

THE IMPACT OF AI-POWERED REFRIGERATORS ON CONSUMER PURCHASE INTENTIONS: A CASE STUDY OF HA COMPANY

Muqing Li ^{1*}

¹ Graduate School, Stamford International University

* Corresponding Author, E-mail: 569962205@qq.com

Abstract

With the rapid development of artificial intelligence (AI) technology, smart home appliances have gradually entered mainstream households. Among these, AI-powered refrigerators, as representative products, have garnered attention for their features such as intelligent recognition, remote control, and personalized services. However, when faced with the technical complexity of these appliances, consumers may be deterred by operational difficulties or inconvenience, which can affect their purchase intentions. This study aims to explore how the perceived ease of use and perceived usefulness of AI refrigerators influence consumers' perceived value and purchase intentions, and to verify the mediating role of perceived value in this relationship.

The study employs structural equation modeling (SEM) as the primary analytical method. Sample data were collected through a questionnaire survey from 378 consumers. The measured variables include perceived ease of use, perceived usefulness, perceived value, and purchase intention. During the research process, the reliability and validity of the scales were verified through reliability and validity analyses, followed by path analysis and mediation effect testing.

The results indicate that both perceived ease of use and perceived usefulness have significant positive impacts on consumers' perceived value. Moreover, both factors also exert a direct positive influence on purchase intention. Additionally, perceived value partially mediates the relationship between perceived ease of use/perceived usefulness and purchase intention. The conclusions of this study provide a theoretical basis and practical guidance for optimizing user experience and functional design in smart home appliances.

Keywords: AI technology, smart home appliances, perceived value, purchase intention, influencing factors

Introduction

In recent years, with the rapid advancement of cutting-edge information technologies such as artificial intelligence (AI) and the Internet of Things (IoT), China's home appliance industry has entered

a pivotal phase of transitioning from traditional intelligence to high-end intelligence. Guided by China's national strategic policies, including the "14th Five-Year Plan for National Informatization" and the "Smart Manufacturing Development Plan (2021 - 2025)," smart home appliances have emerged as a crucial vehicle for promoting high-quality consumption and facilitating the widespread adoption of smart homes. According to the "2024 China Home Appliance Market Report" released by the China Center for Information Industry Development, the market scale of China's smart home appliances reached over 600 billion yuan in 2023.

The sales volume of refrigerators in the Chinese market has surged from 4 million units in 2017 to 30 million units in 2024. The replacement rate of refrigerators in the Chinese market reached 50% in 2020 (Tao et al., 2019). The development scale of China's refrigerator market has been expanding, with the growth rate initially exhibiting a rapid upswing before gradually decelerating. Data from the Boston Consulting Group indicates that by 2025, the majority of the value of home appliance products will be transferred to data services (38%), scenario solutions (27%), and consumable ecosystems (19%) (Hassija et al., 2019). Core indicators such as an industry average device connectivity rate of 43%, a monthly user activity frequency of ≥ 8 times, and a service conversion rate of $\geq 15\%$ have emerged as pivotal determinants in the competitive landscape of the smart home ecosystem (Ibrahim, 2023).

The development trajectory of the industry significantly influences the refrigerator sector, with AI-powered refrigerators representing a crucial breakthrough in its evolution. The Chinese refrigerator market is poised for new growth opportunities, as artificial intelligence has already commenced its application within the industry (Jing et al., 2015). Moreover, consumer behavioral patterns have undergone notable transformations. While high-income consumers previously favored "gourmet-grade" products with sleek designs, the new generation of consumers, namely the "Generation Z" and high-income groups, now exhibit a greater inclination towards high-tech, intelligent products and personalized services. Citing data from Aowei Cloud Network (AVC), the growth rate of high-end smart refrigerators (priced above 8,000 yuan) reached 18.7% in 2023, significantly surpassing the overall growth rate of the traditional refrigerator market (Cheng et al., 2024). In fact, the majority of consumers prioritize the presence of "smart features" when selecting a refrigerator. However, the expansion of the market size does not necessarily equate to the widespread popularity of smart refrigerators, as they have yet to fully deliver an optimal purchasing experience for consumers.

Currently, as a leading brand in China's AI smart home appliance sector, HA Company has, after years of development, upgraded its AI refrigerator to the third-generation product. This large-scale IoT-enabled smart home appliance integrates a voice assistant, food ingredient management, and health recommendation functionalities into a cohesive whole. By drawing on the company's actual operational circumstances and the latest research findings, conducting an investigation and study based on the company's products and their market performance is conducive to gaining profound insights into

how AI refrigerators influence consumers' cognition, attitudes, and behavioral intentions. Such research holds significant guiding value for the optimization of the product and its market promotion strategies.

This research primarily investigates the impact of artificial intelligence refrigerators on consumers' purchase intentions, with a particular focus on how the key functional characteristics of AI refrigerators influence consumers' perceived value and subsequent purchase intentions. In addition, it delves into the role that consumers' cognitive awareness and attitudes towards AI refrigerators play in shaping their purchasing behavior. For instance, while a significant proportion of consumers exhibit a high level of acceptance towards "smart refrigerators," believing in their potential benefits, there is also a subset of the population that holds strong reservations or is influenced by certain misconceptions about "smart refrigerators," which dampen their desire to purchase them. Furthermore, given the diverse demographics of today's consumers, varying in terms of age, income, and lifestyle, there are distinct preferences and choices when it comes to AI refrigerators. This is an area that warrants further exploration.

