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Entropy Method to Analyze the Impact of Eco-Friendly Consumer Attitudes on Green Brand Intention: Apple Brand Consumers

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ABSTRACT

The present study seeks to investigate the impact of environmental friendly consumers' attitude on green brand intention. Based on literature review and identified gaps the study proposed an integrated theoretical model. To empirically test the proposed model this study collected data from 384 individual customers of questionnaire survey method. The study utilized Structural Equation Modeling (SEM) technique to statistically analyses measurement and structural models. The results show the positive effect of variables (environmental concern, attitude to environment, green brand quality and empirical satisfaction on green brand) on green purchase intention and negative impact of variable (environmental knowledge) on green purchase intention is.

1 Introduction

Today, consumers have knowledge and awareness and are aware of the importance and necessity of the environment. Therefore, their environmental concerns are increasing day by day, which reduces the environmental impact of the products and services provided [29,34,41]. Also, The Recent decades have witnessed accelerated growth of environmental problems in various sections of the world giving rise to high pressures on companies. The importance of this subject has given rise to an enormous amount of research since the early 1970s; the research focuses primarily on environmental issues in the local markets [15,16,33]. With increasing environmental concerns

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from consumers, governments and different communities around the world, they have begun to develop environmentally friendly programs such as green product development, green brand and green technology [40]. Chen and Chai [7] research and Joshi & Rahman [28] some of the serious consequences of environmental vulnerability are attributed to global warming and increased environmental pollution. On the other hand, other researchers such as [14] consider environmental pollution as a result of human production and consumption, which have been repeatedly made by active organizations in the field as a threat to humanity [14,16]. In the evaluation of the eco-friendly consumer attitudes on green brand intention, there might be a large number of criteria, all of which, if taken into account, may lead to incorrect results and make the evaluation difficult. Therefore, using the entropy method, the most effective ones can be selected for assessment [53]. The results of the entropy method can be further applied to compare and rank the alternatives in view of eco-friendly variables [18-27,50,53].

In the EU, according to the 2013 Eurobarometer, 26% of consumers frequently purchase eco-friendly products and 54% purchase them occasionally. These numbers could be growing, as in 2015 nearly 75% of millennials were reported to be interested in paying more for eco-friendly products [42,54]. Gonçalves [17] reported that consumer household purchases were responsible for 40% of the environmental damage. Consumers possess the capability to prevent or decrease environmental damage by purchasing green products. Iran, like many countries around the world, has a high level of air pollution, Poor water quality, high volumes of traffic-related noise pollution, and high levels of non-disposable waste and rapid depletion of energy sources. Environmental problems are mainly caused by abnormal consumerism and unstable activities. By making small changes in lifestyle and consumption habits, everyone can make a valuable contribution to the movement. Considering brands as determinants for consumers in their consumption behavior, and consumers' brand experiences as important inputs for green brand management are a must for how brands play an environmental role.

We introduce how consumers' brand experiences of environmental friendliness. Business brands can contribute to sustainable development. The scope of a green brand can add a unique selling point to a product and enhance the company image. However, if a company is found or realizes that it is overstating its green performance, its green brand can provide a competitive advantage.

Therefore, according to the issues raised, the main question in this study is: What is the attitude of eco-friendly consumers towards the intention to buy the Apple Green brand?

2 Conceptual Model and Research Hypotheses

Branding and Sustainability: The last decade witnessed the Green brand expansion and environmentally friendly business strategies [14,16,61]. On the other hand, environmental pollution caused by human production and consumption is one of the issues that have been repeatedly posed by organizations active in the field as a threat to humanity [15]. As such, the green brand should provide benefits to the more environmentally aware consumers. To be able to succeed, the green brand needs to offer a significant eco-advantage over other brands and be aimed at consumers that are willing to value the environmental issues [56].

Green marketing: Green marketing is also known as sustainable marketing, organic marketing, eco-friendly marketing, environmental marketing, nature-friendly and ecological marketing [12,60,62-64]. An organization's efforts to design, promote, price and distribute products for Environmental Protection [6, 10,11,16, 47]. "Environmental" green marketing and the focus shifted on clean technology that involved designing of innovative new products, which take care of pollution and waste issues. Phase was "Sustainable" green marketing [2,39,65]. Green marketing process responsible for identifying, anticipating and satisfying the requirements of customers and society, in a profitable and sustainable way [45,46,67].

