



## Investigating the non-linear effects of e-service quality dimensions on customer satisfaction <sup>☆</sup>

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### ARTICLE INFO

#### Keywords:

e-Service quality  
Customer satisfaction  
Non-linearity  
Retail websites

### ABSTRACT

The literature on service quality initially focused on identifying the service attributes that drive overall measures of customer satisfaction. More recently, the assumption that attribute-level performance is linearly related to customer satisfaction has been challenged. Inspired by Kano's work on product quality, service researchers have used questionable methods to classify service attributes as attractive, one-dimensional, or a must-be, based on the observed shape of their satisfaction response functions. Valid assessment of the shape of satisfaction response functions for services requires crossed service by respondent ratings data to control for differences in respondent's scale use in service assessment. Application of a recommended approach identifies download speed as a must-be performance dimension that interacts negatively with site functionality as the only non-linearity for online retailers. Currently used methods produce quite different results.

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### 1. Introduction

Service managers need to understand how perceptions of their performance on service quality dimensions influence levels of customer satisfaction. The literature shows positive effects of customer satisfaction on such desirable outcomes as repeat purchase (Szymanski and Henard, 2001), retention (Bolton, 1998), loyalty (Anderson and Sullivan, 1993), retailer sales performance (Gomez et al., 2004), and profitability (Anderson et al., 1994; Bernhardt et al., 2000). Reports about which service attributes drive levels of customer satisfaction are available for such application areas as banking (Levesque and McDougall, 1996), software (Kekre et al., 1995), and online shopping (Szymanski and Hise, 2000).

However, the initial assumption that attribute-level performance is linearly related to overall customer satisfaction has now been challenged (Mittal et al., 1998; Anderson and Mittal, 2000). Negative asymmetry or decreasing returns, often attributed to prospect theory (Kahneman and Tversky, 1979), has been found using regression analysis and cross-sectional survey data in a health care and an automobile setting (Mittal et al., 1998), for hypermarkets (Ting and Chen, 2002), for a supplier in the automotive industry (Matzler et al., 2004), and for an educational program e-portal (Cheung and Lee, 2004). Service attributes have

even been classified as attractive, one-dimensional, or must-be by Kano et al. (1984), based on the shape of their response functions.<sup>1</sup> For example, Ting and Chen (2002) determined a 'children's playroom' was attractive, 'quick checkouts' was one-dimensional, and 'sufficient parking area' was a must-be for Taiwanese hypermarkets. Non-linear response functions mean managers not only have to know if an attribute is a driver of customer satisfaction, they need to know the shape of the response function for each driver to identify priorities and allocate resources. If a response function is linear, an improvement in quality has the same effect on customer satisfaction, no matter where the service provider is located on the attribute. If the response function is non-linear, the effect of the improvement depends on the slope of the function at the point where the provider is located on the attribute. But as detailed below, to draw conclusions the published research has relied on samples that truncate the distribution of quality and satisfaction that is investigated, treated categorical ratings as if they were all ratio scale data, and employed regression models that could be expected to produce biased parameter estimates.

The purpose of this research is to compare an appropriate method for identifying any non-linear effects of service quality dimensions on customer satisfaction with the methods that are currently being used in the literature. Valid identification of the

<sup>☆</sup>Support for this research was provided by a Social Sciences and Humanities Council of Canada Initiative on the New Economy Research Grant.

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<sup>1</sup> Oliver (1997, p. 152) identified the same satisfaction response functions, which he labeled as for monovalent satisfier, bivalent satisfier, and monovalent dissatisfier needs.

form of non-linearity is important for categorizing quality dimensions into Kano's attractive, one-dimensional or a must-be and for the allocation of quality improvement resources for services. In particular, this research briefly reviews the literature on the linearity of the service quality dimension–customer satisfaction relationship. Then it identifies the methodological problems evident in the literature. To overcome these problems, we collect a unique service quality and customer satisfaction data set by crossing websites with respondents to control for respondent scale use and employ a method that enables valid testing for non-linear relations. The results are contrasted with those from less careful use of the same data and from analyzing a data set of the type previously used for research on linearity.

## 2. Theoretical background

Reviews by Yi (1990) and Oliver (1997, Ch. 5) trace interest in the functional form of the attribute performance–customer satisfaction relationship to dual-factor theory, based on Herzberg's two-factor motivator-hygiene theory of job satisfaction (Herzberg et al., 1959). According to this view, satisfaction and dissatisfaction are distinct and result from different attributes of the service interaction. As reviewed in Vargo et al. (2007), this distinction between satisfiers and dissatisfiers has also been referred to as motivators versus hygienes (Zhang and von Dran, 2000), expressive versus instrumental factors (Swan and Combs, 1976), and attractive versus must-be attributes (Kano et al., 1984).

