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AN EMPIRICAL APPROACH TO MEASURE CUSTOMER SATISFACTION OF TWO WHEELER USERS USING SIX SIGMA.

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Abstract

The Indian automobile industry is faced with tough competition because of the entry of many automobile companies. Customer satisfaction being the key element for success in business has emerged as a major concern for any industry. Six sigma is a way to measure the probability of manufacturing a product or generating a service with zero defects. The concept of Six Sigma introduces a new standard of measuring Defects Per Million Opportunities (DPMO) instead of defects in percentage or in thousands of opportunities. The objective of study is to analyse the customer satisfaction of two wheeler users and to study the extent of preference for bikes. The data collection was through self prepared questionnaire using convenience sampling method. The data was analysed using SPSS and Six Sigma tool. The result with proper interpretation is presented.

Keywords: *Six Sigma, CTQ, Opportunities, DPMO, Customer Satisfaction.*

INTRODUCTION

In the present competitive global educational environment, priority to the stakeholder is absolutely obligatory for academic excellence as well as the growth of an academic institution. The inability to satisfy all the stated and implied needs of the stakeholders with respect to quality and employability can threaten one's survival in the academic arena. Just as intricately linked as the idea of stakeholder satisfaction is the concept of operational excellence, which denotes adapting changes and reaching out for newer and higher standards of performance. This has become the basic requirement in any field of business and service, and education not being an exception. Six Sigma qualityprogram provides an overall structural frame for continuous improvement in the academic processes of an organization. Six Sigma puts the stakeholders first and uses the facts and data to derive better solutions. This study focuses on the satisfaction of two wheeler users using six sigma tools.

New about Six Sigma

Six Sigma is an approach radically different from traditional quality program like ISO, Total Quality Management (TQM), Activity Based Costing (ABC), Just in Time (JIT), etc. Because Six Sigma emphasizes on developing a disciplined practical plan for achieving sustained tangible product excellence and overall improvement in customer satisfaction. So far, many companies such as Motorola, IBM, General Electric, Microsoft, etc. have successfully implemented Six Sigma and saved billions of dollars.

The concept of Six Sigma introduces a new standard of measuring Defects Per Million Opportunities (DPMO) instead of defects in percentage or in thousands of opportunities. An *'opportunity'* is defined as a possibilityof non-conformance or not meeting the required specifications. Six sigma really helped Motorola in achieving a breakthrough in productivity, quality, profitability, and customer satisfaction. Six Sigma level is definitely achievable and National Aeronautics and Space Administration (NASA) has some processes which are most critical to their missions conforming to 7 or 8 sigma levels.

Statement of the Problem

The automobile industry in indiais facing a tough competition with the advent of many automobile companies constantly veing with each other the attention of consumers by introducing cutting edge features or cosmetic changes in the existing vehicles, changing the design and model. Customer satisfaction, a key element for success in business is a major concern for any industry. In view of the above, the researcher has made an attempt to study the customer satisfaction of Two-Wheeler users.

REVIEW OF LITERATURE

DhananjoyDatta (2010), The many factors which determine the buying behavior of the consumer are thevery same factors motivating them to purchase the two-wheeler includingadvertisement, word of mouth, references from family, friends, own experience, features, price, etc. The survey results showed that around 51% of the customers with two-wheelers are in the age group of 20-30 years with an income below Rs. 5000. Around 64% people were unmarried, using Bajaj two wheelers. In majority of the cases, the motivating factor arefriends (44%) and family (31%). People also look for installment plans and finance schemes prior to purchasing a two wheeler.

Saaravanan and Panchanatham (2009), discussed the nessicitiesfor promotion of a product.The result showed that a customer considers all factors at the time of purchasing a two wheeler, although majority give prominence to the brand image. This study also brought forth the socioeconomic factors which play a key role in decision making for the two wheeler customers and that the employed and the students crave for showroom services.

