Green Awareness Rating Scale (GARS) Development to Extend TAM

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**Abstract:**

Green consumption is one of the key solutions sought by organisations, policy makers and governments to promote sustainability and deal with environmental issues. Surprisingly, in the research discipline sustainability effects of consumer’s green literacy on purchase decision of green product is ignored rather most of the studies address the green feature of product and their impacts on consumer’s perception [1] . This paper is subsequent paper to our previous paper “[Conceptualizing green awareness as moderator in TAM for acceptance of green IS/IT](https://ieeexplore.ieee.org/document/8966710)”. In this paper the green awareness rating scale (GARS) is conceptualised by critically reviewing the existing green literacy scale to develop a scale with more dynamic predictability towards consumer’s green literacy. Development of this scale will help further extending the TAM to test the effectiveness of the model in Green IS/IT adoption study. This paper contributes to the existing knowledge in the science of information systems, study of green/eco scales, mapping users’ intention to adopt Green IS/IT and sustainability by designing green awareness rating scale for users and conceptualising a theoretical framework for a green scale to measure overall green awareness of consumer which later incorporating the scale in Technology Acceptances model to map its role as a moderator.

**Keywords**: Green Awareness, Green Products, Green Consumer, Green Literacy, Adoption, Technology Acceptance Model

**Introduction:**

Green IS/IT has emerged because of mitigating increasing climate change issues. Green is associated with the ability of a technology to be economically effective and resource efficient. Initially the concept of Green IS/IT is treated as a tool to save energy using a combination of technology and information systems [2]. However, the modern concept of Green IT/IS has expanded from merely energy saving namely (Green of IT) to (Green by IT/IS) using IT/IS to carry eco-friendly activities [3], [4]. Green of IT refers to the green characteristics of information technology that helps resource efficient usage e.g. energy saving and recycle ability of information technology throughout its lifecycle, whereas Green by IT/IS means the use of technology in eco-friendly manner to facilitate the change on society to achieve a lower carbon foot print society by maximising resource efficiency and leveraging the responsiveness of technology by incorporating early deserter response systems and real time environmental monitoring to mitigate climate change . With the outspread notion of Green IT/IS has created a need for designers and researchers to identify the factors that affluence the adoption process of Green IT/IS.

Attitude is identified as a strong predictor that derives intention of referent to behave in positive or negative manner towards adoption and usage [5]–[7]. Survey done by the European Commission (2008-2018) to measure consumers’ intention towards adoption of green product consistently reported consumer’s environmental awareness as one of the major influencing factors in forming positive attitude towards sustainability. Mostly studies examined users knowledge and level of information as one single construct as part of user’s motivation to measure intention to adopt green IT/IS [8] and found significantly influencing. They reported that level of information and environmental knowledge of green usage of system can build consumer trust and positive experience towards green information systems. Treating knowledge/awareness as an objective construct may be useful for user’s motivation for traditional system adoption but in case of environmentally friendly IT/IS, consumer’s involvement is very important to understand the green phenomenon and sustainably behave in persuaded manner. Organisational motivational behaviour has been given significant importance however it is essential to identify individual Element that affect Green Information Technology adoption [9], [10] because individual involvement is necessary to protect environment related to Green Information Technology e.g. eco-friendly cars, energy saving desktops, home appliance air conditioner etc. But the level of environmental phenomenon is treated as one objective factor to examine its impact whereas subjective environmental awareness is not only related to the solitude knowledge of systems’ characteristics but also a combination of consumer’s knowledge/information of environmental issues, attitude towards local & global view point of saving the environment at individual level, necessary skills to carry the activities that lead to achieve sustainable goals [11]–[13] and therefore user’s demography can be different based on their level of green awareness and may play a significant role as facilitator if conceptualised by augmenting as a demographic measure in Technology Acceptance Model to measure user intention to adopt and use Green IS/IT. This study emphasises on the role of Green Awareness as a demographic measure in technology acceptance model and identifies the key factors that contribute towards user’s overall green awareness to help designing a scale naming GARS Green Awareness Rating Scale to measure users’ level of green awareness. Further the study conceptualises GARS visualisation as stack bar chart to ease the beneficiaries to dynamically view and differentiate the population with higher and lower level of green awareness for market segments and strategic decision.

