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The Impact of Reliability and Customization on Customer Satisfaction for Goods versus Services

Abstract

Although there is a substantial body of research on quality, disagreement remains as to the effect of reliability, or things gone wrong, as opposed to customization, or things gone right, on customer satisfaction with goods versus services. Service quality researchers argue that reliability is relatively more important for services due to the nature of service production compared to goods production. In contrast, customer satisfaction researchers argue that a service firm's ability to customize their service to individuals makes customization relatively more important for services than for goods. The goal of this paper is to provide insight into this debate through an analysis of firms and industries measured in the American Customer Satisfaction Index database. Our results provide broad-based support for the argument that reliability is relatively more important for services, while customization is relatively more important for manufactured goods.

Key words: services, quality, customer satisfaction, reliability, and customization.

1. Introduction

Central to a firm's customer orientation is the improvement of those aspects of quality that are most important to customers. Quality experts distinguish between two general types of quality, the degree to which a good or service provides key customer requirements, or customization, and how reliably these requirements are delivered, or reliability (Deming 1981; Juran and Gryna 1988). The methods and processes used to improve these two quality types can be quite different. When improving customization or "things gone right," greater emphasis is placed on customer research as a basis for understanding customer needs. When improving reliability or "things gone wrong," greater emphasis is placed on operations and the need to failsafe existing products and processes. It is important, therefore, to understand the relative importance of customization versus reliability when allocating resources for quality improvement.

The issue is particularly relevant to the distinction between goods and services. The research that compares goods and services is, however, inconclusive. There remains a general disagreement as to which quality dimension is more important to maintain or improve between goods and services. Scholars in the services management tradition argue that the co-production process that typifies services makes reliability the more important quality dimension (Grönroos 1990; Zeithaml, Parasuraman and Berry 1996). Unlike goods, services are co-produced with customers at a time, and in a place, of the customer's choosing. And because service production involves more of the human resources of the firm and customers themselves, it adds greater inherent variability to the service production process. Thus reliability should be relatively more important to maintain or improve.

Others argue that the same co-production process makes customization relatively more important in determining customer satisfaction for services (Anderson, Fornell and Rust 1997; Fornell et al. 1996). Because many services are personnel intensive and customized to suit very heterogeneous needs, customization is more important for services than for manufactured goods.

However, there is no broad-based evidence of the *relative* importance of customization versus reliability for goods and services. Our goal is to provide such evidence. We use American Customer Satisfaction Index data from as many as 188 firms and 30 industries over the period 1994 through 1998 to test our hypotheses. We first contrast goods versus services, and then operationalize the firms and industries into four categories along a goods-to-services continuum, to test our predictions. The next section of the paper develops the arguments and describes the available evidence on each side of the debate. We then describe the ACSI model, data and analyses used to test the hypotheses, report the findings, and discuss their implications.

2. The Quality of Goods and Services

Over the course of history, our definition of quality has evolved and changed. It has been equated with excellence, value, conformance to specifications and benchmark superiority. New definitions have not replaced old definitions; rather all the quality definitions continue to be used today (Reeves and Bednar 1994). More common in the latter part of the 20th century is the definition that quality is conformance to requirements and customer specifications (Crosby 1980).

There are two central ideas that underlie this definition of quality. One is that a proper set of requirements and specification is identified. Importantly, the product specifications must match actual customer requirements. The second is that the production and delivery process must conform to those specifications and

irements. These ideas are central to Juran's concept of "fitness for use" (see Juran Gryna 1988). Juran emphasizes that quality is the extent to which a product :essfully serves the purpose of the user. The customers' view of quality derives n two distinctly different dimensions, product performance and freedom from iciencies. Product performance is the degree to which the product's specifications : customized to meet the needs of any given customer. Freedom from deficiencies is nply how reliably the product meets its specifications. For the purpose of our scussion, we refer to these two components of quality as customization and :liability.

Although these features may compete with each other in the marketplace, as vhen one competitor excels on reliability while another excels on customization, they ire only conceptually independent. Reliability may be a necessary condition for differentiation and customization to exist (Fornell and Johnson 1993). Empirically, the two dimensions are closely related components of overall quality. The advantage of this two-dimensional view of quality is that it allows us to make comparisons across very different firms and industries. It is arguably more appropriate to use more abstract, inclusive dimensions when making cross-industry comparisons between relatively "noncomparable" goods and services (Johnson and Fornell 1991). Within any given industry, firm, or even market segment, the quality dimensions that drive customer satisfaction and loyalty are many and varied (Feigenbaum 1991; Garvin 1984; Gustafsson and Johnson 1997; Parasuraman, Zeithaml and Berry 1985). Yet all the dimensions may be viewed, at some level, as falling under the categories of customization and reliability.

Although the definitions of quality described thus far and the distinction between reliability and customization apply to both goods and services, they have

evolved primarily from the study of manufactured goods. Services management has evolved into a research field of its own that provides unique insights into the measurement and management of service quality. Services have several unique qualities relative to physical goods. Services are more intangible than goods, making them hard and sometimes impossible to count, measure, inventory and test (Grönroos 1990; Parasuraman, Zeithaml and Berry 1985). This often makes it difficult for customers to understand service quality and, as a result, more difficult for firms to understand how consumers perceive and evaluate a service (Zeithaml, Parasuraman and Berry 1990). Unlike goods, where production and consumption are typically separated by time and space, services are co-produced at a time and place of the customer's choosing (Parasuraman, Zeithaml and Berry 1985). The inseparability of production and consumption for services means that service reliability is more outside the control of the firm. Finally, service production differs from goods production in that the co-production process involves more of the human resources of the firm and customers themselves (Grönroos 1990). There is simply a higher ratio of people to inanimate objects in the "service factory." As a result, services exhibit higher variances that cannot be controlled by the service process (Bateson and Hoffman 1999).

