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The Kano Model: Recent Developments

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Abstract

The Kano Model is one of the most widely know concepts in American QFD. But most QFD practitioners really don't integrate it into their QFD approach. A simple integration of the Kano model is presented for Modern QFD and Voice of the Customer analysis.

Introduction

The Kano Model was first developed by **Dr Noriaki Kano,** a Japanese professor and international consultant. He received the individual Deming Prize in 1997. In the late 1970s and early 1980s he laid the foundation for an approach for "attractive quality creation" — commonly referred to in the U.S. as the "Kano Model". Dr. Kano challenged the traditional ideal on customer satisfaction that "more is better" — that the better you perform on each product or service attribute, the more satisfied the customers will be. Instead, Dr. Kano held that performance on product and service attributes is not equal in the eyes of the customers. Performance on certain categories of attributes produces higher levels of satisfaction than others.

The Kano model begins with a survey of customers. They are asked about product attributes, and how they feel if the product both has the attribute sufficiently, and does not (has the attribute insufficiently).
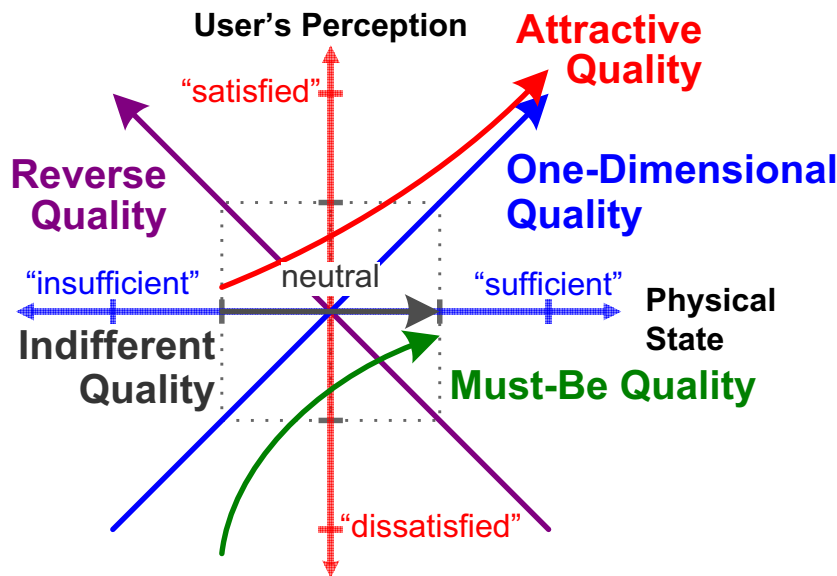
Physical State		Sufficient		
Insufficient	User Perception	Dissatisfied	Neutral	Satisfied
	Dissatisfied	*Skeptical*	*Must-Be*	**One-Dimensional**
	Neutral	*Reverse*	*Indifferent*	*Attractive*
	Satisfied	*Reverse*	*Reverse*	*Skeptical*

The Kano categories result from asking paired questions.

A Kano survey asks these two questions for each product attribute:

The first is, "If the car has <good [**sufficient**] visibility>, how do you feel? <*neutral*>. So the physical state is sufficient, and the user perception is neutral.

The second is, ""If the car does **NOT** have <good [i.e., **insufficient**] visibility>, how do you feel? <*dissatisfied*>. So the physical state is insufficient, and the user perception is dissatisfied. So <good visibility> in this kind of car is "must-be" [expected] for this customer (or customer segment). In this way you can survey customers and determine which Kano category a requirement belongs in, for that product and that customer.

All five Kano categories shown graphically in the "Kano model" Note the neutral zone in the middle, where Attractive quality and Must-Be quality end. Indifferent quality lies entirely within the neutral zone. One-Dimensional quality passes through it on both sides.

Often when this diagram is presented, the Reverse quality and Indifferent quality categories are omitted. But you will get such results if you do enough surveys, and they are wide-ranging enough.

Kano category labels

In Kano's original article, he uses the Japanese word *mi ryoku teki*, which he translates as "attractive". *Mi* is the combination of the character for devil (ghost) and tallest branch of a tree. In modern Japanese it means to bewitch, enchant, fascinate. *Ryoku* is the character for sinew, strength, effort. *Teki* makes it an adjective to modify the following phrase "quality elements". Together, they mean the power to bewitch, fascinate, charm, allure, captivate, attract, appeal, magnetic, fetching. In the rest of this paper, in agreement with common U.S. usage, we'll use the term '**exciting**'. Exciting requirements are generally unknown to customers, so they won't mention them when asked — but when they see them, they really like them.

