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How to Determine Characteristic Importance for Product Success Using a Modified Potential Customer Satisfaction Coefficient in the Kano Model

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〈Abstract〉

For an organization to survive and prosper, it is essential to continuously develop innovative products by proactively anticipating consumers' implicit requirements. The Kano model has become more useful since Sireli et al. (2007) and Tontini (2007) introduced a simple equation for determining the importance of characteristics by using the concept of Kano's Potential Customer Satisfaction Coefficient (PCSC). However, although several studies have utilized the PCSC concept to determine the importance of characteristics, it is surprising that the two equations have been accepted without any validation process. This study aims to propose a modified equation using PCSC and to conduct a validity test of the proposed equation, demonstrating its superiority over the previously suggested two equations, The author analysed 26 Kano related articles (27 cases), and the correlation coefficients were compared with those obtained from direct rating importance, which served as a comparative criterion. The results indicate that the proposed equation is valid for assessing characteristic importance and demonstrates significantly higher correlation coefficients with the direct method than those suggested by Tontini (2007) and Siireli *et al*. (2007). The proposed method offers advantages in terms of accuracy and survey duration over traditional methods that directly ask for relative importance (e.g., AHP by Saaty (1980)). Furthermore, the integration of the Kano model with IPA or QFD could enhance the accuracy and efficiency of research in determining the importance of characteristics.

Keywords : The Kano Model, Product Innovation, Relative Importance, IPA, Potential Customer Satisfaction Coefficient, Quality Characteristics

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1. Introduction

In the era of the Fourth Industrial Revolution, for organizations to survive and prosper, it is important not only to implement management practices that prevent negative changes but also to pursue innovations that drive positive transformations, such as the development of innovative products. As the Kano model [2][15] is well-accepted in a wide range of academia and industries [21][28][34], there are growing studies that the relative importance among quality characteristics can be determined using the concept of PCSC (Potential Customer Satisfaction Coefficient) since Sireli et al. (2007) and Tontini (2007) introduced a simple equation.

However, the equations of Tontini (2007) and Siireli et al. (2007) determine the importance of characteristics by selecting the larger value between PSC and PDC, causing inconsistent results according to situations where two characteristics have identical PSC or PDC values (see section 2.0 for detailed examples). Moreover, despite the widespread acceptance of the PCSC equation in assessing characteristic importance within Kano-related literature, it is surprising that no validation tests of the two equations have been conducted using criteria for importance determination, such as the Direct Questioning Method. It is time to establish a validated standard evaluation criterion. Accordingly, this study is aimed to propose a modified equation using PCSC of Berger *et al.* (1993) to determine characteristic-level importance. A validity test of the proposed equation is conducted through 26 Kano related articles.

2. The Proposed Method: The Modified PCSC Equation

Berger *et al.* (1993) introduced the concept of the Potential Customer Satisfaction Coefficient (PCSC), which quantifies the amount of the potential customer satisfaction when expectations are met (i.e. A and O) and potential dissatisfaction when they are not (i.e. M and O), based on Kano's quality dimensions. This coefficient consists of the Potential Satisfaction Coefficient (PSC) and the Potential Dissatisfaction Coefficient (PDC), calculated using equations (1) and (2):

$$PSC_j = \frac{(A+O)}{(A+O+M+I)} \qquad (;0 \le PSC_j \le 1) \quad (1)$$

$$PDC_j = -\frac{(M+O)}{(A+O+M+I)} \qquad (;-1 \le PDC_j \le 0) \quad (2)$$

where, j = jth quality characteristic (; 1, ..., m)

When the PSC value of a characteristic reaches '1.0', it indicates complete satisfaction when the characteristic is present. Conversely, a PDC value approaching '-1' signifies total dissatisfaction when the characteristic is absent. For analytical purpose, this study disregards the negative sign in the PDC calculation.

Tontini (2007) introduced an adjustment factor equation, Max (|PSC|, |PDC|), to represent the importance value. Siireli *et al.* (2007) proposed a normalized equation, Max (|PSC| / Σ|PSC|, |PDC| / Σ|PDC|), as a measure of relative importance. To illustrate, let's consider the PSC and PDC results for three quality characteristics: (0.74, 0.74), (0.70, 0.75), and (0.52, 0.44). Applying Tontini's (2007) equation, the second characteristic is identified as the most significant (i.e. 0.75). Siireli *et al.* (2007)'s methodology supports this conclusion by calculating values for three characteristics: 0.378 (=0.74 / (0.74 + 0.70 + 0.52)) and 0.383 (=0.74 / (0.74 + 0.75 + 0.44)) for the first; 0.357 (=0.70 / (0.74 + 0.70 + 0.52)) and 0.389 (=0.75 / (0.74 + 0.75 + 0.44)) for the second; and 0.265 (=0.52 / (0.74 + 0.70 + 0.52)) and 0.228 (=0.44 / (0.74 + 0.75 + 0.44)) for the third.

