CHAPTER 3

ASSESSING CUSTOMER PREFERENCES, REQUIREMENTS AND PERCEPTIONS OF CO-OPERATIVE DAIRY

This chapter lays the foundation work for the whole study. The primary objective is to identify customer preferences and customer requirements for dairy products. The next objective is to measure customers' perceptions of the co-operative dairy under study.

Based on foresaid two objectives above the chapter explores the causes for the poor performance of the co-operative dairy.

3.1 Overview of Customer Preferences for Dairy Products

Customer preferences are important to a company to formulate product and marketing strategies, which help dairy to obtain enhance the market share. Like any organisation, dairy must have low-cost strategies, quick market response and differentiated products.

The co-operative dairy under study was established in 1962 under Uttar Pradesh government. Table 3.1 contains the sales data for the dairy from 2010-17, and Figure 3.1 shows a graphical representation of the sales data from 2010-17. The plot in Figure 3.1 shows a decline in that sales over the past seven years from 22000 litres/day to 10000 litres/day.

Table 3.1: Data of Co-operative Dairy Average Sales From 2010-17 in Litres Per Month

Months	2010-11	2011-12	2012-13	2013-14	2014 -15	2015-16	2016-17
April	23303	20068	23777	22264	17964	16387	11053
May	29652	25384	27757	21590	22479	19084	13181
June	28071	32181	24246	25268	17188	16657	11564
July	24756	22776	21368	22046	16578	15156	10292
Aug	23398	24201	27645	22340	21804	18710	12330
Sept	22844	22030	23104	19730	17228	14711	10480
Oct	19753	22100	21942	20471	17825	15299	11014
Nov	21038	24611	22069	20216	17163	14708	10340
Dec	20976	21931	19265	17240	14784	12075	8730
Jan	19353	22122	18595	16827	14764	11868	8223
Feb	20970	21475	19324	17021	14682	11815	8102
March	19843	22517	20587	17239	15360	12284	8757

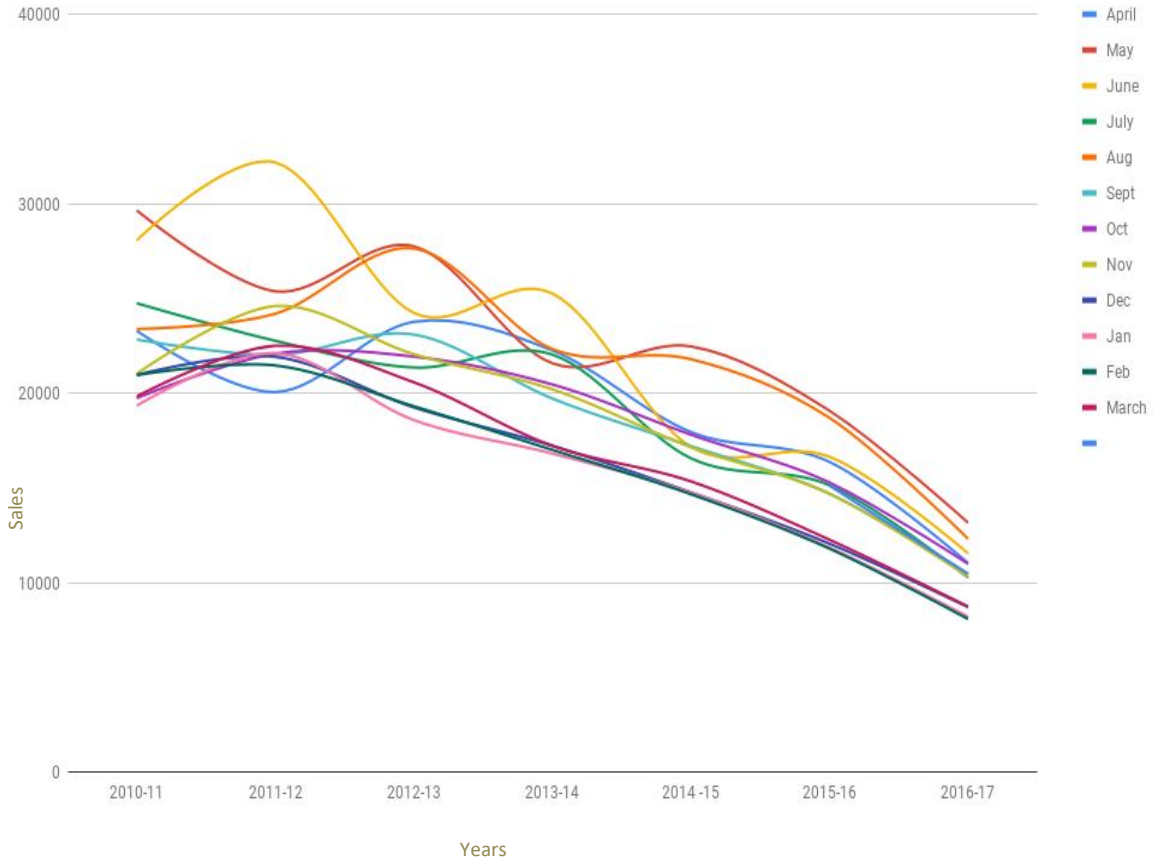

Figure 3.1: Graphical Representation of Monthly Average Sales Data of Co-operative Dairy From 2010 to 2017 in Litres Per Month

To investigate the causes for the decline in sales, survey through a questionnaire was conducted among the consumers of different age groups and genders (Men, Women, Adult male and Adult female) about different attributes of milk like milk quality, packaging type and delivery system. The questionnaire is shown in **Appendix A** of the thesis.

3.1.1 Methodology

1. Sample

The sample was obtained from Varanasi including the locality of Banaras Hindu University (BHU), India. The participants were approached personally and given preliminary information about the study and were requested to participate. Ultimately,150 men, 150 women, 150 adult male and 150 adult females participated in the study.

