

Research Article

AI Co-Creation in Family Education: A Push-Pull-Mooring Analysis of Parents' Adoption of Children's Companion Products

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Based on the Push-Pull-Mooring (PPM) model, this study integrates the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) and the value co-creation theory to construct a push-pull-mooring theoretical framework, aiming to explore the influencing mechanism of consumers' willingness to purchase AI children's companion products. A questionnaire survey was conducted targeting parents of kindergarten and primary and secondary school students in first-tier cities including Beijing and Shanghai, and Partial Least Squares Structural Equation Modeling was implemented via Smart PLS 4.0 software to test the direct effects of key factors and the moderating effect of AI co-creation ability. The findings indicate that performance expectancy, hedonic motivation, and social influence, as pull factors, exert a significant positive impact on purchase intention; ethical and privacy concerns, as push factors, have a significant negative impact on purchase intention; AI co-creation ability not only directly boosts purchase intention but also significantly positively moderates the relationship between pull factors and purchase intention, while negatively moderating the relationship between push factors and purchase intention. This study verifies the action paths of factors such as AI co-creation ability, broadens the theoretical perspective of traditional technology acceptance models, and provides empirical support for AI children's product enterprises in product design and marketing strategies.

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1. Introduction

Against the backdrop of the intelligent era, AI children's companion products, as a frontier intersection of "AI + education" and intelligent manufacturing, have rapidly evolved from concept to marketization. Such products serve as a key medium for integrating artificial intelligence technology into household consumption scenarios and a typical model for China's manufacturing industry to move towards the top of the value chain. Therefore, conducting a systematic study on the consumption-driven mechanism of AI children's companion products holds urgent practical value for promoting the steady development of the AI industry and stimulating household consumption potential.

From the upgrading and replacement of related products, the core demands of the market have undergone subtle yet profound changes. Early intelligent toys were limited to voice interaction based on preset programs as their core competitiveness; in contrast, the new generation of AI companion dolls has transformed from rigid functional tools into interactive partners that can co-create with humans, realizing a paradigmatic leap from "instrumentality" to "co-creation". Its core feature is delegating the authority of function adjustment and model training to parents, who can set personalized training goals and interactive content according to their children's developmental needs and "co-create" product functions with enterprises. This design breaks the traditional one-way value delivery model from "enterprise to user", constructs a positive interactive ecosystem centered on value co-creation, and thus significantly enhances user stickiness and product added value^[1].

However, the integration of artificial intelligence into the private space of families and its in-depth embedding in daily life has also triggered widespread ethical discussions and social concerns. The core of the controversy lies in the worry that children's excessive interaction with AI may hinder the development of their mental health and social communication abilities, and even weaken the intimate parent-child relationship^[2]; meanwhile, potential risks such as sensitive data privacy leakage and the uncertainty of algorithmic decision-making have further deepened parents' sense of anxiety about product use. These ethical and privacy concerns have become key obstacles to the market promotion of AI children's companion products^[3], and also constitute inevitable challenges that need to be addressed in the process of technological innovation and industrial development.

Although numerous studies have explored the acceptance mechanism of AI educational products from different perspectives, the academic understanding of AI children's companion products remains fragmented and incomplete. Specifically, in the research on users' acceptance of new technologies,

mature models such as UTAUT2 are often adopted to analyze the driving effects of performance expectancy, social influence and other factors on technological acceptance [4]. Researches on ethical and privacy security only focus on their push effects on consumers' rejection behavior, lacking a complete analytical framework that integrates push factors, pull factors and consumers' own characteristic factors. Notably, although the academic community generally recognizes that value co-creation is a key path to improve user experience and product competitiveness, but existing studies have not fully answered the operational mechanism of value co-creation in consumers' purchase decision-making for AI children's products. Is value co-creation a core factor that directly drives consumers' purchase behavior, or does it affect the action path of other factors in the PPM model on purchase intention through a moderating role [5]? This theoretical gap leads to an incomplete understanding of the decision-making logic of consumers of AI children's products, and also restricts the theoretical guidance of academic research on industrial practice.

To fill the above research gaps, this study constructs a comprehensive theoretical analysis framework based on the Push-Pull-Mooring model. Specifically, this study uses the UTAUT2 model to extract and analyze pull factors such as performance expectancy and social influence, regards ethical and privacy concerns as core push factors, takes AI co-creation ability as the key mooring factor, places value co-creation theory in a core explanatory position, and systematically explores the operational path of AI co-creation ability as a moderating variable in the purchase decision-making process. This study aims to comprehensively analyze the multiple influence paths and boundary conditions of parents' willingness to purchase AI children's companion products, hoping to provide scientific decision-making references for enterprises in product innovation, risk management and precise marketing, and help the AI children's product industry achieve healthy and sustainable high-quality development while meeting the people's pursuit of a better life.

2. Literature Review

2.1. Expansion of UTAUT2

In the field of consumer technology acceptance research, the Unified Theory of Acceptance and Use of Technology model (UTAUT2) has established a benchmark analytical model that can scientifically explain individual technological usage intentions and actual behaviors by systematically integrating multiple classic technology acceptance theories [4]. This model includes a variety of key influencing

elements—performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, etc.—and provides a scientific research method and analytical framework for exploring the driving mechanism of new technology acceptance at the consumer end.

This study selects UTAUT2 as the core theoretical basis mainly because AI children's companion products are essentially complex information technologies that penetrate into family life scenarios. Whether consumers can accept and adopt such products largely depends on their comprehensive consideration of technical usefulness, social normative recognition, and emotional experience returns. However, when applying the classic UTAUT2 model to such emerging technological products with dual attributes of education and companionship, some concepts and measurement dimensions in the model need to be adjusted and optimized according to specific research scenarios. Therefore, this study focuses on three factors in the model that are most closely related to family consumption decision-making: performance expectancy, hedonic motivation, and social influence [6], so as to more accurately capture the positive driving sources of consumers' willingness to purchase AI children's products.

2.2. Decision-Making Behavior and Push-Pull-Mooring Theory

The Push-Pull-Mooring model (PPM) originated from the research in the field of population migration, and its core advantage is that it can simultaneously explain the push factors that drive individuals to leave the original state, the pull factors that attract individuals to move to a new state, and the mooring factors that affect the intensity and direction of individual decision-making [7]. Parents' decision to purchase AI companion products for their children is essentially a behavioral transformation decision process from the traditional parent-child interaction model to a new interactive model deeply integrated with AI technology. Therefore, the PPM analytical framework provides an appropriate theoretical carrier for comprehensively and systematically analyzing the driving forces, resistance factors and boundary conditions in this decision-making process.

