ATLANTIS PRESS
Advances in Intelligent Systems Research, volume 148
International Conference on Information Technology and Management Engineering (ICITME 2018)

Assessing Task-Technology Fit in Uberization of Chinese Urban Transportation

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***Abstract*—In this paper, we discusses the transformation and upgrading of the logistics industry and the creation of the mobile Internet third-party freight O2O platform, most of the O2O platforms that emerged after 2014 are still in the initial stage. The pre-achievements obtained are often the distribution of android-based and iOS-based smart terminal apps and back-office service management systems. This will have an impact on Chinese urban transportation. We hope to understand the development and prospect of the platform in China. The TTF model framework combined with TAM model was used to study and analyze the driver's intention to adopt the freight O2O platform. It turned out that TTF has indirect influence on intention through usefulness and ease of use.**

Keywords—Task-Technology Fit; freight O2O platform; Uberization

I. INTRODUCTION

With the development of science and technology, all walks of life begin to combine with the Internet, including transportation industry. Uber is a good example. Its platforms can be accessed via its websites and mobile apps. As the first instant vehicle software, its success has attracted the attention of many industries. Following Uber's success, there was an influx of new startups modeled after Uber. In China, many Internet companies have developed "YiHuoDi", "EasyVan" and other freight O2O platform in combination with logistics companies. The value of such venture enterprises is only the strength of the ability to “push”, that is, the ability to attract drivers and shippers to register and publish information through offline promotion. Since 2014, with the rapid spread of smart terminals and 4G wireless communication networks, the access to Internet has significantly increased. At the same time, new taxi operating models driven by venture capital have achieved great success. It stimulated the creation of a large number of O2O platforms based on mobile Internet logistics, providing new opportunities for urban transportation.

Urban transportation is one of the main modes of modern transportation. It realizes "door-to-door" direct transportation in the collection and distribution of short- and medium-distance goods. It has the advantages of being flexible, mobile, and efficient. At present, Chinese urban transportation is facing challenges mainly from:

a) Low industrial concentration: The scale of business entities is small, and the market share of individual enterprises is low. According to CCTV's survey in 2014: China has more than 7 million logistics companies, owns more than 16 million vehicles, but 40% of them are the mode of one person and one vehicle.

b) Low level of informatization: Lack of urban command and dispatch system, low availability of source acceptance, station collection, distribution, vehicle tracking and time control coordination are common phenomenon.

c) Vehicle and cargo information is isolated: The car could not find the goods. The goods could not be found. As a result, the average waiting time for picking up was 78 hours. The average idling rate was as high as 50%.

d) The intermediary costs are high: Every cargo has been handled for five or six times before reaching the driver.

In China, although there are many third-party logistics companies, there are still negative problems. For example, asymmetric freight information, high logistics cost and high vacancy rate of trucks (over 40%). In 2006, the Ministry of Communications carried out inter-provincial urban transportation information system work in 13 provinces in order to establish urban transportation between provinces. Since then, a number of domestic urban transportation public information platforms have been launched. Although relying on the Internet, it is possible to collect a large number of information across regions, but it is constrained by poor skills of information technology, low level of Internet access, and low penetration rate of truck positioning equipment (GPS). The experience of the platform is relatively poor, and user loyalty is not high.

The emergence of freight O2O platform solves some problems of "cargo owners have difficulty finding cars" and "drivers have difficulty finding goods", and builds a bridge between cargo owners and drivers, meanwhile opens a new mode of logistics.

Given the social conditions in China, most truckers have corresponding enterprises affiliated, or have a fixed source of cargos. The driver are dependent on enterprise, and also their freight routes and regularly. It will be very difficult for logistics companies to accept the new model because they have basically formed their own operation mode and fixed supply of goods over the years. This has brought some difficulties to the promotion of freight O2O platform. Therefore, it is necessary to do more investigation on the development of freight O2O platform in China. From the perspective of the driver, this paper studies the intention of the driver to use the freight O2O platform. Taking TTF and TAM as the research framework; the purpose of this research is to examining the development

prospect of the freight O2O platform in urban transportation in China.