2. Tools

The Preferences for Milk and Milk Products questionnaire was the primary tool for the survey. The questionnaire was designed to meet the needs of the co-operative dairy. Responses were obtained from multiple sources, students, the staff of BHU, and some locals. At first, 25 questions were asked. A sample of 20 students was used to check the feasibility of the questionnaire. The questionnaire required about 10-12 minutes for a participant to answer it. The final version had 24 questions including relating to various aspects of milk and milk products. There were questions regarding milk characteristics, concerning delivery, for packaging, regarding brand, for storage options, and for awareness of the co-operative dairy.

3. Methods

The participants were approached directly. At first, participants were given some information about the broad areas covered in the questionnaire 'Preferences for Milk and Milk Products', and then he/she was requested to fill out the questionnaire. They were authorised to seek any clarification on any specific topic, as needed in order to complete the questionnaire.

Parametric (F test) and non-parametric statistics (chi-square test) were used to analyse the data gained from the questionnaire. The parametric statistics serve as estimates of the corresponding population parameters. The computation requires the use of pre-computed statistics as estimates of the parameters. Moreover, they were interpreted concerning the specific population distribution of the variables. Non-parametric or distribution-free statistics, in contrast, require very few assumptions about the distribution of the variables, do not require a normal distribution of variables in the population, do not use any pre-computed statistics in the computation as estimates of the parameter, and can be used even for tiny samples. The non-parametric chi-square test explores the significance of the deviation of an experimentally observed frequency distribution from a proposed frequency distribution and, therefore, constitutes the analysis of frequencies. It requires no assumption of the normality of the population distribution of variables. Chi-square may be defined as the sum of the ratios of squared deviations of observed frequencies from the corresponding frequencies expected from a given distribution.

3.1.2 Results of Statistical Analysis

1. Characteristics of the sample

In total, 600 participants participated in the survey. The mean age of the adult male was 19.53 years, and for adult female, it was 18.62 years. The mean expenditure per month were 2832.1 INR and 1818.6 INR, for adult male and adult female, respectively. The mean age for the men and women was 36.21 years and 33.50 years respectively. The groups did not differ significantly concerning family domicile.

2. Milk characteristics

i. Most of the participants (44%) preferred normal and (35.0%) preferred little-sweetened milk, as shown in Figure 3.2. More adult male preferred thick creamy and little-sweetened milk. In contrast, adult female and men preferred normal or little-sweetened milk. Whereas, women's preference was normal milk.

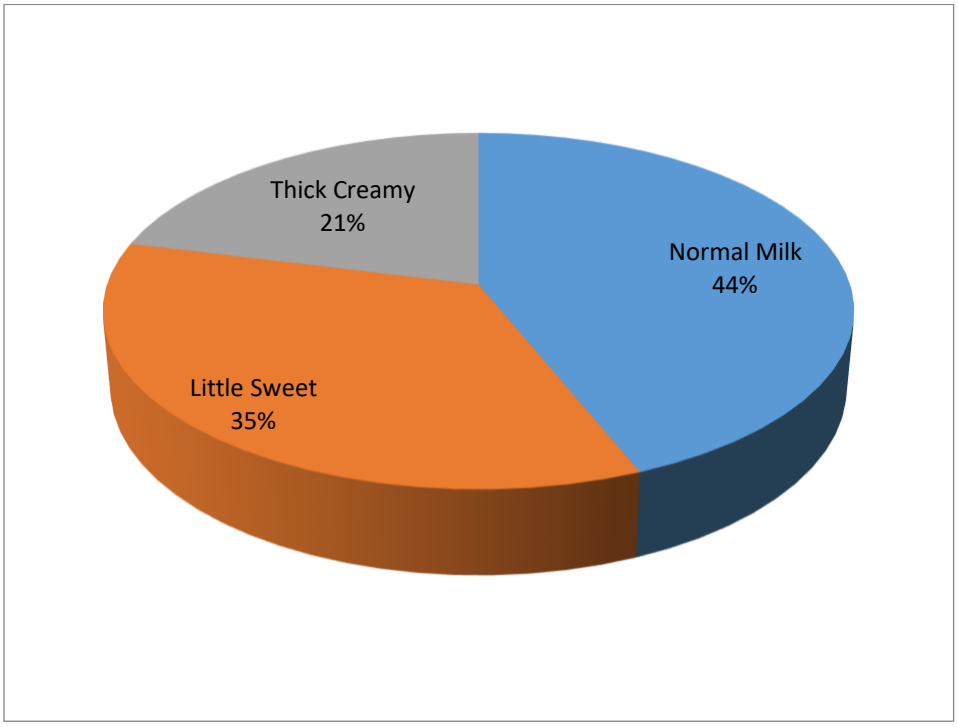

Figure 3.2: Percentage Preferences of Consumer for Type of Milk

ii. Majority of the participants preferred a medium or low-fat milk. More adult male preferred high and medium fat milk, while adult female preferred low and medium fat milk. Among the staff participants, men preferred medium fat milk, but women preferred either high or low-fat milk. The difference in preferences among the groups was statistically significant.

iii. Most of the participants preferred fresh milk and liquid milk. Remaining

preferred concentrated milk or milk powder. Therefore, no significant difference was observed among the four groups regarding choice for fresh milk.

3. Delivery options

i. 36% of the participants preferred delivery of milk at their residence. 37.8% participants did not prefer delivery at their residence. The remaining were not sure about their preferences. More male students and male staff preferred milk delivery at their residence. However, more adult female and women preferred milk not to be delivered to their residence. In delivery options, the difference among the groups was statistically significant.

ii. A little over $1/3^{rd}$ were not willing to pay for the extra cost of delivery to a residence. Most of the adult female and women were not willing to pay in comparison to adult male and men. Amongst those who were willing to p ay up to 10% more were adult male, men and women, while more adult female was willing to only up to 1% or up to 5%. For payment, the difference between the groups was statistically significant.

iii. Around $2/5^{th}$ of the sample preferred buying milk by a vending machine. For a vending machine, there was no significant difference among the four groups of participants concerning preference for buying milk from the vending.

iv. Almost $1/4^{th}$ of the sample preferred buying milk via online shopping of milk. For online shopping, there was no significant difference among the four groups of participants concerning preference for buying milk via online shopping.

v. Nearly $3/5^{th}$ of the participants did not prefer extra cost for online shopping of milk. Whereas, most of the men preferred to pay up to 10% or more of the cost of milk for online shopping.

