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A Causal Model of the Relationship Between Product Design and Brand Awareness in Relation to Purchase Intentions for Smart Household Electrical Appliances

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ARTICLE INFO	ABSTRACT
	This study analyses the relationship between product design and brand awareness in relation to purchase intentions for smart household electrical appliances and to verify the relationship between the variables. In this study, purposive sampling was used to select 500 respondents from five major online shopping platforms in China: JD, Suning, Tmall, TikTok, and Pinduoduo. The reliability and validity of the questionnaires were verified with Cronbach's alpha scores were above 0.7, that AVE values for all factors exceeded 0.5, and that CR values were all above 0.7. Data analysis uses methods such as frequency, descriptive statistical analysis, percentage, the correlation between variables and structural equation model analysis techniques. This study found that consumers' satisfaction with smart home appliances mainly focuses on operability, performance, brand, and appearance. **Keywords:** Product design, brand awareness, purchase intention, smart household electrical appliances

INTRODUCTION

Chinese home appliance companies are actively working to modify and optimize their industrial structures in order to increase product competitiveness. Chinese home appliance manufacturers are inventing in numerous parts of their products, and product innovation has become an important factor in evaluating a company's competitiveness. Among these, increasing product added value through product design is a helpful method that corporate managers recognize and value for leveraging product design innovation while maintaining functionality, technology, and cost effectiveness. Excellent home appliance items are often designed with user experience, functionality, aesthetics, innovation, and sustainability in mind. These design aspects will have a significant impact on the growth of the smart home appliance sector. This impact is especially obvious in areas such as improving user experience, encouraging technical innovation, altering market competitive patterns, increasing brand value, and promoting sustainable development. Considering the significant needs of users, superior product design can enhance the appeal of smart home equipment and enable businesses to differentiate themselves. Furthermore, customers may be apprehensive

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regarding the integration of design with AI technology to augment product intelligence or address practical user issues (Zou, 2020). In regard to user experience, superior design can streamline operational processes and improve human-computer interaction. In the realm of technical innovation, layout may facilitate the emergence of new functionalities like as voice control or adaptive learning. The smart home appliance sector is predominantly propelled by superior product design, shifting from an emphasis on functional functionality to prioritizing user experience. It addresses user challenges and transforms real situations through technical advancement and visual representation. In the future, as AI, IoT, and sustainable development concepts advance, design will increasingly focus on the harmonious coexistence of the "human-machine environment," which will serve as a crucial lever for the industry to overcome homogeneous competition and facilitate a transition in value (Zhang et al., 2019). Intelligent home appliances and their technical capabilities in mobile internet, big data, and cloud computing are characterized by "digital and intelligent product design," which highlights their intelligent features. "Intelligence" denotes cognitive ability, and "digitalization and intelligence" are characterized as "empowering a machine to react in a manner akin to human behavior."

This research also includes further sources for developing unique corporate products. Enterprises may innovate in two ways: first, by mastering key technologies; second, by elevating manufacturing to the top of the industrial chain via product creative design, which allows the product to have both good functionality and high added value (Ji Xin, 2006). Because of differences in technology conditions and scale foundations, businesses must employ distinct innovation tactics. This research blends theoretical discourse with case analysis to give reference ideas for businesses to better their product innovation design, consequently increasing their competitiveness and capabilities in the architecture of product design systems.

According to the information provided above, the researcher was interested in improving unique corporate products, and enterprises can innovate in two ways: first, by mastering key technologies; second, by elevating manufacturing to the top of the industrial chain through product creative design, allowing the product to have both excellent functionality and high added value (Ji Xin, 2006). This study combines theoretical discourse with case analysis to provide reference ideas for organizations to improve their product innovation design, hence enhancing competitiveness and capabilities in the architecture of product design systems. The results can be used as a guideline by the government, businesses, and service providers to take comprehensive initiatives. These efforts can not only improve the product's competitiveness, design, and services, but also serve to promote sustainability, which is helpful for the long-term growth of intelligent home appliances.

LITERATURE REVIEW

The research studies and literature related to the present research were thoroughly reviewed as follows.