The service quality literature also raises the question as to whether quality drives customer satisfaction, or satisfaction drives quality. While some studies find that satisfaction drives a general perception of service quality, others find that perceptions of service quality drive satisfaction (de Ruyter, Bloemer and Peeters 1997). But the issue is largely semantic. We define satisfaction as a customer's overall evaluation of the consumption experience (following Johnson and Fornell 1991). More recent quality received is necessarily an antecedent to this satisfaction.

All of the models and analyses described and proposed herein thus view quality as a driver of satisfaction.

2.1 The Reliability Argument and Evidence

Service quality and customer satisfaction researchers have raised two very different arguments regarding the implications of service production vis-à-vis goods production for customization and reliability. As argued earlier, the simultaneity of production and consumption combined with the greater ratio of human (both employee and customer) involvement creates more inherent reliability problems for services vis-à-vis goods. This suggests that improving reliability, or minimizing things gone wrong, is more important for services than is improving customization. What customers expect service companies to do is provide the fundamentals, or a service free from deficiencies (Parasuraman et al. 1991a). Both the service quality literature and the customer satisfaction literature provide some support for this argument.

Primary support for the importance of service reliability in the services quality literature comes from studies using the SERVQUAL survey methodology (Parasuraman, Zeithaml and Berry 1985, 1988). The SERVQUAL method measures five dimensions of service quality: (1) tangibles (appearance of physical facilities and equipment), (2) reliability (ability to perform the promised service dependably and accurately), (3) responsiveness (willingness to help and provide prompt service), (4) assurance (employee knowledge and courtesy, and ability to inspire confidence), and (5) empathy (caring, individualized attention). The attributes of service reliability in the SERVQUAL survey include: (1) the degree of fulfilled promises, (2) the degree of interest in solving your problems, (3) whether the services are provided right the first time, (4) whether the services are provided at the time they are promised, and (5) the

existence of error-free records. The traditional SERVQUAL approach asks customers to rate the level of performance or excellence they would expect to see on each attribute of each service quality dimensions and then rate the level of performance they actually receive. Those dimensions with the largest gap between expectations and performance are the most important to improve.

In their review of the SERVQUAL research, Parasuraman, Berry and Zeithaml (1991b) note that reliability is consistently the most important service quality dimension, or largest "gap," to improve across service industries. Responsiveness is consistently second in importance, while tangibles are consistently the least important dimension to improve. Researchers have criticized the SERVQUAL approach on methodological grounds, including the validity of the five dimensions, the use of direct expectation or importance measures, and the use of difference scores (for a review see Hoffman and Bateson 1997). Berry, Parasuraman and Zeithaml (1994) subsequently demonstrated the generalizability of their findings using a different methodology (allocation of 100 points among the five dimensions) to identify the most important dimensions to improve. Their results again support reliability as the most important service quality dimension (32%) followed by responsiveness (22%), assurance (19%), empathy (16%), and tangibles (11%).

These results, albeit important, do not directly address the question that motivates our research. Based on the co-production argument, we predict that reliability is relatively more important than customization for services when compared to goods. But the SERVQUAL studies focus on services; they do not include benchmarks for physical products. Another potential limitation of the research for our purposes is that all of the research involves one form or another of direct importance measures (direct scale ratings or point allocation methods). Alternatively, statistically

derived importance provides estimates of the impact that a given quality dimension (such as customization or reliability) has on overall evaluations of satisfaction (Gustafsson and Johnson 1997).

Research using the national customer satisfaction barometers or indices provides more direct comparisons of goods and services. The Swedish Customer Satisfaction Barometer or SCSB (Fornell 1992) provides data on satisfaction across approximately 30 industries and 130 firms. The American Customer Satisfaction Index or ACSI (Fornell et al. 1996) provides data on approximately 35 industries and 200 firms. (The ACSI model and method is described in more detail in a later section.) These surveys find satisfaction with services falling consistently and significantly below the level of satisfaction with more physical goods. Fornell and Johnson (1993), using SCSB data, argue that reliability is a prerequisite for differentiating a product. Their analysis shows that services are less differentiated than products, which is consistent with the reliability argument.

We contend that the satisfaction gap is most likely a reflection of the inherent reliability problems that plague service production. If customization were a service provider's relative strength, service satisfaction should be higher than goods satisfaction, not lower. If reliability were a service provider's relative weakness, it would suggest lower satisfaction for services. Thus the reliability argument is more consistent with the differences we actually observe. But the totality of the evidence is indirect. Nowhere is the relative importance or impact of customization versus reliability explicitly examined.

2.2 The Customization Argument and Evidence

The assumption that reliability is the more important driver of satisfaction for services than for goods is being challenged. Huff, Fornell and Anderson (1996) argue

that reliability is likely to drive overall quality when there is meaningful variation in defects between competing products *and* customers are able to differentiate the variation. The intangible, subjective nature of service performance makes the customers' ability to differentiate the variation more difficult. Huff, Fornell and Anderson (1996) thus conclude that reliability should be more important for customer satisfaction with goods.

