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Factors Affecting the Acceptance Intentions of Consuming at Unmanned Stores in Chengdu, China

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Abstract

Unmanned stores are a modern and efficient form of retail that offers convenience, speed, and personalized shopping experiences. They are particularly appealing to younger generations who value freshness, fashion, and technology. While the development of unmanned stores in China is still relatively new, consumer acceptance is critical to the industry's success. At present, the current usage rate of unmanned stores in Chengdu is relatively low, and many people still feel unfamiliar and uncertain about using them. With the support from the Chengdu Municipal Government and the consumer market, Chengdu's unmanned stores have a great potential for future development. In this regard, it is important to explore consumers' acceptance intentions of consuming at unmanned stores in Chengdu so that the local government can take a proper direction in the unmanned retail industry. The study therefore adopted a consumer perspective for *a theoretical model of consumer acceptance behavior for unmanned stores* based on the Technology Acceptance Model 2 (TAM2) framework. Data were collected through a questionnaire survey, and obtained from various statistical analyses to validate the research hypotheses. The results revealed significant positive relationships between the technological characteristics of unmanned stores and consumers' perceived usefulness and ease of use. Additionally, perceived usefulness and ease of use were found to positively influence usage intention, which, in turn, positively impacted usage behavior. Recommendations were for (1) technological innovation and improvement of advanced unmanned store systems and devices to enhance consumer experience and trust, (2) simplified operation processes and clear interfaces for the ease of use, (3) marketing and consumer education, (4) safety of unmanned stores, and (5) personalized services and promotional activities based on consumer preferences and behaviors. These are for unmanned store companies to gain a competitive edge in the market

development of the unmanned retail industry.

***Keywords**: Unmanned store acceptance, willingness to accept, technology acceptance model, consumers*

1. Introduction: Research Background

Unmanned stores as a new way of shopping in the retail industry has reached a certain stage of development in China. They utilize automation technology and intelligent devices to facilitate product sales and services in the absence of salespersons or cashiers (Feng, 2018). Compared to traditional store models, unmanned stores offer higher efficiency and lower labor costs, providing a more convenient, fast, and personalized shopping experience. In 2019, the market size of unmanned stores in China reached 51 billion yuan, with a year-on-year growth of 260.6% (Huang et al., 2020). Unmanned stores are an important form of unmanned retail, and their market size is continuously expanding (Fang & Fang, 2022). The advantages of unmanned stores lie in their use of advanced technological means, enabling unattended operation, significantly reducing operating costs, improving efficiency, and better adapting to market changes (Fang & Fang, 2022). With the rapid development and widespread adoption of technologies, such as artificial intelligence, the Internet of Things, and computer vision, the technological barriers and implementation costs of unmanned stores are continuously decreasing, making them easier to promote and apply (Technology, 2019).

Currently, the most active cities in the development of unmanned stores in China are mainly concentrated in first-tier cities and some new first-tier cities, such as Shanghai, Shenzhen, Beijing, Guangzhou and Hangzhou (Daily, 2018). Among them, Shanghai has the highest number of unmanned stores, while Shenzhen leads in terms of technological and marketing innovation in unmanned stores. Beijing, as China's political and economic center, has attracted many unmanned store brands and enterprises, becoming one of the important cities for the development of unmanned stores (Anonymous, 2022). In comparison, Chengdu has relatively fewer unmanned stores in terms of quantity and scale, but they are gradually increasing. In recent years, the Chengdu Municipal Government has started to strongly support the development of unmanned stores, issuing a series of policy measures and providing financial support, which has attracted some unmanned store brands and enterprises to settle in the city. Chengdu is considered one of the cities in China with a good potential for innovation and the development of emerging industries. In recent years, Chengdu has been actively promoting innovation and technological development, attracting high-tech enterprises and startups (Wang, Liu & Liu, 2019). The core concept of the innovative city proposed by Landry (2012) is to promote urban development, enhance urban competitiveness, and improve the quality of life for residents through culture, creativity, education, and social innovation theory. Chengdu has currently secured the first place in the ranking of China's

top ten most promising innovative cities (Bai, 2023). Although Chengdu may not be able to compare with cities like Shanghai, Shenzhen, and Beijing at present, the Chengdu Municipal Government and the Foundation of the Consumer Market have supported the city's unmanned stores to develop its potential in the unmanned retail industry.