Taking HA Company's smart refrigerators as a case study, this research examines the interplay between the product and the market, and on this basis, explores the primary factors influencing consumers' purchase intentions regarding AI refrigerators. It is hoped that the findings will provide scientific and rationalized recommendations for enterprises to make more targeted product optimizations, improvements, and marketing strategies for related products. Consequently, this paper primarily employs consumer psychology and behavior as the entry point, and, based on the Perceived Value Theory and the Technology Acceptance Model (TAM), elaborates on and analyzes how artificial intelligence refrigerators affect consumers' purchase intentions.

This research delves into the influence mechanisms of ease of use and usefulness of artificial intelligence (AI) refrigerators on consumers' purchase intentions, using them as entry points for exploration. By introducing perceived value as a mediating variable, the research examines how these two factors positively relate to purchase intentions. This approach holds significant theoretical value for establishing correlations with purchase intentions and broadens the application of the Technology Acceptance Model (TAM) within the smart home appliance sector. While TAM traditionally explains user acceptance of information systems, this research extends its application to smart hardware products, demonstrating that such behaviors and their antecedents can be proven, evaluated, and utilized. By introducing the TAM model into the smart home sector and incorporating the role of perceived value, this research constructs a more realistic cognitive process of consumers towards smart home appliances, namely the "perceived value-importance-consumer cognition" process. This enriches the theoretical framework of smart home appliance consumption behavior research.

The research findings provide supportive insights for the company's promotion of smart products. During market promotion, they enable accurate identification of the product features that

consumers prioritize most—namely, operational convenience and personalized services. This facilitates the cultivation of consumer trust and interest, mitigating information barriers and purchase concerns. To achieve this, it is imperative to introduce the concept of perceived value to uncover the psychological shifts in consumers' purchasing behaviors, thereby attaining a multi-layered transformation from functional value to emotional and social value. This, in turn, can be leveraged for brand building and enhancing user stickiness. For HA Company, being at the forefront of the industry, understanding consumer preferences and habits as a design target, analyzing consumer demands, and identifying differentiated solutions can confer a competitive edge in the upcoming round of technology-driven competition.

Research Objectives

- (1) To investigate the impact of the ease of use of AI refrigerators on consumers' perceived value.
- (2) To investigate the impact of the usefulness of AI refrigerators on consumers' perceived value.
- (3) To investigate the impact of the perceived value of AI refrigerators on consumers' purchase intention.
- (4) To investigate the impact of the ease of use of AI refrigerators on consumers' purchase intention.
- (5) To investigate the impact of the usefulness of AI refrigerators on consumers' purchase intention.
- (6) To investigate the mediating role of the perceived value of AI refrigerators in ease of use and consumers' purchase intention.
- (7) To investigate the mediating role of the perceived value of AI refrigerators on usefulness and consumers' purchase intention.

Literatures Review

Drawing insights from both the Perceived Value Theory and the Technology Acceptance Model (TAM), it becomes evident that the ease of use of an AI refrigerator significantly impacts consumers' perceived value. According to the Perceived Value Theory, when consumers make product selections, they weigh the convenience, functionality, and other factors derived from the usage process against the costs or efforts they invest (Hidayati et al., 2018). This comparison shapes their overall assessment of the product's value. On the other hand, the TAM posits that "ease of use" can substantially alleviate operational confusion, thereby increasing consumers' trust in the product and bolstering their confidence in leveraging its functional benefits (Astuti et al., 2020). Subjectively, this

would be perceived as a "high - value" encounter, effectively enhancing consumers' perceived value of the refrigerator. The direct impact of ease of use lies in making the technology more acceptable to users. It also, to a certain extent, reduces the psychological costs associated with product usage and raises users' efficiency standards. Indirectly, this fosters a more positive consumer attitude towards the product, leading to higher evaluations and increased acceptance. In essence, by prioritizing ease of use, HA Company can significantly enhance the perceived value of its AI refrigerator among consumers, driving greater satisfaction and loyalty.

H1: The ease of use of AI-powered refrigerators has a positive effect on consumers' perceived value.

According to the perceived value theory, during the consumption process, consumers evaluate the value of a product by weighing the benefits they gain against the costs they incur. The TAO model (assuming it's a relevant model in this context, though a more commonly known one is TAM - Technology Acceptance Model; here we'll proceed based on the given information) defines usefulness as consumers' recognition of the extent to which a certain technology can improve their life efficiency or help them achieve their goals (Qiao et al., 2022).

When applied to an AI refrigerator, usefulness manifests in several key aspects. Firstly, the AI - powered intelligent system can achieve more precise food management. It can keep track of food inventory, expiration dates, and even suggest recipes based on the available ingredients, preventing food waste and ensuring that consumers always have the right items on hand. Secondly, it makes our lives more convenient and efficient (Denaputri & Usman, 2019). For instance, it can automate the process of creating shopping lists, send reminders when groceries are running low, and even allow for remote monitoring and control via a mobile app (Cheng et al., 2024). Thirdly, it provides more accurate health advice. By analyzing the nutritional content of the food stored in the refrigerator, it can offer personalized dietary recommendations, helping consumers maintain a healthy lifestyle.

