

CENTER FOR QUALITY OF MANAGEMENT JOURNAL

REPRINT NUMBER:
RP02700

From the Chairman of the Editorial Board Page 2
David Walden

A special issue on
Kano's Methods for Understanding Customer-defined Quality

I. Introduction to Kano's Methods	Page 3
IIa. Developing and Administering Kano Questionnaires	Page 7
IIb. Self-Statement Importance Questionnaire	Page 12
IIIa. Experience in the Use of Kano's Methods in the Specification of BBN RS/1 Release 5.0	Page 12
IIIb. Observation of the Use of Kano's Method	Page 15
IIIc. A Bose Development Team's Experience with Kano Mapping	Page 15
IVa. The Desire for Continuous and Graphical Analysis	Page 17
IVb. Thoughts on Graphical and Continuous Analysis	Page 20
Va. Theoretical Parallels between Kano's and Herzberg's Theories	Page 23
Vb. Wording of the Kano Questionnaire	Page 25
Vc. Theoretical Issues of Kano's Methods	Page 28

Volume 2, Number 4

Fall 1993

© Copyright 1993,1999 The Center for Quality of Management, Inc. Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, to republish, to post to servers, or to redistribute to lists requires prior specific permission and/or a fee. Copying is by permission of The Center for Quality of Management, Inc. • One Alewife Center, Suite 450 • Cambridge, Massachusetts 02140 USA Telephone: (617) 873-8950 • Email: publications@cqm.org The Center for Quality of Management Authors retain rights for re-publication of their articles.
ISSN: 1072-5296

Kano's Methods for Understanding Customer-defined Quality

A compendium of ideas and experiences from Charles Berger, Robert Blauth, David Boger, Christopher Bolster, Gary Burchill, William DuMouchel, Fred Pouliot, Reinhart Richter, Allan Rubinoff, Diane Shen, Mike Timko, and David Walden

The Center for Quality Management (CQM) six-day introductory TQM course presents several concepts relating to understanding customer-defined quality based on the work of Professor Noriaki Kano of Tokyo Rika University and several of his colleagues in Japan. These concepts have become embedded in the Concept Engineering (CE) process for operationally defining customer requirements,¹ which a number of CQM companies are using as part of their product development process.

When first introduced to Kano's ideas, people are usually excited by them. Kano's ideas about types of quality are often a revelation, and his method for sorting the features of a product into various quality categories based on a questionnaire filled out by customers offers an apparently straightforward process for gaining deep understanding of customer requirements. However, as with so many tools, successful application of Kano's methods requires skill and experience.

Within the CQM companies, we now have a good bit of experience with the application of Kano's methods and some insight into how to use the methods effectively. This compendium of material provides an overview of Kano's methods, presents some experiences using the methods and some tips for use, and discusses a number of subtleties that users should be aware of. It is divided into the following major categories, most of which have more than one subsection.

- I. Introduction to Kano's methods (page 3)
- II. Developing and administering Kano questionnaires (page 7)
- III. Experiences in the use of Kano's methods (page 12)
- IV. Continuous and graphical analysis of Kano data (page 17)
- V. Theoretical issues relating to Kano's methods (page 23)

Useful ideas for improving the way we use Kano's methods are scattered throughout sections II through V.

We hope that this compendium will help readers use Kano's methods more successfully—and that the experience and wisdom gained in so doing also can be shared through the CQM.

I. Introduction to Kano's Methods²

In planning a product or service, one makes a list of potential customer needs that the product or service should perhaps try to satisfy. Going to see current and potential customers ("voice-of-the-customer" visits) is one good way to get ideas for what should be on the list of potential customer requirements. For simplicity, throughout the rest of this paper we will call these potential customer requirements simply "customer requirements" or "CRs," with the implicit understanding that one must investigate any CR list in greater detail to understand which of the customer requirements need to be included in the final product (or service).

Many methods are available for investigating the characteristics of customer requirements.³ For instance, one can ask customers to rank-order them. The particular method we will discuss here is based on the work of Professor Noriaki Kano of Tokyo Rika University.

Professor Kano and his colleagues developed a set of ideas⁴ that we summarize as follows.

1. Invisible ideas about quality can be made visible.

Customer ideas about quality are often confused and difficult to see clearly, but they can be made

¹ G. Burchill, D. Shen, et al., *Concept Engineering Manual*, CQM Document 71, September, 1992.

