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CONSUMER ATTITUDES TOWARDS SMART HOME TECHNOLOGIES: THE CASE OF TURKIYE*

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Abstract

This study aims to explain individuals' attitudes toward smart home Technologies (SHT) and their intentions to use these technologies from the perspective of a developing country, Turkiye, as an example. Based on the Technology Acceptance Model (TAM), the study analyzed the effects of perceived ease of use, environmental benefits, economic advantages, security, and cost factors on both attitudes and behavioral intentions. Data was collected through face-to-face and online surveys between June 2024 and February 2025. The findings reveal that perceived ease of use has the most significant effect on attitudes, while perceived environmental benefits influence attitudes and perceived economic advantages influence usage intentions to a greater extent. The study contributes to the extension of TAM and provides practical recommendations for the widespread adoption of smart home technologies in the context of developing countries.

Keywords: Smart home, Technology acceptance model, Turkiye, Attitude, Usage Intention.

TÜKETİCİLERİN AKILLI EV TEKNOLOJİLERİNE YÖNELİK TUTUMLARI: TÜRKİYE ÖRNEĞİ

Öz

Çalışmanın amacı, bireylerin akıllı ev teknolojilerine (AET) yönelik tutumlarını ve bu teknolojileri kullanma niyetlerini, gelişmekte olan bir ülke perspektifiyle Türkiye örneği üzerinden açıklamaktır. Teknoloji Kabul Modeli'ni temel alarak yapılan araştırmada algılanan kolay kullanım, çevresel fayda, ekonomik avantaj, güvenlik ve maliyet unsurlarının hem tutum hem de davranışsal niyet üzerindeki etkileri analiz edilmiştir. Veriler yüz yüze ve çevrimiçi anketler yoluyla Haziran 2024 ve Şubat 2025 tarihleri arasında toplanmıştır. Bulgular, algılanan kolay kullanımın tutum üzerinde en güçlü etkiye sahip olduğunu, algılanan çevresel faydanın tutumu, algılanan ekonomik avantajın ise kullanım niyetini daha yüksek düzeyde etkilediğini göstermektedir. Ayrıca tutum, kimi değişkenler ile niyet arasındaki ilişkide kısmi aracılık rolü oynamaktadır. Çalışma, hem Teknoloji Kabul Modeli'nin genişletilmesine katkı sağlamakta hem de gelişmekte olan ülkeler bağlamında akıllı ev teknolojilerinin yaygınlaşması için uygulanabilir öneriler sunmaktadır.

Anahtar kelimeler: Akıllı ev, Teknoloji kabul modeli, Türkiye, Tutum, Kullanım niyeti.

* A preliminary version of this research was presented as an abstract titled "Consumer Attitudes Towards Artificial Intelligence-Based Smart Home Applications" at the II. International Social Sciences Congress organized by Ufuk University on May 3-5, 2023. This article has been significantly redeveloped with a new research design and a different sample following formal ethical approval.

1. INTRODUCTION

The rapid development of the Internet of Things (IoT) and artificial intelligence (AI) has brought many changes to the consumer world. These changes are being experienced more rapidly in countries with high levels of economic development, while in developing economies, the changes are relatively slower but still significant. The slower pace of change in developing economies may be attributed to factors such as limited infrastructure or financial constraints.

Regardless of the pace of change, the combined effects of advances in both IoT and AI are influencing many areas, particularly consumers' decision-making processes and interactions with brands, while offering substantial benefits. However, this progress brings about ethical challenges, such as considerations regarding constant surveillance and power imbalances between the market forces and consumers (Puntoni et al., 2021:132). The challenges of AI and IoT systems are widely discussed in the literature and call for a comprehensive assessment of the issue, not only from the perspective of technological improvements but also from the perspective of users (Borenstein and Howard, 2021: 63).

Smart home technologies (SHT) are becoming increasingly common in daily life. These systems can be explained as applications that combine the benefits of artificial intelligence and IoT to enable devices to communicate with each other for increased efficiency over an internet connection. These systems are designed to make the home more efficient, safe, and comfortable. For example, smart thermostats and smart lighting systems save energy and reduce utility bills, while smart security cameras and alarm systems make homes safer.

Consumers' attitudes and expectations toward these systems have a significant impact on the formulation of marketing strategies (Canizzaro et al., 2020: 24). Therefore, a comprehensive understanding of consumers' attitudes and expectations plays a critical role in the smart home systems industry. Although the benefits of these technologies are promising, the ethical drawbacks or risks may distort the consumer perception and, in turn, give rise to unfavorable attitudes towards them (Wright and Shank, 2020: 59-61).

In countries with higher economic development, SHTs are used more intensively due to the availability of appropriate infrastructure and economic circumstances, like consumers' relatively higher ability to afford purchasing such systems. Therefore, the number of studies on SHT in these countries is quite high (Kang et al., 2022; Sovacool and Rio, 2020). In addition to studies that generally focus on issues such as technology-based competencies and infrastructure requirements (Ding et al., 2016), there is a lack of research focusing on the user perspective (Li et al., 2022: 2), and it is significantly important to carry out research that is designed to understand the experiences of users and clarify the issue from their perspective (Marikyan et al., 2023: 1102).

The present study, which aims to develop insights into the consumer perspectives in Turkiye regarding SHT, was planned to support the limited research on SHT in the context of emerging economies. Understanding the attitudes of consumers towards smart home technologies in Turkiye, as a developing country, is crucial for grasping the dynamics of this market, which is projected to grow substantially in the coming years. The views of both current working professionals and today's university students are of critical importance: while the former are already dominant consumers with purchasing power, the latter are future market actors whose influence will rise as they enter professional life. This study contributes to the current research area by adding a new and unique geographical context and perspective on potentially and currently important consumer groups.

2. LITERATURE REVIEW

2.1. Artificial Intelligence in Consumer Technologies

Although artificial intelligence is primarily perceived as a technology-focused area at first glance, it is a constantly evolving field that should also be examined in terms of its sociological effects, given its

interaction with consumers in many areas, from banks to streaming platforms to retail services. The rapid development of the field has also been reflected in related academic studies, particularly since 2017; however, the conceptual and qualitative studies in this area remain relatively scarce (Jain et al., 2023: 692).

