PRINTERIA

# Integrated Human

Study Case: Kano Model in Printeria

# Kano model application

Once you have the results of the questionnaire it is time to complete a series of tables so the Kano model will tell us which of those **necessities** are really important and it is worth implementing to improve user satisfaction.

## Table 1: Kano evaluation table.

| **Attributes** | | | **Dysfunctional requirements (negative)** | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1. Like | 2.Must-be | 3.Neutral | 4. Live with | 5.Dislike |
| | | | **1** | **2** | **3** | **4** | **5** |
| **Functional Requirements (positive)** | 1. Like | **1** | Q | A | A | A | O |
| | 2.Must-be | **2** | R | I | I | I | M |
| | 3.Neutral | **3** | R | I | I | I | M |
| | 4.Live with | **4** | R | I | I | I | M |
| | 5.Dislike | **5** | R | R | R | R | Q |

This table is the axis of the Kano model. For each paired question answered (functional and dysfunctional requirement/necessity), an **attribute** will be assigned. This attribute will show if the necessity is (**A**) Attractive, (**M**) Compulsory, (**R**)Opposing, (**O**) One-dimensional, (**Q**) Cuestionable, (**I**) Indifferent. This table will be used later in table number three.

## Table 2: Tabulation of results.

Go to the questionnaire and classify the results obtained in accordance with the next table. For each user surveyed, we will put their answer (check the legend) in the corresponding question, thus with all. We had a total of 30 people surveyed from the Mustang Art Gallery whose 14 answers for the 7 paired questions (can be checked in table 3 section or in the questionnaire) were classified like follows:

| Number of surveyed client | Functional Requirements (positive) | | | | | | | Dysfunctional requirements (negative) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Q 1 | Q 3 | Q 5 | Q 7 | Q 9 | Q 11 | Q 13 | Q 2 | Q 4 | Q 6 | Q 8 | Q 10 | Q 12 | Q 14 |
| **1** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4 | 5 | 4 | 3 | 4 | 4 | 3 |
| **2** | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 4 | 1 | 3 | 3 | 4 | 4 | 4 |
| **3** | 2 | 1 | 3 | 1 | 3 | 2 | 3 | 3 | 4 | 3 | 3 | 3 | 4 | 3 |
| **4** | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 4 | 3 | 4 | 3 | 3 | 3 | 3 |
| **5** | 1 | 1 | 1 | 1 | 3 | 1 | 2 | 4 | 3 | 3 | 4 | 3 | 4 | 3 |
| **6** | 2 | 4 | 3 | 1 | 1 | 1 | 1 | 4 | 1 | 3 | 3 | 3 | 4 | 4 |
| **7** | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 4 | 3 | 3 | 3 | 4 | 3 | 4 |
| **8** | 1 | 3 | 2 | 1 | 1 | 1 | 3 | 4 | 2 | 3 | 2 | 5 | 5 | 1 |
| **9** | 1 | 1 | 2 | 3 | 2 | 1 | 3 | 4 | 4 | 5 | 3 | 5 | 4 | 3 |
| **10** | 1 | 3 | 2 | 1 | 1 | 1 | 3 | 4 | 1 | 4 | 3 | 3 | 3 | 3 |
| **11** | 1 | 1 | 1 | 2 | 3 | 1 | 1 | 4 | 1 | 3 | 3 | 4 | 3 | 3 |
| **12** | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 4 | 3 | 3 | 3 | 3 | 3 | 3 |
| **13** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| **14** | 2 | 4 | 3 | 4 | 1 | 3 | 2 | 5 | 1 | 3 | 3 | 4 | 3 | 3 |
| **15** | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 1 | 4 | 3 | 3 | 3 | 2 |
| **16** | 5 | 5 | 5 | 5 | 3 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 4 |
| **17** | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 4 | 4 | 3 | 3 | 3 | 3 | 4 |
| **18** | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 4 | 3 | 5 | 3 | 5 | 3 |
| **19** | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 5 | 2 | 3 | 3 | 3 | 5 | 4 |
| **20** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 4 | 3 | 4 | 3 | 4 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **21** | 5 | 3 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 5 |
| **22** | 1 | 3 | 2 | 2 | 1 | 1 | 2 | 4 | 1 | 4 | 3 | 4 | 4 | 3 |
| **23** | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 4 | 1 | 3 | 4 | 3 | 4 | 3 |
| **24** | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 4 | 3 | 3 | 4 | 2 | 1 | 3 |
| **25** | 1 | 1 | 3 | 1 | 2 | 1 | 1 | 4 | 3 | 2 | 1 | 1 | 1 | 1 |
| **26** | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 4 | 4 | 3 | 3 | 5 | 3 | 4 |
| **27** | 2 | 1 | 3 | 1 | 2 | 1 | 1 | 5 | 3 | 3 | 4 | 5 | 4 | 5 |
| **28** | 3 | 1 | 2 | 5 | 2 | 1 | 1 | 3 | 4 | 4 | 1 | 3 | 4 | 3 |
| **29** | 1 | 1 | 1 | 2 | 1 | 1 | 3 | 3 | 4 | 3 | 3 | 3 | 4 | 3 |

