International Journal for Quality Research 10(3) 569–582
ISSN 1800-6450

Ismail Wilson Taifa [1]
Darshak A. Desai

Article info:
Received 20.01.2016
Accepted 29.06.2016

UDC – 638.124.8
DOI – 10.18421/IJQR10.03-09

STUDENT-DEFINED QUALITY BY KANO MODEL: A CASE STUDY OF ENGINEERING STUDENTS IN INDIA

Abstract: *Engineering Students in India like elsewhere world-wide need well designed classrooms furniture which can enable them to attend lectures without negative impact in the long run. Engineering students from India have not yet been involved in suggesting their requirements for improving the mostly out-dated furniture at their colleges. Among the available improvement techniques, Kano Model is one of the most effective improvement approaches. The main objective of the study was to identify and categorise all the main attributes regarding the classrooms furniture for the purpose of increasing student satisfaction in the long run. Kano Model has been well applied to make an exhaustive list of requirements for redesigning classroom furniture. Cronbach Alpha was computed with the help of SPSS 16.0 for validation purpose and it ranged between 0.8 and 0.9 which is a good internal consistency. Further research can be done by integrating Kano Model with Quality Function Deployment.*

Keywords: *Kano Model, Voice of Students, Satisfaction, Dissatisfaction, Class Furniture, Kano questionnaire*

1. Introduction

Indian students from various Engineering colleges like other education institutes world-wide require furniture that can satisfy their needs without negative impact. In India, on an average, engineering students utilize classroom furniture around 4 hours a day. This creates a need of well-designed furniture which can be used for long time. Failure to have a well-designed furniture can cause problems in the long run include *Musculoskeletal Disorders* and other related problems. The act of having good furniture increase concentration or being attentive in making follow-up of what professors deliver in classes. There is a big need of understanding student-defined quality for furniture which are being used on daily basis at colleges. Understanding student defined quality need to be translated with well suited techniques including Kano Model (Jylhä and Junnila, 2015) so as to have good design which can ultimately be manufactured.

2. Kano model review

According to (Kano *et al.*, 1984; Xu *et al.*, 2009), Kano Model is a technique which can be used to decide the most influential attributes in the time of designing products and/or services for easy satisfaction to customer (users). Kano Model helps in capturing all necessary nonlinear

[1] Corresponding author: Ismail Wilson Taifa
email: taifaismail@yahoo.com

relationship between classroom furniture`s performance and student satisfaction (Mikulic, 2006). Many researchers clearly mentioned that the first people to propose Kano model was Professor Noriaki Kano from Japan and his colleagues in 1984 (Kano *et al.*, 1984; Paraschivescu and Cotîrleț, 2012; Sulisworo and Maniquiz, 2012; Yadav and Mishra, 2013; Bennur and Jin, 2012).

Table 1. Key five quality dimensions description of Kano Model (Taifa and Desai, 2015; Rashi *et al.*, 2011).

Attributes	For Designer`s Action	Description to Users
Type M (*Must or basic or Expected*) attributes	These attributes must be included in the product and well-functioning	Absence of "*Must-be*" attribute can result to dissatisfaction.
Type O (*one-dimensional or performance*) attributes	The more efforts to be put, the more satisfaction level to users, and vice versa also is true.	Causes satisfaction and dissatisfaction depending on the performance levels.
Type A (*Attractive or Delighter*) attributes	Designers need to capitalize over here by including these attributes for delighting users.	Presence of Attributes satisfy users; it`s absence does not cause dissatisfaction.
Type I (*indifferent or Neutral*) attributes	There is no much need of focusing to these attributes though they should not be ignored totally.	These attributes are neither satisfying nor dissatisfying users.
Type R (*reverse*) attributes	Never consider these attributes in designing the product.	Presence of such attribute cause dissatisfaction.

