Evaluating Consumer Decision-Making Trade-Offs in Smart Service Systems in the Smart Home Domain

Research Paper

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Abstract. This study investigates the trade-offs consumers make when evaluating smart service systems in the smart home domain. While prior research has paid limited attention to how privacy considerations interact with performance and price, we address this gap using a choice-based conjoint analysis of eight attributes spanning performance (reliability, customizability), privacy (data collection scope, data collection purpose, consumer privacy controls, data storage location), and market-related attributes (price, provider). The findings indicate that reliability and provider are the most influential attributes in consumer decision-making, whereas price and privacy-related attributes play a comparatively lesser role. The results also suggest distinct consumer preference patterns, indicating that consumers strategically prioritize certain attributes while accepting trade-offs on others. The findings inform both research and practice, guiding the design of smart service systems and business models that balance technological advancement with consumer concerns about privacy and value.

Keywords: Smart Service Systems, Smart Home, Conjoint, Consumer Preferences, Privacy

1 Introduction

Smart home technology serves as a tangible representation of smart service systems that enhance comfort, security, and sustainability within home environments (Balta-Ozkan et al., 2014; Beverungen et al., 2019). These technologies create an ecosystem of interconnected devices and services that work together to improve home residents' quality of life through automation, remote control capabilities, and data-driven functionalities (Cannizzaro et al., 2020; Carrera-Rivera et al., 2022). While smart home technology is maturing, the factors influencing consumer decision-making remain understudied. Previous research indicates that consumers typically consider attributes related to technical performance, privacy concerns, and price when making purchase decisions (Zheng et al., 2018). At the same time, few studies have comprehensively evaluated how privacy attributes, e.g., data storage location or data collection purpose, interact with major adoption attributes like price, reliability, and manufacturer reputation in shaping consumer decisions (Aldossari and Sidorova, 2020; Barbosa et al., 2019). While some studies have explored consumer attitudes toward smart home technology, particularly concerning privacy and user trust (e.g., Cannizzaro et al., 2020; Korneeva

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et al., 2021; Schomakers et al., 2021), it has been largely overlooked how these preferences factor into trade-off-based decision-making.

This research gap is particularly consequential given the complex and unique privacy challenges in smart home environments because these products and services introduce new actors, information dynamics, and transmission principles into traditionally private spaces previously dominated by offline appliances (Bugeja et al., 2016). Although consumers frequently express concerns about potential data misuse, and regulatory frameworks such as the General Data Protection Regulation (GDPR) increasingly mandate transparency in data practices, actual consumer behavior often contradicts stated privacy concerns (Acquisti et al., 2016; Karwatzki et al., 2017). This discrepancy, known as the privacy paradox, significantly complicates the understanding of consumer decision-making processes in smart home adoption (Adjerid et al., 2018). The misalignment between expressed privacy attitudes and actual decision-making behavior necessitates research approaches that can capture decision-making in naturalistic contexts.

To that end, the primary objective of this study is to quantify consumer preferences regarding performance, privacy, and pricing-related attributes of smart service systems in a realistic decision-making context. We employ a conjoint analysis methodology informed by privacy calculus theory and previous smart home research to address our research question (RQ): *"Which smart service system attributes influence consumer preferences most strongly in the domain of smart home technology?"*

Through this conjoint approach, our research contributes empirical data to quantify the trade-offs consumers make between competing service system attributes. The findings provide actionable insights for both academic research and practice, informing smart service system design strategies, business models, and policy development in the evolving smart home domain. Understanding these consumer preferences and trade-offs is essential for fostering responsible innovation that effectively balances technological advancement with fundamental user concerns regarding privacy and value.

2 Theoretical Background

2.1 Smart Service Systems in the Smart Home Context

Smart home devices are part of the smart product archetype found in service research, referring to internet-connected devices and appliances embedded with sensors, actuators, and computational capabilities (Beverungen et al., 2019; Lim and Maglio, 2019). By combining physical infrastructure with networked digital intelligence, smart home technology transforms static residential environments into adaptive smart service systems that respond to contextual data and user preferences. These systems autonomously collect contextual data like room occupancy or usage patterns in residential environments to enable remote monitoring and automation of device operation (Aldossari and Sidorova, 2020; Carrera-Rivera et al., 2022).