H2: The perceived usefulness of AI-powered refrigerators has a positive effect on consumers' perceived value.

Perceived value serves as a crucial link between consumers' cognition of a product and their purchase decision. It represents consumers' subjective evaluation and weighing of the product. In the context of AI refrigerators, when consumers believe that these appliances can offer them more functionality, convenience, and emotional benefits, their purchase intention significantly increases (Siahaan et al., 2019).

AI refrigerators integrate a series of intelligent functions such as smart recommendations, voice control, and food management, providing users with a better overall experience and use value. The perceived utility derived from these integrated functions is one of the main driving forces behind consumers' purchase intentions (Setyo et al., 2020). Consumers can judge the use value, social value,

and emotional value that a product can bring them based on information or their previous experiences with similar products. When the results of these judgments are positive, consumers are more likely to develop a purchase desire.

Perceived value is a comprehensive assessment of the overall worth of a product or service, formed through a balanced consideration of consumers' consumption costs, benefits, and their subjective feelings (Setyo et al., 2020). This value judgment serves as a crucial determinant of consumers' subsequent purchasing decisions. According to the perceived value theory, when consumers perceive a product to offer more value than its cost or to exceed their expectations, they are more inclined to make a purchase.

H3: The perceived value of AI-powered refrigerators has a positive effect on consumers' purchase intentions.

Ease of use refers to the extent to which consumers perceive a technology as convenient. It is a critical factor in determining individuals' willingness to adopt new technologies. When users perceive a technology as easy to use, they are more likely to accept and utilize it extensively. Research on consumer products indicates that ease of use significantly shapes purchase intentions (Falode, 2018). For AI-enabled home appliances, user-friendly interfaces and intuitive interactions reduce cognitive load, fostering positive evaluations of value. For instance, if users can control a refrigerator's temperature via voice commands without complex learning, they are more likely to perceive the product as satisfactory and desirable (Widyanti & Usman, 2019). Researches on smart refrigerator usage reveal that convenience and minimal technical barriers are key considerations for purchasing smart appliances. For middle-aged and elderly users, "plug-and-play" designs enhance trust in AI refrigerators, simplifying purchase decisions (Qiao et al., 2022). Research on smart home adoption further confirms a message, perceived ease of use significantly impacts purchase intentions, particularly among less tech-savvy consumers. To broaden market appeal, manufacturers should prioritize "foolproof" and non-technical designs for AI refrigerators (Ferguson, 2019).

H4: The ease of use of AI-powered refrigerators has a positive effect on consumers' purchase intentions.

Usefulness is one of the four main variables proposed in the Technology Acceptance Model 2 (TAM2). It refers to consumers' subjective perception of a product's functions, practicality, and the positive impact it has on improving their lives. Siahaan et al. (2019) found that usefulness plays a crucial role in determining whether consumers will purchase high-tech products. When TAM2 is expanded to include the evaluation criterion of a technology product's usefulness, the variables in TAM2 encourage consumers to form positive attitudes and behavioral intentions towards the technology product. In the context of AI refrigerators, applying AI technology makes them a useful technology product. This usefulness is manifested in various functions such as automatic ingredient

recognition, intelligent temperature control, voice interaction, and health recommendations. When consumers perceive that an AI refrigerator can save them more time, better manage food ingredients, and bring more convenience to their lives, they are more likely to have a purchase intention.

H5: The perceived usefulness of AI-powered refrigerators has a positive effect on consumers' purchase intentions.

Ease of use is a critical factor that not only has a direct impact on consumers' attitudes and behavioral intentions but also indirectly influences their purchase decisions by affecting their perceived value of the product. As Astuti et al. (2020) point out, when consumers perceive a technology as easy to operate, their acceptance of the technology increases, leading to a higher sense of utility and satisfaction. This satisfaction is a manifestation of perceived value, which is essentially consumers' subjective assessment of whether the benefits they receive from a product outweigh the costs they incur (Wang & Choi, 20121).

For AI-enabled home appliances like refrigerators, the value perceived by consumers goes beyond mere functional value. It also encompasses emotional experience value and social symbolic value (Ali Sheikh Khawaja & Aisha Abbas, 2019). For example, when consumers experience the functions of an AI refrigerator and find that it offers "great value for money" or "enhances their quality of life," it strengthens their purchase intention. In the case of smart devices such as smart TVs, products with convenient operation and user - friendly interfaces easily gain positive value recognition from consumers, which is then translated into purchase behavior (Awaluddin & Hamid, 2019).

H6: The perceived value of AI-powered refrigerators mediates the relationship between ease of use and consumers' purchase intentions.

Perceived usefulness, as a core variable in the Technology Acceptance Model (TAM), holds great importance when applied to artificial intelligence (AI) refrigerators. In this context, perceived usefulness refers to the refrigerator's capability to offer benefits such as intelligent recognition, automatic management, voice control, and health recommendations (Lee et al., 2019; Setyo et al., 2020). When consumers perceive that an AI refrigerator is useful to them, it generates a purchase intention, which is the essence of the concept of perceived usefulness.

Research on Chinese consumers' purchase behavior of smart appliances has also confirmed this. Chen et al. (2017) found that consumers only internalize the technical evaluation of "usefulness" into an actual purchase motive after they recognize that the product is worth buying. This implies that the direct impact of perceived usefulness on purchase intention is limited, and it requires an intermediary step.