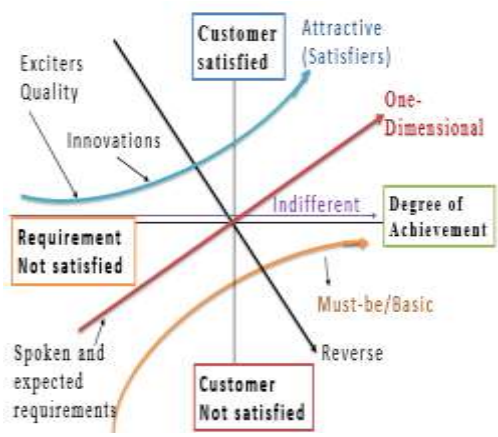

Figure 1. Kano Model with five quality Dimensions (Taifa and Desai, 2015; Sulisworo and Maniquiz, 2012; Xiong *et al.*, 2015)

Table 1 indicates the description of Kano Model regarding the five key quality dimensions as it was explained by (Rashid *et al.*, 2010).

The fundamental concept of the Kano model is as shown by *Figure 1* (Taifa and Desai, 2015; Sulisworo and Maniquiz, 2012; Rashi *et al.*, 2011). The horizontal axis of the diagram shows to what extent a service or

product attribute satisfies users while the vertical axis shows the extent to which users can be satisfied with the service or product.

3. Research objectives and methodology

3.1. Purpose of the study

The major aim of this study was to carryout thoroughly identification of all the Voice of the students for the aim of translating them into Critical to Quality Characteristics (CTQs). These voices of students were required for the aim of redesigning the available classroom furniture in engineering colleges. The CTQs were then needed to be ranked into five major categories as described into *Table 1* (MacDonald *et al.*, 2006).

In this study, Kano model has been adopted since it has the ability in understanding all an important attributes which can influence student satisfaction, getting good decisions regarding the trade-off situations in the attributes especially for the management of engineering colleges whenever they might require to purchase other furniture (Sauerwein *et al.*, 1996). This will be possible after making good database of all the information regarding the current study. Also, such study helped to determine attributes like attractive which are required by designers whenever they need to do some innovations for increasing their market share as well as wallet share.

3.2. Sample size calculation

The total population (N) considered for the study was 500 with 95% as the confidence level while the level of precision or sampling of error considered was 5%. According to Yamane (1967) and Slovin (1960) whenever the targeted population for a study is less than ten thousands (10,000) then, the sample size (n) can be determined using the formula given by Equation 1.

$$\boldsymbol{n} = \frac{\boldsymbol{N}}{\boldsymbol{1+Ne^2}} \quad (1)$$

Whereby **n** is Sample Size, **N** is population size, **e** is level of precision or sampling of error and **1** is constant value. The calculated Sample Size was **222**. In case the population could be greater or equal to 10,000 then Cochran (1963) formula given by Equation 2 could be the appropriate one to be used.

$$\boldsymbol{n} = \frac{\boldsymbol{p(1-p)Z^2}}{\boldsymbol{e^2}} \quad (2)$$

Whereby **Z** is the standard normal deviation; for 95% confidence level usually is being set at 1.96, **p** is the proportion in the targeted population and **(1-p)** as the proportion in the target population not having the particular characteristic and **e** as a level of precision or sampling of error.

3.3. Kano questionnaire development

Students questionnaire developed were having both functional (positive) and dysfunctional (negative) questions regarding the classrooms furniture (Matzler and Hinterhuber, 1998). The questionnaires were too exhaustive and had 23 dysfunctional form questions whereby each question had five choices of answers i.e., "*I like it that way*", *"It must be that way", "I am neutral", "I can live with it that way" and "I dislike it that way*".

Out of the five (5) alternative answers in column III for each either functional or dysfunctional question, students were supposed to choose one answer as per his or her will. *Table 2* shows the format which used in collecting all requirements from engineering students in India. The questionnaires included functional (positive) and dysfunctional (negative) question form for the aim of capturing all necessary requirements from students who are the main users of the classroom furniture.

The filled questionnaires were either hardcopy or Google docs. Hardcopy

questionnaires for Kano model were willingly and namelessly completed under best guidance of the researcher.

Table 2. Functional and dysfunctional questions

I	II	III
Functional form of the question (Positive)	If the classroom desk is having good tilt angle for writing, how do you feel?	I like it that way
		It must be that way
		I am neutral
		I can live with it that way
		I dislike it that way
Dysfunctional form of the question (Negative)	If the classroom desk is not having good tilt angle for writing, how do you feel?	I like it that way
		It must be that way
		I am neutral
		I can live with it that way
		I dislike it that way

Figure 2. Classroom Desk_A

Figure 4. Classroom Desk_C

Figure 3. Classroom Desk_B

Figure 5. Classroom Desk_D

Figure 2, 3, 4 and 5 shows the type of the available classrooms furniture at G H Patel College of Engineering and Technology.