Anderson, Fornell and Rust (1997) further argue that service production offers important advantages over goods production. The co-produced nature of a service allows for intensely personal and customized services that suit a very heterogeneous set of needs (see also Colgate and Danaher 2000; Grönroos 1990; Hoffman and Bateson 1997). Effective service firms find ways to take advantage of the inherently flexible nature of service production to more than compensate for the problems of delivering consistent and predictable levels of service quality. This suggests that customization is relatively more important than reliability for services when compared to goods. Hoffman and Bateson (1997), for example, state that:

> "Producers of goods typically manufacture the good in an environment that is isolated from the customer. As such, mass-produced goods do not meet individual customer needs. Since both the customer and the service provider are involved in the service delivery process, however, it is easier to customize the service based on the customer's specific instructions." (Hoffman and Bateson 1997, pp. 34-35).

The emergence of service recovery systems (Smith, Bolton and Wagner 1999) is consistent with this argument. Service recovery might reduce the negative impact of reliability, while increasing the positive impact of customization, on service satisfaction. However, a study by Bolton (1999) concludes that, for a majority of customers in a restaurant and hotel setting, both customer satisfaction and repurchase intentions decrease after a service failure and recovery encounter.

The primary evidence in support of the customization argument comes from Fornell et al.'s (1996) study of the 1994 baseline ACSI data. The ACSI model measures quality using an index of three survey questions (overall quality, customization, and reliability). The quality index is a driver of customer satisfaction in the model (see Figure 1, described subsequently). The measurement loadings (the correlations between the customization measure and the overall quality index) suggest that customization is more important among the service industries studied than among the manufactured goods industries. The average loadings for customization were 0.909 for services compared to 0.898 manufactured goods, leading the authors to argue that customization is more important for services.

Yet there are several problems with this evidence. The differences in the loadings reported by Fornell et al. (1996) are quite small, and it is unclear whether they are even significant. It is also problematic to view the customization loadings in isolation. Any conclusions regarding customization must take into account the loadings for reliability, which were not reported. Finally, standardized loadings are not the same as effect sizes (impact scores). More direct tests of the arguments surrounding customization and reliability require an analysis of impact or effect size rather than correlation. In the end, while there are good arguments on each side, there is simply no broad-based evidence as to whether customization or reliability is more important for tangible, physical goods when compared with intangible, co-produced services.

3. Research Hypotheses

Although we are ultimately interested in contrasting relative goods and relative services, the distinction is not always so simple. Offerings may be better described as falling along a goods-to-services continuum. After describing the goods-

to-services continuum in more detail, we posit the research hypotheses to be tested in our empirical study.

3.1 The Goods-to-Services Continuum

It has become difficult to clearly distinguish pure goods from pure services. Most of the products in today's economy consist of some "good" as well as "service" components (Bateson and Hoffman 1999). Mittal, Kumar and Tsiros (1999) use the concept of a consumption system to deal with this issue, where a consumption system consists of a bundle of goods and services that are consumed over time in multiple consumption episodes. Even in a traditional service/retail organization like McDonald's customers receive goods (such as a hamburger, fries and a soda) and services (such as a short waiting time and friendly service). Although the ratio of goods to services in the offering is difficult to quantify, there are categorical distinctions in the literature that we can use (Martin and Horne 1992; see also Kotler, 2000). There are four categories that work well for the ACSI industries in our study: (1) pure goods (food products, soft drinks), (2) core goods with accompanying services (cars, computers), (3) core services with accompanying goods (airlines, hotels), and (4) pure services (phone service, banking).

In our analysis of the ACSI data, we first examine differences between both firms and industries with respect to their primary classification as a service/retailer or good (based on SIC code classifications). This is consistent with earlier ACSI research (Fornell et al. 1996). We then examine differences between goods and services in more detail using the four level goods-to-services continuum.

3.2 Hypotheses

Our discussion leads to a series of research hypotheses that are tested in our empirical study. The first two hypotheses posit main effects for both reliability and customization on customer satisfaction.

Hypothesis 1: Perceived reliability has a positive impact on customer satisfaction.

Hypothesis 2: Perceived customization has a positive impact on customer satisfaction.

While these hypotheses are already well supported, it is important to test them again in the context of the potentially moderating effects of the distinction between goods and services.

Our third and focal hypothesis is motivated by the argument that the co-production of services creates greater inherent reliability problems for services as compared to goods. We predict that improving customization has a greater impact (relative to reliability) on goods as opposed to services.

Hypothesis 3: The relative impact of customization versus reliability is greater for goods as opposed to services.

The alternative hypothesis is that, because service reliability may be more difficult for customers to detect and service production offers greater opportunity to customize an offering, the opposite occurs. That is, the relative impact of customization versus reliability is greater for services.

Service researches agree that quality (either customization or reliability) is likely to be more difficult to judge for services (Parasuraman, Zeithaml and Berry 1985). This due to the intangibility of services; there are fewer tangible cues available to judge quality. This means that the impact of both customization and reliability may

decrease somewhat, in an absolute sense, from goods to services. This is why our hypothesis and tests focus on relative changes in the impact of reliability and customization.