With such support, Chengdu has moved toward the development of unmanned stores. Currently, it should be noted that many people in Chengdu still feel unfamiliar and uneasy about using unmanned stores (Pidu, 2023). Although the unmanned store industry in China has been developing for several years, it is still considered an emerging industry (Ye, 2017). Dawar (2013) asserted that consumers are the driving force behind emerging industries, and these industries can only succeed when consumers accept their products and services. Therefore, consumers' acceptance is a crucial factor for the success of emerging industries. In this regard, this study aims to address three main questions: (1) What factors can influence consumers' willingness to accept the technological characteristics of unmanned stores? (2) How do these factors affect consumers' acceptance willingness toward the technological characteristics of unmanned stores? (3) What recommendations can be provided for the future development of unmanned stores or the unmanned economy in Chengdu? It is expected that understanding of consumers' acceptance willingness toward the technological characteristics of unmanned stores and the factors that influence it, can provide theoretical guidance to the field of unmanned economy field and practical implications for the development of retail unmanned stores.

2. Research Status of Unmanned Stores

Unmanned stores utilize technologies, such as the Internet of Things, big data, and artificial intelligence to achieve intelligent sales through self-service selection, self-payment, and self-retrieval functions, all in an unattended store setting (QbitAI, 2018; Hamidi et al., 2020). Unmanned stores rely on various technological means, including the Internet of Things, artificial intelligence, big data analysis, and cloud computing (Hong, 2017). Therefore, technological characteristics form the foundation for the development of the unmanned store industry. Given the background of this emerging shopping method, existing research mainly focuses on the current status, models, development opportunities, and challenges of unmanned stores (Yu, 2017; Feng, 2018; Ding & Li, 2019; Wang & Tian, 2023). For instance, research on unmanned store technologies can be summarized into six aspects: (1) self-service shopping (Huang & Rust, 2018; Al-Qirim et al., 2022), (2) intelligent recognition (Zhang et al., 2021), (3) automatic payment (Liu, 2017; Wang & Yang, 2017), (4) data analysis (Bordonaba-Juste et al., 2012; Lu & Chen, 2020), (5) AI technology support (Chen & Shang, 2021; Bae & Jeon, 2022), and (6) intelligent security control (Zhou et al., 2017). These technological characteristics of unmanned stores, working together, have a significant impact on store operations and consumers' shopping experiences, which can be specifically reflected in: (i) improving efficiency, (ii) reducing

costs, (iii) increasing accuracy, (iv) enhancing consumer experience, and (v) improving security. Based on the research findings of domestic and foreign scholars in the unmanned store industry, the current market development is favorable and holds certain potential, with challenges mainly concentrated on areas, such as consumers' experience, product damage rates in unmanned supermarkets, related intelligent technologies, business models, and legal regulations.

It is evident that relatively little research on consumers has focused on unmanned stores. Chengdu, as a core city in Southwest China and currently driven by both market environment and policy support, clearly possesses a good potential for unmanned stores. The current status of unmanned stores in Chengdu can be summarized as: (1) multiple brands entering the market, (2) coverage of various product categories, (3) technological innovation, (4) widespread geographical distribution, and (5) positive consumer feedback. Despite initial explorations in unmanned stores, there is a lack of targeted research on the acceptance willingness of consumers toward their technological characteristics, and consumers' understanding and willingness to use this technology. The researchers of the present study noted an urgent need to fill the research gap from consumers' perspective on the demand side.

3. Research Methods

3.1 Technology Acceptance Model of Research on Acceptance Willingness of Unmanned Stores

This study assumes that the TAM2 model is equally applicable to the study of acceptance willingness toward unmanned stores. Therefore, the following hypotheses are proposed as shown in Table 1.

