

Powering Persistence: A Conceptual Exploration of Continuous Intention Among Solar Prosumers Through a Trust-Integrated Extended Expectation-Confirmation Model

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Abstract

The transition to renewable energy sources, particularly solar power, has led to the emergence of household solar prosumers—individuals who both produce and consume solar energy within their homes. Ensuring the long-term success of this transition requires a deep understanding of the factors that influence the continuous intention of these household prosumers to engage with their solar photovoltaic (PV) systems post-installation. This paper presents a conceptual framework based on an extended Expectation-Confirmation Theory (ECT) model, integrating the critical variable of trust in the service provider. The framework examines how pre-installation expectations, post-installation perceived performance, confirmation/disconfirmation, and post-installation satisfaction interact to shape prosumers' continuous intention. Trust in the provider is proposed as a pivotal factor that enhances satisfaction and, consequently, the ongoing commitment to solar energy use. By analysing these relationships, the study provides theoretical insights into the drivers of continuous intention among household solar prosumers and offers practical implications for solar energy providers aiming to foster long-term engagement with their customers. This conceptual framework not only contributes to the existing literature on consumer behaviour in renewable energy but also serves as a foundation for future empirical research to validate the significance of trust in sustaining household solar prosumer participation.

Keywords: household solar prosumers, continuous intention, trust in provider, expectation-confirmation theory, conceptual framework

Introduction

The growing importance of solar energy is underscored by its multifaceted benefits, which encompass economic, environmental, and social dimensions. As nations grapple with the dual challenges of climate change and energy security, solar energy emerges as a pivotal solution. The transition towards solar energy is not merely a technological shift; it represents a fundamental change in how energy is produced, consumed, and perceived by society. The rise of solar prosumers—individuals or entities that both produce and consume solar energy—further exemplifies this transformation, highlighting the democratization of energy production and the potential for enhanced energy independence.

Solar energy's significance is amplified by its environmental benefits. The utilization of solar power significantly reduces carbon emissions compared to conventional fossil fuels, thereby contributing to the mitigation of climate change. For instance, studies have shown that solar energy systems can lead to decreased pollution levels and improved air quality, which are critical for public health and environmental sustainability (Al-Ttowi et al., 2022).

Economically, the adoption of solar energy systems is increasingly seen as a financially viable option for consumers. The decreasing costs of solar technology, driven by advancements in photovoltaic (PV) systems and economies of scale, have made solar energy more accessible to a broader audience (Schelly&Letzelter, 2020). Federal policies, such as the Solar Investment Tax Credit in the United States, have further incentivized consumers to invest in solar technologies, thereby increasing the likelihood of adoption (Best & Burke, 2018).

The rise of solar prosumers is a notable trend that reflects changing consumer behavior and attitudes towards energy production. Prosumers are empowered by the ability to generate their own electricity, which not only reduces their energy costs but also allows them to contribute to the grid during peak demand periods (Pitt & Michaud, 2015). This shift towards decentralized energy production fosters a sense of community and collaboration, as individuals and businesses work together to create a more sustainable energy landscape. Moreover, the emergence of community solar projects exemplifies how solar energy can be harnessed collectively, enabling those who may not have suitable rooftops for solar panels to still benefit from solar energy (Chan et al., 2017).

However, the transition to solar energy is not without challenges. Barriers to adoption, such as high initial investment costs, lack of awareness, and regulatory hurdles, continue to impede the widespread implementation of solar technologies (Flórez&Ghazali, 2020). Additionally, the perception of solar energy as a viable alternative to traditional energy sources varies significantly across different regions and demographics, influenced by factors such as cultural attitudes, economic conditions, and government policies (Asif et al., 2022). Addressing these barriers requires a concerted effort from policymakers, industry stakeholders, and communities to create an enabling environment that encourages solar adoption.

In developing regions, the potential for solar energy to address energy poverty is particularly significant. For instance, in countries like Uganda, where energy access is limited, the adoption of solar PV systems can provide a reliable source of electricity for households and businesses (Kabuye&Adaramola, 2023). This not only enhances the quality of life for individuals but also stimulates local economies by enabling small businesses to operate more efficiently and effectively (Ngonda, 2023). The role of solar energy in promoting social equity and economic development cannot be overstated, as it offers a pathway for marginalized communities to gain access to clean and affordable energy.

The technological advancements in solar energy systems, including the development of more efficient PV cells and innovative energy storage solutions, are critical for overcoming the intermittency challenges associated with solar power (Mofijur et al., 2019). The integration of phase change materials (PCMs) for energy storage, for example, allows for the effective capture and utilization of solar energy, ensuring a stable supply even during periods of low sunlight (Mofijur et al., 2019). Such innovations not only enhance the reliability of solar energy systems but also contribute to their overall attractiveness as a sustainable energy solution.