In this study, the pull factors include performance expectancy, hedonic motivation, and social influence in the UTAUT2 model, which together constitute the core attraction of AI children's companion products as a new technology to consumers. The push factors refer to the negative resistance forces that hinder consumers' purchase behavior, which are specifically reflected in parents' anxiety about the ethical relationship risks of AI products [8] and their concerns about personal information privacy security [9]. The traditional PPM model has obvious limitations in explaining AI products that allow users to deeply participate in co-creation, because it cannot fully cover the important moderating role of users' co-

creation ability in the interaction between push-pull factors and purchase intention. This theoretical gap greatly limits the explanatory power of the traditional model for the purchase decision-making behavior of consumers of AI co-creation products.

2.3 Application of Co-Creation Theory

The value co-creation theory breaks the traditional concept of one-way value transmission from enterprises to users, and advocates that product value is jointly created by consumers and enterprises in the process of interactive participation and practical use ^[11]. In the interactive scenario of AI children's products, allowing parents to independently train and adjust AI models is a specific manifestation of the value co-creation concept in the field of intelligent toys, which also transforms parents from passive value recipients into active co-creators of product value.

Although the importance of value co-creation in improving user experience and product competitiveness has been widely recognized in academia and industry, there is still a key theoretical blind spot in the current relevant academic research: most studies regard co-creation as an outcome variable or an antecedent variable that directly affects purchase intention, but ignore its key role as a higher-order variable in regulating consumers' purchase decision-making process. Specifically, in the consumption decision-making of AI products with high participation characteristics, value co-creation is more likely to act as a deep psychological framework, reshaping consumers' ways of weighing and evaluating push-pull factors. Based on this, this study transforms the core concept of value co-creation into an important mooring factor in the PPM model, namely AI co-creation ability.

This study argues that a high level of AI co-creation ability can prompt parents' decision-making logic to shift from that of passive consumers to active co-creators. In this case, they will pay more attention to the plasticity and customization space of the product, and believe that their active participation can amplify the positive effects of pull factors and weaken the negative constraints of push factors ^[10]. AI literacy and digital operation ability lay the necessary ability and confidence foundation for such co-creation behaviors, preventing parents from giving up participation due to unfamiliarity with technology and low operational ability ^[11]. Through this theoretical integration and reconstruction, this study intends to clarify that value co-creation is not merely a "functional selling point" to attract consumers in the marketing of AI children's products, but a core moderating mechanism that can profoundly reshape consumers' entire decision-making calculation and evaluation process.

In summary, although existing studies have separately verified the attraction effect of the UTAUT2 model factors on technological acceptance and the explanatory power of the PPM framework on consumer behavioral transformation, they have not fully clarified the key role of value co-creation in the consumption decision-making of AI children's products, especially its systematic moderating role in the interaction between push-pull factors and purchase intention. This study introduces the value co-creation theory as a higher-level integration perspective, aiming to explore the following core research questions: how does AI co-creation ability affect the impact intensity of push and pull factors on parents' purchase intention? Can a high co-creation scenario make parents feel more capable and willing to participate in product customization, thereby enhancing their purchase intention? Based on this, the study further analyzes the psychological mechanism of value co-creation driving the internalization of AI technology in family education scenarios.

3. Theoretical Model and Research Hypotheses

3.1. Theoretical Model

This study takes the Push-Pull-Mooring model (PPM) as the overall analytical framework, integrates the Unified Theory of Acceptance and Use of Technology (UTAUT2) to explain the formation mechanism of pull factors, introduces the value co-creation theory to clarify the connotation and measurement of key mooring factors, and creatively builds a theoretical model for explaining parents' willingness to purchase AI children's companion products. This model systematically explains the synergistic influence mechanism of three types of factors: pull factors, push factors, and mooring factors. As positive driving variables, pull factors include performance expectancy, hedonic motivation, and social influence, reflecting the multi-dimensional explanatory power of the UTAUT2 model for technological attraction. As negative hindering variables, push factors focus on ethical and privacy concerns, reflecting consumers' risk perception in the consumption decision-making of AI products. As a key mooring factor, AI co-creation ability originates from the value co-creation theory, which not only directly drives the generation of purchase intention but also deeply moderates the degree of association between push/pull factors and the final purchase decision. The model integrates consumers' co-creation ability into the PPM decision-making framework, which not only responds to the demand for user initiative in the field of intelligent consumption, but also provides practical guidance for enterprises on how to empower users and break the market promotion limitations of AI children's products.

3.2. Research Hypotheses

This study innovatively constructs a theoretical model of the influencing mechanism of consumers' willingness to purchase AI children's companion products, and proposes the following research hypotheses for empirical testing, as shown in Figure 1.

