國立成功大學

交通管理科學系碩士班

碩士論文

服務便利性、顧客參與準備與智取站使用意願關係之研究：以互動需要及科技焦慮為干擾變數

Service Convenience, Customer Participation Readiness and Use Intention of Automated Parcel Station: Need for Interaction and Technology Anxiety as Moderators

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本論文業經審查及口試合格特此證明

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摘要

提供無人看管自助取貨的智取站(Automated parcel Station, APS)是目前許多國家推出的新型態物流模式，透過自行完成服務來解決使用宅配及提貨點所面臨到的問題。過去的研究證實，APS 在不同的環境、不同的文化中似乎有不同的接受程度。然而，關於創新服務特色與使用意願之間的關係尚未獲得一致的結果。考慮到 APS 目前在台灣仍處於初期階段，沒有人進行更深入的討論。因此，本研究的目的在於了解影響台灣人民使用智取站意願的因素。我們提出的模型表示顧客參與準備有兩個前因（取得便利性和交易便利性）和一個後果（APS 的使用意願），並以互動需要和科技焦慮為干擾變數來表現個體差異的特徵。

本研究採用便利抽樣來蒐集問卷，共獲得 359 份有效樣本。研究結果顯示取得便利性和交易便利性對顧客參與準備有正向顯著的影響，且進一步影響使用 APS 的意願。此外，取得便利性和交易便利性也直接對使用意願產生正向顯著的影響。換句話說，顧客參與準備扮演部分中介的角色。結果亦發現，互動需要和科技焦慮在取得便利性和使用意願以及交易便利性和使用意願的兩條關係上有干擾效果。本研究將針對結果進行討論並且提供管理意涵以及未來研究的建議。

關鍵字：取得便利性、交易便利性、顧客參與準備、使用意願、智取站

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Abstract

Unattended self-collection is the new logistics mode promoted by many countries at present, that is, Automated parcel station (APS) to be discussed in this study. It solves the problems faced by home delivery and pick-up points by completing services on one's own. In previous studies, APS seems to have different acceptance levels in different environments and different cultures. However, it is still inconclusive in the relationship between the advantages of self-service and use intention. Considering that APS in Taiwan is now in the early stage, no one has made a more in-depth discussion. Therefore, it is worthwhile to know the factors affecting people's use intention of APS in Taiwan. We denote two antecedents of customer participation readiness (access convenience and transaction convenience) and one consequence (use intention of APS) in the proposed model. Moreover, this study takes need for interaction and technology anxiety as moderators to represent the characteristics of individual differences.

Convenience sampling is used in this study, obtaining a total of 359 valid samples. Results show that access convenience and transaction convenience have positive effect on use intention via customer participation readiness. In addition, access convenience and transaction convenience have significantly positive effect on intention directly. In other words, customer participation readiness plays a partial mediator role. Results also showed that moderating effect indeed. Finally, this study will discuss related implications, suggestions for future research, and several research limitations.

Keywords: Access convenience, transaction convenience, customer participation readiness, use intention, automated parcel station

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doi:10.6844/NCKU201900585

Context

Chapter 1 Introduction 1

1.1 Background 1

1.2 Motivation 4

1.3 Research objectives 6

1.4 Research procedures 7

Chapter 2 Literature review 8

2.1 Last-mile delivery 8

2.2 Self-service technology 11

2.3 Automated parcel station 15

2.4 Service convenience 20

2.4.1 Access convenience 22

2.4.2 Transaction convenience 23

2.5 Customer participation readiness 25

2.6 Individual Difference 29

2.6.1 Need for interaction 30

2.6.2 Technology anxiety 30

Chapter 3 Research methodology 32

3.1 Research framework 32

3.2 Research hypothesis 33

3.3 The questionnaire design 39

3.3.1 The measures of service convenience 40

3.3.2 The measures of customer participation readiness 41

3.3.3 The measures of use intention 42

3.3.4 The measures of individual difference 43

doi:10.6844/NCKU201900585

3.4 Sample and data collection 44
3.5 Data analysis 45
3.5.1 Descriptive statistics analysis 45
3.5.2 Exploratory factor analysis (EFA) 45
3.5.3 Reliability analysis 46
3.5.4 Confirmatory factor analysis (CFA) 47
3.5.5 Structural equation modeling (SEM) 48
3.5.6 Hierarchical regression analysis 50
Chapter 4 Results 51
4.1 Sample characteristics 51
4.1.1 Sample profile 51
4.1.2 Descriptive statistic of measurement items 55
4.2 Uni-dimensionality of customer participation readiness 59
4.3 Reliability analysis 60
4.4 Measurement model analysis 62
4.5 Common method bias check 66
4.6 Structural equation modeling analysis 69
4.7 Moderating effect of individual differences 74
Chapter 5 Conclusions and suggestions 83
5.1 Discussions and conclusions 83
5.2 Practical implications 86
5.3 Research limitations and directions for future research 88
References 90
Appendix A Chinese Questionnaire 105
Appendix B English Questionnaire 109

doi:10.6844/NCKU201900585

List of Tables

Table 2-1 Types of last-mile delivery 10

Table 2-2 The differences among three APS operators in Taiwan 16

Table 2-3 Factors affecting people's use intention of APS 18

Table 2-4 Importance of APS attributes in ITRI's survey 19

Table 2-5 Types of service convenience 21

Table 3-1 Service convenience items 40

Table 3-2 Customer participation readiness items 41

Table 3-3 Use intention items 42

Table 3-4 Need for interaction items and technology anxiety items 43

Table 3-5 Goodness-of-fit Indices 49

Table 4-1 Sample characteristics 52

Table 4-2 Descriptive statistics of measurement items 56

Table 4-3 Importance of APS attributes in this study 58

Table 4-4 Results of exploratory factor analysis 59

Table 4-5 Results of reliability analysis 60

Table 4-6 Results of convergent validity 62

Table 4-7 Results of discriminant validity 64

Table 4-8 Goodness-of-fit indices of measurement model 65

Table 4-9 Goodness-of-fit indices of single–factor procedure 67

Table 4-10 Results of common latent factor (CLF) approach 68

Table 4-11 The χ^2 difference between initial model and proposed model 69

Table 4-12 Goodness-of-fit indices of structural model 70

Table 4-13 Results of hypotheses testing for structural model 72

doi:10.6844/NCKU201900585

Table 4-14 Total effect of each construct on use intention of APS 73
Table 4-15 NI as a moderator on AC–UI relationship 76
Table 4-16 NI as a moderator on TC-UI relationship 77
Table 4-17 TA as a moderator on AC-UI relationship 78
Table 4-18 TA as a moderator on TC–UI relationship 79
Table 4-19 Results of hypotheses testing for moderating effects 81

doi:10.6844/NCKU201900585

List of Figures

Figure 1-1 Cost structure per parcel 2
Figure 1-2 Research procedure 7
Figure 2-1 Last-mile delivery procedure 8
Figure 2-2 Smart service interactivity matrix. 12
Figure 2-3 Technology injection service experience matrix 14
Figure 2-4 Three APS operators in Taiwan 15
Figure 3-1 Conceptual model 32
Figure 4-1 Results of structural model 71
Figure 4-2 Summary of moderating effects 82

doi:10.6844/NCKU201900585

Chapter 1 Introduction

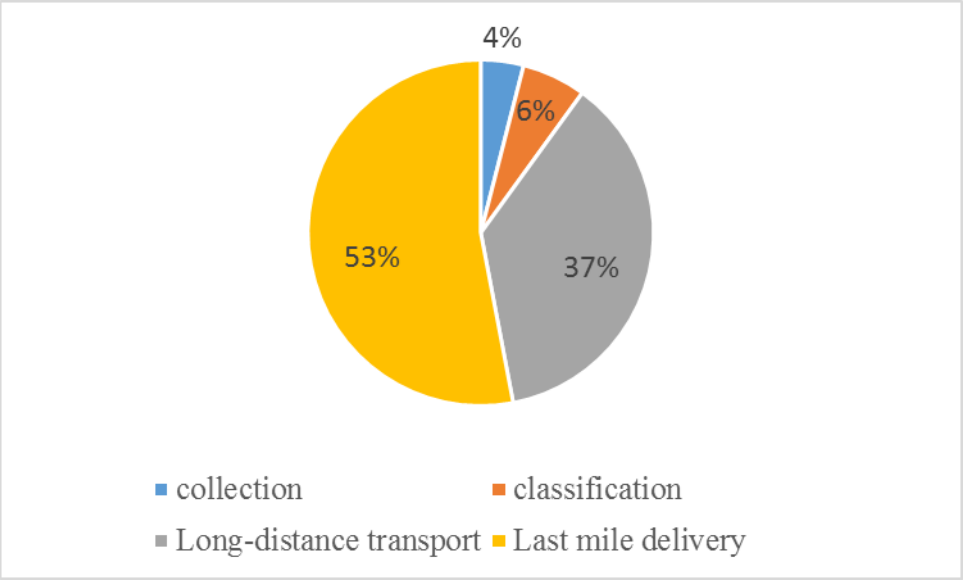
1.1 Background

In e-commerce, the process of delivering parcels from the distribution center to the consumer is called the last-mile delivery. A consumer surveys show that the last-mile delivery has become one of the basic factors for online shoppers to decide whether to shop online (Morganti, Dablanc, & Fortin, 2014). Youn, Park, and Choo (2014) indicated that logistics service is very important in e-commerce. Conway, Fatisson, Eickemeyer, Cheng, and Peters (2012) further pointed out that the delivery time, smooth communication channels, and the overall receiving experience are important factors influencing a customer to choose the last-mile delivery. With the rapid growth of e-commerce, consumers demand for distribution services is rising. How to improve distribution efficiency and meet consumers needs will become the key to the success of e-commerce services in the future.

However, last-mile delivery is a costly phase, accounts for 53 percent of the total transportation cost (Ding, 2014), which is shown in Figure 1-1. This means that the way the last-mile is delivered greatly affects the entire logistics cost. However, failed first time delivery will pay more costs. In addition, traffic safety, life quality, and urban competitiveness will also have a serious impact and this has become a key issue in many major cities (Savelsbergh & Van Woensel, 2016). Therefore, if e-commerce operators intend to provide sufficient manpower to support rapidly growing distribution needs, improve distribution efficiency and meet consumers need, they must improve existing delivery mode or find new logistics solutions (Chen, Yu, Yang,

doi:10.6844/NCKU201900585

& Wei, 2018). That is to say, if companies want to remain competitive, they may have to change the logistics model (Mentzer & Williams, 2001).



Source: Ding (2014)

Figure 1-1 Cost structure per parcel

In view of this, many countries have developed self-collection service. There are two forms of this service, i.e. attended or unattended (Allen, Thorne, & Browne, 2007; Savelsbergh & Van Woensel, 2016). Attended self-collection is "based on the concept of shop-in-shop, where parcels are delivered to a store, a petrol station, a convenience store or a post office" (Yuen, Wang, Ng, & Wong, 2018), these places are called "Pick-up points (PUPs)". On the other hand, unattended self-collection means that "the parcels will be delivered to the automated parcel station (APS)" (Yuen et al., 2018). APS is an application of self-service technology (SST), which usually uses automatic cabinet systems with camera surveillance (Dablanc, Morganti, & Fortin, 2015; Wang, Yuen, Wong, & Teo, 2018；Weltevreden, 2008).

However, there are still some problems with parcels delivered to pick-up points, such as increasing the workload of people and the need for customers to spend time

doi:10.6844/NCKU201900585

queuing. Therefore, unattended self-collection is the new logistics mode promoted by many countries at present, that is, APS to be discussed in this article.

doi:10.6844/NCKU201900585

1.2 Motivation

APS has become an innovative form of logistics to address the problems faced by home delivery and pickup points. Compared to home delivery and pick-up point, APS has more advantages, including 24/7 service, saving waiting time, and fun to use (Dabholkar, 1994). In this study, the previous two were the most prominent features of APS in the last-mile delivery mode, namely access convenience and transaction convenience (Collier & Sherrell, 2010). Despite APS is a perfect alternative to home delivery and pick up points, consumer's acceptance of APS is not as optimistic as expected.

The viability of any innovative service depends on the consumer's acceptance of the service. APS has been widely used in some European regions, such as France and Germany, and is seen as a well-established alternative to home delivery (Morganti, Seidel, Blanquart, Dablanc, & Lenz, 2014). They think it's convenient to use APS because they can have more flexible time (Morganti et al., 2014). However, British consumers have different opinions. They think that using APS is a burden for them because they need to work harder, so they are not willing to use APS (Xu, Ferrand, & Roberts, 2008). As for the Asian region, 80% of Singaporeans say they are used to home delivery, so they don’t want to change to use APS (Tan, 2016). In summary, APS seems to have different acceptance levels in different environments and different cultures. Considering that APS in Taiwan is now in the early stage, no one has made a more in-depth discussion. Therefore, it is worthwhile to understand the use intention of APS for people in Taiwan.

Many studies have confirmed that the characteristics of the technology can directly affect peoples’ use intention (Curran, Meuter, & Surprenant, 2003; Dabholkar,

doi:10.6844/NCKU201900585

2002). However, the relationship between use intention and relative advantage have different directions in a different background (Venkatraman, 1991). In other words, it is still inconclusive in the relationship between service characteristics and use intention. Therefore, we believe that there should be a mediation variable to solve this problem.

In fact, many SST studies take attitude as a mediator (Bitner, Ostrom, & Meuter, 2002; Hsu & Chiu, 2004). Although customers have a positive attitude towards the characteristics of new products or services, they may still choose not to try, and the lack of preparation for customers can explain this phenomenon (Meuter, Bitner, Ostrom, & Brown, 2005). Customers are seen as co-producers in SST, responsible for providing services and meeting their own needs (Bendapudi & Leone, 2003). In other words, even if the public has a positive attitude towards innovative services, if they are not ready, they will not accept SST. Therefore, compared with attitude, it is more appropriate to choose customer readiness as a key factor to affects people's use of SST (Meuter et al., 2005). On the other hand, Dong, Sivakumar, Evans, and Zou (2015) propose a new facet called customer participation readiness (CP readiness).

Compared with customer readiness, customer participation readiness is better suited to our research which will be detailed mentioned in section 2.5. The main difference between the two concepts is that customers who clearly understand the role they involved may not want to use APS unless they accept their service role. Therefore, this study takes customer participation readiness as a mediator.

In addition, since APS is an unattended innovative technology, this study takes need for interaction and technology anxiety as moderators to explore the segmentation for users in the APS market.

doi:10.6844/NCKU201900585

1.3 Research objectives

Based on the research background and motivations, this study aims to explore the factors that affect people's use intention of APS. The research objectives are as follows:

1. Explore whether access convenience and transaction convenience affect customer participation readiness and use intention of APS.
2. Examine the impact of customer participation readiness on use intention of APS.
3. Confirm the moderating effect of need for interaction and technology anxiety on the two relationships： (a) between access convenience and use intention (b) between transaction convenience and use intention.
4. Providing implications to relevant managers (i.e., government and service provider) about how to promote people's use intention of APS.

doi:10.6844/NCKU201900585

1.4 Research procedures

The research procedure is expressed as Figure 1-2. First, this study introduces background, motivation and research objective. Next, in order to construct the research framework and method, we review the relevant literature. Based on the framework and hypotheses of this study, questionnaire is designed. After surveying and data collection, this study conducts analysis data. Last, we present conclusions and suggestions according to the analysis results.