Digitization and intelligent connectivity are key to artificial intelligence technologies. Regrading digitalization: Smart home appliances are the use of the Internet, the Internet of Things, artificial intelligence, and other technologies to improve home life by providing intelligent, efficient, and safe electrical devices. The arrival of digital technology has brought about significant changes in the intelligent home appliance business. Improve the function, performance,

and user experience of smart home appliances, hence further boosting the industry's growth. Modern items have core technical properties such as digitalization and intelligence. Digital and intelligent, can connect and interact with people or other items via data, In the age of big data, digitization and intelligence are the foundations of industrial design goods. It is feasible to get useful data on a large scale and at a reasonable cost. The use of open-source technologies and product crowdfunding (kick-start) shortens the design and development iteration cycle. Increase consumers' participation in the design process (Wang, 2009). The enterprise's own vertical platform allows for direct product sales to users. Businesses may communicate directly with their customers and collect data by creating a user community. As a result, digital and intelligent industrial product design has a physical basis, practical meaning, and operability. Digital intelligent home appliances are a type of modern home appliance that incorporates the Internet, Internet of Things, artificial intelligence, and other technologies. These smart home appliances may achieve automated control, intelligent perception, correct operation, and other tasks by using digital technology, therefore improving the user experience as well as the performance and added value of the items.

Intelligent interconnectivity refers to the use of technologies such as mobile Internet, big data, cloud computing, and the Internet of Things to integrate the Internet with conventional businesses, allowing them to evolve and improve economically. The "intelligent interconnection" discussed in this paper is more than just the online economy or adding the Internet to the industrial design industry; it focusses on using mobile Internet, big data, cloud computing, the Internet of Things, and other technologies to deeply connect the Internet with the manufacturing industry, accelerating the smart improvement of the industrial design industry. We anticipate that this integration will increase efficiency, streamline procedures, and spur innovation in the sector. Businesses may use these sophisticated technologies to develop smarter goods and services that better suit the changing demands of their customers. Intelligent connectivity technology in household appliances has a significant impact on innovation, service improvement, collaboration, industry consolidation, global supply chains, low-carbon economies, and supply chain transformation. The intelligent interconnection would usher in a new wave of manufacturing innovation. It changes the "smile curve" development mode, leads the manufacturing industry to "intelligent" transformation, and opens a new era of sharing economy; it changes the value creation and distribution mode, changes the top-down production mode of the industrial design industry to the production mode in the product life cycle, and customers can participate in every link of product design and production to ensure that the products produced by manufacturing enterprises. The intelligent connectivity provides a one-of-a-kind potential for the expansion of the manufacturing industry, but it also poses considerable challenges. "Smart Internet" represents a significant possibility for the intelligent upgrading of the household appliance business. The "Smart Internet" includes mobile Internet, big data, cloud computing, and the Internet of Things, which all have an impact on the intelligent upgrading of the industrial design industry in different ways, creating conditions for the intelligent upgrading of the manufacturing industry and accelerating the intelligent process.

The Concept of Home Appliance Product Design

Product design is a sequence of technical tasks that range from creating a task book for a new product design to designing product samples. Its job responsibilities include developing a task book for product design and

implementing project requirements in the design task book. Product design should fulfil the following goals: 1) The created product should be sophisticated, of high quality, and capable of meeting user demands. 2) Enable both product makers and end users to reap more economic rewards. 3) To produce the best design, take real-world resource conditions, manufacturing, and living standards into consideration. 4) Focus on enhancing product serialization, generalization, and standardization. The primary categories include self-designed new items, external sample physical mapping and imitation, external drawing design, and enhanced design of existing products. Product appearance design refers to a new design that is aesthetically attractive and acceptable for industrial uses based on a product's shape, pattern, color, or mix of these features. Product appearance design is based on a product's look. The term "product" refers to all goods that are artificially produced. In the United States, according to the dictionary definition, "a product refers to any object made by human hands using raw materials, whether the object is made directly by hand or made by machine." In truth, a product includes all items with the exception of natural objects. The primary reason for consumers to purchase smart home appliances is to obtain the basic functions of the appliances, such as the cooling function of the refrigerator, the washing function of the washing machine, the heating function of the microwave, and the cooling and heating functions of the air conditioning unit. Product functionality, as the most important aspect of product design, is primarily concerned with the design of the product's functional placement and how it interacts with consumers. Product functional design is at the heart of product design, and it must address a variety of features of the product to ensure that it meets the demands of consumers and efficiently performs its tasks. This is also a major area for technical innovation and new product development. The functional design of household appliances is generally concerned with the following aspects: 1) Requirement Analysis: Understand the needs and pain areas of the user, as well as rivals and market trends in design. 2) Create a product structure based on functional specifications, including the form, size, material, color, interface, and so on for each component. 3) Hardware design: Create electronic components such as circuit boards, chips, sensors, and actuators, as well as auxiliary components like power supply and heat dissipation, based on the product structure. 4) Software design: Create control programs and algorithms based on the product's functional specifications and hardware design. 5) Testing and optimization: After the product prototype is created, numerous performance tests and functional verifications are carried out, and the design and manufacturing processes are optimized and enhanced in response to the test results. Interface design is a crucial aspect of home appliance product design, and its quality has a direct influence on user experience. Here are some typical interface design points for household appliances: 1) Ergonomic compliance: When designing an interface, ergonomic principles should be followed to adapt to varied users' usage patterns and demands. 2) Concise and clear: The interface design should be simple and straightforward, with fewer features and information and a focus on the most important functions and information. 3) Simple to use: The interface design should be simple to use, eliminating instances in which people make mistakes or are unable to grasp when using it. (4) Beautiful and elegant: The interface design should be attractive and elegant in order to capture customers' attention and improve the overall quality of the product. 5) Interaction friendly: The interface design should be interactive and user-friendly, allowing people to interact with the product and improve their overall experience. 6) Strong adaptability: The interface design should be highly flexible, able to conform to a variety of usage

