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# Enhancing User Loyalty through Service Quality, Convenience, and Distribution in Drone Rentals

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## Abstract

**Purpose:** This study explores the factors influencing user satisfaction and loyalty in drone rental services, focusing on service convenience, quality, and distribution logistics. It examines differences in rental service experiences between individual and commercial users. **Research Design, Data, and Methodology:** A service evaluation model is constructed, integrating three key variables: service convenience (SC), service quality (SQ), and distribution logistics (DL). Data were collected through 608 valid questionnaires from drone rental platforms in China, divided into individual and commercial user groups. Partial Least Squares Structural Equation Modeling (PLS-SEM) is employed to analyze relationships among the variables. **Results** Service convenience, quality, and effective distribution logistics all positively influence user satisfaction, which enhances customer loyalty, measured by repurchase intention (RI) and word-of-mouth (WOM). Commercial users prioritize service quality and distribution efficiency, while individual users focus on convenience. Multi-group analysis reveals significant differences in the impact of these variables between user types. **Conclusion** The study emphasizes the importance of tailoring drone rental services to meet the distinct needs of individual and commercial users. Optimizing service quality, convenience, and logistics can significantly boost user satisfaction and loyalty, offering valuable insights for business strategy in the drone rental industry.

**Keywords:** Service Quality, Service Convenience, User Satisfaction, Loyalty, Drone Leasing

**JEL Classification Code**: M31, M21, D12

## 1. Introduction

Since its first use in the military in the early 20th century, drone technology has rapidly expanded to multiple industries, including commercial, scientific, and civilian applications. With advantages in flexibility, efficiency, and low cost, drones are widely utilized in various scenarios such as agriculture, logistics, monitoring, and emergency response (Kapustina et al., 2021). In particular, within the commercial sector, drones have become an essential tool for enhancing operational efficiency and optimizing distribution processes (Nassi et al., 2021). However, despite the broad application prospects of drones, their high initial investment and the maintenance costs required for frequent use make the purchase and ownership of drones a heavy burden for many individual and corporate users. Consequently, the drone rental industry has emerged, offering a more economical solution for diverse users to access this advanced technology (Li et al., 2023).

The rapid growth of the drone rental industry has not only facilitated the widespread use of drones across multiple fields but also sparked extensive discussions on service

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quality, distribution logistics, and user experience within this sector. Most existing research focuses on specific applications of drone technology, such as agricultural drones, disaster relief, and environmental monitoring. However, studies on drone rental service systems are relatively scarce, particularly regarding the interrelationships among service quality, convenience, and distribution logistics, which have not received sufficient attention. This research aims to systematically identify key variables and their interrelationships in drone rental services by constructing a service evaluation model.

Existing studies have extensively explored how service quality and convenience influence user experience effectively. For instance, Shah and his team pointed out that improving service quality significantly promotes repurchase intention (RI) and word-of-mouth (WOM) (Shah et al., 2020). Palese further emphasized that user satisfaction serves as an important intermediary for service quality and user loyalty, especially in the online business environment (Palese & Usai, 2018). Additionally, Rashwan's study in commercial banks showed that service convenience has a significant impact on user satisfaction and loyalty (Rashwan et al., 2019). Noor et al. studied service quality in AI services, finding parallels with drone rental services, where service quality enhances user loyalty by improving perceived value and trust (Noor et al., 2022). This highlights the importance of service quality performance across different technological applications, providing a broader contextual foundation for this study. By comparing these findings, we can more comprehensively understand the roles of service convenience, quality, and distribution logistics in drone rental services, offering theoretical insights for optimizing business strategies and enhancing user loyalty.

Owing to the focus of most research on specific industries, the emerging market of drone rental services has not been fully covered. In contrast to previous studies, this research not only examines the influence relationships among variables in the service indicator system but also explores the differences in rental service experiences between individual and commercial users. This differentiated analysis aids drone rental service providers in optimizing their service strategies for distinct user groups, thereby improving overall user satisfaction and loyalty (Lam & Zhang, 2020).

## 2. Theory and Hypothesis

### 2.1. Concepts of Indicators in the Rental Service System

Service quality plays a crucial role in shaping customer perceptions and gratification (Demirel, 2022). However, it is intangible, so many scholars are committed to developing tools and methods that can intuitively measure and evaluate service quality. For example, after the "SERVQUAL" model was first proposed in 1989, it has been applied and improved by many scholars. For example, Gorla, N et al. also further verified it in their research. It mainly includes five parts，such as reliability(Gorla et al., 2010). This model evaluates the gap about user expectations and the level of providers, thereby determining the quality of service. Another related scale, "SERVPERF", which lies in emphasizing the perception of actual level of providers (Ghotbabadi et al., 2015). For rental service providers, how to define and measure good service is crucial. In addition, some researchers have developed new scales for specific research projects based on these two models, such as the RENTQUAL model proposed by Ekiz, E.H. in the rental service system (Ekiz et al., 2009).