4. Packaging types

i. The participants preferred different types of packing of milk: loose milk (consumer should have their own container) 35.8%; plastic packing 26.2%; tetra packing 18.5%,and remaining preferred tin (13.2%) and acrylic packaging (6.3%). For packaging, the choice of four groups of participants did not differ significantly. Glass packing is expensive than other cheaper option available in the market.

ii. Almost $2/3^{th}$ of the sample preferred transparent packing of milk. Others were either preferred non-transparent packaging or not sure. For transparent packaging, there was no significant difference among the groups.

iii. Most of the subjects preferred the content of milk regarding the ingredients to be displayed on the milk packing. More adult female compared to adult male, men and women, preferred ingredients to be displayed on the milk packing. The difference was statistically significant.

iv. Almost $3/5^{th}$ of the sample preferred package Size of 500ml, nearly $1/5^{th}$ prefer 250ml packaging, while the remaining preferred 1000ml or more packaging. Majority adult male preferred 250ml and 500ml packing, whereas adult female, men and women preferred 500ml and 1000ml or more packing, The preference among the four groups be statistically significant. It can be seen from the results that dairy should plan the packaging size according to the customer's needs as people with family will consume more milk than people living alone.

v. Most of the participants preferred recycling of package. The significant difference was not observed among the four groups of participants concerning the same.

vi. Most participants were not willing to pay for the extra cost of recycling packaging. For recycling cost, there was no significant difference among the four groups.

vii. 1/2 of the sample preferred the milk package to be reusable; other preferred the milk package not to be reusable. with the help of analysis, no significant difference observed among the four groups about preference for a reusable milk package.

viii. Nearly 2/3rd of the sample did not prefer to pay for the extra cost of reusable milk packaging. There was no significant difference in the preferences among the four groups.

ix. Most participants preferred the ease of portability. More adult female and men preferred the ease of portability, while for most adult male and women easy of portability was not important.

5. Brand Value

i. 3/5th of the sample preferred their favourite brand. In the analysis, a significant difference was not observed among the four groups concerning the same.

ii. Only 2/3rd of the participants preferred to spend money on their favourite brand of milk. More than 25% of the participants preferred to pay up to 5%, 21.5% of the participants up to 1% and 19.1% of the participants up to 10% or more. More adult male were willing to pay either up to 1% or up to 10% or more. More adult female were willing to pay up to 1% and up to 5%. More men preferred to pay up to 10% or more, and most of the women preferred to either not spend or spend up to 1%. Their differences were statistically significant.

6. Storage

i. Majority (55.8%) of the subjects preferred storage of milk at normal temperature with preservative. The preference of the four groups did not vary significantly.

ii. About half of the sample preferred storage of milk at low temperature. More

adult female preferred storage of milk at low temperature compared to staff, men and women who did not prefer the same.

7. ***Product awareness***

i. Awareness of participants regarding the different products of the co-operative dairy ranged from 25.5 to 81.5% ('Butter'81.5%; 'Ghee' 79.0%; 'Mattha' 71.3%; 'Khoya' 47.8%; 'Pera' 39.5%, 'Kheer' 37.6%; 'Rajbhog' 33.1%; 'Gulab Jamun' 31.2%; 'Laddoo' 30.0%, 'Kalakand' 25.5%). Significant differences were found among the groups concerning 'Khoya' and 'Rajbhog'. More staff, both men and women had an awareness of 'Khoya' compared students, adult male and adult female. On the other hand, the more women have awareness about 'Rajbhog' compared to men and students both adult male and adult female.

ii. The percentage of those who were aware, not aware, partly aware about the process of pasteurisation of milk, and about $1/5^{th}$ were partially aware of the pasteurisation process. Most of the men and women were aware, whereas, most of the adult male were unaware and most of the adult female were partially aware of the same. The differences were statistically significant.

Appendix B shows the results of statistical analysis. Table 3.2 is tabular representation and interpretation of the statistical analysis done in the previous Section 3.1.1, which is given in the next page.

Table 3.2: Results of Statistical Analysis

S.N.	Description	Results	Suggestion
1	**Milk Characteristics**	• From the statistical analysis, it can be observed that there was a significant difference among the four groups for milk choice which was normal, little sweetened and thick creamy.	Dairy should focus on variety of milk according to customers.
		• There was a significant difference for preferences among the groups for high, low and medium fat milk.	
		• There was no difference observed for the preferences for fresh milk.	
2	**Delivery options**	• For delivery at the residence, a significant difference was observed.	Dairy can customise the delivery for their regular customers, who are ready to pay for the convenience.
		• For the delivery cost, there was a significant difference in the preferences among the groups.	
		• There was no significant difference observed for the delivery of milk by the vending machine.	
		• There was no significant difference observed for online shopping for milk.	
3	**Packaging types**	• There was no significant difference found statistically regarding packaging of milk.	The present packaging is okay. However, dairy must print the information about the milk
		• There was no significant difference observed for transparent packaging.	
		• The significant difference was observed regarding information/ingredients in packaging.	

