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# Depth Study of User Purchase Influencing Factors in Platform E-commerce under the Background of Big Data and AI

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## Abstract

Taking Taobao as a typical platform e-commerce, this study is devoted to exploring how big data and artificial intelligence technology can empower platform e-commerce and affect users' purchase intention. This paper adopts the empirical research method, collects data through online questionnaire, uses spss26 for regression analysis, and adopts the gradient lifting algorithm of machine learning model for data verification. The research results show that marketing activities such as "precise placement", "personal privacy", "product details" and "product ranking", which rely on big data and artificial intelligence technology, are the key factors affecting Taobao users' purchase intention, and their impact coefficients are 0.57, 0.135 and 0.288 respectively. Inventory management, profile building and personalized recommendations are also important factors. This paper takes the Consumer Behavior Analysis Model (AISAS) as the theoretical basis, and puts forward corresponding suggestions for Taobao platform e-commerce to enhance user attention, interest, search, purchase and sharing under the background of big data and artificial intelligence technology application.

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## 1. Introduction

With the rapid development of modern science and technology, the rise of big data and artificial intelligence is reshaping the business landscape in an unprecedented way, showing great application potential in the e-commerce industry. As an important part of modern business model, platform e-commerce is undergoing a profound transformation from traditional operation mode to intelligent and personalized service mode. According to Baidu index, Taobao search index has ranked first since 2011 ( see Fig.1 ). As a leading e-commerce platform in China and even in the world, its development process and innovative practice provide rich cases for the application of big data and artificial intelligence technology. Therefore, this study chooses Taobao as a typical representative of platform e-commerce, aiming to explore how big data and artificial intelligence technology can empower Taobao platform and affect its users' purchase intention.

In e-commerce platforms, users' purchase intention is a key indicator to measure their market performance and operational effectiveness. It is of great significance to explore how big data and artificial intelligence technology can empower platform e-commerce and then affect users' purchase intention, which is of great significance for understanding the development trend of e-commerce industry, optimizing user experience and improving platform competitiveness. However, although the application of big data and artificial intelligence technology in the field of e-commerce has achieved certain results, its specific impact mechanism and optimization strategy on user purchase behavior still need to be further studied.

Through empirical research, this study hopes to reveal the key factors affecting users' purchase intention, analyze the current situation and challenges of Taobao platform in personal privacy protection, price dynamic adjustment, commodity sales ranking, etc. Based on the consumer behavior analysis model (AISAS), this paper puts forward targeted suggestions for Taobao platform e-commerce in improving users' attention, interest, search, purchase and sharing. This study is expected to provide theoretical support and practical guidance for the application of big data and artificial intelligence technology in e-commerce platform, which will help e-commerce platform optimize operation strategy, improve user experience, and then find the right position and innovative development in the diversified market.

