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An Analysis of Technology Acceptance Model

Exploring user acceptance and intension of taxi-hailing app in
Shanghai

*Bachelor of Science Thesis in the Programme Software Engineering and
Management*

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Abstract

This study examines the motivations, perceptions and adoption of users towards taxi-hailing app based on the Technology Acceptance Model(TAM) in a large metropolitan setting. Two hundred and eleven taxi-hailing app users were surveyed about their patterns of usage, demographic, perceptions about the technology, and their behavioural intentions to use online taxi-hailing service. The results of this study confirm the TAM that users' perceptions are significantly associated with their intentions to use cellular phones. Furthermore, perceived usefulness is the strongest determinant of users' attitudes and intentions toward taxi-hailing app, followed by perceived ease of use. Finally, implications of these findings for practice and research area are discussed.

Keywords: Technology acceptance model(TAM); Tail-hailing app; behavioural intentions; perceived usefulness

1. Introduction

Rapid advancements of mobile internet and smart phone has caused changes in Chinese consumer behaviour and altered traditional business paradigms. We note that an increasing number of traditional offline activities has been gradually challenged, and likely replaced by the online service. For instance, A quick click on a smartphone app not only eases stranded passengers' despair while they futilely attempt to secure a cab during rush hour, but also reduces drivers' downtime. According to Yao&Wang(2014) from J.P.Morgan, about 7% of total taxi orders in tier 1 cities are now processed through taxi-hailing apps, based on 1) Kuaidi(A taxi-hailing app partly owned by Alibaba processes 110,000 orders on average in a day, 2) there are roughly 50,000 taxies in Shanghai, 3) 45 daily average orders being processed per driver, 4) Kuaidi takes half of the taxi-hailing app market in Shanghai.

According to Vanessa Tan(2013), a editor of TechinAsia, the number of users using taxi-hailing apps exceeded 40 millions as of April 2013, which doubled compared to a month ago. Although the user growth is significant, there is still some evidence supporting the opposite fact that taxi-hailing app acceptance is faced with challenges. For instance, a report by Xing(2014), a researcher from NIT-Research, shows that about only about 70% of the users used the app to book taxis at least once a week in the first of 2014 in Shanghai. It means that 30% of the users that have tried taxi-hailing app didn't become active user.

One of the biggest challenges to researchers and analysts is increase our current understanding of the factors that influence taxi-hailing app acceptance in the light of the technology acceptance model (TAM) (Davis et al,1989). In this project, I collaborated with Beijing CSS-CA Software Technology Co., Ltd to identify factors which could drives user adoption for taxi-hailing app. Beijing CSS-CA Software Technology Co., Ltd. (abbr. CSS-CA) specialises in e-Government and enterprise-level integrated ICT solutions and services. Based on the existing taxi-hailing app, an integrated e-commerce and taxi dispatching management system is customised for Da Zhong Taxi & Leasing Car Company by CSS-CA. Therefore, an acceptance research on existing taxi-hailing app would be conducted before the development process.

The conclusion of this study is intended to contribute in two ways: in terms of research, in light of the Technology Acceptance Model(TAM), the purpose of this study is to examine the motivations, perceptions and behavioural intention of users towards taxi-hailing app in a metropolitan setting. And in terms of practice, this study attempted to increase users acceptance levels, developer and product managers should be able to identify a wide range of users preferences, intentions and purposes towards taxi-hailing system and should then be able to integrate these factors into the development process, preferably at an early stage (Shroff, Barret & Eugenia, 2011).

