

# Attractive Quality Creation: A Case Study of Microwave Ovens

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## **Originality/value**

Empirical research on attractive quality creation is sparse and this study represents a rare example of a comprehensive study of attractive quality creation.

## **Purpose**

The purpose of this study is to present a case study of attractive quality creation on microwave ovens and try to identify the characteristics of attractive quality attributes.

## **Design/methodology/approach**

We involved 30 customers of a company designing and producing microwave ovens. In a number of experiments these customers generated over 100 new ideas on functions, attributes and services related to microwave ovens. The 21 best ideas were identified by company specialists and these ideas were then evaluated by a large customer group using the theory of attractive quality in order to identify what ideas that are really examples of attractive quality attributes.

## **Findings**

Our study shows how the theory of attractive quality can be used in the development of new products and services. We also provide empirical evidence on the characteristics of attractive quality attributes.

**Keywords:** Attractive quality creation, customer idea generation, Kano.

**Categorization:** Research paper.

## Introduction

Inspired by Herzberg's Motivator-Hygiene Theory (Herzberg, 1966), Professor Kano and his co-workers developed the theory of attractive quality (Kano et al., 1984). It is a theory intended to better understand different aspects of how customers evaluate and perceive quality attributes. It explains how the relationship between the degree of sufficiency and customer satisfaction with a quality attribute can be classified into five categories of perceived quality. Using a specific questionnaire, quality attributes can be classified into one of five quality dimensions: (i) attractive; (ii) one-dimensional; (iii) must-be; (iv) indifferent; and (v) reverse (see e.g., Kano et al., 1984; Berger et al., 1993; Löfgren and Witell 2005). The first of these quality dimensions, attractive quality, refers to attributes that often surprise and delight customers. These attributes are used for the purpose of raising customer satisfaction but when not fulfilled customer *dissatisfaction* is not affected. In a literature review of how Kano's theory of attractive quality has been used and interpreted in academic papers over the past two decades, Löfgren and Witell (2008) found a lack of empirical research on attractive quality creation. Therefore, the focus in this paper is on just that: attractive quality creation. We define attractive quality creation as the creation of a useful product with attractive quality attributes that does not exist in the market.

Attractive quality creation has been relatively neglected as quality specialists have tended to focus on elimination of things gone wrong, i.e., must-be quality (Yamada, 1998; Kano, 2001). The theory of attractive quality can be used in two ways to address this imbalance—(i) as a conceptual model of what constitutes 'attractive' quality; and/or (ii) as a survey methodology to ascertain how customers perceive ideas for new features, functions, and products. New ideas trigger the innovation process and the development of new products. Unfortunately, only a very small percentage of the initial ideas for new products eventually lead to commercial success. To be able to use attractive quality creation to develop innovative products, the methodology is dependent on an idea bank with ideas that are original and can create customer value. Yamada (1998) has suggested combining the Kano methodology with creativity techniques to enhance the generation of ideas. We suggest an alternative approach where customers are actively involved in the idea generation process by coming up with new innovative ideas. These customer generated ideas can then be used and classified by larger customer groups in a survey following the theory of attractive quality.

The purpose of our study is to investigate if and how new ideas generated by customers can be used in a process of attractive quality creation. First, we involved 30 customers in the idea generation process of a company designing and producing microwave ovens. In a number of experiments these customers generated about 100 new ideas on functions, attributes, and services related to microwave ovens. The 21 best ideas were identified by company specialists and these ideas were then evaluated by a large customer group in a Kano survey. The specific purpose of that survey was to identify ideas that possess the qualities of attractive quality. The study at hand shows how methods for idea generation and the theory of attractive quality can be used jointly in the development of new products and services. We provide the outline of a process and methodology for

identifying and verifying brand new attractive quality attributes. In the next section of the paper the case study is described in detail.

## A Case Study of Involving Customers in Attractive Quality Creation

In this research project we worked together with a manufacturer of microwave ovens. For the market of microwave ovens each manufacturer sells their different products under a range of different brands, ranging from low-priced ovens with few functions to high-end ovens with a lot of functions. Both the technology and the market are mature and there is an interest for manufacturers to identify new ways of delivering customer value.