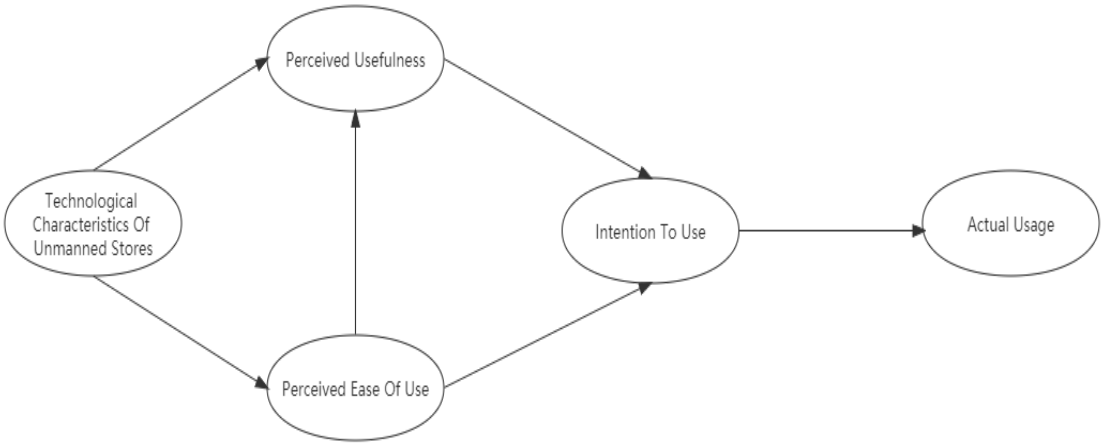
Table 1: Summary of Hypotheses

NO.	Hypotheses Based on Four Key Factors
H1	There is a significant positive relationship between the technological characteristics of un manned stores and consumers' perceived usefulness.
H2	There is a significant positive relationship between the technological characteristics of un manned stores and consumers' perceived ease of use.
H3	There is a significant positive relationship between consumers' perceived ease of use and consumers' perceived usefulness.
H4	There is a significant positive relationship between consumers' perceived usefulness and consumers' intention to use.
H5	There is a significant positive relationship between consumers' perceived ease of use and consumers' intention to use.
H6	There is a significant positive relationship between consumers' intention to use and consumers' actual usage behavior.

3.2 Hypotheses of Research on Willingness to Accept Unmanned Stores Based on Technology Acceptance Model

Based on the hypotheses in Table 1, the causal relationship diagram illustrating the influences is depicted in Figure 1.

Figure 1: Extended Acceptance Intention Model for Unmanned Stores Based on TAM2.



3.3 Questionnaire Design

The scale design in this study consists of 5 latent variables and 16 items based on the five dimensions mentioned earlier. The questionnaire contains two sections: the first section includes demographic information of the participants, and the second section consists of measurement items to assess the latent variables in the proposed model. The scale adopts a Likert five-point rating scale, for respondents to rate each item from their own perspective: 1=strongly disagree, 2=disagree, 3=somewhat disagree, 4=neutral, 5=somewhat agree, 6=agree, 7=strongly agree (Zhou et al., 2017).

Table 2: Model Variable Index System

Variable	Measurement Standard	Scale Items
Technological characteristics of unmanned stores	TT1	I believe that in unmanned stores, the placement of products should facilitate my search and purchase.
	TT2	I believe that unmanned stores should accurately identify and track the products I select for purchase.
	TT3	I believe that unmanned stores should automatically recognize product information and prices.
	TT4	I believe that unmanned stores should provide automatic payment functionality, eliminating the need for manual cashiering.
	TT5	I believe that the automatic payment functionality in unmanned stores should make me feel convenient and secure.
	TT6	I believe that the use of data analysis in unmanned stores to understand consumer preferences and behavior will contribute to providing me with a more personalized shopping experience.
	TT7	I believe that the automation of operations and information dissemination services in unmanned stores will enhance my shopping experience.
	TT8	I believe that unmanned stores should be equipped with intelligent security control systems to ensure my safety and privacy.
Perceived usefulness	PU1	I believe that choosing to shop at unmanned stores will enhance my shopping experience.
	PU2	I believe that choosing to shop at unmanned stores will increase the convenience of my shopping.
	PU3	I believe that choosing to shop at unmanned stores will make my shopping more efficient.
Perceived ease of use	PEO U1	I believe that learning how to use unmanned retail systems is very simple.
	PEO U2	The transaction process of unmanned stores should be highly smooth.
	PEO U3	I believe that the reliability of unmanned stores (product supply, inventory accuracy, stability of payment systems, etc.) should be very high.
	PEO U4	I believe that operating unmanned stores should be simple, quick, and effortless.
Intention to use	CSI1	I believe that the products and brands of unmanned retail systems currently available on the market (such as Alibaba, JD.com, Bingobox, Futuremart, etc.) are trustworthy.
	CSI2	I believe that the services provided by unmanned stores currently align with my expectations.
	CSI3	I believe that the development of unmanned stores is a trend that cannot be ignored.

Variable	Measurement Standard	Scale Items
Actual usage	BIS1	I believe that purchasing goods in unmanned stores is a good shopping choice.
	BIS2	I am willing to buy products in unmanned stores.
	BIS3	I think unmanned stores are worth recommending to others.
	BIS4	If someone asks me, I would recommend them to shop in unmanned stores.

4. Results

4.1 Descriptive Statistics of Questionnaire Results

The survey collected sample data from Chengdu residents using a random sampling method. A total of 409 responses were collected, and after manual inspection and screening, those samples with excessively short completion time or repetitive answers to multiple questions were excluded. Finally, 396 valid responses to the survey questionnaire were obtained, resulting the return rate at 96.82%.

