

A Study on Green Buying Behaviour towards FMCG: An Application of Bayesian Probabilistic Network

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ABSTRACT

The present study has been undertaken to understand the perception and attitude of the green consumer towards FMCG products. A structure questionnaire is developed on the basis of 21 environmental parameters and 308 respondents are surveyed. Principal component analysis and multiple regression analysis have been used to investigate the most substantial factors and their influencing level on green consumer's buying behaviour and Bayesian probabilistic network is applied to frame a model for the FMCG marketers to implement policy on the basis of different scenario and causal analysis.

Keywords: Green, Bayesian, Network, Scenario and Causal Analysis

THEORETICAL BACKGROUND

Increasing alertness on numerous environmental problems has led a paradigm shift in consumers' buying behaviour and affinity towards a green lifestyle over past three decades in India (Henion & Kinnear, 1976). Though the awareness in Indian FMCG market is not so prominent compared to developed countries, still a moderate number of consumers are nowadays becoming more health conscious and sensitive towards environment. Understanding the pulse of the target market, Indian FMCG companies have also started accelerating their green marketing practices as their international counterpart to be a part of the Green Crusade (Kinnear, Taylor & Ahmed, 1974). The concept of 'go green' has also changed; it's not only pollution free, recyclable eco-friendly product (Polonsky, 1994), it's more extensive with respect to starting from manufacturing to selling point, both for consumer and industrial goods, as well as both for supplementary and core services (Roberts & Bacon, 1997).

OBJECTIVES AND METHODOLOGY

The present study has been undertaken to identify the most significant factors influencing consumer's

buying behaviour, to investigate their influencing level, and to develop a framework which may lead to policy implementation in marketing green product.

To understand the perception and attitude of the green consumer towards FMCG products a structure questionnaire is developed on the basis of 21 environmental parameters and 308 respondents are surveyed. Principal component analysis and multiple regression analysis have been used to investigate the most substantial factors and their influencing level on green consumer buying behaviour. Bayesian probabilistic network is applied to frame a model for the FMCG marketers to implement policy on the basis of different scenario and causal analysis.

ANALYSIS AND DISCUSSION

Interpretation of Principle Component Analysis

Here, from the perspective of Bartlett's test of sphericity, factor analysis is significant and feasible as p value is .002 i.e. less than .05. As Bartlett's test is significant, a more discriminating index of factor analysability is the KMO. For this dataset, KMO value is .815 (very close to 1.0), which is very high, so the KMO also supports factor analysis.

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Factor Identification

Determination based on Eigen Values

In this approach, only those factors with eigen values greater than 1 are considered. Other factors are not included in this model. Here, from the scree plot and table Total Variance Explained, three factors can be identified whose eigen values are more than 1.

Determination based on Percentage of Variance

The number of factors extracted can also be determined in a way so that the cumulative percentage of variance extracted by the factors reaches a satisfactory level. Here according to the analysis, the cumulative percentage of variance extracted by the three factors is 82.800 % (from table Total Variance Explained), which is quite satisfactory.

Interpretation of Multiple Regression Analysis

Factor Interpretation

Factor interpretation is facilitated by identifying the variables that have large loading on the same factor. That factor can be interpreted in terms of variables that load high on it.

In the Rotated Component Matrix,

Factor 1 has high coefficients .903 for variable Approach towards Eco-Labeling and Eco-Branding.

Factor 2 has high coefficients .854 for variable Attitude towards Environmental Promotion.

Factor 3 has high coefficients .868 for variable Sensitivity towards Environmental Problem.

As Factor 1 is treated as principal component, so, in this case, *Approach towards Eco-Labeling and Eco-Branding* is the most significant factor followed by the *Attitude towards Environmental Promotion* and *Sensitivity towards Environmental Problem* with respect to *Green Consumer Buying Behaviour*.

