

ASSESSING CONSUMER PROPENSITY FOR ENERGY-EFFICIENT PRODUCT ADOPTION

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ABSTRACT

This study educates about the behavioural intention of consumers in energy-efficient products. Consumer's knowledge, confidence of consequences and environmental awareness was taken in account which establishes the belief, attitude and eagerness of environmental awareness respectively to predict the behavioural intention of consumers in energy-efficient products. For this purpose, quantitative research study was conducted and a questionnaire was developed for data collection. A survey was conducted through convincing sampling technique and 248 respondents from six different age groups were analyzed. Analysis of collected data was run through SPSS and PLS-SEM. Result shows that different factors impact the behavioural intention of consumers, that directly or indirectly influence purchase decision of energy efficient products. This study is practical for growing firms in energy efficient products sector. It is also represents clean environmental feature of using energy efficient products and positive affect of belief, attitude and environmental safety on behavioural intention Future concern for this study is to collect data in big cities if Pakistan.

Key Words: Consumer knowledge, Confidence, Environmental Awareness,

INTRODUCTION

Global climate has rapidly changed in sense it highly received media coverage as for their usage of consumer efficient products actively and their mindset also changed to consume these products in more efficient way. The interest of consumers has increased toward energy-efficient products to the problem of sustainability in research that has also looked at energy-efficient products which has ranged from organic solar energy systems and hybrid cars (Jamil et al., 2022). In developing countries like Pakistan growth is mainly dependent on the resources that are naturally accessible and has made swift growth of energy-efficient products both in rural and urban areas. The consumer is now more aware of their spending patterns and for environment-friendly products. Most developed countries have been relatively alarmed by environmental decline and how it shapes their economies and policies (Clapp & Dauvergne, 2011).

Wells, Ponting, and Peattie (2011) suggest that consumers exhibit a propensity to modify their consumption behaviors toward environmentally sustainable practices, propelled by heightened awareness of climate change and environmental concerns. This heightened awareness is attributed to consumers' increased consciousness regarding their consumption patterns and safety precautions. The widespread integration of energy-saving technologies, such as solar energy systems and LED lighting, by corporations not only conserves energy resources but also fosters the advancement of a low-carbon economy. However, the adoption of energy-efficient appliances, albeit beneficial, is hindered by their higher cost compared to conventional counterparts, exacerbated by limited consumer awareness. Thus, incentivizing consumer motivation to invest in energy-efficient products and enhancing their market penetration emerge as pivotal strategies

for conserving energy and mitigating emissions (Słupik, Kos-Łabędowicz, & Trzęsiok, 2021). Energy efficiency, fundamentally, entails achieving the same level of service or functionality while minimizing energy consumption.

Researchers have observed a steady increase in global demand for environmentally friendly products, particularly energy-efficient items. Companies are progressively introducing energy-efficient products both for consumer use and for their operational purposes. Underscoring the importance of understanding environmental issues affecting consumer attitudes and their purchase intentions regarding energy-efficient products. Numerous studies have established a direct relationship between consumption patterns and environmental concerns (Bhutto, Soomro, & Yang, 2022). Therefore, the primary objective of this study is to investigate consumer attitudes toward environmental issues and their intentions to purchase energy-efficient products. Additionally, the study aims to assess the willingness of consumers to pay a premium for environmentally-friendly products.

In today's context, there is a growing awareness that energy consumption contributes significantly to environmental degradation, including climate change and the depletion of natural resources used for energy production. Consumers are increasingly conscious of environmentally friendly products and prefer companies that prioritize environmental sustainability. This heightened awareness stems from a desire to address the environmental impact caused by companies that neglect environmental concerns. Understanding consumer attitudes towards environmental issues and their purchase intentions regarding green products is crucial due to the intrinsic link between consumer perceptions and energy-efficient product adoption (Ali, Ullah, Akbar, Akhtar, & Zahid, 2019).

Presently, consumers exhibit heightened awareness of green products and demonstrate a willingness to pay a premium for environmentally friendly alternatives. Some consumers actively avoid patronizing companies that do not prioritize eco-friendly practices. Concurrently, companies are increasingly embracing green marketing strategies, positioning themselves as purveyors of eco-conscious products, aiming to garner consumer trust and loyalty (Gabler, Itani, & Agnihotri, 2023).

