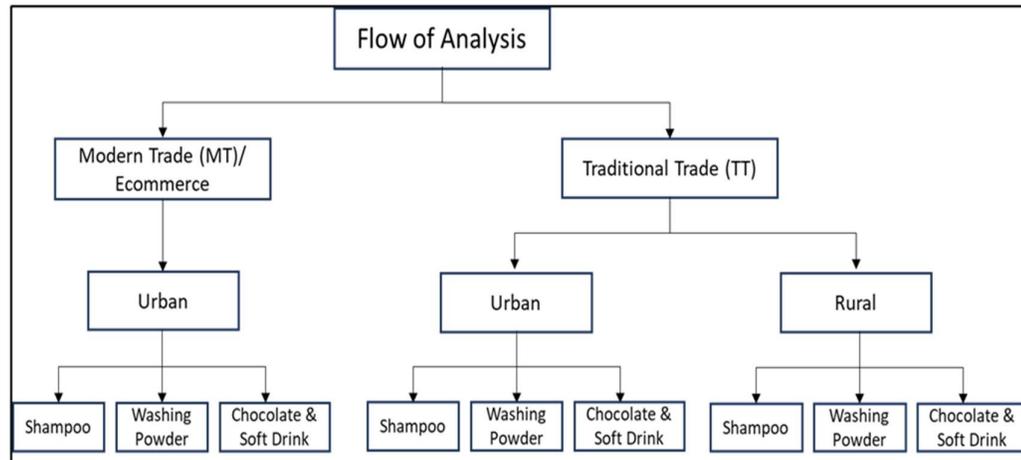


CHAPTER V
DATA ANALYSIS AND
INTERPRETATION

After collecting required data from the respondents using structured questionnaires, now it is time to analyse that data and interpret it to solve all the objectives created for this research. Analysis of the data is the most critical part of the research as it would lead to a conclusion and recommendations.

Overall flow of the analysis is as below. **Figure 5.1 Flow of analysis**



To format and analyse data, below mentioned tools are used exclusively:

1. Microsoft Excel - Microsoft 365 MSO (Version 2309 Build 16.0.16827.20278) 64-bit
2. Python Programming Language – Anaconda Navigator > Jupyter Notebook (6.0.3)

Overall analysis is divided into two major phases.

1. Descriptive Analysis
2. Multivariate Analysis: model fitting and machine learning.

5.1 DETAILS OF THE TOOLS AND TECHNIQUES USED UNDER EACH PHASE IS AS FOLLOWS:

1. **Descriptive Analysis:** A very well-known fact that, descriptive analysis only helps to check the basic trends available in the given data and it also gives idea about the centre, spread and overall distribution of the given data. Descriptive analysis done at three levels, Urban – MT/Ecomm, Urban – TT, Rural – TT. For all categories under study.

Charts: Basic charts like bar chart, doughnut chart etc. are prepared to check the overall trend in the data. Charts prepared for age groups, gender, family type, head of the family, preferred store type, preferred retailers.

Measures of Central Tendency and Dispersion: Mean, Median, Mode, Range, Std. Deviation, Variance etc. are calculated with the help of Python codes using NumPy and Pandas library. KPIs are generated for all the values of Likert scale obtained for each of the question in questionnaire.

2. **Multivariate Analysis:** After inferential analysis to validate population parameters, Multivariate Analysis was carried out to fit final model and the overall classification process for classifying FMCG buyers into various categories. This is most important part of the analysis as it talks about the overall usage of the whole long process that we have developed through this research. Details of the steps of analysis is as follows. Techniques used here are, K-Means Clustering, Exploratory Factor Analysis, Structural Equation Modeling and Support Vector Machine.

Step 1: K-Means Clustering: to have primary classification of buyers into Brand Loyal, Brand Disloyal and Neutral

- Initially we do not have any idea about loyalty of individual respondent. It is good to have at least rough idea about it as this can help us further to fit model and to use ‘Supervised Machine Learning’ approach at the end.
- K-Means clustering is performed using below mentioned Python code. It is unsupervised approach of clustering. Thus, not very accurate.
- It helps to cluster respondents in homogeneous groups. Individuals in the same cluster are very similar in terms of behaviour whereas individuals in different clusters are very different.
- Algorithm calculates mean of the cluster and distance of each point from the mean. It also calculates distance between the points in two different clusters. With multiple iterations, algorithm tries to minimize distance among points within cluster and maximize distance among points between clusters.

Python code: To run K-Means Clustering

In [1]:

```
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans
import seaborn as sns
import scipy
```

In [2]:

```
df = pd.read_excel('C:\\Users\\kalede50\\OneDrive - Nielsen IQ\\Desktop\\Research
Data\\Urban_MTEComm_Data\\Shampoo\\Urban_Shampoo.xlsx', sheet_name =
"Urban_Shampoo_MTEComm")
```

In [3]:

```
df1 = df[['Shampoo Max Run', 'Shampoo_Acceptable', 'REPU3', 'Shampoo Tried Out
Brands']]
```

In [4]:

```
df1.head()
```

Out[4]:

	Shampoo Max Run	Shampoo_Acceptable	REPU3	Shampoo Tried Out Brands
0	8	2	4	1
1	2	2	2	3
2	5	3	4	1
3	3	1	4	3
4	4	2	2	3

In [5]:

```
df1.isnull().sum()
```

Out[5]:

```
Shampoo Max Run      0
Shampoo_Acceptable   0
REPU3                 0
Shampoo Tried Out Brands  0
dtype: int64
```

In [6]:

```
kmeans_model = KMeans(n_clusters = 3)
kmeans_model.fit(df1)
```

Out[6]:

```
KMeans(algorithm='auto', copy_x=True, init='k-means++', max_iter=300,
       n_clusters=3, n_init=10, n_jobs=None, precompute_distances='auto',
       random_state=None, tol=0.0001, verbose=0)
```

In [7]:

```
df1["clusters"] = kmeans_model.labels_
df['cluster'] = df1['clusters']
```

In [8]:

```
df.head()
```

Out[8]:

Shampoo Brand Run 5	Shampoo Brand Run 6	Shampoo Brand Run 7	Shampoo Brand Run 8	Shampoo Max Run	Shampoo Tried Out Brands	cluster
4	5	6	7	8	1	0
0	0	0	0	2	3	1
4	0	0	0	5	1	1
1	0	1	2	3	3	1
3	0	1	2	4	3	1

5 rows × 80 columns

Step 2: Correlation Matrix: to identify highly correlated variables.

- Analysis done at three levels, Urban – MT/Ecomm, Urban – TT, Rural – TT. For all industries under study.
- Correlation matrix is calculated with the help of Python programming language.
- Here correlation is obtained between all possible combinations of pair of variables under study.
- If correlation value for any pair of uncommon variables is greater than 0.9 then one of the variables from the pair is removed in the output.

Python code: To calculate correlation matrix

```
In [1]:
import pandas as pd
import numpy as np
from sklearn import datasets

In [2]:
df = pd.read_excel('C:\\Users\\kalede50\\OneDrive - Nielsen IQ\\Desktop\\Research
Data\\Urban_MTEComm_Data\\Shampoo\\KMOut\\Urban_Shampoo_MTEComm_
KMOut.xlsx')

In [3]:
list(df.columns)

In [4]:
cor_matrix = df.corr().abs()
print(cor_matrix)

In [5]:
upper_tri =
cor_matrix.where(np.triu(np.ones(cor_matrix.shape),k=1).astype(np.bool))
print(upper_tri)

In [6]:
to_drop = [column for column in upper_tri.columns if any(upper_tri[column] > 0.9)]
print(to_drop)

In [7]:
df1 = upper_tri.drop(upper_tri.columns[to_drop], axis=1)
print(); print(df1.head())

In [8]:
df2 = df1.to_excel('C:\\Users\\kalede50\\OneDrive - Nielsen IQ\\Desktop\\Research
Data\\Urban_MTEComm_Data\\Shampoo\\Corr\\Urban_Shampoo_MTEComm_Co
rr.xlsx')
```

- Find sample output of correlation matrix below.

	BRAF1	CUSA1	SWCO1	BRTR1	REPR1	INVO1	PEVA1	AVAI1	BRRE1
BRAF1		0.549021	0.203979	0.345073	0.072358	0.293526	0.274058	0.026478	0.131377
CUSA1			0.215141	0.344589	0.158082	0.234922	0.281814	0.115886	0.181989
SWCO1				0.043871	0.294792	0.069095	0.001209	4.71E-05	0.039873
BRTR1					0.085301	0.27388	0.246239	0.008733	0.066542
REPR1						0.114273	0.088269	0.27049	0.119625
INVO1							0.405748	0.30179	0.205653
PEVA1								0.193456	0.355372
AVAI1									0.016025

- This process helps to eliminate variables which are very similar to each other. This way we can reduce duplication of variables from the study and can deal with only unique set of variables.

Step 3: Exploratory Factor Analysis: To find out most significantly impacting factors.

- Factor analysis is a technique used to identify the structure/dimensionality of observed data and reveal the underlying constructs that give rise to observed phenomena. Techniques help to identify set of intercorrelated variables. These variables are called factors or latent variables.
- There are two main types of factor analysis: 1. exploratory and 2. confirmatory. In exploratory factor analysis each observed variable is potentially a measure of every factor, and the goal is to determine relationships (between observed variables and factors) are strongest. In confirmatory factor analysis (CFA), a simple factor structure is posited, each variable can be a measure of only one factor, and the correlation structure of the data is tested against the hypothesized structure via goodness of fit tests.
- In this research we are focusing on Exploratory Factor analysis as we want to reduce number of variables under study. This will further help to fit model using the approach of Structural Equation Modeling.
- Exploratory Factor Analysis is performed on all the variables which are left after eliminating variables from the pair of highly correlated variables.
- Two key steps of Factor analysis are: 1. Factor Extraction – using Principal Component Analysis or Common Factor Analysis variance partitioning is done to club similar variables under given factor. 2. Factor Rotation – using

Varimax, Quartimax or Promax rotation method we try to convert factors into uncorrelated once so that we can interpret it properly.

- Key terms used in factor analysis are,
 - Factor Loadings – matrix showing relationship of each variable with given factor.
 - Eigenvalues – variation explained by each factor from the total variance.
 - Communalities – common variance ranging between 0-1, value closer to 1 meaning higher variance.
 - Factor Rotation – process of redistribution of variance to finetune given factor.
- Python code to run EFA is as follows.

```
In [1]:
import pandas as pd
import cv2
from factor_analyzer import FactorAnalyzer
import matplotlib.pyplot as plt

In [2]:
df=pd.read_excel('C:\\Users\\kalede50\\OneDrive - Nielsen IQ\\Desktop\\Research
Data\\Urban_MTEComm_Data\\Shampoo\\KMOut\\Urban_Shampoo_MTEComm_
KMOut.xlsx')
```

```
In [3]:
# Get list of columns (column name) of uploaded data
list(df.columns)
```

```
In [4]:
# Get some information about uploaded data file.
df.info()
```

```
In [5]:
# Keep only those variables in dataset which are useful for factor analysis. Remove
all other.
```

```
df = df[['list of useful variables']]
```

In [6]:

```
# Check first five rows of data file.
```

```
df.head()
```

In [7]:

```
from factor_analyzer.factor_analyzer import calculate_bartlett_sphericity
```

```
chi_square_value,p_value=calculate_bartlett_sphericity(df)
```

```
chi_square_value, p_value
```

In [8]:

```
# In Bartlett 's test, the p-value is 0. The test is statistically significant, indicating that the observed correlation matrix is not an identity matrix.
```

In [9]:

```
# Create factor analysis object and perform factor analysis
```

```
fa = FactorAnalyzer()
```

```
fa.fit(df, 47)
```

```
eigen_values, vectors = fa.get_eigenvalues()
```

In [10]:

```
# Check Eigenvalues
```

```
ev, v = fa.get_eigenvalues()
```

```
ev
```

In [11]:

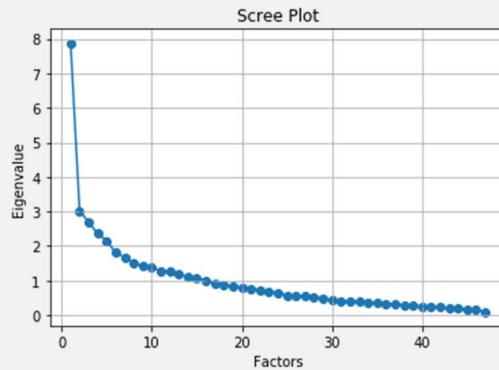
```
# Create scree plot using matplotlib. Factors considered are equal to number of points falling beyond 1 in the plot.
```

```
plt.scatter(range(1,df.shape[1]+1),ev)
```

```
plt.plot(range(1,df.shape[1]+1),ev)
```

```
plt.title('Scree Plot')
```

```
plt.xlabel('Factors')
plt.ylabel('Eigenvalue')
plt.grid()
plt.show()
```



```
In [12]:
```

```
ev_gr1 = sum(float(num) >= 1 for num in ev)
```

```
In [13]:
```

```
f = ev_gr1
```

```
f
```

```
In [14]:
```

```
#n_factors must be equal to ev_gr1
```

```
fa = FactorAnalyzer()
```

```
fa.set_params(n_factors=f, rotation='varimax')
```

```
fa.fit(df)
```

```
loadings = fa.loadings_
```

```
In [15]:
```

```
df1 = pd.DataFrame.from_records(loadings)
```

```
In [16]:
```

```
df1
```

```
In [27]:
```

```
def color_positive_green(val):
```

```
if val >= 0.35 or val <=-0.35:  
    color = 'red'  
else:  
    color = "  
return 'color: %s' % color
```

```
df1.style.applymap(color_positive_green)
```

In [28]:

```
# Red colored values are most impacting values in each factor. If factor has >=3 red  
highlighted values then  
# factor would be considered as final factor.
```

In [29]:

```
df2 = df1.to_excel('C:\\Users\\kalede50\\OneDrive - Nielsen IQ\\Desktop\\Research  
Data\\Urban_MTEComm_Data\\Shampoo\\Factor\\Urban_Shampoo_MTEComm_F  
actorLoadings.xlsx')
```

In [30]:

```
# Get variance of each factors
```

In [31]:

```
# as only 6 factors are qualified after applying factor selection conditions, let us run  
the process again with 5 selected factors.
```

In [32]:

```
# Applying 'Varimax' rotation method to finetune factors  
fa = FactorAnalyzer()  
fa.set_params(n_factors=13, rotation='varimax')  
fa.fit(df)  
loadings1 = fa.loadings_
```

In [33]:

```
fa.get_factor_variance()
```

In [34]:

```
df3 = pd.DataFrame.from_records(loadings1)
```

In [35]:

```
# Output file of factor analysis containing Factor Loadings
```

```
df4 = df3.to_excel('C:\\Users\\kalede50\\OneDrive - Nielsen IQ\\Desktop\\Research  
Data\\Urban_MTEComm_Data\\Shampoo\\Factor\\Urban_Shampoo_MTEComm_F  
actor.xlsx')
```

- Overall factor analysis helped to eliminate not required variables from the study. This allows me to focus only on most important variables while fitting further models using the concept of Structural Equations Model.

Step 4: Structural Equation Models (SEM)

- It helps to find out relationships between measured variables and latent variables, it also helps to find out relationships between latent variables.
- Latent variables are the one that cannot be measured directly. In this research Brand Loyalty is the variable that cannot be measured directly. Even if we try to measure it directly it only be possible to measure through Behavioural aspects i.e. Buying behaviour of FMCG users.
- Data collected through Likert Scale and buying frequency is numeric which helps to define overall model.
- Model indicates relationship among the variables and gives path diagram at the end which is nothing but a required model.
- Models are generated for all three levels, Urban – MT/Ecomm, Urban – TT, Rural – TT. For all industries under study.
- Basic relationships between variables are of three types.
Association relation e.g., correlation, covariance.

Direct effect is a directional relation between two variables, e.g., independent, and dependent variables.

Indirect effect is the effect of an independent variable on a dependent variable through one or more intervening or mediating variables.

- Minimum sample size required is 20 is to 1 parameter or 200. In this research sample size is sufficiently large.

```
In [1]:
import graphviz
import pandas as pd
import semopy
import os

In [2]:
#!pip install graphviz

In [3]:
#!pip install semopy

In [4]:
df = pd.read_excel('C:\Users\Jagavi\Desktop\Python\SEM
Files\Shampoo\Urban_Shampoo_MTEComm_KMOut.xlsx')
df.rename(columns={"cluster": "Brand Loyalty"}, inplace=True)

In [5]:
df.head()

Out[5]:
5 rows × 81 columns

In [6]:
# Specify the model relations using the same syntax given before
model_spec = """
# measurement model
AttitudinalBrandLoyalty =~ PEVA1 + BRPE1 + BRAT2 + BREQ1 + BRIM1 +
ACCE1 + COPF1 + CLAR1
BehaviouralBrandLoyalty =~ -ShampooMaxRun + ShampooTriedOutBrands -
```

```
Shampoo_Acceptable
```

```
SituationalLoyalty =~ SIFA1 + BRAW1 + REPU3
```

```
BrandSatisfaction =~ BRAF1 + CUSA1 + BRTR1
```

```
FamilyDemographics =~ FamilyType - TotalFamilyMember + HeadoftheFamily
```

```
BrandCommitment =~ REPR1 + AVAI1 + CULT1 + COMM1 + BRTR1
```

```
FunctionalValue =~ BRRP1 + FUVA1 + CENT1 + COPF1
```

```
BrandReputation =~ BRRP1 + BRCR1 + FASO1
```

```
ImpactofPromotion =~ ADVE1 + PESE1 + DISC1
```

```
# regressions
```

```
BrandLoyalty ~ AttitudinalBrandLoyalty + BehaviouralBrandLoyalty +  
SituationalLoyalty + BrandSatisfaction + FamilyDemographics + BrandCommitment +  
FunctionalValue + BrandReputation + ImpactofPromotion
```

```
"""
```

```
In [7]:
```

```
# Instantiate the model
```

```
model = semopy.Model(model_spec)
```

```
In [8]:
```

```
# Fit the model using the data
```

```
model.fit(df)
```

```
Out[8]:
```

```
SolverResult(fun=4.8292738926256416, success=True, n_it=102, x=array([  
8.94758369e-01, 7.66538917e-01, 7.64674896e-01, 1.10598929e+00,  
8.13820443e-01, 7.43795841e-01, 8.91573369e-01, 8.29784560e-01,  
-3.59809705e-01, -1.92087841e-01, 1.25519144e+00, 9.68524260e-01,  
]), message='Optimization terminated successfully', name_method='SLSQP',  
name_obj='MLW')
```

```
In [9]:
```

```
df1 = model.inspect()
```

```
df1
```

```
Out[9]:
```

	lval	op	rval	Estimate	Std. Err	z-value	p-value
0	PEVA1	~	AttitudinalBrandLoyalt y	1.00000 0	-	-	-
1	BRPE1	~	AttitudinalBrandLoyalt y	0.89475 8	0.08482 9	10.54784 2	0.0
2	BRAT2	~	AttitudinalBrandLoyalt y	0.76653 9	0.06518 7	11.75916 4	0.0
3	BREQ1	~	AttitudinalBrandLoyalt y	0.76467 5	0.07238 9	10.56347 7	0.0
4	BRIM1	~	AttitudinalBrandLoyalt y	1.10598 9	0.07827 3	14.12993 7	0.0
...
117	COPF1	~ ~	COPF1	0.86584 7	0.05402 2	16.02773 8	0.0
118	CLAR1	~ ~	CLAR1	0.78228 6	0.04852 4	16.12155 8	0.0
119	COMM1	~ ~	COMM1	0.82296 1	0.07613 4	10.80939 1	0.0
120	ShampooMaxRun	~ ~	ShampooMaxRun	0.80414 0	0.1397	5.756172	0.0
121	ACCE1	~ ~	ACCE1	0.56299 1	0.03587 6	15.69254 7	0.0

122 rows × 7 columns

In [10]:

```
df2 = df1.to_excel("C:\\Users\\Jagavi\\Desktop\\Python\\SEM
```

```
Files\Shampoo\Urban_Shampoo_MTEComm_SEMOut_Initial.xlsx")
semopy.calc_stats(model, )
```

Out[10]:

	DoF	DoF Baseline	chi2	chi2 p- value	chi2 Baseline	CFI	GFI	A
Value	448	528	2916.881431	0.0	7712.541735	0.656362	0.6218	0.
	TLI	RMSEA	AIC	BIC	LogLik			
Value	0.594998	0.095599	216.341452	713.945337	4.829274			

In [11]:

```
g = semopy.semplot(model, "C:\Users\Jagavi\Desktop\Python\SEM
Files\Shampoo\MTEComm_model_initial.jpg")
```

In [12]:

```
# Specify the model relations using the same syntax given before
model_spec = """
# measurement model
AttitudinalBrandLoyalty =~ PEVA1 + BRPE1 + BRAT2 + BREQ1 + BRIM1 +
ACCE1 + COPF1 + CLAR1
BehaviouralBrandLoyalty =~ - ShampooMaxRun + ShampooTriedOutBrands -
Shampoo_Acceptable
FunctionalValue =~ BRRP1 + FUVA1 + CENT1 + COPF1
BrandSatisfaction =~ BRAF1 + CUSA1 + BRTR1

# regressions
BrandLoyalty ~ FunctionalValue + BehaviouralBrandLoyalty + BrandSatisfaction +
AttitudinalBrandLoyalty

"""
In [13]:
model = semopy.Model(model_spec)
model.fit(df)
```

```

Out[13]:
SolverResult(fun=1.7106034699789272, success=True, n_it=51, x=array([ 0.90380054,
0.78050409, 0.83897661, 1.15600539, 0.83286052,
0.87188942, 0.27467553, 0.79990152, -0.35300576, -0.18139411,
]), message='Optimization terminated successfully', name_method='SLSQP',
name_obj='MLW')

```

```

In [14]:
df4 = model.inspect()
df4

```

Out[14]: **Sample Output**

	lval	o p	rval	Estimat e	Std. Err	z-value	p- value
0	PEVA1	~	AttitudinalBrandLoyalt y	1.0000 0	-	-	-
1	BRPE1	~	AttitudinalBrandLoyalt y	0.9038 0	0.0888	10.1721	0.0
2	BRAT2	~	AttitudinalBrandLoyalt y	0.7805 0	0.0686	11.3689	0.0
3	BREQ1	~	AttitudinalBrandLoyalt y	0.8389 7	0.0771	10.8736	0.0
4	BRIM1	~	AttitudinalBrandLoyalt y	1.1560 0	0.0842	13.7145	0.0
5	ACCE1	~	AttitudinalBrandLoyalt y	0.8328 6	0.0704	11.8240	0.0
6	COPF1	~	AttitudinalBrandLoyalt y	0.8718 8	0.1201	7.25913	0.0
7	COPF1	~	FunctionalValue	0.2746 7	0.1542	1.78051	0.074 9

8	CLAR1	~	AttitudinalBrandLoyalty	0.79990	0.0761	10.5042	0.0
9	ShampooMaxRun	~	BehaviouralBrandLoyalty	1.00000	-	-	-
10	ShampooTriedOutBrands	~	BehaviouralBrandLoyalty	-0.35300	0.0165	-21.3262	0.0
11	Shampoo_Acceptable	~	BehaviouralBrandLoyalty	-0.18139	0.0275	-6.59270	0.0
12	BRRP1	~	FunctionalValue	1.00000	-	-	-
13	FUVA1	~	FunctionalValue	1.40346	0.1731	8.105	0.0
14	CENT1	~	FunctionalValue	1.03997	0.1403	7.41063	0.0
15	BRAF1	~	BrandSatisfaction	1.00000	-	-	-
16	CUSA1	~	BrandSatisfaction	1.14993	0.0947	12.1302	0.0
17	BRTR1	~	BrandSatisfaction	0.86049	0.0879	9.78616	0.0
18	BrandLoyalty	~	FunctionalValue	0.31884	0.0907	3.51419	0.000
19	BrandLoyalty	~	BehaviouralBrandLoyalty	-0.22441	0.0130	-17.1716	0.0
20	BrandLoyalty	~	BrandSatisfaction	0.1460	0.0522	2.79525	0.005

0				9			
21	BrandLoyalty	~	AttitudinalBrandLoyalty	0.22309	0.0586	-3.80525	0.000
22	BehaviouralBrandLoyalty	~	BehaviouralBrandLoyalty	4.08838	0.3066	13.3313	0.0
23	BehaviouralBrandLoyalty	~	BrandSatisfaction	0.31132	0.0647	4.80567	0.000
24	BehaviouralBrandLoyalty	~	FunctionalValue	0.31103	0.0679	4.57683	0.000
25	BehaviouralBrandLoyalty	~	AttitudinalBrandLoyalty	0.31730	0.0707	4.48452	0.000
26	BrandSatisfaction	~	BrandSatisfaction	0.35978	0.0449	7.99887	0.0
27	BrandSatisfaction	~	FunctionalValue	0.16422	0.0277	5.92017	0.0
28	BrandSatisfaction	~	AttitudinalBrandLoyalty	0.21764	0.02889	7.533318	0.0
29	FunctionalValue	~	FunctionalValue	0.28388	0.0627	4.52253	0.000
30	FunctionalValue	~	AttitudinalBrandLoyalty	0.25148	0.0379	6.63172	0.0
31	AttitudinalBrandLoyalty	~	AttitudinalBrandLoyalty	0.48231	0.0646	7.46026	0.0
32	CENT1	~	CENT1	0.83014	0.0558	14.8696	0.0
33	FUVA1	~	FUVA1	0.4719	0.0534	8.83384	0.0

3		~		5			
3 4	CUSA1	~ ~	CUSA1	0.3250 2	0.0381	8.52040	0.0
3 5	Shampoo_Acceptable	~ ~	Shampoo_Acceptable	1.6103 6	0.0935	17.2079	0.0
3 6	BRTR1	~ ~	BRTR1	0.8362 1	0.0538	15.5329	0.0
3 7	BREQ1	~ ~	BREQ1	0.7972 3	0.0499	15.9756	0.0
3 8	BRRP1	~ ~	BRRP1	1.3648 7	0.0852	16.0010	0.0
3 9	BRAT2	~ ~	BRAT2	0.5814 7	0.0370	15.7110	0.0
4 0	BRIM1	~ ~	BRIM1	0.4533 6	0.0358	12.6480	0.0
4 1	PEVA1	~ ~	PEVA1	0.8714 6	0.0560	15.5502	0.0
4 2	ShampooTriedOutBrands	~ ~	ShampooTriedOutBrands	0.2778 2	0.0236	11.7464	0.0
4 3	COPF1	~ ~	COPF1	0.8997 7	0.0572	15.7191	0.0
4 4	BRAF1	~ ~	BRAF1	0.3902 3	0.0341	11.4138	0.0
4 5	CLAR1	~ ~	CLAR1	0.8201 8	0.0508	16.1402	0.0
4 6	BrandLoyalty	~ ~	BrandLoyalty	0.1819 2	0.0140	12.9518	0.0

4 7	ShampooMaxRun	~ ~	ShampooMaxRun	0.7163 1	0.1449	4.94228	0.000
4 8	ACCE1	~ ~	ACCE1	0.5616 6	0.0364	15.4090	0.0
4 9	BRPE1	~ ~	BRPE1	1.1680 3	0.0717	16.2694	0.0

In [15]:

```
df5 = df4.to_excel("C:\\Users\\Jagavi\\Desktop\\Python\\SEM
Files\\Shampoo\\Urban_Shampoo_MTEComm_SEMOut.xlsx")
df6 = semopy.calc_stats(model, )
df6
```

Out[15]:

	DoF	DoF Baseline	chi2	chi2 p- value	chi2 Baselin e	CFI	GFI	AGFI
Value	125	153	1033.20449 6	0.0	3851.34	0.75442 9	0.73172 9	0.67163 6
	NFI	TLI	RMSEA	AIC	BIC	LogLik		
	0.73172 9	0.69942 1	0.109769	88.57879 3	291.14	1.71060 3		

In [16]:

```
df7=df6.to_excel("C:\\Users\\Jagavi\\Desktop\\Python\\SEMFiles\\Shampoo\\Urban_Sha
mpoo_MTEComm_SEMOut_Reliability.xlsx")
g = semopy.semplot(model,
"C:\\Users\\Jagavi\\Desktop\\Python\\SEMFiles\\Shampoo\\MTEComm_model_final.jpg
")
```

- There are various checks available to check the goodness of model fit. All are not equally effective in all scenarios.

Degrees of Freedom: Number of knowns minus number of free parameters. It can be viewed as number of independent variables.

Chi2 and Chi2 p-value: This value is important when sample size is between 75 to 200. For large sample like the one in this research Chi2 values are mostly statistically significant.

Comparative Fit Index (CFI): CFI ranges between 0 and 1. If it is greater than 1 then approximated to 1 and less than 0 then approximated to 0. Higher value of CFI indicates better fit.

Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI): Both need to be used with caution. They are ranging within 0-1. Higher value indicates better fit of model. However, they are largely dependent on sample size. AGFI is nothing but GFI adjusted for degrees of freedom.

Normed Fit Index (NFI): Very first measure of fit proposed in literature. Value above 0.9 is considered as the best fit.

Tucker Lewis Index (TLI): There is no penalty available in NFI for adding parameters in the model. TLI is having that feature as Chi2 values are divided by degrees of freedom while calculating index.

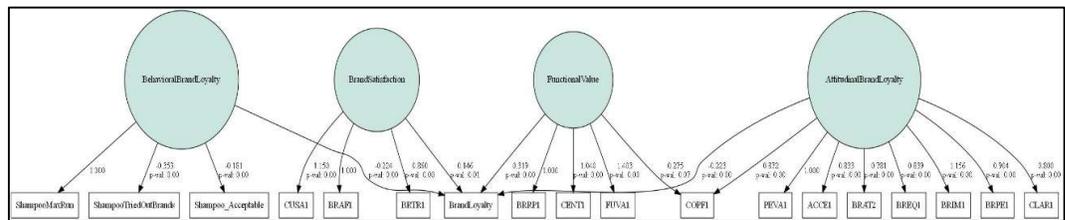
Root Mean Square Error of Approximation (RMSEA): This is most popular measure of the fit. Lower the number better is the model. There are various levels defined in theory like 0.01 best fit, 0.05 moderate fit, above 0.1 is cutoff for not acceptable models.

Akaike Information Criterion (AIC): This is comparative measure of fit. It is meaningful only when two different models are estimated. Lower value indicates better fit. So, the one with lower value is the best fit.

Bayesian Information Criterion (BIC): AIC is not very flexible in terms of applying penalty while increasing sample size. On the other hand, BIC apply more penalty with the increase in the sample size.

Log Likelihood (LogLik): It is also not very useful for individual models but very effective when compared for two models. Higer value of LogLik indicates more better fit.

- Using above mentioned checks final model is decided. Model indicates relationship between latent variables and measured variables.
- Sample output of the process is as follows.



Step 5: Support Vector Machine (SVM)

- After fitting best Structural Equation Model we get only those variables which are really impacting Brand Loyalty. These variables may be from behavioural list or attitudinal list or from both.
- With this set of variables now it is a time to train the most impactful and accurate classification model that can help us in future to classify FMCG buyers into various categories and thus provide an opportunity to take proactive actions to retain existing buyers before they become loyal to any other brands.
- Support Vector Machine (SVM) is one of the most reliable Machine Learning algorithm that has ability to classify cases with greater accuracy and speed.
- SVM is applicable to both Classification and Regression problem. It is very efficient while working with multiple variables.
- SVM construct hyperplane in multidimensional space to separate different classes. After that it tries to minimize classification error.
- SVM run for all three levels, Urban – MT/Ecomm, Urban – TT, Rural – TT. For all industries under study. Including both, loyal based on Behavioural

Variables and based on Attitudinal Variables. So, there would be two columns in the output.

- These columns would help further to create 3*3 matrix where Attitudinal Loyalty will be on one axis and Behavioural will be on the other.

```
import numpy as np

import matplotlib.pyplot as plt

import pandas as pd

from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.20)

In [2]:
df = pd.read_excel('C:\Users\kalede50\OneDrive - Nielsen IQ\Desktop\Research Data\Urban_MTEComm_Data\Shampoo\KMOut\Urban_Shampoo_MTEComm_KMOut.xlsx')

#Shampoo_MTEComm_SVMInput_Attitu

#Shampoo_MTEComm_SVMInput_Behav

In [3]:
df.head()

Out[3]:
```

Sr. No.	Age Group	Gender	Family Type	Total Family Member	Head of the Family	Preferred Channel	Name of Retailor	Res. T	Shampoo Brand Run 2
1	1	1	2	4	2	1	Reliance	20	1
2	1	2	2	3	2	1	D-Mart	20	0
3	1	1	2	3	2	1	D-Mart	0	1

4	1	1	2	4	2	1	D-Mart	10	1	2
5	1	1	2	4	2	1	D-Mart	0	0	1

5 rows × 81 columns

In [4]:

```
list(df.columns)
```

In [5]:

```
df1 = df[['Sr. No.',
```

```
'BRAFI',
```

```
'CUSAI',
```

```
'BRTRI',
```

```
'PEVAI',
```

```
'BRPEI',
```

```
'BREQI',
```

```
'BRIMI',
```

```
'ACCEI',
```

```
'BRRPI',
```

```
'FUVAI',
```

```
'BRAT2',
```

```
'CENTI',
```

```
'COPFI',
```

```
'CLARI',
```

```
'cluster']]
```

In [6]:

```
X = df1.iloc[:, [1, 14]].values
```

```
y = df1.iloc[:, 15].values
```

In [9]:

```
from sklearn.svm import SVC
```

```
classifier = SVC(kernel = 'rbf', random_state = 2, gamma=3, C=1, break_ties = True)
```

```
classifier.fit(X_train, y_train)
```

Out[9]:

```
SVC(C=1, break_ties=True, cache_size=200, class_weight=None, coef0=0.0,  
    decision_function_shape='ovr', degree=3, gamma=3, kernel='rbf', max_iter=-1,  
    probability=False, random_state=2, shrinking=True, tol=0.001,  
    verbose=False)
```

In [10]:

```
y_pred = classifier.predict(X_test)
```

```
y_pred
```

Out[10]:

```
array([[0, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 1, 1, 1, 0, 1, 0, 0, 1, 1, 1,  
        0, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 1, 1, 1, 0, 1,  
        0, 1, 1, 1, 0, 0, 0, 1, 1, 0, 1, 0, 1, 1, 1, 1, 1, 1, 0, 1, 0,  
        1, 0, 0, 0, 1, 1, 0, 0, 1, 1, 0, 1, 1, 0, 0, 1, 1, 1, 1, 1, 0,  
        1, 1, 1, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 1, 1, 1, 0, 0, 1, 0,  
        1, 0, 0, 0, 1, 1, 0, 1, 1, 1], dtype=int64)
```

In [11]:

```
from sklearn.metrics import confusion_matrix
```

```
cm = confusion_matrix(y_test, y_pred)
```

```
from sklearn.metrics import accuracy_score
```

```
print ("Accuracy : ", accuracy_score(y_test, y_pred))
```

```
cm
```

```
Accuracy : 0.6115702479338843
```

Out[11]:

```
array([[37, 29, 0],  
       [10, 37, 0],  
       [ 5,  3, 0]], dtype=int64)
```

In [12]:

```
df1 = pd.DataFrame({'Real Values':y_test, 'Predicted Values':y_pred})
```

```
df1
```

Out[12]:

	Real Values	Predicted Values
0	0	0
1	0	0
2	1	1
3	1	1
4	1	0
...
116	1	1
117	0	0
118	1	1
119	1	1
120	1	1

121 rows × 2 columns

In [13]:

```
#df2 = df1.to_excel('C:\\Users\\kalede50\\OneDrive - Nielsen IQ\\Desktop\\Research Data\\Urban_MTEComm_Data\\Shampoo\\SEM\\Urban_Shampoo_MTEComm_SVMOut_Attitude.xlsx')
```

In [14]:

```
#y_pred_all = classifier.predict(X)
```

In [15]:

```
New_Classes_Attitudinal = classifier.predict(X)
```

```
df4 = df.assign(New_Clusters_Attitudinal = New_Classes_Attitudinal)
```

```
df4.head()
```

Out[15]:

	Shampoo Brand Run 6	Shampoo Brand Run 7	Shampoo Brand Run 8	Shampoo Max Run	Shampoo Tried Out Brands	cluster	New_Clusters_Attitudinal
	5	6	7	8	1	0	0
	0	0	0	2	3	1	1

	0	0	0	5	1	1	1	
	0	1	2	3	3	1	0	
	0	1	2	4	3	1	1	

5 rows × 82 columns

In [16]:

```
df4 = df4.to_excel('C:\\Users\\kalede50\\OneDrive - Nielsen IQ\\Desktop\\Research Data\\Urban_MTEComm_Data\\Shampoo\\SEM\\Urban_Shampoo_MTEComm_SVMOut_Atitude-Behaviour.xlsx', sheet_name = 'SVM_Shampoo_MTEComm')
```

In [17]:

```
from matplotlib.colors import ListedColormap

X_set, y_set = X_test, y_test

X1, X2 = np.meshgrid(np.arange(start = X_set[:, 0].min() - 1, stop = X_set[:, 0].max() + 1, step = 0.01),
                    np.arange(start = X_set[:, 1].min() - 1, stop = X_set[:, 1].max() + 1, step = 0.01))

plt.contourf(X1, X2, classifier.predict(np.array([X1.ravel(), X2.ravel()]).T).reshape(X1.shape),
            alpha = 0.75, cmap = ListedColormap(('red', 'green')))

plt.xlim(X1.min(), X1.max())
plt.ylim(X2.min(), X2.max())

for i, j in enumerate(np.unique(y_set)):
    plt.scatter(X_set[y_set == j, 0], X_set[y_set == j, 1],
                c = ListedColormap(('red', 'green'))(i), label = j)

plt.title('SVM Classification')
plt.xlabel('Age')
plt.ylabel('EstimatedSalary')
plt.legend()
plt.show()
```

- SVM works on Kernel. Kernels are of different types like, Linear, Polynomial, Radial Basis Function (RBF) etc. Kernels transfer low dimensional inputs into higher dimensions.

- Various parameters one need to provide as an input while running SVM algorithm. Please find details of key parameters below,

Gamma: It is used with nonlinear SVM like RBF. It indicates how far the influence of a single training example reaches, low value meaning far and high value meaning close.

C: It provides penalty for each wrong classification in training model. Higher the value of C lower is the possibility of misclassification in training model.

Break_Ties=True: Tie breaking mechanism applied when points are falling on the line. If it is false then all such points are classified as one class.

Cache_Size: Specifies the size of the kernel cache in MB.

Class_weight: Multipliers of parameters C in each class using Class_Weight.

Coef0: Is only significant in 'poly' and 'sigmoid' kernel.

Decision_Function_Shape: They are of two types, ovr – one vs. rest or ovo – one vs. one. Recommended and default is ovr. It maps input features with real value.

Degree: Specifically for Polynomial kernel.

Kernel: Linear, Polynomial, Sigmoid, Radial Basis Function (RBF) etc. Once can select as per the need. Different kernel gives different output so that it is necessary to try few before finalizing model.

Max_Iter: It allows to set maximum iteration limit. -1 indicates no limit on iterations. Process can stop after attaining optimal level.

Probability: One can enable probability by putting 'True'. If done, then process of fitting model will get slow down. As it uses 5-fold cross validation.

Random_State: Numeric number helps to pseudo random numbers. It helps to repeat process with same set of random numbers every time.

Shrinking: It is an independent term in kernel function. Significant in 'poly' and 'sigmoid'. If number of iterations are large, then shrinking can shorter the time.

Tol: Tolerance for stopping criterion default value is 0.001. It tells algorithm to stop searching for maximum or minimum once certain tolerances level is achieved.

Verbose: It is pre-process runtime setting. If set > 0 then process run slower.

- To decide about goodness of fit of the SVM below mentioned criteria are used. Here we have 3*3 confusion matrix. Which looks like this.

		Predicted		
		Loyal	Neutral	Disloyal
Actual	Loyal	TRUE	FALSE	FALSE
	Neutral	FALSE	TRUE	FALSE
	Disloyal	FALSE	FALSE	TRUE

		Behavioural		
		Loyal	Neutral	Disloyal
Attitudinal	Loyal	Strongly Loyal	Potential Loyal	Spurious Disloyalty
	Neutral	Potential Disloyal	Not Predictable	Weakly Disloyal
	Disloyal	Spurious Loyalty	Weakly Disloyal	Strongly Disloyal

Type	Description	Suggested Action
Strongly Loyal	Confirmed repeated buyers	Different flavors, packaging and advertisement for recall
Potential Loyal	Intend to buy given brand in their next purchase occasion. Not able to due to switching cost	Free samples, rate cuts, product bundling with free sample (two unrelated items sold together)
Spurious Disloyalty	Have intention to buy however lack of availability etc. do not allow them.	Manufacturers can increase distribution of their products in all small – big channels.
Potential Disloyal	Not intend to buy given brand in their next purchase occasion	Promotional offers , special shelf can help to attract them more
Not Predictable	Difficult to predict their buying behavior	Nothing to do extra. Regular marketing efforts need to continue.
Weakly Disloyal	Not really disloyal. Can be converted to loyal with little efforts.	Extra quantity, quality assurance , recall etc. can help.
Spurious Loyalty	Have no intention to buy however buy due to no choice	Compare product with other products and see if something can be done.
Strongly Disloyal	Not loyal from attitudinal and behavioural point.	It is as good as sourcing new

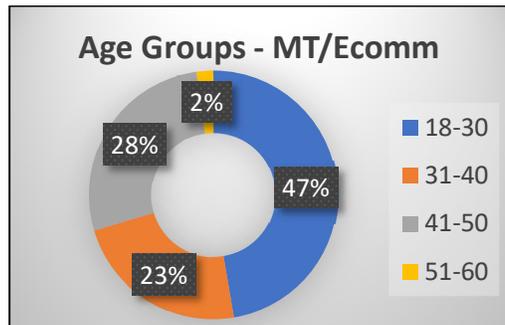
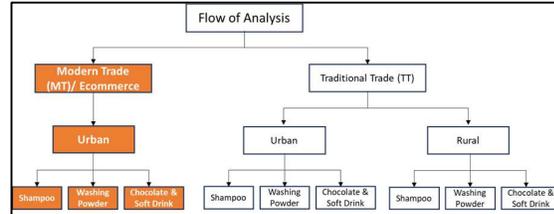
Accuracy = (Sum of All 'TRUE')/(Sum of All 'TRUE' + Sum of All 'False') : It indicates how accurately model can predict correct loyalty status of an individual buyer.

Precision = 'TRUE' / ('TRUE' + Sum of all 'FALSE' in a row) : It gives idea about quality of positive predictions. For eg. Out of all real 'Loyal' customers, how many are correctly predicted by model. Precision is a measure of quality.

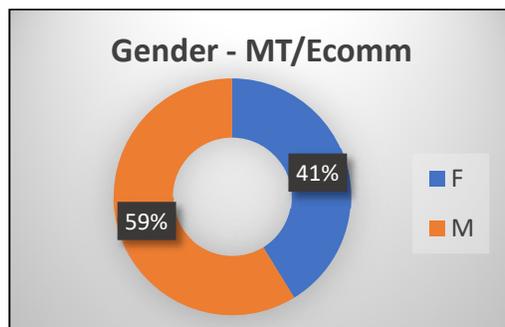
Recall = 'TRUE' / ('TRUE' + Sum of all 'FALSE' in a column) : It is a measure of quantity. Out of all predicted 'Loyal' buyers, how many are real 'Loyal' buyers.

Analysis and Interpretation:

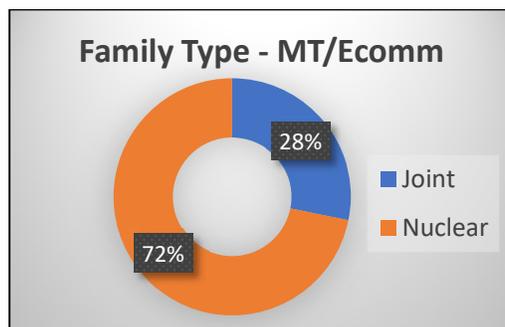
5.2 MODERN TRADE/ECOMMERCE - URBAN:



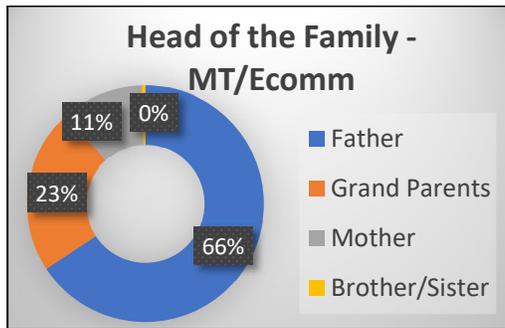
- Respondents are fairly distributed among different age groups.
- Respondents are less for the age group above 51 years as this group is mainly dealing with MT/Ecomm.



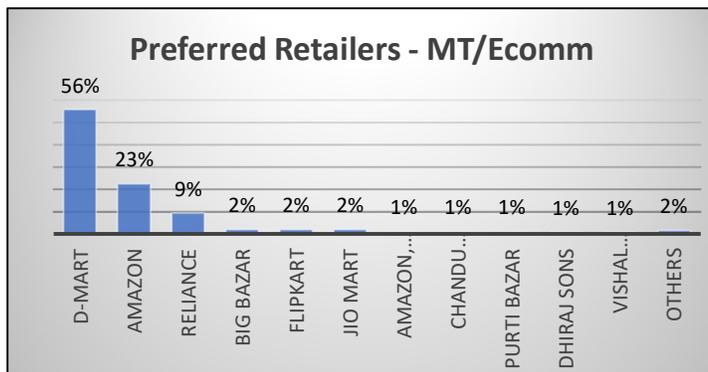
- Male respondents are relatively higher than Female respondents.
- Overall, it indicates changing scenario as males are getting more involved in FMCG buying than females.



- Proportion of Nuclear family is much higher than Joint which truly indicates current scenario of Urban area.

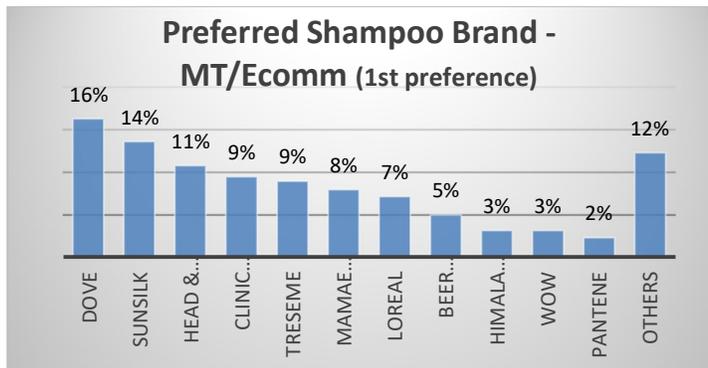


- Even in Urban areas decision making about FMCG products is still dominated by Fathers. This is very surprising.

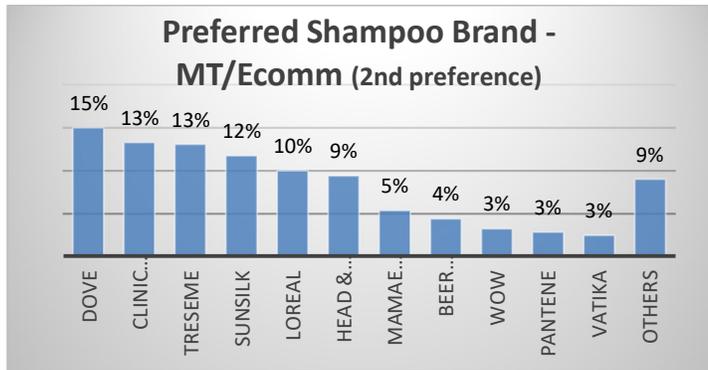


- In terms of retailer preference, D-Mart comes first followed by Amazon.
- Possible factors behind this is higher discounts and variety of products offered at one place.

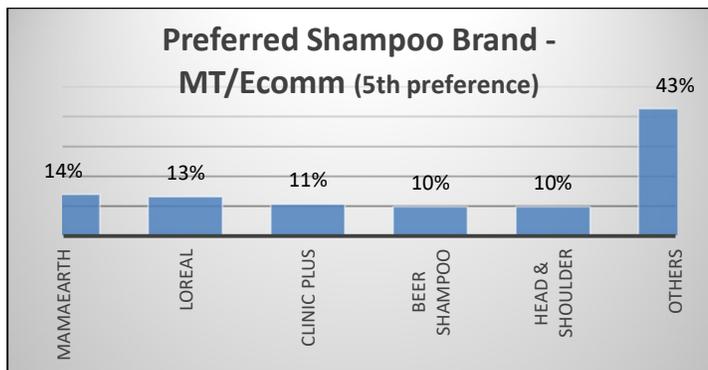
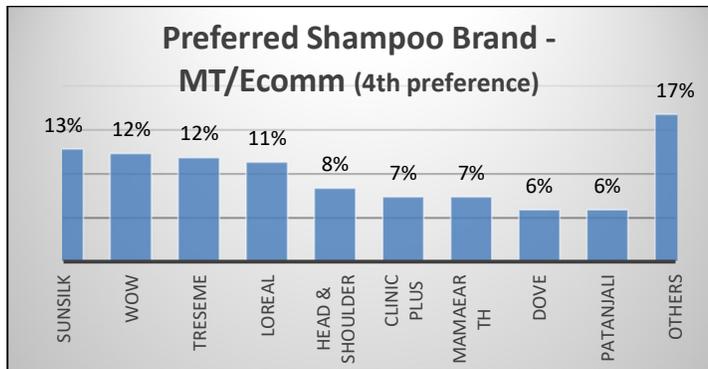
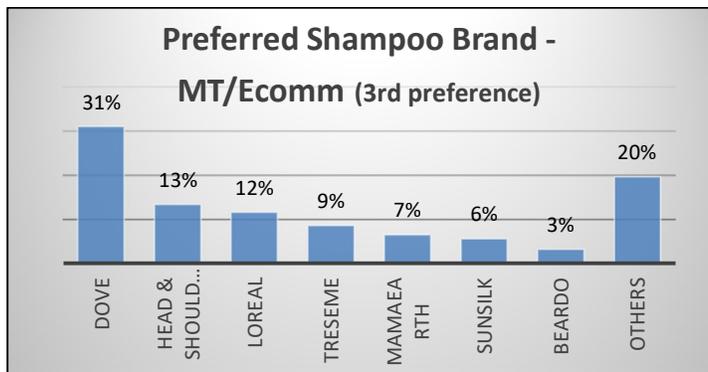
Shampoo - Preferred Brands:



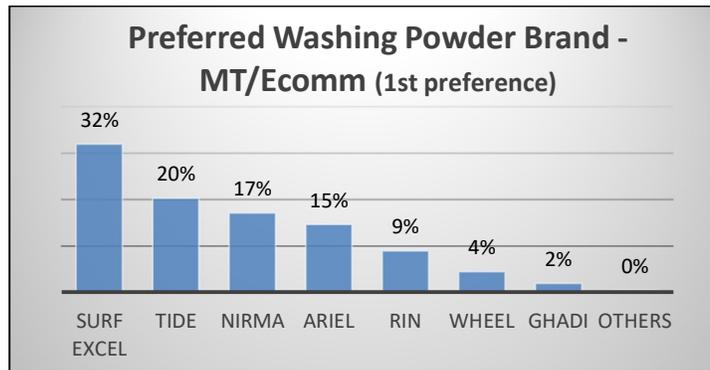
- Dove, Sunsilk, Head & Solder are most preferred brands.
- Though Dove is costly it is preferred most over other brands.



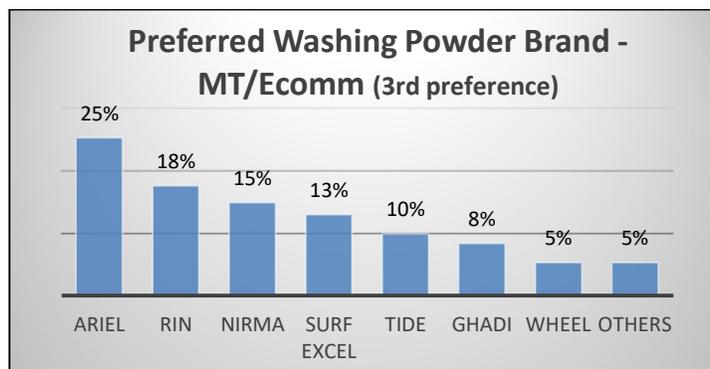
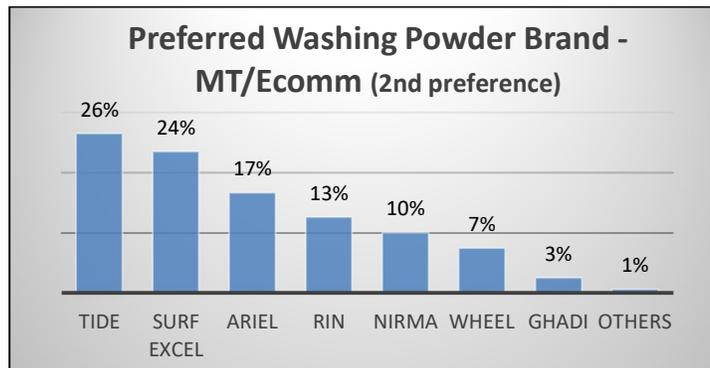
- Apart from international brands, some of the national brands like Patanjali also find place in people's preference.

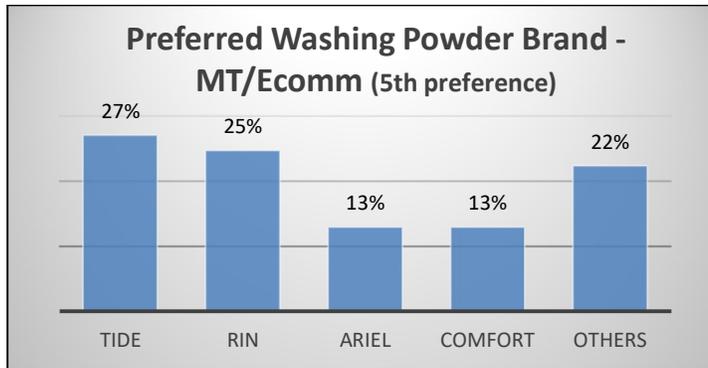
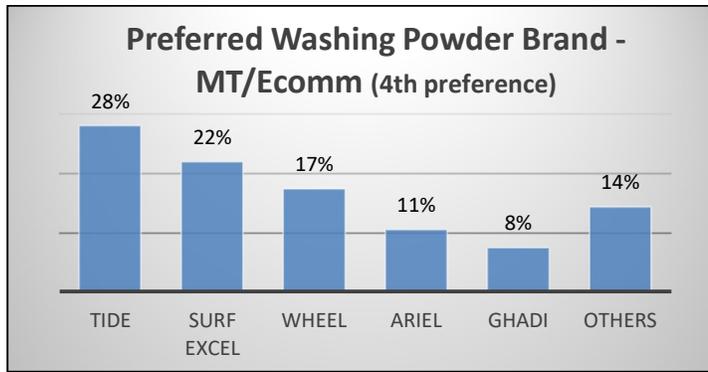


Washing Powder - Preferred Brands:

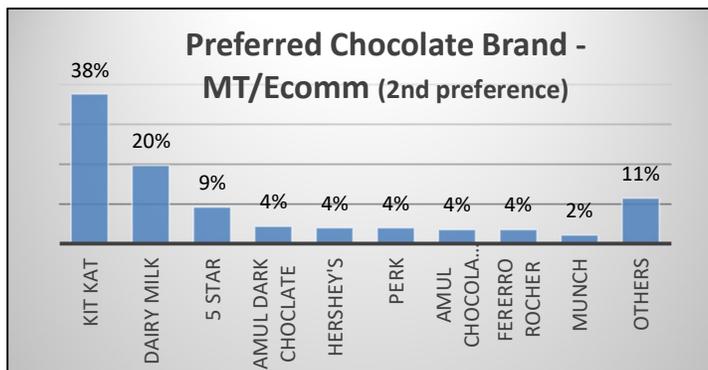
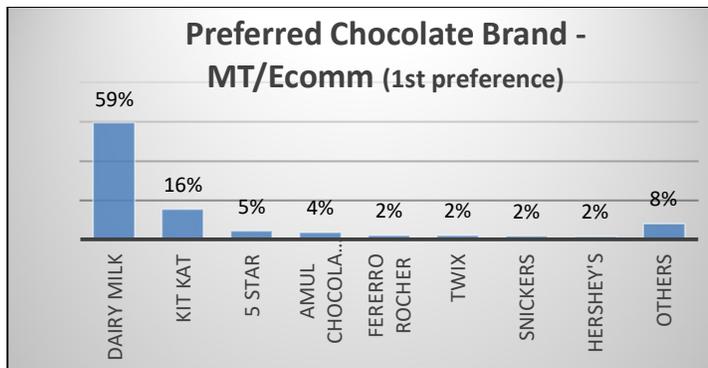


- Surf, Tide and Nirma are most preferred brands by respondents.
- Preference towards washing powder brands is skewed. People are less likely to try all different brands.





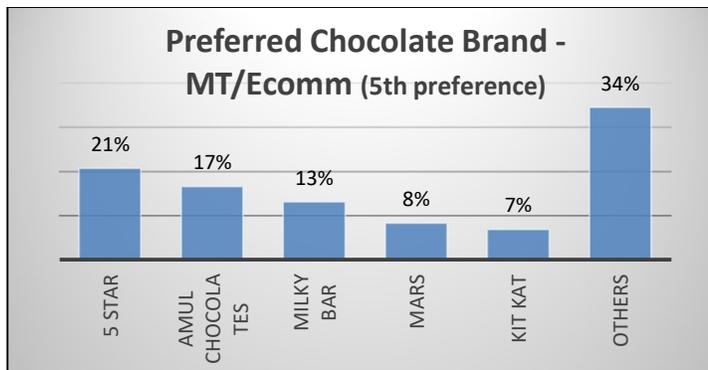
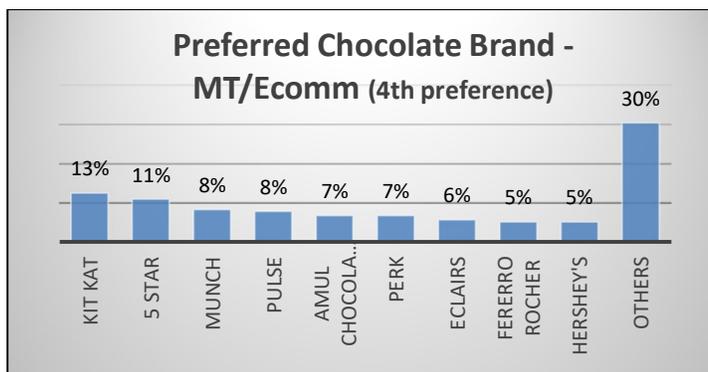
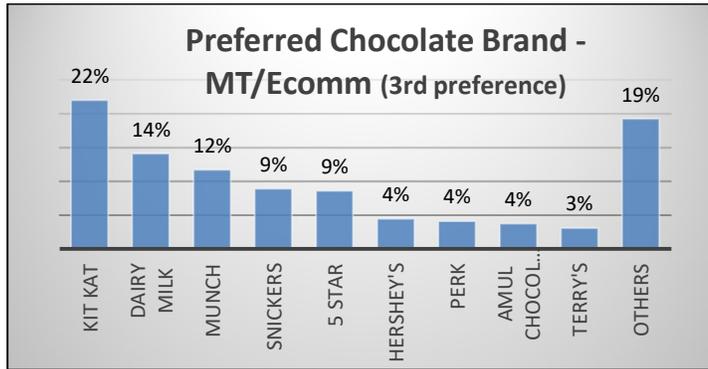
Chocolate – Preferred Brands:



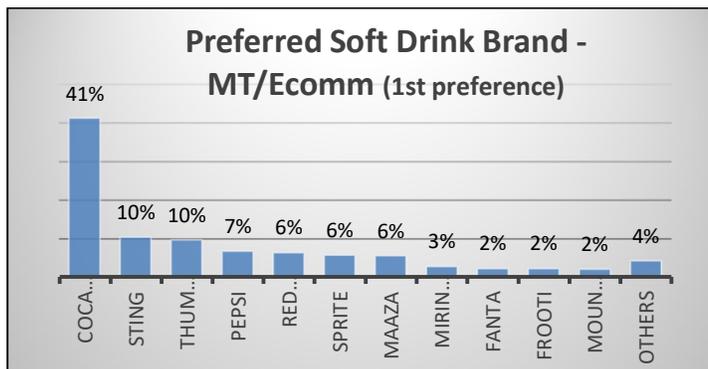
- Most preferred chocolate brands are Dairy Milk and Kit Kat.
- This also follows the Global trend.

