JKSCI

한국컴퓨터정보학회논문지
Journal of The Korea Society of Computer and Information
Vol. 27 No. 9, pp. 217-224, September 2022
https://doi.org/10.9708/jksci.2022.27.09.217

Research on the Continuous Use Intention of Mobile Bus Payment App from the Perspective of user Quality Perception

Shuo Li*, Cong-Ying Sun**

*Senior Economist, China Transport Telecommunications and Information Center, National Public Transportation Card Operation Center, Beijing, China
**Student, Dept. of Global Business, Kyonggi University, Seoul, Korea

[Abstract]

Based on the success model and Expectation Confirmation model of information system, the concept model of mobile bus payment App users' willingness to continue using is constructed by introducing function quality and interface design quality. A total of 264 valid questionnaires are obtained by issuing online questionnaires, and the model is tested by SmartPLS3.0 software The results show that users' perceptions of information quality, system quality and interface design quality will affect users' perceived usefulness and satisfaction through the scene, and then affect users' willingness to continue to use; Perceived functional quality has a significant impact on perceived usefulness, but has no significant impact on satisfaction. Perceived usefulness has a significant impact on user satisfaction.

▸ **Key words**: Mobile Bus Payment App, Continuous Use Intention, User Quality Perception, Perceived Usefulness, Satisfaction

[요 약]

본 연구는 D&M 모델과 ECM모델을 기반으로 소비자가 대중교통 모바일 결제 앱을 지속적으로 사용하는 데 영향을 미치는 연구 모델을 구축하였다. 온라인 설문조사를 통해 중국 베이징지역에서 264개의 유효한 설문지를 획득하여 Smartpls3.0으로 분석하였다. 연구 결과는, 지각된 정보의 질, 지각된 시스템의 질, 그리고 지각된 인터페이스 설계의 질은 지각된 유용성과 만족을 통하여 소비자 지속적 사용의도에 유의한 긍정적 영향을 미치는 것으로 나타났다. 지각된 기능의 질은 단지 지각된 유용성만을 통해 지속적 사용의도에 긍정적인 영향을 미치는 것이다.

▸ **주제어**: 모바일 버스 결제 앱, 지속적인 이용의도, 사용자 품질 지각, 지각 유용성, 만족

• First Author: Shuo Li, Corresponding Author: Cong-Ying Sun
*Shuo Li (2072444@qq.com), China Transport Telecommunications and Information Center, National Public Transportation Card Operation Center
**Cong-Ying Sun (476535211@qq.com), Dept. of Global Business, Kyonggi University
• Received: 2022. 08. 02, Revised: 2022. 09. 13, Accepted: 2022. 09. 14.

http://www.ksci.re.kr pISSN:1598-849X | eISSN:2383-9945

I. Introduction

At present, mobile payment has become the main means of urban public transportation. In Beijing, China, for example, 70% of passengers used mobile payments and took public transport in 2021. Through combing the relevant literature, it is found that the current research on the application of mobile public transportation in China mainly focuses on the technology development and application status, while there is less research on the willingness of users to continue to use. For example, Pan Zhihong and others designed a mobile public transportation app with real-time station reporting and arrival reminder functions based on the haversine formula and the heartbeat charter computing method [1]. Zhang Guifen and others proposed the design scheme of intelligent public transportation system [2], Liang Tian et al. Investigated the intelligent transportation app developed by the local government and found that the user experience was poor [3].

Users are who use mobile bus payment Apps. In the past two years, with the continuous expansion of various mobile payment service providers in the field of public transport, the number of Apps that users can use in daily transportation has increased continuously. By combing the relevant literature, it is found that the current research on the Application of mobile bus payment mainly focuses on the technology development and Application status, while there is few research on the willingness of users to continue to use. Users have the most say whether the App design is successful . Therefore, from the perspective of user quality perception, this study constructs a conceptual model of mobile bus payment App users' willingness to continue to use, and identifies the core factors affecting users' willingness to continue to use through hypothesis testing, in order to provide reference for the development of relevant industries.

