Factors influencing purchase/ adoption of solar technology among Industrial users in Bengaluru.

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Abstract

Purpose: The current economic and social system still relies on traditional energy sources and distribution systems and takes time to allow for the acceptance of renewable energy sources by the current economic and social system. People are currently able to choose their electricity suppliers to choose between traditional and renewable sources. Industrial consumers must examine a wide variety of factors which may influence their choice. The purpose of this research is to determine which factors influence the knowledge, perception, attitude, acceptance and procurement of solar energy of industry clients both internal and external. In addition, adjustments to solar renewable energy marketing technique could be proposed in order to reach industrial masses for renewable energy products.

Design/methodology/approach: Certainly, this analysis is descriptive in nature. Primary data is obtained from (Managers) industrial users. 112 respondents are estimated on the basis of the Cochran Method of uncertain population sample size. The questionnaire is divided into four sections including Rating scale and Likert scale questions and the questionnaire's convergent-divergent validity is also tested. The data analysis is performed by explaining the rankings and then using SPSS Version 25 Tools to test the hypothesis. The study's focus is geographically restricted to Industrial users in Bengaluru.

Findings: The findings of the study show that majority of factories in Bengaluru encounter power cuts 1 to 2 times in a month and use diesel generators. A majority of the industrial users said that they use HT Power. There is a need to market the solar energy to these Organizations. The various responsible and resisting factors are identified in the study. 14 responsible and 9 resisting factors influence the decision of the industrial users to adopt solar technologies

Originality/value: The aim of this study is to develop marketing strategies that maximize solar energy products production, adoption and acquisition. The utilization of solar energy will contribute to the development of the future. It will be helpful to understand how to market Solar Energy Products, given that very few promotional and marketing policies are currently in place

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in this field. As a result of research, the most important factors that influence solar marketing will be identified and marketing areas can be identified that help manufacturers and suppliers of these products to grow sales as a result of increased use of solar energy products. It will benefit the government, which is untiringly working to promote the use of renewable energy resources to achieve sustainable development over the long term. Because of their contribution to environmental preservation, the ultimate buyer will also feel a sense of achievement.

Keywords: Solar technologies, solar energy, Industrial users, Attitude, perception

Introduction

India, with a population of over 1.25 billion individuals, exhibits a substantial and pressing need for energy resources at present. India is positioned as the sixth largest country globally in terms of both power generation capacity and power consumption. In recent times, there has been a notable surge in electricity output, exhibiting a growth rate that closely approximates the corresponding growth rate observed in the nation's population. Approximately 53% of India's electrical generation is derived from coal, while the nation's coal reserves are projected to remain sufficient until the year 2050. A significant proportion of India's population, comprising 1.3 billion individuals, primarily resides in rural regions, where a substantial majority (72%) continues to have challenges in accessing dependable energy sources **Rauf, A., Nureen, N., Irfan, M., & Ali, M. (2023).** The increasing necessity to bridge the disparity between energy demand and supply has prompted a heightened interest in solar power as the most feasible resolution. India is geographically located between the Tropic of Cancer and the Equator, rendering it a favorable region for the utilization of solar energy. In this particular geographical area, the yearly mean temperature ranges from 24°C to 28°C. Consequently, an estimated quantity of 5,000 trillion kilowatt-hours of solar energy is accessible, accompanied by an excess of 300 days characterized by abundant sunshine. India has gained recognition as a prominent nation in the field of solar energy harvesting due to the implementation of numerous solar laws and programs at both the state and central government levels, as part of the National Solar Mission **Khanna, M. K., Malik, S., & Kumar, H. (2023).** The proliferation of solar photovoltaics in India is expected to be expedited in the coming years, as shown by a report jointly released by BRIDGE TO INDIA and GTM Research. The solar industry in India exhibits significant potential for expansion. It is anticipated that a majority of forthcoming electronics would rely on a solar-powered rechargeable battery bank for their energy supply. The increasing need for power and the growing recognition of the advantages associated with renewable energy sources have stimulated the development of novel technology capable of harnessing the ample solar radiation. **Batool, K., Zhao, Z. Y., Irfan, M., Ullah, S., & Işik, C. (2023).**