2. Theoretical Background

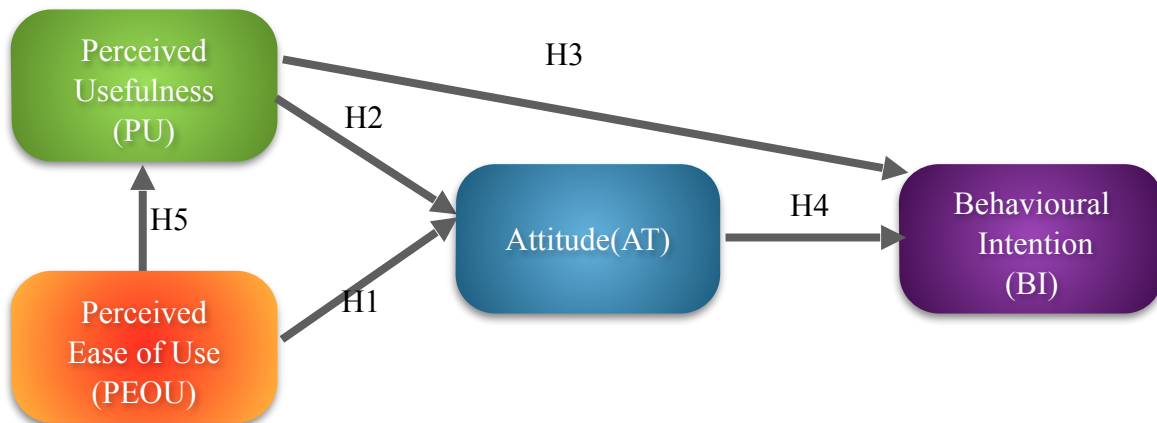
Over the decades, a variety of theories and models have been developed to address this problem. In 1989, Davis(1989) proposed the technology acceptance model(TAM) to explain and predict user's behaviour to use a technological innovation, specifically in user acceptance of an information technology. TAM is originally an extension of Theory Reasoned Action(TRA) (Fishbein and Ajzen,1975), a psychological theory that seeks to explain people's actions by identifying the causal connections between various components: beliefs, attitudes, intentions and behaviours. Unlike the TRA, TAM is built on two primary variables — independent variables which includes *perceived usefulness(PU)* and *Perceived ease-of-use(PEOU)* and the dependent variable *Attitude towards using(AT)*. Davis(1989) defined perceived usefulness as “the degree to which a person believes that using a particular system would enhance his or her job performance,” and defined perceived ease of use as, “the degree to which a person believes that using a particular system would be free of effort.” Furthermore, Davis(1993) theorized that actual information system usage is determined by behavioural intention, and the intention is jointly determined by the users' attitude toward using the system and perceived usefulness.

In previous studies, TAM has been widely used by information technology researchers to gain a better understanding of information technology(IT) adoption and its usage in organisations (Chismar and Wiley-Patton,2002). However, Legris et al.(2003) argued that it is imperfect as all TAM relationships are not borne out in all studies - there remains a wide variation in the predicted effects in various studies with different types of users and systems. This study by using Technology Acceptance Model(TAM) aims to investigate issues related to perceptions, intentions and attitudes towards using taxi-hailing application in a new setting.

3. Research Model and Related Hypotheses

In this study, the theoretical framework of taxi-hailing app user acceptance and intention is based on the technology acceptance model(TAM). Technology Acceptance Model is a robust but parsimonious theory and it is useful to explain a particular information system application. It has proven to be a useful theoretical model in helping to understanding and explain user behaviour in the information system implementation(Chen, S., Li, S & Li, C,2011). Therefore, base on the literature review of technology acceptance model(TAM), specific research model and hypotheses will be addressed included:

Figure1: Research Model Based on Original TAM (Davis et al., 1989)



Perceived Ease of Use (PEOU)

H1: Perceived ease of use (PEOU) will positively influence users' attitude towards taxi-hailing app.

Perceived Usefulness (PU)

H2: Perceived Usefulness (PU) will positively influence users' attitude towards taxi-hailing app.

H3: Perceived Usefulness (PU) will positively influence users' behavioural intention to use of taxi-hailing app.

Perceived Ease of Use (PEOU) and Perceived Usefulness (PU)

H4: Perceived Ease of Use (PEOU) will positively influence Perceived Usefulness (PU) of taxi-hailing app.

Attitude(AT) and Behavioural Intention(BI)

H5: Attitude towards taxi-hailing app will positively influence users' behavioural intention to use taxi-hailing app.

4. Methodology

This research would employ a survey research via a TAM questionnaire as a data collection approach which combined with linear regression model as a data analysis approach to test hypotheses about relations among primary variables of Technology Acceptance Model(TAM).

In terms of data collection, a total number of 300 survey self-administered questionnaire related to the measurement of factors would distribute to end-user of taxi-hailing app via online survey website wenjuan.com. The first section of questionnaire related to demographic questions including age, gender. The second would be close-end questions with a 5-point Likert

scale related to perceived risk, perceived usefulness, perceived ease of use, behavioural intention.

