How do the interactions of service attributes affect customer satisfaction? A study of Kano Model's attributes

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Abstract
This paper objective is analyzing how interactions of services attributes, depending on Kano Model attribute's classification, do affect customer satisfaction. The results show that the impact of a superior level of "attractive" and "one-dimensional" attributes, on customer satisfaction decreases about 60% to 70% if "Basic" attributes are unfulfilled. No interaction was found between "one-dimensional" and "attractive" attributes. These findings reinforce that it is very important to achieve adequate performance of "must-be" attributes before offering "attractive" attributes or achieving superior performance in "one-dimensional" ones.

Keywords: Service Quality, Kano Model, Attributes Interaction

Introduction
The impact of customer satisfaction on business success has been widely discussed in the scientific literature. Anderson and Mittal (2000), studying companies that are part of the Swedish Customer Satisfaction Barometer, found that an increase of 1% in the customer satisfaction index was associated with 2.37% increase in the return over investment. On the other hand, a decrease of 1% in this index was associated with a decrease of 5.08% in the return over investment. These results show that while increasing customer satisfaction is important, avoiding customer dissatisfaction is critical. However, how can a company continuously satisfy its customers?

Satisfaction is related to the fulfillment of implicit and explicit customer needs by the totality of the service's attributes. So, it becomes important to find out how attributes performance does impact on customer satisfaction. Most of the traditional techniques that aim to identify the importance of attributes do assume that there is a linear relationship between attributes' performance and customer satisfaction. The Kano Model of Customer Satisfaction proposes that the relationship between the existence or performance of

attributes and customers satisfaction is non-linear, classifying the attributes as “Must-be”, “One-dimensional” or “Attractive" (Kano et al. 1984, Berger et al 1993, Matzler et al 1996, Nilson-Witell and Fundin 2005).

"Must-be" attributes are related to the basic functions of the service. Generally, customers don’t perceive the presence of these attributes, but their absence brings strong dissatisfaction. For one-dimensional attributes, satisfaction is proportional to performance. Higher performance brings higher satisfaction and vice versa. Attractive attributes bring superior satisfaction if present, but they don’t bring dissatisfaction if absent or insufficient. Two other attributes may be identified in the Kano Model: "Neutral" and "reverse" attributes. Neutral attributes bring neither satisfaction nor dissatisfaction. "Reverse" attributes bring more satisfaction if absent than if present. The identification of the attributes’ Kano category and the use of this information have being used in several papers found in the literature (Rashid 2010).

Since the existence of non-linear relationship between attributes performance and customer satisfaction has been accepted, authors have tried different methodologies for identification of attributes’ category. Among these methods are Penalty-reward Contrast Analysis, Importance Grid, Critical Incident technique and Direct Classification techniques. Mikulic and Prebezäc (2011) compare these methods, stating that they lead to different Kano classifications. The authors defend the use of the traditional Kano method to identify attributes’ classification. Some papers study how to refine Kano model classification of the attributes. Lii, Lin and Wang (2011) develop a new Kano’s evaluation sheet, defining canonical and non-canonical judgment of the evaluation sheet based on a novel “similarity” calculation. According to the authors, their proposed Kano’s evaluation sheet is more practical because it supports a precise judgment of the category of quality attributes.

Although finding the non-linear impact of the attributes on customer satisfaction is important, it is also very important to identify which attributes should be improved. The most-used method for identification of which attributes should be improved in products, and services, is the Importance Performance Analysis, or IPA (Martilla and James 1977, Slack, 1994). Although largely used, IPA presents several limitations that have been criticized in the scientific literature. (Garver 2003, Matzler at al. 2004, Matzler and Sauerwein 2002, Oh 2001, Ting and Chen 2002, Tontini and Silveira 2007, Yavas and Shemwell 2001). One limitation is that IPA doesn’t consider the non-linear relationship between attribute performance and customer satisfaction. Some papers have proposed the joint or fusion use of IPA with Kano Model to overcome this limitation. (Mikulić and Prebezac 2008, Tontini and Picolo 2010). Mikulić and Prebezac (2008) find that the impact of an attribute on customer satisfaction changes with the current performance level. The authors propose a revised approach to IPA that uses scores of attribute’s range of impact on overall customer satisfaction, and an impact-asymmetry analysis, to categorize service attributes according to their non-linear potential impact on customer satisfaction or dissatisfaction. Tontini and Picolo (2010) propose a simple and alternative method that synthesizes IPA with Kano Model, the Improvement Gap Analysis, or IGA. This method uses the expected dissatisfaction with a low level of attribute’s performance, and the gap between the expected satisfaction with a high level of attribute’s performance and the current satisfaction. The method identifies if the attributes are attractive, critical (should be urgently improved), neutral or should keep

