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THE FUTURE OF DELIVERIES: PARCEL LOCKER INTENTIONS

Fara Adura Mohd Yusoff (a), Fazeeda Mohamad (b)*, Puteri Fadzline Tamyez (c),

Siti Aisyah Panatik (d)

*Corresponding author

- (a) Faculty of Industrial Management, Universiti Malaysia Pahang Al-Sultan Abdullah, Lebuh Persiaran Tun Khalil Yaakob, 26300, Kuantan, Pahang, Malaysia, faraadura@gmail.com
- (b) Faculty of Industrial Management, Universiti Malaysia Pahang Al-Sultan Abdullah, Lebuh Persiaran Tun Khalil Yaakob, 26300, Kuantan, Pahang, Malaysia, fazeedamohamad@umpsa.edu.my
- (c) Faculty of Industrial Management, Universiti Malaysia Pahang Al-Sultan Abdullah, Lebuh Persiaran Tun Khalil Yaakob, 26300, Kuantan, Pahang, Malaysia, fadzline@umpsa.edu.my
- (d) Faculty of Social Science and Humanities, Universiti Teknologi Malaysia, Johor Bahru, Johor, Malaysia, saisyah@utm.my

Abstract

The global expansion of e-commerce and increasing usage of parcel locker has prompted researchers to delve into this field. Thus, this study looked into the variables that encourage automated parcel lockers use among Malaysian consumers. In this study, an additional variable, *resistance to change* was added to the Unified Theory of Acceptance and Use of Technology (UTAUT). This study is based on quantitative study and applied non-probability sampling technique which is voluntary technique. Data were collected through an online survey (n=423), and analysed using structured equation modeling. The finding found that three factors: performance expectancy, effort expectancy and innovativeness could affect behavioural intention. These findings provide new and additional knowledge about this innovative last-mile delivery intention, and the contributions to the theory and society. This study has explored the applicability of the UTAUT theory to study last-mile delivery in Malaysia, highlighting its theoretical ramifications. Finally, the findings are useful to aid courier companies and other relevant parties in outlining plans and carrying out strategies and initiatives to encourage consumers to accept parcel locker service.

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Keywords: Customers, E-commerce, Intention, Last-mile delivery, Parcel locker



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1. Introduction

Globally, consumer purchasing behaviours are shifting from in-store to online purchases. With the rise in demand for e-commerce, last-mile delivery (LMD) services have also increased and become an integral component of e-commerce. By 2030, it is forecasted that LMD demand worldwide will have increased by 78%. Although it is popular and has potential, e-commerce is one of the inefficient sectors from the perspective of last-mile logistics management. Last-mile delivery fees are estimated to account for 13 to 75% of overall supply chain costs (Olsson et al., 2019). To deal with high last-mile delivery costs and to assure the efficiency and effectiveness of logistics services, logistic service providers have offered several innovative logistic technologies. A systematic review by Mangiaracina et al. (2019) revealed innovative options for optimising last-mile delivery, including drone delivery, robots, automated parcel lockers, and crowdsourced logistics.

In this regard, the most prevalent solution is parcel locker. It is also known as smart locker delivery stations, collect and delivery points, and automatic delivery points (Yuen et al., 2018; Wang et al., 2018). Utilising a parcel locker requires users to collect their packages from the specified storage points. It is safe and convenient for consumers because it is located in strategic locations such as commercial buildings, higher education centres, and retail stores (Chen et al., 2020). In addition, using parcel lockers can eliminate the problem of "missed delivery" that forces consumers to wait for a second delivery. Moreover, since the parcel locker is available 24 hours a day, consumers may significantly reduce opportunity costs by selecting the time and place for package pick-up at any convenient time (Mostakim et al., 2019).

The global parcel locker market is projected to increase from 718.00 million USD in 2021 to 1,833.90 million USD in 2029 (Statista, 2022). Based on these estimates, parcel locker services will become increasingly popular to facilitate home delivery. In Malaysia, Pos Malaysia Berhad introduced an automated parcel locker in 2016 known as PosLaju EziBox. 170 Pos Laju EziBoxes are located at 166 places all over Malaysia. Ninja Van Sdn Bhd additionally provides an automated parcel locker. The service called NinjaBox is available at the LRT stations that carry the Puchong to Ampang and Gombak routes. Also, as stipulated in the National Courier Accelerator Plan (PAKEJ), additional parcel lockers and pick-up and delivery points will be offered as efforts to improve and expand the quality of courier services (Malaysian Communications and Multimedia Commission, 2021).