- Even after presence of many international brands, local brands like Amul, Pulse have found

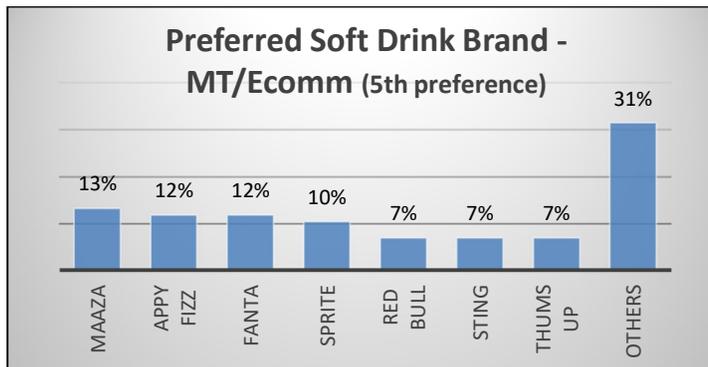
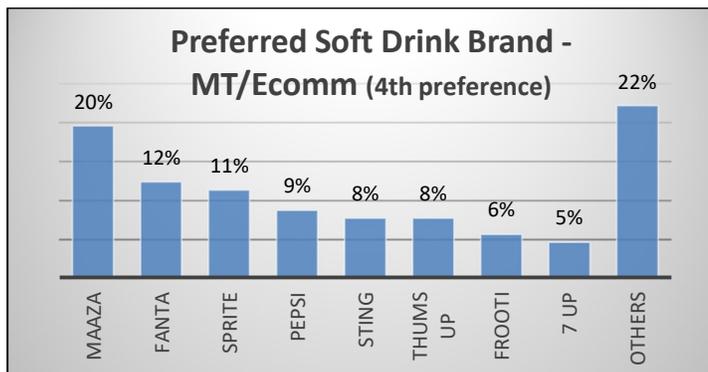
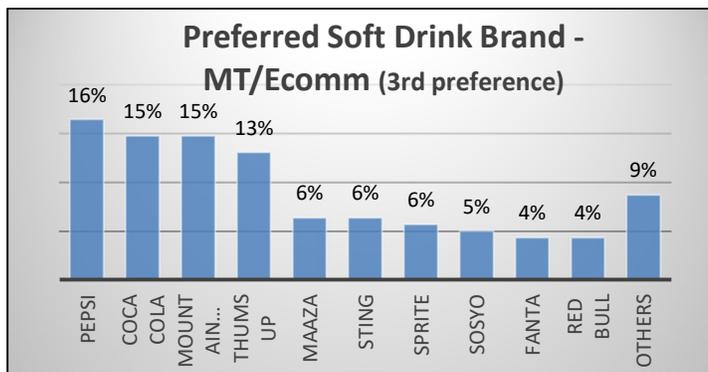
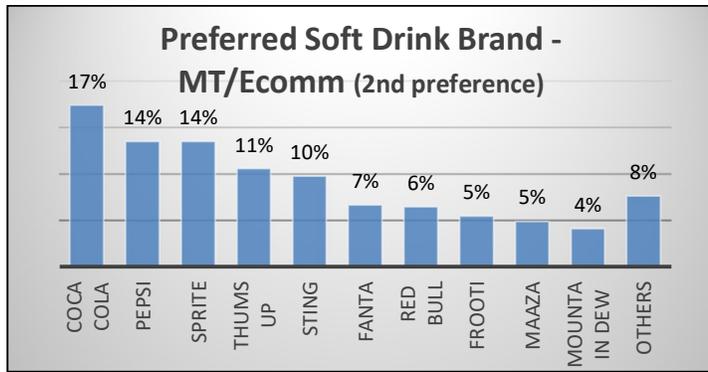
place in the industry.



Soft Drink- Preferred Brands:



- Coca Cola, Thums up, Pepsi are most preferred carbonated soft drinks brands.
- Indian consumers



are following the global trends.

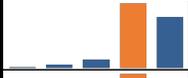
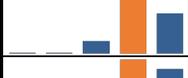
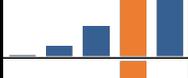
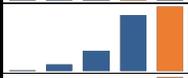
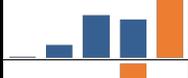
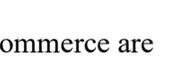
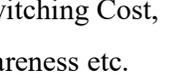
- Trend is also shifting from carbonated soft drinks to energy drinks like Sting, Red Bull etc.
- Also demand for sugar free drinks has increased.
- In many cases it is found that people are moving from carbonated drinks to plant-based drinks.

Below is the ‘Column Sparkline’ and ‘Descriptive Statistics’ summary of all 38 variables, where Urban – MT/Ecomm buyers have provided their inputs on various categories.

5.2.1 URBAN – MT/ECOMM - SHAMPOO: Summary of 38 variables under study

Table 5.1 Urban – MT/EComm – Column Sparkline

Sr. No.	Attribute	Code	Question	Category	MT/Ecomm				
					1	2	3	4	5
1	Brand Affect	BRAF1	After using my preferred brands, I get positive feeling.	Shampoo Brands					
2	Customer satisfaction	CUSA1	I am very satisfied with brands which I use so I repeat purchase.	Shampoo Brands					
3	Switching Cost	SWCO1	I do not switch to other brands as they are costly.	Shampoo Brands					
4	Brand Trust	BRTR1	I buy only those brands on which I have faith.	Shampoo Brands					
5	Relationship Proneness	REPR1	I have developed emotional relationship with the brands I purchase.	Shampoo Brands					
6	Involvement	INVO1	When I am involved in my favorite brands, I never look for other brands.	Shampoo Brands					
7	Perceived Value	PEVA1	The return I am getting on money spent on FMCG decides my product loyalty.	Shampoo Brands					
8	Availability	AVAI1	I never buy other brands if my favorite brands are not available.	Shampoo Brands					
9	Brand Relevance	BRRE1	My brands remains updated with change in technology and buyer's preferences.	Shampoo Brands					
10	Brand Performance	BRPE1	Brand performance really matters to me for loyalty towards it.	Shampoo Brands					
11	Culture	CULT1	I keep religious beliefs in center while selecting my brands.	Shampoo Brands					
12	Price Worthiness	PRWO1	My brands are economical.	Shampoo Brands					
13	Brand Equity	BREQ1	It is wise decision to purchases my brand even if other brands are same.	Shampoo Brands					
14	Brand Image	BRIM1	My brand delivers which it promises.	Shampoo Brands					
15	Accessibility	ACCE1	Without any recall efforts, I can remember my brands quickly.	Shampoo Brands					
16	Habit	HAB11	Buying preferred brand is now my habit.	Shampoo Brands					
17	Brand Reputation	BRRP1	I prefer to buy brands which are reputed among the larger group of buyers.	Shampoo Brands					
18	Brand Credibility	BRCR1	I prefer to buy brands which are more than 50 years old with good track record.	Shampoo Brands					
19	Emotional Value	EMVA1	I feel good when I use my favorite brands.	Shampoo Brands					

20	Functional Value	FUVA1	I like packaging and other features of my favorite brands.	Shampoo Brands	
21	Brand Attitude	BRAT2	In my next purchase I would like to buy these brands.	Shampoo Brands	
22	Centrality	CENT1	I prefer to buy brands which are matching with my value system.	Shampoo Brands	
23	Family Influence/Social Value	FASO1	My purchase decision always based on choice of family members.	Shampoo Brands	
24	Commitment	COMM1	If my favorite brand is not available in store, I don't purchase another brand.	Shampoo Brands	
25	Situational Factors	SIFA1	During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Shampoo Brands	
26	Discounts	DISC1	I never use to switch to other brand only because they offer discounts.	Shampoo Brands	
27	Advertising	ADVE1	Advertising of FMCG products help me to take buying decision.	Shampoo Brands	
28	Personal Selling	PESE1	Personal selling in super stores helps me to take right buying decision.	Shampoo Brands	
29	Comparing Product Features	COPF1	I must compare product features of various brands before buying the final one.	Shampoo Brands	
30	Assortment/Gift Pack/Bended Pack	GIPC1	I continue to buy same brand as gift/bended/assortment pack are available for it.	Shampoo Brands	
31	Product Placement	PRPL1	Due to product placement, I sometimes change my buying decision.	Shampoo Brands	
32	Brand Awareness	BRAW1	I recognize my favorite brands even by color of its packet.	Shampoo Brands	
33	Celebrity Influence	CLIF1	My purchase decision never changes based on the celebrity endorsement.	Shampoo Brands	
34	Repeat Purchase	REPU1	I like to try different FMCG brands every time.	Shampoo Brands	
35	Repeat Purchase	REPU3	My buying behavior towards favorite brands is never deviating in normal conditions.	Shampoo Brands	
36	Brand Market Share	BRMS1	I do consider brand's market share before buying it.	Shampoo Brands	
37	Clarity	CLAR1	I have complete clarity about my brands, so I do not prefer other brands.	Shampoo Brands	
38	Repeat Purchase	REPU2	I usually get board after buying same brand for some time.	Shampoo Brands	

Findings:

- In urban areas people who buy products from Modern Trade or Ecommerce are giving high weightage to Brand Affect, Consumer Satisfaction, Switching Cost, Brand Trust, Relationship Proneness, Emotional Value, Brand Awareness etc.
- All these factors indicate quality assurance, trust, value associated with product and overall satisfaction.

- These consumers are less prone to small changes in prices or offers.
- Spending more amount to buy high quality product is not a stopping factor for such consumers.

Table 5.2 Urban – MT/EComm – Descriptive Statistics

Questions	Que. Type	Que. Code	count	mean	std	min	25% (Q1)	50% (Q2)	75% (Q3)	max
After using my preferred brands, I get positive feeling.	Brand Affect	BRAF1	604	4.230132	0.866754	1	4	4	5	5
I am very satisfied with brands which I use so I repeat purchase.	Customer satisfaction	CUSA1	604	4.208609	0.895646	1	4	4	5	5
I do not switch to other brands as they are costly.	Switching Cost	SWCO1	604	3.150662	1.248076	1	2	3	4	5
I buy only those brands on which I have faith.	Brand Trust	BRTR1	604	4.003311	1.050936	1	4	4	5	5
I have developed emotional relationship with the brands I purchase.	Relationship Proneness	REPR1	604	3.031457	1.312273	1	2	3	4	5
When I am involved in my favorite brands, I never look for other brands.	Involvement	INVO1	604	3.342715	1.18871	1	2	3	4	5
The return I am getting on money spent on FMCG decides my product loyalty.	Perceived Value	PEVA1	599	3.654424	1.167756	1	3	4	5	5
I never buy other brands if my favorite brands are not available.	Availability	AVA1	599	2.856427	1.218347	1	2	3	4	5
My brands remains updated with change in technology and buyer's preferences.	Brand Relevance	BRRE1	599	3.729549	1.130444	1	3	4	5	5
Brand performance really matters to me for loyalty towards it.	Brand Performance	BRPE1	599	3.734558	1.254287	1	3	4	5	5
I keep religious beliefs in center while selecting my brands.	Culture	CULT1	599	2.320534	1.258056	1	1	2	3	5
My brands are economical.	Price Worthiness	PRWO1	599	3.652755	0.957083	1	3	4	4	5
It is wise decision to purchases my brand even if other brands are same.	Brand Equity	BREQ1	599	3.567613	1.070282	1	3	4	4	5
My brand delivers which it promises.	Brand Image	BRIM1	599	3.78798	1.05062	1	3	4	5	5
Without any recall efforts, I can remember my brands quickly.	Accessibility	ACCE1	599	4.041736	0.946704	1	4	4	5	5
Buying preferred brand is now my habit.	Habit	HABI1	599	3.789649	1.064395	1	3	4	5	5
I prefer to buy brands which are reputed among the larger group of buyers.	Brand Reputation	BRRP1	590	3.089831	1.300541	1	2	3	4	5
I prefer to buy brands which are more than 50 years old with good track record.	Brand Credibility	BRCR1	599	3.056761	1.251133	1	2	3	4	5
I feel good when I use my favorite brands.	Emotional Value	EMVA1	599	4.018364	1.088706	1	4	4	5	5
I like packaging and other features of my favorite brands.	Functional Value	FUVA1	599	3.961603	1.016681	1	4	4	5	5
In my next purchase I would like to buy these brands.	Brand Attitude	BRAT2	599	3.946578	0.936344	1	4	4	5	5
I prefer to buy brands which are matching with my value system.	Centrality	CENT1	599	3.69783	1.069732	1	3	4	5	5
My purchase decision always based on choice of family members.	Family Influence/Social Value	FASO1	599	3.09182	1.284035	1	2	3	4	5
If my favorite brand is not available in store, I don't purchase another brand.	Commitment	COMM1	599	2.931553	1.215971	1	2	3	4	5
During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Situational Factors	SIFA1	599	3.530885	1.277002	1	2	4	5	5

I never use to switch to other brand only because they offer discounts.	Discounts	DISC1	599	3.467446	1.282188	1	3	4	4	5
Advertising of FMCG products help me to take buying decision.	Advertising	ADVE1	599	3.639399	1.155263	1	3	4	5	5
Personal selling in super stores helps me to take right buying decision.	Personal Selling	PESE1	599	3.582638	1.097016	1	3	4	4	5
I must compare product features of various brands before buying the final one.	Comparing Product Features	COPF1	599	3.622705	1.191337	1	3	4	5	5
I continue to buy same brand as gift/bended/assortment pack are available for it.	Assortment/ Gift Pack/Bended Pack	GIPC1	599	3.42571	1.112745	1	3	3	4	5
Due to product placement, I sometimes change my buying decision.	Product Placement	PRPL1	599	3.402337	1.047402	1	3	4	4	5
I recognize my favorite brands even by color of its packet.	Brand Awareness	BRAW1	599	3.836394	1.110882	1	3	4	5	5
My purchase decision never changes based on the celebrity endorsement.	Celebrity Influence	CLIF1	599	3.682805	2.389964	1	3	3	5	33
I like to try different FMCG brands every time.	Repeat Purchase	REPU1	599	3.345576	1.064371	1	3	4	4	5
My buying behavior towards favorite brands is never deviating in normal conditions.	Repeat Purchase	REPU3	599	3.54591	1.021907	1	3	4	4	5
I do consider brand's market share before buying it.	Brand Market Share	BRMS1	599	3.088481	1.129056	1	2	3	4	5
I have complete clarity about my brands, so I do not prefer other brands.	Clarity	CLAR1	599	3.459098	1.066946	1	3	4	4	5
I usually get board after buying same brand for some time.	Repeat Purchase	REPU2	599	2.873122	1.158333	1	2	3	4	5

Findings:

- Most volatile responses are for ‘Celebrity Endorsement’. This could be because of different age groups involved in the survey.
- Discount, Family Influence and Situation Factors are also indicating higher volatility in responses. This may be because of varying family demographics and area demographics of respondents.

Below is the Model designing process including all 38 variables, where Urban – MT/Ecomm buyers have provided their inputs on various categories. Process will help to make final decisions to both Retailers and Manufacturers of FMCG products. They will make this decision by classifying buyers into Loyal, Disloyal and Neutral.

Urban – MT/Ecomm - Shampoo: Summary of 38 variables under study

Step 1: K-Means Clustering: to have primary classification of buyers into Brand Loyal, Brand Disloyal and Neutral. Whole analysis is based on unsupervised clustering approach, so not very reliable.

As an output we manage to generate an additional column in the data set where each of the individual respondent is assigned tag of Loyal, Disloyal and Neutral.

Cluster Tag	Category of Consumers	Count
0	Loyal Consumers	299 (50%)
1	Disloyal Consumers	264 (44%)
2	Neutral	41 (7%)
	Total	604

Findings:

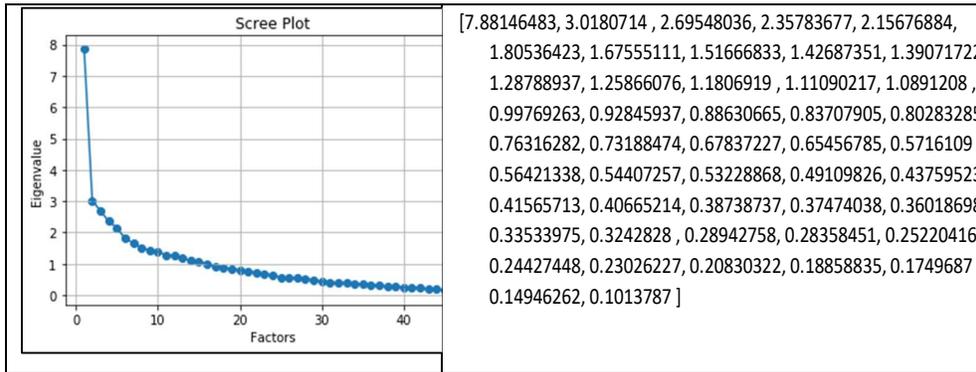
- Initial classification indicates that number of loyal consumers are about 50% and disloyal are 44%.
- Ratio of loyal and disloyal is very close so it requires to have robust model to get prior knowledge of consumers' loyalty. Otherwise, there is a high chance of wrong classification and interpretation.
- Another important information one can derive from the above table is, neutral consumers are only 7% so retailers and manufacturers can take a call to focus on this group or put more efforts on the other two groups.
- Important thing to note here is that, above numbers are not the final one to design final business strategies. They are only indicative of rough pattern available in the data.

Step 2: Correlation Matrix: to find out relation between all pairs of variables under study. Purpose is to eliminate those variables which are identical in nature and thus reducing duplication before fitting the model. Summary of outcomes is as follows.

Findings:

- Correlation values for each pair of variables in the study indicates no significant correlation as all values are less than 0.8.

uning. Eigen values are numeric values indicating the same. There are 15 potential factors to be considered for next round.



- Out of 15 factors derived, only those factors will be considered further where at least 3 variables are having factor loading >0.35 or <-0.35. Summary of factors is given in the table.
- To fine tune the output, Varimax rotation is applied on the eligible factors. Here there are total 13 factors where Varimax rotation applied. Total 50% of variance explained by 13 factors. However further useful factors are only 9 which approximately explains 40% of variance.

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
SS Loadings	2.731822	2.531999	2.491574	2.053491	2.020743	1.971142	1.927475	1.657667	1.519545	1.317999	1.311102	1.00292	0.937378
Proportion Variance	0.058124	0.053872	0.053012	0.043691	0.042995	0.041939	0.04101	0.03527	0.032331	0.028043	0.027896	0.021339	0.019944
Cumulative Variance	0.058124	0.111996	0.165008	0.2087	0.251694	0.293633	0.334644	0.369913	0.402244	0.430286	0.458182	0.479521	0.499465

- Factors defined based on the output are as below. This will become an input for Structural Equation Modeling.

AttitudinalBrandLoyalty= PEVA1 + BRPE1 + BRAT2 + BREQ1 + BRIM1 + ACCE1 + COPF1 + CLAR1
BehaviouralBrandLoyalty= - ShampooMaxRun + ShampooTriedOutBrands - Shampoo_Acceptable
SituationalLoyalty= SIFA1 + BRAW1 + REPU3
BrandSatisfaction= BRAF1 + CUSA1 + BRTR1
FamilyDemographics= FamilyType - TotalFamilyMember + HeadoftheFamily + FASO1
BrandCommitment= REPR1 + AVAI1 + CULT1 + COMM1 + BRTR1
FunctionalValue= BRRP1 + FUVA1 + CENT1 + COPF1
BrandReputation= BRRP1 + BRCR1 + FASO1
ImpactofPromotion= ADVE1 + PESE1 + DISC1

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	0.039	-0.098	0.023	-0.002	0.044	0.106	0.074	0.049	0.069	-0.015	0.015	0.008	0.026	-0.007	0.254
1	-0.039	0.163	0.103	0.031	-0.122	0.139	-0.074	-0.052	0.037	0.028	0.063	-0.045	0.469	0.108	-0.009
2	0.004	-0.072	0.076	-0.064	0.054	0.958	0.074	0.074	-0.037	0.085	-0.065	-0.091	0.041	0.017	0.062
3	-0.045	-0.004	-0.021	-0.117	-0.067	-0.692	-0.012	0.036	-0.085	0.031	0.041	-0.065	-0.086	-0.108	-0.103
4	0.216	-0.068	0.180	0.081	-0.053	0.542	-0.030	-0.161	-0.191	0.065	0.137	0.223	-0.006	-0.038	0.013
5	0.048	-0.059	0.679	0.077	0.046	0.078	0.066	0.066	-0.093	0.084	0.044	0.065	0.058	0.143	0.009
6	0.044	0.018	0.692	0.077	0.035	0.069	0.235	-0.052	0.107	0.129	-0.054	0.085	0.014	0.138	0.003
7	0.028	0.003	0.191	0.003	0.059	0.071	0.009	0.025	0.070	0.020	0.043	0.060	0.042	0.563	-0.009
8	0.174	-0.148	0.462	0.222	-0.082	0.078	-0.036	-0.078	0.061	0.082	-0.020	-0.161	0.342	-0.079	0.331
9	-0.102	-0.116	0.064	-0.087	-0.113	0.164	0.018	-0.038	0.459	0.068	0.150	-0.024	0.081	0.355	0.117
10	0.274	-0.195	0.304	0.246	0.014	0.019	0.148	0.197	0.266	-0.077	0.171	-0.030	-0.168	-0.033	0.104
11	0.170	0.059	0.258	0.591	0.121	0.109	0.188	0.158	0.037	0.053	0.138	0.071	-0.016	-0.175	0.046
12	0.131	-0.017	0.043	0.037	-0.029	0.022	0.010	0.252	0.589	0.241	0.083	0.158	-0.128	-0.090	0.019
13	0.254	0.040	0.116	0.219	0.380	-0.018	0.273	0.106	-0.031	-0.020	0.065	0.248	0.143	-0.164	-0.164
14	0.116	-0.106	0.069	0.486	0.172	-0.006	0.249	0.116	-0.091	0.000	0.095	0.041	0.335	-0.180	0.113
15	-0.149	0.008	-0.116	-0.110	0.013	-0.093	-0.117	0.030	0.344	-0.148	0.093	0.382	0.207	0.314	-0.186
16	0.248	-0.090	0.224	0.297	0.266	0.109	0.134	0.184	0.114	-0.201	0.109	0.099	0.081	0.039	-0.175
17	0.150	-0.020	0.169	0.022	0.092	0.062	0.626	0.109	-0.032	0.083	-0.113	0.026	0.016	-0.009	0.078
18	0.297	-0.059	0.170	0.204	0.055	-0.006	0.708	0.090	-0.107	0.106	0.021	0.184	-0.133	0.054	0.155
19	0.326	-0.127	0.263	0.181	0.069	0.029	0.346	0.435	0.003	0.138	0.018	-0.107	0.016	-0.038	-0.185
20	0.270	-0.079	0.403	0.054	-0.053	0.040	0.209	0.352	0.141	0.025	0.089	-0.139	-0.051	-0.035	0.080
21	-0.001	0.151	0.120	-0.030	0.048	0.001	0.223	-0.126	0.182	0.576	0.410	-0.054	0.100	-0.119	-0.080
22	-0.018	0.052	0.058	0.058	-0.051	-0.015	-0.025	-0.124	0.214	0.083	0.672	0.194	0.116	0.053	0.045
23	0.102	0.062	0.356	0.191	0.116	0.120	0.101	0.482	-0.028	0.076	0.075	0.179	0.144	-0.087	0.102
24	0.317	-0.047	0.262	0.110	-0.015	0.056	0.166	0.301	0.017	0.382	0.058	0.192	0.183	-0.117	0.056
25	0.154	0.017	0.230	0.465	0.130	0.048	0.179	0.111	0.027	0.118	-0.008	0.045	-0.076	0.003	0.422
26	0.102	-0.118	0.147	0.090	0.096	0.072	0.014	0.052	0.015	0.554	-0.014	0.121	-0.004	0.066	0.044
27	0.073	0.103	-0.024	-0.090	0.376	-0.039	-0.148	-0.006	0.007	0.045	0.477	-0.152	-0.060	0.104	-0.008
28	-0.006	-0.016	0.010	0.126	-0.020	-0.088	-0.078	-0.080	0.634	-0.037	0.045	0.021	0.052	0.084	0.060
29	0.428	0.024	0.009	0.061	0.265	-0.059	0.022	0.244	-0.296	0.021	-0.006	0.179	0.050	0.034	-0.014
30	0.335	0.014	0.158	0.054	0.170	-0.004	0.083	0.004	0.143	0.149	-0.297	0.391	0.064	-0.051	0.017
31	0.143	0.101	0.026	0.776	-0.023	0.034	-0.077	0.111	0.152	0.137	-0.200	0.188	0.032	0.148	-0.042
32	0.217	-0.074	0.036	0.270	-0.022	0.055	-0.006	0.186	0.075	0.092	0.046	0.373	-0.271	0.059	0.332
33	0.235	-0.035	-0.024	0.322	0.172	-0.013	0.349	0.232	-0.001	0.420	0.079	0.001	-0.161	0.050	0.016
34	0.071	-0.013	-0.085	0.158	0.146	-0.133	0.080	0.619	0.012	0.018	0.025	0.082	-0.108	0.083	0.105
35	0.002	0.014	0.124	0.062	0.612	0.060	0.023	0.048	-0.211	0.203	-0.075	-0.021	-0.123	0.084	-0.029
36	0.611	0.013	0.081	0.208	0.008	0.076	0.111	0.097	-0.060	0.259	-0.072	0.091	-0.037	0.039	-0.053
37	0.055	-0.019	0.025	0.089	0.015	0.052	0.063	0.037	0.020	0.054	0.039	0.263	-0.040	0.029	0.014
38	0.042	-0.114	0.073	0.070	0.627	0.136	0.121	-0.066	-0.008	-0.089	0.136	0.009	-0.210	-0.110	0.051
39	0.694	-0.134	-0.029	0.101	0.113	0.087	0.184	0.007	0.061	-0.030	-0.051	0.045	0.084	-0.020	0.143
40	0.109	-0.124	-0.095	0.024	0.572	0.041	0.051	0.181	-0.044	-0.084	0.081	0.084	0.287	0.026	0.258
41	0.602	-0.159	0.233	0.075	0.043	0.076	0.137	0.090	0.056	0.067	0.162	0.028	-0.161	-0.026	0.138
42	0.093	0.107	-0.090	0.054	0.506	-0.116	0.037	0.158	0.143	0.264	-0.120	0.043	0.010	0.107	-0.001
43	0.011	0.506	0.104	0.070	-0.042	-0.022	-0.134	0.016	-0.017	0.070	0.031	0.051	0.093	-0.229	0.013
44	0.160	-0.726	0.189	-0.006	-0.093	0.043	-0.012	0.065	0.084	0.146	-0.058	0.092	0.015	-0.174	0.110
45	-0.163	0.702	-0.240	0.065	0.133	-0.088	0.133	0.092	-0.016	-0.110	0.086	-0.194	0.165	0.208	-0.127
46	-0.016	0.904	0.050	-0.065	-0.164	-0.005	-0.037	-0.053	0.005	0.038	-0.010	0.082	-0.031	-0.088	-0.032

Code	0	1	2	3	4	5	6	7	8	9	10	11	12
0 Age Group	0.080	0.133	0.055	0.046	0.052	0.004	0.124	0.087	-0.012	0.037	0.021	0.019	-0.086
1 Gender	-0.002	-0.172	-0.037	-0.095	-0.081	0.116	0.146	0.102	0.018	-0.037	0.043	0.474	0.020
2 Family Type	-0.046	0.083	-0.006	0.094	-0.094	0.084	0.899	-0.011	0.076	0.046	-0.039	-0.064	-0.100
3 Total Family Mem	-0.136	0.001	-0.045	-0.072	-0.007	-0.022	-0.717	-0.144	0.023	0.028	0.059	-0.080	-0.044
4 Head of the Famil	0.102	0.076	0.213	-0.049	-0.030	0.169	0.567	-0.186	0.068	-0.165	0.132	-0.029	0.127
5 BRAF1	0.112	0.072	0.052	0.046	0.065	0.695	0.087	0.041	0.076	0.051	0.054	0.069	0.017
6 CUSA1	0.136	-0.001	0.064	0.002	0.251	0.701	0.059	0.131	0.135	-0.101	-0.026	0.014	0.034
7 SWCO1	-0.080	-0.044	0.007	0.128	0.024	0.275	0.115	0.290	-0.004	0.103	-0.059	0.023	0.130
8 BRTR1	0.320	0.205	0.179	-0.077	-0.035	0.378	0.089	0.068	0.065	-0.102	0.016	0.377	-0.297
9 REPR1	-0.095	0.106	-0.102	-0.071	0.006	0.101	0.178	0.596	0.055	0.002	0.110	0.060	0.010
10 INVO1	0.319	0.220	0.252	-0.007	0.198	0.238	0.001	0.212	-0.083	0.152	0.228	-0.154	-0.099
11 PEVA1	0.653	-0.044	0.142	0.088	0.229	0.171	0.092	-0.041	0.054	0.064	0.178	-0.004	0.001
12 AVAI1	0.164	0.055	0.172	-0.091	0.032	-0.004	-0.027	0.417	0.276	0.169	0.199	-0.131	0.082
13 BRRE1	0.263	-0.035	0.260	0.315	0.311	0.075	-0.045	-0.162	0.013	0.017	0.129	0.108	0.286
14 BRPE1	0.537	0.123	0.086	0.169	0.270	-0.017	-0.005	-0.152	-0.008	0.052	0.103	0.352	0.019
15 CULT1	-0.140	-0.037	-0.099	0.011	-0.144	-0.032	-0.094	0.413	-0.103	0.057	0.073	0.131	0.559
16 PRWO1	0.280	0.070	0.223	0.239	0.196	0.197	0.078	0.066	-0.173	0.134	0.127	0.075	0.179
17 BREO1	0.070	0.035	0.148	0.062	0.633	0.148	0.067	-0.038	0.079	0.048	-0.087	0.011	-0.015
18 BRIM1	0.257	0.068	0.287	0.067	0.643	0.161	0.034	-0.063	0.100	0.071	-0.010	-0.145	0.048
19 ACCE1	0.165	0.109	0.269	0.056	0.438	0.222	-0.007	-0.059	0.126	0.350	0.075	0.049	-0.047
20 HABI1	0.132	0.113	0.247	-0.074	0.273	0.343	0.021	0.093	0.019	0.293	0.170	-0.008	-0.203
21 BRRP1	-0.018	-0.151	-0.029	0.040	0.253	0.055	-0.021	0.110	0.573	-0.201	0.473	0.100	-0.075
22 BRCR1	0.105	-0.049	-0.018	-0.010	-0.041	0.048	0.003	0.227	0.081	0.110	0.627	0.071	0.146
23 EMVA1	0.315	-0.018	0.139	0.077	0.129	0.317	0.116	-0.089	0.110	0.402	0.149	0.141	0.079
24 FUA11	0.210	0.083	0.340	-0.049	0.196	0.212	0.056	-0.063	0.408	0.242	0.145	0.176	0.072
25 BRAT2	0.569	0.029	0.166	0.139	0.155	0.181	0.086	0.065	0.113	0.200	-0.033	-0.063	-0.162
26 CENT1	0.099	0.119	0.109	0.101	0.043	0.150	0.086	0.037	0.550	0.050	-0.009	-0.018	0.040
27 FASO1	-0.132	-0.123	0.029	0.431	-0.123	-0.004	-0.028	0.062	-0.001	0.026	0.431	-0.055	-0.116
28 COMM1	0.177	0.026	0.028	-0.043	-0.097	-0.018	-0.123	0.600	-0.010	-0.010	0.078	0.033	0.033
29 SIFA1	0.061	-0.027	0.427	0.279	0.056	0.042	-0.030	-0.279	0.021	0.253	-0.018	0.033	0.149
30 DISC1	0.177	0.026	0.403	0.090	0.069	0.141	-0.009	0.047	0.213	-0.037	-0.205	0.015	0.273
31 ADVE1	0.651	-0.124	0.137	-0.013	-0.012	0.031	0.033	0.159	0.021	0.127	-0.203	0.024	0.184
32 PESE1	0.384	0.114	0.255	-0.016	-0.027	0.038	0.101	0.105	0.121	0.189	0.027	-0.296	0.132
33 COPF1	0.289	0.012	0.185	0.193	0.402	-0.031	-0.005	0.016	0.383	0.216	0.051	-0.156	-0.037
34 GIPC1	0.195	0.018	0.069	0.155	0.114	-0.060	-0.118	0.032	0.029	0.627	0.024	-0.114	0.057
35 PRPL1	0.037	-0.030	-0.009	0.626	0.049	0.165	0.064	-0.174	0.195	0.051	-0.118	-0.113	-0.017
36 BRAW1	0.188	-0.020	0.565	0.017	0.173	0.078	0.084	0.243	0.078	0.099	-0.059	-0.040	0.034
37 CLIF1	0.128	0.023	0.078	0.003	0.044	0.036	0.066	0.017	0.078	0.030	0.030	-0.083	0.215
38 REPU1	0.124	0.126	0.040	0.589	0.126	0.046	0.118	-0.069	-0.083	-0.107	0.141	-0.205	-0.018
39 REPU3	0.137	0.152	0.699	0.115	0.211	-0.068	0.102	0.052	-0.038	-0.059	-0.031	0.075	-0.039
40 BRMS1	0.103	0.146	0.130	0.558	0.044	-0.078	0.067	-0.009	-0.070	0.159	0.061	0.232	0.061
41 CLAR1	0.138	0.184	0.589	0.047	0.177	0.191	0.089	0.038	0.051	0.070	0.198	-0.163	-0.113
42 REPU2	0.068	-0.115	0.111	0.495	0.056	-0.064	-0.124	0.147	0.281	0.147	-0.122	-0.001	0.064
43 Shampoo Max Ru	0.158	-0.458	0.047	-0.095	-0.147	0.055	-0.039	-0.137	0.101	-0.033	0.112	0.098	-0.023
44 Shampoo Tried O	0.081	0.773	0.169	-0.123	0.012	0.115	0.031	-0.004	0.170	0.022	0.020	0.015	-0.006
45 Shampoo_Accept	-0.048	-0.760	-0.195	0.175	0.134	-0.172	-0.084	0.084	-0.145	0.126	0.006	0.178	-0.028
46 cluster	0.003	-0.846	0.025	-0.209	-0.075	0.048	-0.012	-0.060	0.066	-0.075	0.045	-0.033	0.020

Step 4: Structural Equation Modeling (SEM): is used to fit the model which depicts the relationship between measured variable and latent variables. Output of this process will become input for Support Vector Machine which will help further to have classification of consumers into loyal, disloyal, and neutral in terms of brand loyalty of FMCG products.

- Initially proposed model:

measurement model

AttitudinalBrandLoyalty =~ PEVA1 + BRPE1 + BRAT2 + BREQ1 + BRIM1 + ACCE1 + COPF1 + CLAR1

BehaviouralBrandLoyalty =~ -ShampooMaxRun + ShampooTriedOutBrands - Shampoo_Acceptable

SituationalLoyalty =~ SIFA1 + BRAW1 + REPU3

BrandSatisfaction =~ BRAF1 + CUSA1 + BRTR1

FamilyDemographics =~ FamilyType - TotalFamilyMember +HeadoftheFamily

BrandCommitment =~ REPR1 + AVAI1 + CULT1 + COMM1 + BRTR1

FunctionalValue =~ BRRP1 + FUVA1 + CENT1 + COPF1

BrandReputation =~ BRRP1 + BRCR1 + FASO1

ImpactofPromotion =~ ADVE1 + PESE1 + DISC1

regressions

BrandLoyalty ~ AttitudinalBrandLoyalty + BehaviouralBrandLoyalty + SituationalLoyalty +

BrandSatisfaction + FamilyDemographics + BrandCommitment + FunctionalValue + BrandReputation

+ ImpactofPromotion

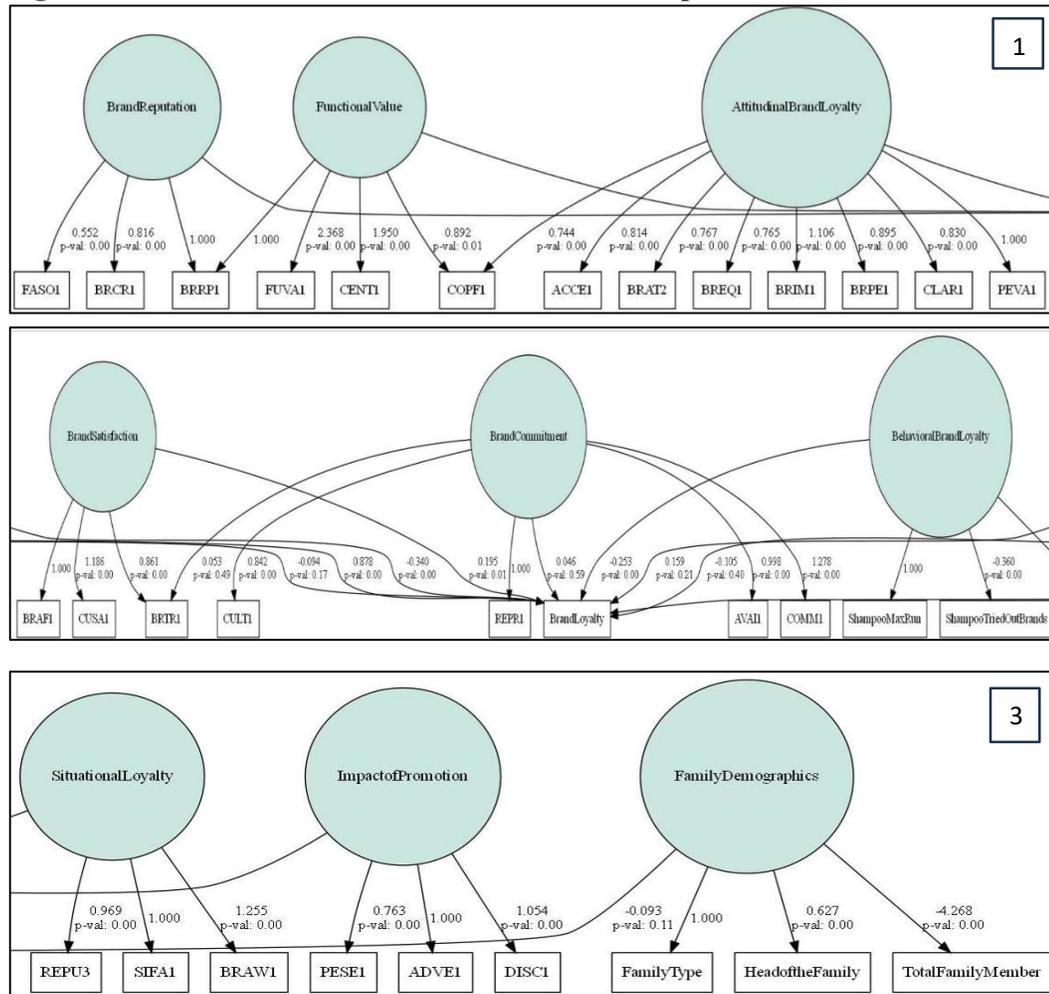
- Initial reliability indicators:

	DoF	DoF Baseline	chi2	chi2 p- value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	448.00	528.00	2916.88	0.00	7712.54	0.66	0.62	0.55	0.62	0.59	0.10	216.34	713.95	4.83

As most of the quality indicators like CFI, GFI, NFI are low. Whole process is repeated after eliminating not impacting variables.

- Initial model is as below:

Figure 5.2 Initial model Urban – MT/Ecomm - Shampoo



Attributes which are Statistically insignificant are removed from the further model building process.

- New model proposed based on the previous model’s output:

measurement model

$$\text{AttitudinalBrandLoyalty} \approx \text{PEVA1} + \text{BRPE1} + \text{BRAT2} + \text{BREQ1} + \text{BRIM1} + \text{ACCE1} + \text{COPF1} + \text{CLAR1}$$

$$\text{BehaviouralBrandLoyalty} \approx \text{ShampooMaxRun} + \text{ShampooTriedOutBrands} + \text{Shampoo_Acceptable}$$

$$\text{FunctionalValue} \approx \text{BRRP1} + \text{FUVA1} + \text{CENT1} + \text{COPF1}$$

$$\text{BrandSatisfaction} \approx \text{BRAF1} + \text{CUSA1} + \text{BRTR1}$$

regressions

BrandLoyalty ~ FunctionalValue + BehaviouralBrandLoyalty + BrandSatisfaction + AttitudinalBrandLoyalty

Using above equations entire process run again to check if values have improved further and model has become useful.

	lval	op	rval	Estimate	Std. Err	z-value	p-value
0	PEVA1	~	AttitudinalBrandLoyalty	1.00	-	-	-
1	BRPE1	~	AttitudinalBrandLoyalty	0.90	0.09	10.17	0.00
2	BRAT2	~	AttitudinalBrandLoyalty	0.78	0.07	11.37	0.00
3	BREQ1	~	AttitudinalBrandLoyalty	0.84	0.08	10.87	0.00
4	BRIM1	~	AttitudinalBrandLoyalty	1.16	0.08	13.71	0.00
5	ACCE1	~	AttitudinalBrandLoyalty	0.83	0.07	11.82	0.00
6	COPF1	~	AttitudinalBrandLoyalty	0.87	0.12	7.26	0.00
7	COPF1	~	FunctionalValue	0.27	0.15	1.78	0.07
8	CLAR1	~	AttitudinalBrandLoyalty	0.80	0.08	10.50	0.00
9	ShampooMaxRun	~	BehavioralBrandLoyalty	1.00	-	-	-
10	ShampooTriedOutBrands	~	BehavioralBrandLoyalty	0.35	0.02	21.33	0.00
11	Shampoo_Acceptable	~	BehavioralBrandLoyalty	0.18	0.03	6.59	0.00
12	BRRP1	~	FunctionalValue	1.00	-	-	-
13	FUVA1	~	FunctionalValue	1.40	0.17	8.11	0.00
14	CENT1	~	FunctionalValue	1.04	0.14	7.41	0.00
15	BRAF1	~	BrandSatisfaction	1.00	-	-	-
16	CUSA1	~	BrandSatisfaction	1.15	0.09	12.13	0.00
17	BRTR1	~	BrandSatisfaction	0.86	0.09	9.79	0.00
18	BrandLoyalty	~	FunctionalValue	0.32	0.09	3.51	0.00
19	BrandLoyalty	~	BehavioralBrandLoyalty	0.22	0.01	17.17	0.00
20	BrandLoyalty	~	BrandSatisfaction	0.15	0.05	2.80	0.01
21	BrandLoyalty	~	AttitudinalBrandLoyalty	0.22	0.06	3.81	0.00
22	BehavioralBrandLoyalty	~~	BehavioralBrandLoyalty	4.09	0.31	13.33	0.00
23	BehavioralBrandLoyalty	~~	BrandSatisfaction	0.31	0.06	4.81	0.00
24	BehavioralBrandLoyalty	~~	FunctionalValue	0.31	0.07	4.58	0.00
25	BehavioralBrandLoyalty	~~	AttitudinalBrandLoyalty	0.32	0.07	4.48	0.00
26	BrandSatisfaction	~~	BrandSatisfaction	0.36	0.04	8.00	0.00
27	BrandSatisfaction	~~	FunctionalValue	0.16	0.03	5.92	0.00
28	BrandSatisfaction	~~	AttitudinalBrandLoyalty	0.22	0.03	7.53	0.00
29	FunctionalValue	~~	FunctionalValue	0.28	0.06	4.52	0.00
30	FunctionalValue	~~	AttitudinalBrandLoyalty	0.25	0.04	6.63	0.00
31	AttitudinalBrandLoyalty	~~	AttitudinalBrandLoyalty	0.48	0.06	7.46	0.00
32	CENT1	~~	CENT1	0.83	0.06	14.87	0.00
33	FUVA1	~~	FUVA1	0.47	0.05	8.83	0.00
34	CUSA1	~~	CUSA1	0.33	0.04	8.52	0.00
35	Shampoo_Acceptable	~~	Shampoo_Acceptable	1.61	0.09	17.21	0.00
36	BRTR1	~~	BRTR1	0.84	0.05	15.53	0.00
37	BREQ1	~~	BREQ1	0.80	0.05	15.98	0.00
38	BRRP1	~~	BRRP1	1.36	0.09	16.00	0.00
39	BRAT2	~~	BRAT2	0.58	0.04	15.71	0.00
40	BRIM1	~~	BRIM1	0.45	0.04	12.65	0.00
41	PEVA1	~~	PEVA1	0.87	0.06	15.55	0.00
42	ShampooTriedOutBrands	~~	ShampooTriedOutBrands	0.28	0.02	11.75	0.00
43	COPF1	~~	COPF1	0.90	0.06	15.72	0.00
44	BRAF1	~~	BRAF1	0.39	0.03	11.41	0.00
45	CLAR1	~~	CLAR1	0.82	0.05	16.14	0.00
46	BrandLoyalty	~~	BrandLoyalty	0.18	0.01	12.95	0.00
47	ShampooMaxRun	~~	ShampooMaxRun	0.72	0.14	4.94	0.00
48	ACCE1	~~	ACCE1	0.56	0.04	15.41	0.00
49	BRPE1	~~	BRPE1	1.17	0.07	16.27	0.00

All p values are less than 0.05 which indicates significant impact of study variables on the latent variables.

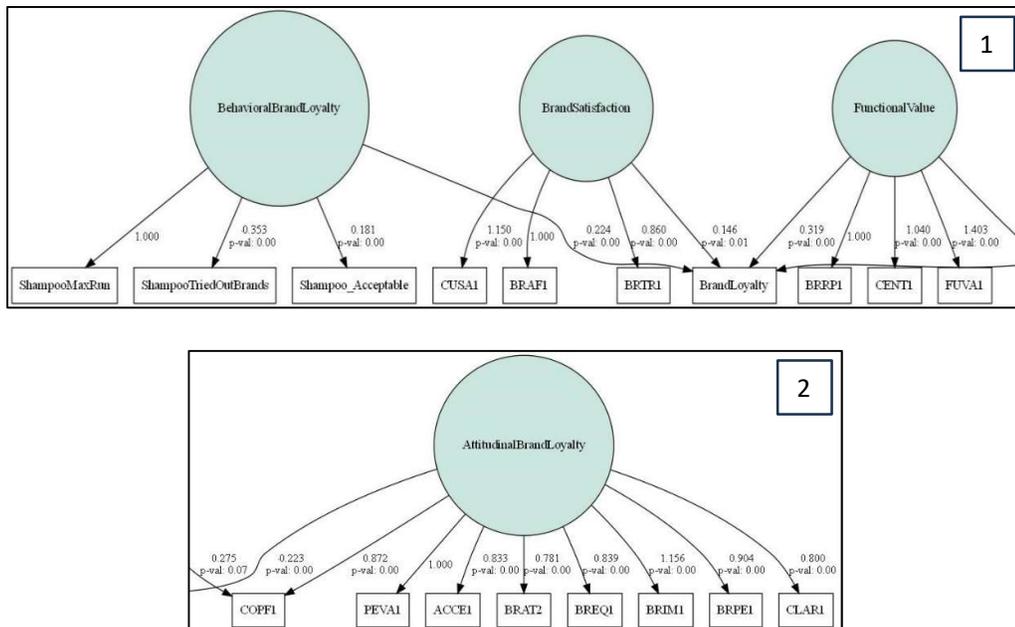
- Revised reliability indicators:

	DoF	DoF Baseline	chi2	chi2 p- value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	448.00	528.00	2916.88	0.00	7712.54	0.66	0.62	0.55	0.62	0.59	0.10	216.34	713.95	4.83

Findings: All reliability indicators are showing improvement compared to first round of fit. P value is zero and CFI, GFI, NFI are above 60%. Also, RMSEA is within tolerance limit, i.e. 0.10. Overall model is good and can be accepted for further decision-making process.

- Revised model is as below:

Figure 5.3 Final model Urban – MT/Ecomm - Shampoo



Findings:

- Behavioural loyalty, Brand Satisfaction, Functional Value and Attitudinal Loyalty are the key factors emerged from the analysis.
- Customer Satisfaction and Brand Trust is something which is more important for the buyers.
- Functional value also plays a key role while making buying decision for Shampoo.

- Attitudinal factor is driven by many other factors however most important are Brand Reputation and Brand Image.

Step 5: Classifying consumers using the concept of Machine Learning – Support Vector Machine (SVM). It is useful to classify FMCG consumers in the category of Brand Loyal, Neutral and Brand Disloyal. This concept is extraordinarily strong concept in Machine Learning. Speed of fitting the model and overall accuracy is the best among all the Machine Learning of same type.

SVM – Attitudinal:

- Variables considered for building model are based on the outcome of SEM which are as below.

BRAF1 - Brand Affect

CUSA1 - Customer satisfaction

BRTR1 - Brand Trust

PEVA1 - Perceived Value

BRPE1 - Brand Performance

BREQ1 - Brand Equity

BRIM1 - Brand Image

ACCE1 - Accessibility

BRRP1 - Brand Reputation

FUVA1 - Functional Value

BRAT2 - Brand Attitude

CENT1 - Centrality

COPF1 - Comparing Product Features

CLAR1 - Clarity

classifier = SVC(kernel = 'rbf', random_state = 2, gamma=3, C=1, break_ties = True)

```
SVC(C=1, break_ties=True, cache_size=200, class_weight=None, coef0=0.0,
decision_function_shape='ovr', degree=3, gamma=3, kernel='rbf', max_iter=-1,
probability=False, random_state=2, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.6115702479338843

Accuracy is average for attitudinal variables.

```
array([[43, 13, 0],
       [31, 31, 0],
       [ 2,  1, 0]])
```

SVM – Behavioural:

- Variables considered for building model are based on the outcome of SEM which are as below.

Shampoo_Acceptable – Buyer may prefer more than one brand of same category. Count of acceptable brands of given individual directly affects his/her loyalty towards product.

Shampoo Max Run – Measure of how many times buyer buys same brand consecutively.

Shampoo Tried Out Brands – It counts how many different brands that buyer has tried out in last 8 periods.

```
classifier = SVC(kernel = 'rbf', random_state = 2, gamma=4, C=1, break_ties = True)
```

```
SVC(C=1, break_ties=True, cache_size=200, class_weight=None, coef0=0.0,
decision_function_shape='ovr', degree=3, gamma=4, kernel='rbf', max_iter=-1,
probability=False, random_state=2, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.8842975206611571

```
array([[53, 11, 0],
       [ 3, 49, 0],
       [ 0,  0, 5]])
```

SVM – Attitudinal and Behavioural

Decision matrix obtained based on above two results is as below.

Table 5.3 SVM Classification of Buyers as per Behavioural and Attitudinal Variables

		Behavioral		
		Loyal	Neutral	Disloyal
Attitudinal	Loyal	Strongly Loyal	Potential Loyal	Spurious Disloyalty
		220	31	119
	Neutral	Potential Disloyal	Not predictable	Weakly Disloyal
		0	0	0
	Disloyal	Spurious Loyalty	Weakly Disloyal	Strongly Disloyal
		68	11	155

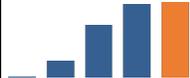
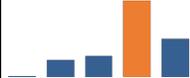
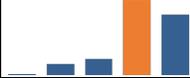
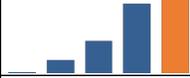
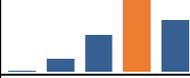
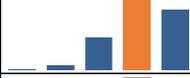
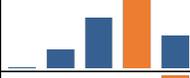
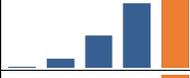
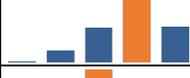
Findings:

Based on shift in the above matrix, manufacturers and retailers can design their strategy.

5.2.2 URBAN – MT/EComm – WASHING POWDER: Summary of 38 variables

Table 5.4 Urban – MT/EComm – Washing Powder– Column Sparkline

Sr. No.	Attribute	Code	Question	Category	MT/Ecomm				
					1	2	3	4	5
1	Brand Affect	BRAF1	After using my preferred brands, I get positive feeling.	Washing Powder brand					
2	Customer satisfaction	CUSA1	I am very satisfied with brands which I use so I repeat purchase.	Washing Powder brand					
3	Switching Cost	SWCO1	I do not switch to other brands as they are costly.	Washing Powder brand					
4	Brand Trust	BTR1	I buy only those brands on which I have faith.	Washing Powder brand					
5	Relationship Proneness	REPR1	I have developed emotional relationship with the brands I purchase.	Washing Powder brand					
6	Involvement	INVO1	When I am involved in my favorite brands, I never look for other brands.	Washing Powder brand					
7	Perceived Value	PEVA1	The return I am getting on money spent on FMCG decides my product loyalty.	Washing Powder brand					
8	Availability	AVAI1	I never buy other brands if my favorite brands are not available.	Washing Powder brand					
9	Brand Relevance	BRRE1	My brands remains updated with change in technology and buyer's preferences.	Washing Powder brand					
10	Brand Performance	BRPE1	Brand performance really matters to me for loyalty towards it.	Washing Powder brand					
11	Culture	CULT1	I keep religious beliefs in center while selecting my brands.	Washing Powder brand					
12	Price Worthiness	PRWO1	My brands are economical.	Washing Powder brand					
13	Brand Equity	BREQ1	It is wise decision to purchases my brand even if other brands are same.	Washing Powder brand					
14	Brand Image	BRIM1	My brand delivers which it promises.	Washing Powder brand					
15	Accessibility	ACCE1	Without any recall efforts, I can remember my brands quickly.	Washing Powder brand					
16	Habit	HABI1	Buying preferred brand is now my habit.	Washing Powder brand					
17	Brand Reputation	BRRP1	I prefer to buy brands which are reputed among the larger group of buyers.	Washing Powder brand					
18	Brand Credibility	BRCR1	I prefer to buy brands which are more than 50 years old with good track record.	Washing Powder brand					
19	Emotional Value	EMVA1	I feel good when I use my favorite brands.	Washing Powder brand					

20	Functional Value	FUVA1	I like packaging and other features of my favorite brands.	Washing Powder brand	
21	Brand Attitude	BRAT2	In my next purchase I would like to buy these brands.	Washing Powder brand	
22	Centrality	CENT1	I prefer to buy brands which are matching with my value system.	Washing Powder brand	
23	Family Influence/Social Value	FASO1	My purchase decision always based on choice of family members.	Washing Powder brand	
24	Commitment	COMM1	If my favorite brand is not available in store, I don't purchase another brand.	Washing Powder brand	
25	Situational Factors	SIFA1	During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Washing Powder brand	
26	Discounts	DISC1	I never use to switch to other brand only because they offer discounts.	Washing Powder brand	
27	Advertising	ADVE1	Advertising of FMCG products help me to take buying decision.	Washing Powder brand	
28	Personal Selling	PESE1	Personal selling in super stores helps me to take right buying decision.	Washing Powder brand	
29	Comparing Product Features	COPF1	I must compare product features of various brands before buying the final one.	Washing Powder brand	
30	Assortment/Gift Pack/Banded	GIPC1	I continue to buy same brand as gift/banded/assortment pack are available for it.	Washing Powder brand	
31	Product Placement	PRPL1	Due to product placement, I sometimes change my buying decision.	Washing Powder brand	
32	Brand Awareness	BRAW1	I recognize my favorite brands even by color of its packet.	Washing Powder brand	
33	Celebrity Influence	CLIF1	My purchase decision never changes based on the celebrity endorsement.	Washing Powder brand	
34	Repeat Purchase	REPU1	I like to try different FMCG brands every time.	Washing Powder brand	
35	Repeat Purchase	REPU3	My buying behavior towards favorite brands is never deviating in normal conditions.	Washing Powder brand	
36	Brand Market Share	BRMS1	I do consider brand's market share before buying it.	Washing Powder brand	
37	Clarity	CLAR1	I have complete clarity about my brands, so I do not prefer other brands.	Washing Powder brand	
38	Repeat Purchase	REPU2	I usually get board after buying same brand for some time.	Washing Powder brand	

Finding:

- Brand Trust, Perceived Value, Accessibility, Brand Performance are highly impacting factors when it comes to buying Washing Powder.
- In urban areas people who buy washing powder from Modern Trade or Ecommerce are giving high weightage to Brand Awareness, Celebrity Influence, Advertising etc.
- All these factors indicate quality assurance, trust, value associated with product and overall satisfaction.
- These consumers are less prone to minor changes in rates or offers.
- Spending more amount to buy high quality product is not a stopping factor for such consumers.

Table 5.5 Urban – MT/EComm – Washing Powder – Descriptive Statistics

Questions	Que. Type	Que. Code	count	mean	std	min	25% (Q1)	50% (Q2)	75% (Q3)	max
After using my preferred brands, I get positive feeling.	Brand Affect	BRAF1	604	4.142384	0.87128	1	4	4	5	5
I am very satisfied with brands which I use so I repeat purchase.	Customer satisfaction	CUSA1	604	4.043046	0.878036	1	4	4	5	5
I do not switch to other brands as they are costly.	Switching Cost	SWCO1	604	3.086093	1.241571	1	2	3	4	5
I buy only those brands on which I have faith.	Brand Trust	BRTR1	604	3.948675	1.053628	1	3	4	5	5
I have developed emotional relationship with the brands I purchase.	Relationship Proneness	REPR1	604	2.890728	1.23438	1	2	3	4	5
When I am involved in my favorite brands, I never look for other brands.	Involvement	INVO1	604	3.306291	1.160671	1	2	3	4	5
The return I am getting on money spent on FMCG decides my product loyalty.	Perceived Value	PEVA1	599	3.69616	1.114439	1	3	4	5	5
I never buy other brands if my favorite brands are not available.	Availability	AVA11	599	2.762938	1.159761	1	2	2	4	5
My brands remains updated with change in technology and buyer's preferences.	Brand Relevance	BRRE1	599	3.821369	0.957182	1	3	4	5	5
Brand performance really matters to me for loyalty towards it.	Brand Performance	BRPE1	599	3.69783	1.267227	1	3	4	5	5
I keep religious beliefs in center while selecting my brands.	Culture	CULT1	599	2.345576	1.271942	1	1	2	4	5
My brands are economical.	Price Worthiness	PRWO1	599	3.559265	0.994673	1	3	4	4	5
It is wise decision to purchases my brand even if other brands are same.	Brand Equity	BREQ1	599	3.626043	1.023335	1	3	4	4	5
My brand delivers which it promises.	Brand Image	BRIM1	599	3.819699	1.000441	1	3	4	5	5
Without any recall efforts, I can remember my brands quickly.	Accessibility	ACCE1	599	3.933222	1.004446	1	3	4	5	5
Buying preferred brand is now my habit.	Habit	HABI1	599	3.679466	1.099146	1	3	4	4	5
I prefer to buy brands which are reputed among the larger group of buyers.	Brand Reputation	BRRP1	599	3.268781	1.230688	1	2	3	4	5
I prefer to buy brands which are more than 50 years old with good track record.	Brand Credibility	BRCR1	599	3.051753	1.167706	1	2	3	4	5
I feel good when I use my favorite brands.	Emotional Value	EMVA1	599	3.96828	1.094527	1	3	4	5	5
I like packaging and other features of my favorite brands.	Functional Value	FUVA1	599	3.944908	0.889536	1	4	4	5	5
In my next purchase I would like to buy these brands.	Brand Attitude	BRAT2	599	3.859766	0.957474	1	3	4	4	5
I prefer to buy brands which are matching with my value system.	Centrality	CENT1	599	3.671119	1.013463	1	3	4	5	5
My purchase decision always based on choice of family members.	Family Influence/Social Value	FASO1	599	3.195326	1.286765	1	2	4	4	5
If my favorite brand is not available in store, I don't purchase another brand.	Commitment	COMM1	599	2.923205	1.146806	1	2	3	4	5
During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Situational Factors	SIFA1	599	3.652755	1.196269	1	3	4	5	5
I never use to switch to other brand only because they offer discounts.	Discounts	DISC1	599	3.434057	1.242466	1	3	4	4	5

Advertising of FMCG products help me to take buying decision.	Advertising	ADVE1	599	3.639399	1.178195	1	3	4	5	5
Personal selling in super stores helps me to take right buying decision.	Personal Selling	PESE1	599	3.594324	1.057242	1	3	4	4	5
I must compare product features of various brands before buying the final one.	Comparing Product Features	COPF1	599	3.771285	1.034251	1	3	4	5	5
I continue to buy same brand as gift/bended/assortment pack are available for it.	Assortment/ Gift Pack/Bended Pack	GIPC1	599	3.400668	1.116792	1	3	3	4	5
Due to product placement, I sometimes change my buying decision.	Product Placement	PRPL1	599	3.36394	1.002223	1	3	3	4	5
I recognize my favorite brands even by color of its packet.	Brand Awareness	BRAW1	599	3.777963	1.099916	1	3	4	5	5
My purchase decision never changes based on the celebrity endorsement.	Celebrity Influence	CLIF1	599	3.527546	1.13569	1	3	4	4	5
I like to try different FMCG brands every time.	Repeat Purchase	REPU1	599	3.348915	1.036198	1	3	3	4	5
My buying behavior towards favorite brands is never deviating in normal conditions.	Repeat Purchase	REPU3	599	3.527546	0.967097	1	3	4	4	5
I do consider brand's market share before buying it.	Brand Market Share	BRMS1	599	3.474124	4.376004	1	2	3	4	55
I have complete clarity about my brands, so I do not prefer other brands.	Clarity	CLAR1	599	3.552588	0.995049	1	3	4	4	5
I usually get board after buying same brand for some time.	Repeat Purchase	REPU2	599	3.001669	1.180243	1	2	3	4	5

Findings:

- High volatility observed for Brand Market Share. This indicates, group of buyers give more importance to the brands with high market share whereas other group is not giving that importance to this factor.
- Also, different opinions are found with respect to Personal Selling, Brand Reputation, Cultural impact and Brand Performance.

Urban – MT/Ecomm – Washing Powder: Summary of 38 variables under study

Step 1: K-Means Clustering: to have primary classification of buyers into Brand Loyal, Brand Disloyal and Neutral. Whole analysis is based on unsupervised clustering approach, so not very reliable.

As an output we manage to generate an additional column in the data set where each of the individual respondent is assigned tag of Loyal, Disloyal and Neutral.

Cluster Tag	Category of Consumers	Count
0	Loyal Consumers	393 (65%)
1	Disloyal Consumers	111 (18%)
2	Neutral	100 (17%)
	Total	604

- Proportion of Loyal Consumers is more than sum of Disloyal and Neutral Consumers. Possible reason for that is, washing powder is such a category where consumers do not want to experiment with. Also, this category is not consumed internally or applied on body.
- Important thing to note here is that above numbers are not the final one to design final business strategies. They are only indicative of rough pattern available in the data.
- Neutral Consumers are around 17%. Manufacturers can take a call if they want to consider this group while framing strategies for other groups.

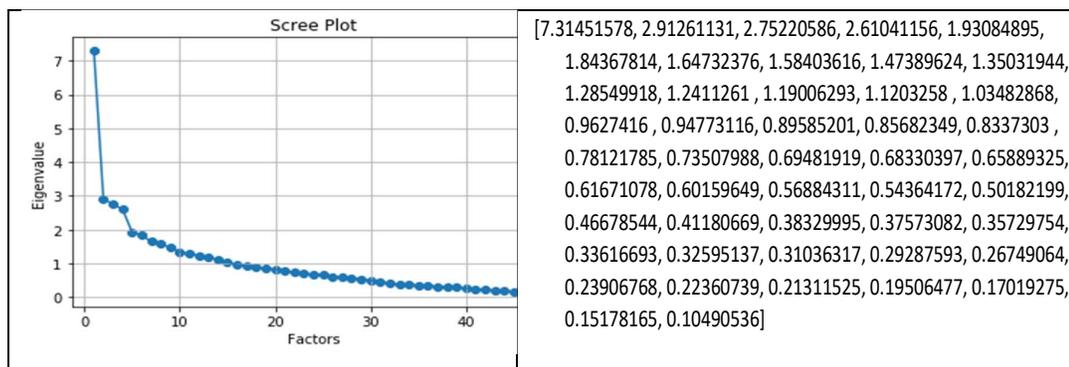
Step 2: Correlation Matrix: to find out relation between all pairs of variables under study. Purpose is to eliminate those variables which are identical in nature and thus reducing duplication before fitting the model. Summary of outcomes is as follows.