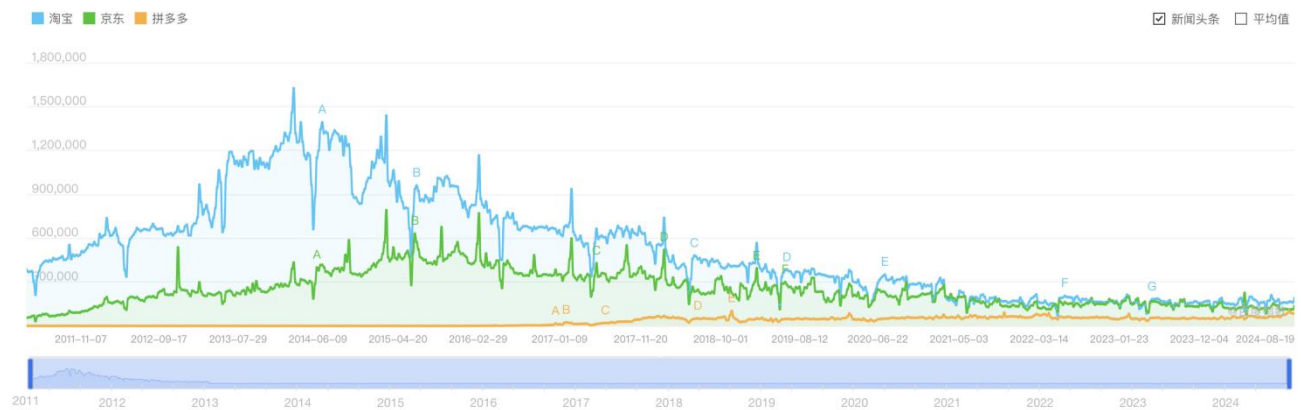


Fig 1. Baidu Search Index of Mainstream E-commerce Platforms from 2011 to 2024

## 1.1 Literature Review

### 1.1.1 Application of Big Data and AI in the Field of E-commerce

Under the background of big data, there are a lot of unstructured information in all aspects of e-commerce, involving the display, sales, logistics and customer evaluation of goods. The collation and use of these unstructured information can make the e-commerce platform provide better support for the development of e-commerce enterprises and customers [Wang, Q., & Zhu, J.]. Big data analysis can also monitor price changes and promotions of competitors in real time, helping companies maintain a competitive advantage. This dynamic price adjustment strategy helps to increase sales and profits while meeting the different needs of consumers. In the field of e-commerce, artificial intelligence technology has also been widely used and achieved good results. At present, the application of artificial intelligence in the field of e-commerce mainly focuses on computer vision, natural language processing and reinforcement learning [Wu, Y.]. The application of artificial intelligence technology in the field of e-commerce involves artificial intelligence assistant, intelligent logistics, recommendation engine, optimal pricing and so on [Yao, J., & Xu, X.]. For example, big data analysis technology and artificial intelligence technology also help enterprises optimize inventory management. Through real-time monitoring of inventory levels and sales, companies can adjust prices in time to promote inventory turnover and reduce inventory costs. [Chen, W., & Wang, L.]

### 1.1.2 Influencing Factors of Purchase Intention of Platform E-commerce

Users' purchase intention is the core driving force to promote sales growth. Under the background of big data and AI, consumers' purchase decision-making process is greatly affected by technological development, involving personalized recommendation, precise advertising, precise preferential service, price dynamic adjustment, user portrait construction, commodity recommendation, logistics optimization, inventory management and other aspects.

Specifically, the personalized recommendation system is one of the most direct and significant applications of big data and AI in e-commerce. The e-commerce platform can analyze consumers' needs and purchase preferences according to consumers' search, browsing, purchase and other information, so as to push goods more accurately for consumers. [Wang, S., & Zhang, Z.] The ranking of recommended goods, the number of word-of-mouth, and the direction of word-of-mouth communication all have a significant positive impact on consumers' purchase intention. Consumer purchase intention significantly positively affects consumer purchase behavior; [Lin, J.] precision advertising uses big data analysis and machine learning algorithms, which are often combined with personalized recommendation systems to provide users with a more personalized consumption experience. The e-commerce platform can also push product coupons or discount information according to the user's purchase history and browsing records. This precise preferential service can improve the user's purchase intention and enhance the user's stickiness. [Wang, L.] In addition, the e-commerce platform also builds a tagged user model based on the user's basic attributes, purchasing power, behavioral characteristics, social networks, psychological characteristics and hobbies and other information to improve the user experience and conversion rate. [Zhang, W.]

## 2. Research Methods

### 2.1 Variable design

According to the literature review, this paper selects Taobao users' purchase intention as the dependent variable, and users' purchase intention is the key factor for the survival and development of platform e-commerce. Because purchase intention is closely related to personalized recommendation, accurate advertising, accurate preferential service, price dynamic adjustment, user portrait construction, product recommendation, logistics optimization, inventory management and personal privacy, this paper selects them as research independent variables.