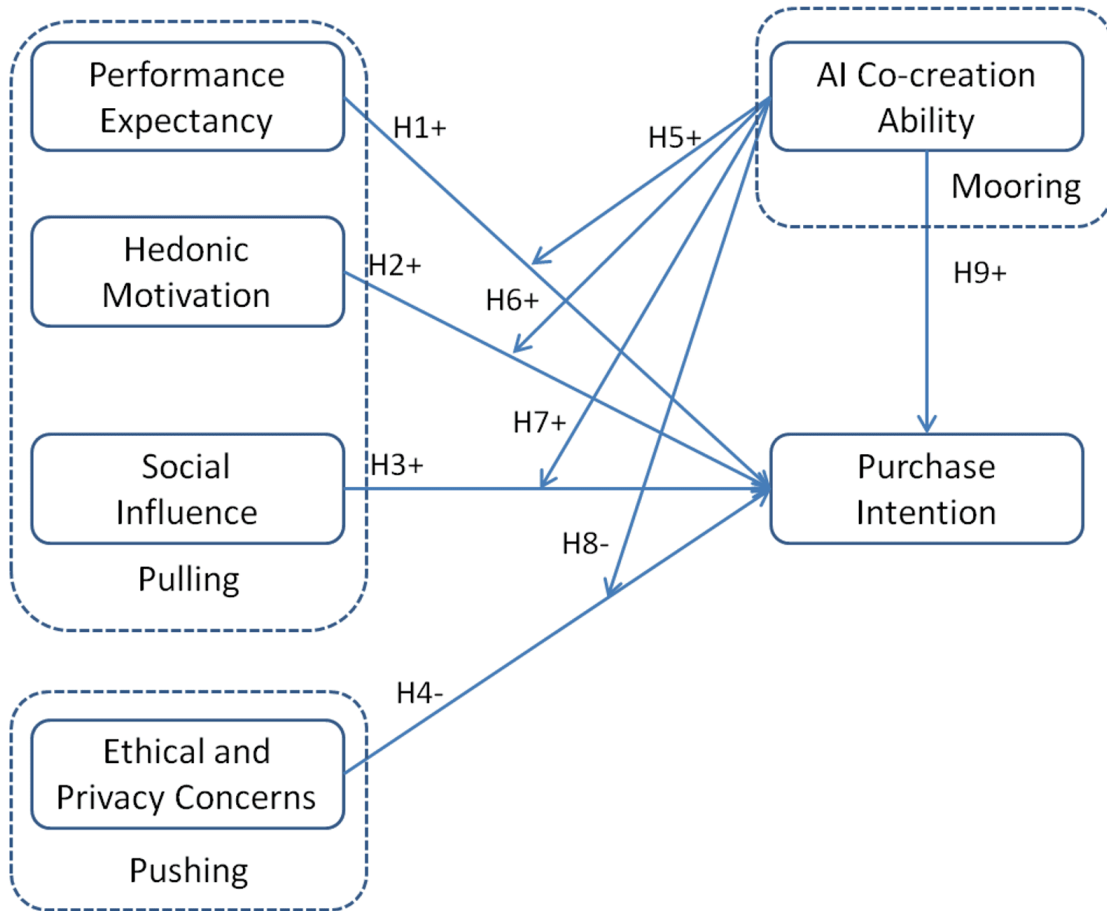


Figure 1. Research Model

Performance expectancy refers to consumers' subjective expectation that using a specific product can effectively improve their work or life performance [4]. When placed in the scenario of family parenting, performance expectancy is specifically reflected in parents' expectation that AI children's companion products can effectively improve their children's knowledge reserve level, promote the formation of good living and learning habits, or provide high-quality emotional companionship for children. For parents, AI children's companion products can partially replace parents' daily interaction with their children, which

can not only make up for the regret of being unable to accompany their children all the time due to work and other reasons, but also provide strong professional help for children's growth and learning with their highly logical answer thinking and extensive knowledge reserve. If parents form a positive perception that this product can effectively achieve their core parenting goals, this kind of positive cognition of practical value will form a key rational basis for their purchase decision-making.

H1: Performance expectancy has a significant positive impact on purchase intention.

Hedonic motivation refers to consumers' intrinsic psychological need to obtain pleasure, fun and emotional satisfaction in the process of product use [6]. In the field of AI children's product consumption, it specifically refers to parents' expectation that both their children and themselves can obtain a pleasant emotional experience from interacting with AI companion products. If parents predict that the built-in story narrative, game interaction and intelligent dialogue functions of the product can arouse children's interest in use and bring positive parent-child emotional interaction experiences, such hedonic expectations will become an important key factor in enhancing their purchase intention.

H2: Hedonic motivation has a significant positive impact on purchase intention.

Social influence refers to the influence of the attitudes, evaluations and behavioral demonstrations of reference groups (e.g., relatives, friends, colleagues) on individuals' decision-making behaviors [4]. If parents observe that people they care about and trust (such as relatives and friends, parenting experts, or other parents around them) hold a positive attitude towards AI children's companion products or have actually purchased and used such products, they are likely to generate a positive recognition of the product and thus choose to purchase it. In fact, this kind of social influence stems from people's herding psychology in decision-making and the inherent desire for social recognition. Parents also hope to gain social approval of their parenting behavior through purchasing mainstream intelligent products and reduce the uncertainty of their purchase decision-making, so social influence will subtly affect their purchase intention of AI children's companion products.

H3: Social influence has a significant positive impact on purchase intention.

Ethical and privacy concerns in this study refer to parents' worry that the use of AI children's companion products may have a negative impact on children's healthy growth, as well as the potential risk of personal and family sensitive data being misused or leaked. Ethical anxiety mainly includes the worry that children's excessive reliance on AI will weaken the parent-child emotional bond, hinder the development of children's real social communication abilities, or make children receive inappropriate

value guidance from AI. Privacy security concerns mainly lie in whether the product will over-collect sensitive data such as children's personal information and family daily life, and how these collected data are stored, used and protected by enterprises. These ethical and privacy concerns constitute a strong "push" force that hinders parents' purchase behavior. When parents frequently see news reports about "AI monitoring children's behavior" or "trafficking of children's personal data", such negative information will form a strong push force to hinder their purchase, which may greatly weaken or even offset the pull force of the product's own advantages. It can be inferred that the deeper parents' ethical and privacy concerns about AI children's companion products, the lower their purchase intention will be ^[9].

H4: Ethical and privacy concerns have a significant negative impact on purchase intention.

The value co-creation concept points out that consumers' active participation in product co-creation can significantly enhance their perceived control over the product and their recognition of product value ^[1]. AI co-creation ability in this study refers to parents' perceived self-ability to participate in adjusting and training AI children's companion products to meet their children's personalized growth and development needs. When parents have a high level of AI co-creation ability, they are not satisfied with the fixed standard functions of the product before purchase, but will actively imagine how to improve the product's use efficiency and adaptability through personalized training and adjustment. Parents not only expect the product to teach children basic cultural knowledge, but also believe that they can set personalized training content according to their children's learning weaknesses, so that AI can focus on tutoring their children in specific learning content. Precisely because parents believe that their active co-creation participation can greatly improve the practical value of the product, this perception of product plasticity will significantly strengthen the positive connection between performance expectancy and purchase intention.

H5: AI co-creation ability positively moderates the relationship between performance expectancy and purchase intention.

A high level of AI co-creation ability is also reflected in parents' not passively accepting the preset entertainment and interaction functions of the product, but being able to actively create or customize a variety of personalized hedonic interaction scenarios according to their children's hobbies and characteristics. When parents perceive that they can independently set interaction themes and game forms to make AI robots develop more and more personalized hedonic functions, their expectation of the hedonic experience that the product can bring to their children will be stronger and more specific. This

perception of transforming "hedonism" from an established product attribute into an extensible creative process makes parents have a stronger and more lasting expectation of the emotional returns that the product can provide, thereby further enhancing the driving effect of hedonic motivation on purchase intention.