II. LITERATURE REVIEW

A. Freight O2O Platform

The emergence of freight O2O platform will provide great convenience for the transformation and upgrading of the logistics industry, and it is also an effective way for the logistics market to move towards standardization and specialization. At present, the combination of traditional logistics industry and Internet technology has become an irresistible trend (Chuanwei Sun, 2015) So far, the freight e-business field has no significant barriers to entry. The potential for innovation and market imagination is huge. Many mobile terminal platforms is in the state of frequent trial and error. (Hualun Liu, 2016) Under the healthy competition of social environment, and break the inherent form of transportation, only when we make the information between the owner and the truck driver transparent, can the development of the transport of goods getting better and better, and get a win-win situation between the owner and the driver. (Hongjie Dan, 2015)

Since 2014, 4G networks and intelligent terminals have brought a tremendous transformation to urban transportation. Since then, truck drivers have realized real access: mobile phones and vehicle-mounted flat panels are easy to use, allowing drivers to track information in time, transportation are dynamic, better routing, transparent management and control of the transportation process, reliable source information guarantee.

The mobile Internet third-party freight O2O platform is the logistics innovation and entrepreneurship model of “Internet + urban transportation”.

B. TTF and TAM

According to Goodhue and Thompson (1995), in order for technology to positively impact performance it must not only be utilized but also fit the needs of the user. They propose TPC (Technology-to-Performance Chain) to help users and organizations understand and use information technology more effectively. Task-technology fit (TTF) is the correspondence between task requirements, individual abilities, and the functionally of the technology. Individuals have a greater tendency to utilize technology if the capabilities of the technology fit the needs of the individual. Therefore, TTF can be a good predictor of technology utilization (Thomas Schrier, 2010). The TTF model, based on rational choice theory, assumes users will adopt technology provided that it has the characteristics necessary to support their tasks. TTF refers to the extent of technological capacity to support a task (S.H. Teo,2008). Lu and Yang (2014) defined TTF as the degree to which a technology assists users in performing their work or coursework. They also found that TTF as the degree to which a system is suitable for providing sufficient help to complete tasks and fit their requirements.

As an extrinsic motivational factor, the task–technology fit is associated positively not only with perceived ease of use but also with the perceived usefulness of hotel information systems (Kimet al., 2010). According to Davis (1989), TAM is often used to analyze individuals ’acceptance of new technologies. According to Venkatesh and Davis (2000), the main factors of the TAM model are perceived usefulness (PU) and perceived ease of use (PEOU). TAM purports that if a technology or innovation enhances a person’s performance and does not greatly increase the effort required to perform a function, it is considered useful and easy to use, and the person will be more likely to adopt the technology, service, or behavior. The validity and reliability of the perceived usefulness and perceived ease of use variables in TAM have been supported by many studies (Linda G. Wallace, 2014).

III. CONCEPTUAL MODEL

The standard TTF model includes task characteristics and technology characteristics, but due to the particularity of freight industry, the source of goods for Chinese truckers is also affected by social relations. Generally, the longer you stay in the industry, the wider your social network will be. It means years of employment will influence the TTF. Business relationships and historical factors can not be ignored. Under normal circumstances, freight drivers are more inclined to familiar and fixed transportation routes, cargo owners are also more inclined to have a successful cooperation experience of the driver. In fact, many distribution services are currently completed through acquaintances. So we put the individual characteristics into the model. Combining the TAM model above, the conceptual model is shown in figure I.

As for technology characteristics, we can track order online. All information is clearly displayed on the platform. Thus, tracking is a factor for technology characteristics. When it comes to task characteristics, the strongest effect of it was on TTF was from non-routines (Goodhue, 1995). We found that freight information on platform is random. It usually does not coincide with the normal route of the driver. So when drivers try to find orders on freight O2O platform, they need to arrange the route ahead.

The utilization of a model which examines intentions to use a new technology makes the hybrid TAM/TTF model a good fit for this study (Thomas Schrier, 2010).