Service convenience has been confirmed by many studies to be an extremely important indicator for evaluating service systems. Berry et al. described it as the time and labor savings felt by customers in the process of finding and using services, and developed a relatively classic measurement scale (Berry et al., 2002). "SERVCON" measurement scale developed by Seiders et al. conducted a detailed evaluation of multiple aspects of service convenience and verified it through experiments (Seiders et al., 2007). Claycomb creat a scale for gauging the convenience of online shopping in an online platform environment is also of great significance to our research on drone product leasing (Claycomb & Martin, 2001). These studies have verified the convenience of services in many fields and provide a reference for our research.

User satisfaction is another key indicator for measuring service effectiveness. ACSI is a widely utilized and systematic case (Khadka & Maharjan, 2017). It evaluates satisfaction by comprehensively considering various contents.

The definition of customer loyalty was first proposed by Oliver et al.. In subsequent studies, Obiegbu, CJ et al. redefined customer loyalty and established a new extended framework (Obiegbu et al., 2020). In the field of marketing services, we usually follow the guidance of Rane, N et al. and use repeat purchase rate and recommendation behavior to measure customer loyalty. They emphasized that there is no significant correlation between the two and assuming them as two independent structures is more conducive to in-depth analysis and measurement accuracy of the research (Rane et al., 2023).

### 2.2. The Hypotheses among Service Quality(SQ), User Satisfaction, Customer Loyalty

Service quality supplies a crucial hint for user satisfaction by many studies. For example, Zhang Min and

her partners make conclusions about service evaluation in the rental industry that service quality has an impact on user gratification, intention to repurchase (RI), word-of-mouth communication (WOM) (Zhang et al., 2013). Rahmatulloh pointed out that service providers of rental service can effectively improve user satisfaction by focusing on improving service quality, thereby increasing repurchase rate and word of mouth (Rahmatulloh et al., 2021). These research results provide strong evidence for this in drone rental service system, so we make the following assumptions:

**H1:** The quality of service positively influences user satisfaction.

Previous studies have given some information about service quality and consumer loyalty. Backman et al. quantified loyalty into two dimensions: RI (behavior) and WOM (attitude) in their investigate. Parasuraman also clearly indicates the better service quality can increase customers' repurchase intention and recommendation behavior, both of which are important indicators for measuring customer loyalty. So we get this two hypotheses on the basis of researches.

**H2a:** High service quality enhances WOM

**H2b:** High service quality strengthens customers' RI.

## 2.3. The Hypotheses among Service Convenience (SC), Service Quality, User Satisfaction, Customer Loyalty

Some researches have marked that SC is a crucial factor in influncing SQ. For example, Dai et al. verified SC facilitate SQ from six dimensions in an electronic media environment (Dai & Salam, 2014). In drone rental services, an efficient and responsive operating system can quickly solve user problems, thereby significantly improving consumers' perception of SQ (Talluri et al., 2013). Thus, we get this hypothesis on the basis of researches.

**H3**: Service convenience positively contributes to the perceived quality of service.

SC improves user satisfaction by reducing the friction users experience in obtaining and using services. Kaura et al. used the "SERVCON" scale to verify impacts of SC on user gratification in transaction services (Kaura, 2013). Users of drone rental services usually need to quickly deploy equipment to cope with various tasks, such as aerial photography, map making, or emergency monitoring. Service convenience can significantly reduce users' waiting time and operational complexity (Otto et al., 2018). Thus, we get this hypothesis on the basis of researches.

**H4:** Service convenience positively influences user satisfaction.

Research shows that SC may facilitate customer loyalty. In a highly competitive market, convenient services make customers tend to repeatedly choose used goods or services when faced with multiple choices because they reduce time costs and energy (Chang et al., 2010). In addition, many studies have also shown on online platforms, SC seriously promotes WOM (Le-hoang, 2020). Thus, we get these two hypotheses on the basis of researches.

**H5a:** Service convenience enhances WOM.

**H5b:** Service convenience boosts the RI.

## 2.4. The Hypotheses between User Satisfaction and Loyalty

In drone rental services, gratification has particularly influenced on RI and WOM. According to Lee et al., customer satisfaction is a key predictor of word-of-mouth communication (Lee et al., 2022). Consumers prefer to share their energetic experiences, which is extremely important for promoting drone rental services through social media and online platforms. In addition, according to Gerpott et al. in high-tech product rentals, customer satisfaction significantly affects their likelihood of recommending the service (Gerpott et al., 2001). So, we get these two hypotheses on the basis of researches.