Moreover, the role of education and awareness in promoting solar energy adoption cannot be overlooked. Research indicates that consumers' willingness to adopt solar technologies is significantly influenced by their understanding of the benefits associated with solar energy (Asif et al., 2022). Educational initiatives aimed at increasing awareness of solar energy's advantages, coupled with transparent information about costs and financing options, can empower consumers to make informed decisions about their energy choices.

In conclusion, the growing importance of solar energy and the rise of solar prosumers represent a significant shift in the global energy landscape. As solar energy becomes more affordable, accessible, and prevalent, it offers a viable solution to the pressing challenges of climate change, energy security, and social equity. The transition towards a solar-powered future necessitates a collaborative approach that encompasses technological innovation, policy support, and community engagement. By fostering

an environment conducive to solar energy adoption, societies can harness the full potential of this abundant and renewable resource, paving the way for a sustainable and resilient energy future.

The significance of continuous intention for the sustainability of solar energy adoption is paramount in ensuring that solar technologies not only gain traction but also maintain their relevance in the evolving energy landscape. Continuous intention refers to the ongoing commitment of consumers to engage with solar energy solutions, which is influenced by various factors including economic incentives, technological advancements, and social acceptance. This commitment is crucial for the long-term viability of solar energy systems, as it directly impacts consumer behavior, market dynamics, and policy frameworks.

Economic incentives play a critical role in shaping consumers' continuous intention to adopt solar energy. Research indicates that the profitability of solar energy systems is heavily influenced by the percentage of self-consumption, which in turn is affected by the economic benefits derived from solar energy production Nicolau et al. (2022). For instance, consumers are more likely to invest in solar technologies when they perceive a clear financial advantage, such as reduced electricity bills or government subsidies. This economic rationale is particularly significant in regions where public electricity costs are high and supply is inconsistent, as seen in Nigeria (Adedeji, 2023). By integrating solar energy into housing solutions, consumers can achieve greater energy reliability and independence, thereby reinforcing their commitment to sustainable energy practices.

Moreover, the emergence of prosumers—individuals who both produce and consume energy—highlights the shift towards a more participatory energy model. Prosumers are motivated by the desire for energy autonomy and the potential for economic savings, which fosters a continuous intention to engage with solar technologies (Dumitrescu, 2023). This shift is evident in various countries, where policies are increasingly supporting the transition from traditional grid systems to decentralized energy production models. The active participation of prosumers is essential for creating a sustainable energy system, as it encourages demand-side management and enhances the overall efficiency of energy consumption (Gram-Hanssen et al., 2020). As consumers become more involved in energy production, their ongoing commitment to solar energy adoption is likely to strengthen.

Technological advancements also play a significant role in sustaining consumer intention towards solar energy. Innovations in solar technology, such as improved photovoltaic systems and energy storage solutions, enhance the efficiency and reliability of solar energy systems (ZEINA &Almaz, 2023). The continuous development of these technologies not only makes solar energy more accessible but also increases consumer confidence in its viability as a long-term energy solution. For example, the integration of phase change materials (PCMs) in solar energy systems can optimize energy storage and usage, thereby addressing concerns related to intermittency and reliability (Verma et al., 2023). As consumers witness the tangible benefits of these advancements, their intention to adopt and maintain solar energy systems is likely to persist.

Social acceptance and awareness are equally important factors influencing continuous intention for solar energy adoption. The perception of solar energy as a viable and sustainable alternative to conventional energy sources is shaped by societal attitudes and cultural norms (Hu, 2023). Educational initiatives that promote the benefits of solar energy can significantly enhance consumer awareness and acceptance, leading to a stronger commitment to solar technologies. Furthermore, community engagement and participation in solar energy projects can foster a sense of collective responsibility and shared benefits, reinforcing the continuous intention to adopt solar solutions (Sareen&Nordholm, 2021). As communities come together to support solar initiatives, the overall momentum for solar energy adoption is likely to grow.

In addition to these factors, policy frameworks and regulatory environments play a crucial role in sustaining consumer intention towards solar energy. Governments worldwide are increasingly recognizing the importance of renewable energy in achieving climate goals and are implementing supportive policies to encourage solar adoption (Sadhu et al., 2016). These policies can include

financial incentives, tax credits, and streamlined permitting processes, all of which contribute to a favorable environment for solar energy investment. Consistent policy support is essential for maintaining consumer confidence and encouraging long-term commitment to solar technologies, particularly in regions where market barriers still exist (Prokopenko, 2024). As consumers perceive a stable and supportive policy landscape, their intention to engage with solar energy solutions is likely to be reinforced.

The role of education and information dissemination cannot be overstated in fostering continuous intention for solar energy adoption. Research indicates that consumers' willingness to invest in solar technologies is significantly influenced by their understanding of the benefits associated with solar energy (Gram-Hanssen et al., 2020). Educational programs that provide clear information about the economic, environmental, and social advantages of solar energy can empower consumers to make informed decisions. Additionally, transparency regarding the costs and benefits of solar systems can alleviate concerns and uncertainties, further promoting continuous intention to adopt solar technologies.