II. Theoretical background

1. D&M model

Delone and McLean believe that system quality, information quality, system use, user satisfaction, personal influence and organizational influence are the six main dimensions reflecting the success of information system. They preliminarily put forward the influence relationship between each dimension and form the initial D&M (Information System Success model). With the continuous development of the information system field, Delone and McLean updated the model, added service quality to the quality dimension, considered the use intention in the use of the system, combined the personal impact and organizational impact into net benefits, and finally formed the D & M model. Subsequently, the D & M model is widely used in different fields and verified. Sun Shaowei and other research on the user's continuance of using WeChat official account in library based on D&M model [4]. Mo Hammadi integrated technology acceptance model (TAM) and D&M model to study the user satisfaction and use intention of e-learning system [5].

2. Modified Expectation-Confirmation Model

Oliver puts forward the Expectation Confirmation Theory (ECT) in 1980, which believes that the higher the degree of conformity between consumers' pre purchase expectations and post purchase performance, the more satisfied consumers will be and the greater the possibility of repurchase or use. Bhattacherjee proposed ECM (Expectation Confirmation model) based on ECT in 2001. The model introduces perceived usefulness to study the potential changes and impact of expectations after purchase. Through empirical research, it shows that Expectation Confirmation affects users' willingness to continue to use by affecting perceived usefulness and satisfaction.

Since ECM was proposed, scholars at home and abroad have integrated different theories according to different research backgrounds to

study user satisfaction and sustainable use intention. Zhao Xueqin and others integrated TAM and ECM to study the users' continuous use intention of WeChat App [6]. Dong Qingxing and others built a research model of users' sustainable use intention in online health community based on ECM and perceived value theory [7]. Joo et al. introduced resource quality on the basis of ECM to study the continuous use intention of online library resources (OLRS) users [8].

By combing the above relevant literature, it is found that D & M and ECM models are widely used in the research of users' willingness to continue to use in the field of information system. Therefore, this paper attempts to add functional quality and interface design quality on the basis of introducing the information quality and system quality in D&M model and the perceived usefulness and satisfaction in ECM.From the perspective of user quality perception, this paper constructs a conceptual model of mobile bus payment App users' willingness to continue to use.

Although there are many researches on mobile payment in e-commerce, there are few researches on consumers' willingness to use mobile payment in the field of public transportation by searching relevant literature. This may be because the academic community has not studied mobile payment in public transportation as a topic in the field of e-commerce. Therefore, this paper makes use of the model commonly used in the field of e-commerce to study consumers' continuous use intention, which has certain innovative value.

III. Research Hypothesis and Model

1. Hypothesis

1.1 Information Quality

Information quality refers to the quality of system output content, which can be measured by indicators such as relevance, comprehensibility and timeliness [9]. Scholars suggest that the information quality should be taken as the key index to evaluate the success of the information system [10]. If the public transport payment service provided by the mobile bus payment App to users is more accurate, timely and stable, the users will have a stronger user perception of the App, so as to improve user satisfaction. Therefore, this paper puts forward the following assumptions:

H1a: The perceived information quality of mobile bus payment App users significantly (+)affects the perceived usefulness.

H1b: The perceived information quality of mobile bus payment App users significantly (+)affects satisfaction.

1.2 System Quality

System quality reflects the success of system technology. System flexibility, response timeliness and reliability are often used to evaluate system quality [10]. The significant impact of system quality on users' perceived usefulness and satisfaction has been fully verified in the fields of mobile library, e-government and so on. When the mobile bus payment App system has strong flexibility and can quickly respond to the needs of users, users will perceive that the App has high system quality, so as to enhance users' useful perception and satisfaction with the mobile bus payment App. Therefore, this paper puts forward the following assumptions:

H2a: The perceived system quality of mobile bus payment App users significantly (+)affects the perceived usefulness.

H2b: The perceived system quality of mobile bus payment App users significantly (+)affects satisfaction.

1.3 Function Quality

Functional quality refers to the use value of products and is the standard to evaluate whether products are useful. Relevant research shows that the functional quality of products has a significant impact on user experience. Yao Yuan and other

certificate users' functional experience of mobile library significantly affects users' experience level [11]. Chen Juan and other researchers have shown that the functional quality of WeChat platform has a great impact on user experience [12]. When the mobile bus payment App provides users with rich functions and can greatly meet the public transport travel needs of different user groups, users will have a perception of the App with comprehensive functions and excellent quality, so as to enhance users' useful perception and satisfaction of the mobile bus payment App. Therefore, this paper puts forward the following assumptions:

H3a: The perceived function quality of mobile bus payment App users significantly (+)affects the perceived usefulness.

H3b: The perceived function quality of mobile bus payment App users significantly (+)affects satisfaction.

