

THE EFFECT OF PERCEIVED VALUE DIMENSIONS ON PURCHASE INTENTION OF SOLAR ENERGY SYSTEMS

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Abstract

This research is focused to study the effect of multiple dimensions of customer perceived value on purchase intention of solar energy products. The dimensions of perceived value include economic value, functional value, convenience value and service value. Data were collected from 165 respondents from Telangana State. A five point Likert scale with judgment sampling method was adopted for data collection. And the data were analyzed using exploratory factor analysis and multiple regression with Software Package for Social Sciences (SPSS) 20 version. The results of the study demonstrate that economic value, functional value and service value have a significant impact on purchase intent of solar energy systems, whereas convenience value has no impact on perceived value.

Key words: Economic value, Functional value, Convenience value, Service value, Purchase intention, Solar energy.

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1. Introduction

Energy is the key driver for the sustainable socio-economic development of any country. In developing countries like India most of the energy needs – household, institutional, commercial and agricultural – are met from the energy produced from the limited sources of conventional fossil fuels. Renewable energy sources is the best alternative for ever increasing energy demand. Solar energy systems are a promising source of energy for household in the developing world like India. However, there is a limited adoption of solar energy systems despite conducive government policies due to several factors. The current study examines the impact of various dimensions of customer perceived value on purchase intent of solar energy. Customer perceived value has become one of the most important and extensively used concept in marketing literature in recent years. An extant review of literature pertaining to dimensions of perceived value has been conducted to develop the conceptual framework for the study. Later the impact of each dimension of perceived value on purchase intention was tested using multiple regression analysis.

2. Review of literature and hypotheses development

While purchasing a product or service a buyer is guided by the idea of the ‘bundle of benefits’ it carries to him/her. These benefits carry value to the customer. Thus, in marketing, instead of going just by utility or benefits we go by the idea of value. This is because the latter captures ‘those several things besides utility. This is because the value captures those benefits the customer looks for in a product in his purchase. All the buyers seek value in all their purchases and they look for it in the form of benefits. The benefits can be tangible or intangible. By the same token, value can be tangible or intangible. Thus, customer value is the composite of all the benefits the customers derives from a product he purchases. The customer assigns weightage/credits for each benefit; different benefits gain different weightage depending on the priority assigned to them by him.

The general concept that can be understood is that perceived value involves the relationship between customer and the product which is strongly related to the utility or benefits the customer obtains in return for the money or any other cost they spend (Zeithaml, 1988).

2.1 Components of customer value:

Customer value has many components. As mentioned earlier, some others are psychological, intangible and quantifiable. Customer value can be bifurcated into two broad categories: tangible values and intangible values.

Tangible values, as the very name indicates, are physical and quantifiable in nature; they can be pinpointed and their effect explained in concrete terms. Intangible values include social value, prestige/status value, sentiment value, aesthetic value, experience value and belief value. Intangible values include social value, prestige/status value, sentiment value, experience value and belief value (Ramaswamy and Namakumari, 2013). But the current study includes economic value, functional value, convenience value and service value.

The concept of perceived value is predominantly used by marketers and researchers in the areas of economics and marketing (Parasuraman & Grewal, 2000). Perceived value is a major factor for predicting and influencing customer purchase intention (Sweeney & Soutar, 2001; Zhuang, Cumiskey, Xiao, & Alford, 2010). Research also proved that perceived value was found to have a positive influence on customer purchase intention (Chen & Chang, 2012). In this context, the researchers focused a lot of attention on the adoption of renewable energy in various manners. However, only a few researches were carried out using the concept of perceived customer value. But this study integrates various dimensions of perceived value to study the influence levels of it on purchase intention of household customers using solar energy.

2.2 Economic value:

When the customer observes a price advantage in a product/service, it is an economic value. When the customer achieves a superior profit-feasibility in using a product, it is also an economic value. Many researchers have studied the various economic benefits provided by the State for purchase of solar home systems and proved that there is a significant relationship between economic benefits and the purchase of solar energy products. (Chaurey and Kandpal 2006, Chaurey and Kandpal 2010, Kumar et al. 2009, Miller 2009, Palit 2003, Ulstrup 2004, Urmee et al. 2009).