As the energy landscape continues to evolve, it is imperative for stakeholders—including policymakers, industry leaders, and community organizations—to work collaboratively to create an environment that nurtures continuous intention for solar energy adoption. By doing so, societies can harness the full potential of solar energy, paving the way for a sustainable and resilient energy future.

Statement of the Problem

The adoption of solar photovoltaic (PV) systems by household prosumers—those who both produce and consume solar energy—has been instrumental in advancing the transition to renewable energy. However, a significant challenge lies in ensuring the continuous engagement and long-term commitment of these prosumers to their solar systems after installation. Despite initial enthusiasm and investment, many prosumers face a decline in engagement over time, driven by factors such as unmet expectations, perceived underperformance, or insufficient support from service providers. This disengagement threatens the sustainability of solar energy adoption and undermines the potential benefits of decentralized energy generation. There is a pressing need to understand the key drivers that influence prosumers' continuous intention to use and optimize their solar PV systems. Existing models of consumer behavior, such as the Expectation-Confirmation Theory (ECT), provide valuable insights but often overlook the critical role of trust in the service provider. This study addresses this gap by proposing an extended ECT framework that integrates trust as a central factor influencing post-installation satisfaction and continuous intention among household solar prosumers. By examining the interplay of expectations, perceived performance, confirmation/disconfirmation, and trust, this research aims to identify strategies to sustain prosumer engagement, thereby supporting the broader goals of renewable energy adoption and environmental sustainability.

While various studies have explored factors influencing consumers' intentions to adopt solar energy solutions, there remains a lack of comprehensive understanding of how trust interacts with these factors, particularly within the framework of ECT. This gap is critical, as trust can significantly influence consumer behaviour and decision-making processes in the context of continuous usage of renewable energy.

Purpose of the Study

The purpose of this study is to develop a comprehensive conceptual framework that explains the continuous intention of household solar prosumers to engage with their solar photovoltaic (PV) systems after installation. The study seeks to provide theoretical insights into the critical factors that sustain long-term engagement among solar prosumers and offer practical guidance for service providers to enhance prosumer satisfaction and loyalty. Ultimately, this research contributes to the understanding of consumer behaviour in the renewable energy sector and supports the broader objective of promoting sustainable energy practices.

Research Questions

- What factors influence continuous intention among solar prosumers?
- How does trust in the provider impact post-installation satisfaction and continuous intention?
- How can the extended ECT framework be applied to analyze these dynamics?

Literature Review

Solar prosumers

Solar prosumers are characterized by their ability to self-consume the energy generated by their PV systems, which not only reduces their reliance on traditional energy sources but also promotes the use of renewable energy (Kim et al., 2021; Medved' et al., 2021). The concept has evolved to include various forms of energy generation and storage, such as heat pumps and energy storage systems, which enhance the efficiency of energy use in residential settings (Månsson, 2014).

The motivations for individuals to become solar prosumers are diverse and can include economic incentives, environmental concerns, and the desire for energy independence (Jonek-Kowalska, 2024). In many regions, government policies and financial mechanisms, such as feed-in tariffs and tax incentives, have played a crucial role in encouraging the adoption of solar technologies among residential consumers (Moser et al., 2021). However, challenges remain, including the need for supportive regulatory frameworks and the development of efficient energy trading platforms that can accommodate the growing number of prosumers (Lüth et al., 2018; Wang et al., 2021).

Contributions of solar prosumers to sustainable energy transition

One of the primary contributions of prosumers is their ability to generate renewable energy, primarily through solar panels and other decentralized energy resources. This capability allows them to reduce their reliance on conventional energy sources and contribute to the overall decrease in carbon emissions. According to (Hu, 2023), energy prosumers play a crucial role in the energy transition by participating in various forms of prosuming, such as individual investments in renewable technologies and collective efforts within energy communities. This participation leads to a remodelling of energy systems, fostering a more sustainable energy landscape.

The decision-making processes of prosumers are also critical to understanding their impact on energy systems. Hamann et al., (2023) emphasize that as the responsibility for energy transition shifts from large-scale producers to individual users, understanding prosumer behavior becomes essential. This shift necessitates research into the motivations and decision-making processes that drive individuals to invest in renewable energy technologies and engage in energy sharing practices.

Furthermore, the integration of advanced technologies, such as blockchain and peer-to-peer trading platforms, is enhancing the capabilities of prosumers. These technologies facilitate energy exchanges among prosumers, allowing for more efficient energy management and fostering a decentralized energy market. For instance, Li, (2020) discusses how edge computing can optimize energy sharing within prosumer communities, thereby improving the overall efficiency of energy distribution.

Therefore, prosumers are integral to the energy transition, as they not only contribute to renewable energy generation but also actively participate in energy management and community initiatives. Their role is further enhanced by technological advancements that facilitate energy sharing and collaboration, ultimately leading to a more sustainable and resilient energy system.