Presently, the prevailing economic and social framework continues to rely on conventional energy sources and distribution networks **Roy, S., & Mohapatra, S. (2022).** Consequently, the integration and acceptance of renewable energy within this system will require a considerable amount of time. Subsequently, consumers now have the ability to choose their electricity supplier based on their preference for either conventional or sustainable energy sources. Industrial consumers must consider several criteria in order to make a well-informed decision. Moreover, it is worth noting that renewable energy sources need a substantial initial investment **Sadhu, M., Chakraborty, S., Das, N., & Sadhu, P. K. (2015).** The hindrance of renewable energy marketplaces in India, which has impeded the widespread adoption of renewable energy, can be attributed to substantial state subsidies allocated to fossil fuels and the limited purchasing power of potential customers. This study aims to investigate the extent of market penetration achieved by conventional funding and financial instruments such as capital subsidies, donor grants, tax rebates, and

fiscal incentives. However, the focus of this study is to analyze the widespread adoption and commercialization of renewable energy products and technologies by end users **Hairat, M. K., & Ghosh, S. (2017).** To achieve this, it is necessary to reassess product selection and evaluate the financial implications associated with this adoption. The objective of this study is to ascertain the internal and external factors that influence the solar energy literacy, perspective, attitude, and acceptance of industrial clients, as well as their subsequent purchase choices. In order to achieve widespread availability of solar renewable energy commodities in the industrial sector, it is imperative to propose novel strategies for advertising these products.

The first section of the study gives an overview of the solar energy and its acceptance in India. The second section focusses on the review of literature. The research methods are specified in the third section and the fourth section presents the results of the study. The last section of this research concludes with limitations and scope for further research.

Review of Literature

This study employed a systematic literature review approach to analyze previous scholarly works that were pertinent to the research inquiries under investigation. The articles were sourced from reputed journals and were scrutinized to determine the level of quality exhibited by each study. Elsevier database, Routledge and CRC Press Taylor and Francis database. Emerald Group Publishing database, Springer Nature database and Sage database. Several supplementary articles were acquired from reputable academic databases such as Wiley, Academia, JSTOR, and Guildford Press.

Kumar, C. M. S & et al, (2023) India is the world's fifth largest economy, and its agricultural and associated industries account for 20% of GDP. Activities such as plowing, watering, planting, harvesting, storing, and processing food are all part of the agricultural sector. Renewable solar energy has emerged as a major energy source that can minimize farmers' reliance on the usage of conventional energy sources in India, where there is a current agricultural energy need. Regular use of fossil fuels depletes these resources and emits massive amounts of carbon dioxide into the air. By 2050, it is predicted that 4 giga tons of CO2 emissions might be avoided annually if solar power installations reached 4600 GW. Therefore, solar energy has been identified as a potentially game-changing renewable resource for the generation of thermal energy and electrical power for use in agricultural and industrial applications. **Li, L., Lin, J., Wu, N., (2022)** The use of renewable energy sources is increasingly being considered as a viable solution to the world's energy and environmental crises. Sustainable development calls for energy efficiency and greenhouse gas emission reduction policies and methods. **Burton, N. A., Padilla, R. V., Rose, A., & Habibullah, H. (2021)** The rise in human-caused disruption has resulted in a dramatic increase in worldwide demand for energy.

McPherson, M., & Stoll, B. (2020) Real-world load data from Bengaluru, India is used to evaluate the proposed demand response system. By allowing for the replacement of high-marginal-cost thermal generators with near-zero-marginal-cost renewables, the results show that demand responsiveness reduces production costs. The utilization rates of demand responses are often limited by their maximum permissible daily deployment, while their operating behavior is governed by intraday recovery limitations. Furthermore, demand response aggregators might anticipate sizable income from price arbitrage on top of the huge value that demand response brings to the grid. **Kabir, Ehsanul & et al (2017)**, the creation of innovative solar power technologies is regarded as a crucial approach to meeting the escalating global energy needs. The field of solar technologies is experiencing rapid growth, however, it is encountering several technical obstacles. These include low solar cell efficiencies, underperforming balance-of-systems

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(BOS), economic challenges such as high upfront costs and a lack of financing mechanisms, as well as institutional barriers such as inadequate infrastructure and a shortage of skilled manpower. **T. Hoang & X. P. Nguyen (2021)** The smart city's energy system is crucial to its overall mission of creating a more sustainable urban environment. The use of renewable energy sources has also been shown to significantly contribute to lowering pollution levels and improving the quality of the surrounding environment. **Nwaigwe, K. N., Mutabilwa, P., & Dintwa, E. (2019)** Incorporating solar energy into non-renewable sources is important because it slows down the rates at which those sources are consumed, integration technology has become important due to the world's energy requirements, which imposed a significant need for different methods by which energy can be produced or integrated.

