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Green Purchase Behaviour: A Move towards Environmental Sustainability- An Application of Interpretive Structural Modeling (ISM)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Green purchase behaviour refers to the purchase of environmental friendly products. It is considered to be one of the most important measures to attain environmental sustainability. Present study aims towards identifying factors influencing green purchase behaviour and to establish a relationship between the factors. Using Interpretive Structural Modeling (ISM), a hierarchical structure has been extracted illustrating the contextual relationship between the factors. Environmental knowledge occupied the lowest form of the hierarchy which is found to be the basis for green purchase behaviour. MICMAC analysis has been applied to group the factors according to their driving power and dependency. Environmental knowledge, environmental concern, eco-labelling, product quality, and brand image have a strong driving power towards green purchasing behaviour. Green purchase intention and green purchase behaviour are highly dependent on other factors.

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Keywords: Green purchase behaviour; green purchase intention; environmental sustainability; eco-labelling; brand image; interpretive structural modeling (ISM).

1. INTRODUCTION

Sustainable development refers to “development that meets the needs of present without compromising the ability of future generation to meet their own needs” (Bruntland report, 1987). The term “sustainability” stresses the importance of preserving the environment for generations to come. Over the last decade, global warming and climate change have become major concerns. It is evident that uses of goods and services which are harmful to environment have degraded the natural resources. In response, governments and corporations across the world have become more concerned about the environment and have moved towards practising environmentally sustainable business model and service operations. In present, various business organizations have started manufacturing environmental friendly products and providing eco- friendly services. Thus, green consumption is emphasised by businesses to their customers. It is a fact that how people consume goods and services have a greater impact on the environment. Thus green consumption becomes an integral part towards achieving sustainable environment.

1.1 Green Marketing

Green marketing refers to a holistic marketing concept in which products and services are produced, marketed, consumed, and disposed of in a manner that is less harmful to the environment. Consumers are more inclined to pay premium price for green products when the business sector endorses constructive green marketing concepts and sustainable marketing programmes [1]. Such consumers exhibit pro-social consumer behaviour and are socially aware of and accountable for environmental protection [2]. Businesses have significant environmental responsibility in producing eco-friendly green products. The company that fulfils that responsibility will be able to thrive in the future.

1.2 Green Purchase Behaviour

Green consumerism refers to the consumption of eco- friendly products which have minimal effect on the environment. It is a state which leads to lower consumption, green purchasing and less pollution [3]. Green purchasing behaviour can be described as the practice of making purchases that are environmentally sustainable, conserve resources, and respond to environmental concerns [4]. Green purchase behaviour refers to the consumption of products which are environmental friendly, renewable, reusable and sensitive to environmental problems [5]. Thus green purchase behaviour refers to the purchase and usage of products which are environmentally amiable, sustainable and has less harm towards our ecosystem. Hence it is evident that green purchase behaviour can be a step towards sustainable development. According to several studies, consumers have a favourable attitude toward environmental conservation [6,7,8]. Despite an increase in the number of consumers wanting to purchase green items, actual green product purchases have remained low (Bray, Johns and Killburn, 2011). Even the most environmentally concerned consumers do not always buy green products; their decision is based on both ecological considerations and their assessment of numerous product features [9]. This suggests that environmental concerns alone haven't had a significant impact on purchase decisions. In this context, understanding the factors which influence green purchase behaviour would help in creating a favourable environment to influence green purchase among consumers. With this background the present study is conducted with the following objectives.

- To identify the factors influencing green purchase behaviour.
- To establish the contextual relationship among the factors influencing green purchase behaviour by using Interpretive Structural Modeling (ISM).

2. METHODOLOGY

Interpretive Structural Modeling (ISM) has been applied to establish the relationships between the identified factors. The relevant factors influencing green purchase behaviour were identified from the past studies. Warfield [10] introduced the ISM as a qualitative and interpretive tool for evaluating complex socioeconomic systems. It solves problems by mapping the interrelationships of elements structurally [11] and converts hazy mental models into practical, well-defined models. It is a modeling tool, as the

specific relationships and overall structure are portrayed in a digraph model. The ISM technique aids in imposing order and direction on the complex interrelationships between system constituents [12].