1.4 Interface Design Quality

As the most intuitive embodiment of user experience, high-quality interface design will bring users a pleasant user experience [13]. Liu et al. explored the impact mechanism of the aesthetic design quality of the home page of the job search website on user satisfaction. The results show that the aesthetic design quality has an indirect impact on user satisfaction through perceived ease of use and emotion [14]. Huang Wulan et al. found that the quality of interface design significantly affects users' experience of mobile library [13]. When users find a clear and comfortable layout of the App, they think it is useful for users to understand the language of the App, and then they can improve the user's satisfaction with the mobile payment module. Therefore, this paper puts forward the following assumptions:

H4a: The perceived interface design quality of mobile bus payment App users significantly (+)affects the perceived usefulness.

H4b: The perceived interface design quality of mobile bus payment App users significantly (+)affects satisfaction.

1.5 Perceived Usefulness

Perceived usefulness refers to the extent to which people believe that using a specific system or Application can improve their job performance [15]. The significant impact of perceived usefulness on user experience has been widely confirmed. When the user perceives that the mobile bus payment App can reduce the carrying items, rapid transit and reduce the waiting time for recharge and ticket purchase, the user will be satisfied with the App and enhance the willingness to continue to use it. Therefore, this paper puts forward the following assumptions:

H5: Users' perceived usefulness significantly (+)affects their satisfaction with mobile bus payment App.

H6: Users' perceived usefulness significantly (+)affects their willingness to continue using the mobile bus payment App.

1.6 Satisfaction

Satisfaction refers to the emotion generated by people after using a specific system or Application, which is expressed as a positive or negative feeling [16]. In the research context of mobile bus payment App, if the user is satisfied after using the mobile bus payment App, the user may continue to use the App during the next transportation trip, so as to enhance the user's willingness to continue to use it. Therefore, this paper puts forward the following assumptions.

H7: Users' satisfaction with mobile bus payment App significantly (+)affects their willingness to continue using it.

According to the above research assumptions, the conceptual model is shown in Figure 1

2. Model

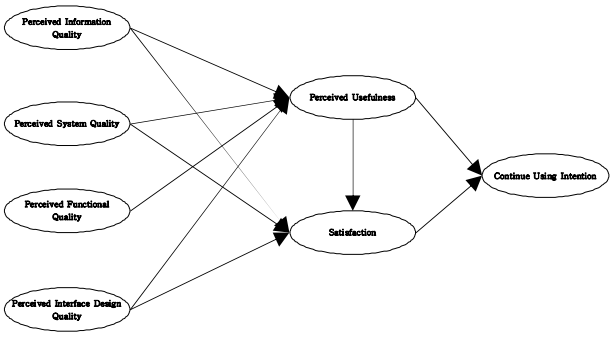


Fig. 1. Study Model

IV. Research Design

1. Scale Design

The measurement items of the dosage table in this study are derived from mature scales at home and abroad, and are adjusted and improved according to the characteristics of mobile bus payment App. In order to ensure the accuracy and comprehensibility of the questionnaire items, a small number of users are invited to conduct a pre survey before the formal distribution of the questionnaire, and the relevant items are corrected according to the pre survey results, so as to finally form a formal questionnaire. The items measured in the scale are measured by Likert level 5 scale, in which " - 2" stands for very disagreement, "0" stands for general and "2" stands for very agreement.

2. Data Collection

Due to COVID-19, in this study the questionnaire survey in this study was conducted online and was conducted among passengers in Beijing. the online questionnaire was distributed by snowballing through the Questionnaire-Star platform. A total of 372 questionnaires were collected. The questionnaires with no use experience, more than 90% repetition rate of answers and inconsistent answers were excluded. Finally, there were 264 valid questionnaires, and the effective rate of the questionnaire was 71%. In terms of gender structure, the proportion of men and women is the same, accounting for 47.3% and 52.7% respectively; In terms of age structure, users aged 20-30 account for the most, accounting for 77.7%; In terms of vocational structure, students account for the largest proportion, 73.9%; In terms of usage frequency, users who use 1-3 days a week account for the most, accounting for 85.2%; In the process of use, the problems such as "unstable system", "imperfect function" and "chaotic interface setting" are more prominent.