Gram-Hanssen, K., M. H. Jacobsen, & A. R. Hansen (2022). A big group of early adopters (annually metered) and a smaller group of later adopters (hourly/real-time metered) in Denmark have solar photovoltaics (PVs) due to lower costs and stop-go policies. **Sadamoro, F., Ajayi, O. M., Ayodel, O. O., & Areola, T. O. (2023)**. The research suggests that in order to uphold customers' trust and commitment, solar power companies should establish a clear strategic plan and an effective system for handling customer complaints. **Kumar, V., Syan, A. S., & Kaur, K. (2022)** The findings of the study indicate that various factors, including rising energy costs, familiarity with the product, financial assistance and incentives, and perceived expenses, have a favorable impact on consumers' inclination to acquire solar water heaters. **Vuichard, Stauch, and Wüstenhagen (2021)** The results indicate that social acceptance can be enhanced through the implementation of local ownership and the utilization of colored solar panels that minimize the perceived alteration of the landscape. This implies that projects should prioritize a localized and unobtrusive approach **Alam, S. A & Khan, S.M. (2017).** Studies have indicated that the level of approval for alpine solar projects is greater among individuals residing in the affected areas as compared to those who reside in non-alpine regions. **Kumar, V., Hundal, B. S., and Syan, A. S. (2020).** The dimensions encompassing environmental knowledge, promotion and advertisement, environmental concern, and peers influence were deemed insignificant in relation to the customer attitude towards solar energy products. **Ali, S., Dogan, E., Chen, F., & Khan, Z. (2021).**

Hypothesis development

There exist multiple factors that exert effect on industrial users' decision to use solar energy. Several causes contribute to the adoption of renewable energy sources **Ã, J. M., & Truffer, B. (2006).** These factors encompass the escalating expenses associated with conventional energy sources, the growing recognition of environmental sustainability **Abbasi S.A., Abbasi Naseema (2001)** and the accessibility of governmental incentives and tax advantages for utilizing renewable energy. Furthermore, recent progress in solar technology has resulted in increased efficiency and improved cost-effectiveness, rendering it a compelling choice for industrial consumers seeking to diminish their environmental impact and achieve long-term energy savings **Adenle, A. A. (2020).** Consequently, an increasing number of enterprises are currently adopting solar energy as a feasible and enduring resolution for their energy requirements. Occasionally, the drawbacks of a particular phenomenon surpass its advantages, exemplified by the considerable upfront expenses associated with installation and the reliance on sunlight as the sole source of energy generation. Moreover, the sporadic nature of solar electricity presents difficulties for companies that necessitate a steady and uninterrupted power provision **Ambepitiya, Kalpana. (2015).** Notwithstanding these obstacles, the collective advantages of solar energy, encompassing its ecological compatibility and capacity for enduring financial gains, render it a persuasive option for several sectors. Industries can effectively address the aforementioned difficulties and maximize the utilization of solar energy by making strategic investments in storage technology and integrating intelligent grid systems.

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Hence, the research Question

What is the impact of responsible and resisting factors in adoption of solar energy?

H1 - **Responsible and resisting factors influence the adoption of solar technologies by Industrial users in Bengaluru**

