International Journal for Research in Engineering Application & Management (IJREAM)
ISSN : 2454-9150 Vol-05, Issue-09, Dec 2019

Performing the KMO and Bartlett's Test for Factors Estimating the Warehouse Efficiency, Inventory and Customer Contentment for E-retail Supply Chain

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Abstract - This paper describes the analysis of the validity test using KMO and Bartlett's test. This test is used in this paper to evaluate the supply chain parameters that is the warehouse, the inventory and the satisfaction level of customers with respect to the E-retail industry. The main aim of this paper is to check the validity of the questionnaire that is used for this study. This paper also helps us to eliminate the variables that do not contribute efficiently to estimate the supply chain parameters thus, helping us to achieve better results.

Keywords - Customer, E-retail, Inventory, KMO and Bartlett's Test, Pilot Study, Supply Chain Management, Validity Test, Warehouse

I. INTRODUCTION

A supply chain is defined as "the integration of key business processes from end users through original suppliers that provides products, services, and information that adds value for customers and other stakeholders" (Lambert et al., 1998) [3]. The supply chain is all about delivering products or services to the end customer and providing value to the customers for their purchase. Therefore, the supply chain includes various processes that work together to create value and contribute towards the successful operation of the supply chain.

E-retail is the need of the hour. Today, even the bricks-and-mortar companies have entered into the online platform. This is because the online platform provides a high range of customers from all over the globe which was not possible for the companies if they were only bricks-and-mortar companies. This has helped the customers in accessing a great variety of products and services which were even specific to a particular region. [4]

Warehouse is the connection between the retailer and the customers. It helps in delivering the product and services to the customers. It helps to maintain the competitive advantage in the supply chain processes. So, it is of utmost importance to have an efficiently running warehouse into place. Warehouse maintenance includes the highly efficient activities with maximum utilization of space while, at the same time incurring low cost. [5]

Inventory management has become the essential feature of supply chain and is the dominant part of the warehouse. There are different types of models of inventory depending upon the type of product and the shelf life of the product. There are two types of products that is perishable and non-perishable products. Thus, there are separate ways of handling and storing the perishable and non- perishable products in the warehouse. [6]

Customers are literally god for every business present in the world. It is important to actually deliver what one promises to their customer that too on the promised time. But, to maintain competitive advantage, companies do try to deliver the products and services before the promised time. Supply chain has to be very efficient to be able to do so. Customers have to be kept happy otherwise they will go the competitors as they have many alternatives available. [7]

II. LITERATURE REVIEW

(Gengeswari Krishnapillai, Abu Bakar, Abdul Hamid, Siti Zaleha Abdul Rashid) [8], Typically, there are three levels in implementation of supply chain practices namely direct supply chain, extended supply chain and an ultimate supply chain (Mentzer et al. 2001). A direct supply chain consists of a company, a supplier and a customer involved in both upstream and/or downstream of products, services, finances and/ or information. an actual supply chain process is broader consisting of company's suppliers (first tier) and their suppliers (second tier) as well as company's customers and their customers. This is known as an extended supply chain. ultimate supply chain includes all the organizations involved in all the upstream and downstream flows of products, services, finances and information from the ultimate supplier to the ultimate customer.

Kenneth T. Rosen, Amanda L. Howard (2000) [9], Electronic commerce, subsidized by an enthusiastic capital market, has the potential to revolutionize the way

 DOI : 10.35291/2454-9150.2019.0531

individuals and organizations interact. E-commerce offers efficiencies for retailers in the form of increased market access and information, and decreased operating and procurement costs. With a growing number of dual heads of household (two working members) and a resulting emphasis on expediency, electronic commerce seems to have the potential to help households better utilize their scarce time resources.

Zhitao Xu, X.G. Ming, Jingling Zhou, Wenyan Song, Lina He, Miao Li (2013) [5], In a steel supply chain, a warehouse is an essential component for linking the manufacturer and customers and maintaining a competitive advantage in supply chain operations (Bagchi et al. 2007). Because of the great significance of warehouse management (WM), efforts have been made toward the goal of high activity efficiency, high utilization, and low cost not only in academic research but also in industrial practice. The first challenge lies in storage keeping unit (SKU) management.

Baker and Halim (2007) [11], Warehouses are important nodes in supply chains. They are often the final point in the supply chain for order assembly, value added services and dispatch to the customer. Kiefer and Novack (1999) [12], Warehouses play a critical intermediate role among supply chain members, affecting both supply chain costs and service particularly because distribution. Ballou (1999) [13], presents a trial-and-error method to seek the best combination of private–public warehouse size alternatives. Chen et al. (2001) [14], present models for optimizing multi-period warehousing contracts under random space demand.

Leonieke and Vries (2003) [16], have developed organizational perspective on inventory control. It was pointed out that in addition to the traditional points for attention such as order quantities and replenishment strategies, other aspects such as allocation of responsibilities and authorities regarding inventory management, the quality of inventory information and the relevant decision-making process need attention to accurately understand the inventory problem. Gupta and Hira (2000) [17], have explained the applicability of forecasting in determination of factors of inventory control, i.e., when to order and how much to order.

Yossi Aviv (2003) [10], In recent years, companies in various industries have been able to significantly improve their inventory management processes through integration of information technology into their forecasting and replenishment systems, and by sharing demand-related information with their supply-chain partners. As expected, the magnitude of the benefits resulting from implementation of the above practices often varies. While the management science literature has studied forecasting-integrated inventory policies, and evidenced a significant growth of research in the area of information sharing and supply-chain coordination, only a few papers address the combination of the two themes; namely, forecasting-integrated inventory policies and information sharing (see, e.g., Chen et al. 1999; Lee et al 2000; Aviv 2001, 2002).

Aviv and Pazgal (2005) [15], consider a model where there is a high level of uncertainty about the demand (as a function of the price) but the firm learns more about the demand throughout the sales horizon by observing customer reaction to the prices.

John C. Taylor, Stanley E. Fawcett, George C. Jackson (2004) [7], Indeed, as retailers have Increased their drive to capture a "lifetime stream of profits," they have increased their emphasis on customer loyalty, which is built on customer service (Blackwell 1997). One recent study noted that loyalty is critical to long term profitability - reporting that a 5% increase in customer retention can lead to a 25% increase in profitability (Lowe 2002; Reichheld 1993). Retailers have long sought to build long-term relationships with their best customers by offering convenient locations, fast check-out, and high levels of in-stock product availability. An executive at Kohl's reiterated the central role of product availability, saying, "in retailing, the single biggest customer service complaint is not having the item" (Faircioth 1998). In today's hectic and hurried world, customers simply do not have the time or the desire to search for unavailable products (Fawcett and Cooper 1998). The importance of product availability in distance-shopping was recently highlighted by a study that found that 41% of shoppers cited stock-outs as the reason for abandoning their on-line shopping carts (Red Herring 2001).