Although the parcel locker service is believed to be convenient and capable of resolving the issue of missing deliveries, the use of parcel lockers in Malaysia remains unpopular. In 2021, as reported by Pos Malaysia Berhad (2021), the average utilization rate of EziBox parcel lockers was merely 23%. Similarly, the average utilization of NinjaBox in Malaysia is lower compared to other countries such as Singapore (Parcelmonitor, 2020). Over the past few years, more researchers have investigated how consumers adopt parcel lockers as last-mile delivery services. For example, a study by (Yuen et al., 2018, 2019; Chen et al., 2018; Mohamad & Ngah, 2022; Zhou et al., 2020; Wang et al., 2018, 2020; Chen et al., 2020; Tsai & Tiwasing, 2021). In the researcher's knowledge, no studies examine resistance to change in parcel locker acceptance studies. Apart from identifying technological, social, and economic variables, it is essential to determine whether consumers resist changing the method they get the parcel. Considering

the concerns, this study aimed to ascertain consumers' intentions to use parcel lockers in Malaysia as a last-mile delivery service.

2. Theoretical Background

The unified theory of acceptance and use of technology (UTAUT) was used in this study, which is a combination of eight technology acceptance theories and models including theory of reasoned action, theory of planned behaviour, technology acceptance model, and many others. UTAUT for example has been regularly utilised in different acceptance of innovation studies for over two decades. Such studies have focused on the acceptance of apps (Duan & Deng, 2021), information technology (Venkatesh et al, 2003), electronic and mobile healthcare (Rahi et al., 2021; Hoque & Sorwar, 2017; Arfi et al., 2021), learning management systems (Khan & Qudrat-Ullah, 2021), green banking technology (Bouteraa et al., 2020) and e-wallet (Esawe, 2022; Yang et al., 2021).

The UTAUT theory is a popular theory in literature regarding technology adoption, judging by its sheer number of citations. However, UTAUT has been criticised mostly for reaching saturation, with little or no new information acquired. However, based on the meta-analysis findings by Blue et al (2021), UTAUT was discovered to provide theoretical development prospects by precisely extending variables or moderators that fit the study setting. Therefore, using UTAUT is appropriate in this study, since parcel locker is popular in last-mile delivery innovation. In this context, users need a mobile phone, and, in some cases, they also need to download an app from the delivery service provider to use the parcel locker. In this context, users need a mobile phone, and, in some cases, they also need to download an app from the delivery service provider or scan QR code. It shows that using parcel lockers involves self-service technology, enabling consumers to retrieve their parcels without contacting the delivery provider in person.

2.1. Conceptual framework and hypotheses development

The UTAUT serves as the conceptual basis for this research framework. Although consumers are given several alternatives to last-mile delivery services, studies show that home delivery is the most preferred method by consumers worldwide (Yuen et al., 2018). As is common knowledge, using a package locker is distinct from home delivery. Consequently, consumers may not wish to change their practice of waiting for the parcel to be delivered to their residence. In this study, a new variable was introduced to look at consumers' inclination to adopt parcel lockers: resistance to change and innovativeness. As proposed by Blut et al. (2021), a researcher can add other variables that suit the study's context and one of the suggestions is innovativeness. The conceptual framework for this study is shown in Figure 1.

Performance Expectancy (PE): This study defines PE as consumers' expectation that parcel lockers can help in receiving and sending express parcels easier (Venkatesh et al., 2003). Performance Expectancy has been seen to influence the willingness to adopt technology in numerous services like mobile learning, e-healthcare, autonomous delivery vehicles, e-wallets and express delivery services, as seen in numerous technology adoption studies (Arfi et al., 2021; Esawe, 2022; Zhou et al., 2020; Zhong et

al., 2022; Chao, 2019; Kapser, 2019). Thus, H₁ is introduced to examine how performance expectation affects the desire to use parcel locker:

H₁: There is a positive relationship between performance expectancy and consumers' intentions