3.4. Kano questionnaire responses

According to references (Matzler and Hinterhuber, 1998; Sauerwein *et al.*, 1996; Griffin and Hauser, 1883), collection of 20–30 % in homogeneous segments are enough to capture 90-95% of all necessary classroom furniture requirements.

In the study carried out, the sample size used was 232 which was more than the calculated sample size of 222. The total filled questionnaires resulted to 29.2% responses. This percentage was sufficed to capture enough requirements regarding the improvement of classroom furniture.

4. Results and discussion

Minitab 17 software and SPSS 16.0 software were both used in analysing all the collected data regarding the classrooms furniture. This analysis was done with the help of Table 3. For example, In the given questionnaire if the provided functional question was "If the classroom desk is having good tilt angle for writing, how do you feel?", then student answered that "I like it that way"; and for the dysfunctional question "If the classroom desk is not having good tilt angle for writing, how do you feel?" then student answered that "I can live with it that way".

Now the combination of the two answers result to categorise such attribute as "A" which stands for an "Attractive" attribute (Berger *et al.*, 1993). All 23 questions for both functional and dysfunctional were well analysed in that way until finalising to get the summarised result in Table 5.

Attractive response (A), One-dimensional (O), Questionable response (Q), Must-be response (M), Indifferent response (I), Reverse (R)

To simplify the space, each student attribute was denoted as SA.

Table 3. Evaluation Matrix for Kano Model (Berger *et al.*, 1993; Tan & Pawitra, 2001)

Student (Users) requirements		**Dysfunctional (Negative)**				
		Like	Must	Neutral	Can live with it	Dislike
Functional (Positive)	Like	Q	A	A	A	O
	Must	R	I	I	I	M
	Neutral	R	I	I	I	M
	Can live with it	R	I	I	I	M
	Dislike	R	R	R	R	Q

Table 4. Requirements from Students

Code	Furniture requirements
SA1	Bigger size of Desk
SA2	Comfortable seat
SA3	Stronger and durable
SA4	Adjustable backrest
SA5	Adjustable Seat
SA6	Adjustable Footrest
SA7	Low price
SA8	Desk is for two seated people
SA9	Desk is having pen holder
SA10	Easy to move
SA11	Attractiveness (aesthetics)
SA12	Bag shelf
SA13	Individual lock
SA14	Tilt angle for writing surface
SA15	Easy to use
SA16	Adjustable height
SA17	Suitable weight
SA18	Correct thick board
SA19	Tilt angle of backrest
SA20	Smooth edges (safety purpose)
SA21	Desk is made from steel material
SA22	Desk is made from wood material
SA23	Desk is made from plastic material

SA: Classroom furniture Attributes

With the help from references (Berger *et al.*, 1993, Kuo, 2004; Liu, 2012), the general formula given by Equation 3 and 4 were used in computing student satisfaction (SS) and Student Dissatisfaction (SD) coefficients.

Student Satisfaction (SS)

$$SS\ (\text{better}) = \frac{A+O}{A+O+I} \quad (3)$$

Student Dissatisfaction (SD)

$$\text{SD (Worse)} = -\frac{O+M}{A+O+M+I} \quad (4)$$

According to (Matzler and Hinterhuber, 1998), the negative sign (-) is being put before the student dissatisfaction for showing an emphasis on negative influence to student`s satisfaction at whatever time the quality of classroom furniture is not achieved. Satisfaction and dissatisfaction coefficients was later on calculated after collecting all requirements in Table 4.