The early phases of the product development process often include a phase of idea generation. In this case, idea generation consists of four main activities: *Generation*, *Screening*, *Identification*, and *Evaluation*, see Figure 1. To build on previous research that claim that customers have the ability to come up with more innovative ideas than product developers do (Kristensson et al., 2004), customers were invited to participate in the activities of generation and identification of ideas. The first activity was idea generation by customers with the purpose of coming up with innovative ideas. In the second activity, company screening of ideas, engineers and marketers made a preliminary screening to identify the ideas with the most innovative potential. Then in the activity customer identification of attractive ideas, these ideas were evaluated by customers using the theory of attractive quality. In the last activity, company evaluation of ideas, the product developers went through all the performed analyses and together with other information, such as technological and financial, a decision was made on what ideas to develop further.

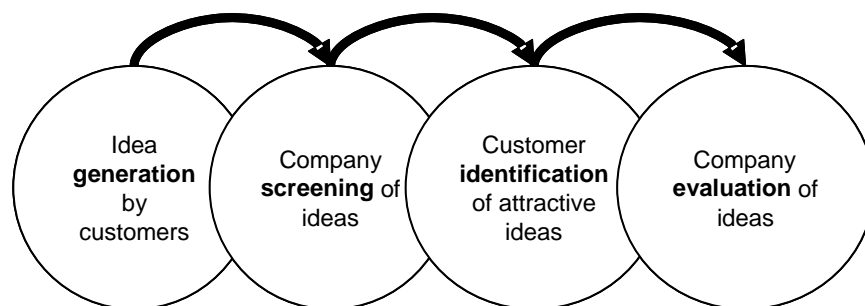


Figure 1: A process for including customer idea generation in attractive quality creation.

### Idea Generation by Customers

The importance of finding potentially successful ideas is well-known, but nevertheless many companies do not take action to assure that every source of ideas is used. Companies often obtain information about customer needs only, and assign manufacturers with the task of generating ideas for solutions leading to new products (Lilien et al., 2003). Company employees are required to translate needs into solutions that should fit these needs. It can be argued that engineers can have it hard to come up

with ideas on new products and services that will be attractive to customers. In a recent study of idea generation in the telecommunication industry, Magnusson et al. (2003) show that customers come up with ideas with a higher degree of innovativeness than the engineers employed by the company. In addition, their studies show that for mobile telephone services the average customers are better at coming up with ideas than lead users are and that the average customers that have gotten training by engineers come up with less innovative ideas. To conclude, a plausible strategy is to involve average customers in the phase of idea generation in the development process.

To be able to get customers to generate new ideas on functions, services, and features related to microwave ovens, customers got access to a new microwave that was not yet available in stores. In addition, the customers got a bag including instructions on how to use the microwave, a camera, a diary, a questionnaire of their microwave oven usage, a bag of popcorn, a cake to bake in the microwave, and a list of some web sites to visit. Customers were supposed to use the new microwave oven for a week and during this time write a diary over how they used the oven. Each time a customer got an idea related to how to buy, use, or dispose a microwave oven the customer was supposed to write down this idea in a specific section of the diary. The customer was supposed to name the idea, describe the essence of the idea, and list the benefits of the idea. At the end of the week, the microwave ovens, the questionnaire, and the diaries were collected and the customers were given cinema tickets as a token of our appreciation.

In total, 30 customers were enabled to use the new microwave ovens for a week. During this period, the customers generated 108 ideas related to microwave ovens. Each customer came up with 1 to 15 new ideas. Examples on new ideas were for instance the self-cleaning microwave oven, i.e., a microwave oven that has a button for self-cleaning so that the microwave becomes perfectly clean without having to scrub it. Some of the ideas were very novel, while others had been tried before or existed on the market.

### **Company Screening of Ideas**

All the ideas collected in the diaries were transcribed and put together in an idea book. This book contained all the ideas, which were grouped together so similar ideas were next to each other. An idea session was conducted with a research team and eight product developers at the manufacturer. Each product developer was to go through the ideas and judge them on a scale (1 to 10) on how original the idea was and to what extent the idea provided customer value. On an overall level, the originality of the ideas ranged from 4.1 to 8.75 while the customer value ranged from 1.25 to 9.25.

The preliminary evaluation of ideas resulted in a list of the 21 most promising ideas (see Table 1). This classification was not only based on the degree of originality and customer value, but also to some extent on the possibility of implementation during the coming decade. Using the scoring of ideas of the different judges an originality and value index was calculated. This resulted in a list of the most promising ideas that was of interest to get some customer input on.

