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Citation for published version:

Utomo, DS & Prasannam, P 2023, 'Factors Influencing Thai Consumers to Adopt Crowdshipping', Paper presented at 27th Annual Conference of The Chartered Institute of Logistics and Transport (UK) - CILT (UK), Logistics Research Network (LRN), Edinburgh, United Kingdom, 6/09/23 - 8/09/23 pp. 547-554.

Link:

[Link to publication record in Heriot-Watt Research Portal](#)

Document Version:

Publisher's PDF, also known as Version of record

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FACTORS INFLUENCING THAI CONSUMERS TO ADOPT CROWDSHIPPING

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1. Introduction

Following the global trends, Thailand's urban growth and development led to severe traffic congestion and pollution, negatively impacting human health, resulting in 6,800 deaths in Bangkok due to poor air quality in 2020 and causing economic losses of 81.4 billion baht (Burton, 2020). Thus, Thailand should decrease the number of vehicles on its roads to benefit its environment and citizens' health. Yet, with increasing e-commerce trends, the traffic may worsen unless eco-friendly delivery methods are utilized.

The increase in e-commerce has led to more traffic for last-mile deliveries, especially during COVID-19 when consumers shifted to online shopping (Chayomchai et al., 2020). In Thailand, online shopping rose from 54% in 2019 to 65.1% in 2022, with a change in purchasing habits towards groceries and second-hand items, causing a 63.3% rise in annual online spending (Kemp, 2019, 2022). Consequently, the demand for delivery services has increased, exacerbating environmental issues associated with delivery logistics.

Crowdsourcing is a new model that satisfies the high demand for shipping, particularly last-mile delivery, where couriers use their own vehicles or public transport during their regular travels (Gatta et al., 2018). It mostly caters to takeaway meals and grocery delivery, but it is expanding into other areas (Pourrahmani & Jaller, 2021). Widespread adoption of crowdsourcing could alleviate traffic congestion and reduce the environmental impact and shipping costs of last-mile logistics (Mckinnon, 2016). Nevertheless, as will be discussed further in the literature review section, behavioural research exploring the factors that influence the use of crowdsourcing services are lacking due to its recent emergence.

Recently, many Asian nations have shown an increasing interest in crowdsourcing resulting in the launch of several new crowdsourcing services to meet the rising demand for deliveries (Mckinnon, 2016; Pani et al., 2022). However, despite the potential environmental and health benefits, there is a lack of research on crowdsourcing in Asia. The lack of research in Asia can be attributed to the fact that crowdsourcing was more popular in Western nations, especially before the COVID-19 pandemic triggered a global shift towards more online purchasing (Jeremić & Andrejić, 2019).

Due to the limited number of studies on crowdsourcing adoption, there is a lack of information available on crowdsourcing acceptance, especially in Asia. Thus, this research aims to fill this gap by examining the impact of demographic, technological, service-based, and consumer factors on crowdsourcing adoption in Thailand using Structural Equation Modelling (SEM).

Section 2 of this paper presents the state of the art of behavioural research relevant to crowdsourcing and the conceptual model proposed in this study. Section 3 discusses the data collection and analysis process. The result of data analysis is then presented in section 4. Section 5 provides conclusion and proposes potential future research.

2. Literature Review

2.1 Crowdsourcing Acceptance Research a State of the Art

Le et al. (2019) reviewed 57 crowdsourcing-related research papers and found that only about 12% of the studies had investigated the behaviour of stakeholders in this system. Gläser et al. (2021) reviewed 61 research papers and reported that only about 23% of the studies had examined factors affecting the acceptance of crowd logistics initiatives. Therefore, studying the behavioral aspects that influence crowdsourcing acceptance remains an important topic.

