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An Analysis For Determination Of The Factors Influencing Consumer Purchase Behaviour Towards Solar Energy Products.

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Abstract:
Solar energy products are an increasingly popular way to reduce your carbon footprint. Consumers have developed a greater interest in the potential environmental impact this technology has on their habits and the earth, as well as their pocketbooks. This study analyzes consumer buying behaviour and the importance of factors influencing purchasing solar energy products in order to develop strategies for increasing demand. The study has considered a sample of 236 respondents from Pune District who have purchased solar energy products in the past one year. The findings of the study reveal that the major decision of the consumers to purchase solar energy products is dependent on the reliability and service offered by the installers and dealers. The socio-economic factors like financial stability, employment status are also significant. The study has concluded that if consumers are provided with adequate information about the solar energy products, have convenient purchasing options (installation, service) and if they see it as an investment in their future, then this would definitely increase buying behaviour.

Keywords: Consumer behaviour; Socio-economic factors; Environment; Solar energy products.

1. Introduction

It is predicted that the solar power market share in India will increase by USD 240.42 billion between 2021 and 2026, at a compound annual growth rate of 35.24%. Solar power is experiencing significant growth in India as a result of increasing investments in renewable energy, although other factors, such as the presence of other energy sources, may impede the market's development. Based on the historical data, the researcher has identified the key market drivers and the COVID-19 pandemic impact on the Indian solar power market. Deducing end goals and refining marketing strategies will be easier through the holistic analysis of drivers. Increased investments in renewable energy are driving solar power market growth in India. Over the past two decades, global energy mixes have changed significantly. The energy supply and demand have been balancing due to improvements in energy efficiency. Global investments in renewable energy have increased due to low carbon emissions from renewable energy sources and growing environmental concerns. During the forecast period, the solar power market in India will grow as the country's focus on renewable energy sources increases.

The solar energy technology has grown as an environmentally friendly and cost effective method of generating electricity. Solar energy is a form of renewable energy which is not depleting like fossil fuels and nuclear fuels. So, this will achieve the goal of sustainable development. In India, even though the solar installations has increased in recent

years but it is yet to bring down the electricity bill. There is an urgent need to study consumer buying behavior in solar energy products and find out some of the influencing factors on it so that we can develop strategies for increasing its demand in an effective manner (Abhede et al., 2010; Shrivastava, 2011; Verma & Gaurav, 2010).

2. Review of Literature

Jain et al. (2016) discuss the demand for energy and the importance of analyzing it. They recommend an analysis of the factors influencing household energy demand and they make a case for a framework based on sustainable development, which includes four pillars:

One: Socio-economic factors, which include financial stability, employment status, education levels and housing standards.

Two: Environmental factors such as climate change, urbanization, modernization and land use.

Three: Technological innovations such as information technology adoption in policy making and monitoring of pollution trends.

Four: Energy supply including oil security and social instability.

In their report, Shrivastava (2011) discuss some of the factors influencing consumer buying behavior like demographic characteristics and previous purchasing experiences. They consider that the environment, technology and policies are also playing a role. It states that electricity consumption is influenced by factors such as employment status, energy consumption, comforts in life and housing standards (Motzkin& Chang, 2011). Motzkin& Chang (2011) have studied the effect of information on demand for solar technologies in Germany. They mention that many European countries have started to implement solar technologies which gives impetus to the research agenda. There is a need to adopt comparative research methodologies due to variable nature of solar energy products (Motzkin& Chang, 2011).

Chen (2021) have analyzed the consumer buying behavior of solar energy products in Taiwan. They have also stated that there are three intrinsic factors, which influence the purchasing decision of solar energy: trust, convenience and interest. The study was conducted in Taiwan. In Taiwan, the retailers give additional information about the products which increases product trust and there is a government tax incentive for solar related products, which enable retailers to keep prices low (Chen, 2011).