## **Customer Identification of Attractive Ideas**

To get customer input on the most promising, and to identify attractive ideas, a Kano questionnaire was used. The questionnaire contains pairs of customer requirement questions, i.e., for each customer requirement two questions are asked (Kano et al., 1984; Berger et al., 1993). In answering each form of the question, the customer is required to choose one of five alternatives. Responses to both the 'functional' and 'dysfunctional' forms of the question are required for the classification of customer requirements. The classification is then made using an evaluation table in which each customer requirement can be classified into one of five dimensions: 'attractive', 'one-dimensional', 'must-be', 'reverse', and 'indifferent quality' (for a detailed description of classification of quality attributes, see Witell and Löfgren, 2007). Finally the responses for each customer requirement were tabulated. In attractive quality creation where the focus is on ideas that do not exist in the market and that the customer has not experienced before the aim of the Kano methodology is to identify the ideas that are attractive to customers.

In the survey, the 21 most promising customer ideas were tested. The questionnaire consisted of three parts. The first section included questions regarding customers' usage of microwave ovens. Then a section with questions based on the theory of attractive followed, and last, a section where the customer judged the value of the different ideas. In total, 87 young adults participated in the study. An overview of how the results were classified is presented in Table I.

**Table I:** Classification of customer ideas into quality dimensions.

Customer Idea	Short Description	Agreement	CS	Classification (CS 15%)	Customer value	Originality
Micro-Bag	<i>A portable microwave oven</i>	0,75	0,56	Indifferent	3,16	8,75
Voice-Pitch	<i>The microwave oven is controlled by speech</i>	0,48	0,11	Indifferent	4,17	4,50
Heat & Freeze	<i>The microwave oven can work as a quick cooler.</i>	0,57	0,22	Attractive	5,05	5,50
Fridge-Micro	<i>The microwave oven works as a refrigerator when not used to cook.</i>	0,53	0,28	Indifferent	3,39	5,75
Do-it-Everywhere	<i>The lunchbox has a microwave effect in the lid.</i>	0,75	0,55	Attractive	5,45	8,00
Make and Bake	<i>The microwave oven mixes, stirs and cook the ingredients into a meal.</i>	0,43	0,08	Combination (Attractive & Indifferent)	3,98	5,50
Parents-in-the-lake	<i>A portable and battery driven microwave oven.</i>	0,48	0,06	Combination (Indifferent & Attractive)	3,43	6,50
Micro-Dry	<i>The microwave oven can be used to dry clothes.</i>	0,41	0,01	Combination (Reverse & Indifferent)	2,26	4,50
Micro-Receipt	<i>The microwave oven can be used to download receipt from the Internet.</i>	0,48	0,03	Combination (Attractive & Indifferent)	3,55	7,00
Freeze Meat	<i>Special boxes to freeze food in that are made for microwave ovens.</i>	0,66	0,37	Indifferent	3,68	5,33
Sense	<i>The microwave oven can sense what food it is and choose program by itself.</i>	0,83	0,72	Attractive	8,26	8,50
SelfClean	<i>A microwave oven that cleans itself on the inside after usage.</i>	0,79	0,66	Attractive	8,57	8,75
Perfect Temp	<i>Can choose temperature on the cooked food.</i>	0,61	0,45	Attractive	8,29	8,50
Easy	<i>A microwave oven that has many functions but is very easy to use.</i>	0,68	0,49	One-dimensional	9,03	8,50
EasyClean	<i>The microwave oven is easy to clean</i>	0,71	0,57	One-dimensional	9,10	6,75
Sensoria Amoria	<i>A microwave that stops when milk or porridge starts to come over the sides of the plate.</i>	0,66	0,39	Attractive	8,09	7,75
PopStop	<i>A microwave that stops when the popcorns are ready.</i>	0,78	0,59	Attractive	8,15	7,75
Customize	<i>A microwave oven where customized programs can be created.</i>	0,55	0,14	Combination (Indifferent & Attractive)	5,21	6,50
ReadySense	<i>The microwave can sense when the food is ready.</i>	0,78	0,67	Attractive	8,37	8,75
NoStart	<i>The microwave oven can not start if not everything is in the right place.</i>	0,39	0,06	Combination (Indifferent & Reverse)	4,80	8,00
Sequence	<i>A microwave oven that works as a sequential cookbook.</i>	0,68	0,44	Indifferent	3,51	7,50

In Table I, agreement represents the percentage of the respondents who have agreed on the final classification and CS stands for category strength, i.e., the percent difference of the highest category above the next-highest category (Lee and Newcomb, 1997). Lee and Newcomb (1997) suggest that the category strength should be at least 6 percent when you have a large sample. Since our sample size is only 87 respondents, we chose to set the category strength to 15 percent. In total, 8 attributes were classified as ‘attractive’, 6 as ‘combinations’, 5 as ‘indifferent’, and 2 as ‘one-dimensional’.