While the practical benefits and ease of use of AI-supported systems increase their preferability (Calahorra-Candao and Martín-de Hoyos, 2024: 13), consumers are reported to evaluate AI-supported systems negatively due to factors such as risk perception and ethical concerns (Gonçalves et al., 2023: 323). In addition to these effects, previous experiences and the gender of users are also indicated to play an important role in the willingness to use AI-supported systems (Kolar et al., 2024: 14).

Industry and product-based studies have also been conducted on consumers' attitudes and intentions toward these systems. The findings show that, in the context of interaction with sectors focused on entertainment and recreation, assigning human characteristics to AI-supported chatbots improves consumer attitudes, but there is no significant effect in benefit-based sectors such as banking (Youn and Cho, 2023: 1041). On the other hand, it is noted that AI-supported recommendations for products and services are perceived as more competent for material products than for experiential products (Jin and Zhang, 2025: 279). In light of these previous studies, it is crucial to evaluate AI-supported systems not only from a technological perspective but also from the user's point of view to assess their market position comprehensively.

2.2. Smart Home Technologies and Consumer Perceptions

Perceived risks, benefits, and value of SHT, as well as adoption processes, may vary across different user groups. As in the case of many innovations, the adoption journey of SHT can be described as a multi-stage process that begins with consumer awareness, followed by use, and then a re-evaluation of it. Users may show varying levels of willingness to use the technology depending on their level of awareness (Sanguinetti et al., 2018: 3, 10).

The benefits that SHT offers to users can be evaluated under many different categories. Benefits such as energy savings, increased comfort, and security can be observed at both the individual level (e.g., reduced utility bills) and the societal level (e.g., enhanced environmental sustainability) (Marikyan et al., 2020: 1103). For example, users in Greece find smart home systems preferable primarily for reasons such as monitoring the sick and elderly, providing greater security, and offering cost advantages (Pliatsikas and Economides, 2022: 7), while in Italy, energy savings and cost advantages have emerged as the main factors encouraging their use (Balta-Özkan et al., 2014: 1183).

Findings from different countries within the scope of perceived risks show that the primary risk factor related to SHT arises in the context of continuous surveillance and data privacy violations (Balta-Özkan et al., 2014: 1185; Pliatsikas and Economides, 2022: 7). This situation is critical in terms of highlighting the importance of user trust in the use of SHT and has motivated researchers to question the main factors in the formation of trust in SHT. Liu et al. (2022: 15) state that perceived system quality in the context of SHT is one of the main elements that shape consumer trust.

On the other hand, there are many studies examining the impact of demographic factors on user attitudes toward SHT. In this context, it has been found that high-income groups are more likely to adopt SHT (Korneeva et al., 2021: 9; Parag and Butbul, 2018: 182), and that women are both less aware of SHT compared to men (Cannizzaro et al., 2020: 8) and less willing to use it (Sanguinetti et al., 2018: 14). Among the findings obtained, it was noted that older age groups not only have less trust in SHT (Cannizzaro et al., 2020: 12) but also experience technical difficulties when using the systems (Pliatsikas and Economides, 2022: 6). Educational level was found to influence both awareness and adoption of SHT, with relatively highly educated individuals being both more informed about SHT and more likely to adopt them (Cannizzaro et al., 2020: 11).

2.3. Smart Home Technologies in Turkiye

Although SHT offers many advantages due to the benefits it presents and points to significant potential in the near future, it was reported to be in its infancy in Turkiye just a few years ago (Başarır-Özel et al., 2022: 2). Probably because of the lack of adequate infrastructure and economic conditions, it was not adopted by mainstream consumers (Coşkun et al., 2018: 2). Consequently, academic research in this field is also limited. Studies examining scholarly publications within the scope of SHT indicate that research conducted in the context of economically developed countries has advanced the field, while Turkiye does not rank among the leading countries in terms of the number of academic publications in this area (Büyük et al., 2022: 15). However, recent sources indicate that the market is gaining momentum and that smart home penetration in Turkiye is projected to reach approximately 78.6% by 2025 (Statista, n.d.). This will increase the need for high-quality research in this field.

It is also noted that the limited number of studies conducted in the context of Turkiye focus more on technical competencies and features within the scope of SHT rather than understanding user experience or perspectives (Daş et al., 2015: 244). Given that SHT represents a market with high growth potential soon, the limited number of studies focusing on marketing activities is also noteworthy (Demir and Ventura, 2021: 385).

Although limited in number, there are a few studies in Turkiye that focus on user experience. It is stated that perceived benefit and ease of use are among the most effective variables on attitudes and usage intentions toward SHT (Ayan and Türkay, 2021: 5; Coşkun et al., 2018: 7; Türkyılmaz and Altındağ, 2022: 28), but the effect of security and cost factors is relatively low (Ayan and Türkay, 2021: 5).

In research designed with a qualitative approach, it may also be possible to identify variables not found in the literature. Studies conducted in Turkiye using this method have revealed additional benefits, such as benefiting from SHT expertise for areas that users do not have much experience with (like cooking), spending more time with children, and creating free time for hobbies as a result of SHT utilization (Coşkun et al., 2018: 7).

In parallel with studies conducted in different geographical contexts—even in more economically developed ones—it has been noted that security and privacy concerns related to SHT have emerged at a significant level in Turkiye as well (Türkyılmaz and Altındağ, 2022: 28).

2.4. Extending the Technology Acceptance Model for Smart Home Contexts

The Technology Acceptance Model (TAM), developed by Davis (1989), has been widely used to explain consumer acceptance behavior of many technological innovations. The perceived ease of use and perceived usefulness dimensions constitute the foundation of the model, and it is stated that perceived usefulness has a higher correlation with usage than perceived ease of use (Davis, 1989: 333). TAM remains a widely adopted model used in studies to explain SHT acceptance as well (see Cui et al., 2024; Nikou, 2019: 15).

However, TAM's applications across different demographic groups or contexts have expanded the model by adding new perspectives and dimensions. In particular, it has been demonstrated that perceptions related to security, privacy, and self-capability are critical in the adoption of SHT by older adults (Pal et al. 2018: 51247). The perception of value in terms of personalization is another dimension added to TAM, along with perceived ease of use and perceived usefulness, both of which influence consumers' intention to use SHT (Hubert et al., 2020: 1163).