Table 3: Demographic Variables of Respondents

Project	Variables	Frequency	Percentage
Gender	Male	190	47.98
	Female	206	52.02
Age	20 years old and below	52	13.13
	21-30 years old	133	33.59
	31-40 years old	91	22.98
	41-50 years old	65	16.41
	51-60 years old	44	11.11
	61 years old and above	11	2.78
Educational background	High school or below	56	14.14
	College diploma	107	27.02
	Bachelor's degree	184	46.46
	Master's degree and above	49	12.37
Profession	Government or public institution employees	93	23.48
	Corporate employees	89	22.47
	Professional and technical personnel (such as doctors, teachers, engineers, etc.)	98	24.75
	Students	53	13.38
	Self-employed business owners	63	15.91

Project	Variables	Frequency	Percentage
Disposable income	3000 CNY or below	52	13.13
	3001 CNF to 5000 CNY	128	32.32
	5001 CNY to 8000 CNY	83	20.96
	8001 CNY to 10000 CNY	62	15.66
	10001 CNY to 15000 CNY	53	13.38
	Above 15000 CNY	18	4.55
Unmanned store	Yes	172	43.43%
understanding	No	224	56.57%
	Multiple times a day on average	100	25.25
	Once a day on average	88	22.22
Shopping frequency	Once every two days on average	83	20.96
	Once every five days on average	93	23.48
	Once a week on average	32	8.08

The respondents' demographic variables and their potential as consumers of unmanned stores in Chengdu point to the young age groups with higher levels of education. This indicates that young consumers with higher education tend to have a stronger acceptance of new technologies. Over a quarter of the respondents reported being aware of unmanned stores, indicating a relatively high level of awareness among the surveyed sample. This result appears to suggest a widespread trend of unmanned stores in Chengdu--due to a good level of understanding of the existence and basic concept of unmanned stores. The respondents' shopping frequency also suggests that Chengdu residents have a significant and stable shopping demand.

4.2 Data Analysis of Questionnaire Results and Research Model Hypothesis Testing

4.2.1 Reliability Analysis

Reliability analysis is used to examine the stability and reliability of a scale. Before analyzing questionnaire data, it is necessary to test the stability and validity of the scale. Cronbach's α coefficient is commonly used to measure the reliability of a scale, where a higher coefficient indicates better reliability. A reliability coefficient between 0.7 and 0.9 is considered acceptable, while a coefficient below 0.7 indicates a need for scale revision. In this study, the SPSS 22.0 software was used to examine the scale data. The Cronbach's α coefficients are presented in Table 4 showing all coefficients higher than 0.7, indicating a high level of data reliability, which in turn validates their use for further analysis.

Table 4: Results of the Reliability Analysis for Each Variable

Variable Names	Reliability of Variable
Technological characteristics of unmanned stores	0.952
Perceived usefulness	0.920
Perceived ease of use	0.949
Intention to use	0.883
Actual usage	0.927

4.2.2 Validity Analysis

Validity can be divided into four types: content validity, construct validity, convergent validity, and discriminant validity (WMS Analyseis., 2000).

(1) Content validity: The method for testing content validity should be referenced from relevant literature sources.

(2) Construct validity: The methods commonly used to test construct validity are exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA is a dimensionality reduction technique that involves conducting tests, such as the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity to determine if the data is suitable for factor analysis. If the fit is satisfactory, CFA can be performed to assess the construct validity. The KMO test coefficient is calculated to compare the simple correlations and partial correlations between variables, with values ranging from 0 to 1. A higher KMO value indicates stronger correlations among variables. Typically, a KMO value greater than 0.6 indicates suitability for factor analysis. The validity verification using KMO and Bartlett's tests is presented in Table 5, with a KMO value of 0.897. Since the KMO value is greater than 0.8, the research data is highly suitable for information extraction.

Table 5: Results of Validity Analysis

KMO and Bartlett's Test		
KMO Data		0.897
Bartlett's Sphericity Test	Approximate Chi-Square	5210.008
	df	231
	p	0.000

Table 6: The Factor Loading Coefficients, the AVE and CR Indicators of the Model

Factors	Measurement Items (Manifest Variables)	Std. Estimate	AVE	CR
Technological characteristics of unmanned stores	TT1	0.737	0.626	0.930
	TT2	0.838		
	TT3	0.733		
	TT4	0.818		
	TT5	0.739		
	TT6	0.743		
	TT7	0.911		
	TT8	0.793		
Perceived usefulness	PU1	0.822	0.583	0.807
	PU2	0.701		
	PU3	0.762		
Perceived ease of use	PEOU1	0.817	0.659	0.885
	PEOU2	0.765		
	PEOU3	0.875		
	PEOU4	0.785		
Intention to use	CSI1	0.847	0.683	0.866
	CSI2	0.844		
	CSI3	0.787		
Actual usage	BIS1	0.768	0.594	0.854
	BIS2	0.756		
	BIS3	0.804		
	BIS4	0.755		

(3) The method used to test convergent validity is generally Confirmatory Factor Analysis (CFA), which involves examining indicators, such as CR (Composite Reliability) and AVE (Average Variance Extracted). CR assesses the internal consistency of the construct, similar to Cronbach's α coefficient. A higher CR indicates higher internal consistency and stronger convergence. The typical threshold is >0.7. AVE represents the average amount of variance that is extracted by the latent variable and reflects the construct's ability to explain the observed variables. A higher AVE indicates higher convergent validity. The typical threshold is >0.5. In this study, CFA analysis was conducted on the five constructs of consumer acceptance: (i) technology acceptance, (ii) perceived usefulness, (iii) perceived ease of use, (iv) intention to use, and (v) actual usage behavior. All factor loadings were above 0.7, indicating significance. The CR values were above 0.8, and the AVE values were above 0.5 for all constructs, demonstrating their convergent validity, as shown in Table 6.