current performance. Attributes that bring strong dissatisfaction if absent (or having low performance) and that don't bring a strong increase in customer satisfaction if improved, tend to fall in the "keep current performance" quadrant. Having a low performance level (or being absent), these attributes fall in the "critical" quadrant. Attributes that don't bring strong dissatisfaction to customers if absent (or with low performance) but that can increase customer satisfaction if offered or improved are classified as "attractive", BBringing low level of dissatisfaction if absent (or with low performance) and not increasing satisfaction if offered or improved, an attribute is considered as a "neutral" one.

However, how customers' perceptions and needs regarding the attributes evolve with time? Fewer researches have studied time dynamics of Kano categories. Kano (2001) introduced how the impact of attributes on customer satisfaction does change with time, stating that attributes do change from attractive to one-dimensional, and later to must-be. Nilsson-Witell and Fundin (2005) conducted a research about an on-line service of ticket's sales, looking for time dynamics of the Kano Model categories based on customers' experience. The results show that when the service was introduced in the market, customers perceived it as a neutral attribute. At the time of the research, the service seemed to be an attractive attribute but the first users already perceived it as one-dimensional or must-be. Following the evolution of Kano Model's classification of packaging's attributes over time, Löfgren, Witell and Gustafsson (2011) not only found that the impact of attributes on customer satisfaction varies over time, but also in different directions. Particularly, the research indicates that some attributes do change from neutral => attractive => one-dimensional => must-be, although others can change from neutral => one-dimensional => neutral, or from must-be => one-dimensional => attractive (reverse). According to the authors, if changes in the product "led to novel or semi-novel features, it could have, then, led to a reverse shift in the life cycle from, for example, one-dimensional to attractive. These changes in attributes are regarded as being innovative, by the customers making the quality attribute move backwards in its life cycle" (Löfgren, Witell and Gustafsson 2011, p. 244). These results conclude that the classification of attributes is dynamic, varying with the novelty of the attributes to customers.

Since most published papers presume that customer satisfaction is an additive result of individual attributes, a question remains: would it be possible that the effect of an attribute on customer satisfaction is significantly affected by the interaction with other attributes? If the answer to this question is affirmative, the identification of interactions may lead managers to have better improvement decisions about actions to increase customers' satisfaction. The study of these interactions may lead to the development of more refined methods that point out not only the relevant attributes, but also their best combination. Thus, it is still an area to be addressed. The present work has as objective to study how the interaction of attributes classified as "Attractive", "One-dimensional" and "Must-be" affects customers' satisfaction.

The paper is structured as follows: section 2 presents the methodological procedures used in this research and presents the identification of the Kano Model categories of the attributes. Using a full factorial design, section 3 makes analysis of how the interaction of attributes classified as "Attractive", "One-dimensional" and "Must-be" does affect customers' satisfaction. Finally, section 4 brings the conclusions of this work.

Methodological procedures

A service was used to study attributes interaction: pizzeria restaurants. Since the objective of this work is to study attributes interaction and not making an exploratory study, any service could be used in the research. Pizzeria restaurant was chosen because it is of frequent use by all respondents. The study was carried out interviewing a sample of 135 undergraduate business students, customers of this kind of service. It is an "all you can eat" pizzeria where customers are continuously served from a wide variety of pizzas.

The sample is composed by students present in the classroom during data collection and that voluntarily consented to participate in the study. As the students come from different regions and social classes, and frequent different pizzerias, the sample was considered adequate for research generalization. A pre-test with 25 subjects was carried out for questionnaire adjustments. After final data collection, 16 questionnaires with invalid or inconsistent answers were eliminated. Invalid or inconsistent answers are those that had several blank answers or the same answer for all questions. Then a sample of 119 students was used in the research. About 50% of the respondents are male, most with age lower than 23 years old (undergraduate students) and 54.6% frequent pizzeria once or more per month. The number of pizzerias that the respondents go more frequently is 24, with 50.4% of the students going to three different ones. This diversity of pizzerias was considered adequate for research generalization.