Effort expectancy (EE): In the context of this research, effort expectancy pertains to consumers' perceptions that using parcel lockers is easy. Effort expectancy has a significant impact on several technological advancements, including self-service deliveries (Zhou et al., 2020), exoskeletons (Elprama et al., 2020) and mobile apps (Wut et al., 2021). Although using a parcel locker requires the customer to be actively involved in the delivery process, using a parcel locker is easy and does not require high-tech knowledge and skills. Consumers need to go to parcel lockers which involve several simple processes to pick up packages, such as entering a PIN or scanning a QR code. Therefore, it is assumed that the ease of using a parcel locker will affect the intent to use it. Thus, H₂ states:

H₂: There is a positive relationship between effort expectancy and consumers' intentions

SI or Social Influence: Social influence is linked to the user's belief that their social circles, such as family and friends, think they need to use a parcel locker. Studies in different respondents' cultures showed that social influence significantly influences mobile payment adoption among Chinese and Belgian samples (Wu & Liu, 2023). In last-mile delivery studies, several research has shown the effect of social influence to increase the desire to adopt autonomous cars and also, self-service delivery services (Kapser & Abdelrahman, 2020; Kapser et al., 2021; Zhou et al., 2020). Moreover, research in various sectors shows that social influence has a significant effect on the acceptability of sophisticated technology such as drone deliveries (Liu et al., 2020). Apart from that, Raza et al (2021) proved this relationship to be significant on learning management systems, and Tarhini et al. (2016) on mobile technologies. Thus, H₃ is introduced as:

H₃: There is a positive relationship between social influence and consumers' intentions

Facilitating Conditions (FC): The facilitating conditions refer to the extent of users' perceived ease in using the existing infrastructure and technology of a system (Venkatesh et al., 2003). For this study, the facilitating conditions can be operated as the user can use the parcel locker due to the organisation and technological infrastructure developed by the delivery service provider. In the last-mile delivery study, FC strongly impacted the inclination of self-service technologies to be employed, as stated by Zhou et al. (2020), while Kapser and Abdelrahman (2020) empirically proved FC influence the intention to adopt delivery vehicles that are autonomous. Hence, as hypothesised below, facilitating conditions are likely to impact the inclination to use parcel lockers:

H₄: There is a positive relationship between facilitating conditions and consumers' intentions

Innovativeness (INNO): In this study, innovativeness refers to the willingness of consumers to try using parcel locker technology as an alternative to home delivery. A comparison study in three countries (China, the United States, and Belgium) found that individual innovativeness significantly affects consumers' intention to adopt mobile payment services (Wu & Liu, 2023). Several researchers who

conducted studies regarding last-mile delivery disclosed that innovativeness is among the substantial factors influencing consumer acceptance of advanced last-mile delivery, such as autonomous delivery vehicles (ADV) (Kapser et al., 2021) and self-service delivery services (Chen et al., 2018). Less innovative consumers are likelier to reject any change in last-mile delivery innovation than more innovative consumers, who might be willing to use innovative last-mile delivery (Wang et al., 2020). Accordingly, the subsequent hypothesis is offered:

H₅: There is a positive relationship between innovativeness and consumers' intentions

Resistance to Change (RTC): For this study, resistance to change refers to consumers' reluctance to change how they receive parcels, from home delivery to parcel locker delivery. Past research indicates that user resistance may influence their decision whether or not to use technology, such as their willingness to adopt electronic health records (EHR) (Hossain et al., 2019), healthcare information systems (Bhattacherjee & Hikmet, 2007), and mobile health systems (Hoque & Sorwar, 2017). However, a last-mile delivery study has not investigated the study on resistance to change. Within the context of this study, consumers might be familiar with and comfortable with home delivery services. Therefore, they may not wish to switch to the parcel locker delivery option. Thus, this study aims to determine if resistance to change harms the intention to adopt parcel locker services among e-consumers in Malaysia. Based on that argument, the following hypothesis has been developed:

H₇: There is a positive relationship between resistance to change and consumers' intentions

