"A Study on 'Factor Analysis'is one of the Suitable tools of 'Multivariate Analysis'for Consumer Behaviour in Marketing Research"

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Abstract-

Consumer behaviour is the behaviour of individual prospects buyer in group or Society to have purchase decision. Study of Consumer behaviour is to study on individual consumer's choice, needs, perception, moto, motive, experiences, ideas and impact on product and becoming prospect buyer. It studies characteristics of individual consumers on geographic existence, psychographic characteristics, demographically and based on behavioural factors.

To measure influences on the consumer from groups such as family, friends, sports, reference groups, and society in general. Hence measure of human behaviour is required with the proper analysis.

One of the suitable tools to measure human behaviour is Factor Analysis. Based on the consumer behaviour analysis it is to do in business about consumer retention, consumer relationship management, personalization, customization and direct marketing, etc.

In this study it is reflected the importance of Factor Analysis as a tool for Research on consumer behaviour. The study is based on the Analysis with the help of Secondary data.

Keywords: - Factor Analysis, Consumer behaviour, Marketing research, Decision Making

1. Introduction-

Consumer Behaviour is stimulated by the various internal and external factors. External environmental factors are depend on different Social, Economic, Religious, Political and cultural circumstances of the Society. Internal factors are instinct behaviour that is based on demographical, intellectuality, physical fitness, Perception, attitude, personality and skill, etc. of the individual. Now Stimulation factors and characteristics of the buyers combined into intention to purchase and have the decision making.

Factor Analysis is a Tool used for evaluating the Consumer behaviour on the product (Goods and Services) and Marketing process. An example, a Refrigerator may have different attributes of volume, colour, Size, Single or double door, Company Brand, etc. Each attribute can be preferable and choice-able by the consumers and decision is made by them to consume.

It is used in research for Consumer's behaviour for Market research and target market, Market Segmentation, Product Management, Product positioning, Service design, in Advertisements, operation research and for various practical uses in social sciences.

Once the alternatives have been evaluated, the consumer is ready to make a buying decision.

5 stages of a consumer purchasing decision process-
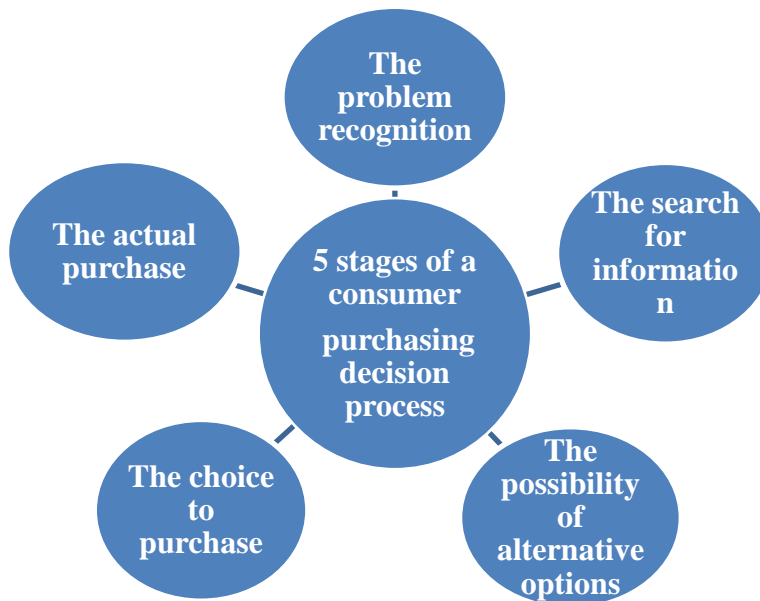
The problem recognition stage is for the identification of something as per consumer needs. **The search for information** is meant for searching the knowledge on the product. **The possibility of alternative options** is meaning whether there is another better or cheaper product available or not. **The choice to purchase** is the product. Lastly the **actual purchase** of the product.