Green Purchase Intention: attitudes, judgments, and comparisons between specific objects and situations [17]. Green purchase intention is the desire or interest of consumers to consume products or services that have little impact on the environment. This means that there is a desire from consumers to consume products or services that are not harmful or environmentally harmful [52].

Green purchase: green purchase Behavior is extracted as an act whereby consumers Consume products that give benefit to the environment and respond to care for the environment [52].

Functional values: Tong et al. [58] considers convenience and price as functional values and the social, emotional, epistemic, and conditional values by studying electronic directory services [17].

Environmental Concern: Tremendous economic expansion has led to the overuse and Depletion of natural resources, which in turn has attracted global attention on environmental concerns [9,44]. Owing to the rising global warming in the world, consumers are more concerned about environmental issues [8,9]. So transforming the competitive pattern of contemporary markets and prompting corporations to think in a "greener" way [65]. Consumers with great environmental concern show a high willingness to buy green brands and participate in environmental protection activities [64].

Environmental Knowledge: Environmental knowledge is important in producing ecological behaviours because an individual must know what type of actions to take. Thus, environmental knowledge is an intellectual prerequisite to performing ecological behavior [43]. Awareness of environment is the extent to which consumers realized and know about the environment, efforts and support has done to the problem of the environment and or the initiative of the to contribute personally to find a solution for the environment. Knowledge of conduct an environmentally friendly constitutes the principal component the internal factor that could lead to a change in attitude somebody to keep more friendly for the environment [57]. With enviromental knowledge, consumers' willingness to high pay for products with green or organic labels [27,48,54,58].

Attitude towards the Environment: Customers' overall attitudes toward a brand can be referred to as customers' evaluations of a particular brand in general, expressed as a dimension of favor or disfavor (good or bad). Such attitudes are determined by customers' subjective values or beliefs regarding a brand [27,38,59].

Green Brand Quality: Chan and Baum [54] conceptualize experiential quality as consumers' affective responses to the psychological benefits they want from a buying experience. With the important of environmentalism, not only have consumers become more willing to purchase green products that enerate minimum impact, but also society is becoming more concerned about the environment [62-64].

Green Brand Experience: Brakus et al. [5] define brand experience as consumers' internal subjective and behavioral responses induced at different levels of interaction, both direct and indirect, with brand-related stimuli [63]. Brand experience is created when customers use the brand [55]. Brand experience as the sensations, cognitions, and behavioral responses that green brand-related stimuli evoke (brand-identifying colors, shapes, typefaces, background design elements) [4-7,13-18]; and that are part of a brand's design and identity, packaging, communications, quality, image, beliefs, attitudes and environment. These stimuli mean that brand experience is subjective, and also evokes internal consumer responses and behavioral responses [35].

Green Brand Experiential Satisfaction: satisfaction is the overall evaluation of the purchased eco-friendly or green products or services based on previous experiences [62-64]. Green experiential satisfaction is extended from the concept of service satisfaction; experiential satisfaction focuses on consumers' overall evaluation of experiences after consumption. Therefore, from the experiential perspective, experiential satisfaction is the satisfaction experienced from the service content under a specific transaction. Customers will compare the experience with prior expectations after consumption, and generate cognitive consistency or cognitive dissonance. The emotional responses based on cognitive consistency or dissonance form the results of satisfaction or dissatisfaction [62].