As boundary resources, smart home devices allow bidirectional interactions and mutual value creation between users and providers (Beverungen et al., 2019). Users gain benefits in dimensions like enhanced comfort, safety, or energy efficiency, whereas

providers gain access to continuous data that inform the optimization of existing products and services and the development of complementary innovations (Andreassen et al., 2016; Balta-Ozkan et al., 2014).

The service architecture in the smart home context is manifested through two interconnected delivery mechanisms (Beverungen et al., 2019).

The embedded functionality of smart home devices enables self-service value creation for users through device-level intelligence. Smart products act as service-distribution mechanisms for providers, where operant knowledge such as machine-learning algorithms is directly embedded into the device (Beverungen et al., 2019). For instance, a smart home lighting system exemplifies this paradigm, integrating ambient light sensors, localized scheduling algorithms, and adaptive brightness protocols that operate independently without external connectivity (Aldossari and Sidorova, 2020).

Beyond embedded functionality, smart home devices enable enhanced functionality and additional services through internet connectivity (Beverungen et al., 2019). Service providers use data collected from smart home devices to offer predictive maintenance, energy efficiency analytics, or personalized recommendations (Balta-Ozkan et al., 2014; Zeng et al., 2017). For example, energy providers might deploy smart product datasets to optimize regional demand response strategies, while insurance companies could use this information to develop dynamic risk assessment models. These services create persistent provider-customer engagement through usage pattern analytics and personalized service provision that evolves with longitudinal data accumulation (Balta-Ozkan et al., 2014; Sequeiros et al., 2022; Zeng et al., 2017).

This convergence of embedded functionality and connected services enables progressive value creation, where basic automation features operate locally while advanced analytics leverage collective network intelligence (Beverungen et al., 2019). The resulting smart service systems demonstrate how smart home technologies transcend conventional appliance functionality to become platforms for continuous service innovation and mutually beneficial stakeholder engagement (Andreassen et al., 2016).

2.2 Key Attributes in Consumer Decision-Making in the Smart Home Context

When assessing smart home products and services, consumers need to balance considerations related to attributes in the categories of performance, privacy, and price.

Performance is a major factor influencing consumer decisions, with previous research showing consumers prioritizing solutions that offer high reliability and customizable features (Balta-Ozkan et al., 2014). Reliability is highly valued by consumers in the smart home domain, as it signifies the technical capability of smart service systems to deliver stable and consistent performance over time, which is essential for building user satisfaction and trust (Schomakers et al., 2021). Customizability and personalization allowing users to tailor functionalities to their personal routines and preferences have also been found to be considered increasingly important in delivering a satisfactory user experience (Sequeiros et al., 2022; Zargham et al., 2022)

Previous research has shown that privacy concerns significantly influence consumer decisions regarding smart home solutions (Barbosa et al., 2019; Zeng et al., 2017). To provide their intended functionality, smart home devices inherently collect data on

household inhabitants and environment, including audio and video recordings, and usage patterns. Consumers have to consider the degree of data collection, the location where data is stored (locally or externally), the explicit purposes for which data is collected (e.g., product improvement or marketing), and the level of control they have over their data (Haney et al., 2020; Zeng et al., 2017). Many consumers express discomfort about extensive data collection practices and potential unauthorized access or misuse of their personal information (Barbosa et al., 2019; Cannizzaro et al., 2020).

The privacy calculus theory offers a framework for understanding consumer decisions about privacy-affecting technologies. This model suggests that users engage in a cognitive cost-benefit analysis where they compare perceived privacy risks to anticipated benefits before deciding to use data-collecting technologies or disclose personal information (Dinev and Hart, 2006). In smart home contexts, this calculus is particularly relevant due to the intimate nature of home environments and the inherent data collection of these systems (Kim et al., 2019; Zeng et al., 2017). The "privacy paradox" further complicates this relationship because, despite expressing significant privacy concerns, consumers often accept products and services that compromise privacy when the benefits of other attributes are perceived to be substantial (Schomakers et al., 2022).

Besides performance and privacy, price has been identified as another important barrier to the widespread adoption of smart home solutions (Barbosa et al., 2019). High initial costs associated with purchasing, installing, and maintaining these technologies can deter many potential consumers (Schomakers et al., 2021; Zeng et al., 2017). Additionally, the geopolitical location of smart service system providers further introduces complexity to consumer decision-making, i.e. in terms of adherence to privacy and data governance standards or long-term service reliability (Xu et al., 2011).