H6: AI co-creation ability positively moderates the relationship between hedonic motivation and purchase intention.

Parents with strong AI co-creation ability generally have a deeper understanding and more rational judgment of intelligent technical products. When receiving external social influence, they are more willing to regard it as a kind of reference information rather than an absolute follow-up standard, and will combine their own co-creation ability to evaluate whether the product can really meet their children's personalized growth needs. Once they through their own analysis and judgment believe that the AI children's companion product is indeed suitable for their family and children, their purchase intention generated under the influence of social factors will be more firm. This internalized and rational decision-making process makes it easier for social influence to be transformed into a firm purchase intention.

H7: AI co-creation ability positively moderates the relationship between social influence and purchase intention.

Sense of control is a key psychological mechanism to alleviate individuals' perception of technical risks ^[10]. Parents with a high level of AI co-creation ability believe that they can effectively control and prevent potential ethical and privacy security risks of the product by actively modifying product privacy settings, supervising children's AI interaction records, and adjusting AI interaction modes. This strong perceived sense of control can effectively buffer the psychological threat caused by ethical and privacy concerns, and thus significantly reduce the negative inhibitory effect of such concerns on purchase intention.

H8: AI co-creation ability negatively moderates the relationship between ethical and privacy concerns and purchase intention.

Self-determination theory indicates that individuals' pursuit of autonomy and self-determination is a basic and inherent psychological need ^[12]. What AI co-creation ability endows parents with is precisely the autonomous control right to participate in and create their children's companionship and education process. The core value proposition of "being able to participate in product customization independently" itself can directly meet parents' internal psychological demand for personalized parenting, thereby

effectively enhancing consumers' purchase intention of the product, even without relying on the driving effect of other pull factors.

H9: AI co-creation ability has a significant positive impact on purchase intention.

4. Methodology

This study takes parents of kindergarten and primary and secondary school students in first-tier cities such as Beijing and Shanghai as the research objects. Their typical characteristics are mainly reflected in three aspects: first, as an important part of digital natives, parents in first-tier cities have a high sensitivity and acceptance of artificial intelligence technology, which creates an ideal sample basis for exploring the consumption decision-making mechanism of AI children's products [3]. In addition, most of these families face the dual pressure of high work intensity and fierce educational competition, and have an obvious practical demand for intelligent products that can improve parenting efficiency and parenting quality [11]. Finally, it is crucial that the group of primary and secondary school parents, especially those with two children, already have rich parenting experience. Their value evaluation of product functions is more systematic and comprehensive, and their evaluation of potential risks such as ethics and privacy security is more prudent and rational, which provides sufficient subjective and objective conditions for studying the complex decision-making mechanism under the push-pull-mooring framework [7].

In terms of research methods, this study adopts a deeply focused single-group sampling strategy, and distributes questionnaires through professional parent communities, online educational platforms and offline parent salons. Although no multi-regional comparison is implemented in the sampling process, this sampling design can effectively avoid the interference of external variables such as regional cultural differences and economic development levels on the research results. By selecting a group of parents in first-tier cities who are typical in both technical acceptance ability and parenting demand characteristics, the study can focus on analyzing the motivation-cognition-intention transmission path in consumption decision-making while effectively controlling environmental variables. This sampling method with strong representativeness and high homogeneity can more accurately reveal the key influence mechanisms affecting consumers' purchase intention compared with broad-spectrum sampling [7].

Data collection is carried out through a professional online questionnaire platform, and all variable measurements are implemented using a Likert 7-point scale (1 = strongly disagree, 7 = strongly agree).

The scale design strictly follows the basic psychometric principles, and all measurement items of the constructs are derived from mature scales in existing literature to ensure the reliability and validity of the measurement tools: the measurement of performance expectancy and social influence is based on the classic research of Venkatesh et al.^[4]; the measurement items of hedonic motivation are borrowed from the mature scale developed by Van der Heijden et al.^[13]; the measurement of ethical and privacy concerns refers to the research results of Borenstein, Smith and other scholars^{[8][14]}; the measurement items of AI co-creation ability integrate Agarwal's personal innovativeness scale and Nambisan's value co-creation scale^{[15][16]}; the measurement of purchase intention adopts the classic scale of Dodds et al.^[17]. The specific measurement items are shown in Table 1.

Measurement	Source
Performance Expectancy (PE)	
PE1 AI children's products can effectively accompany children.	Venkatesh et al., 2003 ^[18] ; Davis, 1989 ^[19] .
PE2 AI children's companion products can help children learn knowledge.	
PE3 AI children's companion products can partially reduce parenting pressure.	
Hedonic Motivation (HM)	
HM1 Children like to interact with AI companion products.	Venkatesh et al., 2012 ^[4] ; Van der Heijden, 2004 ^[13] ;
HM2 AI children's companion products can bring happiness to children.	
HM3 AI children's companion products can provide a variety of interesting functions.	
Social Influence (SI)	
SI1 People around me are using and supporting me to use AI children's companion products.	Venkatesh et al., 2003 ^[18] ; Ajzen, 1991 ^[20] ; MacKenzie & Lutz, 1989 ^[21]
SI2 My social circle recognizes AI children's companion products.	
SI3 I often see various advertisements for AI children's companion products.	
Ethical and Privacy Concerns	
EPC1 Children's excessive reliance on AI companions may weaken their ability to socialize with real people.	Borenstein & Arkin, 2016 ^[8] ; Smith et al., 2011 ^[14] ;
EPC2 AI children's companion products may collect family privacy.	
EPC3 AI children's companion products may reduce children's dependence on their parents	
AICo-creation Ability AI (AICC)	
AICC1 AICC1 Among peers, I always like to be the first to try new things.	Ramaswamy, 2004 ^[11] Agarwal & Prasad, 1998 ^[15] ;

Measurement	Source
AICC2 I am curious about AI children's companion products and willing to explore their new functions.	Nambisan et al., 2019 ^[16] ; Prahalad &
AICC3 I am willing to participate in training AI to achieve personalized companionship for my children.	
Purchase Intention (PI)	
PI1 I have a strong willingness to purchase AI children's companion products.	Venkatesh et al., 2012 ^[4] ; Dodds et al., 1991 ^[17] ;
PI2 I will recommend AI children's companion products to people around me.	
PI3 I will give priority to children's products with AI companion functions.	