² Much of the text in this section is adapted, with permission, from Shoji Shiba et al., *A New American TQM*, Portland, Oregon, 1993, Productivity Press and the CQM, pp. 221-230.

³ Chapters 7 to 11 of *Design and Marketing of New Products* by Glen L. Urban and John R. Hauser, 2nd edition, (Englewood Cliffs, NJ, Prentice Hall, 1993) describes many other methods of inquiring about and understanding customer needs.

⁴ Noriaki Kano et al., "Attractive Quality and Must-be Quality," research summary of a presentation given at Nippon QC Gakka: 12th Annual Meeting (1982), January 18, 1984. Presentations given at Japanese Society for Quality Control Annual Meetings, Noriaki Kano and Fumio Takahashi, "Himshitsu no M-H Sei Ni Tsuite" (Motivator and Hygiene Factor in Quality), October 1979; Noriaki Kano, Shimichi Tsuji, Nobuhiko Seraku, and Fumio Takahashi, "Miryokuteki Himshitsu to Atarimae Himshitsu (1), (2)" (Attractive Quality and Must-be Quality [1], [2]), October 1982, and published in *Quality*, JSQC, vol. 14, no. 2 (Tokyo: Japanese Society for Quality Control, 1984).

clear. As the customer ideas of quality are made clear, many requirements emerge, and they fall into several groups, as represented by the tree structure of customer requirements in figure 1 (below).

David Walden is a senior vice president of BBN and is general manager of BBN's Communications Division. He compiled the material in this paper — editorial comments and unattributed text are by him.

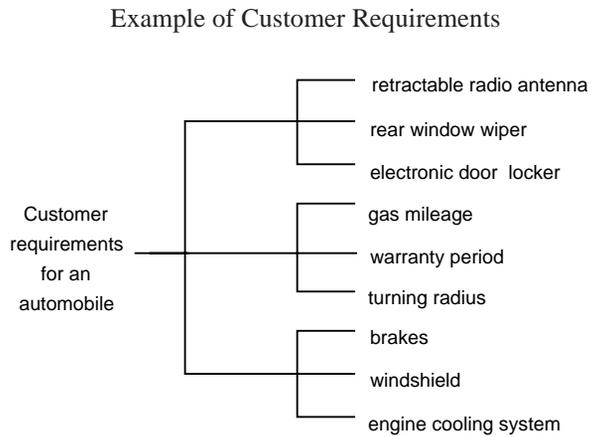


Figure 1

2. For some customer requirements, customer satisfaction is proportional to how fully functional the product is.

The horizontal axis of the Kano diagram in figure 2 (above right) indicates how fully functional some aspect of a product is, and the vertical axis indicates how satisfied the customer is. Traditional ideas about quality have sometimes assumed that customer satisfaction was simply proportional to how functional the product was—that is, the less functional the product, the less satisfied the customer, and the more functional the product, the more satisfied the customer. In the figure, the line going through the origin at 45 degrees graphs the situation in which customer satisfaction is simply proportional to how fully functional the product is: the situation in which the customer is more satisfied (up) with a more fully functional product (right) and less satisfied (down) with a less functional product (left).

Such customer requirements Kano designates as “One-dimensional” customer requirements.⁵ For example, in automobiles, gas mileage (unless it is quite bad) is likely to be a One-dimensional customer requirement: Better gas mileage provides more customer satisfaction and worse gas mileage provides more customer dissatisfaction. (Study the graph for a moment and be sure you understand how the 45-degree line through the origin indicates a One-dimensional customer requirement, one where more functionality leads to more satisfaction.)