Research Methods

According to **Haydam, N. E., and Steenkamp, P. (2021)**, the research process can be visualized as an onion with each layer representing a progressively more comprehensive step. Based on the research Onion model the current study is a positivism approach which is deduced from previous studies on solar energy. Owing to its nature, the study is a mono method quantitative analysis which uses industrial power users as the participants of the study. The current study is descriptive in nature. Primary data was gathered from industrial users who are power department managers or heads; the obvious reason for choosing them is that they are the decision makers in their enterprises on whether or not solar technologies should be installed. The sample size is computed at 112 respondents using the **Chaokromthong, K., and Sintao, N. (2021)** Cochran Formula for an unknown population with a 95% confidence level and a 10% margin of error. The Questionnaire is built using the variables identified in the research review **Morrison, R. L., Dillman, D. A., & Christian, L. M. (2010).** The questionnaire is organized into four sections, each of which contains demographic information about the respondents, an industry profile, factors preventing (Resisting) solar energy adoption, and factors promoting (Responsible) solar energy adoption. The questionnaire uses Likert scale questions, and its convergent-divergent validity is also examined, with the statistics falling within acceptable limits. The variables in the study are divided into Dependent Variables, which represent solar technology adoption, and Independent Variables, which represent the causes preventing and causing solar technology adoption. The data analysis is completed by displaying descriptive statistics and then testing the hypothesis with SPSS Version 25 and AMOS R Version 23 software **Collier, J. (2020).** The study's geographical scope is limited to Bengaluru district in Karnataka state of India and Industrial Consumers; the study is focused on factors influencing solar energy adoption and cannot be applied to other products or services.

Results and Discussion

This section presents the results obtained from the managers of industries in Bengaluru. Firstly, the demographic and the Industrial profile are discussed followed by an item analysis of the responsible and resisting factors. The SEM analysis for the factors is conducted following the exploratory factor analysis results.

Demographic profile of the Industrial Managers

A majority of 94.9% of managers in the study are male, and only 5.1% are female. This huge gender disparity is due to the fact that there are very few women employed in the factories as compared to the other service sectors, and as the study concerned managerial employees, there is very little role for women at higher levels in the factories. A majority of 62.7% of managers in the study belong to the 26–45 year age bracket, and 33.4% of managers are between 45 and 65 years old. A small percentage of 1.9% of managers are above 65 years old and below 25 years old. 41.8% are engineering graduates, and 39.2% have completed their post-graduation. Only 8% of employees had an interim diploma. 9% of managers in the study are from finance and accounting backgrounds. 39.5% of the employees in the study are utility or electrical maintenance managers; 15.4% are procurement leads or sourcing leads; 9.6% are directors,

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heads, or presidents of factories; and 7.4% are consultants. 13.8% are Finance Managers or Assistant Finance Officers. A majority of the 64.3% of managers in the study have more than 15 years of experience. 13.5% of employees have 10–15 years of experience. 19.6% of employees have 5–10 years of experience in the factories. A small percentage of 2.6% of employees have less than 5 years of experience.

Profile of the Industrial users in the study

30.5% of industrial power consumers in the study are located in the urban area, 16.1% are in the semi-urban area, and 18.3% are located in the rural area. The industrial parks and industrial suburbs have 20.3% and 14.8% factories, respectively. 56.6% of industries run on a small scale and operate on a small or microscale level, engaged in the manufacturing, production, and provision of services. 33.4% are manufacturing enterprises and service-rendering enterprises. A majority of 93.9% of industrial consumers receive power supply from the licensee at a high voltage. As per the Indian Electricity Act, high-tension consumers are required to uphold a power factor range of 0.9 to 0.99, and a small 6.1% are low-tension power consumers. Only 16.7% of industrial power consumers use solar power, 32.8% use wind power, and 31.8% use both solar and wind power. 26.7% of industrial power consumers expressed that they face power cuts 1-3 times a month; another 26.7% of industrial power consumers face power cuts about 4–8 times a month, which is very high. 46.6% agreed that power cuts are very rare.

Item analysis for responsible and resisting factors

Table -1

Item analysis for responsible and resisting factors influencing adoption of solar energy by Industrial users

	Mean	Std. Deviation	Skewness	Kurtosis
Resisting_factors_1 Solar energy has become less affordable	4.36	1.124	-0.392	-0.884
Resisting_factors_2 Performance records for solar systems in India is available only for a minimal period and hence decision making is difficult	4.11	0.677	-0.134	-0.806
Resisting_factors_3 Making decisions on purchasing solar energy products is based on longevity and efficiency	3.75	0.690	0.365	-0.870
Resisting_factors_4 Larger investment on solar energy systems is a hindrance	3.25	0.876	-0.515	0.020
Resisting_factors_5 Sales promotion methods Influence the purchase decision	3.22	1.019	-0.652	-0.473
Resisting_factors_6 Previous bad experiences hinder the purchase of solar energy systems	3.71	0.794	-0.301	-0.244
Resisting_factors_7 Absence of priority sector financial assistance from Lenders and Nationalized bank is a hindrance to make quick decisions	3.26	1.046	-0.541	-0.325