(4) Discriminant Validity: Discriminant validity is generally assessed through the comparison of the Average Variance Extracted (AVE) values and the results of correlation analysis in Confirmatory Factor Analysis (CFA). The purpose of discriminant validity is to ensure that the correlations within dimensions are higher than the correlations between dimensions. The results are shown in Table 7: For the dimension of Technological Features, the square root of AVE is 0.791, which is greater than the maximum absolute value of inter-factor correlations (0.394), indicating good discriminant validity. For the dimension of Perceived Usefulness, the square root of AVE is 0.764, which is greater than the maximum absolute value of inter-factor correlations (0.390), indicating good discriminant validity. For the dimension of Perceived Ease of Use, the square root of AVE is 0.812, which is greater than the maximum absolute value of inter-factor correlations (0.381), indicating good discriminant validity. For the dimension of Intention to Use, the square root of AVE is 0.826, which is greater than the maximum absolute value of inter-factor correlations (0.416), indicating good discriminant validity. For the dimension of Actual Usage, the square root of AVE is 0.771, which is greater than the maximum absolute value of inter-factor correlations (0.416), indicating good discriminant validity.

Table 7: Discriminant Validity: Discriminant Validity by Pearson Correlations and the Square Root of Average Variance Extracted (AVE) Values

	Technological Characteristics of Unmanned stores	**Perceived Usefulness**	**Perceived Ease of Use**	**Intention to Use**	**Actual Usage**
Technological characteristics of unmanned stores	0.791				
Perceived usefulness	0.359	0.764			
Perceived ease of use	0.381	0.246	0.812		
Intention to use	0.394	0.390	0.206	0.826	
Actual usage	0.347	0.264	0.262	0.416	0.771

Note: The numbers along the diagonal represent the square root of AVE values.

4.2.3 Structural Equation Model Analysis of Unmanned Store Acceptance Research

Structural Equation Modeling (SEM) is a multivariate statistical method based on the covariance matrix of variables, used to analyze the relationships between variables. It is suitable for studying the mediating effects and causal relationships among multiple independent and dependent variables. The combination of the Technology Acceptance Model and Structural Equation Modeling allows for the logical investigation of influencing factors based on reasonable hypotheses, while also verifying the significance and scientific validity of the hypotheses.

4.2.4 Structural Equation Model Fitting Effect Fitness Test

To ensure the applicability of the model, it is necessary to test the model fit. The fitting results obtained by computer statistical software are shown in Table 8. The test results all meet the standard, indicating that the structural equation modeling used in this study is appropriate for the data analysis.

Table 8: Model Fit Indices

Common Indicators	$\chi2$	*df*	*p*	$\chi2/df$	GFI	RMSEA	RMR	CFI	NFI	NNFI
Judgment criteria	-	-	>0.05	<3	>0.9	<0.10	<0.05	>0.9	>0.9	>0.9
Value	434.234	203	0.000	2.139	0.918	0.054	0.253	0.955	0.919	0.948
Other indicators	TLI	AGFI	IFI	PGFI	PNFI	SRMR	RMSEA 90% CI			
Judgment criteria	>0.9	>0.9	>0.9	>0.9	>0.9	<0.1	-			
Value	0.948	0.997	0.955	0.936	0.907	0.085	0.047 to 0.061			

Default Model: $\chi2(231)=5333.468, p=1.000$

4.2.5 Analysis of Structural Equation Modeling Results

Using computer statistical software, the exploratory and confirmatory analysis of the model's causal relationships was conducted. The standardized path coefficients and their significance were obtained, as shown in Figure 2 and Table 9. The model fit results indicate that all hypotheses are supported, and the summarized results are presented in Table 10.