Consumer behaviour is a process and activities of consumer engage in when searching for, selecting, purchasing, using, evaluating, and disposing of products so as to satisfy their needs and desires. For many goods and services, purchase decisions are the result of a long, detailed process that may include an extensive information search, brand comparisons and evolutions and other activities.

Advertising success in influencing purchase behaviour depends in large part on how well they understood consumer behaviour; the specific need of consumers are attempting to satisfy and how they translate into purchase criteria; how consumers gather information regarding various alternatives and use this information to select among competing brands. They need to understand how consumers make purchase decisions. Where do they prefer to buy a product? How are they influenced by marketing stimuli at the point of purchase? Advertisement also needs to understand how the consumers' decision process and reasons for purchase vary among different types of consumers.

Getting success of Ads is required the data / information and analysis of it. Factor analysis is such analysis after collecting the data and analyzing on it and after facts findingto get the outcome of consumer preference to purchase the product.

2. Objectives-

I.   To Study about the Factor Analysis is one of the tools of Multivariate Analysis (MVA) for Consumer Behaviour research in Market and Marketing Research.
II.   To Analyse and inference to be drawn for the Factor Analysis is also a suitable tools for Consumer Behaviour Analysis comparing with other tools of MVA.

3. Assumption-

The Factor Analysis is one of the suitable tools for Consumer Behaviour Analysis in Market and Marketing Research with other supporting factors of variables.

4. Research Methodology-

The study is based on secondary data from the earlier analysis and it is extended study. This is also limitation of the study.

5. Observations and Findings-

MVA is represented the collection of large set of specified data.It transforms various data observations into smaller composite score.It predicts the variability of the dependent variable basis on independent variables.It classifies the objects mutually exclusive on the basis of a set of independent variables.

MVA accounts more than one factor of independent variables for the variability check of dependent variable in more accuracy.

For more realistic, more accuracy and real life situation 'Multivariate Analysis' (MVA) analyse the data of dependent variables is represented independent number of observation. It is accounted the various relationships amongst the variables.

Major MVA techniques are **Factor Analysis, Conjoint Analysis, Cluster Analysis and Discriminate Analysis.**

Cluster Analysis (CA) may be used to group consumers into different classes on the basis of few consumer's attributes or characteristics. CA is for placing variables into clusters. It is not defined by the researcher but by the analyst is adopting procedure itself.

Considered factors for cluster analysis are firstly forming subgroups and assigned for that. Secondly make matrix association between variables and thirdly assumed that cluster exists itself within the data and finally as an output researcher may get the relation or association between the cluster variables.

Factor Analysis (FA)

FA is an interdependent analysis where the variables are on equal level with all sets of relationship of all variables where the factors are the objects.

FA is focused on all sets of interrelationships of the variable which is not reflected on regression or discriminate analysis. FA is based on the qualitative degree of the data which shows the difference.

FA works with a set of large number of objects and find out the common factor amongst their interconnectedness, say the association between the several factors of tea and factors of hunger.

With the help of data reduction similar in nature, by the structure identification and having various special sealing techniques measurement, the observed data of researcher may reduce for analysis.

It may be used to group attributes into some factors which are important from consumer's view for a product.

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Factor Analysis (FA) is stepping further as:

➢ To find out the definition and then link with the variables and get the objective of FA-The primary data consisted of separate variables pertaining to the related factors are to be examined and confirmed it may be in group or not and if possible reduce the variables.

o The examination output presents a picture of whole correlation and gets the idea of validity of FA for the next step.

➢ Designing of FA –The structure of perception of variables of FA and the introduced correlation matrix between the variables is required and constitutes a homogeneous set of perception and is appropriate for FA.

➢ Assumption in FA - In this section researcher assesses the factorability of the correlation matrix to justify the application of Factor Analysis.

o By visual examination of the correlation it is to identify the statistical significance of it and if no sufficient number of correlation greater than 0.30 then FA is inappropriate.

o For total variance explained it is computed with the help of initial Eigen values, extraction of sums of squared loading and rotation sums of squared loading with respect to component variables and its percentage of variance.