Table 1: Influence of effective variables; Reference: (Research Findings)

Source	Sub-criteria under each criteria	The main purpose of the research
Environmental Concern	Behavior Intention	[2,7,19,34,48,52,63]
Environmental Knowledge	Green Purchase	[3,5,8,17,32-41]
Green Brand Experience	Green Brand Switching Behavior	[54,63]
Experiential Quality	Experiential Satisfaction	[62]
Experiential Satisfaction	Green Brand Switching Behavior	[63]
Green Brand Experience	Experiential Satisfaction	[5]

Environmental Knowledge	Green Brand Attitude	[25,27]
Green Purchase Intention	Green Purchase Behavior	[25,52]
Green Brand Attitude	Green Brand Purchase	[18,63]

So the author presents her research conceptual model based on the above-mentioned theories, as fallow:

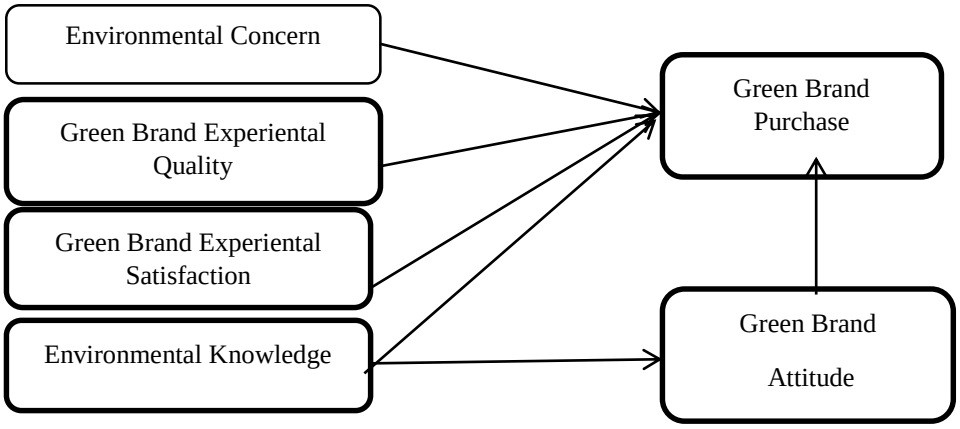

Fig.1: Conceptual Model; Reference: (Research Findings)

3 Entropy Method

Entropy is known as an objective weighting approach based on the dispersion of information and is used in various fields such as information theory, statistics, and transportation models [53]. This method is based on measuring each criterion's amount of provided information to decision-makers. The fact that a criterion is assigned more weight that contains more information than other criteria. In such a case, this criterion introduces more discriminating power in the decision-making process. Accordingly, the results of the Entropy method can be used as the relative importance (weight) of the criteria [50]. The steps of the Entropy approach for measuring the criteria's weights are stated as follows:

First, consider the following decision matrix. In this decision matrix, m alternatives $A_1, \dots, A_m$ are evaluated based on n criteria $C_1, \dots, C_n$ and the value of x_{ij} indicate the score of alternative A_i over the criterion C_j.

	C_1	$\cdots$	C_n
A_1	x_{11}	$\cdots$	x_{1n}
$\vdots$	$\vdots$	$\ddots$	$\vdots$
A_m	x_{m1}	$\cdots$	x_{mn}

Next, the decision matrix is normalized according to (1).

$$n_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}}; \quad i = 1, \dots, m, \qquad j = 1, \dots, n \tag{1}$$

After that, the Shannon's entropy e_j *for the criterion* C_j is computed by (2).

$$e_j = -\frac{1}{\ln m} \sum_{i=1}^{m} n_{ij} \ln n_{ij}\,; j = 1, \dots, n \tag{2}$$

Where $n_{ij}.\, ln\, n_{ij}$ is defined as o if $n_{ij} = 0$. Then, the degree of diversification for the *criterion* C_j is denoted by d_j and is defined as $d_j = 1 - e_j$. Finally, the weight of the j^{th} criterion is computed using (3).

$$w_j = \frac{d_j}{\sum_{t=1}^{n} d_t}; j = 1, \dots, n \tag{3}$$

Given that the entropy technique is used to indicate degrees of uncertainty or changes in the amount of information, it can be seen that the richer (weaker) the information, the lower (higher) the degree of uncertainty, and as a result, the entropy value is lower (higher) [24-29].

4 Previous Research Studies

Indriani et al [25] research titled the Influence of Environmental Knowledge on Green Purchase Intention the Role of Attitude as Mediating Variable. The findings of this study signify that Environmental Knowledge have no significant direct effect on consumers' Green Purchase

Intention. More important, Attitude is found to have a full mediation effect on the relationship of Environmental Knowledge and green Purchase Intention.