### 2.2 Research hypotheses

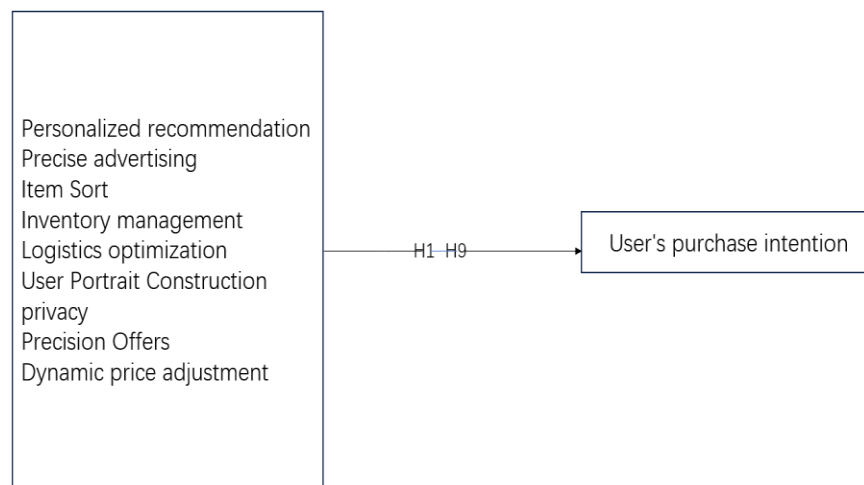


Fig 2 Research hypothesis diagram.

### 2.3 Data acquisition and analysis methods

In this paper, a total of about 500 user feedbacks were collected by designing and distributing a gradient questionnaire. The content of the questionnaire ( Table 1 ) revolves around the specific application of big data and artificial intelligence technology in Taobao platform, aiming to fully understand the user 's perception of technology application and platform purchase intention. In addition, this paper will also refer to the public data in Taobao 's official annual reports, industry reports and related academic papers as auxiliary analysis materials to enhance the comprehensiveness and accuracy of the research.

The questionnaire design follows the scientific and systematic principles to ensure that the questions are comprehensive, clear and easy to understand. The content of the questionnaire is divided into two parts : independent variable and dependent variable, which are respectively divided into one or more application dimensions of big data and artificial intelligence technology in Taobao platform for detailed investigation ( as shown in table 1 ). The questionnaire is distributed through online channels ( such as social media, Taobao communities, some merchants ) and offline channels ( real Taobao users ). In order to ensure the representativeness and universality of the samples, a stratified random sampling method is used to ensure that users of different ages, genders, occupations, and consumption levels have the opportunity to participate in the survey.

*Table 1. Questionnaire Design*

variable	operational definition	Measurement questions
Independent variable	Personalized recommendations	Can consumers obtain products and services that highly match their specific needs and interests during the process of using Taobao? Are you satisfied with the accurately recommended products implemented by Taobao through big data technology calculation? (1-5)
	Precise advertising placement	Do consumers generate purchasing behaviors through advertising placements when using Taobao? Does precise advertising placement make it easier for you to find products of interest and increase your purchase intention? (1-5)
	Price dynamic adjustment	Can consumers perceive changes in the prices of goods or services within a certain period due to other factors? And will this directly affect their purchasing decisions and consumption experiences? Does the dynamic adjustment of commodity prices have a significant impact on promoting your purchase intention? (1-5)
	Product sorting	Can consumers find products that meet their expectations more efficiently through the commodity sorting presented by Taobao during the purchasing process? To what extent do you think the top rankings of hot-selling and highly-rated products help you find products? (1-5)
Inventory management	Can consumers ensure that they can purchase the required goods in a timely and smooth manner during the shopping process, and at the same time avoid Do you think that when a certain product is almost sold out, it will affect your purchase intention? (1-5)	

		shopping inconvenience or dissatisfaction caused by inventory problems?	
Logistics Optimization	Consumers' attitudes towards Taobao's logistics service		Will you be affected in your purchase intention because the accuracy of the logistics delivery predicted by big data is not high? (1-5)
User Profile Construction	Can consumers accept personal information and data collected by Taobao through big data during the consumption process?		To what extent does big data-based price discrimination affect your purchase intention? (1-5)
privacy	Can consumers accept that their consumption habits and personal information are collected and used by Taobao?	What do you think of the degree of protection of personal privacy by the Taobao platform? (1-5)	
Precise discounts	Can consumers increase their purchase intention through the actually attractive preferential policies and services provided by Taobao during the consumption process?		How satisfied are you with the preferential activities delivered to you by Taobao based on big data analysis? (1-5)
Dependent variable	User purchase intention	The degree of consumers' tendency to purchase using Taobao	To what extent are you willing to make purchases on Taobao? (1-5)

### 3. Result and Discussion

#### 3.1 Reliability and validity test

This paper first evaluates the overall reliability and validity of the questionnaire ( Table 2 and 3 ). The Cronbach 's alpha coefficient is 0.914, indicating that the questions in the questionnaire are highly consistent and have high internal consistency reliability. In the structural validity test, the KMO value is 0.906, which is very close to 1, the Bart 's sphericity value is 593.798, the degree of freedom is 45, and the p value is significant, indicating that there is a significant correlation between variables, which is suitable for further factor analysis.