Validity Test

Validity test is used to estimate the true worth of the measuring tools. [18]

III. KMO & BARTLETT'S TEST

This approach evaluates the variance proportion amongst all the variables. [19]

Formula of KMO test is:

$$MO_j = \frac{\Sigma_{i\neq j}\, r_{ij}^2}{\Sigma_{i\neq j}\, r_{ij}^2 + \Sigma_{i\neq j}\, u}$$

Where,

$R = [r_{ij}]$ is Correlation Matrix

$U = [u_{ij}]$ is Partial Covariance Matrix

The variance proportion can be interpreted as per the following table:

KMO Value	Interpretation of Sampling Adequacy
1 to 0.9	Very Good
0.8 to 0.9	Good
0.7 to 0.8	Medium
0.6 to 0.7	Reasonable
0.5 to 0.6	Acceptable
< 0.5	Unacceptable

Table 1: KMO Value Interpretation Criteria

 DOI : 10.35291/2454-9150.2019.0531

ISSN : 2454-9150 Vol-05, Issue-09, Dec 2019

Warehouse Efficiency

Descriptive Statistics				
	Mean	Std. Deviation	Analysis N	Missing N
Q.31.Location	10.9556	19.34608	45	0
Q.32.Distribution	1.0889	0.28780	45	0
Q.33.Procedure	1.0667	0.25226	45	0
Q.34.Area	1.0667	0.25226	45	0
Q.39.Demand	16.7778	23.67477	45	0
Q.40.Variations	18.2222	26.11155	45	0
Q.41.Tracking	15.3556	27.03882	45	0
Q.42.Alert	14.4889	27.33930	45	0
Q.43.Count	1.7111	0.72683	45	0
Q.44.Method	3.4889	14.57211	45	0
Q.45.Record	1.2667	0.44721	45	0
Q.47.Theft	21.8444	29.82598	45	0

Table 2: Descriptive Statistics for Warehouse Efficiency

The above Table 2, gives the descriptive statistics of the variables used to analyze the warehouse efficiency through the KMO & Bartlett's Test. The column 'Analysis N' shows the number of respondents. The column 'Missing N' is 0 for all the variables. This states that none of the respondents missed the questions.

'Warehouse Efficiency' is analyzed using the 12 variables as listed in the above Table 2.

The variable Q.47. shows the highest mean of 21.8444 indicating that it is the most important variable in interpreting the 'Warehouse Efficiency'. If column 'Mean' is observed around 6 variables have mean of 4 or above. They have a significant role in contributing a great deal towards analyzing the 'Warehouse Efficiency'.

Correlation Matrix[a]													
		Q.31.	Q.32.	Q.33.	Q.34.	Q.39.	Q.40.	Q.41.	Q.42.	Q.43.	Q.44.	Q.45.	Q.47.
Correlation	Q.31.	1.000	-0.101	0.341	-0.111	0.377	0.331	0.275	0.295	-0.264	0.690	0.353	0.210
	Q.32.	-0.101	1.000	0.543	0.543	-0.150	-0.157	0.113	0.113	-0.200	-0.043	0.165	0.269
	Q.33.	0.341	0.543	1.000	0.286	-0.115	-0.116	0.476	0.480	-0.140	-0.046	0.242	0.101
	Q.34.	-0.111	0.543	0.286	1.000	-0.153	-0.154	0.153	0.160	0.231	-0.040	0.040	0.340
	Q.39.	0.377	-0.150	-0.115	-0.153	1.000	0.883	0.327	0.367	-0.240	0.524	0.347	0.502
	Q.40.	0.331	-0.157	-0.116	-0.154	0.883	1.000	0.497	0.534	-0.283	0.465	0.271	0.617
	Q.41.	0.275	0.113	0.476	0.153	0.327	0.497	1.000	0.993	-0.281	-0.084	0.253	0.362
	Q.42.	0.295	0.113	0.480	0.160	0.367	0.534	0.993	1.000	-0.256	-0.049	0.281	0.417
	Q.43.	-0.264	-0.200	-0.140	0.231	-0.240	-0.283	-0.281	-0.256	1.000	-0.145	-0.107	-0.112
	Q.44.	0.690	-0.043	-0.046	-0.040	0.524	0.465	-0.084	-0.049	-0.145	1.000	0.255	0.399
	Q.45.	0.353	0.165	0.242	0.040	0.347	0.271	0.253	0.281	-0.107	0.255	1.000	0.434
	Q.47.	0.210	0.269	0.101	0.340	0.502	0.617	0.362	0.417	-0.112	0.399	0.434	1.000
Sig. (1-tailed)	Q.31.		0.254	0.011	0.234	0.005	0.013	0.034	0.025	0.040	0.000	0.009	0.083
	Q.32.	0.254		0.000	0.000	0.162	0.152	0.231	0.230	0.093	0.389	0.140	0.037
	Q.33.	0.011	0.000		0.029	0.225	0.224	0.000	0.000	0.179	0.382	0.055	0.254
	Q.34.	0.234	0.000	0.029		0.157	0.156	0.158	0.147	0.063	0.397	0.396	0.011
	Q.39.	0.005	0.162	0.225	0.157		0.000	0.014	0.007	0.056	0.000	0.010	0.000
	Q.40.	0.013	0.152	0.224	0.156	0.000		0.000	0.000	0.030	0.001	0.036	0.000
	Q.41.	0.034	0.231	0.000	0.158	0.014	0.000		0.000	0.031	0.292	0.047	0.007
	Q.42.	0.025	0.230	0.000	0.147	0.007	0.000	0.000		0.045	0.376	0.031	0.002
	Q.43.	0.040	0.093	0.179	0.063	0.056	0.030	0.031	0.045		0.171	0.242	0.232
	Q.44.	0.000	0.389	0.382	0.397	0.000	0.001	0.292	0.376	0.171		0.045	0.003
	Q.45.	0.009	0.140	0.055	0.396	0.010	0.036	0.047	0.031	0.242	0.045		0.001
	Q.47.	0.083	0.037	0.254	0.011	0.000	0.000	0.007	0.002	0.232	0.003	0.001	

a. Determinant = 5.04E-006

Table 3: Correlation Matrix for Warehouse Efficiency

The above Table 3, showcases the correlation of every variable with each of the other variable. The correlation matrix is divided into two parts. The upper half of the correlation table represents the Pearson correlation coefficient. The lower half of the correlation table represents the one-tailed significance of the coefficients of the Pearson correlation.

The upper half of the table does not consist of any value greater than 0.9 for any of the variables. This means there is no singularity present in the data.

The determinant of the correlation matrix obtained is 5.04E-006, that is, 0.00000504 which is less than 0.00001. This indicates that the problem of multicollinearity does exist for the above data.

In this case, deleting of variables should be considered that have a correlation value less than 0.3.

 DOI : 10.35291/2454-9150.2019.0531

ISSN : 2454-9150 Vol-05, Issue-09, Dec 2019

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.587
Bartlett's Test of Sphericity	Approx. Chi-Square	477.781
	df	66
	Sig.	0.000

Table 4: KMO and Bartlett's Test Value for Warehouse Efficiency

The above shown Table 4, shows the KMO and Bartlett's test output. This test analyzes whether the responses given are adequate with the sample or not.

