Identification of Incremental Innovations' Impact on Customers Satisfaction using Improvement Gap Analysis

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Abstract
This paper presents how a new method, Improvement Gap Analysis (IGA), has a superior performance of Diagonal Importance Performance Analysis (IPA), proposed by Slack (1994). It evaluates how 24 cell phones' attributes do impact on customers' satisfaction if improved or offered, focusing on 6 incremental innovations. The analysis shows that, although diagonal IPA (Slack, 1994) overcomes limitations of original IPA, it is unable to identify the possible impact of incremental innovations on customer satisfaction.

Keywords: Importance Performance Analysis, Kano Model, Improvement Gap Analysis.

Introduction
The impact of customer satisfaction on business success has been widely discussed in the scientific literature. It is related to the fulfillment of implicit and explicit customer needs by the totality of attributes of products and services. Thus, it is important to identify which attributes should be improved, offered or innovated to increase customer satisfaction. At present, possibly the most-used technique for this purpose is Importance Performance Analysis (IPA), proposed by Martilla and James (1977). Despite being widely used due to its inherent simplicity, however, several limitations of IPA have been criticized in the scientific literature (Oh 2001, Garver 2003, Ting and Chen 2002, Matzler and Sauerwein 2002, Matzler et al. 2003, Fallon and Schofield 2006, Eskildsen and Kristensen 2006, Tontini and Silveira 2007).

Although stated importance is considered a more appropriate method for original IPA (Bacon 2003), many studies have found that it has a high correlation with customer satisfaction for each attribute (Sampson and Showalter 1999, Bacon 2003, Matzler et al. 2003). It brings a problem that arises with respect to the development or improvement of products if the company only interviews its own customers, and does not know about the performance of its competitors' products. This lack of independence leads to an excess of attributes classified as minor weaknesses, or as strengths. It possibly leads to erroneous improvement decisions (Sampson and Showalter 1999, Bacon 2003). The diagonal IPA approach (Slack 1994) deals with this problem, but it has not been widely explored or studied in scientific research.

Another criticism to the original IPA is that it doesn't consider the existence of nonlinear relationships between attributes performance and customer satisfaction (Kano et al. 1984), which

means that it may erroneously direct improvement efforts (Matzler et al. 2003, Deng 2007, Pezeshki et al. 2009, Huiskonen and Pirttilä 1998, Tontini and Silveira 2007).

On the other hand, since customers tend to see innovations as less important than other attributes, IPA has the tendency to present innovative attributes as minor weaknesses (Tontini and Silveira 2007). This, in turn, can also lead companies to make wrong decisions regarding opportunities for improvement.

In order to overcome these weaknesses of the IPA, this paper presents the concept of Improvement Gap Analysis (IGA), which is a fusion of IPA and the Kano Model. It identifies which attributes: are attractive to customers if offered or improved; are critical for improvement; should be evaluated; or should be kept as they are, dealing with incremental innovations.

This paper first presents a brief introduction of the Kano model of attractive and must-be attributes. Then, Diagonal IPA is presented, showing how it overcomes some of the limitations of original IPA. Improvement Gap Analysis (IGA) is then presented. The following section presents the application of diagonal IPA and IGA, comparing performance and limitations of each method, focusing the evaluation of incremental innovative attributes.

Diagonal Importance Performance Analysis

The original Importance Performance Analysis method (Martilla and James 1977) is based on a matrix divided into four quadrants. Attributes being considered with high importance and that customers are satisfied are considered as major strengths. If having high importance and low customers' satisfaction, they are considered as major weaknesses and immediate improvement action is required. If having low importance and low satisfaction, they are classified as minor weaknesses. With low importance and high satisfaction, they are considered as minor strengths (possibly excessive).

Slack (1994) proposes a different way to analyze the IPA matrix, overcoming a problem that the orignial IPA has with the high correlation between stated importance and customer satisfaction. He proposes dividing it into nonsymmetrical action zones. Using standardized stated importance and standardized current satisfaction (performance), a diagonal division line between the "appropriate" and "improve" zones has a 45^{o} angle (Bacon 2003, Magal et al. 2009). Attributes with higher performance than importance are classified as "appropriate" and should be kept as they are, while attributes coincident with the diagonal line have the same priority for improvement, and are called attributes with "isopriority" (Bacon 2003). Attributes with higher importance than satisfaction should be imporved. Slack's approach allows a more continuous transition in improvement priorities (Eskildsen and Kristensen 2006) than original IPA. According to Eskildsen and Kristensen (2006), the reasoning behind this is that customers accept lower performance in less important attributes, and require higher performance in more important attributes.