circumstances and user needs. As a result, the design of household appliances is primarily composed of three elements: appearance design, functional design, and interface design.

Brand concept: Brand refers to the level of consumer awareness of a certain type of product and product line. The essence of a brand is that its owner's products, services, or other advantages over competitors can bring equal or higher value to the target audience. The values include functional benefits and emotional benefits. In a broad sense, a "brand" is an intangible asset with economic value, represented by abstract, unique, and recognizable mental concepts that express its differences, thus occupying a certain position in people's consciousness as a comprehensive reflection. Brand building has a long-term nature. Narrowly defined, "brand" is a "standard" or "rule" that has both internal and external characteristics. It is a recognition system that standardized and regularized concepts, behaviors, and visual and auditory aspects, making it unique, valuable, long-term, and cognitive. This system is also known as the CIS (Corporate Identity System). The term perception in marketing refers to consciousness, which is also known as brand awareness. Brand awareness is a marketing term that describes the probability of consumers identifying a brand or product based on its name or their familiarity with a specific product or service. It also represents whether the brand image has sufficient status in the minds of consumers.

Establishing brand awareness is key to familiarizing the public with a product and distinguishing it from competitors. Enterprises that maintain a high level of brand awareness may increase revenue and market share, as consumers are more likely to purchase familiar brands compared to unknown ones. VOXCO's statistics show that 59% of consumers are more willing to purchase brands they already know. Just like people buying smartphones, they are more inclined to buy Apple or Huawei rather than lesser-known brands. So, the higher the brand awareness of a product, the more easily it attracts consumers (Keller, 2008). Brand awareness helps to enhance three aspects of consumer perception: quality perception, value perception, and emotional perception, while consumer perception contributes to the improvement of purchase intention; that is, there is a connecting effect between brand awareness and purchase intention. In the specific purchasing process, in addition to the functionality of the product itself, consumers will also pay attention to the brand's visibility, reputation, and image. The higher the consumer's understanding of the brand, the stronger their willingness to purchase its products. Consumers' perception of product quality is by understanding the factors that influence consumers' determination of product quality. Another 30% of respondents defined quality based on brand name, while 23% used manufacturer name as a strong indicator of quality. Brand image refers to the personality traits exhibited by a company or its brand in the market and in the minds of the general public, reflecting the evaluation and recognition of the brand by the public, especially consumers. Brand image and brand are inseparable. Image is the characteristic displayed by a brand, reflecting its strength and essence. Brand image includes product name, packaging, graphic advertising design, etc. Image is the foundation of a brand, so companies must attach great importance to shaping their brand image. Brand Trust: the concept of brand trust was first proposed by Howard & Sheth (1969). who believed that trust is one of the determining factors of purchase intention. They assume that trust is positively correlated with purchase intention. Similarly, Bennett & Harrell (1975), brand trust is essentially a commitment made by businesses to consumers, and both the external image and internal quality of the brand should demonstrate a responsible attitude towards consumers. Brand loyalty is an indicator of