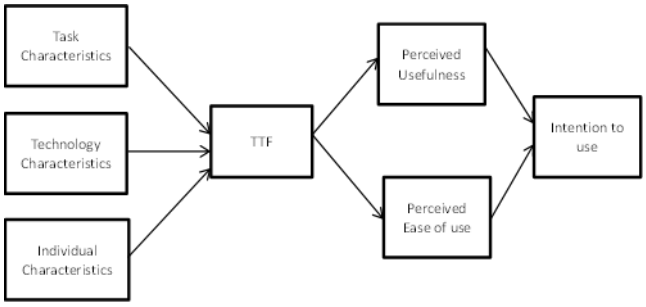

FIGURE I. CONCEPTUAL MODEL.

IV. METHODOLOGY

According to the seven parts of the model, we introduce fourteen items to design questionnaire. Questions were based on the literature review and discussions with a number of experts. The item of the questionnaire using the five-level Likert scale which is designed by the social psychologist Likert in 1932 based on the original sum scale improvement. From

low to high score 1 represents strongly disagree and 5 represents strongly agree. The factors which may influence TTF are divided into four dimensions. They are reliable, freight information, the success rate and payment respectively. Reliable means the data got from the platform are reliable. Moreover, the platform provides a large number of freight information which can be got by subscribers or drivers in need. Success rate means not only can we get information and find suitable orders, but also complete a transport without accident. Payment is also an indicator which cannot be ignored. Payment method and security need to be taken in to account by all the Internet companies. The first condition of trust platform is financial.

We selected a number of logistics companies which are located in east China area and distributed 300 questionnaires, and 218 useful questionnaires were obtained, the overall response rate was 72.7%.Within the scope of the whole China, logistics industries in east of China developed most rapidly.

Reliability of the items comprising each dimension was also examined using Cronbach's alpha and CITC. Reliability analysis is used to study the reliability and accuracy of quantitative data, especially attitude scale questions. If the value of α is higher than 0.8, it indicates high reliability. If this value is between 0.7 and 0.8, it means that the reliability is good. If this value is between 0.6 and 0.7, it means that the reliability is acceptable. If this value is less than 0.6, it means poor reliability. If CITC value is less than 0.3, we can consider delete the item.

The Cronbach's alpha scores for all the items are over 0.7, The CITC values corresponding to the analysis items were all higher than 0.6, indicating a good correlation between the analysis items and a good reliability level. Multiple linear regression analysis was carried out for the data collected. The results of multiple regression analysis are presented in Table 1.

TABLE I. TEST OF ALL KINDS OF CHARACTERISTICS ON TTF FACTOR

TTF Factor	Tracking	Arrangement	Non-Routine	Income	Employment	Adj.R Square
Reliability	0.406	0.17	0.336	0.011	0.004	0.428
Freight Information	0.473	0.135	0.223	-0.084	0.071	0.542
Success Rate	0.385	-0.09	0.471	-0.079	-0.092	0.513
Payment	0.442	0.068	0.351	0.007	-0.006	0.59

It can be seen from table I that arrangement is negatively related to success rate; income has negative correlation with freight information and success rate. Employment has negative correlation with success rate and payment. The rest of the variables more or less can explain part of the TTF factors. Tracking and non-routine are the most significant which can explain about 40% and 30% respectively. This indicates that task characteristic and technology characteristic can positively influence TTF, which confirmed the other research about TTF model, especially the tracking factor and non-routine factor. Table II shows that TTF has a positive influence on ease of use and usefulness. It indicates that that a combination of the two models would be a better indicator of technology acceptance (Dishaw and Strong, 1999).

TABLE II. TEST OF TTF FACTOR ON EASE OF USE AND USEFULNESS

	TTF Factor				
	Reliability	***Freight Information***	***Success Rate***	***Payment***	***Adj.R Square***
Ease of use	0.135	0.438	0.04	0.268	0.533
useefulness	0.264	0.096	0.215	0.402	0.632

The ease of use regression coefficient value is 0.330, and the P value is 0.000, which is less than 0.01, which means that ease of use has a significant positive impact on intention. Usefulness has a regression coefficient of 0.505 and a P value of 0.000, which is less than 0.01, meaning that usefulness has a significant positive effect on intention. The result was shown in Table III.