Especially for SHT, since the systems are grounded in user experience and offer multiple benefits, relying solely on a single theoretical model may limit explanatory power, even if the validity of the model is repeatedly demonstrated. Therefore, extending TAM with additional dimensions reflecting the contextual factors becomes crucial for capturing the full complexity of user acceptance behavior.

2.5. Gaps in the Literature and the Rationale for the Study

Until just a few years ago, the SHT market in Turkiye was still considered to be in its early stages (Başarır-Özel et al., 2022: 2). Current statistics, however, indicate that the market is growing rapidly in Turkiye, with household penetration rates expected to reach 78.6% by 2025 and 94% by 2029 (Statista, n.d.). This swift transition from an emerging to a rapidly growing market is expected to underscore the need for comprehensive research reflecting the current dynamics and consumer perspective on the field in the Turkish context.

Research conducted within the scope of SHT users in the literature has been limited to either users who already utilize smart home systems (Coşkun et al., 2018) or individuals with professional backgrounds in technology, such as engineers (Ayan & Türkay, 2021). In addition, several studies focus on SHT experiences of elderly users, in cases where SHT promises to improve the quality of life (Daş et al., 2015; Ehrenhard et al., 2017; Seven & Dirik, 2023).

On the other hand, potential user experiences and expectations, such as those of university students, who will be among the important participants of this market soon, appear to be an insufficiently researched context. Supporting this gap, Korneeava et al. (2021: 1), in their research across EU countries and Russia, found that young people are more concerned about potential data leaks and privacy than other groups when using SHT. This situation also highlights the need for a focused study on youth perspectives within the scope of SHT.

In light of all this information, the current study aims to measure the attitudes and usage intentions of a diverse user group, including both university students and working professionals, to present original findings in the context of Turkiye, which has not been sufficiently researched. It also aims to address the existing gaps in the literature in terms of representation, diversity, and the context of developing countries like Turkiye.

2.6. Hypothesis Development

Consumer perceptions of smart home systems are influenced by many different variables; however, studies generally focus on perceived economic advantages, costs, environmental benefits, security, and ease of use of the SHT. For instance, research revealed that the economic advantages of SHT positively influence attitudes (Larionova et al., 2024: 5-6; Lau et al., 2022: 2231), and factors such as installation and maintenance costs are among the main barriers to usage intention (Gebsombut et al., 2025: 14; Nikou, 2019: 8). On the other hand, the perceived environmental benefits of SHT are evaluated positively (Strzelecki et al., 2024: 10), and safety concerns associated with SHT are not significant for the younger generation born in the digital age (Chin et al., 2023:15). Moreover, young people, who relatively have a higher innovation potential, positively evaluate ease of use of SHT (Gebsombut et al. 2025:10). Therefore, the first hypothesis is formulated as follows:

H1: Individuals positively perceive the economic advantages, costs, environmental benefits, safety, and ease of use of SHT.

Studies show that although SHT have high initial costs, they are economically advantageous considering their long-term efficiency and energy savings (Pliatsikas & Economides, 2022: 7). For example, Larionova et al. (2024: 5-6) revealed that SHT saves $120 per household -per month on average- through energy savings and creates an economic advantage despite the monthly investment cost. Similarly, research conducted with elderly users emphasized that the perceived economic advantage is an important factor in the adoption of SHT (Tural et al., 2021: 9). These findings suggest that individuals' attitudes toward SHT with high perceived economic advantages will be positively shaped and their intention to use them will increase. In this context, the following hypotheses have been formulated:

H2a: Perceived economic advantages positively influence individuals' general attitudes toward SHT.

H3a: Perceived economic advantages positively influence individuals' intention to use SHT.

The perceived cost of SHT can be considered as a variable with two sub-dimensions, including installation and maintenance or repair costs. Previous research revealed that users' perception of these costs as high has a negative effect on their attitudes and intention to use SHT (Nikou, 2019: 8). Especially during periods of economic instability, the high installation and maintenance costs of these technologies can negatively affect consumers' intention to use them (Gebsombut et al., 2025: 14). Based on these findings, the following hypotheses were formulated:

H2b: Perceived costs negatively influence individuals' general attitudes toward SHT.

H3b: Perceived costs negatively influence individuals' intention to use SHT.

The smart management of the world's scarce resources, considering the needs of future generations, is the fundamental principle of sustainability. Research shows that users recognize the positive effects of SHT in the context of environmental sustainability and that this perception significantly and positively influences their attitudes toward the systems and their intention to use them. For example, Strzelecki et al. (2024:10) found that SHT are considered a useful tool due to the real-time and continuous monitoring of consumption, thereby contributing to energy and resource savings. Similarly, Guo and Xiao (2023: 4) revealed that the intention to use SHT is directly proportional to the increase in perception regarding environmental benefits. However, some studies indicate that the elderly, in particular, prioritize practical benefits, and their perceptions of environmental benefits are not among the factors that directly influence attitudes or usage intentions (Dermody et al., 2021:4850; Kilcullen et al., 2022:5). On the other hand, although consumers with high levels of environmental concern have strong intentions to use SHT, this intention does not always translate into purchasing behavior (Lau et al., 2022:2231). In light of all this preliminary information, the following hypotheses have been formulated regarding the positive effect of perceived environmental benefits on attitudes and usage intentions towards SHT:

H2c: Perceived environmental benefits positively influence individuals' general attitudes toward SHT.

H3c: Perceived environmental benefits positively influence individuals' intention to use SHT.

Studies on the perceived risks of SHT—such as personal data leakage and personal data being used for purposes other than permitted—indicate that perceived risk negatively affects users' attitudes (Yang et al. 2017: 80), and this risk has a negative moderating effect on the relationship between attitudes and intentions to use SHT (Cui et al., 2024: 1844). Perceived risks are particularly prominent among older consumers (Dermody et al., 2021: 4856; Patskanick et al., 2024: 11; Tural et al., 2021: 10). On the other hand, security sensitivities were reported as lower among younger consumers, and no significant relationship was revealed between the SHT usage intentions of young individuals and the security of SHT (Chin et al., 2023:15). In parallel with studies conducted in many different economic and geographical contexts, security and privacy concerns are perceived at a high level among consumers in Turkiye regarding the use of SHT (Türkyılmaz & Altındağ, 2022: 28). Therefore, perceived safety is thought to be an important variable for being tested in terms of its effects on attitudes and intentions in the Turkish context. Considering the findings of previous studies, it is hypothesized that positive perceptions of security and privacy levels strengthen users' attitudes and their intention to use SHT.

