \zeta_{10} = .07, p < .01$). The results support prior research on the role of both product attributes and ancillary services on assessments of product quality. From Equations 2 and 3, main effects for resolvable ($\gamma_1 = .54, p < .01; \lambda_4 = .17, p < .01$) and irresolvable ($\gamma_2 = .44, p < .01; \lambda_5 = .11, p < .01$) attributes are evident in both models. Significant main effects for all nine product attributes are also evident from the results of Equation 4 (see Table 4). For covariate effects, the results indicate that satisfaction with the vehicle purchase experience has a positive effect on satisfaction with vehicle quality ($p < .01$). The results also show that men and younger owners are more likely to be less satisfied with vehicle quality ($p < .01$), which is similar to the findings of prior research (Mittal and Kamakura 2001).

Results for overall resolvability. For the overall effect of resolvability, the results from Equations 2 and 3 illustrate similar effects across each of the two approaches. More important, the results indicate that the effect of overall resolvable attribute satisfaction on assessments of product quality over time is positive and significant for both the mean and the factor-weighted specifications. In particular, the results show that the effect from a contrast comparison of 21 months to 9 months of ownership for resolvable attribute satisfaction is significant and positive ($\lambda_6 = .06, p < .01; \lambda_7 = .02, p < .01$). Furthermore, for resolvable attributes, the effect from a contrast comparison of 33 months of ownership to the mean of the prior two periods is also significant and positive ($\gamma_5 = .07, p < .01; \lambda_7 = .02, p < .01$). Thus, the results indicate that the effect of resolvable attrib-
ute satisfaction on satisfaction with product quality becomes stronger as ownership progresses through the warranty period, in support of $H_3$.

Also as we predicted, the results from Equations 2 and 3 show that the effect of overall irresolvable attribute satisfaction on satisfaction with product quality over time is negative and significant for both the mean and the factor-weighted specifications. The results show that for irresolvable attribute satisfaction, the effect from a contrast comparison of 21 months to 9 months of ownership is significant and negative ($\gamma_9 = -.06, p < .01; \lambda_9 = -.02, p < .01$). Furthermore, for irresolvable attributes, the effect from a contrast comparison of 33 months of ownership to the mean of the prior two periods is also significant and negative ($\gamma_{10} = -.05, p < .01; \lambda_{10} = -.01, p < .01$). Therefore, it appears that whereas, early on, owners’ dismay with the performance of irresolvable attributes has an exacerbated impact on satisfaction with product quality, the accommodation process attenuates the influence as the ownership process unfolds in the warranty period, which offers support for $H_4$.

Thus, the effect of product attribute satisfaction on satisfaction with product quality increases over time for resolvable attributes but decreases over time for irresolvable attributes. Overall, our results underscore that as time passes during the warranty period, the relative return on investment of managing customer attribute-level satisfaction shifts from irresolvable attributes to resolvable attributes.

**Results for individual product attributes.** The results from Equation 4 also offer support for $H_3$ and $H_4$ (see Table 4). Specifically, the results indicate that of the eight variables that capture the longitudinal trend with resolvable attribute satisfaction on satisfaction with product quality, three are positive and significant (accessories $\times Y_3 = .02, p < .05$; quietness $\times Y_2 = .03, p < .01$; quietness $\times Y_3 = .03, p < .01$). In addition, all eight of the coefficients are positive, which offers directional support that is also validated by a nonparametric sign test ($p < .01$). In contrast, the effect of irresolvable attribute satisfaction on satisfaction with product quality decreases over time; seven of the ten coefficients are negative, and four are significantly so (see Table 4). A positive and significant trend effect emerges: that of handling at 21 months compared with at 9 months ($\zeta = .04, p < .05$). Overall, 15 of the 18 trend effects are in the predicted direction; a nonparametric sign test is again significant ($p < .01$).

**Results for ancillary services.** The results across the three model estimations show that the effect of ancillary service satisfaction on satisfaction with product quality decreases over time. In particular, the results from all three equations consistently show that for ancillary service satisfaction, the effect from a comparison of 21 months with 9 months of ownership is significant and negative ($\gamma_{10} = -.01, p < .05; \lambda_{10} = -.01, p < .05; \xi_{11} = -.01, p < .05$). Furthermore, the effect from a contrast comparison of 33 months of ownership with the mean of the prior two periods for ancillary service satisfaction is also significant and negative ($\gamma_{11} = -.02, p < .01; \lambda_{11} = -.02, p < .01; \xi_{32} = -.02, p < .01$). Therefore, the results offer support for $H_5$. Overall, it appears that the satisfaction with postpurchase ancillary service experiences exhibits a weakening asymmetric effect, which further attenuates as the owner approaches the end of the warranty period.