H7: The perceived value of AI-powered refrigerators mediates the relationship between perceived usefulness and consumers' purchase intentions.

This research constructs a conceptual model to analyze the impact of HA Company's

AI-powered refrigerators on consumer purchase intentions. The model positions ease of use and usefulness as independent variables, perceived value as a mediator, and purchase intention as the dependent variable (Astuti et al., 2020). Integrating perceived value theory and TAM, this framework provides theoretical and practical insights into consumer decision-making processes for AI refrigerators.

Methodology

This research applies quantitative research methods and collects data through questionnaire surveys to systematically explain the impact of usability and usefulness on consumer purchase intention, as well as the mediating role of perceived value. It also explores the causal relationship and impact path between the three, hoping to provide some new insights for the study of this issue and make the research more scientific and generalizable. The questionnaire designed for this study is the data collection tool used in this research. After appropriate modifications and localization based on mature scales, the questionnaire covers four dimensions: usability, usefulness, perceived value, and consumer purchase intention. It adopts the Likert five level scale form and uses the Likert reverse scoring method (1=strongly disagree; 5=strongly agree) for representation. The total weight of all indicators has been adjusted accordingly.

The population of this research is consumers in Zhengzhou who have experience purchasing or using artificial intelligence refrigerators. Potential consumers in Zhengzhou who meet the criteria of "having experience in purchasing or using artificial intelligence refrigerators" account for about 5% of the resident population, with a population of 580000 people. The research focuses on the user group who have actually come into contact with HA company's artificial intelligence refrigerator products. These consumers have a cognitive level in terms of information technology acceptance, quality of life needs, and household appliance usage habits, and can make reasonable evaluations of the usability, usefulness, perceived value, and purchase intention of HA Company's AI refrigerator.

To ensure the normal operation of statistical analysis and structural equation modeling (SEM), no less than 400 questionnaires were selected. According to the guidance of Hair et al., the conclusion was drawn that when the model structure is complex and involves multiple latent variables, each latent variable should have at least 10 observation indicators, and the total sample size should be at least 200 or more; Strive to obtain around 400 questionnaires for robust regression analysis and mediation effect testing.

Perceived Ease of Use is used to measure the level of convenience and psychological burden that consumers feel when operating and understanding AI refrigerators. The system reflects users' subjective evaluation of the product's usability characteristics from five aspects: overall user experience, learning cost, operational effort, user-friendly interface, and smooth user flow. These

questions provide a foundation for subsequent quantitative analysis, aiming to explore the mechanism of "usability" in the formation of perceived value and purchase intention.

Perceived Usefulness originates from the Technology Acceptance Model (TAM), which emphasizes individuals' subjective evaluation of the positive outcomes that technology products bring in daily life. The five measurement items cover key functional points of artificial intelligence refrigerators in home application scenarios, starting from aspects such as life efficiency, food management, intelligent functions, health control, and overall practicality, which can comprehensively reflect consumers' perception of product benefits.

Perceived value is the core basis for consumers to evaluate whether a product is worth purchasing, usually including an overall assessment of product functionality, price reasonableness, and psychological satisfaction. The five items in this table are presented from multiple perspectives, including functional value, user experience, purchasing rationality, expectations surpassing, and overall recognition, reflecting consumers' overall evaluation of the actual and perceived benefits brought by the smart product.

Consumer purchase intention is a key factor in predicting actual purchasing behavior, typically reflected in a positive attitude towards a product and the likelihood of future purchases. The five measurement items in this table involve different aspects of purchasing behavior, including willingness to purchase, preference, recommendation to others, repurchase, and overall performance of purchasing intention. These questions reflect consumers' interest, identification, and brand loyalty towards HA's artificial intelligence refrigerator, and comprehensively reflect their biased behavior towards the product.

Results

1. Demographic Distribution of Respondents

A total of 400 questionnaires were distributed. After removing incomplete or inconsistent responses, 386 valid questionnaires were retained, yielding a validity rate of 96.5%. Accuracy and rationality are ensured during Data cleaning and standardization.

In terms of gender, the number of male respondents is slightly higher than that of females, with males accounting for 52.3% of the total population and females only accounting for 47.7% of the total population. Overall, the gender ratio is relatively balanced, which helps to compare the differences in cognitive preferences of different gender groups towards AI refrigerators; The majority of the surveyed population are aged between 26 and 35 (accounting for 35.2%), 18 and 25 (accounting for 28.8%), and 36 and 45 (accounting for 25.4%), while those aged 45 and above only account for 10.6% of the total surveyed population.

From the educational background of the interviewees, the proportion of those with a

bachelor's degree is the highest, accounting for 63.0% of the entire sample; The proportion of individuals with a master's degree is second, accounting for 33.4% of the total sample; The proportion of students with a master's degree is the lowest, only 3.6%. Those who have worked for less than 5 years and those who have worked for more than 16 years are 15.8% and 3.1%, respectively. The sample size of this survey is in line with the distribution of the audience, with a similar gender ratio and a reasonable age structure. The audience is concentrated in the middle-aged and young groups with strong purchasing power and higher educational levels, who are interested in and will consume the product reasonably, which is more conducive to testing the effectiveness of this research questionnaire.