4. Empirical Study

The hypotheses are tested using data from the American Customer Satisfaction Index (ACSI) survey (Fornell et al. 1996). Although we only use a part of the data in the survey, the next section provides a brief description of the ASCI for those readers unfamiliar with the model and data.

4.1 The ACSI Model and Data

The ACSI model is presented in Figure 1 while the survey measures used to operationalize the model are shown in Table 1. There are three main drivers of satisfaction in the model, quality, value, and customer expectations. Satisfaction, in turn, should reduce the incidence of complaints and increase customer loyalty. The model is estimated for each of approximate 200 firms annually and based on a random sample telephone survey of approximately 250 of a firm's customers. The survey questions are all rated on 1 to 10-point scales with the exception of price tolerance (a percentage rating) and complaint behavior (a dichotomous variable). In every case, the measurement variables are specified as reflective indicators of the latent (abstract) constructs in the model.

- insert Figure 1 and Table 1 about here -

Our interest is in the overall satisfaction index and the survey ratings for customization and reliability. Specifically, we examine the impact that customization and reliability ratings have on the satisfaction index to determine the relative importance of each quality dimension. The satisfaction index is a weighted average of

three survey ratings: (1) an overall rating of satisfaction; (2) the degree to which performance falls short of or exceeds expectations; and (3) a rating of overall performance relative to the customer's ideal good or service in the category. Each measure is an overall evaluation of the good or service. The 1-10 point scale ratings for these measures are combined into a weighted average and re-scaled to provide a 0 to 100-point satisfaction index (see Fornell et al. 1996 for details). Our measures for customization and reliability are on their original 1-10 point scales (where 1 = poor customization or reliability, and 10 = excellent customization or reliability).

4.2 Firm and Industry Samples

We use both firm and industry-level data from the 1994 to 1998 ACSI survey to test the hypotheses. For the purpose of this study, the public/government monopolies were not included because of the relative lack of consumer choice. Outliers were also deleted from the samples. The outliers were determined by building separate regression models for reliability on satisfaction and customization on satisfaction (using the industry-level data) and studying the studentized residuals. If an observation (an industry in a given year) exceeded the specified limit (greater than +/- 2.0; see Hair et al. 1995), the observations were deleted from our subsequent analyses.[2] For consistency, when an observation was removed from the industry-level sample, the corresponding firms were removed from the firm-level sample as well.

In a very small number of cases we had to deal with missing values for a variable for particular firm-level observations. In these cases (6 cases out of 823 observations), we replaced the value with the previous year's value for the firm on the

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[2] The industries deleted from the analysis were all from the years of 1997 and 1998. The observations on Personal Computers, Household Appliances, Broadcasting and Phone (Long Distance) were deleted for both years (1997 and 1998), while U.S. Postal Service (parcel delivery) was deleted for 1997, and Utilities were deleted for 1998.

variable. This rule is consistent with the observed stability of the ACSI measures over time. Finally, a small number of companies were dropped from the sample because they were either dropped from the ACSI in the midst of the time frame or the structure (composition) of the industry changed.[3]

Our final industry-level sample includes 25 to 30 industries in any given year. There are a total of 140 industry observations over the five years. Our firm-level sample includes141 to 188 firms in any given year. There are a total of 823 firm-level observations. Recall that 250 customer interviews are conducted for each firm in each year. The five years of data were stacked for purposes of the analysis and a five-level categorical variable was included in the analysis to capture the differences from year to year.

Table 2 shows the 30 industries classified along the four-level goods-to-services continuum. The two-level classification (goods versus services) is based on SIC code classifications previously used in ACSI research (Fornell et al. 1996). Subdivision of the goods and services into the four-level classification (pure good, core good with services, core service with goods, core service) was based on discussion and agreement between the authors. The only two industries for which the classification was not so clear were household appliances and consumer electronics. Our final classification is based on the argument that the amount of service provided to customers of these goods is relatively minimal, especially compared to those who purchase and consume automobiles and personal computers. Both the automobiles and computers are, on average, more expensive purchases where service is more naturally bundled with the goods. However, we performed a sensitivity analysis and

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[3] Altogether 97 such observations were deleted representing 43 different companies.

found that our results do not systematically change when appliances and electronics are classified as core goods with services.

- insert Table 2 about here -

As our primary focus is on goods versus services, and the number of "core products with services" is relatively small (especially for the industry-level data), our analyses emphasize the goods versus services classification. We subsequently analyze the data using the four-level classification to provide additional insight.

4.3 Distinguishing Reliability from Customization

Reliability and customization are theoretically and conceptually distinct. However, empirically they are closely related. Our approach to distinguishing between the impact of reliability and the impact of customization must take into account the fact that these measures are far from independent of each other. The ACSI model uses customization and reliability as highly redundant, reflective indicators of an overall quality construct. The two survey ratings are correlated 0.91 for the firm-level data, and 0.94 for the industry-level data. This presents problems when regressing both measures as independent variables on satisfaction. Our solution is to analyze the impact of each measure separately and compare the results to test hypothesis three. If we find that customization and reliability behave very differently across conditions, it supports our use of separate analyses. If customization and reliability are so redundant that they behave exactly the same, hypothesis three will not be supported.