Findings:

- Correlation values for each pair of variables in the study indicates no significant correlation as all values are less than 0.8.
- Overall conclusion is, no variable is to be removed from the analysis before applying Exploratory Factor Analysis.

Step 3: Exploratory Factor Analysis (EFA): is useful to reduce dimensionalities by creating liner combinations of variable with its constructs. Output of this process will become input for Structural Equation Modeling.

- Bartlett’s test value: (11106.24491613275, 0.0): As p value is zero test is statistically significant, and matrix is not an identity matrix.
- Scree Plot and Eigen Values: helps to decide about the number of useful factors. Points plotted above 1 are the potential factors to be considered for further tuning. Eigen values are numeric values indicating the same. There are 15 potential factors to be considered for next round.



- Out of 15 factors derived, only those factors will be considered further where at least 3 variables are having factor loading >0.35 or <-0.35 . Summary of factors is given in the table.
- To fine tune the output, Varimax rotation is applied on the eligible factors. Here there are total 14 factors where Varimax rotation applied. Total 50% of variance explained by 14 factors. However further useful factors are only 10 which approximately explains 40% of variance.

0	0.0791	-0.0888	-0.0102	0.0878	0.0570	0.0038	0.1937	-0.1268	-0.0957	0.0935	-0.0701	0.0114	0.1333	0.0178	-0.0263
1	0.1249	0.0553	0.1620	0.1497	-0.1159	-0.1059	-0.1096	-0.0387	0.1229	-0.1865	-0.1444	0.0459	0.0958	-0.2603	-0.0116
2	-0.0122	-0.0798	0.1217	0.8232	0.0344	0.0049	0.0417	-0.0559	-0.1077	0.0181	-0.0510	-0.0510	0.0544	-0.0410	-0.1034
3	-0.1412	0.0371	-0.0001	-0.7907	0.0461	0.0439	0.0704	0.0704	0.0146	-0.1569	-0.0350	-0.0148	-0.0117	0.1061	-0.1138
4	0.1141	0.0579	0.0716	0.6150	-0.0536	0.0430	0.3371	0.1428	0.1818	-0.1886	-0.1428	0.0233	0.0330	0.3223	-0.0273
5	0.0846	0.0381	0.6320	0.0699	-0.0258	0.1040	0.0561	0.1250	0.0495	0.0242	-0.0544	0.0644	0.2016	0.0644	0.0831
6	0.1461	-0.0786	0.7336	0.0643	0.0843	0.1825	0.0473	-0.0180	0.0023	0.0637	0.0893	0.0267	-0.0150	0.0051	-0.0103
7	0.0576	-0.0802	0.1076	0.0906	-0.0234	0.1100	0.1863	-0.0060	0.3295	0.3253	-0.0123	0.0777	0.0293	-0.2247	-0.0643
8	0.2824	-0.0598	0.4696	0.1258	0.1045	-0.1186	0.2923	-0.0905	-0.1407	-0.0404	-0.1680	0.0099	0.0767	-0.0552	0.2071
9	-0.1118	-0.0735	0.1386	0.0031	0.0669	-0.1090	0.2270	-0.3446	0.2093	-0.0036	0.1799	0.1257	0.0599	-0.2144	-0.0785
10	0.2166	-0.0805	0.2309	0.0514	0.0326	0.0847	0.1866	-0.0054	0.0593	0.0838	0.5385	-0.0646	0.0046	0.2001	0.0583
11	0.6302	-0.0539	0.1771	0.2131	0.1279	0.1684	0.1170	0.1403	-0.1066	0.0130	0.0681	0.0974	0.0063	-0.0114	0.1182
12	-0.0443	-0.0146	-0.1114	-0.0535	0.0757	0.0732	-0.0666	0.0327	0.0461	-0.0938	0.7024	0.1211	0.0679	-0.0721	0.0110
13	0.3660	0.0738	0.3421	-0.0626	0.0911	0.2276	0.1264	0.0701	0.1131	0.1399	0.2412	-0.0959	-0.0278	0.1309	0.1459
14	-0.1991	0.0814	0.0062	-0.1012	0.0748	-0.0874	-0.0579	-0.1835	0.8425	0.1020	0.0904	0.0603	-0.0770	-0.0589	0.0943
15	0.5629	0.0264	0.1541	0.1322	0.0887	0.1818	-0.0647	0.0567	0.0439	0.0783	0.1030	-0.2115	0.0772	0.0217	-0.0961
16	0.1670	0.0741	0.2268	-0.0269	0.1305	0.6144	0.1270	-0.0291	-0.0052	0.1502	0.0938	-0.0418	0.0584	0.0450	0.0838
17	0.1860	-0.1706	0.1616	0.0049	0.0559	0.7006	0.1777	0.1769	-0.1587	0.0892	0.1176	0.1226	0.0805	0.1306	0.1363
18	0.2591	-0.1149	0.3328	-0.1129	-0.0704	0.3028	0.1159	0.2695	0.0286	0.0334	0.2737	-0.2651	0.0522	-0.0452	-0.1014
19	0.4523	-0.1484	0.2869	0.0644	0.0754	0.1530	0.2294	-0.0165	-0.0619	0.0289	0.2185	-0.0291	0.1873	-0.0019	-0.0792
20	-0.0589	0.0544	0.1000	0.0042	0.1471	0.0508	-0.0430	-0.0527	0.0381	0.0701	0.0329	0.7567	0.0412	0.0012	0.0564
21	0.3356	0.0550	-0.0642	-0.0461	-0.1750	-0.0725	0.1015	0.0158	0.4047	0.0295	0.1270	0.4302	0.1324	0.0739	-0.1999
22	0.3728	0.0589	0.2553	0.1285	0.2476	0.0229	0.1055	0.0811	0.0278	0.0311	0.0159	0.0003	0.4876	0.0275	0.0274
23	0.1322	-0.0833	0.1532	0.0257	0.1743	0.1421	0.1775	0.1638	-0.0475	-0.0008	0.1292	0.1104	0.7604	0.0873	0.1715
24	0.2712	0.0053	0.3592	-0.0214	0.2860	0.2974	0.3523	0.0424	0.0069	0.0945	-0.1357	0.0461	0.0162	0.0078	0.0208
25	-0.0323	0.0035	0.1396	0.0354	0.4908	0.1335	-0.0271	0.0397	-0.0253	0.0220	0.0142	0.1625	0.0551	0.2284	0.0451
26	-0.0686	0.0925	0.0019	-0.1117	-0.2882	-0.3146	0.2107	-0.0280	0.0413	0.3437	0.2376	0.2906	-0.0701	-0.0218	-0.0781
27	0.1203	0.0820	-0.0165	0.0076	-0.0814	-0.0167	0.1141	-0.2519	0.2413	0.0580	0.1577	0.1292	-0.2909	-0.4476	0.0730
28	0.1680	-0.0539	0.0855	-0.1048	0.1730	0.0173	0.0838	0.5413	0.0249	0.1328	0.0534	-0.0956	0.1727	0.1345	-0.0138
29	0.0854	0.0083	0.1126	-0.0333	0.1271	0.1423	0.0291	0.1457	0.0042	0.1237	0.0362	0.0158	0.1175	0.1328	0.5238
30	0.4352	0.1577	0.0277	0.1520	0.5083	0.0588	0.1091	0.2033	0.0641	-0.0783	-0.0944	-0.0335	-0.0237	-0.1195	0.3000
31	0.1804	-0.0693	0.0333	0.0779	0.4850	0.0587	0.1608	-0.0134	-0.0502	0.0203	0.0460	0.0419	0.1530	0.1791	0.1781
32	0.1670	-0.0011	0.0001	-0.1602	0.2864	0.2329	0.2922	0.0585	-0.3225	0.0808	0.1123	0.1217	0.1231	0.1130	0.0999
33	0.1344	-0.1578	-0.0342	-0.1543	0.5609	-0.0255	0.0153	0.2634	0.0593	0.1135	0.1923	-0.1116	0.1510	-0.0994	-0.1248
34	0.0901	0.0097	0.0092	0.0335	0.0044	0.0129	-0.0556	0.4787	-0.1198	0.3032	0.0054	0.0390	0.0263	0.0305	0.0557
35	0.0712	-0.0945	0.1259	0.0030	0.1831	0.1195	0.2639	0.5301	0.0000	-0.2090	0.0630	0.0172	0.0571	-0.0024	0.2673
36	0.1618	-0.0550	0.0821	-0.0074	0.1229	0.0739	0.1042	0.0537	0.0000	0.0491	0.0577	0.0698	0.0402	0.5645	0.1289
37	0.0600	0.0032	0.0307	0.1971	-0.0128	0.0433	0.0709	0.0805	0.1057	0.5260	0.0027	0.1050	-0.0457	0.1123	-0.0910
38	0.1952	-0.2044	0.0640	0.0333	0.2053	0.2053	0.4008	-0.0018	0.0488	0.1623	0.0778	-0.1521	0.0441	0.1026	0.2907
39	0.0592	-0.0122	0.1470	0.0257	0.0773	-0.0320	0.0801	0.0751	-0.0551	0.3841	-0.0229	-0.2176	0.0454	0.0798	0.0922
40	0.0132	-0.0749	0.2309	0.0696	0.0738	0.2095	0.5366	0.1352	0.0349	0.0457	0.1204	-0.0309	0.1494	0.0629	0.0265
41	-0.0641	0.0797	-0.0446	-0.0822	0.0520	0.2196	-0.0602	0.0403	0.0650	0.5821	-0.0402	0.0880	0.0458	-0.1059	0.2003
42	-0.0035	0.2750	-0.0983	0.1331	-0.0095	-0.1715	-0.0575	-0.0886	-0.0343	0.0219	-0.0316	0.0316	0.0500	-0.0187	0.0500
43	-0.0333	-0.9663	0.0352	-0.0330	0.0378	0.0616	-0.0465	-0.0512	-0.0267	-0.0265	0.0256	-0.0372	0.0031	0.0830	0.0064
44	0.0146	0.8261	-0.0299	0.0331	-0.0043	-0.0355	-0.0510	-0.0006	0.0613	-0.0027	-0.0002	-0.0127	-0.0869	0.0200	0.0753
45	0.0245	0.6629	0.0901	-0.1722	-0.1735	0.0511	-0.0711	-0.0796	0.0511	0.0727	-0.0870	0.1247	-0.0054	-0.0194	-0.1617

	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Age Group	-0.83336	0.05262	0.00230	0.09556	0.13707	0.00626	0.15725	0.08610	-0.15243	-0.08143	-0.15412	0.03842	0.01537	-0.00144
Gender	0.05679	0.10822	0.18893	0.14680	-0.01590	-0.10101	-0.11322	-0.18098	-0.03209	-0.14189	0.07998	0.08650	-0.27031	0.02263
Family Type	-0.07969	-0.02889	0.11985	0.82950	0.00240	0.01030	0.00479	0.05246	-0.06793	-0.01358	-0.11630	-0.06341	-0.05895	-0.03454
Total Family Member	0.03717	-0.16724	-0.00752	-0.77612	-0.00235	0.05300	0.01595	-0.16132	0.04038	-0.04213	-0.00943	0.08258	0.08048	-0.06810
Head of the Family	0.05325	0.08059	0.09054	0.62734	-0.01255	0.05083	0.30740	-0.18334	0.11062	-0.16383	0.08584	0.25340	0.26533	-0.07726
BRAF1	0.04034	0.04068	0.07186	0.07389	0.09337	0.07389	0.02806	0.03342	0.02806	0.06184	0.00102	0.07187	0.05691	0.04841
CUSA1	-0.08322	0.13694	0.70966	0.06222	0.03184	0.18489	0.04961	0.07144	-0.03514	0.09984	0.03190	0.06067	0.01930	0.03197
SWCO1	-0.08528	0.03219	0.11921	0.09309	0.04496	0.11250	0.14934	0.34705	-0.06262	-0.02139	0.23260	0.22927	-0.24274	-0.00136
BRTR1	-0.05911	0.31190	0.47910	0.12136	0.09999	-0.13600	0.31914	-0.03342	-0.09018	-0.15996	-0.10838	-0.13254	-0.01411	0.07767
REPR1	-0.07228	-0.12571	0.14047	0.00847	0.05213	-0.10664	0.17607	0.00082	-0.39577	0.16871	0.14850	0.14873	-0.21043	0.09409
INVO1	-0.08115	0.18031	0.23956	0.05689	0.05379	0.07877	0.19206	0.08589	-0.02928	0.52735	0.03161	0.07035	0.21935	-0.11848
PEVA1	-0.05671	0.63712	0.19698	0.20881	0.11414	0.17375	0.12801	0.02531	0.13823	0.08956	-0.11228	0.02017	0.01359	0.06367
AVAI1	-0.00950	-0.06281	-0.10340	-0.05389	0.12959	0.06919	-0.04474	-0.09427	0.02844	0.70501	0.04504	0.06946	-0.04841	0.10033
BRRE1	0.06944	0.36011	0.35114	-0.06441	0.05739	0.22041	0.16662	0.15832	0.06459	0.24313	0.12648	-0.01405	0.16876	-0.10901
BRPE1	0.15224	0.59207	0.08794	-0.12605	0.12236	-0.01781	0.02022	-0.03951	0.19369	-0.16396	-0.23092	0.07589	0.17098	0.01038
CULT1	0.07627	-0.16985	-0.00236	-0.09801	0.02002	-0.08323	-0.02194	0.13527	-0.19978	0.07115	0.81545	0.21135	-0.03650	0.05777
PRWO1	0.02532	0.50115	0.17830	0.14034	0.17094	0.20887	-0.10330	0.07839	0.02519	0.10013	-0.00996	0.04279	0.01587	-0.28998
BREQ1	0.07582	0.14987	0.23567	-0.02738	0.11498	0.60936	0.16595	0.16823	-0.02743	0.09448	-0.00335	-0.06827	0.07488	-0.00988
BRIM1	-0.16933	0.17050	0.18486	0.00035	0.06781	0.68041	0.23134	0.10640	0.19701	0.12495	-0.17882	0.00395	0.15015	0.12668
ACCE1	-0.11902	0.18064	0.35421	-0.10873	0.04849	0.30356	0.10212	0.03916	0.21933	0.26796	-0.03203	0.06292	-0.07121	-0.36080
HABI1	-0.14545	0.37830	0.31959	0.07484	0.22810	0.16864	0.17362	0.02237	-0.07571	0.20847	-0.16870	0.14189	-0.00975	-0.12876
BRRP1	0.05700	-0.01434	0.09942	-0.00223	0.08358	0.05374	-0.05121	0.07536	-0.03932	0.05539	0.01762	0.23237	0.02130	0.72079
BRCR1	0.05375	0.05564	-0.01527	-0.03090	0.01702	-0.05073	0.00540	0.02594	-0.04443	0.10217	0.17431	0.65252	0.00815	0.18093
EMVA1	0.07087	0.29163	0.31410	0.14390	0.54483	0.03746	0.08315	0.01976	0.04382	-0.01142	-0.08807	0.13284	0.03639	-0.03728
FUVA1	-0.06882	0.06602	0.24321	0.03877	0.56620	0.12462	0.20050	-0.00547	0.15982	0.08264	-0.18253	0.16017	0.11849	0.09374
BRAF2	-0.00011	0.27983	0.34552	-0.01507	0.21341	0.29810	0.33025	-0.11037	-0.00637	-0.11349	0.01388	-0.02594	0.03457	0.05195
CENT1	0.00231	0.01848	0.10156	0.03502	0.33717	0.14919	0.00507	0.02277	0.03874	0.02363	0.07160	-0.14323	0.26740	0.24839
FASO1	0.08848	-0.09411	0.01383	-0.10968	-0.22822	-0.32871	0.13321	0.34008	-0.06635	0.23124	-0.08132	0.33881	-0.05685	0.13941
COMM1	0.07239	0.19365	-0.04066	-0.00818	-0.24858	-0.02167	0.12864	0.08986	-0.26393	0.18431	0.28088	0.02923	-0.42329	0.13335
SIFA1	-0.05336	0.11673	0.10205	-0.09696	0.31728	0.02280	0.08501	0.13398	0.49142	0.04380	-0.01849	0.08382	0.11603	-0.15746
DISC1	0.01461	0.14205	0.12499	-0.04312	0.14088	0.10842	0.18870	0.13754	0.21241	0.02906	0.07404	-0.17136	0.20339	0.15059
ADVE1	0.15433	0.53335	0.00416	0.14079	0.35777	0.06458	0.20837	-0.04670	0.20930	-0.06777	0.21722	-0.26348	-0.03782	0.10634
PESE1	-0.06423	0.21762	0.02039	0.08146	0.43789	0.06806	0.20220	0.02335	-0.02206	0.04417	0.01950	-0.15612	0.24740	0.14464
COPF1	0.00315	0.18004	-0.00019	-0.15889	0.27287	0.27336	0.30299	0.07958	0.04451	0.11832	-0.30012	-0.09430	0.15604	0.16305
GIPC1	-0.15304	0.12669	-0.05294	-0.14031	0.54160	0.01978	0.00061	0.10373	0.17267	0.18509	0.09455	-0.08841	-0.05541	-0.07889
PRPL1	0.00664	0.08578	0.01816	-0.00296	0.05154	-0.00296	-0.03178	0.30878	0.48455	0.01826	-0.12093	0.00894	0.02323	0.01411
BRAW1	-0.09649	0.11353	0.12355	-0.00802	0.18297	0.09632	0.37262	-0.18713	0.53501	0.07258	-0.03186	-0.10995	0.02074	0.08029
CLIF1	-0.05462	0.15580	0.09076	0.00150	0.08837	0.07085	0.12061	0.04350	0.06968	0.04562	-0.01113	0.06630	0.59125	0.05159
REPU1	-0.00168	0.03611	0.03104	0.02080	-0.01476	0.04505	0.01597	0.52152	0.04529	0.00439	0.03468	0.16952	0.09018	0.01977
REPU3	-0.20152	0.20221	0.09526	0.06308	0.05828	0.17542	0.46190	0.18105	0.00537	0.06263	0.03764	-0.04875	0.14182	-0.10415
BRMS1	-0.01280	0.05471	0.14435	0.02622	0.09390	-0.04707	0.10127	0.38699	0.07083	-0.02975	-0.03449	-0.14132	0.10510	-0.17200
CLAR1	-0.07530	-0.02614	0.24709	0.07829	0.19328	0.52559	0.05814	0.07195	0.07195	0.10240	-0.04061	0.11707	0.05201	-0.07430
REPU2	0.08114	-0.03366	-0.03461	-0.09015	0.05255	0.18493	0.00400	0.58190	0.07198	-0.02940	0.07822	-0.05876	-0.05308	0.15484
Washing Powder Max	0.27969	0.01560	-0.10244	-0.14345	-0.02878	-0.14345	-0.03916	-0.02878	0.02732	-0.02681	-0.01528	0.01235	0.04187	0.04187
Washing Powder Trial	0.96408	-0.03901	0.03014	-0.03286	0.03230	0.05964	-0.04132	-0.03125	-0.04586	0.02641	-0.01522	-0.06115	0.09466	-0.01018
Washing Powder Acc	0.82491	0.04529	-0.03614	0.03001	-0.08380	-0.03975	-0.01998	0.00681	0.02394	0.00555	0.10962	-0.04625	0.03228	0.01161
cluster	0.66056	-0.01143	0.10541	-0.16776	0.06193	-0.13563	-0.13277	0.06770	-0.09088	-0.08975	-0.02685	0.19418	-0.05739	0.02636

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14
SS Loadings	2.432642	2.341447	2.322075	2.074795	2.033928	1.64176	1.61854	1.475431	1.449449	1.360206	1.307558	1.234907	1.228615	1.179919
Proportion Variance	0.051758	0.049818	0.049406	0.044145	0.043275	0.034931	0.034437	0.031392	0.030839	0.028941	0.02782	0.026275	0.026141	0.025105
Cumulative Variance	0.051758	0.101576	0.150982	0.195127	0.238402	0.273333	0.30777	0.339162	0.370001	0.398942	0.426762	0.453037	0.479178	0.504282

- Factors defined based on the output are as below. This will become an input for Structural Equation Modeling.

Behavioural Brand Loyalty = -Washing Powder Tried Out Brands + Washing Powder_Acceptable
Attitudinal Brand Loyalty = PEVA1 + BRRE1 + BRPE1 + PRWO1 + HABI1 + BREQ1 + BRIM1
Brand Satisfaction = BRAF1 + CUSA1 + BRTR1 - ACCE1
Family Demographics = Family Type - Total Family Member + Head of the Family
Impact of Promotion = EMVA1 + FUVA1 + ADVE1 + PESE1 + GIPC1
Repeat Purchase = BRAW1 + REPU3 + CLAR1
Brand Commitment = INVO1 + AVAI1 - COMM1

Step 4: Structural Equation Modeling (SEM): is used to fit the model which depicts the relationship between measured variable and latent variables. Output of this process will become input for Support Vector Machine which will help further to have classification of consumers into loyal, disloyal, and neutral in terms of brand loyalty of FMCG products.

- Initially proposed model:

measurement model

BehaviouralBrandLoyalty =~ -WashingPowderTriedOutBrands + WashingPowder_Acceptable
 AttitudinalBrandLoyalty =~ PEVA1 + BRRE1 + BRPE1 + PRWO1 + HABI1 + BREQ1 + BRIM1
 BrandSatisfaction =~ BRAF1 + CUSA1 + BRTR1 - ACCE1
 FamilyDemographics =~ FamilyType - TotalFamilyMember + HeadoftheFamily
 ImpactofPromotion =~ EMVA1 + FUVA1 + ADVE1 + PESE1 + GIPC1
 RepeatPurchase =~ BRAW1 + REPU3 + CLAR1
 BrandCommitment =~ INVO1 + AVAI1 - COMM1

regressions

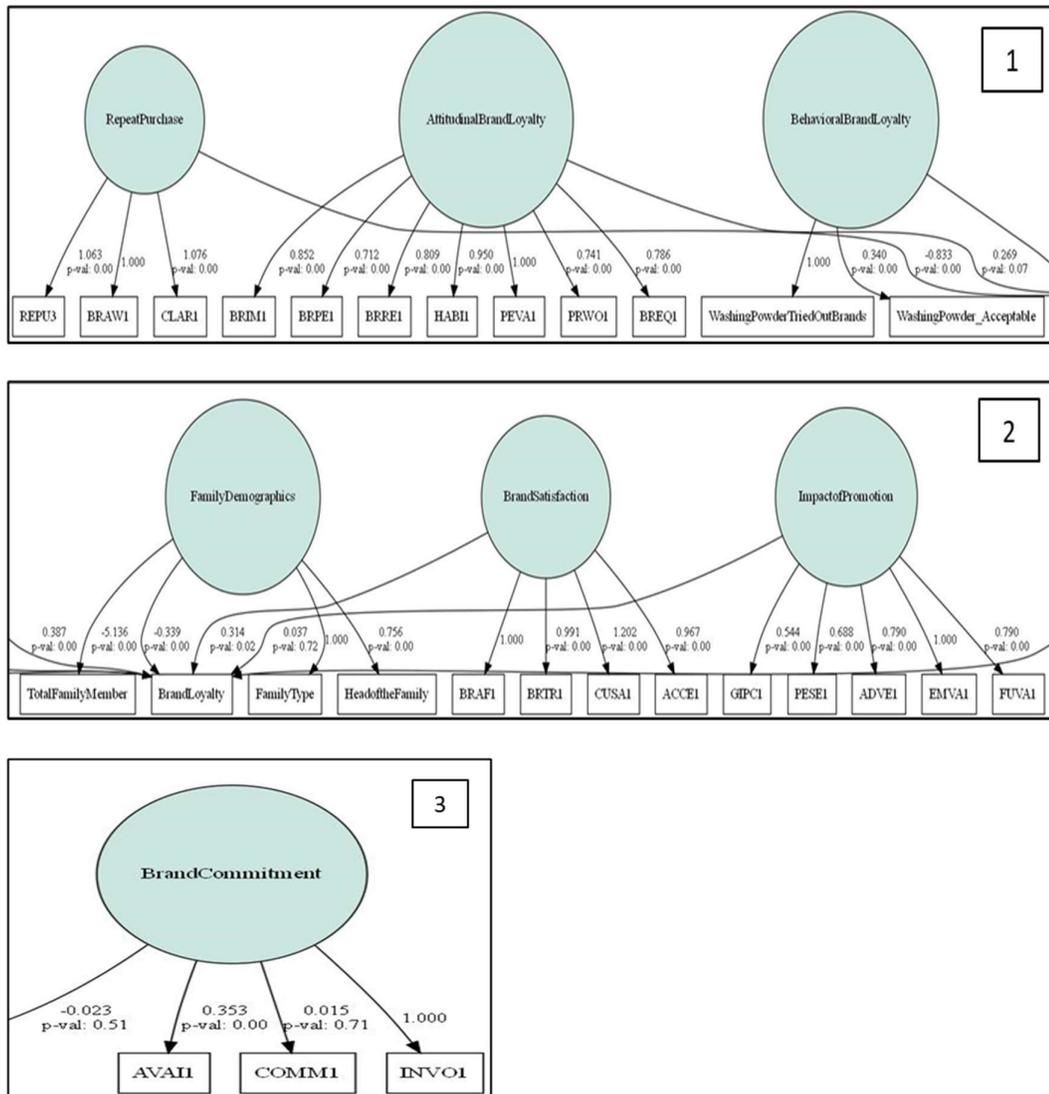
BrandLoyalty ~ BehaviouralBrandLoyalty + AttitudinalBrandLoyalty + BrandSatisfaction + FamilyDemographics + ImpactofPromotion + RepeatPurchase + BrandCommitment

- Initial reliability indicators:

Indicators	DoF	DoF Baseline	chi2	chi2 p-value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	323	378	2239.8	0	5746.07	0.6429	0.6102	0.5438	0.6102	0.5821	0.0992	158.58	524.08	3.7082

As there is a scope for improvement for most of the indicators, whole process is repeated after eliminating not impacting variables.

Figure 5.4 Initial model Urban – MT/Ecomm – Washing Powder



Attributes which are Statistically insignificant are removed from the further model building process.

- New model proposed based on the previous model's output:

measurement model

BehaviouralBrandLoyalty =~ -WashingPowderTriedOutBrands + WashingPowder_Acceptable
AttitudinalBrandLoyalty =~ PEVA1 + BRRE1 + BRPE1 + PRWO1 + HABI1 + BREQ1 + BRIM1
BrandSatisfaction =~ BRAF1 + CUSA1 + BRTR1 - ACCE1
FamilyDemographics =~ FamilyType - TotalFamilyMember + HeadoftheFamily
RepeatPurchase =~ BRAW1 + REPU3 + CLAR1

regressions

BrandLoyalty ~ BehaviouralBrandLoyalty + AttitudinalBrandLoyalty + BrandSatisfaction +
FamilyDemographics + RepeatPurchase

Using above equations whole process run again to check if values have improved further and model has become useful.

	lval	op	rval	Estimate	Std. Err	z-value	p-value
0	WashingPowderTriedOutBranc	~	BehavioralBrandLoyalty	1	-	-	-
1	WashingPowder_Acceptable	~	BehavioralBrandLoyalty	0.3398258	0.093564	3.6320141	0.00
2	PEVA1	~	AttitudinalBrandLoyalty	1	-	-	-
3	BRRE1	~	AttitudinalBrandLoyalty	0.857059	0.071152	12.045465	0.00
4	BRPE1	~	AttitudinalBrandLoyalty	0.7062536	0.0868809	8.1289818	0.00
5	PRWO1	~	AttitudinalBrandLoyalty	0.7469089	0.0711122	10.503244	0.00
6	HABI1	~	AttitudinalBrandLoyalty	0.9357864	0.0806305	11.605868	0.00
7	BREQ1	~	AttitudinalBrandLoyalty	0.8757532	0.0751556	11.652541	0.00
8	BRIM1	~	AttitudinalBrandLoyalty	0.9432577	0.0753771	12.513843	0.00
9	BRAF1	~	BrandSatisfaction	1	-	-	-
10	CUSA1	~	BrandSatisfaction	1.2083679	0.0975973	12.381165	0.00
11	BRTR1	~	BrandSatisfaction	0.9792927	0.1015363	9.6447582	0.00
12	ACCE1	~	BrandSatisfaction	0.9627469	0.0973951	9.8849581	0.00
13	FamilyType	~	FamilyDemographics	1	-	-	-
14	TotalFamilyMember	~	FamilyDemographics	-5.0689002	0.3638905	-13.929741	0.00
15	HeadoftheFamily	~	FamilyDemographics	0.74809	0.0663111	11.281516	0.00
16	BRAW1	~	RepeatPurchase	1	-	-	-
17	REPU3	~	RepeatPurchase	1.1603174	0.1386488	8.3687499	0.00
18	CLAR1	~	RepeatPurchase	1.0490335	0.1327286	7.9035995	0.00
19	BrandLoyalty	~	BehavioralBrandLoyalty	0.3756655	0.1075702	3.4922808	0.00
20	BrandLoyalty	~	AttitudinalBrandLoyalty	0.364721	0.1737246	2.0994206	0.04
21	BrandLoyalty	~	BrandSatisfaction	0.2636022	0.1307232	2.0164918	0.04
22	BrandLoyalty	~	FamilyDemographics	-0.3189287	0.0814704	-3.9146569	0.00
23	BrandLoyalty	~	RepeatPurchase	-0.9219027	0.2576631	-3.5779377	0.00
24	AttitudinalBrandLoyalty	~	AttitudinalBrandLoyalty	0.4732689	0.0613338	7.7162767	0.00
25	AttitudinalBrandLoyalty	~	BehavioralBrandLoyalty	-0.0316087	0.0262882	-1.2023898	0.23
26	AttitudinalBrandLoyalty	~	FamilyDemographics	0.0407176	0.0142473	2.8579116	0.00
27	AttitudinalBrandLoyalty	~	BrandSatisfaction	0.2760931	0.0313238	8.8141508	0.00
28	AttitudinalBrandLoyalty	~	RepeatPurchase	0.2634349	0.0358547	7.3472953	0.00
29	BehavioralBrandLoyalty	~	BehavioralBrandLoyalty	0.6847168	0.1648109	4.1545608	0.00
30	BehavioralBrandLoyalty	~	FamilyDemographics	-0.0136357	0.0148647	-0.9173221	0.36
31	BehavioralBrandLoyalty	~	BrandSatisfaction	-0.0527581	0.021659	-2.4358512	0.01
32	BehavioralBrandLoyalty	~	RepeatPurchase	-0.0958241	0.0244239	-3.9233682	0.00
33	FamilyDemographics	~	FamilyDemographics	0.1698094	0.0154865	10.964995	0.00
34	FamilyDemographics	~	BrandSatisfaction	0.0427893	0.0117786	3.6327956	0.00
35	FamilyDemographics	~	RepeatPurchase	0.03282	0.0124804	2.6297177	0.01
36	BrandSatisfaction	~	BrandSatisfaction	0.2871742	0.0392274	7.3207518	0.00
37	BrandSatisfaction	~	RepeatPurchase	0.1647639	0.0251778	6.5440162	0.00
38	RepeatPurchase	~	RepeatPurchase	0.2452911	0.049908	4.9148633	0.00
39	TotalFamilyMember	~	TotalFamilyMember	3.5092521	0.3357048	10.453386	0.00
40	CLAR1	~	CLAR1	0.7127551	0.0487622	14.616949	0.00
41	HeadoftheFamily	~	HeadoftheFamily	0.2520362	0.0157504	16.00184	0.00
42	PEVA1	~	PEVA1	0.7600504	0.0505058	15.048774	0.00
43	BRTR1	~	BRTR1	0.8329186	0.0531554	15.669502	0.00
44	BRRE1	~	BRRE1	0.5650852	0.0374797	15.077105	0.00
45	FamilyType	~	FamilyType	0.0324683	0.0105512	3.0772056	0.00
46	PRWO1	~	PRWO1	0.7183642	0.0448679	16.010642	0.00
47	BRAW1	~	BRAW1	0.9578781	0.0614308	15.592806	0.00
48	WashingPowder_Acceptable	~	WashingPowder_Acceptable	1.0116118	0.0610749	16.563467	0.00
49	ACCE1	~	ACCE1	0.73974	0.0476786	15.51513	0.00
50	BRIM1	~	BRIM1	0.5752633	0.0393092	14.634321	0.00
51	REPU3	~	REPU3	0.5981358	0.045776	13.066588	0.00
52	BREQ1	~	BREQ1	0.6770844	0.0440343	15.376282	0.00
53	BRAF1	~	BRAF1	0.4706446	0.033228	14.1641	0.00
54	BRPE1	~	BRPE1	1.3579553	0.0811492	16.734057	0.00
55	CUSA1	~	CUSA1	0.3502029	0.0318367	10.999962	0.00
56	HABI1	~	HABI1	0.7855402	0.0509815	15.408348	0.00
57	BrandLoyalty	~	BrandLoyalty	0.3266213	0.0387834	8.4216847	0.00
58	WashingPowderTriedOutBranc	~	WashingPowderTriedOutBranc	1.039E-17	0.1600318	6.491E-17	1.00

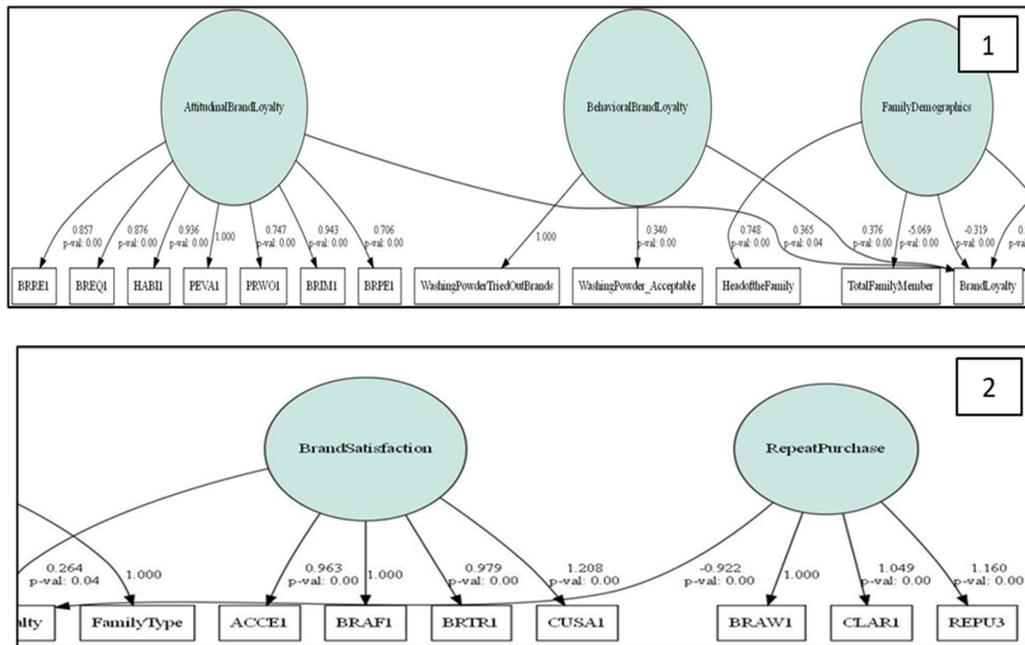
- Revised reliability indicators:

	DoF	DoF Baseline	chi2	chi2 p-value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	156	190	1079.207	0	3654.335	0.733511	0.704678	0.640312	0.704678	0.67543	0.099067	104.4265	342.2195	1.786767

Findings: All reliability indicators are showing improvement compared to first round of fit. P value is zero and CFI, GFI, NFI are above 70%. Also, RMSEA is within

tolerance limit of 0.10. Overall model is good and can be accepted for further decision-making process.

Figure 5.5 Final model Urban – MT/Ecomm – Washing Powder



Findings:

- Attitudinal Loyalty, Behavioural Loyalty, Family Demographics, Brand Satisfaction and Repeat Purchase are the key factors.

Step 5: Support Vector Machine (SVM): After getting most impacting features from the final model of SEM. Now it is time to train the model to classify FMCG users into three categories called, Loyal, Disloyal and Neutral based on both Behavioural and Attitudinal factors.

SVM will be run on both Behavioural and Attitudinal factors separately. Output will be in the form of 3*3 matrix, 3 levels from Behavioural and 3 levels from Attitudinal. This will help further to Retailers and Manufacturers to decide about their strategy.

SVM – Attitudinal:

- Variables considered for building model are based on the outcome of SEM which are as below.

BRAF1 - Brand Affect
CUSA1 - Customer satisfaction
BRTR1 - Brand Trust
PEVA1 - Perceived Value
BRRE1 - Brand Relevance
BRPE1 - Brand Performance
PRWO1 - Price Worthiness
BREQ1 - Brand Equity
BRIM1 - Brand Image
ACCE1 - Accessibility
HABI1 - Habit
BRAW1 - Brand Awareness
REPU3 - Repeat Purchase
CLAR1 – Clarity

```
classifier = SVC(kernel = 'rbf', random_state = 8, gamma=3, C=6, break_ties = False)
```

```
SVC(C=6, break_ties=False, cache_size=200, class_weight=None, coef0=0.0,  
decision_function_shape='ovr', degree=3, gamma=3, kernel='rbf', max_iter=-1,  
probability=False, random_state=8, shrinking=True, tol=0.001, verbose=False)
```

Accuracy : 0.6446280991735537 – Accuracy is relatively low for attitudinal variables.

```
array([[ 73,  2,  7],  
       [ 14,  1,  6],  
       [ 14,  0,  4]])
```

SVM – Behavioural:

- Variables considered for building model are based on the outcome of SEM which are as below.

Washing Powder_Acceptable – Buyer may prefer more than one brand of same category. Count of acceptable brands of given individual directly affects his/her loyalty towards product.

Washing Powder Tried Out Brands - It counts how many different brands that buyer has tried out in last 8 periods.

```
classifier = SVC(kernel = 'rbf', random_state = 8, gamma=3, C=6, break_ties = False)
```

```
SVC(C=6, break_ties=False, cache_size=200, class_weight=None, coef0=0.0,
decision_function_shape='ovr', degree=3, gamma=3, kernel='rbf', max_iter=-1,
probability=False, random_state=8, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.8512396694214877
array([[77, 1, 1],
[0, 16, 7],
[7, 2, 10]])

SVM – Attitudinal and Behavioural

Decision matrix obtained based on above two results is as below.

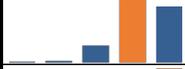
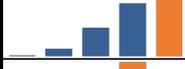
Table 5.6 Urban – MT/EComm – Washing Powder - SVM Classification of Buyers as per Behavioural and Attitudinal Variables

		Behavioral		
		Loyal	Neutral	Disloyal
Attitudinal	Loyal	Strongly Loyal	Potential Loyal	Spurious Disloyalty
		392	70	58
	Neutral	Potential Disloyal	Not predictable	Weakly Disloyal
		17	25	13
	Disloyal	Spurious Loyalty	Weakly Disloyal	Strongly Disloyal
		10	6	13

5.2.3 URBAN – MT/EComm – SOFT DRINK & CHOCOLATE: Summary of 38 variables

Table 5.7 Urban – MT/EComm – SD & Chocolate– Column Sparkline

Sr. No.	Attribute	Code	Question	Category	MT/Ecomm				
					1	2	3	4	5
1	Brand Affect	BRAF1	After using my preferred brands, I get positive feeling.	Soft Drink & Chocolate brand					
2	Customer satisfaction	CUSA1	I am very satisfied with brands which I use so I repeat purchase.	Soft Drink & Chocolate brand					
3	Switching Cost	SWCO1	I do not switch to other brands as they are costly.	Soft Drink & Chocolate brand					
4	Brand Trust	BRTR1	I buy only those brands on which I have faith.	Soft Drink & Chocolate brand					
5	Relationship Proneness	REPR1	I have developed emotional relationship with the brands I purchase.	Soft Drink & Chocolate brand					
6	Involvement	INVO1	When I am involved in my favorite brands, I never look for other brands.	Soft Drink & Chocolate brand					
7	Perceived Value	PEVA1	The return I am getting on money spent on FMCG decides my product loyalty.	Soft Drink & Chocolate brand					
8	Availability	AVAI1	I never buy other brands if my favorite brands are not available.	Soft Drink & Chocolate brand					
9	Brand Relevance	BRRE1	My brands remains updated with change in technology and buyer's preferences.	Soft Drink & Chocolate brand					
10	Brand Performance	BRPE1	Brand performance really matters to me for loyalty towards it.	Soft Drink & Chocolate brand					
11	Culture	CULT1	I keep religious beliefs in center while selecting my brands.	Soft Drink & Chocolate brand					
12	Price Worthiness	PRWO1	My brands are economical.	Soft Drink & Chocolate brand					
13	Brand Equity	BREQ1	It is wise decision to purchases my brand even if other brands are same.	Soft Drink & Chocolate brand					
14	Brand Image	BRIM1	My brand delivers which it promises.	Soft Drink & Chocolate brand					
15	Accessibility	ACCE1	Without any recall efforts, I can remember my brands quickly.	Soft Drink & Chocolate brand					
16	Habit	HABI1	Buying preferred brand is now my habit.	Soft Drink & Chocolate brand					
17	Brand Reputation	BRRP1	I prefer to buy brands which are reputed among the larger group of buyers.	Soft Drink & Chocolate brand					
18	Brand Credibility	BRCR1	I prefer to buy brands which are more than 50 years old with good track record.	Soft Drink & Chocolate brand					
19	Emotional Value	EMVA1	I feel good when I use my favorite brands.	Soft Drink & Chocolate brand					

20	Functional Value	FUVA1	I like packaging and other features of my favorite brands.	Soft Drink & Chocolate brand	
21	Brand Attitude	BRAT2	In my next purchase I would like to buy these brands.	Soft Drink & Chocolate brand	
22	Centrality	CENT1	I prefer to buy brands which are matching with my value system.	Soft Drink & Chocolate brand	
23	Family Influence/Social Value	FASO1	My purchase decision always based on choice of family members.	Soft Drink & Chocolate brand	
24	Commitment	COMM1	If my favorite brand is not available in store, I don't purchase another brand.	Soft Drink & Chocolate brand	
25	Situational Factors	SIFA1	During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Soft Drink & Chocolate brand	
26	Discounts	DISC1	I never use to switch to other brand only because they offer discounts.	Soft Drink & Chocolate brand	
27	Advertising	ADVE1	Advertising of FMCG products help me to take buying decision.	Soft Drink & Chocolate brand	
28	Personal Selling	PESE1	Personal selling in super stores helps me to take right buying decision.	Soft Drink & Chocolate brand	
29	Comparing Product Features	COPF1	I must compare product features of various brands before buying the final one.	Soft Drink & Chocolate brand	
30	Assortment/Gift Pack/Banded Pack	GIPC1	I continue to buy same brand as gift/banded/assortment pack are available for it.	Soft Drink & Chocolate brand	
31	Product Placement	PRPL1	Due to product placement, I sometimes change my buying decision.	Soft Drink & Chocolate brand	
32	Brand Awareness	BRAW1	I recognize my favorite brands even by color of its packet.	Soft Drink & Chocolate brand	
33	Celebrity Influence	CLIF1	My purchase decision never changes based on the celebrity endorsement.	Soft Drink & Chocolate brand	
34	Repeat Purchase	REPU1	I like to try different FMCG brands every time.	Soft Drink & Chocolate brand	
35	Repeat Purchase	REPU3	My buying behavior towards favorite brands is never deviating in normal conditions.	Soft Drink & Chocolate brand	
36	Brand Market Share	BRMS1	I do consider brand's market share before buying it.	Soft Drink & Chocolate brand	
37	Clarity	CLAR1	I have complete clarity about my brands, so I do not prefer other brands.	Soft Drink & Chocolate brand	
38	Repeat Purchase	REPU2	I usually get board after buying same brand for some time.	Soft Drink & Chocolate brand	

Findings:

- Factors like Habit are key for Chocolate and Soft Drink category. This indicates test and preference that buyer has developed over time which is difficult to change.

Table 5.8 Urban – MT/EComm – SD & Chocolate – Descriptive Statistics

Questions	Que. Type	Que. Code	count	mean	std	min	25% (Q1)	50% (Q2)	75% (Q3)	max
After using my preferred brands, I get positive feeling.	Brand Affect	BRAF1	604	4.413907	0.846927	1	4	5	5	5
I am very satisfied with brands which I use so I repeat purchase.	Customer satisfaction	CUSA1	604	4.210265	0.903555	1	4	4	5	5
I do not switch to other brands as they are costly.	Switching Cost	SWCO1	604	3.254967	1.24238	1	3	3	4	5
I buy only those brands on which I have faith.	Brand Trust	BRTR1	604	4.009934	1.057188	1	4	4	5	5
I have developed emotional relationship with the brands I purchase.	Relationship Proneness	REPR1	604	3.221854	1.393108	1	2	3	4	5
When I am involved in my favorite brands, I never look for other brands.	Involvement	INVO1	604	3.649007	1.123833	1	3	4	5	5
The return I am getting on money spent on FMCG decides my product loyalty.	Perceived Value	PEVA1	599	3.994992	0.983973	1	3	4	5	5
I never buy other brands if my favorite brands are not available.	Availability	AVAI1	599	3.040067	1.187334	1	2	3	4	5
My brands remains updated with change in technology and buyer's preferences.	Brand Relevance	BRRE1	599	3.923205	1.082289	1	3	4	5	5
Brand performance really matters to me for loyalty towards it.	Brand Performance	BRPE1	599	3.954925	1.200462	1	3	4	5	5
I keep religious beliefs in center while selecting my brands.	Culture	CULT1	599	2.462437	1.40407	1	1	2	4	5
My brands are economical.	Price Worthiness	PRWO1	599	3.81803	0.997627	1	3	4	4	5
It is wise decision to purchases my brand even if other brands are same.	Brand Equity	BREQ1	599	3.833055	1.037189	1	3	4	5	5
My brand delivers which it promises.	Brand Image	BRIM1	599	3.986644	1.031197	1	4	4	5	5
Without any recall efforts, I can remember my brands quickly.	Accessibility	ACCE1	599	4.198664	0.944407	1	4	4	5	5
Buying preferred brand is now my habit.	Habit	HABI1	599	3.916528	1.072479	1	3	4	5	5
I prefer to buy brands which are reputed among the larger group of buyers.	Brand Reputation	BRRP1	599	3.420701	2.665268	1	2	3	4	44
I prefer to buy brands which are more than 50 years old with good track record.	Brand Credibility	BRCR1	599	3.220367	1.264985	1	2	3	4	5
I feel good when I use my favorite brands.	Emotional Value	EMVA1	599	4.30384	0.907698	1	4	5	5	5
I like packaging and other features of my favorite brands.	Functional Value	FUVA1	599	4.245409	0.864503	1	4	4	5	5
In my next purchase I would like to buy these brands.	Brand Attitude	BRAT2	599	4.068447	0.856017	1	4	4	5	5
I prefer to buy brands which are matching with my value system.	Centrality	CENT1	599	3.843072	1.025795	1	3	4	5	5
My purchase decision always based on choice of family members.	Family Influence/Social Value	FASO1	599	3.016694	1.361089	1	2	3	4	5
If my favorite brand is not available in store, I don't purchase another brand.	Commitment	COMM1	599	2.988314	1.223323	1	2	3	4	5
During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Situational Factors	SIFA1	599	3.791319	1.20819	1	3	4	5	5
I never use to switch to other brand only because they offer discounts.	Discounts	DISC1	599	3.694491	1.215213	1	3	4	5	5

Advertising of FMCG products help me to take buying decision.	Advertising	ADVE1	599	3.752922	1.159108	1	3	4	5	5
Personal selling in super stores helps me to take right buying decision.	Personal Selling	PESE1	599	3.601002	1.030991	1	3	4	4	5
I must compare product features of various brands before buying the final one.	Comparing Product Features	COPF1	599	3.689482	1.179708	1	3	4	5	5
I continue to buy same brand as gift/bended/assortment pack are available for it.	Assortment/ Gift Pack/Bended Pack	GIPC1	599	3.814691	1.046119	1	3	4	5	5
Due to product placement, I sometimes change my buying decision.	Product Placement	PRPL1	599	3.517529	1.06602	1	3	4	4	5
I recognize my favorite brands even by color of its packet.	Brand Awareness	BRAW1	594	4.154882	1.020656	1	4	4	5	5
My purchase decision never changes based on the celebrity endorsement.	Celebrity Influence	CLIF1	599	3.752922	1.111984	1	3	4	5	5
I like to try different FMCG brands every time.	Repeat Purchase	REPU1	599	3.400668	1.08797	1	3	4	4	5
My buying behavior towards favorite brands is never deviating in normal conditions.	Repeat Purchase	REPU3	599	3.731219	1.02292	1	3	4	5	5
I do consider brand's market share before buying it.	Brand Market Share	BRMS1	599	3.250417	1.193935	1	2	3	4	5
I have complete clarity about my brands, so I do not prefer other brands.	Clarity	CLAR1	599	3.72621	1.028928	1	3	4	4	5
I usually get board after buying same brand for some time.	Repeat Purchase	REPU2	599	3.045075	1.282623	1	2	3	4	5

Findings:

- Relationship proneness, brand reputation, culture are the variables showing higher volatility.
- This group of buyers are having different opinions about importance of cultural value and brand reputation.

Urban – MT/Ecomm – Soft Drink & Chocolate: Summary of 38 variables under study

Step 1: K-Means Clustering: to have primary classification of buyers into Brand Loyal, Brand Disloyal and Neutral. Whole analysis is based on unsupervised clustering approach, so not very reliable.

As an output we manage to generate an additional column in the data set where each of the individual respondent is assigned tag of Loyal, Disloyal and Neutral.

Cluster Tag	Category of Consumers	Count
2	Loyal Consumers	344 (57%)
1	Disloyal Consumers	155 (26%)
0	Neutral	105 (17%)
	Total	604

Findings:

- Proportion of Loyal Consumers is more than sum of Disloyal and Neutral Consumers. This could be due to the same test that consumers want to have every time. Also, Chocolate and Soft Drink are mostly impulsive in nature that consumers buy them without any prior planning. This further adds strong need for overall satisfaction every time.
- Important thing to note here is that above numbers are not the final one to design final business strategies. They are only indicative of rough pattern available in the data.
- Neutral Consumers are around 17%. Manufacturers can take a call if they want to consider this group while framing strategies for other groups.

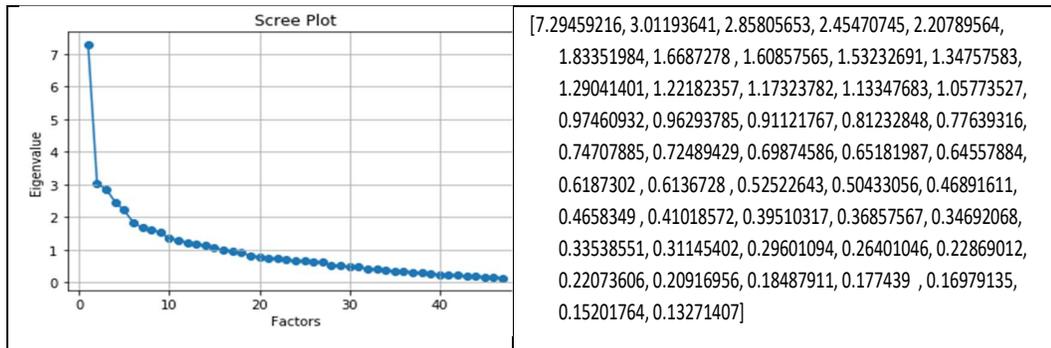
Step 2: Correlation Matrix: to find out relation between all pairs of variables under study. Purpose is to eliminate those variables which are identical in nature and thus reducing duplication before fitting the model. Summary of outcomes is as follows.

- Correlation values for each pair of variables in the study indicates no significant correlation as all values are less than 0.8.

- Overall conclusion is, no variable is to be removed from the analysis before applying Exploratory Factor Analysis.

Step 3: Exploratory Factor Analysis (EFA): is useful to reduce dimensionalities by creating liner combinations of variable with its constructs. Output of this process will become input for Structural Equation Modeling.

- Bartlett’s test value: (11528.723134521402, 0.0): As p value is zero test is statistically significant, and matrix is not an identity matrix.
- Scree Plot and Eigen Values: helps to decide about the number of useful factors. Points plotted above 1 are the potential factors to be considered for further tuning. Eigen values are numeric values indicating the same. There are 15 potential factors to be considered for next round.



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	0.0912	-0.0285	0.0796	0.1041	0.0360	-0.0055	0.0823	-0.0148	-0.0491	-0.0009	0.0906	0.2046	0.0244	0.0650	-0.2687
1	-0.0492	0.0507	0.1090	-0.0250	-0.1657	0.0073	-0.0476	0.4752	-0.0898	0.0135	-0.0520	-0.0268	0.0120	-0.0736	-0.0170
2	0.1272	-0.0520	0.8195	0.0381	-0.0324	-0.0851	-0.1049	0.1049	0.0381	-0.0079	-0.0297	0.0144	0.0924	0.0363	-0.1020
3	0.0365	0.0003	-0.8438	0.0274	-0.0327	-0.0602	-0.1453	-0.1097	0.0322	-0.0807	0.0043	-0.0309	0.0421	0.0169	-0.0258
4	0.1016	-0.0417	0.5016	0.0106	-0.1064	-0.0915	0.0857	0.0077	0.0453	-0.0026	0.0902	-0.0153	0.5136	0.0587	-0.0575
5	0.3732	0.0409	0.0850	-0.1353	0.0220	0.0912	0.0293	0.3519	0.1090	0.0042	-0.1020	0.3499	0.0389	0.0389	0.0540
6	0.4273	0.0350	0.1258	-0.0602	0.0777	0.1131	0.0543	0.2789	0.0784	0.0573	-0.1006	0.0123	0.1548	0.0919	0.0116
7	0.1082	0.2997	0.1323	0.0107	0.0008	-0.3874	0.0402	0.1287	0.0668	0.2279	0.0764	-0.0159	-0.1119	-0.1206	-0.1702
8	0.2118	-0.1808	0.0873	0.0328	0.0630	-0.1061	0.1719	0.4915	0.0724	-0.1332	0.2451	0.1020	0.0014	-0.0165	0.0660
9	0.2911	0.4015	0.1895	0.1369	-0.0844	0.1101	-0.1665	0.1949	-0.1231	0.0733	0.0190	0.0519	-0.1135	-0.0774	-0.1314
10	0.4104	0.1775	0.0091	0.1567	0.1711	-0.1997	0.1345	-0.1696	-0.0714	0.1890	0.1983	-0.1656	0.0364	0.0448	0.0336
11	0.3166	0.0120	0.1023	-0.0118	0.0785	-0.1001	0.4754	0.0735	0.2081	0.1391	0.0389	0.0080	-0.0351	0.1481	-0.0623
12	0.2045	0.4068	-0.0459	0.1461	0.0841	-0.1990	0.1446	-0.1536	-0.1115	0.1517	0.1647	-0.1848	-0.1922	-0.0616	-0.0232
13	0.4994	0.0493	-0.0285	-0.0394	0.0485	0.0041	0.1480	0.0533	0.2030	0.1607	0.0476	0.1028	0.0873	0.1236	0.1358
14	0.2284	-0.1292	-0.1246	-0.1151	-0.0692	0.0478	0.2386	0.2964	-0.0846	-0.0308	0.0470	0.4140	0.0313	0.1186	0.0158
15	-0.2221	0.5792	-0.2077	0.0187	0.0500	-0.0296	0.1056	-0.0852	0.0568	0.7585	0.2652	0.0398	-0.0108	0.0850	-0.0193
16	0.3037	-0.0197	0.0948	0.0245	0.0425	-0.0296	0.1056	-0.0852	0.0568	0.7585	0.2652	0.0398	-0.0108	0.0850	-0.0193
17	0.6767	-0.0068	0.0014	0.0425	0.0616	0.1434	0.1562	-0.1258	0.0887	-0.0416	0.0865	-0.0209	0.0402	0.2496	0.0520
18	0.6986	-0.1045	0.0004	-0.1470	0.1026	-0.0407	-0.0101	0.0691	0.0540	0.0694	0.0433	0.0044	-0.1026	0.0744	0.0064
19	0.7149	0.0840	0.0712	0.0249	0.0667	-0.0220	-0.0193	0.0815	-0.1521	0.0167	0.1971	-0.0258	-0.0611	-0.0625	-0.0318
20	0.0840	0.2561	0.0418	-0.1033	0.0357	0.0556	0.0399	-0.0079	-0.0420	-0.1121	-0.0334	0.0835	-0.0545	0.1561	0.0364
21	0.0443	0.6540	-0.0048	-0.1599	0.0109	-0.0797	-0.0551	-0.0649	-0.0221	0.0163	-0.0858	0.1684	0.1591	0.1318	-0.0759
22	0.3720	-0.0206	0.0386	-0.0127	-0.0513	0.0638	0.1774	0.2065	0.0489	0.1801	0.1255	0.0049	-0.0336	-0.1231	-0.0540
23	0.6895	0.0094	0.0689	0.0134	0.0875	0.1784	0.1277	0.0702	-0.0661	-0.0294	-0.0790	0.1196	0.1602	-0.1122	0.0702
24	0.4576	-0.0635	0.1032	0.0867	0.0167	0.2032	0.3082	0.2800	0.0278	-0.1152	0.1668	0.0731	-0.0807	0.0709	0.0451
25	0.1220	-0.0229	-0.0309	-0.1003	0.1690	0.5019	0.1171	-0.0659	-0.2540	-0.0943	0.1733	0.1339	0.2840	0.0311	-0.0281
26	-0.0410	0.6407	-0.0317	0.1245	-0.0362	0.1484	-0.0758	-0.0163	0.1639	-0.1597	-0.0425	-0.0222	-0.0598	-0.0644	0.1149
27	0.0110	0.3206	-0.0650	0.1265	0.0379	0.0166	0.0945	0.2946	-0.2823	0.2419	0.1314	-0.0321	-0.1858	0.1222	-0.0500
28	0.0683	-0.0400	0.0209	-0.0631	-0.0500	0.1088	0.1708	-0.0381	0.6847	0.0430	0.0250	0.0485	0.0513	-0.0056	-0.0083
29	0.2429	0.0286	-0.0433	0.1121	-0.0150	0.1023	0.2280	0.0063	-0.0275	-0.0269	0.1359	0.1397	0.0295	0.1060	0.6702
30	0.0683	-0.0400	0.0209	-0.0631	-0.0500	0.1088	0.1708	-0.0381	0.6847	0.0430	0.0250	0.0485	0.0513	-0.0056	-0.0083
31	0.3280	0.0009	0.0201	0.0783	0.0301	-0.0345	0.5644	-0.1624	0.0508	-0.2255	-0.0728	0.3074	0.0735	-0.1616	-0.0196
32	0.1251	-0.1420	-0.0991	0.0024	0.1176	-0.3866	0.2461	-0.1448	0.1254	-0.2364	0.1609	-0.1477	-0.0495	0.1472	-0.1259
33	0.4874	0.0873	-0.0887	0.0510	0.0937	0.1129	0.0454	-0.2478	0.0844	0.1017	-0.0734	0.1558	-0.1155	-0.0988	-0.0221
34	0.1093	0.0535	0.0267	-0.0083	-0.0160	0.6319	-0.0059	0.0561	0.1717	-0.0199	-0.0694	0.0691	0.0758	0.0346	0.0262
35	0.4682	-0.0807	0.1094	0.1109	0.0309	-0.0099	0.0622	-0.0352	0.3868	-0.0879	0.1937	0.0879	0.1455	0.4330	0.0752
36	0.3391	0.0340	-0.0094	-0.0110	0.0188	0.0247	0.0188	0.0206	0.1181	-0.0834	0.2769	0.0410	0.2915	0.0635	0.1793
37	-0.0452	0.0590	0.2533	-0.0624	0.0117	0.2566	-0.1455	-0.0836	0.3106	0.0793	0.1947	0.0611	-0.2017	0.0174	0.0509
38	0.3213	-0.0560	0.0006	0.1861	-0.0281	0.0810	0.0450	0.0586	0.0380	0.0867	0.7315	0.0837	0.0176	0.0199	0.0308
39	0.0703	0.2354	0.0747	-0.0680	-0.0401	0.1912	-0.0029	-0.0347	0.1370	0.1269	0.0668	0.7529	-0.0205	-0.0172	0.0526
40	0.5518	0.0508	-0.0127	0.1727	-0.0258	0.0186	0.0420	-0.0187	0.1552	0.0210	0.2607	0.0932	0.1306	0.0859	-0.0467
41	0.0681	0.1344	0.0251	0.0274	-0.0888	0.5820	-0.0262	-0.0363	0.0632	0.0428	0.0065	0.1232	-0.2559	0.0076	-0.3003
42	0.1136	0.0310	0.0444	0.1930	0.8605	0.0045	0.0223	-0.0674	0.0430	0.0441	0.0079	-0.0214	0.0208	-0.0432	-0.0088
43	-0.1535	-0.0040	0.0060	-0.1225	-0.8248	-0.0169	0.0212	0.0773	0.0201	0.0011	0.0154	0.0268	0.0252	-0.0423	0.0425
44	-0.0067	-0.0334	0.0645	-0.8970	-0.0666	0.0329	0.0332	0.0161	-0.0197	-0.0284	-0.0973	0.0504	-0.0315	-0.0109	-0.0125
45	0.0387	-0.0351	0.0028	0.7961	0.3527	-0.0026	0.0004	-0.0296	-0.0064	-0.0029	0.0611	-0.0182	-0.0899	0.0379	0.0057
46	0.0387	-0.0351	0.0028	0.7961	0.3527	-0.0026	0.0004	-0.0296	-0.0064	-0.0029	0.0611	-0.0182	-0.0899	0.0379	0.0057

Out of 15 factors derived, only those factors will be considered further where at least 3 variables are having factor loading >0.35 or <-0.35. Summary of factors is given in the table.

To fine tune the output, Varimax rotation is applied on the eligible factors. Here there are total 12 factors where Varimax rotation applied. Total 48% of variance explained by 12 factors. However further useful factors are only 10 which approximately explains 43% of variance.

	0	1	2	3	4	5	6	7	8	9	10	11
Age Group	0.11668	0.11178	-0.0246	0.09489	0.04151	-0.0611	0.04235	0.02172	-0.0074	0.19124	0.00395	-0.0691
Gender	-0.094	0.10844	-0.0694	-0.0354	-0.1567	0.03904	-0.0618	0.06348	0.48699	-0.042	-0.0679	-0.06
Family Type	0.12478	0.84152	0.05429	0.10659	0.05033	-0.0558	-0.1201	-0.10974	0.04682	-0.0779	-0.0779	0.02185
Total Family Member	0.05176	-0.7696	-0.1179	0.00748	-0.0255	0.05127	-0.0992	-0.1378	-0.1056	-0.0712	0.0797	0.00715
Head of the Family	0.14005	0.59339	-0.1467	-0.0318	-0.0729	0.09358	-0.1365	0.0419	-0.0312	0.21223	0.02365	0.02365
Brand Affect	0.37294	0.15731	0.02037	-0.1819	0.04793	0.15503	0.06319	-0.1607	0.37036	-0.0384	0.07785	0.06728
Customer satisfaction	0.42589	0.16481	0.07379	-0.1024	0.09255	0.08098	0.06116	-0.0063	0.27684	0.00062	-0.0062	0.06253
Switching Cost	0.07281	0.11385	0.40897	-0.0077	0.03031	0.17998	-0.0229	0.34944	0.13225	0.01785	-0.0802	0.06289
Brand Trust	0.19791	0.07131	-0.0705	0.03339	-0.2144	0.14834	0.07689	0.50842	0.07689	0.21177	0.04371	0.04371
Relationship Proneness	0.23904	0.15318	0.13792	0.14976	-0.0717	0.31357	-0.2209	0.29014	0.22171	0.07903	-0.1298	-0.1218
Involvement	0.4067	0.0256	-0.1989	0.15381	0.15831	0.09991	0.09158	0.34148	-0.1785	-0.1048	0.16529	-0.0306
Perceived Value	0.35134	0.13045	-0.0717	-0.0135	0.06045	-0.0507	0.41867	0.17614	0.04063	0.01025	0.00821	0.21159
Availability	0.16469	-0.0857	-0.146	0.18505	0.06897	0.24141	0.0632	0.46528	-0.1494	-0.1072	0.00338	-0.0442
Brand Relevance	0.51725	-0.0123	0.00821	-0.0692	0.04492	0.06372	0.16426	0.09955	0.06203	0.10726	0.11735	0.22106
Brand Performance	0.24587	-0.1061	0.02335	-0.1298	-0.085	-0.0926	0.26487	-0.0753	0.30265	0.339	0.08145	-0.1088
Culture	-0.2729	-0.2007	0.11215	-0.0103	0.06574	0.53075	0.02289	0.33907	0.03966	0.00393	0.09007	0.0783
Price Worthiness	0.28293	0.11454	-0.0199	-0.0688	0.05294	-0.0851	0.07359	0.51996	-0.1181	0.17372	-0.006	0.17961
Brand Equity	0.6312	0.08559	0.09917	0.07673	-0.0312	0.05616	0.13871	0.03532	-0.1444	0.00347	0.12566	-0.0549
Brand Image	0.73514	0.01307	0.14746	0.05122	0.04742	0.0083	0.15631	-0.0251	-0.1172	-0.0445	0.10463	0.01433
Accessibility	0.69136	-0.0299	-0.0162	-0.148	0.09707	-0.1391	-0.044	0.12127	0.09009	0.02426	-0.0332	0.04922
Habit	0.66213	0.03259	-0.0066	0.04437	0.07335	0.00946	-0.0693	0.24155	0.14428	0.02088	0.04804	-0.1614
Brand Reputation	0.10802	0.02141	0.08064	-0.0595	0.00794	0.24769	0.04092	-0.0212	-0.0162	0.0294	-0.0136	-0.0707
Brand Credibility	0.06445	0.0348	-0.0876	-0.1422	0.00165	0.65649	-0.051	0.07839	-0.0681	0.10933	0.00996	-0.0198
Emotional Value	0.33309	0.03191	0.0706	-0.0365	-0.0331	-0.0943	0.12846	0.26051	0.24081	0.0447	0.00319	0.07566
Functional Value	0.643	0.06864	0.12597	-0.021	0.12917	0.08612	0.14742	-0.0263	0.16707	0.10458	-0.0515	-0.0992
Brand Attitude	0.4644	0.08365	0.22821	0.11549	0.00657	-0.1197	0.27143	0.04261	0.30901	0.03912	0.05971	-0.0493
Centrality	0.14741	0.02034	0.38626	-0.1239	0.18526	0.04906	0.15419	-0.1311	-0.1014	0.08406	0.23628	-0.3376
Family Influence/Social N	-0.0589	-0.0834	0.20988	0.18926	-0.0405	0.61571	-0.064	0.03599	0.01856	-0.0567	-0.0321	0.12615
Commitment	-0.004	-0.0683	0.02348	0.12441	0.00032	0.1659	0.03831	0.43882	0.20538	-0.0126	0.03607	-0.2032
Situational Factors	0.24456	-0.0147	0.26339	0.01942	0.05323	0.03091	0.1661	-0.0865	-0.0094	0.01912	0.05055	0.64297
Discounts	0.25139	-0.0933	0.13862	0.10777	-0.0451	0.07569	0.28975	-0.0107	0.02769	0.09062	0.25813	-0.0056
Advertising	0.07291	0.05554	0.0903	-0.0524	-0.0589	-0.0589	0.80299	0.17148	0.0755	-0.0362	0.0771	0.03068
Personal Selling	0.31646	0.01145	-0.0321	0.0816	0.06153	0.04662	0.51478	-0.1334	-0.0273	0.23334	-0.0827	0.00305
Comparing Product Feat	0.1892	-0.0883	0.36297	0.04335	0.1125	-0.1601	0.20833	-0.1611	-0.1246	-0.1632	0.08909	0.00067
Assortment/Gift Pack/Be	0.46329	-0.1312	0.12903	0.04796	0.12279	0.07449	0.04279	0.12265	-0.1809	0.1846	-0.1756	0.0837
Product Placement	0.12998	0.03583	0.60774	-0.0436	0.01621	0.11338	0.03431	-0.1382	0.0723	0.02133	0.0004	0.07499
Brand Awareness	0.57591	0.15533	0.03254	0.12675	-0.0104	-0.0462	0.08417	-0.1805	-0.0661	0.03828	0.30909	0.2938
Celebrity Influence	0.36581	0.02694	-0.0272	-0.0042	0.2295	0.09389	0.04895	-0.0955	0.06084	-0.0028	0.42638	0.0618
Repeat Purchase	-0.0317	0.1825	0.37543	-0.0211	-0.013	-0.028	-0.1688	0.10977	-0.1021	0.07626	0.10516	0.26865
Repeat Purchase	0.33669	-0.0061	0.13774	0.21539	-0.056	-0.1868	0.00275	0.26702	0.08239	0.11582	0.54868	0.00011
Brand Market Share	0.05943	0.04016	0.23985	-0.0796	-0.0444	0.25878	0.03746	0.04127	-0.008	0.84572	0.0862	0.12972
Clarity	0.57902	0.02138	0.02566	0.16968	0.03369	0.02554	0.06204	0.01542	0.09816	0.23652	0.10315	0.03175
Repeat Purchase	0.05371	-0.0775	0.63183	0.03722	-0.0935	0.10985	0.02577	0.07588	-0.308	0.11142	-0.0097	0.02082
SD & Chocolate Max Run	0.09823	0.03606	-0.0077	0.19059	0.87863	0.01273	0.01762	0.07054	-0.0546	0.00315	0.03985	0.04872
SD & Chocolate Tried Ou	-0.1565	0.01694	-0.0012	-0.132	-0.80404	0.01318	0.02724	-0.0296	0.08281	0.0156	-0.0046	0.03349
SD & Chocolate Accepta	-0.0168	-0.0767	0.03062	-0.8404	-0.0729	0.00164	0.02544	-0.0798	0.02214	0.02188	-0.0884	-0.0302
cluster	0.04757	-0.0139	0.00665	0.80577	0.33802	-0.0859	0.00291	0.06349	-0.0406	0.01138	0.02506	-0.0019

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
SS Loadings	5.37121424	2.00822627	1.86420385	1.85787556	1.81975361	1.738738	1.714489	1.670195	1.359488	1.161386	1.070861	1.033203
Proportion Variance	0.11428115	0.04272822	0.03966391	0.03952927	0.03871816	0.036994	0.036478	0.035536	0.028925	0.02471	0.022784	0.021983
Cumulative Variance	0.11428115	0.15700937	0.19667328	0.23620255	0.27492071	0.311915	0.348394	0.38393	0.412855	0.437565	0.46035	0.482333

- Factors defined based on the output are as below. This will become an input for Structural Equation Modeling.

Attitudinal Brand Loyalty \approx CUSA1 + INVO1 + BRRE1 + BREQ1 + BRIM1 + ACCE1 + HABI1 + FUVA1 + BRAT2 + GIPC1 + BRAW1 + CLAR1
Family Demographics \approx Family Type - Total Family Member + Head of the Family
Repeat Purchase \approx SWCO1 + CENT1 + COPF1 + PRPL1 + REPU1 + REPU2
Behavioural Brand Loyalty \approx SD & Chocolate Max Run - SD & Chocolate Tried Out Brands - SD & Chocolate_Acceptable
Value System \approx CULT1 + BRRCR1 + FASO1
Impact of Promotion \approx PEVA1 + ADVE1 + PESE1
Brand Commitment \approx AVAI1 + PRWO1 + COMM1
Brand Satisfaction \approx BRAF1 + BRTR1
Situational Loyalty \approx CLIF1 + REPU3 + SIFA1

Step 4: Structural Equation Modeling (SEM): is used to fit the model which depicts the relationship between measured variable and latent variables. Output of this process will become input for Support Vector Machine which will help further to have classification of consumers into loyal, disloyal, and neutral in terms of brand loyalty of FMCG products.

- Initially proposed model:

measurement model

AttitudinalBrandLoyalty \approx CUSA1 + INVO1 + BRRE1 + BREQ1 + BRIM1 + ACCE1 + HABI1 + FUVA1 + BRAT2 + GIPC1 + BRAW1 + CLAR1

FamilyDemographics \approx FamilyType - TotalFamilyMember + HeadoftheFamily

RepeatPurchase \approx SWCO1 + CENT1 + COPF1 + PRPL1 + REPU1 + REPU2

BehaviouralBrandLoyalty \approx SDChocolateMaxRun - SDChocolateTriedOutBrands - SDChocolate_Acceptable

ValueSystem \approx CULT1 + BRRCR1 + FASO1

ImpactofPromotion \approx PEVA1 + ADVE1 + PESE1

BrandCommitment \approx AVAI1 + PRWO1 + COMM1

BrandSatisfaction \approx BRAF1 + BRTR1

SituationalLoyalty \approx CLIF1 + REPU3 + SIFA1

regressions

BrandLoyalty \sim AttitudinalBrandLoyalty + RepeatPurchase + BehaviouralBrandLoyalty

- Initial reliability indicators:

Indicators	DoF	DoF Baseline	chi2	chi2 p-value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	664	741	4610.3	0	9627.52	0.5559	0.5211	0.4656	0.5211	0.5044	0.0993	216.73	727.55	7.633

As there is a scope for improvement for most of the indicators, whole process is repeated after eliminating not impacting variables.

Figure 5.6 Initial model Urban – MT/Ecomm – Soft Drink & Chocolate



- New model proposed based on the previous model's output:

measurement model

BehaviouralBrandLoyalty \approx SDChocolateMaxRun + SDChocolateTriedOutBrands + SDChocolate_Acceptable

AttitudinalBrandLoyalty \approx CUSAI + INVO1 + BRRE1 + BREQ1 + BRIM1 + ACCE1 + HABI1 + FUVA1 + BRAT2 + GIPC1 + BRAW1 + CLAR1

ValueSystem \approx CULT1 + BRRC1 + FASO1

regressions

BrandLoyalty ~ AttitudinalBrandLoyalty + BehaviouralBrandLoyalty +
ValueSystem

Using above equations entire process run again to check if values have improved further and model has become useful.

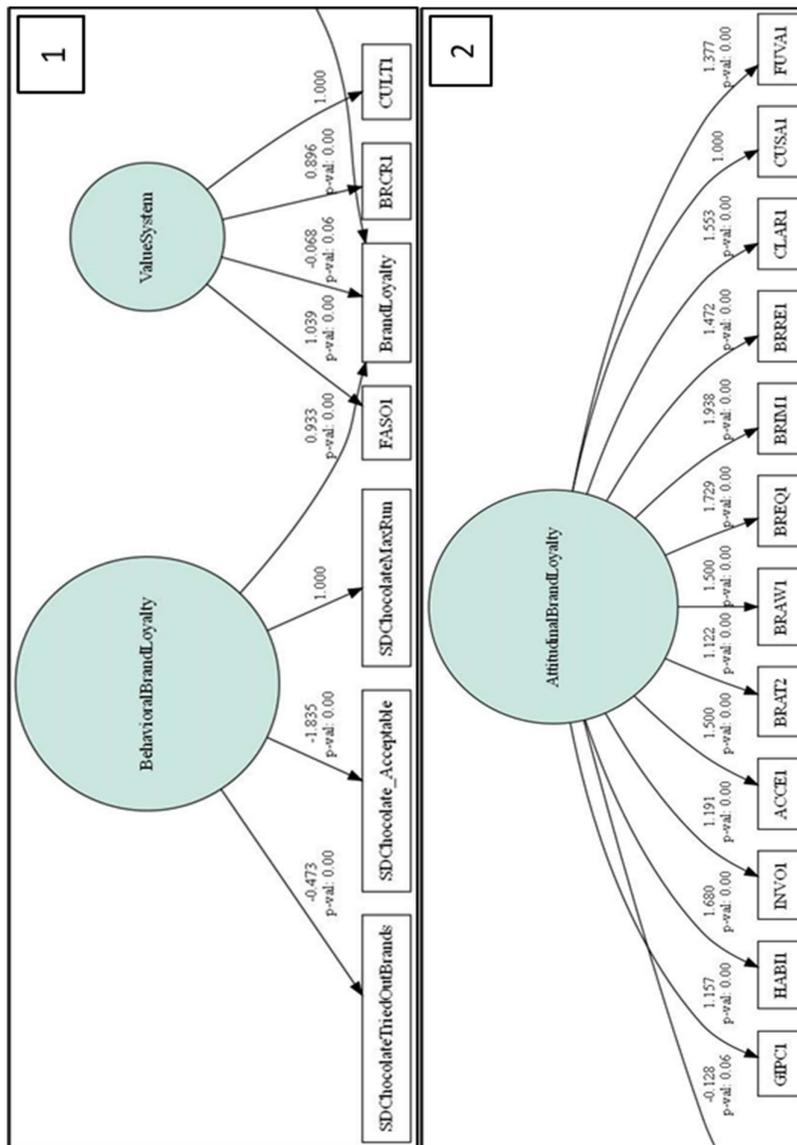
- Revised reliability indicators:

	DoF	DoF Baseline	chi2	chi2 p-value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	147	171	1336.326	0	4317.314	0.713	0.690	0.640	0.690	0.666	0.090	81.575	270.929	2.212

Findings: All reliability indicators are showing improvement compared to first round of fit. P value is zero and CFI, GFI, NFI are above 69%. Also, RMSEA is within tolerance limit, i.e. 0.10. Overall model is good and can be accepted for further decision-making process.

	lval	op	rval	Estimate	Std. Err	z-value	p-value
0	SDChocolateMaxRun	~	BehavioralBrandLoyalty	1	-	-	-
1	SDChocolateTriedOutBrands	~	BehavioralBrandLoyalty	-0.473	0.057	-8.238	0.000
2	SDChocolate_Acceptable	~	BehavioralBrandLoyalty	-1.835	0.156	-11.749	0.000
3	CUSA1	~	AttitudinalBrandLoyalty	1.000	-	-	-
4	INVO1	~	AttitudinalBrandLoyalty	1.191	0.150	7.958	0.000
5	BRRE1	~	AttitudinalBrandLoyalty	1.472	0.160	9.207	0.000
6	BREQ1	~	AttitudinalBrandLoyalty	1.729	0.171	10.127	0.000
7	BRIM1	~	AttitudinalBrandLoyalty	1.938	0.183	10.595	0.000
8	ACCE1	~	AttitudinalBrandLoyalty	1.500	0.152	9.903	0.000
9	HABI1	~	AttitudinalBrandLoyalty	1.680	0.170	9.856	0.000
10	FUVA1	~	AttitudinalBrandLoyalty	1.377	0.139	9.905	0.000
11	BRAT2	~	AttitudinalBrandLoyalty	1.122	0.124	9.012	0.000
12	GIPC1	~	AttitudinalBrandLoyalty	1.157	0.141	8.183	0.000
13	BRAW1	~	AttitudinalBrandLoyalty	1.500	0.157	9.555	0.000
14	CLAR1	~	AttitudinalBrandLoyalty	1.553	0.160	9.696	0.000
15	CULT1	~	ValueSystem	1.000	-	-	-
16	BRCR1	~	ValueSystem	0.896	0.114	7.872	0.000
17	FASO1	~	ValueSystem	1.039	0.134	7.747	0.000
18	BrandLoyalty	~	AttitudinalBrandLoyalty	-0.128	0.067	-1.914	0.056
19	BrandLoyalty	~	BehavioralBrandLoyalty	0.933	0.087	10.729	0.000
20	BrandLoyalty	~	ValueSystem	-0.068	0.037	-1.855	0.064
21	BehavioralBrandLoyalty	~~	BehavioralBrandLoyalty	0.689	0.119	5.788	0.000
22	BehavioralBrandLoyalty	~~	AttitudinalBrandLoyalty	0.067	0.020	3.367	0.001
23	BehavioralBrandLoyalty	~~	ValueSystem	0.020	0.043	0.468	0.640
24	ValueSystem	~~	ValueSystem	0.667	0.119	5.599	0.000
25	AttitudinalBrandLoyalty	~~	AttitudinalBrandLoyalty	0.166	0.030	5.493	0.000
26	AttitudinalBrandLoyalty	~~	ValueSystem	-0.030	0.019	-1.609	0.108
27	BRCR1	~~	BRCR1	1.049	0.090	11.603	0.000
28	SDChocolate_Acceptable	~~	SDChocolate_Acceptable	1.675	0.149	11.257	0.000
29	BRAW1	~~	BRAW1	0.672	0.042	16.028	0.000
30	CLAR1	~~	CLAR1	0.653	0.041	15.888	0.000
31	CUSA1	~~	CUSA1	0.650	0.039	16.759	0.000
32	INVO1	~~	INVO1	1.026	0.061	16.822	0.000
33	SDChocolateTriedOutBrands	~~	SDChocolateTriedOutBrands	0.808	0.047	17.150	0.000
34	GIPC1	~~	GIPC1	0.867	0.052	16.758	0.000
35	CULT1	~~	CULT1	1.287	0.112	11.507	0.000
36	BRIM1	~~	BRIM1	0.439	0.032	13.915	0.000
37	HABI1	~~	HABI1	0.679	0.043	15.699	0.000
38	ACCE1	~~	ACCE1	0.522	0.033	15.636	0.000
39	BRRE1	~~	BRRE1	0.808	0.050	16.297	0.000
40	BREQ1	~~	BREQ1	0.576	0.038	15.277	0.000
41	FUVA1	~~	FUVA1	0.439	0.028	15.634	0.000
42	SDChocolateMaxRun	~~	SDChocolateMaxRun	2.511	0.148	16.920	0.000
43	FASO1	~~	FASO1	1.114	0.111	10.057	0.000
44	BRAT2	~~	BRAT2	0.526	0.032	16.415	0.000
45	BrandLoyalty	~~	BrandLoyalty	0.000	0.029	0.000	1.000

Figure 5.7 Final model Urban – MT/Ecomm – Soft Drink & Chocolate



Findings:

- Value System, Attitudinal Loyalty and Behavioural Loyalty are the key factors of beverage and chocolate category when it is bought from MT/Ecomm in Urban area.
- Due to overly complex MT/Ecomm market in Urban area there are many factors impacting overall attitudinal loyalty.
- Accessibility, Habit, Brand Involvement, Clarity, Brand Image are most impacting factors.

Step 5: Support Vector Machine (SVM): After getting most impacting features from the final model of SEM. Now it is time to train the model to classify FMCG users into three categories called, Loyal, Disloyal and Neutral based on both Behavioural and Attitudinal factors.

SVM will be run on both Behavioural and Attitudinal factors separately. Output will be in the form of 3*3 matrix, 3 levels from Behavioural and 3 levels from Attitudinal. This will help further to Retailers and Manufacturers to decide about their strategy.

SVM – Attitudinal:

- Variables considered for building model are based on the outcome of SEM which are as below.

CUSA1 - Customer satisfaction

INVO1 - Involvement

BRRE1 - Brand Relevance

CULT1 - Culture

BREQ1 - Brand Equity

BRIM1 - Brand Image

ACCE1 - Accessibility

HABI1 - Habit

BRCR1 - Brand Credibility

FUVA1 - Functional Value

BRAT2 - Brand Attitude

FASO1 - Family Influence/Social Value

GIPC1 - Assortment/Gift Pack/Bended Pack

BRAW1 - Brand Awareness

CLAR1 - Clarity

Cluster