Wu et al [62] research titled the role of environmental concern in the public acceptance of autonomous electric vehicles: A survey from China. The results indicate that green perceived usefulness, perceived ease of use and environmental concerns have a positive relationship with people's intentions to use AEVs. Environmental concern poses a powerful indirect effect on using intention through mediating effects. Implications for improving the public acceptance of AEVs and suggestions for further research are given correspondingly in this study.

Kumar et al [32] research titled Purchasing behavior for environmentally sustainable products: A conceptual framework and empirical study. First, the attitude towards environmentally sustainable products mediates the relationship between environmental knowledge and purchase intention. Next, this mediated relationship is moderated by the environmental knowledge. Third, the subjective norm is not significantly related to the purchase intention - contrary to established findings - in a collectivistic culture considered in this study. And last but not the least, the direction of subjective norm as a moderator on relationship between environmental knowledge and attitude is not supported. The findings of this study offer some important guidance for marketing theory, retailing practices for environmentally sustainable products and public policy. Prakash & Pathak [49] research titled Intention to buy eco-friendly packaged products among young consumers of India: A study on developing nation. The finding of the study confirmed that purchase intention towards ecofriendly packaging is significantly influenced by personal norms, attitude, environmental concern and willingness to pay. The paper also provides interesting insights about young consumers towards eco-designed packaging. These useful insights will helpful to marketers in developing the focused strategies towards young consumers and encourage them to reduce the global ecological footprint of packaging.

Jeong et al [27] research titled the impact of eco-friendly practices on green image and customer attitudes: An investigation in a café setting. The results suggest that the perception of green practices affects customers' perceived green image of a restaurant which in turn influences customers' attitudes toward a restaurant. Second, the study identifies recyclable take-out containers, recycling waste, and energy-efficient lighting as the key green practices that contribute to the formation of customers' perceptions of a restaurant's green image, but only across ecologically conscious customers. Wu et al [62] research titled what drives green brand switching

behavior? The results indicate that green brand experiential risk, green brand cognitive dissonance, green brand experiential quality and green brand experience influence green brand experiential satisfaction. In addition, green brand experiential satisfaction has an impact on green brand switching intentions, which, in turn, positively influence green brand switching behavior. Also, Saari et al [54] Research titled Eco-Friendly Brands to Drive Sustainable Development: Replication and Extension of the Brand Experience Scale in a Cross-National Context. The study presents a consumer-focused measure of sustainable development that could be used to track how consumers perceive the eco-friendliness of brands. The paper links consumer experiences that guide sustainable consumption behavior to the macro-level management of sustainable development. This paper extends previous research on brand experience measurement by testing cross-nationally a scale including a dimension for measuring eco-friendliness. The brand experience measurement scale could aid companies in tracking the success of their sustainable development initiatives on the brand level. Rahmi et al [52] research titled Green brand image, green awareness, green advertisement, and ecological knowledge in improving green purchase intention and green purchase behavior on creative industry products. Result shows ecological knowledge affects green purchase intention, but the green brand image, green awareness, and green advertisement have no effect on the increase in the green purchase intention. Green purchase intention can increase in consumer green purchase behavior. It implies that the creative industry should continue to improve the quality and knowledge of the consumer, so the competitive advantage will be achieved.

Kautish & Dash [30] research titled environmentally concerned consumer behavior: evidence from consumers in Rajasthan. The major finding of the study is consumers living in rural areas are well aware about the environmental movement but probably marketers have not fully explored the potential for environmental friendly products. The study strongly argues that organizations should leverage on rural market opportunity in India. It confirms the need to tailor marketing mix for rural markets for determining behavioral dimensions of consumer decision making. Ahmad et al [1] research titled Consumer's Intention to Purchase Green Brands: the Roles of Environmental Concern, Environmental Knowledge and Self Expressive Benefits. The results of this research show that environmental concern, environmental knowledge and self-expressive benefits would positively influence attitude which in turn positively influences intention to purchase green

brands. The influence of consumer's knowledge of the environment on purchase intention was found to be non-significant.