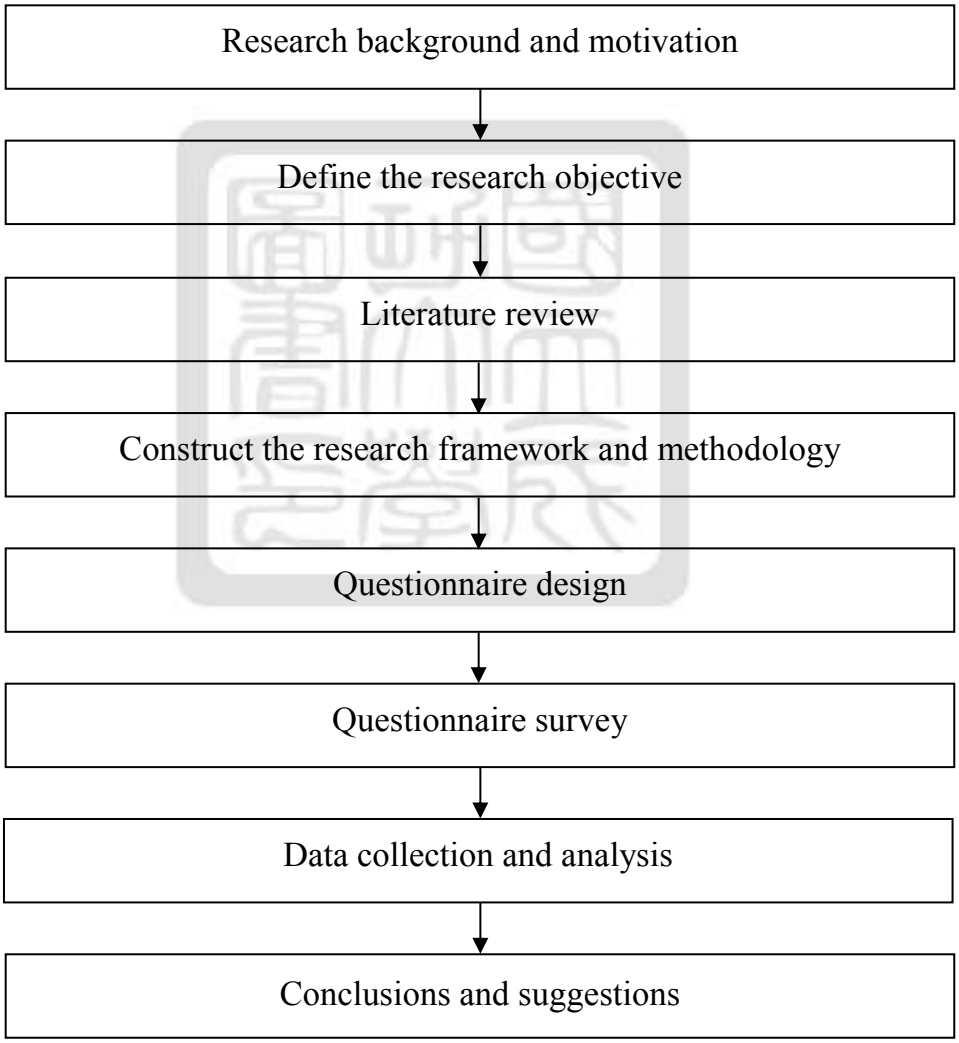


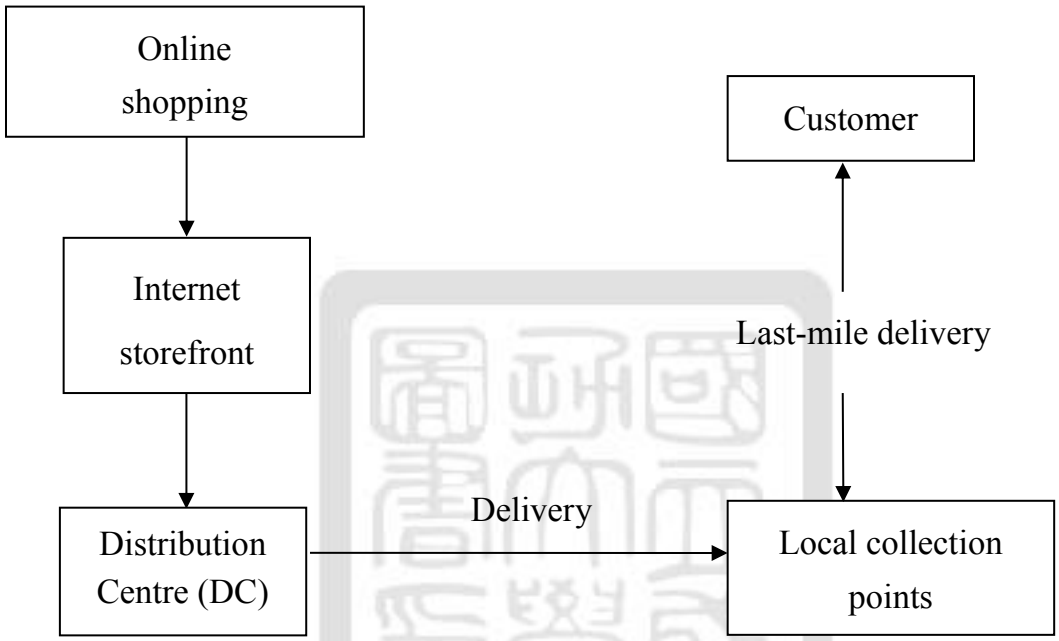
Figure 1-2 Research procedure

doi:10.6844/NCKU201900585

Chapter 2 Literature review

2.1 Last-mile delivery

Last-mile delivery is viewed as "the last step in the business-to-customer delivery service" (Gevaers, Voorde, & Vanelslander, 2009). Ring and Tigert (2001) take online shopping as an example, the last-mile delivery process is shown in Figure 2-1.



Source: Ring and Tigert (2001)

Figure 2-1 Last-mile delivery procedure

Okholm and Thelle (2013) indicated that the main factors for online shoppers to choose the last-mile delivery are low prices, receive notification and tracking, and delivery at specific times. Also, they also hope to have a convenient return process, which avoids the hassle of visiting the service counter and goes through a series of cumbersome procedures. Therefore, if the environment of e-commerce is to mature,

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not only information flow, business flow, cash flow need to improve the cooperation, but also logistic flow is a critical determinant.

However, with the continuous growth of global e-commerce, the demand for last-mile delivery has increased dramatically, resulting in e-commerce companies have faced some problems. The followings are the two most important challenges. The first challenge is the high cost of transportation. As mentioned in section 1.1, last-mile delivery cost accounts for 53% of the total transportation cost (Ding, 2014), meaning that it has a significant impact on the overall logistics costs. Furthermore, if the first delivery fails, it will pay more; The second challenge is the quality of delivery. In the last-mile delivery, the industry must provide customized services to meet each customer's different delivery time and delivery methods, such as not knocking on the door or handing the good to the administrator and so on. Therefore, if the communication between the delivery staff and the customer is not immediate and smooth, it will be easy to generate customer complaints or delay delivery.

In view of this, many e-commerce companies have adopted new ways to solve these problems. Pick-up point (PUP) and APS are the solutions for the industry to solve the last-mile delivery problem, which are shown in Table 2-1. However, PUP still has some disadvantages such as package hoarding and increasing the workload of the store clerk. Therefore, many operators have adopted APS to provide people with all-day services in order to effectively solve the problems arising from the home delivery and pick up point. The introduction of APS will be clearly stated in section 2.3.

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Table 2-1 Types of last-mile delivery

Delivery mode	Description	Main problem
Home delivery	Parcels will be shipped to the recipient's home.	1. High first delivery failure rate. 2. Customers are forced to stay at home. 3. Unable to meet the different needs of customers.
Pick-up point（PUP）	Parcels will be shipped to stores, convenience stores or post offices.	1. Parcel accumulation. 2. Increase staff workload. 3. Customers need to wait in line.
Automated Parcel Station（APS）	Parcels will be shipped to APS.	1. Loss of parcels. 2. Safety of pickup in the middle of the night.

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2.2 Self-service technology

There was no clear definition of SST in the early days, and it was only seen as a tool to improve efficiency in the service process (Bateson, 1985; Lovelock & Young, 1979). Until the recent research, SST was clearly defined as “the user's ability to complete the entire service process through technology, and no need for the participation of service personnel in the process” (Bitner et al., 2002; Meuter, Ostrom, Roundtree, & Bitner, 2000). By using SST, consumers can control time, pace, location, desired interaction and thus getting over many constraints (Collier & Kimes, 2013). In addition, for companies, productivity and efficiency can be increased at lower labor costs without lowering service standards (Bitner et al., 2002). SST attracts lots of research attention in service marketing and management because when they successfully implement, it has been proven to provide more efficient service standards (Curran & Meuter, 2005). Self-check-in at the airport, self-service laundry, hotel check-in kiosk and self-checkout at the store, etc. are all examples of SST.

Wünderlich, Wangenheim, and Bitner (2013) examined that when services can provide services through smart products such as intelligent remote monitoring machines and SST, this is called “smart services”. Smart services can provide significant benefits to service providers and consumers, such as reducing costs, increasing flexibility, increasing access, and saving time (Allmendinger & Lombreglia, 2005). Smart services can be interpreted in two dimensions, including the provider’s activity level and user’s activity level, and the formation of four types, which are shown in Figure 2-2.

In the last-mile delivery, in order to deal with the increasing number of delivered and returned parcels, as well as to enhance customer expectations and

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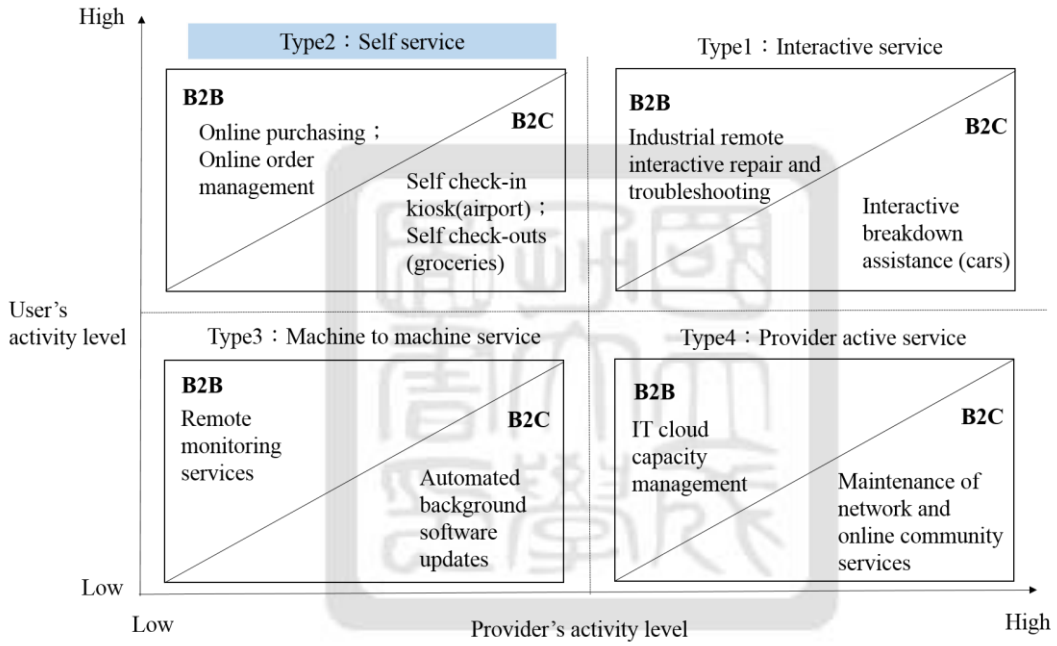
enhance market competition, logistics service providers are actively developing this innovative SST, APS thus launched (Augereau & Dablanc, 2008). APS requires the customer to operate the machine to complete the mailing service, so the user's activity is high. However, the service provider's mission is only to launched APS at the beginning, so the activity level is not high. Therefore, APS belongs to the second category. Self-service consist of two types, B2B and B2C. Examples of the former are online purchasing and online order management; the latter examples are self-service check-in kiosk and self-check-outs (Wünderlichetal., 2013).



Source: Wünderlich et al. (2013)

Figure 2-2　Smart service interactivity matrix

Besides, the rapid growth of technology quickly changes the relationship between customers and service providers (Ostrom, Parasuraman, Bowen, Patricio, & Voss, 2015; Rust & Huang, 2014). Technology products can provide services with humans, or they can be a complete substitute for human resources. For example,

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nurses can work with care robots to provide patient assistance, and such robots are auxiliary; However, technology products can also provide services without personnel, such as robotic waiters in restaurants. To explain the different configurations of these technologies, Doorn et al. (2017) examined a matrix of technology injection service experiences. This matrix can be interpreted by two dimensions, which are shown in Figure 2-3.

Social presence represents “the sense of being with another” (Biocca, Harms, & Burgoon, 2003; Heeter, 1992). Human social presence represents “the degree to which the interaction with human beings that makes consumers feel with others”, while automated social presence represents “the degree to which technology makes consumers feel with others while” (Heerink, Kröse, Evers, & Wielinga, 2010).

APS is considered a lack of social presence design because it doesn't have much interactive service, so automated social presence is low. Apart from, APS does not have service personnel beside, so the human social presence is also low (Doorn et al., 2017). For these reasons, we classify APS as the third category.

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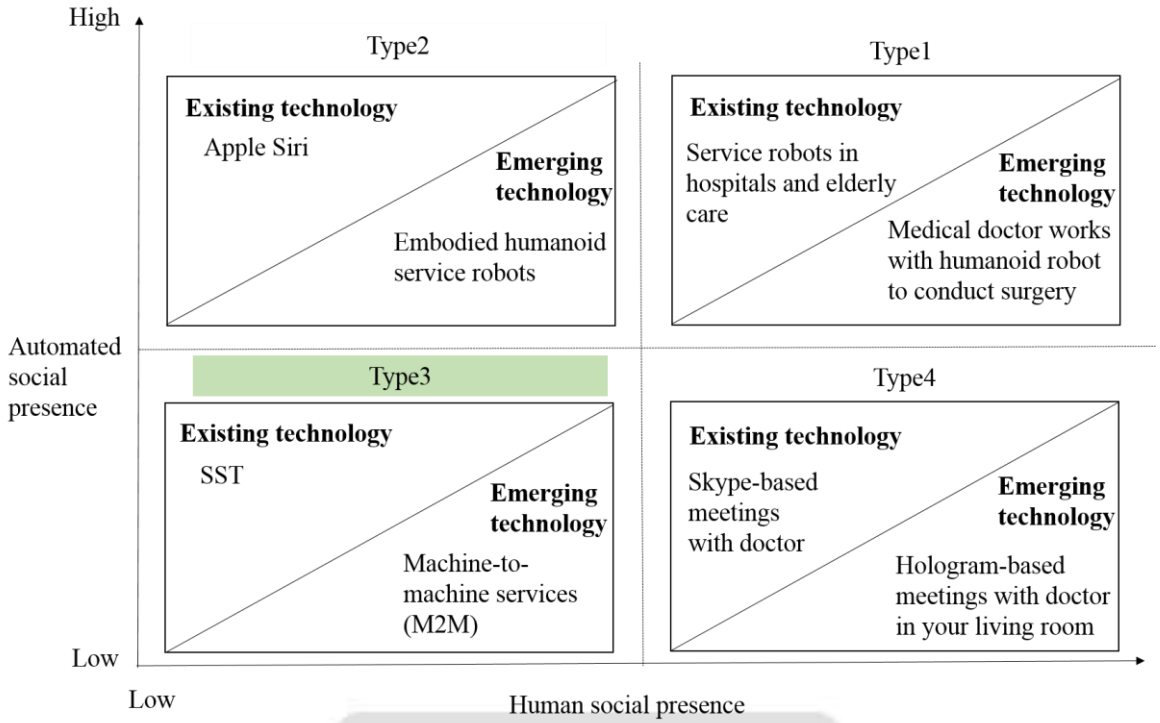

Source: Doorn et al. (2017)

Figure 2-3 Technology injection service experience matrix

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2.3 Automated parcel station

APS is now an innovative logistics approach for many operators to address conditions that are not compatible with the recipient in space and time, also reducing cost. APS was launched by Deutsche Post in 2001 and has been used in many countries since then, with examples of ByBox in UK, Pack Station in Germany, Inpost in Poland (Iwan, Kijewska, & Lemke, 2016) and POP Station in Singapore (Choo, 2016), and so on. Since 2016, three operators in Taiwan have also launched APS, such as I-box, IPickup, and Palmbox, providing people with 24/7 self-service, which are shown in Figure 2-4 and Table 2-2. The main difference is that both I-box and Palmbox provide shipping and pickup service, but I-pickup only provides pickup service.