V. Data Analysis

In this study, with the help of smartpls 3.0 software, partial least squares structural equation model (PLS-SEM) technology was used to analyze the sample data. PLS-SEM is applicable to the research with relatively small number of samples and low restriction on the normal distribution of sample data [17]. PLS-SEM has higher statistical power than covariance based structural equation model (CB-SEM) [18].

1. Measurement Model

Firstly, through the Cronbach coefficient (α) And combined reliability (CR) to evaluate the reliability of the research scale. As shown in Table 1, the of each latent variable α The coefficient and Cr value are higher than the standard of 0.7, indicating that the scale of this study has sufficient reliability.

Secondly, the validity of the research scale is evaluated by content validity, convergent validity and differential validity. Thanks to the scales of this study are adapted from the maturity scales at home and abroad, the scales have good content validity.

Factor load and average variance extraction (AVE) are important evaluation indicators of convergence validity. It can be seen from table 1 that the factor load of each measurement item is higher than the standard of 0.7; The ave values

Table 1. Factor load, α, CR and AVE values were measured by questionnaire

Latent Variable	Measurement item	Factor load	α	CR	AVE
Perceived information quality (PIQ)	1.The app provides correct, accurate and error free information	0.827	0.754	0.859	0.67
	2. The app provides comprehensive, complete and user required information	0.839			
	3. The app updates information in time and provides users with the latest information	0.789			
Perceived system quality (PSQ)	1. During the use of the app, the operation is smooth and does not get stuck	0.856	0.752	0.858	0.669
	2. During the use of the app, there is timely response or feedback for each step of operation	0.837			
	3. During the use of the app, there were no failures such as black screen, flash back and failure to provide services	0.757			
Perceived functional quality (PFQ)	1. The app provides rich use functions	0.83	0.746	0.855	0.663
	2. The functions provided by the app can be realized	0.74			
	3. The function provided by the app can meet my actual needs	0.868			
Perceived interface design quality (PIDQ)	1. I like the display style of the app (such as comfortable color matching, font size reasonable, picture and text ratio appropriate, etc.)	0.811	0.819	0.892	0.733
	2. The structure of the app interface is clear and it is easy to find the required services	0.889			
	3. The characters and symbols displayed on the interface or function of the app platform are easy to understand	0.868			
Perceived usefulness (PU)	1. In an unfamiliar area, the app can guide me to my destination smoothly	0.824	0.796	0.88	0.71
	2. This app can shorten my travel time	0.837			
	3. In general, the app is useful for my travel	0.866			
Satisfaction (SA)	1. I think using this app is a wise decision	0.843	0.823	0.895	0.739
	2. I am satisfied with the experience of using this app	0.899			
	3. The app meets my expectations	0.837			
Continue using Intention (CI)	1. I intend to continue using mobile bus payment apps	0.847	0.807	0.886	0.722
	2. I will not look for other apps to replace the app I currently use	0.854			
	3. If someone asks for my opinion, I am willing to recommend others to use this app	0.847			

are higher than the standard of 0.5, indicating that the scale has high convergent validity. The evaluation criterion of discriminant validity is that the root of ave of each latent variable is greater than its correlation coefficient with other latent variables [19]. As shown in Table 2, the root of ave of each latent variable meets the above criteria, indicating that the scale has good discriminant validity.

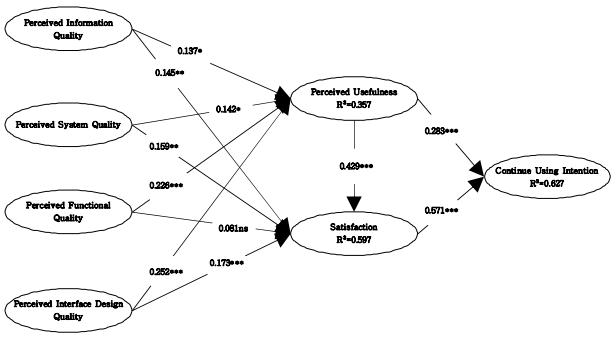
2. Structural Model

The rate (R2) and path coefficient are explained by the variance of each endogenous potential variable (β) As shown in Figure 2, the variance interpretation rates of this research model for continuous use intention, perceived usefulness and satisfaction are 62.7%, 35.7% and 59.7% respectively. In terms of significance, except that perceived functional quality is not significant to satisfaction, other hypotheses have been verified, that is, H1aH1b, H2aH2b, H3a, H4aH4b, H5, H6 and H7 are true and H3b is not true.