4. Materials and Method

4.1. Method

This research is applied in terms of its purpose and non-experimental in terms of its implementation and the research design is based on factor analysis and structural equations methods. The study population includes: Apple Brand Consumers in 2018. Thus the statistical population is of unlimited type, which according to Morgan table is a sample of 384 persons. The questionnaire was sent to each of these companies for consumers by electronic tools, attached to a letter aimed at demonstrating the usefulness of the results of this study. In some cases, personal meetings were used to encourage participation. A total of 334 questionnaires were returned. Required and proprietary information was collected by using field method. In this regard, in order to measure the impact of world green marketing strategies and their impact on green export operation, the researcher made questionnaire was used. Cronbach's alpha coefficient (α = .88) was used to calculate the reliability of the questionnaire. Finally, this research data analysis was carried out by statistical characteristics like charts, frequency tables, percent, structural equations test, factor analysis and SPSS and Smart PLS software, on two descriptive and inferential levels. The average value of the extracted variance is always greater than .4 and composite reliability value is also greater than average extracted variance. So the convergent validity is also confirmed. After examining the fitting of the tested pattern, the results of the research hypothesis testing are presented.

5 Research Findings

Based on the results of measurement model, factor loadings in all cases have acceptable value (above .3), that shows there is an appropriate correlation between observed variables and hidden variables related to them. So it can be concluded that each major variable has been measured correctly and given the findings from this scale the research hypothesis can be tested. The research model was evaluated based on the optimal values of the fit indices, which are presented in Table (2).

Table 2: The Results of the Structural Model; Reference: (Research Findings)

Symbol	Model Estimation	Symbol	Model Estimation
(NFI)	0/89	(RMR)	0/070
(NNFI)	0/93	(GFI)	0/86
(CFI)	0/94	(AGFI)	0/82
(IFI)	0/94		

According to the values obtained in the table, the present research model shows excellent fit and is approved.

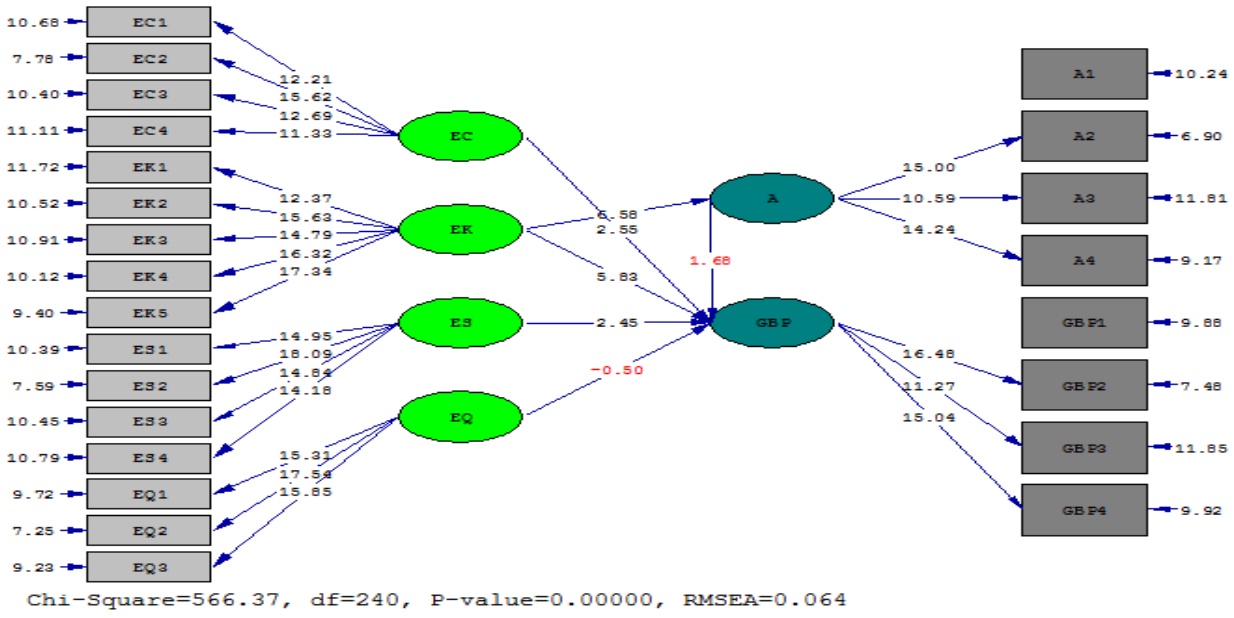

Fig. 1: T-statistic coefficients; Reference: (Research Findings)