I-box I-Pickup Palmbox

Figure 2-4 Three APS operators in Taiwan

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Table 2-2 The differences among three APS operators in Taiwan

	I-box	**I-Pickup**	**Palmbox**
Operators	ITRI and Chunghwa Post Co., Ltd.	ITRI , 7-11 and FamilyMart	Palmbox
Launch time	July 2016	July 2016	September 2016
Functions	Shipping, pickup and return	pickup	Shipping, pickup and return
Shipping method	APS to APS, APS to residence	-	APS to APS, APS to residence
Number of positions	409 points	30 points	931 points
Locations	Post office, MRT station, train station	7-11, FamilyMart, Chung Hua University, Chung Yuan Christian University, Soochow University etc.	Simple Mart and Xiaobei convenience Store
Cooperative logistics	DHL and Chunghwa Post	HCT,T-cat, KERRY TJ, E-CAN and Chunghwa Post	SF Express, E-CAN, KERRY TJ, DHL and UPS
Cooperation Platform	Postmall and PayEasy	—	Kingstone, SP book and TAAZE etc.
Payment method	Easy Card	—	Easy Card, credit card, Line Pay and Gamapay

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The main reason why APS can be widely used in many countries is that it solves the last-mile delivery problem, and the key lies in APS's cloud management system. APS can instantly receive foreground-background information, logistics manpower, broadcast advertising content, and order status through this system. Moreover, the electronic control system is used to automatically open the storage, handheld mobile devices, and cooperate with the logistics provider in order to solve the inefficient secondary delivery (Locision, 2016).

Overall, APS is beneficial to consumers, carriers and the environment, it is considered to be the best last-mile delivery mode (Meuter et al., 2000). For consumers, APS provides more convenient times and locations, faster delivery, avoiding time pressure and more private for picking up parcels (Collins, 2015); For common carrier, it not only allows for the elimination of the need for redistribution, leading to more efficient distribution arrangements and higher vehicle usage, but, most importantly, a significant reduction in delivery costs (Morganti, Seidel, Blanquart, Dablanc, & Lenz, 2014; Punakivi, Yrjölä, & Holmström, 2001); As for the benefits to the environment, in the best case, if consumers delivery or pick up parcels from APS, it will be able to reduce carbon emissions by 83%, which can translate into significant environmental improvements (Edwards, McKinnon, Cherrett, McLeod, & Song, 2010).

In order to understand the considerations of people using APS, some foreign studies have explored the factors affecting people's use intention of APS, as shown in Table 2-3. When individuals perceive higher relative advantages, compatibility, trialability, observability, and lower complexity, the higher the willingness to use it (Yuen et al., 2018). Chen et al. (2018) founded people's willingness to use APS in combination with individual factors, situational factors, and socialized factors. Moreover, use intention is affected by low prices, location convenience, time

doi:10.6844/NCKU201900585

flexibility, and traceable cargo information, as well as the fast delivery speed (Iwan et al., 2016; Moroz & Polkowski, 2016).

Table 2-3 Factors affecting people's use intention of APS

Study	Method	Theory base	Factors
Yuen et al. (2018)	SEM	Innovation Diffusion Theory（IDT）	Relative advantages, compatibility, trialability, observability, complexity
Chen et al. (2018)	SEM	Resource matching theory, consumer coproduction theory	Location convenience, perceived time pressure, need for human interaction, innovativeness, optimism
Iwan et al. (2016)	Descriptive statistics	-	Delivery Costs, accessibility, location convenience, time flexibility and trackable information
Moroz and Polkowski (2016)	Descriptive statistics	-	Time flexibility, delivery costs, and delivery speed
Oliveira, Morganti, Dablanc, (2017)	Descriptive statistics	-	Trackable information, delivery speed, delivery costs, and location convenience

doi:10.6844/NCKU201900585

In addition to foreign scholars, Industrial Technology Research Institute (ITRI) in Taiwan also investigated the importance of APS attributes from consumers in 2018, which are shown in Table 2-4. The top three attributes are the high security of the goods in APS, the cabinet of APS is clean and the high density of APS.

Table 2-4 Importance of APS attributes in ITRI's survey

Items	Percentage	Ranking
1. The high density of APS	43.6%	3
2. The process of shipping and pick-up in APS is simple and clear.	42.8%	4
3. The security of the goods in APS is high.	66.3%	1
4. The cabinet of APS is clean.	46.9%	2
5. The number of cabinets in APS is sufficient	31.2%	6
6. The size of the storage space in APS is moderate.	36.4%	5

Source: ITRI (2018)

doi:10.6844/NCKU201900585

2.4 Service convenience

Due to social and economic environment changes, technological progress, promoting the increasing demand for service convenience of consumers (Nickols & Fox, 1983). This encourages consumers to consider convenience as the basis for decisions-making (Anderson & Shugan, 1991; Gross & Sheth, 1989; Jacoby, 1977；Njite, 2005). As the demand for convenience increases, marketers must have a more comprehensive understanding of convenience (Berry et al., 2002). However, there is relatively little focus on convenience in past studies (Seiders, Voss, Godfrey, & Grewal, 2007). Therefore, Seiders et.al (2007) proposed that service convenience is "a second-order structure consisting of five first-order structures (or dimensions)", and is described as "consumers' perceived time and effort in purchasing or using a service" (Seiders et.al, 2007). Table 2-5 shows service convenience "reflects a multi-stage consumer process in which consumers have different assessments of the convenience of each stage" (Hui, Thakor, & Gill, 1998; Taylor, 1994; Seiders et.al, 2007).

doi:10.6844/NCKU201900585

Table 2-5 Types of service convenience

Types	Definition
1. Decision convenience	The time and effort consumers spend on deciding how to get the service they want.
2. Access convenience	The time and effort consumers perceived to spend to start service delivery.
3. Transaction convenience	The time and effort consumers perceived to spend to conclude a transaction.
4. Benefit convenience	The time and effort consumers perceived when they experience the core benefits of service.
5. Postbenefit convenience	The time and effort consumers perceived when they come into contact with the company after they have enjoyed the services.

Source: Seiders et.al (2007)

Compared to home delivery, the most obvious advantage of APS for consumers is that APS is not subject to time constraints. Customers can allow transactions to occur at any time through APS. Therefore, this study chooses “access convenience” facet. However, compared with the pick-up point, the biggest feature of APS is that it can save the queue time and speed up the transaction. Therefore, this study uses the “transaction convenience” facet.

Furthermore, Yuen et al. (2018) found that relative advantages, compatibility, and trialability positively affects customers' adoption of APS. Especially, the influence of relative advantage and compatibility are the most obvious among them (Yuen et al., 2018). This supports us to use access convenience and transaction convenience in this study, which will be explained separately below.

doi:10.6844/NCKU201900585

2.4.1 Access convenience

Access convenience is viewed as “consumers’ perceived time and effort to spend to start service delivery” (Berry et al., 2002; Seiders et.al, 2007). Access convenience depends on location, operating hours and parking availability (Meuter et al., 2000; Seiders, Berry, & Gresham, 2000).

Yuen et al. (2018) claimed that compatibility explains “how self-collection services is consistent with an individual's lifestyle, values, and needs”. About lifestyle, people who are not at home for most of the time or who support privacy may prefer to use self-service, this concept is similar to the “access convenience”; With regard to values, people with an environmental attitude may tend to use self-service because it is considered to be a greener alternative to home delivery and using this service in line with their environmental values; Similarly, individuals will be more willing to use self-service if such services meet their needs (Yuen et al., 2018).

APS can be located in a number of locations, such as shopping malls, shops, business centers, residential parking lots, workplaces, and gas stations, as well as in transportation hubs, allowing customers to visit through the shortest path and shorten the time to APS as much as possible (Morganti et al., 2014). Besides, almost all APS is available 24 hours and people can trade at any time. That is to say, APS's access convenience enables consumers to trade at any time and place.

doi:10.6844/NCKU201900585

2.4.2 Transaction convenience

Transaction convenience is viewed as “consumers’ perceived time and effort spent to conclude a transaction” (Berry et al., 2002). Specifically, Kumar, Kalwani, and Dada (1997) pointed out that transaction convenience reflects “the time it takes to queue in line and can have a negative impact on overall service evaluation”. Waiting times can affect consumers ' assessment of transaction convenience (Davis & Vollmann, 1990).

The relative advantage is regarded as “the degree innovation is considered to be better than the other, depending on whether the individual believes that innovation is beneficial” (Hashem & Tann, 2007). Yuen et al. (2018) pointed out that the comparison between the two views can be measured by economic value, social prestige factors, convenience, and satisfaction. In the context of self-collection, consumers may think that self-collection is more beneficial than home delivery because of their economic value (e.g. less waiting time), this concept similar to the “transaction convenience” used in this article; social prestige (e.g. those who are important to me prefer to use self-collection); convenience (e.g. easier and faster in using self-collection) and satisfaction (e.g. good previous experience with self-collection). When there is such an advantage over home delivery, they will be more willing to use self-collection (Chen, Conway, & Cheng, 2017；Yuen et al., 2018).

Unlike traditional service contacts, APS does not determine the speed of trading by the number of employees. The convenience of APS allows customers to always come first, resulting in faster trading. In the early self-service studies, transaction convenience is viewed as a critical determinant to use intention of self-service (Bateson, 1985; Langeard, Bateson, Lovelock, & Eiglier, 1981). Some customers prefer using self-service because times are saved (Lovelock & Young, 1979). Lemon,

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Newell, and Lemon (2002) further pointed out that people are competing for time in time-sensitive markets, which means time is the most valuable asset for consumers.

doi:10.6844/NCKU201900585

2.5 Customer participation readiness

Customer participation is “the extent to which customers invest in the production and service delivery” (Yim, Chan, & Lam, 2012). Take a hotel as an example, if the service staff fails to meet the needs, customers who have had good experience with the hotel may have an unsatisfactory experience. Therefore, one solution that meets a large number of needs is to let customers participate in (Vargo & Lusch, 2004).

Customer readiness is “the condition or state in which the customer is prepared and may use innovation for the first time, which can be conceptualized as ability, motivation, and role clarity (Meuter et al., 2005)”. Kotler, Bowen, and Makens (2006) pointed out that it is critical to understand customer readiness because of the inseparability and heterogeneity of the service. The inseparability of the service means that “the customer is part of the product and the customer must know how to use the service” (Kotler et al., 2006), while the heterogeneity of the service means that “the quality of service depends on who provides the service and when and where it is provided” (Kotler et al., 2006). Some studies pointed out that customer readiness affects service quality (Ho & Ko, 2008; Kelley, Donnelly & Skinner, 1990); customer satisfaction (Bowen, 1986) and use intention (Kim, Shim, & Ahn, 2011; Yoo, Han, & Huang, 2012).

In addition, customers are expected to be strongly responsive to customer behavior in many SST studies (Liljander, Gillberg, Gummerus, & Van Riel, 2006; Tsikriktsis, 2004). SST's success comes from customer readiness, which include “ability (having the necessary knowledge and skills required to perform a task)”, “motivation (a desire to receive the rewards associated with using the SST)” and “role clarity (knowledge and understanding of what is required to them in service process)”

doi:10.6844/NCKU201900585

(Bowen & Schneider, 1995; Dellande et al., 2004; Meuter et al., 2005). That is to say, the higher the customer's readiness, the more people are ready to use it. When the evaluation phase is reached, the customer will be more willing to use it; otherwise, if the customer is not ready, he/she is unlikely to use SST (Kotler et al., 2006). Therefore, for many companies, the challenge is usually not to manage technology, but to get consumers ready to try to use it.

However, Dong et al. (2015) argued that exploring the concept of customer readiness is not enough. “Since customers are considered to be partial employees in service participation (Claycomb, Cynthia, and Lawrence 2001), person-job fit theory was the most relevant theoretical basis in customer participation context” (Dong et al., 2015). They incorporate the concept of person-job fit theory into customer readiness and propose a new facet for customer participation readiness, and define as “the extent to which a customer is prepared to participate in service production and delivery” (Dong et al., 2015).

“Person-job fit theory is composed of two parts: (1) demand-ability fit—the employee’s ability matches the job requirement and (2) needs-supply fit—the employee perceives a match between rewards desired by him and those offered by the company” (Krist, Zimmerman, & Johnson, 2005). If there is good consistency between employees and their work, it can lead to positive results, for example, better job satisfaction and performance, and also lower turnover rates (Krist et al., 2005). Dong et al. (2015) proposed that “customer participation readiness consists of three sub-facets: (1) perceived ability (demand-ability fit) (2) perceived benefit (needs-supply fit)and (3) role clarity”, which will be described separately in the following.

doi:10.6844/NCKU201900585

The first is about perceived ability. Perceived ability measures the knowledge and skills of customer perception, enabling them to use service efficiently (Dong et al., 2015).

The second is about perceived benefit. Perceived benefit refers to "the customer's assessment of the interests of participation, including external and internal interests" (Dong et al., 2015). "Perceived benefit" is alike to "motivation" and "perceived value" in existing studies (Dong et al., 2015). Motivation is described as "a desire to receive the rewards associated with using the SST" (Meuter et al., 2005), while perceived value represents "an overall assessment of the utility of based on the perception of acquisition and giving" (Parasuraman, Zeithaml, & Berry, 1988). Perceived value, that is to say, a trade-off between perceived benefits and perceived costs (Lovelock, 2000；Bolton & Drew, 1991). By contrast, "perceived value" is more suitable in our study, because it measures the comprehensive value of the customer for the use of APS, which consists of monetary prices and non-monetary prices (Parasuraman et al., 1988；Bolton & Drew, 1991). For these reasons, this study measures perceived value through money, time, and effort.

Last is about the role clarity. "Role clarity" is alike to "role identification" in existing studies (Dong et al., 2015). Role clarity represents "the knowledge and understanding required in the service process" (Meuter et al., 2005), while role identification means "the degree to which customers accept and internalize their roles in participation" (Dong et al., 2015). By contrast, "role identification" is better suited in our study, because in this study, although customers clearly understand the role they are involved in, some customers may not agree with using APS, so it is critical to understand whether a customer accepts a service role. That is, people are more willing to use APS only if they agree with their role.

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To sum up, the customer participation readiness used in this study includes perceived ability, perceived value, and role identification.

doi:10.6844/NCKU201900585

2.6 Individual Difference

As consumers serve as an active participant in a self-service technology environment (Anitsal & Schumann, 2007), the technical characteristics and individual differences are the key reason for people using it (Harrison & Rainer, 1992). Meuter et al. (2005) also pointed out that a person's willingness to use self- service depends on his or her attitude, which is determined by two antecedents, product's characteristics and individual differences.

The individual difference consists of demographic variables and consumer personality traits (Schaninger & Sciglimpaglia, 1981). As for demographic variables, self- service technology adopters are usually young males (Lu, Yu, Liu, & Yao, 2003). In addition to demographic variables, many studies have shown that consumer personality traits, for example, technology anxiety, self-efficacy, seeking innovation and need for interaction all have a direct impact on using SST (Meuter et al., 2005). Dabholkar (2002) also pointed out that it is very important to explore individual differences in the marketing research of market segregation.