```
classifier = SVC(kernel = 'rbf', random_state = 8, gamma=0.5, C=3, break_ties = False)
```

```
SVC(C=3, break_ties=False, cache_size=200, class_weight=None, coef0=0.0, decision_function_shape='ovr', degree=3, gamma=0.5, kernel='rbf', max_iter=-1, probability=False, random_state=8, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.5867768595041323

Accuracy is average for attitudinal variables.

```
array([[ 2,  1, 18],  
       [ 0,  4, 30],  
       [ 0,  1, 65]])
```

SVM – Behavioural:

- Variables considered for building model are based on the outcome of SEM which are as below.

SDChocolateMaxRun - Measure of how many times buyer buys same brand consecutively.

SDChocolateTriedOutBrands - It counts how many different brands that buyer has tried out in last 8 periods.

SDChocolate_Acceptable - Buyer may prefer more than one brand of same category. Count of acceptable brands of given individual directly affects his/her loyalty towards product.

```
classifier = SVC(kernel = 'rbf', random_state = 8, gamma=0.5, C=3, break_ties = False)
```

```
SVC(C=3, break_ties=False, cache_size=200, class_weight=None, coef0=0.0, decision_function_shape='ovr', degree=3, gamma=0.5, kernel='rbf', max_iter=-1, probability=False, random_state=8, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.9669421487603306

```
array([[19, 1, 0],
       [ 0, 26, 2],
       [ 0,  1, 72]])
```

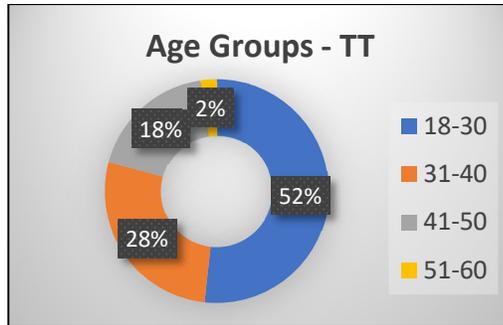
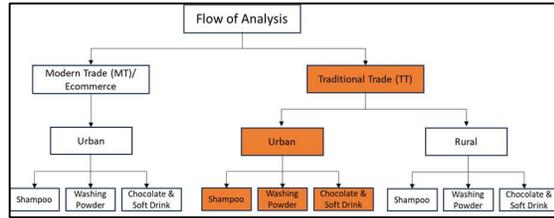
SVM – Attitudinal and Behavioural

Decision matrix obtained based on above two results is as below.

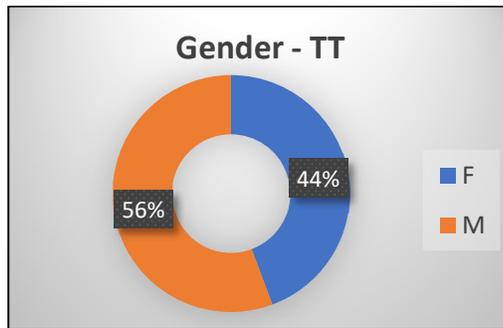
Table 5.9 Urban – MT/EComm – SD & Chocolate - SVM Classification of Buyers as per Behavioural and Attitudinal Variables

		Behavioral		
		Loyal	Neutral	Disloyal
Attitudinal	Loyal	Strongly Loyal	Potential Loyal	Spurious Disloyalty
		338	88	132
	Neutral	Potential Disloyal	Not predictable	Weakly Disloyal
		7	12	6
	Disloyal	Spurious Loyalty	Weakly Disloyal	Strongly Disloyal
		4	4	13

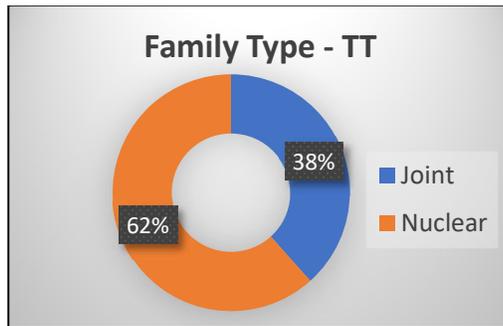
5.3 TRADITIONAL TRADE - URBAN



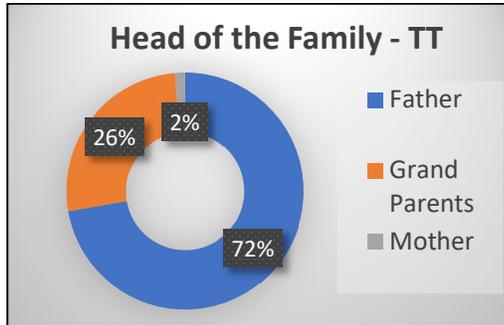
18-30 age group is dominating



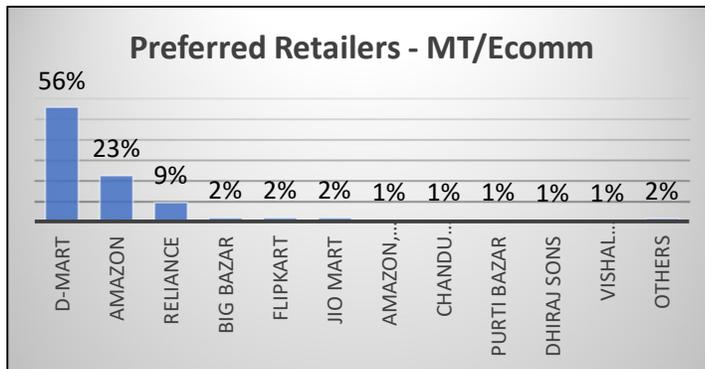
Ratio of Male respondents is higher than female respondents.



This follows current scenario where nuclear families are higher than joint families.

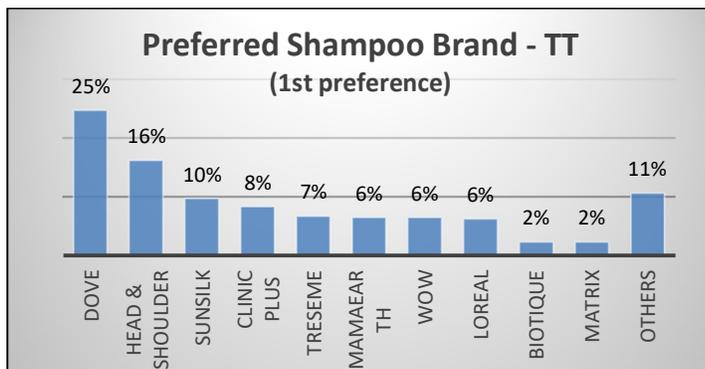


Fathers are still acting as head of the family.



D-Mart is very popular retailer followed by Amazon.

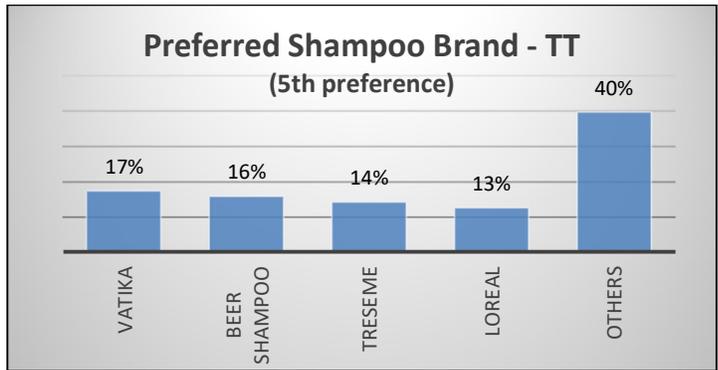
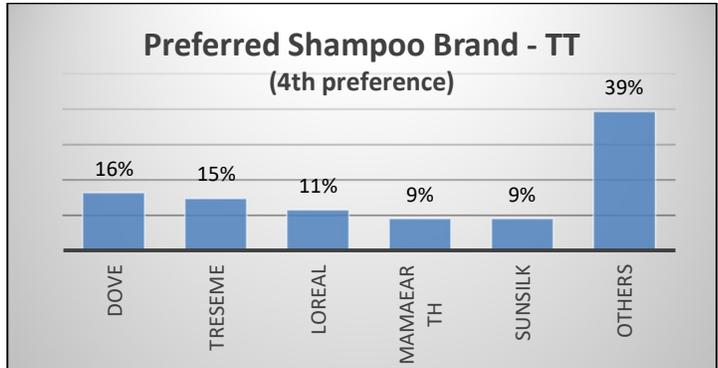
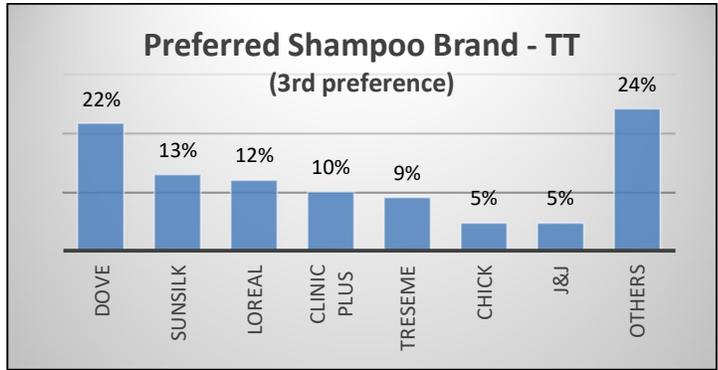
Shampoo - Preferred Brands:



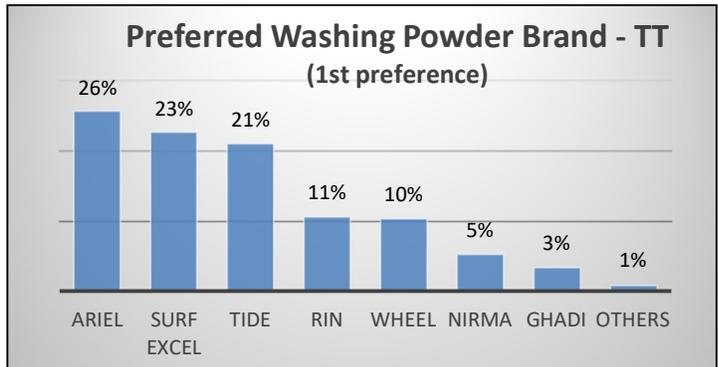
- Though premium product urban consumers are preferring Dove and H&S over other brands.



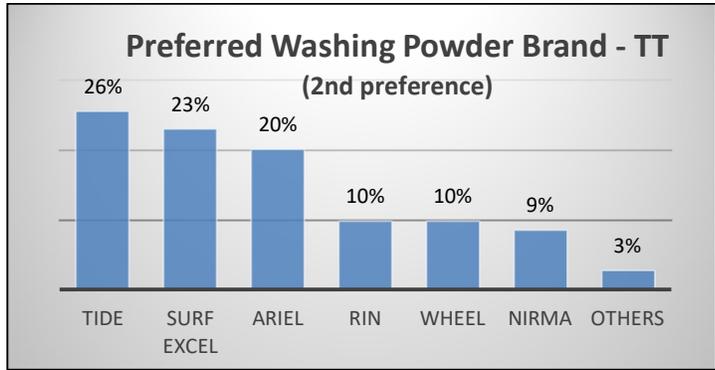
Dove is very popular as it is number one even for second/third preference of consumers.



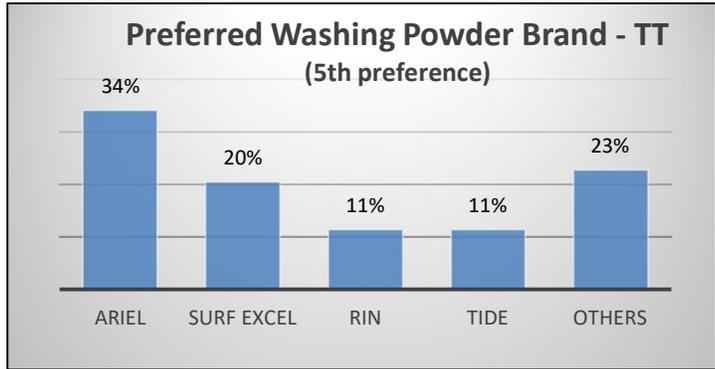
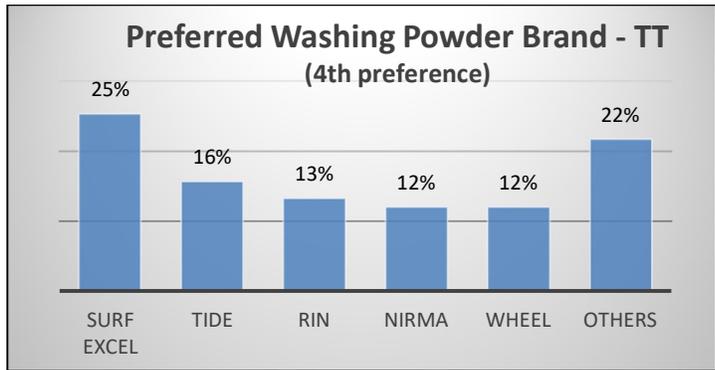
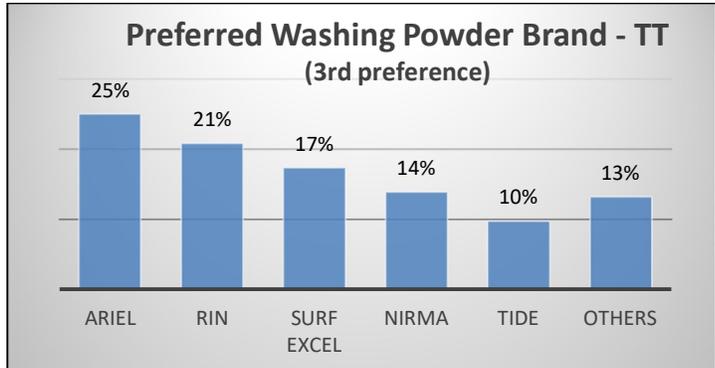
Washing Powder - Preferred Brands:



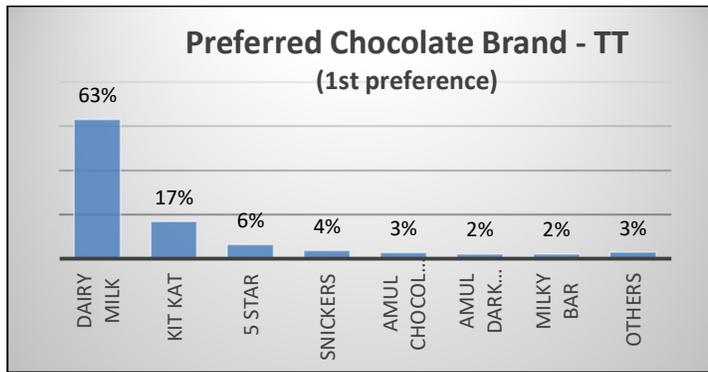
Arial and Tide are dominating in terms of popularity.



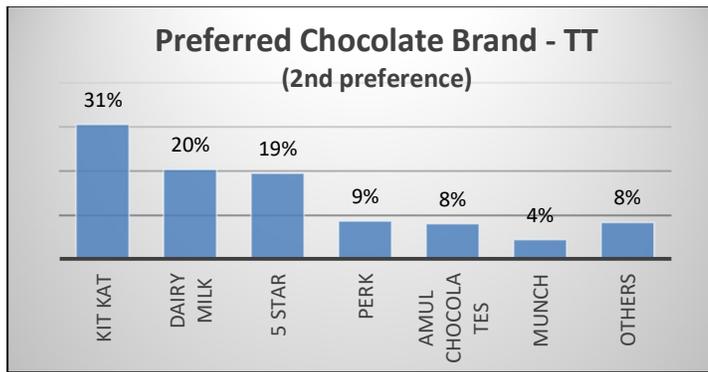
Surfexcel and Tide are also popular in Urban market.



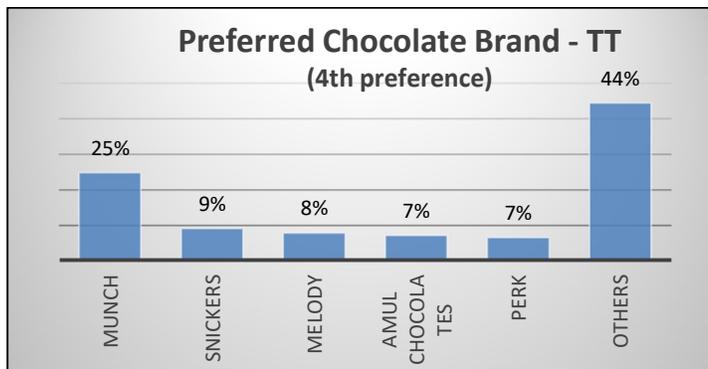
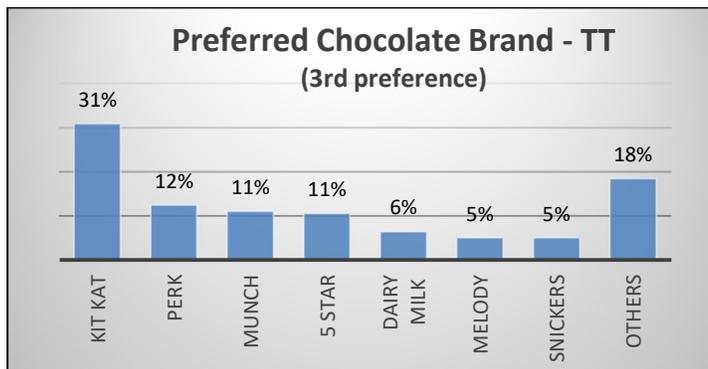
Chocolate - Preferred Brands:

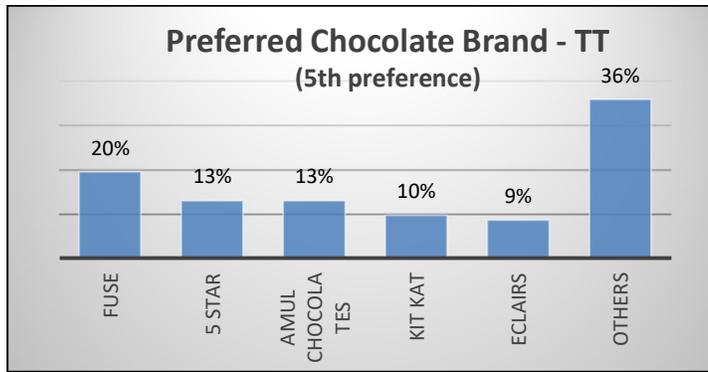


Dairy milk, Kit Kat, 5 Star are dominating in Indian markets since many decades.

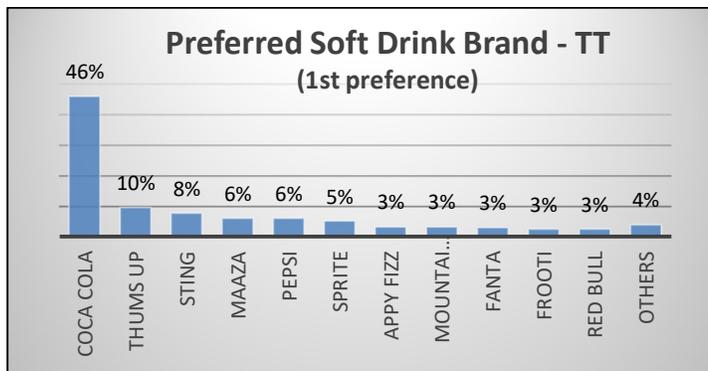


Apart from it small candies also have found place in Indian market.

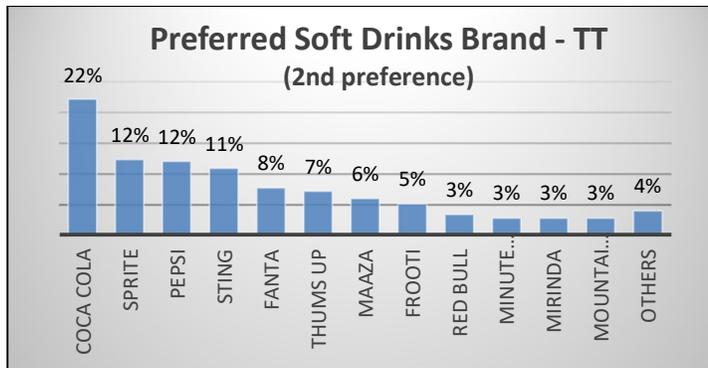




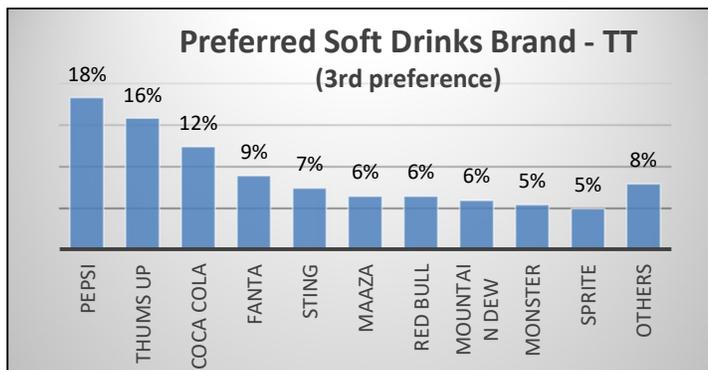
Soft Drink- Preferred Brands:

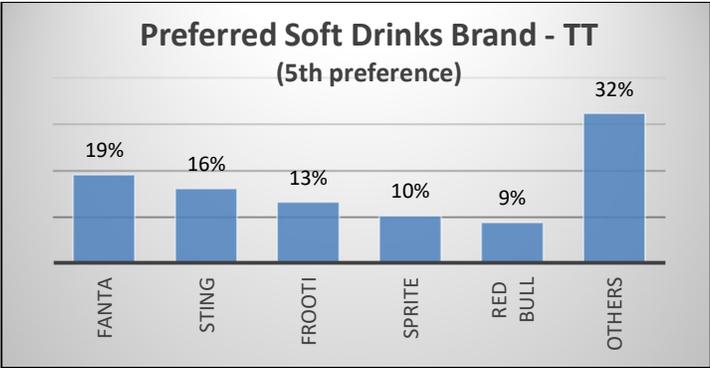
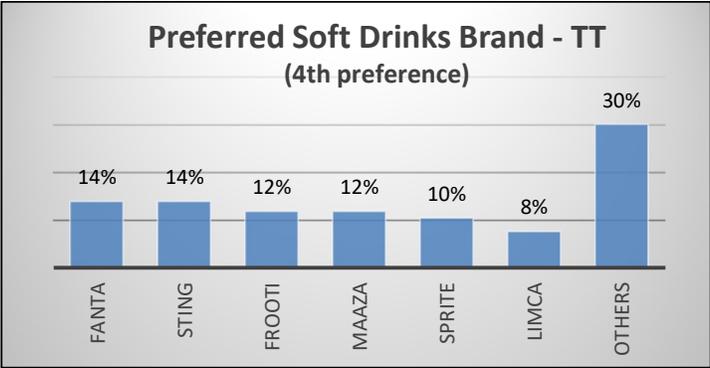


Just like global trends in India also Coca Cola, Thumps up, PepsiCo is popular brand.



Consumers are also showing demand for energy drinks.



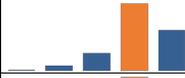
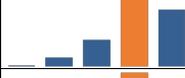


Below is the 'Column Sparkline' and 'Descriptive Statistics' summary of all 38 variables, where Urban – TT buyers have provided their inputs on various categories.

5.3.1 URBAN – TT - SHAMPOO: Summary of 38 variables under study

Table 5.10 Urban – TT - Shampoo– Column Sparkline

Sr. No.	Attribute	Code	Question	Category	Traditional Trade				
					1	2	3	4	5
1	Brand Affect	BRAF1	After using my preferred brands, I get positive feeling.	Shampoo Brands					
2	Customer satisfaction	CUSA1	I am very satisfied with brands which I use so I repeat purchase.	Shampoo Brands					
3	Switching Cost	SWCO1	I do not switch to other brands as they are costly.	Shampoo Brands					
4	Brand Trust	BRTR1	I buy only those brands on which I have faith.	Shampoo Brands					
5	Relationship Proneness	REPR1	I have developed emotional relationship with the brands I purchase.	Shampoo Brands					
6	Involvement	INVO1	When I am involved in my favorite brands, I never look for other brands.	Shampoo Brands					
7	Perceived Value	PEVA1	The return I am getting on money spent on FMCG decides my product loyalty.	Shampoo Brands					
8	Availability	AVAI1	I never buy other brands if my favorite brands are not available.	Shampoo Brands					
9	Brand Relevance	BRRE1	My brands remains updated with change in technology and buyer's preferences.	Shampoo Brands					
10	Brand Performance	BRPE1	Brand performance really matters to me for loyalty towards it.	Shampoo Brands					
11	Culture	CULT1	I keep religious beliefs in center while selecting my brands.	Shampoo Brands					
12	Price Worthiness	PRWO1	My brands are economical.	Shampoo Brands					
13	Brand Equity	BREQ1	It is wise decision to purchases my brand even if other brands are same.	Shampoo Brands					
14	Brand Image	BRIM1	My brand delivers which it promises.	Shampoo Brands					
15	Accessibility	ACCE1	Without any recall efforts, I can remember my brands quickly.	Shampoo Brands					
16	Habit	HABI1	Buying preferred brand is now my habit.	Shampoo Brands					
17	Brand Reputation	BRRP1	I prefer to buy brands which are reputed among the larger group of buyers.	Shampoo Brands					
18	Brand Credibility	BRCR1	I prefer to buy brands which are more than 50 years old with good track record.	Shampoo Brands					
19	Emotional Value	EMVA1	I feel good when I use my favorite brands.	Shampoo Brands					

20	Functional Value	FUVA1	I like packaging and other features of my favorite brands.	Shampoo Brands	
21	Brand Attitude	BRAT2	In my next purchase I would like to buy these brands.	Shampoo Brands	
22	Centrality	CENT1	I prefer to buy brands which are matching with my value system.	Shampoo Brands	
23	Family Influence/Social Value	FASO1	My purchase decision always based on choice of family members.	Shampoo Brands	
24	Commitment	COMM1	If my favorite brand is not available in store, I don't purchase another brand.	Shampoo Brands	
25	Situational Factors	SIFA1	During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Shampoo Brands	
26	Discounts	DISC1	I never use to switch to other brand only because they offer discounts.	Shampoo Brands	
27	Advertising	ADVE1	Advertising of FMCG products help me to take buying decision.	Shampoo Brands	
28	Personal Selling	PESE1	Personal selling in super stores helps me to take right buying decision.	Shampoo Brands	
29	Comparing Product Features	COPF1	I must compare product features of various brands before buying the final one.	Shampoo Brands	
30	Assortment/Gift Pack/Bended Pack	GIPC1	I continue to buy same brand as gift/bended/assortment pack are available for it.	Shampoo Brands	
31	Product Placement	PRPL1	Due to product placement, I sometimes change my buying decision.	Shampoo Brands	
32	Brand Awareness	BRAW1	I recognize my favorite brands even by color of its packet.	Shampoo Brands	
33	Celebrity Influence	CLIF1	My purchase decision never changes based on the celebrity endorsement.	Shampoo Brands	
34	Repeat Purchase	REPU1	I like to try different FMCG brands every time.	Shampoo Brands	
35	Repeat Purchase	REPU3	My buying behavior towards favorite brands is never deviating in normal conditions.	Shampoo Brands	
36	Brand Market Share	BRMS1	I do consider brand's market share before buying it.	Shampoo Brands	
37	Clarity	CLAR1	I have complete clarity about my brands, so I do not prefer other brands.	Shampoo Brands	
38	Repeat Purchase	REPU2	I usually get board after buying same brand for some time.	Shampoo Brands	

Findings:

Brand affect, involvement, brand trust, satisfaction are very important.

Table 5.11 Urban – TT - Shampoo – Descriptive Statistics

Questions	Que. Type	Que. Code	count	mean	std	min	25% (Q1)	50% (Q2)	75% (Q3)	max
After using my preferred brands, I get positive feeling.	Brand Affect	BRAF1	433	4.1	1.0	1	4	4	5	5
I am very satisfied with brands which I use so I repeat purchase.	Customer satisfaction	CUSA1	433	4.2	0.9	1	4	4	5	5
I do not switch to other brands as they are costly.	Switching Cost	SWCO1	433	3.2	1.2	1	2	3	4	5
I buy only those brands on which I have faith.	Brand Trust	BRTR1	433	4.0	1.0	1	4	4	5	5
I have developed emotional relationship with the brands I purchase.	Relationship Proneness	REPR1	433	3.0	1.3	1	2	3	4	5
When I am involved in my favorite brands, I never look for other brands.	Involvement	INVO1	433	3.3	1.2	1	2	3	4	5
The return I am getting on money spent on FMCG decides my product loyalty.	Perceived Value	PEVA1	431	3.5	1.2	1	3	4	4	5
I never buy other brands if my favorite brands are not available.	Availability	AVAI1	431	2.8	1.2	1	2	2	4	5
My brands remains updated with change in technology and buyer's preferences.	Brand Relevance	BRRE1	431	3.6	1.2	1	3	4	4	5
Brand performance really matters to me for loyalty towards it.	Brand Performance	BRPE1	432	3.6	1.2	1	3	4	5	5
I keep religious beliefs in center while selecting my brands.	Culture	CULT1	432	2.2	1.2	1	1	2	3	5
My brands are economical.	Price Worthiness	PRWO1	432	3.6	1.1	1	3	4	4	5
It is wise decision to purchases my brand even if other brands are same.	Brand Equity	BREQ1	432	3.6	1.0	1	3	4	4	5
My brand delivers which it promises.	Brand Image	BRIM1	431	3.8	1.0	1	3	4	5	5
Without any recall efforts, I can remember my brands quickly.	Accessibility	ACCE1	431	4.1	1.0	1	4	4	5	5
Buying preferred brand is now my habit.	Habit	HABI1	431	3.9	1.0	1	3	4	5	5
I prefer to buy brands which are reputed among the larger group of buyers.	Brand Reputation	BRRP1	431	3.0	1.2	1	2	3	4	5
I prefer to buy brands which are more than 50 years old with good track record.	Brand Credibility	BRCR1	431	3.0	1.3	1	2	3	4	5
I feel good when I use my favorite brands.	Emotional Value	EMVA1	431	4.1	0.9	1	4	4	5	5
I like packaging and other features of my favorite brands.	Functional Value	FUVA1	431	3.9	0.9	1	3	4	4	5
In my next purchase I would like to buy these brands.	Brand Attitude	BRAT2	431	4.4	5.2	1	3	4	5	44
I prefer to buy brands which are matching with my value system.	Centrality	CENT1	431	3.6	1.0	1	3	4	4	5
My purchase decision always based on choice of family members.	Family Influence/Social Value	FASO1	431	3.1	1.3	1	2	3	4	5
If my favorite brand is not available in store, I don't purchase another brand.	Commitment	COMM1	431	2.9	1.3	1	2	3	4	5
During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Situational Factors	SIFA1	431	3.4	1.2	1	2	4	4	5
I never use to switch to other brand only because they offer discounts.	Discounts	DISC1	431	3.3	1.2	1	3	4	4	5

Advertising of FMCG products help me to take buying decision.	Advertising	ADVE1	431	3.5	1.1	1	3	4	4	5
Personal selling in super stores helps me to take right buying decision.	Personal Selling	PESE1	431	3.5	1.1	1	3	4	4	5
I must compare product features of various brands before buying the final one.	Comparing Product Features	COPF1	431	3.5	1.2	1	3	4	4	5
I continue to buy same brand as gift/bended/assortment pack are available for it.	Assortment/ Gift Pack/Bended Pack	GIPC1	431	3.5	1.2	1	3	4	4	5
Due to product placement, I sometimes change my buying decision.	Product Placement	PRPL1	431	3.4	1.1	1	3	3	4	5
I recognize my favorite brands even by color of its packet.	Brand Awareness	BRAW1	431	3.7	1.1	1	3	4	5	5
My purchase decision never changes based on the celebrity endorsement.	Celebrity Influence	CLIF1	431	3.5	1.2	1	3	3	4	5
I like to try different FMCG brands every time.	Repeat Purchase	REPU1	431	3.1	1.1	1	2	3	4	5
My buying behavior towards favorite brands is never deviating in normal conditions.	Repeat Purchase	REPU3	431	3.3	1.1	1	2	3	4	5
I do consider brand's market share before buying it.	Brand Market Share	BRMS1	431	3.0	1.1	1	2	3	4	5
I have complete clarity about my brands, so I do not prefer other brands.	Clarity	CLAR1	431	3.4	1.2	1	3	4	4	5
I usually get board after buying same brand for some time.	Repeat Purchase	REPU2	431	2.8	1.2	1	2	3	4	5

Findings:

Brand attitude, relationship proneness are very volatile which indicates respondents are having different experiences around these factors.

Below is the Model designing process including all 38 variables, where Urban – TT buyers have provided their inputs on various categories. Process will help to make final decisions to both Retailers and Manufacturers of FMCG products. They will make this decision by classifying buyers into Loyal, Disloyal and Neutral.

Urban – TT - Shampoo: Summary of 38 variables under study

Step 1: K-Means Clustering: to have primary classification of buyers into Brand Loyal, Brand Disloyal and Neutral. Whole analysis is based on unsupervised clustering approach, so not very reliable.

As an output we manage to generate an additional column in the data set where each of the individual respondent is assigned tag of Loyal, Disloyal and Neutral.

Cluster Tag	Category of Consumers	Count
2	Loyal Consumers	194 (45%)
1	Disloyal Consumers	134 (31%)
0	Neutral	105 (24%)
	Total	433

- Proportion of Loyal Consumers is higher than Disloyal one which is positive factor for both retailers and manufacturers.
- Important thing to note here is that above numbers are not the final one to design final business strategies. They are only indicative of rough pattern available in the data.
- Important point to note is proportion of Neutral Consumers which is 24%. Both manufacturers and retailers should analyse this set of consumers to get more information that can help them to design further strategies.

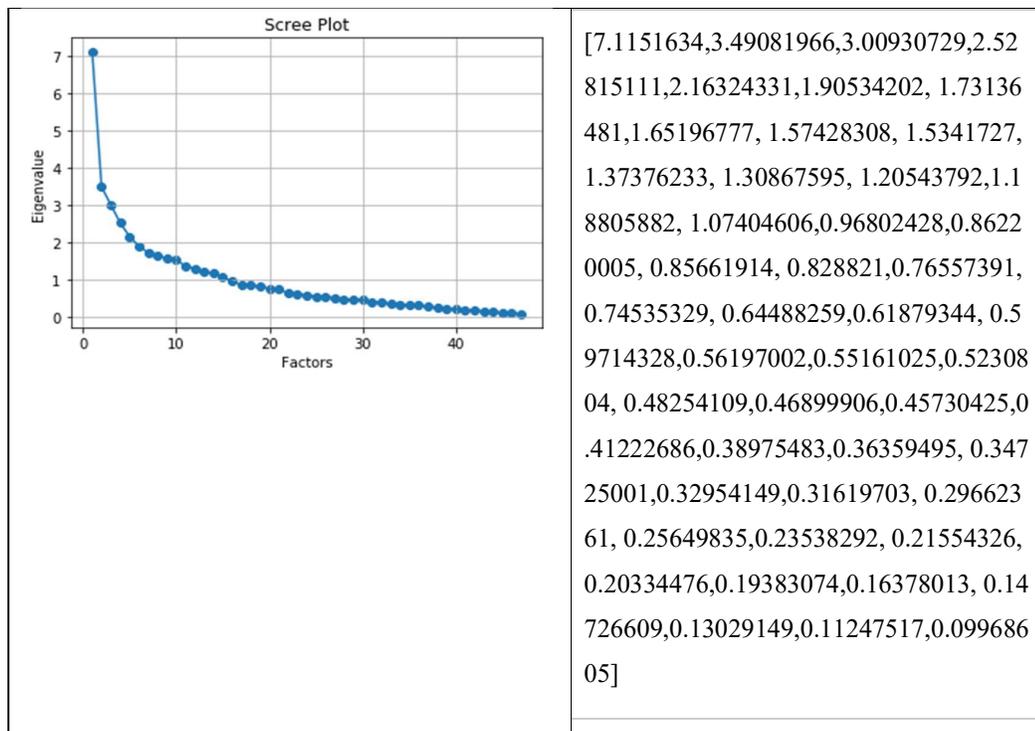
Step 2: Correlation Matrix: to find out relation between all pairs of variables under study. Purpose is to eliminate those variables which are identical in nature and thus reducing duplication before fitting the model. Summary of outcomes is as follows.

Findings:

- Correlation values for each pair of variables in the study indicates no significant correlation as all values are less than or equal 0.8.
- Overall conclusion is, no variable is to be removed from the analysis before applying Exploratory Factor Analysis.

Step 3: Exploratory Factor Analysis (EFA): is useful to reduce dimensionalities by creating liner combinations of variable with its constructs. Output of this process will become input for Structural Equation Modeling.

- Bartlett’s test value: (9224.86640289162, 0.0): As p value is zero test is statistical ly significant and matrix is not an identity matrix.
- Scree Plot and Eigen Values: helps to decide about the number of useful factor s. Points plotted above 1 are the potential factors to be considered for further t uning. Eigen values are numeric values indicating the same. There are 12 pote ntial factors to be considered for next round.



- Out of 15 factors derived, only those factors will be considered further where a t least 3 variables are having factor loading >0.35 or <-0.35. Summary of fact ors is given in the table.
- To fine tune the output, Varimax rotation is applied on the eligible factors. Her e there are total 13 factors where Varimax rotation applied. Total 53% of var iance explained by 13 factors. However further useful factors are only 9 whic h approximately explains 41.5% of variance.

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
SS Loadings	3.412117	2.719491	2.463529	2.099271	2.090781	2.049471	1.691271	1.50294	1.4951	1.408459	1.295455	1.287255	1.24316
Proportion Variance	0.072598	0.057862	0.052416	0.044665	0.044485	0.043606	0.035984	0.031977	0.031811	0.029967	0.027563	0.027388	0.02645
Cummulative Variance	0.072598	0.13046	0.182875	0.227541	0.272025	0.315631	0.351616	0.383593	0.415404	0.445371	0.472934	0.500322	0.526772

- Factors defined based on the output are as below. This will become an input for Structural Equation Modeling.

Attitudinal BrandLoyalty=	BRAF1 + CUSA1 + PEVA1 + ACCE1 + HABI1 + EMVA1 + BRAT2
ImpactofPromotion=	ADVE1 + PESE1 + COPF1 + GIPC1
BehaviouralBrand Loyalty=	SD & Chocolate Tried Out Brands - SD & Chocolate_Acceptable + SD & Chocolate Max Run
BrandPerformance=	BRPE1 + BRMS1
FamilyDemographics=	Family Type - Total Family Member + Head of the Family + Total Family Member
BrandImage=	BREQ1 + BRIM1 + BRAW1 + BRRE1 + PRWO1
RepeatPurchase=	REPU3 + CLAR1 + COMM1 + INVO1
BrandReputation=	BRRP1 + BRRCR1 + DISC1 + BRTR1
ImpactofPromotion=	SWCO1 + COPF1 + PRPL1

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	-0.039	0.052	-0.080	0.325	0.111	0.041	-0.006	-0.006	0.063	0.091	-0.192	-0.028	-0.080	0.074	0.008
1	-0.074	-0.049	0.006	0.099	0.234	0.041	0.123	0.228	-0.111	0.133	-0.117	-0.197	-0.028	-0.151	0.104
2	-0.082	-0.056	0.056	0.813	-0.044	-0.012	0.064	0.064	-0.034	0.007	0.059	-0.043	0.043	-0.048	0.026
3	0.074	-0.005	0.003	-0.617	-0.054	0.012	-0.029	-0.075	-0.045	0.041	-0.035	0.750	-0.031	0.048	0.031
4	-0.026	0.036	0.042	0.817	-0.080	0.003	0.036	0.009	-0.046	-0.063	0.077	0.100	0.006	-0.109	-0.020
5	0.085	-0.071	0.256	-0.021	0.020	0.640	0.225	0.088	0.316	0.135	0.141	-0.094	0.050	-0.037	0.097
6	0.109	-0.103	0.252	0.050	0.105	0.664	0.076	-0.042	-0.056	0.051	0.051	0.049	0.037	-0.023	0.062
7	-0.102	-0.059	-0.037	0.025	0.093	0.057	0.463	0.067	0.220	-0.098	0.075	0.023	-0.076	0.062	0.261
8	0.043	0.210	0.088	0.008	0.124	0.516	0.079	0.190	-0.004	-0.089	-0.095	0.011	0.002	0.239	0.015
9	0.053	0.095	0.054	0.078	-0.001	0.142	0.601	0.050	-0.032	-0.026	0.023	0.036	0.072	0.080	0.028
10	0.165	0.139	0.190	-0.141	0.138	0.219	0.231	0.062	-0.110	-0.034	0.158	0.009	-0.049	0.606	-0.064
11	0.447	-0.035	0.140	-0.128	-0.078	0.060	0.332	-0.199	-0.212	0.196	0.199	-0.001	0.133	0.261	-0.061
12	-0.068	0.048	0.155	0.196	0.301	0.180	-0.044	0.540	0.061	0.069	0.175	-0.002	0.135	0.054	0.054
13	-0.010	0.115	0.362	-0.094	-0.077	0.098	-0.340	0.181	0.132	-0.198	0.065	0.038	0.372	0.093	0.090
14	0.340	-0.022	-0.019	-0.172	-0.221	-0.059	0.460	-0.203	-0.080	0.261	-0.100	0.125	0.068	0.061	-0.158
15	0.010	0.169	0.022	0.023	0.015	0.094	0.190	0.599	0.177	0.063	0.194	-0.020	0.063	-0.003	0.014
16	0.030	0.008	0.179	-0.028	0.711	0.044	0.021	0.044	0.000	-0.060	0.005	-0.066	0.063	-0.003	0.014
17	0.070	-0.054	0.267	0.099	0.595	0.220	0.000	0.008	0.292	0.072	0.245	0.012	0.141	0.082	0.048
18	0.025	0.011	0.671	0.050	0.320	0.174	-0.094	0.063	0.076	0.111	0.055	0.034	-0.003	-0.018	0.176
19	0.018	0.019	0.649	0.031	0.321	0.131	0.063	-0.055	0.199	-0.018	0.204	0.077	-0.052	-0.017	-0.069
20	0.071	-0.304	0.020	0.000	0.176	0.191	-0.063	0.201	0.071	0.467	0.185	0.138	-0.065	0.184	-0.155
21	0.159	-0.030	0.133	0.011	-0.052	0.000	0.077	0.042	0.008	0.830	-0.115	0.037	-0.025	0.071	-0.007
22	0.178	0.072	0.681	0.026	0.037	0.228	0.034	0.019	0.063	0.107	-0.096	-0.041	0.091	0.067	0.176
23	0.283	-0.006	0.220	-0.019	0.224	0.214	0.005	0.151	-0.047	0.215	0.025	-0.004	0.223	-0.019	0.407
24	0.054	0.111	0.046	-0.017	-0.015	0.017	0.118	0.044	0.040	0.056	0.051	0.668	0.064	0.044	0.051
25	0.548	0.051	0.018	0.007	-0.004	0.113	-0.010	-0.145	0.059	0.128	0.187	0.007	0.091	0.116	0.115
26	-0.007	-0.172	-0.039	-0.018	-0.075	-0.012	-0.028	-0.148	0.200	0.237	0.084	0.099	0.042	0.542	0.074
27	0.145	0.135	-0.219	0.084	0.083	0.071	0.485	0.260	-0.083	0.180	-0.053	0.089	0.194	-0.151	-0.064
28	0.072	0.044	0.148	-0.059	-0.076	0.043	-0.002	0.056	0.286	-0.113	0.144	0.037	0.089	0.095	0.500
29	0.205	-0.066	-0.010	0.035	0.245	0.130	0.171	-0.158	0.089	-0.089	0.107	0.059	0.792	-0.036	0.122
30	0.537	-0.037	0.140	-0.006	0.049	0.163	0.097	0.260	0.062	-0.249	-0.050	0.142	0.130	0.043	0.031
31	0.754	0.186	0.024	-0.098	0.031	0.021	-0.012	0.019	0.209	0.076	0.115	0.068	-0.025	-0.060	0.008
32	0.430	-0.033	0.090	0.000	0.477	0.050	-0.031	0.018	0.103	0.083	-0.136	0.121	0.058	0.370	0.336
33	0.472	0.044	0.201	-0.180	0.199	-0.075	0.243	0.141	0.103	0.174	-0.206	0.023	-0.029	0.047	0.291
34	0.138	0.069	0.163	0.001	0.084	0.087	0.001	0.063	0.656	-0.003	-0.027	-0.081	0.024	0.008	0.150
35	0.170	0.093	0.091	0.146	0.361	0.056	0.170	0.110	-0.013	-0.070	0.202	0.089	0.030	-0.139	0.498
36	0.354	0.180	0.257	-0.011	0.093	0.118	0.034	0.106	0.231	0.115	-0.029	-0.102	0.225	-0.032	0.022
37	0.131	0.053	0.038	-0.032	0.032	0.051	-0.146	0.027	0.351	0.001	0.229	0.172	0.095	0.158	-0.101
38	0.213	0.203	-0.060	-0.075	0.154	0.047	0.123	0.310	0.125	-0.103	0.472	-0.011	0.156	0.250	0.212
39	0.074	0.148	0.317	-0.081	-0.072	-0.183	0.049	0.108	0.302	0.120	-0.092	0.113	0.406	0.149	0.011
40	0.089	0.089	0.108	0.060	0.086	0.041	0.018	0.195	-0.025	-0.019	0.703	0.041	-0.005	0.087	0.139
41	0.207	-0.041	0.107	0.039	0.104	-0.155	0.105	-0.085	0.419	0.042	-0.244	0.233	0.213	-0.010	0.137
42	0.057	-0.304	0.035	-0.053	-0.110	-0.034	-0.025	0.375	-0.099	0.004	0.075	0.035	-0.090	0.002	-0.002
43	0.043	0.919	0.092	0.027	0.027	-0.055	0.038	0.067	-0.035	-0.071	0.105	0.078	-0.081	-0.068	0.003
44	-0.087	-0.826	0.002	0.034	0.037	-0.077	0.006	0.099	-0.026	-0.099	-0.145	-0.010	0.020	0.089	-0.090
45	0.132	0.627	0.011	0.034	-0.038	-0.062	0.070	0.144	0.105	-0.178	-0.068	0.107	0.112	0.178	-0.041

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	Age Group	-0.049	-0.063	0.032	0.048	0.300	-0.132	0.118	-0.001	-0.008	-0.051	0.070	0.034
1	Gender	0.056	-0.031	-0.032	-0.132	0.124	0.259	0.091	0.236	0.118	-0.162	-0.093	0.093
2	Family Type	0.055	-0.062	-0.054	-0.058	0.847	0.048	-0.013	0.043	0.045	-0.189	-0.063	0.038
3	Total Family Member	-0.004	0.072	-0.009	0.048	-0.659	-0.015	0.052	-0.049	-0.024	0.692	0.035	-0.023
4	Head of the Family	0.045	-0.056	0.043	0.780	-0.052	0.084	-0.069	0.008	0.052	0.124	-0.105	-0.002
5	BRAF1	0.633	0.062	-0.064	0.154	-0.055	0.034	0.170	0.089	0.223	-0.180	0.030	0.277
6	CUSA1	0.609	0.090	-0.108	-0.100	0.001	0.063	0.068	0.013	-0.019	-0.008	0.071	0.058
7	SWCO1	0.029	-0.035	-0.045	0.063	0.034	0.076	-0.036	0.060	0.125	0.029	0.084	0.600
8	BTR1	0.349	-0.006	0.150	0.016	-0.022	0.092	-0.071	0.150	0.146	-0.043	0.353	0.060
9	REPR1	0.139	0.104	0.098	-0.049	0.104	-0.041	-0.009	0.006	0.409	0.077	0.203	0.360
10	INVO1	0.237	0.191	0.099	-0.073	-0.106	0.088	0.051	-0.019	0.029	0.046	0.699	0.094
11	PEVA1	0.608	0.173	-0.100	0.117	-0.085	0.001	0.135	-0.064	0.221	-0.022	0.248	-0.192
12	AVA1	0.149	0.536	-0.038	-0.116	-0.085	-0.104	0.158	-0.222	0.221	0.069	0.253	0.026
13	BRRE1	0.259	-0.103	0.030	0.116	0.200	0.326	0.249	0.470	0.104	-0.010	0.096	-0.045
14	BRPE1	0.322	-0.028	0.063	0.374	-0.075	0.003	0.165	-0.301	0.107	-0.125	0.037	-0.251
15	CULT1	-0.055	0.385	-0.010	-0.020	-0.146	-0.266	-0.184	0.260	-0.209	0.348	0.155	0.104
16	PRWD1	0.102	-0.003	0.200	0.080	0.027	0.020	0.193	0.071	0.616	0.118	-0.042	-0.038
17	BREQ1	0.194	0.006	0.016	0.001	-0.018	0.693	0.009	-0.045	-0.012	0.042	-0.058	0.061
18	BRIM1	0.396	0.029	-0.054	0.233	0.079	0.342	0.310	0.100	-0.063	0.043	-0.038	0.052
19	ACCE1	0.648	0.075	0.051	0.125	0.077	0.557	0.003	0.077	0.226	-0.226	0.082	-0.045
20	HABI1	0.576	0.007	0.075	0.133	0.046	0.253	0.107	0.046	-0.063	-0.124	0.089	0.024
21	BRP1	0.165	0.027	-0.303	0.009	-0.032	0.129	0.531	0.172	0.052	0.080	0.150	-0.115
22	BRCR1	0.119	0.254	-0.020	0.081	0.033	-0.035	-0.140	0.747	0.054	0.069	0.052	-0.033
23	EMVA1	0.657	0.245	0.085	0.206	0.070	0.071	-0.146	0.034	0.018	-0.107	0.019	0.064
24	FUVA1	0.335	0.385	-0.025	0.106	-0.002	0.296	0.061	0.047	0.155	0.068	0.016	-0.065
25	BRA12	0.050	0.045	0.100	0.136	-0.055	-0.015	0.093	0.059	0.026	0.116	0.653	0.030
26	CENT1	0.100	0.565	0.035	0.090	-0.010	-0.010	0.229	0.075	-0.131	0.028	-0.023	0.048
27	FASO1	-0.060	0.058	-0.227	0.238	-0.016	-0.069	0.182	0.289	-0.192	-0.145	0.081	0.345
28	COMM1	-0.094	0.143	0.128	-0.035	0.083	0.067	-0.056	0.128	0.219	0.633	0.084	-0.018
29	SIFA1	0.150	0.173	0.029	0.304	-0.050	0.008	0.201	-0.170	0.079	-0.179	0.033	-0.041
30	DISC1	0.133	0.246	-0.138	0.335	0.039	0.270	0.214	-0.263	-0.256	0.482	0.039	-0.070
31	ADVE1	0.199	0.434	-0.049	0.178	-0.025	0.050	0.014	-0.262	0.238	0.161	0.110	0.143
32	PESE1	0.054	0.623	0.197	0.200	-0.125	0.009	0.133	0.062	0.059	0.036	0.012	-0.025
33	COPF1	0.097	0.461	-0.081	0.242	-0.008	0.510	-0.006	0.060	0.004	-0.097	0.106	0.267
34	GIPC1	0.106	0.555	0.062	0.192	-0.141	0.246	-0.243	0.131	0.182	0.006	0.058	0.052
35	PRP1	0.193	0.078	0.071	0.551	-0.018	0.080	0.073	0.040	0.063	-0.102	-0.171	-0.048
36	BRAW1	0.157	0.283	0.113	-0.040	0.147	0.416	0.184	-0.158	0.147	0.024	0.124	-0.167
37	CLIF1	0.285	0.328	0.171	0.345	0.002	0.100	0.011	0.044	0.080	0.134	-0.134	-0.015
38	REPU1	0.067	0.039	0.031	0.333	-0.069	0.000	0.333	0.053	-0.016	-0.051	0.084	0.093
39	REPU3	0.002	0.248	0.170	0.133	-0.061	0.169	0.546	-0.121	0.248	0.094	-0.020	0.229
40	BRMS1	0.119	0.108	0.108	0.539	-0.027	-0.007	-0.025	0.041	0.006	0.060	0.133	0.060
41	CLAR1	0.157	0.141	0.115	-0.123	0.071	0.647	-0.020	0.020	0.169	-0.064	0.073	0.041
42	REPU2	-0.011	0.198	-0.059	0.546	0.034	0.136	-0.158	0.020	-0.107	0.051	0.196	-0.100
43	SD & Chocolate Max Run	0.006	0.052	-0.284	-0.096	-0.038	-0.096	0.046	0.014	0.399	-0.056	0.062	0.019
44	SD & Chocolate Tried Out Brands	0.014	0.031	0.945	-0.007	0.038	0.027	0.066	-0.083	0.063	-0.004	0.099	-0.014
45	SD & Chocolate Acceptable cluster	-0.044	-0.110	-0.810	-0.023	0.043	0.035	-0.138	-0.038	0.077	-0.031	0.010	0.052
46		-0.085	0.080	0.586	0.261	0.046	-0.026	0.002	-0.182	0.088	0.092	0.100	0.268

Step 4: Structural Equation Modeling (SEM): is used to fit the model which depicts the relationship between measured variable and latent variables. Output of this process will become an input for Support Vector Machine which will help further to have classification of consumers into loyal, disloyal, and neutral in terms of brand loyalty of FMCG products.

- Initially proposed model:

```
# measurement model

AttitudinalBrandLoyalty=~ BRAF1+CUSA1+PEVA1+ACCE1+HABI1+EMVA1+BRAT2

ImpactofPromotion=~ ADVE1+PESE1+COPF1+GIPC1

BehaviouralBrandLoyalty=~

ShampooMaxRun+ShampooTriedOutBrands+Shampoo_Acceptable

BrandPerformance=~ BRPE1+BRMS1

FamilyDemographics=~ FamilyType+TotalFamilyMember+HeadoftheFamily+TotalFamilyMember

BrandImage=~ BREQ1+BRIM1+BRAW1+BRRE1+PRWO1

RepeatPurchase=~ REPU3+CLAR1+COMM1+INVO1

BrandReputation=~ BRRP1+BRCR1+DISC1+BRTR1

ImpactofPromotion=~ SWCO1+COPF1+PRPL1

# regressions

BrandLoyalty ~ AttitudinalBrandLoyalty + ImpactofPromotion

BehaviouralBrandLoyalty + BrandPerformance + FamilyDemographics + BrandImage

+ RepeatPurchase + BrandReputation + ImpactofPromotion
```

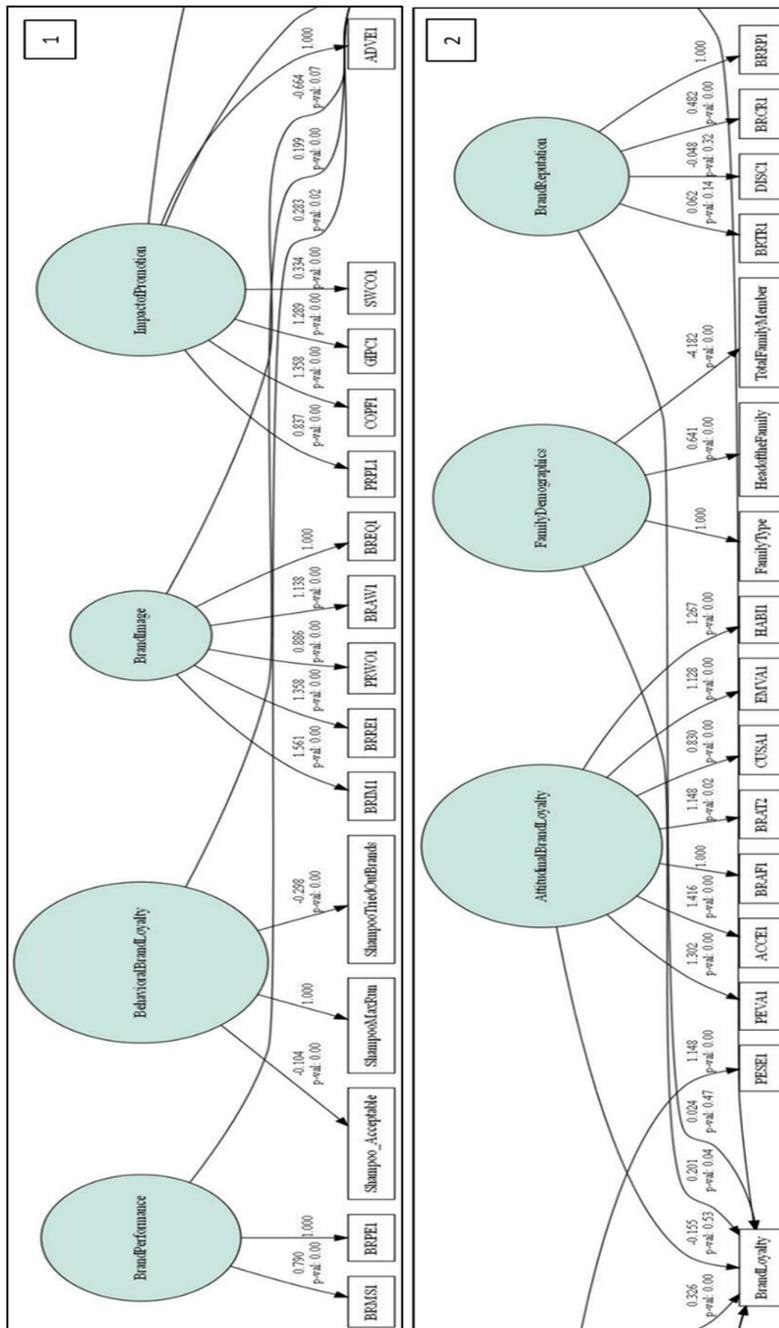
- Initial reliability indicators:

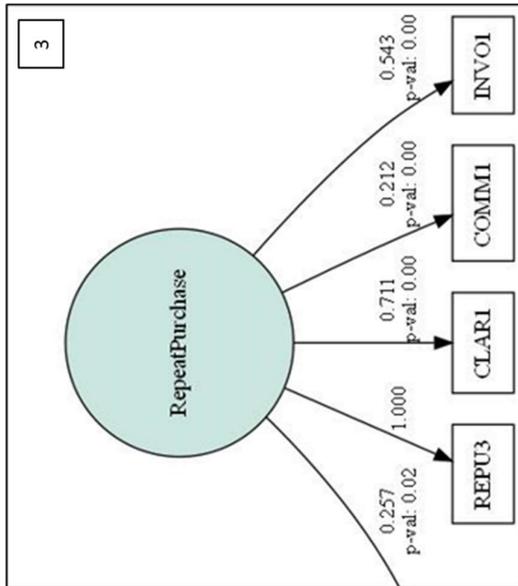
Indicators	DoF	DoF Baseline	chi2	chi2 p- value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	525	595.0	3087	0.0	6564.5	0.6	0.5	0.5	0.5	0.5	0.1	195.7	623.2	7.1

As there is a scope for improvement for most of the indicators, whole process is repeated after eliminating not impacting variables.

-

- Initial model is as below: **Figure 5.8 Initial model Urban – TT - Shampoo**





Attributes which are Statistically insignificant are removed from the further model building process.

- New model proposed based on the previous model’s output:

```
# measurement model

AttitudinalBrandLoyalty=~ BRAF1+CUSA1+PEVA1+ACCE1+HABI1+EMVA1+BRAT2

BehaviouralBrandLoyalty=~ ShampooMaxRun+ShampooTriedOutBrands+Shampoo_Acceptable

BrandPerformance=~ BRPE1+BRMS1

RepeatPurchase=~ REPU3+CLAR1+COMM1+INVO1

# regressions

BrandLoyalty ~ BehaviouralBrandLoyalty + BrandPerformance + RepeatPurchase + AttitudinalBrandLoyalty
```

Using above equations whole process run again to check if values have improved further and model has become useful.

- Revised reliability indicators:

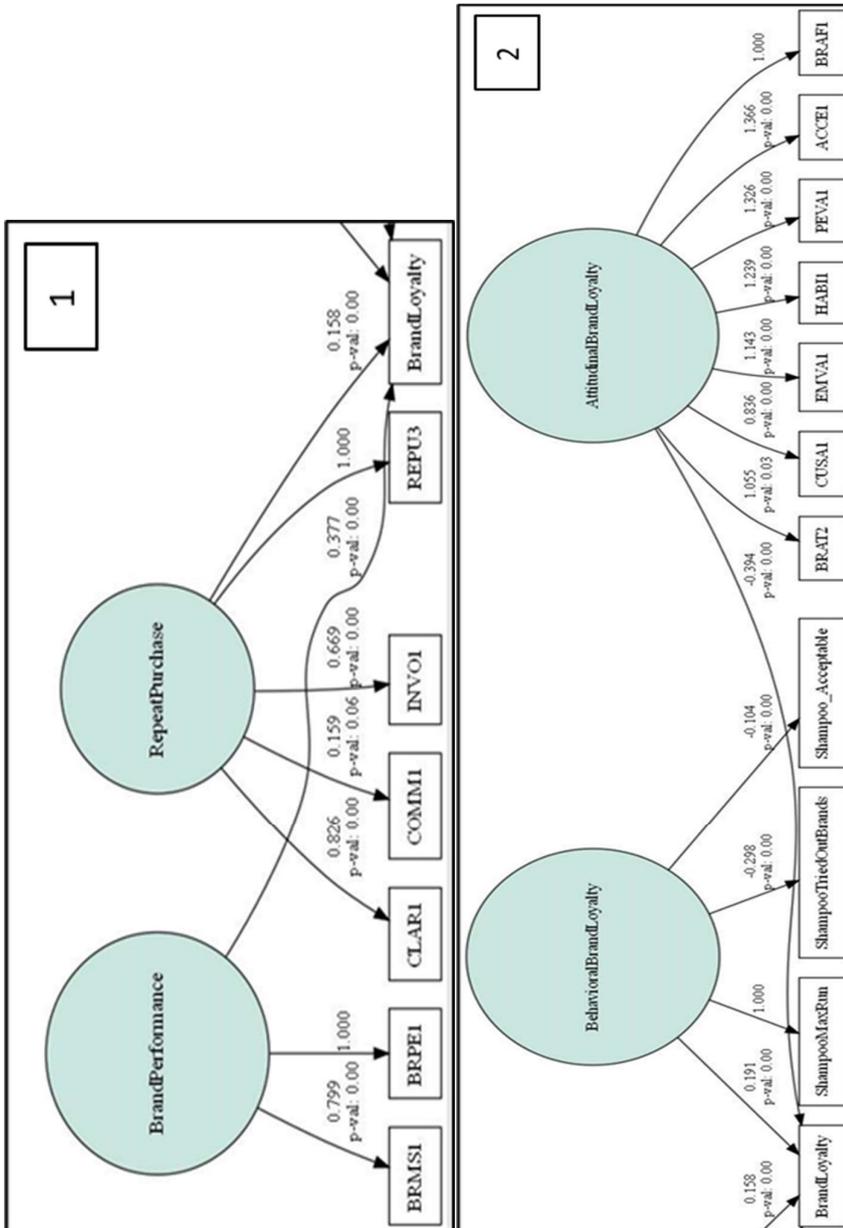
Indicators	DoF	DoF Baseline	chi2	chi2 p-value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	110	136	569.9453	0	2257.042	0.783	0.747	0.688	0.747	0.732	0.098	83.367	258.409	1.316

Findings: All reliability indicators are showing improvement compared to first round of fit. P value is zero and CFI, GFI, NFI are above 75%. Also, RMSEA is within tolerance limit, i.e. 0.10. Overall model is good and can be accepted for further decision-making process.

	lval	op	rval	Estimate	Std. Err	z-value	p-value
0	BRAF1	~	AttitudinalBrandLoyalty	1.0000	-	-	-
1	CUSA1	~	AttitudinalBrandLoyalty	0.8355	0.1006	8.3065	0.0000
2	PEVA1	~	AttitudinalBrandLoyalty	1.3262	0.1374	9.6518	0.0000
3	ACCE1	~	AttitudinalBrandLoyalty	1.3656	0.1299	10.5092	0.0000
4	HABI1	~	AttitudinalBrandLoyalty	1.2387	0.1241	9.9822	0.0000
5	EMVA1	~	AttitudinalBrandLoyalty	1.1429	0.1125	10.1582	0.0000
6	BRAT2	~	AttitudinalBrandLoyalty	1.0551	0.4996	2.1120	0.0347
7	ShampooMaxRun	~	BehavioralBrandLoyalty	1.0000	-	-	-
8	ShampooTriedOutBrands	~	BehavioralBrandLoyalty	-0.2983	0.0183	-16.2843	0.0000
9	Shampoo_Acceptable	~	BehavioralBrandLoyalty	-0.1043	0.0220	-4.7448	0.0000
10	BRPE1	~	BrandPerformance	1.0000	-	-	-
11	BRMS1	~	BrandPerformance	0.7995	0.1259	6.3504	0.0000
12	REPU3	~	RepeatPurchase	1.0000	-	-	-
13	CLAR1	~	RepeatPurchase	0.8261	0.1021	8.0887	0.0000
14	COMM1	~	RepeatPurchase	0.1590	0.0845	1.8809	0.0600
15	INVO1	~	RepeatPurchase	0.6686	0.0945	7.0753	0.0000
16	BrandLoyalty	~	BehavioralBrandLoyalty	0.1913	0.0191	10.0194	0.0000
17	BrandLoyalty	~	BrandPerformance	0.3771	0.1051	3.5874	0.0003
18	BrandLoyalty	~	RepeatPurchase	0.1584	0.0531	2.9827	0.0029
19	BrandLoyalty	~	AttitudinalBrandLoyalty	-0.3940	0.1071	-3.6795	0.0002
20	BrandPerformance	~~	BrandPerformance	0.5719	0.1217	4.6971	0.0000
21	BrandPerformance	~~	RepeatPurchase	0.2088	0.0562	3.7120	0.0002
22	BrandPerformance	~~	BehavioralBrandLoyalty	0.3375	0.1145	2.9481	0.0032
23	BrandPerformance	~~	AttitudinalBrandLoyalty	0.2329	0.0406	5.7337	0.0000
24	RepeatPurchase	~~	RepeatPurchase	0.7330	0.1115	6.5712	0.0000
25	RepeatPurchase	~~	BehavioralBrandLoyalty	0.4885	0.1111	4.3975	0.0000
26	RepeatPurchase	~~	AttitudinalBrandLoyalty	0.1537	0.0338	4.5500	0.0000
27	BehavioralBrandLoyalty	~~	BehavioralBrandLoyalty	4.6573	0.3849	12.1007	0.0000
28	BehavioralBrandLoyalty	~~	AttitudinalBrandLoyalty	0.0582	0.0635	0.9161	0.3596
29	AttitudinalBrandLoyalty	~~	AttitudinalBrandLoyalty	0.3043	0.0525	5.7968	0.0000
30	REPU3	~~	REPU3	0.5265	0.0876	6.0097	0.0000
31	CUSA1	~~	CUSA1	0.6009	0.0442	13.6087	0.0000
32	ShampooTriedOutBrands	~~	ShampooTriedOutBrands	0.2801	0.0272	10.2818	0.0000
33	HABI1	~~	HABI1	0.5644	0.0467	12.0972	0.0000
34	BRMS1	~~	BRMS1	0.9040	0.0843	10.7274	0.0000
35	INVO1	~~	INVO1	1.2082	0.0930	12.9973	0.0000
36	CLAR1	~~	CLAR1	0.8194	0.0795	10.3029	0.0000
37	Shampoo_Acceptable	~~	Shampoo_Acceptable	0.9252	0.0629	14.7034	0.0000
38	PEVA1	~~	PEVA1	0.7855	0.0625	12.5657	0.0000
39	ACCE1	~~	ACCE1	0.4704	0.0432	10.8875	0.0000
40	ShampooMaxRun	~~	ShampooMaxRun	0.0000	0.2190	0.0000	1.0000
41	BRPE1	~~	BRPE1	0.9781	0.1121	8.7266	0.0000
42	COMM1	~~	COMM1	1.5836	0.1081	14.6458	0.0000
43	BrandLoyalty	~~	BrandLoyalty	0.3246	0.0306	10.6005	0.0000
44	EMVA1	~~	EMVA1	0.4288	0.0364	11.7765	0.0000
45	BRAT2	~~	BRAT2	26.3781	1.7976	14.6741	0.0000
46	BRAF1	~~	BRAF1	0.6632	0.0500	13.2756	0.0000

- Final Model is as below:

Figure 5.9 Final model Urban – TT - Shampoo



Step 5: Support Vector Machine (SVM): After getting most impacting features from the final model of SEM. Now it is time to train the model to classify FMCG users into three categories called, Loyal, Disloyal and Neutral based on both Behavioural and Attitudinal factors.

SVM will be run on both Behavioural and Attitudinal factors separately. Output will be in the form of 3*3 matrix, 3 levels from Behavioural and 3 levels from Attitudinal. This will help further to Retailers and Manufacturers to decide about their strategy.

SVM – Attitudinal:

- Variables considered for building model are based on the outcome of SEM which are as below.

BRAF1 - Brand Affect

CUSA1 - Customer satisfaction

INVO1 - Involvement

PEVA1 - Perceived Value

BRPE1 - Brand Performance

ACCE1 - Accessibility

HABI1 - Habit

EMVA1 - Emotional Value

BRAT2 - Brand Attitude

COMM1 - Commitment

REPU3 - Repeat Purchase

BRMS1 - Brand Market Share

CLAR1 – Clarity

Cluster

```
classifier = SVC(kernel = 'rbf', random_state = 2, gamma=4, C=6, break_ties = True)
```

```
SVC(C=6, break_ties=True, cache_size=200, class_weight=None, coef0=0.0,
```

```
decision_function_shape='ovr', degree=3, gamma=4, kernel='rbf', max_iter=-1,  
probability=False, random_state=2, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.632183908045977
Accuracy is average for attitudinal variables. However, in rural area this is quite normal as required brands are not always available.

```
array([[ 6,  5,  7],  
       [ 4, 18,  3],  
       [ 5,  8, 31]])
```

SVM – Behavioural:

- Variables considered for building model are based on the outcome of SEM which are as below.

Shampoo_Acceptable - Buyer may prefer more than one brand of same category. Count of acceptable brands of given individual directly affects his/her loyalty towards product.

ShampooMaxRun - Measure of how many times buyer buys same brand consecutively.

ShampooTriedOutBrands - It counts how many different brands that buyer has tried out in last 8 periods.

```
classifier = SVC(kernel = 'rbf', random_state = 2, gamma=1, C=3, break_ties = True)
```

```
SVC(C=3, break_ties=True, cache_size=200, class_weight=None, coef0=0.0,
```

```
decision_function_shape='ovr', degree=3, gamma=1, kernel='rbf', max_iter=-1,  
probability=False, random_state=2, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.7586206896551724

```
array([[ 2,  9,  9],  
       [ 0, 20,  2],  
       [ 1,  0, 44]])
```

SVM – Attitudinal and Behavioural

Decision matrix obtained based on above two results is as below.

Table 5.12 Urban – TT - Shampoo - SVM Classification of Buyers as per Behavioural and Attitudinal Variables

		Behavioral		
		Loyal	Neutral	Disloyal
Attitudinal	Loyal	Strongly Loyal	Potential Loyal	Spurious Disloyalty
		285	83	397
	Neutral	Potential Disloyal	Not predictable	Weakly Disloyal
		12	20	17
	Disloyal	Spurious Loyalty	Weakly Disloyal	Strongly Disloyal
		170	29	93

5.3.2 URBAN – TT – WASHING POWDER: Summary of 38 variables under study

Table 5.13 Urban – TT – Washing Powder– Column Sparkline

Sr. No.	Attribute	Code	Question	Category	Traditional Trade				
					1	2	3	4	5
1	Brand Affect	BRAF1	After using my preferred brands, I get positive feeling.	Washing Powder brand					
2	Customer satisfaction	CUSA1	I am very satisfied with brands which I use so I repeat purchase.	Washing Powder brand					
3	Switching Cost	SWCO1	I do not switch to other brands as they are costly.	Washing Powder brand					
4	Brand Trust	BRTR1	I buy only those brands on which I have faith.	Washing Powder brand					
5	Relationship Proneness	REPR1	I have developed emotional relationship with the brands I purchase.	Washing Powder brand					
6	Involvement	INVO1	When I am involved in my favorite brands, I never look for other brands.	Washing Powder brand					
7	Perceived Value	PEVA1	The return I am getting on money spent on FMCG decides my product loyalty.	Washing Powder brand					
8	Availability	AVAI1	I never buy other brands if my favorite brands are not available.	Washing Powder brand					
9	Brand Relevance	BRRE1	My brands remains updated with change in technology and buyer's preferences.	Washing Powder brand					
10	Brand Performance	BRPE1	Brand performance really matters to me for loyalty towards it.	Washing Powder brand					
11	Culture	CULT1	I keep religious beliefs in center while selecting my brands.	Washing Powder brand					
12	Price Worthiness	PRWO1	My brands are economical.	Washing Powder brand					
13	Brand Equity	BREQ1	It is wise decision to purchases my brand even if other brands are same.	Washing Powder brand					
14	Brand Image	BRIM1	My brand delivers which it promises.	Washing Powder brand					
15	Accessibility	ACCE1	Without any recall efforts, I can remember my brands quickly.	Washing Powder brand					
16	Habit	HABI1	Buying preferred brand is now my habit.	Washing Powder brand					
17	Brand Reputation	BRRP1	I prefer to buy brands which are reputed among the larger group of buyers.	Washing Powder brand					
18	Brand Credibility	BRCR1	I prefer to buy brands which are more than 50 years old with good track record.	Washing Powder brand					
19	Emotional Value	EMVA1	I feel good when I use my favorite brands.	Washing Powder brand					

20	Functional Value	FUVA1	I like packaging and other features of my favorite brands.	Washing Powder brand	
21	Brand Attitude	BRAT2	In my next purchase I would like to buy these brands.	Washing Powder brand	
22	Centrality	CENT1	I prefer to buy brands which are matching with my value system.	Washing Powder brand	
23	Family Influence/Social Value	FASO1	My purchase decision always based on choice of family members.	Washing Powder brand	
24	Commitment	COMM1	If my favorite brand is not available in store, I don't purchase another brand.	Washing Powder brand	
25	Situational Factors	SIFA1	During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Washing Powder brand	
26	Discounts	DISC1	I never use to switch to other brand only because they offer discounts.	Washing Powder brand	
27	Advertising	ADVE1	Advertising of FMCG products help me to take buying decision.	Washing Powder brand	
28	Personal Selling	PESE1	Personal selling in super stores helps me to take right buying decision.	Washing Powder brand	
29	Comparing Product Features	COPF1	I must compare product features of various brands before buying the final one.	Washing Powder brand	
30	Assortment/Gift Pack/Banded	GIPC1	I continue to buy same brand as gift/banded/assortment pack are available for it.	Washing Powder brand	
31	Product Placement	PRPL1	Due to product placement, I sometimes change my buying decision.	Washing Powder brand	
32	Brand Awareness	BRAW1	I recognize my favorite brands even by color of its packet.	Washing Powder brand	
33	Celebrity Influence	CLIF1	My purchase decision never changes based on the celebrity endorsement.	Washing Powder brand	
34	Repeat Purchase	REPU1	I like to try different FMCG brands every time.	Washing Powder brand	
35	Repeat Purchase	REPU3	My buying behavior towards favorite brands is never deviating in normal conditions.	Washing Powder brand	
36	Brand Market Share	BRMS1	I do consider brand's market share before buying it.	Washing Powder brand	
37	Clarity	CLAR1	I have complete clarity about my brands, so I do not prefer other brands.	Washing Powder brand	
38	Repeat Purchase	REPU2	I usually get board after buying same brand for some time.	Washing Powder brand	

Findings:

Brand performance, Brand affect, Customer Satisfaction are the key factors indicates buyer are more concern with historical performance of brands.

Table 5.14 Urban – TT – Washing Powder – Descriptive Statistics

Questions	Que. Type	Que. Code	count	mean	std	min	25% (Q1)	50% (Q2)	75% (Q3)	max
After using my preferred brands, I get positive feeling.	Brand Affect	BRAF1	433	4.1	0.9	1	4	4	5	5
I am very satisfied with brands which I use so I repeat purchase.	Customer satisfaction	CUSA1	433	4.1	0.9	1	3	4	5	5
I do not switch to other brands as they are costly.	Switching Cost	SWCO1	433	3.1	1.2	1	2	3	4	5
I buy only those brands on which I have faith.	Brand Trust	BRTR1	433	3.9	1.0	1	3	4	5	5
I have developed emotional relationship with the brands I purchase.	Relationship Proneness	REPR1	433	2.9	1.2	1	2	3	4	5
When I am involved in my favorite brands, I never look for other brands.	Involvement	INVO1	433	3.2	1.2	1	2	3	4	5
The return I am getting on money spent on FMCG decides my product loyalty.	Perceived Value	PEVA1	431	3.5	1.1	1	3	4	4	5
I never buy other brands if my favorite brands are not available.	Availability	AVAI1	431	2.9	1.2	1	2	3	4	5
My brands remains updated with change in technology and buyer's preferences.	Brand Relevance	BRRE1	431	3.6	1.1	1	3	4	4	5
Brand performance really matters to me for loyalty towards it.	Brand Performance	BRPE1	432	3.8	1.3	1	3	4	5	5
I keep religious beliefs in center while selecting my brands.	Culture	CULT1	421	2.3	1.4	1	1	2	4	5
My brands are economical.	Price Worthiness	PRWO1	432	3.5	1.1	1	3	4	4	5
It is wise decision to purchases my brand even if other brands are same.	Brand Equity	BREQ1	431	3.7	1.0	1	3	4	4	5
My brand delivers which it promises.	Brand Image	BRIM1	431	3.7	1.0	1	3	4	4	5
Without any recall efforts, I can remember my brands quickly.	Accessibility	ACCE1	431	3.9	1.1	1	3	4	5	5
Buying preferred brand is now my habit.	Habit	HABI1	431	3.7	1.1	1	3	4	5	5
I prefer to buy brands which are reputed among the larger group of buyers.	Brand Reputation	BRRP1	431	3.0	1.2	1	2	3	4	5
I prefer to buy brands which are more than 50 years old with good track record.	Brand Credibility	BRCR1	431	3.1	1.3	1	2	3	4	5
I feel good when I use my favorite brands.	Emotional Value	EMVA1	431	4.0	1.0	1	3	4	5	5
I like packaging and other features of my favorite brands.	Functional Value	FUVA1	431	3.7	1.0	1	3	4	4	5
In my next purchase I would like to buy these brands.	Brand Attitude	BRAT2	431	3.9	1.0	1	3	4	5	5
I prefer to buy brands which are matching with my value system.	Centrality	CENT1	431	3.5	1.0	1	3	4	4	5
My purchase decision always based on choice of family members.	Family Influence/Social Value	FASO1	431	3.1	1.3	1	2	3	4	5
If my favorite brand is not available in store, I don't purchase another brand.	Commitment	COMM1	431	2.9	1.2	1	2	3	4	5
During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Situational Factors	SIFA1	431	3.5	1.2	1	3	4	4	5
I never use to switch to other brand only because they offer discounts.	Discounts	DISC1	431	3.3	1.2	1	3	4	4	5

Advertising of FMCG products help me to take buying decision.	Advertising	ADVE1	431	3.5	1.1	1	3	4	4	5
Personal selling in super stores helps me to take right buying decision.	Personal Selling	PESE1	431	3.5	1.1	1	3	4	4	5
I must compare product features of various brands before buying the final one.	Comparing Product Features	COPF1	431	3.6	1.1	1	3	4	4	5
I continue to buy same brand as gift/bended/assortment pack are available for it.	Assortment/ Gift Pack/Bended Pack	GIPC1	431	3.5	1.1	1	3	4	4	5
Due to product placement, I sometimes change my buying decision.	Product Placement	PRPL1	431	3.2	1.1	1	2	3	4	5
I recognize my favorite brands even by color of its packet.	Brand Awareness	BRAW1	431	3.7	1.1	1	3	4	5	5
My purchase decision never changes based on the celebrity endorsement.	Celebrity Influence	CLIF1	431	3.5	1.0	1	3	4	4	5
I like to try different FMCG brands every time.	Repeat Purchase	REPU1	431	3.2	1.1	1	2	3	4	5
My buying behavior towards favorite brands is never deviating in normal conditions.	Repeat Purchase	REPU3	431	3.3	1.0	1	3	3	4	5
I do consider brand's market share before buying it.	Brand Market Share	BRMS1	431	3.0	2.8	1	2	3	4	55
I have complete clarity about my brands, so I do not prefer other brands.	Clarity	CLAR1	431	3.6	1.0	1	3	4	4	5
I usually get board after buying same brand for some time.	Repeat Purchase	REPU2	431	3.0	1.2	1	2	3	4	5

Findings:

Culture, switching cost, brand market share are very volatile. That indicates different opinion for all these variables.

Urban – TT – Washing Powder: Summary of 38 variables under study

Step 1: K-Means Clustering: to have primary classification of buyers into Brand Loyal, Brand Disloyal and Neutral. Whole analysis is based on unsupervised clustering approach, so not very reliable.

As an output we manage to generate an additional column in the data set where each of the individual respondent is assigned tag of Loyal, Disloyal and Neutral.

Cluster Tag	Category of Consumers	Count
0	Loyal Consumers	165 (38%)
1	Disloyal Consumers	128 (30%)
2	Neutral	140 (32%)
	Total	433

Findings:

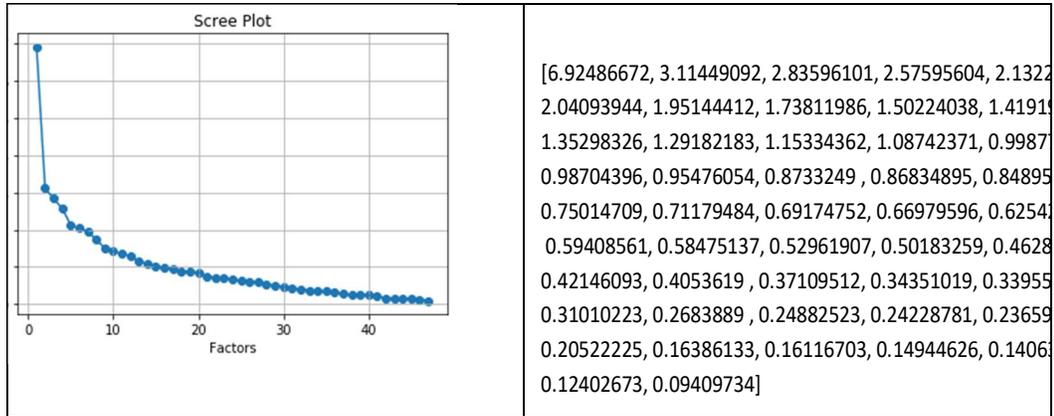
- Initial classification indicates that percentage difference among all three categories is not significantly different. So extra care needs to be taken while identifying the best fit model.
- Important thing to note here is that above numbers are not the final one to design final business strategies. They are only indicative of rough pattern available in the data.

Step 2: Correlation Matrix: to find out relation between all pairs of variables under study. Purpose is to eliminate those variables which are identical in nature and thus reducing duplication before fitting the model. Summary of outcomes is as follows.

Findings:

- Correlation values for each pair of variables in the study indicates no significant correlation as all values are less than 0.8.
- Overall conclusion is, no variable is to be removed from the analysis before applying Exploratory Factor Analysis.

Step 3: Exploratory Factor Analysis (EFA): is useful to reduce dimensionalities by creating liner combinations of variable with its constructs. Output of this process will become input for Structural Equation Modeling.



- Out of 14 factors derived, only those factors will be considered further where at least 3 variables are having factor loading >0.35 or <-0.35. Summary of factors is given in the table.
- To fine tune the output, Varimax rotation is applied on the eligible factors. Here there are total 13 factors where Varimax rotation applied. Total 39% of variance explained by 13 factors. However further useful factors are only 10 which approximately explains 43% of variance.

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
SS Loadings	3.055	2.527	2.279	2.239	2.058	1.915	1.845	1.631	1.506	1.384	1.321	1.316	1.045
Proportion Variance	0.065	0.054	0.048	0.048	0.044	0.041	0.039	0.035	0.032	0.029	0.028	0.028	0.022
Cumulative Variance	0.065	0.119	0.167	0.215	0.259	0.299	0.339	0.373	0.405	0.435	0.463	0.491	0.513

- Factors defined based on the output are as below. This will become an input for Structural Equation Modeling.

AttitudinalBrandLoyalty =	BRAF1 + CUSA1 + BRTR1 + INVO1 + PEVA1 + BRAT2
ValueSystem =	BRIM1 + ACCE1 + HABI1 + EMVA1 + FUVA1
ImpactofPromotion =	DISC1 + ADVE1 + PESE1 + PRPL1 + CLIF1
FamilyDemographics =	Family Type + Total Family Member + Head of the Family
BehaviouralBrandLoyalty =	Washing Powder Max Run + Washing Powder Tried Out Brands + Washing Powder_Acceptable
RepeatPurchase =	REPR1 + AVAI1 + CULT1 + BRCR1 + COMM1 + REPU3 + CLAR1
BrandSatisfaction =	BREQ1 + BRIM1 + COPF1
PriceWorthy =	SWCO1 + GIPC1 + PRWO1
BrandPerformance =	BRPE1 + BRRP1 + CENT1

0	1	2	3	4	5	6	7	8	9	10	11	12	13	
0	0.0383	-0.2085	0.2958	0.0625	0.0802	-0.0126	0.0128	0.0080	0.0365	0.0484	-0.1063	-0.0612	-0.0691	0.0653
1	-0.0578	-0.0008	0.1742	0.0565	-0.1674	0.0738	-0.0434	0.0087	0.2522	-0.0232	0.0984	-0.4284	0.0813	-0.0529
2	-0.0005	0.0706	-0.9284	-0.0409	-0.0283	0.0069	-0.0153	0.0264	0.0703	-0.0205	0.0085	-0.0848	0.0669	0.0635
3	0.0381	0.0353	-0.7198	0.0102	-0.0224	0.1132	-0.0211	-0.0612	-0.0041	-0.1084	-0.1391	0.1223	0.0639	0.0540
4	0.0539	0.0361	0.7115	-0.0526	0.0467	0.0342	0.0528	0.0258	-0.0041	-0.1084	-0.0191	0.1347	0.1041	-0.0190
5	0.5594	0.1432	0.0342	0.1429	0.0299	-0.0834	0.0249	0.0996	0.2473	0.0525	0.0833	0.0760	0.1619	0.1462
6	0.7296	0.0104	0.0028	0.0357	0.2068	-0.0691	-0.0122	0.1823	0.0227	0.1546	0.1171	-0.0657	0.0463	0.1462
7	0.1095	-0.0828	0.0942	0.0003	-0.0578	0.1253	0.0345	0.0055	0.4789	0.0152	0.0755	0.1119	0.0515	0.0974
8	0.6945	0.0563	0.0261	0.0304	0.0554	0.0994	-0.0449	0.0238	0.1034	-0.1309	-0.0459	-0.0805	-0.0091	-0.0384
9	0.1303	-0.0142	0.0982	-0.1833	0.1465	0.0449	0.4072	-0.0266	0.4525	0.0932	0.1403	-0.0231	0.1304	-0.0765
10	0.4901	0.1590	-0.0399	0.1001	0.0219	0.1600	0.2484	0.1764	0.1291	0.0831	0.0058	0.0158	-0.1307	-0.0416
11	0.5732	0.2972	-0.0012	0.2580	-0.0692	0.1879	-0.0712	-0.0878	-0.0867	-0.0218	0.0756	-0.0250	0.0101	-0.0513
12	-0.0451	0.0160	-0.0401	0.0705	0.1201	-0.0245	0.7568	0.1570	0.0062	0.0277	-0.0492	-0.1129	0.0002	0.0436
13	0.2796	0.2688	0.1712	0.0405	-0.2140	0.1644	-0.1254	0.2151	0.3042	0.0533	0.3276	0.1563	-0.0134	-0.2405
14	0.0883	0.1039	0.0365	0.1656	-0.1271	0.0488	-0.1112	0.0968	0.0043	-0.4645	-0.0096	0.0428	-0.0896	0.0333
15	-0.0894	-0.1357	-0.1266	0.0440	0.0902	0.0212	0.5245	-0.1150	0.0594	0.2570	-0.0780	0.0739	0.2331	-0.1380
16	0.0339	0.0381	0.0581	0.1783	0.0302	0.0766	-0.0701	-0.0196	0.1200	-0.1322	0.7458	-0.0337	0.0029	-0.0174
17	0.1611	0.0335	0.1073	0.1306	0.0004	0.0985	0.0511	0.6330	0.0752	-0.1815	0.0118	-0.1176	0.0980	0.0550
18	0.1367	0.3372	0.0334	-0.0235	0.0724	0.1420	0.0143	0.7234	-0.0803	-0.0847	-0.0514	0.1680	-0.0700	0.0270
19	0.0408	0.5687	-0.0002	0.1019	-0.0351	0.1834	-0.0071	0.0981	-0.2925	-0.0842	0.3729	-0.0275	0.1827	0.2984
20	0.2285	0.6072	-0.0209	-0.0914	0.2445	0.0445	0.0845	0.2200	-0.1778	-0.1913	-0.0334	0.1477	0.0703	0.0336
21	0.2048	0.1225	-0.0402	0.0101	-0.1125	0.1561	0.0818	-0.0436	0.0592	0.5974	-0.0946	0.0211	0.0101	-0.0486
22	0.0181	-0.0323	0.0440	0.1858	-0.0536	0.1078	0.3862	-0.0955	0.0076	0.3804	-0.0680	-0.1645	-0.0026	0.1769
23	0.2875	0.6769	-0.0482	0.0630	0.1003	0.1332	-0.0996	0.0520	0.1253	0.0510	-0.0556	-0.0091	-0.1444	-0.0400
24	0.1132	0.7286	0.0346	0.0584	-0.0899	0.2071	-0.0542	0.1722	0.1426	0.0909	0.0253	0.0651	-0.0489	0.0833
25	0.3895	0.1720	0.1121	0.2811	0.1190	0.0434	0.0693	0.1784	0.1099	-0.1035	-0.2760	-0.0240	0.1012	0.1713
26	0.1738	0.2281	-0.0092	0.3620	0.3031	0.0547	-0.0396	0.1200	0.0591	0.2844	-0.1169	0.0097	0.0222	-0.1333
27	0.0348	-0.1091	-0.0328	0.0058	-0.0653	-0.0543	0.2312	-0.0078	-0.0137	0.3004	-0.2150	0.2669	-0.2257	0.1006
28	0.1301	-0.0749	0.0274	0.0550	-0.0719	0.0162	0.3636	-0.0406	0.1924	0.0839	0.0194	-0.1171	0.5297	0.0592
29	0.2373	0.1584	-0.0915	0.2230	-0.0980	0.0754	-0.0442	0.1593	0.3247	-0.1475	0.0118	0.2427	-0.4354	0.2528
30	0.0344	0.0402	-0.0632	0.3302	0.0020	0.2020	-0.0272	0.2426	0.1409	0.0360	0.0005	0.0442	0.5119	0.1030
31	0.3557	0.2239	-0.0272	0.4036	-0.0208	0.0186	0.1841	0.0544	0.0321	-0.2449	-0.1126	0.1168	0.3138	0.0394
32	0.1067	-0.0090	-0.0993	0.6803	0.1159	0.1192	0.1327	0.0293	-0.0106	0.1864	-0.0399	0.0849	0.0216	0.0755
33	-0.0336	0.2069	-0.1123	0.3446	-0.1253	0.1877	0.0235	0.3929	0.0451	0.1864	-0.0399	0.0849	0.0216	0.0755
34	0.0681	0.2502	-0.0097	0.3831	0.1249	0.0756	0.0937	0.0272	0.5784	0.0554	-0.1220	0.0152	0.0621	0.0645
35	0.0972	-0.1042	0.0383	0.5122	-0.1763	-0.0171	-0.1227	-0.0554	0.1675	-0.0532	0.2602	0.2754	0.0466	0.2032
36	0.2195	0.2315	0.0177	0.2293	0.2428	0.0483	-0.0599	0.2511	0.2374	0.0110	-0.0778	-0.1776	0.1219	0.5517
37	0.2227	-0.0137	0.0777	0.4569	0.0908	0.1496	0.0320	0.1290	0.1499	-0.1396	0.0913	-0.0565	-0.0681	-0.0201
38	-0.1721	0.1088	-0.0479	0.0277	-0.0714	0.0400	-0.0262	-0.0638	0.0271	0.0461	0.0895	0.5497	-0.0699	-0.0429
39	0.1035	0.2279	-0.0415	0.1081	0.0300	0.8250	-0.0370	0.0997	0.1036	0.0294	0.1366	0.0936	0.0999	0.0714
40	0.0732	0.0231	0.0179	0.0384	0.0384	0.0940	0.0747	0.0517	0.1401	-0.0638	0.0139	0.2913	0.0198	-0.0081
41	0.2322	0.0963	0.2139	0.1527	-0.0180	0.4163	0.2366	0.0619	0.1474	-0.1106	0.0198	0.0969	-0.0681	0.3754
42	-0.0843	0.0072	0.0622	0.0764	0.3223	0.0306	-0.1156	0.1362	0.2243	-0.0570	-0.3202	0.4299	0.0961	-0.0869
43	0.0172	-0.0053	-0.1024	-0.0493	-0.0629	0.0227	-0.0265	-0.0320	-0.0470	-0.0270	0.1684	0.0469	0.0502	-0.0437
44	0.1533	-0.0365	-0.0198	0.0272	0.8274	-0.0096	0.0754	0.0366	-0.0200	-0.0704	0.1390	-0.0002	-0.0394	-0.0492
45	-0.0634	-0.0811	-0.0064	-0.0299	-0.8194	-0.0090	-0.0616	0.0706	0.0247	0.0186	-0.0447	-0.1145	-0.0869	-0.0671
46	0.1613	0.1620	-0.0945	0.1447	-0.0477	0.7863	0.0350	0.1752	0.0136	0.1345	-0.0024	-0.0287	0.0343	-0.0496

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	Code												
Age Group	0.034	-0.214	0.059	0.299	0.088	-0.006	0.005	0.012	0.037	0.036	-0.107	-0.070	0.082
Gender	-0.039	-0.035	0.018	0.171	-0.169	0.062	-0.046	0.047	0.275	0.010	0.123	-0.356	-0.144
Family Type	0.003	0.074	-0.033	0.931	-0.027	0.014	-0.018	0.025	0.084	-0.024	0.003	-0.070	-0.005
Total Family Member	0.035	0.049	0.032	-0.717	-0.024	0.116	0.142	-0.026	-0.058	-0.031	-0.161	0.099	-0.004
Head of the Family	0.058	0.045	-0.039	0.710	0.040	0.034	0.070	0.023	-0.021	-0.107	-0.014	0.159	-0.088
BRAF1	0.548	0.148	0.193	0.041	0.032	0.100	-0.026	-0.022	0.115	0.197	0.008	0.035	-0.018
CUSA1	0.688	0.038	0.090	0.017	0.202	-0.036	0.030	0.119	0.032	0.081	0.064	-0.115	0.017
SWCO1	0.111	-0.097	0.034	0.099	-0.058	0.145	0.078	-0.013	0.459	-0.017	0.086	0.121	0.019
BRT1	0.713	0.014	-0.010	0.021	0.048	0.084	-0.059	0.046	0.091	-0.104	-0.017	-0.041	-0.011
REPR1	0.141	-0.043	-0.200	0.098	0.131	0.047	0.460	-0.020	0.408	0.067	0.190	0.021	-0.079
INVO1	0.505	0.119	0.041	-0.046	0.024	0.141	0.213	0.205	0.097	0.115	0.045	0.031	0.166
PEVA1	0.589	0.266	0.215	-0.011	-0.068	0.160	-0.098	-0.055	-0.080	0.043	0.082	-0.007	-0.022
AVA1	-0.044	0.035	0.052	-0.040	0.126	-0.021	0.715	0.184	-0.006	0.009	-0.063	-0.135	0.113
BRRE1	0.306	0.209	-0.018	0.160	-0.225	0.132	-0.120	0.232	0.243	0.124	0.420	0.235	-0.040
BRPE1	0.095	0.106	0.154	0.030	-0.116	0.035	-0.170	0.130	0.016	0.016	-0.005	0.067	0.071
CULT1	-0.085	-0.150	0.022	-0.132	0.079	0.014	0.574	-0.093	0.018	0.250	-0.053	0.092	-0.157
PRWO1	0.031	0.073	0.229	0.059	0.031	0.080	-0.058	-0.045	0.081	-0.148	0.735	-0.065	-0.011
BREQ1	0.164	0.047	0.149	0.110	0.005	0.100	0.047	0.642	0.088	-0.177	0.006	-0.103	-0.075
BRIM1	0.142	0.352	-0.021	0.033	0.078	0.141	-0.018	0.693	-0.077	-0.067	-0.048	0.164	0.090
ACCE1	0.244	0.643	0.226	0.009	-0.027	0.212	0.002	0.041	-0.207	-0.131	0.221	-0.127	-0.081
HAB1	0.215	0.078	-0.027	-0.040	-0.117	0.150	0.114	-0.052	0.048	0.602	-0.071	0.016	0.020
BRRP1	0.012	-0.017	0.202	0.051	-0.042	0.121	0.393	-0.096	0.030	0.342	-0.116	-0.231	0.120
EMVA1	0.322	0.609	-0.025	-0.058	0.099	0.105	-0.152	0.088	0.155	0.138	-0.017	0.045	0.096
FUVA1	0.139	0.718	0.035	0.031	-0.087	0.197	-0.082	0.169	0.191	0.143	0.018	0.077	0.072
BRAT2	0.407	0.165	0.282	0.113	0.126	0.043	0.065	0.193	0.155	-0.082	-0.302	-0.012	-0.028
CENT1	0.208	0.166	0.258	-0.022	0.299	0.026	-0.043	0.150	0.066	0.361	-0.067	0.067	-0.060
FASO1	0.019	-0.111	0.005	-0.029	-0.051	-0.040	0.216	-0.026	-0.040	0.265	-0.216	0.203	0.326
COM1	0.132	-0.051	0.131	0.036	-0.088	0.036	0.473	-0.059	0.200	0.029	-0.022	-0.108	-0.407
SIFA1	0.236	0.151	0.223	-0.090	-0.070	0.089	-0.118	0.150	0.326	-0.147	0.007	0.199	0.531
DISC1	0.048	0.070	0.406	-0.056	-0.004	0.216	0.075	0.209	0.171	0.025	-0.046	0.057	-0.416
ADVE1	0.377	0.223	0.413	-0.033	-0.022	0.010	0.203	0.081	0.048	-0.197	-0.131	0.149	-0.220
PESE1	0.125	0.000	0.662	-0.105	0.129	0.106	0.128	0.052	-0.001	0.061	0.061	0.031	-0.035
COPF1	-0.021	0.204	0.344	-0.112	-0.113	0.185	0.019	0.395	0.060	0.222	-0.047	0.078	0.037
GIPC1	0.104	0.189	0.326	-0.014	0.131	-0.081	0.102	0.060	0.600	0.113	-0.087	0.081	-0.005
PRPL1	0.091	-0.065	0.592	0.044	-0.159	0.006	-0.086	-0.097	0.159	-0.080	0.204	0.213	0.068
BRAW1	0.226	0.281	0.338	0.046	0.243	0.105	-0.005	0.180	0.311	-0.067	-0.182	-0.225	0.024
CLIF1	0.237	-0.020	0.400	0.067	0.100	0.124	-0.012	0.164	0.012	0.160	0.103	-0.034	0.058
REPU1	-0.176	0.112	0.048	-0.052	-0.069	0.040	-0.014	-0.087	-0.026	0.055	0.108	0.533	0.121
REPU3	0.119	0.234	0.126	-0.045	0.028	0.844	-0.024	0.099	0.045	0.128	0.045	0.101	-0.072
BRM51	0.077	0.015	0.086	0.015	0.039	0.094	-0.059	0.042	0.114	-0.052	0.031	0.304	0.007
CLAR1	0.224	0.152	0.236	0.223	-0.004	0.446	0.227	0.033	0.165	-0.170	-0.057	0.018	0.230
REPU2	-0.072	-0.037	0.051	-0.054	0.021	-0.040	-0.090	0.150	0.204	-0.004	-0.264	0.504	-0.084
Washing Powder Max R	0.009	0.009	-0.018	-0.102	-0.367	0.023	-0.015	-0.043	-0.063	-0.070	0.160	0.034	-0.041
Washing Powder Tried C	0.160	-0.038	-0.002	-0.024	0.830	-0.016	0.065	0.042	-0.043	-0.062	0.155	0.001	0.003
Washing Powder Accep	-0.068	-0.101	-0.048	-0.007	-0.818	-0.017	-0.083	0.089	0.020	0.032	-0.020	-0.091	0.067
cluster	0.184	0.146	0.105	-0.102	-0.052	0.747	0.025	0.200	0.006	0.182	0.025	0.005	-0.044

Step 4: Structural Equation Modeling (SEM): is used to fit the model which depicts the relationship between measured variable and latent variables. Output of this process will become input for Support Vector Machine which will help further to have classification of consumers into loyal, disloyal, and neutral in terms of brand loyalty of FMCG products.

- Initially proposed model:

```
# measurement model

AttitudinalBrandLoyalty =~ BRAF1 + CUSA1 + BRTR1 + INVO1 + PEVA1 + BRAT2

ValueSystem =~ BRIM1 + ACCE1 + HABI1 + EMVA1 + FUVA1

ImpactofPromotion =~ DISC1 + ADVE1 + PESE1 + PRPL1 + CLIF1

FamilyDemographics =~ FamilyType + TotalFamilyMember + HeadoftheFamily

BehaviouralBrandLoyalty =~ WashingPowderMaxRun +
WashingPowderTriedOutBrands + WashingPowder_Acceptable