Table 1 summarises relevant previous behavioral research on crowdsourcing acceptance, categorized by case study (Case) and economic development level (Eco.Dev (The World Bank, 2021)). The studies are also classified as users or drivers (Pers), with users indicating whether a study measure the willingness of consumers to use a crowdsourcing platform as a sender or receiver, and drivers indicating whether a study measures the willingness to participate as a courier or driver. Finally, the previous studies are categorized based on the theoretical lens that have been adopted.

Table 1: Summary of previous studies based on the case, economic development, perspective and theory. Eco.Dev: Economic Development; HI: High income countries; LMI: Lower middle income countries; UMI: Upper middle income countries; Pers: Perspective; SN: Social network; UT: utility theory; SIT: Social Identity Theory; TRA: Theory reasoned action; PPM: Push–Pull–Mooring Theory; TAM: Technology acceptance model; DOI: Diffusion of innovation; N/A: Not mentioned.

Authors	Case	Eco.Dev	Pers	Theory
Devvari et al. (2017)	US	HI	Driver	SN
Miller et al. (2017)	US	HI	Driver	UT
Punel and Stathopoulos (2017)	US	HI	User	UT
Gatta et al. (2018)	Italy	HI	User	UT
Punel et al. (2018)	US	HI	User	UT
Ta et al. (2018)	US	HI	User	SIT
Felch et al. (2019)	Germany	HI	User	TRA
Le and Ukkusuri (2019a)	US	HI	Driver	UT
Le and Ukkusuri (2019b)	US	HI	Driver	UT
Huang et al. (2020)	China	UMI	Driver	PPM
Buldeo Rai et al. (2021)	Belgium	HI	User	N/A
Wicaksono et al. (2022)	Netherland	HI	User; Driver	UT
Huynh et al. (2021)	Vietnam	LMI	User	TAM, DOI
Truong (2023)	Vietnam	LMI	User	DOI

Table 1 indicates limited research in lower or upper-middle-income countries especially those in Asia. Most of the prior studies are dominated by economic theories, specifically utility theory (about 50%), with a lack of studies employing psychological or information systems theories like TRA or TAM. Our study, like most prior studies, is user-focused, but it is unique in its focus on Thailand as an upper middle income country in Asia, and in its use of a consumer behaviour theory, namely TAM combined with additional namely, demography, personal innovativeness, trust and price.

2.2 Technology Acceptance Model (TAM)

TAM specifies causal relationships that impact technology adoption (Davis, 1989). According to TAM, external factors influence Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), which in turn affect attitudes. Attitudes then determine intentions, which predict actual system use. PEOU can also directly affect PU, and PU can directly impact attitudes. Thus, TAM suggests that the likelihood of adopting a new technology depends on interplay of factors that lead potential users to believe that the technology is easy to use (PEOU) and beneficial for achieving desired goals (PU), resulting in a positive attitude toward it.

The original factors in TAM and the hypotheses to be tested in this paper are:

1. Perceived Usefulness (PU): PU, or the belief that technology can improve task performance, directly impacts crowdshipping adoption (Felch et al., 2019) and acceptance. Although no studies specifically investigated how PU affects attitudes toward crowdshipping, research in other areas has suggested a connection between PU and attitudes towards technology adoption.

H1: PU influences attitude toward crowdshipping system use.

2. Perceived Ease of Use (PEOU): PEOU is consumers' perception of the effort required to use a new technology (Chen et al., 2011). Huynh et al. (2021) has found that PEOU significantly influenced consumer attitudes towards mobile shopping using a crowdshipping platform.

H2: PEOU influences attitude toward crowdshipping system use.

3. Consumer Attitude (Att): Attitudes are evaluations of things as favourable or unfavourable and are a predictor of intentions and subsequent behaviours according to the TAM (Davis, 1989). Two studies examined general attitudes as a predictor of behaviour in crowdshipping. Buldeo Rai et al. (2021) found that consumers who preferred at-home delivery and can rely on their neighbors in case of failed deliveries were most likely to adopt crowdshipping. Huynh et al. (2021) concluded that attitudes predicted the likelihood of repeat purchasing through a crowdshipping app.