Post-installation prosumer behaviour

One of the primary reasons for understanding prosumer behavior is the impact it has on energy consumption patterns. Research by Li et al. (2020) highlights that the behavior of prosumers can lead to significant changes in electricity consumption after the installation of distributed energy resources. These changes can either contribute positively to sustainability goals or, conversely, lead to increased consumption that undermines the environmental benefits of renewable energy. Therefore, it is essential to analyze how prosumers adjust their energy usage habits and the factors that influence these adjustments.

Moreover, the decision-making processes of prosumers regarding energy management are complex and influenced by various factors, including economic incentives and social norms. Sirviö et al., (2024) emphasize the importance of understanding these decision-making processes, particularly in the context of a circular economy. As prosumers transition from passive consumers to active participants in energy markets, their motivations and behaviors can significantly affect the deployment of sustainable energy solutions. Understanding these dynamics can help policymakers and energy providers design better incentives and support mechanisms that encourage energy-efficient behaviors among prosumers.

Additionally, the integration of prosumers into energy communities can enhance the efficiency and stability of the grid. According to Gallego-Castillo et al.(2021) prosumers participating in energy communities can improve self-consumption of renewable energy and provide ancillary services to grid operators. This collaborative approach not only benefits individual prosumers but also contributes to the overall resilience of the energy system. Understanding how prosumers interact within these communities and their willingness to share resources is vital for optimizing energy distribution and ensuring grid reliability.

Furthermore, the role of technology in shaping prosumer behavior cannot be overlooked. Advances in smart grid technologies and energy management systems enable prosumers to actively manage their energy production and consumption. Zafar & Sami(2022) discuss how distributed control strategies allow prosumers to engage in real-time energy trading, thereby enhancing their role as independent stakeholders in the energy market. Understanding how these technologies influence prosumer behavior is essential for maximizing their potential contributions to the energy transition.

Therefore, understanding prosumer behavior post-installation is critical for leveraging their potential in the energy transition. By analysing their consumption patterns, decision-making processes, interactions within energy communities, and the influence of technology, stakeholders can develop strategies that promote sustainable energy practices and enhance the overall effectiveness of renewable energy initiatives.

Factors Influencing Continuous Intention

One significant driver identified in the literature is the economic incentive associated with renewable energy systems. Vartiainen et al.(2024) discusses how the attractiveness of photovoltaic (PV) prosumerism in the European electricity market is influenced by the potential for cost savings and financial benefits. The study highlights that the current energy crisis has accelerated the adoption of solar PV systems, as consumers seek to mitigate rising energy costs by generating their own electricity. Similarly, Zhou et al.(2020)emphasizes the financial benefits of peer-to-peer (P2P) energy trading systems, which allow prosumers to maximize their financial returns through localized energy exchanges.

Another critical factor is the technological advancement and integration of smart technologies that facilitate energy management. ang et al. Huang et al.(2021)explore coordinated control systems that optimize energy sharing among building clusters equipped with renewable energy sources and energy storage systems. The study indicates that such technologies enhance the operational efficiency of renewable energy systems, thereby reinforcing prosumers' commitment to continuous engagement with these technologies.

Social and behavioral aspects also play a crucial role in driving continuous intention among prosumers. Hu (2023) underscores the importance of consumer behavior in achieving net-zero emissions and promoting sustainable energy practices. The study suggests that effective energy policies can encourage consumers to adopt proactive roles in the energy transition, thereby fostering a culture of prosumerism.

Moreover, the formation of energy communities is another driver that enhances prosumer engagement. Klement et al. (2022) discuss how the transition to a low-carbon energy system creates opportunities for citizens to become active participants in energy markets. The establishment of prosumer communities allows individuals to collaborate, share resources, and collectively manage energy consumption, which can lead to increased participation and commitment to renewable energy systems. In conclusion, the continuous intention of prosumers in renewable energy systems is driven by a combination of economic incentives, technological advancements, social influences, and the formation of collaborative energy communities. Understanding these drivers is essential for policymakers and energy providers to design effective strategies that promote sustainable energy practices and enhance the overall effectiveness of renewable energy initiatives.

Continuous Intention to Adopt

Continuous intention to adopt refers to the sustained commitment of individuals or households to integrate and utilize a specific technology or system over time, particularly in the context of renewable energy solutions such as solar rooftop systems. This concept encompasses not only the initial decision to adopt the technology but also the ongoing engagement and willingness to continue using and optimizing it.

Theoretical Underpinnings

Expectation-Confirmation Theory (ECT)

The adoption of Expectation-Confirmation Theory (ECT) for this study is driven by its strength in explaining post-adoption behavior, making it a particularly suitable framework for analyzing the continuous intention of solar prosumers. ECT has been widely used in various domains, especially in technology adoption and consumer behavior research, to understand why individuals continue to engage with a product or service after their initial adoption.