Table 9: Model Regression Coefficients Summary Table

X	→	Y	Unstandardized Path Coefficients	SE	z(CR value)	p	Standardized Path Coefficients	Results
Technological characteristics of unmanned stores	→	Perceived usefulness	0.316	0.051	6.167	0.000	0.340	significant
Perceived ease of use	→	Perceived usefulness	0.120	0.047	2.534	0.011	0.122	significant
Technological characteristics of unmanned stores	→	Perceived ease of use	0.415	0.050	8.213	0.000	0.201	significant
Perceived usefulness	→	Intention to use	0.366	0.048	7.627	0.000	0.451	significant
Perceived ease of use	→	Intention to use	0.111	0.045	2.462	0.014	0.112	significant
Intention to use	→	Actual usage	0.405	0.044	9.109	0.000	0.541	significant

Remarks: → Indicates the path influence relationship

Figure 2: Structural Equation Model of Acceptance of Consumers toward Unmanned stores (Standardization Coefficient)

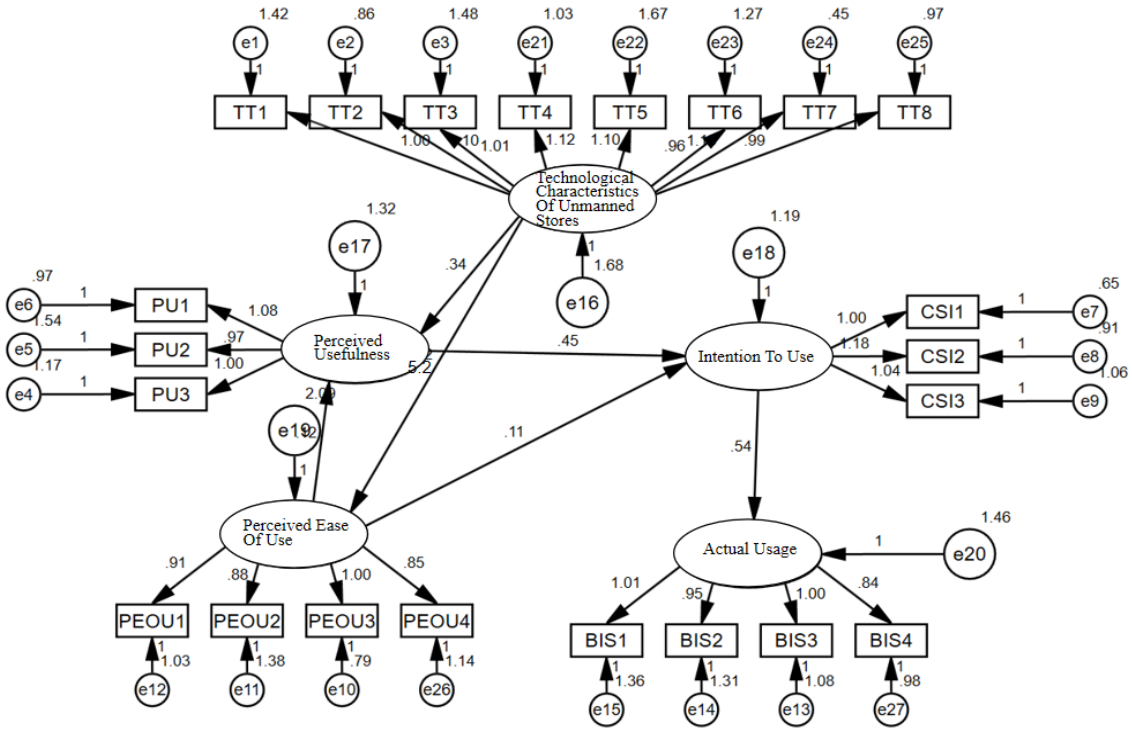


Table 10: Summary of Research Hypotheses and Results

No.	Hypotheses	Results
H1	There is a significant positive relationship between the technical characteristics of unmanned store technology and consumers' perceived usefulness.	Supported
H2	There is a significant positive relationship between the technical characteristics of unmanned store technology and consumers' perceived ease of use.	Supported
H3	Consumers' perceived ease of use has a significant positive relationship with their perceived usefulness.	Supported
H4	Consumers' perceived usefulness has a significant positive relationship with their intention to use.	Supported
H5	Consumers' perceived ease of use has a significant positive relationship with their intention to use.	Supported
H6	Consumers' intention to use has a significant positive relationship with their actual usage behavior.	Supported

5. Conclusions and Suggestions of Acceptance Willingness of Unmanned Stores

5.1 Research Conclusions on Willingness to Accept Unmanned Stores

Based on the analysis results, the following conclusions can be drawn: There is a positive relationship between the technological characteristics of unmanned stores and consumers' perception of usefulness and ease of use. Technological characteristics include self-service shopping, intelligent identification, automatic payment, data analysis, AI technology support, and intelligent security control, which can provide convenient and personalized shopping experiences, enhancing consumers' recognition and acceptance of unmanned stores. Consumers' perception of ease of use also has a positive impact on perceived usefulness and willingness to use. Simplifying the operation process, providing clear and understandable guidance and interface design can reduce consumers' learning costs and operational difficulties, making it easier for them to adapt to and use unmanned stores. Consumers' perception of usefulness positively influences their willingness to use, meaning that when consumers perceive that unmanned stores can meet their needs and provide beneficial shopping experiences, they are more likely to use them. Furthermore, there is a positive relationship between consumers' willingness to use and their actual usage behavior. Positive evaluations and decision support from consumers toward the stores can motivate them to actually choose unmanned stores for shopping and consumption. In this regard, enhancing the technological characteristics, ease of use, and perceived usefulness of unmanned stores is crucial to consumers' acceptance and willingness to use, thereby driving the development of unmanned stores.