2. Confirmatory Factor Analysis

The mean factor loading of each measurement item are between 0.74 and 0.81, which is higher than 0.7. This indicates that the relationship strength between each observed variable and its corresponding latent variable is strong, and the homogeneity of the test is high; AVE values greater than 0.5, reaching PEU of 0.614; PU is 0.600; PV is 0.591; The PI is 0.592, which meets the judgment criteria and has good conceptual aggregation validity; At the same time, the combined reliability (CR) is also relatively high, with all four variables exceeding the recognized standard of 0.87 and 0.7, indicating good consistency among the internal measurement items of these constructs.

All predicted path C.R. values are significantly greater than 1.96, and the $p < 0.001$, indicating that the path relationships have reached a highly significant level in statistics; In addition, the initial measurement term mean of latent variables is assigned a standard value of 1.000, with the standard value of the measurement term as the base term set at 1.000. The standard values of the remaining measurement terms are adjusted accordingly, resulting in a stable and reliable measurement model. The displayed data is also solid and powerful, indicating that the measurement structure of the four main concepts in this context can accurately and reasonably measure the target, and has a good measurement level, laying a good quantitative foundation for exploring the influence mechanism of artificial intelligence refrigerator purchase intention in the future.

3. Correlation Analysis

From the square root of AVE, the values of PEU, PU, PV, and PI are 0.784, 0.775, 0.769, and 0.769, respectively. If the square root of AVE of a variable is higher than its correlation coefficient with other variables, it indicates that the variable has good discriminant validity. The data in this study meets the standard. The correlation coefficient between PEU and PU is 0.621, which is much lower than the $\sqrt{\text{AVE}}$ of PEU itself (0.784). The correlation coefficient between PU and PI is 0.640, which is also lower than PU's $\sqrt{\text{AVE}}$ (0.775). This result indicates that the various constructs can be distinguished statistically, and variable measurements have clear definitions.

The Pearson correlation coefficients between each variable in the relationship item table of

the article are all over 0.56, and all p-values are less than 0.01 (all below the horizontal line), indicating that the correlation has reached a medium to high degree. In addition, the Pearson correlation coefficient between PEU and PU is 0.621, indicating that consumers will find the product more useful the more convenient it is to use. The Pearson correlation coefficient between PU and PI is 0.640, indicating that consumers who feel the product has high practicality will be more willing to purchase it. The Pearson correlation coefficient between PV and PI is 0.585, indicating that the overall satisfaction level of the product determines whether or not to make a final purchase. The Pearson correlation coefficient between PEU and PV is 0.565, indicating that the user's perceived convenience in using the product will affect their perception of its value. The results of the variable relationships in the theoretical model, which empirically confirm the positive effects of perceived ease of use, perceived usefulness, and perceived value in promoting purchase intention. The data logical relationship between different variables is good, and the differences between variables are significant, which is conducive to subsequent path analysis and structural equation modeling, and has a good structural foundation.

4. Structural Equation Model Hypothesis Testing

The chi square value is 313.797 with 164 degrees of freedom, while the chi square/df value is 1.913, far less than 5 and close to the best case 3. This indicates that the model is very simple, reasonable, and has a high degree of fitting. GFI (goodness of fit index) greater than 0.931, AGFI (modified goodness of fit index) greater than 0.912, both greater than 0.9; The CFI (Comparative Fit Index) is greater than 0.967, which is greater than the ideal fitting value of 1. This model also meets the ideal condition of achieving the best satisfaction level, that is, RMSEA (root mean square error approximation) is less than the critical point of 0.08. At the same time, all the criteria for evaluating the goodness of fit have reached the excellent standard, indicating that the model established in this study is reliable and effective, and can also effectively demonstrate whether the model matches the data.

The estimation results of each path in the structural equation model. According to Table1, all paths reached significance ($p < 0.01$, with C.R. values greater than 1.96), indicating that the causal relationship between variables is highly important. Under non standardized estimation and standard error, the critical ratio (C.R.) of all paths is greater than 1.96, and the P-values are all less than 0.01, indicating statistical significance between paths.

The impact of perceived usability on perceived value is 0.380, and after standardized conversion, it is 0.317. It can be inferred that when users feel the convenience of using a product, they will correspondingly increase their perception of its value; The path coefficient of perceived usefulness (PU) for PV is 0.487, and the standardized coefficient value is 0.459, $PU > PEU$, Users are more concerned about whether AI refrigerators can truly meet their practical needs and whether they

have a certain degree of practicality.

On the path where PI is influenced by PU, PEU, and PV, the standard coefficient of PU is 0.411, indicating that if consumers believe that the product will be helpful to them, it will greatly promote their purchase intention; Although PEU can also make PI reach a statistically significant level ($p=0.004$), its standard coefficient is only 0.194, indicating that its impact is relatively weak; The path coefficient of PI affected by PV is 0.264, indicating that value perception is one of the key mediating variables that influence consumers' final decisions. At the same time, the rationality and statistical support of various path effects in the model provide empirical support for researchers in explaining the mechanism of AI refrigerator purchase intention formation.