To sum up, it is critical to find out the individual difference when exploring the willingness of customers to use APS. This study chooses need for interaction and technology anxiety as individual difference traits, which will be explained in the following.

doi:10.6844/NCKU201900585

2.6.1 Need for interaction

Bateson (1985) argued that need for interaction is “the tendency of individuals to engage with service employees when receiving services”. Because employees and consumers interactions between are challenged by SST entry, many studies concerned about need for interaction (Meuter et al., 2005). Need for interaction is viewed as a critical consumer personality trait, and should be studied in SST context (Gelderman, Paul, & Diemen, 2011; Monsuwé, Dellaert, & Ruyter, 2004; Reinders, Dabholkar, & Frambach, 2008; Wang, Harris, & Patterson, 2013). Bitner (2001) also pointed out that some consumers prefer to interact with service employees, while others do not, so need for interaction may be a useful factor in predicting the level of personal behavior for the use of self-service. Some studies also confirmed that need for interaction does prevent consumers from using those technology (Dabholkar, 2002; Lee, Fairhurst, & Cho, 2013). In this study, APS is an unattended self-collection service. Therefore, it is reasonable to consider need for interaction, which allows managers to develop more effective strategies.

2.6.2 Technology anxiety

Anxiety is a determinant key to use intention in social cognitive theory (Compeau & Higgins, 1995). Although technology plays an important role in nowadays, people are faced with the problem of not being able to keep up with technological progress. Thus, many studies have explored the impact and extent of technology anxiety on the public (Caramba Coker, 2009; Chai, 2008; Phongkusolchit, 2008).

Meuter et al. (2005) argued that technology anxiety is“the ability and willingness of customers to use and control technology-related products”. Those who are anxious

doi:10.6844/NCKU201900585

about technology will be nervous about using technology, and even avoid using technology-related products as much as possible. In other words, anxiety comes from a lack of power or confidence in controlling technology (Doronina, 1995).

In this study, people need to use technology to complete the self-collection service. Therefore, it is reasonable to consider technological anxiety.

doi:10.6844/NCKU201900585

Chapter 3 Research methodology

Based on the literature review in Chapter 2, this chapter proposes the research framework and hypotheses among each construct. Next, the questionnaire design, sample and data collection, and data analysis are also illustrated explicitly.

3.1 Research framework

This study will examine how access convenience and transaction convenience of APS affects customer participation readiness and the use intention of APS. Besides, need for interaction and technology anxiety will have a moderating effect on the two relationships: (a) between access convenience and use intention (b) between transaction convenience and use intention. The conceptual model is shown in Figure 3-1.

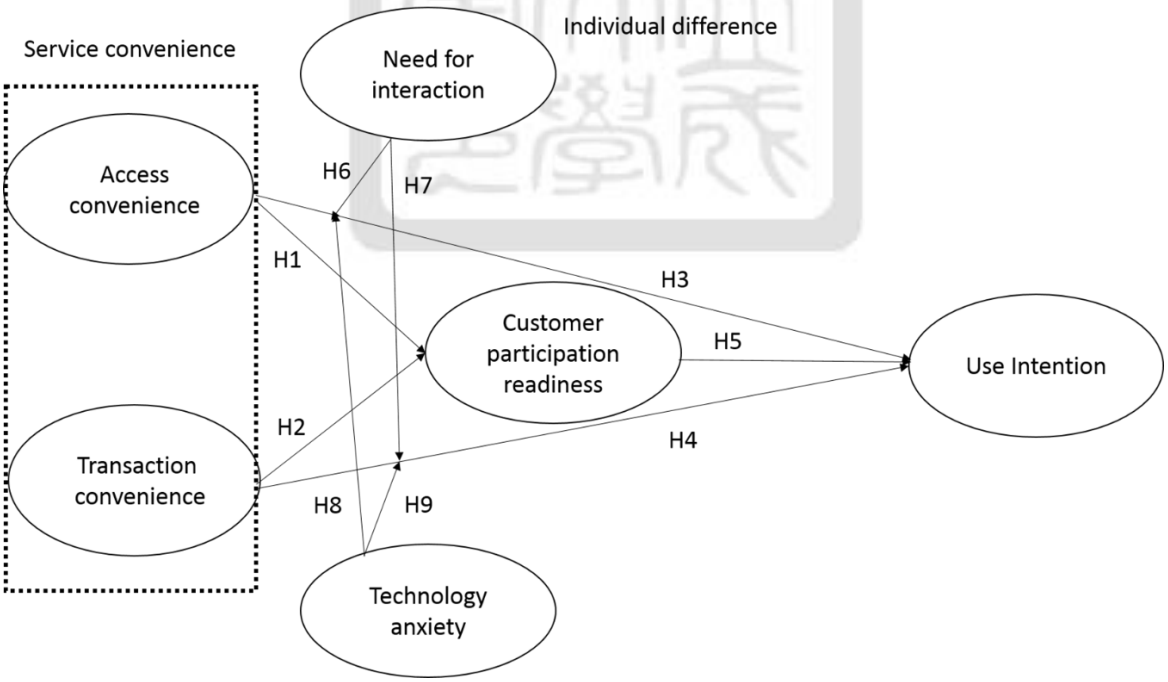

Figure 3-1 Conceptual model

doi:10.6844/NCKU201900585

3.2 Research hypothesis

People have different views about convenience, including the importance and their sensitivity to time and effort issues (Farquhar & Rowley, 2009). According to Resource-matching theory, consumers have limited cognitive resources to handle and perform related tasks (Anand & Sternthal, 1990). Some studies adopted the resource matching theory in the SST context (Collier, Moore, Horky, & Moore, 2015; Zhu, Nakata, Sivakumar, & Grewal, 2007). The location of the SST affects the user's cognitive resources (Zhu et al., 2007). For instance, if a person has to spend much time for visiting self-service, he needs requires extra effort and the task would become more difficult (Zhu et al., 2007). In addition, customer perception of time pressure may influence their cognitive resources.

Self-service technology providers provide customers with more convenience to compensate for the loss of employee interaction so that customers can usually be able to trade self-service at a convenient location and time without the need to queue (Dabholkar, 2002). As mentioned in section 2.4, this study uses two facets of service convenience, which are access convenience and transaction convenience. Access convenience represents “the time and effort consumers perceived to spend to start service delivery”, while transaction convenience represents “the time and effort consumers perceived to spend to conclude a transaction” (Berry et al., 2002 ； Seiders, Voss, Godfrey, & Grewal, 2007). If APS is installed in a poor location, a customer must consider the surrounding environmental factors and therefore reduce customer participation readiness; On the contrary, if APS is installed in a convenient location, customers can reduce the time it takes and the effort they make, and therefore improve customer participation readiness. Similarly, transaction time can also affect customer

doi:10.6844/NCKU201900585

readiness (Collier & Kimes, 2013). In other words, APS's physical location, operating time, and overall availability can determine whether a customer is ready to use it (Berry et al., 2002). These characteristics of technology will encourage customers to prepare and accept a service role (Collier & Sherrell, 2010). Thus, we propose the following two hypotheses:

H1: Access convenience is positively related to customer participation readiness.

H2: Transaction convenience is positively related to customer participation readiness.

Early studies on access convenience have pointed out that the convenient location of service will make customers more willing to use it (Gehrt & Yale, 1993). Jones, Mothersbaugh, and Beatty (2003) find location convenience has a significant, positive effect on consumer satisfaction. The convenience of self-service technology reduces time pressure, which encourages customers to use the service (Collier & Sherrell, 2010). Compared to other last-mile delivery modes, if APS is installed away from the consumer, then the consumer will choose to use another last-mile delivery mode (Chen et al., 2018).

On the other hand, perceived time pressure has a negative impact on shoppers' buying behavior (Duncan Herrington & Capella, 1995). Perceived time pressure will also seriously impact the use of self-service (Collier et al., 2015). The fast transaction is the reason why customers prefer to use SST rather than interact with employees (Durkin, 2004). One of the service standards in evaluating SST is the speed of the transaction (Meuter et al., 2000). If a customer can conduct the transaction more

doi:10.6844/NCKU201900585

quickly, the more willingness to use it (Ding, Hu, & Sheng, 2011). Howard and Worboys (2003) have classified these users as “utilitarians” who value speed and hope to get the fastest results with minimal interpersonal contact. Under the time pressure of perception, some people think that home delivery is inconvenient, so they choose alternatives, such as APS (Chen et al., 2018). Thus, we propose the following two hypotheses:

H3: Access convenience is positively related to use intention of APS.

H4: Transaction convenience is positively related to use intention of APS.

Customer readiness can affect the use of technology, such as before use (Meuter et al., 2005) and after use (Liljander et al., 2006; Lin & Hsieh, 2006). As customer readiness increases, customers become more enthusiastic about using smart products (Ho & Ko, 2008). Although smart products are now an integral part of our daily lives, some people may not be able to use it because of lack of preparation (Lin & Hsieh, 2006). In other words, customers will tend to try new technology if they are ready.

The concept of customer readiness has been taken into account in SST contexts, such as ATM and self-checkout machines and has demonstrated a significant, positive effect on adoption (Meuter et al., 2005). Thus, we propose the following hypotheses:

H5: Customer participation readiness is positively related to use intention of APS.

doi:10.6844/NCKU201900585

Consumer personality traits such as technology anxiety, self-efficacy, seeking innovation and need for interaction have positive effect on the use of self-service (Elliott & Hall, 2005). However, another group of scholars has different views, they pointed out that it is redundant to explore the direct impact. It is more meaningful to study the moderating effect because this can provide managers with marketing strategy advice in self-service technology design (Ajzen, Timko, & White, 1982; Baron & Kenny, 1986; James & Brett, 1984; Klein & Yadav, 1989). Therefore, this article takes individual differences as moderators, which will be further explained below.

In spite of the fact that there are many new technologies, consumers often refuse to adopt self-service technologies. Some consumers like to interact with cashiers, so they don't see the benefits of these technologies. That is, these consumers are in great need of human interaction and tend to have less intrinsic incentive to use self- service (Lee & Yang, 2013). In previous studies, it has been found that need for interaction results in negative adoption of self-service (Dabholkar, 1996; Dabholkar & Bagozzi, 2002; Gelderman et al., 2011).

In addition to being an antecedent of use intention, need for interaction is also a vital indicator of market segmentation. Consumers with higher interaction needs prefer personal services, so whether a cashier provides high-quality services is important for them to decide whether to go to the store (Lee & Yang, 2013). In other words, for consumers with higher interaction needs, the assessment of self-checkout quality will have a small impact on their intentions (Lee & Yang, 2013).

In this study, customers with lower need for interaction prefer using self-service, human contact in providing services bothers them. Therefore, whether APS provides high-quality service will be important for them to decide in using APS. On the

doi:10.6844/NCKU201900585

contrary, consumers with higher need for interaction prefer to interact with employees, human contact makes them enjoyable (Dabholkar, 1996), so whether APS is convenient is less important for them to decide whether to use it. Thus, we propose the following two hypotheses:

H6: The effect of access convenience on use intention will be stronger for consumers in low NI groups than those who are in high NI groups.

H7: The effect of transaction convenience on use intention will be stronger for consumers in low NI groups than those who are in high NI groups.

Technology anxiety is an important determinant of a consumer using self-service products (Heinssen Jr, Glass, & Knight, 1987; Nguyen Vu Bao & Mpambara, 2011; Walczuch, Lemmink, & Streukens, 2007). High-technology anxiety people will be afraid of not being able to solve the technology problem, so they will not use self-service; while those with low technology anxiety are more confident in using technology, so they tend to adopt it (Doronina, 1995).

In addition to being an antecedent of use intention, technology anxiety is also a vital indicator of market segmentation. Consumers with higher technology anxiety prefer to contact with cashier, so when they decide whether to patronize stores, their assessment of the cashier services will be an important determinant than consumers with lower technology anxiety (Lee & Yang, 2013). In other words, for consumers with higher technology anxiety, their assessment of self-service checkout quality has less impact on consumer intention in situations of low technology anxiety (Lee & Yang, 2013).

doi:10.6844/NCKU201900585

In this study, customers with lower technology anxiety prefer trying new technology and are confident in learning technology-related skills (Meuter, Ostrom, Bitner, & Roundtree, 2003). Therefore, whether APS provides high-quality service is critical to their decision to use APS. That is, when they regard APS as a convenience service, they are more willing to use APS. On the contrary, consumers with higher technology anxiety are more worried about using technology (Meuter et al., 2005), so whether APS is convenient is less important for them to decide whether to use it. Thus, we propose the following two hypotheses:

H8: The effect of access convenience on use intention will be stronger for consumers in low TA groups than those who are in high TA groups.

H9: The effect of transaction convenience on use intention will be stronger for consumers in low TA groups than those who are in high TA groups.

doi:10.6844/NCKU201900585

3.3 The questionnaire design

Based on the explications of the aforementioned chapter and section, the questionnaire includes the following four parts. The first section is service convenience (i.e., access convenience and transaction convenience) scales; the second section is customer participation readiness scales; the third section is use intention scales; the fourth section is individual differences (i.e., need for interaction and technology anxiety) scales. The complete questionnaire is shown in Appendix A. The measurement scales for all constructs come from existing literature and have been modified to fit the context of APS.

doi:10.6844/NCKU201900585

3.3.1 The measures of service convenience

Two facets of service convenience are used in this study, which are access convenience and transaction convenience. Access convenience is described as "the time and effort consumers perceived to spend to start service delivery", while defining transaction convenience is described as "the time and effort consumers perceived to spend to conclude a transaction" (Berry et al., 2002; Seiders et al., 2007). Access convenience and transaction convenience consists of four items and three items adapted from Seiders et al. (2007). The measurement items are shown in Table 3-1. Five-point Likert-type scale are used in all items (from 1 = "strongly disagree" to 5 = "strongly agree").

Table 3-1 Service convenience items

Construct	Items	Source
Access convenience	AC1: I am able to get to APS quickly and easily. AC2: There is a good public transport around APS. AC3: APS is located in a convenient location. AC4: APS offers convenient store hours.	Seiders et al. (2007)
Transaction convenience	TC1: APS makes it easy for me to conclude shipping and pick up. TC2: I am able to complete shipping and pick up quickly at APS. TC3: It takes me a little time to complete shipping and pick up at APS.	Seiders et al. (2007)

doi:10.6844/NCKU201900585

3.3.2 The measures of customer participation readiness

Customer participation readiness is described as "the extent to which a customer is prepared to participate in service production and delivery" (Dong et al., 2015). Perceived ability, perceived value, and role identification are used as a second-order factor for customer participation readiness, sourced by Dong et al. (2015) and Bolton and Drew (1991) with ten items. The measurement items are shown in Table 3-2. Five-point Likert-type scale is used in all items (from 1 = "strongly disagree" to 5 = "strongly agree").

Table 3-2 Customer participation readiness items

Construct	Items	Source
Perceived ability	PA1: I am fully capable of using APS. PA2: I am confident in my ability to use APS. PA3: Using APS to conclude shipping and pick up is well within the scope of my abilities.	Dong et al. (2015)
Perceived value	PV1: Compared to the money I spend, using APS is worthy. PV2: Compared to the time I spend, using APS is worthy. PV3: Compared to the efforts I made, using APS is worthy.	Bolton& Drew (1991)

doi:10.6844/NCKU201900585

Table 3-2 Customer participation readiness items (continued)

Construct	Items	Source
Role Identification	RI1: I am glad to perform some service roles that would normally be provided by related employee. RI2: I enjoy serving myself by being involved in APS. RI3: I am happy to take on some roles to replace an employee's work. RI4: I think I have the responsibility to be involved in this service.	Dong et al. (2015)

3.3.3 The measures of use intention

Use intention is described as "the degree to which a person is willing to use APS (Chen et al., 2018)", which includes three items adapted from Chen et al. (2018). The measurement items are shown in Table 3-3. Five-point Likert-type scale is used in all items (from 1 = "strongly disagree" to 5 = "strongly agree").