Kano also uses the Japanese word *ichi gen teki*, which he translates as "one-dimensional". *Ichi* is the character for "one". *Gen* is the character for "dimension". *Teki* makes it an adjective to modify the following phrase "quality elements". So together they mean one-dimensional. So the relationship of fulfillment (the "physical state") to satisfaction moves together, linearly. The more performance you provide the customer, the greater their satisfaction — and the less you give, the less satisfying it is. This was the standard understanding that applied to all requirements before Kano's research. For such requirements, the customers know about the requirement, they wish for it, and getting more is good, and getting less is bad. In the rest of this paper, in agreement with common U.S. usage, we'll use the term '**desired**'. Desired requirements are typically what you get by just asking the customer what they want. Customers are generally willing to trade-off more performance on one for less on another.

Kano also uses the Japanese word *atari mae* which he translates as "must be". *Atari* means to match, equal, or hit the mark. *Mae* means to advance to, approach (a boat approaching a harbor). Together, they mean approaching reasonable, just, fair, common, or ordinary. In the rest of this paper, in agreement with common U.S. usage, we'll use the term '**expected**'. Expected requirements are assumed by the customer, so they don't usually mention them — unless they have been recently disappointed. These are "deal breakers" for the customers. Often they would not consider products lacking these requirements.

Kano also uses the Japanese word *mu kan shin*, which he translates as "indifferent". *Mu* means not. *Kan* is made of the characters for gate with an ember or coal (manageable fire) in front of it. A barrier or gateway. *Shin* means heart or feeling. Together, they mean concern or of interest, as in "gateway to the heart". Not of interest or concern, indifferent. We'll continue to use '**indifferent**'. Customers simply don't care about indifferent requirements.

Kano also uses the Japanese word *gyaku*, which he translates as "reverse". *Gyaku* means to reverse, encounter, oppose, inverse. We'll continue to use '**reverse**'. Reverse requirements are those that customers would prefer not to have. They may even be willing to pay not to have the requirement. The presence is dissatisfying, and the absence is satisfying.

It is possible to have results in the **skeptical** category. Kano labels those cells that way because he is "skeptical" of the customer's responses. Some practitioners report responses in this cell when evaluating levels of performance that the customer either doesn't care about either level of performance ("how would you feel if your raise was $2 <sufficient> or $1 <insufficient>?"), or would accept either physical state ("how would you feel if your salary was $2,000,000 <sufficient> or $1,000,000 <insufficient>?"). It is important to note that the customer will always evaluate the questions with some level of performance in mind, if the performance levels are not stated in the question.

Kano also recommends a fourth choice on surveys of "other". In this way, if there is a problem with the question, the respondent can choose that answer, and we can spot poor questions in the survey.

Note that Kano follows all these terms with "quality elements" meaning high-level functional requirements. So they refer to attributes of the product, or solution — not to customer needs.

Product: car

Feature	Expected	Desired	Exciting	Indifferent	Reverse
good visibility	●				
roomy back seat		●			
enhanced traction system			●		
fun and adventureous image				●	
6 speed manual transmission					●

Example of Kano category responses to features for a car.

Almost all the examples of the Kano model analysis are done on product attributes ("quality elements" as Kano calls them). This is fine after you have an idea about an attribute to then ask customers about it on a Kano survey. But how can we find exciting requirements, in order to ask customers about them?

Relating Kano categories to customer needs

How can we relate Kano categories, which apply to attributes of the solution, and have either a stated or implied level of performance, to customer needs? We have to explore why customers react as they do to the various categories. For exciting requirements, customer react positively because exciting requirements represent **new benefits** (if this is a new feature), or a new level of performance (if this is a feature they are familiar with). This is in contract to desired requirements, even at high levels of performance. These do satisfy customers, but in this case they are simply receiving more of the benefits they are already familiar with. Note that is is possible that an existing feature can jump to exciting feature in some cases if the level of performance is raised high enough, and if new benefits, or new levels of benefits result to the customer. So the key is to find benefits, and then check if they are new for the customer.

In Modern QFD, Voice of Customer analysis requires "going to *gemba*" to study the customer's situation. This is done to understand what the customer is trying to do (what their "job" is) and what their problems and opportunities are in that situation. The understanding of the goals of the customers that results allow us to explore what new benefits the customer would appreciate. From the new benefits, we can then look for product attributes that would contribute to those benefits. Such features should be exciting to the customer. Similar analysis can be done to explore if substantially higher levels of performance for existing features would provide any new benefits to customers, and these are also candidates for exciting quality.