ECT is a psychological framework that seeks to explain how consumers' expectations influence their satisfaction and subsequent behavioral intentions regarding a product or service. Developed primarily within the context of consumer behavior, ECT posits that individuals form expectations prior to their experience with a product or service, and these expectations are subsequently confirmed or disconfirmed based on their actual experiences. The theory has been widely applied across various domains, including marketing, information systems, and service management.

ECT was initially introduced by Oliver in the late 1970s and early 1980s, focusing on the relationship between consumer expectations, satisfaction, and repurchase intentions. The foundational premise of ECT is that consumers enter into a transaction with certain expectations regarding the performance and benefits of a product or service. After experiencing the product, consumers evaluate their experiences against these initial expectations. If the actual performance meets or exceeds expectations, confirmation occurs, leading to satisfaction. Conversely, if the performance falls short, disconfirmation occurs, resulting in dissatisfaction (Leonard & Needham, 2020; Roberts & Griffith, 2019).

Expectations: Consumers form expectations based on prior experiences, marketing communications, and social influences. These expectations serve as benchmarks against which actual performance is evaluated (Leonard & Needham, 2020; Rahi& Ghani, 2019).

Confirmation/Disconfirmation: After using the product or service, consumers assess their experiences in relation to their initial expectations. Confirmation occurs when actual performance meets or exceeds expectations, while disconfirmation arises when performance falls short (Roberts & Griffith, 2019; Rahi& Ghani, 2019).

Satisfaction: The level of satisfaction derived from the confirmation or disconfirmation of expectations significantly influences consumers' future intentions. High levels of satisfaction typically lead to positive behavioral intentions, such as repurchase or continued use, while dissatisfaction can result in negative intentions (Leonard & Needham, 2020; Rahi& Ghani, 2019).

Behavioral Intentions: ECT posits that the confirmation of expectations not only affects satisfaction but also influences consumers' intentions to continue using a product or service. This relationship is critical in understanding long-term consumer engagement and loyalty (Rahi& Ghani, 2019; Juliana et al., 2021).

Table 1
Technology-Based Studies Using Expectation-Confirmation Theory (ECT)

Type of Technology	Variables Studied	Authors
Internet Banking	Expectation Confirmation, Perceived Usefulness, Satisfaction, Continuance Intention	Rahi& Ghani (2019)
Healthcare Services	Expectation, Performance, Confirmation, Satisfaction, Repurchase Intention	Leonard & Needham (2020)
Aviation	Expectation, Confirmation, Satisfaction, Customer Service	Roberts & Griffith (2019)
Online Communities	Pre-Adoption Expectations, Post-Adoption Evaluations, Satisfaction, Continuance Intention	Liu & Wang (2021)
E-Learning and Educational Contexts	Repurchase Intentions, Expectation Confirmation, Consumer Behavior	Juliana et al. (2021)
Mobile Applications	User Satisfaction, Confirmation, Continuance Intention, Technology Adoption	Tam et al. (2018)
Crowdsourcing Platforms	Satisfaction, Perceived Benefits, Platform Trust, Confirmation, Continuance Intention	Wang & Wang (2019)
E-Commerce	Expectation, Perceived Performance, Satisfaction,	Bhattacharjee

Platforms	Loyalty Intention	(2001)
Smart Home Technology	Perceived Ease of Use, Perceived Usefulness, Satisfaction, Continuous Use Intention	Zhou et al. (2016)
Social Media Platforms	User Expectations, Perceived Enjoyment, Confirmation, Satisfaction, Continuance Intention	Hsu & Lin (2015)
Cloud Computing Services	Perceived Service Quality, Perceived Value, Satisfaction, Continuance Intention	Wang et al. (2014)
Mobile Payment Systems	Perceived Security, Expectation Confirmation, Satisfaction, Adoption Intention	Kim et al. (2010)
Online Learning Platforms	Perceived Usefulness, User Satisfaction, Confirmation, Continuous Use Intention	Limayem& Cheung (2008)
Gaming Applications	Enjoyment, Perceived Value, Satisfaction, Intention to Continue Use	Hamari&Kerone n (2017)
Digital Subscription Services	Perceived Content Quality, Expectation Confirmation, Satisfaction, Renewal Intention	Park & Lee (2017)

Source: Author's Own

The variables studied in terms of ECT theory across these different technology contexts have been systematically examined in **Table 1**. Extending this framework to the energy sector, particularly in the context of solar prosumers, can provide valuable insights into understanding post-adoption behaviours, such as satisfaction, trust, and continuous usage intentions, which are crucial for promoting sustainable energy transitions. In the context of solar prosumers, continuous engagement with solar photovoltaic (PV) systems is crucial for ensuring the long-term success of renewable energy adoption. This theory focuses on the relationship between pre-adoption expectations and post-adoption perceived performance, highlighting how the confirmation or disconfirmation of these expectations affects satisfaction, which is a key determinant of ongoing use.