| Legend | |
|---|---|
| 1 | Like |
| 2 | Must be |
| 3 | Neutral |
| 4 | Live with |
| 5 | Dislike |
| Q | Question |

## Table 3: Ranking of attributes

Making use of table 2 we will see where the paired questions intersect using table 1. Such intersections will give us an **attribute** which we will associate to a paired question. To see which are the paired questions check out the table below table 3.

| Surveyed users | Evaluated criteria (paired questions) | | | | | | |
|---|---|---|---|---|---|---|---|
| | PQ1 | PQ2 | PQ3 | PQ4 | PQ5 | PQ6 | PQ7 |
| 1 | A | O | A | A | A | A | A |
| 2 | I | R | A | A | I | I | A |
| 3 | I | A | I | A | I | I | I |
| 4 | A | I | A | A | A | A | A |
| 5 | A | A | A | A | I | A | I |
| 6 | I | R | I | A | A | A | A |
| 7 | A | I | I | A | I | A | A |
| 8 | A | I | I | A | A | O | R |
| 9 | A | A | M | I | M | A | I |
| 10 | A | R | I | A | A | A | I |
| 11 | A | Q | A | I | I | A | A |
| 12 | A | A | I | A | A | A | I |
| 13 | O | O | O | O | O | O | O |
| 14 | M | R | I | I | A | I | I |
| 15 | A | Q | A | A | A | I | I |
| 16 | Q | Q | Q | Q | M | Q | I |
| 17 | A | A | A | I | I | A | A |
| 18 | A | A | A | O | A | O | I |
| 19 | M | A | A | A | A | O | A |
| 20 | A | A | A | A | A | A | A |
| 21 | Q | M | M | R | Q | I | Q |
| 22 | A | R | I | I | A | A | I |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **23** | A | R | A | A | A | A | A |
| **24** | A | A | I | A | A | Q | I |
| **25** | A | A | I | Q | R | Q | Q |
| **26** | I | A | I | A | O | A | A |
| **27** | M | A | I | A | M | A | O |
| **28** | I | A | I | R | I | A | I |
| **29** | A | A | A | I | A | A | I |

| Number of paired questions | Positive and negative questions | |
|---|---|---|
| PQ1 | + | How would you feel if Printeria had explanatory videos of use? |
| | - | How would you feel if Printeria did not have explanatory videos of use? |
| PQ2 | + | How would you feel if Printeria's control software had two versions of use? One for experts and another one for amateurs. |
| | - | How would you feel if Printeria's control software did not have two versions of use? Both versions are in one software. |
| PQ3 | + | How would you feel if Printeria could print the results observed in the final phase? |
| | - | How would you feel if Printeria could not print the results observed in the final phase? |
| PQ4 | + | How would you feel if Printeria had led lights in the bottom to do it more attractive? |
| | - | How would you feel if Printeria did not have led lights in the bottom to do it more attractive? |
| PQ5 | + | How would you feel if Printeria had a searcher to find biological parts instead of taking them from a list? |
| | - | How would you feel if Printeria did not have a searcher to find biological parts instead of taking them from a list? |
| PQ6 | + | How would you feel if Printeria warned you on your cell phone when the biological reaction finished? |
| | - | How would you feel if Printeria did not warn you on your cell phone when the biological reaction finished? |
| PQ7 | + | How would you feel if Printeria's control software showed in the same graph the final results compared with the ones obtained from the model? |
| | - | How would you feel if Printeria's control software did not show in the same graph the final results compared with the ones obtained from the model? |