The R^2 value of perceived value (PV) measured based on SMC (Squared Multiple Correlation) is 0.52, indicating that the independent variables of the model can explain 52% of the variability in perceived value and have a certain explanatory power; However, 48% of the variation still comes from variables outside the model, so the main factors affecting respondents' perceived value are not within the range of variables selected in this article. The Squared Multiple Correlation (SMC) of Purchase Intention (PI) is 0.60, indicating that purchase intention can be explained not only by perceived value, but also by perceived value and other predictive variables, explaining 60% of the change, indicating that the model can effectively explain consumer purchase behavior intention. And the explanatory power of the model for the main endogenous variables has reached a generally acceptable level for structural equation modeling, which can verify whether the hypothesis relationship is valid.

The direct effect of PEU on PI is 0.393 ($SE = 0.050$, $t = 7.84$, $p < 0.001$), with a 95% confidence interval (0.294 - 0.491), confirming statistical significance. The indirect effect through Perceived Value (PV) ($PEU \rightarrow PV \rightarrow PI$) is 0.230 ($SE = 0.035$), with a confidence interval (0.165–0.299) excluding zero, validating partial mediation.

The total effect of PEU on PI is 0.623 ($t = 13.93$, $p < 0.001$), with direct and indirect effects accounting for 63.1% and 36.9%, respectively. All of the above results indicate a conclusion, while PEU primarily drives purchase intention directly, enhancing user perceptions of product value further amplifies this effect.

The direct effect of PU on PI is 0.447, with a standard error of 0.046, a t-value of 9.724, a p-value of 0.000, and a confidence interval of 0.357-0.538, indicating that consumers' purchasing intention increases with the perceived usefulness of the product.

PU indirectly affects PI. According to its t-test, the indirect utility is 0.187, SE is 0.031, and 0 is not within the range of [0.131, 0.256]. This indicates that the mediating path is established, and PU will affect users' perception of the value enhancement of AI refrigerators, thereby increasing their purchase intention. The direct effect accounts for 70.5% of the total effect, and the indirect effect

accounts for 29.5% of the total effect, indicating that PU's impact on users' purchase intention is mainly direct, but the indirect path through value perception still has a high effect. The total effect of PU is 0.634, which has a significant impact, indicating that PU plays a significant role in influencing users' purchase intention.

Discussion

The usability of artificial intelligence refrigerators has a positive impact on consumers' perceived value. In the structural equation model, it is expressed that when consumers consider artificial intelligence refrigerators to be user-friendly, easy to use, or understandable, they will score their product value higher. This is in line with the theoretical logic of the Technology Acceptance Model (TAM) path (Davis, 1989). Usability directly affects users' subjective feelings and increases their utility and overall favorability of the product (Chen et al., 2017), thereby reducing their learning and operating costs and potentially gaining higher confidence in use. If the user experience is good, they are more willing to internalize these good experiences as recognition of the added value of the product (Milly et al., 2020). The AI refrigerator includes functions such as voice interaction, automatic food recognition, and automatic recommendation. In this case, if a certain technology is designed to be simple and convenient, it is easier for consumers to transform the "convenience brought by technology" into "value worth buying".

The perceived usefulness of artificial intelligence refrigerators is strongly positively correlated with consumer perceived value. When consumers believe that artificial intelligence refrigerators can better meet their living needs, improve storage efficiency and household management level, they consider artificial intelligence refrigerators to be products with high usage value and purchasing significance. The refrigerator is equipped with AI technology, which allows users to intelligently determine whether food has expired, whether it can be purchased and made into a healthy recipe, whether it can help save energy and water, and even remotely monitor the refrigerator to place orders with suppliers (Falode, 2018). If these functions are truly embedded in our lives, they can help us save on living expenses or bring us more convenience. Naturally, this "tool value" will also be transformed into more "perceived value" in our psychology. The correlation coefficient between PU and PV is $r=0.601$, indicating a strong correlation between the two, which is consistent with the research results of Feng et al. (2016).

The purchase intention becomes more apparent when consumers have a higher evaluation of the value of artificial intelligence refrigerators. The perceived value here is not simply a judgment of price and functionality, but a comprehensive judgment of the overall experience of "worth buying" obtained by consumers after their usage experience. It is also a comprehensive judgment obtained by consumers from multiple perspectives on how much functional benefits this product has, whether it

can make life more convenient, whether it has technological novelty, and whether it can bring more emotional satisfaction to themselves (Qiao et al., 2022). The conclusion of this study is consistent with Jeong's (2016) conclusion, which states that when consumers integrate their perception of artificial intelligence refrigerators into a definite value cognition and give positive evaluations, it becomes a source of psychological motivation that drives them to make behavioral decisions. The impact of perceived value on purchase intention is statistically significant, reflecting its important position in consumer psychological mechanisms.

The usability of artificial intelligence refrigerators will have a significant positive impact on consumers' willingness to purchase. From Figure 3, it can be seen that the impact of perceived usability is slightly smaller than that of usefulness and perceived value, but still significant, indicating that usability still has a direct impact on consumers' purchase intention. Therefore, the conclusion is that usability also has an effect on consumers' purchase decisions. And the research results of this article are consistent with Tao et al. (2019). Easy to use can further amplify the impact of perceived value on purchase intention, so the positive effect of usability should not be ignored; Manufacturers pay attention to highlighting design details in terms of functionality (such as fast voice control response, ingredient management, etc.), which can provide consumers with a better experience and leave a better impression, promoting purchasing behavior (Milly et al., 2020).