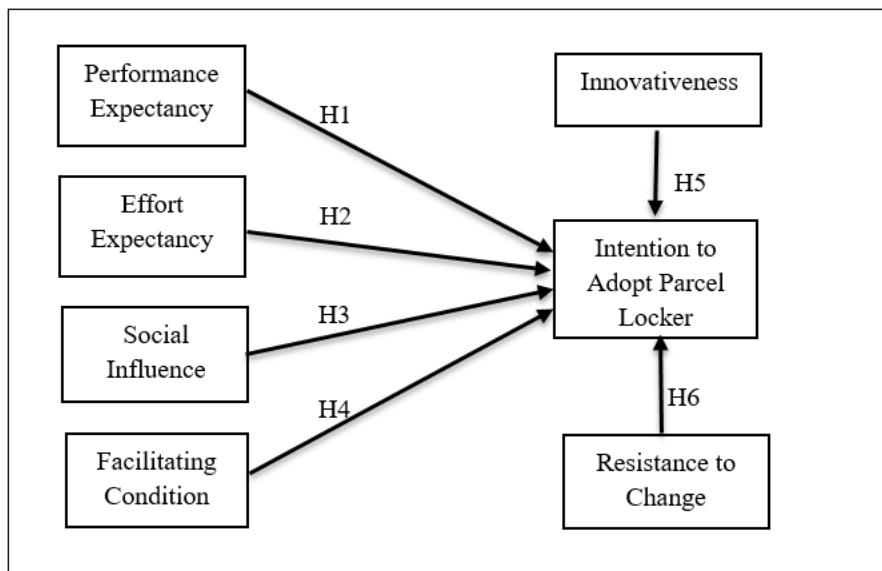


Figure 1. Research framework

3. Methods of Research

Quantitative research design was used where data is obtained from Malaysian consumers that meet the criteria: (1) Who have online buying experience; (2) Have never used the parcel locker service to receive their parcels. Since it involves individual responses, this research's analysis unit is the user. The researcher used a non-probability method called voluntary sampling to acquire data for this study. A

G*Power 3.1 a priori power analysis was done before data collection to determine the smallest sample size required to provide statistical power adequate to explain the model's interactions (Hair et al., 2017). G-Power was used to calculate minimum samples by using the following test: F-test; effect size $f^2 = 0.15$; α error problem = 0.05; and power = 0.95. A minimum samples for five predictors is 138. Of the 478 responses received, only 425 were usable due to the respondents not fulfilling the criteria, such as having experience using parcel locker. Four hundred twenty-five responses were collected and considered sufficient for assessing the research model.

Previous studies determined all the measurement items for each construct. The measurement items for performance expectancy and effort expectancy were adapted from Zhou et al. (2020), social influence and facilitating conditions (Zhou et al., 2020; Venkatesh et al., 2012), resistance to change from Bhattacherjee and Hikmet (2007), and behaviour intention from Venkatesh et al. (2012). This study was carried out using structural equation modeling (SEM), and the research model was created using SmartPLS 4. The outer and inner models of path models were constructed using partial least squares (PLS), which are two sets of linear equations.

4. Findings

4.1. Measurement model

Also, these two tests looked at the linkage among the constructs. Table 1 display the convergent validity for each of the measurements. Table 1 shows the convergent validity results for each of the measurements.

Table 1. Convergent Validity

Construct	Item Code	Outer Loading	Cronbach's Alpha	CR	AVE
BI	BI1	0.928	0.954	0.967	0.879
	BI2	0.943			
	BI3	0.946			
	BI4	0.933			
EE	EE1	0.885	0.922	0.945	0.81
	EE2	0.923			
	EE3	0.882			
	EE4	0.911			
FC	FC1	0.823	0.899	0.925	0.712
	FC2	0.864			
	FC3	0.832			
	FC4	0.815			
	FC5	0.884			
INNO	INNO1	0.899	0.931	0.951	0.829
	INNO2	0.888			
	INNO3	0.928			
	INNO4	0.926			

Construct	Item Code	Outer Loading	Cronbach's Alpha	CR	AVE
PE	PE1	0.866	0.906	0.935	0.781
	PE2	0.929			
	PE3	0.853			
	PE4	0.886			
RTC	RTC1	0.795	0.893	0.91	0.771
	RTC2	0.867			
	RTC4	0.965			
SC	SC1	0.901	0.904	0.932	0.775
	SC2	0.919			
	SC3	0.842			
	SC4	0.857			

Once convergent validity is determined, discriminant validity must be executed. If the HTMT is lower than 0.90, discriminant validity is reached (Franke & Sarstedt, 2019). Table 2 demonstrates that each HTMT value is less than the specified value, indicating that discriminant validity has not been compromised.