Table 3-3 Use intention items

Construct	Items	Source
Use intention	UI1: I intend (continue) to use APS in the future. UI2: I intend to recommend relatives and friends to use APS. UI3: I will say positive things about APS to others.	Chen et al. (2018)

doi:10.6844/NCKU201900585

3.3.4 The measures of individual difference

Need for interaction is described as “the tendency of individuals to engage with service employees when receiving services”, while technology anxiety is described as “the degree of anxiety experienced by individuals in the face of decisions to use technological innovations such as computer technology” (Meuter et al., 2005). Need for interaction and technology anxiety are respectively developed by Meuter et al. (2005) with three items and four items. Five-point Likert-type scale is used in all items (from 1 = “strongly disagree” to 5 = “strongly agree”).

Table 3-4 Need for interaction items and technology anxiety items

Construct	Items	Source
Need for interaction	NI1: Personal contact with an employee makes me feel happy. NI2: Personal attention by a customer service employee is important to me. NI3: I won't choose to use self-service machine when there are service people on site.	Meuter et al. (2005)
Technology anxiety	TA1: I feel apprehensive about using technology. TA2: Technical terms bothers me. TA3: I have avoided technology because it is unfamiliar to me. TA4: I hesitate to use technology for fear of making mistakes I cannot correct.	Meuter et al. (2005)

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3.4 Sample and data collection

To test the research model, we conduct a questionnaire survey to collect data. As mentioned in section 2.3, there are three APS operators in Taiwan, namely I-box, I-Pickup, and Palmbox. In order to better understand the use intention of APS, this study issued questionnaires at three sites of different operators. Convenience sampling is used to collect questionnaires in this study. This survey spanned one month in January 2019 and a total of 359 valid samples were acquired after deleting incomplete ones from the 380 respondents. Before respondents answer the questionnaire, the background of APS and the steps of using APS will be explained through the pictures and forms to them.

Respondents are questioned about their views in access convenience, transaction convenience, customer participation readiness, use intention of APS, need for interaction and technology anxiety. This study also queries the importance of APS attributes.

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3.5 Data analysis

This study uses statistical software SPSS 17.0 and AMOS24.0 to analyze the collected questionnaires. Descriptive statistics analysis, exploratory factor analysis (EFA), reliability analysis, confirmatory factor analysis (CFA), structural equation modeling (SEM) and hierarchical regression analysis are applied to analyze data. Following are the descriptions of the above methods:

3.5.1 Descriptive statistics analysis

Descriptive statistics analysis is used to calculate mean, standard deviation, frequency distribution, and percentage to analyze the demographic data. By this analysis, it can provide a primary understanding of data and a clear description of the sample. Moreover, in order to understand respondents' responses, we also use this method to measure mean, standard deviation, skewness, and kurtosis of each item.

3.5.2 Exploratory factor analysis (EFA)

The purpose of exploratory factor analysis (EFA) is to examine the interrelationships among several variables and then reduces several variables to less underlying dimensions. It is a reduction technique using less number of dimensions to express initial variables. By exploratory factor analysis, underlying dimensions will be extracted from similar variables. Factor loading of variable had better be greater than 0.5 in a certain dimension, while the cross-loading variable will be deleted during the analysis (Hair, Black, Babin, & Anderson, 2014).

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3.5.3 Reliability analysis

This study uses Cronbach's α to examine the internal consistency of each item in the same construct. The coefficient of Cronbach's α is range from 0 to 1. While the coefficient is closer to 1, indicating there is higher reliability (Hair et al., 2014). If the coefficient is greater than 0.7, it means that it has enough reliability in certain construct. Therefore, this study sets 0.7 as criteria to examine the reliability of each construct.

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3.5.4 Confirmatory factor analysis (CFA)

Anderson and Gerbing (1988) proposed the two-stage approach to analyze the data. First, confirmatory factor analysis (CFA) is conducted to examine construct reliability, convergent validity, discriminant validity and goodness-of-fit of the measurement model. After that, structural equation modeling (SEM) is applied to verify the hypothesis among constructs of the conceptual model.

According to Fornell and Larcker (1981), standardized factor loading (λ) estimates greater than 0.5, and t values must reach significant levels. Moreover, the indices of construct reliability (CR) and average variance extracted (AVE) in each construct should higher than 0.7 and 0.5 respectively (Fornell & Larcker, 1981). The acceptable criteria of discriminant validity are that the square root of AVE for each construct should higher than its correlation coefficients with other constructs (Fornell & Larcker, 1981).

In order to check model adequacy, goodness-of-fit (GOF) indices are applied. There are three types of fitness: absolute fit measures, incremental fit measures and parsimonious fit measures. These indices include chi-square ($\chi 2$) statistics, the root mean square of approximation (RMSEA), the goodness-of-fit index (GFI), the normed fit index (NFI), the comparative fit index (CFI), the adjusted goodness of fit index (AGFI), parsimonious normed fit index (PNFI), and parsimonious goodness of fit index (PGFI) and mean square residual (RMR). The criteria of these indices are shown in Table 3-5.

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3.5.5 Structural equation modeling (SEM)

The conceptual model of this study includes several relationships among multiple independent variables and dependent variables. In order to measure these causal relationships simultaneously, this study applies structural equation modeling (SEM) which is deemed to be a method for testing the relationships among constructs.

The fitness indicators and criteria assessed for structural model are the same as that for the measurement model, which are also shown in Table 3-5.

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Table 3-5 Goodness-of-fit Indices

Goodness-of-Fit Indices		
Absolute fit measures	Chi-Square/d.f.	<3 is good
	RMSEA	≦0.08 is good (At least 0.05-0.08)
	GFI	GFI≧0.9 means satisfactory fit 0.8<GFI<0.9 means acceptable fit
Incremental fit measures	NFI	NFI≧0.9 means satisfactory fit 0.8<NFI<0.9 means acceptable fit
	CFI	CFI≧0.9 means satisfactory fit 0.8<CFI<0.9 means acceptable fit
	AGFI	AGFI≧0.9 means satisfactory fit 0.8<AGFI<0.9 means acceptable fit
Parsimonious fit measures	PNFI	0-1 bigger is better
	PGFI	0-1 bigger is better
	RMR	<0.1

Source: Hair et al. (2014)

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3.5.6 Hierarchical regression analysis

Hierarchical regression analysis divided the selection of variables into three steps in order to verify the existence of the moderator (Baron & Kenny, 1986). In the first step, we add social-economic variables (i.e. gender, age, education) to the regression. In the second step, we add the main effect (independent variable and moderator) into our model. And last, the interaction term is added into the model to test the moderating effect, which is generated by the multiplication of independent variable and moderator. If the interaction term has a significant effect on the dependent variable, it indicates that a moderator exists.

For avoiding a high degree of correlation between independent variables, the interaction items is generated by standardized independent variables and moderators (Aiken, West, & Reno, 1991).

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Chapter 4 Results

Based on the questionnaire data we collected, there are seven sections to be introduced during the analysis process. In the first section, we introduce the sample characteristics of measured items. Then, we introduce the uni-dimensionality of customer participation readiness and the result of reliability analysis in the second and third sections. In the fourth and fifth section, the result of the measurement model and common method analysis are introduced. Moreover, the results of SEM are introduced in the sixth section. And in the last section, moderating effects are tested.

4.1 Sample characteristics

4.1.1 Sample profile

The sample characteristics are shown in Table 4-1. In this sample, 49.3% of the respondents were male and 50.7% of the respondents were female. Most of the respondents are 21-30 years old (29.2%). On the other hand, the majority of respondents work in the manufacture industry (27.0%). With regard to the main identity, most of the respondents are buyers (71.6%). About the frequency of using logistics services per month, 50.4% of the respondents use it 0-2times a month, while 49.6% of the respondents use it over 3times a month.

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Table 4-1 Sample characteristics

Characteristic		Frequency	Percentage
Gender	Male	177	49.3%
	Female	182	50.7%
Age	18-20	16	4.5%
	21-30	105	29.2%
	31-40	94	26.2%
	41-50	65	18.1%
	51-60	56	15.6%
	Over 61	23	6.4%
Occupation	Student	82	22.8%
	Public servant and Military	55	15.4%
	Service industry	78	21.7%
	Manufacture industry	97	27.0%
	Homemaker	25	7.0%
	Retired	13	3.6%
	Others	9	2.5%
Education	Junior / Senior high school	28	7.8%
	Bachelor’s degree	225	62.7%
	Master’s degree	91	25.3%
	PhD	8	2.3%
	Others	7	1.9%
Income	Less than 10,000	52	14.5%
	10,001-20,000	30	8.3%
	20,001-30,000	74	20.7%
	30,001-40,000	111	30.9%
	40,001-50,000	58	16.1%
	Greater than 50,001	34	9.5%

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Table 4-1 Sample characteristics (continued)

Characteristic		Frequency	Percentage
Main Identity	Seller	6	1.7%
	Buyer	257	71.6%
	General purpose (no trading)	96	26.7%
Main use of logistics services	Shipment	102	28.4%
	Pickup	254	70.8%
	Return	3	0.08%
Frequency of using logistics services per month	0 times	4	1.1%
	1 times	93	25.9%
	2 times	84	23.4%
	Over 3 times	178	49.6%
Main last-mile delivery mode	Home delivery	62	17.3%
	Pick up points (PUPs)	287	79.9%
	Automated parcel station (APS)	10	2.8%
Did you originally know the services provided by APS:	Yes	176	49.0%
	No	183	51.0%
Have you ever used APS?	Yes	54	15.0%
	No	305	85.0%
Which APS did you most commonly use?	I -box	34	63.0%
	I -pickup	1	1.8%
	Palm box	19	35.2%

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Table 4-1 Sample characteristics (continued)

Characteristic		Frequency	Percentage
How long have you use this APS?	Less than 3 months	14	25.9%
	3-6 months	27	50.0%
	6-9 months	9	16.7%
	9-12 months	2	3.7%
	More than 1 year	2	3.7%
Where did you get the information of APS?	Introduction of colleagues, classmates or friends	41	23.3%
	Internet	90	51.1%
	Television / Radio	29	16.5%
	Magazine /Newspaper	7	4.0%
	Others	9	5.1%

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4.1.2 Descriptive statistic of measurement items

Table 4-2 shows each construct and items with the code number in this study. The mean, standard deviation, skewness, and kurtosis of each item are also shown in this table. Skewness is used to measure the degree to which the distribution status of data deviates from the mean, while kurtosis is used to measure the distribution status of data is peak (leptokurtic) or flat-topped (platykurtic) compared to normal distribution. The items in AC, TC, PA, PV, UI, and NI all show negative skewness, which indicate that the distribution of data is centered above mean. However, RI1 and TA show positive skewness, which indicate that the distribution of data is centered below mean. On the other hand, most of the items show negative kurtosis, which means the distribution of data is heterogeneity. This indicates that people obtain different opinions on these concepts.

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Table 4-2 Descriptive statistics of measurement items

Constructs and items	Mean	SD	Skewness	Kurtosis
Access convenience (AC)				
AC1: I am able to get to APS quickly and easily.	4.09	0.64	-0.275	1.169
AC2: There is a good public transport around APS.	4.14	0.59	-0.054	-0.288
AC3: APS is located in a convenient location.	4.13	0.61	-0.227	0.227
AC4: APS offers convenient store hours.	4.22	0.60	-0.211	-0.101
Transaction convenience (TC)				
TC1: APS makes it easy for me to conclude shipping and pick up.	4.18	0.73	-0.462	-0.400
TC2: I am able to complete shipping and pick up quickly at APS.	4.13	0.66	-0.498	0.610
TC3: It takes me a little time to complete shipping and pick up at APS.	4.06	0.69	-0.283	-0.206
Customer participation readiness (CPR) -Perceived ability (PA)				
PA1: I am fully capable of using APS.	4.16	0.75	-0.620	0.050
PA2: I am confident in my ability to use APS.	4.14	0.78	-0.826	0.825
PA3: Using APS to conclude shipping and pick up is well within the scope of my abilities.	4.20	0.72	-0.720	0.777
Customer participation readiness (CPR)- Perceived value (PV)				
PV1: Compared to the money I spend, using APS is worthy.	3.88	0.76	-0.191	-0.43
PV2: Compared to the time I spend, using APS is worthy.	3.95	0.72	-0.295	-0.098
PV3: Compared to the efforts I made, using APS is worthy.	3.95	0.74	-0.290	-0.250
Customer participation readiness (CPR)- Role Identification (RI)				
RI1: I am glad to perform some service roles that would normally be provided by related employee.	3.67	0.80	0.079	-0.619
RI2: I enjoy serving myself by being involved in APS.	3.79	0.79	-0.014	-0.536
RI3: I am happy to take on some roles to replace an employee's work.	3.67	0.80	-0.029	-0.528
RI4: I think I have the responsibility to be involved in this service.	3.60	0.86	-0.409	0.306
Use Intention (UI)				
UI1: I intend (continue) to use APS in the future.	4.20	0.63	-0.317	0.023
UI2: I intend to recommend relatives and friends to use APS.	4.08	0.67	-0.322	0.001
UI3: I will say positive things about APS to others.	4.08	0.70	-0.313	-0.290

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Table 4-2 Descriptive statistics of items (continued)

Constructs and items	Mean	SD	Skewness	Kurtosis
Need for interaction (NI)				
NI1: Personal contact with an employee makes me feel happy.	3.05	1.07	-0.225	-0.755
NI2: Personal attention by a customer service employee is important to me.	3.04	1.02	-0.062	-0.745
NI3: I won't choose to use self-service machine when there are service people on site.	2.93	1.03	-0.038	-0.672
Technology anxiety (TA)				
TA1: I feel apprehensive about using technology.	2.84	1.10	0.330	-0.832
TA2: Technical terms bothers me.	2.91	1.12	0.164	-0.981
TA3: I have avoided technology because it is unfamiliar to me.	2.90	1.13	0.262	-0.875
TA4: I hesitate to use technology for fear of making mistakes I cannot correct.	2.84	1.12	0.137	-0.842

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People's opinions on the importance of APS attributes are shown in Table 4-3. The higher the mean is, it represents that people consider it is more important. According to the ranking, people consider the high security of the goods in APS is the most important attribute. On the contrary, the moderate size of the storage space in APS is the least concerned by people. This result is different from the results of the ITRI's survey in 2018 (see Table 2-4).

Table 4-3 Importance of APS attributes in this study

Items	Mean	SD	Ranking
IM1 : High density of APS	4.30	0.71	2
IM2 : The process of shipping and pick-up in APS is simple and clear.	4.29	0.73	3
IM3 : The security of the goods in APS is high.	4.39	0.73	1
IM4 : The cabinet of APS is clean.	4.22	0.73	4
IM5 : The number of cabinets in APS is sufficient	4.18	0.75	5
IM6: The size of the storage space in APS is moderate.	4.17	0.74	6

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4.2 Uni-dimensionality of customer participation readiness

Exploratory factor analysis (EFA) is applied to examine the uni-dimensionality of "customer participation readiness" (CPR) because the items in CPR are derived from different measurements of literature respectively. As shown in Table 4-4, the results of EFA make sure that PA1, PA2, and PA3 can be delineated into uni-dimension of PA (α=0.851)；PV1, PV2, and PV3 can be delineated into uni-dimension of PV (α=0.840)；RI1, RI2, RI3, and IRI4 can be delineated into uni-dimension of RI (α=0.860).