This approach can be significant in identifying important characteristics when users exhibit extreme reactions (i.e., 5.0 on a 5-point Likert scale: being highly satisfied or highly dissatisfied) to specific characteristics. However, this is not a common scenario, and it can be easily supplemented by separately reviewing the highest PSC or PDC among the considered characteristics.

It is crucial to note that the two equations previously discussed do not consider the total strength of PSC and PDC, such as 1.48 for the first characteristic, 1.45 for the second, and 0.96 for the third. In this case, unlike the results of the other two formulas, the first quality characteristic appears to be the most important. In situations where two characteristics have identical PSC or PDC values, challenges can arise. For instance, if PSC values are the same, the characteristic with the higher PDC should be given priority. Likewise, if two characteristics exhibit the same PDC, preference should go to the one with the higher PSC. Nonetheless, employing Tontini's (2007) method in such scenarios may lead to the same rankings for certain pairs like [0.4, 0.5] and [0.35, 0.5].

This oversight is significant as customer-perceived importance often depends on both the delight when a characteristic is provided and the disappointment when it is absent [4][29]. Kano's paired positive and negative questions assist in effectively measuring these inherent satisfactions and dissatisfactions.

It is necessary to modify equation (1) and (2) to acknowledge the asymmetric influence on satisfaction and dissatisfaction. For instance, in the case of a new product with a cutting-edge function, the primary goal is to create customer satisfaction (PSC becomes more important than PDC). Consequently, attractive characteristics should be regarded as more important than one-dimensional or must-be characteristics [22][9][19][37][36]. Conversely, for basic or safety-related items, such as remote controllers for television sets, consumers often take these for granted and experience significant dissatisfaction if they are absent. In these cases, must-be characteristics are more important [2][18]. Therefore, the current study proposes the following equation (3).

$$RI_j = k \mid PSC_j \mid + (1-k) \mid PDC_j \mid \quad (3)$$
$$\begin{pmatrix} 0 \le RI_j \le 1,\ 0 \le k \le 1, \\ 0 \le PSC_j \le 1,\ 0 \le PDC_j \le 1 \end{pmatrix}$$

where, j = jth quality characteristic (; 1, ..., m), k = Kano parameter

In equation (3), the Kano parameter is denoted as 'k,' which determines the relative importance between PSC and PDC. When the 'k' value approaches 1, it indicates a higher priority for attractive characteristics over must-be characteristics. In cases where the specific weight between PSC and PDC cannot be determined, the characteristic with the higher absolute value between PSC and PDC can be considered more important, such as Max (0.5×PSC, 0.5×PDC), as suggested by Sireli *et al.* (2007) and Tontini (2007).

The Kano parameter is a value that reflects the non-linear relationship between the magnitude of satisfaction when expectations are fulfilled and the magnitude of dissatisfaction when expectations are not fulfilled, across different quality characteristics or dimensions. For safety products, it is anticipated that the level of dissatisfaction will be very high when expectations are not met; thus, the weight for the Potential Dissatisfaction Coefficient (PDC) will be set relatively high in such cases. Conversely, characteristics such as surprise events in restaurants can induce high satisfaction when they are fulfilled, resulting in a higher weight being assigned to the Potential Satisfaction Coefficient (PSC).

3. Data Collection and Analysis

This study identified 41 documents discussing the relative importance of quality dimensions from 1993, the year the Kano model was first introduced to the Western world, up to 2018. Among these, 26 papers were found that reveal Kano frequency data for PCSC calculation and importance data at the characteristic level (see Table 2). All of these are peer-reviewed scientific journals, with one document [32] including two cases. The data published in each article were downloaded using the subscription service of the affiliated universities. Data on the Kano classification results at the characteristic level and the importance of each characteristic were extracted. The scales for measuring importance in the selected cases, as detailed in Table 1, show that most articles used a 5-point ordinal scale, referred to in this paper as 5DI for direct rating of importance.