The research instrument was structured in three parts. In the first part, the Kano Model category of each researched attribute is identified using the traditional Kano questionnaire (Kano et al, 1984) and the Customer Satisfaction Index, proposed by Berger et al (1993). Customer Satisfaction Index (CSI) is a method to identify attributes' classification according to Kano Model. It is formed by the rate of customers who state being satisfied with attributes' presence or sufficiency (SI – Satisfaction Index) and by the rate of customers who state being dissatisfied with attributes' absence or insufficiency (DI – Dissatisfaction Index). If $SI > 0.5$ and $DI < 0.5$, the attribute is classified as Attractive. If $SI \leq 0.5$ and $DI \geq 0.5$, it is classified as Must-be. If $SI > 0.5$ and $DI > 0.5$, it is classified as One-dimensional. If $SI < 0.5$ and $DI < 0.5$, it is classified as Neutral. The classifications of the attributes are: Perceived cleanness of the restaurant (Must-be: $SI = 0.27$; $DI = 0.97$), Waiters' courtesy (One-dimensional: $SI = 0.83$; $DI = 0.68$), choice of pasta besides pizza (Attractive: $SI = 0.57$; $DI = 0.13$) and Diversified filled border, i.e., filing pizza's border with the same pizza topping (Attractive: $SI = 0.75$; $DI = 0.17$). This last attribute was an innovation, not offered in the market at the time of the study. From this point on, we call the choice of pasta as "Extra Products" and diversified filled border simply as "Filled border".

In the second part, the attributes' interaction was studied using full factorial research, a questionnaire that asks respondents to answer about their satisfaction with any possible combination of attributes. The effect of each attribute is calculated by the average of customer satisfaction when it is present less the average of customer satisfaction when it isn't present. For example, the effect of "courtesy" is given by the average satisfaction of all combinations it has a high level, minus the satisfaction with all combinations it has a low level. The logic behind the factorial research is that the effect of presence or absence of other attributes is canceled by the combination of the symmetric questions. One advantage of this method, called conjoint analysis (Green et al. 2001), is that it measures the effect of attributes on satisfaction by forcing the respondent

to make a tradeoff between attributes' combination. The third part of the research asked information about frequency of using these services, respondent age and gender.

To prevent or decrease answers' symmetry, sufficiency and insufficiency questions were placed in random order to identify the classification according to the Kano Model. Moreover, for each researched service, three versions with different sequence of questions were used to decrease the possible effect of questions' sequence.

Research results

The full factorial research shows if the interaction of attributes classified as "attractive", "one-dimensional" and "must-be" does affect customers' satisfaction. A initial stepwise regression model included as independent variables the four studied attributes and all possible interactions. The residuals of the final regression equation follow a normal distribution (Skewness = 0.223, Std. Error = 0.122; Kurtosis = 0.122, Std. Error = 0.244; Jarque-Bera = 4.05 < 5.99), indicating that the regression equation is valid (Jarque and Bera, 1980).

Table 1 – Regression Equation of satisfaction about attributes' existence and their interactions.

Coefficients					
Model	No standardized. Coefficients		Standardized. Coefficients (Beta)	T	p-value
	B	Std. Error			
(Constant)	-4.20	0.14		-30.63	0.000
Cleanness	2.98	0.19	0.50	15.33	0.000
Cleanness X Courtesy	2.41	0.19	0.35	12.42	0.000
Courtesy	0.85	0.14	0.14	6.18	0.000
Filled Border	0.41	0.14	0.07	2.99	0.003
Cleanness X Extra Products	0.75	0.19	0.11	3.88	0.000
Cleanness X Filled Border	0.89	0.19	0.13	4.57	0.000
Extra Products	0.28	0.14	0.05	2.05	0.041

$R^2 = 0.897$ $R^2_{adj.} = 0.895$ Durbin Watson = 2.079

Table 1 shows the results of the regression model. It shows that "cleanness" (Must-be) has interaction with all other attributes. The impact of the "Attractive" attributes on customer satisfaction decreased 68% for "Filled Border" and 73% for "Extra Products" (coefficients not standardized, table 1) if "cleanness" has a low level. "Courtesy" (one-dimensional) has an impact reduction of 74%. The result demonstrates that the effect on customer satisfaction of increasing or offering "One-dimensional" and "Attractive" attributes is very reduced if "Must-be" attributes are not fulfilled.