Table 5. Classification of Classroom furniture requirement based on Kano's model for all Students

Code	Percentage of replies (%)							Category	SS	SD
	A	O	M	R	Q	I	Total			
SR1	21.92	26.03	21.92	8.22	0.68	21.23	100	**O**	0.69	-0.53
SR2	21.23	36.99	26.71	0.68	0.68	13.70	100	**O**	**0.81**	**-0.65**
SR3	15.07	20.55	17.12	2.74	2.74	41.78	100	I	0.46	-0.40
SR4	32.19	23.29	10.27	4.79	2.74	26.71	100	**A**	0.68	-0.36
SR5	28.08	16.44	11.64	6.16	1.37	36.30	100	I	0.55	-0.30
SR6	26.03	14.38	15.07	5.48	2.74	36.30	100	I	0.53	-0.32
SR7	12.33	6.16	4.11	15.07	3.42	58.90	100	I	0.24	-0.13
SR8	36.30	8.90	9.59	8.22	3.42	33.56	100	**A**	0.57	-0.21
SR9	23.29	10.27	8.90	10.96	2.05	44.52	100	I	0.43	-0.22
SR10	22.60	17.12	10.27	3.42	5.48	41.10	100	I	0.49	-0.30
SR11	36.99	16.44	8.22	4.11	4.79	29.45	100	**A**	0.64	-0.27
SR12	22.60	22.60	25.34	4.11	3.42	21.92	100	**M**	0.67	-0.52
SR13	19.86	6.16	8.90	10.96	2.74	51.37	100	I	0.34	-0.17
SR14	30.82	15.07	13.70	8.90	2.74	28.77	100	**A**	0.61	-0.33
SR15	22.60	20.55	19.18	4.79	4.79	28.08	100	I	0.61	-0.44
SR16	24.66	13.70	10.27	8.90	4.79	37.67	100	I	0.50	-0.28
SR17	17.81	11.64	6.85	4.11	0.00	59.59	100	I	0.33	-0.19
SR18	22.60	23.29	16.44	5.48	6.16	26.03	100	I	0.64	-0.45
SR19	28.77	8.90	14.38	5.48	4.79	37.67	100	I	0.50	-0.26
SR20	15.75	19.18	29.45	9.59	1.37	24.66	10	**M**	0.59	-0.55
SR21	14.38	4.11	0.68	15.75	4.79	60.27	100	I	0.23	-0.06
SR22	28.08	6.16	9.59	2.74	5.48	47.95	100	I	0.42	-0.17
SR23	10.27	0.68	4.11	27.40	6.16	51.37	100	I	0.18	-0.07