Table 1. Variable and Measurement Items

4.1. Data Sources and Research Methods

All scales in this study have passed the preliminary reliability and validity test in the pre-survey stage, with Cronbach's α coefficients all higher than 0.8, indicating that the measurement tools have good internal consistency reliability. This study uses Structural Equation Modeling (SEM) to test the proposed theoretical hypotheses, and specifically implements Partial Least Squares Structural Equation Modeling (PLS-SEM) with Smart PLS 4.0 software. The core advantage of this method is that it can effectively handle the formative indicators and complex moderating effects in the structural model, and is suitable for the exploration of new theoretical models, thus providing an appropriate and scientific analytical tool for verifying the theoretical model of this study.

4.2. Data Analysis

4.2.1. Data Sample Analysis

A total of 605 questionnaires were collected through the online questionnaire platform from July to September 2024. After rigorous data cleaning steps, 187 invalid questionnaires with excessively short

response time, identical consecutive options, and significant logical conflicts in answers were removed, and finally 418 valid questionnaires were obtained, with an effective recovery rate of 69.1%. The distribution of the sample in terms of demographic characteristics is shown in Table 2. In terms of family roles, mothers account for the largest proportion at 70.1%, which is consistent with the actual social situation that mothers generally take on the main parenting responsibilities in Chinese family education; in terms of age composition, the sample is mainly middle-aged and young parents, with the 31-40 age groups accounting for the largest proportion at 39.0%. Parents in this age group are in a critical stage of parenting, have strong learning ability and mostly have high digital literacy; in terms of education level, 59.8% of the respondents have a college degree or above, indicating that the overall education level of the sample group is relatively high, which is consistent with the characteristic that parents in first-tier cities have higher education levels; the distribution of annual family income is relatively balanced, with the 30,000-40,000 US dollars range accounting for the highest proportion at 44.7%, which is in line with the income characteristics of middle-income families in first-tier cities; from the perspective of product use experience, 59.3% of the respondents have used AI children's products for less than 6 months, which means that AI children's companion products are still in the initial stage of market promotion in China. Overall, the sample structure has good representativeness and rationality, and can provide solid and reliable data support for subsequent hypothesis testing and model verification.

Category	Subcategory	Frequency (n)	Percentage (%)
Family Role	Mother	293	70.1
	Father	125	29.9
Age	20-30 years old	157	37.6
	31-40 years old	163	39.0
	41-50 years old	58	13.9
	Over 51 years old	40	9.6
Education Level	High school or below	168	40.2
	College or undergraduate	190	45.5
	Master's degree	47	11.2
	Doctoral degree	13	3.1
Annual Family Income (US dollar)	Below 30,000 yuan	126	30.2
	30,000-40,000	187	44.7
	40,000-60,000	74	17.7
	Above 60,000	31	7.4
Usage Duration of AI Children's Companion Products	Less than 3 months	121	28.9
	3-6 months	127	30.4
	6-12 months	87	20.8
	More than 12 months	83	19.9

Table 2. Demographic Data

4.2.2. Measurement Model Test

To ensure the reliability and validity of the theoretical model, this study conducts a comprehensive reliability and validity test on the measurement model using Smart PLS 4.0 software. As can be seen from Table 3, the Cronbach's α coefficients, composite reliability (ρ_a and ρ_c) of all constructs are greater

than the ideal critical value of 0.7, and the Average Variance Extracted (AVE) all exceed 0.85, which is much higher than the minimum standard of 0.5 in existing research. These indicators strongly indicate that the measurement model of this study has good internal consistency reliability and convergent validity, and the measurement items of each construct can effectively and accurately reflect its theoretical connotation.

In terms of discriminant validity test, this study adopts the Heterotrait-Monotrait Ratio (HTMT) criterion, which is widely recognized in existing literature, for verification. From the HTMT matrix presented in Table 4, the maximum value of HTMT between constructs is 0.386 and the minimum value is 0.010. The HTMT values between all constructs are significantly lower than the critical standard of 0.85. This result effectively verifies that there is clear and good discriminant validity between each construct of the model, ensuring that the subsequent path analysis will not be affected by serious multicollinearity problems.

The overall reliability and validity test results show that the measurement model of this study not only ensures the accuracy and reliability of the measurement of each construct, but also verifies the rationality of the theoretical framework design, laying a solid methodological foundation for subsequent structural model analysis and hypothesis testing. All these test results comply with the basic PLS-SEM analysis criteria in the field of social science, proving that the quality of the measurement tools meets the standard research norms.

	Cronbach's alpha	rho_a	rho_c	AVE
AICC	0.992	0.993	0.995	0.985
HM	0.982	0.983	0.988	0.966
EPC	0.983	0.986	0.988	0.966
SI	0.989	0.989	0.992	0.978
PE	0.986	0.990	0.991	0.973
PI	0.988	0.991	0.992	0.977

Table 3. Reliability and Validity Analysis

	AICC	HM	EPC	SI	PE	PI	AICC×HM	AICC×EPC	AICC×SI	AICC×PE
AICC										
HM	0.051									
EPC	0.010	0.042								
SI	0.075	0.386	0.106							
PE	0.017	0.545	0.054	0.394						
PI	0.173	0.356	0.246	0.323	0.360					
AICC x HM	0.104	0.044	0.239	0.198	0.145	0.319				
AICC x EPC	0.134	0.268	0.012	0.187	0.278	0.299	0.068			
AICC x SI	0.058	0.221	0.185	0.089	0.226	0.308	0.375	0.235		
AICC x PE	0.085	0.142	0.242	0.198	0.093	0.341	0.668	0.149	0.414	

Table 4. Discriminant Validity Analysis (HTMT)

4.2.3. Structural Model and Hypothesis Testing

Based on the Bootstrap sampling test results (5000 samples) of the Partial Least Squares Structural Equation Model (PLS-SEM), the theoretical model of this study has been fully and effectively verified. As can be seen from Table 5, the T-statistics of all hypothesis paths are greater than the critical value of 1.96, and the p-values are all less than the significance level of 0.05, indicating that all 9 research hypotheses proposed in the study have received sufficient statistical support.