The most well-known technique for acquiring explicit customer importance information at the characteristic level is the Direct Importance (DI) method, which involves directly asking respondents. This

Table 1. Scales of importance data

Total	Importance							
	5^{DI}	5^{AHP}	5^{FUN}	7^{DI}	7^{EXP}	9^{DI}	10^{DI}	n/s
27	17	-	-	1	-	3	3	3

Notes: DI (direct rating importance), AHP (analytic hierarchy process), FUN (functional question), EXP (expectation), PER (performance), n/s (not specified).

study employs the DI scale method as a comparative criterion for determining the weighted scores between PSC and PDC.

To identify the Kano parameter '*k*' value as defined in Equation (3), this study investigated 27 cases which reveal Kano frequency data for PCSC calculation and importance data at the characteristic level. In this study, to derive the average value of 'k' according to different industry sectors, 'k' was analyzed within the range of 0.00 to 0.99 up to the second decimal place, as shown in Table 2. For each case, correlation coefficients were calculated between the DI results at the characteristic level (used as a comparative criterion) and the importance results of those characteristics derived from the three approaches: Equation (3) from this study (for each of nine '*k*' values ranging from 0.1 to 0.9) and the equations proposed by Tontini (2007) and Sireli *et al.* (2007). For example, if a case shows the highest correlation, e.g., *r* = 0.900 (to the third decimal place), between the DI results and those obtained from Equation (3) when '*k*' is between 0.3 and 0.4 (assumed here to be 0.34 to the second decimal place), this correlation result is highlighted and expressed as '0.900 (*k* = 0.34)'. Finally, the average industry value of the Kano parameter '*k*' is determined by calculating the mean of these 27 '*k*' values (highlighted in bold).

The significance of differences in the correlation coefficients is tested across nine '

Table 2. Correlation results of the three methods with direct rating importance

Author (Year)	Case	Correlation with DI and: Proposed equation = $k \times \lvert PSC \rvert + (1-k) \times \lvert PDC \rvert$ (High priority on Must-be → High priority on Attractive)									Tontini = Max (|PSC|, |PDC|)	Sireli = Max(|PSC|/Σ|PSC|, |PDC|/Σ|PDC|)
		k=0.10	*k*=0.20	*k*=0.30	*k*=0.40	*k*=0.50	*k*=0.60	*k*=0.70	*k*=0.80	*k*=0.90		
1. Matzler & Hinterhuber (1998)	Ski	0.453	**0.456 (*k*=0.25)**	0.4549	0.446	0.418	0.347	0.215	0.057	-0.071	0.380	**0.639**
2. Fundin & Nilsson (2003)	On-line ticket service	0.896**	0.903**	**0.909** (*k*=0.34)**	0.906**	0.871**	0.728*	0.352	-0.091	-0.364	0.746*	0.743*
3. Löfgren & Witell (2005)	Packaging	**0.953** (*k*=0.01)**	0.936**	0.909**	0.854**	0.748**	0.566**	0.308	0.032	-0.198	0.848**	0.689**
4. Tontini (2007)	Beer mug	**0.630 (*k*=0.01)**	0.623	0.617	0.606	0.585	0.547	0.465	0.296	0.019	**0.672**	0.618
5. Khalid *et al.* (2008)	University website	**0.795** (*k*=0.01)**	0.782**	0.763**	0.728**	0.665**	0.556**	0.393*	0.191	-0.009	0.785**	0.430*
6. Baki *et al.* (2009)	Logistics service	0.360	0.414	0.476	0.541	0.599	0.636	**0.643* (*k*=0.66)**	0.614*	0.568	0.518	**0.686***
7. Lee *et al.* (2009)	Computer	0.800**	0.832**	**0.850** (*k*=0.32)**	0.840**	0.790**	0.701**	0.588*	0.473	0.368	0.575*	0.547*
8. Wang (2009)	Notebook computer	0.425	0.457	0.492	**0.522 (*k*=0.43)**	0.507	0.424	0.300	0.187	0.104	0.095	0.374

Table 2. (Continued)