		• Regarding the size of packing, the difference among groups was statically significant.	and milk content. The unique packaging can make some difference. Dairy should vary the size of package.
		• Majority of the participants prefer recyclable packaging.	
		• however, no one willing to pay for recyclable packaging.	
		• There was no significant difference regarding reusable packaging.	
		• There was a significant difference in ease of portability.	
4	**Brand value**	• the significant difference was observed among groups regarding the spending money on their favourite brand.	Dairy should improve the banding policy.
5	**Storage**	• Majority of participants are ready for preservatives if the milk can be stored in normal temperature.	Dairy can make high shelf life milk.
		• There was a significant difference among storage at low temperature.	
6	**Product awareness**	• Some of the products show significant difference regarding awareness among the groups.	People are less aware about the other products of dairy; they can focus on marketing.
		• Participants show a significant difference in the awareness of the process pasteurisation done by the dairy.	

The results illustrate that there are significant differences in the preferences of participants concerning the milk and milk products.The dairy should customise the

products to compete in the present market, adding options like flavoured milk and small size packaging. Additionally, the study demonstrates that people are less aware of the other milk product of the co-operative dairy. The finding from the analysis should be included to improve the product quality (Taste, smell etc.) , awareness and product variety.

This co-operative dairy was primarily established, by the Uttar Pradesh State Government, for the farmers' well-being but it is now facing trouble because of declining market sales. In fact, most people do not know that the co-operative dairy performs pasteurisation and homogenisation, which may be a negative factor for dairy sales.

3.2 Customer Requirements & Perception of Co-operative Dairy

The co-operative dairy need to be cautious about the voice of the customers to run a successful business. A decade before only a single dairy used to operate in the Varanasi region, but now the situation has changed. Recent years have witnessed various private and co-operative societies fiercely fighting for their share in the dairy market in cities like Varanasi. It is high time for the management of older existing co-operative dairies to manage the perceptions of their brands and work to revive their market share.

Figure 3.1 shows that the sales of the co-operative dairy are declining. The findings of Table 3.2 in the previous section mean that customer preferences are now known. To meet these preferences a Quality Function Deployment (QFD) model was made to identify what customers want. A Multi-Dimensional Scaling (MDS) is used to measure the customer perception, to find out the why the sales are going down and how competitors are distinct from the co-operative dairy under study.

3.2.1 Methodology

This section describes the methods used in this section, Quality Function Deployment (QFD) and Multi- Dimensional Scaling (MDS).

3.2.1.1 Quality Function Deployment (QFD) Method

The QFD method is a way to assure design quality while a product is still in the design stage." A significant side benefit pointed out by Dr Akao, (1990) is that, when appropriately applied, QFD has demonstrated the reduction of development time by one-half to one-third (Y. Akao, 1990). House of Quality (HoQ) is a part of QFD and was used first in 1972 to design an oil tanker by Mitsubishi Heavy Industries (Hauser J. R. and Don Clausing, 1988).

In this part House of Quality (HoQ), is used to match 'customer requirements (WHAT)' with 'technical requirements (HOW)'. The results from the statistical analysis are used to build customer requirements of HoQ, which is also known as WHATs the customer needs.

Technical requirements are found with the help of a brainstorming session with experts of the field, and some interviews of experts and customers were also taken into account. The technical requirements in QFD can also be classified as a solution to customer requirements known as HOWs.

In next stage an interrelationship matrix and a technical co-relationship matrix or roof matrix is developed. With all the technical scoring and data analysis the relative weights are calculated. The importance of the interrelationship matrix is

that it establishes the relationship among customer requirements and the technical requirements to improve the quality of the product according to customer requirements.

The technical correction or roof matrix is used to assist the build relationships in between customers' requirements and technical requirements. The symbols used in the matrix are given below:

++	Strong positive
+	Positive
-	Negative
--	Strong negative

When the correlation between the points is recognised, these symbols are inserted in the cell unit of the roof matrix. The cell unit distinguished with a strong correction is a sign that substantial direction is needed if several modifications are to be incorporated. If a negative or strong negative correlation is found, then it can be conceded that an adverse effect is calculated.

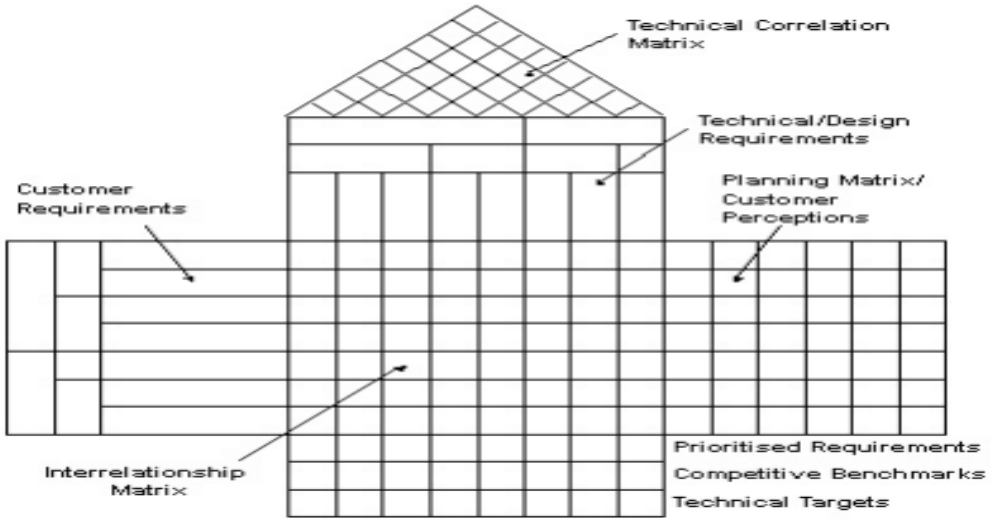

Figure 3.3: Layout of House of Quality (HoQ)
Image source: https://blog.cognizantzdlc.com/2013/01/24/hoq-ehouse-of-quality-enhanced-for-it-part-12/

The Figure 3.3 shows the layout of House of Quality (HoQ). According to Akao, (1990) the customers' requirements and product characteristics, targets or benchmark is set across the relationships. This helps to prioritise the product characteristics corresponding to customer requirements. The customer requirement has been identified by the survey as discussed in Section 3.1. So, it can be said that QFD helps an organisation to identify those negative factors which help their competitors to move forward. Also, QFD helps to connect the organisations to their customers.