The perceived usefulness of AIG refrigerators has a positive impact on consumer purchase intention, and the two are significantly positively correlated, which is consistent with the research results of Lu et al. (2022). Consumers evaluate the quality of refrigerators not only based on their effectiveness, but also from a functional perspective to determine whether they can achieve effective functions, solve problems such as energy conservation, food preservation, and intelligent control; If AIG refrigerators can enable people to experience the convenience and benefits brought by artificial intelligence, and these benefits are brought about through the combination of AI refrigerators and intelligent technology, then consumers will consider such products to be valuable (Tao et al., 2019).

The perceived value of artificial intelligence refrigerators is a mediating variable between refrigerator usability and consumer purchase intention, that is, perceived value conveys the impact of usability on consumer purchase intention, and also reflects the benefits of usability that encourage consumers to purchase and use more; The ease of use reduces the threshold for consumers to use the product and increases their satisfaction with it, thereby affecting their attitude and behavioral performance towards the product. The above conclusion is consistent with the research findings of Siahannet et al. (2019). Perceived value is an overall evaluation of a product formed by an individual based on a comprehensive evaluation of multiple aspects of the product. Only when users feel that this refrigerator has indeed brought convenience, improved their living conditions, and enhanced their quality of life, can they discover the increase in consumer perceived value and purchase intention

from their feelings and experiences.

Research has found that perceived value is a partial mediating variable for the usefulness of artificial intelligence refrigerators and consumer purchase intention. That is, when consumers feel that a certain product is "useful" to themselves, they also need to decide whether they recognize its full value in order to facilitate real purchasing behavior. This study is consistent with the findings of Wang & Choi (2021): in the use of artificial intelligence refrigerators, although their usefulness can directly promote consumer purchasing behavior, this effect is not direct or completely linear; That is to say, users are not only concerned about whether a refrigerator has rich and complete functions, but also whether its functions themselves will bring real convenience and tangible benefits to people's lives, which is the focus of users' attention (Feng et al., 2016). Among them, perceived value is a bridge and link in this process. The acceptance of product features by consumers also largely depends on whether users are satisfied with their inner feelings and whether the cost-effectiveness of the product is appropriate (Astuti et al., 2020).

Conclusion

This research takes artificial intelligence refrigerators as an example to explore the impact paths of perceived ease of use (PEU), perceived usefulness (PU), and perceived value (PV) on consumer purchase intention (PI), and verifies the relationships between each variable through structural equation modeling. The research sample consists of 386 consumers, and the model's various fitting indicators are excellent. Chi square/df is 1.913, GFI, AGFI, and CFI are 0.931, 0.912, and 0.967, respectively. RMSEA is 0.049, indicating that the overall model has high explanatory power and fitting degree.

In terms of perceived usability, analysis shows that it has a significant positive impact on perceived value and purchase intention. The standardized path coefficient of perceived value is 0.317, and the direct impact of purchase intention is 0.194. The indirect effect of perceived value on purchase intention is 0.230. Perceived usefulness also shows significant influence, with a standardized coefficient of 0.459 for perceived value, 0.411 for direct effect on purchase intention, and 0.187 for indirect effect. The overall impact of perceived usefulness on purchase intention is significant, with a total effect of 0.634, while perceived ease of use is 0.623, indicating that in consumers' psychological judgments, "practicality" is slightly stronger than "convenience".

Perceived value is a mediating variable that affects two relationships, and the 95% confidence intervals of both paths (PEU-PV, PU-PV) do not contain zero, indicating that perceived value plays a significant mediating role in both path relationships; At the same time, the proportion of intermediaries in the PEU-PV pathway is 36.9%, indicating that when consumers use artificial intelligence products, they first feel the convenience of AI products, and then convert this sense of use

into a value judgment of the product, thereby triggering purchasing behavior.

Except for Pearson correlation analysis, which can verify the significant positive correlation between variables (PU-PI: 0.640, PEU-PV: 0.565, PV-PI: 0.585; all $p < 0.01$), this indicates that the four variables are interrelated, that is, for a certain product or service, users' experience of using the product and the benefits it brings will directly affect their consumption behavior; In hypothesis testing, all the above hypotheses can be accepted, thus ensuring that the theoretical model constructed in this article is relatively complete and the empirical logic has a certain degree of reliability.

Reference

- Ali, A. A., & Elshahhawy, T. (2019). Determinants of consumer purchasing intention toward energy-efficient bulbs. *The International Journal of Business & Management*, 7(2), 78–84. <https://doi.org/10.24940/theijbm/2019/v7/i2/bm1902-003>
- Astuti, N. D., Adi, K., & Putro, A. S. (2020). Analisis penerimaan sistem pendaftaran online puskesmas menggunakan TAM2 dan UTAUT. *Jurnal Manajemen Informasi Kesehatan Indonesia*, 8(2), 170. <https://doi.org/10.33560/jmiki.v8i2.285>
- Awaluddin, I., & Hamid, W. (2019). Interaction of social identity, empathy and planned behavior theories to understand domestic product purchasing intention. *Problems and Perspectives in Management*, 17(1), 95–102.
- Chen, C., Xu, X., & Arpan, L. (2017). Between the technology acceptance model and sustainable energy technology acceptance model: Investigating smart meter acceptance in the united states. *Energy Research & Social Science*, 25(11), 93–104. <https://doi.org/10.1016/j.erss.2016.12.011>
- Cheng, W., Cao, X., Lian, W., & Tian, J. (2024). An introduction to smart home ward-based hospital-at-home care in china. *JMIR Health and Health*, 12(1), e44422–e44422. <https://doi.org/10.2196/44422>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *Journal of Risk and Uncertainty*, 18(3), 321–325. JSTOR. <https://doi.org/10.1023/a:1011156710779>
- Denaputri, A., & Usman, O. (2019). Effect of perceived trust, perceived security, perceived usefulness and perceived ease of use on customers' intention to use mobile payment. *SSRN Electronic Journal*, 12(22), 1155–1177. <https://doi.org/10.2139/ssrn.3511632>
- Falode, O. (2018). Pre-service teachers' perceived ease of use, perceived usefulness, attitude and intentions towards virtual laboratory package utilization in teaching and learning of physics. *Malaysian Online Journal of Educational Technology*, 6(3), 63–72.