By applying ECT, this study can comprehensively explore the dynamics between expectations, performance, and satisfaction, ultimately offering insights into the drivers of continuous intention among solar prosumers.

Foundational Concepts of Expectation-Confirmation Theory

Expectations refer to the beliefs or anticipations that users hold regarding the performance and outcomes of a product or service prior to its use. In the context of ECT, expectations serve as a baseline against which actual performance is evaluated. When users' experiences align with or exceed their expectations, they are likely to experience positive confirmation, leading to increased satisfaction. Conversely, if the actual performance falls short of expectations, users may experience disconfirmation, resulting in dissatisfaction Bhattacharjee (2001).

Perceived performance is a critical determinant of user satisfaction within the ECT framework. Ashworth & Bourassa (2020) emphasize that the magnitude and direction of discrepancies between prior expectations and perceived performance significantly influence user satisfaction. Their findings indicate that positive disconfirmation, where actual performance exceeds expectations, leads to higher satisfaction levels, while negative disconfirmation results in lower satisfaction. This relationship underscores the importance of managing user expectations to enhance satisfaction and foster continued engagement.

Confirmation/Disconfirmation plays a pivotal role in determining customer satisfaction. It refers to the process through which consumers compare their pre-purchase expectations with the actual performance of a product or service after use. According to Oliver (1980), confirmation occurs when the perceived performance of the product meets the consumer's expectations, while disconfirmation arises when there is a mismatch between expectations and performance. Disconfirmation can be either positive—when performance exceeds expectations—or negative—when performance falls short. Positive disconfirmation typically leads to enhanced satisfaction, as the product delivers more than what was anticipated, while negative disconfirmation often results in dissatisfaction due to unmet expectations (Oliver, 1980). The confirmation/disconfirmation process is critical in shaping post-purchase evaluations, which in turn influence future behaviors such as repurchase intention and brand loyalty.

Satisfaction serves as an important determinant of post-purchase behaviors, such as repurchase intentions, word-of-mouth recommendations, and long-term loyalty (Oliver, 1980). It is not only an outcome of the evaluation process but also a critical predictor of whether consumers will continue engaging with a product or service over time.

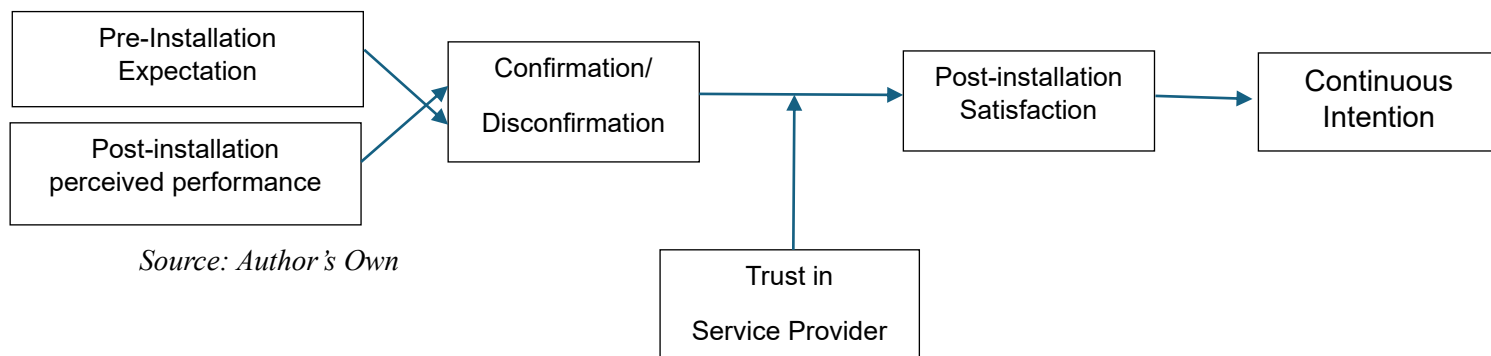
Continuous Intention is a specific form of post-purchase behavior that refers to the ongoing commitment of consumers to continue using a product or service over time. It is especially relevant in technology or service-based sectors, where long-term use is critical to success. According to Bhattacharjee (2001), continuous intention is influenced by the extent to which consumers feel their initial expectations have been met and how satisfied they are with the product's performance.

Proposed Conceptual Model

Building upon the foundational Expectation-Confirmation Theory (ECT) model, there is a need to move forward with a new conceptual model due to its limitations in fully capturing the complexities of continuous intention in certain contexts, such as solar prosumers. While ECT effectively explains the relationships between expectations, confirmation/disconfirmation, satisfaction, and post-purchase behavior, it does not account for additional variables that may play a significant role in long-term engagement. For example, factors such as trust in the service provider or perceived value are increasingly recognized as crucial in shaping consumers' continuous intention, especially in sectors like renewable energy, where the product lifecycle and relationship with the service provider extend far beyond the initial purchase.