## Table 4: Kano model results

Finally for each question we have to sum how many times each attribute appears and put a calification. The calification cell will take the value of the most representative attribute. So, it will tell you if that attribute is (**A**) Attractive, (**M**) Compulsory, (**R**) Opposing, (**O**) One-dimensional, (**Q**) Cuestionable, (**I**) Indifferent. Lets see how it works:

| **Viewing criteria** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Paired Questions** | **A** | **O** | **M** | **R** | **Q** | **I** | **TOTAL** | **Calification** |
| **PQ1** | 18 | 1 | 3 | 0 | 2 | 5 | 30 | A |
| **PQ2** | 14 | 2 | 1 | 6 | 3 | 3 | 30 | A |
| **PQ3** | 12 | 1 | 2 | 0 | 1 | 13 | 30 | I |
| **PQ4** | 17 | 2 | 0 | 2 | 2 | 6 | 30 | A |
| **PQ5** | 14 | 2 | 3 | 1 | 1 | 8 | 30 | A |
| **PQ6** | 17 | 4 | 0 | 0 | 3 | 5 | 30 | A |
| **PQ7** | 11 | 2 | 0 | 1 | 2 | 13 | 30 | I |

| Approximate Viewing criteria as a percentage (%) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Paired Questions** | **A(%)** | **O(%)** | **M(%)** | **R(%)** | **Q(%)** | **I(%)** | **Calification** |
| **PQ1** | 62 | 3.45 | 10.35 | 0 | 6.89 | 17.25 | A |
| **PQ2** | 48.27 | 6.89 | 3.45 | 20.68 | 10.35 | 17.24 | A |
| **PQ3** | 41.38 | 3.45 | 6.89 | 0 | 3.45 | 44.83 | I |
| **PQ4** | 58.62 | 6.89 | 0 | 6.89 | 6.89 | 20.68 | A |
| **PQ5** | 48.27 | 6.89 | 10.35 | 3.45 | 3.45 | 27.58 | A |
| **PQ6** | 58.62 | 13.79 | 0 | 0 | 10.35 | 17.24 | A |
| **PQ7** | 37.93 | 6.89 | 0 | 3.45 | 6.89 | 44.83 | I |

As we can see, each paired cuestion has an attribute which describes **whether it is an important feature or not**. To help you understand this situation here you have what do this attributions mean:

- (**A**) Attractive: Are **necessities** which **user does not request or expect**. However, if they are fulfilled, user satisfaction increases exponentially. They work as product differentiators even with a poor execution in the device or product. If they are not present, they do not cause dissatisfaction.


**Figure 1**. Exponential relationship between execution and satisfaction of attractive necessities.

- (**M**) Compulsory: These type of **necessities are dangerous**. On the one hand, customers will not tell you they need them because they take them for granted. On the other hand, if they are not present in the product it may cause a great dissatisfaction. So, they are decisive factors which make your product good or bad.


**Figure 2**. Inverse exponential relationship between execution and satisfaction of compulsory necessities.

- (**R**) Opposing: Opposing **necessities are those you do not want them in your product** because when they are present, they cause dissatisfaction, and when they are not present, they cause satisfaction. They can be identified with one sentence: "*I hate when it do that*". If they are present in your design is due to a lack of product testing/research.