TABLE III. REGRESSION ANALYSIS RESULTS

	Unstandardized Coefficients		***Standardized Coefficients***	t	p	VIF	R^2	Adjusted R^2	F
	B	standard error	Beta						
constant	0.617	0.167	-	3.701	0.000**	-	0.607	0.603	166.107**
usefulness	0.505	0.053	0.527	9.501	0.000**	1.686			
Ease of use	0.33	0.056	0.329	5.919	0.000**	1.686			
Intention									
* p<0.05 ** p<0.01									

After summarizing and analyzing, it can be seen that both the ease of use and the usefulness have a significant positive influence on the intention, which can explain 52.7% and 32.9% respectively.

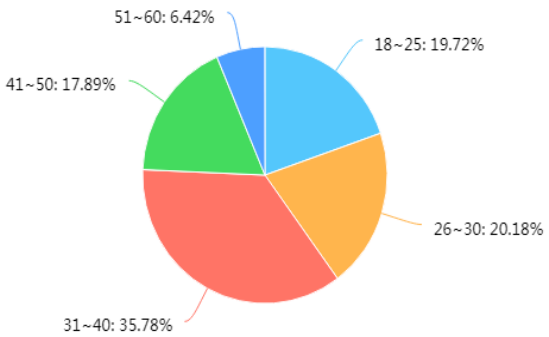

FIGURE II. AGE CHART

V. CONCLUSION

Based on the above data statistics, the influence of task characteristic and technology characteristic on TTF is greater than that of individual characteristic on TTF. However, the individual characteristic is still a part that cannot be ignored. It is important to note some research limitations, according to the chart (show in Figure II), most of the people who participated in the questionnaires were in low-middle income. Most of them are middle-aged and young people, they have not been involved in the freight industry for a long time. Thus, the intention of the people who have been in business for a long time using the O2O freight platform is not obvious. In general.

The longer the people who work in the industry, the higher their business capacity are, so the demand for the platform is not high. On the contrary, those who have just entered the market have a large demand for orders and need to use the platform to find suitable resources as an aid to business development.

At present, most of the platforms have not yet established a complete logistics information management system. The freight information is time-sensitive and geographically strong. It is impossible for trucks to wait for goods in one place for a long time. On the other hand, the source of goods and the source of vehicle is often a one-to-one match. The lower degree of informatization leads to slow development of platform enterprises. In addition, the current market is still in the stage of user promotion and market seizure, and the industry profit model is still blurred. It can be seen that, compared with the mechanism of taxi software, the trucking system for urban transportation faces greater and more complex technical difficulties.

Due to the lack of credit in the domestic urban transportation market, the serious proliferation of spam, the low degree of standardization of freight procedures, weak supervision and control of freight on the road, low level of Internet access, etc., only through deep processing of information, standardization of operations, and supervision and control of the whole process can improve the system availability, user experience and user loyalty. Then the role of public information platforms can be truly enhanced.

But the results of the study give a positive picture. The emergence of freight O2O platform can make use of mobile Internet technology to effectively integrate fragmented resources and fragmented demand. From the current point of view, the application of freight O2O platform is an innovation and a future development trend. In summary, on the basis of the third-party freight O2O platform, develop intelligent technology for urban transportation and achieve accurate and effective information push has a vital role to enhance user experience, information proliferation capabilities. It is the key to reshaping the socialization of the urban transportation market and to upgrade the level of logistics information technology. It has far-reaching implications on integrating urban freight resources, reducing logistics costs and developing a low-carbon recycling economy.

ACKNOWLEDGMENT

This research was supported by the Science and Technology Project of Zhejiang Province (No. LGF18G010002) and the Humanities and Social Sciences Foundation of the Ministry of Education (No.17YJA630015)

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