**H6a:** User satisfaction positively influences WOM.

**H6b:** User satisfaction enhances the RI

## 2.5. Exploration of the Difference in the Impact Relationship between Variables Under Commercial Use and Personal Use

Generally speaking, commercial users who rent drones usually have higher requirements for the stability and technicality of the service, because these factors often directly affect the efficiency and cost of their business operations. For example, in the field of commercial logistics, drones are used for efficient cargo delivery and fast delivery. Any potential technical failure may lead to delivery delays or losses, which in turn affects supply chain efficiency (Mohsan et al., 2023). In contrast, individual users may pay more attention to cost-effectiveness and user experience, such as easy operation and strong entertainment. In addition to different purposes of use, commercial users may need faster responses and support to avoid business delays, while individual users may prefer convenient rental processes and product flexibility. In addition, many studies have shown that the importance of different aspects of services to different user groups varies greatly. Including the service-dominant logic, it is also believed that the value of services is created through the joint participation of customers and providers, and different usage scenarios may lead to differences. So, we get this hypothesis on the basis

of researches.

**H7:** The variables under commercial use is different from personal use.

### 2.6. Hypothesized Conceptual Model Diagram

Based on previous research, we used SC and SQ as IV, user satisfaction, RI and WOM as DV, expanded service experience evaluation system constructed by Berry et al., and constructed a conceptual model (figure 1).

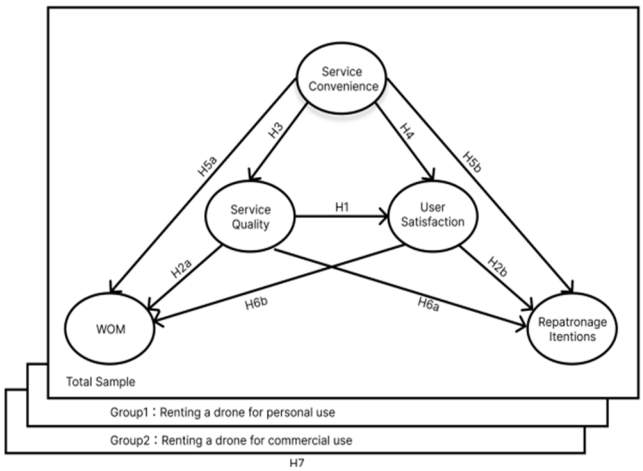



**Figure 1:** Hypothesis framework

## 3. Methods

### 3.1. Establishment of Measurement

Specific scales used in this study are all from existing validated studies and have been adjusted according to this topic to maximize their reliability and validity.

The items of SQ refer to the measurement of "SERVPERF" (Jain & Gupta, 2004) and the "RENTQUAL" model developed by Ekiz et al. According to the suggestions of the expert group, we deleted the two dimensions of "comfort" and "ergonomics". Since "accessibility" is repeated in the subsequent service convenience, we unified this dimension into the measurement of service convenience. On this basis, we added the two dimensions of "innovation" and "guidance" according to the research results of Gunday et al. and adjusted the specific questions of some items; SC's scale refer to research items of Chang et al., which include five dimensions: decision-making, acquisition, transaction, benefit and post-benefit. According to expert group's advice, the decision-making dimension was deleted to cater for our topic; the measurement items of user satisfaction adopt the cumulative satisfaction scale developed by Oliver et al.; the scale of WOM adopt Zeithaml's three-item; RI roots in the four-item RI scale. It's developed by Oliver.

### 3.2. Pre-test

100 questionnaires were distributed to individual and commercial subjects, and 75 and 82 valid questionnaires were collected respectively. The main purpose of the pre-test is to ensure that measurement tools have sufficient reliability before the formal test. The results of the pre-test not only provide a data basis for subsequent research, but also effectively repair possible measurement biases and potential problems.

We conducted exploratory factor analysis on the recovered data to verify the structural validity of the questionnaire and the rationality of each measurement indicator. Through factor analysis of the five first-level constructs, the KMO values were all within the standard range. And the lowest KMO value of all refined measurement indicators was 0.712, which was greater than the standard value of 0.7. In addition, the p-value of the Bartlett test was also under 0.05.

### 3.3. Sample Size Estimation

In order to ensure the dependability of structural equation, we used MedPower system to evaluate it. Based on previous similar research projects and guidance experience, we assume that service convenience affects repurchase intention through user satisfaction, and the assumed path coefficients are as follows: SC → Sat path coefficient (a) = 0.4; Sat → RI path coefficient (b) = 0.4; setting the significance level to 0.05; the test power (1-β) is 0.8. The dimensions were calculated to be 307 people, so we finally decided to set the sample size of personal and commercial subjects to 300 people each to ensure that the sample size is doubled to better deal with possible invalid reactions.

### 3.4. Data Collection

We divided the subjects into two groups: drone renters for personal use and commercial drone renting teams/ companies. The data was collected from two online drone rental platforms in Beijing and Shenzhen, with careful timing to minimize common method bias. We glean 608 questionnaires, 302 for personal use and 305 for commercial use.

For personal use, male respondents made up 52.3%, while females accounted for 47.7%. The majority (92.7%) were aged 18-49, and 85.1% had a bachelor's degree or higher. Additionally, 71.8% reported using drones at least

once a month, reflecting high engagement.

For commercial use, drone usage was evenly distributed across various business fields, with 92% using drones at least once a month. Moreover, 91.8% of respondents reported medium to high dependence on drones, indicating a strong reliance on the technology.