H3: Attitude influences intention to use a crowdshipping system.

4. Intention to Use (IU): According to TAM, intentions do not always accurately predict behaviors, although the two are strongly correlated (Yousafzai et al., 2007). Intentions to continue a behavior may not always be fulfilled due to various reasons such as difficulty, social pressure, forgetfulness, procrastination, distractions, lack of willpower, and even life events (Sheeran & Webb, 2016), eventhough, stronger intentions are more likely to result in actual behavior. The TAM proposes that intentions should predict behaviors (Davis, 1989).

H4: Intention to use is positively related to crowdshipping system use.

4.3. Other factors influencing the acceptance of crowdshipping

In addition to the original factors in TAM, listed in section 2.2, this paper also analysed other factors that might influence the acceptance of crowdshipping. These factors are:

1. Trust (T): Online shopping and delivery services come with many risks (financial, privacy, time-loss and product related problems) that may discourage customers from using them (Ashrafi et al., 2020). Trust factors such as perceived security and privacy (Felch et al., 2019), and driver experience and real-time tracking (Punel & Stathopoulos, 2017) affect crowdshipping affect usage intentions, preferences and behaviors. However, Huynh et al. (2021) is the only study that have explicitly examined the positive relationship between trust and attitudes toward crowdshipping platform.

H5: Trust influences attitude toward crowdshipping system use.

2. Price (P): Research has shown that price is an important factor that influences the likelihood of using crowdshipping services (Punel et al., 2018). Studies have mainly investigated the direct impact of price on usage intentions, or through consumer satisfaction (for example Huynh et al. (2021)), but Yeo et al. (2017) found that price can also affect usage through attitudes toward delivery services.

H6: Price influences attitude toward crowdshipping system use.

3. Personal Innovativeness (PI): PI, referring to the ability to rapidly adapt to new technologies and embrace them (Ashrafi et al., 2020). Huynh et al. (2021) is the only study that has explored PI in the context of crowdshipping, and they found that PI indirectly influenced attitudes towards crowdshipping via PEOU and trust. Hence, it is expected that PI will positively impact attitudes towards crowdshipping.

H7: PI influences PU of crowdshipping system.

H8: PI influences PEOU of crowdshipping system.

H9: PI influences trust toward crowdshipping system.

H10: PI influences perception toward crowdshipping price.

4. Demographic factors: Two studies have investigated the impact of demographics on crowdshipping acceptance. Punel and Stathopoulos (2017) and Punel et al. (2018) found that crowdshipping use was higher among males and younger individuals. However, these studies did not explore the impact of education level on crowdshipping adoption.

H11: There are significant age differences in crowdshipping system use.

H12: There are significant gender differences in crowdshipping system use.

H13: There are significant education level differences crowdshipping system use.

4.4. Conceptual Framework

The conceptual model (Figure 1) illustrates the relationships proposed by the 10 hypotheses. The model incorporates predictors of attitudes such as PI, trust, and price, in addition to the TAM's original predictions that PU and PEOU influence attitudes, which lead to intentions and actual system use. Also, in contrast to Huynh et al. (2021), this research assumes that price directly affects consumers' attitudes. The model also suggests that actual system use may vary by demographic factors.