The principal aim of this research is to investigate consumer attitudes and purchasing behaviors

concerning energy-efficient products across various demographic segments. Moreover, the study aims to enhance comprehension of consumer purchasing behaviors related to eco-friendly energy efficient resources and provide managerial insights for companies aiming to introduce such products to the market. This research contributes to the existing body of literature on energy-efficient products in three key ways. Firstly, it applies the framework of the theory of reasoned action to the context of energy-efficient purchases. Secondly, it focuses on developing a comprehensive understanding of consumer attitude formation towards green and energy-efficient products. Thirdly, the study incorporates factors such as knowledge and beliefs regarding energy-efficient products, confidence in the outcomes of using such products, environmental awareness, and willingness to engage in environmental activities. To further elucidate environmental engagement, the subjective norms component will be examined to enrich the findings effectively.

Problem statement:

Consumer knowledge plays a pivotal role in shaping purchasing behavior toward environmentally-friendly products. Companies employ various strategies, asserting that consumers can enhance their safety by using eco-friendly products. This study contends that within the context of the formation of consumer attitudes, environmental sustainability, and objective knowledge serves as a significant contributor towards energy-efficient products. Energy-saving products promoted as modern advancements and efficient devices are anticipated to reinforce consumer confidence by following the Theory of Reasoned Action (TRA). Increased awareness about green products fosters stronger convictions regarding their benefits and a more balanced assessment of their impact (Roy, 2023). Consumers exhibit a propensity to alter their behaviors predominantly driven by environmental and societal considerations. Researchers utilize diverse measurement scales to assess consumer apprehensions regarding environmental issues. Environmental concern encompasses sentiments encompassing climate change, awareness of clean and alternative energy sources, and endeavors toward energy conservation (Stefanelli et al., 2019). Hartmann and Apaolaza-Ibañez (2012) provide evidence of the direct and indirect effects of

environmental concern on consumer willingness to purchase green electricity at a premium price.

The acceptance of energy-efficient products and adoption of energy-saving behaviors within households is influenced by a diverse array of concepts from psychology, sociology, anthropology, demographics, and economics. The concept of the energy-efficiency gap posits that consumers tend to heavily discount future energy savings, resulting in the devaluation of their present value and affecting their perceived likelihood of energy-saving actions. Numerous studies like (Akroush, Zuriekat, Al Jabali, & Asfour, 2019; Liao, Shen, & Shi, 2020; Takahashi, Duan, & Van Witsen, 2018) have investigated the influence of information accessibility and energy awareness on intentions toward energy conservation. The awareness of energy-efficient products is closely associated with consumer behavior, contingent upon existing knowledge regarding the benefits derived from utilizing such products, notwithstanding their price (Akroush et al., 2019).

The primary aim of this study is to discern the principal determinants influencing the purchase of energy-efficient products, which subsequently impact decision-making and environmental values. Subjective norms have been identified as a significant predictor of green purchasing behavior, with cultural influences driving both norms and attitudes. The choice of variables in this investigation derives from the Theory of Reasoned Action (TRA), which asserts that beliefs arise from the knowledge or perceived truth held by individuals. Within the context of decision-making research, confidence is delineated as an individual's conviction in the correctness of their judgment or the anticipation that forthcoming events will unfold as expected (Fenton-O'Creevy, Tuckett, & Science, 2022). As discussed earlier, both belief and confidence are psychologically classified as akin perceptions. However, the level of confidence denotes the depth to which a consumer perceives that a product effectively addresses a tangible issue—in this instance, environmental benefits. Hence, confidence ought to be interpreted as an evaluation of consequences within the Theory of Reasoned Action (TRA) (Doane, Kelley, & Pearson, 2016).

Research objectives:

- Investigate the association between consumer knowledge and behavioral intentions, confidence of consequences and behavioral intentions,

environmental awareness and behavioral intentions, knowledge and belief, confidence of consequences and attitude, environmental awareness and eagerness for environmental engagement, belief and behavioral intentions, attitude and behavioral intentions, eagerness for environmental engagement and behavioral intentions.

- Explore the mediating role of belief in the relationship between knowledge and behavioral intentions.
- Investigate the mediating role of attitude in the relationship between confidence and behavioral intentions.
- Examine the mediating role of eagerness for environmental engagement in the relationship between environmental awareness and behavioral intentions.
- Assess the moderating influence of subjective norms on the relationship between environmental awareness and behavioral intentions.