4.4 Model Specifications

A general linear model was estimated for both reliability and customization. The models were estimated for both firms (n = 823) and industries (n = 140) to

provide a comprehensive test of the hypotheses. Obtaining consistency in the firm and industry level results helps to rule out alternative explanations for the findings (such as fixed effects that exist for the firms but not the industries). The dependent variable was customer satisfaction (the ACSI), while the independent variables included reliability or customization as a continuous variable, a two-level factor for product (versus service) classification, and a five-level variable to account for year-to-year variation in satisfaction. The models included the two-way interaction term involving reliability (or customization) and product classification.

To summarize, hypotheses one and two predict that reliability and customization each has a positive main effect on satisfaction across firms and industries. Hypothesis three predicts that the effect of reliability increases relative to the effect of customization when going from goods to services. The interactions involving reliability/customization and the good (versus service) classification are used to test the third hypothesis. For example, the effect of reliability might decrease for goods (versus services) while the effect of customization might increase. If both interactions are in the same direction, the interaction involving customization should at least be more positive for products than the interaction involving reliability.

4.5 Results

Tables 3 and 4 contain the ANOVA (analysis of variance) results from the general linear model estimations for the firm-level data. The models for customization and reliability explain 86% and 77% of the variation in customer satisfaction respectively. Consistent with previous ACSI research (Fornell et al. 1996), the tables show that both customization and reliability have a significant impact on satisfaction. The effect sizes reveal a positive linear effect for both perceived reliability as well as perceived customization on satisfaction ($\beta = 9.663$, $p < 0.001$ for customization; $\beta =$

8.263, $p < 0.001$ for reliability). These results support hypotheses one and two. The results are also consistent with Fornell et al.'s observation that, while both customization and reliability are important, customization is generally more important than reliability across industries.

- insert Tables 3 and 4 about here -

Also consistent with the earlier studies, there is a main effect for good versus service classification in the customization model, where the satisfaction with services is lower than the satisfaction with manufactured goods. The fixed effect of year is significant in the model for customization, but not in the model containing the reliability dimension.

The ANOVA results also reveal a significant ($p < 0.001$) two-way interaction involving product (versus service) classification and customization. In contrast, the interaction involving reliability was not significant. The direction and size of the interaction effects reveals a pattern of results that supports hypothesis three. For the customization model, the positive effect of customization on satisfaction *increases* for goods when compared to services ($\beta = 3.069$, $p < 0.001$). For the reliability model, the positive effect of reliability on satisfaction *decreases* for goods when compared to services, but not significantly ($\beta = -0.456$, n.s.). Relating this back to the language used in hypothesis three, this confirms that the *relative* impact of customization versus reliability increases when we examine product firms as opposed to service firms. The third hypothesis is thus supported by the firm-level analyses.

To illustrate our findings, we ran simple regression models involving satisfaction and customization (reliability) for products (services). The unstandardized betas or impact scores from these models are shown in Figure 2. Keep in mind that the impacts reflect the change in the 0-100-point satisfaction index that results from a

one-point increase in the 1-10-point customization or reliability scales. Consistent with the general linear model results, the simple regressions show a greater effect of customization on satisfaction for products compared to services. The opposite pattern holds for reliability where the impact increases slightly for services.

We then estimated the models using the four-level goods-to-services classification. The ANOVA results for the customization model (not shown) reveal significant main effects ($p < 0.05$) for year, customization, and the product-to-service classification. There is also a product-to-service classification by customization interaction ($F = 7.985, p < 0.001$). The ANOVA results for the reliability model reveal main effects ($p < 0.05$) for reliability and the product-to-service classification. There is also a product-to-service by reliability interaction effect in this model ($F = 5.978, p < 0.001$). The pattern of effect sizes for the interactions are consistent with the previous results and provide some insight into what is driving them. We use the pure service category as the baseline when contrasting effect sizes across levels of the goods-to-services continuum. The contrasts reveal no significant difference in the effect of customization on satisfaction between the two service categories. However, the effect of customization is higher for the two product categories. Customization has a greater effect for pure goods ($\beta = 1.168, p < 0.077$) and core goods ($\beta = 3.544, p < .001$). In contrast, the effect of reliability on satisfaction is systematically lower for goods, but is concentrated in the pure goods category ($\beta = -2.787, p < 0.001$).

These results are again consistent with hypothesis three in that the impact of customization increases, while the impact of reliability remains the same or decreases, from services to goods. Importantly, the results reveal where the effects are concentrated. The increase in the effect of customization on satisfaction is concentrated among core goods, albeit still marginally significant for pure goods. The

pure goods drive the decrease in the effect of reliability on satisfaction. As this category is dominated by consumer non-durables, the result is not surprising. Given the relatively simple nature of non-durable products, their technology, and production, there are relatively few "things gone wrong." Rather, the relative emphasis is on "things gone right" or customizing the goods to fit multiple market segment needs.

The industry-level models generally mirror what we find for the firms. The industry models for customization and reliability explain 79% and 78% of the variation in customer satisfaction respectively. The ANOVA results, presented in Tables 5 and 6, reveal highly significant main effects for both customization and reliability on satisfaction ($\beta = 7.619$, $p < 0.001$ for reliability; $\beta = 8.218$, $p < 0.001$ for customization). The interaction involving customization and goods (versus service) classification is marginally significant ($F = 3.544$, $p = 0.062$), while the interaction involving reliability and goods classification is not significant ($F = 0.744$, n.s.). Directionally, the effect of customization on satisfaction increases for goods ($\beta = 2.854$, $p = 0.062$), while the effect of reliability on satisfaction decreases for goods ($\beta = -0.987$, n.s.).