In terms of direct effects: performance expectancy ($\beta=0.134$, $t=2.590$, $p<0.01$), hedonic motivation ($\beta=0.136$, $t=2.448$, $p<0.05$), and social influence ($\beta=0.132$, $t=2.621$, $p<0.01$) all show significant positive effects on purchase intention, and hypotheses H1, H2, and H3 are fully supported; ethical and privacy concerns ($\beta=-0.138$, $t=3.144$, $p<0.01$) have a significant negative inhibitory effect on purchase intention, and hypothesis H4 is supported; the direct driving effect of AI co-creation ability ($\beta=0.167$, $t=4.108$, $p<0.001$) on purchase intention is also fully confirmed, and hypothesis H9 is supported.

In terms of moderating effects: AI co-creation ability shows a significant positive moderating effect on the relationship between pull factors and purchase intention. Specifically, AI co-creation ability significantly strengthens the positive effects of hedonic motivation ($\beta=0.108$, $t=2.141$, $p<0.05$), social influence ($\beta=0.120$, $t=2.454$, $p<0.05$), and performance expectancy ($\beta=0.099$, $t=1.995$, $p<0.05$) on purchase intention, and hypotheses H5, H6, and H7 are supported. At the same time, AI co-creation ability shows a significant negative moderating effect on the relationship between ethical and privacy concerns and purchase intention ($\beta=-0.123$, $t=2.826$, $p<0.01$), that is, a high level of AI co-creation ability can effectively alleviate the inhibitory effect of ethical and privacy concerns on purchase intention, and hypothesis H8 is supported.

The overall test results show that the push-pull-mooring theoretical framework constructed in this study has good explanatory power for parents' purchase intention of AI children's companion products. AI co-creation ability not only directly drives the generation of parents' purchase intention, but also plays a key moderating role through the dual paths of strengthening the positive driving effect of pull factors and weakening the negative inhibitory effect of push factors in the consumer decision-making process. The specific research results are shown in Figure 2.

	Path Coefficient	Sample Mean	Standard Deviation	T Statistics	P Value
AI co-creation ability -> Purchase intention	0.167	0.168	0.041	4.108	0.000
AI co-creation ability × Hedonic motivation -> Purchase intention	0.108	0.111	0.050	2.141	0.032
AI co-creation ability × Ethical and privacy concerns -> Purchase intention	-0.123	-0.120	0.044	2.826	0.005
AI co-creation ability × Social influence -> Purchase intention	0.120	0.119	0.049	2.454	0.014
AI co-creation ability × Performance expectancy -> Purchase intention	0.099	0.098	0.050	1.995	0.046
Hedonic motivation -> Purchase intention	0.136	0.137	0.055	2.448	0.014
Ethical and privacy concerns -> Purchase intention	-0.138	-0.140	0.044	3.144	0.002
Social influence -> Purchase intention	0.132	0.133	0.050	2.621	0.009
Performance expectancy -> Purchase intention	0.134	0.132	0.052	2.590	0.010

Table 5. Direct Effect Path Coefficients

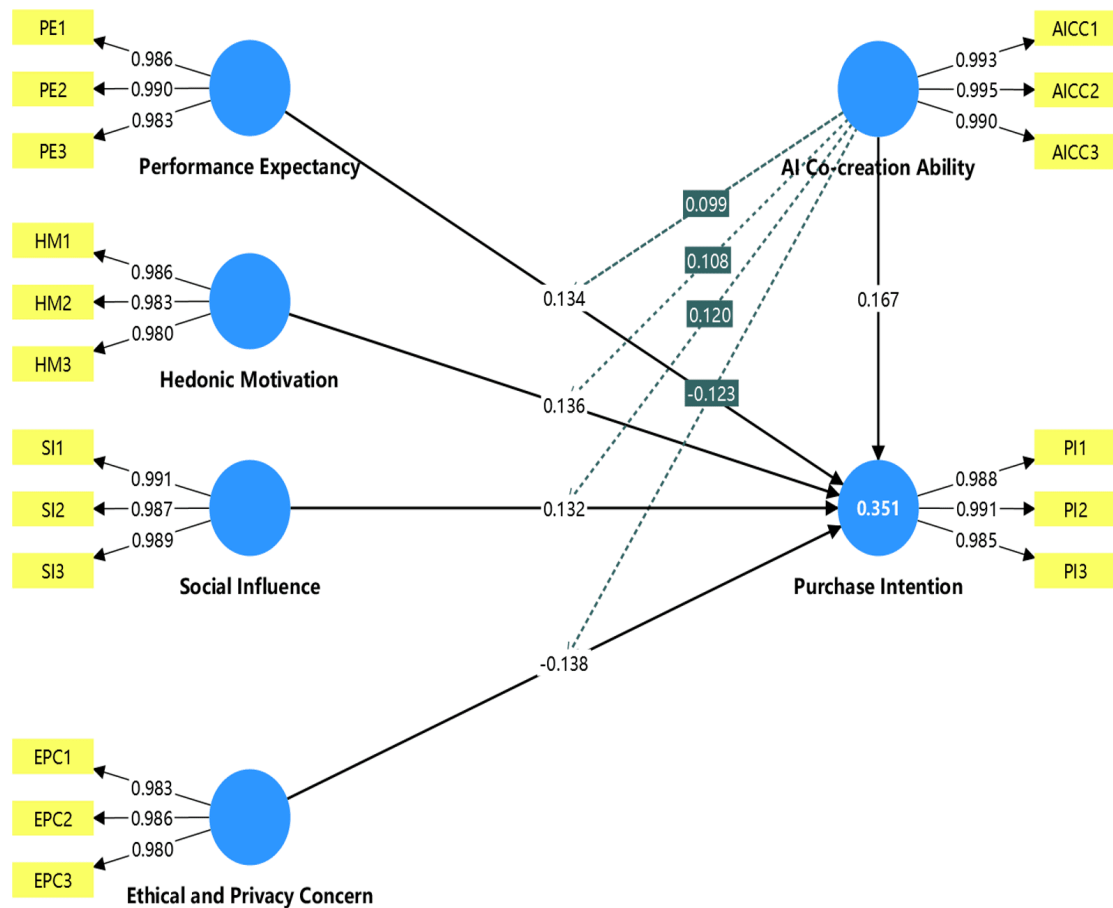


Figure 2. Research Results (Path Coefficients)

5. Results and Discussion

5.1. Main Research Findings

This study comprehensively verified the influencing mechanism of consumers' willingness to purchase AI children's companion products based on the push-pull-mooring framework using structural equation modeling, and drew the following core research conclusions.