Table 4-4 Results of exploratory factor analysis

Factors	Items	Factor loading	Variance Explained (%)	Cronbach's α
Perceived ability (PA)	PA1	.872	28.16%	0.851
	PA2	.821		
	PA3	.809		
Perceived value (PV)	PV1	.756	23.70%	0.840
	PV2	.834		
	PV3	.832		
Role Identification (RI)	RI1	.811	22.78%	0.860
	RI2	.796		
	RI3	.871		
	RI4	.709		

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4.3 Reliability analysis

This study applies internal consistency (Cronbach's α) to examine the reliability of each construct. When the coefficient of Cronbach's α is greater than 0.7, it means that it has enough reliability (Hair et al., 2014). As shown in Table 4-5, all of Cronbach's α in each construct is higher than 0.7, which access convenience is 0.796, transaction convenience is 0.731, perceived ability is 0.851, perceived value is 0.840, role identification is 0.860, use intention is 0.761, need for interaction is 0.865, and technology anxiety is 0.909. Hence, the scale development of this study possesses internal consistency and homogeneity.

Table 4-5 Results of reliability analysis

Constructs	Items	Corrected Item-total correlation	Cronbach's alpha
Access convenience (AC)	AC1	0.609	0.796
	AC2	0.671	
	AC3	0.587	
	AC4	0.563	
Transaction Convenience (TC)	TC1	0.484	0.731
	TC2	0.640	
	TC3	0.547	
Perceived ability(PA)	PA1	0.717	0.851
	PA2	0.726	
	PA3	0.723	
Perceived value (PV)	PV1	0.664	0.840
	PV2	0.728	
	PV3	0.722	
Role Identification(RI)	RI1	0.737	0.860
	RI2	0.730	
	RI3	0.780	
	RI4	0.585	

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Table 4-5 Results of reliability analysis (continued)

Constructs	Items	Corrected Item-total correlation	Cronbach's alpha
Use Intention(UI)	UI1	0.605	0.761
	UI2	0.525	
	UI3	0.653	
Need for interaction(NI)	NI1	0.739	0.865
	NI2	0.779	
	NI3	0.713	
Technology anxiety(TA)	TA1	0.784	0.909
	TA2	0.822	
	TA3	0.816	
	TA4	0.757	

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4.4 Measurement model analysis

The convergent validity of the measurement model is first tested, and then examined discriminant validity (Hair, Black, Babin, & Anderson, 2014). As shown in Table 4-6, all items performed significantly on their construct and all factor loadings are greater than .50 (Fornell & Larcker, 1981). In addition, the CR of all constructs are higher than 0.70 and the AVE of each construct is greater than 0.5, supporting convergent validity (Fornell & Larcker, 1981).

Table 4-6 Results of convergent validity

Constructs/Indicators	Item reliability			CR	AVE
	S.F.L.	S.E.	T-Value		
Access convenience (AC)				0.80	0.516
AC1	0.75	0.56	-		
AC2	0.76	0.57	11.987***		
AC3	0.66	0.44	10.931***		
AC4	0.70	0.49	10.779 ***		
Transaction convenience (TC)				0.749	0.508
TC1	0.67	0.45	-		
TC2	0.80	0.64	11.338***		
TC3	0.66	0.43	9.813***		
Customer participation readiness (CPR) (second order)				0.750	0.573
PA	0.76	0.58	-		
PV	0.78	0.61	9.395***		
RI	0.73	0.53	9.460***		

Notes:1. *** denotes p < .001.

2. S.F.L.: standard factor loading; S.E.: standard error.

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Table 4-6 Results of convergent validity (continued)

Constructs/Indicators	Item reliability			CR	AVE
	S.F.L	S.E.	T-Value		
Perceived ability (PA)				0.751	0.657
PA1	0.78	0.60	-		
PA2	0.82	0.67	15.387***		
PA3	0.83	0.69	15.580***		
Perceived value (PV)				0.749	0.641
PV1	0.76	0.58	-		
PV2	0.83	0.69	15.005***		
PV3	0.81	0.66	14.771***		
Role identity (RI)				0.798	0.633
RI1	0.79	0.63	-		
RI2	0.86	0.75	17.317***		
RI3	0.84	0.70	17.439***		
RI4	0.68	0.46	12.711***		
Use intention (UI)				0.747	0.519
UI1	0.75	0.57	-		
UI2	0.70	0.50	11.235***		
UI3	0.71	0.51	13.574***		
Need for interaction (NI)				0.751	0.690
NI1	0.82	0.67	-		
NI2	0.88	0.77	17.156***		
NI3	0.79	0.62	15.850***		
Technology anxiety (TA)				0.800	0.727
TA1	0.85	0.73	-		
TA2	0.86	0.74	20.067***		
TA3	0.86	0.73	20.045***		
TA4	0.84	0.70	17.793***		

Notes:1. *** denotes $p < .001$.

2. S.F.L.: standard factor loading; S.E.: standard error.

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Moreover, this study also applies discriminant validity to confirm whether the square root of AVE for each construct is larger than its correlation with other constructs (Fornell & Larcker, 1981). As shown in Table 4-7, it reveals that there is the discriminant validity in this study, and the constructs are distinct from each other.

Table 4-7 Results of discriminant validity

	Mean	SD	AC	TC	CPR	UI	NI	TA
AC	4.15	0.48	***0.719***					
TC	4.12	0.56	0.412**	***0.713***				
CPR	3.92	0.54	0.482**	0.550**	***0.757***			
UI	4.12	0.55	0.464**	0.568**	0.636**	***0.720***		
NI	3.01	0.92	-0.206**	-0.228**	-0.196**	-0.376**	***0.831***	
TA	2.87	0.99	-0.355**	-0.562**	-0.434**	-0.609**	0.386**	***0.853***

Note: 1. **p<0.01

2. The square roots of AVE show in the diagonal of the matrix.

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Table 4-8 shows goodness-of-fit indices of measurement model. It indicates that measurement model has a good fit ($\chi 2$/d.f. = 1.67, RMSEA = 0.043, GFI = 0.91, AGFI = 0.88, NFI = 0.91, CFI = 0.96, PNFI = 0.78, PGFI = 0.72, and RMR = 0.031).

Table 4-8 Goodness-of-fit indices of measurement model

Indicators	**Criteria**	**Measurement model**
Chi-Square/df	<3 is good	500.27/300=1.67
RMSEA	≦0.08 is good	0.043
GFI	GFI≧0.9 means satisfactory fit 0.8<GFI<0.9 means acceptable fit	0.91
AGFI	AGFI≧0.9 means satisfactory fit 0.8<AGFI<0.9 means acceptable fit	0.88
NFI	NFI≧0.9 means satisfactory fit 0.8<NFI<0.9 means acceptable fit	0.91
CFI	CFI≧0.9 means satisfactory fit 0.8<CFI<0.9 means acceptable fit	0.96
PNFI	0-1 bigger is better	0.78
PGFI	0-1 bigger is better	0.72
RMR	<0.1	0.031

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4.5 Common method bias check

Because all items are measured by a five-point Likert-type scale and the semantics are positive, so common method bias (CMB) may occur and generate wrong estimations of the observed relationships between the constructs in our model (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Therefore, it is necessary to check the existence of common method bias in this study.

In order to test CMB, we used “Harman's single factor test (1976)” as an exploratory method. To do this, all the items used in this study should be loaded into one factor. If this factor can explain more than 50% variance, then it will be considered to have a serious CMB (Podsakoff et al., 2003). This test resulted in 34.74% of variance explained, which means CMB does not exist in this study.

In addition, if the CMB is largely responsible for the co-variation among the measures, a confirmatory factor analysis should indicate that a single-factor model fits the data (Podsakoff et al., 2003). Table 4-9 shows goodness-of-fit indices of single factor procedure. A one-factor model does not fit the data, which reduces concerns about CMB ($\chi 2$/d.f. = 8.08, RMSEA = 0.141, GFI = 0.58, AGFI = 0.51, NFI = 0.53, CFI = 0.56, PNFI = 0.49, PGFI = 0.50, and RMR = 0.093).

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Table 4-9 Goodness-of-fit indices of single–factor procedure

Indicators	Criteria	Measurement model
Chi-Square/df	<3 is good	2619.15/324=8.08
RMSEA	≦0.08 is good	0.141
GFI	GFI≧0.9 means satisfactory fit 0.8<GFI<0.9 means acceptable fit	0.58
AGFI	AGFI≧0.9 means satisfactory fit 0.8<AGFI<0.9 means acceptable fit	0.51
NFI	NFI≧0.9 means satisfactory fit 0.8<NFI<0.9 means acceptable fit	0.53
CFI	CFI≧0.9 means satisfactory fit 0.8<CFI<0.9 means acceptable fit	0.56
PNFI	0-1 bigger is better	0.49
PGFI	0-1 bigger is better	0.50
RMR	<0.1	0.093

The common latent factor (CLF) was also used as a confirmatory method by adding a latent factor to our model and then connected it to all the observed variables. The comparison between the standardized regression weights of the two models (with and without the CLF) should be smaller than 0.2 (Chin, Thatcher, & Wright, 2012). In this study, most of the differences are less than 0.2, which are shown in Table 4-10. Therefore, we conclude that CMB does not exist in this study.

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Table 4-10 Results of common latent factor (CLF) approach

Path	Standardized regression weights of model with CLF	Standardized regression weights of model without CLF	Difference (absolute value)
AC1 <---AC	0.621	0.751	0.13
AC2 <---AC	0.629	0.756	0.127
AC3 <---AC	0.48	0.662	0.182
AC4 <---AC	0.564	0.703	0.139
TC1 <---TC	0.568	0.668	0.1
TC2 <---TC	0.492	0.801	0.309
TC3 <--- UI	0.55	0.658	0.108
UI1 <--- UI	0.507	0.754	0.247
UI2 <--- UI	0.435	0.704	0.269
UI3 <--- UI	0.386	0.713	0.327
NI1 <--- NI	0.8	0.817	0.017
NI2 <--- NI	0.882	0.877	-0.005
NI3 <--- NI	0.768	0.786	0.018
TA1<--- TA	0.761	0.855	0.094
TA2 <--- TA	0.783	0.858	0.075
TA3 <--- TA	0.769	0.857	0.088
TA4 <--- TA	0.692	0.838	0.146
PA1 <--- PA	0.758	0.777	0.019
PA2 <--- PA	0.726	0.819	0.093
PA3 <--- PA	0.713	0.832	0.119
PV1 <--- PV	0.404	0.762	0.358
PV2 <--- PV	0.522	0.828	0.306
PV3 <--- PV	0.57	0.811	0.241
RI1<--- RI	0.505	0.793	0.288
RI2<--- RI	0.582	0.864	0.282
RI3<--- RI	0.581	0.839	0.258
RI4<--- RI	0.336	0.677	0.341

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4.6 Structural equation modeling analysis

The structural equation modeling is subsequently implemented to examine the causal relationships among constructs. In this section, we compared two models to see whether the model with a mediator has a better fit in this study. The initial model specifies that access convenience and transaction convenience are exogenous latent variables that directly influence use intention of APS. On the other hand, customer participation readiness was added to serves as a mediator in the proposed model. As shown in Table 4-11, there are significant differences between the two models (p-value=0.000<0.05).

Table 4-11 The χ^2 difference between initial model and proposed model

	Chi square (X^2)	***df***	ΔX^2	Δdf	***p***
Initial model	122.39	33			
Proposed model	404.82	162	282.43	129	0.000

To further select which model has better explanatory power, a number of indices assessing the goodness-of-fit of SEM models were used. The overall model fit indices are provided in Table 4-12. Based on the recommended criteria (Hair et al., 2014), the model we proposed is better than the initial model in most of the indicators except for GFI, AGFI, and NFI (χ2/d.f. = 2.50, RMSEA = 0.065, GFI = 0.90, AGFI = 0.87, NFI = 0.89, CFI = 0.93, PNFI = 0.76, PGFI = 0.70, and RMR = 0.050). Hence, the proposed model was used in this study.

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Table 4-12 Goodness-of-fit indices of structural model

Indicators	Criteria	Initial model	Proposed model
Chi-Square/df	<3 is good	122.39/33=3.71	404.82/162 =2.50
RMSEA	≦0.08 is good	0.087	0.065
GFI	GFI≧0.9 means satisfactory fit 0.8<GFI<0.9 means acceptable fit	0.94	0.90
AGFI	AGFI≧0.9 means satisfactory fit 0.8<AGFI<0.9 means acceptable fit	0.90	0.87
NFI	NFI≧0.9 means satisfactory fit 0.8<NFI<0.9 means acceptable fit	0.90	0.89
CFI	CFI≧0.9 means satisfactory fit 0.8<CFI<0.9 means acceptable fit	0.93	0.93
PNFI	0-1 bigger is better	0.66	0.76
PGFI	0-1 bigger is better	0.56	0.70
RMR	<0.1	0.062	0.050

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Figure 4-1 shows the structural model with standardized path estimates and t-value in parentheses. All hypotheses in the model are supported. The analysis shows that access convenience and transaction convenience have positive effect on use intention via customer participation readiness. In addition, access convenience and transaction convenience have the significantly positive effect on intention directly. In other words, this study supports that customer participation readiness has a partial mediating effect instead of a fully mediating effect on the relationship between service convenience and use intention.

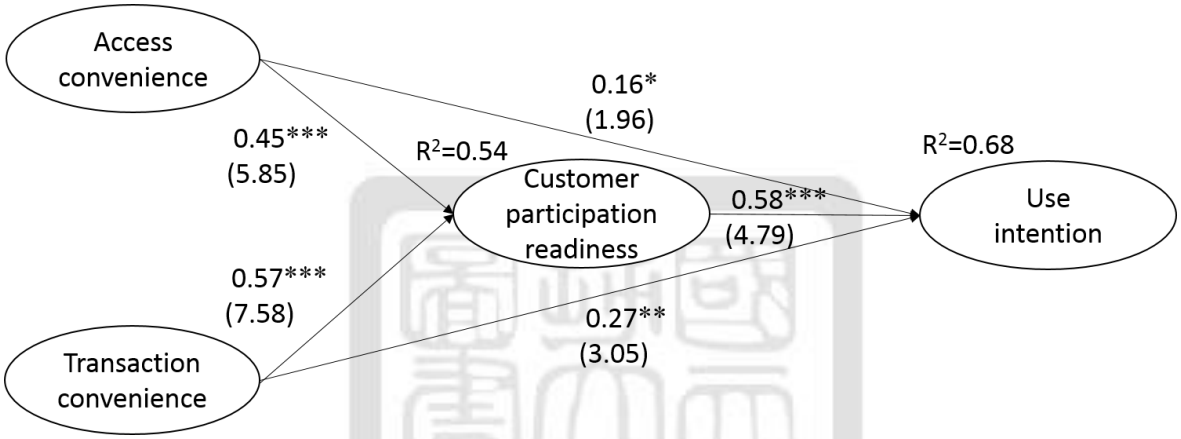

Figure 4-1 Results of structural model

Note: ***p<0.001; **p<0.01; *p<0.05

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Results reveal that access convenience (β=0.45***, t=5.85) and transaction convenience (β=0.57***, t=7.58) have a significantly positive effect on customer participation readiness, thus supporting H1 and H2. Access convenience (β=0.16*, t=1.96) and transaction convenience (β=0.27**, t=3.05) have a significantly positive effect on the use intention of APS, thus supporting H3 and H4. Customer participation readiness (β= 0.58***, t= 4.79) has a significantly positive effect on the use intention of APS, thus supporting H5. The testing results of the hypotheses are summarized in Table 4-13.