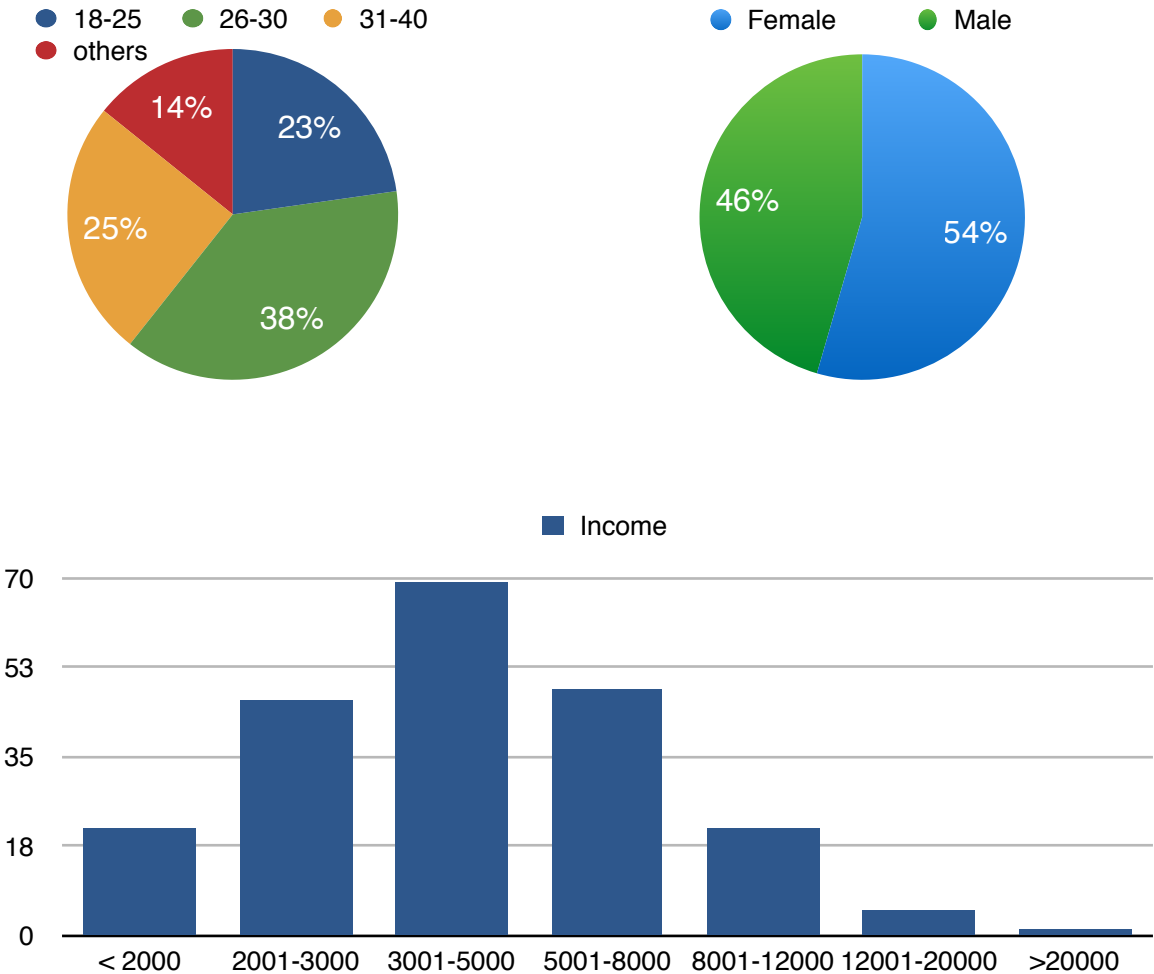
After that, a descriptive analysis would be used as data analysis approach of the demographic information of the respondents in the first place. Then, Reliability testing would be conducted to measure the internal validity and consistency of items used for each construct. Later, correlation analysis would be performed in order to measure the convergent of the items of TAM questionnaire (Al-Adwan & Smedley, 2013). Lastly, in order to test the five Hypotheses, linear regression models would be conducted by using the SPSS 22 analysis software.

5. Data Analysis and Result

5.1 Demographic Data

This questionnaire was administered to 211 respondents via online survey website wenjuan.com, giving a response rate of around 70%. Respondent consisted with 60.66% female and 39.34% male, age in the range of 25-30 years (37.91%), 30-40 years (25.12%), 18-25 (22.75%) and others. About 32.7% respondents' in sample make about 3001-5000 yuan per month. More demographics are detailed in Table 1.

Table 1: Demographic analysis



5.2 Instrument Reliability

The reliability analysis was conducted in order to check the internal validity and consistency of the items used for each factors by using spas 22 as the analysis tool. The result of Reliability Analysis are presented in Table 2. According to Nunnally(1978), questionnaire for the various factors of taxi-hailing app were judged to be well reliable measurement instrument, with the Cronbach's alpha scores were all above 0.8.

Table 2: Reliability

Factor	Items	Cronbach's alpha
Perceived Usefulness (PU)	4	0.88
Perceived Ease of Use (PEOU)	3	0.87
Attitude(AT)	4	0.89
Behavioural Intention(BI)	3	0.82

5.3 Correlation Analysis

After conducting the Reliability Analysis, I inspected the correlation coefficients to discover the relationships between four factors and investigate the hypotheses of the research model(See table 3). The analysis tool is also SPSS.