H2d: Perceived safety positively influences individuals' general attitudes toward SHT.

H3d: Perceived safety positively influences individuals' intention to use SHT.

Perceived ease of use is a factor that significantly affects consumer attitudes and intentions to use, especially for products with recent and high technology. Because new technologies can sometimes be confusing, and consumers who perceive risks or difficulties in use may have their attitudes or intentions negatively affected. Studies examining this relationship reveal perceived ease of use has a significant and positive effect on attitudes toward SHT (Gebsombut et al., 2025: 13) and intention to use it (Chin et al., 2024: 13; Nikou, 2019: 13). Studies conducted specifically in the context of individuals

over the age of 50 have indicated that attitudes and intentions toward SHT are highly positively correlated with the variable of perceived ease of use (Tural et al., 2021: 5). Furthermore, as individuals' innovativeness level increases, the perceived ease of use of SHTs is also positively affected (Gebsombut et al. 2025:10). This forms the basis for the below hypotheses:

H2e: Perceived ease of use positively influences individuals' general attitudes toward SHT.

H3e: Perceived ease of use positively influences individuals' intention to use SHT.

Finally, the following hypothesis was formulated to test the mediating role of attitude in the relationship between predictor variables and intention to use:

H4: General attitude toward SHT mediates the relationship between perceived economic advantages, costs, environmental benefits, safety, and ease of use and the intention to use SHT.

3. METHODOLOGY

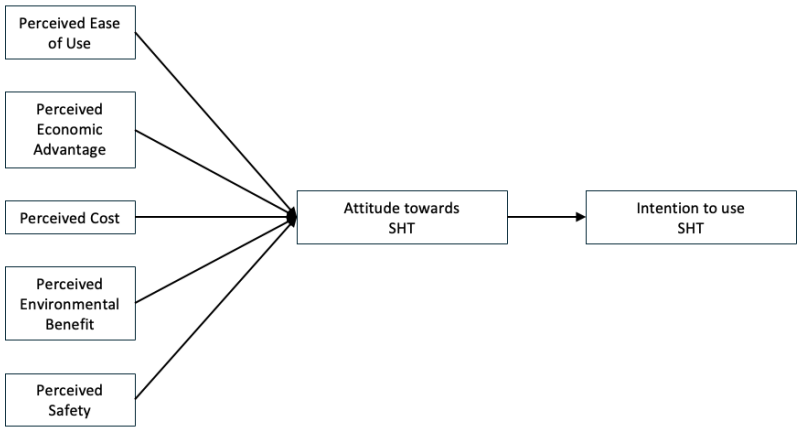
3.1. Theoretical Framework and Research Scope

This study aims to examine the perceptions and usage intentions of individuals towards SHT. Working professionals and university students who are expected to enter the workforce in the coming years and experience an increase in purchasing power are likely to constitute a significant part of future SHT users and become key actors in this market. Therefore, it is vitally important to understand their perceptions, attitudes, and behavioral intentions towards SHT.

Many studies in the literature have extended the Technology Acceptance Model (TAM) (Davis, 1989) to explain attitudes toward SHT and intention to use, adding new constructs to the original dimensions of perceived usefulness and ease of use (see Ma, 2024; Zhanga and Liu, 2022; Zhou et al., 2024). Within the scope of the study, participants were given statements regarding perceived economic advantage, perceived cost, perceived environmental benefit, perceived ease of use, perceived safety, general attitude towards SHT, and intention to use SHT. They were asked to evaluate these statements on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Therefore, the Extended TAM is preferred since it enables the integration of these variables.

The statements related to the dimensions mentioned above in the questionnaire were adapted from previous studies (Lau et al., 2022; Pal et al., 2018; Park et al., 2018; Pliatsikas and Economides, 2022; Sanguinetti et al., 2018). The survey also includes a section where participants evaluate the perceived usefulness of various smart home technology (SHT) applications (e.g., security systems, lighting, heating, entertainment, etc.) using a 5-point Likert scale (1 = Not useful at all, 5 = Very useful), as well as demographic questions.

Figure 1. *Research model.*



The relationships between the variables included in the research model will be evaluated based on the analysis results. Instead of introducing a new theoretical model, the study focuses on conducting a comprehensive exploration of consumers' perceptions of SHT, including various aspects like cost-benefit assessments and concerns about security and privacy.

The research questions below aim to be answered via the current study:

(1) How do individuals perceive the economic advantages, costs, environmental benefits, safety, and ease of use of SHT?

(2) To what extent do perceived economic advantages, costs, environmental benefits, safety, and ease of use influence individuals' general attitudes toward SHT?

(3) To what extent do perceived economic advantages, costs, environmental benefits, safety, and ease of use predict individuals' intention to use SHT?

(4) Does general attitude toward SHT mediate the relationship between perceived economic advantages, costs, environmental benefits, safety, and ease of use and the intention to use SHT?

3.2. Data Collection Method

The data were collected using a convenience sampling method between June 2024 and February 2025 through both face-to-face and online surveys. In order to comply with ethical principles, an informed consent form was added to the beginning of each printed survey, and a question was added to the online surveys asking participants to indicate their consent before starting.

Ethical approval for this study was obtained from the Ege University, Social and Human Sciences Scientific Research and Publication Ethics Committee (Date: May 2024, Approval No: 2465).

Furthermore, the questionnaire included a statement that read, "This survey is ridiculous; I don't know why I am filling it out." The responses of participants who answered "agree" or "strongly agree" to this question were excluded from the analysis because the validity of their answers was considered to be potentially unreliable. Of the 338 surveys collected, 316 were deemed valid and included in the analysis. The minimum sample size for multiple regression is stated with the formula $N \geq 50 + 8p$, where p represents the number of predicting variables (Tabachnick and Fidell, 1996, as cited in Dunlap, Xin, & Myers, 2004: 695). Since both multiple linear regression and mediation analyses were conducted with five predictors—perceived cost, perceived economic advantage, perceived environmental benefit, perceived safety, and perceived ease of use—the sample size of 316 is considered sufficient for the analyses.

The survey was administered in Turkish. The original English items were translated into Turkish and then back-translated into English using an online translation tool to ensure accuracy and consistency.