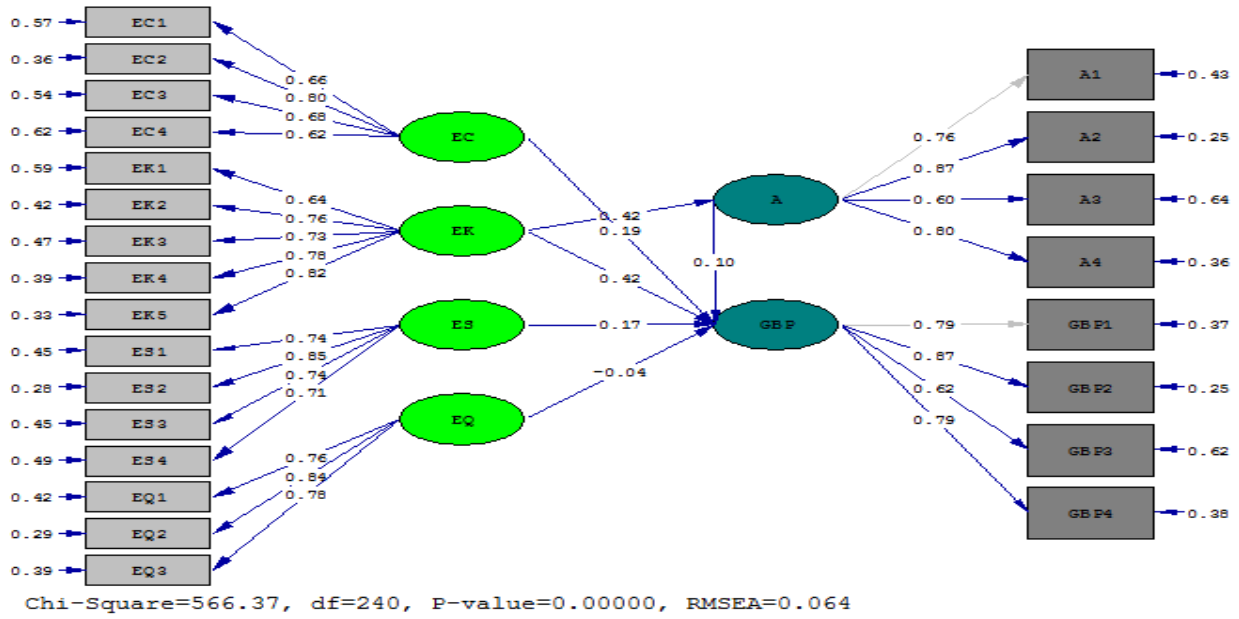

Fig. 2: Factor load coefficients; Reference: (Research Findings)

Table 3: λ Coefficient values and and t-statistic; Reference: (Research Findings)

Variables	Observed Variables	λ	t
Environmental Concern	EC1	0.66	12.21
	EC2	0.80	15.62
	EC3	0.68	12.69
	EC4	0.62	11.33
Environmental knowledge	EK1	0.64	12.37
	EK2	0.76	15.63
	EK3	0.73	14.79
	EK4	0.78	16.32
	EK5	0.82	17.34
Green Brand Experiental Satisfaction	ES1	0.74	14.95
	ES2	0.85	18.09
	ES3	0.74	14.84
	ES4	0.71	14.18
Green Brand Experiental Quality	EQ1	0.76	15.31
	EQ2	0.84	17.54
	EQ3	0.78	15.85
Green Brand Attitude	A1	0.76	-
	A2	0.87	15.00
	A3	0.60	10.59
	A4	0.80	14.24
Green Brand Purchase	GBP1	0.79	-
	GBP2	0.87	16.48
	GBP3	0.62	11.27
	GBP4	0.79	15.04