As customers do not have previous experience with innovative attributes, they tend to assign these attributes lower importance and have close to neutral satisfaction with them (Tontini and Silveira 2007). It may lead both IPA methods to classify innovations as "keep as it is", meaning, do not incorporate in the product.

The Kano model of attractive and must-be attributes

The Kano Model (Kano et al. 1984, Berger et al. 1993) identifies the nonlinear relationship between attribute performance and customer satisfaction. According to this model, attributes do impact on customer satisfaction in five different ways: **Must-be** attributes (M) fulfill basic

functions of the product. Customers see these attributes as prerequisites, and will be highly dissatisfied if these attributes are not present, or their performance is inadequate. On the other hand, these attributes don't bring satisfaction being present or having sufficient performance. **One-dimensional** attributes (O) are directly related, in terms of their performance, to customer satisfaction: the higher the attributes' performance, the greater the customer satisfaction, and vice versa. **Attractive** attributes (A) bring about superior satisfaction when their performance is high. However, they don't bring dissatisfaction if their performance is low. Two other types of attributes can be identified in the Kano Model: neutral (N) and reverse (R): **neutral** attributes don't bring about satisfaction or dissatisfaction, while **reverse** attributes bring about more satisfaction by their absence than their presence.

Improvement Gap Analysis - IGA

Improvement Gap Analysis (Tontini and Picolo 2010) also uses quadrant analysis, similar to original IPA. It compares attributes' relevance based on the expected impact on customer satisfaction if these attributes are improved or offered, and on the expected dissatisfaction if they have low performance.

Basically, using a similar structure to the questionnaire used in the Kano Model (Kano et al., 1984), customers provide information about their expected satisfaction or dissatisfaction with each attribute by responding to two hypothetical questions: a functional question, wherein the attribute is considered to have high performance; and a dysfunctional question, wherein it has low performance or is not present. A question regarding satisfaction with current attributes' performance is also asked in the second part of the questionnaire. Then, the possible improvement gap (IG) for each attribute is calculated by subtracting current satisfaction from expected satisfaction using the functional question.

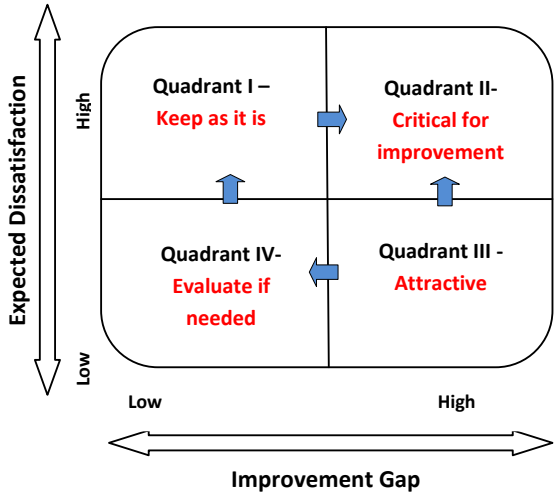

Figure 1 - Improvement Gap Analysis

In IPA, improvement priorities depend on attributes' relevance, which is generally identified in terms of stated importance. According to Garver (2003), this tends to have low discrimination power, since customers are reasoning about the importance of the attributes, which may result in socially acceptable or "status quo" answers (Gustafsson and Johnson 2004). To decrease this reasoning and deal with the different categories of the Kano Model, IGA uses

expected dissatisfaction with lack of performance as a measure of attributes' relevance. In this case, customers imagine a bad situation and answer accordingly, with lower reasoning compared to stated importance. Then, as in IPA, the attributes are analyzed according to their position on the matrix (Figure 1).