Research Questions:

- RQ1: Is there a significant relationship between consumer knowledge and behavioral intentions, confidence of consequences and behavioral intentions, environmental awareness and behavioral intentions, Knowledge and Belief, Confidence of Consequences and Attitude, Environmental awareness an eagerness of environmental engagement, Belief and Behavioral intentions, Attitude, and Behavioral intentions, the eagerness of environmental engagement and behavioral intentions?
- RQ2: Is there any mediating effect between belief on knowledge and behavioral intentions?
- RQ3: Does any mediating effect between attitude on confidence and behavioral intentions?
- RQ4: Does any mediating effect between eagerness of environmental engagement on environmental awareness and behavioral intentions?
- RQ5: Does any moderating effect between of subjective norms on environmental awareness and behavioral intentions?

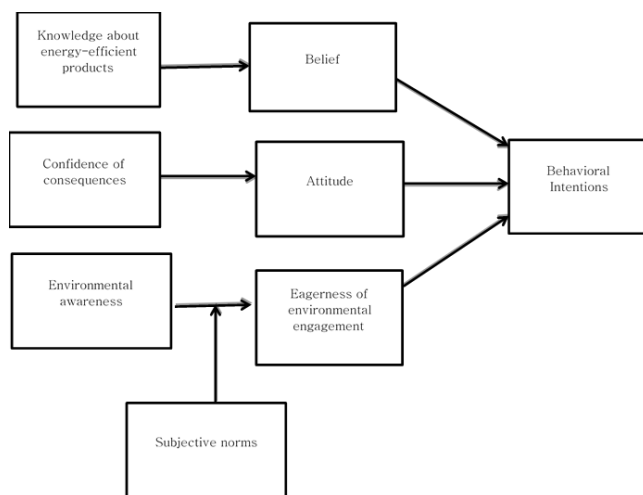
Literature review:

Theoretical background

According to the Theory of Reasoned Action (TRA), an individual's actions are determined by their behavioral intention, which is influenced by their attitude toward the behavior and subjective norms. (Hagger, Cheung, Ajzen, & Hamilton, 2022) conducted a meta-analysis, finding that measures of attitude, subjective norms, and perceived behavioral control account for between 40% and 50% of the variance in intentions, with behavioral intentions explaining 19% to 38% of the variance.

The Theory of Planned Behavior (TPB) is extensively employed in the analysis and prediction of human behaviors, particularly within environmental domains such as energy-saving practices, low-carbon commuting, environmental innovation, and green purchasing behaviors. Moreover, the Theory of Reasoned Action (TRA) has found application in investigations concerning green purchasing behavior, underscoring its pertinence in elucidating consumer behavior within the realm of environmental conservation (Hagger et al., 2022). Considering the parallelism in consumer purchasing behavior exhibited towards both energy-saving appliances and green products, TPB offers a robust theoretical underpinning for examining consumers' propensity to invest in energy-saving appliances.

Theoretical framework



1: Consumer knowledge

In the realm of consumer behavior, knowledge assumes a pivotal role in influencing how individuals obtain, structure, and evaluate information about products and services. Numerous examinations on the strength of attitudes underscore the substantial impact of knowledge on the depth of attitudes held. Typically, robust attitudes emanate from a thorough and intricately organized knowledge base, acting as an informational bedrock that shapes individuals' reactions toward the subjects of their attitudes(Lengnick-Hall, Beck, & Lengnick-Hall, 2011).

2: Belief

Consumers' general attitude towards an object is shaped by their beliefs, which often mirror the readily accessible evidence regarding product characteristics, thereby contributing to individuals' psychological comfort(Wen Wan, Peng Chen, & Jin, 2017).

3: Attitude

Attitude is defined as "a cognitive and affective state of readiness, which guides an individual's response to various objects and situations encountered." It encompasses individuals' inclinations and disinclinations, and consumers commonly ground their product procurement choices on their environmental attitudes (Schwarz & Bless, 2020) . We hypothesize that particular convictions regarding the outcomes of energy-efficient products will shape specific attitudes toward environmentally sustainable products.