3.2.1.2 Multi- Dimensional Scaling (MDS) Method

To focus on market analysis, the work further was continued with Multi-Dimensional Scaling (MDS) analysis. The steps involved in Multidimensional scaling (MDS) are as follows (http://www.statisticshowto.com/multidimensional-scaling/):

1. Assign a number of points to coordinate in n-dimensional space. The number of dimensions can be 2 dimensional or higher spaces.
2. Calculate the Euclidean distance for all pairs of points
3. Compare the similarity matrix with the original input matrix
4. Adjust coordinates to minimise stress

With the known set of objects, multidimensional scaling aims to discover a representation of the objects in a low-dimensional space. The proximities among the objects are used to acquire the solution. With this course of action, the reduction in the squared deviations among the original probably changed object closeness and

their Euclidean distances in the low-dimensional space. Figure 3.4 shows the procedure involved in MDS:

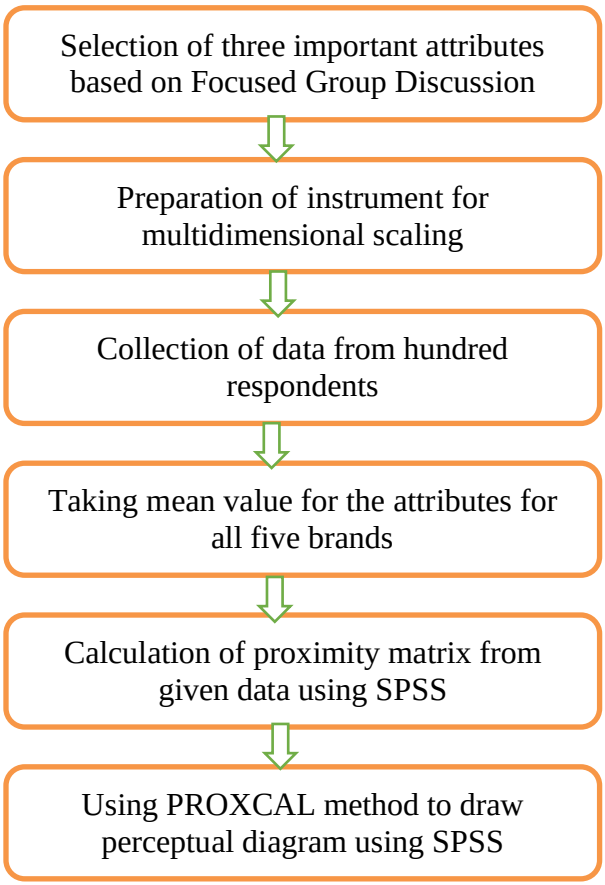

Figure 3.4: Six Step Process for Creating Perceptual Diagram, FGD (Focused Group Discussion)

In this case, five main dairy companies have been used, and study is done to understand how they are considered differently by milk consumers. Independently twenty consumers have completed a survey in which each of the five companies would be paired off with each others, and the participants would be asked a series of scale based questions including in **(Appendix C)**, how similar they believe the compines to be, in three attributes: quality, price, and availability.

The software used for Multi-Dimensional Scaling is IBM SPSS, and it has specified that the data will reproduce on two dimensions. With the help of MDS analysis, a rated output was obtained for each attribute that shows the two-dimensional representation of how similarly or differently the companies are viewed by consumers. MDS makes the data much more comfortable to look at and gives the observer a more precise sense of how different each company is. This information can be used in brand positioning or identifying if work is needed to make a utility company's brand more unique in the specific marketplace.

Given the number of dimensions (K=2) find the configuration in K –dimensions are found so that stress is minimised.

$$d_{ij} = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2} \quad \text{… Equation 3.1}$$

$$\text{stress} = \mathcal{L}(d_{ij}) = \left(\sum_{i<j} (d_{ij} - f(d_{ij}))^2 / \sum d_{ij}^2 \right)^{\frac{1}{2}} \quad \text{… Equation 3.2}$$

Where *f* (d_{ij}) *is a parametric monotonic function given by:*

$$f(d_{ij}) = \alpha + \beta d_{ij} \quad \text{… Equation 3.3}$$

The objective of the MDS algorithm is to minimise the stress given by the equation 3.2 above for given α, β, *and* d_{ij}. Thus, the smaller the stress, the better the MDS map represents the input provided by the participants.

Table 3.3: Guidelines for assessing fit using stress (Kruskal, 1978)
Source: Kruskal, J. B., and Wish, M. (1978). Multidimensional scaling (Vol. 11). Sage

Stress (Kruskal's type I)	Assessment of Fit
0.20	**Poor**
0.05	**Good**
0.00	**Perfect**

3.2.2 Results of House of Quality (HoQ) and Multi-Dimensional Scaling (MDS)

The House of Quality (HoQ), is to be made first with 'WHATs', this is done with the help of Table 3.2, which contains the finding, using a questionnaire 'Preferences for Milk and Milk Products,' for customer's requirements for the co-operative dairy and its products. The customers seem cautious in term of quality and hygiene of the products that they consume additionally they are very brand specific. After finding the customer requirements, the importance rating out of five was also given by the participants. Table 3.4 contains the WHATs, customer rating and relative weight calculated.