Figure 1 shows the evolution of the average stated satisfaction due to attributes' presence. The first column presents an index of attributes' combination. The following four columns indicate if the attributes are present or not in each combination. The number "1" means that the attribute is present or has high performance, while "0" means that it is not present or has low performance. Each line represents a combination of all attributes. The sixth column shows the average stated satisfaction for each combination. The seventh column presents the increase in stated satisfaction in relation to the preceding combination. Column eight presents the p-value if the satisfaction increase would be null.

The graphs in the right of figure 1 show the evolution of expected satisfaction for each combination of attributes.

Attributes Evolution 1							
	Clean-ness	Courte-sy	Extra Products	Filled Border	Stated Satisf.	Satisf. Increase	p-value
1	0	0	0	0	-4.40		
2	1	0	0	0	-1.13	3.28	0.000
3	1	1	0	0	1.91	3.04	0.000
4	1	1	1	0	3.14	1.23	0.000
5	1	1	1	1	4.46	1.33	0.000
Attributes Evolution 2							
	Clean-ness	Courte-sy	Extra Products	Filled Border	Stated Satisf.	Satisf. Increase	p-value
1	0	0	0	0	-4.40		
2	0	0	0	1	-3.80	0.60	0.001
3	0	0	1	1	-3.40	0.40	0.001
4	0	1	1	1	-2.78	0.62	0.005
5	1	1	1	1	4.46	7.25	0.000

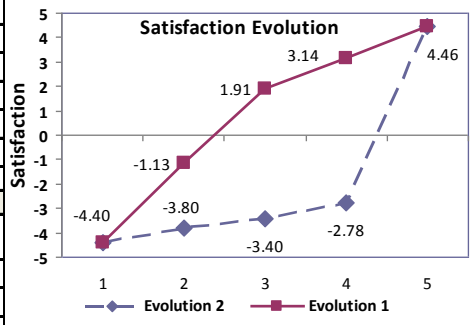
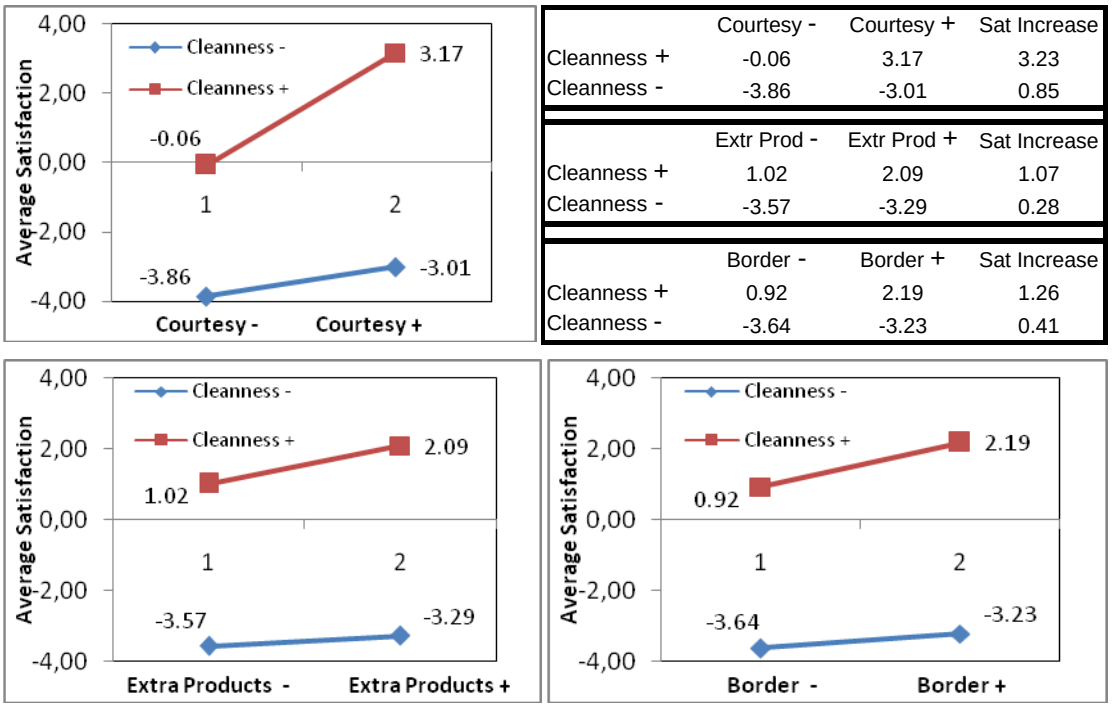


Figure 1 – Evolution of stated satisfaction due to the presence or absence of attributes.