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measuring brand loyalty. Consumers form brand loyalty by repeatedly purchasing and using a brand over a long period of time, developing a certain level of trust, commitment, emotional support, and even emotional dependence on the brand. Customers with high brand loyalty have lower sensitivity to price and are willing to pay high prices for high-quality products. They can recognize the value of the brand and see it as a friend and partner, and they are also willing to contribute to it. Brand loyalty is the core of brand value. It consists of five levels: 1) No brand loyalists: This group of consumers will constantly change brands, lack brand recognition, and be very sensitive to prices. Choose whichever price is lower, as many low-value consumables, homogeneous industries, and habitual consumer goods do not have loyal brands. 2) Habitual Buyer: This group of consumers is loyal to a certain brand or several brands, has fixed consumption habits and preferences, and had a clear understanding and goal when made purchases. If competitors have obvious incentives, such as price discounts, advertising, unique packaging, sales promotion, etc., to encourage consumers to try. Allowing them to purchase or continue purchasing a certain product will lead to brand switching and purchasing other brands. 3) Satisfied Buyer: Consumers at this level are already quite satisfied with the original brand and have developed concerns about brand-switching risks. This means that purchasing a new brand carries risks, benefits, and adaptation risks. 4) Like Friend: Consumers at this level already have a love and emotion for brands, and some brands are the foundation of their emotions and hearts. The reason why they can last for a long time is that they have become friends with consumers, indispensable items in life, and are not easily replaced. 5) Loyal buyer: This layer is the highest level of brand loyalty, where consumers develop emotions towards the brand and take pride in it. Therefore, three factors primarily comprise brand awareness: brand image, brand trust, and brand loyalty.

Perceived ease of use is a fact that people learn and use new things based on products or services (Alfadda&, Mahdi, 2021). This variable has been studied as a determining factor for various outcomes, such as customer repurchase intention, customer satisfaction, customer loyalty, etc. (Keni, 2020). Perceived ease of use (PEOU) is a key concept in the Technology Acceptance Model (TAM), which assumes that users' attitudes towards adopting new technologies are influenced by their perception of the ease of use and perceived usefulness of the technology (Saif et al., 2024). In the context of home appliance intelligence, PEOU refers to how consumers can easily adopt smart home appliances. Users' ease of using smart home appliances can significantly influence their willingness to adopt them. The research on the usability of smart home appliances emphasizes its importance in promoting consumer adoption. Research has shown that smart home appliances with intuitive interfaces and user-friendly features are more likely to be accepted by consumers. This adoption, in turn, can promote the development of smart home appliances. The study also investigated the factors that affect PEOU in smart home appliances, including user usage habits and the quality of smart home appliances. In addition, PEOU also assesses user satisfaction with smart home appliances and overall acceptance of artificial intelligence technology.

The Technology Acceptance Model (TAM), abbreviated as TAM, was first proposed by Fred D Dives from the University of Michigan in 1989. This model is based on the rational behavior theory (Fishbein & Ajzen, 1975), which states that attitude determines willingness and that willingness further influences behavior. It further studies the predictive variables of behavioral willingness and introduces two important concepts: "cognitive usefulness" and

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"cognitive ease of use." The initial purpose was to provide an explanation of the decisive factors for the widespread acceptance of computers. With the continuous development of TAM theory, it has been widely applied to study users' use and acceptance of new technologies. The technology acceptance model includes four core concepts (constructions): Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude Towards Using (AT), and Behavioral Intent to Use (BI). Perceived usefulness refers to the degree to which users believe that using a specific system or new technology can improve their work performance or expected work efficiency. Perceived ease of use refers to the degree to which users perceive the system to be easy to use. Attitude towards usage refers to the subjective attitude of users towards new technologies or systems, whether positive or negative; Behavioral intention refers to the user's willingness to use new technologies or systems and is also a subjective expression of intention. They, together with external variables and system usage, constitute the basic structure of the technology acceptance model.