Table 3: Correlation

Factor		PEOU	PU	AT	BI
PEOU	Pearson Correlation	1	0.539**	0.637**	0.495**
PU	Pearson Correlation	0.539**	1	0.727**	0.764**
AT	Pearson Correlation	0.637**	0.727**	1	0.692**
BI	Pearson Correlation	0.495**	0.764**	0.692**	1

** . Correlation is significant at the 0.01 level (2-tailed).

The table above shows that the correlations between the PEOU, PU, AT and BI are positive and significant. This confirms the original hypothesis made in the literature concerning the Technology Acceptance Model.

5.4 Hypotheses Testing

To further enhance these findings, a regression analysis was conducted to test the H1 and H2. Table 4 summarises the result of regression shows blow.

Table 4: Predictors: PU & PEOU → Dependent Variable: AT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.783 ^a	.613	.609	.50840

a. Predictors: (Constant), PU, PEOU

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.284	.187		1.519	.130
	PEOU	.327	.048	.346	6.763	.000
	PU	.595	.056	.540	10.542	.000

a. Dependent Variable: AT

As we can see from the table 4, the value of R square indicates that the two predictors(PU, PEOU) explained 61.3% of the variation in Attitudes to use. It means that this model is a rational model, although there are other unknown factors may impact on the users' attitude to use taxi-hailing app which are not accounted in this model. The standardised coefficients(β) shows that Perceived Usefulness ($\beta = 0.540$) have larger impact than the Perceived Ease of Use ($\beta = 0.346$). Also, the Sig indicates that both of the predictors had a significant and positive impact on AT scores at the 0.001 level.

Subsequently, a linear regression model was also used to test H3 and H5 which are the impact of Perceived Usefulness and Attitude on users' behavioural intention towards taxi-hailing app.

Table 5: Predictors: PU & AT → Dependent Variable: BI

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.789 ^a	.623	.619	.49837

a. Predictors: (Constant), AT, PU

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.313	.178		1.755	.081
	PU	.605	.068	.553	8.931	.000
	AT	.288	.062	.290	4.673	.000

a. Dependent Variable: BI

As appears in Table 5, it confirmed the H3 that Perceived Usefulness(PU) had a significant effect on Behavioural Intention(BI), with $\beta = 0.553$, Sig = 0. While Attitude Toward (AT) had a positive influence on dependent variable BI, with $\beta = 0.290$, Sig = 0.

Finally, another linear regression model was determined to investigate the influence of Perceived Ease of Use(PEOU) on Perceived Usefulness (PU) (see Table 6 below).

Table 6: Predictors: PEOU → Dependent Variable: PU

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.539 ^a	.291	.287	.62348

a. Predictors: (Constant), PEOU

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.985	.184		10.807	.000
	PEOU	.462	.050	.539	9.251	.000

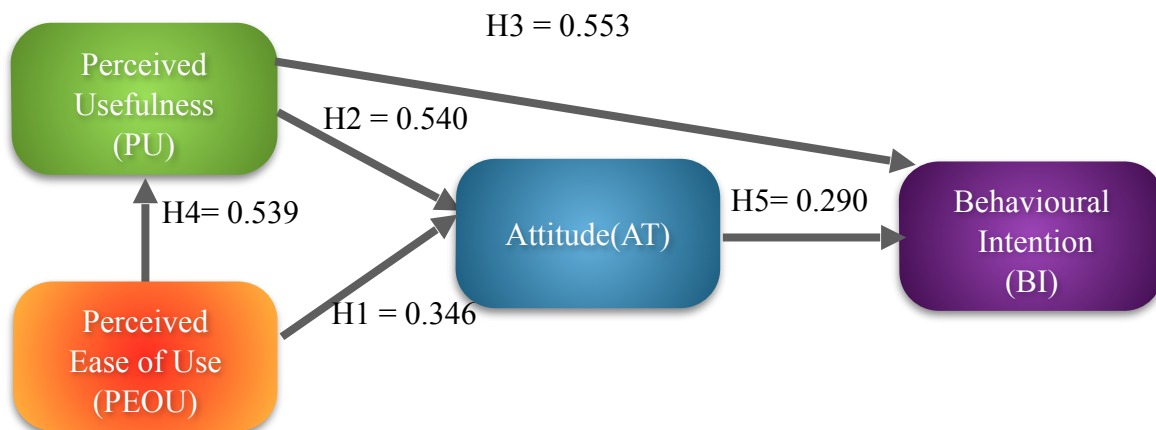
a. Dependent Variable: PU

As seen, the R Square value (0.291) is low, thus indicating that PEOU explained only 29.1% of the variation in PU. Based on Standardised coefficient value ($\beta = 0.290$), Perceived Ease of Use (PEOU) had significant impact on Perceived Usefulness (PU).