The Kano Diagram

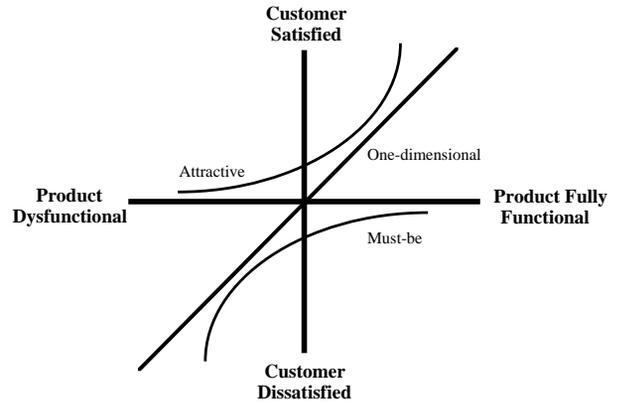


Figure 2

3. Some customer requirements are not One-dimensional—there are also “must-be” and “attractive” elements.

Figure 2 also has curves labeled “Must-be” and “Attractive.”⁶ The Must-be curve indicates aspects where the customer is more dissatisfied when the product is less functional, but where the customer’s satisfaction never rises above neutral no matter how functional the product becomes. For instance, having poor brakes in an automobile causes a customer to be dissatisfied; having good brakes, however, does not raise the level of the customer’s satisfaction. Good brakes are expected—they are a Must-be requirement.⁷ (Study the Must-be curve to understand this requirement situation: A little or a lot of a given feature leaves the customer unmoved [basically neutral and certainly not satisfied]; however, any lack of that particular feature quickly dissatisfies the customer.)

The Attractive curve indicates areas in which the customer is more satisfied when the product is more functional but is not dissatisfied when the product is less functional. For instance, an automobile customer may not be unsatisfied if the radio antenna does not automatically lower itself into the car body when the radio is turned off, but the customer may be more satisfied when the car has this feature.⁸ (Study the Attractive

⁵ Some companies use the word “satisfiers” instead of One-dimensional customer requirement. That is, the more fulfilled this requirement is, the more satisfied the customer is.

⁶ These curves are just roughly sketched. Section Vc will consider their exact shape in more detail.

⁷ Some companies call these Must-be elements “dissatisfiers”; they can dissatisfy but they cannot produce a significant level of satisfaction.

⁸ Some companies call these attractive elements “delighters,” that is, they do not dissatisfy if absent but can delight when present.

curve to understand the kind of situation where lack of a feature leaves a customer basically neutral [certainly not dissatisfied]; however, having more of the feature quickly increases the customer's level of satisfaction.)

A customer may also be indifferent to a quality element, for instance to having a cigarette lighter in a car. Indifference would be plotted on figure 2 roughly along the horizontal axis—that is, the customer is neither satisfied nor dissatisfied whether the product is dysfunctional or fully functional.⁹

4. Customer requirements can be classified by questionnaire.

Kano and his colleagues believe that the One-dimensional, Attractive, Must-be, and Indifferent customer requirements can be classified through a customer questionnaire. On this questionnaire each question has two parts: How do you feel if that feature is present in the product, and how do you feel if that feature is not present in the product? To each part of the question, the customer can answer in one of five different ways.¹⁰ For example, see figure 3 (below).

Based on the responses to the two parts of the question in figure 3, the product feature (how good gas mileage is, in this example) can be classified into one of six categories:

- A=Attractive
- M=Must-be
- O=One-dimensional
- I=Indifferent
- R=Reversel
- Q=Questionable

The first four categories have already been defined, and these are primarily what we are seeking in the Kano analysis. The other two categories indicate the following situations: There is a contradiction in the customer's answers to the questions (=Questionable); or our *a priori* judgment of functional and dysfunctional was the reverse what the customer feels (=Reverse).¹²

For each customer one determines into which category a given product feature falls by looking up the customer's answers to that feature's questions in the following Kano Evaluation Table, figure 4 (next page).¹³

For example, if the customer answers, "1. I like it that way," about "gas mileage is good," the functional form of the question, and "5. I dislike it that way," about "gas mileage is poor," the dysfunctional form of the question, we look at the intersection of the first row and the fifth column and find an O, indicating that gas mileage is a One-dimensional customer requirement from

⁹ The Kano diagram showing in figure 2 is useful for illustrating Kano's concepts of quality. However, the tabulations explained in part 4 of this section are more useful for understanding the quality elements of an actual product.

¹⁰ These are the translation of Kano's five answers as the CQM companies were taught them by Professor Shoji Shiba in 1990. Sections III and V discuss alternative formulations of the five answers.

¹¹ The answers to the questions are numbered in this example to help the reader follow the description of how a Kano questionnaire is processed. Subsection IIIa gives a fairly compelling argument for not numbering the answers.

¹² See part IIa.4 for a suggestion of how to handle the Reverse case in certain instances.

¹³ A derivation of this table is explained in subsection Vc.