Perceived usefulness: The degree to which consumers mistakenly believe that using a specific technology will increase their productivity is called perceived effectiveness (Mailizar et al., 2021). Doll et al. also defined it as consumers' perception of whether the new technology they are currently using will improve their efficiency and performance in performing tasks (Doll et al., 1998). When customers believe that a new technology or system will bring them some added value, they will use it (Karim et al., 2020). In addition, perceived usefulness (PU) is another fundamental concept in the Technology Acceptance Model (TAM), which assumes that users' willingness to adopt new technologies is influenced by their level of usefulness in achieving their goals (Rajak & Shaw, 2021). In the context of smart home appliances, PU refers to consumers' belief that smart home appliances will increase their adoption. This view includes how these smart home appliances can effectively bring convenience to life. The research on the perceived usefulness of smart home appliances emphasizes their importance in promoting consumer adoption. Research indicates that consumers often have a higher willingness to adopt intelligent home appliances. This adoption can improve the convenience and satisfaction of life. In addition, the study also explored how PU is influenced by factors such as the quality of smart home appliances and the degree of convenience in user experience (Keni, 2020). In addition, PU is also related to users' intention to continue using smart home appliances and their overall satisfaction with smart home appliance brands and designs.

With respect to the SOR model theory, The SOR model originated from the "Stimulus Response" principle proposed by John B. Watson, the founder of psychology, in 1913. It was his belief that he could divide complex human behavior into two parts: internal body stimuli and external environmental stimuli. The model looks at how both internal feelings and outside factors affect consumers, but it still treats their mental processes as a mystery. This model considers both the inner activities of consumers and external environmental stimuli, yet it still views consumers' psychological processes as a mystery. Afterwards, Mehrabian and Russell (1974) conducted research on the "black box" of consumers and further introduced the "organism" variable, proposing the "stimulus organism response" model, also known as the SOR model. This model emphasizes that the connection between external stimuli and individual behavior is not a simple mechanical one, and the individual's willingness and emotion play a mediating role before the two. They further hypothesize that individual emotions are the basic psychological activity that connects consumers between receiving external stimuli and responding. The study of the consumer black box, that

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consumer behavior is formed by the dual effects of external stimuli and personal factors and is a psychological decision-making process. The psychological response is crucial for understanding the factors influencing consumer behavior, as it involves how consumers process and understand information. Subsequently, Eroglu, Machleit and Davis (2003) redefined the meaning of each variable in the SOR model based on disciplines such as consumer behavior and marketing. S refers to the stimulating effect of the internal and external environment on consumers, O refers to the internal emotional perception generated by consumers after being stimulated, and R refers to the internal and external reactions of consumers.

The interactive atmosphere and supportive atmosphere of social e-commerce platforms have a significant positive impact on consumers' perceived trust, and consumers' perceived trust and perceived entertainment have a significant positive impact on their willingness to continue purchasing. This willingness to continue purchasing is further enhanced by the sense of community fostered within these platforms, as users often share experiences and recommendations. Consequently, the synergy between trust and entertainment drives repeat purchases and encourages consumers to become advocates for the brand. As advocates, these consumers contribute to the platform's growth and attract new users through their testimonials and social interactions. This organic promotion reinforces the community aspect, creating a virtuous cycle that benefits both the consumers and the e-commerce platforms. In this study, S represents smart home appliances; O represents consumer behavior intentions; and R represents consumer purchases and uses.

METHODOLOGY

The research design and instrument in this study employed a quantitative approach, utilizing questionnaires to gather information. The research survey is focused on 449 million consumers in China, with an error margin of 5% and a reliability of 95%. According to Taro Yamane's formula, it is calculated that at least 400 consumer respondents should be selected for the study, but in practice, the questionnaire is distributed through the Internet, and the actual number of collected questionnaires may be lower than the number distributed. Therefore, to guarantee the validity of the results of the study, the number of respondents was increased by 40% (Vanichbuncha, 2006), and the final sample size was 400 + (400 × 0.4) = 560. Then, the sampling method, adhering to the five platforms with the largest number of online shopping platforms in China which including JD, Suning, Tmall, Tiktok and Pinduoduo (China National Bureau of Statistics, 2022). The data collection was carried out by the distribution questionnaires, with a total of 560 respondents. This indicates that 500 respondents, or 89.28 percent of the total, returned the questionnaire. Cronbach's Alpha is an α coefficient between 0.8 and 0.9, indicating excellent scale reliability; if the coefficient is between 0.7 and 0.8, it means that the scale's reliability is acceptable; if the coefficient is below 0.6, it indicates that the scale's internal reliability is destitute and lacks reference value. In this study, the minimum acceptable value of the coefficient Cronbach's alpha was at least 0.7. In addition, the convergent validity of the survey questionnaire in this study that the AVE values corresponding to all factors are greater than 0.5, and the CR values are all higher than 0.7, indicating that the data analyzed in this study has good convergence validity. The analysis data were used with social science statistical techniques, such as frequency, descriptive statistical analysis, percentage, the correlation between variables and structural equation model analysis techniques.