Table 1: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					F Change	df1	df2	Sig. F Change	
1	.821 ^a	.674	.569	.141	.105	20.142	2	306	.000

a. Predictors: (Constant), Eco-Labeling and Eco-Branding, Environmental Promotion, Environmental Problem

Table 1 represents the value of R, the multiple correlation coefficient. Here the value of “R”, 0.821 indicates a high level of prediction. From the R square value of 0.674 it can be depicted that our independent variables explain 67.4% of the variability of our dependent variable. Here our dependent variable is *Green Consumer Buying Behaviour* and the three independent variables are categorised under three parameters, namely *Approach towards Eco-Labeling and Eco-Branding*, *Attitude towards Environmental Promotion* and *Sensitivity towards Environmental Problem*.

Unstandardised coefficients indicate how much the dependent variable varies with an independent variable when all other independent variables are held constant. Consider the effect of *Approach towards Eco-Labeling and Eco-Branding* on *Green Consumer Buying Behaviour*, the unstandardised coefficient for *Approach towards Eco-*

Labeling and Eco-Branding score is equal to 0.492. This means that for each one scale increase in the average value of *Approach towards Eco-Labeling and Eco-Branding*, there is an increase in *Green Consumer Buying Behaviour* of 0.492. Similarly, for each one scale increase in the score of *Attitude towards Environmental Promotion*, there is an increase in *Green Consumer Buying Behaviour* of 0.313, for each one scale increase in the score of *Sensitivity towards Environmental Problem*, there is an increase in *Green Consumer Buying Behaviour* of 0.221. From the “t” value and the “Sig.” value we test whether the coefficients are statistically significantly different to 0 (zero). Here for three independent variables $p < .05$, so this explained that those coefficients are statistically significantly different to 0 (zero).

So, the equation from the regression output is as follows:

$$\text{Green Consumer Buying Behaviour} = 1.012 + (.492 \times \text{Approach towards Eco-Labeling and Eco-Branding}) + (.313 \times \text{Attitude towards Environmental Promotion}) + (.221 \times \text{Sensitivity towards Environmental Problem})$$

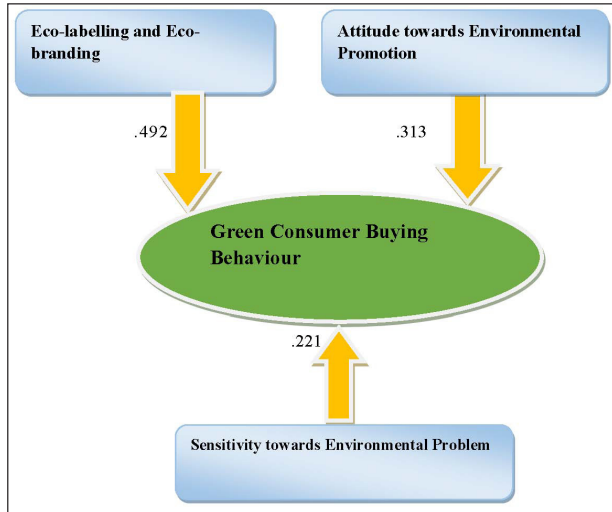


Fig. 1: Factors Influencing Performance Green Consumer Buying Behaviour

Interpretation of Bayesian Probabilistic Network

As a part of initiative for further research, the empirical analysis has been recast in terms of Bayesian probabilistic framework. The independent factors – *Approach towards Eco-Labeling and Eco-Branding*, *Attitude towards Environmental Promotion* and *Sensitivity towards Environmental Problem* – have binary measures from the available evidence and a probability distribution of the dependent variable, *Green Consumer Buying Behaviour*, occupies and completes the Bayesian framework. As it is well known, Bayesian probabilistic frameworks provide an elegant solution, particularly in cases of limited data and when qualitative and/ or a mix of qualitative and quantitative data need to be used. This is precisely the case in the current investigation. The basic framework is given in Fig. 2. A spectrum of scenario and causal analyses follows.