Various financial benefits provided by the State has a significant impact on customer purchase intention of energy-efficient and renewable energy products at household level (Tingting Zhao *et.al.*, 2012)

Cheryl (2008) observed that economic incentives (benefits) provided by the government have a significant impact on purchase decision of solar energy power projects.

K.C. Chang, *et al.* (2009) conducted a study on customer purchase of solar water heaters and proved that there is a relationship between economic benefits provided and the purchase of solar water heaters.

Theocharis Tsoutsos *et al.* (2004), indicated that there is a significant positive relationship between economic benefits and the adoption of solar energy.

Hypothesis 1 (H1): Perceived Economic value has a positive effect on customer's purchase intention of solar energy systems.

2.3 Functional value

Functional value mainly denotes the ability of a product to meet a given need. Factors like usefulness, reliability, durability, performance, resale value, delivery and maintenance are all parts of functional value. From the minimum functional level, companies constantly strive to augment their products by adding more and more features to them and enhance their functional value.

In relation to the customer need for product function, several authors had a notion that price attribute is part of functional value besides the reliability and durability which is often referred as product quality (Sheth *et al.*, 1991b). However, Sweeney and Soutar (2001) argued that the price attribute should be separated from the other attribute such as quality in measuring perceived functional value as price and quality have different influence on perceived value; price has negative effect and quality has positive effect on perceived value (e.g., (Doddset *al.*, 1991)). Thus they suggest that quality and price are sub factors of functional value.

Rishi Raj Borah, Debajit Palit, Sadhan Mahapatra (2014) The survey indicates that majority of the customers are satisfied with the performance and functioning of solar energy systems and indicated that it is the major factor for purchase of solar energy.

Reinders *et al.*, (1999) found that customers are satisfied with the functional benefits of solar systems, functional benefits in terms of reliability and durability has a significant positive impact on customer purchase intent of solar energy products.

Hypothesis 2 (H2): Perceived functional value has a positive effect on customer's purchase intention of solar energy systems.

2.4 Convenience value

Convenience value refers to a i) easy procurability of the product or service and ii) convenience in application of the product.

Several studies have found that the customers do not only consider the product performance or its quality when evaluate the function of the product, but also consider about how the product can be used easily without any difficulty or confusing while using it. In this regard, the study of Pura (2005) use the term "convenience value" instead of functional value and included ease of use as one of the scale to measure it. While the other study of Creusen and Schoormans (2005) separated the perceived of "ease of use" as another dimension of value namely "ergonomic value". It was found that perceived "ease of use" has positive and direct effect on customer satisfaction (e.g. (Tung, 2010).

Rashid, S. S. (2012) noticed that ease of use has significant positive influence on intention to use renewable energy.

Ease of use is explained from the technical standpoint of renewable energy. Studies perceive that the use of solar energy and management of biomass spell out numerous technical barriers to end users (Haidar, John &Shawal 2011; Komendantova et al. 2012)

Rishi Raj Borah, Debajit Palit, Sadhan Mahapatra (2014) concluded that ease of use (convenience) of solar energy system has a significant positive relationship with purchase intention of solar energy system.

Hypothesis 3 (H3): Perceived convenience value has a positive effect on customer's purchase intention of solar energy systems.

2.5 Service value:

Service value encompasses promptness and quality of service, as well as good customer relationship. People and technology together, can create a high service value. Service value gets translated into best solutions to customer problems.

Several research studies were conducted on the relationship between service personnel support and purchase of solar energy products. And it is found that there is a significant relationship between service value and purchase of solar home systems (Chaurey and Kandpal 2006, Chaurey and Kandpal 2010, Kumar et al. 2009, Miller 2009, Palit 2003, Ulsrud 2004, Urme et al. 2009). Rishi Raj Borah, Debajit Palit, Sadhan Mahapatra (2014) in their study proved that there is a positive relationship between the service provided by the service personnel and the adoption of solar photovoltaic systems.