These statistics highlight the diversity and representativeness of the collected data, enhancing the credibility and robustness of the experimental analysis and conclusions.

### 3.5. Analysis Methods

PLS-SEM was used to analyze the investigate data. It has been proven by many studies to be suitable for exploratory research and can effectively handle complex interactions and mediating effects between variables. This analytical method has been increasingly used in the fields of business and marketing and is a very suitable experimental method for verifying the hypotheses.

## 4. Results

### 4.1. Measurement Evaluation

Firstly, we used HSFT to guage CMV. EFA's first factor is 30.1%, which was undern 40%-50%, this manifests the study did not have a strong CMV problem.

Secondly, the minimum values of the CA value and CR value of the measurement model were 0.823 and 0.863, respectively, which were both greater than the conventional threshold requirement of 0.7, proving that the consistency reliability was favourable.

The AVEwas 0.589, which was less than the CR value and greater than the conventional threshold requirement of 0.5. The factor loadings of the items are all over 0.7, manifesting the observable variables have pretty correspondences with constructs, thus proving that the convergent validity of the model is good. See Table 1 and Table 2 for specific data.

**Table 1:** Measurement Model Evaluation

| Variables | Projects | | | Factor Loadings | CA | CR | AVE |
|---|---|---|---|---|---|---|---|
| Service Convenience | Access | Ac1 | It's simple to get in touch with this RS | 0.764 | 0.846 | 0.890 | 0.669 |
| | | Ac2 | It doesn't take long to access this RS | 0.817 | | | |
| | | Ac3 | The location of this RS is easy to find | 0.715 | | | |
| | | Ac4 | It has a convenient online platform of this RS | 0.783 | | | |
| | Transaction | Tra1 | RS offers a variety of payment options | 0.769 | 0.833 | 0.879 | 0.654 |
| | | Tra2 | This RS give a convenient payment method | 0.803 | | | |
| | | Tra3 | Changes and cancellations of this RS are easy | 0.746 | | | |
| | Benefit | Ben1 | I can easily obtain benefits from this RS | 0.712 | 0.823 | 0.863 | 0.615 |
| | | Ben2 | This RS is easy to use | 0.829 | | | |
| | | Ben3 | The service speed of this RS meets my expectations | 0.735 | | | |
| | Post-benefit | Pb1 | When I have a problem, this RS can resolve my problem quickly | 0.738 | 0.826 | 0.875 | 0.624 |
| | | Pb2 | This RS can provide derivative services and technical supports | 0.796 | | | |
| | | Pb3 | This RS has a good channel to handle complaints and recommendations | 0.759 | | | |
| Service Ouality | Security | Sec1 | Drone should have no technical problem | 0.751 | 0.856 | 0.893 | 0.675 |
| | | Sec2 | Drones should have excellent endurance | 0.821 | | | |
| | | Sec3 | RS should have extensive insurance and claims business | 0.799 | | | |
| | Delivery | Del1 | RS should deliver the drone to where I want | 0.755 | 0.853 | 0.888 | 0.667 |
| | | Del2 | RS should offer the flexibility to return the drone at a location of my choice | 0.823 | | | |
| | | Del3 | The staff of RS should provide detailed information | 0.801 | | | |
| | Handing over | Ho1 | Drone should be very good when I receive it | 0.767 | 0.865 | 0.904 | 0.694 |
| | | Ho2 | Drone should have enough power when I receive it | 0.832 | | | |
| | | Ho3 | Some additional information about item should be provided while receiving the drone | 0.810 | | | |
| | Policy | Pol1 | RS should have a resonable compensation towards unlikely destorys of the drone | 0.748 | 0.834 | 0.876 | 0.641 |
| | | Pol2 | RS should be tolerant towards unlikely delays in the return of the drone | 0.815 | | | |
| | | Pol3 | RS should provide flexible rental time | 0.790 | | | |

| Variables | Projects | | | Factor Loadings | CA | CR | AVE |
|---|---|---|---|---|---|---|---|
| | Innovation | Inn1 | Increasingly advanced technology and richer variety | 0.804 | 0.876 | 0.911 | 0.718 |
| | | Inn2 | Increasingly satisfaction for employees of RS | 0.846 | | | |
| | | Inn3 | RS provides customized services and optimize my experience | 0.821 | | | |
| | Guideness | Gui1 | RS provides diverse technical supports | 0.772 | 0.832 | 0.872 | 0.633 |
| | | Gui2 | Technical support provided by RS is effective | 0.817 | | | |
| | | Gui3 | The way of providing support is abundant | 0.783 | | | |
| Satisfaction | | Sa1 | It's satisfied with RS | 0.764 | 0.866 | 0.900 | 0.693 |
| | | Sa2 | It's happy with RS | 0.826 | | | |
| | | Sa3 | It's pleased to RS | 0.816 | | | |
| | | Sa4 | My decision to use this RS is successful | 0.845 | | | |
| Word-of-Mouth | | WOM1 | I would like to say that this RS is very good | 0.762 | 0.869 | 0.905 | 0.761 |
| | | WOM2 | I would recommend this RS to anyone seeking my advice | 0.830 | | | |
| | | WOM3 | I encourage my surroundings to choose this RS | 0.815 | | | |
| Repatronage Intention | | RI1 | I wanna use this RS again | 0.758 | 0.857 | 0.894 | 0.680 |
| | | RI2 | It's possible to rent a drone from this RS in the future | 0.819 | | | |
| | | RI3 | It's likely that I will actually rent drone again in this RS in the near future | 0.805 | | | |