➢ Designing Factors and assessing overall fit – FA based on the computation of the table of inter-correlations among the variables and which transforms into a factor matrix through factor models. Then the loading of each variable is on the factors to identify the structure of the variables. In the consumer research, say buying related factors are considered and steps of FA are examined. Then the researcher selects the number of components to be retained for future analysis. Again to assess the components researcher also uses the Eigen values to assist in selecting the number of factors.

➢ Interpreting the factors with the help of various matrix or models – The total percentage of trace extracted for the factor solution becoming index to determine a particular factor solution for the variables together present.

Some Limitations of FA are –

❖ Still it is not strongly supported by the statistical method.
❖ Different results may come with different factors.
❖ Large number of characters are to be analysed
❖ Sometimes it handles the complicated factors to analyse.

Determinant Analysis –It works with the combination of Nominal dependent and Interval independent variables. In consumer research the nominal dependent variables are such like that satisfied, unsatisfied or delighted consumer for marketing research.

The discrimination function indicates the liner combination of the independent variables which stands the mean scores of categories of the dependent variables and that may be maximally different.

Discriminate function (DF) = V_1 x X_1 + V_2 x X_2 + ...+V_nx X_n
Where: V and X are independent and dependent variables respectively.

DA used extensively in marketing such to get new buyer group , consumer behaviour on new products and brand, and brand loyalty, etc. Research for market, the segment is done on the basis of kinds of product or brands and then to differentiate each of the products or brands based on the combination of the instinct characteristics of behaviour of the consumer.

Conjoint Analysis (CA) –

The thinkers Prof. Paul Green, Prof. V S Srinivasan Richard Johnson, and Jordan Louviere are the great contributors for CA.

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Choice-Based Conjoint (CBC), Adaptive Conjoint Analysis (ACA), Discrete Choice Analysis / Discrete Choice Modelling / Shelf-based designs, Full-profile, and Adaptive Choice Based Conjoint (ACBC) are the main kinds of CA for the marketing research.

It is also one of the Multivariate Techniques for Market and Marketing especially for Products and preference of Consumer preference of the product based on the product characteristics. Like FA this also prefers the less number of attributes of the products for analysis in Market and Marketing research.

Attributes and Level of the product are the basic things in this analysis, which will help the consumer and customer to choose the product preference based on their characteristic and to have the decision as inference. That is done by the researcher to prepare questionnaire of 10-20 Questions and have the response. Researcher finds out what is the prominent attributes preferred by the respondents for the analysis.

Aspects of FA as better tools-

For **Psychological testing** of **Consumer behavior** it is required main two aspects **Reliability** and second one is **Validity**. Both should be in high degree if the test scores are grading of individuals, Prediction of Performance or Academic Guidance. Reliability is the close similarity or identity of test, consist of the outcome of a measurement. That is coming again and again for the same sample and same situation. It is in repetitive in nature for the same environment. Reliability shows the dependability of measurement for selection prediction and guidance. Reliability Coefficient is equal to $R_{it}=S_i^2/S_t^2=1-S_e^2/S_t^2$.

For scientific planning of experiments always we see the effect of Independent variables is on the dependent variables to have the results. For example dose of Tummy-flu (Independent variable) is depending on the degree of Swine-flu (dependent variable). For factorial experiment it is involved more independent variables and may be in one group as controlled group for the dependent variables.

Validity is the capacity of the test to measure the special investigated variables. As example, say aptitude test for clerical job is specified for joining the clerical job only but not for the job of engineering.

Validity indicates three criteria as **(a) The relevance of the test (b) Discriminatory of the powerof the test (c) Predictive value of the test of the variables**. It is not generalized value. Validity Coefficient r_{xy} is directly proportional to the magnitude of the correlation coefficient. Various kinds of validity are representing as content, construct, criterion related as predictive and concurrent validity. FA may be undertaken in the construct validity.