The predictive validity (Q2) of the structural model is evaluated by nonparametric test (stone geisser test). When Q2 > 0, it indicates that the structural model has predictive correlation [20]. The test results show that the Q2 values of perceived usefulness, satisfaction and willingness to continue use are 0.241, 0.429 and 0.446 respectively, indicating that the structural model of this study has good predictive correlation.

Table 2. Discriminant validity analysis

	PIQ	PSQ	PFQ	PIDQ	PU	SA	CI
PIQ	0.819						
PSQ	0.44	0.818					
PFQ	0.561	0.453	0.814				
PIDQ	0.454	0.519	0.467	0.856			
PU	0.441	0.436	0.485	0.494	0.842		
SA	0.528	0.536	0.523	0.571	0.687	0.860	
CI	0.490	0.539	0.544	0.585	0.675	0.765	0.849
Note: the data at the bottom left of the table is the correlation coefficient, and the diagonal BOLD data is the root and value of Ave							



*: P<0.05, **: P<0.01; ***: P<0.001; ns: non-signficant
Fig. 2. PLS-SEM Analysis Results

VI. Conclusion and discussion

1. Theoretical enlightenment

Firstly, users' perception of information quality, system quality, function quality and interface design quality of mobile bus payment App significantly affects its perceived usefulness. This conclusion is consistent with the research of Chen Juan et al. [12] and Huang Wulan et al. [13]. This study found that perceived interface design quality (β = 0.252) has the greatest impact on users' useful perception and perceived function quality (β = 0.226).

Secondly,the effect of perceived functional quality on user satisfaction is not significant, which is inconsistent with the research of Yao yuan et al. [11]. The possible reason is that the main purpose of current users using mobile bus payment App is to complete the bus payment function in real time, while the existing mobile bus payment App can basically meet the needs of users. When users do not encounter more than their expected use functions in the process of use, they will only feel the usefulness of the App and will not be satisfied.

Thirdly, perceived usefulness and satisfaction are the two main factors affecting users' willingness to continue to use, and satisfaction is significantly affected by perceived usefulness. This conclusion verifies the Applicability of ECM in the Research scenario of mobile bus payment App. Satisfaction (β= 0.571) has the greatest impact on users' willingness to continue to use.

2. Practical enlightenment

Firstly, in the development stage of mobile bus payment App, we should pay attention to the design of quality dimension. In terms of information quality, mobile bus payment App operators should provide users with comprehensive, accurate, timely and reliable real-time travel information, so that users feel that the services provided by the App are convenient and easy to use for their own transportation. In terms of system quality, improve the fluency and response timeliness of mobile bus payment App, so that users can complete public transport payment services quickly and smoothly.

And when developing mobile bus payment App, operators should focus on the interface design and function of the App. In terms of interface design, operators should ensure that the interface is concise and easy to operate, and advertising can be Appropriately reduced to improve the efficiency of users' access to information. In terms of function quality, on the basis of meeting the basic functions, some humanized practical functions can be added. For example, with the help of 5G(5th Generation Mobile Communication Technology) technology, it can provide real-time bus congestion information for mobile bus payment App users, so that users can arrange their own travel plan in advance.

Secondly,, mobile bus payment App operators should not only pay attention to information quality, system quality and interface design quality, but also pay attention to function quality in the future design. More high-quality practical functions can be added to improve user satisfaction.

Thirdly, in the future development, mobile bus payment App operators can improve user satisfaction and willingness to continue to use by enhancing users' quality perception.

3. Limitations and future prospects

Although this study has important reference value for the development of mobile bus payment App, it still has deficiencies. Firstly, compared with the huge number of users of mobile bus payment App, this study collects data on the premise that the data is effective and the research problems can be solved.

The effective sample size of is relatively small; Secondly, due to the limitation of sample size, this study does not consider the impact of sample demographic characteristics (such as gender, age, occupation, etc.) on users' willingness to continue to use. Further research on the above deficiencies will be carried out in the follow-up, in order to provide more perfect suggestions.

REFERENCES

[1] Z.H. Pan, Z. P. Wan, H. M. Xie, "Research on smart bus application based on mobile perception under cross platform framework. Computer engineering and application," No. 19, pp. 243-247, 2018.

[2] G. F. Zhang, W. Shen, J. Liu. "Design and implementation of intelligent public transport information acquisition system. Surveying and mapping bulletin," No. 4, pp. 121-124, 2017.