3 Method

As the methodology, a conjoint design was chosen because it is well suited to quantifying how consumers make trade-offs between multiple competing attributes simultaneously (Carroll and Green, 1995; Gustafsson et al., 2013). Specifically, a choice-based conjoint (CBC) was chosen because it offers a particularly realistic decision situation. In conjoint surveys, respondents select one product from a set of competing product profiles, closely simulating an actual marketplace shelf scenario where consumers make holistic evaluations of complete product offerings (Elrod et al., 1992). This approach forces participants to make trade-offs similar to real-world purchasing decisions revealing their true preference structures rather than simply rating the significance of individual attributes in isolation (Eggers et al., 2022).

3.1 Selection of Relevant Attributes for the Conjoint Study

Following established practices in conjoint methodology, the attributes for our analysis were chosen based on their relevance to smart home service systems and their alignment with consumer priorities in this domain (Balta-Ozkan et al., 2014; Cannizzaro et al., 2020; Schomakers et al., 2021; Zeng et al., 2017). The attributes need to be

clearly defined, measurable, and independent from one another and have varying levels to enable the provision of different product profiles for the analysis to represent trade-offs that consumers are likely to make. For that purpose, we have deliberately limited our attribute selection to three categories encompassing a total of eight attributes to maintain cognitive manageability for study participants: performance and functionality, privacy and data governance, as well as pricing and market context (see Table 1).

Table 1: Conjoint attributes evaluated in this study

Performance and functionality	Privacy and data governance	Pricing and market
Reliability	Scope of user data collection	Price
Customizability	Main data collection purpose	Provider
	Degree of data privacy control for users	
	Data storage location	

When examining consumer preferences for smart home technology, performance and functionality represent essential considerations for users in both adoption decisions and continued use (Hubert et al., 2019). Our inclusion of reliability and customizability aligns with previous research identifying these attributes as among the top priorities for consumers when evaluating smart home solutions (Aldossari and Sidorova, 2020).

Attributes related to privacy and data governance are prominent in our attribute selection due to the extensive data collection inherent to smart home devices and services as well as the stated significance of privacy for consumer decision-making in prior research (Haney et al., 2020; Kim et al., 2019; Zeng et al., 2017). With four distinct attributes addressing different aspects, this enables a more nuanced understanding of the multifaceted nature of privacy concerns. The scope of user data collection attribute measures consumer sensitivity to the volume and types of data being gathered, as users must evaluate how much personal information they're willing to provide for benefits (Kim et al., 2019; Zheng et al., 2018). The main purpose of the data collection attribute is to capture how consumers view the stated intentions of the smart home provider for data collection (Aldossari and Sidorova, 2020; Zeng et al., 2017). The degree of data privacy control assesses the value users place on personal agency over personal information, with prior research alleging that consumers express strong preferences for configurable privacy controls (Bugeja et al., 2016; Zheng et al., 2018). Finally, data storage location examines consumer preferences regarding where their information is saved, with research showing users distinguishing between data stored locally versus external data storage (Acquisti et al., 2016; Haney et al., 2020).

Attributes related to pricing and market are standard in conjoint-based research due to their impact on consumer choices (Gustafsson et al., 2013). Price is a universal determinant of consumer behavior and is particularly relevant in competitive markets like smart home technology. The inclusion of price as an attribute enables this study to assess consumer trade-offs between cost and other attributes (Carroll and Green, 1995). Additionally, the provider attribute was included due to potential concerns about data sovereignty and trust in different regulatory jurisdictions (Hummel et al., 2021). Prior

research indicates that the geographical identity of the provider may influence consumer perceptions (Bombik et al., 2022).

3.2 Choice-Based Conjoint Questionnaire Used in this Study

Table 2: Attributes and corresponding levels included in this conjoint study

Attribute	Level 1	Level 2	Level 3	Level 4	Level 5
Reliability	60%	90%	99%		
Customizability	Basic	Medium	Extensive		
Data storage location	Local storage on smart home device	Customer's personal server or computer	Cloud of smart home provider (in Europe)	Cloud of smart home provider (outside Europe)	
Degree of privacy control for user	Basic	Medium	Extensive		
Scope of user data collection	Essential functionality data only	Basic user profile	Extensive user profile		
Data collection purpose	Predictive maintenance	Product & service improvement	Revenue generation		
Price	Low (5€)	Medium (15€)	High (25€)		
Provider	German	European (other than German)	USA	Chinese	Korean

The survey's introduction explained its purpose: to better understand customer decision-making regarding smart home technology. Participants were encouraged to answer freely, with reassurance that there were no "incorrect" answers, as the study aimed to capture their personal perspectives (Eggers et al., 2022; Elrod et al., 1992).