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Resisting_factors_8 Signing long term solar power purchase agreements under the Build, Own and Operate model is a major road block towards opting for solar power	3.48	0.923	0.046	-0.817
Resisting_factors_9 Non availability of credible solar power players	3.30	0.941	0.190	-0.862
Responsible_factors_1 Prefer to use solar energy products because it is eco-friendly and reduces carbon emission.	4.21	0.863	-1.785	4.687
Responsible_factors_2 Prefer to use solar energy technology products to reduces the electricity bill to a significant extent	4.22	0.822	-1.209	1.418
Responsible_factors_3 Prefer to use solar energy to reduce Diesel usage through Diesel Generators during Power Cuts due frequent power cuts	3.51	1.040	-0.349	-0.502
Responsible_factors_4 Prefer to use solar energy systems to get government subsidies	3.43	1.184	-0.877	0.079
Responsible_factors_5 Prefer to use solar energy systems to get tax deductions or other IT benefits extended by the Government	3.35	1.177	-0.449	-0.384
Responsible_factors_6 Prefer to use solar energy systems as the maintenance is low compared to other renewable energy sources	3.96	0.735	-0.495	0.290
Responsible_factors_7 Prefer to use solar energy systems as it is compatible with the existing electrical systems installed in the Industry	3.96	0.870	-1.261	2.791
Responsible_factors_8 Prefer to use solar energy generation as it has become an affordable power source	4.04	0.870	-0.735	-0.004
Responsible_factors_9 Prefer to use solar energy systems through word of mouth promotion or reference from other industry counterparts	3.68	0.714	-0.039	-0.259
Responsible_factors_10 Prefers Solar energy production as its less complex when compared with other renewable energy sources	3.79	1.086	-0.774	-0.075
Responsible_factors_11 Prefer to use solar energy as its available throughout the year	3.57	1.056	-0.183	-1.169
Responsible_factors_12 Prefers solar energy to meet the RPO/Green energy commitments set by the Government	3.93	1.106	-1.316	1.323
Responsible_factors_13 Prefers solar energy systems as it can be installed in the factory itself unlike other renewable sources which can be installed only in certain locations away from the factory	4.01	0.928	-1.385	2.427

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Responsible_factors_14 Prefers solar energy generation as its the only available alternate sources of energy available	3.32	1.007	0.189	-1.049

There are 8 resisting factors and 14 responsible factors identified through extensive review of literature. Industrial users show agreement towards both resisting factors and responsible factor which is indicated by the mean scores which are above 3.500. The standard deviations are below 1.500 indicating less variation in responses and the measures of skewness and kurtosis are within the acceptable range of -3.00 and +3.00 indicating normal distribution of data.

H1 - Responsible and resisting factors influence the adoption of solar technologies by Industrial users in Bengaluru

STEP -1 Exploratory Factor Analysis

Step -1 Exploratory Factor analysis

The KMO measure of sampling adequacy, which is equal to 0.878, and Barlett's Test of Sphericity, which comes with a significance level of 5%, are statistically significant. It was found by chi-square analysis that the Chi-square value of the Bartlett test is 30209.750 with the significant value less than 0.05 and 127 degrees of freedom, which shows that correlation matrix, is not an identity matrix and that it looks to be factorable.

Communalities refer to the extraction values for each of the items and should be above 0.300 and the communalities for stress items were between 0.487 and 0.879.

The total of squared loadings that has been removed accumulates to about 83.737 % of the original loadings. In social sciences, a cumulative Rotation Sums of Squared Loadings is considered good if it is above 50%. 2 components are discovered while applying the approach of Factor Analysis, according to the results of the study.

The rotated component matrix showed that due to the appropriate factor loadings no items were deleted in the study. 9 Resisting factors and 14 responsible factors were considered for the study.