- insert Tables 5 and 6 about here -

It should be noted that the significance levels reported in the ANOVA tables use more conservative two-tailed tests of significance. As our hypotheses make directional predictions, one-way tests are also appropriate. This makes the interaction involving customization significant ($p < 0.05$) while the interaction involving reliability is not. Thus the pattern of results again supports hypothesis three. The effect of customization on satisfaction increases relative to the effect of reliability on satisfaction from services to products. We then estimated the models using the four-level goods-to-services classification. These results reveal that it is the pure goods

industries that drive the increased effect of customization on satisfaction. This is most likely due to the relative small number of "core goods with services" in the industry-level sample.

To illustrate the industry-level results, we again ran simple regression models involving satisfaction and customization (reliability) for goods (services). The unstandardized betas or impact scores for these models, shown in Figure 3, are very consistent with the firm-level results in Figure 2. Customization has a greater effect on satisfaction for goods when compared to services, while the effect of reliability on satisfaction is more equal. Relatively, customization is more important for goods and reliability is more important for services.

5. Discussion and Conclusions

Our study and results clearly show that customization, or things gone right, and reliability, or things gone wrong, play different roles in driving satisfaction for goods versus services. Customization is more important than reliability in affecting the satisfaction with manufactured goods. However, there is no significant difference in the effects of customization versus reliability for services. Thus reliability is relatively more important than customization in driving satisfaction with services as opposed to goods.

Our findings are consistent with the argument that the co-production of services makes reliability inherently more important for services (Grönroos 1990; Zeithaml, Parasuraman and Berry 1996). The findings also refute arguments that the co-production of services allows for greater customization, making it the more important driver of service satisfaction. This has important implications for where both goods and services focus their quality improvement efforts. While customization

is the greater driver of satisfaction across firms and industries, service firms should focus more on driving variation out of the production process.

Our analysis goes beyond the general distinction between goods and services. Categorizing the firms along a goods-to-services continuum provides further insights into the findings. For the firm-level data, it reveals that the effect of customization is concentrated among goods with a significant service content, such as automobiles. It also shows that reliability is least important in the pure goods sector. As noted, the competing products in these industries are relatively simple and reliable from a production standpoint. This makes it hard for reliability to have much impact on customer perceptions.

A strength of our study is that it is based on customers' own perceptions of actual goods and services in the marketplace. Since quality is in the eyes of the beholder, customer perceptions are the best available measure of quality. At the same time, this creates a limitation. Although customization and reliability are conceptually distinct, they are empirically quite similar. This makes it difficult when using both customization and reliability as independent variables in the same analysis. Our solution was simple – analyze them separately. If they are completely redundant perceptions of quality, then they should behave the same in any analysis. But clearly they did not. As a check, we also tested the hypotheses using simple structural equation models (following Gustafsson and Johnson 1997) where customization and reliability are either reflective or formative indicators of latent quality as a driver of satisfaction. Again the results were consistent with our ANOVA results. Whether using linear regression, ANOVA or structural equation modeling, our findings are robust.

The fact that we find reliability to be an important driver of customer satisfaction is an important contribution . Both scholars and practitioners have promoted customization heavily of late. It is critical not to ignore the role of reliability and quality assurance in the process. Consider, for example, a recent study by Curkovic, Vickery and Droge (1999) in the automotive industry. These authors find that both product reliability and durability have strong relationships to business performance. At the same time, they are low strategic priorities among the chief executive officers who participated in the study. To be able to retain and expand their customer base, an organization needs to implement new product attributes that correspond to customer needs. However, the organization must also make the product reliable and create it faster and more efficiently in order to beat its competitors. This means that organizations must have a dual focus during product development, incorporating methodologies for getting to know the voice of the customer in the early phases of product development and subsequently breaking it down to the different subsystems to assure reliability. One recent suggestion is to make greater use of Customer Satisfaction Modeling (CSM) in combination with Quality Function Deployment (QFD; Gustafsson and Johnson 1997). In latter phases of the development process, other methodologies for driving variation out of the production process include Robust Design (RD) and Design of Experiment (DoE).

Several avenues for future research are possible based on our findings. To bring more clarity to the role of how different quality dimensions influence customer satisfaction, research might simultaneously collect both objective quality data and perceived quality. This would make it possible to gain a deeper understanding of the relationship between internal and external quality. Another appealing avenue is to follow a goods industry over time and study the changing role of customization and

reliability. If the amount of services to goods in the product increases or changes over time, it would be informative to examine whether the impact of customization and reliability change as well. This would help researchers to better understand how a firm's quality strategy should evolve.