A Pair of Customer Requirement Questions in a Kano Questionnaire

functional form of the question	↓
If the gas mileage is good, how do you feel?	<ol style="list-style-type: none"> 1. I like it that way. 2. It must be that way. 3. I am neutral. 4. I can live with it that way. 5. I dislike it that way.
If the gas mileage is poor, how do you feel?	<ol style="list-style-type: none"> 1. I like it that way. 2. It must be that way. 3. I am neutral. 4. I can live with it that way. 5. I dislike it that way.
dysfunctional form of the question	↑

Figure 3¹¹

Kano Evaluation Table

Customer Requirements →		Dysfunctional				
		1. like	2. must-be	3. neutral	4. live with	5. dislike
Functional	1. like	Q	A	A	A	O
	2. must-be	R	I	I	I	M
	3. neutral	R	I	I	I	M
	4. live with	R	I	I	I	M
	5. dislike	R	R	R	R	Q

Customer Requirement is:

A: Attractive

M: Must-be

R: Reverse

O: One-dimensional

Q: Questionable result

I: Indifferent

Figure 4

Examples of Three (Potential) Customer Requirements in a Kano Questionnaire

1a. If the gas mileage is good, how do you feel?	1. I like it that way. 2. It must be that way. 3. I am neutral. 4. I can live with it that way. 5. I dislike it that way.
1b. If the gas mileage is poor, how do you feel?	1. I like it that way. 2. It must be that way. 3. I am neutral. 4. I can live with it that way. 5. I dislike it that way.
2a. If the brakes are good, how do you feel?	1. I like it that way. 2. It must be that way. 3. I am neutral. 4. I can live with it that way. 5. I dislike it that way.
2b. If the brakes are poor, how do you feel?	1. I like it that way. 2. It must be that way. 3. I am neutral. 4. I can live with it that way. 5. I dislike it that way.
3a. If the radio antenna automatically retracts when the radio is turned off, how do you feel?	1. I like it that way. 2. It must be that way. 3. I am neutral. 4. I can live with it that way. 5. I dislike it that way.
3b. If the radio antenna does not automatically retract when the radio is turned off, how do you feel?	1. I like it that way. 2. It must be that way. 3. I am neutral. 4. I can live with it that way. 5. I dislike it that way.

Figure 5

the customer's point of view.

A portion of the Kano questionnaire for a survey about an automobile is reproduced in figure 5 (facing page).¹⁴

Once all the Kano questionnaires for a survey have been collected, one tabulates them by looking up the classification of each customer requirement on each questionnaire in the Kano Evaluation Table and tallying it in the appropriate place in the row for that requirement on a Kano questionnaire tabulation form (figure 6, next page).

The result of the tallying of all customer's questionnaires is a matrix such as the one shown in figure 7 (next page).

For each row of the tabulation, that is, for each customer requirement, the dominant customer view (dominate classification) is indicated by the highest tally.¹⁵ If two or more categories are tied or close to tied, it may be an indication that more information is needed: You may be dealing with two market segments, or you may need to ask questions about more detailed customer requirements.

From the tabulation of customer responses to the Kano survey for the automobile, a Kano diagram can be annotated—for example, a diagram showing the Must-be, One-dimensional, and Attractive, as in figure 8 (page 39)¹⁶.

All customer requirements are not equal. Improving performance on a Must-be customer requirement that is already at a satisfactory level is not productive when compared to improving performance on a One-dimensional or Attractive customer requirement. Having insight into which customer requirements fall into which quality dimensions can improve focusing “on the vital few.”¹⁷

IIa. Developing and Administering Kano Questionnaires¹⁸

In general, the steps to follow to develop and use a Kano questionnaire are:

1. Develop the questionnaire.
2. Test the questionnaire and revise if necessary.
3. Administer the questionnaire to customers.
4. Process the results.
5. Analyze the results.

1. Developing the Questionnaire

To construct the questionnaire formulate a pair of questions for each potential customer requirement for which you desire customer feedback. In the Concept Engineering (CE) process, these potential customer requirements come from step 6, the requirements KJ; the Kano process itself is

step 7 of Concept Engineering. In Concept Engineering, the Kano questionnaire and analysis are used to confirm and categorize the customer requirements discovered through voice-of-the-customer visits and analysis of the data collected from customers. In other situations, potential customer requirements might be developed in other ways. For instance, a survey might test aspects of an existing product or service to find out if they are valid—if customers appreciate them as much as, or in the same way that, the provider of the product or service expects.