2.1 Steps in ISM

1. Identification of pertinent elements to the problem or issues; this could be accomplished through a literature review or any other group problem-solving technique.
2. Creating a contextual relationship between components that will be analysed in pairs.
3. Creating a Structural Self-Interaction Matrix (SSIM) of elements, this depicts the system's pair-wise relationships.
4. The SSIM is used to create a reachability matrix, which is then checked for transitivity. The assumption of transitivity of the contextual connection is central to ISM, and it states that if element A is related to B and B is related to C, then A must be related to C.
5. The reachability matrix is divided into multiple levels.
6. Drawing a directed graph (DIGRAPH) and deleting transitive links based on the relationships in the reachability matrix.
7. By replacing element nodes with statements, the resultant digraph can be converted into an ISM.
8. Examining the ISM model for conceptual inconsistencies and making any necessary changes.

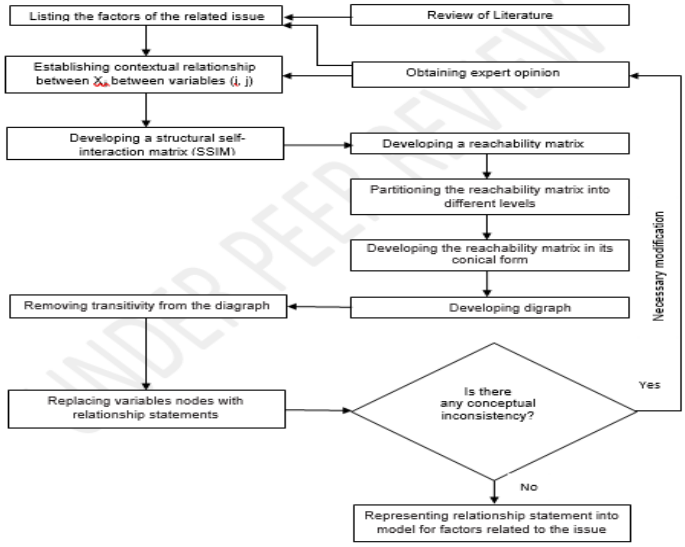

Fig. 1. Flow diagram for preparing ISM model

Table 1. Variables identified for ISM model

Variables	Reference	Parameter
Environmental concern	Wang, Liu, and Qi, 2014	1
Perceived consumer effectiveness	Gleim et al., 2013	2
Perceived behavioural control	Richa Chaudhary, Samrat Bisai, 2018	3
Values	Chen et al., 2012;	4
Trust	Chen,2010	5
Environmental Knowledge	Chan et al., 2000	6
Price	Aertsens et al., 2011	7
Subjective norms	Welsch et al., 2009	8
Product quality	Young et al., 2010	9
Brand image	Young et al., 2010	10
Eco- labelling	Young et al., 2010	11
Purchase intention	Chen,2013, Gleim et al., 2013	12
Green Purchase behaviour	Chen,2013, Gleim et al., 2013	13

3. RESULTS AND DISCUSSION

3.1 Structural Self-Interaction Matrix (SSIM):

Natures of the contextual relationship among the variables were identified through reviewing literatures and presented in the Table 2. Symbols used to denote the direction of their relationship between two variables i and j are as follows

V- when i influences j
A- when j influences i;
X- when i and j each other; and
O- when i and j are unrelated.

3.2 Reachability matrix

Initial reachability matrix was then developed from SSIM (Table 3). SSIM was converted into the initial reachability matrix by replacing the four symbols (V, A, X, or O) in the initial reachability matrix with 1s or 0s.