Table 2. Discriminant Validity

	BI	EE	FC	INNO	PE	RTC	SC
BI							
EE	0.677						
FC	0.536	0.657					
INNO	0.656	0.608	0.561				
PE	0.643	0.84	0.587	0.587			
RTC	0.091	0.066	0.078	0.047	0.081		
SC	0.593	0.726	0.741	0.628	0.696	0.116	

4.2. Structural model

When using a one-tailed, a significance level of $\alpha \leq 0.05$, and t-values > 1.645 are required to support the null hypothesis (Hair et al., 2017). Table 3 displays the results of the bootstrapping hypothesis testing. There are three acceptable hypotheses, and three rejected hypotheses. The findings indicated that the expectation of effort, performance expectancy, and innovativeness play a role in influencing the decision to use parcel lockers. Hence, hypotheses 1, 2, and 5 were confirmed. Meanwhile, facilitating conditions, social influence and resistance to change did not influence the intention to adopt a parcel locker (refer to Table 3).

Table 3. Bootstrapping testing

	Beta	Error	T-Value	P-Value	Confidence Interval		Result
					5%	95%	
H2: EE -> BI	0.247	0.078	3.182	0.001	0.117	0.369	Supported
H4: FC -> BI	0.062	0.051	1.229	0.110	-0.021	0.146	Not supported
H5: INNO -> BI	0.334	0.055	6.046	0	0.245	0.426	Supported
H1: PE -> BI	0.15	0.068	2.194	0.014	0.035	0.261	Supported
H6: RTC -> BI	-0.073	0.043	1.714	0.043	-0.128	0.021	Not supported
H3: SC -> BI	0.06	0.057	1.049	0.147	-0.035	0.154	Not supported

The intention was measured using a coefficient that was determined to be 0.528. This shows that PE, EE, SI, FC, RTC, and innovativeness might explain 52.8% of the variation in intention to adopt parcel locker. Cohen (2013) classified the effect sizes into three categories: small (0.02), medium (0.15), and large (0.35). The analysis discovered that f^2 for PE → INT = 0.018, EE → INT = 0.042, RTC → INT = 0.011, FC → INT = 0.004 and SC → INT = 0.003, and INNO → INT = 0.139. This shows that the exogenous variables have a modest impact on the endogenous variable. Shmueli et al. (2016) proposed researchers conduct PLS prediction to overcome the weakness of blindfolding and improve the prediction ability. As shown in Table 4, most RMSE values for PLS-SEM were below those of the LM for the dependent behaviour intention constructs. This shows a medium level of predictive capability in the current model.

Table 4. The Evaluation of PLS Predict

Q²predict	PLS-SEM (RMSE)	LM-RMSE
BI1	0.416	0.959
BI2	0.422	0.925
BI3	0.482	0.966
BI4	0.461	0.982

4.3. Discussion

Based on the findings, consumers' expectations of effort and performance significantly impact their intentions to use parcel lockers. These findings are consistent with those of other studies showing that performance expectancy impacts the intent to adopt different types of technology in last-mile delivery, such as an autonomous delivery vehicle (Kapser & Abdelrahman, 2020) and self-delivery services (Zhou et al., 2020). Furthermore, some studies have shown that effort expectancy has a major effect on adopting novel technology. A good example is shown by Wut et al (2021) on mobile apps, and Arfi et al (2021) empirically tested and proven the influence of effort expectancy in the context of eHealthcare technology. This means that users are concerned about the performance of parcel locker services, such as flexibility and convenience, and the involvement and efforts that need to be carried out if using a parcel locker which can affect the intention to use it. Apart from UTAUT factors, the extended factor, personal innovativeness, needs to be also considered because it significantly influences the intention to adopt a parcel locker. This result is consistent with earlier research on the intention to employ

autonomous delivery vehicles during the COVID-19 pandemic by Kapser et al. (2021) and self-service delivery by Chen et al. (2018).