5.2 Recommendations

Based on the obtained findings, the researchers would like to encourage and support unmanned store companies in Chengdu to gain a competitive advantage and promote the healthy development of the unmanned store industry as follows:

(1) Innovate and improve unmanned store technology: To enhance consumers' acceptance of unmanned stores, focus on technological innovation and improvement. Consider introducing advanced systems like automated shelves, smart devices, optimized face recognition technology, and smart payment systems. Utilize sensors and data analysis to understand consumer preferences, provide personalized recommendations, and enhance their shopping experience.

(2) Emphasize ease of use and usefulness: Simplify the operation process of unmanned stores and provide clear guidance and user-friendly interfaces. Highlight the practicality and value of unmanned stores by offering personalized product recommendations, preferential activities, and high-quality products. This enhances consumer satisfaction, perceived benefits, and encourages them to convert their intention into actual shopping behavior.

(3) Marketing and consumer education: Promote the advantages, convenience, and safety of unmanned stores through advertising, social media, television, and radio. Emphasize 24-hour convenience, fast payment, and personalized shopping experiences. Use platforms like WeChat, Weibo, and Douyin to share news, promotions, and user reviews. Organize demonstration events and temporary unmanned stores in public places to allow consumers to experience the convenience firsthand. Educate consumers through detailed guides and instructions on the shopping process, payment methods, and goods pickup in unmanned stores.

6. Conclusion

In this study, the researchers conducted a comprehensive investigation and analysis of unmanned stores in Chengdu. By collecting extensive data and employing statistical methods and structural equation modeling, the study arrived at major findings as follows:

Firstly, technological characteristics have a significant positive impact on consumers' perceived usefulness and perceived ease of use. This implies that enhancing the technical characteristics of unmanned stores can improve consumers' perception of their usefulness and ease of use, thereby increasing their acceptance of unmanned stores.

Secondly, consumers' perceived ease of use and perceived usefulness have a significant positive impact on their willingness to use unmanned stores. This indicates that the easier and more useful consumers perceive unmanned stores to be provided, the more likely they are to use them for shopping.

Finally, consumers' willingness to use unmanned stores has a significant positive impact on their actual usage behavior. This means that consumers' willingness translates into concrete usage behavior, making them more likely to shop in unmanned stores.

As for practical implications of the study, the researchers would like to propose for the development of unmanned stores in Chengdu:

(1) Prioritize technological innovation and improvement by introducing more advanced unmanned store systems and equipment to enhance consumer experience and trust.

(2) Highlight the ease of use and usefulness of unmanned stores by simplifying the operation process, providing clear and user-friendly interfaces and guidance. This ensures that consumers can easily use and enjoy the convenience of unmanned stores.

(3) Strengthen marketing and consumers' education for the advantages, convenience, and safety of unmanned stores.

(4) Provide personalized services and preferential activities by analyzing consumer purchasing preferences and behaviors through data analysis for pleasant personalized shopping experience.

Although this study conducted an in-depth examination of unmanned stores in Chengdu, it does have certain limitations, particularly sample selection and research scope restrictions. Future research can address these limitations by expanding the sample size and extending the research scope to encompass other regions and different types of unmanned stores. This will yield more comprehensive and robust results in support of the unmanned retail industry.

7. The Authors

Manling Yuan is a graduate student in Creative Industries Management under thesis supervision of Dr Nuttapong Jotikasthira, the Director of Rattanakosin International College of Creative Entrepreneurship (RICE), Rajamangala University of Technology Rattanakosin (RMUTR), Nakhon Pathom, Thailand. Both authors share their interest in the areas of digital marketing, consumers' purchase intention, and their acceptance of unmanned stores.

8. References

Al-Qirim, N., Rouibah, K., Abbas, H. & Hwang, Y. (2022). Factors affecting the success of social commerce in Kuwaiti microbusinesses: A qualitative study. *Journal of Global Information Management (JGIM), 2022, 30*(1), 1-31.

Anonymous. (2022). Market Panorama Evaluation and Development Strategic Planning Report of China's Unmanned Retail Industry. A Survey Report. (Online). https://roll.sohu.com/a/586465936_121024202, June 23, 2023.

Bae, J.-H. & Jeon, H.-M. (2022). Exploring the relationships among brand experience, perceived product quality, hedonic value, utilitarian value, and brand loyalty in unmanned coffee shops during the COVID-19 Pandemic. *Sustainability, 2022, 14*(18), 11713.