Note: RS = Rental Service

**Table 2:** Measurement Model Evaluation

| Variables | Projects | Factor Loadings | CA | CR | AVE |
|---|---|---|---|---|---|
| 2nd round | | | | | |
| Service Conveniences | Access | 0.770 | 0.861 | 0.916 | 0.589 |
| | Transaction | 0.773 | | | |
| | Benefit | 0.759 | | | |
| | Post-benefit | 0.764 | | | |
| Service Ouality | Security | 0.790 | 0.893 | 0.953 | 0.637 |
| | Delivery | 0.793 | | | |
| | Handing over | 0.803 | | | |
| | Policy | 0.784 | | | |
| | Innovation | 0.824 | | | |
| | Guideness | 0.791 | | | |

Note: RS = Rental Service

The discriminant validity of the model was evaluated using three methods in SmartPLS 4.0. First, cross-loading analysis showed that the loading value of each observed variable on its corresponding latent construct was significantly surpass the cross-loadings on left variables, confirming good discriminant validity for the first-level constructs.

Next, HTMT follows approaches by Henseler and Ringle. It assesses the variables were under the critical value of 0.85, with confidence intervals not containing 1, further verifying DV (see table 3 for details).

Lastly, we utilize the Fornell-Larcker criterion to ensure that √AVE for every variable exceeded the relationships between variables, offering further evidence for DV (see Table 4 for details).

In summary, the comprehensive analysis confirmed that the measurement model exhibits good CR, CV and DV.

**Table 3:** HTMT

| | SC | SQ | Sat | RI | WOM |
|---|---|---|---|---|---|
| Service Convenience | | | | | |
| Service Quality | 0.653 | | | | |
| Satisfaction | 0.608 | 0.680 | | | |
| Repatronage Intentions | 0.627 | 0.669 | 0.722 | | |
| Word-of-Mouth | 0.644 | 0.658 | 0.730 | 0.743 | |

Note: The values of SQ and SC are derived from higher-level constructs.

**Table 4:** Fornell-Larcker Criteria

| | SC | SQ | Sat | RI | WOM |
|---|---|---|---|---|---|
| Service Convenience | 0.767 | | | | |
| Service Quality | 0.653 | 0.842 | | | |
| Satisfaction | 0.608 | 0.680 | 0.841 | | |
| Repatronage Intentions | 0.627 | 0.669 | 0.722 | 0.844 | |
| Word-of-Mouth | 0.644 | 0.658 | 0.730 | 0.743 | 0.826 |

Note: The diagonal values are the √AVE

## 4.2. Structural Model Evaluation

First, a collinearity check was conducted before testing the structural model to ensure unbiased regression results. The maximum VIF was 2.577, below the threshold of 3, showing there is no collinearity problem.

Next, $R^2$ values were used to evaluate the explanatory power of this model. $R^2$ values for SQ, user satisfaction, WOM, and RI were 0.387, 0.347, 0.334, and 0.188, indicating the moderate explanatory ability of this model.

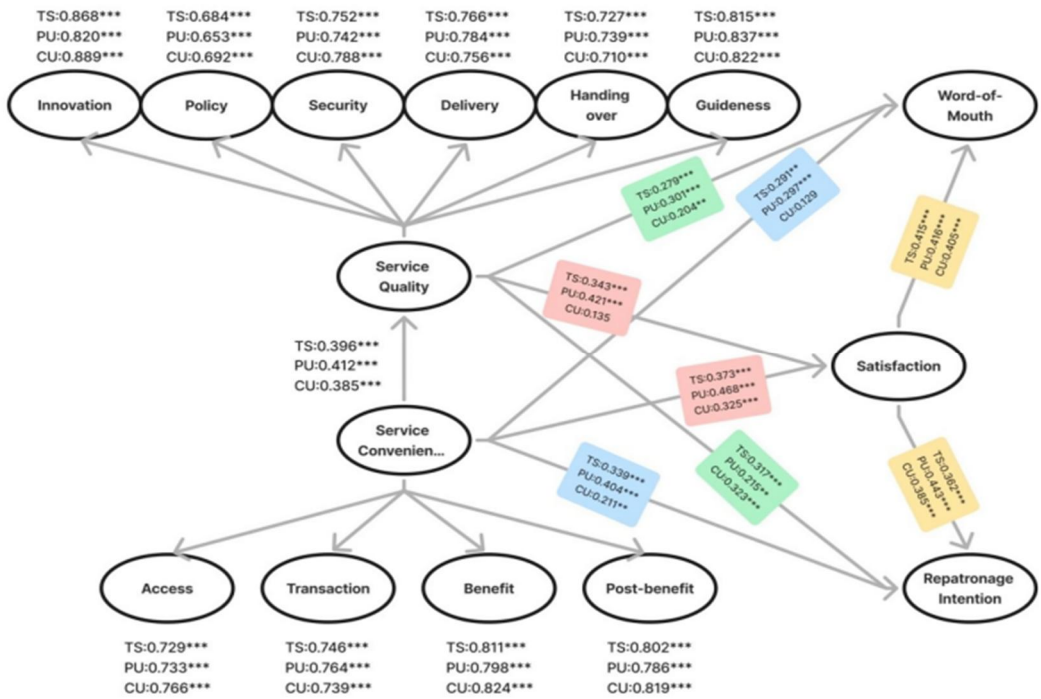
Third, the $Q^2$ values obtained through Blindfolding showed predictive relevance, with SQ, user satisfaction, WOM and RI having values of 0.265, 0.226, 0.215, and 0.094, respectively, all above the threshold of 0.