Thus, moving towards a new conceptual model as of *Fig 1* not only addresses the theoretical gaps in the existing ECT framework but also enhances its applicability in real-world settings where long-term engagement with technology is essential. This extended model will allow for a deeper exploration of the factors that influence continuous use and provide more actionable insights for businesses aiming to foster sustained customer relationships.

Trust-Integrated Extended Expectation-Confirmation Model



Source: Author's Own

Before adopting a product or service, consumers form certain expectations based on available information and personal needs, which guide their evaluation after purchase. Pre-installation expectations refer to consumers' anticipations or beliefs about a product or service before experiencing it. These expectations, which can be shaped by marketing messages, past experiences, and social influence, set the standard against which the product's performance will be evaluated (Oliver, 1980). For example, in the context of solar photovoltaic (PV) systems, a prosumer might expect substantial reductions in energy bills or an improvement in environmental sustainability. Pre-installation expectations are crucial as they influence how consumers perceive performance, confirmation, and ultimately, satisfaction. If these expectations are realistic and well-formed, they are more likely to result in satisfaction post-installation (Santos & Boote, 2003). High pre-installation expectations, if unmet, could lead to dissatisfaction despite adequate product performance.

At the core of the model is post-installation perceived performance, a measure of how well the product or service meets the consumer's practical needs and expectations post-usage. Perceived performance denotes to how consumers evaluate the actual outcomes of a product or service post-adoption, based

on their personal experience. This evaluation is subjective and plays a key role in how consumers compare their expectations with reality (Bhattacharjee, 2001). In technology and service-based sectors, perceived performance can significantly affect satisfaction, especially when dealing with complex products like solar PV systems (Venkatesh et al., 2012). For instance, if a solar prosumer perceives that their system generates the expected energy savings, they are likely to feel satisfied. However, if the system underperforms, even slightly, it could impact their overall satisfaction. Perceived performance thus serves as a direct link between the objective functionality of a product and the emotional response of the consumer.

Confirmation or disconfirmation is the process through which consumers compare their pre-installation expectations to the product's perceived performance. According to Oliver (1980), confirmation occurs when the product meets expectations, while positive disconfirmation arises when performance exceeds expectations, and negative disconfirmation occurs when performance falls short. This process is central to the Expectation-Confirmation Theory (ECT) and influences satisfaction directly. Positive disconfirmation leads to higher levels of satisfaction, as consumers feel that the product has outperformed their expectations (Churchill & Surprenant, 1982). Conversely, negative disconfirmation often results in dissatisfaction. For instance, a solar prosumer who finds that their system is not delivering the promised savings may experience negative disconfirmation, which would likely diminish their satisfaction and trust in the provider.

Trust in the service provider, acting as a pivotal moderating factor, influences how consumers interpret and react to confirmation or disconfirmation. Trust refers to the consumer's belief in the provider's competence, reliability, and ability to act in their best interest (Gefen et al., 2003). Trust can enhance satisfaction by mitigating the effects of negative disconfirmation or amplifying the effects of positive disconfirmation. In cases where performance falls short, high trust in the provider may buffer dissatisfaction, as the consumer believes the provider will address the issues. Conversely, when performance exceeds expectations, trust further solidifies satisfaction by reinforcing the consumer's positive evaluation of the provider (McKnight, Choudhury, & Kacmar, 2002). In the solar energy sector, trust is crucial, as prosumers rely on the provider for ongoing maintenance and support, making it a determinant of long-term engagement.

Post-installation satisfaction is the consumer's emotional response to the comparison between expectations and the actual performance of the product or service (Bhattacharjee, 2001). In this extended model, trust plays a key role in shaping satisfaction, particularly in situations where the performance may not fully meet expectations. According to Parasuraman et al. (1988), satisfaction is not only about the product's technical performance but also involves the perceived quality of the overall experience, including customer support and post-installation services. In the context of solar prosumers, satisfaction is likely to be higher when the system performs well, and the provider is perceived as trustworthy and responsive to any issues. Satisfaction influences future behaviors, such as the decision to continue using the product, engage in word-of-mouth marketing, or recommend the provider to others (Anderson & Sullivan, 1993).

Lastly, continuous intention represents the consumer's ongoing commitment to using the product or service, often shaped by satisfaction and trust in the provider. This variable is critical in determining whether a consumer remains engaged with a product, particularly in industries where sustained use is essential, such as renewable energy (Bhattacharjee, 2001). Satisfaction is the primary driver of continuous intention, but trust in the provider also plays a significant role (Kim et al., 2009). When consumers are satisfied and trust the provider, they are more likely to continue using the product, recommend it to others, and even invest in additional services from the same provider. In the case of solar prosumers, continuous intention would mean ongoing use of the solar PV system and future decisions such as upgrading or expanding the system. Trust reassures the consumer that the provider will offer long-term support, making it more likely for them to commit to future interactions.