The Kaiser-Meyer-Olkin (KMO) value obtained is 0.587. If we compare this value with the values in the Table 1, it is clear that the value is 0.587 is an acceptable value. This means that the sum of partial correlations is not large in comparison to the sum of correlations. The sum of analysis variables is 58.7%. This indicates there is no diffusion in the correlation pattern. Hence, the factor analysis is appropriate in this case. Therefore, reliable and distinct factors would be obtained from the factor analysis of these data.

The Table 4, also contains the Bartlett's Test of Sphericity. The Approx. Chi-Square value obtained is 477.781. The significance value p of the Bartlett's Test of Sphericity is 0.000 is less than 0.001. Thus, the correlation matrix is not an identity matrix. This indicates relationship strength amongst the variables. Thus, factor analysis is applicable for this set of data.

Communalities	Initial	Extraction
Q.31. Location	1.000	0.808
Q.32. Distribution	1.000	0.721
Q.33. Procedure	1.000	0.835
Q.34. Area	1.000	0.781
Q.39. Demand	1.000	0.827
Q.40. Variations	1.000	0.927
Q.41. Tracking	1.000	0.953
Q.42. Alert	1.000	0.956
Q.43. Count	1.000	0.408
Q.44. Method	1.000	0.870
Q.45. Record	1.000	0.392
Q.47. Theft	1.000	0.816

Table 5: Communalities for Warehouse Efficiency

From observing the above Table 5, the deductions are made as below:

The extracted factor has accounted for 80.8% of the variance for variable Q.31.Warehouse.

The extracted factor has accounted for 72.1% of the variance for variable Q.32.Distribution.

The extracted factor has accounted for 83.5% of the variance for variable Q.33.Recycle.

The extracted factor has accounted for 78.1% of the variance for variable Q.34.SeparateArea.

The extracted factor has accounted for 82.7% of the variance for variable Q.39.Demand.

The extracted factor has accounted for 92.7% of the variance for variable Q.40.Supply.

The extracted factor has accounted for 95.3% of the variance for variable Q.41.Applications.

The extracted factor has accounted for 95.6% of the variance for variable Q.42.Alert.

The extracted factor has accounted for 40.8% of the variance for variable Q.43.Count.

The extracted factor has accounted for 87.0% of the variance for variable Q.44.Method.

The extracted factor has accounted for 39.2% of the variance for variable Q.45.Inventory.

The extracted factor has accounted for 81.6% of the variance for variable Q.47.Stolen.

From the above deductions,

we get extraction value for variable Q.43.Count as 0.408 and

we get extraction value for variable Q.45.Inventory as 0.392.

Thus, both values are less than 0.5, therefore variable Q.43.Count and variable Q.45.Inventory should be considered for elimination from the questionnaire.

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.068	33.904	33.904	4.068	33.904	33.904	2.834	23.614	23.614
2	2.416	20.132	54.036	2.416	20.132	54.036	2.426	20.213	43.826
3	1.513	12.612	66.648	1.513	12.612	66.648	2.123	17.694	61.520
4	1.296	10.802	77.449	1.296	10.802	77.449	1.911	15.929	77.449
5	0.946	7.886	85.335						
6	0.751	6.257	91.593						
7	0.392	3.267	94.860						
8	0.298	2.485	97.345						
9	0.162	1.353	98.698						
10	0.099	0.829	99.527						
11	0.053	0.442	99.969						
12	0.004	0.031	100.000						

Table 6: Total Variance for Warehouse Efficiency

The above Table 6, represents the variance of the 12 components.

The three stages of the above Table 6 are:

a) Variance before extraction denoted by the column 'Initial Eigenvalues'.

b) Variance after extraction denoted by the column 'Extraction Sums of Squared Loadings'.

c) Variance after rotation denoted by the column 'Rotation Sums of Squared Loadings'.

At the first 'before extraction' stage, the total number of components is equal to the total number of variables used in the test.

 DOI : 10.35291/2454-9150.2019.0531

International Journal for Research in Engineering Application & Management (IJREAM)
ISSN : 2454-9150 Vol-05, Issue-09, Dec 2019

In Table 6, observe the 'Total' column in the 'Initial Eigenvalues' columns. The first four components have large amount of variance as the eigenvalues for them is more than 1 with respect to the other eight components which have eigenvalues less than 1.

In Table 6, observe '% of Variance' column in the 'Initial Eigenvalues' columns. The deductions made from this column are as followed:

The component 1 explains 33.904% of the total variance.
The component 2 explains 20.132% of the total variance.
The component 3 explains 12.612% of the total variance.
The component 4 explains 10.802% of the total variance.
The component 5 explains 7.886% of the total variance.
The component 6 explains 6.257% of the total variance.
The component 7 explains 3.267% of the total variance.
The component 8 explains 2.485% of the total variance.
The component 9 explains 1.353% of the total variance.
The component 10 explains 0.829% of the total variance.
The component 11 explains 0.442% of the total variance.
The component 12 explains 0.031% of the total variance.

At the second 'after extraction' stage, the components having eigenvalues less than 1 are extracted. So, only the first four components are retained at this stage as they have eigenvalues above 1. The eigenvalues of the column 'Total' in both the 'Initial Eigenvalues' column and 'Extraction Sums of Squared Loadings' remain same.

At the third 'after rotation' stage, the factor structure is optimized and all the four components are equalized. The observations at this stage are:

For component 1, it accounted for 33.904% of variance for rotation. Now it accounts for 23.614% of variance.

For component 2, it accounted for 20.132% of variance for rotation. Now it accounts for 20.213% of variance.

For component 3, it accounted for 12.612% of variance for rotation. Now it accounts for 17.694% of variance.

For component 4, it accounted for 10.802% of variance for rotation. Now it accounts for 15.929% of variance.

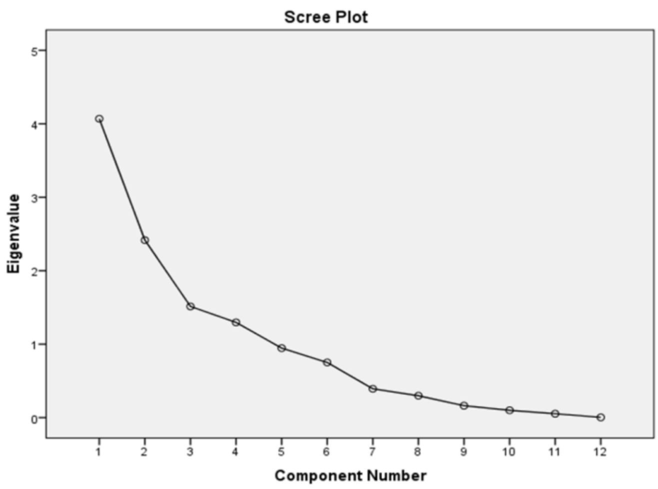

Figure 1: Scree Plot for Warehouse Efficiency

The Figure 1 above, represents the eigenvalues of all the components as a graph. This scree plot is the representation of the Table 6. This graph will be estimated using the help of Table 6.

The Y-axis on the graph represents the 'Eigenvalues' ranging from 0 to 5. The maximum value of 5 is obtained from the column 'Total' of the column 'Initial Eigenvalues'. This column of eigenvalues has been represented as points on the curve of the scree plot in the Figure 5.