<https://doi.org/10.17220/mojet.2018.03.005>

- Feng, X., Alenzi, E., & Dwibedi, N. (2016). Impact of perceived stress, perceived social support, and personality on the perceived health status among west virginia university students. *Value in Health, 19*(3), A191. <https://doi.org/10.1016/j.jval.2016.03.1340>
- Ferguson, L. M. (2019). Expectancy-Value theory of achievement motivation: how perceived racial prejudice can influence ability beliefs, expectancy beliefs and subject task value of méris post-secondary students. *Aboriginal Policy Studies, 8*(1), 1155–1177. <https://doi.org/10.5663/aps.v8i1.29341>
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50.
- Hassija, V., Chamola, V., Saxena, V., Jain, D., Goyal, P., & Sikdar, B. (2019). A survey on iot security: Application areas, security threats, and solution architectures. *IEEE Access, 7*(1), 82721–82743. <https://doi.org/10.1109/access.2019.2924045>
- Hidayati, A., Oktaviana, S., & Ismail, I. E. (2018). Analisa perilaku dosen dalam memanfaatkan e-learning di lingkungan PNJ menggunakan TAM2 (technology acceptance model). *Multinetics, 3*(2), 1.
- Ibrahim, M. (2023). Smart home system using home assistant. *International Journal of Science and Research (IJSR), 12*(6), 1345–1350.
- Jeong, B. (2016). Effects of perceived usefulness, perceived ease of use and perceived enjoyment on intention to use tourism application: Moderating effects of demographic characteristics. *International Journal of Tourism and Hospitality Research, 30*(1), 101. <https://doi.org/10.21298/ijthr.2016.01.30.1.101>
- Jing, H., Lun, X., Dan, L., Zhijie, H., & Zhiliang, W. (2015). Cognitive emotion model for eldercare robot in smart home. *China Communications, 12*(4), 32–41. <https://doi.org/10.1109/cc.2015.7114067>
- Lee, Lee, & Liang. (2019). An empirical analysis of brand as symbol, perceived transaction value, perceived acquisition value and customer loyalty using structural equation modeling. *Sustainability, 11*(7), 2116. <https://doi.org/10.3390/su11072116>
- Lu, H., Cao, X., & Hsu, Y. (2022). Product innovation and design strategies for 5G technology in china's home appliance companies. *Sustainability, 14*(22), 14781. <https://doi.org/10.3390/su142214781>
- Milly, N., Xun, S., Meena, M. E., & Cobbinah, B. B. (2020). Measuring mobile banking adoption in Uganda using the technology acceptance model (TAM2) and perceived risk. *Open Journal of Business and Management, 9*(1), 397–418.

- Qiao, Y., Yin, X., & Xing, G. (2022). Impact of perceived product value on customer-based brand equity: Marx's theory – value-based perspective. *Frontiers in Psychology, 13*(11), 45–56. Frontiers in. <https://doi.org/10.3389/fpsyg.2022.931064>
- Setyo, Gatot, & Solekhah. (2020). Perceived value of green residence: The role of perceived newness and perceived relative advantage. *International Journal of Economics and Business Administration, VIII* (Issue 2), 443–456. <https://doi.org/10.35808/ijeba/474>
- Siahaan, E., Amalia Fachrudin, K., Linda Leonita Sibarani, M., & Muda, I. (2019). Evaluating customer perceived value of housing based on location factor and economic value. *Problems and Perspectives in Management, 17*(3), 196–206.
- Tao, Z., Zhang, Z., Wang, X., Shi, Y., & Soar, J. (2019). Comparison of subsidy schemes for reducing waiting time: Special focus on smart home care for elderly people. *Procedia CIRP, 83*(23), 716–721. <https://doi.org/10.1016/j.procir.2019.04.102>
- Wang, Y., & Choi, K.-H. (2021). A study of mobile payment app on the intention to continue use of Chinese tourists visiting Korea: A moderating effect of perceived relationship benefits using the extended technology acceptance model(tam2). *Journal of MICE & Tourism Research, 21*(4), 125–142. <https://doi.org/10.35176/jmtr.21.4.7>
- Widyanti, J., & Usman, O. (2019). Leverage of perceived usefulness, perceived ease of use, information quality, behavioral intention towards intention to use mobile banking. *SSRN Electronic Journal, 12*(33), 45–60. <https://doi.org/10.2139/ssrn.3509950>