Discussion

This study aimed to extend the traditional Expectation-Confirmation Theory (ECT) by integrating trust as a key moderating variable, providing a deeper understanding of the factors influencing continuous intention among solar prosumers. The proposed Trust-Integrated Extended Expectation-Confirmation Model highlights the complex interplay between pre-installation expectations, perceived performance, confirmation/disconfirmation, trust in the provider, post-installation satisfaction, and continuous

intention. The findings and theoretical implications presented in this study offer important insights for both scholars and practitioners in the fields of renewable energy adoption, consumer behavior, and service management.

Theoretical Implications

This research contributes to the body of knowledge by extending the Expectation-Confirmation Theory to include trust as a moderating factor, enhancing the understanding of consumer behavior in service-oriented industries. By doing so, it addresses the limitations of the traditional ECT model, which assumes that satisfaction is primarily driven by the confirmation or disconfirmation of expectations. The incorporation of trust provides a more holistic view, acknowledging that consumer relationships with providers play an equally important role in satisfaction and continuance behavior.

Practical Implications

From a practical perspective, service providers, particularly in the renewable energy sector, must recognize the importance of managing expectations, delivering consistent performance, and building trust. Providers should focus not only on the technical performance of their systems but also on fostering strong customer relationships through transparency, reliability, and excellent post-installation support. Building trust will not only increase satisfaction but also buffer against dissatisfaction in cases of underperformance, ultimately leading to higher continuous intention and customer loyalty.

Limitations and Future Research

While the Trust-Integrated Extended Expectation-Confirmation Model offers valuable insights, the study is not without its limitations. First and foremost, this is a conceptual model and not an empirical study, which means the proposed relationships between trust, satisfaction, and continuous intention have not been tested through data collection or statistical analysis. As such, the findings should be viewed as theoretical propositions rather than verified conclusions. Future research should involve empirical testing of the model across different industries and contexts to validate the hypothesized relationships.

Second, the focus on the solar energy sector may limit the generalizability of the model to other sectors. Applying this model to other renewable energy contexts, such as electric vehicles or community projects, would test its broader applicability. Additionally, the model's emphasis on trust as the sole moderating variable leaves room for further exploration of other factors that might influence consumer behavior. Variables such as perceived value, social influence, or environmental concern were not considered in this study but could be critical in shaping both satisfaction and continuous intention.

Moreover, the model was developed based on a cross-sectional perspective, without considering how trust evolves over time. A longitudinal approach could offer insights into the dynamics of trust and its long-term impact on customer satisfaction and behavior. Furthermore, technological advancements in sectors like renewable energy could also impact the trust-satisfaction relationship, and these were not accounted for in the current conceptual model. Future studies should explore how innovations in solar technologies or energy storage systems influence the relationship between trust and continuous intention.

Conclusion

This study advances the Trust-Integrated Extended Expectation-Confirmation Model to provide a deeper understanding of the factors influencing continuous intention among solar prosumers. By extending the traditional Expectation-Confirmation Theory (ECT) with trust in the provider as a moderating variable, the model recognizes that consumer satisfaction is not solely driven by the alignment between expectations and perceived performance. Instead, trust plays a critical role in shaping how consumers respond to confirmation or disconfirmation of their expectations. Specifically, trust acts as a buffer in cases of negative disconfirmation, where underperformance might otherwise lead to dissatisfaction, and as an enhancer in cases of positive disconfirmation, amplifying satisfaction when expectations are exceeded.

The integration of trust within the ECT framework enriches both theoretical and practical understanding of consumer behavior in high-involvement sectors like renewable energy. The model underscores the importance of managing expectations, delivering consistent performance, and fostering trust to ensure long-term consumer engagement. For practitioners, the implications are clear: trust-building measures, such as transparent communication, reliable support, and post-installation

services, are essential for mitigating dissatisfaction and promoting sustained loyalty. Ultimately, this study offers a comprehensive approach to analyzing continuous intention, with significant implications for service providers aiming to enhance customer retention and long-term relationship management.

Declaration of use of AI

The authors declare that generative AI and AI-assisted technologies were utilized in the writing of this manuscript. It was used to assist in drafting sections of the manuscript and refining the language. The authors have thoroughly reviewed and approved the content generated by AI to ensure its accuracy and integrity.

All intellectual insights, analyses, and conclusions presented in this paper are solely the result of the authors' expertise, and the use of AI was limited to linguistic assistance. No data analysis, experimental design, or substantive scientific contributions were produced by AI technologies.

The final manuscript reflects the original thoughts and research of the authors.

Declaration of Funding

The authors declare that no specific funding was received for conducting this study. The research, authorship, and publication of this article were carried out without any financial support from external funding agencies, commercial entities, or not-for-profit organizations.

Data availability statement

The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

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