Lisa R. Klein and Gary T. Ford (2003), It has been stated by the authors that the customers do a cost benefit analysis while choosing a search methodology, i.e. what, when, how much, and where to search, but the customers do not search much, due to the perception that high search costs or the low search value. As part of pre-purchase search for perfect automobile as per their requirements is conducted in this digital age through the help of internet websites as well as social networking sites with comparative study of the different models of various brands available in the market. Hence their opinion is also influenced by the reviews of the people already possessing and using the motorcycles.

Snelders&Schoormans (2000), Different techniques are suggested in the literature to find out which attributes consumers use to judge products. Simonson &Tversky (1992) Making a product

different by adding even a meaningless attribute from its competitors can increase consumers' quality perception or can decrease perceived risk.Aaker& Jacobson (1994) Aconsumer's judgment about a product's overall excellence or superiorityis defined as perceived quality. Wallendorf (1979),However decision while purchasing are almost solely based upon the attitude existing at the time of purchase.

Murphy John and Bellman Eric(2008), It has been discussed that Bajaj Auto Ltd in 1948 came up with import and sale of Vespa scooters. The scope of the scooters had decreased since the boom in the motorcycle market segment. The customers' preferences changed the automotive strategies adopted by the Hero Honda Motor Co. in India.

Subhadip Roy (2006) &Mohnot (2002), In his study of two and three wheelers, the two-wheeler has become an expression of the owners' personality. The customer while making his choice evaluates the product in terms of utility, fuel economy, reliability, maintenance, affordability, performance, good after-sales service at reasonable cost, availability of spare parts at economical prices, looks, safety and comfort, and ease of riding for driving. Total sales of two-wheeler in first eight months of 2001-02 had increased to 2.70 million units from 1.33 million units in the corresponding period of the preceding year.

Siddhartha and Mukherjee (2002), The Study reveals that, the two-wheelers in India are used for a variety of work such as visiting people, transporting goods, outdoor jobs like selling and buying. In rural areas it helps people to travel more frequently to nearby towns for their day to day needs. The two-wheeler has become a valuable support for increasing productivity and in turn the profit, besides helping as a personal mode of transportation.

Rajmani Singh and Yasso (2001), He also pointed out that a major part of growth in the two-wheeler industry has come from motorcycles, which are considered fuel efficient, reliable, and its sturdiness on rough roads. As per his study, TVS-Suzuki, Hero Honda, and Bajaj dominate the two wheeler scene. The study also says that due to stiff competition from automobile major Bajaj, which is the largest producer of scooters, the LML is facing considerably stiff competition. However, dominance of this category has been declining because of shift in customer preference towards motorbikes.

Chandrasekaran (2009), while investigated the expectationsof the customer by careful studing by conducting surveys on consumer behavior. The study also helps to know various marketing variables such as price and product features. This study helped gain knowledge about the factors that encourage a consumer leanings towards a particular brand and the problems faced by them in the usage of such brands.

Sinha, Ajay &Wagh (2008), examined that India being one of the fastest growing telecommunication markets of the twenty first century the common man, artisans, agricultural labours, vendors, and workers from every walk of life are comfortably using the services provided by telecom industries. The potential of capturing market segment depends upon understanding the dynamics governing customer's preference.

Annandan, Prasanna Mohan Raj,&Madhu (2007), examined the new formula of all FMCG giants to get rich, sell to the rural,initiating marketing programs exploring the untapped rural marketsegment. As far as FMCG is concerned, the market penetration and consumption in rural areas is low so there is an opportunity for marketers to penetrate the market effectively.

Rachel Dardis, HoracioSoberon-Ferrer (1994), investigated the consumer decision making with regard to multinational, that is consumer choices were not based on a single product attribute. Instead consumers view products as a combination of product attributes (automobile attributes) as well as household characteristics. In both instances, the higher the value of the Cost Index or the Trouble Index, the more unsatisfactory the car is relative to other cars. A better educated household might be more informed about the performance properties of Japanese cars thereby getting attracted to the higher value reliability of these cars.

Objectives

- To study the extent of preference of the bike.
- To analyse the customer satisfaction of two wheeler.