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Figure 1
The American Customer Satisfaction Index Model

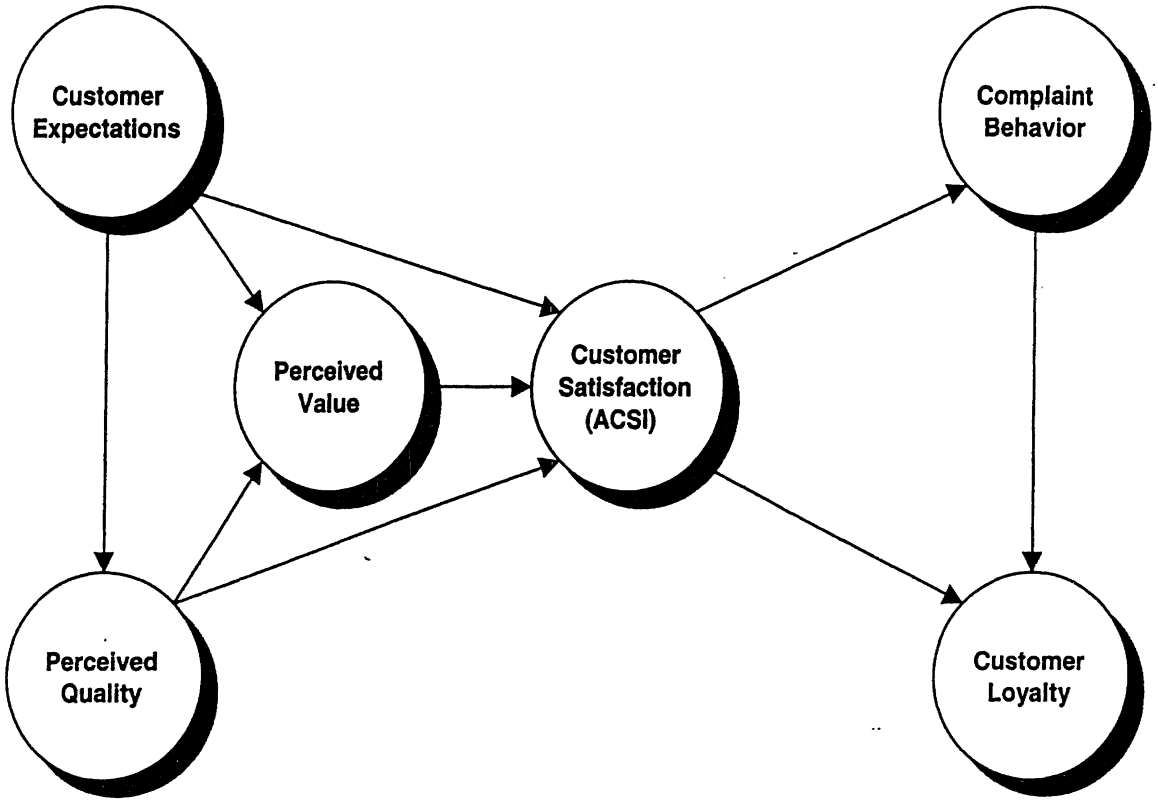

Figure 2
Firm-level impacts for customization and reliability on satisfaction

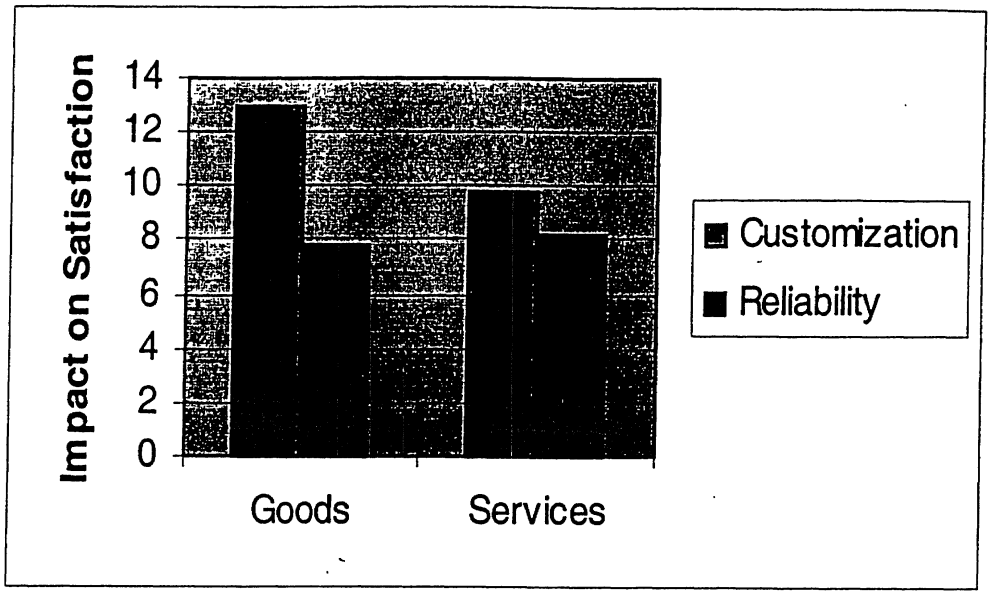

Figure 3
Industry-level impacts for customization and reliability on satisfaction