Since the purpose of the study is to identify the ideas that possess attractive quality attributes and that possibly should be included in future products, our main interest concerns the ideas that are attractive. We find it notable that six of eight attractive quality ideas score 8+ in stated customer value and that seven of the same ideas got originality scores in the range of 7.75-8.75 from the company experts. To get an overview of all ideas we plotted all the ideas in a Better-Worse diagram (Berger et al., 1993), see Figure 2. In the calculation formula below, each quality dimension is represented by its first letter, e.g., ‘A’ stands for ‘attractive quality’.

$$\text{Better} = \frac{A+O}{A+O+M+I} \quad \text{Worse} = - \frac{O+M}{A+O+M+I}$$

The positive better numbers indicate that customer satisfaction will be increased by providing a quality attribute and the negative worse numbers indicate that customer satisfaction is decreased by not providing a quality attribute (Berger et al., 1993). For the purpose of clarity, all numbers have been made positive in Figure 2.

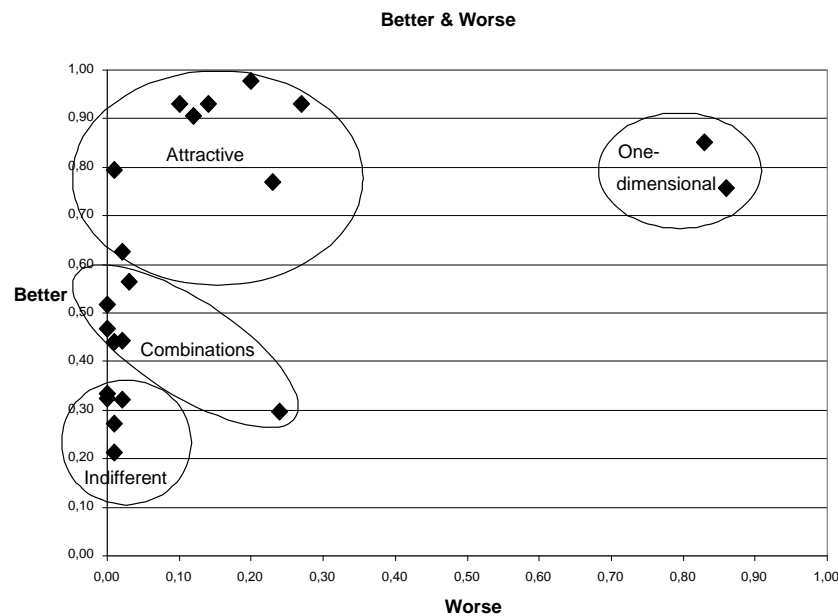


Figure 2: An overview of the customer ideas in a Better-Worse diagram.

Going through the classification of ideas and the Better-Worse diagram, it is revealed that there are 8 ideas that have been classified as attractive. These ideas cover areas such as the microwave ovens ability to make food colder, to stop when the food overcooks, the food or popcorn are ready, to sense what food is in the oven and choose program thereafter, to clean itself after use, the ability to cook the food to a specific temperature, and an idea that puts a micro-effect in the lid of a lunch box. All these ideas have the potential to delight the customers if included in future generations of microwave ovens. But not all ideas should be chosen to be developed further. By using additional information the company needs to prioritize among the ideas with the highest potential.

## Company Evaluation of Ideas

In the last activity of idea generation, the company needs to evaluate the ideas with the most potential. For these ideas more information is needed on what is technical feasible, what the market potential is, and what the financial consequences might be. As an illustration of information that can be used, the perceived customer value of all ideas is provided in Figure 3. Here, two views of the customer perceived value are provided. First, the value of all ideas as judged by the customer and second, the customer perceived value as judged by the company. As can be seen, the two views agree on the value of 9 ideas. In one case, the customers have a much higher perception of the value than the developers do. But in general, the company has an over belief in the customer perceived value of the ideas. In addition, not all product ideas lead to action. In the end, the company should choose some of the attractive ideas to develop further.