The second part of the survey included questions about participants' experience with and ownership of smart home devices. Additionally, control variables relevant to the research objective were measured using established constructs from prior studies, measured using 5-point Likert scales ranging from 1 (fully disagree) to 5 (fully agree). These measures included the disposition to value privacy adopted from Xu et al. (2011), and general privacy concerns from Malhotra et al. (2004). Furthermore, personal innovativeness with IT was measured using items from Agarwal and Prasad (1998).

In the third part, participants were introduced to a scenario involving a smart home lightbulb. In addition to its embedded functionality, the lightbulb offers additional smart services such as dynamic lighting based on the game state of live sports events or access to assisted ambient living services. Participants were told that their objective was to evaluate different configurations of this smart service system that vary in key attributes and decide which configuration they would choose.

In the fourth section, participants had to decide on a total of 12 CBC choice tasks, with each task requiring them to choose between two configurations of the smart lightbulb. The configurations were randomly generated based on different levels of the eight attributes examined in this study.

Finally, in the last part, demographic information of the participants was collected.

3.3 Data Collection and Analysis

Participants for this study conducted as part of a larger research project were recruited from a bachelor-level business course at a German university in 2024 and 2025. This population is particularly relevant for examining the trade-offs between privacy, performance, and pricing in emerging technologies, such as smart home, as they are consumers who are beginning to establish independent households and make their own purchasing decisions. To further ensure the relevance of responses, participation in our conjoint survey was limited to students who had either prior usage experience, purchase intent, or at least a general interest in smart home devices verified through screening questions as part of a pre-survey. Additionally, a minimum level of technological self-efficacy was required to ensure participants could understand and meaningfully engage with the survey content (Compeau et al., 2017).

Participation was voluntary, and students received partial course credit as an incentive for participating in this study. The survey was administered through Qualtrics XM software, ensuring accessibility and ease of participation. Detailed and precise instructions were provided to guide participants through the survey process. The study adhered to ethical research guidelines, including informed consent and survey data confidentiality (Eggers et al., 2022).

A thorough quality control process was conducted to ensure the reliability and accuracy of the collected data. Only fully completed surveys were included in the analysis, while incomplete responses were excluded. Additionally, we addressed inattentive responding by analyzing completion times and response behavior. The completion time in our pre-test for the conjoint survey was 19.53 minutes on average. We set a conservative threshold, removing participants who completed the conjoint survey in under 10 minutes, as this timeframe was considered inadequate for genuine engagement with the scenario information, conjoint decision tasks and survey items. Furthermore, the dataset was screened for inattentive responses using embedded attention checks (e.g. “Please select strongly disagree for this item”). This screening process ensured that only reliable responses were retained for analysis. After applying these criteria, a total of 103 valid responses were available for further analysis.

Data analysis focused on estimating the relative importance of attributes and the part-worth utilities of attribute levels using Hierarchical Bayes (HB) estimation. HB is a widely used method in conjoint-based research that accounts for individual-level heterogeneity, providing robust estimates of consumer preferences even with relatively small sample sizes (Eggers et al., 2022; Gustafsson et al., 2013). This approach allowed us to collect data on how participants evaluated various configurations of the smart home lightbulb and provided insights into their underlying decision-making processes.

4 Results

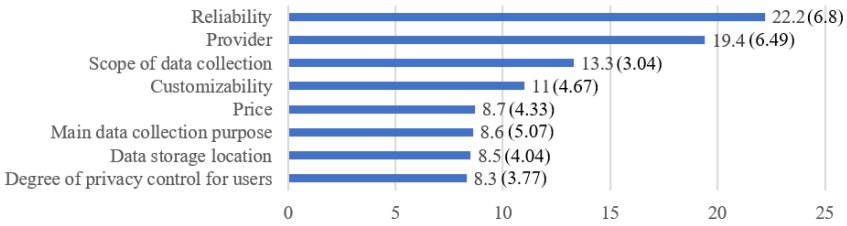

Figure 1. Average relative importance of the attributes in percent

4.1 Descriptive Statistics of the Sample

The final sample used for analysis included 103 participants, with a nearly equal gender distribution (50.2% female and 49.8% male). The average age of respondents was 21.73 years (SD = 3.61). Participants required an average of 18.32 minutes to complete the survey. They reported an average self-rated experience with smart home technology of 2.8 (SD = 1.1). On average, participants personally owned 2.75 smart home devices (SD = 1.09), while their households contained an average of 3.54 smart home devices (SD = 3.06). Disposition to value privacy had an average score of 3.03 (SD = 0.8), and general privacy concerns were rated with an average value of 3.67 (SD = 1.01). Personal innovativeness with IT had an average score of 2.64 (SD = 0.67).