Author (Year)	Case	Correlation with DI and										
		Proposed equation = $k \times \vert PSC\vert + (1 - k) \times \vert PDC\vert$ High priority on Must-be … High priority on Attractive									Tontini = Max (|PSC|, |PDC|)	Sireli = Max(|PSC|/Σ|PSC|, |PDC|/Σ|PDC|)
		k=0.10	k=0.20	k=0.30	k=0.40	k=0.50	k=0.60	k=0.70	k=0.80	k=0.90		
9. Högström *et al.* (2010)	A snowpark	0.893**	0.915**	0.935**	**0.941** (k=0.36)**	0.887**	0.718**	0.433	0.149	-0.060	0.547*	0.642**
10. Bilgili *et al.* (2011)	Jewelries	0.917**	**0.928** (k=0.24)**	0.926**	0.906**	0.858**	0.775**	0.660**	0.524*	0.386	0.610**	0.814**
11. Chang & Chen(2011)	Hot spring hotel	**0.856** (k=0.13)**	0.855**	0.844**	0.815**	0.747**	0.615**	0.410*	0.169	-0.046	0.806**	0.480*
12. Chaudha *et al.* (2011)	Website design	0.912**	0.926**	0.936**	**0.939** (k=0.36)**	0.924**	0.885**	0.815**	0.710**	0.581*	0.884**	0.924**
13. Chen & Kuo (2011)	Banks' e-learning program	**0.714** (k=0.01)**	0.689**	0.668**	0.638*	0.595*	0.531*	0.442	0.322	0.176	0.370	0.480
14. Sahney (2011)	Educational service	**0.187 (k=0.01)**	0.135	0.099	0.058	0.012	-0.038	-0.090	-0.139	-0.184	0.206	0.083
15. Yang (2011)	Intl. certification service	0.749**	0.759**	0.768**	0.775**	**0.776** (k=0.47)**	0.767**	0.743**	0.695**	0.620**	0.819**	**0.819****
16. Gupta & Rivastava(2012)	Hotel service	0.679**	0.698**	0.719**	0.742**	0.762**	**0.767** (k=0.56)**	0.718**	0.586**	0.384*	0.667**	0.447*
17. Hashim & Dawal (2012)	Ergonomic design	-0.328	-0.139	0.051	0.220	0.355	0.458	0.536	0.594	**0.669* (k=0.99)**	0.611*	0.237
18. Hasoloan *et al.* (2012)	Education institution service	0.629**	0.662**	0.687**	0.703**	**0.712** (k=0.55)**	0.711**	0.705**	0.693**	0.677**	0.591**	0.634**
19. Kuo *et al.* (2012)	Mobile service	0.776**	0.792**	0.803**	**0.806** (k=0.39)**	0.801**	0.787**	0.764**	0.734**	0.698**	0.755**	0.785**
20. Xie and Li (2012)	Combine harvester	**0.397 (k=0.01)**	0.330	0.251	0.107	-0.107	-0.297	-0.400	-0.446	-0.467	-0.272	-0.197
21. Kim *et al.* (2013)	TV	0.924**	0.929**	**0.934** (k=0.35)**	0.933**	0.920**	0.874**	0.742**	0.4543	0.072	0.751**	0.860**
22. Mozdabadi & Alizadeh (2013)	Automobile	**0.873** (k=0.04)**	0.868**	0.857**	0.832**	0.781**	0.684**	0.522*	0.300	0.063	0.794**	0.811**
23. Song (2013)	E-learning service	0.734**	**0.739** (k=0.24)**	0.737**	0.717**	0.647**	0.463**	0.170	-0.096	-0.267	0.328	0.589**
24. Yadav *et al.* (2013)	Aesthetic design	0.663*	0.690*	**0.695* (k=0.27)**	0.680*	0.653*	0.620*	0.585*	0.551	0.520	0.620*	0.582*
25. Tontini & Picolo (2014)	Mobile phone	0.887**	0.890**	**0.891** (k=0.27)**	0.887**	0.877**	0.854**	0.813**	0.742**	0.633**	0.812**	0.846**
	Fitness center	0.893**	**0.897** (k=0.23)**	0.896**	0.889**	0.876**	0.857**	0.833**	0.803**	0.770**	0.845**	0.847**
26. Song (2018)	Smartphone	0.928**	0.944**	**0.950** (k=0.28)**	0.928**	0.845**	0.673**	0.433	0.197	0.008	0.756**	0.687**

Notes: * Correlation is significant at 0.05 level (two-tailed), ** Correlation is significant at 0.01 level (two-tailed) k ' values (from 0.10 to 0.90) of Equation (3) using the two methods proposed by Tontini (2007) and Sireli *et al.* (2007) with a paired *t*-test (n = 27). For example, if the average correlation results of 27 cases (assumed to be *r* = 0.800) at ' *k* = 0.30' are significantly higher than those at '*k* = 0.70' (assumed to be *r* = 0.300) with a 1% significance level, this is indicated as "*k* 0.30 〉 *k* 0.70**".