Role of green awareness is critically reviewed in user’s decision-making process of technology adoption and usage in our previous paper [1]. Further in this paper critical literature is reviewed to build the insights of green awareness. Further the key factors are identified based on existing literature of user’s environmental awareness/consciousness models and theories to design proposed Green Awareness Rating Scale (GARS) and question items selection

 **Green awareness Models/Theories**

Researchers used several measures to determine a consumer’s state of being environmentally aware and conscious. This includes several theories and models [11]–[13]. According to Partanen-Hertell et al. (1999), awareness is the combination of Motivation, Knowledge and Skills. Three elements comprise several aspects of awareness. The model measures consumers’ attitude, values, level of knowledge and skills to solve environmental problem. Based on this view point the model further revised by Sánchez and Lafuente (2010), the model based on four dimensions with belief of environmental psychological theories. The psychology of this model also supports the decision-making process of Technology Acceptance Model stages. Four dimensions of environmental consciousness defined by model are *Cognitive*, *Affective*, *Dispositional* and *Active*. Cognition is a stage where an individual processes the level of information and knowledge related to environment in decision making process that directly interconnected with affective and dispositional dimensions. Affective dimensions are defined as individual’s pro environmental viewpoint and belief of pursuing solutions to mitigate environmental issues. Dispositional dimensions are related to individual’s personal norms, attitude, and willingness to be inconvenient to practice green activities e.g., paying more for eco-friendly products, adopting habits of saving energy, water, and recycling. Active dimension is about individual’s engagement in environmental organisational collaboration, donation, and degree of agreement of spending personal financial and temporal resources to solve environmental issues [13]. Further, scales related to environmental consciousness are reviewed and it is identified these scales denominated in measuring consumption behaviour whereas consumer’s cognition and actions cannot be ignored when measuring individual’s overall awareness related to environment. Based on Critical literature review the most widely referred scales Webster (1975), Antil (1984), Stone et al. (1995), Straughab & Roberts (1999), Francois-Lecompte & Roberts (2006), Webb et al. (2008) are discussed below. It is found that these scales mainly focused on consumer’s consumption behaviour.

The table shows that how these scales define socially responsible consumers.

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| **Study** | **Scale** | **Concept** |
| Antil (1984) | Socially Responsible Consumption Behaviour (40 items) | *‘consumer’s behaviour and purchases that are motivated by concern of future consequences, social impact related to environment, consumer also concern with personal need satisfaction’* |
| Francois-Lecompte & Roberts (2006) | Socially Responsible Consumption Scale (20 Items) | *Similar to CSR, this scale defines a consumer who is socially responsible will consider the wellbeing of stakeholder related to his or her purchasing impacts’*  |
| Haws et al. (2010) | GREEN Scale (6items) | *‘Green consumer not only converse natural resources but also personal and financial resource and makes a rational decision when purchasing a product’* |
|  Stone et al. (1995) | ECOSCALE (31 items) | *‘Environmentally responsible person not only have environmental knowledge but also get engaged in environmental activities and possess a positive attitude towards environment’*  |
| Straughab & Roberts (1999) | Ecologically Conscious Consumer Behaviour Scale (30 items) | *‘a consumer who demonstrates social concerns with his or her purchase power by positively behaving and purchasing the product that has less or no environmental impact.’* |
| Webb et al., (2008) | Socially Responsible Purchase and Disposal Scale (SRPD) (26 Items) | *‘Consumer who possess a desire of acquisition, usage and disposition of products to minimise and eliminate harmful impact on society to promote long run beneficial impact.’* |
| Webster (1975) | Socially Conscious Consumer(8 items) | *‘a consumer who brings about social changes from his or her environmentally friendly behaviour’*  |

These scales are single factor scales consist of certain number of question items to measure if a consumer is socially responsible towards one’s purchase and consumption. Unlike these scale Stone et al., (1995) scale include factors such as Attitude, Basic Belief, Knowledge/information, Willingness to Act and concluded these factors to be significant in measuring the level of consumer environmental awareness. In this research agenda dimensional approach is adopted due to subject specification to measure referents green awareness level and its impact as a moderator on intention to adopt and use Green IS/IT. The above literature can be summarised in this regard a green consumer should have knowledge/information about environmental issues, personal activity impact, green indictors literacy e.g. eco labels to perceive usefulness of Green IS/IT, pro environmental attitude, willingness to sacrifice personal financial and temporal resources to ensure eco-friendly consumption and engagement or willingness to get engage in environmental activities.

The key element identified for this research agenda are shown below.