RESULTS AND DISCUSSION

Regarding the demographic frequency analysis, the study's results showed that among the 500 survey respondents, there were 260 males, accounting for 52% of the total sample size, and 240 females, accounting for 48% of the total sample size, with a relatively balanced gender distribution. The number of people in the age group of 18−25 is 140, which accounts for 28% of the total sample size. A total of 126 individuals, or 25.2% of the sample size, are in the 26−35 age range. There are 117 people in the 36−45 age range, which makes up 23.4% of the sample size. Of the total sample size, 117 individuals, or 23.4%, are in the age group of 46 and over. The age distribution is relatively balanced. The number of people with high school/vocational school education and below is 142, accounting for 28.4% of the total sample size; the number of people with college education is 131, accounting for 26.2% of the total sample size; the number of people with undergraduate education is 114, accounting for 22.8% of the total sample size; and the number of people with master's degrees or above is 113, accounting for 22.6% of the total sample size. The distribution of educational backgrounds is relatively balanced. The number of people with monthly average expenses less than or equal to 2000 yuan is 120, accounting for 24% of the total sample size. The number of people with monthly average expenses between 2001 and 4000 yuan is 131, accounting for 26.2% of the total sample size. Of the total sample size, 126 individuals, or 25.2%, have monthly average expenses between 4001 and 6000 yuan. The number of people with monthly average expenses greater than or equal to 6001 yuan is 123, accounting for 24.6% of the total sample size. The details are as follows in Table 1.

Table 1. Results of demographic frequency analysis (n=500)

Characteristic		Number	Percentage (%)
Gender	Male	260	52
	female	240	48
Age	18-25 years old	140	28
	26-35 years old	126	25.2
	36-45 years old	117	23.4
	≥ 46 years old	117	23.4
Education	High school/vocational school and below	142	28.4
	College diploma	131	26.2
	undergraduate college	114	22.8
	Master's degree or above	113	22.6
Monthly average expenses	≤ 2000 yuan/month	120	24
	2001-4000 yuan/month	131	26.2
	4001-6000 yuan/month	126	25.2
	≥ 6001/month	123	24.6

The relationship between product design and brand awareness and purchase intentions to use smart household electrical appliances was analyzed based on the research framework and statistical software. The findings revealed that aesthetically pleasing and user-friendly designs significantly enhance brand recognition, ultimately influencing consumers' decisions to purchase these innovative devices. Additionally, the study highlighted the importance of

incorporating sustainable materials, which further resonates with environmentally conscious buyers. The development model of the relationships among the factors influencing the purchase intentions to use smart household electrical appliances in China is displayed in Figure 1.
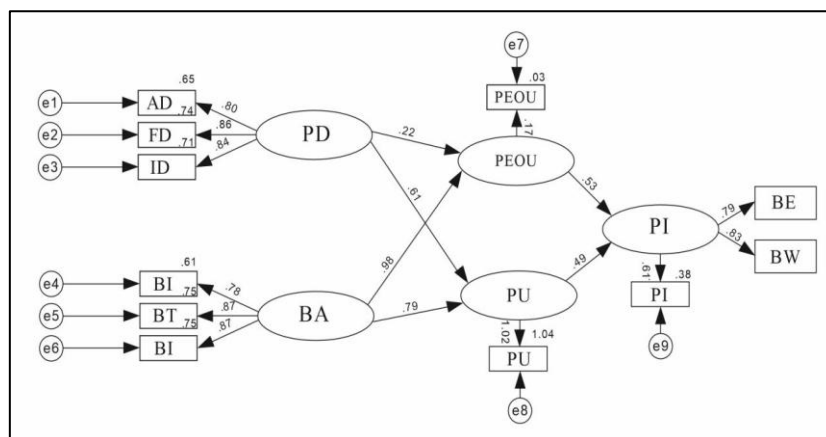

Figure 1: A development model of the relationship between product design and brand awareness among purchase intentions to use smart household electrical appliances

By analysis in the structural equation model, the result of the indicator value of the structural equation model was a fitting index of the variables in this study to be consistent with the empirical data, considering that $\chi2/df$ is 1.72, less than 3; RMSEA is 0.065, less than 0.10; IFI is 0.948; GFI is 0.922; CFI is 0.911; and TLI is 0.925, all greater than 0.9. Table 2 displays the results.