Fig. 1 shows the shape of the response functions that underlie Kano's attribute categorization. The straight-line for a one-dimensional attribute is the response function that was assumed in early work on the drivers of customer satisfaction. The upper curve shows the increasing returns of an attractive attribute that adds a positive quadratic to the core positive linear response function. Attractive attributes exhibit positive asymmetry, associated with customer delight (Oliver et al., 1997). Customer delight is a positive emotion generally resulting from a surprisingly positive experience (Rust and Oliver, 2000). Attractive attributes surprise and arouse by providing

something customers do not expect. The lower curve shows the decreasing returns of a must-be attribute that adds a negative quadratic to the core positive linear response function. The negative asymmetry of Kano's must-be attributes can be explained by prospect theory (Kahneman and Tversky, 1979). It suggests that an individual's evaluation of customer satisfaction is reference dependent, in that it is assessed as a gain or loss from the individual's performance standard, that act as a reference point. It also exhibits loss aversion, in that the evaluation function is steeper for the negative losses than for the positive gains, as seen in Kano's must-be attributes.

Increasing and decreasing returns can both be thought of as having a single threshold, where the slope of the response function changes. However, non-linearity can also be more complex. When combined with diminishing sensitivity with greater distance from the reference point (Mittal et al., 1998), prospect theory justifies a more complex 'satisfaction maintaining' response function (Anderson and Mittal, 2000, Fig. 2, Panel 2). This function adds a negative cubic element to a core positive linear response function. Fig. 2a illustrates this response function, which can be thought of as having dual thresholds that identify three distinct response zones. It has increasing returns from low to average levels of attribute quality and decreasing returns from average to high levels of attribute quality. A second, dual threshold function, shown in Fig. 2b, adds a positive cubic to the core positive linear function. It combines the decreasing returns of a must-be attribute at low to average levels of attribute quality with the increasing returns of an attractive attribute from average to high levels of attribute quality, to reveal what amounts to a zone of indifference (Woodruff et al., 1983).

Kano et al. (1984) proposed their categorization of attributes to help set priorities for quality improvement of tangible products, and proscribed an interview procedure to distinguish attractive, one-dimensional and must-be attributes from indifferent attributes. Subsequent applications in retailing (Schvaneveldt et al., 1991) and insurance (Bartikowski and Llosa 2004) illustrate how this approach can work for services. But in the service literature, the shape of the attribute service quality–customer satisfaction response function has predominantly been determined by fitting cross-sectional data. However, empirically

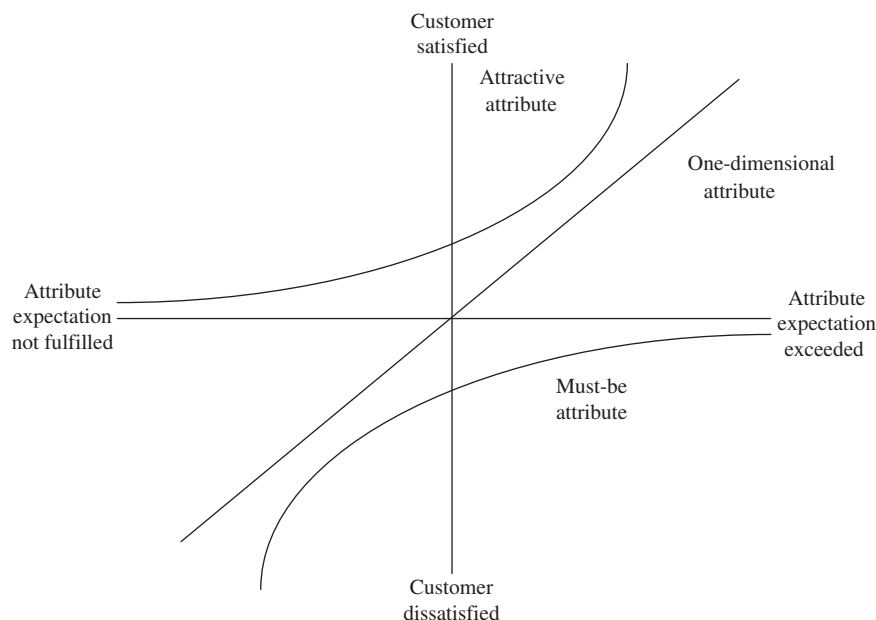


Fig. 1. Kano's model of customer satisfaction.

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