3.3. Survey Design

In the current study, several scales were employed to assess individuals' evaluations regarding SHT. Participants were asked to respond to statements measuring perceived economic advantage, perceived cost, perceived environmental benefit, perceived ease of use, perceived safety, general attitude towards SHT, and intention to use SHT on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).

Perceived cost, perceived ease of use, perceived safety, attitude toward smart home technologies, and intention to use were measured using items adapted from Pal et al. (2018) and Park et al. (2018). In the original Technology Acceptance Model (TAM), perceived usefulness represents a broad construct including various types of benefits. In this study, the concept was operationalized through two dimensions for more specificity, which are perceived economic advantage and perceived environmental benefit. The items for perceived environmental benefit were adapted from Lau et al. (2022) and Sanguinetti et al. (2018), while those for perceived economic advantage were derived from Lau et al. (2022) and Pliatsikas and Economides (2022).

The questionnaire also includes a section that allows participants to evaluate the benefits of SHT in various domains (e.g., security systems, lighting, heating, entertainment, etc.). In this part, participants were asked to rate their opinions on a 5-point Likert scale (1 = Not useful at all, 5 = Very useful). The last section of the survey is designed to gather demographic information about participants, such as gender, age, educational status, and occupation.

3.4. Data Preparation and Preliminary Analysis

In the study, multivariate analysis techniques were applied using the JAMOVI statistical software (version 2.6) within the context of quantitative analysis methods. The six-step model development approach proposed by Hair et al. (2019) was adopted during the analysis process. Following development of the conceptual model and data gathering, preliminary analyses were conducted on the data, as detailed below.

Some of the items in the scales are positive, while others are negatively worded. For example, the items for perceived costs originally indicated higher costs, and they are reversely coded for analysis so that higher scores indicate lower perceived cost (i.e., more affordability). Reverse coding was performed to ensure that the items on the scales were in the same direction. In other words, to align all items in a positive direction. This was done to ensure consistent results and to interpret higher scores as more favorable perceptions.

Following reverse coding, missing values for each participant were replaced with the mean of the variable group to which that item belonged to protect each participant's unique response profile. Means were calculated separately for each variable group rather than for all responses, and missing values were replaced with the mean of the variable group to which they belonged.

Items with low factor loadings (<0.400) were removed to improve factor structures depending on the optimal cutoff points revealed in the previous research (Usta, 2023:432; Pires et al., 2019:458). The results of reliability analysis and explanatory factor analysis showed that internal consistency and factor validity were sufficient for each variable structure, which necessitates a minimum Cronbach's Alpha value of 0.7, a KMO value of 0.500, and a significant Bartlett's test of sphericity at p <.001 (George and Mallery, 2010; Miljkovic, 2025). The following table provides details of these analyses.

Normality analysis revealed that the mean scores of each variable were normally distributed depending on acceptable ranges for skewness and kurtosis (±2) (George and Mallery, 2010; Gravetter and Wallnau, 2014).

Table 1. *Reliability analysis and exploratory factor analysis results.*

FACTOR	ITEM	FACTOR LOADING	% of VARIANCE EXPLAINED
Cronbach's α = 0.852; KMO = 0.802; Bartlett's test of sphericity, $\chi^2(6) = 579$, $p < .001$			
Perceived Economic Advantage of SHT Mean= 3.76 Skewness= -0.829 Kurtosis= 1.000	Smart home systems are economically advantageous.	0.642	60.6%
	Smart home systems help save electricity.	0.848	
	Smart home systems prevent unnecessary energy consumption.	0.845	
	Smart home systems contribute to my budget in the long run.	0.762	
Cronbach's α = 0.730; KMO = 0.750; Bartlett's test of sphericity, $\chi^2(6) = 257$, $p < .001$			
Perceived Cost of SHT Mean= 2.57 Skewness= 0.310 Kurtosis= -0.348	Smart home system products are expensive. (R)	0.664	41.7%
	Using smart home systems is a financial burden. (R)	0.558	
	Using smart home systems requires a significant investment. (R)	0.750	
	I don't have the financial means to use smart home systems. (R)	0.594	
Cronbach's α = 0.906; KMO = 0.833; Bartlett's test of sphericity, $\chi^2(6) = 850$, $p < .001$			

Perceived Environmental Benefit of SHT Mean= 3.80 Skewness= -0.573 Kurtosis= 0.450	Smart home systems contribute to environmental protection.	0.787	71.4%
	Smart home systems prevent the negative effects of global warming.	0.824	
	Smart home systems help reduce carbon emissions.	0.945	
	Smart home systems help protect our natural environment through energy-saving applications.	0.814	
Cronbach's α = 0.903; KMO = 0.751; Bartlett's test of sphericity, $\chi^2(3) = 605$, $p < .001$			
Perceived Ease of Use of SHT Mean= 3.95 Skewness= -0.725 Kurtosis= 0.650	Smart home systems are easy to use.	0.879	75.9%
	I will not have difficulty using smart home systems.	0.898	
	Smart home systems are easy to understand.	0.835	
Cronbach's α = 0.792; KMO = 0.593; Bartlett's test of sphericity, $\chi^2(3) = 470$, $p < .001$			
Perceived Safety of SHT Mean= 2.93 Skewness= -0.134 Kurtosis= -0.285	Using smart home systems poses a risk to the security of my personal data. (R)	0.953	63.3%
	Using smart home systems makes my personal data accessible to others. (R)	0.897	
	Using smart home systems is safe for my personal data.	0.431	
Cronbach's α = 0.931; KMO = 0.765; Bartlett's test of sphericity, $\chi^2(3) = 776$, $p < .001$			
Attitude towards SHT Mean= 3.91 Skewness= -0.817 Kurtosis= 0.993	Using smart home systems is a good idea.	0.909	81.9%
	I have a positive opinion about using smart home systems.	0.925	
	Using smart home systems generally provides a good experience.	0.881	
Cronbach's α = 0.922; KMO = 0.885; Bartlett's test of sphericity, $\chi^2(10) = 1259$, $p < .001$			
Intention to Use SHT Mean= 3.76 Skewness= -0.749 Kurtosis= 0.548	I intend to use smart home systems in the near future.	0.778	71.1%
	I would like to use smart home systems as much as possible.	0.931	
	I recommend smart home systems to my close friends and family.	0.888	
	I am eager to use smart home systems in the future.	0.914	
	I would like to try smart home systems.	0.677	