Moreover, in the customer requirements phase, the relative weight is a percentage, which is calculated with the formulation given below.

$$Relative\ weight = \frac{Customer\ Importance\ Rating}{\sum Customer\ Importance\ Rating} \quad \text{… Equation 3.4}$$

For example, the first value for 'easily available in the market' is calculated as:

$\sum$ Customer Importance Rating= 4.96 + 4.89 + 4.78 + 4.57 + 4.55 + 4.33 + 3.67 + 3.21 + 3.15 + 3.09 + 3.00 + 2.98= 47.18

Relative weight = $\frac{4.96}{47.18}$= 10.5%

Table 3.4: Customer Requirements or WHATs

WHATs	**Customer Importance**	**Relative weight (%)**
Availability	4.96	10.5
Fresh milk	4.89	10.4
Hygiene	4.78	10.1
Nutritional value	4.57	9.69
Product awareness	4.55	9.64
High shelf life	4.33	9.18
Low preservatives	3.67	7.78
Variety in Size	3.21	6.80
Attractive packaging	3.15	6.68
Recycling package	3.09	6.55
Variety in taste	3.00	6.36
Packaging	2.98	6.32

Figure 3.5 represents the comparison chart of the co-operative dairy with another leading brand, that has about 21% of the market share. The target values of attributes are given by experts of the dairy industry. The dairy in question lags on every attribute, except on '*fresh milk'* and '*low preservatives*'.

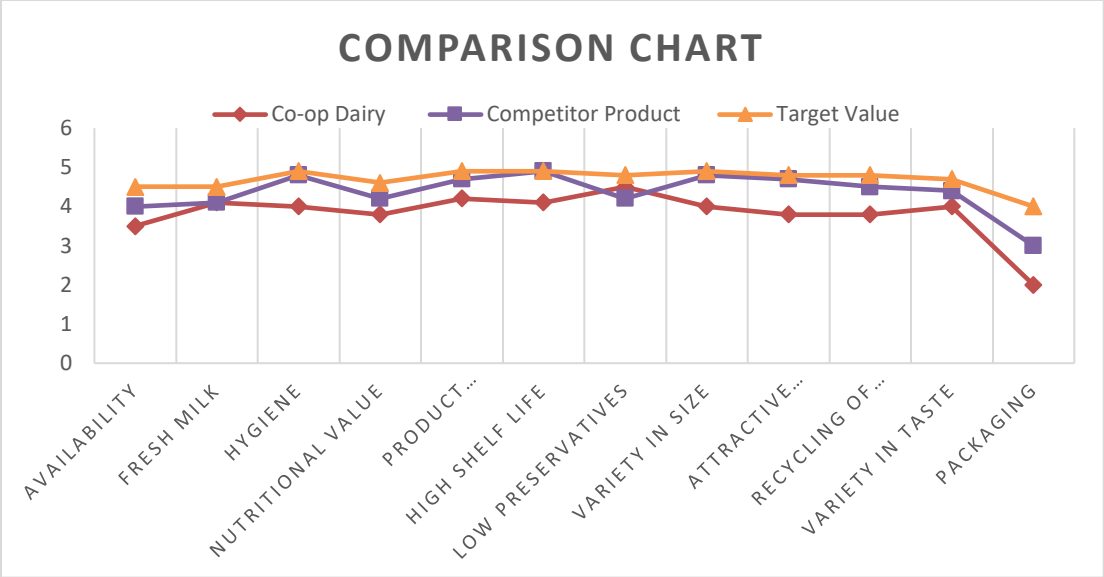

Figure 3.5: Comparison Chart of the Co-operative Dairy and Competitor Product

After considering customer requirements, the technical requirements are gathered with the help of experts. Table 3.5 contains the technical requirements of the customers:

Table 3.5: Technical requirements or HOWs

	HOW s
1	Distribution cost and time
2	Only Low Preservatives or no preservatives
3	Pasteurisation process
4	Homogenization process
5	Market planning (like advertisement, promotion)
6	Vending machine
7	Product description on package
8	Product line expansion

Subsequently, Interrelationship matrix and the Technical co-relationship matrix was built and Figure 3.6, and Figure 3.7 shows it respectively. In the interrelationship matrix the symbol used are specified below:

Table 3.6: Symbols Used

S.N.	Symbol	Meaning	Values
1	●	Strong relationship	9
2	Θ	Moderate relationship	3
3	Δ	Weak relationship	1

Relative weight (%)	Customer Importance	Technical Requirements / Customer requirements	Distribution cost and time	Pasteurisation process	Homogenization process	Market planning (advertisement, promotion etc.)	Transparent or semi-transparent packaging	Vending machine	Product description on package	Product line expansion	Our Product	Competitor Product	Target	Scale up factor
10.5	4.96	Availability	●	Θ	Θ	●	Θ	●		●	3.5	4.0	4.5	1.2
10.4	4.89	Fresh Milk	●	●	●			●		●	4.1	4.1	4.5	1.09
10.1	4.78	Hygiene	Θ	●	●	Θ	Δ	●	●	Θ	4.0	4.8	4.9	1.23
9.69	4.57	Nutritional value	Θ	Θ	Θ	●		Δ	●	Θ	3.8	4.2	4.6	1.21
9.64	4.55	Product awareness	●	Θ	Θ	●	Δ	●	Θ	●	4.2	4.7	4.9	1.17
9.18	4.33	High shelf life	●	●	●	●		Θ	Θ	Θ	4.1	4.9	4.9	1.19
7.78	3.67	Low preservatives	●	Θ	Θ	Θ			●	Δ	4.5	4.2	4.8	1.07
6.80	3.21	Variety in size		Δ	Δ	●	Θ	Δ	●	Θ	4.0	4.8	4.9	1.23
6.68	3.15	Attractive packaging				●	Θ		Θ	Θ	3.8	4.7	4.8	1.26
6.55	3.09	Recycling of package	Θ			●			Δ	Δ	3.8	4.5	4.8	1.26
6.36	3.00	Variety in taste	●	●	●	●		Δ		●	4.0	4.4	4.7	1.17
6.32	2.98	Packaging					●		Δ		2.0	3.0	4.0	2.00
	47.18		563.76	443.99	443.99	642.24	148.56	416.15	398.7	473.78				