Fourth, the $f^2$ values were calculated to assess the impact of external constructs on the $R^2$ of internal constructs, ranging from 0.025 to 0.226. Notably, the $f^2$ values for Sat-WOM (0.225), SC-Sat (0.207), and SC-SQ (0.194) demonstrated medium impact.

Finally, path coefficients were analyzed using Bootstrap with 5000 samples, confirming all direct relationship hypotheses. Significant paths include SQ-Sat (β=0.343, *p*=0.000), SQ-WOM (β=0.279, *p*=0.000), and SQ-RI (β=0.317, *p*=0.000), it supports H1-H2b. Similarly, SC-SQ (β=0.396, *p*=0.000), SC-Sat (β=0.373, *p*=0.000), SC-WOM (β=0.291, *p*=0.003), and SC-RI (β=0.339, *p*=0.000), it validates H3-H5b. Sat-WOM (β=0.415, *p*=0.000) and Sat-RI (β=0.362, *p*=0.000) confirmed H6a, H6b (see Table 5 for details). The path significance is detailed in Figure 2.

**Table 5:** Path Test Structural Model Evaluation

| Hypothesis | Path | β | t-Value | *p* | $R^2$ | $Q^2$ | $f^2$ | VIF | Supported |
|---|---|---|---|---|---|---|---|---|---|
| H1 | SQ-Sat | 0.343 | 7.146 | 0.000 | 0.347 | 0.226 | 0.098 | 1.507 | Yes |
| H2a | SQ-WOM | 0.279 | 4.895 | 0.000 | 0.334 | 0.215 | 0.045 | 1.446 | Yes |
| H2b | SQ-RI | 0.317 | 4.662 | 0.000 | 0.188 | 0,094 | 0.146 | 1.233 | Yes |
| H3 | SC-SQ | 0.396 | 8.082 | 0.000 | 0.387 | 0.265 | 0.194 | 1.134 | Yes |
| H4 | SC-Sat | 0.373 | 6.322 | 0.000 | | | 0.207 | 1.201 | Yes |
| H5a | SC-WOM | 0.291 | 4.409 | 0.003 | | | 0.071 | 1.478 | Yes |
| H5b | SC-RI | 0.339 | 5.557 | 0.000 | | | 0.094 | 1.605 | Yes |
| H6a | Sat-WOM | 0.415 | 8.137 | 0.000 | | | 0.225 | 1.377 | Yes |
| H6b | Sat-RI | 0.362 | 6.136 | 0.000 | | | 0.139 | 1.005 | Yes |




Note: TS = Total Sample; PU = Individual Use; CU = Commercial Use.
***$p$<0.001, **$p$<0.01, *$p$<0.05.

**Figure 2:** Path Significance

### 4.3. Mediation Effect's Evaluation

The results and the 95% fiducial intervals not containing zero, mediation results in the model are confirmed, as shown in Table 6. For word-of-mouth communication, the 95% confidence interval (0.129-0.353) and standardized mediation effect $\beta$ (0.241) indicate that SQ significantly adjusts the relationship between SC and WOM. Additionally, user satisfaction also shows a significant mediation effect, and both SQ and user satisfaction exhibit a meaningful chain regulatory effect.

Similarly, for repurchase intention, the 95% confidence interval (0.165-0.417) and standardized mediation effect $\beta$ (0.291) confirm a pretty regulatory influence of SQ between SC and RI. User satisfaction also mediates this relationship, with a chain mediating effect through both SQ and user satisfaction.