4. FINDINGS

4.1. Participant Profile

More than half of the participants were women (61.3%), while men represented 37.4% of the participants. Participants' monthly and personal income levels were categorized into three brackets: low, medium, and high. 39.2% of participants reported having an income of 23,000 TL or less, which roughly aligns with the national minimum wage level at the time of data collection. 37.9% of participants reported an income between 23,001 and 41,000 TL, and 23% reported an income of more than 41,001 TL. The results regarding educational level show that nearly half of the participants have a high school diploma (50.5%), 30.2% have a bachelor's degree, and 19.3% have a graduate degree. This distribution is reflected in the participants' occupational status. 51.62% of participants are university students, while 43.18% are working professionals. A minority of participants (5.19%) indicated that they are retired, homemakers, or currently unemployed. The average age of participants is 28.9 years (SD=9.55), suggesting that the sample is relatively young, yet diverse in terms of age. Overall, the sample demonstrates considerable diversity across education, occupation, and income levels. Table 2 contains detailed information about the demographic profile of the participants.

Table 2. *Descriptive statistics.*

GENDER			INCOME		
	N	Valid %		N	Valid %
Female	190	61.3%	23.000 TL and lower	121	39.2%
Male	116	37.4%	23.001 – 41.000 TL	117	37.9%
Preferring not to state	4	1.3%	41.001 TL and more	71	23%
Valid Responses	310	100.00%	Valid Responses	309	100.00%
Missing	6		Missing	7	
Total	316		Total	316	
EDUCATION			OCCUPATION		
	N	Valid %		N	Valid %
High School Diploma	159	50.5%	University Students	159	51.62%
Undergraduate Degree	95	30.2%	Working Professionals	133	43.18%
Graduate Degree	61	19.3%	Retired, Homemaker and Unemployed	16	5.19%
Valid Responses	315	100.00%	Valid Responses	308	100.00%
Missing	1		Missing	8	
Total	316		Total	316	

4.2. Participants' Evaluation of Smart Home Technology Usefulness across Domains

Participants were also asked to evaluate the domains in which smart home technologies provide benefits. The findings obtained from the evaluation of the usefulness of various domains on a 5-point Likert scale (1 = Not useful at all, 5 = Very useful) are shown in Table 3.

Table 3. *One-sample t-test Results (1 = Not useful at all, 5 = Very useful; test value = 3).*

Variable	N	Mean ($\bar{x}$)	SD	t	p value
Security Systems	311	4.50	0.842	31.52	< .001
Heating Systems	311	4.55	0.760	35.89	< .001
Cooling Systems	311	4.39	0.905	27.12	< .001
Lighting Systems	311	4.28	1.008	22.44	< .001
Sound Systems	311	3.71	1.288	9.68	< .001

The figures in Table 3 show that participants rated the usefulness of SHT significantly higher than the neutral midpoint of 3 in all five domains, indicating that they found SHT useful in all domains. In particular, SHT applications in heating systems ($\bar{x}$ = 4.55, SD = 0.76, t(310) = 35.89, p < .001) and security systems ($\bar{x}$ = 4.50, SD = 0.84, t(310) = 31.52, p < .001) were found to be more useful than in other domains, while the lowest perceived usefulness was reported in sound systems ($\bar{x}$ = 3.71, SD = 1.29, t(310) = 9.68, p < .001).

4.3. Hypothesis Testing

The independent variables (predictors) to be tested in the hypothesis test are Perceived Economic Advantage, Perceived Cost (reversed), Perceived Environmental Benefit, Perceived Safety, and Perceived Ease of Use. The mediator variable is defined as General Attitude toward SHT, and the dependent variable is defined as Intention to Use SHT.

Initially, to test the hypothesis H1, -Individuals positively perceive the economic advantages, costs, environmental benefits, safety, and ease of use of smart home technologies-, a one-sample t-test was performed with the aim to understand whether the mean scores of each factor were significantly different from the indifference point of 3. Table 4 shows the results of this test in detail.

Table 4. *One-sample t-test Results (1 = strongly disagree, 5 = strongly agree; test value = 3).*

Variable	N	Mean (x̄)	s.d.	t	p value
Average Perceived Economic Advantage Scores	316	3.76	0.826	16.43	< .001
Average Perceived Cost Scores	316	2.57	0.812	-9.46	< .001
Average Perceived Environmental Benefits Scores	316	3.80	0.806	17.55	< .001
Average Perceived Ease of Use Scores	316	3.95	0.802	20.96	< .001
Average Perceived Safety Scores	316	2.93	0.915	-1.43	.154

The results summarized in Table 4 show that participants perceive economic advantage ($\bar{x}$ = 3.76, SD = 0.83, t(315) = 16.43, p < 0.001), environmental benefits ($\bar{x}$ = 3.80, SD = 0.81, t(315) = 17.55, p < 0.001), and ease of use ($\bar{x}$ = 3.95, SD = 0.80, t(315) = 20.96, p < 0.001) of SHT as positive. However, perceived costs were found to be significantly lower than 3 ($\bar{x}$ = 2.57, SD = 0.81, t(315) = -9.46, p < 0.001). Since the items in this factor were reverse-coded (indicating that the systems were inexpensive), it can be said that perceived affordability of SHT is negative. Besides, perceptions of the reliability of SHT were not significantly different from the indifference point of 3 ($\bar{x}$ = 2.93, SD = 0.92, t(315) = -1.43, p = 0.154). Therefore, it can be stated that participants are unsure about the safety of these systems. The fact that participants generally have positive perceptions in dimensions other than perceived cost and safety can be interpreted as partially supporting H1.

Multiple Linear Regression (MLR) was used to test the second and third groups of hypotheses in order to examine to which extent each independent variable (perceived economic advantage, perceived cost, perceived environmental benefits, perceived ease of use, and perceived safety) predicted general attitudes and usage intentions toward SHT. This method is widely recommended in social sciences to measure the individual effect of more than one predictors (Hair et al., 2019). Multicollinearity was tested using the Variance Inflation Factor (VIF). Since all VIF values obtained were below 2, and the cutoff point is determined to be 10 (Hair et al., 2019: 316), it was concluded that there was no multicollinearity among the variables.

The results of the multiple linear regression analysis are presented in Table 5.