4. Results

The results of the correlation analysis, derived from 27 cases are summarized as follows: The analysis of 22 out of the 27 cases (81%), calculated using three approaches, demonstrates a statistically significant correlation with Direct Importance (DI) results at significance levels of 1% or 5%. Among these, 20 cases using the proposed Equation (3) exhibit the highest correlation coefficients with DI results. Meanwhile, the importance results of two specific cases, 'logistics service' of Baki *et al.* (2009) and 'international certification service' of Yang (2011), calculated using Sireli *et al.* (2007)'s equation, show the highest correlation with the DI results. This finding substantiates the effectiveness of the PCSC approaches that incorporate both PSC and PDC within the Kano model framework.

The *t*-test results of 27 cases (*n* = 27; see Table 3) indicate that for all '*k*' values, except for '*k* = 0.6', the average of the correlation coefficients calculated from the proposed equation (3) are significantly greater than those from Tontini (2007) and/or Sireli *et al.* (2007)'s equations at the 1% or 5%

Table 3. *P*-value results of the three equations

	Mean '*r*'(order)	S.D.	Equation (3)									Tontini	Sirelli
			*k*_0.1 (0.687)	*k*_0.2 (0.700)	*k*_0.3 (0.708)	*k*_0.4 (0.702)	*k*_0.5 (0.671)	*k*_0.6 (0.600)	*k*_0.7 (0.485)	*k*_0.8 (0.344)	*k*_0.9 (0.209)		
*k*_0.1	0.687(4)	0.291	1										
*k*_0.2	0.700(3)	0.277	0.175	1									
*k*_0.3	0.708(1)	0.261	0.260	0.375	1								
*k*_0.4	0.702(2)	0.254	0.610	0.920	0.545	1							
*k*_0.5	0.671(5)	0.257	0.623	0.308	0.081	0.010**	1						
*k*_0.6	0.600(6)	0.265	0.077	0.021*	0.003**	0.000**	0.000**	1					
*k*_0.7	0.485(9)	0.287	0.003**	0.001**	0.000**	0.000**	0.000**	0.000**	1				
*k*_0.8	0.344(10)	0.334	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	1			
*k*_0.9	0.209(11)	0.378	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	1		
Tontini	0.597(7)	0.264	0.091	0.034*	0.011*	0.006**	0.024*	0.908	0.004**	0.000**	0.000**	1	
Sirelli	0.596(8)	0.259	0.042*	0.010**	0.002**	0.001**	0.004**	0.862	0.004**	0.000**	0.000**	0.980	1

Notes: *The difference in correlations is significant at 0.05 level (two-tailed), **Correlation is significant at 0.01 level (two-tailed) significance level.

The highest mean correlation coefficient (r = 0.708**) with the DI data is observed at 'k = 0.3' (with the lowest r = 0.209 at 'k = 0.9'). This result is statistically significantly higher than those obtained using the equations of Tontini (2007) and Sireli *et al.* (2007), with p-value 〈 0.01**. To be specific, 'k0.3 〉 k0.5* (one-tailed), k0.3 〉 k0.6**, k0.3 〉 k0.7**, k0.3 〉 k0.8**, k0.3 〉 k0.9**, k0.3 〉 Tontinti*, and k0.3 〉 Sireli**'.

No significant difference is observed when the 'k' value lies between 0.1 and 0.4 (k0.1 ≠ k0.2 with p = 0.175; k0.1 ≠ k0.3 with p = 0.260; k0.1 ≠ k0.4 with p = 0.610; k0.2 ≠ k0.3 with p = 0.375; k0.2 ≠ k0.4 with p = 0.920; k0.3 ≠ k0.4 with p = 0.545).

In this study, the grand mean value of 'k (0.29)' calculated, indicating that the relative weight between PSC and PDC is approximately 1 : 2.5. This demonstrates that the importance result at the characteristic level, derived using equation (3) when 'k' is set to 0.29, aligns most closely with the actual customer-perceived importance of characteristics.

5. Conclusion and Limitations

Empirical evidence suggests that the Potential Satisfaction Coefficient (PSC) approach can be used as an alternative to the direct rating importance (DI) approach. This is supported by the fact that the bolded correlation coefficients for 22 cases out of 27 cases (representing 82%) in Table 2, which compare the characteristic importance derived from the three equations with that from the DI method, are statistically significantly high. Assigning relative priorities to quality characteristics is a cumbersome process, and as Saaty (1980) has pointed out, the complexity significantly increases when the number of characteristics exceeds nine. The method proposed in this study simplifies this process, making it possible to obtain the relative importance of quality characteristics using only the Kano model survey.