Table 2 Summary of Goodness-of-fit indices for SEM

Indicators	χ^2/df	GFI	IFI	CFI	TLI	RMSEA
criterion	< 3	≥0.90	≥0.90	≥0.90	≥0.90	<0.10
SEM: Results	1.72	0.922	0.948	0.911	0.925	0.065

Summary: all values met the criteria for acceptable model fit

By analysis of the measured variables, the correlation between variables showed significant positive correlation. The details are presented in Table 3.

Table 3 Correlation Coefficient Table

	product design	Brand awareness	Perceived usefulness	Perceived ease of use	Actual use
Product design	1				
Brand awareness	0.830**	1			
Perceived usefulness	0.584**	0.651**	1		
Perceived ease of use	0.176**	0.192**	0.185**	1	
Purchase and use	0.113**	0.138**	0.142**	0.144**	1

Note: **At the 0.01 level (two-tailed), the correlation is statistically significant.

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From table 3, it can be seen that there is a correlation (r=0.830, p<0.01; r= 0.584; p<0.01; r=0.176, p<0.01; r=0.830, p<0.01). There is a correlation between perceived usefulness, perceived ease of use, purchase and use, and brand awareness (r=0.651, p<0.01; r=0.192, p<0.01; r=0.138, p<0.01). There is a correlation (r=0.185, p<0.01; r=0.142, p<0.01). There is a correlation between purchase and perceived ease of use (r=0.144, p<0.01).

CONCLUSIONS

In summary, the data analytics results have been analyzed to meet the research objectives. The analysis focuses on the product design level and brand awareness level of household appliance enterprises. Product design results indicate that the level of the three designs is very high, even quite high. The average level of appearance design is the highest, followed by functional design and interface design. From the perspective of household appliances, their average level is the highest, followed by audiovisual appliances and home control appliances. In addition, the analysis of brand awareness results shows that the levels of all three dimensions are consistently high. The average level of brand trust is the highest, followed by brand image and brand loyalty. From the perspective of household appliances, the average level is the highest, followed by kitchen appliances, and audio-visual appliances are the third highest. The analysis results demonstrate the effectiveness of product design and brand awareness in influencing perceived usefulness and ease of use. The direct effects analysis results indicate that the correlation coefficients of each relationship are positive, ranging from 0.207 to 0.585. The most valuable relationship is the one between brand awareness and perceived usefulness. The lowest is the relationship between brand awareness and perceived ease of use. The results of the relationship between product design, brand awareness, and purchase intentions to use smart household electrical appliances were analyzed, and a fitting index of the variables in this study was found to be consistent with the empirical data, considering that $\chi2/df$ is 1.72, RMSEA is 0.065, IFI is 0.948, GFI is 0.922, CFI is 0.911, and TLI is 0.925. All values met the criteria for acceptable model fit. All values meet the requirements for an adequate model fit. These findings suggest that the policy should encourage smart home appliance development, implement high-quality development action plans, strengthen standard guidance and platform construction, and promote integration and development with other industries. Set up the National High-end Intelligent Home Appliance Innovation Centre to accelerate advances in intelligent technology, essential components, and novel material applications. Help businesses innovate autonomously, enhance R&D, and solidify industry progress. By creating industry development plans, technology roadmaps, and the China Household Electrical Appliances Technology Conference, the China Household Electrical Appliances Association promotes innovation-driven innovation and collaborative innovation in the industry chain. Increase the home appliance industry's autonomous innovation capabilities and world-leading intelligent technology application. World's first or leading technologies should continue to emerge and attain marketisation, with considerable success in important technological upgrades and industrialization, establishing the groundwork for high-quality industry development. Conversely, the firm should seek and enhance new growth opportunities and boost domestic demand. Actively grasp the trend of consumer upgrading; explore and strengthen new growth points in emerging product areas and subsectors like smart, health, elderly-friendly, maternal and child, integrated, and bundled home appliances by understanding consumer demand. Guide enterprises to put people first, value user value, develop good products

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that match needs through technological innovation, model innovation, and business innovation, improve user experience, and better meet diverse, multi-level, and personalized user needs. To determine demand, pattern innovation may be used to healthy eating, home-based aged care, disinfection and antibacterials, and pre-made dishes. Promote green product design, low-carbon and energy-saving products, "trade-ins", and a green lifestyle. Improve AWE, impact consumer trends, and grow Chinese home appliance businesses.

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