Table 5. *Multiple linear regression results predicting general attitudes toward smart home technologies.*

Variable	Std. β	p value
Perceived Economic Advantage	0.220	< .001
Perceived Cost	0.008	.845
Perceived Environmental Benefits	0.230	< .001
Perceived Ease of Use	0.355	< .001
Perceived Safety	0.224	< .001

The analysis showed that the independent factors explained about 51.3% of the variance in general attitude, and the model was overall significant (R = 0.716, R^2 = 0.513, F (5,310) = 65.3, p <.001)(Hair et al., 2019) . The results shown in Table 5 indicate that individuals' general attitudes toward SHT are significantly and positively affected by perceived ease of use (β = .355, p < .001), environmental benefits (β = .230, p < .001), safety (β = .224, p < .001), and economic advantage (β = .220, p < .001). Perceived ease of use was identified as the factor with the greatest explanatory power and strongest impact. Conversely, perceived cost does not significantly influence attitudes (β = .008, p = .845). When considering other benefits, this suggests that affordability may not be a key factor shaping general attitudes towards SHT. Therefore, it can be stated that the second group of hypotheses is partially supported. Hypotheses 2a, 2c, 2d, and 2e are supported based on the analysis results, while hypothesis 2b is not supported.

Multiple linear regression was also used to test the third group of hypotheses, to understand the extent to which each factor influenced the dependent variable of intention to use SHT. The results of the multiple linear regression analysis are presented in Table 6.

Table 6. *Multiple linear regression results predicting ıntention to use smart home Technologies.*

Variable	Std. β	p value
Perceived Economic Advantage	0.249	< .001
Perceived Cost	0.022	.627
Perceived Environmental Benefits	0.229	< .001
Perceived Ease of Use	0.251	< .001
Perceived Safety	0.178	< .001

The analysis revealed that the independent factors explained about 41.0% of the variance in intention to use SHT, and the model was overall significant ($R = 0.641$, $R^2 = 0.410$, $F(5,310) = 43.1$, $p < .001$) (Hair et al., 2019). The analysis results show that perceived economic advantage ($\beta = 0.249$, $p < .001$), environmental benefits ($\beta = 0.229$, $p < .001$), ease of use ($\beta = 0.251$, $p < .001$), and perceived safety ($\beta = 0.178$, $p < .001$) variables significantly and positively predict SHT usage intention. However, similar to the previous analysis results, perceived cost was not found to have a significant effect on SHT usage intention ($\beta = 0.022$, $p = .627$).

The multiple regression analyses conducted revealed that the perceived economic advantage, environmental benefit, safety, and ease of use significantly predicted both attitude and intention variables. However, the extent of these effects was found to differ across the two models. Therefore, a mediation test based on the Technology Acceptance Model (Davis, 1989), which defines attitude as a precursor to behavioral intention, was conducted, as a potential mediating effect was anticipated. In line with the logic of this test (see Baron and Kenny, 1986), it was aimed to understand whether the effect of the factors measured in terms of perceived economic advantage, cost, environmental benefit, safety, and ease of use on behavioral intention was mediated by attitude or direct. Hypothesis H4 was formulated to test the mediating effect of general attitudes toward SHT between the independent variables and behavioral intention to use SHT. Indirect effects were estimated using the standard procedure, which follows the Sobel test approach to assess whether the mediator variable transmits a significant effect from the independent variable to the dependent variable (Baron and Kenny, 1986; Sobel, 1982). The results of the mediator test are presented in Table 7.

Table 7. *Mediation Analysis Results for the Mediating Effect of General Attitudes Toward Smart Home Technologies.*

Variable	Ind. Effect	SE	p value	Dir. Effect	SE	p value	Total Effect	SE	p value	Mediation
Perceived Economic Advantage	0.416	0.0432	< .001	0.133	0.0423	0.002	0.550	0.0511	< .001	Partial
Perceived Cost	0.0974	0.0481	0.043	0.024	0.0370	0.516	0.121	0.0604	0.044	Full
Perceived Environmental Benefit	0.411	0.0448	< .001	0.112	0.0426	0.008	0.524	0.0537	< .001	Partial
Perceived Ease of Use	0.467	0.0474	< .001	0.015	0.0443	0.731	0.482	0.0553	< .001	Full
Perceived Safety	0.284	0.0414	< .001	0.032	0.0352	0.365	0.316	0.0510	< .001	Full

According to the data and information provided in Table 7, it can be stated that perceived economic advantage (Indirect effect: $\beta = 0.416$, $p < .001$; Direct effect: $\beta = 0.133$, $p = .002$) and perceived environmental benefit (Indirect: $\beta = 0.411$, $p < .001$; Direct: $\beta = 0.112$, $p = .008$) have a significant effect on SHT usage intention, both directly and indirectly. Accordingly, general attitudes play a partial mediation role in explaining the relationship between these two variables and SHT usage intention.

On the other hand, perceived cost (Indirect: β = 0.097, p = .043; Direct: β = 0.024, p = .516), perceived ease of use (Indirect: β = 0.467, p < .001; Direct: β = 0.015, p = .731), and perceived safety (Indirect: β = 0.284, p < .001; Direct: β = 0.031, p = .365) do not directly affect SHT usage intention, but they show their effects indirectly by shaping individuals' attitudes. In this case, the variables of perceived cost, ease of use, and perceived safety are said to have a full mediation effect on intention through general attitudes.

5. DISCUSSION AND CONCLUSION

5.1. Key Findings of the Research

This study is important in terms of evaluating individuals' general attitudes toward SHT and their intentions to use it in the context of a developing country such as Turkiye. The research examined the effects of various factors on attitudes and behavioral intentions separately and also revealed the mediating role of general attitude between these factors and the intention to use.

Participants generally evaluated the economic advantages, environmental benefits, and ease of use of SHT positively. In contrast, the perception that SHT is expensive prevails in terms of perceived costs. This situation indicates that there may be regional differences when compared to countries such as Greece and Italy, where cost advantages are cited as key reasons for choosing SHT (Balta-Özkan et al., 2014; Pliatsikas and Economides, 2022).

On the other hand, participants' perceptions of safety are neutral, and they have not expressed a definitive opinion on this matter. This finding is consistent with concerns highlighted in the literature, both globally and in the Turkish context, based on high-risk perceptions due to constant surveillance and data privacy violations (Balta-Özkan et al., 2014; Pliatsikas and Economides, 2022; Türkyılmaz and Altındağ, 2022).