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| **Construct** | **Key Argument** | **Reference** |
| **Actions\*** | - Verbal commitment willingness to act.- Personality elements reportedly associated with willingness to act- consumers involvement and commitment represent willingness to act | Bennet (1974); Berkowitz and Daniels (1964); Maloney & Ward (1973); Dunlap & Van Liere (1978); Webb, Mohr, & Harris (2008).Hines et al. (1986); Antil (1984) |
| **Attitude\*** | Attitude is one of the key elements of an individual’s ecological concern. | Dunlap Van Liere( 1978); Jackson (1985); Maloney & Ward (1973); Thompson &Gasteigner (1985); Straughab & Roberts (1999); Kinnear, Taylor, & Ahmed (1974) |
| **Emotional Connection\*** | Degree to which a consumer feels emotionally connected with their environment | Kals, Schumacher,&Montada, 1999;Pansa Müller, Kals, 2009; Stern, 2000;Mayer &Frantz,2004 (Connectedness to Nature) |
| **Green Value** | Green Values defines consumer environmentally consciousness and readiness to response towards environmental problem. | Haws, Winterich, and Naylor (2010). |
| **Knowledge\*** | - Knowledge is considered to be an essential element among other to measure consumer’s consciousness and green awareness  | Maloney and Ward (1973); Stone et al,(1995); Hines, Hungerford, and Tomera (1986) |

**4.2 Knowledge and Awareness**

Green Aware or environmentally conscious person must be knowledgeable about terms and indicators related to environment. Several studies reported Knowledge as a key element to measure consumer environmental consciousness (Maloney and Ward, 1973; Hines, Hungerford, and Tomera 1986; Stone et al., 1995). But knowledge as an isolated factor cannot measure user’s overall environmental consciousness as reported in a study by [14] in which environmental knowledge was examined of Americans who were exposed substantially to environmental information for number of years yet researcher were unable to measure the actual level of knowledge/awareness perceived by public. It is reviewed that studies with meta-analysis of 53 environmental studies at different level identified knowledge as one of most important key elements to measure consumer environmental awareness and level of acceptance of green products [15]. Thus, it can be said that merely knowledge cannot determine the overall level of environmental awareness of individuals but its importance as one of the key factors to measure environmental awareness/consciousness cannot be ignored. Therefore, this study agenda proposes Knowledge as one of the key factors to measure green awareness.

**4.3 Attitude**

Green conscious persons are reported have positive attitude towards environment. In psychology of environmental research Attitude is seen as a determinant of user’s ecological concern. Several studies(Thompson&Gasteigner, 1985; Maloney and Ward, 1973; Kinnear, Taylorand Ahmed, 1974; Dunlap and Van Liere, 1978; Joshi and Rahman, 2015) identified attitude to be the one of the vital among other elements to be present when measuring individual appealing to be environmentally responsible. These studies significantly reported that it is very important for a consumer to have positive attitude towards environment in order to accept green products. Attitude is a determinant of user’s green concern then it is very important to count its significant role as one of the key elements to measure consumer’s green awareness. Thus, this study proposes Attitude as another key element to measure consumer green awareness.

**4.4 Green Consumer Value**

Green consumer value is a very recent concept identified by Haws et al., (2010) and is defined as those who have propensity to conserve the environment by reducing individual impact through their purchase and consumption behaviour. They also identified green consumption value that shows their level of environmental conciseness therefore ready to positively respond towards green products. The study shows the evidence of consumers with stronger green value; tend to make environmentally sustainable consumption decisions. Therefore, this study proposes to include these question items as part of green awareness questionnaire.

**4.5 Emotional Connection and Willingness to Act:**

Environmentally conscious consumers must be emotionally connected to nature and have tendency to act or willingness to act in order to save the environment. Studies identified affective dimensions to measure consumer’s environmental consciousness [13]. Therefore, individual’s affective influence on environmental concern has been explored by many researchers; these dimensions include emotional connection of consumer towards environment [15], [16]. These studies identified that environmentally conscious consumers show their willingness to act to save the environment. Maloney and Ward, (1973) measured willingness to act as a consumers’ verbal commitment to save the environment. Hines et al., (1986) identified that if a consumer desires to act in future claimed to closely associate with individuals’ factors that exhibit environmental responsibility. Therefore, to be environmentally aware, consumer’s verbal commitment should be included to measure overall green awareness.

**4.6 Action Taken:**

Studies identified the individual engagement in eco-friendly activities a measure for environmentally responsible consumer **(**Dunlap and Van Liere, 1978; Bennet, 1974). In a study it is argued that in addition to attitude and knowledge in determining the environmental behaviour also includes the measure of consumer’s actions that one pursues or willing to pursue and consumer’s behaviour is reflected in their past behaviour related to environment. Therefore, when measuring consumer’s green awareness Active Dimension should also be included as part of overall level of green awareness.