Concerning the impact of facilitating conditions and social influence on the inclination to use a parcel locker, past studies that used UTAUT revealed that facilitating conditions did not affect the acceptance of online apps (Popova & Zagulova, 2022) or the inclination to use a mobile phone (Nikolopoulou et al., 2020). In terms of social influence, in this research, the influence of friends and family did not affect their adoption of parcel lockers. This aligns with other fields of study, such as online shopping (Erjavec & Manfreda, 2022) and electronic health care (Arfi et al., 2021). In general, parcel locker services differ from the old ways people have used them for a long time. So, it is assumed that users might not want to switch to a more innovative delivery method. Interestingly, resistance to change did not influence consumers' intention to adopt parcel lockers. The findings are consistent with those of Hossain et al. (2019), who discovered that resistance to change did not affect physicians' intentions to use electronic health records.

4.4. The theoretical and practical contribution

The present research may improve the theoretical and practical understanding of last-mile delivery and technology adoption. Regarding its theoretical contribution, this research broadens UTAUT in the context of the intention and inclination to use parcel lockers in terms of last-mile delivery service, notably in Malaysia. As suggested by Blut et al. (2021) this study also extends the model by adding another variable to the study model, which is innovativeness. Resistance to change has also been added to the model since this factor is less studied in last-mile delivery studies. Based on the literature, a major bulk of studies that looked into last-mile delivery using the UTAUT theory was conducted outside Malaysia. There is a possibility that driving factors that impact parcel lockers adoption might have differed between countries, such as Malaysia and its neighbouring countries. The driving factor impacting the willingness to use parcel lockers might vary between Malaysia and other countries. The findings here may be useful for future academics, and those in research and innovation, and government bodies. The current study can be a critical literature for upcoming scholars who want to delve into the issue of consumers' intentions about using parcel lockers.

The study's findings have important practical implications that may improve the usage of parcel lockers in the future. It revealed the most crucial variables about the intent to use a parcel locker. Logistics and courier service providers would do well to be aware of the variables and causes that influence the choice to use parcel locker services. With this information, they could tailor their service offerings, create plans and strategies, and implement appropriate actions such as carrying out promotions about the effectiveness of parcel locker technology and interventions to increase user awareness of the existence of parcel lockers and further increase the acceptance and use of parcel locker services. As a result, while attracting consumers, parcel locker service providers should emphasise their technological expertise in increasing consumers' convenience when using parcel lockers (An et al., 2022). In addition, this study also helps the government and related agencies to strengthen planning and policies to raise the quality of courier services. Malaysia's government has announced the National Courier Accelerator Package (PAKEJ) to improve the quality of service (QoS) and experience (QoE) in courier services. In

connection, more pick-up and drop-off (PUDO) is provided to users. Therefore, it is crucial for all parties involved to understand the elements that drive the consumers' intention to adopt a parcel locker to ensure that the PAKEJ goals can be met.

4.5. Limitations and recommendations for future research

During this study, some limitations were identified. These restrictions should be addressed to allow for a more thorough study. Firstly, this focus of the study was solely set on consumers in urban areas. Further research, however, is needed to broaden the study to include respondents from rural locations to establish the possibility of parcel locker service in remote areas. Additionally, this study's data was acquired through a survey questionnaire. The possibility of dishonest answers from respondents may hamper the effectiveness of the survey purpose. As a result, other procedures, namely mixed method, interviewing consumer face-to-face or other data collection modes are emphatically suggested. Third, the cross-sectional method was used to collect data simultaneously, and thus, detecting dynamic changes in consumers' social influence, innovativeness, and resistance to change cannot be obtained. Considering this, the researchers recommended using the longitudinal study for future research. Also, a longitudinal study can help to mitigate the issues arising from prevalent method bias.

5. Conclusion

This study looked into the factors that influence consumers' acceptance of parcel lockers as last-mile delivery services. Given the critical importance of last-mile delivery in business-to-consumer (B2C) e-commerce, parcel lockers are one of the most popular solutions for last-mile delivery issues. Thus, ensuring that consumers embrace the self-service parcel locker services is paramount. As this research predominantly aimed to examine consumers' intention to adopt parcel lockers as a last-mile delivery service in Malaysia, the UTAUT was used and extended in this study. The paper contributed significantly to outlining a framework that introduces resistance to change, an additional independent variable to look at the intention to adopt parcel locker. Most research concentrates on consumers who intend to use parcel lockers, and they hardly ever take resistance to change into account. In summary, three factors: effort expectancy, performance expectancy, and innovativeness are the three significant variables that affect consumers' intention to adopt parcel locker delivery.

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