4: Confidence

A multidimensional construct of consumer self-confidence is delineated, characterizing it as an individual's ability to feel secure in their decisions and actions within the marketplace. Confidence denotes a subjective evaluation of one's competence in developing favorable expertise as a consumer in this domain (Lind et al., 2020). This suggests that consumer self-confidence encompasses various facets beyond mere certainty in decision-making, extending to aspects such as knowledge acquisition, decision-making skills, and adaptability to market dynamics(Collen, 2022).

5: Environmental Awareness

Environmental awareness encompasses an individual's comprehensive grasp of facts, concepts, and interconnections concerning the natural environment and its elements. Several studies have highlighted that heightened environmental awareness and expanded knowledge regarding eco-friendly products correlate positively with attitudes toward purchasing behavior and consumption levels (Rusyani, Lavuri, & Gunardi, 2021). This suggests that individuals who possess a deeper understanding of environmental issues and eco-friendly alternatives are more inclined to adopt environmentally conscious behaviors in their consumption habits (Carrete, Castaño, Felix, Centeno, & González, 2012).

6: Subjective norms

Individual perceptions, known as subjective norms, denote an individual's interpretation of the expectations held by significant others regarding their behavior. Essentially, subjective norms encompass the perceptions assimilated from our surroundings, which sway us towards either participating in or refraining from specific actions or behaviors. This implies that our behavior is influenced not only by our personal beliefs and attitudes but also by the perceived social pressures and expectations from those around us (Al-Swidi, Mohammed Rafiul Huque, Haroon Hafeez, & Noor Mohd Shariff, 2014).

7: Eagerness of environmental engagement

Robust subjective norms associated with participating in environmental behaviors would bolster consumer enthusiasm if they perceive that such actions would benefit the present environment. The degree of enthusiasm for environmental engagement correlates positively with subjective norms (Chen & Chen, 2021).

8: Behavioral intentions

The anticipated fostering of behavioral intentions is attributed to subjective norms and environmental motivations. In essence, subjective norms encapsulate an individual's perception of societal expectations regarding their actions, while environmental motivations signify the drive stemming from concerns about ecological well-being. Together, these factors are anticipated to shape individuals' inclinations towards certain

behaviors, particularly those aligned with environmental conservation efforts (Goldman et al., 2020).

Hypothesis:

H1. A significant relationship exists between consumer knowledge and behavioral intentions regarding energy-efficient products.

H2. There is a significant relationship between confidence of consequences and behavioral intentions.

H3. A significant relationship exists between environmental awareness and behavioral intentions.

H4. The relationship between knowledge about energy-efficient products and belief is significant.

H5. There is a significant relationship between confidence of consequences and attitude.

H6. Environmental awareness significantly correlates with the eagerness of environmental engagement.

H7. The relationship between belief and behavioral intentions is significant.

H8. A significant relationship exists between attitude and behavioral intention.

H9. The relationship between eagerness of environmental engagement and behavioral intention is significant.

H10. Belief serves as a mediator in the relationship between knowledge and behavioral intentions.

H11. Attitude mediates the relationship between confidence and behavioral intentions.

H12. Eagerness of environmental engagement mediates the relationship between environmental awareness and behavioral intentions.

H13. Subjective norms moderate the relationship between environmental awareness and eagerness of environmental engagement.

Methodology:

In this study, population would take 18 and sample size is 248 questionnaires would filled by different type of respondent. Sampling technique will design as convincing technique. Quantitative method will use to collect data. In quantitative data collection method will survey method. In this study, research instruments will use structured questionnaires. The data analysis technique would be Structured Equation Modeling. For the evolution of data, the software would be used Smart PLS 3 and SPSS for the analysis of demographics.

Data Analysis:

Demographics:

This section provides an overview of the demographic characteristics of the respondents.

Examination of the respondent profile reveals a diverse array of attributes including age, gender, marital status, employment status, family income, and educational background.