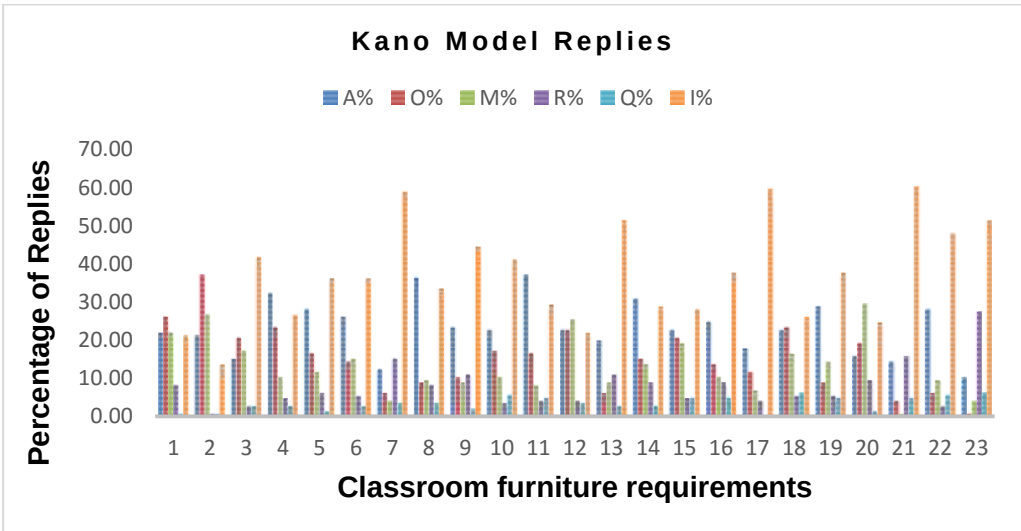

Figure 6. Kano Model Replies

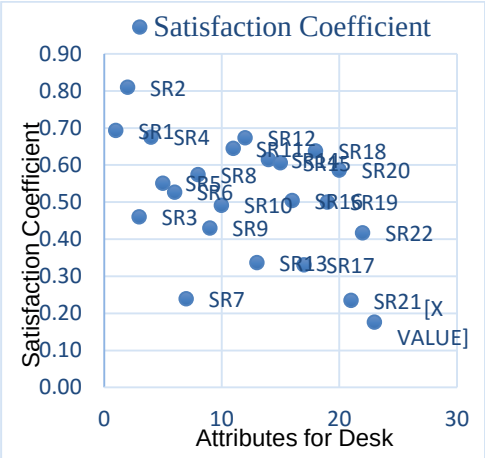

Figure 7 Student Satisfaction coefficients

Regarding the computed coefficient "*Comfortable seat*" attribute has Student Satisfaction (SS) coefficient of 0.81 which is more than other attributes of classroom furniture as shown in *Figure 7 (represented by SA2)*, therefore such requirement if it can be capitalised then it can result to more satisfaction to engineering students.

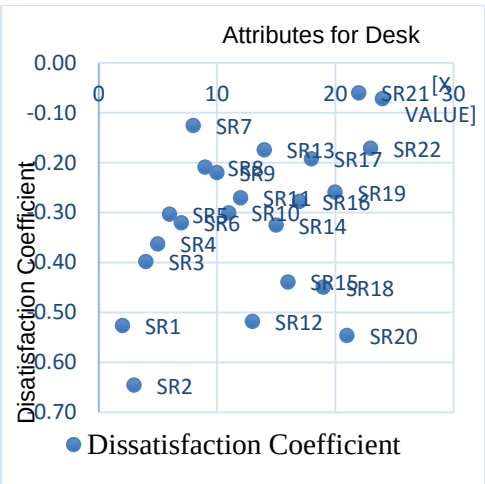

Figure 8. Student Dissatisfaction coefficient

For Student Dissatisfaction (SD) coefficient same "*Comfortable Seat*" attribute got highest value of - *0.65* as shown in *Figure 8 (represented by SA2).*

The Student satisfaction coefficient ranges from 0 to 1. The more Student Satisfaction coefficient approaches to 1, the more satisfaction of the attribute to engineering students and vice versa too. For Student Dissatisfaction Coefficient, it ranges from 0 to -1. The more Student Dissatisfaction approaches to -1, the more dissatisfaction to the student and vice versa too.

Therefore, ensuring that there are comfortable seats for all classrooms furniture in engineering college will help to create maximum satisfaction while reducing student dissatisfaction. The list for all satisfaction and dissatisfaction coefficients should be considered till the maximum satisfaction is achieved.

Table 4 shows all 23 requirements mentioned by students. In *Figure 6*, majority requirements from students followed under *indifferent (neutral attributes)* except few requirements. From the exhaustive list of 23 requirements from students there are four categories which can be observed with the help of *Table 5*. In the list there is no any Reverse attribute (inconsistence response).

Attractive Attributes

Table 5 indicates four (4) requirements which are under attractive category. These attributes include "Adjustable backrest", "Desk is for two seated people", "Tilt angle for writing surface" and "Desk is attractiveness (aesthetics)". References (Zhu *et al.*, 2010; Wu *et al.*, 2010) indicate that, students be more satisfied if these attributes are present and the absence of such attributes does not cause dissatisfaction. Therefore, in improving classroom furniture there is highly need for considering the four mentioned attractive attributes for increasing satisfaction of students.

Must-be Attributes

These are the basic or expected attributes. Pertaining to the study done, Must-be (M) quality include "Bag shelf" and "Smooth edges (safety)". By any means they must be included in designing the classroom furniture

(Hsu *et al.*, 2007; Sulisworo and Maniquiz, 2012).

One-Dimensional Attributes

One-dimensional qualities include "bigger size of Desk" and "Comfortable seat". These attributes produce satisfaction and dissatisfaction depending on performance levels (Ho *et al.*, 2013).