RESEARCH METHODOLOGY

Descriptive Research Design was used to describe customer satisfaction of two wheeler users. The study was conducted in Thanjavur District, Tamil Nadu. All the two wheeler users in the Thanjavur District were the chosen subjects of this study. Since the size of the population is unknown, Non-Probability sampling using Convenience Sampling technique was adopted to collect the data. The two wheeler users who were willing to participate in the study were the sample. The data was collected through self-prepared questionnaire about the satisfaction of two wheeler users. The data was analysed using Statistical Package for Social Sciences (SPSS) and Six Sigma.

Data Analysis & Interpretation

1 Ranks were found out by weightage method where lowest weightage % is considered as highest rank and vice versa.

Wgt for brand = (20x1)+(11x2)+(10x3)+(14x4)+(12x5)+(9x6)+(13x7)+(10x8)+ (15x9)+(16x10) =708.

Wgt % for brand = (Total of desire of brand switching Wgt ÷ Grand Total of Wgt) x100

= (708÷7137) x100 = 9.9 %

To purchase two wheelers, an individual depends on many factors and is influenced by many factors. Here, based on the satisfaction level of two wheelers, ten important factors were identified such as price, mileage, style, insurance, resale value, maintenance, petrol consumption, luxury, after sales, and easy driving were selected and ranked by weighted average method. Through this method, it is possible to know the respondents satisfaction preference for each factor and which factor is considered as more significant as well.

The above table highlights the factors taken into consideration by the two wheeler users while purchasing the preferred brand. Weightage average method was used to find out the most preferred factor chosen to purchase the two wheeler. The result shows that the maximum number of respondents satisfied with low maintenance cost as their choice for purchasing a product followed by milege, style, petrol consumption, resale value of the bike, price, easy driving, insurance, after sales and luxury.

H_0: There is no significant difference between Satisfaction level and two wheeler brands

One way ANOVA was calculated to find the significant difference between satisfaction of respondents with regard to the various two wheeler brands.

The above table shows that p value is less than 0.05. Hence it can be inferred that there is a significant difference in the mean score on two wheeler brands with regard to satisfaction levels [F (3, 126) =

4.961, p = 0.003]. The result reveals that the respondents who were using Yamaha two wheeler brands were having more satisfaction than the other two wheeler brands. Hence the null hypothesis is rejected.

H_0: There is no significance difference between Satisfaction level and various Age groups

One way ANOVA was calculated to find out the significant difference between various Age group of respondent with regard to the satisfaction level of two wheelers.

The above table shows that p value is less than 0.05, hence it can be inferred that there is significant differences in the mean score on age. [F (2, 127) = 3.584, p = 0.031]. The age group between 20-25 years had more satisfaction when compared with other age groups. The result reveals that Age group between 20-25 years were influencing the satisfaction levels. Hence the null hypothesis is rejected.

H_0: There is no significance difference between various occupations and satisfaction level.

One way ANOVA was calculated to find out the significant difference between various occupations and satisfaction level of the respondents.

The above table shows that p value was greater than 0.05, hence it can be inferred that there is no significant difference between various occupations with regard to satisfaction level (F = 1.627, p = 0.186). Hence null hypothesis is accepted.

Reliability and predicted validity

The Cronbach's Alpha coefficient value is 0.724, for the fourteen items employed to measure the satisfaction level of two wheeler users indicating a high level of internal consistency in the items. This value of Cronbach's alpha when used is acceptable and desirable while confirming the scale's reliability.

Data Quality and Normality

Skewness for all the features is less than 1.22; smaller than the lower bound four or five. The Kurtosis values similarly for nine features is below one. Only five features showed Kurtosis value greater than one, a level beyond which non-normality of distribution becomes a concern (Shridhar G., 2009). Thus, both Kurtosis and Skewness of the features indicate that the data are normally distributed.

Factor Analysis

Multivariate statistical technique,factor analysis is used to summarize the information contained in a large number of variables into a smaller number of subsets or factors (Hair et al., 2003). For the present study, factor analysis is used for the reduction of the number of variables used to measure the satisfaction level of respondents. Respondents were asked to give their level of satisfaction (1-Highly Dissatisfied to 5-Highly Satisfied) for fourteen variables pertatining to the two wheelers. For these variables, factor analysis was performed in this study.