The X-axis on the graph represents the 'Component Number'. These values have been obtained from the Table 6 from the column 'Component'. The values of the 'Component Number' vary from 1 to 12.

When Figure 5 is observed, it is found that the curve in the scree plot begins to flatten between the component 4 and component 5. The curve also portrays that the eigenvalues for the components 1 to 4 are above 1. From components 5 to 12, the eigenvalues are less than 1.

Therefore, after the process of extraction only 4 factors have been retained.

Component Matrix[a]

	Component			
	1	2	3	4
Q.40. Variations	0.811			
Q.42. Alert	0.762		-0.478	
Q.39. Demand	0.748	-0.469		
Q.41. Tracking	0.728		-0.515	
Q.47. Theft	0.708			0.438
Q.31. Location	0.609			-0.590
Q.45. Record	0.549			
Q.32. Distribution		0.723	0.418	
Q.33. Procedure		0.715		-0.448
Q.34. Area		0.652	0.447	
Q.44. Method	0.504	-0.482	0.580	
Q.43. Count	-0.404			0.445

Table 7: Component Matrix for Warehouse Efficiency

The above Table 7, showcases the extracted values of each of the 12 variables of the column 1 under the 4 components which were extracted in the Table 6.

This means that the 12 variables are divided into 4 components.

The extracted values represent the extent to which each component contributes towards the understanding of the respective variable.

The Table 7, shows the extracted values above 0.4 only because that criteria was chosen for the test, to read the table easily. This was done as the higher the extracted

 DOI : 10.35291/2454-9150.2019.0531

ISSN : 2454-9150 Vol-05, Issue-09, Dec 2019

value, the higher that particular component contributes towards the understanding of that particular variable. The highest value for some components is 0.4. The empty cells of the table mean that the value extracted was less than 0.4.

The inference made from the above Table 7 are as follows:

The loading of variable Q.40.Supply on component 1 is 0.811.

The loading of variable Q.42.Alert on component 1 is 0.762.

The loading of variable Q.39.Demand on component 1 is 0.748.

The loading of variable Q.41.Applications on component 1 is 0.728.

The loading of variable Q.47.Stolen on component 1 is 0.708.

The loading of variable Q.31.Warehouse on component 1 is 0.609.

The loading of variable Q.45.Inventory on component 1 is 0.549.

The loading of variable Q.32.Distribution on component 2 is 0.723.

The loading of variable Q.33.Recycle on component 2 is 0.715.

The loading of variable Q.34.SeparateArea on component 2 is 0.652.

The loading of variable Q.44.Method on component 3 is 0.580.

The loading of variable Q.43.Count on component 4 is 0.445.

Rotated Component Matrix[a]

	Component 1	2	3	4
Q.40.Variations	0.851			
Q.39.Demand	0.827			
Q.47.Theft	0.792		0.405	
Q.45.Record				
Q.41.Tracking		0.933		
Q.42.Alert		0.917		
Q.34.Area			0.832	
Q.32.Distribution			0.831	
Q.33.Procedure		0.491	0.578	0.430
Q.31.Location				0.859
Q.44.Method	0.578			0.640
Q.43.Count				-0.505

Table 8: Rotated Component Matrix for Warehouse Efficiency

The Table 8 above represents the Rotated Component Matrix. This matrix will help in reducing the number of components on which the variables are under analysis having high loadings.

From the above table 8, we observe that, variable Q.40.Supply, Q.39.Demand, Q.47.Stolen are loaded on component 1. This component can be used as variable for further analysis.

variable Q.41.Applications, Q.42.Alert are loaded on component 2. This component can be used as variable for further analysis.

variable Q.34.SeparateArea, Q.32.Distribution, Q.33.Recycle are loaded on component 3. This component can be used as variable for further analysis.

variable Q.31.Warehouse, Q.44.Method, Q.43.Count are loaded on component. This component can be used as variable for further analysis.

Inventory

Descriptive Statistics

	Mean	Std. Deviation	Analysis N	Missing N
Q.22.Planning	3.6000	0.88933	45	0
Q.24.Lead Time	3.6889	0.70137	45	0
Q.31.Location	10.9556	19.34608	45	0
Q.39.Demand	16.7778	23.67477	45	0
Q.40.Variations	18.2222	26.11155	45	0
Q.41.Tracking	15.3556	27.03882	45	0
Q.42.Alert	14.4889	27.33930	45	0
Q.43.Count	1.7111	0.72683	45	0
Q.44.Method	3.4889	14.57211	45	0
Q.45.Record	1.2667	0.44721	45	0
Q.47.Theft	21.8444	29.82598	45	0

Table 9: Descriptive Statistics for Inventory

The above Table 9, gives the descriptive statistics of the factors used in the KMO & Bartlett's Test. The column 'Analysis N' shows the number of respondents who answered for these particular variable questions. The column 'Missing N' is 0 for all the variables. This states that none of the respondents missed the questions.

The factor 'Inventory' is analyzed using the 11 variables as listed in the above Table 9. The variable Q.47.Stolen shows the highest mean of 21.8444 indicating that it is the most important variable in interpreting the factor 'Inventory'. If column 'Mean' is observed, around 6 variables have mean of 4 or above. They have a significant role in contributing a great deal towards analyzing the factor 'Inventory'.

 DOI : 10.35291/2454-9150.2019.0531

International Journal for Research in Engineering Application & Management (IJREAM)
ISSN : 2454-9150 Vol-05, Issue-09, Dec 2019

Correlation Matrix[a]

		Q.22.	Q.24.	Q.31.	Q.39.	Q.40.	Q.41.	Q.42.	Q.43.	Q.44.	Q.45.	Q.47.
Correlation	Q.22.	1.000	0.379	0.039	0.038	-0.177	-0.280	-0.298	-0.148	0.066	0.103	-0.027
	Q.24.	0.379	1.000	-0.040	-0.075	-0.336	-0.221	-0.241	0.310	-0.152	0.053	-0.329
	Q.31.	0.039	-0.040	1.000	0.377	0.331	0.275	0.295	-0.264	0.690	0.353	0.210
	Q.39.	0.038	-0.075	0.377	1.000	0.883	0.327	0.367	-0.240	0.524	0.347	0.502
	Q.40.	-0.177	-0.336	0.331	0.883	1.000	0.497	0.534	-0.283	0.465	0.271	0.617
	Q.41.	-0.280	-0.221	0.275	0.327	0.497	1.000	0.993	-0.281	-0.084	0.253	0.362
	Q.42.	-0.298	-0.241	0.295	0.367	0.534	0.993	1.000	-0.256	-0.049	0.281	0.417
	Q.43.	-0.148	0.310	-0.264	-0.240	-0.283	-0.281	-0.256	1.000	-0.145	-0.107	-0.112
	Q.44.	0.066	-0.152	0.690	0.524	0.465	-0.084	-0.049	-0.145	1.000	0.255	0.399
	Q.45.	0.103	0.053	0.353	0.347	0.271	0.253	0.281	-0.107	0.255	1.000	0.434
	Q.47.	-0.027	-0.329	0.210	0.502	0.617	0.362	0.417	-0.112	0.399	0.434	1.000
Sig. (1-tailed)	Q.22.		0.005	0.401	0.403	0.122	0.031	0.023	0.167	0.333	0.251	0.429
	Q.24.	0.005		0.398	0.311	0.012	0.073	0.056	0.019	0.160	0.364	0.014
	Q.31.	0.401	0.398		0.005	0.013	0.034	0.025	0.040	0.000	0.009	0.083
	Q.39.	0.403	0.311	0.005		0.000	0.014	0.007	0.056	0.000	0.010	0.000
	Q.40.	0.122	0.012	0.013	0.000		0.000	0.000	0.030	0.001	0.036	0.000
	Q.41.	0.031	0.073	0.034	0.014	0.000		0.000	0.031	0.292	0.047	0.007
	Q.42.	0.023	0.056	0.025	0.007	0.000	0.000		0.045	0.376	0.031	0.002
	Q.43.	0.167	0.019	0.040	0.056	0.030	0.031	0.045		0.171	0.242	0.232
	Q.44.	0.333	0.160	0.000	0.000	0.001	0.292	0.376	0.171		0.045	0.003
	Q.45.	0.251	0.364	0.009	0.010	0.036	0.047	0.031	0.242	0.045		0.001
	Q.47.	0.429	0.014	0.083	0.000	0.000	0.007	0.002	0.232	0.003	0.001	