- If the (i, j) entry in the SSIM is V, the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry becomes 0;
- If the (i, j) entry in the SSIM is A, the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry becomes 1;
- If the (i, j) entry in the SSIM is X, the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry also becomes 1; and
- If the (i, j) entry in the SSIM is O, the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry also becomes 0.

The reachability matrix was reworked and tested for the transitivity rule using the revised SSIM. This technique was repeated until the reachability matrix matches the transitivity rule's requirements.

3.3 Level partition

The reachability and antecedent set for each element were determined from the final reachability matrix. The reachability set includes the element itself and any other elements that may aid in its attainment, whereas the antecedent set includes the element and any other elements that may aid in its attainment. After that, for each element, the intersection of these sets is calculated. The ISM hierarchy's top level is occupied by the element for which the reachability and intersection sets are the same. The hierarchy's top-level element would not assist any other element above its own level. The top-level element was removed from the other elements once it has been determined. This procedure was repeated until each factor's level is determined. These levels enable in the construction of the diagraph and the ISM model.

The levels of each parameter are shown in the final level partitioning given in Table 5. Level I is occupied by green purchasing behaviour (13) followed by purchase intention (12), perceived behavioural control (3), and trust (5). Level IV includes perceived consumer effectiveness (2) and price (7), whereas level V includes values (4) and product quality (7). Subsequently, level VI and VII are occupied by subjective norm (8) and brand image (10) and environmental concern (1) and eco- labelling (11) respectively. Final & level VIII is occupied by environmental knowledge (6).

Table 2. Structural Self Interaction Model

Parameter	13	12	11	10	9	8	7	6	5	4	3	2	1
1	V	V	O	O	O	V	O	A	O	V	V	V	X
2	V	V	O	O	O	O	O	A	O	A	V	X	
3	V	V	O	O	O	O	A	A	O	O	X		
4	V	V	O	O	O	A	O	A	O	X			
5	V	V	A	A	A	O	O	O	X				
6	V	V	V	O	O	V	O	X					
7	V	V	A	A	A	O	X						
8	V	V	O	O	O	X							
9	V	V	A	A	X								
10	V	V	A	X									
11	V	V	X										
12	V	X											
13	X												

Table 3. Final Reachability Matrix

Parameter	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1	1	1	1	0	0	0	1	0	0	0	1	1
2	0	1	1	0	0	0	0	0	0	0	0	1	1
3	0	0	1	0	0	0	0	0	0	0	0	1	1
4	0	1	0	1	0	0	0	0	0	0	0	1	1
5	0	0	0	0	1	0	0	0	0	0	0	1	1
6	1	1	1	1	0	1	0	1	0	0	1	1	1
7	0	0	1	0	0	0	1	0	0	0	0	1	1
8	0	0	0	1	0	0	0	1	0	0	0	1	1
9	0	0	0	0	1	0	1	0	1	0	0	1	1
10	0	0	0	0	1	0	1	0	1	1	0	1	1
11	0	0	0	0	1	0	1	0	1	1	1	1	1
12	0	0	0	0	0	0	0	0	0	0	0	1	1
13	0	0	0	0	0	0	0	0	0	0	0	0	1

Table 4. Iteration 1

Parameter	Reachability set	Antecedent set	Intersection set	Level
1	1,2,3,4,8,12,13	1,6	1	
2	2,3,12,13	1,2,6,7	2	
3	3,12,13	1,2,3,6	3	
4	2,4,12,13	1,4,6,8	4	
5	5,12,13	5,9,10,11	5	
6	1,2,3,4,6,8,11,12,13	6	6	
7	3,7,12,13	7,9,10,11	7	
8	4,8,12,13	1,6,8	8	
9	5,7,9,12,13	9,10,11	9	
10	5,7,9,10,12,13	10,11	10	
11	5,7,9,10,11,12,13	6,11	11	
12	12,13	1,2,3,4,5,6,7,8,9,10,11,12	12	
13	13	1,2,3,4,5,6,7,8,9,10,11,12,13	13	I