Statistics		Age	Gender	Marital Status	Employment	Family Income	Education
N	Valid	248	248	248	248	248	248
	Missing	0	0	0	0	0	0

Table 1.1 for profile of the Respondents

Characteristics	Frequency	Percent (%)	Cumulative (%)
Age			
18-25	105	42.3	42.3
26-35	79	31.9	74.2
36-45	54	21.8	96
46-55	7	2.8	98.8
56-65	2	0.8	99.6
>65	1	0.4	100
Total	248	100	
Gender			
Male	105	42.3	42.3
Female	143	57.7	100
Total	248	100	
Marital. Status			
Single	146	58.9	58.9
Married	101	40.7	99.6
14	1	0.4	100
Total	248	100	
Employment			
Full time	74	29.8	29.8
Part time	5	2	31.9
Self-employed	12	4.8	36.7
Student	138	55.6	92.3
Retired	19	7.7	100
Total	248	100	
Family. Income			
Below 50000	88	35.5	35.5
50000-100000	106	42.7	78.2
101000-200000	22	8.9	87.1
Above 200000	32	12.9	100
Total	248	100	
Education			
High School	3	1.2	1.2
Secondary School	21	8.5	9.7
Bachelor Degree	33	13.3	23
Masters Degree	127	51.2	74.2
Doctorate degree	64	25.8	100
Total	248	100	

Measurement Model:

Analysis of the measurement model involves assessing the validity and reliability of the measures used in a study. It examines how well the chosen variables represent the underlying constructs or concepts of interest. This analysis typically includes evaluating the relationships between observed variables and latent constructs, assessing the

appropriateness of measurement scales, and examining the consistency and accuracy of the measurements (Clark & Watson, 2019). Overall, the measurement model analysis helps researchers ensure that their measures effectively capture the intended constructs and provide trustworthy data for subsequent analyses.

Table 1.2 Outer loading:

	SN	AD	BI	BL	CD	EG	EA	KN		
AD1		0.525								
AD2		0.861								
AD3		0.826								
AD4		0.798								
BI1			0.9							
BI2			0.9							
BL1				0.374						
BL2				0.857						
BL3				0.749						
CD1					0.851					
CD2					0.735					
CD3					0.787					
EA1							0.723			
EA2							0.811			
EA3							0.734			
EG1						0.798				
EG2						0.772				
EG3						0.765				
KN1								0.662		
KN2								0.684		
KN3								0.781		
KN4								0.768		
SN1	0.653									
SN2	0.712									
Construct Reliability and Validity:										
Subjective norm					0.5	0.541	0.732	0.413		
Attitude					0.7	0.767	0.845	0.584		
Behavioral intentions					0.8	0.828	0.914	0.842		
Belief					0.4	0.565	0.715	0.478		
Confidence of consequences					0.7	0.71	0.835	0.628		
Eagerness of environmental engagement					0.7	0.676	0.822	0.606		
Environmental awareness					0.6	0.628	0.8	0.573		
Knowledge					0.7	0.738	0.816	0.527		

Discernment Validity:

	SN	AD	BI	BL	CD	EG	EA	KN	
Subjective norms	0.6								
Attitude	0.5	0.764							
Behavioral intentions	0.4	0.356	0.918						
Belief	0.4	0.331	0.185	0.692					
Confidence of consequences	0.6	0.593	0.483	0.351	0.792				
Eagerness of environmental engagement	0.4	0.578	0.531	0.432	0.57	0.779			
Environmental awareness	0.4	0.545	0.442	0.35	0.466	0.513	0.757		
Knowledge	0.4	0.287	0.296	0.568	0.35	0.494	0.315	0.726	

Structure Model:

Path coefficient:

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ((O/STDEV))	P Values
attitude -> behavioral intentions	0.1	0.086	0.087	0.93	0.176
belief -> behavioral intentions	-0	-0.06	0.071	0.89	0.187
confidence of consequences -> attitude	0.6	0.598	0.047	12.637	0
eagerness of environmental engagement -> behavioral intentions	0.5	0.511	0.077	6.679	0
environmental awareness -> eagerness of environmental engagement	0.4	0.405	0.061	6.586	0
knowledge about energy-efficient products -> belief	0.6	0.576	0.051	11.062	0
subjective norms -> eagerness of environmental engagement	0.3	0.296	0.068	4.225	0

Mediation Results:

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ((O/STDEV))	P Values
confidence of consequences -> attitude -> behavioral intentions	0	0.052	0.053	0.911	0.181
knowledge about energy-efficient products -> belief -> behavioral intentions	-0	-0.035	0.041	0.875	0.191
environmental awareness -> eagerness of environmental engagement -> behavioral intentions	0.2	0.207	0.045	4.563	0
subjective norms -> eagerness of environmental engagement -> behavioral intentions	0.1	0.152	0.042	3.459	0

Confidence interval bias corrections:

	Original Sample (O)	Sample Mean (M)	Bias
attitude -> behavioral intentions	0.1	0.085	0.004
belief -> behavioral intentions	-0	-0.058	0.005
confidence of consequences -> attitude	0.6	0.6	0.007
eagerness of environmental engagement -> behavioral intentions	0.5	0.511	0
environmental awareness -> eagerness of environmental engagement	0.4	0.405	0.004
knowledge about energy-efficient products -> belief	0.6	0.574	0.007
subjective norms -> eagerness of environmental engagement	0.3	0.297	0.01

R values:

	R Square	R Square Adjusted
Attitude	0.352	0.349
Behavioral intentions	0.288	0.28
Belief	0.322	0.319
Eagerness of environmental engagement	0.333	0.327

Predictive relevance Q values:

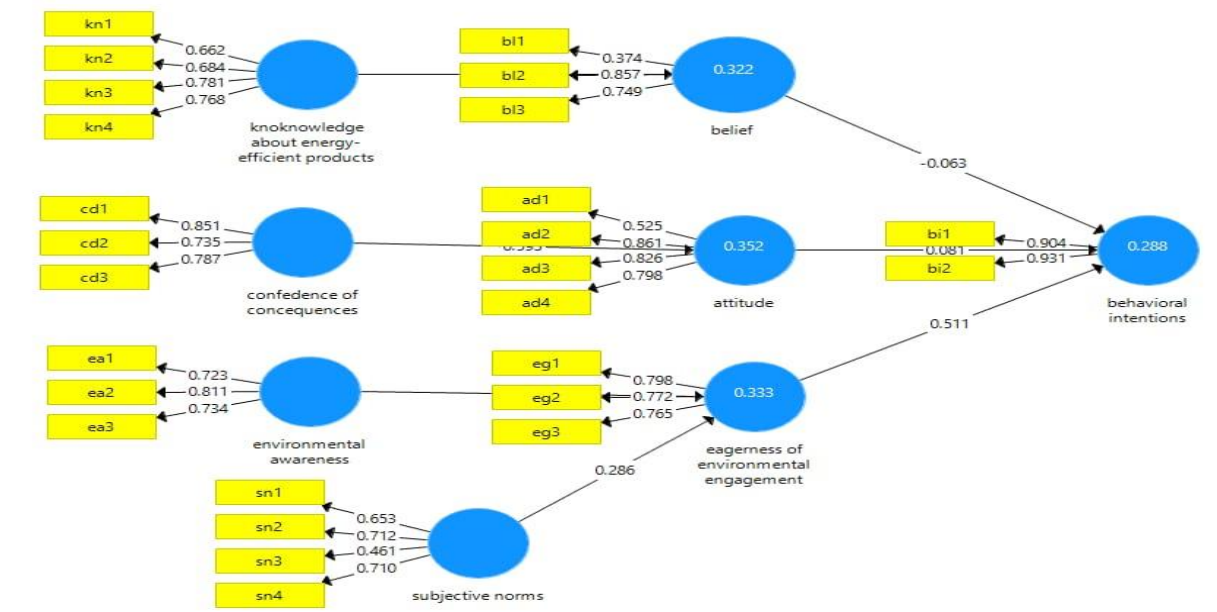
	SSO	SSE	Q ² (=1-SSE/SSO)
attitude	992	801.503	0.192
behavioral intentions	496	384.82	0.224
belief	744	637.087	0.144
confidence of consequences	744	744	
eagerness of environmental engagement	744	603.739	0.189
environmental awareness	744	744	
knowledge about energy-efficient products	992	992	
subjective norms	992	992	

Discussion and conclusion:

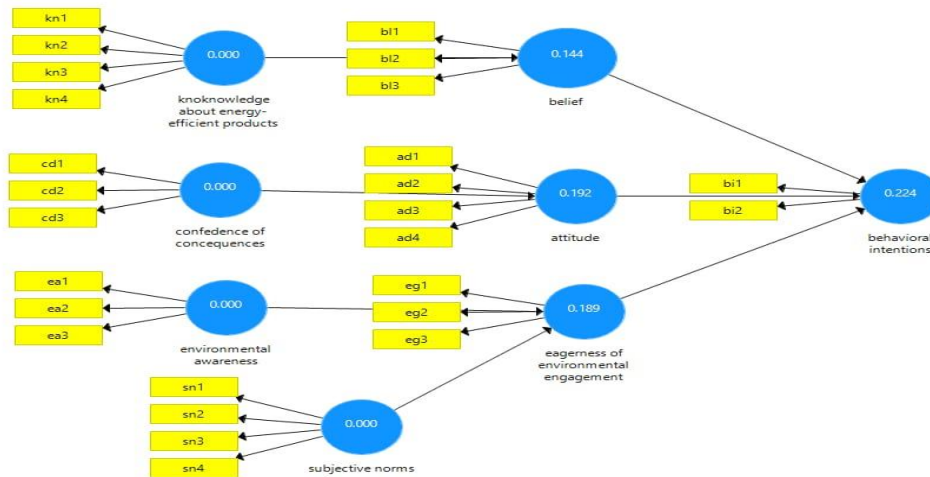
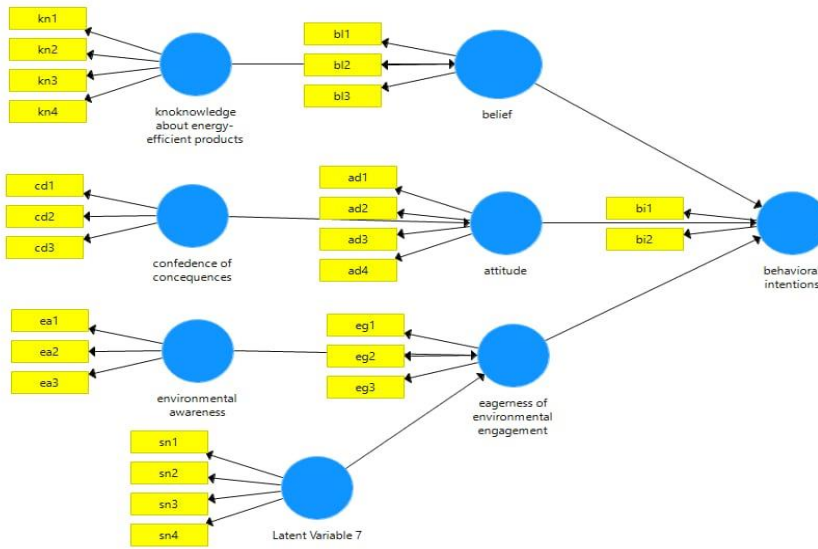
In this study, we examined that the customer purchase intentions depend on different factor which are directly and indirectly influence on purchase

decisions regarding energy-efficient products. In energy-efficient products customer intentions calculations is done by Structured Equation Model in measurement and structure model.

Measurement model:



Structure model:



This study will draw an important contribution for the companies which are now moving towards energy efficient products to improve energy security and reduction of the price risk for energy consumers. The aims of the study will contribute the body of research both theoretically and empirically. This study will be relevant for today's environment because climate changes are increasing day by day. Environmental awareness will be used as a predictor of subjective norms. Belief about energy efficient products being considered and confidence of consequences are tested as predictors of attitude toward energy efficient products.

This study assesses the impact of energy efficient products on the electricity consumption of the Pakistan sectors by using electricity end use data. This study will help consumers how their purchase intentions are changed for eco-friendly and energy efficient products. That's why environmental awareness would be used for subjective norms to change the environmental eagerness. This research will result in some implications that may help in formulating strategies for energy-efficient production and as well as for the consumer purchase intention.

It is important that in future energy efficient products will have greater demand and growth potential in markets. Using energy-efficient product is also a social trend like subjective norms in prior rating. Companies can also create awareness about energy saving attitude of consumer regarding energy-efficient products to increase their brand image and their positive impact to environment.

Customers are more aware about company policies and also for their safety measures. Therefore customers want more information to purchase energy-efficient products. Customers require more reliable and valid data about energy-efficient products from the companies which are claiming that they produce eco-friendly products for the customer. This article also helpful for the companies which are producing energy-efficient products, they must keep in view that toady customer is more informative and more knowledgeable. Customer beliefs also change according to their experience which we analysis in smart PLS software that how customer behavioral intention effect their purchasing in term of energy-efficient products.

This study is conducted in particular area of Pakistan which are too small sample size to determine the customer intentions regarding energy-efficient products. In future study will conducted in larger population to judge more reliability and validity of energy-efficient products.

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