[3] T. Liang, G. C.Peng, F. Xing. "Application status and problem analysis of smart city app in China. Library and information work," No. 8, pp. 65-73, 2019.

[4] S. Sun, C. Gan and C. Song, "Research on the continued use intention of WeChat official account in library based on D & M," Library Forum, No. 1, pp. 101-108, 2017. DOI: 10.3969/j.issn.1002-1167.2017.01.015

[5] H. Mohammadi, "Investigating users' perspectives one learning : An integration of TAM and is success model," Computers in Human Behavior, Vol. 45, pp. 359--374, 2015. DOI: 10.1016/j.chb.2014.07.044

[6] X. Zhao and S. Wang, "Research on the influencing factors of WeChat Applet users' continuous use intention," Modern Intelligence, Vol. 39, No. 6, pp. 70-80,90, 2019. DOI: 10.3969/j.issn.1008-0821.2019.06.008

[7] Q. Dong, X. Zhou and F. Mao, "Research on users' sustainable use intention in online health community: Based on perceived value theory," Modern Intelligence, No. 3, pp. 3-14, 2019.

[8] S. Joo and N. Choi, "Understanding users' continuance intention to use online library resources based on an extended expectation-confirmation model," The Electronic Library, Vol. 34, No. 4, pp. 554-571, 2016.

[9] S. Petter, W. Delone and E. Mclean, "Measuring information systems success: Models, dimensions, measures, and interrelationships," European Journal of Information Systems, Vol. 17, No. 3, pp. 236--263, 2008.

[10] W. Delone and E. Mclean, "The DeLone and McLean model of information systems success: A ten-year update," Journal of Management Information Systems, Vol. 19, No. 4, pp. 9--30, 2003.

[11] Y. Yao and T. Xu, "Research on user experience evaluation structure model of mobile library," Journal of National Library, Vol. 27, No. 5, pp. 32-43, 2018. DOI: 10.13666/j.cnki.jnlc.2018.05.004

[12] J. Chen, Y. Zhong and S. Deng, "Analysis and demonstration of influencing factors of mobile social platform user experience: Taking WeChat as an example," Information Theory and Practice, Vol. 39, No. 1, pp. 95-99, 2016. DOI: 10.16353/j.cnki.1000-7490.2016.01.016

[13] W. Huang and T. Zhang, "Research on user experience of mobile library based on structural equation model: Taking the mobile library of Changzhou University as an example," Library Journal, No. 4, pp. 80-89, 2017. DOI: 10.13663/j.cnki.lj.2017.04.013

[14] W. Liu, F. Guo, G. Ye and X. Liang, "How homepage aesthetic design influences users' satisfaction: Evidence from China," Displays, Vol. 42, No. 1, pp. 25--35, 2016. DOI: 10.1016/j.displa.2016.02.004

[15] P. Usefulness, "Perceived ease of use, and user acceptance of information technology," Mis Q, Vol. 13, No. 3, pp. 319--340, 1989.

[16] A. Bhattacherjee, "Understanding information systems continuance: An expectation-confirmation model," MIS Quarterly, Vol. 25, No. 3, pp. 351--370, 2001.

[17] X. Xu, Z. Yao and T. Teo, "Moral obligation in online social interaction: Clicking the "like" button," Information & Management, Vol. 57, No. 7, pp. 103249, 2020. DOI: 10.1016/j.im.2019.103249

[18] W. Reinartz, M. Haenlein and J. Henseler, "An empirical comparison of the efficacy of covariance-based and variance-based SEM," International Journal of Research in Marketing, Vol. 26, No. 4, pp. 332--344, 2009. DOI: 10.2139/ssrn.1462666

[19] D. Gefen and D. Straub, "A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example," Communications of the Association for Information Systems, Vol. 16, No. 1, pp. 91-109, 2005.

Authors

Shuo Li, Senior Economist China Transport Telecommunications and Information Center, National Public Transportation Card Operation Center, China. Doctor Shuo Li, Graduated from Renmin University of China in 2011. Then joined China Transport Telecommunications and Information Center. Research for information and intelligibility transportation, urban public transportation IC card, cross-border retail payment services.

Cong-Ying Sun, Graduated from Renmin University in China. Now studying for a doctor degree at Kyonggi University. Cong-Ying Sun entered the Kyonggi University Korea in 2021. During the school period, her main research interests are global business, marketing and statistics.