Table 5. Final level partitioning

Parameter	Reachability set	Antecedent set	Intersection set	Level
1	1	1,6	1	VII
2	2	1,2,6,7	2	IV
3	3	1,2,3,6	3	III
4	4	1,4,6,8	4	V
5	5	5,9,10,11	5	III
6	6	6	6	VIII
7	7	7,9,10,11	7	IV
8	8	1,6,8	8	VI
9	9	9,10,11	9	V
10	10	10,11	10	VI
11	11	6,11	11	VII
12	12	1,2,3,4,5,6,7,8,9,10,11,12	12	II
13	13	1,2,3,4,5,6,7,8,9,10,11,12,13	13	I

Table 6. Conical matrix and ranking driving power and dependency

Parameter	13	12	3	5	2	7	4	9	8	10	1	11	6	Driving power	Ranks
13	1	0	0	0	0	0	0	0	0	0	0	0	0	1	VIII
12	1	1	0	0	0	0	0	0	0	0	0	0	0	2	VII
3	1	1	1	0	0	0	0	0	0	0	0	0	0	3	VI
5	1	1	0	1	0	0	0	0	0	0	0	0	0	3	VI
2	1	1	1	0	1	0	0	0	0	0	0	0	0	4	V
7	1	1	1	0	0	1	0	0	0	0	0	0	0	4	V
4	1	1	0	0	1	0	1	0	0	0	0	0	0	4	V
9	1	1	0	1	0	1	0	1	0	0	0	0	0	5	IV
8	1	1	0	0	0	0	1	0	1	0	0	0	0	4	V
10	1	1	0	1	0	1	0	0	1	1	0	0	0	6	III
1	1	1	1	0	1	0	1	0	1	0	1	0	0	7	II
11	1	1	0	1	0	1	0	1	0	1	0	1	0	7	II
6	1	1	1	0	1	0	1	0	1	0	1	1	1	9	I
Dependency	13	12	5	4	4	4	4	2	4	2	2	2	1		
Ranks	I	II	III	IV	IV	IV	IV	V	IV	V	V	V	VI		