a. Determinant = 2.35E-005

Table 10: Correlation Matrix for Inventory

The above Table 10, showcases the correlation of every variable with each of the other variable. The correlation matrix is divided into two parts. The upper half of the correlation table represents the Pearson correlation coefficient. The lower half of the correlation table represents the one-tailed significance of the coefficients of the Pearson correlation.

By observing, the upper half of the table, it is found that the variable Q.41.Applications has one of the correlation coefficient value of 0.993 and the variable Q.42.Alert has one of the correlation coefficient value of 0.993. This indicates singularity in data in the above table. Thus, variable Q.41.Applications and Q.42.Alert should be considered for elimination to improve the correlation matrix coefficients.

The determinant of the correlation matrix obtained is 2.35E-005, that is, 0.0000235. Since, the value of determinant obtained is 0.0000235 which is less than 0.00001. This indicates that the problem of multicollinearity does exist for the above data.

In this case, deleting of variables should be considered that have a correlation value less than 0.3.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.570
Bartlett's Test of Sphericity	Approx. Chi-Square	420.960
	df	55
	Sig.	0.000

Table 11: KMO and Bartlett's Test Value for Inventory

The above shown Table 11, shows the KMO and Bartlett's test output. This test analyzes whether the responses given are adequate with the sample or not.

The Kaiser-Meyer-Olkin (KMO) value obtained is 0.570. If we compare this value with the values in the Table 1, it is clear that the value is 0.570 is an acceptable value. This means that the sum of partial correlations is not large in comparison to the sum of correlations. The sum of analysis variables is 57.0%. This indicates there is no diffusion in the correlation pattern. Hence, the factor analysis is appropriate in this case. Therefore, reliable and distinct factors would be obtained from the factor analysis of these data.

The Table 11, also contains the Bartlett's Test of Sphericity. The Approx. Chi-Square value obtained is 420.960. The significance value p of the Bartlett's Test of Sphericity is 0.000. The p-value 0.000 is less than 0.001. Thus, the correlation matrix is not an identity matrix. This indicates relationship strength amongst the variables. Thus, factor analysis is applicable for this set of data.

Communalities		
	Initial	Extraction
Q.22.Planning	1.000	0.690
Q.24.Lead Time	1.000	0.785
Q.31.Location	1.000	0.556
Q.39.Demand	1.000	0.718
Q.40.Variations	1.000	0.812
Q.41.Tracking	1.000	0.952
Q.42.Alert	1.000	0.957
Q.43.Count	1.000	0.876
Q.44.Method	1.000	0.858
Q.45.Record	1.000	0.544
Q.47.Theft	1.000	0.604

Table 12: Communalities for Inventory

From observing the above Table 12, the deductions are made as below:

The extracted factor has accounted for 69.0% of the variance for variable Q.22.Planning.

The extracted factor has accounted for 78.5% of the variance for variable Q.24.LeadTime.

The extracted factor has accounted for 55.6% of the variance for variable Q.31.Warehouse.

The extracted factor has accounted for 71.8% of the variance for variable Q.39.Demand.

The extracted factor has accounted for 81.2% of the variance for variable Q.40.Supply.

The extracted factor has accounted for 95.2% of the variance for variable Q.41.Applications.

The extracted factor has accounted for 95.7% of the variance for variable Q.42.Alert.

The extracted factor has accounted for 87.6% of the variance for variable Q.43.Count.

The extracted factor has accounted for 85.8% of the variance for variable Q.44.Method.

The extracted factor has accounted for 54.4% of the variance for variable Q.45.Inventory.

 DOI : 10.35291/2454-9150.2019.0531

ISSN : 2454-9150 Vol-05, Issue-09, Dec 2019

The extracted factor has accounted for 60.4% of the variance for variable Q.47.Stolen.

Since, all the communality values are more than 0.5, thus, all the variables will be considered for further analysis.

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	4.103	37.304	37.304	4.103	37.304	37.304	3.177	28.885	28.885
2	1.921	17.460	54.764	1.921	17.460	54.764	2.406	21.875	50.760
3	1.252	11.385	66.149	1.252	11.385	66.149	1.521	13.823	64.583
4	1.076	9.780	75.930	1.076	9.780	75.930	1.248	11.347	75.930
5	0.921	8.371	84.301						
6	0.783	7.120	91.421						
7	0.492	4.477	95.898						
8	0.274	2.491	98.389						
9	0.117	1.065	99.454						
10	0.057	0.515	99.969						
11	0.003	0.031	100.000						

Table 13: Total Variance for Inventory

The above Table 13, represents the variance of the 11 components.

The three stages of the above Table 13 are:

a) Variance before extraction denoted by the column 'Initial Eigenvalues'.

b) Variance after extraction denoted by the column 'Extraction Sums of Squared Loadings'.

c) Variance after rotation denoted by the column 'Rotation Sums of Squared Loadings'.

At the first 'before extraction' stage, the total number of components is equal to the total number of variables used in the test.

In Table 13, observe the 'Total' column in the 'Initial Eigenvalues' columns. The first four components have large amount of variance as the eigenvalues for them is more than 1 with respect to the other seven components which have eigenvalues less than 1.

In Table 13, observe '% of Variance' column in the 'Initial Eigenvalues' columns. The deductions made from this column are as followed:

The component 1 explains 37.304% of the total variance.

The component 2 explains 17.460% of the total variance.

The component 3 explains 11.385% of the total variance.

The component 4 explains 9.780% of the total variance.

The component 5 explains 8.371% of the total variance.

The component 6 explains 7.120% of the total variance.

The component 7 explains 4.477% of the total variance.