Step -2 Run the model

Table 1 –

Measurement Model – Responsible and resisting factors influence the adoption of solar technologies by Industrial users in Bengaluru

Model Fit Summary				
CMIN				
Model	NPAR	CMIN	Degrees of Freedom	CMIN/DF (χ2/df)
Default model	119	212.997	123	2.876
Criteria				<3.000
RMR, GFI				
Model	RMR	GFI	AGFI	PGFI
Default model	0.048	0.826		

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Criteria	<0.100	>0.80

The table above displays the essential statistics for model fit. The chi-square divided by degrees of freedom (χ2 / df) falls within the acceptable range of 3 (specifically, 2.876). The observed Goodness of Fit value (0.826) surpasses the proposed attributes. The boundary estimation yields a value of 0.048 for the RMR. The model in question has garnered significant recognition within the academic community, and its measures of fit are reasonably appropriate.

Table 2

Structural Model – Responsible and resisting factors influence the adoption of solar technologies by Industrial users in Bengaluru

			Unstd estimates	Standardised estimates	P values
Adoption_Solar	<---	Resisting	(0.296)	0.112	***
Adoption_Solar	<---	Responsible	0.116	0.083	***

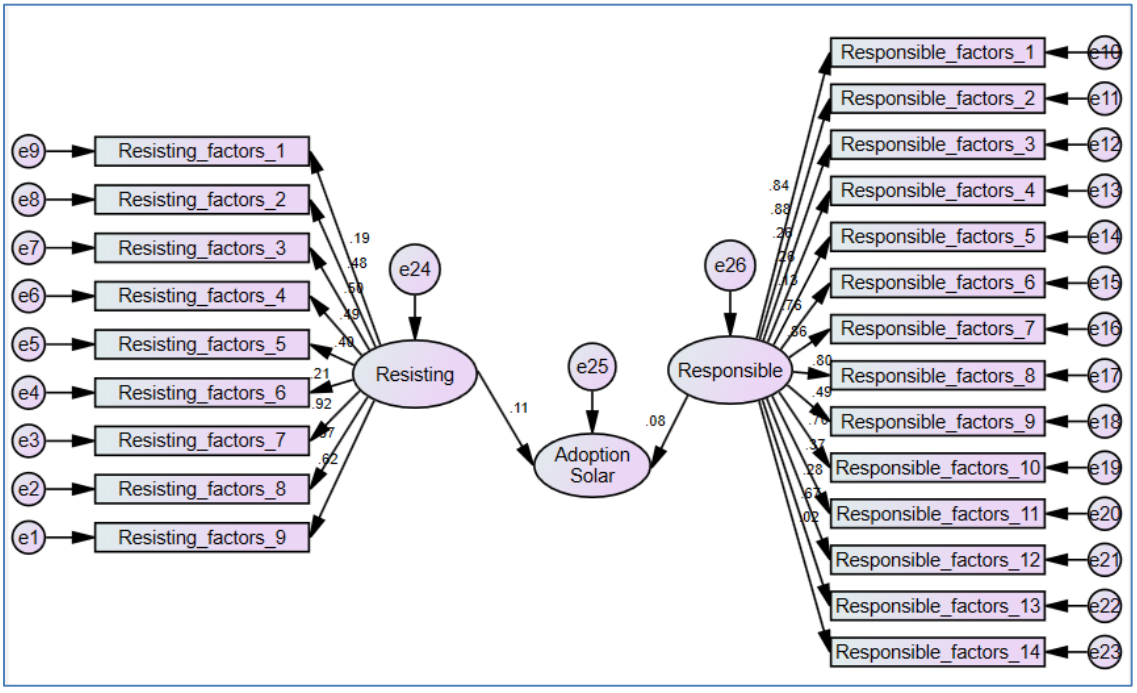
The results of the structural model presented in the table 2 show that -

One unit increase in mean scores of resisting factors will lead to 30% decrease in adoption of solar technologies and this relationship is statistically significant at (B=0.296, b=0.112, p=0.000)

One unit increase in mean scores of responsible factors lead to 12% increase in the adoption of solar energy by industrial users and this relationship is statistically significant at (B=0.116, b=0.083, p=0.000)

Table 3

Structural Equation Model – Responsible and resisting factors influence the adoption of solar technologies by Industrial users in Bengaluru