These results provide an answer to the first research question: How do individuals perceive the economic advantages, costs, environmental benefits, safety, and ease of use of SHT? According to the findings, economic advantages, environmental benefits, and ease of use are perceived positively, whereas cost is perceived negatively, and safety is evaluated neutrally.

The research findings show that the strongest influence on consumers' attitudes toward SHT is perceived ease of use. This differs from Davis' (1989: 33) statement that perceived benefits have a stronger influence than ease of use. This difference can be attributed to the fact that SHT has not yet become widespread in developing markets such as Turkiye and may be perceived as complex; thus, ease of use has become a priority over benefits. Additionally, perceived environmental benefits, safety, and economic advantages also play an important role in attitude formation. These results are consistent with the literature, indicating that the perceived benefits and ease of use of SHT increase its preference (Ayan and Türkay, 2021: 5; Calahorra-Candao and Martín-de Hoyos, 2024: 13; Coşkun et al., 2018:7; Türkyılmaz and Altındağ, 2022: 28).

The study found that perceived cost had no significant effect on attitudes toward SHT, while perceived safety had a lower effect compared to other variables. The reasons for these findings, which are consistent with previous studies conducted in the Turkish context (Ayan and Türkay, 2021: 5), may include the weakening of the negative effect of high costs by sufficient perceived benefits (Marikyan et al., 2019: 282) and the limited awareness level of Turkish consumers regarding data privacy and security issues (Eroğlu, 2018: 150).

These findings provide an answer to the second research question: To what extent do perceived economic advantages, costs, environmental benefits, safety, and ease of use influence individuals' general attitudes toward SHT? According to the results, perceived ease of use has the strongest effect on attitude, followed by perceived environmental benefits, perceived safety, and perceived economic advantage, respectively. In contrast, perceived cost does not have a significant effect on attitude.

The stronger positive effect of perceived environmental benefits on attitude compared to perceived economic benefits aligns with the approach outlined in the literature, which suggests that benefits can be realized at both the individual and societal levels (Marikyan et al., 2020: 1103). However, this does not fully apply to the intention to use SHT. The study revealed that perceived economic advantages had a stronger influence on the intention to use SHT, while perceived environmental benefits had a greater impact on shaping attitudes. In short, perceived environmental benefit is more effective than economic advantage in shaping individuals' attitudes toward SHT; however, when it comes to behavioral intention, economic advantage plays a more decisive role. This difference may be due to consumers prioritizing social benefits when forming their attitudes and individual interests when it comes to intentions or behavior. This is consistent with the "attitude-behavior gap" phenomenon frequently discussed in the literature (Park and Lin, 2020). Regarding this phenomenon, Lau et al. (2022: 2232) suggest that both person-related and company-related factors may explain why positive attitudes do not always translate into actual behavior. From this perspective, individual motivations, organizational practices, and contextual barriers—such as the habitual reliance on traditional methods instead of SHT—could be further examined to better understand the underlying causes of this gap.

These findings address the third research question: To what extent do perceived economic advantages, costs, environmental benefits, safety, and ease of use predict individuals' intention to use SHT? According to the results, perceived ease of use has the strongest impact on intention, followed by perceived economic advantage, perceived environmental benefit, and perceived safety, respectively. In contrast, perceived cost is not a significant predictor of intention.

Finally, the study findings reveal that attitude plays a partial mediating role in the effect of perceived economic advantage and environmental benefit on SHT usage intention. In contrast, the relationship between perceived ease of use, cost, and safety variables and usage intention is fully mediated by attitude. These findings not only support the mediating structure in the original Technology Acceptance Model (Davis, 1989) but also highlight the value of contextualizing and extending the model in order to better explain SHT adoption in emerging markets.

These findings address the fourth research question: Does general attitude toward SHT mediate the relationship between perceived economic advantages, costs, environmental benefits, safety, and ease of use and the intention to use SHT? According to the results, general attitude partially mediates the effects of perceived economic advantage and environmental benefits on intention, while it fully mediates the effects of perceived cost, ease of use, and safety.

5.2. Practical Implications

Based on the research findings, practical recommendations have been formulated to increase the adoption of SHT, particularly in developing countries. Firstly, due to the relatively high impact of perceived ease of use on attitudes, it is expected that awareness-raising meetings, workshops, or online training sessions organized within the scope of SHT will positively influence users' perceptions of ease of use, thereby increasing positive attitudes toward SHT.

On the other hand, based on the finding that perceptions of environmental benefits are effective in developing positive attitudes toward SHT, it is recommended to plan marketing communication campaigns that highlight these benefits, especially for environmentally conscious consumers. Using the positive effects of SHT on energy savings and carbon footprint reduction in communication campaigns may positively influence positive attitudes and, consequently, usage intentions.

The positive effect of the perception of economic advantages on user attitudes can be expanded by public authorities providing tax deductions or installment/credit options for products covered by SHT.

Moreover, the partial mediation effect on SHT usage intention indicates that perceived economic advantage and perceived environmental benefits significantly influence both attitude and intention.

These factors should therefore be carefully considered and prioritized by industry practitioners to enhance adoption outcomes.

5.3. Limitations and Future Research

Although the research provides several findings from a theoretical perspective and important recommendations in terms of practical implementations, it is subject to certain limitations.

Firstly, the sample, which represents a relatively young group with high technological awareness living in a specific region of Turkiye, may raise some concerns in terms of generalizability. Therefore, future studies should involve participants from different demographic groups and geographical regions to comprehensively understand attitudes toward SHT and intentions to use it.

It is noteworthy that participants consider SHT to be useful in all domains evaluated. However, these domains are more closely linked to individual interests, and the evaluation of social benefits is limited in this study. Therefore, it is recommended that future research focus on the social benefits of SHT to address the issue more comprehensively.

Furthermore, the research tests the mediating effect of attitudes toward SHT. Future research that includes some more dimensions, such as technology anxiety, environmental sensitivity level, and digital literacy, may enable a more in-depth interpretation of the framework.

Declarations and Disclosures

1. The author acknowledges and declares compliance with research and publication ethics principles.

2. No conflict of interest has been declared by the author.

3. This study has been screened for plagiarism using plagiarism detection software.

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