RepeatPurchase =~ REPR1 + AVAI1 + CULT1 + BRCR1 + COMM1 + REPU3 + CLAR1

BrandSatisfaction =~ BREQ1 + BRIM1 + COPF1

PriceWorthy =~ SWCO1 + GIPC1 + PRWO1

BrandPerformance =~ BRPE1 + BRRP1 + CENT1
```

```
# regressions

BrandLoyalty ~ AttitudinalBrandLoyalty + ValueSystem + ImpactofPromotion +
FamilyDemographics + BehaviouralBrandLoyalty + RepeatPurchase +
BrandSatisfaction + PriceWorthy + BrandPerformance
```

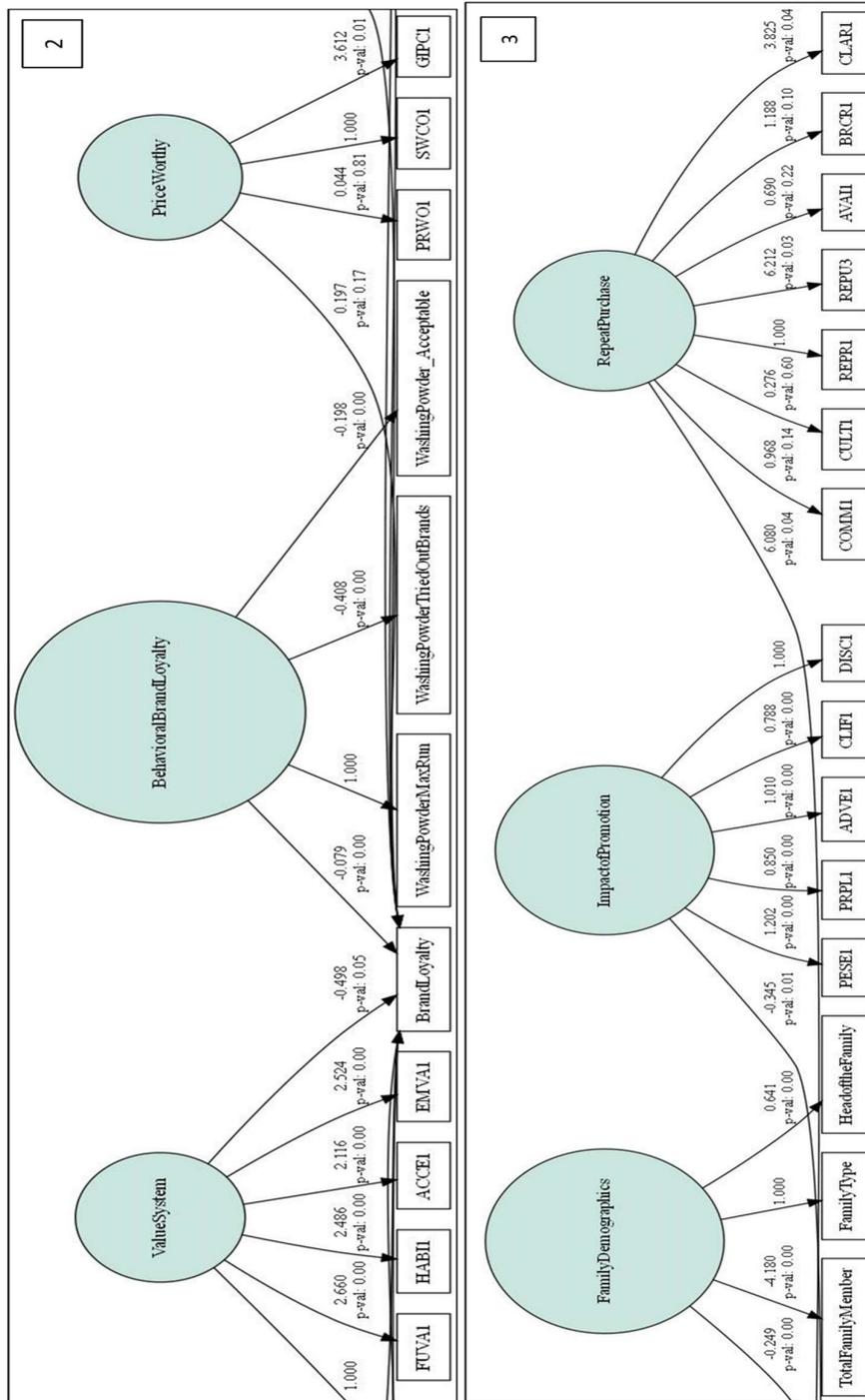
- Initial reliability indicators:

Indicators	DoF	DoF Baseline	chi2	chi2 p- value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	620	703	3478.985	0	7135.777	0.55556	0.512459	0.447191	0.512459	0.496062	0.103316	225.9308	718.49	8.034608

Over all indicators are close to 0.8 and shows good model fit, however, still there is a scope for improvement.

- Initial model is as below:

Figure 5.10 Initial model Urban – TT – Washing



Attributes which are Statistically insignificant are removed from the further model building process.

- New model proposed based on the previous model's output:

measurement model

ImpactofPromotion =~ DISC1 + ADVE1 + PESE1 + PRPL1 + CLIF1

FamilyDemographics =~ FamilyType + TotalFamilyMember + HeadoftheFamily

BehaviouralBrandLoyalty =~ WashingPowderMaxRun + WashingPowderTriedOutBrands

+ WashingPowder_Acceptable

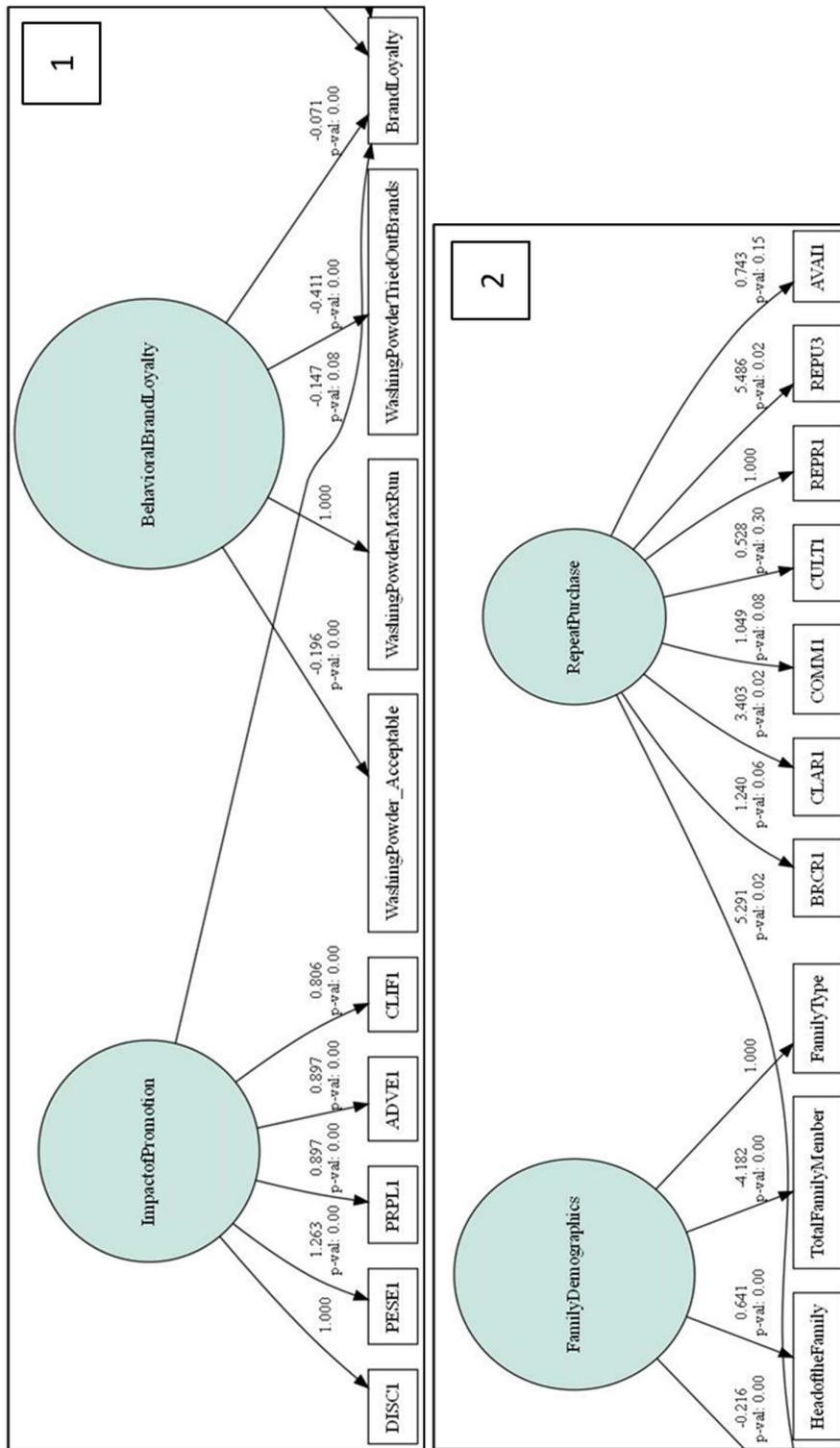
RepeatPurchase =~ REPR1 + AVAI1 + CULT1 + BRCR1 + COMM1 + REPU3 + CLAR1

regressions

BrandLoyalty ~ ImpactofPromotion + FamilyDemographics + BehaviouralBrandLoyalty + RepeatPurchase

	lval	op	rval	Estimate	Std. Err	z-value	p-value
0	DISC1	~	ImpactofPromotion	1	-	-	-
1	ADVE1	~	ImpactofPromotion	0.897	0.124	7.233	0.000
2	PESE1	~	ImpactofPromotion	1.263	0.154	8.216	0.000
3	PRPL1	~	ImpactofPromotion	0.897	0.126	7.128	0.000
4	CLIF1	~	ImpactofPromotion	0.806	0.115	6.992	0.000
5	FamilyType	~	FamilyDemographics	1.000	-	-	-
6	TotalFamilyMember	~	FamilyDemographics	-4.182	0.289	-14.486	0.000
7	HeadoftheFamily	~	FamilyDemographics	0.641	0.047	13.693	0.000
8	WashingPowderMaxRun	~	BehavioralBrandLoyalty	1.000	-	-	-
9	WashingPowderTriedOutBrands	~	BehavioralBrandLoyalty	-0.411	0.048	-8.558	0.000
10	WashingPowder_Acceptable	~	BehavioralBrandLoyalty	-0.196	0.033	-5.893	0.000
11	REPR1	~	RepeatPurchase	1.000	-	-	-
12	AVAI1	~	RepeatPurchase	0.743	0.519	1.434	0.152
13	CULT1	~	RepeatPurchase	0.528	0.507	1.041	0.298
14	BRCR1	~	RepeatPurchase	1.240	0.669	1.852	0.064
15	COMM1	~	RepeatPurchase	1.049	0.608	1.724	0.085
16	REPU3	~	RepeatPurchase	5.486	2.311	2.374	0.018
17	CLAR1	~	RepeatPurchase	3.403	1.458	2.334	0.020
18	BrandLoyalty	~	ImpactofPromotion	-0.147	0.084	-1.736	0.082
19	BrandLoyalty	~	FamilyDemographics	-0.216	0.063	-3.407	0.001
20	BrandLoyalty	~	BehavioralBrandLoyalty	-0.071	0.020	-3.547	0.000
21	BrandLoyalty	~	RepeatPurchase	5.291	2.249	2.353	0.019
22	RepeatPurchase	~	RepeatPurchase	0.022	0.019	1.188	0.235
23	RepeatPurchase	~	ImpactofPromotion	0.045	0.020	2.207	0.027
24	RepeatPurchase	~	BehavioralBrandLoyalty	0.023	0.017	1.356	0.175
25	RepeatPurchase	~	FamilyDemographics	0.004	0.004	0.924	0.356
26	ImpactofPromotion	~	ImpactofPromotion	0.386	0.078	4.941	0.000
27	ImpactofPromotion	~	BehavioralBrandLoyalty	0.109	0.060	1.807	0.071
28	ImpactofPromotion	~	FamilyDemographics	-0.025	0.018	-1.435	0.151
29	BehavioralBrandLoyalty	~	BehavioralBrandLoyalty	2.452	0.368	6.662	0.000
30	BehavioralBrandLoyalty	~	FamilyDemographics	-0.015	0.038	-0.404	0.687
31	FamilyDemographics	~	FamilyDemographics	0.236	0.020	11.828	0.000
32	PRPL1	~	PRPL1	0.909	0.072	12.694	0.000
33	CULT1	~	CULT1	1.782	0.121	14.707	0.000
34	HeadoftheFamily	~	HeadoftheFamily	0.118	0.009	12.564	0.000
35	CLAR1	~	CLAR1	0.756	0.054	13.936	0.000
36	REPR1	~	REPR1	1.505	0.102	14.684	0.000
37	COMM1	~	COMM1	1.510	0.103	14.681	0.000
38	AVAI1	~	AVAI1	1.470	0.100	14.697	0.000
39	BrandLoyalty	~	BrandLoyalty	0.135	0.040	3.351	0.001
40	WashingPowderMaxRun	~	WashingPowderMaxRun	1.535	0.289	5.303	0.000
41	CLIF1	~	CLIF1	0.797	0.062	12.857	0.000
42	BRCR1	~	BRCR1	1.521	0.104	14.668	0.000
43	TotalFamilyMember	~	TotalFamilyMember	4.002	0.342	11.690	0.000
44	DISC1	~	DISC1	0.998	0.080	12.418	0.000
45	ADVE1	~	ADVE1	0.853	0.068	12.556	0.000
46	WashingPowderTriedOutBrands	~	WashingPowderTriedOutBrands	0.041	0.046	0.891	0.373
47	REPU3	~	REPU3	0.294	0.047	6.298	0.000
48	PESE1	~	PESE1	0.669	0.072	9.261	0.000
49	FamilyType	~	FamilyType	0.000	0.012	0.000	1.000
50	WashingPowder_Acceptable	~	WashingPowder_Acceptable	1.019	0.070	14.515	0.000

Figure 5.11 Final model Urban – TT – Washing Powder



- Revised reliability indicators:

	DoF	DoF Baseline	chi2	chi2 p- value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	143	171	925.223	0	2714.804	0.692	0.659	0.592	0.659	0.632	0.101	89.726	281.051	2.137

Findings:

All reliability indicators are showing improvement compared to first round of fit. P value is zero and CFI, GFI, NFI are above 65%. Also, RMSEA is within tolerance limit of 0.10 Overall model is good and can be accepted for further decision-making process.

Step 5: Support Vector Machine (SVM): After getting most impacting features from the final model of SEM. Now it is time to train the model to classify FMCG users into three categories called, Loyal, Disloyal and Neutral based on both Behavioural and Attitudinal factors.

SVM will be run on both Behavioural and Attitudinal factors separately. Output will be in the form of 3*3 matrix, 3 levels from Behavioural and 3 levels from Attitudinal. This will help further to Retailers and Manufacturers to decide about their strategy.

SVM – Attitudinal:

- Variables considered for building model are based on the outcome of SEM which are as below.

FamilyType – Nuclear or Joint

TotalFamilyMember – Number of family members

HeadoftheFamily – Key decision maker in the family

REPR1 - Relationship Proneness

AVAI1 - Availability

CULT1 - Culture

BRCR1 - Brand Credibility

COMM1 - Commitment

DISC1 - Discounts

ADVE1 - Advertising

PESE1 - Personal Selling

PRPL1 - Product Placement

CLIF1 - Celebrity Influence

REPU3 - Repeat Purchase

CLAR1 - Clarity

cluster

```
classifier = SVC(kernel = 'rbf', random_state = 2, gamma=2, C=4, break_ties = True)
```

```
SVC(C=4, break_ties=True, cache_size=200, class_weight=None, coef0=0.0,  
decision_function_shape='ovr', degree=3, gamma=2, kernel='rbf', max_iter=-1,  
probability=False, random_state=2, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.6091954022988506

Accuracy is average for attitudinal variables. However, in rural area this is quite normal as required brands are not always available.

```
array([[28, 6, 6],  
       [ 9, 6, 4],  
       [ 3, 6, 19]])
```

SVM – Behavioural:

- Variables considered for building model are based on the outcome of SEM which are as below.

WashingPowder_Acceptable

WashingPowderMaxRun

WashingPowderTriedOutBrands

cluster

```
classifier = SVC(kernel = 'rbf', random_state = 2, gamma=6, C=4, break_ties = True)
```

```
SVC(C=4, break_ties=True, cache_size=200, class_weight=None, coef0=0.0,  
decision_function_shape='ovr', degree=3, gamma=6, kernel='rbf', max_iter=-1,  
probability=False, random_state=2, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.6436781609195402

array([[35, 0, 1],
 [6, 16, 0],
 [24, 0, 5]])

SVM – Attitudinal and Behavioural

Table 5.15 Urban – TT - Washing Powder - SVM Classification of Buyers as per Behavioural and Attitudinal Variables

		Behavioral		
		Loyal	Neutral	Disloyal
Attitudinal	Loyal	Strongly Loyal 98	Potential Loyal 19	Spurious Disloyalty 39
	Neutral	Potential Disloyal 123	Not predictable 13	Weakly Disloyal 33
	Disloyal	Spurious Loyalty 67	Weakly Disloyal 2	Strongly Disloyal 39

5.3.3 URBAN – TT – SOFT DRINK & CHOCOLATE: Summary of 38 variables under study

Table 5.16 Urban – TT – SD & Chocolate– Column Sparkline

Sr. No.	Attribute	Code	Question	Category	Traditional Trade				
					1	2	3	4	5
1	Brand Affect	BRAF1	After using my preferred brands, I get positive feeling.	Soft Drink & Chocolate brand					
2	Customer satisfaction	CUSA1	I am very satisfied with brands which I use so I repeat purchase.	Soft Drink & Chocolate brand					
3	Switching Cost	SWCO1	I do not switch to other brands as they are costly.	Soft Drink & Chocolate brand					
4	Brand Trust	BRTR1	I buy only those brands on which I have faith.	Soft Drink & Chocolate brand					
5	Relationship Proneness	REPR1	I have developed emotional relationship with the brands I purchase.	Soft Drink & Chocolate brand					
6	Involvement	INVO1	When I am involved in my favorite brands, I never look for other brands.	Soft Drink & Chocolate brand					
7	Perceived Value	PEVA1	The return I am getting on money spent on FMCG decides my product loyalty.	Soft Drink & Chocolate brand					
8	Availability	AVAI1	I never buy other brands if my favorite brands are not available.	Soft Drink & Chocolate brand					
9	Brand Relevance	BRRE1	My brands remains updated with change in technology and buyer's preferences.	Soft Drink & Chocolate brand					
10	Brand Performance	BRPE1	Brand performance really matters to me for loyalty towards it.	Soft Drink & Chocolate brand					
11	Culture	CULT1	I keep religious beliefs in center while selecting my brands.	Soft Drink & Chocolate brand					
12	Price Worthiness	PRWO1	My brands are economical.	Soft Drink & Chocolate brand					
13	Brand Equity	BREQ1	It is wise decision to purchases my brand even if other brands are same.	Soft Drink & Chocolate brand					
14	Brand Image	BRIM1	My brand delivers which it promises.	Soft Drink & Chocolate brand					
15	Accessibility	ACCE1	Without any recall efforts, I can remember my brands quickly.	Soft Drink & Chocolate brand					
16	Habit	HABI1	Buying preferred brand is now my habit.	Soft Drink & Chocolate brand					
17	Brand Reputation	BRRP1	I prefer to buy brands which are reputed among the larger group of buyers.	Soft Drink & Chocolate brand					
18	Brand Credibility	BRCR1	I prefer to buy brands which are more than 50 years old with good track record.	Soft Drink & Chocolate brand					
19	Emotional Value	EMVA1	I feel good when I use my favorite brands.	Soft Drink & Chocolate brand					

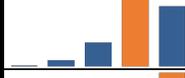
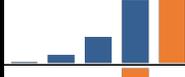
20	Functional Value	FUVA1	I like packaging and other features of my favorite brands.	Soft Drink & Chocolate brand	
21	Brand Attitude	BRAT2	In my next purchase I would like to buy these brands.	Soft Drink & Chocolate brand	
22	Centrality	CENT1	I prefer to buy brands which are matching with my value system.	Soft Drink & Chocolate brand	
23	Family Influence/Social Value	FASO1	My purchase decision always based on choice of family members.	Soft Drink & Chocolate brand	
24	Commitment	COMM1	If my favorite brand is not available in store, I don't purchase another brand.	Soft Drink & Chocolate brand	
25	Situational Factors	SIFA1	During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Soft Drink & Chocolate brand	
26	Discounts	DISC1	I never use to switch to other brand only because they offer discounts.	Soft Drink & Chocolate brand	
27	Advertising	ADVE1	Advertising of FMCG products help me to take buying decision.	Soft Drink & Chocolate brand	
28	Personal Selling	PESE1	Personal selling in super stores helps me to take right buying decision.	Soft Drink & Chocolate brand	
29	Comparing Product Features	COPF1	I must compare product features of various brands before buying the final one.	Soft Drink & Chocolate brand	
30	Assortment/Gift Pack/Banded Pack	GIPC1	I continue to buy same brand as gift/banded/assortment pack are available for it.	Soft Drink & Chocolate brand	
31	Product Placement	PRPL1	Due to product placement, I sometimes change my buying decision.	Soft Drink & Chocolate brand	
32	Brand Awareness	BRAW1	I recognize my favorite brands even by color of its packet.	Soft Drink & Chocolate brand	
33	Celebrity Influence	CLIF1	My purchase decision never changes based on the celebrity endorsement.	Soft Drink & Chocolate brand	
34	Repeat Purchase	REPU1	I like to try different FMCG brands every time.	Soft Drink & Chocolate brand	
35	Repeat Purchase	REPU3	My buying behavior towards favorite brands is never deviating in normal conditions.	Soft Drink & Chocolate brand	
36	Brand Market Share	BRMS1	I do consider brand's market share before buying it.	Soft Drink & Chocolate brand	
37	Clarity	CLAR1	I have complete clarity about my brands, so I do not prefer other brands.	Soft Drink & Chocolate brand	
38	Repeat Purchase	REPU2	I usually get board after buying same brand for some time.	Soft Drink & Chocolate brand	

Table 5.17 Urban – TT – SD & Chocolate – Descriptive Statistics

Questions	Que. Type	Que. Code	count	mean	std	min	25% (Q1)	50% (Q2)	75% (Q3)	max
After using my preferred brands, I get positive feeling.	Brand Affect	BRAF1	433	4.4	0.9	1	4	5	5	5
I am very satisfied with brands which I use so I repeat purchase.	Customer satisfaction	CUSA1	433	4.1	1.1	1	4	4	5	5
I do not switch to other brands as they are costly.	Switching Cost	SWCO1	433	3.2	1.2	1	2	3	4	5
I buy only those brands on which I have faith.	Brand Trust	BTRR1	433	3.9	1.2	1	4	4	5	5
I have developed emotional relationship with the brands I purchase.	Relationship Proneness	REPR1	433	3.5	1.4	1	2	4	5	5
When I am involved in my favorite brands, I never look for other brands.	Involvement	INVO1	433	3.5	1.2	1	3	4	4	5
The return I am getting on money spent on FMCG decides my product loyalty.	Perceived Value	PEVA1	431	3.7	1.0	1	3	4	5	5
I never buy other brands if my favorite brands are not available.	Availability	AVAI1	431	3.0	1.2	1	2	3	4	5
My brands remains updated with change in technology and buyer's preferences.	Brand Relevance	BRRE1	431	3.8	1.1	1	3	4	5	5
Brand performance really matters to me for loyalty towards it.	Brand Performance	BRPE1	432	3.8	1.3	1	3	4	5	5
I keep religious beliefs in center while selecting my brands.	Culture	CULT1	432	2.4	1.4	1	1	2	4	5
My brands are economical.	Price Worthiness	PRWO1	432	3.6	1.0	1	3	4	4	5
It is wise decision to purchases my brand even if other brands are same.	Brand Equity	BREQ1	431	3.8	1.1	1	3	4	5	5
My brand delivers which it promises.	Brand Image	BRIM1	431	4.0	1.1	1	4	4	5	5
Without any recall efforts, I can remember my brands quickly.	Accessibility	ACCE1	431	4.3	1.0	1	4	5	5	5
Buying preferred brand is now my habit.	Habit	HABI1	431	4.0	1.0	1	4	4	5	5
I prefer to buy brands which are reputed among the larger group of buyers.	Brand Reputation	BRRP1	431	3.3	2.3	1	2	3	4	44
I prefer to buy brands which are more than 50 years old with good track record.	Brand Credibility	BRCR1	431	3.4	1.3	1	2	3	5	5
I feel good when I use my favorite brands.	Emotional Value	EMVA1	431	4.3	0.9	1	4	4	5	5
I like packaging and other features of my favorite brands.	Functional Value	FUVA1	424	4.1	0.9	1	4	4	5	5
In my next purchase I would like to buy these brands.	Brand Attitude	BRAT2	431	3.9	0.9	1	3	4	5	5
I prefer to buy brands which are matching with my value system.	Centrality	CENT1	431	3.8	1.1	1	3	4	5	5
My purchase decision always based on choice of family members.	Family Influence/Social Value	FASO1	431	2.7	1.3	1	2	3	4	5
If my favorite brand is not available in store, I don't purchase another brand.	Commitment	COMM1	431	2.9	1.2	1	2	3	4	5
During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Situational Factors	SIFA1	431	3.6	1.2	1	3	4	5	5
I never use to switch to other brand only because they offer discounts.	Discounts	DISC1	431	3.5	1.2	1	3	4	4	5

Advertising of FMCG products help me to take buying decision.	Advertising	ADVE1	431	3.5	1.2	1	3	4	5	5
Personal selling in super stores helps me to take right buying decision.	Personal Selling	PESE1	431	3.5	1.1	1	3	4	4	5
I must compare product features of various brands before buying the final one.	Comparing Product Features	COPF1	431	3.6	1.3	1	3	4	5	5
I continue to buy same brand as gift/bended/assortment pack are available for it.	Assortment/ Gift Pack/Bended Pack	GIPC1	431	3.9	1.1	1	3	4	5	5
Due to product placement, I sometimes change my buying decision.	Product Placement	PRPL1	431	3.4	1.2	1	2	4	4	5
I recognize my favorite brands even by color of its packet.	Brand Awarness	BRAW1	426	4.0	1.0	1	3	4	5	5
My purchase decision never changes based on the celebrity endorsement.	Celebrity Influence	CLIF1	431	3.7	1.1	1	3	4	5	5
I like to try different FMCG brands every time.	Repeat Purchase	REPU1	431	3.4	1.1	1	2	4	4	5
My buying behavior towards favorite brands is never deviating in normal conditions.	Repeat Purchase	REPU3	431	3.6	1.0	1	3	4	4	5
I do consider brand's market share before buying it.	Brand Market Share	BRMS1	431	3.2	1.3	1	2	3	4	5
I have complete clarity about my brands, so I do not prefer other brands.	Clarity	CLAR1	431	3.6	1.1	1	3	4	5	5
I usually get board after buying same brand for some time.	Repeat Purchase	REPU2	431	3.2	1.4	1	2	3	4	5

Rural – TT - Soft Drink & Chocolate: Summary of 38 variables under study

Step 1: K-Means Clustering: to have primary classification of buyers into Brand Loyal, Brand Disloyal and Neutral. Whole analysis is based on unsupervised clustering approach, so not very reliable.

As an output we manage to generate an additional column in the data set where each of the individual respondent is assigned tag of Loyal, Disloyal and Neutral.

Cluster Tag	Category of Consumers	Count
1	Loyal Consumers	223 (52%)
2	Disloyal Consumers	114 (26%)
0	Neutral	96 (22%)
	Total	433

Findings:

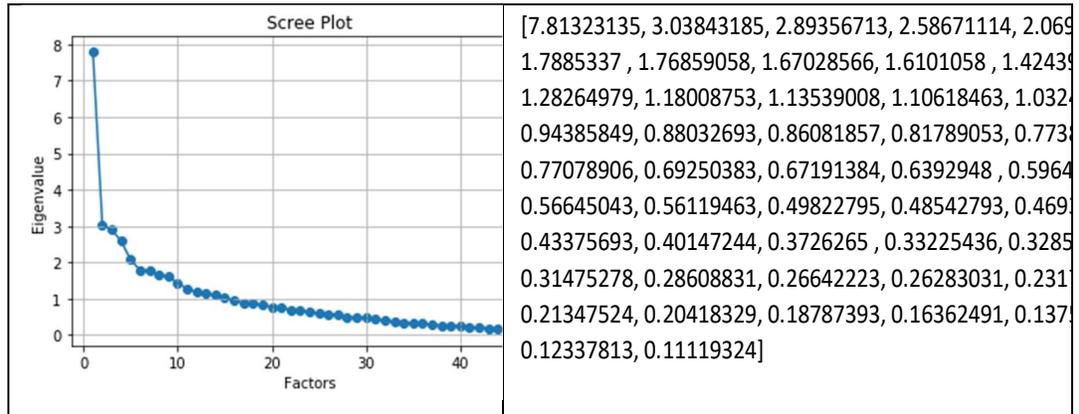
- Initial classification indicates that number of loyal consumers are about 52% whereas disloyal and neutral are 26% and 22% respectively.
- Ratio of neutral and disloyal is very close so it requires to have robust model to get prior knowledge of consumers' loyalty. Otherwise, there is a high chance of wrong classification and interpretation.
- Important thing to note here is that, above numbers are not the final one to design final business strategies. They are only indicative of rough pattern available in the data.

Step 2: Correlation Matrix: to find out relation between all pairs of variables under study. Purpose is to eliminate those variables which are identical in nature and thus reducing duplication before fitting the model. Summary of outcomes is as follows.

Findings:

- Correlation values for each pair of variables in the study indicates no significant correlation as all values are less than 0.8.
- Overall conclusion is, no variable is to be removed from the analysis before applying Exploratory Factor Analysis.

uning. Eigen values are numeric values indicating the same. There are 15 potential factors to be considered for next round.



- Out of 15 factors derived, only those factors will be considered further where at least 3 variables are having factor loading >0.35 or <-0.35. Summary of factors is given in the table.
- To fine tune the output, Varimax rotation is applied on the eligible factors. Here there are total 12 factors where Varimax rotation applied. Total 50% of variance explained by 12 factors. However further useful factors are only 8 which approximately explains 40% of variance.

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
SS Loadings	4.992	2.169	2.137	2.106	1.861	1.790	1.666	1.652	1.639	1.537	1.097	0.951
Proportion Variation	0.106	0.046	0.045	0.045	0.040	0.038	0.035	0.035	0.035	0.033	0.023	0.020
Cumulative Variation	0.106	0.152	0.198	0.243	0.282	0.320	0.356	0.401	0.426	0.459	0.482	0.502

- Factors defined based on the output are as below. This will become an input for Structural Equation Modeling.

Attitudinal Brand Loyalty =	INVO1 + PEVA1 + BRRE1 + PRWO1 + BREQ1 + BRIM1 + ACCE1 + HABI1 + FUVA1 + BRAT2 + BRAW1 + CLIF1
Family Demographics =	Family Type + Total Family Member + Head of the Family
Brand Satisfaction =	BRAF1 + CUSA1 + BRTR1 + EMVA1
Impact of Promotion =	ADVE1 + PESE1
Behavioural Brand Loyalty =	SD & Chocolate Max Run + SD & Chocolate Tried Out Brands + SD & Chocolate_Acceptable
Value System =	AVAI1 + CULT1 + FASO1
Brand Relation =	REPR1 + BRCR1 + FUVA1
Brand Commitment =	COMMI + DISC1

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	0.086	-0.071	0.326	0.004	0.074	-0.029	-0.005	-0.023	-0.041	-0.031	0.041	0.040	0.066	-0.009	-0.031
1	0.094	0.074	0.130	0.034	0.050	-0.083	0.103	0.033	0.034	-0.011	0.017	0.035	0.112	0.038	0.512
2	0.028	0.130	0.911	-0.017	-0.083	0.037	0.042	0.040	0.055	0.044	-0.025	0.060	0.042	0.082	0.165
3	0.029	-0.196	-0.705	0.064	0.094	-0.059	0.031	0.082	0.080	0.034	0.037	0.075	-0.019	0.041	-0.240
4	0.046	0.136	0.687	0.060	0.053	-0.001	0.075	0.059	0.107	0.137	-0.150	-0.014	-0.063	0.130	-0.112
5	0.254	0.618	0.027	0.064	-0.063	-0.064	-0.045	0.039	0.015	0.073	0.024	0.330	-0.020	-0.279	-0.027
6	0.091	0.703	0.122	0.061	-0.063	0.129	0.148	-0.033	0.116	0.020	0.020	0.002	0.147	0.074	0.040
7	0.133	0.128	-0.040	0.082	0.006	-0.129	0.034	0.080	0.188	0.244	0.098	0.379	-0.033	-0.060	0.140
8	0.022	0.656	0.146	0.061	-0.076	0.056	0.005	0.125	-0.019	0.032	-0.004	-0.099	-0.048	0.133	0.065
9	0.196	0.097	-0.043	0.069	0.200	-0.011	0.008	0.169	-0.041	0.088	-0.242	0.366	0.152	0.190	0.132
10	0.296	0.076	-0.021	0.084	0.231	0.212	-0.005	0.463	0.027	-0.151	0.130	0.081	0.056	-0.015	0.033
11	0.155	0.219	-0.040	0.182	-0.097	0.029	-0.174	0.556	0.067	-0.017	0.064	0.056	-0.066	-0.049	-0.195
12	0.068	-0.052	0.100	-0.039	0.621	0.144	0.032	0.099	-0.113	0.072	-0.066	0.035	0.006	0.260	0.132
13	0.365	0.273	0.139	0.089	-0.088	0.046	0.062	0.292	0.052	0.145	0.020	-0.007	0.062	-0.043	0.175
14	0.143	0.236	-0.008	0.159	-0.455	0.055	0.095	0.174	0.142	0.283	-0.020	-0.007	-0.077	0.064	0.087
15	-0.154	0.011	-0.072	0.051	0.739	0.154	-0.158	-0.075	0.005	0.105	-0.022	0.174	-0.117	0.049	0.021
16	0.136	-0.019	0.004	0.027	-0.122	-0.027	0.167	0.599	0.070	-0.108	-0.118	-0.140	0.153	0.025	0.096
17	0.741	0.086	0.073	0.063	-0.019	0.096	-0.022	0.080	0.068	0.099	0.086	0.044	0.004	0.004	0.202
18	0.627	0.098	0.089	0.165	-0.141	0.135	0.170	0.206	0.021	-0.074	0.120	0.088	0.134	-0.024	-0.081
19	0.472	0.305	0.060	0.115	-0.287	0.004	0.100	0.220	0.072	-0.081	-0.079	0.104	0.140	-0.102	-0.047
20	0.456	0.366	0.014	0.112	-0.128	0.172	0.148	0.170	0.021	0.055	-0.176	0.048	0.144	-0.101	-0.139
21	-0.007	0.016	0.006	0.044	0.070	-0.007	0.032	0.000	0.064	0.001	0.136	0.407	-0.060	0.097	-0.025
22	0.143	-0.112	0.110	-0.019	0.092	0.127	0.039	-0.154	0.154	0.035	-0.138	0.660	0.333	-0.031	-0.006
23	0.198	0.414	-0.051	0.245	-0.042	-0.054	0.102	0.081	-0.047	-0.074	0.028	0.013	0.276	0.024	0.089
24	0.300	0.253	0.087	0.255	-0.345	0.088	-0.003	0.110	0.033	0.117	0.063	0.248	0.371	0.035	0.174
25	0.414	0.293	0.092	0.426	-0.082	-0.049	0.276	-0.011	-0.058	0.039	0.075	0.027	0.171	0.111	-0.029
26	0.272	-0.031	0.068	0.391	-0.101	0.130	-0.048	-0.007	0.272	0.074	0.024	0.054	0.157	-0.088	0.114
27	-0.283	-0.068	0.035	-0.008	0.479	0.085	0.123	-0.096	-0.140	0.115	0.282	0.113	0.100	-0.036	-0.055
28	-0.067	0.054	0.090	-0.017	0.124	0.029	-0.018	-0.019	0.061	-0.048	-0.014	0.096	0.015	0.649	0.034
29	-0.047	0.120	-0.124	0.249	0.010	-0.103	0.349	0.166	-0.141	0.008	0.576	0.019	0.062	-0.041	-0.061
30	0.379	0.071	0.057	0.193	0.011	-0.073	-0.097	-0.065	-0.078	0.251	0.213	0.019	0.067	0.356	-0.003
31	0.088	0.112	-0.022	0.613	0.089	-0.093	0.045	0.111	0.011	0.015	0.293	0.002	-0.102	0.094	-0.062
32	0.059	0.072	-0.080	0.586	-0.031	0.181	0.152	0.091	-0.044	0.034	0.273	0.159	0.074	0.019	-0.153
33	0.245	-0.029	-0.049	0.136	0.014	0.018	-0.080	-0.073	0.029	-0.033	0.679	0.086	0.038	0.020	0.080
34	0.211	0.192	0.114	0.063	-0.001	0.033	0.083	0.112	0.002	0.204	0.077	0.066	0.679	0.043	0.146
35	-0.010	0.200	-0.020	0.339	-0.029	-0.066	0.383	-0.139	0.040	0.215	0.139	-0.044	-0.021	-0.254	0.159
36	0.516	0.041	0.023	0.241	-0.047	-0.159	0.433	0.134	-0.069	-0.075	0.184	0.090	0.196	-0.015	0.060
37	0.213	0.129	0.036	0.507	-0.075	0.072	0.072	0.106	0.099	-0.023	-0.154	0.010	0.094	-0.070	0.147
38	0.043	0.031	0.052	0.018	-0.020	-0.114	0.581	-0.084	0.114	0.173	-0.006	-0.017	0.033	-0.040	0.039
39	0.337	0.007	-0.038	0.310	-0.012	-0.082	0.271	0.291	0.021	0.234	-0.090	0.062	-0.095	0.003	0.208
40	-0.055	0.053	-0.004	0.023	0.006	0.041	0.230	0.010	0.087	0.680	-0.052	0.202	0.119	-0.025	0.085
41	0.253	0.169	0.034	0.195	-0.086	0.094	0.662	0.290	0.070	0.032	0.019	0.184	0.031	0.075	0.097
42	0.285	-0.032	0.119	0.016	0.184	-0.040	0.050	-0.291	0.007	0.764	0.014	-0.071	0.095	-0.010	-0.180
43	0.065	0.068	0.015	0.140	0.110	0.873	0.013	0.085	0.019	0.013	-0.029	-0.078	0.041	0.094	-0.097
44	-0.079	0.010	0.049	0.045	-0.122	-0.781	0.142	0.000	0.099	0.021	0.006	-0.074	0.001	0.054	0.009
45	-0.032	0.029	-0.010	-0.018	-0.144	-0.335	0.045	0.094	0.818	-0.026	-0.016	0.058	0.066	-0.102	0.033
46	-0.098	-0.080	0.004	-0.108	0.079	-0.135	-0.133	-0.060	-0.783	-0.104	0.039	-0.063	0.063	-0.154	-0.010

	0	1	2	3	4	5	6	7	8	9	10	11	
0	Age Group	0.044	0.312	-0.071	-0.005	-0.011	0.047	0.010	-0.002	-0.053	0.056	0.009	0.005
1	Gender	0.145	0.186	0.082	-0.060	-0.126	0.044	-0.045	0.189	0.008	0.127	0.060	0.127
2	Family Type	0.088	0.941	0.116	-0.024	-0.059	-0.047	0.007	0.049	0.065	-0.070	-0.052	0.067
3	Total Family Member	0.024	-0.726	-0.198	0.115	0.099	0.029	-0.027	0.085	0.031	-0.004	0.004	0.004
4	Head of the Family	0.086	0.641	0.109	0.025	0.020	0.067	0.140	0.014	0.132	-0.050	-0.181	0.079
5	BRAF1	0.293	0.029	0.583	0.092	-0.086	-0.024	0.102	-0.099	0.020	0.260	0.022	-0.338
6	CUSA1	0.144	0.124	0.721	0.031	0.041	0.002	0.028	0.177	0.106	0.030	0.053	0.087
7	SWCO1	0.193	-0.020	0.113	0.159	-0.185	0.091	0.184	0.017	-0.161	0.302	-0.029	-0.112
8	BTR1	0.146	0.166	0.639	0.092	0.029	-0.006	-0.015	-0.033	0.007	-0.154	-0.115	0.081
9	REPR1	0.299	-0.035	0.087	-0.036	-0.039	0.226	0.044	-0.027	-0.047	0.411	-0.207	0.225
10	INVO1	0.479	-0.026	0.042	0.112	0.173	0.332	-0.250	-0.078	0.028	0.037	0.084	-0.024
11	PEVA1	0.404	-0.067	0.168	0.252	0.010	0.033	-0.163	-0.282	0.109	-0.061	-0.133	-0.141
12	AVAI1	0.057	0.110	-0.056	-0.055	0.129	0.633	0.067	0.035	-0.119	0.058	-0.039	0.291
13	BRRE1	0.523	0.157	0.238	0.094	-0.013	0.018	0.061	0.027	0.061	0.125	0.015	-0.066
14	BRPE1	0.320	0.014	0.205	0.157	0.002	-0.323	0.168	0.047	0.185	-0.064	-0.190	-0.012
15	CULT1	-0.249	-0.066	0.010	0.060	0.158	0.676	0.138	-0.122	-0.001	0.180	-0.015	0.054
16	PRWO1	0.466	0.000	-0.040	-0.015	-0.050	-0.024	-0.315	0.111	0.080	-0.123	-0.210	0.056
17	BREQ1	0.662	0.097	0.051	-0.036	0.054	0.014	0.211	-0.067	0.050	0.044	0.255	0.035
18	BRIM1	0.688	0.069	0.056	0.124	0.128	-0.094	0.111	0.075	0.016	0.060	0.177	-0.035
19	ACCE1	0.595	0.049	0.261	0.017	0.001	-0.257	-0.064	0.002	0.064	0.089	0.003	-0.087
20	HAB1	0.554	-0.006	0.315	-0.012	0.188	-0.127	0.085	0.054	0.012	0.057	-0.084	-0.081
21	BRRP1	-0.007	0.004	0.014	0.163	-0.044	0.136	-0.005	-0.030	0.081	0.302	0.044	0.007
22	BRCR1	0.093	0.091	-0.080	-0.125	0.133	0.033	0.082	0.066	0.106	0.742	0.054	0.019
23	EMVA1	0.310	-0.041	0.407	0.150	-0.029	-0.101	-0.075	0.136	-0.073	0.109	0.069	0.119
24	FUVA1	0.453	0.102	0.266	0.147	0.072	-0.339	0.061	0.057	0.014	0.354	0.083	0.104
25	BRAT2	0.455	0.089	0.260	0.333	-0.010	-0.141	0.132	0.226	-0.060	0.064	0.102	0.158
26	CENT1	0.305	0.073	-0.024	0.199	0.148	-0.172	0.114	0.013	0.243	0.167	0.112	0.015
27	FASO1	-0.323	0.023	-0.043	0.162	0.098	0.442	0.069	0.210	-0.157	0.148	0.153	-0.047
28	COMM1	-0.079	0.102	0.071	0.031	0.013	0.167	-0.031	-0.062	0.076	0.061	-0.036	0.546
29	SIFA1	0.095	-0.129	0.113	0.506	-0.116	0.075	-0.097	0.336	-0.120	-0.058	0.263	-0.099
30	DISC1	0.278	0.061	0.072	0.212	-0.076	0.006	0.367	-0.113	-0.072	0.016	0.242	0.354
31	ADVE1	0.166	-0.021	0.080	0.678	-0.070	0.070	0.035	-0.010	0.051	-0.052	0.092	0.079
32	PESE1	0.182	-0.094	0.050	0.662	0.212	-0.055	0.015	0.102	-0.020	0.145	0.066	0.006
33	COPF1	0.129	-0.032	-0.014	0.325	-0.018	0.045	0.032	-0.031	0.006	0.055	0.602	-0.015
34	GIPC1	0.342	0.117	0.216	-0.019	0.056	-0.069	0.108	0.232	-0.057	0.298	0.136	0.166
35	PRPL1	0.049	0.002	0.180	0.313	-0.058	-0.078	0.200	0.439	0.044	-0.006	0.020	-0.198
36	BRAW1	0.589	0.019	0.009	0.209	-0.154	-0.050	-0.034	0.375	-0.087	0.093	0.233	0.039
37	CLIF1	0.356	0.046	0.112	0.255	0.094	-0.138	-0.009	0.078	0.098	0.091	-0.093	0.048
38	REPU1	0.086	0.045	0.020	0.021	-0.108	-0.017	0.149	0.584	0.115	-0.023	-0.058	-0.037
39	REPU3	0.523	-0.015	-0.044	0.231	-0.124	0.066	0.155	0.193	0.059	0.015	-0.206	0.007
40	BRMS1	0.529	0.005	0.061	0.050	0.009	0.057	0.499	0.297	0.100	0.242	-0.219	-0.051
41	CLAR1	0.508	0.041	0.121	0.235	0.039	0.034	-0.079	0.508	0.099	0.093	-0.148	0.027
42	REPU2	0.073	0.086	-0.024	-0.028	0.017	0.094	0.846	0.139	-0.006	0.024	0.075	-0.002
43	SD & Chocolate Max Run	0.139	0.009	0.059	0.099	0.897	0.124	-0.003	-0.022	0.026	-0.051	-0.058	0.085
44	SD & Chocolate Tried Out	-0.063	0.041	0.011	0.062	-0.740	-0.150	0.004	0.161	0.109	-0.087	-0.036	0.069
45	SD & Chocolate Accepted	0.045	-0.017	0.029	-0.069	-0.322	-0.150	-0.093	0.080	0.781	0.099	0.017	-0.076
46	cluster	-0.159	0.005	-0.063	-0.060	-0.125	0.034	-0.078	-0.087	-0.048	0.052	-0.120	

Step 4: Structural Equation Modeling (SEM): is used to fit the model which depicts the relationship between measured variable and latent variables. Output of this process will become input for Support Vector Machine which will help further to have classification of consumers into loyal, disloyal, and neutral in terms of brand loyalty of FMCG products.

- Initially proposed model:

```
# measurement model

AttitudinalBrandLoyalty =~ INVO1 + PEVA1 + BRRE1 + PRWO1 + BREQ1 + BRIM1 +
ACCE1 + HABI1 + FUVA1 + BRAT2 + BRAW1 + CLIF1

FamilyDemographics =~ FamilyType + TotalFamilyMember + HeadoftheFamily

BrandSatisfaction =~ BRAF1 + CUSA1 + BRTR1 + EMVA1

ImpactofPromotion =~ ADVE1 + PESE1

BehaviouralBrandLoyalty =~ SDChoMaxRun + SDChoTriedOutBrands +
SDCho_Acceptable

ValueSystem =~ AVAI1 + CULT1 + FASO1

BrandRelation =~ REPR1 + BRRC1 + FUVA1

BrandCommitment =~ COMM1 + DISC1

# regressions

BrandLoyalty ~ AttitudinalBrandLoyalty + FamilyDemographics +
BrandSatisfaction + ImpactofPromotion + BehaviouralBrandLoyalty +
ValueSystem + BrandRelation + BrandCommitment
```

- Initial reliability indicators:

	DoF	DoF Baseline	chi2	chi2 p- value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	428	496	2184.89	0	5589.42	0.655	0.609	0.547	0.609	0.600	0.097	189.908	596.982	5.046

Over all indicators are close to 0.8 and shows good model fit, however still there is a scope for improvement.

- Initial model is as below: (Available on next page)

Attributes which are Statistically insignificant are removed from the further model building process.

- New model proposed based on the initial model's output:

```
# measurement model

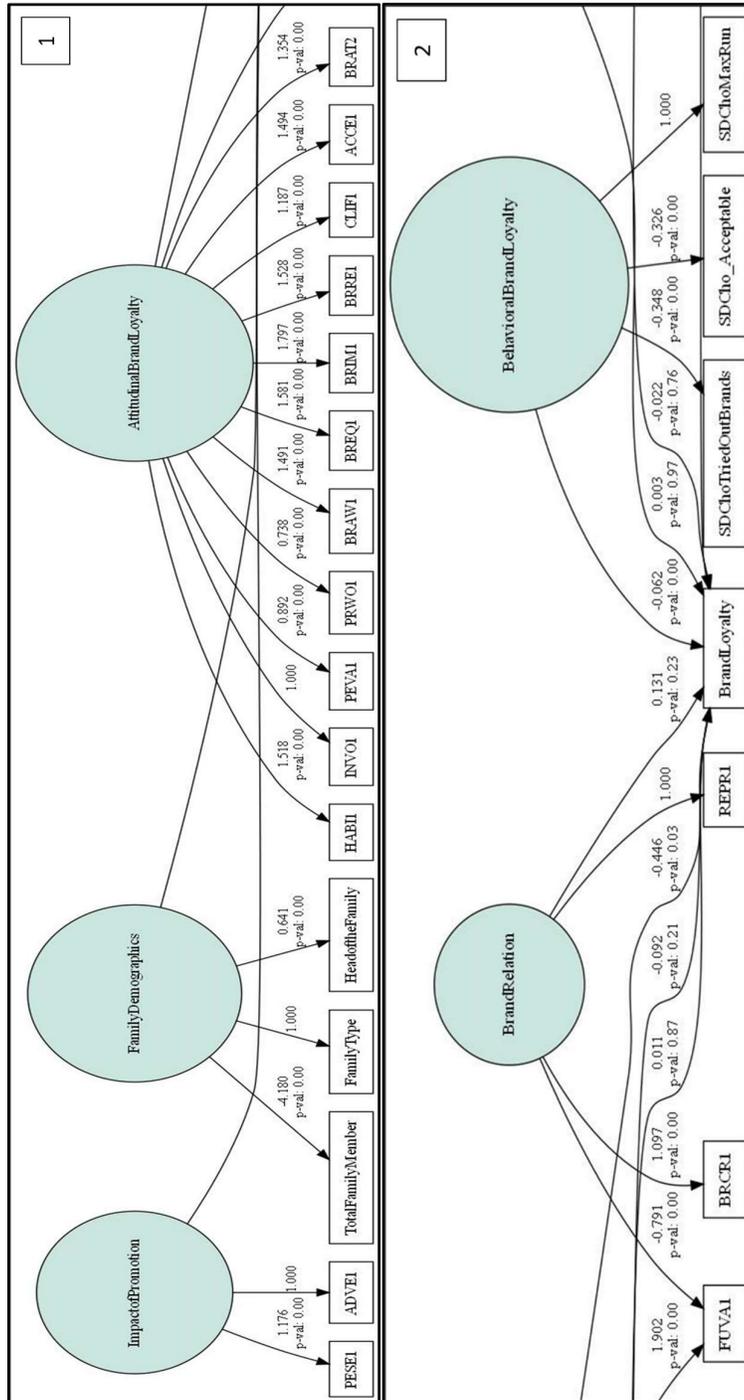
AttitudinalBrandLoyalty =~ INVO1 + PEVA1 + BRRE1 + PRWO1 + BREQ1 + BRIM1 +
ACCE1 + HABI1 + FUVA1 + BRAT2 + BRAW1 + CLIF1

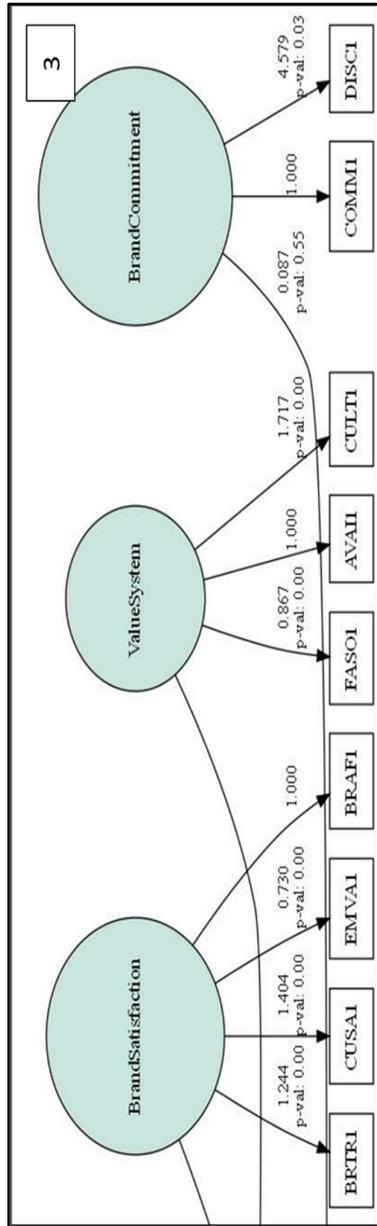
BehaviouralBrandLoyalty =~ SDChoMaxRun + SDChoTriedOutBrands +
SDCho_Acceptable

# regressions

BrandLoyalty ~ AttitudinalBrandLoyalty + BehaviouralBrandLoyalty
```

Figure 5.12 Initial model Urban – TT – Soft Drink & Chocolate





	lval	op	rval	Estimate	Std. Err	z-value	p-value
0	INVO1	~	AttitudinalBrandLoyalty	1.000	-	-	-
1	PEVA1	~	AttitudinalBrandLoyalty	0.871	0.153	5.691	0.000
2	BRRE1	~	AttitudinalBrandLoyalty	1.438	0.206	6.975	0.000
3	PRWO1	~	AttitudinalBrandLoyalty	0.766	0.143	5.378	0.000
4	BREQ1	~	AttitudinalBrandLoyalty	1.524	0.213	7.166	0.000
5	BRIM1	~	AttitudinalBrandLoyalty	1.766	0.233	7.565	0.000
6	ACCE1	~	AttitudinalBrandLoyalty	1.413	0.193	7.336	0.000
7	HABI1	~	AttitudinalBrandLoyalty	1.441	0.199	7.239	0.000
8	FUVA1	~	AttitudinalBrandLoyalty	1.227	0.174	7.049	0.000
9	BRAT2	~	AttitudinalBrandLoyalty	1.192	0.171	6.964	0.000
10	BRAW1	~	AttitudinalBrandLoyalty	1.406	0.196	7.158	0.000
11	CLIF1	~	AttitudinalBrandLoyalty	1.105	0.178	6.204	0.000
12	SDChoMaxRun	~	BehavioralBrandLoyalty	1.000	-	-	-
13	SDChoTriedOutBrands	~	BehavioralBrandLoyalty	-0.348	0.044	-7.909	0.000
14	SDCho_Acceptable	~	BehavioralBrandLoyalty	-0.326	0.058	-5.589	0.000
15	BrandLoyalty	~	AttitudinalBrandLoyalty	-0.307	0.086	-3.592	0.000
16	BrandLoyalty	~	BehavioralBrandLoyalty	-0.062	0.019	-3.326	0.001
17	AttitudinalBrandLoyalty	~~	AttitudinalBrandLoyalty	0.211	0.054	3.910	0.000
18	AttitudinalBrandLoyalty	~~	BehavioralBrandLoyalty	0.161	0.050	3.201	0.001
19	BehavioralBrandLoyalty	~~	BehavioralBrandLoyalty	3.702	0.496	7.456	0.000
20	BRRE1	~~	BRRE1	0.851	0.063	13.550	0.000
21	HABI1	~~	HABI1	0.611	0.047	13.082	0.000
22	SDChoMaxRun	~~	SDChoMaxRun	0.000	0.428	0.000	1.000
23	BrandLoyalty	~~	BrandLoyalty	0.443	0.030	14.591	0.000
24	BREQ1	~~	BREQ1	0.755	0.057	13.239	0.000
25	PEVA1	~~	PEVA1	0.931	0.065	14.325	0.000
26	SDChoTriedOutBrands	~~	SDChoTriedOutBrands	0.508	0.062	8.157	0.000
27	SDCho_Acceptable	~~	SDCho_Acceptable	3.184	0.221	14.398	0.000
28	ACCE1	~~	ACCE1	0.507	0.040	12.823	0.000
29	PRWO1	~~	PRWO1	0.893	0.062	14.400	0.000
30	BRIM1	~~	BRIM1	0.513	0.044	11.789	0.000
31	BRAW1	~~	BRAW1	0.650	0.049	13.255	0.000
32	CLIF1	~~	CLIF1	1.027	0.073	14.146	0.000
33	FUVA1	~~	FUVA1	0.568	0.042	13.444	0.000
34	INVO1	~~	INVO1	1.194	0.083	14.314	0.000
35	BRAT2	~~	BRAT2	0.592	0.044	13.564	0.000

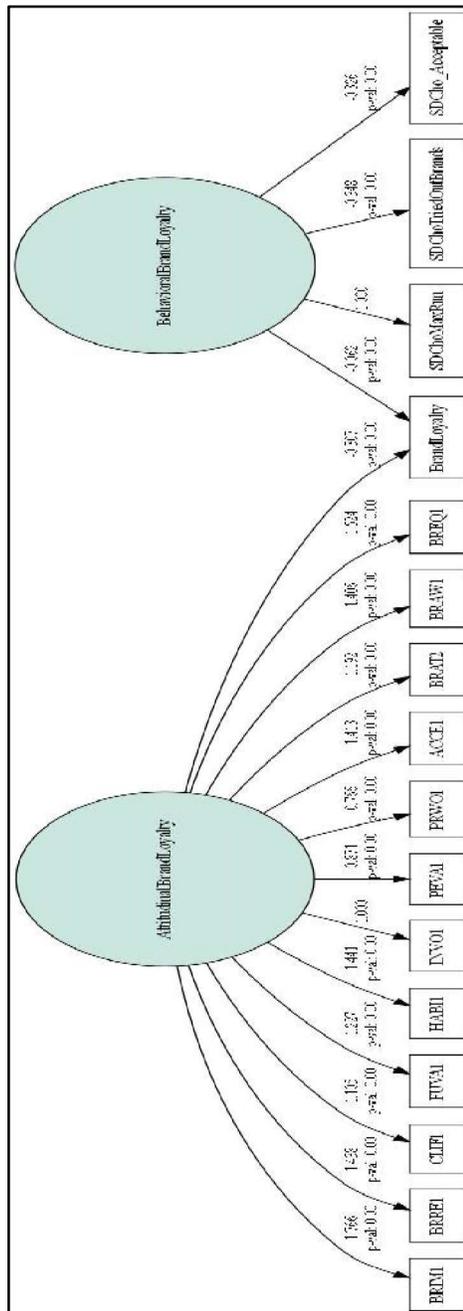
- Revised reliability indicators:

	DoF	DoF Baseline	chi2	chi2 p-value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	102	120	869.656	0	2496.39	0.677	0.652	0.590	0.652	0.620	0.099	63.983	202.388	2.008

Findings: All reliability indicators are showing improvement compared to first round of fit. P value is zero and CFI, GFI, NFI are above 65%. Also, RMSEA is within tolerance limit of 0.10 Overall model is good and can be accepted for further decision-making process

- Revised model is as below:

Figure 5.13 Final model Urban – TT – Soft Drink & Chocolate



Step 5: Support Vector Machine (SVM): After getting most impacting features from the final model of SEM. Now it is time to train the model to classify FMCG users into three categories called, Loyal, Disloyal and Neutral based on both Behavioural and Attitudinal factors.

SVM will be run on both Behavioural and Attitudinal factors separately. Output will be in the form of 3*3 matrix, 3 levels from Behavioural and 3 levels from Attitudinal. This will help further to Retailers and Manufacturers to decide about their strategy.

SVM – Attitudinal:

- Variables considered for building model are based on the outcome of SEM which are as below.

INVO1 - Involvement

PEVA1 - Perceived Value

BRRE1 - Brand Relevance

PRWO1 - Price Worthiness

BREQ1 - Brand Equity

BRIM1 - Brand Image

ACCE1 - Accessibility

HABI1 - Habit

FUVA1 - Functional Value

BRAT2 - Brand Attitude

BRAW1 - Brand Awareness

CLIF1 - Celebrity Influence

Cluster

```
classifier = SVC(kernel = 'rbf', random_state = 2, gamma=1, C=4, break_ties = True)
```

```
SVC(C=4, break_ties=True, cache_size=200, class_weight=None, coef0=0.0,
```

```
decision_function_shape='ovr', degree=3, gamma=1, kernel='rbf', max_iter=-1,
```

```
probability=False, random_state=2, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.6091954022988506

```
array([[ 7, 10,  0],
       [ 4, 44,  4],
       [ 0, 16,  2]])
```

Accuracy is average for attitudinal variables. However, in rural area this is quite normal as required brands are not always available.

SVM – Behavioural:

- Variables considered for building model are based on the outcome of SEM which are as below.

SDChoMaxRun - Measure of how many times buyer buys same brand consecutively.

SDChoTriedOutBrands - It counts how many different brands that buyer has tried out in last 8 periods.