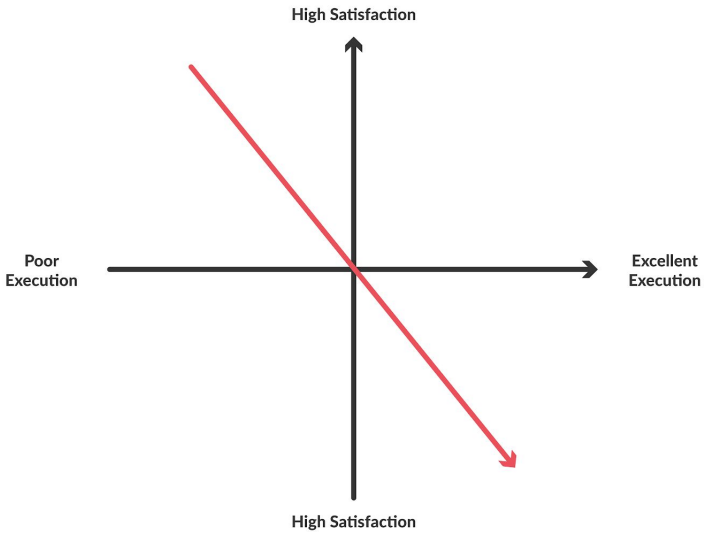


**Figure 3**. Inverse proportional relationship between execution and satisfaction of opposing necessities.

- (**O**) **One-directional**: These **necessities are explicitly demanded by the user**. The more you implement them in your product, the greater will we user satisfaction with your product (proportional relationship).

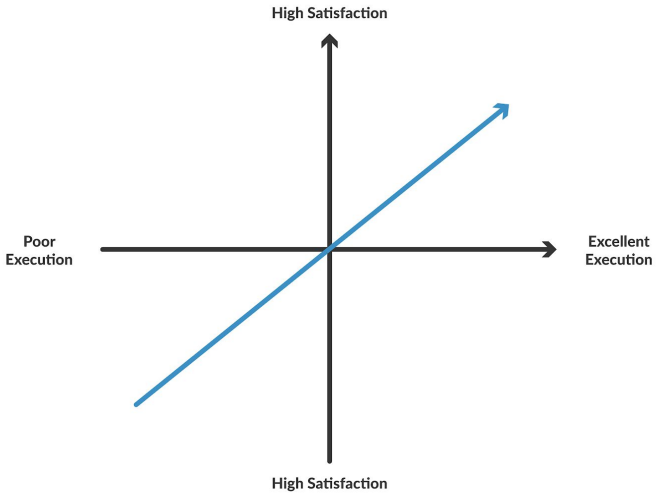


**Figure 4**. Proportional relationship between execution and satisfaction of One-directional necessities.

- (**Q**) Questionable: This designation appears when the user has not understand the paired questions. It results in conflicting answers.

- (**I**) Indifferent: These necessities are those which **customers do not care about**. If they are built-in cause the same satisfaction as if they are not. However, it does not mean they are not useful to someone other than the customer (inventor, distributors...).

# Concluding remarks

As we can see, except paired cuestion number three and seven which have been calificated as an indifferent necessity, the rest of the attributes are calificated as attractive.

Those attributes which obtained an A, should be implemented as well as we can due to the fact that user satisfaction increase exponentially with them.

Last but not least, here you have an overview of what and how these necessities have been implemented during the summer.

| **Necessity** | | Necessity description | Implementation |
|---|---|---|---|
| **1** | A | Explanatory videos of use | ✓ |
| **2** | A | Two software versions, one for experts and one for amateurs | ≈ |
| **3** | I | Print the results obtained in Printeria | ✓ |
| **4** | A | Led lights under Printeria | ✓ |
| **5** | A | Searcher of parts instead of a large list | ✓ |
| **6** | A | An alarm on the mobile phone when a process is over | 🕘 |
| **7** | A | A interface comparing the results obtained with the model and with the real process in Printeria. | 🕘 |

| Legend | Meaning |
|---|---|
| ✓ | It has already been implemented and will be visible in the Giant Jamboree Exhibition. |
| ≈ | It has been implemented but in a different way. |
| 🕘 | Will be implemented in a near future. |

On attribute two we have done an unique interface but, are extra options like "*Preferences*" which allow the experienced user to go a step further and change the

value of certain parameters like temperature of the reaction or the value of model constants. Furthermore, there are several tool-tips which explain the different options you can see in the software and programmed recipes to learn how printeria works.

# References


1. TERNINKO, J. (1997). *Step-by-Step QFD, Customer-Driven Product Design, Second edition.* USA: St . Lucie Press.
2. Olson,D. (2014) “Kano Model Priorization” <http://bawiki.com/wiki/techniques/kano-model-prioritization/>.[Consulted: 10/8/2018]
3. Youtube, “Aplicación del modelo Kano-Caso práctico Excel” en Youtube <https://www.youtube.com/watch?v=_ZgFEur-vLA>[Consulted: 10/8/2018]