Indifferent attributes

In this study, 15 out of 23 of the requirements from students are under indifferent quality including attributes such as "Desk is having pen holder", "Adjustable Seat", "Adjustable Footrest", "Low price", "Easy to move", "Bag shelf", "Individual lock", "Easy to use", "Adjustable height", "Suitable weight", "Correct thick board", "Tilt angle of backrest", "Desk is made from steel material", "Desk is made from wood material", and "Desk is made from plastic material". There is no need of focusing about them in designing though they should not be completely ignored (Yuan and Guan, 2014).

Reverse Attributes

From the study of categorising requirements there was no classroom furniture attribute which was seen under reverse category. Kano called it "one dollar quality" (Yang *et al.*, 2014).

5. Cronbach's alpha analysis

Using SPSS 16.0, the Cronbach`s Alphas was quite strong. An alpha value (α) of the functional (positive question form) is 0.80, while α of the dysfunctional (negative question form) is 0.90. The acceptable Cronbach alpha was widely recommended by (Cortina, 1993; Hashim and Dawal, 2012; Fonseca *et al.*, 2013) that it should be within the range of 0.65 to 0.95. Therefore, the computed Cronbach Alpha shows that it was within the range, hence the questionnaires used for this study and the results obtained were both reliable for improving classroom furniture at college.

Table 6. Summary table of Attributes

Attributes	Student`s Requirements	Total
Type M (Must-be or Expected)	"Bag shelf and "Smooth edges (safety)"	**2**
Type O *(One-dimensional)*	Bigger size of Desk" and "Comfortable seat"	**2**
Type A (*Attractive or Delighter or excitement*)	Adjustable backrest", "Desk is for two seated people", "Tilt angle for writing surface" and "Desk is attractiveness (aesthetics)"	**4**
Type I (*indifferent or Neutral*) attributes	"Desk is having pen holder", "Adjustable Seat", "Adjustable Footrest", "Low price", "Easy to move", "Bag shelf", "Individual lock", "Easy to use", "Adjustable height", "Suitable weight", "Correct thick board", "Tilt angle of backrest", "Desk is made from steel material", "Desk is made from wood material", and "Desk is made from plastic material"	**15**
Type R (*reverse*)		**0**

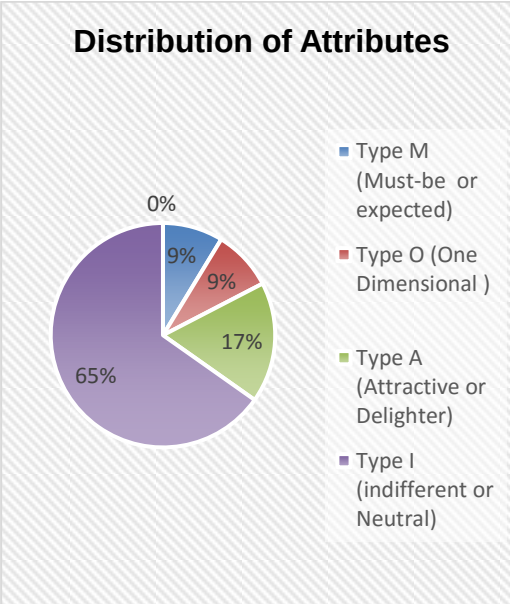

Figure 9. Pie Chart for Students Requirements

Table 6 indicates the summary of the requirements after being analysed with the help of Minitab 17 and SPSS 16.0 software.

6. Conclusions

The basic objective of this study was to identify and categorise all the main attributes regarding the classroom furniture at engineering college for the purpose of increasing student satisfaction. *Figure 9* indicates that Indifferent attributes was 65%, 17% for Attractive attributes, 9% for Must-be and 9% for One-Dimensional attributes. In designing college furniture, attributes for Must-be, Attractive and One dimensional should be considered much without ignoring completely all attributes followed under Indifferent attributes.

Kano Model has been well applied to achieve the main objective of the study. By integrating students in the process, then more advantages are expected to be captured after implementation stage. The use of Kano model for users will helps in having good priorities regarding the type of furniture required to be in use, better understanding of requirements from engineering students and ultimately to create good students satisfaction. For designers or manufacturer, Kano Model helps in differentiating among the market segment behaviour and serving in the trade-off process design. In validating the questionnaire and the accuracy of the results, Cronbach Alpha was computed with the help of SPSS 16.0 and was found to be between 0.80 and 0.90 which is good range.