First, in the consumption decision-making of parents regarding AI children's companion products, the roles played by push and pull factors show significant differentiation and heterogeneity. The research results show that performance expectancy ($\beta=0.134$), hedonic motivation ($\beta=0.136$), and social influence ($\beta=0.132$), as core pull factors, all have significant positive driving effects on parents' purchase intention; however, ethical and privacy concerns ($\beta=-0.138$), as the main push factor, show a significant negative

inhibitory effect on purchase intention. This finding verifies the applicability and explanatory power of the PPM model in the field of intelligent consumption decision-making, indicating that consumers are indeed affected by the joint action of both positive driving factors and negative resistance factors in the process of AI technology adoption and product purchase decisions.

Second, AI co-creation ability presents a unique dual action mechanism in the consumption decision-making of AI children's companion products. The study found that AI co-creation ability not only directly and positively promotes parents' purchase intention ($\beta=0.167$) but also plays a key and multi-dimensional moderating role in the decision-making process. Specifically, AI co-creation ability significantly enhances the positive driving effects of performance expectancy ($\beta=0.099$), hedonic motivation ($\beta=0.108$), and social influence ($\beta=0.120$) on purchase intention, and effectively alleviates the negative inhibitory effect of ethical and privacy concerns ($\beta=-0.123$) on purchase intention. This finding empirically explains the possible reason why traditional marketing strategies fail to effectively improve the conversion rate of intelligent products in the market—the neglect of consumers' co-creation ability as a key mooring factor leads to the failure of the effects of push and pull factors to be fully exerted in the decision-making process.

Third, the value co-creation theory shows a deep and comprehensive explanatory power in the consumption decision-making of AI children's companion products. The study found that parents with high AI co-creation ability show obvious co-creator thinking characteristics in the purchase decision-making stage: they not only pay attention to the current fixed functions and immediate value of the product, but also attach great importance to the plasticity and personalized customization space of the product. This kind of co-creator thinking enables them to enhance the practical use value of the product through personalized adjustment, enrich the entertainment and emotional value of the product through functional extension, and reduce the potential ethical and privacy risks of the product through their own technical cognition and operational control. This finding breaks the theoretical shackles of traditional technology acceptance theories that regard consumers as passive recipients of technology and products, and provides a new theoretical entry point and analytical perspective for understanding the consumption decision-making mechanism in the era of intelligent consumption.

5.2. Theoretical Contributions

The theoretical innovation of this study lies in constructing an integrated push-pull-mooring model from the perspective of value co-creation and verifying its explanatory power in the field of AI children's

product consumption. By introducing AI co-creation ability as a key mooring factor and verifying its dual moderating mechanism between push/pull factors and purchase intention, this study successfully introduces the value co-creation theory into the field of consumer consumption decision research, expands the theoretical connotation and application boundary of the traditional PPM model. This integrated theoretical model is particularly suitable for explaining the adoption behavior of intelligent consumption products with high participation and high interaction characteristics, and brings a new theoretical tool and analytical framework for understanding the consumption decision-making mechanism in the digital intelligence era.

Second, this study deepens the academic understanding of the action mechanism of value co-creation in the consumption decision-making process. This study not only verifies the direct driving effect and complex moderating effect of AI co-creation ability on purchase intention, but more importantly, reveals the deep psychological mechanism of its role—by empowering consumers and enhancing their perceived control over products, it changes consumers' perceived weight and response strategies to push and pull factors in the decision-making process. This finding breaks the theoretical limitation of traditional research that regards value co-creation as a mere marketing tool or a single antecedent variable, and provides a new empirical basis for the application of dynamic capability theory in the field of consumer behavior research. The research results show that in the scenario of intelligent product consumption, consumers' co-creation ability not only affects their post-purchase usage experience and product loyalty, but also profoundly affects their entire pre-purchase decision-making thinking and evaluation criteria of push-pull factors.

In addition, this study expands the application boundary of the UTAUT2 model and provides a new idea for its evolution and optimization in the field of family consumption. By integrating the core constructs of UTAUT2 into the pull dimension of the PPM framework and verifying its applicability and explanatory power in the emerging consumption scenario of AI children's companion products, this study provides a new research path for the combination of traditional technology acceptance models and the PPM model. At the same time, the study found that AI co-creation ability has a significant strengthening effect on the positive relationships between various core constructs of UTAUT2 and purchase intention. This means that in the era of intelligent consumption, traditional technology acceptance models should incorporate consumers' initiative and co-creation ability as key boundary variables, which has important enlightenment significance for improving and perfecting the theoretical system of technology acceptance in the new era.

5.3. Practical Implications

Based on the above core research results, AI co-creation ability is a core key factor affecting consumers' purchase decision-making of AI children's companion products. Therefore, the study suggests that AI children's product enterprises fully implement the concept of value co-creation in the whole process of product design and development. In terms of product function design, enterprises should develop and provide user-friendly visual custom dashboards and modular co-creation interfaces, allowing parents to independently adjust the AI interaction styles, content themes and training focus according to their children's age characteristics and growth needs. For example, create personalized educational training modules to enable parents to set exclusive educational goals and interactive topics for their children; build a visual ability growth map to intuitively show the personalized development results achieved by parents through AI training and customization. Such product design can effectively stimulate parents' co-creation willingness and participation enthusiasm, and further amplify their perceived performance expectancy and hedonic motivation of the product, thus enhancing the perceived value of the product.

Second, in response to the differentiated roles of push and pull factors in the decision-making process, enterprises need to formulate precise and targeted marketing strategies based on the moderating role of AI co-creation ability. On the pull side of marketing communication, it is necessary to focus on showing how the product achieves value upgrading through user co-creation—not only presenting the standard basic functions of the product, but also emphasizing the huge potential of personalized customization; not only presenting the current entertainment and interaction effects of the product, but also highlighting its long-term educational significance and personalized growth value for children. On the push side of risk response, enterprises need to establish a transparent data collection and management mechanism and clear ethical norms for product use, and endow parents with comprehensive product supervision and risk control rights through co-creation functions. For example, set a one-click privacy setting wizard, a real-time AI interaction record check function, and a customizable AI interaction mode training function, so that parents can actively manage and control the potential ethical and privacy risks of the product through their own co-creation ability. In the marketing process, enterprises should highlight the "user-controlled" attribute of the product brought by co-creation features, position the product as an "intelligent partner with customizable functions" rather than a passive functional tool, and thus effectively alleviate parents' ethical and privacy concerns.