**Table 6:** Examination

| Path | β | S.E. | t-Value | *p* | 2.50%CI | 97.50%CI | Supported |
|---|---|---|---|---|---|---|---|
| SC-WOM (SQ) | 0.241 | 0.057 | 4.228 | 0.000 | 0.129 | 0.353 | Yes |
| SC-WOM (Sat) | 0.219 | 0.005 | 3.982 | 0.000 | 0.111 | 0.327 | Yes |
| SC-WOM (SQ Sat) | 0.278 | 0.063 | 4.413 | 0.000 | 0.154 | 0.402 | Yes |
| SC-RI (SQ) | 0.291 | 0.064 | 4.457 | 0.000 | 0.165 | 0.417 | Yes |
| SC-RI (Sat ) | 0.267 | 0.060 | 4.450 | 0.000 | 0.149 | 0.385 | Yes |
| SC-RI (SQ Sat) | 0.285 | 0.062 | 4.597 | 0.000 | 0.163 | 0.407 | Yes |

### 4.4. Multi-group Analysis

The intention of this section wants to investigate whether the influence connection among the original route paths will be different in the two cases of renting drones for personal use and commercial use. We intend to use multi-group analysis to process this part of the data and verify the hypothesis. For the sake of validating the consistency and stability in these models, we first conducted a measurement invariance study of the composite model. In terms of configuration invariance, we have always maintained that both groups use the same model structure and measurement tools since the beginning of the study. In terms of metric invariance, the test results of MICOM are detailed in Table 7. The original correlation coefficients of all constructs are greater than their 5% quantiles, and the *p* values are all >0.05, proving that the model has passed the test in terms of metric invariance and partial invariance is established.

**Table 7:** MICOM Test Results

| | Original Correlation | 5% | *p* |
|---|---|---|---|
| SC | 0.053 | 0.012 | 0.019 |
| SQ | 0.094 | 0.022 | 0.015 |
| Sa | 0.065 | 0.018 | 0.022 |
| WOM | 0.045 | 0.014 | 0.024 |
| RI | 0.073 | 0.019 | 0.020 |
| Ac | 0.081 | 0.021 | 0.018 |
| Tra | 0.076 | 0.020 | 0.017 |
| Ben | 0.089 | 0.023 | 0.016 |
| Pb | 0.062 | 0.017 | 0.021 |
| Sec | 0.055 | 0.015 | 0.019 |
| Del | 0.093 | 0.024 | 0.014 |
| Ho | 0.087 | 0.022 | 0.015 |
| Pol | 0.072 | 0.018 | 0.018 |
| Inn | 0.064 | 0.016 | 0.022 |
| Gui | 0.053 | 0.013 | 0.019 |

On this basis, we use the Bootstrap method of comparative analysis across multiple groups to compare some distinctions in the impact relationship between the paths in the two cases. This method relies on the resampling technique to assess the statistical relevance of the model parameters, which makes the analysis results more robust, It's abbreviation is PLS-MGA. We still randomly sampled the data in the two cases 5000 times and recorded their respective statistics to establish their empirical distributions.

The specific test results are shown in Table 8. The results demonstrate a substantial difference in the influence of SQ on RI ($p$=0.015, Difference=0.022). In the case of commercial use, the influence of SQ on RI ($p$<0.001, β=0.507) is obviously more powerful than that in personal use ($p$>0.05, β=0.485). Secondly, there is an effective distinction in the aspects of SC affects RI ($p$=0.027, Difference=-0.008). Under personal use, the influence of SC on user satisfaction ($p$<0.001, β=0.457) is obviously more powerful than that under commercial use ($p$>0.05, β=0.464). In addition, the SQ brings some influences to customer satisfaction under commercial and personal use conditions shows a weak difference ($p$<0.01), and no notable difference was observed between these two conditions on these remaining paths ($p$>0.05).

**Table 8:** Comparative Analysis Across Multiple Groups

| Path | Total Sample | | | Personal Use | | | Commercial Use | | | Difference |
|---|---|---|---|---|---|---|---|---|---|---|
| | β | 2.50%CI | 97.50%CI | β | 2.50%CI | 97.50%CI | β | 2.50%CI | 97.50%CI | |
| SQ-Sat | .421 | .339 | .486 | .447 | .362 | .518 | .463 | .374 | .532 | .016 |
| SQ-WOM | .316 | .252 | .376 | .298 | .231 | .368 | .323 | .246 | .384 | .025 |
| SQ-RI | .498 | .429 | .565 | .485 | .418 | .553 | .507 | .437 | .578 | .022 |
| SC-Sat | .374 | .309 | .437 | .369 | .305 | .428 | .372 | .303 | .436 | .003 |
| SC-WOM | .293 | .228 | .356 | .284 | .217 | .348 | .302 | .232 | .364 | .018 |
| SC-RI | .457 | .381 | .526 | .472 | .392 | .542 | .464 | .387 | .532 | -0.008 |
| Sat-WOM | .341 | .271 | .409 | .327 | .260 | .396 | .346 | .275 | .414 | .019 |
| Sat-RI | .478 | .403 | .549 | .468 | .393 | .541 | .474 | .398 | .545 | .006 |

Note: To make the data clearer, the zeros before the decimal point are omitted in the data in this table.