More exhaustive list of students' requirements can be concluded after integrating Kano Model with Quality Function Deployment (QFD) which is one of the concurrent engineering technique as suggested by (Zultner and Mazur, 2006; Gupta and Srivastava, 2011; Pourhasomi *et al.*, 2013). Currently many researchers explain well that QFD has a big challenge in capturing, understanding and organising all the users' requirements. Integration with Kano Model can help to solve such problem (Sireli *et al.*, 2007; Liu, 2012).

Lastly, the study had a major limitation which can hinder the results obtained not to be generalized since the study was done from a one engineering college. India is very large country with many engineering colleges. Since different people have different feelings, requirements, etc., then further research can be extended to cover large geographical area.

Acknowledgements: We would like to thank all engineering students from G H Patel College of Engineering and Technology, Vidyanagar, Anand, Gujarat, India who volunteered in filling up and return all questionnaires. The study was self-supported.

References:

Bennur, S., & Jin, B. (2012). A Conceptual Process of Implementing Quality Apparel Retail Store Attributes : An Application of Kano ' s Model and the Quality Function Deployment A pproach. *International Journal of Business, Humanities and Technology*, *2*(1), 174–183.

Berger, C., Blauth, R., Boger, D., Bolster, C., Burchill, G., DuMouchel, W., Walden, D. (1993). Kano's methods for understanding customer-defined quality. *Center for Quality Management Journal*, *2*(4), 3–36.

Berger, et al, C. (1993). Kano`s Method for understanding customer defined quality. *Center for Quality Management Journal (Fall)*, *2*, 3 – 35.

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology*, *78*(1), 98–104. http://doi.org/10.1037/0021-9010.78.1.98

Fonseca, M. J., Costa, P., Lencastre, L., & Tavares, F. (2013). A statistical approach to quantitative data validation focused on the assessment of students' perceptions about biotechnology. *SpringerPlus*, *2*(496), 1–13. http://doi.org/10.1186/2193-1801-2-496

Griffin, A., & Hauser, J. R. (1883). The Voice of the Customer. *Marketing Science*, *12*(1), 1–27.

Gupta, P., & Srivastava, R. (2011). Customer Satisfaction for Designing Attractive Qualities of Healthcare Service in India using Kano Model and Quality Function Deployment. *MIT International Journal of Mechanical Engineering*, *1*(2), 101–107.

Hashim, A. M., & Dawal, S.Z.M. (2012). Kano Model and QFD integration approach for Ergonomic Design Improvement. *Procedia - Social and Behavioral Sciences*, *57*, 22–32. http://doi.org/10.1016/j.sbspro.2012.09.1153

Ho, L., Peng, T., Feng, S., & Yen, T. (2013). Integration of Kano's model and SERVQUAL for enhancing standard hotel customer satisfaction. *Africa Journal of Business Management*, *7*(23), 2257–2265.

Hsu, C., Chang, T., Wang, S., & Lin, P. (2007). Integrating Kano's Model into Quality Function Deployment to Facilitate Decision Analysis for Service Quality. In *8th WSEAS International Conference on Mathematics and Computers in Business and Economics, Vancouver, Canada, June 19-21*, 226–232.

Jylhä, T., & Junnila, S. (2015). Using the Kano Model to Identify Customer value. In *Prooceedings for 20th Annual Conference of the International Group for Lean Construction*, 1–13.

Kano, N., Seraku, N., Takahashi, F., & Tsuji, S. (1984). Attractive quality and must be quality, *14*(2), 39–48.

Kuo, Y.-F. (2004). Integrating Kano's model into Web-community service quality. *Total Quality Management and Business Excellence*, *15*(7), 925–939.

Liu, H. (2012). Research on Module Selection Method Based on the Integration of Kano Module with QFD Method. *Journal of Service Science and Management*, *5*(2), 206–211.

MacDonald, E., Backsell, M., Gonzalez, R., & Papalambros, P. (2006). The Kano Method's Imperfections, and Implications in Product Decision Theory. *International Design Research Symposium*, 1–12.

Matzler, K., & Hinterhuber, H.H. (1998). How to make product development projects more successful by integrating Kano`s model of customer satisfaction into Quality Function Deployment. *Technovation, Elsevier*, *18*(1), 25– 38.