From the t-test results in Table 3, this study showed that the proposed equation (3) yields significantly higher correlation results compared to the methods of Sireli *et al.* (2007) and Tontini (2007). This indicates that the method proposed in this study demonstrates superior validity over the two considering formulas.

The study establishes a specific relative importance weight between PSC and PDC as approximately 1:2.5 (industry average). This is based on the highest correlation being observed when 'k = 0.29'.

The findings of this study align with the asymmetric relationship between characteristic performance and overall satisfaction, as described in prospect theory [14], and with the negative and positive effects of word-of-mouth [30].

One notable advantage of the PSC methods, as highlighted by Doyle *et al.* (1997), lies in their capacity to overcome the severe ‘concavity bias (∩)’ inherent in DI techniques. This bias tends to differentiate less among more important characteristics than among less important ones, leading to suboptimal discrimination in Importance-Performance Analysis (IPA) or Quality Function Deployment (QFD). However, the proposed Equation (3) mitigates subjective factors by employing objectively quantified PSC and PDC derived from Kano’s paired questions, thereby anticipating more objective results in determining importance of characteristics.

To verify the optimized figures differentiated by industry sector or analytical products, it is necessary to recognize that k-values are applied differentially according to product or service characteristics within the following three groups. Accordingly, the accuracy of the importance results for the characteristics using equation (3) can be improved: Group I, which includes goods bundles such as fuel, pens, and groceries, has a relatively low value of 'k' ranging from 0.00 to 0.10. Group II, comprising goods and services bundles, has a 'k' value between 0.10 and 0.50. Group III, consisting of services bundles, has a high value of 'k' ranging from 0.50 to 1.00. For example, Table 2 shows that tangible goods (Group I), such as beer mugs (k = 0.01) and combine harvesters (k = 0.01), demonstrate low 'k' values. Group II, representing blended industries, presents medium 'k' values, such as e-learning (k = 0.24), skiing (k = 0.25), smartphones (k = 0.28), website design (k = 0.36), notebook computers (k = 0.43), and international certification (k = 0.47). Group III, representing intangible-dominant industries, shows higher 'k' values, such as educational institutions (k = 0.55), hotel services (k = 0.56), logistics (k = 0.66), and ergonomic design (k = 0.99).

Regarding limitations, this study did not account for the concept of reverse characteristics, defined as the antithesis of the ‘one-dimensional’ characteristics, which decrease satisfaction if fulfilled and increase

Table 4. Guidance values of ‘k’

Relative importance (Product or service level)	RI = k × |SC| + (1-k) × |DC|, where , $0 \le k \le 1$, $0 \le RI \le 1$		
Preferred ‘k’ (Industrial average is 0.29)	Group I (Goods bundles)	Group II (Goods / services bundles)	Group III (Services bundles)
	$0 \le k \le 0.1$ (Tangible dominant)	$0.1 < k < 0.5$ (Tangible / intangible dominant)	$0.5 \le k \le 1$ (Intangible dominant)
Examples	beer mugs (k = 0.01) and combine harvesters (k = 0.01)	e-learning (k = 0.24), skiing (k = 0.25), smartphones (k = 0.28), website design (k = 0.36), notebook computers (k = 0.43), and international certification (k = 0.47)	educational institutions (k = 0.55), hotel services (k = 0.56), logistics (k = 0.66), and ergonomic design (k = 0.99)

satisfaction if not [15]. This omission is due to the rarity of reverse characteristics being selected by respondents, as observed in past research. In fact, none of the 621 characteristics (across 34 cases) in this study were classified as reverse. For instance, a frequency test conducted for smartphones [28] revealed that only 0.26% (41/15,729) of 749 respondents classified 21 smartphone characteristics as reverse. However, given the significance of the reverse concept, particularly in the development of creative products or services, it is advisable to investigate the importance value of a characteristic and examine the impact on its importance determination if more than 5% of respondents classify it as a reverse element. This is suggested as a subject for further research.

According to the dynamics of quality [16], when a new product is successfully introduced to the market, it transitions from initially being perceived as indifferent to becoming an attractive characteristic. Over time, it evolves into a taken-for-granted characteristic, deemed essential by customers, much like the remote control of a television. Such shifts in the quality dimensions directly impact the Potential Customer Satisfaction Coefficients (PCSC), thereby altering the relative importance of quality characteristics. Consequently, given that this study's investigative scope extends only up to the year 2018, ongoing research is necessary to observe these changes and update the findings to reflect the latest trends.

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