

# Applying UTAUT2 to understanding online buyers' intention to adopt delivery drones in Iran

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## ABSTRACT

Drone delivery is an emergent idea for last-mile delivery that has received the attention of many service providers, marketing activists, and logistic planners. This study is aimed at determining the factors influential in the acceptance of delivery drones as a new way for last-mile delivery in the future. In this regard, the study model was proposed using the unified theory of acceptance and use of technology (UTAUT2) as the base model and adding socio-demographic variables (age, education, gender, monthly household income and drone delivery familiarity) as control variables to it. The information about 357 Iranian buyers was collected for the partial least square structural equation modeling (PLS-SEM) by designing an online questionnaire. The results indicated that all variables of UTAUT2, except for performance expectancy (effort expectancy, facilitating conditions and hedonic motivation), had a positive and significant effect on the intention of buyers to use delivery drones. In addition, the effect of monthly household income and drone delivery familiarity was also positive and significant. In the end, the theoretical and applied results of the study are explained.

## KEYWORDS

Delivery drone, Last-mile delivery, UTAUT2, Adoption behavior, PLS-SEM

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## 1. Introduction

Drones are one of the emerging technologies that have found applications in various industrial sectors such as photography and videography, agricultural irrigation, traffic monitoring, emergency medical and pharmaceutical transportation [1, 2]. In recent years, online stores and companies have adopted new technologies such as delivery drones to reduce costs, increase delivery speed, and contribute to environmental sustainability [3].

In Iran, delivery drones are still in the design and testing phase and have not yet entered the stage of implementation and operation. In recent years, postal drones have been introduced for the delivery of postal items, and the use of drones for urban services, the Red Crescent, and specific emergency operations has also been under consideration [4]. Accordingly, it is likely that in the near future, drones will be used for delivering goods purchased online. Therefore, understanding the factors influencing consumers' willingness to receive their purchases via drones is of great importance. In this regard, the present study seeks to examine users' intention to use delivery drones by applying a well-established framework, namely the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2), and by analyzing the effects of control variables such as demographic characteristics.

## 2. Methodology

The present study aims to investigate the factors influencing the acceptance of delivery drones by employing the UTAUT2 as the main model, and incorporating demographic characteristics as control variables. The UTAUT was first introduced by [5] through the integration of eight well-known acceptance models. [6] extended this theory by adding additional variables, resulting in what is known as UTAUT2, which has been widely used in numerous studies [6-8]. This study includes four hypotheses derived from the relationships between the variables in the UTAUT2 and individuals' intention to use delivery drones.

- H1: Performance expectancy has a positive effect on consumers' intention to use delivery drones.
- H2: Effort expectancy has a positive effect on consumers' intention to use delivery drones.
- H3: Facilitating conditions have a positive effect on consumers' intention to use delivery drones.
- H4: Hedonic motivation has a positive effect on consumers' intention to use delivery drones.

In the present study, an online questionnaire was designed for distribution among the target population—Iranian users who have purchased a product online at least once. The questionnaire consists of three sections. Since respondents may not be familiar with delivery drones, the first section introduces the functions, features, and applications of this system, accompanied by several images and a video. The second section includes questions related to the latent variables in the proposed model. These questions were designed using a seven-point Likert scale [9], ranging from 1 = strongly disagree to 7 = strongly agree. Finally, the third section of the questionnaire collects demographic information from the respondents, such as age, gender, education level, and so on.

To implement and distribute the online questionnaire, the Google Forms platform was used. The questionnaire was made available for two months starting from December 2020, and was distributed through social media platforms (Twitter, Instagram, and Facebook), messaging apps (Telegram and WhatsApp), as well as email lists. The estimated time to complete the questionnaire was approximately 13 minutes. Participants who completed the questionnaire were entered into a lottery to win one of five gift cards worth 2,000,000 Iranian Rials each. After collecting 404 responses, some entries were excluded from the analysis to ensure data quality. Following this data cleaning process, 357 responses were deemed valid, resulting in an effective response rate of 88.4%.

## 3. Results and Discussion

The structural equation model was employed to analyze the proposed model. It evaluates the relationships of latent variables with their observable indicators (known as the measurement model) and the relationships between the latent variables (known as the structural model) [10]. The structural equation model adopts two approaches, namely the covariance-based and variance-based approaches. The partial least square (PLS) method was selected as a variance-based approach to test the proposed hypotheses [11].

Reliability, convergent validity, and discriminant validity were evaluated to investigate the measurement model. The entire factor loadings were found to be larger than 0.7 and thus statistically significant [12]. Cronbach's alpha should be higher than 0.7 for reliability [13]. It was obtained to be higher than 0.7 for the entire constructs. For convergent validity, the composite reliability (CR) value should be higher than 0.7 [11], and the average variance extracted (AVE) needs to be greater

than 0.5 [12]. The entire constructs obtained permissible CR and AVE values.

Bootstrapping with 5000 subsamples was employed to test the proposed hypotheses. The modeling results indicated that in the UTAUT2, no significant effect was found between performance expectancy and consumers' intention to use delivery drones (H1). This result may be due to the limited development of this system in Iran and users' lack of awareness about it. Similar findings have been reported in some other studies across various domains, although performance expectancy generally has a significant and substantial effect on users' intention to adopt new technologies. In line with certain related studies, effort expectancy was found to have a positive and significant effect on consumers' intention (H2). The more users perceive the use of delivery drones as simple and hassle-free, the more likely they are to adopt this method. Facilitating conditions also had a positive and significant impact on consumers' intention, consistent with findings from several studies (H3). When the necessary resources, infrastructure, and skills for using delivery drones are available, consumers are more inclined to adopt this technology. Finally, hedonic motivation plays an important role in influencing consumers' intention to use delivery drones. The sense of enjoyment and entertainment associated with using delivery drones can be a major factor in their acceptance. This finding is in line with the results of several studies.

Table 1. Results of the structural model

	Path	Path Co.	P-value
H1	PE on Intention	0.138	0.170
H2	EE on Intention	0.150	0.029
H3	FC on Intention	0.277	0.001
H4	HM on Intention	0.271	0.001

#### 4. Conclusions

This study investigated the factors influencing consumers' intention to use delivery drones as a new idea to compete with traditional delivery methods. The authors used the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) to propose a delivery drone adoption model. The PLS-SEM was employed to test the proposed hypotheses. The results indicated that effort expectancy, facilitating conditions, and hedonic motivation influenced consumers' intention to use delivery drone; however, no significant relationship was found between performance expectancy and intention.

#### 5. References

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