The component 8 explains 2.491% of the total variance.

The component 9 explains 1.065% of the total variance.

The component 10 explains 0.515% of the total variance.

The component 11 explains 0.031% of the total variance.

At the second 'after extraction' stage, the components having eigenvalues less than 1 are extracted. So, only the first four components are retained at this stage as they have eigenvalues above 1. The eigenvalues of the column 'Total' in both the 'Initial Eigenvalues' column and 'Extraction Sums of Squared Loadings' remain same.

At the third 'after rotation' stage, the factor structure is optimized and all the four components are equalized. The observations at this stage are:

For component 1, it accounted for 37.304% of variance for rotation. Now it accounts for 28.885% of variance.

For component 2, it accounted for 17.460% of variance for rotation. Now it accounts for 21.875% of variance.

For component 3, it accounted for 11.385% of variance for rotation. Now it accounts for 13.823% of variance.

For component 4, it accounted for 9.780% of variance for rotation. Now it accounts for 11.347% of variance.

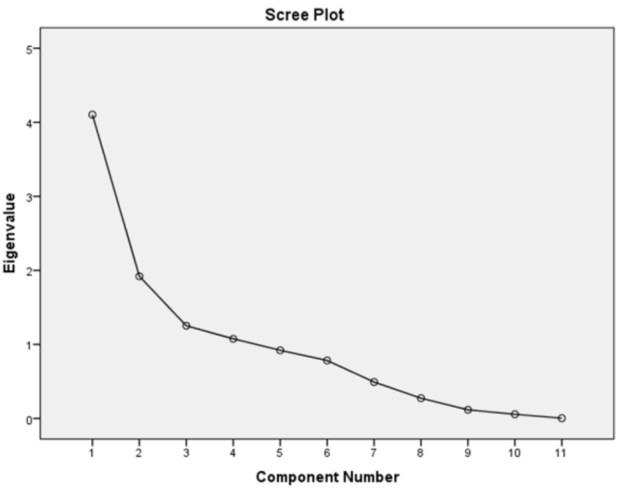

Figure 2: Scree Plot for Inventory

The Figure 2 above, represents the eigenvalues of all the components as a graph. This scree plot is the representation of the Table 13. This graph will be estimated using the help of Table 13.

The Y-axis on the graph represents the 'Eigenvalues' ranging from 0 to 5. The maximum value of 5 is obtained from the column 'Total' of the column 'Initial Eigenvalues'. This column of eigenvalues has been represented as points on the curve of the scree plot in the Figure 2.

The X-axis on the graph represents the 'Component Number'. These values have been obtained from the Table 43 from the column 'Component'. The values of the 'Component Number' vary from 1 to 11.

When Figure 2 is observed, it is found that the curve in the scree plot begins to flatten between the component 4 and component 5. The curve also portrays that the eigenvalues for the components 1 to 4 are above 1. From components 5 to 11, the eigenvalues are less than 1.

Therefore, after the process of extraction only 4 factors have been retained.

DOI : 10.35291/2454-9150.2019.0531

Component Matrix[a]				
	Component			
	1	2	3	4
Q.40.Variations	0.873			
Q.39.Demand	0.778			
Q.42.Alert	0.733	-0.555		
Q.47.Theft	0.713			
Q.41.Tracking	0.697	-0.575		
Q.31.Location	0.579	0.420		
Q.45.Record	0.497		0.438	
Q.44.Method	0.527	0.674		
Q.22.Planning		0.600	0.434	
Q.24.LeadTime			0.686	
Q.43.Count	-0.410			0.840

Table 14: Component Matrix for Inventory

The above Table 14, showcases the extracted values of each of the 11 variables of the column 1 under the 4 components which were extracted in the Table 13.

This means that the 11 variables are divided into 4 components.

The extracted values represent the extent to which each component contributes towards the understanding of the respective variable.

The Table 14, shows the extracted values above 0.4 only because that criteria was chosen for the test, to read the table easily. This was done as the higher the extracted value, the higher that particular component contributes towards the understanding of that particular variable. The highest value for some components is 0.4. The empty cells of the table mean that the value extracted was less than 0.4.

The inference made from the above Table 14 are as follows:

The loading of variable Q.40.Supply on component 1 is 0.873.

The loading of variable Q.39.TransportationTime on component 1 is 0.778.

The loading of variable Q.42.Alert on component 1 is 0.733.

The loading of variable Q.47.Stolen on component 1 is 0.713.

The loading of variable Q.41.Applications on component 1 is 0.697.

The loading of variable Q.31.Warehouse on component 1 is 0.579.

The loading of variable Q.45.Inventory on component 1 is 0.497.

The loading of variable Q.44.Method on component 2 is 0.674.

The loading of variable Q.22.Planning on component 2 is 0.600.

The loading of variable Q.24.LeadTime on component 3 is 0.686.

The loading of variable Q.43.Count on component 4 is 0.840.

Rotated Component Matrix[a]				
	Component			
	1	2	3	4
Q.44.Method	0.845			
Q.39.Demand	0.812			
Q.40.Variations	0.765			
Q.47.Theft	0.687			
Q.31.Location	0.617			
Q.45.Record	0.510		0.410	
Q.41.Tracking		0.944		
Q.42.Alert		0.939		
Q.24.LeadTime			0.813	
Q.22.Planning			0.720	
Q.43.Count				0.907

Table 15: Rotated Component Matrix for Inventory

The Table 15 above represents the Rotated Component Matrix. This matrix will help in reducing the number of components on which the variables are under analysis having high loadings.

From the above table 15, we observe that,

variable Q.44.Method, Q.39.Demand, Q.40.Supply, Q.47.Stolen, Q.31.Warehouse, Q.45.Inventory are loaded on component 1. This component can be used as variable for further analysis.

variable Q.41.Applications, Q.42.Alert are loaded on component 2. This component can be used as variable for further analysis.

variable Q.24.LeadTime, Q.22.Planning are loaded on component 3. This component can be used as variable for further analysis.

variable Q.43.Count is substantially loaded on component 4.

Customer Contentment

Descriptive Statistics				
	Mean	Std. Deviation	Analysis N	Missing N
Q.32.Distribution	1.0889	0.28780	45	0
Q.48.Traning	3.2444	13.10128	45	0
Q.49.Requirement	4.0667	0.49543	45	0
Q.50.FairPlay	4.0000	0.42640	45	0
Q.51.Consistency	4.0000	0.52223	45	0
Q.52.Feedback	4.0000	0.56408	45	0
Q.53.Satisfaction	4.2000	0.54772	45	0
Q.54.Expectation	4.0222	0.45171	45	0

Table 16: Descriptive Statistics for Customer Contentment

 DOI : 10.35291/2454-9150.2019.0531

The above Table 16, gives the descriptive statistics of the factors used in the KMO & Bartlett's Test. It depicts the mean of each variable, the standard deviation of each variable. The column 'Analysis N' shows the number of respondents who answered for these particular variable questions. This means that out of 45 respondents, all the 45 respondents had answered for the particular variable questions. The column 'Missing N' denotes the missing answers from that particular variable question. In this case, the value of column 'Missing N' is 0 for all the variables. This states that none of the respondents missed the questions.