1. **Questionnaire Item Selection for GARS**

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| **Constructs**  | **Measurement Items** | **Source Justification** |
| **Knowledge/Awareness** | 1. What the term environmentally friendly product means.
2. What the term eco-labels means.
3. What are the major reasons responsible for Climate Change?
4. What are the current laws and regulations in my country to protect the environment?
5. I can easily interpret the information given on eco-labels.
 | Items 1-3 are adopted from (Taufique et al., 2014) who used ECOSCALE of (Stone et al., 1995) to measure the knowledge dimension, item 4-5 are proposed for the study due to their extensive reference in multiple studies on current environmental related issues |
| **Attitude** | 1. It is important to me that the products I use do not harm the environment.
2. I consider the potential environmental impact of my actions when making many of my decisions.
3. I would describe myself as environmentally responsible.
4. I am willing to be inconvenienced in order to take actions that are more environmentally friendly.
 | (Barden et al,. 2010) GREEN Scale (Haws et al,. 2010) reported be highly reliable internal consistency of alpha .85. |
| **Emotional Connection and Willingness to Act** | 1. I feel my connection to nature and responsibility to save it.
2. I am willing to be a member of environmental group.
3. I strive to learn more about environmental issues.
4. I would be willing to choose green product over non green product if available.
 | (Muller et al., 2009) originally used by Kals Schumacher and Montada 1999, (alpha = .86), willingness to act adopted form Ramly 2012 with Alpha = .90 |
| **Involvement/Actions** | 1. I have switched products for ecological reason.
2. I try hard to reduce the amount of energy i use.
3. I encourage my family & friends to buy energy efficient appliance.
4. I always read eco-labels of product to make an environmentally friendly decision.
 | Adopted from Ecologically Conscious Consumer Behaviour scale used by Rebert (1996a) and Staughan and Roberts (1999) |

Referring to out previous paper this scale can further be used to extend the TAM and can be quantified. The framework is as followed



Fig1. Conceptual Framework for Green Technology Acceptance Model incorporated with GARS ([Sultana et al., 2019](https://ieeexplore.ieee.org/document/8966710))

1. **Conclusion and Future Work**

A critical literature is reviewed on factors affecting consumer’s adoption for Green IS/IT. It is not very easy for designers to convince users to adopt however they take the approach of identifying the potential barriers influencing consumer adoption of green technology that can be subject or object related. For this purpose, many factors have been identified and examined by several acceptance theories but in green specific case subjective green literacy rate cannot be ignored and should be examined for its significance role as consumer’s demography in Technology Acceptance Model (TAM). Focusing on the adoption of such technology that is positioned as sustainable or can be perceived with sustainable benefits, we derived that consumer’s intention towards green IT/IS acceptance can be increased or decreased depending on the level of green literacy rate of users. This research touches the study areas of environment, user behaviour and IS/IT adoption. Two potential contribution of research framework are expected.

* Understanding Green Awareness Level of users for IS/IT acceptance and usage and societal degree of green awareness.
* Understanding user’s overall green literacy including attitude towards environmental situation, environmental knowledge to understand green indicators, and willingness or active to sacrifice personal and financial resources in their purchase decision for technology.

The proposed Green-Technology Acceptance Model (G-TAM) has a wider validity. G-TAM is not limited to test the technology that is positioned as Green IS/IT but also to persuasively designed technology that may be not positioned as green IS/IT but can influence consumer’s attitude towards sustainable behaviour e.g., smartphones, wearable, AI voice assistance (smart speakers), health related information systems and technologies etc. We further identify the method of designing the elements to measure proposed moderator “Green Awareness” with existing literature review as a scale to rate users based on their environmental literacy with combination of social and psychological dimensions. The study offers future opportunity to empirically test the role of green awareness as moderator and if the moderation role is significantly proven then this study can be used in many applications of sustainability, technology acceptance and environmental literacy. To empirically test the model, primary data can be supplemented using questionnaire tool. Confirmatory factor analysis, linear regression can be used to analyse the significance value of factors and combine variance of proposed key factors. Practitioners can utilise the study to measure and rate referents based on their level of environmental education. The proposed study is limited because of no empirical evidence of conceptual framework. The identified constructs can or cannot be equally important in different subject areas.

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