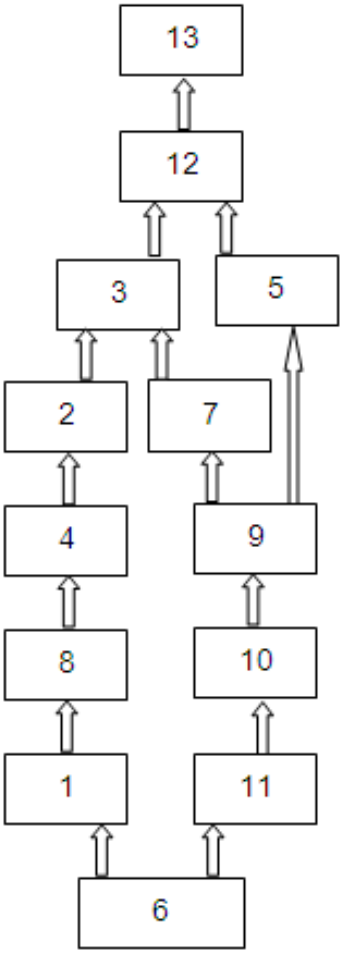

Fig. 2. Digraph

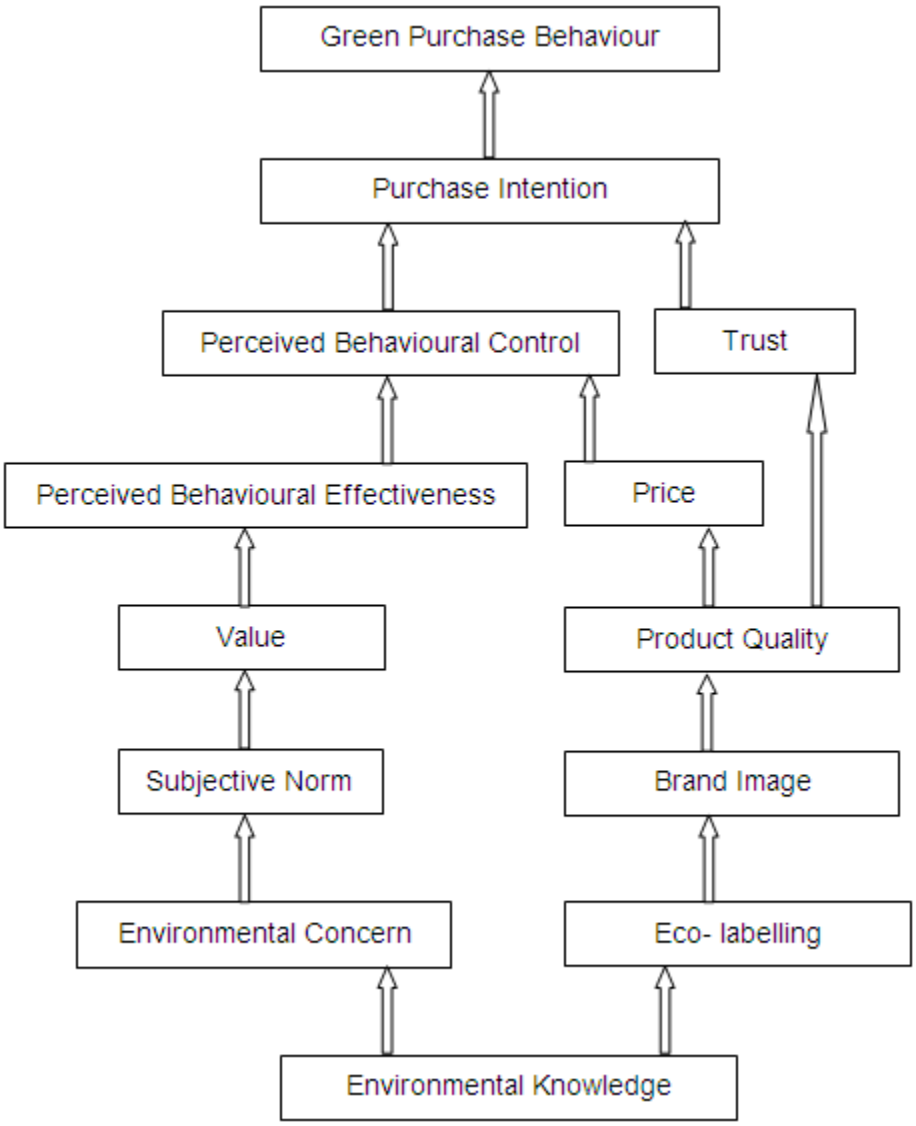

Fig. 3. ISM model for improving green purchase behaviour

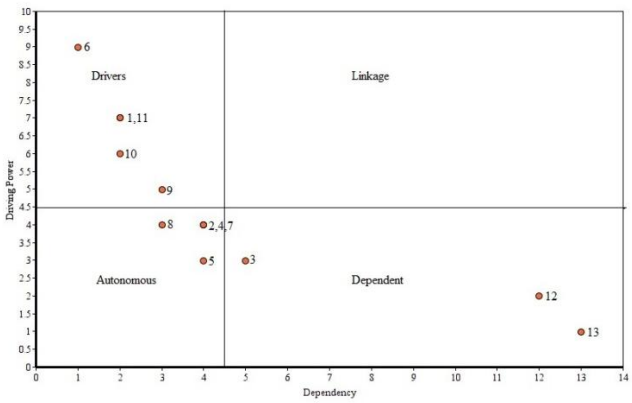

Fig. 4. Cluster of factors influencing green purchase behaviour

3.4 Conical Matrix

Conical matrix was constructed by clustering factors at the same level throughout the rows and columns of final reachability matrix. Driving power and the dependency was then calculated from the reachability matrix. Driving power of an element is the total number of elements (including itself), which it may help achieve. Dependence is the total number of elements (including itself), which may help achieve it. Next, the highest ranks were given to the factors that have the most ones in the rows and columns, respectively, to determine drive and dependent power ranks.