**Summary.** The general effects of resolvability are illustrated in Figure 2, which shows the effects on satisfaction with product quality that are based on the factor-weighted sum estimation model (Equation 3). As is evident in Figure 2, the effect on satisfaction with product quality illustrates different patterns for the attribute types: It increases over time for resolvable attributes and weakens over time for irresolvable attributes and ancillary services. Overall, the results offer strong support for our assertion that the drivers of satisfaction with quality shift over time in different ways based on the resolvability of the attribute used. Consequently, the results point to the need to address different stages of the ownership cycle strategically, which has important implications for the management of customer equity.

**DISCUSSION**

To date, the literature has tended to focus on a cross-sectional view of how consumers form satisfaction and quality assessments, investigating product-specific or service-related attributes and the asymmetric effects attributed to negative affect. Building on this literature, we propose and find that the drivers of satisfaction with product quality can shift over the ownership experience, depending on the type of attribute used. In particular, our results indicate that the effects on satisfaction with product quality become stronger over time for resolvable attributes but become weaker over time for irresolvable attributes and for ancillary service encounters. Overall, the findings have important implications for understanding the processes by which consumers form satisfaction and quality assessments. In particular, our results show that product attributes are not equivalent, in support of the findings of Mittal, Katrichis, and Kumar (2001). However, although Mittal, Katrichis, and Kumar demonstrate a shift in attribute weights over the ownership process, we provide evidence that shifts occur in systematic ways as a function of the type of attribute.
sequently, our results point to two important theoretical implications.

First, our results show that attribute satisfaction experiences a decline over time, yet the rate of decline depends in part on the resolvability of the attribute. That is, satisfaction tends to decline at a greater rate over time for product attributes that an owner perceives can be fixed or corrected under the product warranty than for ones that an owner perceives cannot be changed. Although research has shown that satisfaction in the United States appears to be declining (Fornell et al. 1996), our results indicate that the rate of decline differs in part because of perceived resolvability. This suggests that firms that use customer-satisfaction tracking studies as a measure of their market performance should consider investigating the satisfaction trends for specific attributes in addition to overall satisfaction ratings. For example, the American Customer Satisfaction Index is a valuable index for examining the extent to which customer satisfaction influences a firm’s return on investments, and it offers the ability to examine trends over time (Fornell et al. 1996). Although the index provides macrolevel value, it focuses on only overall satisfaction at the brand or model level. Our results suggest that additional value lies in the investigation of satisfaction at an attribute level, which can heighten a firm’s attention to different customer needs at different stages of ownership.

Second, our results show that the effect of attribute satisfaction on satisfaction with product quality asymmetrically shifts over time, depending on the resolvability of the attribute. These results heighten the importance of understanding how product-quality assessments can change over time. On the one hand, the effect of satisfaction with attributes that the owner believes can be corrected tends to increase over time. On the other hand, the differential effect of satisfaction with attributes that the owner believes cannot be changed is relatively great early in the cycle and declines as time of ownership increases. It appears that consumers may judge the quality of a product under warranty in accordance with attribute-specific assessments, which consequently points to the importance of firms’ examining satisfaction at an attribute level. Moreover, our results indicate that a focus on attribute-specific assessments may have different effects on global assessments of product quality as ownership progresses through the warranty period. It appears that consumers weigh attributes that may be flawed and can be fixed more heavily as ownership progresses, whereas they weigh product attributes that reflect design and define the nature of the product (and cannot be changed without altering the product) less heavily as ownership progresses. Overall, it appears that consumers seem to “punish” the manufacturer in terms of perceived quality for dissatisfaction with attributes that they believe should be fixed, but they learn to live with concerns about irresolvable attributes where the effect concomitantly declines.

In addition, our results offer insights into customer equity for the marketing strategy literature. In particular, our results highlight the complex nature of how consumers form assessments of quality during their ownership experience. We illustrate not only the importance of managing attribute-level satisfaction as it shifts in value from irresolvable attributes to resolvable attributes but also the importance of the long-term effects of the service experience on assessments of product quality. The findings extend customer-equity research by showing that the factors that affect satisfaction with product quality may shift over time. Research indicates that strategies directed toward satisfying customers are unlikely to have a strong impact unless they also delight customers (Oliver, Rust, and Varkey 1997), which suggests that customer equity is higher when quality delights rather than merely satisfies. Our results suggest that to improve customer equity, firms must understand that different product attributes can differentially affect satisfaction with product quality at different stages of the ownership cycle. From a marketing strategy perspective, our results suggest that stages of ownership need to be strategically addressed in different ways, such as through customer relationship management programs that acknowledge owners’ different “hot buttons” (e.g., Mittal, Katrichis, and Kumar 2001) at different periods in the ownership cycle.

Finally, our results yield insights for the services literature. In particular, our results confirm the role of ancillary services in influencing perceptions of the product. We also show that whereas overall satisfaction with ancillary services tends to decline during a product’s warranty period, its effect on satisfaction with product quality also weakens over time. It is possible that this accommodation effect may have a direct bearing on the service provider that the owner selects when the warranty period expires, which is an important avenue for further research.