An attribute is classified as "attractive" when the improvement gap is high and the possible dissatisfaction with the attribute's absence is low. It is classified as critical to improve if both, the improvement gap and expected dissatisfaction are high. It should be kept as it is when the improvement gap is low, and the dissatisfaction with its absence, or poor performance, is high. It should be evaluated if needed when both the improvement gap and dissatisfaction are low (Figure 1). An attribute is considered critical if it falls on the border between quadrants I or III, and quadrant II. If it falls on the border between quadrants IV and I, it should be kept as it is, and if it falls between IV and III, it should be evaluated if needed. In any case, depending on the specific attributes in these situations, common sense and experience should indicate the final classification.

The reasoning behind IGA is that customers tend to imagine the ideal or desired situation and mark their expected satisfaction when answering the functional question. Then, the improvement gap indicates the possible gain in satisfaction if the attribute is improved to the desired situation. Similarly, when answering the dysfunctional question about dissatisfaction, customers imagine the worst-case scenario, and respond accordingly. It may lead Improvement Gap Analysis to identify the possible impact of incremental innovations, separating them from "indifferent" attributes (real neutral ones).

Methodological procedures

In this study, a research about mobile phones was carried out to compare the application of IGA with Diagonal IPA. This research was conducted from September 2009 to July 2010.The sample of mobile phone users was composed of 352 college students, who were present in a classroom at the moment of data collection and who voluntarily took part in the research. Of the 352 students, 53% are female, and 75% are aged between 18 and 25 years old. Two brands of mobile phones are used by 57% of the respondents. Since the sample is composed of college students, the results in terms of improvement opportunities are valid only to this sample; they are not generalizable for the type of product, but are adequate to compare the methods in question here.

The attributes of mobile phones to consider in this study were chosen by analyzing technical specifications and their presence in advertisements. The attributes are: At1 - Vibra-call (silent ring mode); At2 - Battery charge life; At3-Low weight; At4 - Being a universal remote control for TV appliances*; At5 - Resolution of the camera (Mega Pixel); At6 - Taking pictures in dark environments (flash light); At7 - Photo's quality (in general); At8 - Ease on-screen viewing (big screen); At 9 - Resistance falling on the floor; At10 - GPS (location, route maps and satellite)*; At11 - Universal battery charger (be used for multiple devices)*; At12 - Digital photo camera; At13 - Touch screen; At14 - Video call in dark environments*; At15- MP3 player; At16 - Sensitivity to the signal tower (good coverage); At17 - Headset with wireless microphone*; At18 -Front camera for video calls*; At19 -Integrated video camcorder; At20 - Connectivity (Bluetooth, Wi-Fi, USB, etc.); At21 - Size of the device (being small); At22 - Easiness of typing messages; At23 -Internet browsing access; At24 -Access to Twiter, Orkut and Facebook.

During the time of the research, the attributes At04, At10, At11, At14 and At17 were innovations that customers could understand and imagine the possible benefits of. These attributes were chosen specifically to enable investigation of how the researched methods identify innovative attributes. The attribute At18 can also be considered an innovative attribute due to its

recent introduction and presence only in very expensive phones at the time of the research. None of the respondents' mobile phones had this attribute during the research.

The questionnaires used to collect the data are composed of four parts in both case studies. In the first part, original questions from the Kano Model were used to identify the attribute classifications (attractive, one-dimensional, must-be or neutral). In the second part, the questions were used to estimate the expected satisfaction in two imaginary situations with respect to attribute performance (sufficiency and insufficiency). These questions were asked in a random order to avoid polarizing answers between the functional and dysfunctional questions, and to reduce the possibility of the halo effect (Wirtz 2000). The scale of satisfaction ranges from -4 (extremely dissatisfied) to 4 (extremely satisfied). In the third part of the questionnaire, using the same scale as that used in part two, the subjects were asked to mark their current satisfaction with respect to each attribute. Then, they identified the importance of attributes on a scale ranging from 1 (no importance) to 5 (high importance), and provided personal information.

Comparison of Diagonal IPA and IGA

In this section, the application of IGA and Diagonal IPA methods are presented and compared. The figures show the Kano Model classification of the attributes in parentheses. For example, At11(A) means that the attribute At11 is an attractive attribute. The other classifications, as outlined above, are one-dimensional (O), must-be (M), and neutral (N).