Kaiser-Meyer-Olkin Test for Sampling Adequacy

The Kaiser-Meyer-Olkin (KMO) anindex to samplecompentecy is used to examine the appropriateness of factor analysis. The KMO value for this study is found to be 0.703, nearer to 1, making this value acceptable and justifying the appropriateness of factor analysis.

Bartlett's test of Sphericity

Bartlett's test of Sphericity, a statistical test used to examine the hypothesis that the variables are uncorrelated in the population. The significant value of Bartlett's Test is 0.000, because of which the idea that the correlation matrix is identity matrix can be rejected, again assuring that factor analysis is appropriate for this data.

Communalities

Principal Component Analysis (PCA) used for grouping the variables under a few unrelated factors. The initial communalities for principal component analysis are one.A low communality figure indicating the statistically independent variable and cannot be combined with other variables. The result shows that in the extracted communalities thirteen features are high (greater than 0.5), and hence, acceptable for all the features.

For the present study, all the factors have Eigen value of more than one, so all the four factors are considered. The factors extracted in the study are four in number and together contribute 64.28 of total variance. There is a fair percentage of variance to be explained for the suitability of the factor analysis. Thus extracting four factors from total 14 variables for measuring the satisfaction level is good by all means. Interpretation is done by identifying the variables that have very high loadings on the same factor. These factors can then be interpreted in terms of the highly loaded variables.

From the above table it can be seen that two variables are petrol and resale value clubbed in factor 1 and named as economic aspects. Factor 2 consists of four variables as service delivery, colour, comfortable seat and delivery time of the two wheelers. Hence factor 2 was named as Optimum service time and Safety . Variables with high loading in factor 3 include Maintenance Cost and Easy Handling while using the two wheelers. Therefore factor 3 was named as Easy handling. After sales& Service, Service Network and General Performances of two wheelers are variables that form factor 4. Therefore factor 4 was named as Service Facilities.

Factor 1: Economic aspects

This factor includes two variables viz. Petrol and Resale values. These two features focus on the cost associated with usage of the two wheelers. The respondents, therefore, demand from the two wheeler manufacturing company. All variables in this factor indicate that customers demand 'Value for money'; the purchasing of the two wheeler is an investment.

Factor 2: Optimum service time and Safety

Features like Service Delivery, colour, Comfortable seat and Delivery time of two wheelers in this factor focus on optimum service time and safety of the user. Physical 'comfort and safety' are important while travelling by two wheelers with some brands also focusing on providing comfort.

Factor 3: Service facilities

Servicing the two wheelers after a customer purchases is important to satisfy the two wheeler users. The service network and the general performance also play an important role in satisfying a customer. Therefore the items such as aftersales& service, Service Network and General Performances of two wheelers are named as Service Facilities.

Factor 4: Easy handling

Handling two wheelers should not make the customer feel difficult and confused. And the maintenance cost of the two wheelers should be affordable. Therefore the maintenance cost and easy handling of two wheelers plays a major role in satisfying the customers.

The above four factors contribute 64.28 percent of total variance. The grand mean score values of these factors indicate that companies have to give more focus on these factors to expand customer base.

Analysis of satisfactions using Six Sigma

To study the satisfaction level of customers of two- wheeler a recent measure viz. Six Sigma has been applied in this study. The strategy of Six Sigma includes following six components.

1. Number of units processed.
2. Total number of defects made.
3. Defects per unit.
4. Number of Defect Opportunities Per unit(DPO).
5. Defects Per Million Opportunity (DPMO).

Abridged Sigma conversion table

Based on the value attained from the conversion table, the satisfaction level of the customersfrom the two wheeler is predicted. The measure between 5 and 6 is considered to be the best. The score between 3 and 4.9 predicts average level of satisfaction. The value less than 3 denotes poor or low level of satisfaction. The following table takes in to account 14 components to assess the level of satisfaction.