Shamsun Nahar Momotaz and Asif Mahbub Karim (2012) concluded that consumers of solar home systems are satisfied with the service provided by the sales personnel. Customers have a positive attitude towards solar energy products.

Bundit Limmeechokchai, Saichit Chawana (2007) stated that lack of experts and skilled manpower are the barriers to adopt sustainable energy.

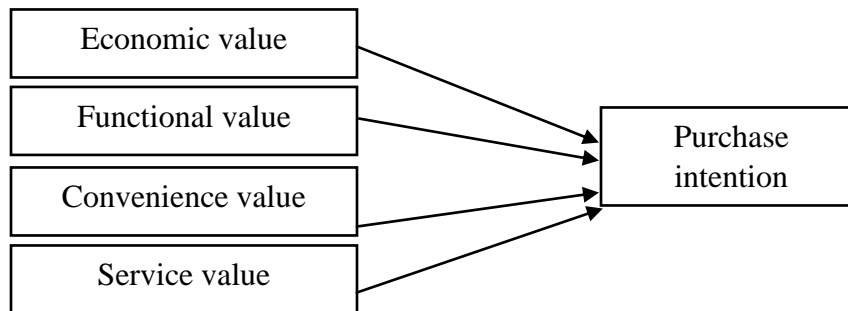
Mahmood *et al.* (2008) demonstrated that after sales service (service value) has a significant positive impact on purchase of solar energy.

Hypothesis 4 (H4): Perceived service value has a positive effect on customer's purchase intention of solar energy systems.

3. Objective of the study:

The current research examines the effect of various dimensions of customer perceived value on purchase intention of solar energy systems.

Conceptual framework of the study



4. Research Methodology

The research paper at hand is empirical in nature. The survey was conducted using a structured questionnaire. Responses from participants were captured using a five point Likert rating-scale ranging from 5 (strongly agree) to 1 (strongly disagree). 250 prospective solar customers from Telangana State were requested to participate in the study, however, 165 usable questionnaires were collected. Participants for the study were selected on the judgement basis since the population for the study is very large. Exploratory factor analysis and multiple regression was used to analyze the data.

Survey instrument for the study was developed after the exhaustive review of literature. The survey items for the present study were developed from previously studied and validated measures and were restated in the context of solar energy systems. Software Package for Social Sciences (SPSS) version 20 was used to conduct exploratory factor analysis and multiple regression analysis.

Table 1: Constructs and their sources for instrument development

S.No	Construct	No. of items	Citation
1	Financial value	2	Robert J. Procter and Wallace E. Tyner (1984)
		1	B.S. K. Naidu (1996)
		1	Stephen W. Sawyer and Stephen L. Feldman (1981)
		3	B.S. K. Naidu (1996)
2	Functional value	2	Sunyoung Yun, Joosung Lee (2015)
		2	Sunil Luthra et. al. (2015)
3	Convenience value	3	Azhar Ahmad et al (2014)
		1	K. Sovacool et.al.(2011)
4	Service value	2	Benjamin Tania Urmee, David Harries (2009)
		1	Sunyoung Yun, Joosung Lee (2015)
5	Purchase intention	3	Boulding et al.(1993)

5. Data Analysis:

Before proceeding to exploratory factor analysis, reliability was checked using Cronbach alpha which was found to be 0.827 for all the variables exceeding the cut off value 0.7 suggested by Hair J.F.*et. al.* (1998). Cuieford (1965) advises that an alpha value larger than 0.7 has a high reliability.

KMO test was applied on the data to know the sampling adequacy. KMO value for the data was 0.817 which was greater than cut off value 0.7, signifying that the data set fits for factor analysis.

Later, an exploratory factor analysis was done to identify the different factors of the study using SPSS 20 version. A total of four factors were identified. The factors were named economic value, functional value, convenience and service value.

5.1 Profile of the respondents: Respondents' demographic information such as gender, age, education, income levels, size of the family, and ownership of the house are presented in the table 2.