Bai, J. (2023). China's top ten most growing and innovative cities. (Online). https://baijiahao.baidu.com/s?id=1759217101858313822&wfr=spider&for=pc., July 15, 2023.

Bordonaba-Juste, V., Lucia-Palacios, L. & Polo-Redondo, Y. (2012). Antecedents and consequences of e-business adoption for European retailers. *Internet Research, 2012, 22*(5), 532-550.

Chen, S.-C. & Shang, S. S. (2021). Sustaining user experience in a smart system in the retail industry. *Sustainability, 2021, 13*(9), 5090.

Daily, Z. (2018). Do you know which are the five most popular cities for unmanned retail? Beijing, Shanghai, Shenzhen, Guangzhou and Hangzhou. (Online). https://baijiahao.baidu.com/s?id=1596360295551357649&wfr=spider&for=pc, July 22, 2023.

Dawar, N. (2013). *Tilt: Shifting Your Strategy from Products to Customers*. Cambridge, MA: Harvard Business Review Press.

Ding, Y. & Li, Z. (2019). O2O store and unmanned store, VR store in online marketing. *Market Modernization, 2019,* (10), 15-16.

Fang, Y.-S. & Fang, L.-C. (2022). *A Review of Chinese E-Commerce Research: 2001-2020*. IEEE Access.

Feng, W. (2018). Development status and trend of unmanned retail industry. *Tech China, 2018,* (3), 63-72.

Hamidi, S. R., Yusof, M. A. M., Shuhidan, S. M. & Kadir, S. (2020). IR4. 0: Unmanned store apps. *Indonesian Journal of Electrical Engineering and Computer Science, 2020, 17*(3), 1540-1547.

Hong, T. (2017). "Unmanned supermarket" is an innovation of the smart store revolution. *Shanghai Business, 2017,* (11), 31-34.

Huang, C., Xu, Y., Zhang, S. & Shao, L. (2020). Exploring the changing pace of market size in the unmanned retail industry and its implications. *Modern Marketing, 2020, 10*, 32.

Huang, M. & Rust, R. T. (2018). Artificial intelligence in service. *Journal of Service Research, 2018, 21*(2), 155-172.

Landry, C. (2012). *The Creative City: A Toolkit for Urban Innovators*. Oxfordshire, UK: Earthscan Publications.

Liu, Y. (2017). Research on the application of Internet of Things technology in unmanned convenience stores. *Digital Communication World, 2017,* (9), 53-54.

Lu, C. & Chen, J. (2020). The evolution mechanism of Internet innovation in physical retail industry--A multi-case study based on adaptive marketing capabilities. *Management Case Studies & Reviews, 2020, 13*(2), 149-169.

Pidu, C. (2023). Advocating integrity and practicing integrity [#The rise of unmanned stores on the streets of Chengdu#]. (Online). https://weibo.com/3601005894/N9bYKgzgF, June 11, 2023.

QbitAI. (2018). Disrupting retail? The unmanned store on the outlet is actually still in the transitional stage. (Online). https://developer.aliyun.com/article/497950, June 25, 2023.

Technology., C. A. o. I. a. C. (2019). 2019 China artificial intelligence industry white paper. *Chinese Engineering Science, 2019, 23*(3), 90-97.

Wang, H., Liu, C. & Liu, X. (2019). Analysis on the quality measurement and spatial-temporal characteristics of the development of strategic emerging industries in Chinese cities. *Urban Development Studies, 2019, 26*(12), 130-136.

Wang, Y. & Tian, X. (2023). Research on the development dilemma and countermeasures of unmanned retail in the era of digital intelligence. *Operations Research and Fuzziology, 2023, 13,* 847.

Wang, Z. & Yang, Z. (2017). Research on artificial intelligence technology and thoughts on future intelligent information service system. *Telecommunications Science, 2017, 33*(5), 1-11.

WMS Analyseis. (2000). *Practical Application of SPSS Statistics (Vol. 9). China Railway Publishing House. (Vol. 9).* Beijing: China Railway Press.

Ye, C. (2017). Rise of new retail model--unmanned retail store. *Financial Technology Era, 2017, 25*(8), 86-86.

Yu, H. (2017). The "new outlet" of unmanned retail stores. *Decision Making, 2017,* (9), 77-79.

Zhang, H.-B., Zhou, Y.-Z., Dong, L.-J., Lei, Q. & Du, J.-X. (2021). Design and implementation of a vision-and-grating-sensor-based intelligent unmanned settlement system. *IEEE Transactions on Artificial Intelligence, 2021, 3*(2), 254-264.

Zhou, X., Liu, W., Jiang, W. & Zhu, J. (2017). A cloud-based intelligent management and control of unmanned stores. (Online). https://patents.google.com/patent/CN207337465U/zh, July 17, 2023.