FA Analysis finds out the concerned variables in the test. Then assesses the relative independence correlate them for contributing to get the total scores. After that it is analysed the weights of factors responsible for the common several of scores in comparative tests. It searches common factors and then compares them of two tests and correlates them. E.g. test for Arithmetic calculation of Consumer data analysis Subtraction, addition, multiplication, division in one test and in the other test vocabulary and writing capability. Here validity co-efficient, being the correlation co-efficient between the test scores X and Y (both). Factorial validity is given by the loading of a test on the factor and the correlation with the factors. Hence FA has given the validity of a test in the form of factor loading or correlating each other factors. FA helps to identify the most required factors and getting the common factors by which it is reducing the number of factors.

Cross products of common factor loading of X and Y is $r_{xy} = a_x a_y + b_x b_y + \ldots + k_x k_y$. r_{xy} is zero when there is no common factor. FA ensures a good criterion through inter-correlation of criterion measures among themselves.

Reliability and Validity of measurements are the aspects of testing to maintain for grading individuals, prediction of performances and academic guidance for research inferences. It will be in standard scales for interpretation and comparison and to have the average population scores.

The test items as sample are chosen from the population for their high co-relation with the total test scores or objective course of information of the ultimate results.

Variable errors or random errors of measurement affect the reliability of a test with uncontrolled and uncorrelated factors say interest and attention of the subjects, errors of interpretation, etc.

Constant or systematic errors are affecting the validity not the reliability of the test results. It may be due to test constructions or personal or situational based or environmental variations.

Reliability tends to dependability of a test for use in Selection, Prediction, or Guidance. If true score Xa, obtained score Xb, error of measurement Xc, then random errors Xb = Xa + Xc or Xa = Xb-Xc.

Earlier said the Validity of a test to predict and measure the specific variables under investigation and includes (a) trait to be investigated (Relevance), (b) the measurement of other variables (Discriminatory) (c) when only the specific test (Predictive). Validity should not be generalized based on the specific phenomenal. As example, by the memory test of lunatic person cannot be valid with the normal person.

6. Inference Drawn-

In this conceptual research after observation and findings it is found that the Factor Analysis is one of the suitable tools of MVA for Consumer behaviour Analysis in Market and Marketing Research with other supporting factors of the variables.

7. Suggestions-

+ Marketing and Market research should not adopt only single target oriented analysis, which may not give fruitful outcome. Hence they may adopt combination of different techniques for analysis.
+ Researcher should not prepare the statistical inferences of large data for one of these above said analysis for social scientific research due to measuring error and existence of non-sampling elements.
+ Researcher should know that above said four analysis techniques are for conceptualizing the problems but not for designing the research.
+ Researcher should use Cluster Analysis before using the discriminate analysis, but not mandatory for the Factor Analysis.
+ Researcher should be careful to choose the above said techniques for finding out the relationship among the variables and put meaning the data as sometimes there is no sampling theory behind them such as Cluster Analysis, Multidimensional Scaling Techniques, etc.
+ The researcher should adopt always the simple, easy, suitable, appropriate analysis for consumer research (Market and Marketing Research) for appropriate results.

8. Conclusions-

Factor Analysis is the study of a large number of various factors and earlier the researcher has consumed more time and experience. But now we can use computer and get the faster result and comparatively less experience is required.

Initially FA works with imperfect collected data. It changes because of changes in the samples and procedures and measurement errors. Always the results of any analysis of lot number of observation are better than simple analysis on small number of observation.

The marketing organisation needs to understand what benefits consumers are seeking and therefore which attributes are most important in terms of making a decision. It also needs to check other brands of the Consumer and customer's consideration set to prepare the right plan for its own brand.

The consumer applies certain beliefs to a particular known brand. The consumer's beliefs may differ depending on the consumers experience and the effects of selective perception, distortion and retention. Hence it is required suitable tools for doing analysis to have good outcome of the research.

Now the SPSS Procedure is utilized with Factor Analysis to find out the outcome in correct, suitable and authenticated manner. Like General Electric, 3M, Google, General Motors, Procter & Gamble, and Microsoft like many MNC's specially manufacturing companies are using various software and success in Market and Marketing Research.

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