Figure 3.6: Interrelationship Matrix with the Technical Scores

The overall weight for the interrelationship matrix was calculated with the formula given below:

$$R_n = \sum_{n=1}^{k} W_{mn} C_m \quad \text{… Equation 3.5}$$

Where,

R_n = row cell of weight for the technical requirements (n= 1…, k)

C_m= column cell of weight for the customer requirements (m=1…, j)

W_{mn}= weight assigned to relationship matrix

For example, for 'distribution cost and time' the score can be calculated as:

9 x 10.5 + 9 x 10.4 + 3 x 10.1 + 3 x 9.69 + 9 x 9.64 + 9 x 9.18 + 9 x 7.78 + 3 x 6.55 + 9 x 6.36 = 563.76

The same calculations are done to obtain the score of other technical requirements or 'HOWs'. From the overall analysis, the weighted score of what the customer wants and what companies can provide, weight scores in the bottom row of Figure 3.6. The top three technical requirements according to rank are given below:

Rank	Technical Requirements	Scores
1	Market Planning (like advertisement, promotion)	642.24
2	Distribution Cost and Time	563.76
3	Product Line Expansion	473.78

The technical co-relationship matrix or roof matrix describes the associations among the technical requirements and how the technical variables are correlated with each other.

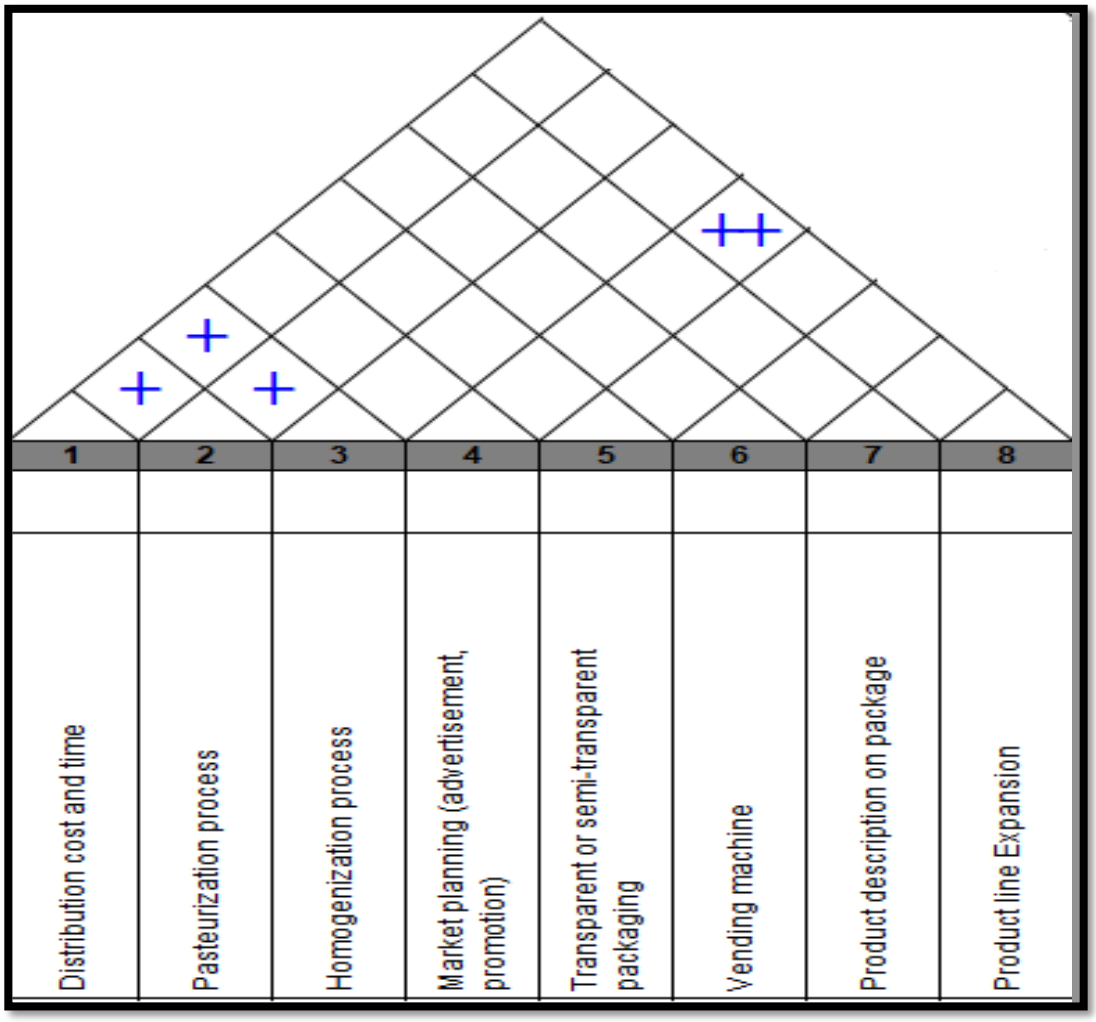

Figure 3.7 Technical Co-Relationship Matrix

Figure 3.7 shows the details of co-relationship among the technical requirements. The roof or technical co-relationship matrix of the House of Quality (HoQ) gives additional information on how variables are positively and negatively related to each other. That means, providing the

technical requirements that is positively related to another technical requirements automatically improves and provides information whether an improvement is needed. The co-relationship variables that show a negative or strongly negative correlation means that the planning of these variables can be paused until the negative impact is erased. Sometimes the change in one variable can create an adverse effect on a negatively correlated variable.

Next, as discussed in Section 3.2.1.2 with the help questionnaire **(Appendix C)** for Multi-Dimensional Scaling (MDS) a visual map of the quality perceptions of various corporate dairies situated in Varanasi is analysed. The method used for the MDS in this study is PROXCAL. The programme PROXSCAL performs multidimensional scaling of proximity ((dis)similarity, distance-like) data to find the least squares representation of the objects in a low-dimensional Euclidean space(Jeong and Kwon, 2016).