Table 7: Summary of hypothesis testing

Hypothesis	Specification	Results
H1	Perceived ease of use (PEOU) will positively influence users' attitude towards taxi-hailing app	Supported (($\beta = 0.346$, $p < 0.001$))
H2	Perceived Usefulness (PU) will positively influence users' attitude towards taxi-hailing app	Supported (($\beta = 0.54$, $p < 0.001$))
H3	Perceived Usefulness (PU) will positively influence users' behavioural intention to use of taxi-hailing app .	Supported (($\beta = 0.553$, $p < 0.001$))
H4	Perceived Ease of Use (PEOU) will positively influence Perceived Usefulness (PU) of taxi-hailing app.	Supported (($\beta = 0.539$, $p < 0.001$))
H5	Attitude towards taxi-hailing app will positively influence users' behavioural intention to use taxi-hailing app.	Supported (($\beta = 0.29$, $p < 0.001$))

Figure 2: Linear regression model results



In summary, the results of linear regression analyses confirmed the five hypothesis. Perceived Usefulness (PU) had the strongest impact on Behavioural Intention (BI), followed by the influence of Perceived Usefulness (PU) on Attitude Toward (AT) using taxi-hailing app. Perceived Ease of Use (PEOU) also had positive impact on users Attitude Toward (AT) taxi-hailing app, although the magnitude of the effect was moderate. Finally, Users' Attitude had small influence on their Behavioural Intention (BI).

6. Discussion

The purpose of this study was to determine if the TAM could legitimately be applied in an taxi-hailing app by examining the relationship between PEOU, PU, AT and BI to taxi-hailing app.

Results highlighted that users' intention to use taxi-hailing app is mostly determined by usefulness of the application. Consistent with prior research (Davis, 1989), perceived usefulness was found to have a significant impact on users' attitude and intention to use taxi-hailing app when they need a taxi. An explanation might be that users are willing to adopt a beneficial application which could make their life convenient. This findings support current research which suggests that in order to foster individual intention to use a technology, positive perception of the technology's usefulness is crucial (Masrom, 2007). Furthermore, the result of this study also indicated that perceived ease of use (PEOU) had a strong influence no perceived usefulness (PU). This may suggest that providing proper user training is essential for improving users' perception of the usefulness of a new technology. The results of this study confirms that TAM can be legitimately used to explain the users' adoption of taxi-hailing application.

7. Conclusion

This paper presents the findings obtained from the data analysis of the survey that was conducted to examine the motivations, perceptions and behavioural intention of users towards

taxi-hailing app in a metropolitan setting. Taxi-hailing apps are a subset of O2O (online to offline) service, which may lack proper evaluation in terms of design, development, marketing. In order to increase users' acceptance level, developer and product managers should be able to identify a wide range of users preferences, intentions and purposes towards taxi-hailing system and should then be able to integrate these factors into the development process.

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Appendix A: Taxi-hailing App Usage Questionnaire

Section 1

Demographic variables	Description
Age	Younger than 18
	18~25
	25~30
	30~40
	40~50
	Elder than 50
Gender	Male
	Female
Income	<2000
	2001-3000
	3001-5000
	5001-8000
	8001-12000
	12001-20000
>20001	

Section 2

Varibales in TAM	Items
Perveived ease of use (PEOU)	I feel that most taxi-hailing app are easy to interact with.
	Learning to use the Taxi-hailing app on mobile phone was easy for me.

Varibales in TAM	Items
	The tutorial of most taxi-hailing apps was clear and understandable.
Perceived usefulness (PU)	Using taxi-hailing app helps me get better service.
	I find that the taxi-hailing app improve my travel convenience.
	I find it easier to get a taxi using taxi-hailing app than picking up a cruising cab.
	Using taxi-hailing app saves my time.
Attitude toward taxi-hailing App	Using the taxi-hailing app is a pleasant experience for me.
	I feel using taxi-hailing apps is a wise choice.
	I have a generally favourable attitude towards using taxi-hailing app.
	Overall, I enjoyed using taxi-hailing app.
Intention to use taxi-hailing app	I intend to continue use taxi-hailing app when I need a taxi.
	It is likely that I will use taxi-hailing app in the future.
	When I need to book a taxi, I prefer using taxi-hailing app to pick up a cursing taxi.