In addition, the study shows that there are significant differences in AI co-creation ability among parent groups with different demographic characteristics, and it is proposed that enterprises build a hierarchical

and personalized user training system for AI co-creation ability. For parents with high co-creation ability and strong digital literacy, enterprises should build in-depth participation channels such as product co-creation communities and function improvement suggestion collection activities, and transform this group of users into loyal brand advocates and core product co-creators. For ordinary parents with low co-creation ability, enterprises should design a progressive and step-by-step learning path, and gradually improve their co-creation ability and participation confidence through AI training guides, personalized case sharing and video teaching content. This differentiated co-creation ability training strategy can effectively expand the product's target user group and enhance the long-term user stickiness and brand loyalty.

From an industrial development perspective, this study provides clear directional guidance for the high-quality development of the AI children's companion product industry. The whole industry needs to jointly establish unified technical standards and ethical norms under the guidance of relevant government departments, to ensure that AI children's companion products can effectively exert their educational and companion functions while effectively protecting children's legitimate rights and interests and family privacy security. At the same time, enterprises in the industry should strengthen technical communication and successful experience sharing, break the technical barriers between different enterprises, and work together to promote the transformation and upgrading of AI children's companion products from standardized mass supply to personalized value co-creation, so as to achieve the steady and sustainable development of the entire industry.

6. Conclusions and Prospects

6.1. Research Conclusions

This study verified the influencing mechanism of consumers' willingness to purchase AI children's companion products from the perspective of value co-creation through empirical analysis based on the PPM model and UTAUT2 model. The study found that in the push-pull-mooring analytical framework, performance expectancy, hedonic motivation, and social influence, as core pull factors, significantly drive the generation of parents' purchase intention of AI children's companion products; while ethical and privacy concerns, as the main push factor, significantly inhibit parents' purchase intention. This result fully verifies the effectiveness and explanatory power of the PPM model in explaining the consumption

decision-making of intelligent products. It also provides empirical evidence for the joint action of push and pull factors in consumer behavioral transformation.

The most critical research achievement of this study is clarifying the key dual role of AI co-creation ability in the consumption decision-making process of AI children's companion products. AI co-creation ability not only directly and significantly drives the generation of parents' purchase intention ($\beta=0.167$) but also significantly moderates the relationship between push/pull factors and purchase intention: it significantly enhances the positive driving effects of performance expectancy ($\beta=0.099$), hedonic motivation ($\beta=0.108$), and social influence ($\beta=0.120$) on purchase intention, and effectively weakens the negative inhibitory effect of ethical and privacy concerns ($\beta=-0.123$) on purchase intention. This finding verifies the important theoretical and practical significance of the value co-creation theory in the research of AI product consumption decision, indicating that in the era of intelligent consumption, consumers' co-creation ability has become a core key factor affecting their purchase decision-making.

This study further constructs a complete action path of "value co-creation - push/pull factors - consumption intention", and systematically explains the internal operation mechanism of consumption decision-making of AI children's companion products. Different from the traditional consumption decision-making of physical products, the consumption decision-making of AI children's companion products presents obvious two-way interactive characteristics: consumers are not only passive recipients of product value, but also active co-creators of product value. This role transformation of consumers transforms the consumption decision-making process from passive value recognition to active value construction, which has important theoretical significance for understanding the laws of consumer behavior in the digital intelligence era.

6.2. Research Limitations and Future Prospects

This study still has some inevitable research limitations, which also point out the direction for subsequent in-depth research. First, from the perspective of research samples, although focusing on parents in first-tier cities such as Beijing and Shanghai has typicality and representativeness for the current market promotion stage of AI children's companion products, the geographical distribution of the sample is not broad enough, which may limit the generalizability of the research conclusions. Future research can expand the sampling scope to include samples from second and third-tier cities and rural areas, and compare the differences in the purchase decision-making mechanism of AI children's companion products among parents in different regions to test the universality and boundary conditions

of the theoretical model. In terms of research design, the cross-sectional data adopted in this study can only capture the static snapshot of parents' purchase intention at a specific time point, and it is difficult to dynamically capture the changes of consumers' attitudes and purchase intention over time. In the future, longitudinal research design can be used to track the entire process of consumers from product cognition, intention generation to actual purchase and post-use behavior, so as to more comprehensively reveal the dynamic evolution mechanism of consumption decision-making.

Second, in terms of the theoretical framework, this study focuses on the direct and moderating role of AI co-creation ability as the core mooring factor, and there is still room for further expansion of the mooring factor system in the PPM model. Future research can further explore the potential moderating or mediating effects of other mooring factors such as consumers' technical anxiety, parenting concepts, and family income level on the relationship between push/pull factors and purchase intention, so as to further improve the theoretical model. At the same time, this study mainly focuses on purchase intention as a key behavioral tendency variable, and future research can extend the research perspective to actual purchase behavior, continuous use intention and word-of-mouth recommendation behavior and other outcome variables, thereby building a more complete and systematic behavior explanation model of "cognition-intention-behavior".

Third, from an industrial promotion perspective, with the rapid iteration and upgrading of AI technology (such as the continuous development of generative AI and large language models) and the continuous transformation of social parenting concepts, the consumption decision-making mechanism of AI children's companion products will also continue to evolve and change. Future research should keep up with the pace of technological development and changes in market demand, and timely adjust and optimize the theoretical model and research hypotheses according to the new characteristics of product development and consumer demand. Especially against the background of the rapid development of generative artificial intelligence and large-scale model technology, the capabilities of AI children's companion products in personalized content generation, emotional interaction experience, and intelligent education guidance will be significantly enhanced. How these technological upgrades will change consumers' decision-making thinking and product value evaluation criteria is worthy of in-depth exploration and research in the future.

Finally, this study mainly explores the influencing factors of parents' purchase intention from the consumer perspective, and lacks the integration of the enterprise perspective. In the future, research can integrate the dual perspectives of consumers and enterprises to study how enterprises can promote the

realization of value co-creation through product design innovation, marketing strategy optimization and service system improvement, so as to achieve a win-win situation between consumer satisfaction and enterprise sustainable development. This kind of dual perspective research not only has important theoretical innovation significance, but also has more direct and important practical value for promoting the high-quality development of the AI children's companion product industry.

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