The company wise analysis of satisfaction level using six sigma is given in the above table in order to find out the variation in the 14 components namely petrol consumption, mileage, during service delivery, less repair cost, spares available, mileage, comfortable seat, easy handling, availability of colour, delivery time purchases, after sales service, service network, and general performances.

Six Sigma for the performance of Hero Honda

The six sigma scores for petrol consumption, resale value, and mileage had greater than 3 scores which means that the satisfaction level is average. The remaining 11 components were had less than 3 which shows that the satisfaction level is poor or lower for Hero Honda.

Six Sigma for the performance of TVS

The six sigma scores for TVS Brand shows that only one component namely, easy handling had score more than 3 and the remaining 13 components were scored less than 3 which denoted that the satisfaction level is poor or lower.

Six Sigma for the performance of Bajaj

The six sigma scores for Bajaj shows that two component namely, resale value and maintenance, were greater than 3 which means that the satisfaction level is average. The remaining 12 components scored less than 3, shows that the satisfaction level is poor or lower.

Six Sigma for the performance of Yamaha

The six sigma scores for Yamaha reveal that service delivery time, maintenance, spares available, comfortable seat, easy handling, availability of colour, delivery time purchase, and after sales service are greater than 3. This shows that the satisfaction level is average. The remaining components had less than 3 which denotes that the satisfaction level is poor or lower.

Research Findings And Conclusions

1)Maximum numbers of respondents were satisfied with low maintenance cost as their choice for purchasing a two wheeler.

2)The respondents using two wheeler brand Yamaha had more satisfaction than the other two wheeler brands.

3)The age group between 20-25 years were more satisfied when compared with other age groups.

4)There is no significant difference between users of various occupations with regard to satisfaction level.

5)Four factors were identified for their satisfaction level namely, economic aspects, Optimum Service Time and Safety, Easy Handling and Service Facilities. About 64.28 percent of total variance are contributedby the above four factors. The grand mean score values of these factors indicate that companies have to give more focus on the factors to expand customer base.

a)Six Sigma for the performance of Hero Honda

The six sigma result for the brand Hero Honda shows that two wheeler users were satisfied with the petrol consumption, resale value, and mileage.

b)Six Sigma for the performance of TVS

The six sigma result for the brandTVS shows that two wheeler users were satisfied with easy handling.

c)Six Sigma for the performance of Bajaj

The six sigma scores for Bajaj showed that two component namely resale value and maintenance were greater than 3 which means that the satisfaction level is average. The remaining 12 components were had scores less than 3, showing that the satisfaction level is poor or lower.

d)Six Sigma for the performance of Yamaha

The six sigma scores for Yamaha reveals that the two wheeler users were satisfied with during service delivery time, maintenance, spares available, comfortable seat, easy handling, availability of colour, delivery time purchase, and after sales service.

Recommendation

- Focus should be on youth as they represent the highest portion of the bike using segment.
- Indian two wheeler users generally do not use bike as a style statement, but out of necessity, so low maintenancec and mileage is of utmost concern, causing a need to create a better image in the mind of its customers regarding two wheelers.

CONCLUSION

The advantages of Six Sigma approach are reduction in defects/rejections, cycle time, work in progress etc. and increase in product quality and reliability, customer satisfaction, proactive etc. leading ultimately to excellent business results. By successfully implementing Six Sigma an institution can substantially improve the Customers Satisfaction Index and also increase bottom line by eliminating wastages. Statisticians can play a very important role in designing and monitoring Six Sigma practices in their respective organizations because they are experts in statistics and its application in practical business scenario.