The factor 'Customer Satisfaction' is analyzed using the 8 variables as listed in the above Table 51. The variable Q.49.Requirement shows the highest mean of 4.0667. This indicates that the variable Q.49.Requirement is the most important variable in interpreting the factor 'Customer Satisfaction'. If column 'Mean' is observed around 6 variables have mean of 4 or above. They have a significant role in contributing a great deal towards analyzing the factor 'Customer Satisfaction'.

Correlation Matrix[a]

		Q.32.	Q.48.	Q.49.	Q.50.	Q.51.	Q.52.	Q.53.	Q.54.
Correlation	Q.32.	1.000	-0.012	-0.043	0.185	0.000	0.000	0.173	-0.016
	Q.48.	-0.012	1.000	0.267	0.004	0.007	0.009	-0.045	-0.001
	Q.49.	-0.043	0.267	1.000	0.538	0.439	0.244	0.369	0.399
	Q.50.	0.185	0.004	0.538	1.000	0.612	0.472	0.487	0.708
	Q.51.	0.000	0.007	0.439	0.612	1.000	0.463	0.477	0.674
	Q.52.	0.000	0.009	0.244	0.472	0.463	1.000	0.588	0.714
	Q.53.	0.173	-0.045	0.369	0.487	0.477	0.588	1.000	0.625
	Q.54.	-0.016	-0.001	0.399	0.708	0.674	0.714	0.625	1.000
Sig. (1-tailed)	Q.32.		0.469	0.391	0.112	0.500	0.500	0.128	0.460
	Q.48.	0.469		0.038	0.489	0.483	0.476	0.385	0.498
	Q.49.	0.391	0.038		0.000	0.001	0.053	0.006	0.003
	Q.50.	0.112	0.489	0.000		0.000	0.001	0.000	0.000
	Q.51.	0.500	0.483	0.001	0.000		0.001	0.000	0.000
	Q.52.	0.500	0.476	0.053	0.001	0.001		0.000	0.000
	Q.53.	0.128	0.385	0.006	0.000	0.000	0.000		0.000
	Q.54.	0.460	0.498	0.003	0.000	0.000	0.000	0.000	

a. Determinant = .034

Table 17: Correlation Matrix for Customer Contentment

The above Table 17, showcases the correlation of every variable with each of the other variable. The correlation matrix is divided into two parts. The upper half of the correlation table represents the Pearson correlation coefficient. The lower half of the correlation table represents the one-tailed significance of the coefficients of the Pearson correlation.

The upper half of the table does not consist of any value greater than 0.9 for any of the variables. This means there is no singularity present in the data.

The determinant of the correlation matrix obtained is 0.034. Since, the value of determinant obtained is 0.034 which is greater than 0.00001. This indicates that the problem of multicollinearity does not exist for the above data.

The off-diagonal elements in the correlation part are very small and close to zero. This makes the matrix a good model.

This summarizes that all the variables correlate well with each other. The value of correlation coefficients is not large. Hence, eliminating of questions is not applicable at this stage.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.762
Bartlett's Test of Sphericity	Approx. Chi-Square	136.656
	df	28
	Sig.	0.000

Table 18: KMO and Bartlett's Test Value for Customer Contentment

The above shown Table 18, shows the KMO and Bartlett's test output. This test analyzes whether the responses given are adequate with the sample or not.

The Kaiser-Meyer-Olkin (KMO) value obtained is 0.762. If we compare this value with the values in the Table 1, it is clear that the value is 0.762 is a medium range value. This means that the sum of partial correlations is not large in comparison to the sum of correlations. The sum of analysis variables is 76.2%. This indicates there is no diffusion in the correlation pattern. Hence, the factor analysis is appropriate in this case. Therefore, reliable and distinct factors would be obtained from the factor analysis of these data.

The Table 18, also contains the Bartlett's Test of Sphericity. The Approx. Chi-Square value obtained is 136.656. The significance value p of the Bartlett's Test of Sphericity is 0.000 is less than 0.001. Thus, the correlation matrix is not an identity matrix. This indicates relationship strength amongst the variables. Thus, factor analysis is applicable for this set of data.

Communalities

	Initial	Extraction
Q.32.Distribution	1.000	0.976
Q.48.Traning	1.000	0.785
Q.49.Requirement	1.000	0.671
Q.50.FairPlay	1.000	0.710
Q.51.Consistency	1.000	0.636
Q.52.Feedback	1.000	0.629
Q.53.Satisfaction	1.000	0.635
Q.54.Expectation	1.000	0.836

Table 19: Communalities for Customer Contentment

From observing the above Table 19, the deductions are made as below:

The extracted factor has accounted for 97.6% of the variance for variable Q.32.Distribution.

 DOI : 10.35291/2454-9150.2019.0531

The extracted factor has accounted for 78.5% of the variance for variable Q.48.Training.

The extracted factor has accounted for 67.1% of the variance for variable Q.49.Requirement.

The extracted factor has accounted for 71.0% of the variance for variable Q.50.FairPlay.

The extracted factor has accounted for 63.6% of the variance for variable Q.51.Consistency.

The extracted factor has accounted for 62.9% of the variance for variable Q.52.Feedback.

The extracted factor has accounted for 63.5% of the variance for variable Q.53.Satisfaction.

The extracted factor has accounted for 83.6% of the variance for variable Q.54.Expectation.

Since, all the communality values are more than 0.5, thus, all the variables will be considered for further analysis.

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	3.650	45.626	45.626	3.650	45.626	45.626	3.549	44.362	44.362
2	1.186	14.827	60.453	1.186	14.827	60.453	1.261	15.758	60.120
3	1.042	13.027	73.480	1.042	13.027	73.480	1.069	13.361	73.480
4	0.743	9.282	82.762						
5	0.519	6.493	89.255						
6	0.403	5.035	94.289						
7	0.286	3.576	97.865						
8	0.171	2.135	100.000						

Table 20: Total Variance for Customer Contentment

The above Table 20, represents the variance of the 8 components.

The three stages of the above Table 20 are:

a) Variance before extraction denoted by the column 'Initial Eigenvalues'.

b) Variance after extraction denoted by the column 'Extraction Sums of Squared Loadings'.

c) Variance after rotation denoted by the column 'Rotation Sums of Squared Loadings'.

At the first 'before extraction' stage, the total number of components is equal to the total number of variables used in the test.

In Table 20, observe the 'Total' column in the 'Initial Eigenvalues' columns. The first three components have large amount of variance as the eigenvalues for them is more than 1 with respect to the other five components which have eigenvalues less than 1.

In Table 20, observe '% of Variance' column in the 'Initial Eigenvalues' columns. The deductions made from this column are as followed:

The component 1 explains 45.626% of the total variance.

The component 2 explains 14.827% of the total variance.

The component 3 explains 13.027% of the total variance.

The component 4 explains 9.282% of the total variance.

The component 5 explains 6.493% of the total variance.

The component 6 explains 5.035% of the total variance.

The component 7 explains 3.576% of the total variance.

The component 8 explains 2.135% of the total variance.