Table 2. Reliability test

Name	Correlation of total correction items(CITC)	Item deleted $\alpha$ factor	Cronbach $\alpha$ coefficient
Personalized recommendation	0.762	0.902	
Precise advertising	0.772	0.901	
Precision Offers	0.729	0.903	0.914
Item Sort	0.817	0.899	
Inventory management	0.669	0.908	

Dynamic adjustment	price	0.715	0.904
User Construction	Portrait	0.557	0.914
Logistics optimization		0.605	0.911
privacy		0.598	0.911
User's intention	purchase	0.689	0.906

Table 3. Validity test

KMO Sampling Suitability Quantity	0.906	
Bartlett's sphericity test	Approximate square	chi-593.798
	Degree of freedom	45
	significance	0.000

### 3.2 Correlation analysis

The results of correlation analysis ( Table 4 ) show that there is a significant correlation between independent variables and dependent variables, and there is a strong correlation between independent variables. This may be because these problems revolve around the experience and willingness of consumers in the process of Taobao shopping, and are closely related to the application of big data in Taobao and its impact on consumer decision-making. They are logically coherent with each other, so the correlation is strong, and it is necessary to further use principal component analysis and other methods to reduce the dimension.

Table 4. Correlation analysis

	Personalized recommendation	Precise advertising	Precision Offers	Item Sort	Inventory management	Dynamic price adjustment	User Portrait Construction	Logistics optimization	privacy	Willingness to buy
Personalized recommendation	1.000									
Precise advertising	.720**	1.000								
Precision Offers	.713**	.671**	1.000							
Item Sort	.724**	.637**	.700*	1.000						
Inventory management		.516**	.557*	.529**	1.000					

ent							
Dynamic price adjustment			.520**	.577**	1.000		
User Portrait Construction					.571**	1.000	
Logistics optimization				.501**	.557**	.536**	1.000
privacy							1.000
Willingness to buy	.585**	.514**	.560*	.547**			1.000

### 3.3 principal component analysis

According to the results of principal component analysis ( Table 5 ), this paper divides the nine independent variables into three dimensions and generates new variables, which are precise delivery, product details and personal privacy. Among them, accurate delivery highlights the core position of accurate recommendation in improving Taobao users ' purchase intention ; product details reveal the multi-dimensional impact of commodity inventory, price dynamics and the negative impact of big data technology on users ' purchase intention. Personal privacy emphasizes the importance of personal privacy security in the era of big data and its far-reaching impact on purchase intention.

Table 5. Principal component analysis

	Accurate targeting	Product Details	privacy
Personalized recommendations	0.852		
Precise advertising placement	0.828		
Precise discount service	0.836		
Taobao sorts by product sales and other factors	0.751		
Inventory management		0.723	
Price dynamic adjustment		0.788	
User Profile Construction		0.719	
Logistics optimization		0.722	
privacy			0.854

### 3.4 Regression analysis

The above linear regression analysis ( table 6 ) is composed of a linear combination of accurate delivery, product details and personal privacy through the dependent variable Taobao user purchase intention as the independent variable factor. The coefficient of determination of the regression model is 0.612, indicating that the independent variable can explain 61.2 % of the variability of the dependent variable, and the model has a strong correlation. The significance of the coefficients of the regression model is all below 0.01, which is very

significant. That is, the independent variable factors, product details and personal privacy are all involved in the regression model, and the coefficients are 0.573,0.135 and 0.288 respectively. It is expected that the purchase intention of Taobao users will increase by 0.573,0.135 and 0.288 units when the factors are accurately placed, the product details and personal privacy are increased by one unit. That is, Taobao users ' purchase intention = 2.803 + 0.57 precision delivery + 0.135 product details + 0.288 personal privacy. In addition, the standardized coefficient of precision delivery is 0.684, indicating that ' precision delivery ' has a significant positive impact on the dependent variable ( purchase intention ), and its  $\beta$  value is large, indicating that ' precision delivery ' is the key factor affecting purchase intention when other conditions remain unchanged. Although the standardized coefficients and  $\beta$  values of product details and personal privacy are smaller than those of precision delivery, they can still show a positive impact on purchase intention.