## 5. Discussion

This study expands and refines existing theories in many aspects. First, path analysis verifies the significant impact of SC, SQ and user satisfaction on RI and WOM, filling the research gap in this field. In addition, it also indirectly verifies that SC and SQ have an important positive effect on RI and WOM through the regulatory role of user satisfaction.

Comparison with past researches:

The results of Zhang and his group also found that SQ has an active effect on user loyalty. Their research gives others some tips that the SQ of the rental industry directly influences the user's RI and WOM, which is in line with and supports the outcomes observed in this study, confirming the consistency of the results. The study further confirms that SQ not only has an immediate influence on RI, but also through the role of user satisfaction surveys, thereby deepening the comprehension of the relationship between SQ and consumer loyalty.

This research of Rahmatulloh and his team also supports the active relationship between SQ and consumer loyalty found in this study. Especially in the commercial leasing environment, they emphasized the professionalism and reliability of services to enhance user loyalty. This study further revealed through multi-group analysis that the influence of SQ on RI in commercial use is more significant than that in personal use, which indicates that commercial users have higher expectations for SQ.

Compared with the study of service convenience in the electronic media environment by Dai et al., the conclusion of this study is different. Dai et al.'s study underlined the firsthand improvement of SC on SQ, while this study found that in drone leasing services, SC has a greater effect on user's RI and WOM through user satisfaction, especially among individual users, which indicates that individual users attach more importance to convenience and comfort during use.

Kaura et al.'s study verified the positive impact of SC on user satisfaction, which is consistent with a direct peroration of this research. In their study of Indian commercial banks, they pointed out that service convenience directly affects user satisfaction and This study revealed the different needs of individual and commercial users for service convenience through multi-group analysis. Commercial users give broader concerns to the professionalism and timeliness of services, while individual users give broader concerns to the intuitiveness and flexibility of operations and services.

Comparison and discussion with contradictory studies:

Unlike the study of Demirel et al. this study did not find that SQ has an immediate and decisive influence on user loyalty under all conditions. This study of Demirel et al. showed that in digital customer relationship management, SQ directly affects consumer long-term loyalty, but this study found through multi-group analysis that among individual users, service convenience indirectly affects consumer loyalty through customer's satisfaction, and the direct effect of service quality is not obvious. This may be due to the different usage frequency and needs of rental services. Individual users pay more attention to the immediate convenience experience rather than the long-term service quality evaluation.

The study of Otto et al. pointed out that in drone application scenarios (such as logistics products), service convenience is not the main factor determining user satisfaction. On the contrary, technical level and operational stability are more important. The research gives obvious evidence that SC has a significant impress on user satisfaction, especially among individual users, whether for personal or commercial use. This difference shows that in different application scenarios, users have different needs for service convenience, and drone rental services are key because of their strong operability and high convenience requirements.

Benefits and Contributions of This Study:

This study not only verifies the effect of convenience and SQ on user satisfaction, RI and WOM, but also compares some differences between individual users and commercial users in these relationships through multi-group analysis for the first time. Unlike previous studies that

mostly focused on user groups, this study reveals the different needs and behavior patterns of the two types of users in rental services, which provides more accurate value inspiration for drone rental services in service optimization and market analysis. By distinguishing between the motivations and decision-making processes of individual and commercial users, this research uncovers subtle nuances that have often been overlooked. Such insights allow for a more tailored approach to service design, ultimately driving higher customer retention and satisfaction in the drone rental industry.

In addition, this study further refines the complex connections between SC, SQ and user satisfaction, RI and WOM by verifying the chain effect. This not only enriches the theoretical investigates on the survey of service system indicators and their mutual effects, but also provides a specific practical reference for services in improving user experience. This deeper understanding aids in crafting a more responsive and user-centered rental service system, capable of adapting to shifting market dynamics and evolving consumer expectations.

## 6. Conclusion, Limitations and Prospective Study Orientation

This study empirically examined the effects of service convenience (SC), service quality (SQ), and user satisfaction on consumer loyalty in drone rental services, exploring how these variables differ across various use cases through multi-group analysis. The results demonstrate that enhancing service convenience and quality significantly boosts user satisfaction and customer loyalty, particularly for commercial users. Innovative developments in high-tech logistics have become crucial factors influencing users' perceptions of service quality.

However, our research on drone rental services has some limitations concerning sample scale, survey method, and research direction. First, the sample is primarily drawn from drone rental platforms in Beijing and Shenzhen, which may restrict the generalizability of the findings due to the specific geographical context. Second, reliance on self-reported questionnaires may introduce social desirability bias, affecting the accuracy of responses. Finally, this study focused solely on service convenience and quality, leaving out other potentially influential factors such as price perception, brand trust, and distribution logistics.

Future research should aim to address these limitations by broadening the geographical scope of the sample to include diverse regions, employing varied data collection methods such as in-depth interviews or targeted experiments to minimize social bias, and incorporating additional variables to create a more comprehensive model of customer loyalty. Overall, the research findings offer valuable academic insights and practical guidance for improving drone rental services, while also providing clear directions for future studies in the field of logistics and service optimization.

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