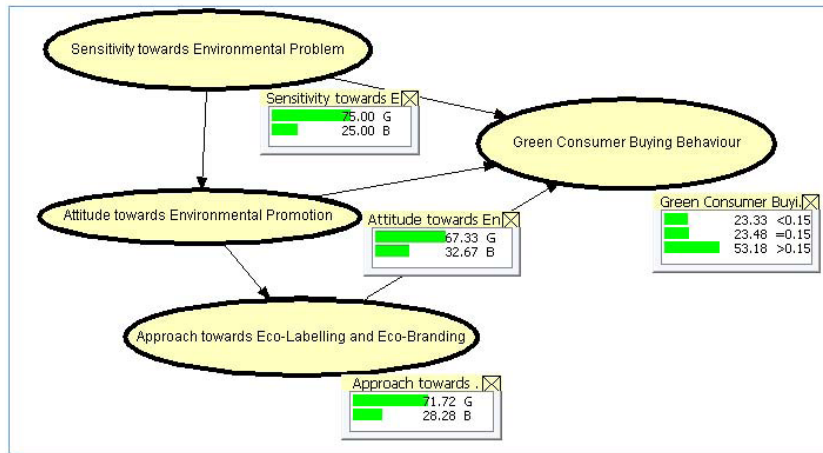


Fig. 2: Bayesian Probabilistic Networks

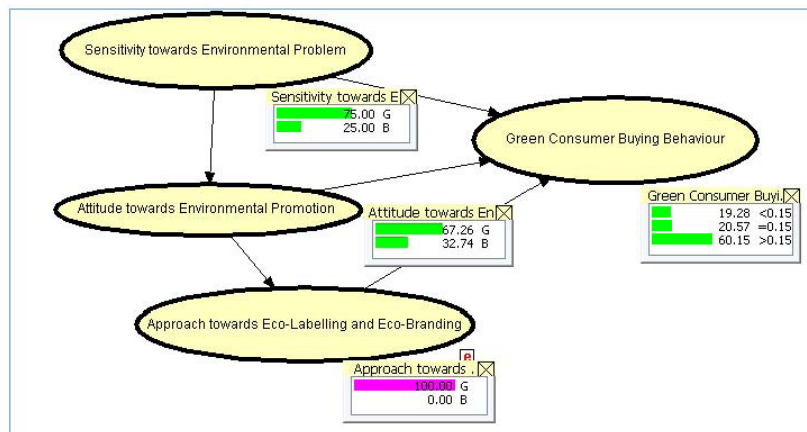


Fig. 3: Scenario Analysis 1



Fig. 4: Scenario Analysis 2



Fig. 5: Scenario Analysis 3

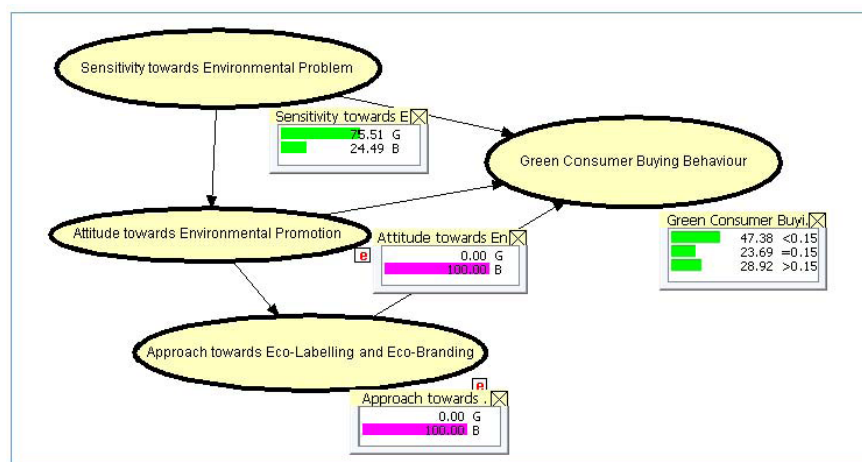


Fig. 6: Scenario Analysis 4

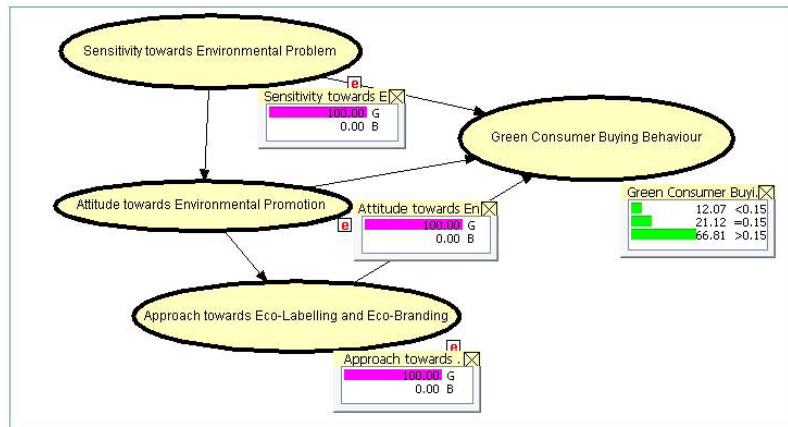


Fig. 7: Scenario Analysis 5

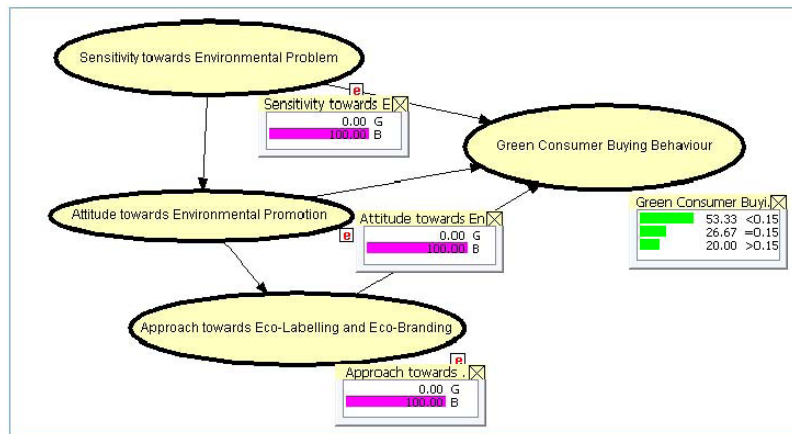


Fig. 8: Scenario Analysis 6



Fig. 9: Casual Analysis 1



Fig. 10: Casual Analysis 2



Fig. 11: Casual Analysis 3

Scenario and Causal Analysis

With scenario analysis, one can calibrate one or more causal or independent factors in the network and analyse its impact on the *Green Consumer Buying Behaviour* estimate. For example, one might be interested in estimating *Consumer Buying Behaviour* under different sets of *Eco-Labeling and Eco-Branding*, (other conditions remaining unchanged).

Under causal analysis, new evidence of *Green Consumer Buying Behaviour* is used to calculate updated probabilities (also referred to as posterior probabilities) of all the causal/ independent factors. In other words, additional buying behaviour information is propagated to all the nodes in the network. This technique of evidence (new buying behaviour data) propagation is extremely useful for analysing the causes that impact buying behaviour.

The Bayesian process of statistical estimation is one of continuously revising, refining and probable influences of the independent environment related factors about the state of the outcomes regarding buying behaviour as more data become available.

CONCLUSION

The research lays the foundation of a green consumer buying behaviour model for the Indian FMCG companies. Most significant factors and their influencing levels have been identified by principal component analysis and multiple regression. Bayesian analysis lays down different scenarios available to them where they can find out how the highest or lowest value of the most significant

factors like *Approach towards Eco-Labeling and Eco-Branding, Attitude towards Environmental Promotion and Sensitivity towards Environmental Problem* affect on the lowest, moderate, and highest level of *Green Consumer Buying Behaviour*. On the contrary, a causal analysis at the end clearly discerns what levels of the significant factors would obtain for the FMCG marketer desired values of green consumer purchases.

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