Mikulic, J. (2006). The Kano Model – A Review of its Application in Marketing Research from 1984 to 2006.

Paraschivescu, A.O., & Cotîrleț, A. (2012). Kano Model. *Economy Transdisciplinarity Cognition*, *15*(2), 116–125.

Pourhasomi, M.H., Arshadi Khamseh, A., & Ghorbanzad, Y. (2013). A hybrid of Kano and QFD for ranking customers preferences: A case study of Bank Melli Iran. *Management Science Letters*, *3*, 845–860.

Rashi, M.M., Tamaki, J., Ullah, S.A.M.M., & Kubo, A. (2011). A Kano Model Based Linguistic Application for Customer Needs Analysis. *International Journal of Engineering Business Management*, *3*(2), 1–8.

Rashid, M.M., Tamaki, J., Ullah, S.A.M.M., & Kubo, A. (2010). A proposed computer system on Kano model for new product development and innovation aspect : A case study is conducted by an attractive attribute of automobile. *International Journal of Engineering, Science and Technology*, *2*(9), 1–12.

Sauerwein, E., Bailom, F., Matzler, K., & Hinterhuber, H.H. (1996). The Kano model: How to delight your customers. In *International Working Seminar on Production Economics, Innsbruck/ Igls/ Austria, February 19-23 1996*, *1*, 313–327.

Sireli, Y., Kauffmann, P., & Ozan, E. (2007). Integration of Kano's model into QFD for multiple product design. *IEEE Transactions on Engineering Management*, *54*(2), 380–390. http://doi.org/10.1109/TEM.2007.893990

Sulisworo, D., & Maniquiz, N.E.F. (2012). Integrating Kano`s Model and SERVQUAL to Improve Healthcare Service Quality. In *IC - GWBT2012, Ahmad Dahlan University, March 23-24, 2012*, 130–144.

Taifa, I.W., & Desai, D.A. (2015). Quality Function Deployment Integration with Kano Model for Ergonomic Product Improvement (Classroom Furniture) - A Review. *Journal of Multidisciplinary Engineering Science and Technology (JMEST)*, *2*(9), 2484–2491.

Wu, H., Tang, Y., & Shyu, J. (2010). An integrated approach of Kano's model and Importance-Performance Analysis in identifying key success factors. *African Journal of Business Management*, *4*(15), 3238–3250.

Xiong, W., Yu, Y., & Wang, J. (2015). An Improved Algorithm for Product Conceptual Design based on Quality Function Deployment. *Applied Mathematics & Information Sciences*, *297*(1), 289–297.

Xu, Q., Jiao, R. J., Yang, X., Helander, M., Khalid, H. M., & Opperud, A. (2009). An analytical Kano model for customer need analysis. *Design Studies, Elsevier*, *30*(1), 87–110.

Yadav, H. C., Jain, R., Shukla, S., Avikal, S., & Mishra, P. K. (2013). Prioritization of aesthetic attributes of car profile. *International Journal of Industrial Ergonomics*, *43*(4), 296–303. http://doi.org/10.1016/j.ergon.2013.04.008

Yang, C.-L., Huang, R.-H., & Liao, S.-J. (2014). Customer Requirement Based on Quality Planning and Improvement for Food and Beverage Management. *Service Science and Management Research (SSMR)*, *3*, 25–33.

Yuan, Y., & Guan, T. (2014). Design of Individualized Wheelchairs Using AHP and Kano Model. *Advances in Mechanical Engineering*, 1–6.

Zhu, D.-S., Lin, C.-T., Tsai, C.-H., & Wu, J.-F. (2010). A Study on the Evaluation of Customers` Satisfaction - The Perspective of Quality. *International Journal for Quality Research*, *4*(2), 105–116.

Zultner, R.E., & Mazur, G. H. (2006). The Kano Model: Recent Developments. *The Eighteenth Symposium on Quality Function Deployment- Austin, Texas 2006*, 109–116.

Ismail Wilson Taifa
G H Patel College Of Engineering and Technology,
India
taifaismail@yahoo.com

Darshak A Desai
G H Patel College Of Engineering and Technology,
India
darshakdesai@gcet.ac.in