Diagonal IPA (Slack 1994)

The high correlation between stated importance and customer satisfaction ($R^2 = 0.67$) limit the original IPA. Critical attributes (one-dimensional and must-be) tend to be classified as strengths, and attractive attributes as minor weaknesses.

Figure 5a shows the Diagonal IPA. It suggests that attributes AT6(A), At24(A), AT5(O), AT7(O), At23(A), AT20(O), At9(O), At2(O) and AT16(M) should be improved or included, while the other attributes should be kept as they are. Attributes identified as neutral by Kano Model are classified as having appropriate performance. These findings indicate that diagonal IPA not only solves the traditional IPA problem relating to the high correlation between stated importance and customer satisfaction, as identified by several authors (Sampson and Showalter 1999, Oh 2001, Bacon 2003, Matzler et al. 2003); it also deals with the problem of original IPA regarding the non-linear relationship between attribute performance and customer satisfaction (Bacon 2003, Matzler et al. 2003, Deng 2007, Pezeshki et al. 2009).

Regarding incremental innovations, AT11(A) – universal battery charger is the only innovation identified as "attractive" by Kano Model. It leads us to conclude incremental innovations tend to be classified as "neutral" by the Kano Model. Also, it is recommended for improvement (or to be offered) by the diagonal IPA. Customers stated this attribute as important, leading it to be placed in the improve/offer region. Maybe it is because customers have the feeling that the existence of this attribute could overcome the problem of having to have different battery chargers for different mobile phones. The other innovative attributes, which were all classified as neutral, are recommended to be kept as they are (At4(N) – "doubling up" as a universal remote control, AT10(N) – GPS, At14(N) – video call in dark environments, At17 – headset with wireless microphone, and At18(N) – front camera for video calls). These attributes did not exist in respondents' mobile phones at the time of the research, and the diagonal IPA in fact recommends that they are not needed. So, innovative attributes tended to fall into the "appropriate" region of the diagonal IPA region, indicating that they are not necessary.

Fig. 5a - Diagonal IPA

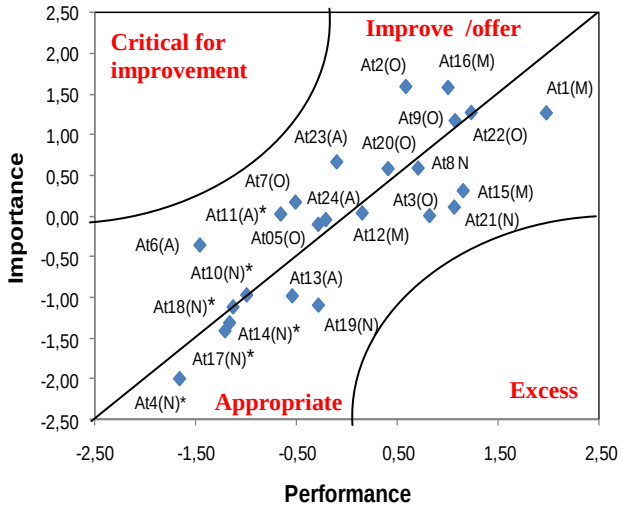

Fig. 5b – Improvement Gap Analysis

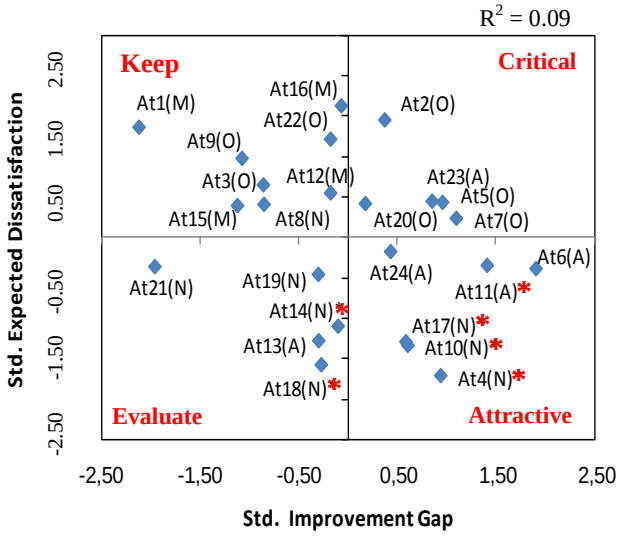

Figure 5 – Diagona IPA x IGA Results

Improvement Gap Analysis

Figure 5b shows the Improvement Gap Anlysis method (IGA). Unlike IPA, the correlation between improvement gap and customer dissatisfaction in the case of an absence or poor performance of attributes is not significant (pearson correlation = -0.294, p-value = 0.164). This overcomes the problem of high correlation between stated importance and customer satisfaction in original IPA.