Table 4: The Entropy results

Variables	E(j)	D(j)	Weight	Rank
GBP1	0.990631	0.009369	0.035714	17
GBP2	0.991588	0.008412	0.032067	21
GBP3	0.989578	0.010422	0.039726	14
GBP4	0.990924	0.009076	0.034597	19
EK1	0.989571	0.010429	0.039755	13
EK2	0.991805	0.008195	0.03124	23
EK3	0.990005	0.009995	0.0381	16
EK4	0.989671	0.010329	0.039374	15
EK5	0.989315	0.010685	0.040729	12
A1	0.987814	0.012186	0.046451	7
A2	0.983942	0.016058	0.061212	1
A3	0.991644	0.008356	0.031851	22
A4	0.986631	0.013369	0.05096	4
EC1	0.98571	0.01429	0.05447	3
EC2	0.985644	0.014356	0.054724	2
EC3	0.987547	0.012453	0.04747	6
EC4	0.98787	0.01213	0.04624	8
EQ1	0.99141	0.00859	0.032743	20
EQ2	0.992383	0.007617	0.029036	24
EQ3	0.990871	0.009129	0.034797	18
ES1	0.986992	0.013008	0.049583	5
ES2	0.989176	0.010824	0.041258	11
ES3	0.987979	0.012021	0.045823	9
ES4	0.988961	0.011039	0.042079	10

Results of the entropy method are summarized in Table 4. In this table, the weights of variables alongside their rank positions are provided. We can see the variables A2, EC2, and EC1 are the most important variables. Additionally, Fig. 1 illustrates the importance of variables. According to Fig. 1, the variable EQ2 is recognized as the least important variable among all.