4.2 Relative Importance of Attributes for Consumer Decision-Making

As depicted in Figure 1, our data reveals the relative importance of relevant attributes in consumer decision-making, with standard deviation denoted in brackets. Our results indicate that reliability (22.2%, SD = 6.8) is the most influential attribute, followed closely by provider (19.4%, SD = 6.49). The scope of data collection is ranked third (13.3%, SD = 3.04), whereas customizability is ranked fourth (11%, SD = 4.67). The other attributes such as price (8.7%, SD = 4.33), main data collection purpose (8.6%, SD = 5.07), data storage location (8.5%, SD = 4.04), and degree of privacy control for users (8.3%, SD = 3.77) are less influential, with their importance being roughly less than half that of reliability and provider for consumer decision-making in this context.

4.3 Part-Worth Utility of the Attribute Levels

Customer preferences for the levels of the respective attribute are examined by analyzing zero-centered differences between average part-worth utilities. Figure 2 shows the values for each attribute level, with the standard deviation denoted in brackets.
Regarding the two attributes related to performance, very high reliability (99%) was the most favored level, with a utility value of 9.8 (SD = 6.36). Reliability at 90% was less preferred with an average utility value of 2.5 (SD = 1.78), while 60% reliability was deemed unacceptable, reflected by a negative utility score of -12.3 (SD = 6.09).

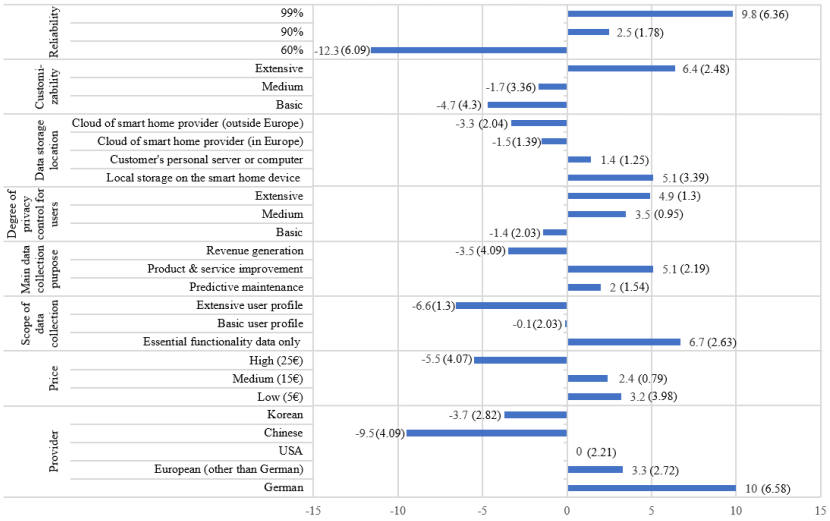

Figure 2. Zero-centered differences of average part-worth utilities of attribute levels

The data on preferences for customizability shows that customers prefer extensive customizability with a utility value of 6.4 (SD = 2.48). Medium customization had a negative average utility of -1.7 (SD = 3.36), and basic customization was perceived even less favorably, with an average utility score of -4.7 (SD = 4.3).

The analysis of the privacy-related attributes shows that local storage on the smart home device itself was the most preferred data storage location, with an average utility value of 5.1 (SD = 3.39). Storage on the customer's personal server or computer was also positively received (utility value of 1.4, SD = 1.25). In contrast, data storage in the cloud of the smart home provider in Europe (-1.5 utility, SD = 1.39) and outside Europe (-3.3 utility, SD = 2.04) were negatively rated. Regarding the degree of privacy control for the user, extensive privacy controls were most preferred with a value of 4.9 (SD = 1.3). Close in average utility was a medium level of privacy controls (3.5 utility, SD = 0.95). A basic level of privacy controls was comparably less accepted with a utility value of -1.4 (SD = 2.03). For the main purpose of data collection, product & service improvement was the most preferred option with a utility value of 5.1 (SD = 2.19). Predictive maintenance was accepted with a utility of 2 (SD = 1.54), whereas revenue generation had a negative utility value of -3.5 (SD = 4.09). Preferences for the scope of user data collection show that only essential functionality data collected is strongly preferred with an average utility of 6.7 (SD = 2.63). The collection of a basic user profile was considered barely unacceptable with a utility value of -0.1 (SD = 2.03), while an extensive user profile had a high negative utility value of -6.6 (SD = 1.3).