Table 4-13 Results of hypotheses testing for structural model

Hypotheses	Estimate	T-value	Testing results
H1: Access convenience → Customer participation readiness	0.45	5.85	Support
H2: Transaction convenience → Customer participation readiness	0.57	7.58	Support
H3: Access convenience → Use intention	0.16	1.96	Support
H4: Transaction convenience → Use intention	0.27	3.05	Support
H5: Customer participation readiness → Use intention	0.58	4.79	Support

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Moreover, this study calculates the total effect to compare the effect of each construct on use intention of APS. The calculating procedure is explicated at the note of Table 4-14. Results show that TC (0.60) has the greatest effect, followed by AC (0.42).

Table 4-14 Total effect of each construct on use intention of APS

Paths	**Direct effect**	**Indirect effect**	**Total effect (Direct effect + Indirect effect)**
AC → UI	0.16	0.26[a]	0.42
TC → UI	0.27	0.33[b]	0.60

Note: AC = Access convenience; TC = Transaction convenience;
CPR = Customer participation readiness; UI = Use intention
a. 0.26 = 0.45×0.58 (AC⟶CPR⟶UI)
b. 0.33 = 0.57×0.58 (TC⟶CPR⟶UI)

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4.7 Moderating effect of individual differences

Need for interaction (NI) and technology anxiety (TA) is hypothesized as a moderating effect on the relationships between service convenience and use intention. This study uses hierarchical regression method and sets up three models to investigate the existence of moderating effect. The dependent variable is use intention in all three models.

For independent variables, we set three important demographic variables such as gender, age, and education as control variables in the first model. All of them are dummy variables. In the second model, we added two main effects, and in the last model, the interaction effect is added.

As shown in Table 4-15, all control variables are not significant on dependent variable in model 1. In model 2, education and two main effects have positive significant effect on use intention. This means that the higher the education level of the respondents, the higher use intention of APS. In model 3, aside from the significant influence of the aforementioned three variables, the added interaction effect is also significant on use intention. Need for interaction has a negative significant moderating effect on access convenience–use intention relationship (β =−0.055*, t=−2.388). It represents that the effect of access convenience on use intention will be stronger for consumers in low NI groups than those who are in high NI groups.

As shown in Table 4-16, all control variables are not significant on dependent variable in model 1. In model 2, two main effects have positive significant effect on use intention. In model 3, aside from the significant influence of the aforementioned

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three variables, the added interaction effect is also significant on use intention. Need for interaction has a negative significant moderating effect on transaction convenience–use intention relationship (β =−0.048*, t=−2.291). It represents that the effect of transaction convenience on use intention will be stronger for consumers in low NI groups than those who are in high NI groups.

As shown in Table 4-17, all control variables are not significant on dependent variable in model 1. In model 2, two main effects have positive significant effect on use intention. In model 3, aside from the significant influence of the aforementioned three variables, the added interaction effect is also significant on use intention. Technology anxiety has a negative significant moderating effect on access convenience–use intention relationship (β=−0.069***, t=−3.295). It represents that the effect of access convenience on use intention will be stronger for consumers in low TA groups than those who are in high TA groups.

As shown in Table 4-18, all control variables are not significant on dependent variable in model 1. In model 2, two main effects have positive significant effect on use intention. In model 3, aside from the significant influence of the aforementioned three variables, the added interaction effect is also significant on use intention. Technology anxiety has a negative significant moderating effect on transaction convenience–use intention relationship (β=−0.043*, t=−2.134). It represents that the effect of transaction convenience on use intention will be stronger for consumers in low TA groups than those who are in high TA groups.

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Table 4-15 NI as a moderator on AC–UI relationship

Variable	Use intention		
	Model 1 Control variables	Model 2 Independent variables	Model 3 Interaction terms
Control variables			
Gender	-0.012	-0.020	-0.012
Age	0.017	0.032	0.037
Education	0.063	0.071*	0.071*
Main effects			
Access convenience		0.236 ***	0.238***
Need for interaction		-0.166***	-0.158***
Interaction effects			
Access convenience ×Need for interaction			-0.055*
R^2	0.011	0.316	0.327
Adjusted R^2	0.002	0.306	0.316
F-value	1.294	32.636***	28.509***
R^2 change	0.011	0.305	0.011
F-value for R^2 change	1.294	78.797***	5.704*

Notes: 1. *** p-value < 0.001; ** p-value < 0.01; * p-value < 0.05

2. Gender: 1 = male, 2 = female; Age: 1 = 18 to 20 years old, 2 = 21 to 30 years old=2, 3 = 31 to 40 years old, 4 = 41 to 50 years old, 5 = 51 to 60 years old, 6 = over 61 years old; Education: 1= junior / senior high school, 2 = bachelor's degree, 3 = master's degree, 4 = PhD, 5 = others.

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Table 4-16 NI as a moderator on TC-UI relationship

Variable	Use intention		
	Model 1 Control variables	Model 2 Independent variables	Model 3 Interaction terms
Control variables			
Gender	-0.012	-0.051	-0.048
Age	0.017	0.031	0.033
Education	0.063	0.054	0.054
Main effects			
Transaction convenience		0.288***	0.280***
Need for interaction		-0.148***	-0.144***
Interaction effects			
Transaction convenience ×Need for interaction			-0.048*
R^2	0.011	0.403	0.412
Adjusted R^2	0.002	0.395	0.402
F-value	1.294	47.752***	41.147***
R^2 change	0.011	0.393	0.009
F-value for R^2 change	1.294	116.179***	5.249*

Notes: 1. *** p-value < 0.001; ** p-value < 0.01; * p-value < 0.05

2. Gender: 1 = male, 2 = female; Age: 1 = 18 to 20 years old, 2 = 21 to 30 years old=2, 3 = 31 to 40 years old, 4 = 41 to 50 years old, 5 = 51 to 60 years old, 6 = over 61 years old; Education: 1= junior / senior high school, 2 = bachelor's degree, 3 = master's degree, 4 = PhD, 5 = others.

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Table 4-17 TA as a moderator on AC-UI relationship

Variable	Use intention		
	Model 1 Control variables	Model 2 Independent variables	Model 3 Interaction terms
Control variables			
Gender	-0.012	-0.065	-0.047
Age	0.017	0.027	0.030
Education	0.063	0.044	0.050
Main effects			
Access convenience		0.166***	0.167***
Need for interaction		-0.281***	-0.284***
Interaction effects			
Access convenience ×Technology anxiety			-0.069***
R^2	0.011	0.456	0.472
Adjusted R^2	0.002	0.448	0.463
F-value	1.294	59.091***	52.426***
R^2 change	0.011	0.445	0.016
F-value for R^2 change	1.294	144.220***	10.854***

Notes: 1. *** p-value < 0.001; ** p-value < 0.01; * p-value < 0.05

2. Gender: 1 = male, 2 = female; Age: 1 = 18 to 20 years old, 2 = 21 to 30 years old=2, 3 = 31 to 40 years old, 4 = 41 to 50 years old, 5 = 51 to 60 years old, 6 = over 61 years old; Education: 1= junior / senior high school, 2 = bachelor's degree, 3 = master's degree, 4 = PhD, 5 = others.

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Table 4-18 TA as a moderator on TC–UI relationship

Variable	Use intention		
	Model 1 Control variables	Model 2 Independent variables	Model 3 Interaction terms
Control variables			
Gender	-0.012	-0.077	-0.073
Age	0.017	0.025	0.028
Education	0.063	0.037	0.037
Main effects			
Transaction convenience		0.187***	0.191***
Need for interaction		-0.235***	-0.239***
Interaction effects			
Transaction convenience ×Technology anxiety			-0.043*
R^2	0.011	0.460	0.467
Adjusted R^2	0.002	0.452	0.457
F-value	1.294	60.061***	51.313***
R^2 change	0.011	0.449	0.007
F-value for R^2 change	1.294	146.617***	4.554*

Notes: 1. *** p-value < 0.001; ** p-value < 0.01; * p-value < 0.05

2. Gender: 1 = male, 2 = female; Age: 1 = 18 to 20 years old, 2 = 21 to 30 years old=2, 3 = 31 to 40 years old, 4 = 41 to 50 years old, 5 = 51 to 60 years old, 6 = over 61 years old; Education: 1= junior / senior high school, 2 = bachelor's degree, 3 = master's degree, 4 = PhD, 5 = others.

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The statistical result of moderating effects is summarized in Table 4-19 and Figure 4-2. We utilized the unstandardized regression coefficients calculated in model 3 to draw this figure. Use intention is put in vertical axis. In horizontal axis, we divide respondents into four groups, namely low AC groups, high AC groups, low TC groups, and high TC groups, according to the level of response toward access convenience and transaction convenience.

Low AC is defined by mean of AC minus one standard error. On the contrary, high AC is defined by mean of AC plus one standard error; Low TC is defined by mean of TC minus one standard error. On the contrary, high TC is defined by mean of TC plus one standard error. Simultaneously, to compare the users with different level of individual differences, we also define low and high NI groups and TA groups. Low NI is defined by mean of NI minus one standard error. On the other hand, high NI is defined by mean of NI plus one standard error; Low TA is defined by mean of TA minus one standard error. On the other hand, high TA is defined by mean of TA plus one standard error.

Therefore, we could draw two regression lines in each hypothesis. Figure 4-2 shows the two lines are not parallel in each figure, which indicates that NI and TA have moderating effects on the four relationships between service convenience and use intention.

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Table 4-19 Results of hypotheses testing for moderating effects

	Access convenience → Use intention			Transaction convenience → Use intention		
	Estimate	**T-value**	**Testing results**	**Estimate**	**T-value**	**Testing results**
NI	-0.055*	-2.388	H6:supported	-0.048*	-2.291	H7:supported
TA	-0.069***	-3.295	H8:supported	-0.043*	-2.134	H9:supported

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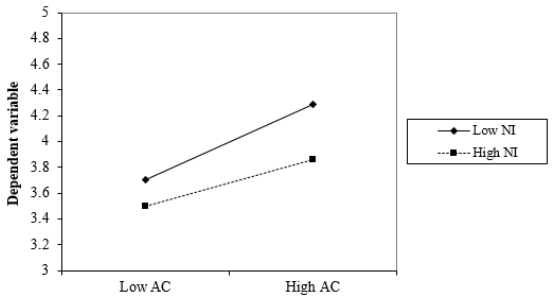
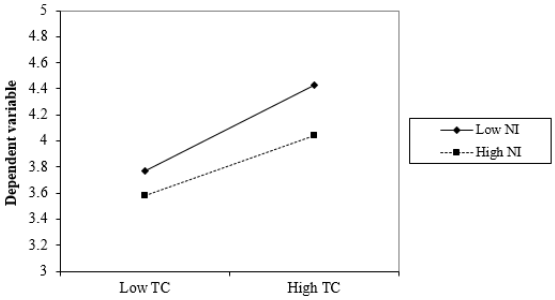
<tr><td> 
</td><td> 
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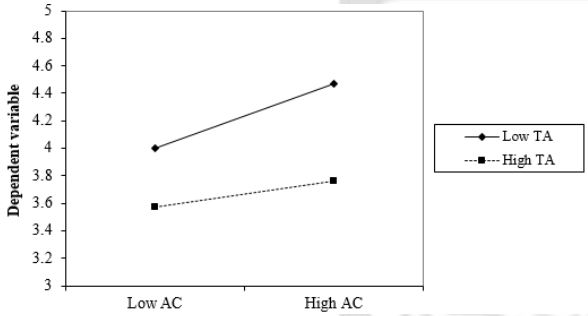
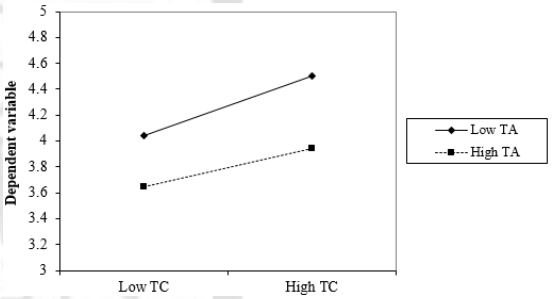
<tr><td>(1) Need for interaction as a moderator on access convenience–use intention relationship.</td><td>(2)Need for interaction as a moderator on transaction convenience–use intention relationship.</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>(3) Technology anxiety as a moderator on access convenience–use intention relationship.</td><td>(4) Technology anxiety as a moderator on transaction convenience–use intention relationship.</td></tr>
</table>

Figure 4-2 Summary of moderating effects

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Chapter 5 Conclusions and suggestions

According to the previous chapters, this chapter will discuss the results of data analysis and make the conclusions. Next, the practical implications and suggestions will be proposed to related managers for promoting APS. Finally, the research limitation and directions for future research will be described.

5.1 Discussions and conclusions

This study establishes a perspective to take service convenience, customer participation readiness, and individual factors into consideration to explain the use intention of APS. The relationship among constructs in this study is proposed by relevant pieces of literatures, so this section will discuss the results on the basis of literature. Results reveal that nine of nine hypotheses are supported.

First, in accordance with the ranking of importance of APS attributes, top three attributes are high security of the goods in APS, high density of APS, and the process of shipping and pick-up in APS is simple and clear, which is different from the ITRI's survey in 2018 (see Table 2-4). The last two attributes are more valued by the public than before. This implies that people care about access convenience and transaction convenience, corresponding with the structural equation modeling. Considering these results, this study can propose the practical implications for relevant managers based on these attributes.

Second, regarding antecedents of customer participation readiness (i.e., access convenience and transaction convenience), results indicate that these factors determine people’s participation readiness. It is obvious that when people perceive APS is in a convenient location, customers can reduce the time it takes to find it and the effort they make to improve their readiness (Berry et al., 2002; Collier & Kimes,

doi:10.6844/NCKU201900585

2013; Collier & Sherrell, 2010). Also, when it takes people a little time to complete shipping and pick up, the more likely will encourage customers to prepare for it. In other words, people will be ready for APS as long as they perceive APS as a self-service with accessibility and fast transactions, and result in using intention of APS.

Third, with regard to antecedents of use intention (i.e., access convenience, transaction convenience, and customer participation readiness), results indicate that the three all have significantly positive influence on people's use intention of APS. As for the effect of access convenience and transaction convenience on use intention of APS, this study is consistent with previous studies (Collier & Sherrell, 2010; Ding et al., 2011; Durkin, 2004; Gehrt & Yale, 1993; Howard & Worboys, 2003; Pujari, 2004) rather than Venkatraman (1991). This implies that people will intend to use APS as long as people can get to APS quickly and easily. Moreover, people will increase the use intention of APS if they consider APS can provide a clear and understandable procedure, which makes them take less time and effort to conclude shipping and pick up.

On the other hand, the higher the customer participation readiness is, the stronger the intention will people use APS. This indicates that people will intend to use APS if they perceived they have the knowledge and skills of using APS, evaluate APS is valuable and accept the roles they play in self-service. Based on the results in Table 4-14, both service convenience showed an indirect effect greater than direct effect, it explains that customer participation readiness could enhance the effect on use intention. In other words, customer participation readiness plays an important role in factors affecting use intention of APS.

Fourth, as for moderating effect, this study implements hierarchical regression to examine whether the relationship (a) between access convenience and use intention

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of APS (b) between transaction convenience and use intention of APS have different strength of the relationship due to the level of individual difference. The findings reveal that need for interaction and technology anxiety do have significant moderating effect, which is consistent with previous research (Lee & Yang, 2013). Both relationships are stronger in the low NI group and low TA group. For customers with lower need for interaction, they prefer not to interact with service employees and tend to use self-service. On the other hand, for customers with lower technology anxiety, they are more pursuing innovation and intend to contact new technology. Consequently, if both of them perceive characteristics of APS as being beneficial, they will have more use intention of APS.

According to the total effects on use intention, transaction convenience is the most important factor, which followed by access convenience. Results help managers to realize which factor is more important for people, and then implement the adequate decision-making.