The first question in each pair of questions for a customer requirement refers to a situation in which the requirement is met, and it is worded in a format similar to the following: “If [the product] satisfied [requirement x], how would you feel?” This is the *functional* question. The second question in each pair refers to the case where the requirement is not met. This is called the *dysfunctional* question, and is worded in a format similar to the following: “If [the product] did not satisfy [requirement x], how would you feel?”

When writing the pairs of functional and dysfunctional questions for each potential customer requirement, use the following guidelines:¹⁹

- You may have to step down the ladder of abstraction to construct a clear question. When the potential requirements come from analysis of voice-of-the-customer data, avoid straying from the original intent of the customer requirement statement. In Concept Engineering, refer to the requirement KJ and translation worksheets if necessary.
- Beware of polar wording in the question pairs; multivalued orientation is preferred. Consider this functional question: “If line placed in the basket stayed in it until cast, how would you feel?” Instead of wording the dysfunctional question “If line placed in the basket falls out before casting, how

¹⁴ In this example the first question in every pair is the functional form of the question, and the second question in every pair is the dysfunctional form of the question.

¹⁵ The mode of the distribution.

¹⁶ This optional annotated Kano diagram may be useful in explaining the results of the survey to other people; however, it has a lot less information than a tabulation table such as that shown in figure 7.

¹⁷ See part 5 of section II for more discussion on how to act on the Kano results.

¹⁸ Much of the text in this section is adapted with permission from *Concept Engineering*, CQM Document 71, G Burchill, D. Shen, et al., 1992, pp. 3.3-3.12.

¹⁹ It is also helpful to get some advice from someone in your firm who has experience in administering surveys.

Diane Shen worked extensively to develop the CQM Concept Engineering manual. She now works with various firms that are implementing Concept Engineering methodologies and is course manager for the CQM Concept Engineering Course.



Editorial Board

David Walden, Chairman
Center for Quality of Management

Stephen Graves
Professor & LFM Co-Director
Massachusetts Institute of Technology

Ted Walls
Boston College

Robert Chapman Wood
Writer

Alan Graham
Consultant
Pugh-Roberts Associates

Shoji Shiba
Tokiwa University

Production Team

Eric Bergemann
Publisher

Kevin M. Young
Design & Production

Jay Howland
Copy Editing

CQM Officers

Ray Stata
Chairman

Gary Burchill
President

Thomas H. Lee
Treasurer and President Emeritus

William Wise
Clerk

The Center for Quality of Management Journal is a forum for disseminating the experience of organizations learning to implement modern management practices. It seeks to capture experiences and ideas that may be useful to others working to create customer-driven, continuously improving organizations.

The CQM Journal is refereed. However, it is not an academic publication. Experiences and ideas will be published if they seem likely to be useful to others seeking to improve their organizations.

Send to:

The Center for Quality of Management Journal
Editorial Department
One Alewife Center, Suite 450
Cambridge, MA 02140
Tel. 617-873-8950 Fax 617-873-8980
E-mail: publications@cqm.org

If you have thoughts for a paper and you would like to discuss it with us, please write, call or submit an outline. We welcome your ideas.

Final Manuscript Requirements:

Entire manuscript should be double-spaced, including footnotes, references, etc. Text should include all the elements listed below. Generally, The CQM Journal follows the editorial principles of The Chicago Manual of Style. We strongly prefer submissions in electronic format for all text and as many of the figures as possible. IBM-based software (particularly Microsoft Word for Windows) is preferable to Macintosh-based software if you have a choice, but is by no means a requirement.

Please include:

1. Title page, stating the type of article (e.g., 7-Step case study, research paper, short communication, letter to the editor, etc.), main title, subtitle, and authors' full name(s), affiliation(s), and the address/phone/fax of the submitting author;
2. All needed figures, tables, and photographs (see below);
3. Footnotes (if appropriate), numbered consecutively from the beginning to the end of the article;
4. Reference list, if appropriate.

Figures, Tables and Photographs:

If you can, insert each figure or table into the text where you would like it to fall. Figures should be composed to conform to one of two widths: 3 1/8 or 6 1/2 inches. The maximum height for any figure is 9 3/8 inches. Text within figures should not be smaller than 5 points and lines not less than 1/4 point at the figure's final size. Figures should be labeled with the figure number underneath and title on top. Be sure that the text mentions each figure or table.

Please retain separate PICT or TIFF files of figures generated in drawing programs and a file with the text only for final submission.