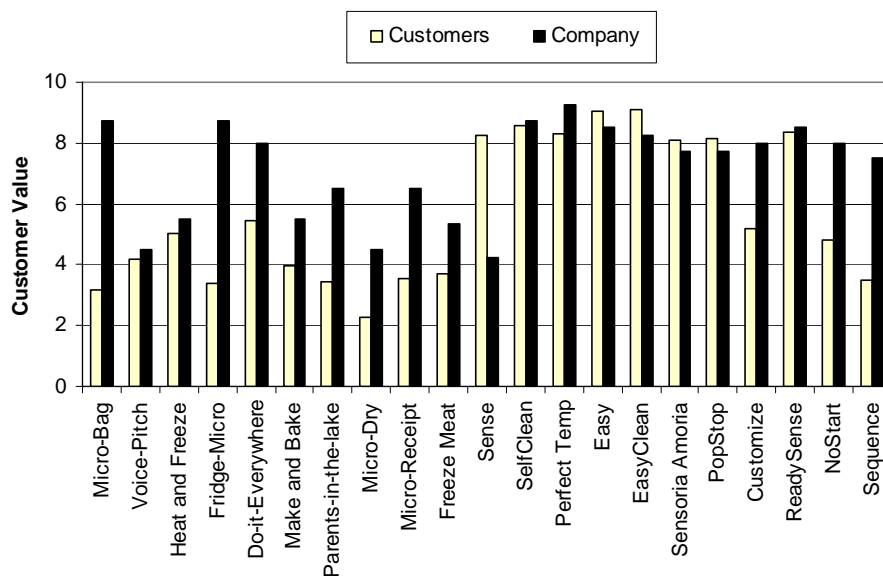


Figure 3: Comparisons customers' and the company's stated customer value of the different ideas.

## Similarities and Differences between Different Quality Dimensions

The sparse research on attractive quality creation provides us with no guidance on if the theory of attractive quality can be used to actually separate between different kinds of attributes early in the development process. To be an alternative for companies, attractive quality creation needs to be able to pinpoint those attributes that are more original and provide more customer value and this has to be done before the attribute is implemented in an actual product.

To test this we decided to make a comparison between the different kinds of attributes identified in our empirical investigation. We divided the attributes to enable a comparison between the 8 attractive attributes, the 11 indifferent or combinations of attributes and the 2 one-dimensional attributes. T-tests were performed to compare the customer value



originality of attractive quality attributes with the two other kinds of attributes identified in our study. Our results show that attractive quality attributes are more original and provide more customer value than the indifferent attributes do. In addition, the one-dimensional attributes are perceived as providing more customer value, while no difference can be identified concerning originality.

**Table II:** Comparisons between quality dimensions.

Classification	Attractive (A)	Indifferent (I)	One-dimensional (O)	A-I	A-O
Customer Value	7,53	3,74	9,07	p < 0.01	p < 0.05
Originality	7,94	6,35	7,63	p < 0.05	p > 0.05

Note: The sample sizes for the observations are limited.

Our results show that the ideas that have been identified as attractive are more original and provide more customer value in comparison to the ideas that have been pointed out as indifferent. This follows the logic of the life-cycle of quality attributes (Kano, 2001). This logic also explains that we can find certain indifferent ideas that score high on originality, since some of these attributes might become attractive over time. Following a similar reasoning it is logical that the ideas identified as one-dimensional provide higher customer value in comparison to the ideas identified as attractive. No difference can be found concerning the originality of the attractive and the one-dimensional ideas. We should expect that the attractive ideas are more original than the one-dimensional ideas. However, the sample size of our study is limited and our results should be interpreted with caution.

## Discussion and Implications for Attractive Quality Creation

In this paper, we have investigated if customer generated ideas can be used in attractive quality creation. Successful idea generation is one of the most important activities in attractive quality creation, and since customers have been identified as a source of innovative ideas it is fruitful to combine idea generation by customers with attractive quality creation. Our case study of microwave ovens show that the four main activities of idea generation (Generation, Screening, Identification, and Evaluation) works well as a framework to guide the involvement of customers in certain activities of the process.