A one-unit rise in the average scores of factors that resist the adoption of solar technologies is associated with a 30% decrease in the likelihood of adopting those technologies. This discovery implies that persons who perceive a greater prevalence of obstacles to adoption are less inclined to embrace solar technologies. The factors that impede the adoption of solar energy can include significant upfront expenses, limited knowledge about the advantages of solar power, or apprehensions regarding the dependability of solar technology. Hence, it is imperative for policymakers and industry stakeholders to acknowledge and tackle these concerns, while offering more support and incentives to promote the extensive implementation of solar technologies. However, it should be noted that there is a positive correlation between an increase in the average scores of responsible variables and a 12% rise in the adoption of solar energy among industrial users. By acknowledging and mitigating these variables that impede progress, governments and industry stakeholders can facilitate the surmounting of obstacles hindering the widespread implementation of solar technologies. The observed increase in adoption rates among industrial users, as shown by a 12% rise in mean scores of relevant factors, suggests a potential for substantial growth in the utilization of solar energy. This underscores the significance of establishing a conducive atmosphere for the use of solar energy by means of educational initiatives, financial incentives, and technological progress. The standardized estimates indicate that the factors that oppose the adoption of solar electricity have a substantial impact on the decision-making process of industrial customers. This observation suggests that it is imperative to tackle these sources of resistance in order to enhance the uptake of solar energy among industrial consumers. Moreover, the provision of additional support and incentives has the potential to surmount these challenges and foster increased adoption of solar technologies. Through acknowledging the influence of accountable elements and effectively addressing the opposing variables, policymakers and industry stakeholders possess the ability to provide a conducive atmosphere that facilitates the extensive integration of solar energy.

Conclusion

The adoption of solar energy is hindered by various sources of resistance. To enhance the uptake of solar energy, marketers should prioritize the mitigation of these problems. One potential strategy is implementing educational and awareness initiatives aimed at addressing potential misconceptions and apprehensions among customers regarding solar energy. Furthermore, the provision of financial incentives and subsidies can serve as a viable approach to mitigate the initial financial burden linked to the installation of solar panels. By taking proactive measures to address these factors of resistance, marketers can contribute to expediting the process of transitioning towards a future characterized by sustainability and clean energy. The implementation of solar electricity by industrial entities not only has the potential to mitigate their carbon emissions but also offers substantial long-term cost savings. By leveraging solar energy, businesses can reduce their dependence on conventional energy sources, leading to decreased electricity expenses and enhanced financial performance. In addition, the incorporation of solar energy into many businesses has the potential to stimulate innovation and generate employment prospects within the renewable energy field. In general, the implementation of solar electricity among industrial consumers presents a mutually beneficial scenario that yields advantages for both ecological preservation and economic prosperity. The imperative for the Government to engender awareness and mitigate barriers to the adoption of solar power is evident. The government may foster the adoption of renewable energy among businesses by enacting rules and providing incentives that specifically promote the utilization of solar power in industrial sectors. One such approach involves the dissemination of knowledge to businesses regarding the enduring financial advantages and ecological merits linked to the utilization of solar energy. Furthermore, governmental entities have the capacity to offer monetary aid and tax incentives as a means of mitigating the initial capital outlay associated with the installation of solar panels. Through strategic intervention, the government can assume a pivotal position in expediting

the integration of solar power within various industrial sectors, thereby facilitating the progression towards a more environmentally sustainable trajectory.

Scope For Further Research

Future researchers are anticipated to focus their efforts on exploring alternative geographical areas characterized by abundant solar radiation. The study can also encompass residential power consumers. Also, it would be advantageous for forthcoming researchers to investigate the potentiality of utilizing solar energy in regions characterized by ample sunlight, such as arid deserts or tropical areas. Through the examination of these specific geographical areas, it is possible to cultivate enhanced solar energy systems that possess heightened efficiency, hence facilitating the provision of sustainable power to accommodate the expanding global populace. In addition, broadening the scope of the investigation to encompass residential power consumers would afford us the opportunity to get insights into the viability and advantages of integrating solar energy on a more localized level. This might potentially result in a reduction of carbon emissions and a decreased reliance on conventional energy sources. Future researchers have the opportunity to employ a mixed research methodology that incorporates qualitative analysis. This would entail the collection of data from inhabitants residing in these geographically sun-drenched areas via surveys and interviews, with the aim of comprehending their energy consumption patterns and requirements. Furthermore, the application of quantitative analysis can be employed through the collection of data pertaining to solar energy generation and its subsequent influence on domestic power consumption. By integrating qualitative and quantitative methodologies, forthcoming researchers can get a holistic comprehension of the prospective advantages and obstacles associated with the implementation of solar energy in diverse home contexts.

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