The most common measure used to evaluate how well (or poorly) a particular configuration reproduces the observed distance matrix is the stress measure. The raw stress value Phi of a configuration is defined by:

$$\text{Phi} = \sum(d_{ij} - f(delta_{ij}))\text{^}2 \qquad \ldots \text{ Equation 3.6}$$

In this formula, d_{ij} stands for the reproduced distances, given the respective number of dimensions, and $delta_{ij}$ stands for the input data (i.e., observed distances). The expression $f(delta_{ij})$ indicates a nonmetric, monotone transformation of the observed input data (distances). Thus, it will attempt to reproduce the general rank-ordering of distances among the objects in the analysis. There are several similar related measures that are commonly used, however, most of them amount to the computation of the sum of squared deviations of observed distances (or some monotone transformation of those

distances) from the reproduced distances. Thus, the smaller the stress value, the better is the fit of the reproduced distance matrix to the observed distance matrix.

The stress value is indicative of the quality of the MDS (Multi-Dimensional Scaling) solutions whereas Dispersion Accounted For (D.A.F) and Trucker's Coefficient of Congruence are measures of Goodness of Fit and should be as close to 1 as possible.

The stress-I score of the model was found as 0.02 which is the under recommended range (Table 3.7). The literature suggests a rule of thumb stating anything under 0.1 is excellent and anything over 0.15 is unacceptable.

Table 3.7: Stress and Fit Measures

Normalised Raw stress	0.00
Stress-I	0.022[a]
Dispersion Accounted for (D.A.F)	0.99
Tucker's Coefficient of Congruence	0.99

In the next page, Table 3.8 gives the dimension of the different dairy brands on a two-dimension perception map. Here, PRA is the co-operative dairy under study.

Table 3.8: Final Coordinates of Dairy Brands

	Dimension	
	1	2
PRA	-.618	.192
AMU	1.154	.088
SHU	-.012	-.267
SHA	-.219	.113
SUD	-.304	-.127

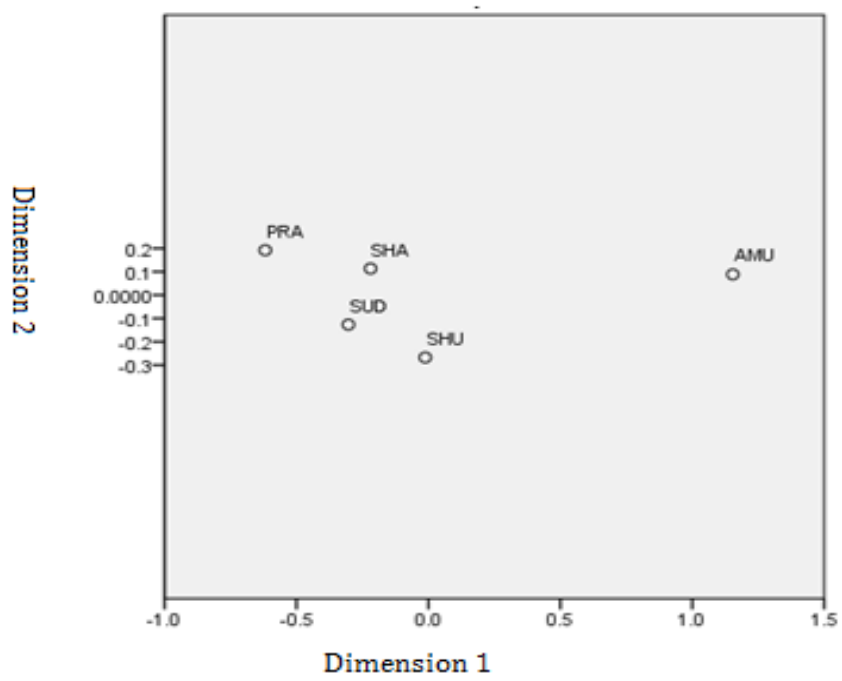

Figure 3.8: Perceptual Map for Co-operative Dairy (PRA) with its Competitors

Figure 3.8 provides the final perception map of the different brands on a two-dimensional scale. MDS (Multi-Dimensional Scaling) is relevant to present a graphical illustration of a complex set of relationships that can be scanned at a glance. Since maps

on paper are two-dimensional objects, this translates technically to finding an optimal configuration of points in two-dimensional space. These two dimensions are orthogonal to each other and used only for creating a visual map for analysing the possible proximity of various objects/brands under study.

It is apparent that the AMU brand is distantly located on quality perception from PRA (co-operative dairy under study). As far as other brands, SUD Dairy is also located at distance from PRA.

3.3 Conclusions

Based on statistical analysis of survey , as discussed in the chapter, the customer requirements and prefernecs were identified. These identified preferences were subjected to the House of Quality (HoQ), the Quality Function Deployment (QFD) tool, to find out the 'Technical Requirements' with the finding of 'Customer Requirements'. It was concluded, with the help of the HoQ that the current marketing strategies of the co-operative dairy are not sufficient to the extent desired. This work will modify and improve the marketing strategies of the co-operative dairy.

In attempt to arrest sales decline, the findings from the House of Quality (HoQ) and MDS (Multi-Dimensional Scaling) will be quite instrumental. The MDS (Multi-Dimensional Scaling) result shows that AMU is distantly positioned in term of quality, cost and availability perception. The other brands form a close cluster, but the co-operative dairy under study (PRA) is also distantly located from the SHU, which is a winner in the remaining brand group. The result suggests that the corporate dairy under study needs to work on factors, including quality, cost and availability, to improve its falling market share. The factors indicated in the study,

specifies that co-operative dairy should identify and create demand, reduce the distribution cost and time, expand the product line and promote the dairy with aggressive marketing.

The Next, chapter has extensively dealt with marketing planning (advertisement, promotion) and distribution cost and time. Further, this may also be observed that distribution time and cost are closely related.