Table 2: Descriptive statistics for the sample:

Variable	Category	Frequency	Percentage (%)
Gender	Male	103	62.4
	Female	62	37.6
Age (Yrs.)	18-25	12	7.2
	26-30	28	17
	31-40	49	29.7
	41-50	54	32.8
	Above 51 years	22	13.3
Educational Qualification	SSC	11	6.7
	Intermediate	28	17
	Graduate	59	35.8
	Post Graduate	45	27.2
	Any other	22	13.3
Monthly household income	Below 10,000	17	10.3
	10,001 – 20,000	23	14
	20,001 – 30,000	28	17
	30,001 – 40,000	34	20.6
	40,001 – 50,000	36	21.8
	Above 50,000	27	16.3
Number of members in family (Family size)	2	9	5.4
	3	22	13.3
	4	34	20.7
	5	43	26
	Above 5	57	34.6
TOTAL		165	100

Table 3: Factor analysis results

S. No	Dimension	Variables	Factor loading	Eigen value
	Economic value	Capital subsidy provided by the state government is beneficial. to install solar energy	0.912	1.856
		Capital subsidy provided by the central government is beneficial to install solar energy	0.895	
		Over all, capital subsidy provided by the government is beneficial.	0.921	
		Government provides low interest or interest-free loan to install solar energy	0.872	1.766
		Tax credits provided the government is beneficial.	0.911	
		Energy buy back by government (net metering) is beneficial.	0.876	
		Income tax credits are beneficial	0.852	
	Functional value	Solar energy systems are reliable enough to safely provide electricity	0.895	1.804
		Solar energy is robust enough to meet the energy needs	0.864	
		Solar energy systems are efficient to meet the energy needs	0.873	
		Level of performance of solar energy systems is satisfactory	0.855	
	Convenience value	Solar energy manuals are easy to understand	0.912	1.893
		It's easy to operate solar energy systems	0.905	
		It's easy to master the operating of solar energy system	0.896	
		Maintenance of solar energy systems is easy	0.887	
	Service value	Technical personnel are available to resolve problems	0.821	1.782
		Technical personnel are efficient in resolving problems	0.845	
		After sales services are satisfactory	0.833	
	Purchase Intention	I would like to purchase solar energy systems	0.803	1.745
		I would like to use solar energy systems	0.787	
		I would like to recommend others to adopt solar energy systems	0.842	

Table 4: Reliability of measure instruments

Construct	Number of items	Cronbach Alpha
Economic value	7	0.821
Functional value	4	0.785
Convenience value	4	0.832
Service value	3	0.765
Purchase intention	3	0.812

5.2 Multiple Regression results

Regression analysis is widely accepted statistical technique for prediction and forecasting. Multiple regression analysis is used to study the impact of several independent variables on one dependent variable. This research paper uses multiple regression analysis to assess the impact of various dimensions of customer perceived value on purchase intention of solar energy. In this study economic value, functional value, convenience value and service value are considered as predictor variables and customer purchase intention as outcome.

5.2.1 Analysis of Multicollinearity

Multicollinearity occurs when two or more predictor variables are highly correlated. Multicollinearity is higher when there is stronger relationship between the independent variables (Walker, 2011). It can be assessed by Tolerance and Variance Inflation Factor (VIF) values. Tolerance value should be higher for a lower multicollinearity. Tolerance value higher than 0.50 suggests that the data is free from multicollinearity, similarly VIF should be less than 3 indicating the data is free from multicollinearity (Hair J.F.*et. al.* 1998). From the table 6 all the Tolerance values and VIF values are in the threshold range, indicating the data is not having issues of multicollinearity.

5.2.2 Model fit

For a regression model to be fit, the difference between R^2 and adjusted R^2 should be less than 0.05. From the table 5, $R^2 - \text{adj } R^2$ value is 0.026 which is acceptable value for the model fit.

Durbin-Watson test value 2.018 indicating there is no problem of auto correlation in the regression model. ANOVA results indicating a significant value of the model ($p < 0.05$).