When Dr. Kano originally devised his model, Voice of Customer analysis was still in its infancy. Today methods for analyzing the context, the verbatims, the problems and the process of the customer, segment by segment, give us the means to systemically uncover candidate requirements in every Kano category. A Kano survey can then confirm our analysis.

Kano and the House of Quality

Although the Kano model was covered even in the very early courses on QFD in the U.S., it was not clear just how the Kano categories should be integrated with QFD. Some advocated just feeding exciting customer needs in the rows of the House of Quality matrix. Others suggested feeding all three categories in and then making a distinction is how the resulting functional requirements would be deployed. It seemed for many years that everyone in QFD talked about the Kano model, but no one actually did very much with the categories in the QFD process. And this was compounded by the confusion about what actually went into the rows (the "whats" was one common and misleading description) and the columns (the "hows" was a common and misleading description). In Modern QFD, the rows are only customer needs, and customer needs are benefits — not any attribute of the product or service. Similarly the columns are functional requirements, which describe what the solution must "do" (it's capabilities) or "be" (it's characteristics) without implying or assuming "how" the solution be designed, or what technology it will employ.

Kano and the Quality Planning table

One of the best known parts of traditional QFD is the "House of Quality" (customer needs / functional requirements) matrix. And first place to integrate the Kano Model with the House of Quality is the Quality Planning table — the "room" where a customer competitive assessment is done on the customer needs, and the customer's priorities adjusted to reflect competitive factors.

Customer Needs	Kano Category	Customer Importance (33%)		Competitive Benchmark (57%)						Sales Check Point (10%)			Final Wt.
		Customer Importance (renormalized wt)	Customer Importance Global wt	Us	Competitor Alpha	Plan (U leave as is, = equal, + exceed, - reduce)	Competitive Edge	Competitive Edge Wt.	Global Competitive Edge Wt.	Sales Capability Difficulty (Interest, Choice, Loyalty)	Sales Check Pt. Wt	Global Sales Check Pt Wt.	Adjusted CN Wt.
I always have with me	Exciting	0.200	0.066	Fits in my pocket	Buy special case	+ / Fits in my wallet	V. Strong / 0.26	0.578	0.329	I / 0.60	0.48	0.048	0.443
Customer Needs 2	Expected	0.400	0.132	adfdsa	rgr	= / rgr	Weak / 0.03	0.067	0.038	C / 0.25	0.2	0.02	0.190
Customer Needs 3	Desired	0.150	0.050	cghjd	hdhg	U / cghjd	Weak / 0.03	0.067	0.038	L / 0.15	0.12	0.012	0.100
Customer Needs 4	Expected	0.250	0.083	tyehjt	gfhe	= / gfhe	Moderate / 0.13	0.289	0.165	C / 0.25	0.2	0.02	0.267
		1.000	0.330			0.450		1.000	0.570	1.250	1.000	0.100	1.000

A Quality Planning table (QPT) from the Modern QFD "House of Quality" matrix, with Kano categories integrated into the analysis. Since the purpose of this table is to adjust customer need priorities based on competitive analysis, the Kano categories are valuable to distinguish the Exciting, Desired, and Expected benefits of particular customer needs. The value depends on the customer segment and product maturity.

In this example, the body of the table has the standard components of a Modern QFD quality planning table: customer importance, competitive benchmarking, and the sales check point. These are applied using ratio-scales, by using the Analytic Hierarchy Process (AHP), to produce an adjusted customer need weight. This weight then is deployed to the body of the House of Quality matrix. The Kano categories serve as information columns — in the same was as the first two competitive benchmarking columns do. They serve as decision factors, not priority factors.

The Design Planning table (DPT) has a similar structure in Modern QFD, and has a similar purpose: to adjust the priorities of functional requirements based on competitive analysis. Kano categories can be applied in a similar way as information rows (not columns, as the table is vertical, instead of horizontal) that are decision factors but not priority factors. The determination of Kano categories can be done by either: (1) transferring the Kano categories of exciting, desired, and expected from the customer needs (where they where assess based on benefits) to those functional requirements that most strongly contribute to them (as shown in the body of the HoQ matrix), or by (2) a Kano survey on functional requirements (or "quality elements" as Kano refers to them). Of course, using both methods would allow the analysis to be cross-checked.

Conclusion

The Kansei Engineering method used was a variation of the "pure" method developed by Dr. Nagamashi. The modified process made it more complex, however the results were conclusive. A deeper knowledge of the method was obtain during the experiment, bringing designers,

engineers and marketing people to cooperate on designing for the users. By integrating the users in the process, the team gained a greater understanding of the people reactions to the proposed solutions.

Acknowledgments

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