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5.2 Practical implications

With the development of technology, encouraging consumers to provide services on their own is a viable way to address inefficiencies in the last-mile delivery context. For companies that are considering implementing APS and currently managing APS, they want to understand which factors will affect use intention of APS. According to the results, we can improve the willingness of people to use APS from two major perspectives, APS's characteristics and customer participation readiness.

First, compared to access convenience, transaction convenience is a more important marketing antecedent for increasing the use intention of APS. The time saved by APS should be continuously optimized in order to save more time for customers. As for access convenience, self-service location is the major consideration for customers. Therefore, stakeholders should constantly check the locations of APS and move unwelcome sites to a more popular location in order to enhance utilization (Yuen et al., 2018). On the other hand, APS can also form strategic alliances with competitors that have convenient advantages, which may lead to greater competitiveness.

Second, customer participation readiness is the core of this study. By establishing consumer participation readiness as a key mediator, this study provides a range of actionable factors to help them understand the key drivers of APS success. Managers can use the following strategies to influence perceived ability, perceived value, and role identification before or after an APS has been installed. In order to provide additional motivation, companies should give consumers the opportunity to try APS. For example, hosting APS experience activities in various places and use media to promote people to deliver parcels at the appointed time, thereby obtaining

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gifts and get postage discounts. Moreover, establish a “first-time user” area that provides detailed instructions, FAQs, toll-free phone numbers and online help (Meuter et al., 2005). These are important in influencing perceived ability. On the other hand, companies should clearly communicate customer the benefits of using APS. For example, saving time, money and effort, which are important in influencing perceived value. On the other hand, education could be used to build role identification.

Finally, individual differences also affect peoples’ use intention of APS. Results reveal that need for interaction and technology anxiety have moderating effects on the relationship of service convenience-use intention. As mentioned in section 5.1, for low NI group and low TA group, they perceived service convenience of APS, they are more willing to use APS. Therefore, decreasing their worries about need for interaction and technology anxiety is necessary for relevant managers. For example, relevant managers could incorporate social cues in the interface of APS such as video and voice instruction which could increase consumer trust. Specifically, these ways could help create a sense of social presence and bring closer to a face-to-face communication (Steinbrück, Schaumburg, Duda, & Krüger, 2002). Also, it could be effective in reducing technical anxiety.

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5.3 Research limitations and directions for future research

Although this study contributes to the knowledge concerning factors affecting use intention of APS, several research limitations of the present study and research directions for future studies are also provided.

First, regarding the antecedents of customer participation readiness, this study only considers the facilitators without considering the barriers. Results showed that people most valued the security of the goods in APS. Perceived risk is represented as "uncertainty of the negative consequences of using a product or service" (Hwang & Kim, 2007). Due to APS is an unattended self-collection, some problems may occur, such as loss of parcels and the safety of people in APS. Therefore, future research can incorporate perceived risk into our model.

Second, because APS in Taiwan is now in the early stage, this study mainly focuses on the use intention for potential users. Therefore, the behavioral aspect can be further explored when APS is at a mature stage. Although this study found that customer participation readiness is an important antecedent of use intention, this study does not really confirm whether the relationship between intention and actual behavior has a positive effect as assumed. Such problems have also been debated by many people in past studies. Some studies recognized that intention is a predictor of behavior (Ajzen, 1991; Bamberg, 2007; Eriksson & Forward, 2011; Gardner, 2009; Heath & Gifford, 2002). However, others considered intention as an antecedent of behavioral readiness rather than actual behavior (Gollwitzer, 1999; Heckhausen, 1991; Kang, Jayaraman, Soh, & Wong, 2019). In particular, Kang et al. (2019) cited the Rubicon Model to explore behavioral readiness as an influential factor between

doi:10.6844/NCKU201900585

intention and actual behavior. This study did not explore this part, so it is suggested that that future research can be extended to this relationship for further discussion.

Third, customers are seen as co-producers in using APS, responsible for providing services and meeting their own needs. Such co-creation behavior is composed of in-role behavior (e.g., customer participation behavior), which involves the necessary regulations obeyed, and extra-role behavior (e.g., customer citizenship behavior), which involves discretionary behaviors that are not required (Groth, 2005). Future research can expand our theoretical framework by adding this two behavior into our model.

Last but not least, due to difficulties in collecting seller samples, this study mainly focuses on the perspective of non-sellers. However, sellers may probably have different opinions, so future research can discuss this part and see whether they have different opinions for APS.

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Appendix A　Chinese Questionnaire

親愛的受訪者，您好：

首先非常感謝您撥冗填答此問卷。本問卷主要目的為探討「**服務便利性、顧客參與準備與智取站使用意願關係之研究：以互動需要及科技焦慮為干擾變數**」，需要您寶貴的意見。請依照您的實際感受填答，本問卷純屬學術研究之用，個人資料絕不對外公開，懇請您撥冗填寫。在此向您致上萬分的感謝。

敬祝 萬事如意

國立成功大學交通管理科學系

為改善收送貨雙方在時間與空間無法配合以及減輕人員處理包裹的負荷，自2016年開始業者陸續推出智取站,例子有中華郵政的「i郵箱」、工研院的「ipickup」以及掌櫃公司的「掌櫃」,提供民眾24小時自助寄取件服務。

第一部分:請就下列描述,依您的同意程度在合適的□內打勾:

問卷題目	極不同意	不同意	普通	同意	非常同意
1. 我覺得自己能夠**快速**且**容易地**到達智取站的服務據點。	□1	□2	□3	□4	□5
2. 我覺得智取站的服務據點周圍有**便利的交通**。	□1	□2	□3	□4	□5
3. 我覺得智取站的服務據點位在**方便到達的地方**。	□1	□2	□3	□4	□5
4. 我覺得智取站有**便利的服務時間**。	□1	□2	□3	□4	□5
5. 我覺得智取站的使用能輕鬆地完成寄取件。	□1	□2	□3	□4	□5
6. 我覺得自己能夠在智取站**快速地**完成寄取件。	□1	□2	□3	□4	□5
7. 我覺得智取站的使用**只需花少許的時間**即可完成寄取件。	□1	□2	□3	□4	□5
8. 我覺得我自己有**充分地能力**來使用智取站。	□1	□2	□3	□4	□5
9. 我對我自己使用智取站的**能力有信心**。	□1	□2	□3	□4	□5
10. 我覺得智取站的使用**基本上在我自己的能力範圍內**。	□1	□2	□3	□4	□5

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問卷題目	極不同意	不同意	普通	同意	非常同意
11. 相較於我花的**金錢**,我覺得智取站的使用是有價值的。	□1	□2	□3	□4	□5
12. 相較於我花的**時間**,我覺得智取站的使用是有價值的。	□1	□2	□3	□4	□5
13. 相較於我花的**精力**,我覺得智取站的使用是有價值的。	□1	□2	□3	□4	□5
14. 我覺得自己去**扮演**通常由服務人員所提供的那些服務角色是**令人開心的**。	□1	□2	□3	□4	□5
15. 我覺得使用智取站**來為自己服務**是**令人快樂的**。	□1	□2	□3	□4	□5
16. 我覺得自己做些**取代**服務人員工作的角色是**令人高興的**。	□1	□2	□3	□4	□5
17. 我覺得自己**有責任**參與智取站的使用。	□1	□2	□3	□4	□5
18. 我有**意願(繼續使用)使用**智取站。	□1	□2	□3	□4	□5
19. 我有意願**推薦**我的親朋好友使用智取站。	□1	□2	□3	□4	□5
20. 我有意願**向別人說明**使用智取站的**好處**。	□1	□2	□3	□4	□5
21. **有**服務人員的**接觸互動**會讓我感到愉快。	□1	□2	□3	□4	□5
22. **有**服務人員的**個人關注**對我是重要的。	□1	□2	□3	□4	□5
23. 如果**有**服務人員在現場服務,我**就不會想要使用**自助服務的機器。	□1	□2	□3	□4	□5
24. 我對使用科技會**感到擔憂**。	□1	□2	□3	□4	□5
25. 我覺得科技的專業術語會**困擾我**。	□1	□2	□3	□4	□5
26. 我對不熟悉的科技,我會**避免使用它**。	□1	□2	□3	□4	□5
27. 我會因擔心自己在使用上導致無法解決的錯誤而對使用科技**感到猶豫**。	□1	□2	□3	□4	□5

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第二部分:請就下列描述,依您認為的重要程度在合適的□內打勾:

問卷題目	極不重要	不重要	普通	重要	非常重要
1. 智取站設置地點密集程度高。	□1	□2	□3	□4	□5
2. 智取站寄取件流程簡明。	□1	□2	□3	□4	□5
3. 智取站貨品保管安全性高。	□1	□2	□3	□4	□5
4. 智取站櫃子清潔程度好。	□1	□2	□3	□4	□5
5. 智取站櫃子數量足夠。	□1	□2	□3	□4	□5
6. 智取站置物空間尺寸大小適中。	□1	□2	□3	□4	□5

第三部分:個人基本資料

1.	性別:	□1 男 □2 女
2.	年齡:	□1 18~20 歲 □2 21~30 歲 □3 31~40 歲 □4 41~50 歲 □5 51-60 歲 □6 61 歲以上
3.	職業:	□1 學生 □2 軍公教 □3 服務業 □4 製造(工)業 □5 家管 □6 退休 □7 其他_____
4.	教育程度:	□1 國高中 □2 學士 □3 碩士 □4 博士 □5 其他 _____
5.	每月可支配所得:	□1 10,000 元(含)以下 □2 10,001~20,000 元 □3 20,001~30,000 元□4 30,001~40,000 元 □540,001~50,000 元 □6 50,001 元以上
6.	使用物流服務的主要用途:	□1 賣家 □2 買家 □3 一般用途(無買賣行為)
7.	主要使用的物流服務:	□1 寄件 □2 取件 □3 退貨
8.	平均每月使用物流服務次數:	_____次

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9.	主要使用的物流配送方式:	□1 宅配 □2 提貨點(便利商店、郵局等) □3 智取站(*若本題選填「智取站」,請跳至第 12 題*)
10.	原先是否知道智取站所提供的服務:	□1 知道 □2 不知道(*若本題選填「不知道」,本問卷到此結束*)
11.	是否使用過智取站:	□1 是 □2 否(*若本題選填「否」,請跳至第 14 題*)
12.	最常使用哪種智取站:	□1 i-郵箱 □2 i-pickup □3 掌櫃
13.	使用此智取站已多久:	□1 未滿 3 個月 □2 3~6 個月 □3 6~9 個月 □4 9~12 個月 □5 1 年以上
14.	原先從何處得知智取站的資訊:	□1 同事、同學或親友介紹 □2 網路 □3 電視、廣播 □4 雜誌、報紙 □5 其他_____

本問卷到此結束,煩請您再檢查一遍,
以免遺漏您寶貴的意見,再次感謝您的協助!

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Appendix B English Questionnaire

Part 1:

Please tick the most appropriate answer for the following description.
Questions are measured from 1 (strongly disagree) to 5 (strongly agree).

Questions	1	2	3	4	5
1. I am able to get to APS quickly and easily.	☐	☐	☐	☐	☐
2. There is a good public transport around APS.	☐	☐	☐	☐	☐
3. APS is located in a convenient location.	☐	☐	☐	☐	☐
4. APS offers convenient store hours.	☐	☐	☐	☐	☐
5. APS makes it easy for me to conclude shipping and pick up.	☐	☐	☐	☐	☐
6. I am able to complete shipping and pick up quickly at APS.	☐	☐	☐	☐	☐
7. It takes me a little time to complete shipping and pick up at APS.	☐	☐	☐	☐	☐
8. I am fully capable of using APS.	☐	☐	☐	☐	☐
9. I am confident in my ability to use APS.	☐	☐	☐	☐	☐
10. Using APS to conclude shipping and pick up is well within the scope of my abilities.	☐	☐	☐	☐	☐
11. Compared to the money I spend, using APS is worthy.	☐	☐	☐	☐	☐
12. Compared to the time I spend, using APS is worthy.	☐	☐	☐	☐	☐
13. Compared to the efforts I made, using APS is worthy.	☐	☐	☐	☐	☐
14. I am glad to perform some service roles that would normally be provided by related employee.	☐	☐	☐	☐	☐
15. I enjoy serving myself by being involved in APS.	☐	☐	☐	☐	☐
16. I am happy to take on some roles to replace an employee's work.	☐	☐	☐	☐	☐
17. I think I have the responsibility to be involved in this service.	☐	☐	☐	☐	☐
18. I intend (continue) to use APS in the future.	☐	☐	☐	☐	☐
19. I intend to recommend relatives and friends to use APS.	☐	☐	☐	☐	☐
20. I will say positive things about APS to others.	☐	☐	☐	☐	☐
21. Personal contact with an employee makes me feel happy.	☐	☐	☐	☐	☐
22. Personal attention by a customer service employee is important to me.	☐	☐	☐	☐	☐

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Questions	1	2	3	4	5
23. I won't choose to use self-service machine when there are service people on site.	☐	☐	☐	☐	☐
24. I feel apprehensive about using technology.	☐	☐	☐	☐	☐
25. Technical terms bothers me.	☐	☐	☐	☐	☐
26. I have avoided technology because it is unfamiliar to me.	☐	☐	☐	☐	☐
27. I hesitate to use technology for fear of making mistakes I cannot correct.	☐	☐	☐	☐	☐

Part 2:

Please tick the most appropriate answer for the following description.
Questions are measured from 1 (strongly unimportant) to 5 (strongly important).

Questions	1	2	3	4	5
1. High density of APS	☐	☐	☐	☐	☐
2. The process of shipping and pick-up in APS is simple and clear.	☐	☐	☐	☐	☐
3. The security of the goods in APS is high.	☐	☐	☐	☐	☐
4. The cabinet of APS is clean.	☐	☐	☐	☐	☐
5. The number of cabinets in APS is sufficient	☐	☐	☐	☐	☐
6. The size of the storage space in APS is moderate.	☐	☐	☐	☐	☐

Part 3: **Sample characteristics**

1. Gender: ☐1 Male ☐2 Female

2. Age: ☐1 18-20 ☐2 21-30 ☐3 31-40 ☐4 41-50 ☐5 51-60 ☐6 Over 61

3. Occupation: ☐1 Student ☐2 Public servant and Military ☐3 Service industry ☐4 Manufacture industry ☐5 Homemaker ☐6 Retired ☐7 Others_____

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4.	Education:	☐1 Junior /Senior high school ☐2 Bachelor's degree ☐3 Master's degree ☐4 PhD ☐5 Others_____
5.	Income (TWD):	☐1 Less than 10,000 ☐2 10,001-20,000 ☐3 20,001-30,000 ☐4 30,001-40,000 ☐5 40,001-50,000 ☐6 Greater than 50,001
6.	Main Identity:	☐1 Seller ☐2 Buyer ☐3 General purpose (no trading)
7.	Main use of logistics	☐1 Shipment ☐2 Pickup ☐3 Return
8.	Average number of times of using logistics services per month:	_____times
9.	Main last-mile delivery mode	☐1 Home delivery ☐2 Pick-up point (e.g. convenience store, post office) ☐3 APS (*If you choose to fill in "APS", please skip to question 12*)
10.	Did you originally know the services provided by APS:	☐1 Yes ☐2 No (*If you choose to fill in "No", this is the end of the question*)
11.	Have you ever used APS:	☐1 Yes ☐2 No (*If you choose to fill in "No", please skip to question 14*)
12.	Which APS did you most commonly used:	☐1 I-box ☐2 I-pickup ☐3 Palmbox

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13.	How long have you used this APS:	☐1 Less than 3 months ☐2 3-6 months ☐3 6-9 months ☐4 9-12months ☐5 More than 1 year
14.	Where did you get the information of APS?	☐1 Referred by colleagues, classmates or relatives ☐2 Internet ☐3 Television and radio ☐4 Magazines and newspapers ☐5 Others_____

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