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Table(1) Ranking the factors based on product preferences

Factors ranked by respondents													
	I	II	III	IV	V	VI	VII	VIII	IX	X	*Wgt	** Wgt%	[1]Rank
Price	20	11	10	14	12	9	13	10	15	16	708	9.9	VI
Mileage	27	15	19	10	12	7	13	9	10	8	589	8.3	II
Style	19	19	10	13	11	17	7	9	14	11	653	9.1	III
Insurance	7	5	12	17	18	8	15	14	21	13	795	11.1	VIII
Resale	10	16	9	13	20	14	12	21	8	7	699	9.8	V
Maintenance	30	31	25	14	16	8	3	2	0	1	398	5.6	I
Petrol Consumptions	3	11	20	25	15	16	14	5	18	3	686	9.6	IV
Luxury	1	7	6	4	10	13	25	17	16	31	942	13.2	X
After Sales	2	6	7	9	7	18	18	22	19	22	907	12.7	IX
Easy Driving	11	8	13	11	11	21	10	20	11	14	760	10.6	VII
Total											7137	100	

Source: Primary Source
* Wgt – Weightage
** Wgt % - Weightage Percentage

Table(2) One way ANOVA between Satisfaction and Two wheeler brands

	Sum of Squares	df	Mean Square	Mean	Statistical Inference
Satisfaction Between Groups Within Groups	 567.048 4800.222	 3 126	 189.016 38.097	Hero Honda = 54.30 TVS Star City = 53.10 Bajaj = 57.72 Yamaha = 57.92	F = 4.961 P = 0.003 Significant

Table(3) One way ANOVA between Age and Satisfaction Level

	Sum of Squares	df	Mean Square	Mean	Statistical Inference
Satisfaction Between Groups Within Groups	 286.743 5080.526	 2 127	 143.37 40.00	**Age** 20-25 = 59.70 26-30 = 55.20 31-35 = 55.40	 F = 3.584 P = 0.031 Significant

Table(4) One way ANOVA between various Occupationsand Satisfaction Level

	Sum of Squares	df	Mean Square	Mean	Statistical Inference
Satisfaction Between Groups Within Groups	 84.434 5282.835	 3 126	 28.145 41.927	Own business = 58.33 Private job = 57.35 Govt. job = 55.02 Others = 59.00	 F = 1.627 P = 0.186 Not Significant

Table (5) Total variance explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.207	22.909	22.909	3.207	22.909	22.909	2.998	21.417	21.417
2	3.124	22.315	45.225	3.124	22.315	45.225	2.584	18.459	39.876
3	1.515	10.823	56.048	1.515	10.823	56.048	2.083	14.881	54.757
4	1.154	8.242	64.289	1.154	8.242	64.289	1.334	9.532	64.289
5	.884	6.312	70.601						
6	.783	5.593	76.194						
7	.670	4.786	80.980						
8	.581	4.149	85.129						
9	.507	3.625	88.754						
10	.457	3.265	92.019						
11	.400	2.855	94.874						
12	.343	2.448	97.323						
13	.235	1.679	99.002						
14	.140	.998	100.000						

Extraction Method: Principal Component Analysis.

Table(6) Grouping of variables based on factor loadings

Variable	Component			
	Factor 1	Factor2	Factor 3	Factor 4
Petrol	.814			
Resale Value	.724			
Service Delivery		.724		
Comfortable Seat		.501		
Colour		.802		
Delivery Time		.723		
After sale & Service			.828	
Service Network			.724	
General Performances			.686	
Maintenance Cost				.685
Easy Handling				.817

Table 7: Analysis of Satisfactions level on the basis of Six Sigma

S.No	Items	Hero	TVS	Bajaj	Yamaha
1	Petrol consumption	3.7	2.4	2.4	2.8
2	Resale Value	3.4	2.2	3.6	2.5
3	During service delivery time	2.6	2.6	2.7	3.2
4	Maintenance	2.6	2.5	3.4	3
5	Less repair cost	2.3	2.5	2.5	2.8
6	Spares available	2.7	2.7	2.7	3.1
7	Mileage	3.4	2.2	2.5	2.4
8	Comfortable seat	2.5	2.4	2.6	3.3
9	Easy handling	2.7	3.1	2.4	3.2
10	Availability of colour	2.2	2.4	2.7	3.1
11	Delivery time purchase	2.3	2.8	2.6	3.3
12	After sales service	2.4	2.3	2.5	3
13	Service network	2.4	2.4	2.4	2.9
14	General performance	2.4	2.3	2.5	2.8