At the second 'after extraction' stage, the components having eigenvalues less than 1 are extracted. So, only the first three components are retained at this stage as they have eigenvalues above 1. The eigenvalues of the column 'Total' in both the 'Initial Eigenvalues' column and 'Extraction Sums of Squared Loadings' remain same.

At the third 'after rotation' stage, the factor structure is optimized and all the three components are equalized. The observations at this stage are:

For component 1, it accounted for 45.626% of variance for rotation. Now it accounts for 44.362% of variance.

For component 2, it accounted for 14.827% of variance for rotation. Now it accounts for 15.758% of variance.

For component 3, it accounted for 13.027% of variance for rotation. Now it accounts for 13.361% of variance.

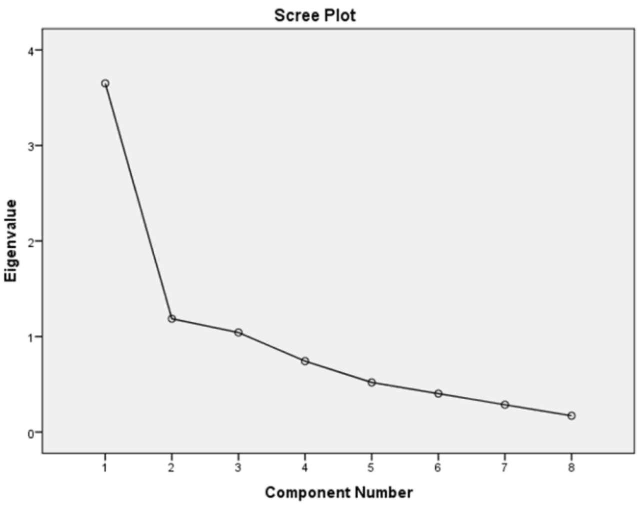

Figure 3: Scree Plot for Customer Contentment

The Figure 7 above, represents the eigenvalues of all the components as a graph. This scree plot is the representation of the Table 20. This graph will be estimated using the help of Table 20.

The Y-axis on the graph represents the 'Eigenvalues' ranging from 0 to 4. The maximum value of 4 is obtained from the column 'Total' of the column 'Initial Eigenvalues'. This column of eigenvalues has been represented as points on the curve of the scree plot in the Figure 3.

The X-axis on the graph represents the 'Component Number'. These values have been obtained from the Table 20 from the column 'Component'. The values of the 'Component Number' vary from 1 to 8.

When Figure 3 is observed, it is found that the curve in the scree plot begins to flatten between the component 3 and component 4. The curve also portrays that the eigenvalues for the components 1 to 3 are above 1. From components 4 to 8, the eigenvalues are less than 1.

 DOI : 10.35291/2454-9150.2019.0531

Therefore, after the process of extraction only 3 factors have been retained.

Component Matrix[a]			
	Component		
	1	2	3
Q.54.Expectation	0.897		
Q.50.FairPlay	0.828		
Q.51.Consistency	0.790		
Q.53.Satisfaction	0.763		
Q.52.Feedback	0.753		
Q.49.Requirement	0.613	0.532	
Q.48.Traning		0.830	
Q.32.Distribution			0.913

Table 21: Component Matrix for Customer Contentment

The above Table 21, showcases the extracted values of each of the 8 variables of the column 1 under the 3 components which were extracted in the Table 20.

This means that the 8 variables are divided into 3 components.

The extracted values represent the extent to which each component contributes towards the understanding of the respective variable.

The Table 21, shows the extracted values above 0.4 only because that criteria was chosen for the test, to read the table easily. This was done as the higher the extracted value, the higher that particular component contributes towards the understanding of that particular variable. The highest value for some components is 0.4. The empty cells of the table mean that the value extracted was less than 0.4.

The inference made from the above Table 21 are as follows:

The loading of variable Q.54.Expectation on component 1 is 0.897.

The loading of variable Q.50.FairPlay on component 1 is 0.828.

The loading of variable Q.51.Consistency on component 1 is 0.790.

The loading of variable Q.53.Satisfaction on component 1 is 0.763.

The loading of variable Q.52.Feedback on component 1 is 0.753.

The loading of variable Q.49.Requirement on component 1 is 0.613.

The loading of variable Q.48.Training on component 2 is 0.830.

The loading of variable Q.32.Distribution on component 3 is 0.913.

Rotated Component Matrix[a]			
	Component		
	1	2	3
Q.54.Expectation	0.911		
Q.50.FairPlay	0.791		
Q.52.Feedback	0.787		
Q.51.Consistency	0.782		
Q.53.Satisfaction	0.771		
Q.48.Traning		0.878	
Q.49.Requirement	0.503	0.645	
Q.32.Distribution			0.987

Table 22: Rotated Component Matrix for Customer Contentment

The Table 22 above represents the Rotated Component Matrix. This matrix will help in reducing the number of components on which the variables are under analysis having high loadings.

From the above table 22, we observe that, variable Q.54.Expectation, Q.50.FairPlay, Q.52.Feedback, Q.51.Consistency, Q.53.Satisfaction are loaded on component 1. This component can be used as variable for further analysis.

variable Q.48.Training, Q.49.Requirement are loaded on component 2. This component can be used as variable for further analysis.

variable Q.32.Distribution is substantially loaded on component 3.

IV. FINDINGS

- For Warehouse Efficiency parameter, according to Table 5 the deductions are made are: we get extraction value for variable Q.43.Count as 0.408 and we get extraction value for variable Q.45.Inventory as 0.392.
- For the Inventory parameter, we observe the correlation matrix. In the upper half of the table, it is found that the variable Q.41.Applications has one of the correlation coefficient value of 0.993 and the variable Q.42.Alert has one of the correlation coefficient value of 0.993. This indicates singularity in data in the above table.

V. CONCLUSION

- The KMO and Bartlett's test was conducted for the three parameters that are responsible for the smooth operation of the supply chain in the E-retail industry.
- The result about Warehouse Efficiency indicates that the variables Q.43.Count and Q.45 Inventory will be considered for elimination from the questionnaire. This is because they do not assess the Warehouse Efficiency completely and do not

 DOI : 10.35291/2454-9150.2019.0531

help in describing it. Thus, if this variable is eliminated, the other variables will be more productive in analyzing the Warehouse Efficiency.

- The result obtained for the Inventory parameter clearly states that the variables Q.41.Applications and Q.42.Alert should be considered for elimination to improve the correlation matrix coefficients which in turn would help in achieving better results using the other variables.
- In case of Customer Contentment, no change in questionnaire is needed. All the variables used for defining the Customer Contentment are required to assess it optimally.
- Therefore, if the above changes are made, they would help in achieving more optimized results for the study and evaluating the hypothesis of the study too.

VI. Suggestions

- More variables can be explored to judge the supply chain parameters Warehouse, Inventory and Customer.
- After removing the eliminated variables from the questionnaire, the test can be performed again to check the validity of the questionnaire.
- It is also recommended that instead of deleting the variable entirely from the questionnaire, it can be modified to include in the questionnaire.
- More parameters can be recognized that define the supply chain.

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