Table 5 Regression Model Summary

Model Summary^b

Model	R	R Square	Adjusted R square	Std. Error of the Estimate	Durbin-Watson
1	0.783 ^a	0.613	0.587	0.953	2.018

Table 6 Multicollinearity Analysis

Multicollinearity statistics^a

Model		Collinearity statistics	
		Tolerance	VIF
1	Economic value	0.614	1.628
	Functional value	0.624	1.605
	Convenience value	0.732	1.366
	Service value	0.636	1.572
	Purchase intention	0.628	1.592

Note: ^a Dependent Variable: Purchase intention of Solar Energy

Table 7 Multiple regression coefficients and critical ratios

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
(Constant)	-0.257	0.283		-.683	0.474	
1	Economic value → Purchase intention of Solar Energy	0.352	0.047	0.357	6.793	0.000
	Functional value → Purchase intention of Solar Energy	0.281	0.061	0.239	5.213	0.000
	Convenience value → Purchase intention of Solar Energy	-0.067	0.038	-0.043	-1.061	0.124
	Service value → Purchase intention of Solar Energy	-0.176	0.043	0.151	2.793	0.005

5.3 Hypotheses testing:

Hypothesis testing results of the regression model are presented in table 7.

5.3.1 Economic value and purchase intention

According to the regression results, the variable economic value has a significant impact with purchase intention. Specifically, economic value has a significant positive impact on purchase intention of solar energy systems with Beta = 0.352 and $p < 0.05$. Therefore, the hypothesis 1 is supported.

5.3.2 Functional value and purchase intention

From the regression analysis out, it is evident that functional value and purchase intention of solar energy are significantly related. Further, it is stated that functional value has a significant positive impact on purchase intention (Beta = 0.281 and $p < 0.05$). Hence, the hypothesis 2 is supported.

5.3.3 Convenience value and purchase intention

The regression analysis output results confirm that there is no significant relationship between convenience value and purchase intention of solar energy products as $p > 0.05$. Hence, the hypothesis 3 is not supported.

5.3.4 Service value and purchase intention

Regression analysis output values from table 7 demonstrate that the relationship between service value and purchase intention is significant. Furthermore, service value has a significant positive impact purchase intention of solar energy system. Hence, the hypothesis 4 is supported.

6 Results and discussion

The main objective of the study was to study the significant impact of each dimension of perceived value on customer purchase intention of solar energy products. This study framed a conceptual framework based on a thorough review of literature, and tested the conceptual model empirically. The study incorporated four important dimensions of customer perceived value – economic value, functional value, convenience and service value. Hypotheses of the conceptual framework were tested using multiple regression. The findings of the study are in consistent with

the previous studies (Chen, 2013). Results of the study revealed that economic value, functional value and service value have a significant positive impact on purchase intention of solar energy products, whereas customer purchase intention is not influenced by service value.

7 Limitations and directions for future research

The current study has some limitations which could be regarded as an opportunity for further research. First, the study cannot be generalized as it was conducted in a single State with limited sample size. When performed in more States with higher sample size it may give different results. The study adopted judgment sampling technique with different sampling techniques results may alter. The study incorporated only a few dimensions of customer perceived value, hence future studies could add more variables. Behavioural elements could be incorporated in further studies. The current research is purely based on quantitative data, qualitative studies could be taken up with in-depth interviews.

8 Practical Implications

The study offers several implications to both marketers and policy makers. Overall, customer perceived value has a significant impact on purchase intention of solar energy products. Service value or service personnel support has a significant impact on purchase intention of solar energy. Marketers need to focus more and more on service value. Economic benefits as perceived by the customers has a significant impact on adoption intention of solar energy. Since the initial cost solar energy is very high the economic benefits to the customers are significantly influencing the purchase intention. Functional value is high with its durability and reliability of solar energy system. Marketers and policy makers need to focus to enhance the convenience value of solar energy system so that it encourages the customers to adopt solar energy products.

9 Conclusion

Customer perceived value has a great influence on purchase intention. The findings of the research study indicate that the predictors customer economic value, functional value and service have a significant relationship with the purchase intention of solar energy systems. Customer convenience has no significant relationship the purchase intention of solar energy products.

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