In India, Govt. has announced that by 2022 all new houses shall be constructed having solar water heating panels but there are less than 0.02% of houses in India having solar energy systems installed (Bhattacharya et al., 2016). There is a need to increase the awareness among consumers about the positive impact of installing solar energy systems on their environment and financial gains (Bhattacharya et al., 2016).

Mishra et al. (2021) have studied the consumer buying behavior for solar energy products in Gujarat, India. They have stated that in India, due to the variations in fair price and interest rates, the financial stability of buyers is a critical factor influencing their decisions. Also, lack of education about energy consumption and high number of people without a bank account play an important role as it influences the decision making process (Mishra et al., 2021). Mishra et al. (2021) have analyzed a survey conducted in Gujarat, which reveals that the major factors influencing buying decisions are: trust on salespersons and well-maintained vehicles. Also they consider purchasing habits while considering purchase behaviour influenced by demographic characteristics and previous purchasing experiences (Mishra et al., 2021).

Kumar et al. (2017) have studied the consumer buying behavior for solar energy products in India. They have also considered that there is a high demand for solar energy products in rural areas, especially unorganized and semi-urban areas. They have also stated that buyers are willing to pay a higher price for renewable energy products as it supports the national policy of using renewable energies as well as motivate the government to develop more sustainable policies and schemes (Kumar et al., 2017).

Another study was done by Krishnan (2016) analyzing the influence of socio-economic factors on consumer buying behavior. He has also mentioned that in India, the government is encouraging use renewable energy, which will be

beneficial for the sustainable development and energy security and it will reduce poverty, improve solid waste management and improve urban environment (Krishnan, 2016).

Subramani et al. (2017) have analyzed the impact of various socio-economic factors on solar energy product. They have also stated that there is a need to take immediate steps to reduce electricity consumption by focusing on usage patterns at various locations including using smart meters. It is also necessary to promote solar energy products and its demand (Subramani et al., 2017).

Nath et al. (2018) have surveyed the consumers regarding solar energy product adoption in India. They have found that financial constraints (high cost of products and lack of capital) are affecting the adoption of solar energy products in urban areas. Also, they have stated that people's awareness level about solar energy product is low. They make a case for the manufacture of low cost, easy to install and maintainable solar systems which can be made available at subsidized rates using government schemes combined with promotional campaigns (Nath et al., 2018).

Overall, there is paucity of research on the consumer behavior on solar energy product and it is necessary to document the difference in buying behavior of consumers who have some knowledge about renewable energy as compared to those who know nothing about this subject. Adopting a comparative research methodology can help in understanding the impact of various socio-economic factors on consumer buying decisions.

3. Objective and hypothesis for the Study

3.1. Objective

To analyse the factors influencing consumer decision making while purchasing solar energy products.

3.2. Hypothesis

H1: Reliability, after sales service and support, convenience in purchasing, awareness, long term benefits and ease of use have a direct impact on the buying decisions of the consumers who have purchased solar energy products.

4. Methodology

Following methodology was designed for the study to collect primary data.

a. Identify a sample of 236 customers from Pune District, using convenience sampling who have purchased solar energy products in the past one year.

b. Design and validate a (minimum 10-point) questionnaire for ascertainment of

- Reliability
- After sales service and Support
- Convenience in Purchasing
- Awareness
- Long term benefits
- Ease of Use

c. Seek responses on a 5-point agree-disagree scale

d. Conduct the survey

e. Summarize the responses

f. Apply correlation and regression analysis and check the model fit.

g. Analyze the results

The study was conducted across Pune District.

Scheme formed for testing of hypotheses

a. Responses were collected under 2 sections:

First section of the questionnaire was dedicated to the profile information of the consumers.

Second section: Reliability, After sales service and Support, Convenience in Purchasing, Awareness and Long term benefits, Ease of Use and actual purchase behaviour were considered.

b. For each of the sections an average was calculated.

c. Percentages to questions under a particular section of the questionnaire were averaged to get a single score for that section,

d. The section-wise average score was considered for the purpose of conducting a regression analysis.

e. P-values were calculated, and the null hypotheses was checked for rejection or non-rejection.