Finally, for attributes related to pricing and market, a high price of 25€ was the least preferred option (utility value of -5.5, SD = 4.07), whereas a medium price of 15€ (utility value of 2.4, SD = 0.79) and a low price of 5€ (utility value of 3.2, SD = 3.98) were less well received. Regarding the provider, a German provider was strongly preferred with an average utility value of 10 (SD = 6.58), whereas a European (other than German) and US provider were considered less favorable with average utility values of 3.3

(SD = 2.72) and 0 (SD = 2.21) respectively. Korean (average utility of -3.7, SD = 2.82) and Chinese providers (average utility of -9.5, SD = 4.09) were rated negatively.

5 Discussion

Smart home technology exemplifies the potential of smart service systems to deliver significant benefits to consumers, such as enhanced comfort, sustainability, and safety (Balta-Ozkan et al., 2014; Beverungen et al., 2019). However, these systems face inherent challenges due to the need for consumer trade-offs between attributes related to performance, privacy, and price (Schomakers et al., 2021; Zeng et al., 2017). Accordingly, our choice-based conjoint study was designed to address our research question: *"Which smart service system attributes influence consumer preferences most strongly in the domain of smart home technology?"*

Our analysis reveals that performance attributes play a crucial role in consumer decision-making regarding smart home technology. Reliability emerged as the most influential attribute overall, with decreases in reliability resulting in significantly lower utility scores for smart home solutions in the conjoint survey. This finding aligns with prior research emphasizing reliability as a key determinant of user satisfaction in smart service systems (Schomakers et al., 2021). The strong negative response to reduced reliability likely stems from consumers having zero or low tolerance for failure in systems that are deeply integrated into their daily routines and home environments (Balta-Ozkan et al., 2014). Furthermore, consumers show a strong preference for advanced customization over basic or medium options. This highlights the demand for smart home solutions that are highly adaptive and can respond dynamically to both user preferences and environmental conditions (Ding and Keh, 2016; Zargham et al., 2022).

Despite the heightened discourse surrounding data privacy in recent years (e.g. Haney et al., 2020; Zheng et al., 2018), our data indicates that privacy-related attributes account for comparably less decision weight than performance factors in smart home solutions. The strong preference for local data storage over cloud storage aligns with previous findings on privacy concerns in smart home adoption and growing calls for data sovereignty (Bugeja et al., 2016; Hummel et al., 2021). However, the small utility of personal servers or computers as data storage could suggest technical literacy barriers may influence privacy-related decisions, consistent with prior research (Lutz and Newlands, 2021; Zeng et al., 2017). Data collection purposes elicited particularly polarized responses among participants, with product improvement as a data use purpose receiving relatively high utility, while commercial monetization faced opposition. This contrast suggests consumers make distinctions between different types of data usage rather than rejecting data collection categorically (Beverungen et al., 2019; Milne et al., 2017).

Overall, participants consistently prioritized functional gains, corroborating previous research findings that utilitarian value often outweighs abstract data risks in consumer decision-making (Balta-Ozkan et al., 2014; Cannizzaro et al., 2020; Schomakers et al., 2021). The comparatively low utility scores across privacy-related attributes align with the privacy paradox (Karwatzki et al., 2017). Our results suggest smart service

system providers in the smart home context may not need to maximize the various privacy dimensions if performance thresholds are met. This nuanced evaluation gradation supports revised approaches to privacy calculus incorporating benefit thresholds where privacy may become a “negotiable attribute” when offset by certain functional or economic benefits that justify data exposure (Adjerid et al., 2018; Karwatzki et al., 2017).