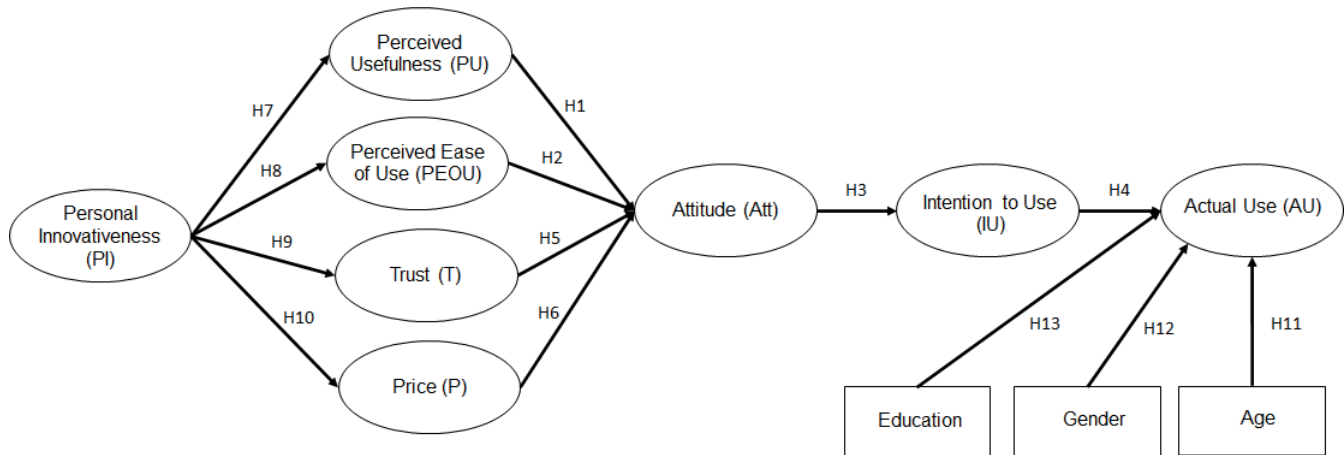


Figure 1 Conceptual model

3. Methodology

3.1. Data Collection

A survey was designed to measure variables affecting crowdshipping adoption. We used likert-scale questions adapted from relevant studies such as Ha and Stoel (2009), Shafiq et al. (2011), Yeo et al. (2017), Ali et al. (2020), and Huynh et al. (2021). This questionnaire was then distributed to the potential respondent as an online survey. We consider online survey as an efficient data collection method for both the researcher and participants and allows for a larger and more representative sample. This method also offers the benefit of anonymity, convenience, and safety during the ongoing COVID-19 pandemic. 297 samples mainly from Bangkok Thailand were obtained. The collected data were then tabulated and analysed using IBM SPSS. After assessing the collected surveys for accuracy and completeness 253 samples were retained for further analysis.

3.2. Sample Characteristics

The sample consists of 55.9% female respondents, 43.1% male respondents and 1% of the respondents preferred not to mention their gender. 48.1% of the respondents are below 41 years old. 81.5% of the respondents have at least obtained a bachelor degree, hence this sample can be considered to represent highly educated consumers in Thailand. With regards to income, 85.9% of the respondents earn more than 15,000 THB monthly indicating that this sample represents medium to high income consumers. And 67% of the respondents use crowdshipping service at least once in every two weeks.

3.3 Hypotheses Testing Results

Hypothesis testing was carried out using IBM SPSS AMOS 29. The SEM model fitting produced CMIN/DF of $2.349 < 3$ indicating an acceptable fit. The Goodness of Fit Index (GFI) of our model is sufficiently high namely, 0.806. The Comparative Fit Index of our model is 0.897 which is also sufficiently high. Our model has Parsimony Comparative Fix Index (PCFI) of 0.795, indicating high likelihood of a more parsimonious model that can explain the actual crowdshipping system use. The RMSEA (Root Mean Square Error of Approximation) of our model is 0.073 which is acceptable.

Table 2 shows the result of the hypotheses testing. It shows that all relationships are significant at 5% significance level except for H2, H11, H12 and H13.