Attractive quality attributes are often referred to as ‘surprise’ or ‘delight’ attributes (see e.g. Matzler et al., 1996; Watson 2003). As a result of the idea generation process, our case company has a number of attractive ideas that has the potential to delight customers. In addition, when these ideas were evaluated by company experts, it was revealed that the attractive ideas also scored high on originality. To a layman some of the originality scores shown in Table I may seem strange. For instance the ‘Voice-Pitch’ idea, about controlling the microwave oven by speech, only scored 4.5 on ten-point scale. However, after discussing with the company experts that made the originality evaluation, it was made clear that some of the ideas already had been tried by different microwave oven manufacturers. This explains why some of the ideas that seem novel to the public are not viewed the same way by company experts. It also strengthens the methodological choice

made in this paper to use company experts and not customers when evaluating originality.

Our results show that the operationalization of the theory of attractive quality can aid a company in pointing out those attributes that provide higher customer value and that are more original than other attributes. This is an important finding since it enables an organization to estimate the originality and the provided customer value before the attribute has been built into a product.

Research on attractive quality creation has thus far been sparse. Lilja and Wiklund (2006) have identified two obstacles to the creation of attractive quality: (i) the diversity of meanings given to the concept of 'attractive quality'; and (ii) a lack of explanations of the occurrence of attractive quality. The authors argued that these two obstacles have led to misunderstandings and mismanagement of attractive quality creation. We would also like to add the lack of empirical research focusing on attractive quality creation as a third obstacle. We feel that it is time to address these issues and put emphasis on innovation within the quality movement and that this paper is a first step in that direction. The main managerial implication to be learnt from our research is that ordinary customers can be used for generating original ideas in attractive quality creation.

## References

- Berger, C., R. Blauth, D. Boger, C. Bolster, G. Burchill, W. DuMouchel, F. Pouliot, R. Richter, A. Rubinoff, D. Shen, M. Timko, and D. Walden. (1993), "Kano's methods for understanding customer-defined quality", *The Center for Quality of Management Journal*, Vol. 2, No. 4, pp. 2-36.
- Herzberg, F. (1966), *Work and nature of man*. Cleveland, World Publishing Co.
- Kano, N. (2001), "Life Cycle and Creation of Attractive Quality", *4th International QMOD Conference Quality Management and Organisational Development*, Linköpings Universitet, Sweden.
- Kano, N., N. Seraku, F. Takahashi, and S. Tsjui (1984), "Attractive quality and must-be quality", *Hinshitsu*, Vol. 14, No. 2, pp. 147-56.
- Kristensson, P., A. Gustafsson and T. Archer (2004), "Harnessing the creative potential among users", *Journal of Product Innovation Management*, Vol. 21, No. 1, pp. 4-14.
- Lee, M., C. and J. Newcomb, F. (1997). "Applying the Kano methodology to meet customer requirements: NASA's microgravity science program", *Quality Management Journal*, Vol. 4, No. 3, pp. 95-110.
- Lilien, G. L., P. D. Morrison, K. Searls, M. Sonnack and E. von Hippel (2003), "Performance Assessment of the Lead User Idea-Generation Process for New Product Development", *Management Science*, Vol. 48, No. 8, pp. 1042-1059.
- Lilja, J. and H. Wiklund (2006), "Obstacles to the creation of attractive quality", *The TQM Magazine*, Vol. 18, No. 1, pp. 55-66.
- Löfgren, M. and L. Witell (2005), "Kano's theory of attractive quality and packaging", *Quality Management Journal*, Vol. 12, No. 3, pp. 7-20.

- Löfgren, M. and L. Witell (2008), "Two decades of using Kano's theory of attractive quality: A literature review", *Quality Management Journal*, Vol. 15, No. 1, pp. 59-75.
- Magnusson, P., J. Matthing and P. Kristensson (2003), "Managing user involvement in service innovation: Experiments with innovating end users", *Journal of Service Research*, Vol. 6, No. 2, pp. 111-124.
- Matzler, K., H. H. Hinterhuber, F. Bailom, and E. Sauerwein (1996), "How to delight your customers", *Journal of Product & Brand Management*, Vol. 5, No. 2, pp.6-18.
- Watson, G., H. (2003), "Customer Focus and Competitiveness", K. Stephens, S, *Six Sigma and Related Studies in the Quality Disciplines*, Milwaukee, ASQ Quality Press.
- Witell, L. and M. Löfgren (2007), "Classification of quality attributes", *Managing Service Quality*, Vol. 17, No. 1, pp. 54-73.
- Yamada, S. (1998), "Idea Generation in Attractive Quality Creation", *Second International Congress on Total Quality Management*, Belgrade, Yugoslavia, 542-547.