Figure 5b also shows that innovative attributes fall into the "attractive" and "evaluate" quadrants. Innovative attributes that fall into the "attractive" quadrant are: At4(N) – universal remote control, At10(N) – GPS, At11(A) – universal battery charger, and At17(N) – headset with wireless microphone. This suggests that these attributes may have a significant impact on customer satisfaction if included in the product. The innovative attributes At18(N) – front camera for video calls, and At14(N) – video call in dark environment fell into the "evaluate" quadrant. This means that these innovations would not have a high impact on customer satisfaction if improved/offered. This may be due to respondents being unwilling or unknowledgeable about how to make video calls. They also may not have realized that the front camera on touchscreen phones could allow the user to take pictures of themselves more easily. These results lead to the conclusion that IGA can identify the possible impact of incremental innovations, separating them from "indifferent" attributes (real neutral ones).

In both cases, all attributes classified as one-dimensional or must-be by the Kano Model fall into the "keep" or "critical" quadrants. This shows that IGA considers the possible impact of these attributes having high or low performance.

All attributes classified as critical by IGA also fall into the "improve" region of diagonal IPA. On the other hand, attributes At9(O), At16(M), At22(O) are recommended to be improved by diagonal IPA, and to be kept as they are by IGA. This difference may have arisen because IPA is based on current satisfaction and rational importance – i.e. it is a static method relating to the present situation of the attributes. On the other hand, IGA evaluates the possible dynamic impact that attribute improvement may have on customer satisfaction.

Conclusions

Due to its simplicity, IPA, as originally proposed by Martilla and James (1977), is probably the most widely used tool for identifying improvement opportunities in products and services. Despite its wide use, however, IPA has limitations that must be considered to avoid decision errors. This research evidenced the existence of high correlations between stated importance and customer satisfaction. This problem has already been identified by several authors (Sampson and Showalter, 1999; Bacon 2003). It can be seen as a limitation for using original IPA if the company in question is unable to compare the satisfaction of its own customers with that of its competitors' customers.

Diagonal IPA (Slack 1994) seems to overcome the cited problems of original IPA. The division line between the "appropriate" and "improve/offer" regions is diagonal, overcoming the correlation problem with regards to stated importance and customer satisfaction. Furthermore, it seems that diagonal IPA (Slack, 1994) overcomes the problem of original IPA (Martilla and James, 1977) regarding the non-linear relationship between attribute performance and customer satisfaction (Bacon 2003, Matzler et al. 2003, Deng 2007, Pezeshki et al. 2009). No attribute classified as neutral by the Kano Model was recommended to be improved by the diagonal IPA, and the neutral attributes only reached the division line between "appropriate" and "improve" regions. However, there were attractive attributes with either improvement recommendations or appropriate classification.

Although it overcomes the problems with original IPA, diagonal IPA does not deal with the possible impact of innovative attributes on customer satisfaction. Out of the nine innovative attributes (in both studied cases), only one is recommended to be offered (At11(A) – universal battery charger in mobile phones). Since this is an attribute that is not currently offered in the market, this may suggest that customers are dissatisfied with the current situation of having different chargers. All other innovative attributes are recommended to be kept as they are. They have not yet been incorporated, and, according to the results, should not be offered.

This research shows that IGA can identify the possible impact of attribute improvement/offering, whilst dealing with innovative attributes. This method identifies whether such attributes can be improved or offered by measuring how each attribute could serve to increase customers' satisfaction. Four of the six innovative attributes of the mobile phones case, and all the innovative attributes of the fitness centre, were considered as attractive attributes. This means that, if offered, they may increase customer satisfaction, though they do not bring about dissatisfaction if they are absent.

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