Hypotheses				Estimate	S.E.	C.R.	P
1	Att	<---	PU	0.204	0.067	3.066	0.002
2	Att	<---	PEOU	0.097	0.065	1.485	0.138
3	IU	<---	Att	1.12	0.084	13.262	***
4	AU	<---	IU	0.894	0.052	17.328	***
5	Att	<---	T	0.23	0.069	3.311	***
6	Att	<---	Price	0.313	0.049	6.326	***
7	PU	<---	PI	0.802	0.08	10.082	***
8	PEOU	<---	PI	0.863	0.082	10.554	***
9	T	<---	PI	0.686	0.075	9.122	***
10	Price	<---	PI	0.632	0.089	7.123	***
11	AU	<---	Age	-0.001	0.003	-0.562	0.574
12	AU	<---	Gender	0.069	0.058	1.185	0.236
13	AU	<---	Years_Formal_Edu	-0.012	0.009	-1.28	0.201

Table 2 Structural model for hypothesis testing results

4. Discussion

The survey responses indicate that in common with other Asian nations, many Thai consumers have used crowdshipping services in the past and will continue to do so regularly. Our model shows that the actual crowdshipping system use is influenced mainly by the consumers' intention to use, while demographic factors have no significant influence. One potential explanation is because the adoption of crowdshipping has been spreading throughout the population over the past few years due to word-of-mouth and the high demand for delivery services. This might have eliminated the significance of demographic factors.

Other research relevant to crowdshipping have usually omitted attitudes from their research models. However our study shows that attitude is an important predictor of consumers' intention to use crowdshipping platform. This is in alignment with the findings of other crowdshipping adoption studies such as (Buldeo Rai et al., 2021). In common with Huynh et al. (2021) our SEM model fitting shows that PU significantly influence consumers' attitude hence the intention to use crowdshipping platform. However this is not the case of PEOU. One of the possible explanation is because Huynh et al. (2021) used the case of brick and mortar crowdshipping, in which the consumers use the crowdshipping platform less regularly than in our case. Other variables that positively influence consumers' attitude are perception toward price and trust. Among those three variables perception toward price is the one with the strongest influence. This indicates that it is very important for a crowdshipping service provider to offer a price that is acceptable for the consumers.

Personal innovativeness variable positively influence perceived usefulness, perception toward price and trust toward crowdshipping platform. This indicates that a highly innovative person will be more convenience to use crowdshipping platform.

5. Conclusions and Future Research

This research has examined trends in crowdshipping system use and the factors that contribute to crowdshipping adoption among Thai consumers. An online survey was conducted, and the survey data have been analysed to test a predictive research model for crowdshipping adoption in Thailand. The data shows that many Thai consumers have used crowdshipping services and those who have adopted crowdshipping use these services regularly. Moreover, Thai consumers tend to have generally positive attitudes toward crowdshipping, viewing the services as convenient, and reasonably priced. However Thai consumers also tend to be price-sensitive, so the majority would probably be deterred by higher delivery costs.

We have also identified the factors that contribute to crowdshipping adoption in Thailand. Statistical analysis using SEM indicates that attitudes toward crowdshipping are influenced by PU, trust, and price, while all of these variables are positively influenced by PI. This indicates that PI plays indirect role in crowdshipping adoption in Thailand i.e., improving the positive perception toward crowdshipping usefulness, trust and price. Attitudes predict intentions to use crowdshipping, which in turn predict actual system use. However, although these correlations are strong, not all those who have positive attitudes toward crowdshipping intend to use these services, and some who intend to arrange deliveries via crowdshipping do not follow through. This indicates that there are other factors not included in the research model that can intervene in these relationships.

This research also sought to determine whether crowdshipping adoption in Thailand varies based on age, gender, or education level, but no demographic differences in adoption rates were found. The lack of demographic differences in crowdshipping adoption may be unique to Thailand. However, it could also indicate that crowdshipping has become more accepted among a wider range of people in recent years due to increased familiarity with the concept and the need to meet rising demand for delivery services.

The consumers' behavioural model elicited in this study can be used in more advance modelling techniques such as agent-based modelling and simulation (ABM). ABM can aid to design robust and optimal crowdshipping system by considering human behaviour. ABM has been employed in relevant areas such as last-mile delivery (e.g., Utomo et al. (2021)) and food supply chain (e.g., Utomo et al. (2018)), but its application in crowdshipping is currently lacking.

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