Cronbach's alpha score for the questionnaire was calculated the results have been discussed in the next section of the paper.

5. Results and Discussion

Table 1. Questionnaire Validity

Sr. no	Factor	Number of Items	Cronbach's Alpha
1	Reliability	12	0.821
2	After sales service and Support	11	0.713
3	Convenience in Purchasing	10	0.821
4	Awareness	10	0.760
5	Long term benefits	13	0.787
6	Ease of Use	10	0.756
7	Purchase behaviour	5	0.728

The above table shows that the values of Cronbach's alpha was above 0.7 in each of the cases. This shows the level of internal consistency and proves the validity of the measures that have been calculated.

Table 2.Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Ease of Use, Awareness, Reliability , Convenience in Purchasing, Long term benefits, After sales service and Support[b]	.	Enter

a. Dependent Variable: Purchase behaviour

b. All requested variables entered.

Table 3. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.710[a]	.504	.491	.63298

a. Predictors: (Constant), Ease of Use, Awareness, Reliability , Convenience in Purchasing, Long term benefits, After sales service and Support

The second table generated is a linear regression test in SPSS and is called 'Model Summary'. It provides details about the characteristics of the model. In the present case, Ease of Use, Awareness, Reliability , Convenience in Purchasing, Long term benefits, After sales service and Support were the main variables considered. The model summary table is as follows:

b. Predictors: (Constant), Ease of Use, Awareness, Reliability, Convenience in Purchasing, Long term benefits, After sales service and Support.

R-value represents the correlation between the dependent and independent variable. A value greater than 0.4 is taken for further analysis. In this case, the value is 0.710, which is significant.

R-square shows the total variation for the dependent variable that could be explained by the independent variables. A value greater than 0.5 shows that the model is effective enough to determine the relationship. In this case, the value is .504, which shows that the model has the required potential.

Therefore, the model summary table is satisfactory to proceed with the next step.

Table 4. ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	93.209	6	15.535	38.773	.000[b]
	Residual	91.753	229	.401		
	Total	184.962	235			

a. Dependent Variable: Purchase behaviour

b. Predictors: (Constant), Ease of Use, Awareness, Reliability , Convenience in Purchasing, Long term benefits, After sales service and Support

F-ratio: It represents an improvement in the prediction of the variable by fitting the model after considering the inaccuracy present in the model. A value should be greater than 1 for F-ratio in order to yield an efficient model. In the above table, the value is 38.773, which is satisfactory.

These results estimate that as the p-value of the ANOVA table is below the tolerable significance level, thus there is a possibility of rejecting the null hypothesis in further analysis.

The table below shows the strength of the relationship i.e. the significance of the variable in the model and magnitude with which it impacts the dependent variable. This analysis helps in performing the hypothesis testing for a study.

5. Conclusion

Ease of Use, Awareness, Reliability , Convenience in Purchasing, Long term benefits, After sales service and Support are important variables that affect the actual purchase behaviour towards solar energy products.

The factors contributing to purchase decisions with solar energy products are ease of use, awareness, reliability, convenience in purchasing and long term benefits. Ease of use includes the design and build quality of the product being easy to install, understand and maintain. Awareness includes how easy it would be for people to get information about this particular type of product. Reliability is referring to how well the product will function in real life conditions compared to other solar energy products that are available on the market. Convenience in purchasing refers to how convenient it is for people when obtaining a solar energy product; whether it comes at a good price or not as well as having good after-sales support. Long term benefits refers to how long term benefits of buying solar energy products can be and what they are.

The price of the product is one of the important factors affecting the purchase decision. The price that people pay for a product should represent what they get value for and it is related to the quality of the product. Price influences consumers' perception and generates a feeling of value for money hence, people will trade-off benefits against price when making purchase decisions, however different buyers have different expectations about quality in relation to price hence, each individual has their own trade-off curve. The price of the solar energy product is covered under the variable of long terms benefits. Thus, when a consumer purchases a solar energy product a rough estimate of the pay back period of the asset is calculated which has to include price as one of the major attributes.

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