Table 6. Regression analysis

	B	standard error	Beta	t	significance	Lower bound of confidence interval	Upper limit of confidence interval
(Constant)	2.083	0.026		79.454	0.000	2.031	2.134
Accurate targeting	0.573	0.026	0.684	21.844	0.000	0.522	0.625
Product Details	0.135	0.026	0.161	5.147	0.000	0.083	0.187
privacy	0.288	0.026	0.343	10.969	0.000	0.236	0.339

### 3.5 Gradient lifting analysis

The MSE on the training set is 0.177, and the RMSE is 0.42, indicating that the model fits well on the training data, and the deviation between the predicted value and the actual value is small. MAE is 0.248, which further confirms the stability of the prediction, while MAPE is 14.178 %. Although it is relatively high, considering that MAPE is sensitive to outliers, this value is still acceptable, reflecting that the prediction accuracy of the model is acceptable. The R2 value was 0.748, which was close to 0.8, indicating that the model explained about 75 % of the variability in the training data and had strong fitting ability. In the cross-validation set, MSE increased to 0.462, RMSE increased to 0.675, MAE and MAPE also increased significantly to 0.478 and 25.341 %, respectively, while R2 decreased sharply to 0.287, revealing that the model may have over-fitting risk. The results of the test set are between the two, MSE is 0.332, RMSE is 0.576, which shows that the performance of the model on the independent test set is better than that of the cross-validation set but worse than the training set. The MAE is 0.4, which indicates that the prediction deviation is stable, and the MAPE is 19.803 %, which reflects a certain degree of prediction accuracy, but there is still room for improvement. The R2 value is 0.524, indicating that the model explains about 52 % of the variability in the test data. Although it does not reach a high degree of fitting, it has certain practical application value.

Table 7. Model Evaluation Results

	MSE	RMSE	MAE	MAPE	R <sup>2</sup>
Training set	0.177	0.42	0.248	14.178	0.748
Cross validation set	0.462	0.675	0.478	25.341	0.287
Test set	0.332	0.576	0.4	19.803	0.524



### 3.6 Results show

The results of the linear regression model show that ( Figure 4 ), precise delivery, product details and personal privacy are the key factors affecting the purchase intention, and all three have a positive impact on the user 's purchase intention. In today 's era of efficiency, accurate delivery can help users efficiently save time to buy the goods they want, and the overall purchase experience can be optimized, with immediate results ; in the e-commerce platform, the user 's personal privacy is manifested as purchase records, browsing history, search keywords, collected goods, and concerned stores. The platform can analyze the background data by using big data technology, and then optimize the business model. At the same time, the user 's attention to personal privacy and protection awareness have also increased simultaneously, and have become a key factor for users to choose a platform for online shopping. In the process of purchase, users judge whether the product meets their own needs according to the key display contents such as the characteristics, functions, specifications and materials of the product, so as to judge whether to purchase. With the support of artificial intelligence and big data technology, the advantages and characteristics of the product should be fully displayed, and the potential problems that users may have should be solved in time through the details of the product, and the experience should be optimized to promote purchase.

In the gradient boosting model, the importance of product ranking is 29.70 %. This may be because users are more inclined to pay attention to and browse the top-ranked products. At the subconscious level, they will think that the front-row products are better. At the same time, a reasonable ranking method can also help users filter products more efficiently, so as to reduce the time cost of search and comparison. The importance of marketing effectiveness evaluation is 14.30 %, which is due to the attractive advertising copy, vivid product display, fascinating story narration, etc., which can quickly tap and stimulate the potential needs of users, and further establish emotional resonance with users.

According to the two models, the analysis results of the gradient lifting algorithm are consistent with the regression analysis results. Both of them believe that precise delivery, personal privacy, product details and product sorting are the key factors affecting Taobao users ' purchase intention. At the same time, inventory management, user portrait construction, personalized recommendation, logistics optimization, price dynamic adjustment and other factors also have an impact on users ' purchase intention to varying degrees.