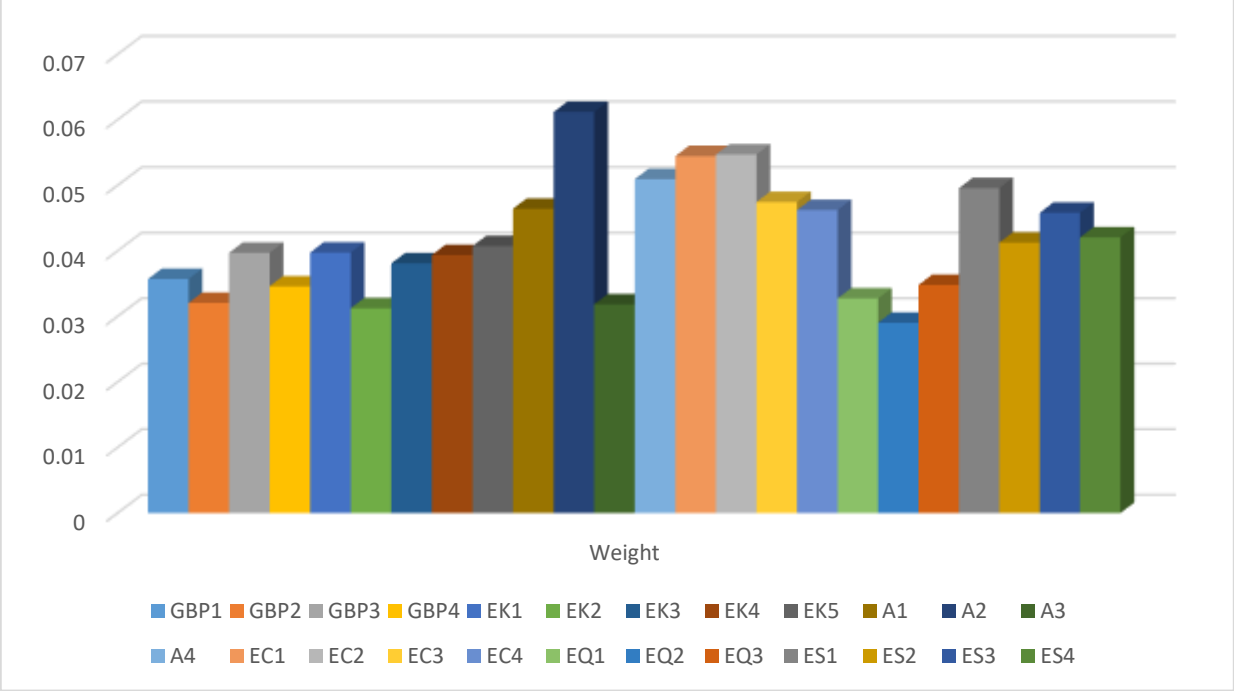

Fig. 1: The results of Entropy method

6 Conclusions

The findings showed that environmental concern had a positive effect on green purchase intention. The results of this hypothesis are supported by researches [1,2,3,30,49,63]. Because consumers' environmental concerns are causing them to gradually change their purchasing behavior, many consumers are willing to pay more for products that meet environmental standards in order to truly protect the environment. Environmental concerns have little importance in influencing consumers' awareness of environmentally conscious behaviors. Concerned about environmental issues, consumers pay close attention to environmental protection and natural resources and this is reflected in their attitudes. The results of the second hypothesis test showed that environmental knowledge had a positive effect on green purchase intention. The results are consistent with [25, 30, 32, 45, 56, 62]. Environmental knowledge includes consumer beliefs about key aspects of the environment that come in two forms, first that consumers need to be educated to understand the environmental impacts, and second, that the products are produced in an environmentally friendly manner. To raise consumer awareness.

Because consumers' knowledge of environmental issues affects their green purchasing decision, it may be influenced by other moderating factors as well. The results of the third hypothesis test showed that green brand empirical satisfaction had a positive effect on green purchase intention. The results are consistent with the researches by [5,62,63]. Green skepticism prompts consumers to seek more information about the green product. Accordingly, environmental organizations should make continuous efforts to decrease perceptions of green brand skepticism, because lower perceptions of green brand skepticism will lead to favorable perceptions of green brand experiential satisfaction. The results of the fourth hypothesis test showed that the empirical quality of green brand did not have a positive effect on green purchase intention.

The results are not consistent with the research by Wu & Ai [62], also the results of the fifth hypothesis test showed that environmental knowledge has a positive effect on green brand attitude. The results of this hypothesis are supported by researches [25,27]. To increase perceptions of green brand experiential satisfaction, environmental organizations should build an awareness which enables consumers to realize that using green branded products will protect our environment. In finally the results of the sixth hypothesis test showed that green brand attitude did not have a positive effect on green purchase intention. The results are not consistent with the research by Hamdi et al. [18] and Wu et al. [62]. According to research, attitudes are based on the criteria of whether or not the values of environmental issues are useful through judgments based on the value, cognition, awareness and logic of individuals in relation to environmental issues. Consumer beliefs indicate to what extent they can solve environmental problems through their efforts. On the other hand, quality can provide value to customers by providing a rational reason for purchasing, and by differentiating the product or brand from competing companies, it can enhance product quality in order to gain competitive advantage. On the other hand, satisfaction with the performance of a product or brand in meeting the needs, wants and expectations of customers reflects the degree of overall satisfaction perceived by the customer. According to the results of study, the following managerial implications can be stated:

- Environmental organizations should allow consumers to believe that using green branded products is the right decision to buy products.
- To satisfy consumers' demands for green products, environmental organizations must provide an interesting environmental experience to engage with environmentally friendly behaviors when using branded products.

The current study has the following limitations and future researches:

- Future studies can try to add or modify more variables to expand the scope of this study and enhance accuracy.
- This study conducted random sampling of consumers who had purchased Apple brand products. However, most surveyed respondents did not fully understand the reasons they switched from one green branded product to another.
- This study focuses only on the effect of green brand attitude on green brand intention experiential satisfaction and effect factors on green brand intention. This study focuses solely on the attitude of the green brand and the intention to buy the green brand. Future studies may try to examine what factors drive green brand experiential risk, such as consumer innovativeness, green brand image, and green experiential trust.

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