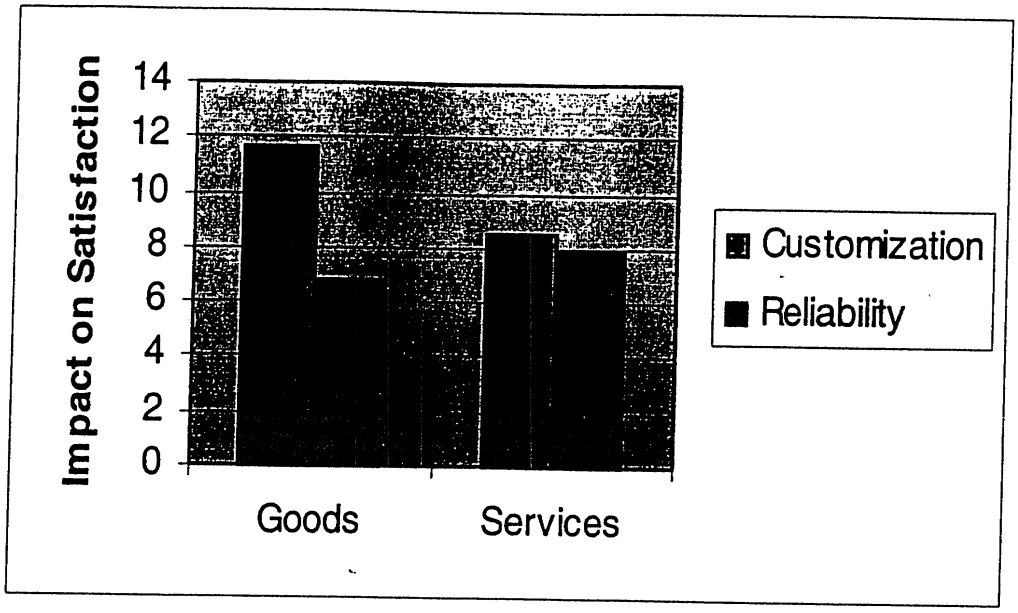

Table 1
The ACSI Survey Measures

Measurement Variable	Latent Variable
1. Overall expectation of quality (pre-purchase)	Customer Expectations
2. Expectation regarding customization, or how well the product fits the customer's personal requirements (pre-purchase)	Customer Expectations
3. Expectation regarding reliability, or how often things would go wrong (pre-purchase)	Customer Expectations
4. Overall evaluation of quality experience (post-purchase)	Perceived Quality
5. Evaluation of customization experience, or how well the product fit the customer's personal requirements	Perceived Quality
6. Evaluation of reliability experience, or how often things have gone wrong	Perceived Quality
7. Rating of quality given price	Perceived Value
8. Rating of price given quality	Perceived Value
9. Overall satisfaction	ACSI
10. Expectancy Disconfirmation (performance that falls short of or exceeds expectations)	ACSI
11. Performance versus the customer's ideal product or service in the category	ACSI
12. Has the customer complained either formally or informally about the product or service?	Customer Complaints
13. Repurchase likelihood rating	Customer Loyalty
14. Price tolerance (increase) given repurchase	Customer Loyalty
15. Price tolerance (decrease) to induce repurchase	Customer Loyalty

Table 2
Industry and firm classifications

Goods-to-Services Categories			
Goods		Services	
Pure Good	Core Good (with Service)	Core Service (with Goods)	Pure Service
Food Products	Personal Computers	Gas-Service Stations	Parcel Delivery
Beer	Automobiles	Publishing	U.S. Postal Service
Soft Drinks		Restaurants	Phone (Long Distance)
Tobacco		Department Stores	Phone (Local)
Personal Care Products		Discount Stores	Broadcasting
Apparel		Supermarkets	Utilities
Athletic Shoes		Airlines	Banks
Household Appliances		Hotels	Life Insurance
Consumer Electronics		Motion Pictures	Personal Insurance
			Health Care

Table 3
Firm-level ANOVA results for customization

Source	Type III Sum of Squares	Degrees of Freedom	Mean Square	F	Significance (two-tailed)
Intercept	342.123	1	342.123	67.377	0.000
Year	50.035	4	12.509	2.463	0.044
Goods (vs. Services)	163.313	1	163.313	32.162	0.000
Customization	8999.354	1	8999.354	1772.308	0.000
Goods X Customization	174.454	1	174.454	34.356	0.000
Error	4138.375	815	5.078		
Total	4902992.00	823			

Table 4
Firm-level ANOVA results for reliability

Source	Type III Sum of Squares	Degrees of Freedom	Mean Square	F	Significance (two-tailed)
Intercept	141.512	1	141.512	17.158	0.000
Year	45.646	4	11.412	1.384	0.238
Goods (vs. Services)	12.412	1	12.412	1.505	0.220
Reliability	7596.959	1	7596.959	921.065	0.000
Goods X Reliability	6.530	1	6.530	0.792	0.374
Error	6722.132	815	8.248		
Total	4902992.00	823			

Table 5
Industry-level ANOVA results for customization

Source	Type III Sum of Squares	Degrees of Freedom	Mean Square	F	Significance (two-tailed)
Intercept	4.122	1	4.122	0.758	0.386
Year	45.727	4	11.432	2.102	0.084
Goods (vs. Services)	18.149	1	18.149	3.338	0.070
Reliability	848.934	1	848.934	156.131	0.000
Goods X Customization	19.271	1	19.271	3.544	0.062
Error	717.725	132	5.437		
Total	819275.000	140			

Table 6
Industry-level ANOVA results for reliability

Source	Type III Sum of Squares	Degrees of Freedom	Mean Square	F	Significance (two-tailed)
Intercept	65.103	1	65.103	11.108	0.001
Year	25.935	4	6.484	1.106	0.356
Goods (vs. Services)	5.386	1	5.386	0.919	0.339
Reliability	855.548	1	855.548	145.972	0.000
Goods X Reliability	4.361	1	4.361	0.744	0.390
Error	773.660	132	5.861		
Total	819275.000	140			

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