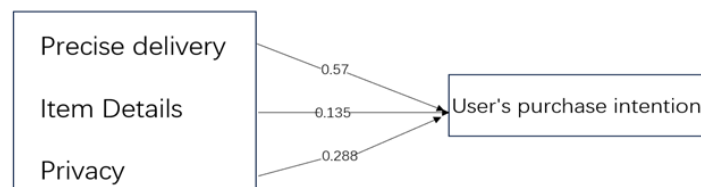


Fig 4. Research Results Chart

### 3.7 Research Suggestions

Based on the above discussion, this paper puts forward the following suggestions based on the AISAS model. First of all, in terms of attention, Taobao platform can first use social media and advertising to promote Taobao 's latest technology and strict implementation in protecting user privacy, and launch attractive price concessions, such as time-limited discounts, full deductions, etc. ; secondly, in terms of stimulating interest, Taobao platform should avoid frequent or substantial adjustment of commodity prices and formulate fair and transparent price strategies to increase users ' purchase confidence. At the same time, Taobao merchants can

also optimize the display of product information, such as providing high-definition pictures, detailed reference data, user evaluation, etc., to increase the attractiveness of goods ; in terms of information search, the accuracy of the search algorithm is continuously improved, the user behavior data is continuously analyzed, the personalized search recommendation is strengthened, and the data generated in the user search process is encrypted. Then in the aspect of purchase action ( Action ), the sorting option is adopted. In addition to the sales sorting, it can also be set to sort according to evaluation, price, new products and other ways, so that consumers can filter according to their own needs.It can also establish a strict monitoring mechanism to audit the sales volume of merchants in real time to ensure the accuracy and authenticity of sales data. Finally, in terms of information sharing ( Share ), protection measures for user data should be strengthened to ensure that users do not disclose private information during the sharing process ; at the same time, users are encouraged to share positively, set up sharing rewards and optimize sharing functions, encourage users to share a positive shopping experience, and enhance the platform 's reputation.

#### 4. Conclusions

This paper innovatively uses measurement and machine learning models to jointly conduct data verification, and conducts empirical research on how big data and artificial intelligence technology can empower platform e-commerce to affect purchase intention. The research shows that precision delivery, product details and personal privacy are the key influencing factors. This paper enriches the research theory of e-commerce and provides reference suggestions for platform e-commerce in technology application. The follow-up study can increase the sample size, increase the control variables such as age, gender, etc.to conduct user stratification research, so as to explore the changes in platform purchase intention caused by the application of big data and artificial intelligence technology among different user groups.

#### 5.References

- Chen, W., & Wang, L. (2024). Research on precision marketing of e-commerce enterprises based on user portraits. *Journal of Zhejiang Industry and Trade Vocational and Technical College*, 24(02), 51–56.
- Lin, J. (2019). Analysis of the application of artificial intelligence technology in the field of e-commerce. *China Business*, (02), 19–20.
- Wang, J., & Fan, Y. (2024). The application of artificial intelligence technology in e-commerce marketing. *Time-honored Brand Marketing*, (10), 73–75.
- Wang, L. (2022). Research on precision marketing strategy for e-commerce platform promotion activities [Doctoral dissertation, Guangdong University of Technology].
- Wang, Q., & Zhu, J. (2023). Research on the impact of product information accurately pushed by e-commerce platform on consumers' online shopping behavior. *Office Automation*, 28(11), 23–26.
- Wang, S., & Zhang, Z. (2020). Research on the application of unstructured information in the field of e-commerce under the background of big data. *Information and Computer (Theoretical Version)*, 32(04), 3–5.
- Wu, Y. (2015). An empirical study on the impact of online product recommendation information on consumer purchase behavior based on big data [Doctoral dissertation, Liaoning University].
- Yao, J., & Xu, X. (2022). Research on the application of artificial intelligence technology in the field of e-commerce. *Industrial Innovation Research*, (13), 108–110.
- Zhang, W. (2024). The optimization and innovation of digital economy in logistics and supply chain management - Taking the logistics system algorithm of Jingdong E-commerce as an example. *National Circulation Economy*, (13), 52–55.