Contrary to our expectations regarding the third group of attributes, price exhibited only moderate influence on consumer decision-making, with a nonlinear preference curve emerging from our analysis. The lowest price point was only marginally preferred over mid-range options, while the highest price was strongly disliked. This overall comparatively low priority of price conflicts with previous research showing significant customer cost sensitivity in Smart Home technology (Balta-Ozkan et al., 2014; Schomakers et al., 2021). This suggests consumers may perceive very low-priced smart home solutions as potentially lacking quality or reliability, while still rejecting options they deem excessively expensive. In addition, the high relative importance of the provider attribute, with customers showing a very strong preference for German providers, suggests that geopolitical provider trust factors may outweigh many other attributes. This aligns with research showing that data storage in "trusted" jurisdictions could mitigate privacy concerns to a certain level, emphasizing the geopolitical dimensions of consumer trust and acceptance (Jaspers and Pearson, 2022; Xu et al., 2011).

The interplay between attributes underscores the complexity of consumer decision-making in smart service systems. Our findings indicate that unpopular attributes or levels may be accepted as part of an overall favorable configuration with other important attributes such as high reliability, or lower price, suggesting that smart home providers can compensate for weaknesses by excelling elsewhere (Balta-Ozkan et al., 2014).

5.1 Limitations, Implications, and Future Research

This study features some limitations that suggest potential for future research. First, our sample of German university students limits generalizability, as they may be more tech-savvy and have a greater willingness to adopt and use smart home technology compared to older generations. While student samples are considered viable and commonly used in research due to their accessibility and ability to provide valuable initial insights (Steelman et al., 2014), future research should aim to include more diverse demographics to enhance the external validity and applicability of the findings. Second, because conjoint studies employ hypothetical choices without actual purchases, participants' real-world behavior may differ, especially when actual financial or privacy risks are involved. To mitigate these issues, we deliberately limited the number of choice sets presented to each participant and provided clear instructions to ensure participants understood the tasks. Still, future research could address this by using longitudinal or mixed-method approaches that combine stated preferences with observational data.

Nevertheless, our study provides researchers with a more nuanced understanding of how customers balance competing attributes when evaluating smart service systems. The findings challenge simplistic assumptions about user priorities and demonstrate the multi-dimensional nature of consumer preferences in smart service systems by revealing a preference structure that challenges traditional price-sensitivity assumptions. The

importance of reliability and manufacturer reputation supports a threshold effect for smart service systems, the idea that certain attributes like reliability, customizability, and manufacturer trust must reach a minimum acceptable level before price or other features become relevant in the adoption decision (e.g., Schomakers and Ziefle, 2023). The focus on reliability over pricing indicates that consumers approach smart home adoption through a risk-mitigation lens rather than a pure cost-benefit analysis (Adjerid et al., 2018; Emami-Naeini et al., 2021). The manufacturer can serve as a heuristic for reliability and after-sales support, which is especially valued in smart home contexts where failure can have significant consequences, e.g., security or safety risks (Cannizzaro et al., 2020). This is supported by prior research suggesting that perceived risks and trust in providers can inhibit or facilitate consumer adoption, regardless of price (Hubert et al., 2019; Li et al., 2021). Future research could investigate whether minimum acceptable performance levels vary across different use contexts or user segments, and how these thresholds might evolve as smart service systems mature.

The choice-based conjoint methodology employed in this study demonstrates its utility in translating complex multi-attribute decisions into measurable preference structures. By quantifying the relative importance of performance, privacy, and price attributes, we offer a framework that can be adapted to investigate consumer decision-making in other smart service domains such as healthcare or smart mobility where similar trade-offs are relevant. The evaluation of privacy in particular as distinct attributes (scope of user data collection, data storage location, control mechanisms, collection purposes) rather than one abstract construct provides a template for more precise measurement in consumer research. The identified disparity between consumers' expressed privacy values and actual privacy factor decision utility supports further investigation into the contextual factors that trigger or suppress privacy considerations.

For practitioners, our findings provide valuable insights that can guide product development and marketing strategies for smart home service systems. The strong consumer preference for reliability, manufacturer, and potential acceptance of trade-offs suggests that rather than trying to excel in all attributes simultaneously, vendors could strategically prioritize investments based on consumer preference patterns. In terms of privacy, smart service providers should adopt granular data collection practices with strict purpose limitations. Implementing user-facing controls that clearly communicate data usage, and providing meaningful opt-in choices rather than blanket permissions, would align with consumer preferences while still allowing for the necessary data collection to optimize services. The preference for domestic providers suggests that companies should develop localization strategies that go beyond mere translation. Geographic brand localization or partnerships with trusted local institutions could significantly mitigate trust deficits for non-domestic providers.

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