The graph Evolution 1 of attributes' presence, showed by the superior line in figure 1, presents the following sequence: Low level or not presence of all attributes (1) => + Cleanness (2) => + Courtesy (3) => + Extra Products (4) => + Filled Border (5). The introduction of good cleanness (Must-be) is enough to decrease the expected dissatisfaction by 3.28. The introduction sequence of the other attributes shows that the "one-dimensional" attribute (Courtesy) has a stronger effect than of the "attractive" ones (Extra products and Filled border). This effect agrees with the Kano Model assumption that absence or low level of a "one-dimensional" attribute brings dissatisfaction to customers, while its presence or high level brings superior satisfaction. In addition, figure 1 shows that together with a good level of the "must-be" attribute a high level of the "one-dimensional" attribute may be enough to bring satisfaction to customers.

The lower line of figure 1 shows the evolution of satisfaction when the attributes are introduced in the following order: Low level or not presence of all attributes (1) => + Filled Border (2) => + Extra Products (3) => + Courtesy (4) => + Cleanness (5). The table shows that the effect of the "attractive" attributes on customer satisfaction (Extra products and Filled border) is only 32% and 42% respectively of what they have when "Cleanness" (must-be) is in superior level. The influence of "Courtesy" (one-dimensional) is much more affected. Its effect in customer satisfaction is about 20% of the effect it has when the "must-be" attribute (Cleanness) is in superior level.

Figure 2 shows the interaction between the "must-be" attribute (cleanness) and the other three attributes based on customer's answers. Comparing to having a low level, the effect of increasing "courtesy" (one-dimensional) is 3.8 times higher if "cleanness" (must-be) is in adequate level. If "cleanness" is in adequate level, the effect of offering the attractive attributes is also respectively 3.8 and 3.1 times higher than what they have if "cleanness" has low performance. It reinforces the conclusion that when "must-be" attributes have low performance the impact of the other attributes is very much reduced.



	Courtesy -	Courtesy +	Sat Increase
Cleanness +	-0.06	3.17	3.23
Cleanness -	-3.86	-3.01	0.85

	Extr Prod -	Extr Prod +	Sat Increase
Cleanness +	1.02	2.09	1.07
Cleanness -	-3.57	-3.29	0.28

	Border -	Border +	Sat Increase
Cleanness +	0.92	2.19	1.26
Cleanness -	-3.64	-3.23	0.41

Figure 2 – Interaction between the must-be attribute (Cleanness) and the other attributes

Conclusion

The non-linear relationship between attribute performance and customers' satisfaction brings a very important issue when companies want to find out how the attributes of products or services impact on customers' satisfaction. However, the identification of "attractive", "must-be" and "one-dimensional" attributes is not enough to achieve the desired effect in customers' satisfaction. Although published papers identify the Kano Model Category of the attributes and use that classification together with Importance Performance Analysis to decide about improvement actions, they don´t consider attributes' interaction.

This work is at the beginning of researches about how the interactions of attributes classified by the Kano Model do affect customer satisfaction. The findings of this research show that "must-be" attributes have strong interaction with "one-dimensional" and "attractive" ones. The non fulfillment of "must-be" attributes reduces the effect of increasing or offering "one-dimensional" and "attractive" attributes. This finding shows that low performance of "must-be" attributes can't be compensated by superior performance or presence of other attributes. Customers will remain dissatisfied. The managerial implication is that companies should identify and keep "must-be" attributes in adequate performance level. Only in this way the presence or superior performance of "attractive" and "one-dimensional" attributes, that can bring differential in the market, will have full effect on customer satisfaction.

A limitation of the current research is that it did not study the interaction between one-dimensional attributes. Furthermore, since a low performance of "one-dimensional" attributes can cause dissatisfaction to customers, why this kind of attribute doesn't have interaction with "attractive" attributes? These questions should be further studied.

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