3.5 Digraph for Interpretive Structural Modeling

The graphic representation of the elements and their interaction is called a digraph. The preliminary digraph with transitive linkages was constructed from the conical form of the reachability matrix. It is made up of nodes and edge lines. After the indirect links were removed, a final digraph was generated. The final digraph for the given parameters is shown in the Fig. 2.

3.6 Interpretive Structural Model

By replacing the nodes of the factors with statements, digraph (Fig. 2) was transformed into an ISM model. Links between various factors has been given in the ISM model (Fig. 3). Environmental knowledge occupied the lowest position in the hierarchy. It shows that environmental knowledge is the basic factor influencing green purchase behaviour which leads to environmental concern and knowledge on eco- labelling. Eco-labelling is a major factor which establishes the quality of product and brand image which in turn affects the price thus determining the capacity of an individual to buy a product. Perceived behavioural control is the capacity of an individual to do a given behaviour. Thus, price has a significant influence on perceived behavioural control. Subjective norms, values and perceived consumer effectiveness were tending to be the factors affecting individuals in purchasing green products. These factors are highly subjective and differ with each individual. Trust is another major factor which refers to the belief on the environmental performance of the product by the customers. Trust comes when a product remains consistent in its quality and credible over time. All these factors collectively lead to purchase intention which eventually leads to green purchase.

3.7 MICMAC Analysis

The MICMAC method was developed by Michel Godet and François Bourse. MICMAC analysis is used to cluster the variables based on its driving power and dependency. It is utilised to classify the components and validate the interpretive structural model factors. Figure 4 shows the driver power-dependence diagram. The autonomous, dependent, linkage and independent components are represented by four quadrants in this diagram. All variables are positioned in these parts depending on their respective driving and dependent powers. The first quadrant represents the autonomous factors influencing green purchase behaviour. They have a weak driving power and dependency. Factors such as subjective norms (8), perceived consumer effectiveness (2), values (4), price (7) and trust (5) fall under this cluster. The second quadrant represents variables which are highly dependent and weak drivers.

Green purchase behaviour (13) and purchase intention (12) are highly dependent on other factors whereas perceived behavioural control (3) is moderately dependent. Third quadrant represents linkage factors with strong dependency and driving power. There is no linkage factors which is high in both driving and dependency power. The fourth quadrant indicates the factors which are high in driving power and weak dependency. Factors including environmental knowledge (6), eco-labelling (11), environmental concern (1), brand image (10) and product quality (9) belong to this category.

4. CONCLUSION

In this paper, factors influencing green purchase behaviour were identified by literature review approach. By applying ISM model the linkages between factors have been established. This model helped in precise way of selecting significant factors affecting green purchase behaviour. It is evident from the result that individual factors such as environmental knowledge and environmental concern and situational factors which include eco-labelling, product quality and brand image serve as the major drivers towards green purchase behaviour. Manufacturers of environmentally friendly goods and services should focus on situational

elements. The presence of a green label would improve the brand's image as well as the product's quality. It's a wise practice to mention the advantages of utilising a green product in the packaging. Therefore, manufacturing goods with good quality and credible features will build trust among consumers which further encourage consumers to switch from conventional to green products. For a successful marketing campaign, it is crucial to target the right population. Consumers having high concern towards environment show ethical values and appear to have a positive attitude towards green purchase. Marketers should target these consumers for effective marketing of green products. It is not just the marketers' obligation, but also the government's, to promote green purchasing behaviour among the general people. Thus government and corporate should come forward to educate the general public about the adverse consequences of consuming conventional products and raise awareness about the benefits of going green. This will improve customer knowledge on the environment and the significance of switching to green products. With increased knowledge and responsibility, consumers will gradually move towards purchasing green products thus paving the way towards long term environmental sustainability.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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