SDCho_Acceptable - Buyer may prefer more than one brand of same category. Count of acceptable brands of given individual directly affects his/her loyalty towards product.

```
classifier = SVC(kernel = 'rbf', random_state = 2, gamma=0.5, C=2, break_ties = True)
```

```
SVC(C=2, break_ties=True, cache_size=200, class_weight=None, coef0=0.0, decision_function_shape='ovr', degree=3, gamma=0.5, kernel='rbf', max_iter=-1, probability=False, random_state=2, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.9885057471264368

```
array([[18,  0,  0],
       [ 0, 48,  0],
       [ 1,  0, 20]])
```

SVM – Attitudinal and Behavioural

Decision matrix obtained based on above two results is as below.

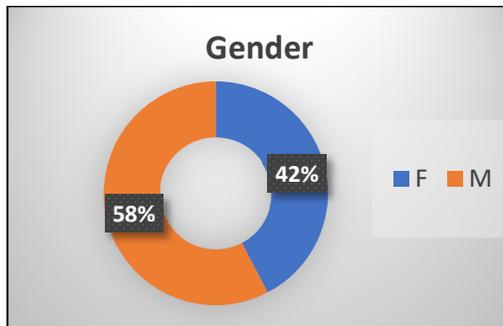
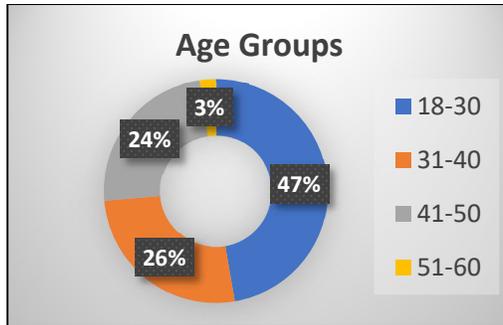
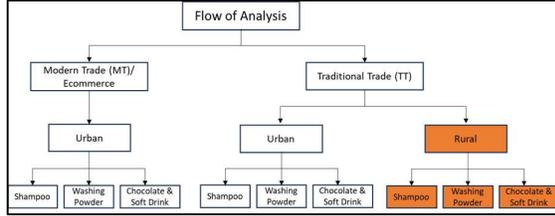
Table 5.18 Urban – TT – SD & Chocolate - SVM Classification of Buyers as per Behavioural and Attitudinal Variables

		Behavioral		
		Loyal	Neutral	Disloyal
Attitudinal	Loyal	Strongly Loyal	Potential Loyal	Spurious Disloyalty
		189	73	55
	Neutral	Potential Disloyal	Not predictable	Weakly Disloyal
		16	37	10
	Disloyal	Spurious Loyalty	Weakly Disloyal	Strongly Disloyal
		18	3	32

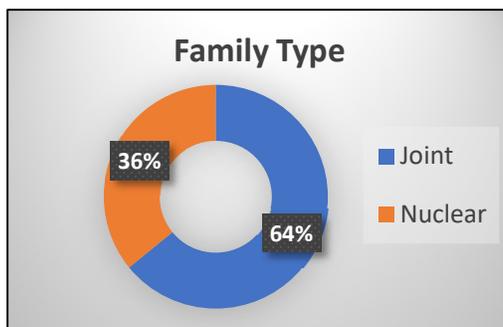
Analysis and Interpretation:

Manufacturer and retailers will take decisions based on changes accruing in above matrix. Matrix guidelines are given in theoretical description.

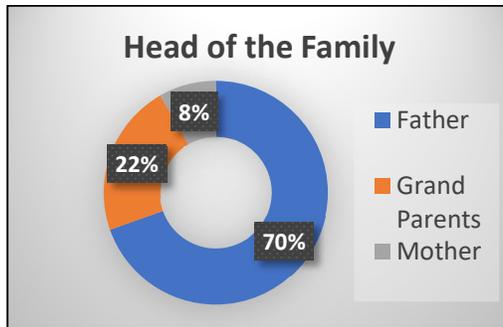
5.4 TRADITIONAL TRADE - RURAL:



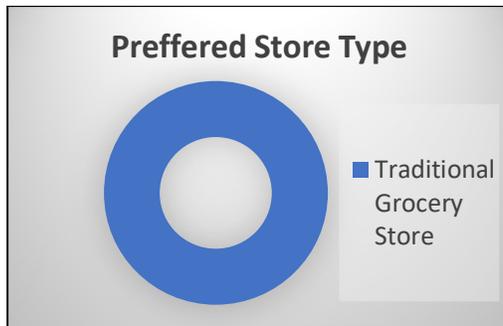
Significant difference between Male and Female proportion.



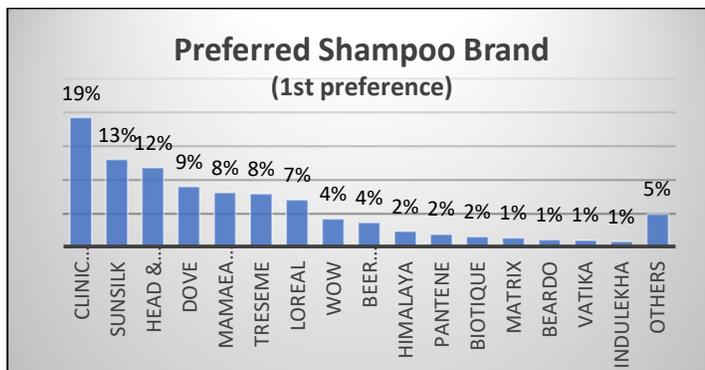
In rural family type is opposite to urban areas. Here Joint families are dominating.



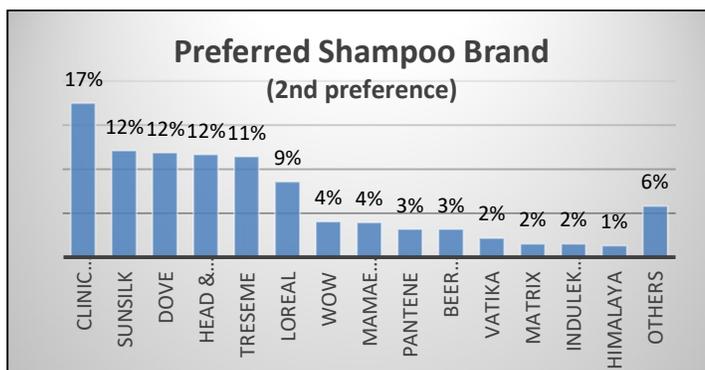
In Rural area, most families are having Father as head of the family who is making decisions.

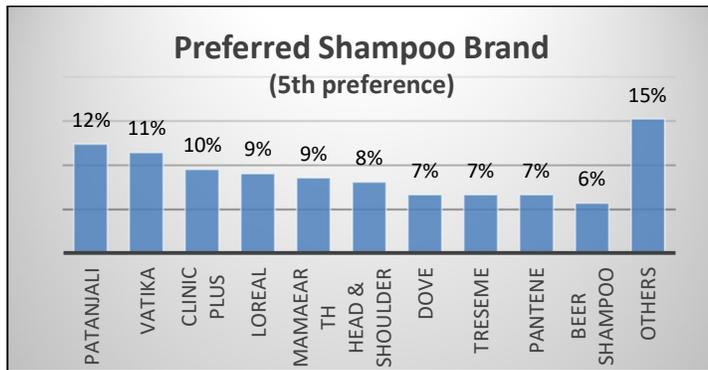
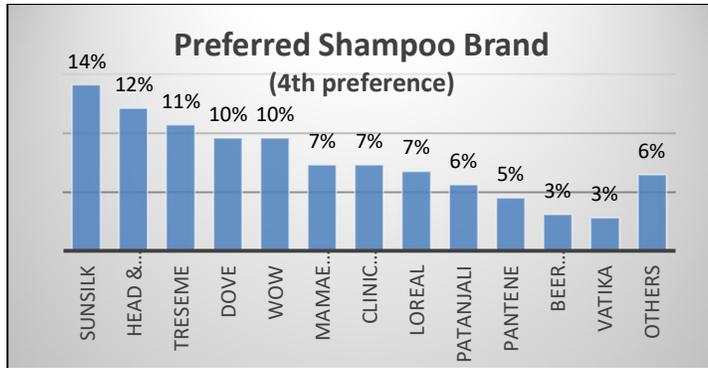
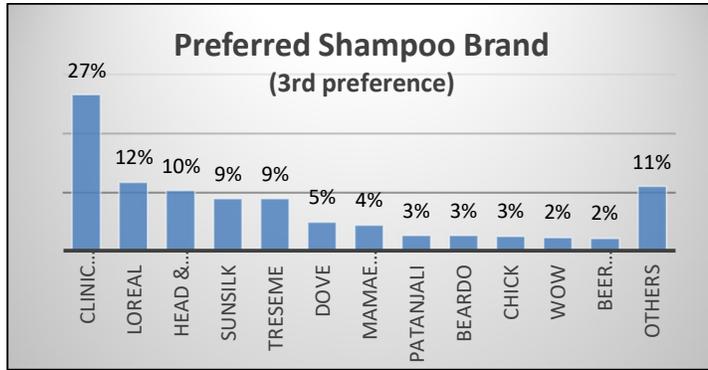


Shampoo - Preferred Brands:

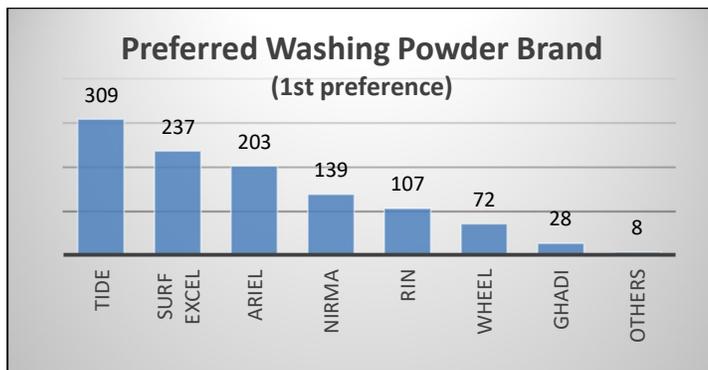


Clinic Plus, Sunsilk are the popular brands which are different from Urban areas.

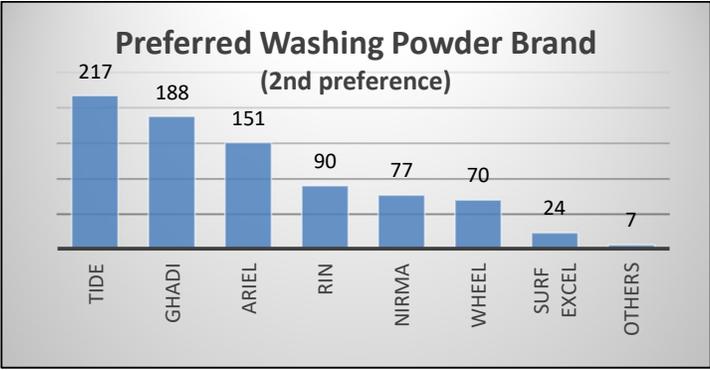




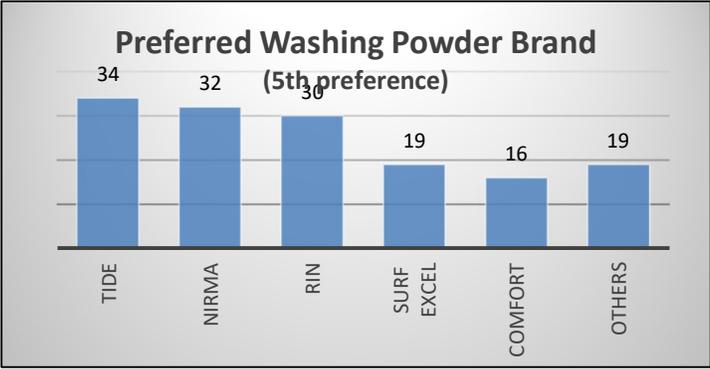
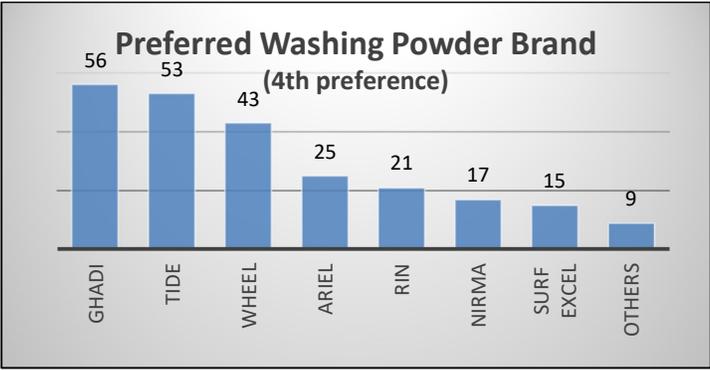
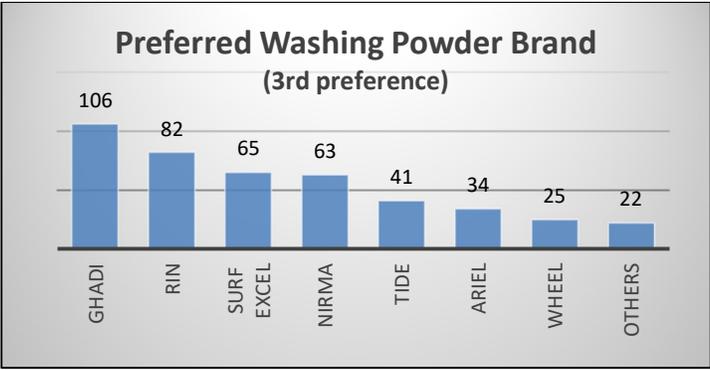
Washing Powder - Preferred Brands:



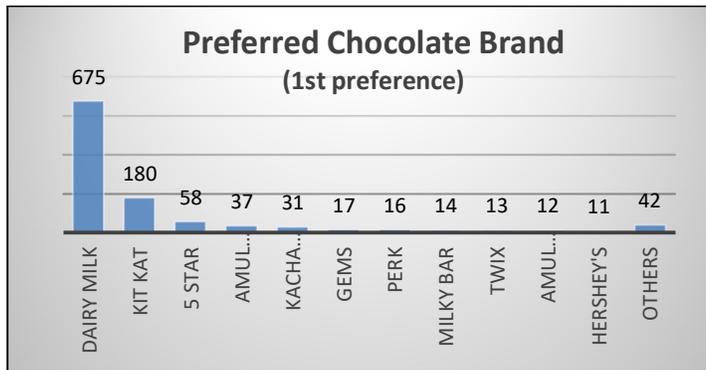
Tide is most preferred washing powder.



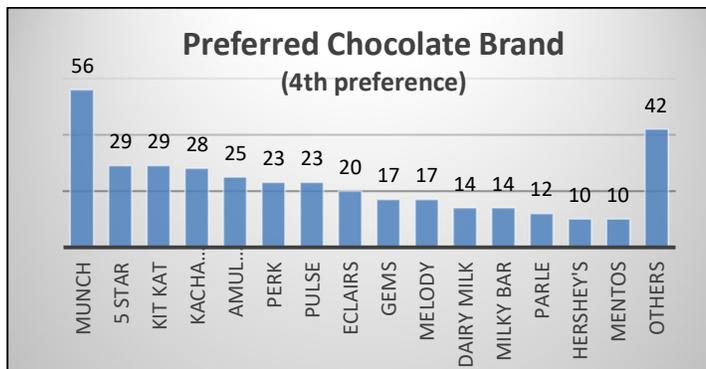
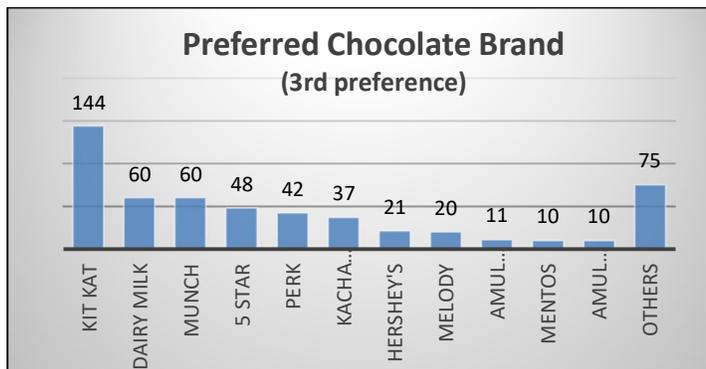
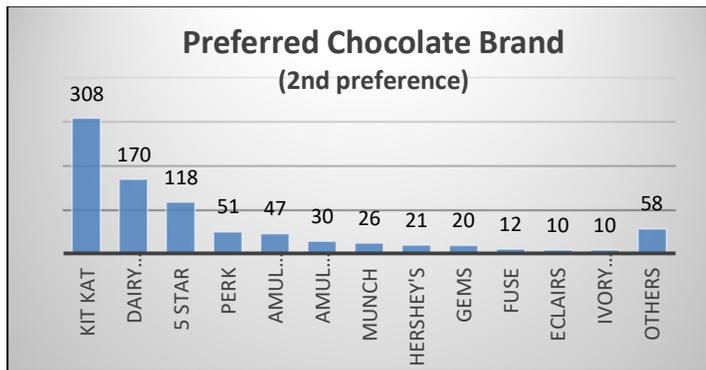
In many places Ghadi detergent is also very popular.

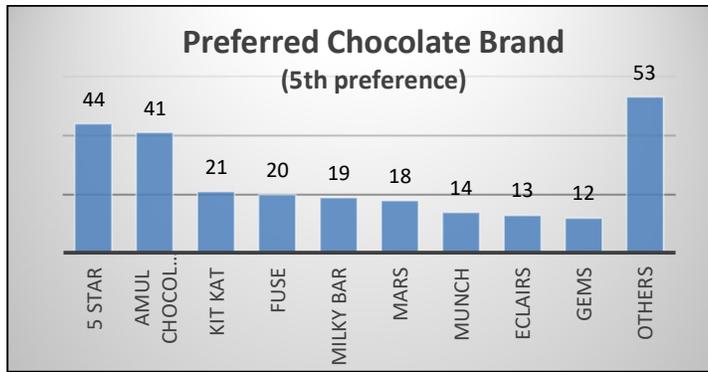


Chocolate - Preferred Brands:

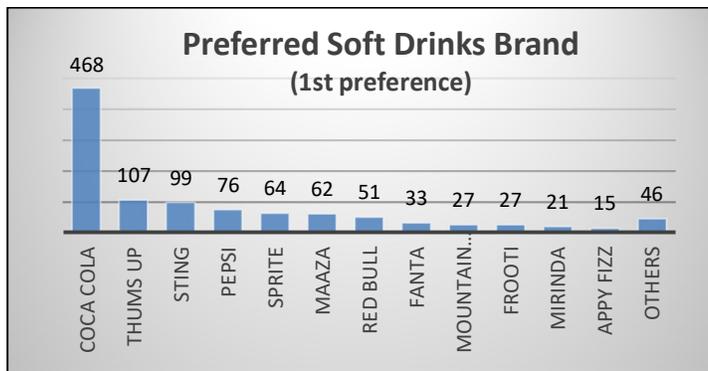


Dairy Milk and Kit Kat are still popular in Rural area also.

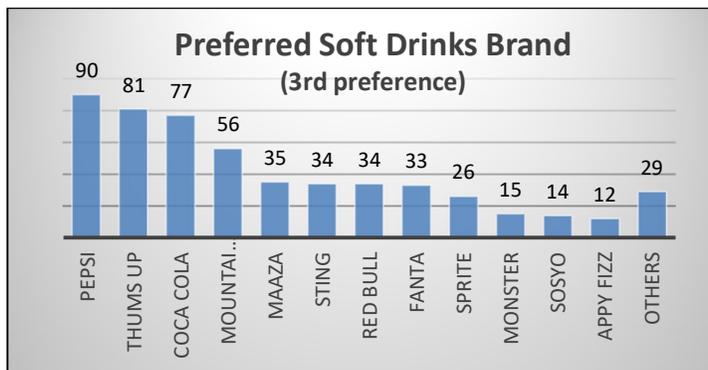
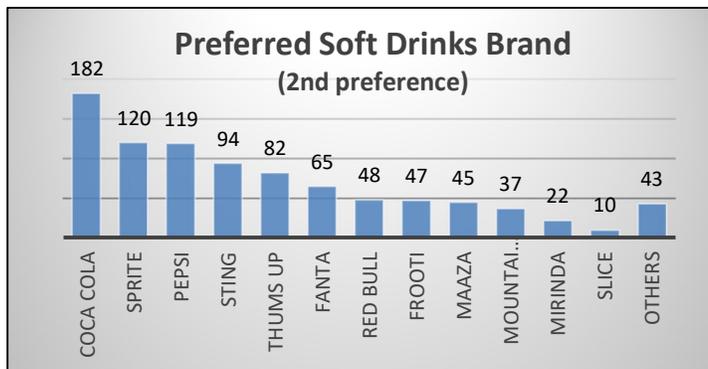


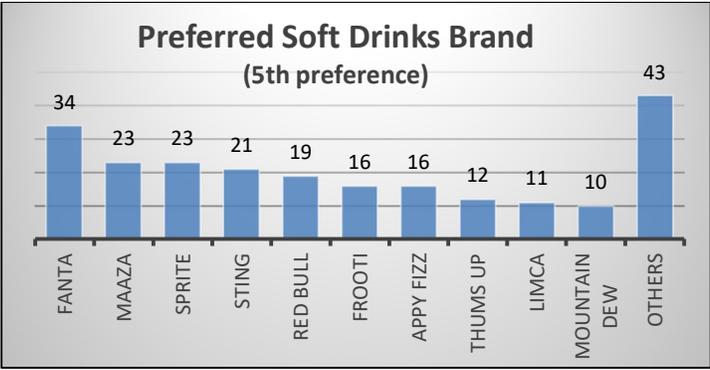
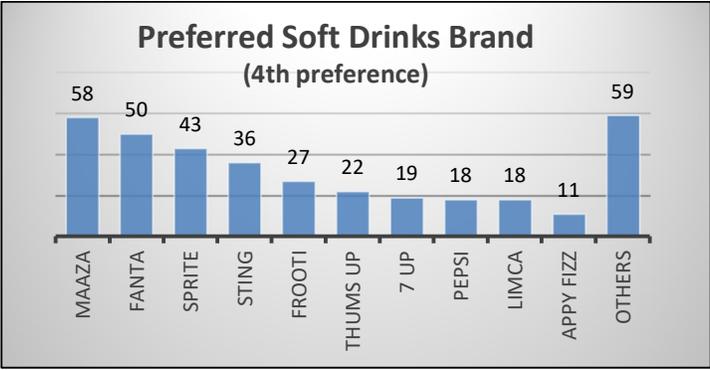


Soft Drink- Preferred Brands:



Same trend can be observed in Rural areas as we have seen in Urban areas.



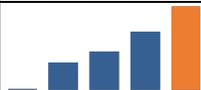


Below is the 'Column Sparkline' and 'Descriptive Statistics' summary of all 27 variables, where Rural – TT buyers have provided their inputs on various categories.

5.4.1 RURAL – TT - SHAMPOO: Summary of 27 variables under study

Table 5.19 Rural – TT - Shampoo– Column Sparkline

Sr. No.	Attribute	Question	Category	Traditional Trade				
				1	2	3	4	5
1	Brand Affect	After using my preferred brands, I get positive feeling.	Shampoo Brands					
2	Customer satisfaction	I am very satisfied with brands which I use so I repeat purchase.	Shampoo Brands					
3	Switching Cost	I do not switch to other brands as they are costly.	Shampoo Brands					
4	Brand Trust	I buy only those brands on which I have faith.	Shampoo Brands					
5	Relationship Proneness	I have developed emotional relationship with the brands I purchase.	Shampoo Brands					
6	Perceived Value	The return I am getting on money spent on FMCG decides my product loyalty.	Shampoo Brands					
7	Availability	I never buy other brands if my favorite brands are not available.	Shampoo Brands					
8	Culture	I keep religious beliefs in center while selecting my brands.	Shampoo Brands					
9	Price Worthiness	My brands are economical.	Shampoo Brands					
10	Accessibility	Without any recall efforts, I can remember my brands quickly.	Shampoo Brands					
11	Habit	Buying preferred brand is now my habit.	Shampoo Brands					
12	Brand Credibility	I prefer to buy brands which are more than 50 years old with good track record.	Shampoo Brands					
13	Emotional Value	I feel good when I use my favorite brands.	Shampoo Brands					
14	Functional Value	I like packaging and other features of my favorite brands.	Shampoo Brands					
15	Brand Attitude	In my next purchase I would like to buy these brands.	Shampoo Brands					
16	Family Influence/Social Value	My purchase decision always based on choice of family members.	Shampoo Brands					
17	Commitment	If my favorite brand is not available in store, I don't purchase another brand.	Shampoo Brands					

18	Situational Factors	During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Shampoo Brands	
19	Discounts	I never use to switch to other brand only because they offer discounts.	Shampoo Brands	
20	Advertising	Advertising of FMCG products help me to take buying decision.	Shampoo Brands	
21	Comparing Product Features	I must compare product features of various brands before buying the final one.	Shampoo Brands	
22	Brand Awareness	I recognize my favorite brands even by color of its packet.	Shampoo Brands	
23	Celebrity Influence	My purchase decision never changes based on the celebrity endorsement.	Shampoo Brands	
24	Repeat Purchase	I like to try different FMCG brands every time.	Shampoo Brands	
25	Repeat Purchase	My buying behavior towards favorite brands is never deviating in normal conditions.	Shampoo Brands	
26	Clarity	I have complete clarity about my brands, so I do not prefer other brands.	Shampoo Brands	
27	Repeat Purchase	I usually get board after buying same brand for some time.	Shampoo Brands	

5.20 Rural – TT - Shampoo – Descriptive Statistics

Questions	Que. Type	Que. Code	count	mean	std	min	25% (Q1)	50% (Q2)	75% (Q3)	max
After using my preferred brands, I get positive feeling.	Brand Affect	BRAF1	1106	4.1	1.1	1	4	4	5	5
I am very satisfied with brands which I use so I repeat purchase.	Customer satisfaction	CUSA1	1106	4.2	0.9	1	4	4	5	5
I do not switch to other brands as they are costly.	Switching Cost	SWCO1	1106	3.6	1.3	1	3	4	5	5
I buy only those brands on which I have faith.	Brand Trust	BRTR1	1106	3.8	1.1	1	3	4	5	5
I have developed emotional relationship with the brands I purchase.	Relationship Proneness	REPR1	1106	3.0	1.3	1	2	3	4	5
The return I am getting on money spent on FMCG decides my product loyalty.	Perceived Value	PEVA1	1106	3.6	1.2	1	3	4	4	5
I never buy other brands if my favorite brands are not available.	Availability	AVAI1	1106	2.6	1.2	1	2	2	3	5
I keep religious beliefs in center while selecting my brands.	Culture	CULT1	1106	2.8	1.4	1	2	2	4	5
My brands are economical.	Price Worthiness	PRWO1	1106	3.7	1.1	1	3	4	4	5
Without any recall efforts, I can remember my brands quickly.	Accessibility	ACCE1	1106	4.0	1.2	1	4	4	5	5
Buying preferred brand is now my habit.	Habit	HABI1	1106	3.1	1.4	1	2	3	4	5
I prefer to buy brands which are more than 50 years old with good track record.	Brand Credibility	BRCR1	1106	3.0	1.3	1	2	3	4	5
I feel good when I use my favorite brands.	Emotional Value	EMVA1	1106	3.4	1.4	1	2	4	5	5
I like packaging and other features of my favorite brands.	Functional Value	FUVA1	1106	4.0	1.1	1	4	4	5	5
In my next purchase I would like to buy these brands.	Brand Attitude	BRAT2	1106	3.9	1.1	1	3	4	5	5
My purchase decision always based on choice of family members.	Family Influence/Social Value	FASO1	1106	3.2	1.4	1	2	4	4	5
If my favorite brand is not available in store, I don't purchase another brand.	Commitment	COMM1	1106	2.6	1.2	1	2	2	3	5
During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Situational Factors	SIFA1	1106	3.6	1.4	1	2	4	5	5
I never use to switch to other brand only because they offer discounts.	Discounts	DISC1	1106	2.8	1.4	1	2	3	4	5
Advertising of FMCG products help me to take buying decision.	Advertising	ADVE1	1106	3.8	1.2	1	3	4	5	5
I must compare product features of various brands before buying the final one.	Comparing Product Features	COPF1	1106	2.9	1.4	1	2	3	4	5
I recognize my favorite brands even by color of its packet.	Brand Awareness	BRAW1	1106	3.7	1.2	1	3	4	5	5
My purchase decision never changes based on the celebrity endorsement.	Celebrity Influence	CLIF1	1106	3.8	2.4	1	3	4	5	44
I like to try different FMCG brands every time.	Repeat Purchase	REPU1	1106	3.5	1.2	1	3	4	4	5
My buying behavior towards favorite brands is never deviating in normal conditions.	Repeat Purchase	REPU3	1106	3.6	1.1	1	3	4	4	5
I have complete clarity about my brands, so I do not prefer other brands.	Clarity	CLAR1	1106	3.2	1.3	1	2	3	4	5
I usually get board after buying same brand for some time.	Repeat Purchase	REPU2	1106	3.1	1.4	1	2	3	4	5

Below is the Model designing process including all 27 variables, where Rural – TT buyers have provided their inputs on various categories. Process will help to make final decisions to both Retailers and Manufacturers of FMCG products. They will make this decision by classifying buyers into Loyal, Disloyal and Neutral.

Rural – TT - Shampoo: Summary of 27 variables under study

Step 1: K-Means Clustering: to have primary classification of buyers into Brand Loyal, Brand Disloyal and Neutral. Whole analysis is based on unsupervised clustering approach, so not very reliable.

As an output we manage to generate an additional column in the data set where each of the individual respondent is assigned tag of Loyal, Disloyal and Neutral.

Cluster Tag	Category of Consumers	Count
2	Loyal Consumers	458 (41%)
1	Disloyal Consumers	501 (45%)
0	Neutral	147 (13%)
	Total	1106

- Proportion of Disloyal Consumers is more than Loyal Consumers. Possible reasons for that are, in Rural areas all required brands are not available all the time. Due to which consumer may shift to other brands due to unavailability of their preferred brands. This would be clear in next few steps of analysis.
- Important thing to note here is that above numbers are not the final one to design final business strategies. They are only indicative of rough pattern available in the data.
- Neutral Consumers are around 13%. Manufacturers can take a call if they want to consider this group while framing strategies for other groups.

Step 2: Correlation Matrix: to find out relation between all pairs of variables under study. Purpose is to eliminate those variables which are identical in nature and thus reducing duplication before fitting the model. Summary of outcomes is as follows.

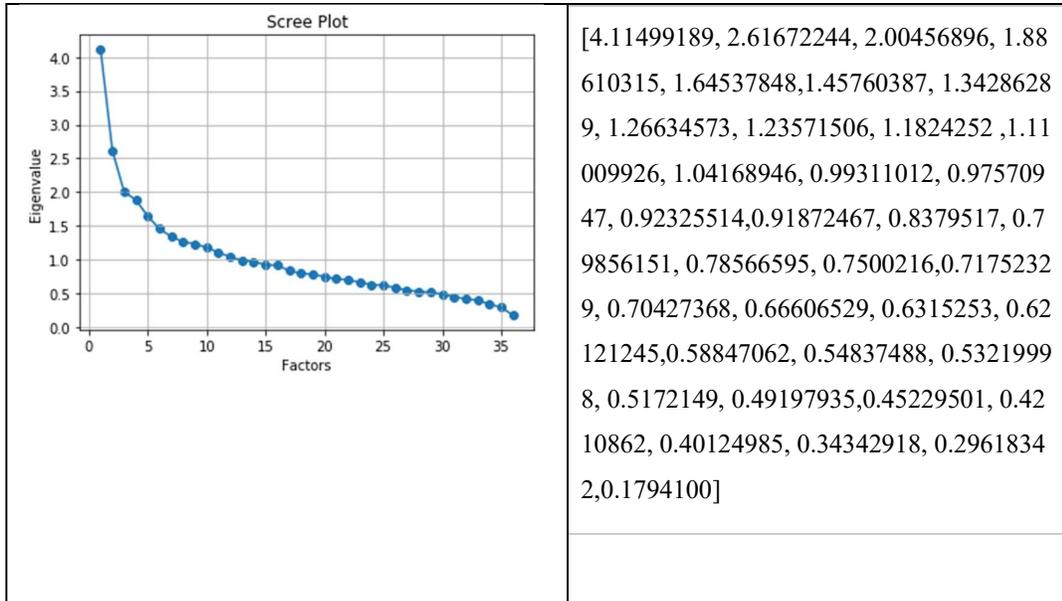
Findings:

- Correlation values for each pair of variables in the study indicates no significant correlation as all values are less than or equal 0.8.
- Overall conclusion is, no variable is to be removed from the analysis before applying Exploratory Factor Analysis.

Step 3: Exploratory Factor Analysis (EFA): is useful to reduce dimensionalities by creating liner combinations of variable with its constructs. Output of this process will become input for Structural Equation Modeling.

cluster	Shampoo Tried Out Brands	Shampoo Max Run	Shampoo_Acceptable	REPU2	CLAR1	REPU3	REPU1	CLIF1	BRAW1	COPF1	ADVE1	DISC1	SIFA1	COMM1	FASO1	BRAT2	FUVA1	EMVA1	BRCR1	HABI1	ACCE1	PRWO1	CULT1	AVAI1	PEVA1	REPR1	BRTR1	SWCO1	CUSA1	BRAF1
BRAF1	0.3	0.1	0.1	0.3	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
CUSA1	0.1	0.3	0.1	0.0	0.2	0.3	0.1	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SWCO1	0.1	0.2	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
BRTR1	0.1	0.2	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
REPR1	0.0	0.2	0.1	0.0	0.0	0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PEVA1	0.2	0.1	0.2	0.3	0.1	0.1	0.2	0.3	0.4	0.0	0.0	0.1	0.1	0.3	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
AVAI1	0.1	0.1	0.2	0.0	0.3	0.2	0.1	0.0	0.2	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
CULT1	0.0	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PRWO1	0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ACCE1	0.2	0.1	0.2	0.0	0.3	0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
HABI1	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
BRCR1	0.2	0.3	0.2	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
EMVA1	0.2	0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
FUVA1	0.3	0.1	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
BRAT2	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
FASO1	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0
COMM1	0.1	0.1	0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SIFA1	0.1	0.1	0.1	0.3	0.1	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
DISC1	0.0	0.1	0.2	0.1	0.0	0.2	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ADVE1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
COPF1	0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
BRAW1	0.1	0.0	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
CLIF1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
REPU1	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
REPU3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
CLAR1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
REPU2	0.1	0.1	0.0	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Shampoo_Acceptable	0.2	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Shampoo Max Run	0.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Shampoo Tried Out Brands	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
cluster																														

- Bartlett's test value: (7885.600802319, 0.0): As p value is zero test is statistically significant, and matrix is not an identity matrix.
- Scree Plot and Eigen Values: helps to decide about the number of useful factors. Points plotted above 1 are the potential factors to be considered for further testing. Eigen values are numeric values indicating the same. There are 15 potential factors to be considered for next round.



- Out of 12 factors derived, only those factors will be considered further where at least 3 variables are having factor loading >0.35 or <-0.35. Summary of factors is given in the table.
- To fine tune the output, Varimax rotation is applied on the eligible factors. Here there are total 11 factors where Varimax rotation applied. Total 38% of variance explained by 11 factors. However further useful factors are only 9 which approximately explains 33% of variance.

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
SS Loadings	1.740810	1.551420	1.510695	1.387882	1.311199	1.124700	1.093202	1.088946	1.078450	0.981673	0.897812
Proportion Variance	0.048356	0.043095	0.041964	0.038552	0.036422	0.031242	0.030367	0.030249	0.029957	0.027269	0.024939
Cumulative Variance	0.048356	0.091451	0.133415	0.171967	0.208389	0.239631	0.269997	0.300246	0.330203	0.357472	0.382411

- Factors defined based on the output are as below. This will become an input for Structural Equation Modeling.

SituationalLoyalty=	PRWO1 + SIFA1 + BRAW1 + REPU3
FamilyDemographics=	Family Type - Total Family Member + Head of the Family
AttitudinalBrandLoyalty=	ACCE1 + COPF1 + CLAR1
BrandSatisfaction=	BRAF1 + CUSA1 + PEVA1
BrandCommitment=	REPR1 + AVAI1 + COMM1
BehaviouralBrandLoyalty=	- Shampoo_Acceptable + Shampoo Max Run - Shampoo Tried Out Brands

	0	1	2	3	4	5	6	7	8	9	10	11
0	0.04531	0.01939	0.03392	0.09980	0.33458	0.02207	-0.01806	-0.01094	0.06404	-0.06362	-0.03789	-0.02536
1	0.11351	-0.07808	0.11582	-0.13105	0.10741	-0.14582	-0.03905	-0.12839	-0.14016	0.01455	0.37227	0.01368
2	-0.03698	0.00097	-0.00362	0.74507	0.05968	0.04600	0.00916	0.04438	-0.03948	-0.05705	0.01934	0.01251
3	0.05550	-0.11334	0.04309	-0.73130	-0.05308	0.08239	0.03200	0.08300	-0.14350	-0.12566	0.10577	-0.00382
4	0.18429	0.11290	-0.02181	0.40191	0.11253	0.14756	0.02139	-0.00775	-0.03770	-0.00741	-0.04191	0.00734
5	-0.07694	0.02062	-0.08433	-0.03589	-0.04343	0.48766	0.06629	0.06594	-0.10334	0.10011	0.09155	0.02747
6	0.03837	0.06337	0.02628	0.01063	0.20856	0.71068	-0.00279	0.06940	0.16024	-0.00622	-0.08932	0.07937
7	-0.09014	0.20032	0.05204	0.05703	0.00039	0.10043	0.04506	0.03654	0.23302	-0.02494	-0.07406	0.01887
8	0.23056	0.10800	-0.05731	0.03057	0.14843	0.31759	0.07282	0.00754	0.09750	0.09148	-0.14271	0.01700
9	0.02386	-0.03041	0.05046	0.06876	0.00397	0.04491	-0.00657	0.09234	0.57526	-0.04390	-0.02674	0.06085
10	0.02762	0.14232	-0.07336	0.07707	0.35003	0.38036	0.03407	0.09339	-0.07646	0.44201	0.09041	0.04515
11	0.06259	0.01748	-0.09056	-0.02749	0.25715	-0.00296	-0.01417	0.17515	0.30181	0.12969	0.08566	0.16496
12	-0.04200	-0.05607	-0.00628	-0.03733	-0.30684	0.00834	0.14178	0.18639	0.21625	0.04694	-0.04399	0.07206
13	0.10073	0.41520	0.02450	0.07640	0.03054	0.16165	0.01093	0.09930	0.10870	0.27544	-0.10725	-0.18432
14	0.05786	0.18802	0.05068	-0.02160	0.40760	0.22129	0.20977	0.18014	-0.08068	0.10167	-0.10036	0.00772
15	0.02257	0.05286	-0.01902	0.00474	0.02241	0.11250	0.98604	-0.03593	0.01302	-0.00977	-0.00779	0.07730
16	-0.01537	-0.02693	-0.10390	-0.08175	0.07868	0.05540	0.00750	0.74595	0.23313	0.05637	0.09666	-0.03393
17	-0.00905	0.04170	-0.01640	0.15747	0.32116	0.11345	-0.11506	0.23728	-0.01029	-0.00210	0.01012	0.08214
18	0.11387	0.29023	-0.08980	0.01207	0.17246	0.20541	-0.03246	0.35418	-0.04440	0.04798	-0.01838	0.23763
19	0.10047	0.18332	-0.00280	0.02904	0.30435	0.19736	0.03728	0.25472	0.00529	0.25230	0.02324	0.23016
20	-0.13248	0.06053	-0.04157	-0.05247	-0.01090	-0.04154	-0.01918	0.18461	0.09791	-0.04378	0.53796	-0.05539
21	0.05564	-0.01461	-0.03739	-0.05591	0.04943	-0.07517	-0.01553	-0.00423	0.45594	0.24787	-0.02041	0.01362
22	-0.04132	0.49019	0.00274	0.04592	0.04042	0.05416	0.00210	0.10570	-0.23507	-0.01027	0.18314	0.20137
23	0.08382	0.09877	0.00347	0.00622	0.07677	0.04966	0.06334	0.00496	0.12186	0.06938	-0.03200	0.45628
24	-0.08015	0.04827	-0.07220	0.02017	-0.01613	0.08570	-0.00305	0.02648	0.12398	0.47929	0.04723	0.07421
25	-0.00916	0.03324	0.05915	-0.02295	0.40959	0.02725	0.07741	0.05578	0.05717	0.10125	0.05195	0.17242
26	0.04018	0.45250	-0.01722	0.10064	0.29943	0.07143	0.04572	0.04915	-0.00679	-0.02892	-0.04627	0.27183
27	0.03312	0.07169	0.00192	0.04075	-0.00751	0.08992	-0.02625	0.13954	0.00778	0.12054	-0.02670	0.14647
28	0.05528	0.12710	0.08811	0.04990	-0.02733	0.17014	0.03836	-0.04872	-0.12657	0.19848	0.44765	-0.00209
29	0.14032	0.63701	-0.07945	0.08290	0.05006	-0.00288	0.01071	-0.06228	0.04179	0.18447	0.09882	0.12616
30	0.12932	0.38330	-0.02905	0.02265	0.36133	0.00834	0.02461	-0.04786	0.08496	-0.03818	0.07955	-0.12697
31	-0.20589	0.09978	0.02140	-0.11629	-0.04828	-0.07347	0.00303	0.08841	0.02497	0.29325	0.23931	0.22352
32	-0.13002	0.09216	-0.62108	0.02306	-0.05280	0.06763	-0.00679	0.05577	-0.07373	0.14152	-0.06346	-0.03371
33	0.75869	0.14101	0.23212	0.02785	0.13504	-0.01826	0.00789	0.05567	0.03714	-0.01767	-0.07156	0.03628
34	-0.91417	-0.06326	-0.17705	-0.00933	-0.00833	-0.02107	-0.00532	0.00000	-0.01071	0.09705	-0.06065	-0.12196
35	0.21178	0.03924	0.96413	-0.04830	0.03826	-0.04123	-0.02508	-0.07637	-0.06344	0.05307	0.04120	-0.04675

	Code	0	1	2	3	4	5	6	7	8	9	10
0	Age Group	0.03935	0.01974	0.03414	0.09880	0.33109	0.00169	0.00061	-0.01600	0.05842	-0.06240	-0.02967
1	Gender	0.14425	-0.05421	0.12728	-0.13320	0.10644	-0.13749	-0.05509	-0.03552	-0.15035	-0.07182	0.21784
2	Family Type	-0.03261	-0.00378	-0.00252	0.74833	0.05529	0.05195	-0.03238	0.01178	-0.05069	-0.04986	0.02690
3	Total Family Member	0.06575	-0.11809	0.04661	-0.73279	-0.05256	0.07376	0.09251	0.03332	-0.14490	-0.09864	0.07398
4	Head of the Family	0.17637	0.11421	-0.02027	0.39947	0.11941	0.00709	0.12024	0.02096	-0.04099	-0.01174	-0.04002
5	BRAF1	-0.06347	0.03133	-0.08242	-0.03499	-0.05003	0.07629	0.57804	0.06050	-0.08209	0.08513	0.02226
6	CUSA1	0.03573	0.06098	0.02324	0.00868	0.23588	0.12032	0.58624	0.00852	0.15100	0.00343	-0.06150
7	SWCO1	-0.10106	0.19316	0.05417	0.06003	-0.00478	0.04344	0.06906	0.04264	0.22050	-0.04258	-0.01757
8	BRTR1	0.23022	0.07227	-0.06858	0.01708	0.18706	-0.00464	0.17830	0.07262	0.07851	0.12538	-0.02671
9	REPR1	0.01395	-0.03822	0.05878	0.07091	0.00352	0.08809	-0.01242	-0.00565	0.54313	-0.04517	0.06019
10	PEVA1	0.03443	0.16435	-0.07389	0.07503	0.34726	0.13895	0.36789	0.03985	-0.04283	0.43388	0.00402
11	AVAI1	0.07180	0.04497	-0.09617	-0.02424	0.24891	0.20961	0.05414	-0.00777	0.36347	0.10327	-0.00017
12	CULT1	-0.04324	-0.05365	-0.00629	-0.03215	-0.32962	0.18384	0.02573	0.14317	0.23567	0.01850	-0.02630
13	PRWO1	0.08137	0.44336	0.02001	0.08079	0.01389	0.12414	0.15032	0.01075	0.14376	0.20452	-0.13250
14	ACCE1	0.04545	0.21283	0.04425	-0.02099	0.39882	0.23994	0.23111	0.22765	-0.03863	0.04672	-0.15690
15	HABI1	0.02013	0.05222	-0.01847	0.00443	0.01266	-0.04398	0.08972	0.98428	0.00697	0.00694	-0.00207
16	BRCR1	-0.01338	-0.03496	-0.10334	-0.08594	0.04660	0.67390	0.04248	0.01484	0.23810	0.04915	0.15843
17	EMVA1	-0.00746	0.04138	-0.01665	0.15652	0.30893	0.27148	0.10383	-0.10628	-0.00170	-0.00350	0.01112
18	FUVA1	0.10978	0.27466	-0.09018	0.00785	0.16312	0.39646	0.14091	-0.02293	-0.04658	0.05778	0.03045
19	BRAT2	0.09932	0.15820	0.00062	0.01994	0.30863	0.31038	0.08620	0.04593	-0.02181	0.31965	0.03578
20	FASO1	-0.09616	0.04970	-0.02112	-0.05774	-0.00431	0.12078	-0.02432	-0.01290	0.05521	0.03128	0.78762
21	COMM1	0.04781	0.00804	-0.03561	-0.04833	0.03519	-0.00731	-0.06279	-0.01809	0.47393	0.20816	-0.02835
22	SIFA1	-0.03072	0.47144	0.01029	0.04014	0.03242	0.13048	0.05149	0.00288	-0.26764	0.04736	0.14001
23	DISC1	0.08264	0.10639	0.00608	0.01033	0.06695	0.04801	0.05029	0.06260	0.12961	0.08020	-0.05585
24	ADVE1	-0.07587	0.05103	-0.07302	0.02001	-0.02004	0.03848	0.05520	-0.00438	0.13470	0.50684	0.00726
25	COPF1	-0.00797	0.03705	0.06267	-0.02370	0.40156	0.08407	-0.00482	0.08582	0.05201	0.12686	0.05822
26	BRAW1	0.02865	0.44835	-0.01487	0.10125	0.28909	0.10277	0.03015	0.05076	-0.02198	-0.01809	-0.03970
27	CLIF1	0.03099	0.07866	0.00190	0.04291	-0.02080	0.17412	0.09336	-0.02364	0.02257	0.10945	-0.06409
28	REPU1	0.08580	0.14564	0.10073	0.03890	-0.01524	-0.05663	0.23343	0.03441	-0.13851	0.25489	0.26696
29	REPU3	0.13590	0.64393	-0.07459	0.08344	0.04360	-0.04483	-0.00816	0.00649	0.02989	0.19006	0.06040
30	CLAR1	0.12355	0.40069	-0.02473	0.02562	0.35310	-0.03951	0.02071	0.02746	0.08181	-0.05862	0.05679
31	REPU2	-0.18338	0.10832	0.02657	-0.11612	-0.06639	0.09212	-0.01454	0.00094	0.02602	0.32443	0.15937
32	Shampoo Acceptable	-0.13229	0.08512	-0.62731	0.02197	-0.05265	0.05931	0.03579	-0.00705	-0.07054	0.13616	-0.02001
33	Shampoo Max Run	0.73724	0.14691	0.23397	0.02723	0.13229	0.07850	0.07910	0.01425	0.03835	-0.03102	-0.07145
34	Shampoo Tried Out Bra	-0.93140	-0.08181	-0.18096	-0.01161	-0.00280	-0.01673	-0.02863	-0.00679	-0.01794	0.10187	0.01606
35	cluster	0.20889	0.03926	0.96249	-0.05110	0.04663	-0.07542	-0.05237	-0.02484	-0.06848	0.06509	-0.01210

Step 4: Structural Equation Modeling (SEM): is used to fit the model which depicts the relationship between measured variable and latent variables. Output of this process will become input for Support Vector Machine which will help further to have classification of consumers into loyal, disloyal, and neutral in terms of brand loyalty of FMCG products.

- Initially proposed model:

```
# measurement model

SituationalLoyalty=~ PRWO1 + SIFA1 + BRAW1 + REPU3

FamilyDemographics=~ FamilyType + TotalFamilyMember + HeadoftheFamily

AttitudinalBrandLoyalty=~ ACCE1 + COPF1 + CLAR1

BrandSatisfaction=~ BRAF1 + CUSA1 + PEVA1

BrandCommitment=~ REPR1 + AVA11 + COMM1

BehaviouralBrandLoyalty=~ Shampoo_Acceptable + ShampooMaxRun + ShampooTriedOutBrands

# regressions

BrandLoyalty ~ BrandCommitment + BehaviouralBrandLoyalty + BrandSatisfaction + SituationalLoyalty + Famil
yDemographics + AttitudinalBrandLoyalty
```

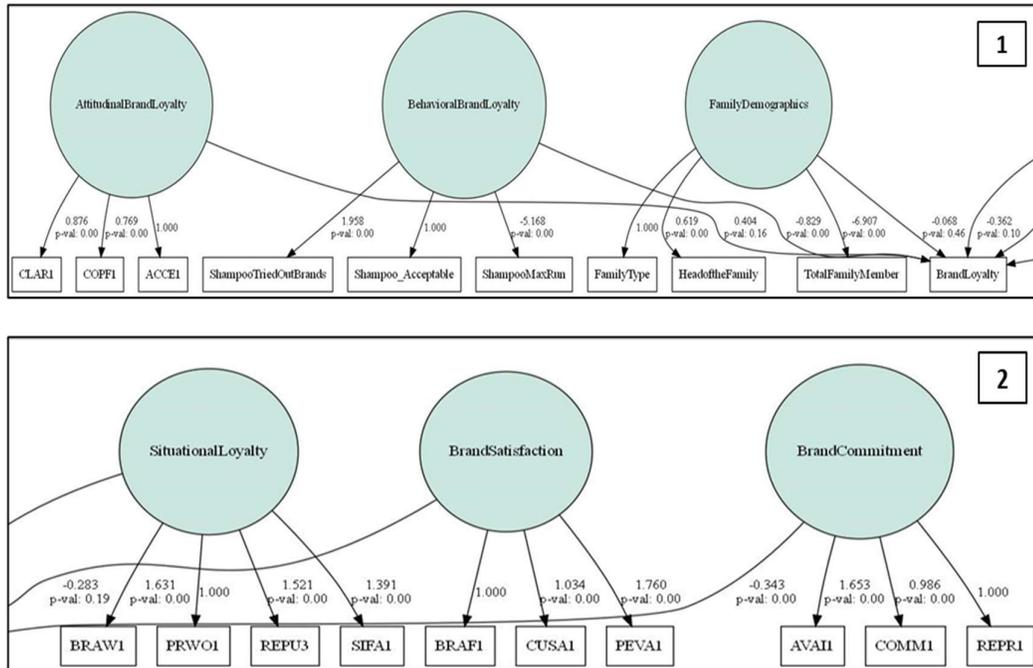
- Initial reliability indicators:

Indicators	DoF	DoF Baseline	chi2	chi2 p- value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	150	190	1419.8	0	4606.45	0.712	0.692	0.610	0.692	0.636	0.088	117.432	417.943	1.284

As there is a scope for improvement for most of the indicators, whole process is repeated after eliminating not impacting variables.

- Initial model is as below:

Figure 5.14 Initial model Rural – TT - Shampoo



Attributes which are Statistically insignificant are removed from the further model building process.

- New model proposed based on the previous model's output:

```
# measurement model
BrandCommitment =~ REPR1 + AVAI1 + COMMI
BehaviouralBrandLoyalty =~ Shampoo_Acceptable + ShampooMaxRun + ShampooTriedOutBrands
# regressions
BrandLoyalty ~ BrandCommitment + BehaviouralBrandLoyalty
```

Using above equations whole process run again to check if values have improved further and model has become useful.

	lval	op	rval	Estimate	Std. Err	z-value	p-value
0	REPR1	~	BrandCommitment	1.0000	-	-	-
1	AVAI1	~	BrandCommitment	0.8538	0.1383	6.1749	0.0000
2	COMM1	~	BrandCommitment	0.9464	0.1553	6.0950	0.0000
3	Shampoo_Acceptable	~	BehavioralBrandLoyalty	1.0000	-	-	-
4	ShampooMaxRun	~	BehavioralBrandLoyalty	-4.8015	0.4966	-9.6687	0.0000
5	ShampooTriedOutBrands	~	BehavioralBrandLoyalty	1.8988	0.1955	9.7120	0.0000
6	BrandLoyalty	~	BrandCommitment	-0.1788	0.0488	-3.6608	0.0003
7	BrandLoyalty	~	BehavioralBrandLoyalty	-0.8644	0.1015	-8.5159	0.0000
8	BehavioralBrandLoyalty	~~	BehavioralBrandLoyalty	0.1422	0.0289	4.9135	0.0000
9	BehavioralBrandLoyalty	~~	BrandCommitment	-0.0316	0.0122	-2.6006	0.0093
10	BrandCommitment	~~	BrandCommitment	0.3949	0.0829	4.7655	0.0000
11	AVAI1	~~	AVAI1	1.1814	0.0714	16.5526	0.0000
12	ShampooMaxRun	~~	ShampooMaxRun	0.9480	0.1379	6.8739	0.0000
13	ShampooTriedOutBrands	~~	ShampooTriedOutBrands	0.1889	0.0221	8.5289	0.0000
14	REPR1	~~	REPR1	1.3152	0.0885	14.8595	0.0000
15	BrandLoyalty	~~	BrandLoyalty	0.3590	0.0167	21.5591	0.0000
16	COMM1	~~	COMM1	1.1860	0.0795	14.9167	0.0000
17	Shampoo_Acceptable	~~	Shampoo_Acceptable	1.3449	0.0581	23.1330	0.0000

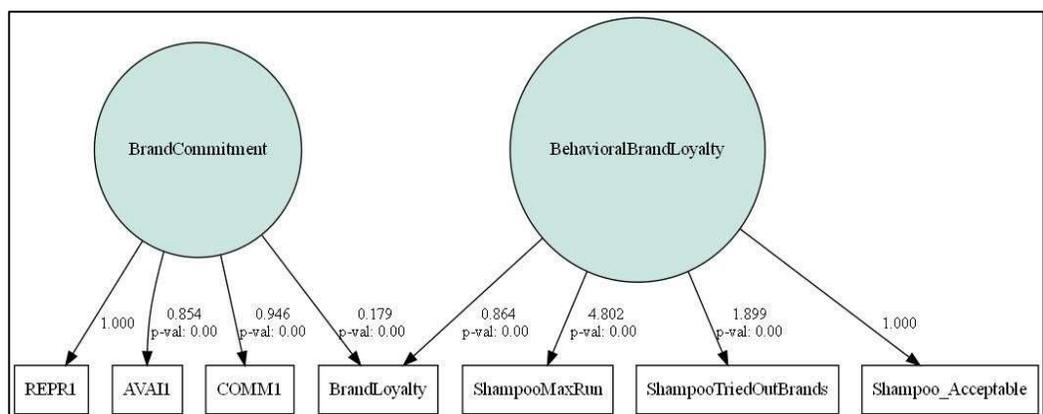
- Revised reliability indicators:

Indicators	DoF	DoF Baseline	chi2	chi2 p-value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	12	21	558.87	0	1961.9815	0.7183	0.7151	0.5015	0.7151	0.5069	0.0931	30.989	111.13	0.5053

Findings: All reliability indicators are showing improvement compared to first round of fit. P value is zero and CFI, GFI, NFI are above 70%. Also, RMSEA is within tolerance limit, i.e. 0.10. Overall model is good and can be accepted for further decision-making process.

- Revised model is as below:

Figure 5.15 Final model Rural – TT - Shampoo



Step 5: Support Vector Machine (SVM): After getting most impacting features from the final model of SEM. Now it is time to train the model to classify FMCG users into

three categories called, Loyal, Disloyal and Neutral based on both Behavioural and Attitudinal factors.

SVM will be run on both Behavioural and Attitudinal factors separately. Output will be in the form of 3*3 matrix, 3 levels from Behavioural and 3 levels from Attitudinal. This will help further to Retailers and Manufacturers to decide about their strategy.

SVM – Attitudinal:

- Variables considered for building model are based on the outcome of SEM which are as below.

AVAI1 - Availability

COMM1 – Commitment

- classifier = SVC(kernel = 'rbf', random_state = 2, gamma=2, C=6, break_ties = True)

```
SVC(C=6, break_ties=True, cache_size=200, class_weight=None, coef0=0.0,  
decision_function_shape='ovr', degree=3, gamma=2, kernel='rbf', max_iter=-1,  
probability=False, random_state=2, shrinking=True, tol=0.001,  
verbose=False)
```

- Accuracy : 0.55 – Accuracy is relatively low for attitudinal variables. However, in rural area this is quite normal as required brands are not always available.