Overall, our research has important practical implications for brand managers. Managers need to recognize that the type of attribute and the time of the customer’s product ownership each play an important role in the customer’s assessments of product quality. A possible approach for reinforcing the importance of such complex effects is to implement training programs that emphasize a match between specific product attributes (emphasizing both resolvable and irresolvable attributes for different stages of the ownership cycle) and customers’ current and future usage of the product, which allows for anticipation of long-term product needs that may not be readily evident to customers during the purchase process. Another potential approach is to install specific response programs that emphasize two-way communication between the customer and the manufacturer, both to reinforce the manufacturer’s commitment to its products’ quality and to enable managers to foster a relationship with customers throughout the ownership experience. Both strategies reinforce the importance of focusing on the long-term aspects of the customer’s product ownership experience.

Further Research and Current Limitations

Our primary goal for this article was to show that effects on satisfaction with product quality can shift over time. In this section, we suggest specific areas for further research and tie these suggestions to the limitations of this research. First, additional product attributes and product categories should be examined. Our examination of nine product attributes offers specific insight into the influence of resolvability over time, though other attributes that are unaccounted for in our empirical estimation may also be critical to ownership experiences and may shed additional light on the longitudinal shift of the drivers of satisfaction with product quality. Our research also focuses on the automotive industry, which provides a good framework for examining the role of product attributes and ancillary services in a
specific warranty period. Although we expect that other industries illustrate similar effects as a result of the resolvability of the attributes, it is possible that the strength of the effects differs. For example, consider the high-technology industry (e.g., laptop computers, personal digital assistants), in which product improvements shift at such a rapid rate that the length of product warranty may be less critical to owners, and the asymmetric shift due to resolvability may occur early in the ownership experience.

Second, further research should examine different time horizons during the warranty period and after the warranty expiration. Our research focused on a three-year warranty period, which has been the standard length of manufacturers’ automobile warranties for many years. However, if consumer demand for longer warranties—precipitated by the ten-year warranties offered by Hyundai, Isuzu, and Kia—forces other automotive manufacturers to lengthen their warranty periods (Harris 2002), it is possible that a longer warranty period will cause resolvability issues to be experienced later in the ownership experience, when the shift in the strengthening (weakening) of effects peaks (dips). Furthermore, it is possible for other effects to occur when the warranty expires, which is also when the burden of risk shifts to the consumer. Consumers will likely face the decision of whether to engage in a coping strategy that entails fixing the problem or purchasing a new car. Moreover, examination of the effects of ancillary service encounters after the expiration of the warranty may indicate a change in asymmetric effects, because consumers may no longer believe that they are restricted to servicing their vehicle at a particular dealership.

Third, further research should consider how longitudinal shifts in the drivers of satisfaction with product quality influence long-term product sales and profits. Recent research on the role of satisfaction on retail firm performance in the supermarket sector shows that the effect of customer satisfaction on store sales is asymmetric, so that when a high level of satisfaction is obtained, it is critical to maintain that level (Gomez, McLaughlin, and Wittink 2004). Thus, research that focuses on the effects of attribute resolvability beyond that of product quality may offer critical insight to managers for their resource allocation decisions.

APPENDIX

Satisfaction with Product Quality Measure

How satisfied are you with your vehicle quality? (1, 2 = “very dissatisfied”; 3, 4 = “somewhat dissatisfied”; 5, 6 = “fairly well satisfied”; 7, 8 = “very satisfied”; 9, 10 = “completely satisfied”)

Product Attribute Satisfaction Measures

How satisfied are you with your vehicle in each of the following areas? (1, 2 = “very dissatisfied”; 3, 4 = “somewhat dissatisfied”; 5, 6 = “fairly well satisfied”; 7, 8 = “very satisfied”; 9, 10 = “completely satisfied”)

- Interior roominess
- Driver’s seat comfort
- Operation of accessories (radio, heater, wipers, etc.)
- Riding comfort
- Ease of handling
- Quietness
- Power and pickup
- Smoothness of transmission
- Operation of brakes

Service Satisfaction Measure

Considering your most recent service visit, how satisfied would you say you are with your overall service experience? (1, 2 = “very dissatisfied”; 3, 4 = “somewhat dissatisfied”; 5, 6 = “fairly well satisfied”; 7, 8 = “very satisfied”; 9, 10 = “completely satisfied”)

Sales Satisfaction Measure (measured only once, just after vehicle purchase)

Thinking about your experience at [dealership name], how satisfied are you with your overall purchase experience at your dealership? (1, 2 = “very dissatisfied”; 3, 4 = “somewhat dissatisfied”; 5, 6 = “fairly well satisfied”; 7, 8 = “very satisfied”; 9, 10 = “completely satisfied”)

Sample Characteristics

Your gender: Male, Female
Are you: Married, Single, Other
Your education: Some high school or less, High school graduate, Some college, College graduate, Postcollege graduate
Number of children in your household: None, 1, 2, 3, 4 or more

REFERENCES