```
array([[ 3, 20,  7],  
       [ 3, 78, 22],  
       [ 3, 56, 30]])
```

SVM – Behavioural: Variables considered for building model are based on the outcome of SEM which are as below.

Shampoo_Acceptable – Buyer may prefer more than one brand of same category. Count of acceptable brands of given individual directly affects his/her loyalty towards product.

Shampoo Max Run – Measure of how many times buyer buys same brand consecutively.

Shampoo Tried Out Brands – It counts how many different brands that buyer has tried out in last 8 periods.

- classifier = SVC(kernel = 'rbf', random_state = 2, gamma=0.0999, C=1, break_ties = True)

SVC(C=1, break_ties=True, cache_size=200, class_weight=None, coef0=0.0, decision_function_shape='ovr', degree=3, gamma=0.0999, kernel='rbf', max_iter=-1, probability=False, random_state=2, shrinking=True, tol=0.001, verbose=False)

- Accuracy : 0.8738738738738738

```
array([[27, 6, 0],
       [ 7, 90, 9],
       [ 0, 6, 77]])
```

SVM – Attitudinal and Behavioural

Decision matrix obtained based on above two results is as below.

Table 5.21 Rural – TT - Shampoo - SVM Classification of Buyers as per Behavioural and Attitudinal Variables

		Behavioral		
		Loyal	Neutral	Disloyal
Attitudinal	Loyal	Strongly Loyal	Potential Loyal	Spurious Disloyalty
		170	29	93
	Neutral	Potential Disloyal	Not predictable	Weakly Disloyal
		12	20	17
	Disloyal	Spurious Loyalty	Weakly Disloyal	Strongly Disloyal
		285	83	397

5.4.2 RURAL – TT – WASHING POWDER: Summary of 27 variables under study

Table 5.22 Rural – TT – Washing Powder– Column Sparkline

Sr. No.	Attribute	Question	Category	Traditional Trade				
				1	2	3	4	5
1	Brand Affect	After using my preferred brands, I get positive feeling.	Washing Powder brand	0.1	0.1	0.1	0.4	0.2
2	Customer satisfaction	I am very satisfied with brands which I use so I repeat purchase.	Washing Powder brand	0.1	0.1	0.2	0.4	0.2
3	Switching Cost	I do not switch to other brands as they are costly.	Washing Powder brand	0.1	0.1	0.2	0.4	0.2
4	Brand Trust	I buy only those brands on which I have faith.	Washing Powder brand	0.1	0.1	0.2	0.4	0.2
5	Relationship Proneness	I have developed emotional relationship with the brands I purchase.	Washing Powder brand	0.2	0.2	0.3	0.3	0.2
6	Perceived Value	The return I am getting on money spent on FMCG decides my product loyalty.	Washing Powder brand	0.1	0.1	0.2	0.4	0.2
7	Availability	I never buy other brands if my favorite brands are not available.	Washing Powder brand	0.1	0.2	0.2	0.3	0.2
8	Culture	I keep religious beliefs in center while selecting my brands.	Washing Powder brand	0.2	0.2	0.3	0.3	0.2
9	Price Worthiness	My brands are economical.	Washing Powder brand	0.1	0.1	0.2	0.4	0.2
10	Accessibility	Without any recall efforts, I can remember my brands quickly.	Washing Powder brand	0.1	0.1	0.2	0.3	0.3
11	Habit	Buying preferred brand is now my habit.	Washing Powder brand	0.1	0.2	0.1	0.3	0.3
12	Brand Credibility	I prefer to buy brands which are more than 50 years old with good track record.	Washing Powder brand	0.1	0.1	0.2	0.4	0.2
13	Emotional Value	I feel good when I use my favorite brands.	Washing Powder brand	0.1	0.1	0.2	0.4	0.2
14	Functional Value	I like packaging and other features of my favorite brands.	Washing Powder brand	0.1	0.1	0.2	0.4	0.2
15	Brand Attitude	In my next purchase I would like to buy these brands.	Washing Powder brand	0.1	0.1	0.2	0.4	0.2
16	Family Influence/Social Value	My purchase decision always based on choice of family members.	Washing Powder brand	0.1	0.1	0.2	0.4	0.2
17	Commitment	If my favorite brand is not available in store, I don't purchase another brand.	Washing Powder brand	0.2	0.2	0.3	0.3	0.2

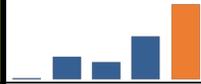
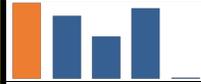
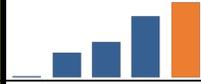
18	Situational Factors	During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Washing Powder brand	
19	Discounts	I never use to switch to other brand only because they offer discounts.	Washing Powder brand	
20	Advertising	Advertising of FMCG products help me to take buying decision.	Washing Powder brand	
21	Comparing Product Features	I must compare product features of various brands before buying the final one.	Washing Powder brand	
22	Brand Awareness	I recognize my favorite brands even by color of its packet.	Washing Powder brand	
23	Celebrity Influence	My purchase decision never changes based on the celebrity endorsement.	Washing Powder brand	
24	Repeat Purchase	I like to try different FMCG brands every time.	Washing Powder brand	
25	Repeat Purchase	My buying behavior towards favorite brands is never deviating in normal conditions.	Washing Powder brand	
26	Clarity	I have complete clarity about my brands, so I do not prefer other brands.	Washing Powder brand	
27	Repeat Purchase	I usually get board after buying same brand for some time.	Washing Powder brand	

Table 5.23 Rural – TT – Washing Powder – Descriptive Statistics

Questions	Que. Type	Que. Code	count	mean	std	min	25% (Q1)	50% (Q2)	75% (Q3)	max
After using my preferred brands, I get positive feeling.	Brand Affect	BRAF1	1106	3.944846	1.283954	1	4	4	5	5
I am very satisfied with brands which I use so I repeat purchase.	Customer satisfaction	CUSA1	1106	4.0434	0.904447	1	4	4	5	5
I do not switch to other brands as they are costly.	Switching Cost	SWCO1	1106	3.524412	1.301527	1	3	4	5	5
I buy only those brands on which I have faith.	Brand Trust	BRTR1	1106	3.786618	1.085337	1	3	4	5	5
I have developed emotional relationship with the brands I purchase.	Relationship Proneness	REPR1	1106	2.877034	1.27605	1	2	3	4	5
The return I am getting on money spent on FMCG decides my product loyalty.	Perceived Value	PEVA1	1106	3.338156	1.262594	1	2	4	4	5
I never buy other brands if my favorite brands are not available.	Availability	AVA1	1106	2.720615	1.212555	1	2	2	3	5
I keep religious beliefs in center while selecting my brands.	Culture	CULT1	1106	2.824593	1.432642	1	2	3	4	5
My brands are economical.	Price Worthiness	PRWO1	1106	3.603978	1.107989	1	3	4	4	5
Without any recall efforts, I can remember my brands quickly.	Accessibility	ACCE1	1106	3.836347	1.25967	1	3	4	5	5
Buying preferred brand is now my habit.	Habit	HABI1	1106	3.031646	1.333825	1	2	3	4	5
I prefer to buy brands which are more than 50 years old with good track record.	Brand Credibility	BRCR1	1106	3.055154	1.248215	1	2	3	4	5
I feel good when I use my favorite brands.	Emotional Value	EMVA1	1106	3.384268	1.34927	1	2	4	5	5
I like packaging and other features of my favorite brands.	Functional Value	FUVA1	1106	3.870705	1.124998	1	3	4	5	5
In my next purchase I would like to buy these brands.	Brand Attitude	BRAT2	1106	3.830018	1.070393	1	3	4	5	5
My purchase decision always based on choice of family members.	Family Influence/Social Value	FASO1	1106	3.259494	1.342829	1	2	4	4	5
If my favorite brand is not available in store, I don't purchase another brand.	Commitment	COMM1	1106	2.571429	1.205139	1	2	2	3	5
During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Situational Factors	SIFA1	1106	3.786618	1.274051	1	3	4	5	5
I never use to switch to other brand only because they offer discounts.	Discounts	DISC1	1106	2.777577	1.361156	1	2	3	4	5
Advertising of FMCG products help me to take buying decision.	Advertising	ADVE1	1106	3.748644	1.192785	1	3	4	5	5
I must compare product features of various brands before buying the final one.	Comparing Product Features	COPF1	1106	2.943038	1.436881	1	2	3	4	5
I recognize my favorite brands even by color of its packet.	Brand Awareness	BRAW1	1106	3.692586	1.218069	1	3	4	5	5
My purchase decision never changes based on the celebrity endorsement.	Celebrity Influence	CLIF1	1106	3.713382	1.077177	1	3	4	4	5
I like to try different FMCG brands every time.	Repeat Purchase	REPU1	1106	3.512658	1.184486	1	3	4	4	5
My buying behavior towards favorite brands is never deviating in normal conditions.	Repeat Purchase	REPU3	1106	3.626582	1.056237	1	3	4	4	5
I have complete clarity about my brands, so I do not prefer other brands.	Clarity	CLAR1	1106	3.334539	1.262125	1	2	3	4	5
I usually get board after buying same brand for some time.	Repeat Purchase	REPU2	1106	3.300181	1.370121	1	2	4	5	5

Rural – TT – Washing Powder: Summary of 27 variables under study

Step 1: K-Means Clustering: to have primary classification of buyers into Brand Loyal, Brand Disloyal and Neutral. Whole analysis is based on unsupervised clustering approach, so not very reliable.

As an output we manage to generate an additional column in the data set where each of the individual respondent is assigned tag of Loyal, Disloyal and Neutral.

Cluster Tag	Category of Consumers	Count
1	Loyal Consumers	480 (43%)
0	Disloyal Consumers	318 (29%)
2	Neutral	308 (28%)
	Total	1106

Findings:

- Initial classification indicates that number of loyal consumers are about 43% and disloyal are 29%.
- Ratio of disloyal and neutral is very close so it requires to have robust model to get prior knowledge of consumers' loyalty. Otherwise, there is a high chance of wrong classification and interpretation.
- Important thing to note here is that above numbers are not the final one to design final business strategies. They are only indicative of rough pattern available in the data.

Step 2: Correlation Matrix: to find out relation between all pairs of variables under study. Purpose is to eliminate those variables which are identical in nature and thus reducing duplication before fitting the model. Summary of outcomes is as follows.

- Correlation values for each pair of variables in the study indicates no significant correlation as all values are less than 0.8.
- Overall conclusion is, no variable is to be removed from the analysis before applying Exploratory Factor Analysis.

Step 3: Exploratory Factor Analysis (EFA): is useful to reduce dimensionalities by creating liner combinations of variable with its constructs. Output of this process will become input for Structural Equation Modeling.

- Bartlett's test value: (8490.674793270999, 0.0): As p value is zero test is statistically significant, and matrix is not an identity matrix.

- Out of 13 factors derived, only those factors will be considered further where at least 3 variables are having factor loading >0.35 or <-0.35. Summary of factors is given in the table.
- To fine tune the output, Varimax rotation is applied on the eligible factors. Here there are total 12 factors where Varimax rotation applied. Total 39% of variance explained by 12 factors. However further useful factors are only 9 which approximately explains 32% of variance.

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12
SS Loadings	2.438	1.473	1.399	1.213	1.135	1.087	1.035	0.914	0.877	0.834	0.730	0.717
Proportion Variance	0.068	0.041	0.039	0.034	0.032	0.030	0.029	0.025	0.024	0.023	0.020	0.020
Cumulative Variance	0.068	0.109	0.148	0.181	0.213	0.243	0.272	0.297	0.321	0.345	0.365	0.385

- Factors defined based on the output are as below. This will become an input for Structural Equation Modeling.

BehaviouralBrandLoyalty=	Washing Powder_Acceptable + Washing Powder Max Run - Washing Powder Tried Out Brands
BrandSatisfaction=	BRAF1 + CUSA1 + BRTR1 + BRAT2
FamilyDemographics=	Family Type - Total Family Member + Head of the Family
SituationalLoyalty=	FUVA1 + COMM1 + SIFA1 + BRAW1
BrandCommitment=	REPR1 + AVAI1 + BRRCR1 + FASO1

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0.064	0.060	0.073	-0.045	-0.090	0.015	-0.037	0.501	-0.057	0.025	0.028	-0.045	-0.011
1	0.078	-0.088	-0.106	0.051	-0.064	0.046	0.017	0.004	0.323	-0.031	-0.314	0.099	-0.027
2	-0.012	0.013	0.729	0.023	-0.041	0.063	-0.007	0.048	-0.038	0.025	-0.028	-0.024	-0.044
3	0.017	0.040	-0.772	0.031	0.038	0.100	-0.037	-0.053	-0.054	-0.041	-0.179	0.002	-0.142
4	-0.033	0.284	0.365	-0.016	-0.032	0.002	0.036	0.115	0.039	0.019	0.194	0.244	-0.179
5	-0.063	0.321	-0.105	0.000	-0.003	0.042	0.129	-0.063	-0.081	0.406	0.021	-0.080	-0.060
6	0.100	0.488	-0.005	0.101	0.058	0.073	-0.019	0.104	-0.070	0.151	0.116	0.078	0.017
7	0.043	0.070	0.029	-0.014	0.155	0.059	0.136	0.278	0.083	-0.032	0.250	-0.163	0.021
8	0.030	0.602	0.053	0.024	-0.079	0.006	0.071	0.126	-0.078	0.103	0.051	0.016	0.073
9	0.123	0.161	0.023	-0.077	0.409	-0.099	-0.024	0.064	-0.070	-0.001	0.025	-0.220	-0.047
10	0.022	0.199	0.091	0.073	-0.085	-0.038	0.061	0.261	0.066	0.449	0.217	0.187	0.195
11	0.078	-0.141	0.013	0.136	0.397	-0.021	0.000	-0.051	-0.071	0.112	-0.107	0.037	0.139
12	0.037	0.041	-0.053	-0.025	0.368	-0.067	0.135	-0.262	0.030	-0.218	0.065	-0.049	0.044
13	-0.029	0.091	0.121	0.196	-0.081	0.041	0.052	0.012	-0.010	0.104	0.492	0.101	0.079
14	0.020	0.089	-0.041	0.930	-0.007	0.071	0.079	0.103	-0.014	0.093	0.127	0.061	-0.018
15	0.070	0.250	0.022	0.283	0.009	-0.004	0.096	-0.019	0.028	-0.066	0.038	-0.019	0.027
16	-0.065	-0.003	-0.066	0.007	0.498	0.088	0.004	0.106	0.054	-0.012	0.047	0.157	-0.055
17	0.025	0.080	0.144	-0.036	0.038	0.174	0.011	0.196	-0.040	0.319	0.028	0.040	0.012
18	-0.020	0.153	0.035	0.155	0.106	0.357	0.286	0.033	0.016	0.387	-0.018	0.081	-0.153
19	0.030	0.472	-0.023	0.098	0.073	0.236	0.061	0.246	0.026	0.095	-0.069	0.158	0.149
20	-0.054	-0.052	-0.054	-0.150	0.376	0.043	-0.068	0.003	0.262	0.054	-0.250	-0.019	0.007
21	-0.053	0.076	-0.007	0.104	0.321	-0.340	0.022	0.132	-0.001	-0.025	0.047	-0.082	0.296
22	-0.006	0.083	-0.035	0.010	-0.034	0.677	0.025	0.082	0.216	0.085	0.087	0.059	0.093
23	0.000	0.048	-0.027	0.023	0.003	0.002	0.328	0.029	-0.105	0.100	-0.058	0.176	0.223
24	-0.051	0.316	0.090	-0.002	0.025	0.133	0.019	-0.054	0.129	0.001	0.196	0.002	0.526
25	0.036	0.078	0.013	0.082	0.072	-0.003	0.041	0.245	-0.064	0.076	-0.132	0.154	0.068
26	0.098	0.237	0.003	0.152	0.048	0.399	0.135	0.156	-0.185	0.065	-0.094	0.185	0.078
27	0.053	0.103	0.018	0.018	0.023	0.132	0.115	0.019	-0.008	0.037	0.033	0.597	-0.014
28	-0.005	0.005	0.103	0.039	0.027	0.081	0.026	-0.062	0.684	0.004	0.066	-0.022	-0.003
29	-0.010	0.086	0.052	0.122	-0.003	0.095	0.697	0.068	0.127	0.056	0.115	0.058	-0.026
30	0.045	0.149	0.008	0.107	0.127	0.069	0.117	0.393	0.032	0.072	0.040	0.064	-0.048
31	-0.080	-0.118	-0.071	-0.072	0.047	0.003	0.065	0.008	0.315	-0.075	-0.074	-0.049	0.228
32	-0.310	-0.106	-0.015	0.049	-0.102	0.005	0.010	-0.107	-0.022	0.033	-0.017	-0.036	0.081
33	0.962	0.029	0.004	0.050	-0.015	0.011	0.072	0.011	-0.041	0.005	-0.008	0.065	-0.010
34	-0.807	-0.027	0.052	-0.095	0.022	-0.007	-0.146	-0.079	-0.032	-0.060	0.039	0.046	0.032
35	0.812	-0.041	-0.025	0.019	-0.041	0.069	-0.405	-0.055	-0.100	-0.051	-0.048	-0.002	0.126

	Code	0	1	2	3	4	5	6	7	8	9	10	11
0	Age Group	0.065	0.054	0.073	-0.047	0.011	-0.087	-0.037	0.481	-0.002	-0.036	0.040	-0.051
1	Gender	0.085	-0.095	-0.123	-0.002	0.063	-0.005	0.051	0.090	-0.054	0.343	-0.088	0.023
2	Family Type	-0.013	0.010	0.703	0.010	0.072	-0.032	-0.004	0.066	-0.023	-0.005	-0.004	-0.035
3	Total Family Membe	0.018	0.049	-0.807	0.001	0.110	0.044	-0.031	-0.016	-0.123	-0.027	-0.107	-0.025
4	Head of the Family	-0.038	0.238	0.357	0.001	0.009	-0.063	0.054	0.114	0.009	0.105	0.024	0.245
5	BRAF1	-0.065	0.355	-0.105	-0.009	0.085	0.007	0.145	-0.052	-0.040	-0.057	0.319	-0.097
6	CUSA1	0.096	0.487	-0.003	0.115	0.067	0.045	-0.023	0.097	0.074	-0.033	0.131	0.092
7	SWCO1	0.045	0.075	0.044	0.034	0.041	0.092	0.093	0.171	-0.001	0.047	0.004	-0.075
8	BRTR1	0.031	0.601	0.061	0.037	-0.004	-0.086	0.063	0.120	0.109	-0.054	0.076	0.025
9	REPR1	0.122	0.164	0.021	-0.083	-0.099	0.391	-0.029	0.020	-0.020	-0.043	-0.037	-0.188
10	PEVA1	0.017	0.213	0.097	0.091	-0.016	-0.062	0.089	0.258	0.181	0.043	0.499	0.160
11	AVAI1	0.082	-0.150	0.002	0.107	0.002	0.472	0.032	0.001	0.087	-0.086	0.097	-0.015
12	CULT1	0.040	0.019	-0.054	-0.006	-0.095	0.328	0.118	-0.292	0.077	0.014	-0.220	0.010
13	PRWO1	-0.036	0.042	0.126	0.258	0.012	-0.122	0.059	-0.031	0.231	0.008	0.218	0.150
14	ACCE1	0.017	0.095	-0.037	0.930	0.085	0.009	0.081	0.114	-0.023	0.004	0.100	0.041
15	HABI1	0.072	0.239	0.026	0.295	-0.011	0.000	0.087	-0.025	0.044	0.028	-0.079	-0.005
16	BRCR1	-0.069	0.017	-0.063	0.013	0.086	0.460	-0.007	0.059	-0.059	0.050	-0.025	0.187
17	EMVA1	0.021	0.120	0.146	-0.044	0.205	0.049	0.019	0.182	-0.011	-0.041	0.288	0.016
18	FUVA1	-0.023	0.235	0.048	0.146	0.431	0.110	0.280	-0.014	-0.212	0.016	0.308	0.063
19	BRAT2	0.031	0.502	-0.014	0.097	0.240	0.073	0.044	0.249	0.100	-0.003	0.030	0.156
20	FASO1	-0.053	-0.021	-0.064	-0.191	0.054	0.404	-0.064	0.012	-0.078	0.250	-0.011	-0.029
21	COMM1	-0.048	0.060	-0.006	0.107	-0.350	0.334	0.036	0.128	0.224	-0.049	0.013	-0.078
22	SIFA1	-0.005	0.051	-0.047	0.015	0.649	-0.040	0.023	0.082	0.188	0.222	0.068	0.073
23	DISC1	0.008	0.078	-0.016	0.025	0.018	0.018	0.326	0.041	0.085	-0.187	0.090	0.161
24	ADVE1	-0.044	0.242	0.081	0.016	0.106	0.039	0.051	-0.035	0.747	0.068	0.045	-0.012
25	COPF1	0.038	0.102	0.015	0.061	0.014	0.103	0.046	0.269	-0.020	-0.075	0.053	0.113
26	BRAW1	0.103	0.232	-0.004	0.134	0.420	0.063	0.137	0.207	0.075	-0.181	-0.020	0.146
27	CLIF1	0.051	0.105	0.020	0.028	0.132	0.013	0.112	0.040	-0.010	-0.011	0.051	0.624
28	REPU1	-0.009	-0.029	0.097	0.042	0.076	0.025	0.043	-0.085	0.085	0.627	0.024	-0.001
29	REPU3	0.001	0.076	0.049	0.133	0.105	-0.016	0.683	0.048	0.024	0.128	0.045	0.068
30	CLAR1	0.048	0.133	-0.001	0.096	0.081	0.130	0.128	0.397	0.009	0.065	0.050	0.050
31	REPU2	-0.080	-0.078	-0.051	-0.052	-0.029	0.030	0.033	-0.048	0.054	0.223	-0.039	0.006
32	Washing Powder Ac	-0.310	-0.083	-0.008	0.056	0.002	-0.093	0.003	-0.110	0.009	-0.055	0.054	-0.037
33	Washing Powder Ma	0.955	0.033	0.004	0.050	0.009	-0.012	0.058	0.016	-0.019	-0.022	0.015	0.063
34	Washing Powder Tri	-0.810	-0.035	0.053	-0.084	-0.022	0.012	-0.145	-0.080	0.047	-0.039	-0.042	0.060
35	cluster	0.823	-0.028	-0.014	0.032	0.055	-0.035	-0.461	-0.064	0.046	-0.131	-0.010	0.019

Step 4: Structural Equation Modeling (SEM): is used to fit the model which depicts the relationship between measured variable and latent variables. Output of this process will become input for Support Vector Machine which will help further to have classification of consumers into loyal, disloyal, and neutral in terms of brand loyalty of FMCG products.

- Initially proposed model:

```
# measurement model

BehaviouralBrandLoyalty=~ WashingPowder_Acceptable + WashingPowderMaxRun - WashingPowderTriedOutBrands

BrandSatisfaction=~BRAFI + CUSA1 + BRTR1 + BRAT2

FamilyDemographics=~FamilyType - TotalFamilyMember + HeadoftheFamily

SituationalLoyalty=~FUVA1 + COMM1 + SIFA1 + BRAW1

BrandCommitment=~REPR1 + AVAI1 + BRRCR1 + FASO1

# regressions

BrandLoyalty ~ BrandCommitment + BehaviouralBrandLoyalty + BrandSatisfaction + SituationalLoyalty + FamilyDemographics
```

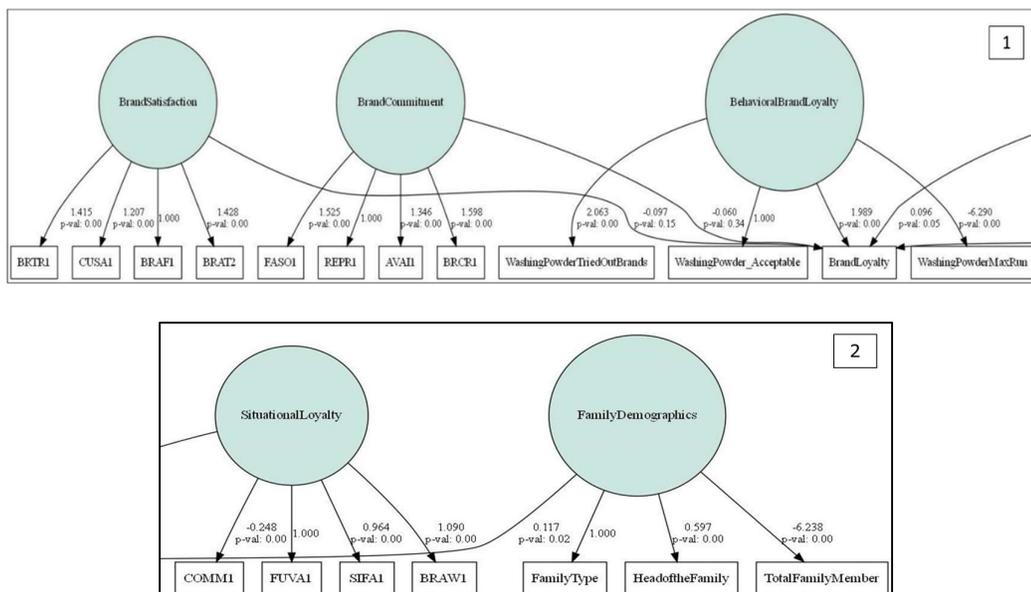
- Initial reliability indicators:

Indicators	DoF	DoF Baseline	chi2	chi2 p-value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	138	171	808.4	0	4514.68	0.8457	0.8209	0.7781	0.8209	0.8088	0.0663	102.54	362.98	0.7309

Over all indicators are close to 0.8 and shows good model fit, however still there is a scope for improvement.

- Initial model is as below:

Figure 5.16 Initial model Rural – TT – Washing Powder



Attributes which are Statistically insignificant are removed from the further model building process.

- New model proposed based on the previous model's output:

measurement model

FamilyDemographics \sim FamilyType - TotalFamilyMember + HeadoftheFamily

SituationalLoyalty \sim FUVA1 + COMM1 + SIFA1 + BRAW1

BehaviouralBrandLoyalty \sim WashingPowder_Acceptable + WashingPowderMaxRun - WashingPowderTriedOutBrands

regressions

BrandLoyalty \sim FamilyDemographics + BehaviouralBrandLoyalty + SituationalLoyalty

	lval	op	rval	Estimate	Std. Err	z-value	p-value
0	FamilyType	~	FamilyDemographics	1	-	-	-
1	TotalFamilyMember	~	FamilyDemographics	-6.30258	0.623431	-10.1095	0.00
2	HeadoftheFamily	~	FamilyDemographics	0.592156	0.060343	9.81318	0.00
3	FUVA1	~	SituationalLoyalty	1	-	-	-
4	COMM1	~	SituationalLoyalty	-0.4562	0.087308	-5.22515	0.00
5	SIFA1	~	SituationalLoyalty	1.145186	0.137537	8.326368	0.00
6	BRAW1	~	SituationalLoyalty	0.987855	0.118336	8.347904	0.00
7	WashingPowder_Acceptable	~	BehavioralBrandLoyalty	1	-	-	-
8	WashingPowderMaxRun	~	BehavioralBrandLoyalty	-6.33248	0.668983	-9.46583	0.00
9	WashingPowderTriedOutBrands	~	BehavioralBrandLoyalty	2.077166	0.221707	9.368959	0.00
10	BrandLoyalty	~	FamilyDemographics	0.116339	0.049077	-2.37055	0.02
11	BrandLoyalty	~	BehavioralBrandLoyalty	1.990556	0.212813	-9.35355	0.00
12	BrandLoyalty	~	SituationalLoyalty	0.137821	0.033631	-4.09798	0.00
13	BehavioralBrandLoyalty	~~	BehavioralBrandLoyalty	0.087331	0.018618	4.690611	0.00
14	BehavioralBrandLoyalty	~~	FamilyDemographics	0.00147	0.003603	0.408	0.68
15	BehavioralBrandLoyalty	~~	SituationalLoyalty	-0.01738	0.007636	-2.27667	0.02
16	FamilyDemographics	~~	FamilyDemographics	0.118996	0.014122	8.426172	0.00
17	FamilyDemographics	~~	SituationalLoyalty	0.002123	0.010005	0.212173	0.83
18	SituationalLoyalty	~~	SituationalLoyalty	0.371552	0.058973	6.300378	0.00
19	COMM1	~~	COMM1	1.373659	0.061159	22.4605	0.00
20	TotalFamilyMember	~~	TotalFamilyMember	3.374426	0.468333	7.205181	0.00
21	WashingPowderTriedOutBrands	~~	WashingPowderTriedOutBrands	0.23551	0.012149	19.3853	0.00
22	FamilyType	~~	FamilyType	0.111123	0.012179	9.123832	0.00
23	WashingPowderMaxRun	~~	WashingPowderMaxRun	0	0.063918	0	1.00
24	BRAW1	~~	BRAW1	1.119883	0.065537	17.08768	0.00
25	HeadoftheFamily	~~	HeadoftheFamily	0.2427	0.011072	21.92082	0.00
26	FUVA1	~~	FUVA1	0.892855	0.058906	15.15721	0.00
27	WashingPowder_Acceptable	~~	WashingPowder_Acceptable	1.04579	0.0445	23.50086	0.00
28	SIFA1	~~	SIFA1	1.134656	0.07616	14.89833	0.00
29	BrandLoyalty	~~	BrandLoyalty	0.220229	0.011523	19.11295	0.00

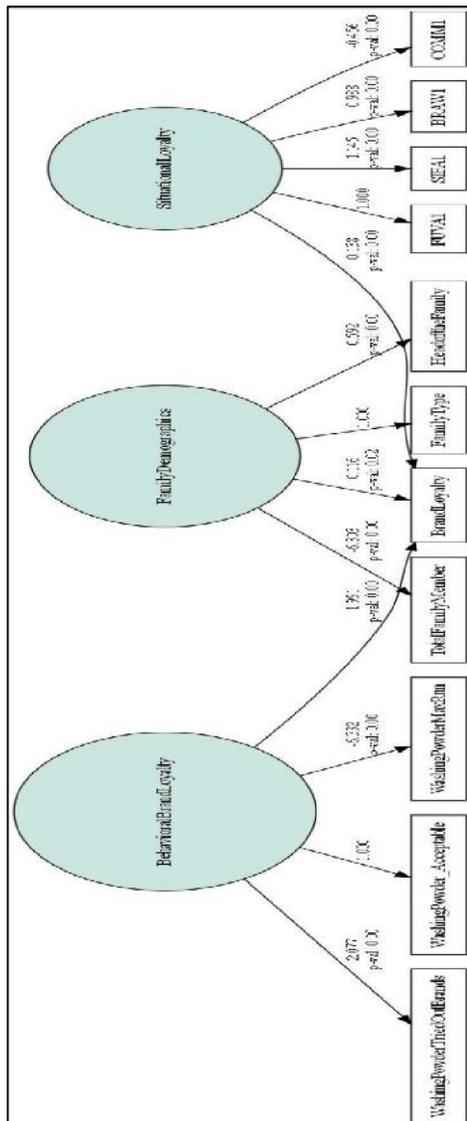
- Revised reliability indicators:

	DoF	DoF	chi2	chi2 p-value	chi2	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
		Baseline		Baseline										
Value	39	55	239.72	0.00	3202.00	0.94	0.93	0.89	0.93	0.91	0.07	53.57	188.80	0.22

Findings: All reliability indicators are showing improvement compared to first round of fit. P value is zero and CFI, GFI, NFI are above 90%. Also, RMSEA is within tolerance limit of 0.10 Overall model is good and can be accepted for further decision-making process.

- Revised model is as below:

Figure 5.17 Final model Rural – TT – Washing Powder



Step 5: Support Vector Machine (SVM): After getting most impacting features from the final model of SEM. Now it is time to train the model to classify FMCG users into three categories called, Loyal, Disloyal and Neutral based on both Behavioural and Attitudinal factors.

SVM will be run on both Behavioural and Attitudinal factors separately. Output will be in the form of 3*3 matrix, 3 levels from Behavioural and 3 levels from Attitudinal. This will help further to Retailers and Manufacturers to decide about their strategy.

SVM – Attitudinal:

- Variables considered for building model are based on the outcome of SEM which are as below.

FUVA1 – Functional Value

SIFA1 - Situational Factors

BRAW1 – Brand Awareness

COMM1 – Commitment

```
classifier = SVC(kernel = 'rbf', random_state = 2, gamma=3, C=8, break_ties = True)
```

```
SVC(C=8, break_ties=True, cache_size=200, class_weight=None, coef0=0.0,
```

```
decision_function_shape='ovr', degree=3, gamma=3, kernel='rbf', max_iter=-1,
```

```
probability=False, random_state=2, shrinking=True, tol=0.001,
```

```
verbose=False)
```

- Accuracy : 0.50 – Accuracy is relatively low for attitudinal variables. However, in rural area this is quite normal as required brands are not always available.

```
array([[ 17, 43, 10],
```

```
       [ 9, 68, 15],
```

```
       [ 12, 22, 26]])
```

SVM – Behavioural:

- Variables considered for building model are based on the outcome of SEM which are as below.

Washing Powder_Acceptable – Buyer may prefer more than one brand of same category. Count of acceptable brands of given individual directly affects his/her loyalty towards product.

Washing Powder Max Run – Measure of how many times buyer buys same brand consecutively.

Washing Powder Tried Out Brands – It counts how many different brands that buyer has tried out in last 8 periods.

```
classifier = SVC(kernel = 'rbf', random_state = 2, gamma=0.099, C=2, break_ties = True)
```

```
SVC(C=2, break_ties=True, cache_size=200, class_weight=None, coef0=0.0, decision_function_shape='ovr', degree=3, gamma=0.099, kernel='rbf', max_iter=-1, probability=False, random_state=2, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.6846846846846847
array([[67, 5, 0],
 [2, 85, 0],
 [5, 58, 0]])

SVM – Attitudinal and Behavioural

Decision matrix obtained based on above two results is as below.

Table 5.24 Rural – TT - Washing Powder - SVM Classification of Buyers as per Behavioural and Attitudinal Variables

		Behavioral		
		Loyal	Neutral	Disloyal
Attitudinal	Loyal	Strongly Loyal	Potential Loyal	Spurious Disloyalty
		693	0	232
	Neutral	Potential Disloyal	Not predictable	Weakly Disloyal
			0	
	Disloyal	Spurious Loyalty	Weakly Disloyal	Strongly Disloyal
		98	0	83

5.4.3 RURAL – TT – SOFT DRINK & CHOCOLATE: Summary of 27 variables under study

Table 5.25 Rural – TT – SD & Chocolate– Column Sparkline

Sr. No.	Attribute	Question	Category	Traditional Trade				
				1	2	3	4	5
1	BRAF1	After using my preferred brands, I get positive feeling.	Soft Drink & Chocolate brand					
2	CUSA1	I am very satisfied with brands which I use so I repeat purchase.	Soft Drink & Chocolate brand					
3	SWCO1	I do not switch to other brands as they are costly.	Soft Drink & Chocolate brand					
4	BRTR1	I buy only those brands on which I have faith.	Soft Drink & Chocolate brand					
5	REPR1	I have developed emotional relationship with the brands I purchase.	Soft Drink & Chocolate brand					
6	PEVA1	The return I am getting on money spent on FMCG decides my product loyalty.	Soft Drink & Chocolate brand					
7	AVAI1	I never buy other brands if my favorite brands are not available.	Soft Drink & Chocolate brand					
8	CULT1	I keep religious beliefs in center while selecting my brands.	Soft Drink & Chocolate brand					
9	PRWO1	My brands are economical.	Soft Drink & Chocolate brand					
10	ACCE1	Without any recall efforts, I can remember my brands quickly.	Soft Drink & Chocolate brand					
11	HABI1	Buying preferred brand is now my habit.	Soft Drink & Chocolate brand					
12	BRCR1	I prefer to buy brands which are more than 50 years old with good track record.	Soft Drink & Chocolate brand					
13	EMVA1	I feel good when I use my favorite brands.	Soft Drink & Chocolate brand					
14	FUVA1	I like packaging and other features of my favorite brands.	Soft Drink & Chocolate brand					
15	BRAT2	In my next purchase I would like to buy these brands.	Soft Drink & Chocolate brand					
16	FASO1	My purchase decision always based on choice of family members.	Soft Drink & Chocolate brand					
17	COMM1	If my favorite brand is not available in store, I don't purchase another brand.	Soft Drink & Chocolate brand					
18	SIFA1	During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Soft Drink & Chocolate brand					
19	DISC1	I never use to switch to other brand only because they offer discounts.	Soft Drink & Chocolate brand					
20	ADVE1	Advertising of FMCG products help me to take buying decision.	Soft Drink & Chocolate brand					
21	COPF1	I must compare product features of various brands before buying the final one.	Soft Drink & Chocolate brand					
22	BRAW1	I recognize my favorite brands even by color of its packet.	Soft Drink & Chocolate brand					
23	CLIF1	My purchase decision never changes based on the celebrity endorsement.	Soft Drink & Chocolate brand					
24	REPU1	I like to try different FMCG brands every time.	Soft Drink & Chocolate brand					
25	REPU3	My buying behavior towards favorite brands is never deviating in normal conditions.	Soft Drink & Chocolate brand					
26	CLAR1	I have complete clarity about my brands, so I do not prefer other brands.	Soft Drink & Chocolate brand					
27	REPU2	I usually get board after buying same brand for some time.	Soft Drink & Chocolate brand					

Table 5.26 Rural – TT – SD & Chocolate – Descriptive Statistics

Questions	Que. Type	Que. Code	count	mean	std	min	25% (Q1)	50% (Q2)	75% (Q3)	max
After using my preferred brands, I get positive feeling.	Brand Affect	BRAF1	1106	4.173599	0.808702	1	4	4	5	5
I am very satisfied with brands which I use so I repeat purchase.	Customer satisfaction	CUSA1	1106	4.15009	1.006353	1	4	4	5	5
I do not switch to other brands as they are costly.	Switching Cost	SWCO1	1106	3.545208	1.266427	1	3	4	4	5
I buy only those brands on which I have faith.	Brand Trust	BRTR1	1106	3.834539	1.14896	1	3	4	5	5
I have developed emotional relationship with the brands I purchase.	Relationship Proneness	REPR1	1106	3.300181	1.420707	1	2	4	5	5
The return I am getting on money spent on FMCG decides my product loyalty.	Perceived Value	PEVA1	1106	3.599458	1.215123	1	3	4	5	5
I never buy other brands if my favorite brands are not available.	Availability	AVAI1	1106	2.871609	1.269827	1	2	3	4	5
I keep religious beliefs in center while selecting my brands.	Culture	CULT1	1106	2.926763	1.504463	1	1	3	4	5
My brands are economical.	Price Worthiness	PRWO1	1106	3.798373	1.055062	1	3	4	5	5
Without any recall efforts, I can remember my brands quickly.	Accessibility	ACCE1	1106	4.149186	1.140129	1	4	5	5	5
Buying preferred brand is now my habit.	Habit	HABI1	1106	3.124774	1.433529	1	2	3	4	5
I prefer to buy brands which are more than 50 years old with good track record.	Brand Credibility	BRCR1	1106	3.264919	1.311066	1	2	3	4	5
I feel good when I use my favorite brands.	Emotional Value	EMVA1	1106	3.546112	1.405274	1	2	4	5	5
I like packaging and other features of my favorite brands.	Functional Value	FUVA1	1106	4.206148	1.030309	1	4	4	5	5
In my next purchase I would like to buy these brands.	Brand Attitude	BRAT2	1106	3.975588	1.022082	1	4	4	5	5
My purchase decision always based on choice of family members.	Family Influence/Social Value	FASO1	1106	2.988246	1.435443	1	2	3	4	5
If my favorite brand is not available in store, I don't purchase another brand.	Commitment	COMM1	1106	2.641953	1.222205	1	2	2	3	5
During Pandemic, I used to buy brands which were available nearby and not the one which I prefer.	Situational Factors	SIFA1	1106	3.762206	1.242702	1	3	4	5	5
I never use to switch to other brand only because they offer discounts.	Discounts	DISC1	1106	2.903255	1.4379	1	2	3	4	5
Advertising of FMCG products help me to take buying decision.	Advertising	ADVE1	1106	3.768535	1.216309	1	3	4	5	5
I must compare product features of various brands before buying the final one.	Comparing Product Features	COPF1	1106	2.960217	1.48179	1	1	3	4	5
I recognize my favorite brands even by color of its packet.	Brand Awareness	BRAW1	1106	4.033454	1.127911	1	3	4	5	5
My purchase decision never changes based on the celebrity endorsement.	Celebrity Influence	CIUF1	1106	3.846293	1.096217	1	3	4	5	5
I like to try different FMCG brands every time.	Repeat Purchase	REPU1	1106	3.616637	1.209859	1	3	4	5	5
My buying behavior towards favorite brands is never deviating in normal conditions.	Repeat Purchase	REPU3	1106	3.807414	1.066978	1	3	4	5	5
I have complete clarity about my brands, so I do not prefer other brands.	Clarity	CLAR1	1106	3.454792	1.32441	1	2	4	5	5
I usually get board after buying same brand for some time.	Repeat Purchase	REPU2	1106	3.297468	1.406878	1	2	4	5	5

Rural – TT - Soft Drink & Chocolate: Summary of 27 variables under study

Step 1: K-Means Clustering: to have primary classification of buyers into Brand Loyal, Brand Disloyal and Neutral. Whole analysis is based on unsupervised clustering approach, so not very reliable.

As an output we manage to generate an additional column in the data set where each of the individual respondent is assigned tag of Loyal, Disloyal and Neutral.

Cluster Tag	Category of Consumers	Count
0	Loyal Consumers	643 (58%)
1	Disloyal Consumers	236 (21%)
2	Neutral	227 (21%)
	Total	1106

Findings:

- Initial classification indicates that number of loyal consumers are about 58% whereas disloyal and neutral are 21% each.
- Ratio of neutral and disloyal is very close so it requires to have robust model to get prior knowledge of consumers' loyalty. Otherwise, there is a high chance of wrong classification and interpretation.
- Important thing to note here is that, above numbers are not the final one to design final business strategies. They are only indicative of rough pattern available in the data.

Step 2: Correlation Matrix: to find out relation between all pairs of variables under study. Purpose is to eliminate those variables which are identical in nature and thus reducing duplication before fitting the model. Summary of outcomes is as follows.

Findings:

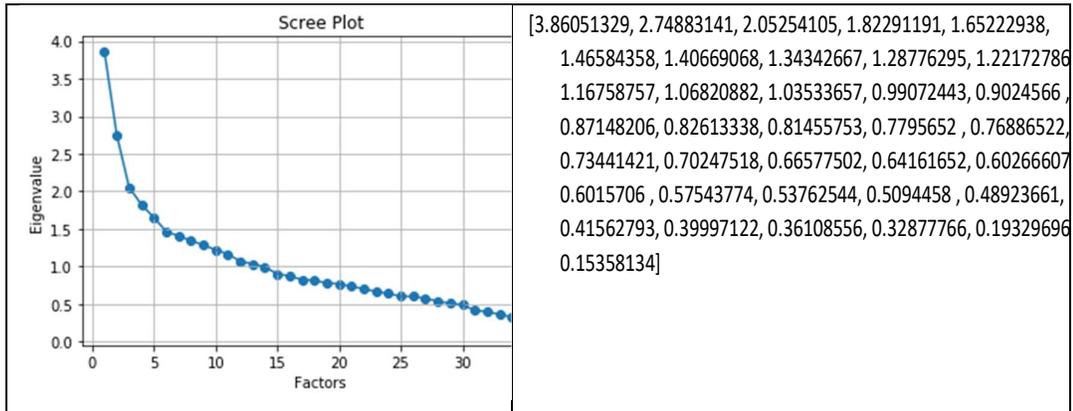
- Correlation values for each pair of variables in the study indicates no significant correlation as all values are less than 0.8.
- Overall conclusion is, no variable is to be removed from the analysis before applying Exploratory Factor Analysis.

cluster	SD & Chocolate_Acceptable	SD & Chocolate Tried Out	SD & Chocolate	REPU2	CLAR1	REPU3	REPU1	CLIF1	BRAW1	COPF1	ADVE1	DISC1	SIFA1	COMM1	FASO1	BRAT2	FUVA1	EMVA1	BRCR1	HABI1	ACCE1	PRWO1	CULT1	AVAI1	PEVA1	REPR1	BRTR1	SWCO1	CUSA1	BRAF1
BRAF1																														
CUSA1	0.1																													
SWCO1		0.1																												
BRTR1			0.1																											
REPR1				0.1																										
PEVA1					0.1																									
AVAI1						0.1																								
CULT1							0.1																							
PRWO1								0.1																						
ACCE1									0.1																					
HABI1										0.1																				
EMVA1											0.1																			
FUVA1												0.1																		
BRAT2													0.1																	
FASO1														0.1																
COMM1															0.1															
SIFA1																0.1														
DISC1																	0.1													
ADVE1																		0.1												
COPF1																			0.1											
BRAW1																				0.1										
CLIF1																					0.1									
REPU1																						0.1								
REPU3																							0.1							
CLAR1																								0.1						
REPU2																									0.1					
SD & Chocolate Max Run																														
SD & Chocolate Tried Out Brands																														
SD & Chocolate_Acceptable																														
cluster																														

Step 3: Exploratory Factor Analysis (EFA): is useful to reduce dimensionalities by creating liner combinations of variable with its constructs. Output of this process will become input for Structural Equation Modeling.

- Bartlett’s test value: (8494.98197422199, 0.0): As p value is zero test is statistically significant and matrix is not an identity matrix.
- Scree Plot and Eigen Values: helps to decide about the number of useful factors. Points plotted above 1 are the potential factors to be considered for further t

uning. Eigen values are numeric values indicating the same. There are 13 potential factors to be considered for next round.



- Out of 13 factors derived, only those factors will be considered further where at least 3 variables are having factor loading >0.35 or <-0.35. Summary of factors is given in the table.
- To fine tune the output, Varimax rotation is applied on the eligible factors. Here there are total 11 factors where Varimax rotation applied. Total 37% of variance explained by 11 factors. However further useful factors are only 9 which approximately explains 33% of variance.

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
SS Loadings	1.75236927	1.690927	1.645775	1.473527	1.192671	1.135356	1.125669	1.019648	0.874524	0.849731	0.728177
Proportion Variation	0.04867692	0.04697	0.045716	0.040931	0.03313	0.031538	0.031269	0.028324	0.024292	0.023604	0.020227
Cumulative Variation	0.04867692	0.095647	0.141363	0.182294	0.215424	0.246962	0.27823	0.306554	0.330846	0.35445	0.374677

- Factors defined based on the output are as below. This will become an input for Structural Equation Modeling.

BehaviouralBrandLoyalty=	SD & Chocolate Max Run - SD & Chocolate Tried Out Brands + SD & Chocolate_Acceptable
AttitudinalBrandLoyalty=	ACCE1 + FUVA1 + BRAT2 + BRAW1 + CLIF1 + REPU3
FamilyDemographics=	Family Type - Total Family Member + Head of the Family
BrandCommitment=	REPR1 + AVAI1 + CULT1 + BRRC1 + FASO1

	Code	0	1	2	3	4	5	6	7	8	9	10
0	Age Group	0.0094	-0.0922	-0.0017	0.0605	-0.0021	-0.0410	0.4308	0.0372	0.0661	-0.0351	-0.0115
1	Gender	0.1135	-0.0312	-0.0466	-0.0965	0.0392	-0.0580	-0.0199	-0.0067	-0.0147	0.0365	-0.5464
2	Family Type	-0.0386	-0.0161	-0.0074	0.6163	0.0521	-0.0090	0.1132	-0.0133	0.0013	-0.0312	0.0692
3	Total Family Member	-0.0236	-0.0143	-0.0123	-0.8866	0.0724	0.0569	-0.0717	0.0852	0.00714	-0.1747	-0.0980
4	Head of the Family	-0.0248	0.0365	0.1387	0.4109	0.0910	0.0122	0.0440	0.2366	0.1164	-0.2333	-0.0149
5	BRAF1	-0.0127	0.0077	-0.0034	-0.0696	0.0029	-0.0232	0.0053	0.4784	0.0666	0.0719	-0.0651
6	CUSA1	0.1034	0.0849	0.1998	0.1440	0.1297	0.0376	0.1250	0.5063	0.0233	0.0172	0.1846
7	SWCO1	0.0301	-0.0090	0.0610	0.0455	0.1226	0.1468	0.1246	0.0873	0.1279	0.3939	0.1466
8	BRTR1	0.0670	-0.0085	0.3043	0.1142	-0.0501	-0.1391	0.0834	0.2808	-0.0218	-0.0983	0.2659
9	REPR1	-0.0332	-0.0952	0.1297	0.0507	-0.0671	0.4329	0.0697	0.0682	0.1001	0.1573	0.2502
10	PEVA1	0.0597	-0.0010	0.0594	0.0704	0.0385	0.0271	0.3117	0.1909	0.2734	-0.0315	-0.1425
11	AVAI1	0.1115	-0.0911	0.1221	-0.0062	-0.0722	0.4099	0.0112	-0.1188	0.1209	0.0152	-0.0722
12	CULT1	0.0314	-0.0358	0.0436	-0.0904	-0.0275	0.3680	-0.3115	-0.0717	-0.0517	0.0975	0.0351
13	PRWO1	0.0285	0.0329	0.0647	0.0797	0.0668	0.0164	0.0710	0.0523	0.6227	0.0237	0.0267
14	ACCE1	0.1050	0.1622	0.3747	-0.0275	-0.0353	-0.0244	0.2301	0.2266	0.2400	0.0266	0.0389
15	HABI1	0.0529	0.0114	0.3425	0.0108	-0.1382	-0.0513	-0.1553	0.1665	0.0081	0.0727	0.0776
16	BRCR1	-0.0011	0.1556	0.0015	-0.0241	0.0326	0.5020	0.0158	0.1200	-0.0423	-0.0009	-0.0141
17	EMVA1	-0.0050	0.0374	0.0461	0.1010	0.0598	0.0588	0.3838	0.0158	0.0359	-0.0073	0.1173
18	FUVA1	0.1497	0.1002	0.3539	0.1094	0.1858	0.0633	0.1401	0.2220	0.0740	0.0866	0.1303
19	BRAT2	0.0036	-0.0621	0.4089	0.0226	0.2367	0.0148	0.2643	0.2760	0.0224	0.1154	0.2059
20	FASO1	0.0498	-0.0972	-0.1293	-0.0160	0.3379	0.4421	-0.1109	-0.1387	-0.2985	0.1706	0.0178
21	COMM1	0.0649	-0.0468	-0.0649	-0.0060	-0.1168	0.2437	0.1667	-0.0116	0.0134	0.0921	0.1441
22	SIFA1	0.0407	-0.0042	0.1183	-0.0127	0.6550	-0.1089	0.1674	0.0449	0.0157	0.0909	-0.0957
23	DISC1	-0.0503	-0.0526	0.3427	-0.0097	-0.0494	0.0327	-0.0032	-0.0471	-0.0512	0.0454	-0.0393
24	ADVE1	-0.0597	0.0572	0.0561	0.0029	0.1165	0.0014	-0.0139	0.1244	0.0529	0.0659	-0.0107
25	COPF1	0.0450	0.0721	0.2125	-0.0659	0.0538	-0.0436	0.3330	-0.0538	-0.2129	0.1778	-0.0807
26	BRAW1	-0.0522	-0.0504	0.4345	0.0855	0.4049	0.0433	0.2551	0.1780	0.0201	-0.0977	-0.1577
27	CLIF1	0.1453	0.0680	0.4860	0.0547	0.1866	0.1080	0.0350	0.0355	0.0455	-0.2099	-0.0060
28	REPU1	-0.0541	0.0591	-0.0086	0.1008	0.3279	-0.0532	-0.1602	0.0314	0.1141	0.2462	0.0208
29	REPU3	-0.0490	-0.0300	0.4605	0.0098	0.1851	0.0537	0.0621	-0.0389	0.2110	0.0621	0.0683
30	CLAR1	-0.0058	-0.0569	0.2286	-0.0299	0.2936	0.0979	0.2714	0.1072	0.2468	-0.0328	0.1059
31	REPU2	-0.0296	0.0249	0.0329	-0.0405	0.0517	0.1119	-0.0901	0.0501	-0.0913	0.5579	-0.1363
32	SD & Chocolate Max Ru	0.8981	-0.1869	0.0351	0.0377	0.0383	0.0818	0.0251	0.0160	0.0272	-0.0864	-0.0419
33	SD & Chocolate Tried O	-0.8082	0.2062	-0.0409	0.0856	0.0403	-0.0612	-0.0074	-0.0674	-0.0218	-0.0582	0.1102
34	SD & Chocolate_Accept	-0.1233	0.8994	-0.0140	-0.0164	-0.0128	-0.0805	-0.0094	0.0292	0.0097	0.0479	0.0009
35	cluster	-0.3791	0.8135	-0.0042	0.0434	0.0124	0.0372	-0.0766	0.0612	0.0449	-0.0262	0.0359

Step 4: Structural Equation Modeling (SEM): is used to fit the model which depicts the relationship between measured variable and latent variables. Output of this process will become input for Support Vector Machine which will help further to have classification of consumers into loyal, disloyal, and neutral in terms of brand loyalty of FMCG products.

- Initially proposed model:

```
# measurement model

BehaviouralBrandLoyalty=~SDChocolateMaxRun + SDChocolateTriedOutBrands +
SDChocolate_Acceptable

AttitudinalBrandLoyalty=~ACCE1 + FUVA1 + BRAT2 + BRAW1 + CLIF1 + REPU3

FamilyDemographics=~FamilyType + TotalFamilyMember + HeadoftheFamily

BrandCommitment=~REPR1 + AVAI1 + CULT1 + BRCR1 + FASO1

# regressions

BrandLoyalty ~ AttitudinalBrandLoyalty + BehaviouralBrandLoyalty +
FamilyDemographics + BrandCommitment
```

- Initial reliability indicators:

	DoF	DoF Baseline	chi2	chi2 p- value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	126	153	1749.63	0	4943.2393	0.661	0.646	0.570	0.646	0.588	0.108	86.836	312.219	1.582

- Initial model is as below: (Available on next page)

Attributes which are Statistically insignificant are removed from the further model building process.

- New model proposed based on the previous model's output:

```

# measurement model

BehaviouralBrandLoyalty=~SDChocolateMaxRun + SDChocolateTriedOutBrands +
SDChocolate_Acceptable

AttitudinalBrandLoyalty=~ACCE1 + FUVA1 + BRAT2 + BRAW1 + CLIF1 + REPU3

BrandCommitment=~REPR1 + AVAI1 + CULT1 + BRCR1 + FASO1

# regressions

BrandLoyalty ~ AttitudinalBrandLoyalty + BehaviouralBrandLoyalty +
BrandCommitment

```

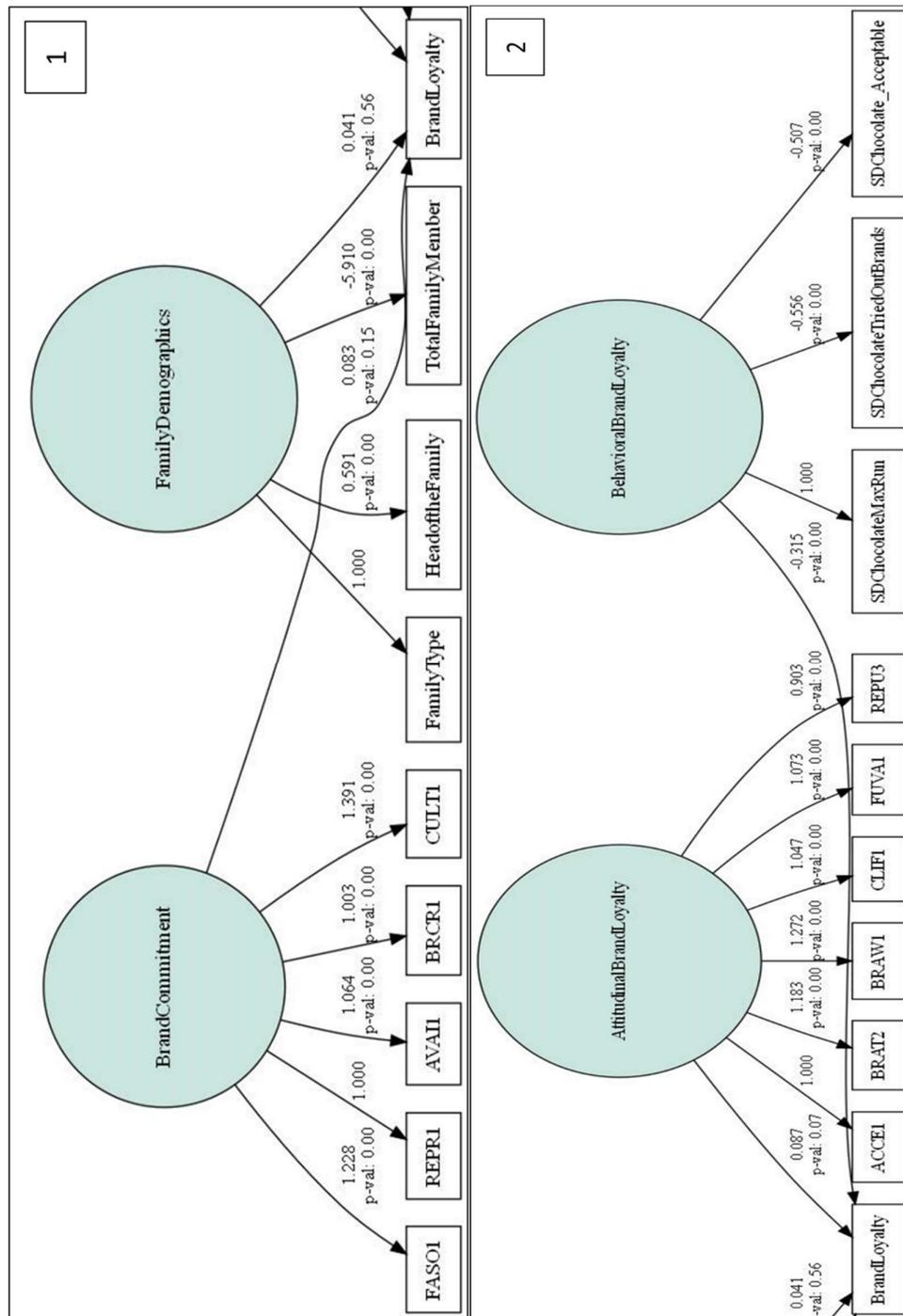
Using above equations whole process run again to check if values have improved further and model has become useful.

- Revised reliability indicators:

	DoF	DoF Baseline	chi2	chi2 p- value	chi2 Baseline	CFI	GFI	AGFI	NFI	TLI	RMSEA	AIC	BIC	LogLik
Value	85	105	1527.396	0	4182.166	0.646	0.635	0.549	0.635	0.563	0.0899	67.238	242.536	1.381

Findings: All reliability indicators are showing improvement compared to first round of fit. P value is zero and CFI, GFI, NFI are above 63%. Also, RMSEA is within tolerance limit, i.e. 0.10. Overall model is good and can be accepted for further decision-making process.

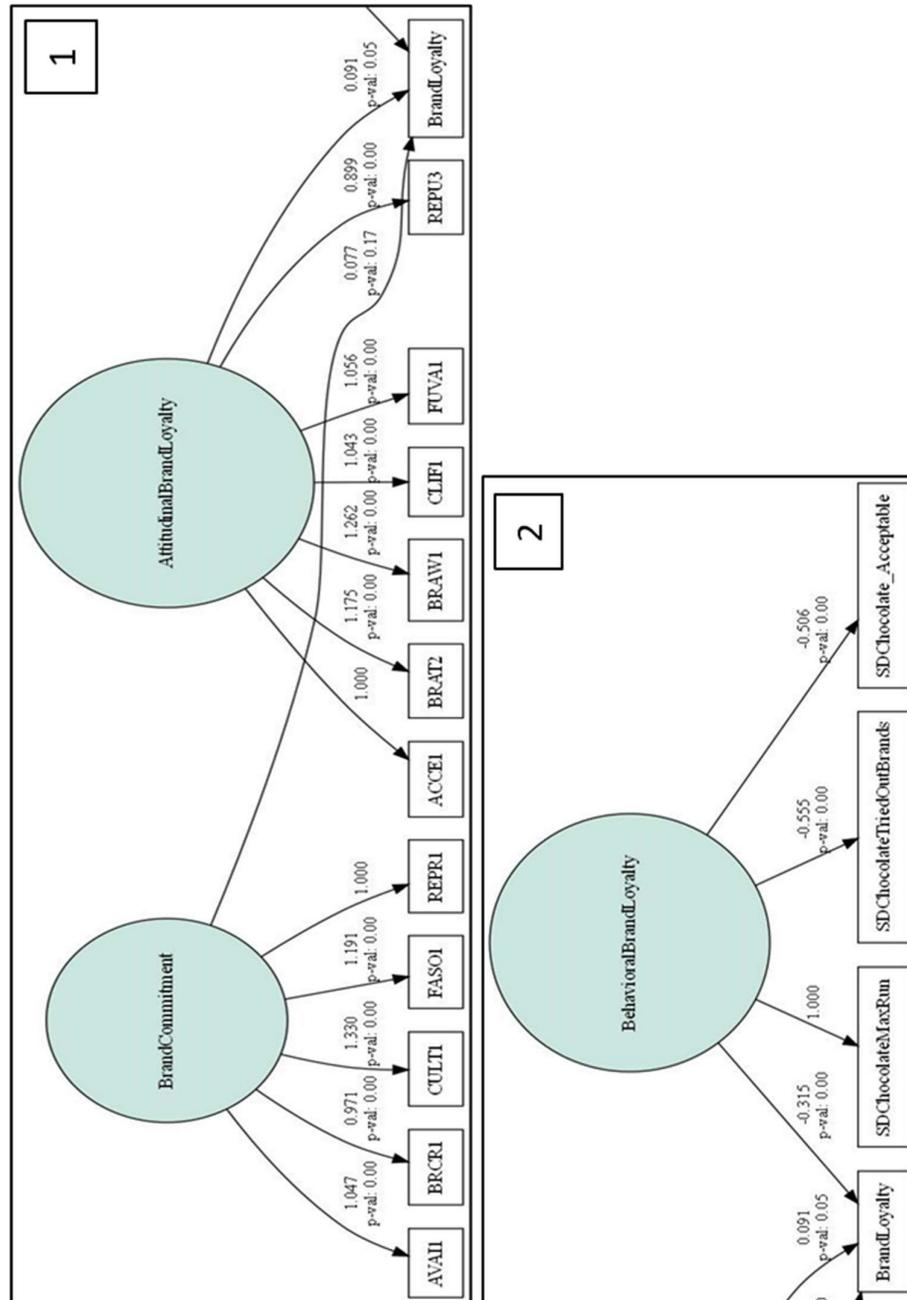
Figure 5.18 Initial model Rural – TT – Soft Drink & Chocolate



	lval	op	rval	Estimate	Std. Err	z-value	p-value
0	SDChocolateMaxRun	~	BehavioralBrandLoyalty	1	-	-	-
1	SDChocolateTriedOutBrands	~	BehavioralBrandLoyalty	-0.555	0.020	-27.816	0.000
2	SDChocolate_Acceptable	~	BehavioralBrandLoyalty	-0.506	0.039	-12.945	0.000
3	ACCE1	~	AttitudinalBrandLoyalty	1.000	-	-	-
4	FUVA1	~	AttitudinalBrandLoyalty	1.056	0.099	10.622	0.000
5	BRAT2	~	AttitudinalBrandLoyalty	1.175	0.106	11.136	0.000
6	BRAW1	~	AttitudinalBrandLoyalty	1.262	0.114	11.026	0.000
7	CLIF1	~	AttitudinalBrandLoyalty	1.043	0.102	10.239	0.000
8	REPU3	~	AttitudinalBrandLoyalty	0.899	0.094	9.568	0.000
9	REPR1	~	BrandCommitment	1.000	-	-	-
10	AVAI1	~	BrandCommitment	1.047	0.159	6.602	0.000
11	CULT1	~	BrandCommitment	1.330	0.198	6.728	0.000
12	BRCR1	~	BrandCommitment	0.971	0.153	6.349	0.000
13	FASO1	~	BrandCommitment	1.191	0.180	6.615	0.000
14	BrandLoyalty	~	AttitudinalBrandLoyalty	0.091	0.047	1.925	0.054
15	BrandLoyalty	~	BehavioralBrandLoyalty	-0.315	0.016	-19.602	0.000
16	BrandLoyalty	~	BrandCommitment	0.077	0.056	1.373	0.170
17	BrandCommitment	~~	BrandCommitment	0.276	0.063	4.407	0.000
18	BrandCommitment	~~	AttitudinalBrandLoyalty	0.015	0.014	1.061	0.289
19	BrandCommitment	~~	BehavioralBrandLoyalty	0.135	0.039	3.467	0.001
20	AttitudinalBrandLoyalty	~~	AttitudinalBrandLoyalty	0.275	0.041	6.705	0.000
21	AttitudinalBrandLoyalty	~~	BehavioralBrandLoyalty	0.105	0.032	3.289	0.001
22	BehavioralBrandLoyalty	~~	BehavioralBrandLoyalty	2.351	0.142	16.537	0.000
23	BRAT2	~~	BRAT2	0.664	0.038	17.694	0.000
24	REPU3	~~	REPU3	0.915	0.043	21.074	0.000
25	CLIF1	~~	CLIF1	0.901	0.045	20.160	0.000
26	SDChocolateTriedOutBrands	~~	SDChocolateTriedOutBrands	0.241	0.023	10.412	0.000
27	BRCR1	~~	BRCR1	1.457	0.074	19.633	0.000
28	ACCE1	~~	ACCE1	1.024	0.049	20.810	0.000
29	SDChocolate_Acceptable	~~	SDChocolate_Acceptable	3.170	0.138	22.894	0.000
30	SDChocolateMaxRun	~~	SDChocolateMaxRun	0.670	0.073	9.173	0.000
31	FUVA1	~~	FUVA1	0.754	0.039	19.384	0.000
32	BrandLoyalty	~~	BrandLoyalty	0.420	0.019	21.529	0.000
33	CULT1	~~	CULT1	1.774	0.101	17.495	0.000
34	REPR1	~~	REPR1	1.741	0.087	20.080	0.000
35	FASO1	~~	FASO1	1.668	0.091	18.384	0.000
36	AVAI1	~~	AVAI1	1.309	0.071	18.462	0.000
37	BRAW1	~~	BRAW1	0.833	0.046	18.159	0.000

- Final Model is as below:

Figure 5.19 Final model Rural – TT – Soft Drink & Chocolate



Step 5: Support Vector Machine (SVM): After getting most impacting features from the final model of SEM. Now it is time to train the model to classify FMCG users into three categories called, Loyal, Disloyal and Neutral based on both Behavioural and Attitudinal factors.

SVM will be run on both Behavioural and Attitudinal factors separately. Output will be in the form of 3*3 matrix, 3 levels from Behavioural and 3 levels from Attitudinal. This will help further to Retailers and Manufacturers to decide about their strategy.

SVM – Attitudinal:

- Variables considered for building model are based on the outcome of SEM which are as below.

AVAI1 - Availability

BRCR1 – Brand Credibility

CULT1 - Culture

FASO1 – Family Influence/Social Value

ACCE1 - Accessibility

BRAT2 – Brand Attitude

BRAW1 – Brand Awa

CLIF1 – Celebrity Influence

FUVA1 – Functional Value

REPU3 – Repeat Purchase

cluster

```
classifier = SVC(kernel = 'rbf', random_state = 1, gamma=1, C=8, break_ties = True)
```

```
SVC(C=8, break_ties=True, cache_size=200, class_weight=None, coef0=0.0,
```

```
decision_function_shape='ovr', degree=3, gamma=1, kernel='rbf', max_iter=-1,
```

```
probability=False, random_state=1, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.6081081081081081

Accuracy is average for attitudinal variables. However, in rural area this is quite normal as required brands are not always available.

```
array([[ 127, 0, 13],  
       [ 38, 0, 13],  
       [ 33, 0, 8]])
```

SVM – Behavioural:

- Variables considered for building model are based on the outcome of SEM which are as below.

SDChocolate_Acceptable – Buyer may prefer more than one brand of same category. Count of acceptable brands of given individual directly affects his/her loyalty towards product.

SDChocolateMaxRun – Measure of how many times buyer buys same brand consecutively.

SDChocolateTriedOutBrands – It counts how many different brands that buyer has tried out in last 8 periods.

```
classifier = SVC(kernel = 'rbf', random_state = 2, gamma=0.099, C=2, break_ties = True)
```

```
SVC(C=2, break_ties=True, cache_size=200, class_weight=None, coef0=0.0,  
decision_function_shape='ovr', degree=3, gamma=0.099, kernel='rbf', max_iter=-1,  
probability=False, random_state=2, shrinking=True, tol=0.001, verbose=False)
```

- Accuracy : 0.89

```
array([[124, 6, 0],  
       [ 10, 33, 1],  
       [ 6, 2, 40]])
```

SVM – Attitudinal and Behavioural

Decision matrix obtained based on above two results is as below.

Table 5.27 Rural – TT – SD & Chocolate - SVM Classification of Buyers as per Behavioural and Attitudinal Variables

		Behavioral		
		Loyal	Neutral	Disloyal
Attitudinal	Loyal	Strongly Loyal	Potential Loyal	Spurious Disloyalty
		620	195	150
	Neutral	Potential Disloyal	Not predictable	Weakly Disloyal
		61	16	57
	Disloyal	Spurious Loyalty	Weakly Disloyal	Strongly Disloyal
		0	7	0