

# A study on industrial customers loyalty to application service providers – The case of logistics information services

Cheng-Kiang Farn and Li Ting Huang

**Abstract**— The growth of application service providers has been phenomenal in application service industry worldwide. Application service providers usually provide service which is comprised with modularized and standard components. Customers can easily switch to another supplier based on the comparison between cost and benefit if their service is comprised with modularized and standard components. So, keeping a long-term relationship with industrial customers is getting an imperative strategy for application service providers in order to pursue more predictable source of revenues and successive income streams. Yet, cost-effective feature of ASPs is not the sufficient condition for ensuring business success. Cultivating relationship management whose core concept is to enhance loyalty of existing customers gradually becomes a critical issue for application service providers. This study investigates economic and psychological factors simultaneously and compares subtle difference between influences of economic and psychological factors on customer loyalty. Empirical result from a questionnaire survey leads to several findings. The importance of psychological factors is relative importance to loyalty formation in comparison with economic factors. Service quality both directly and indirectly affects customer loyalty. Trust affects loyalty mediated by affective commitment. Switching barrier affects continuous commitment, while it positively moderates the relationship of service quality and loyalty. This finding is contrary to literature. Moreover, influences of affective and continuous commitment are distinct by business types. Findings reveal that psychological factors are also important to loyalty formation in B2B environment. Firms could pay more attention on commitment. Implications and limitations are discussed.

**Keywords**—Commitment, Loyalty, Switching barrier, Service quality, Trust.

## I. INTRODUCTION

FOR pursuing more predictable source of revenues, keeping a long-term relationship with customers is getting an imperative strategy for application service providers. Crosby et al. [6] indicated that relationship quality the major determinants

of continuing exchange between buyers and sellers in B2B environment. Relationship management is gradually received more attention. This trend is especially prominent in the area of application service providers. This market attracts lots of players because customers want to cut costs, reduce management complexity, and focus on core competence for firms [34]. However, the application service is delivered by modularized and standard components, similar to commodity. The competitive pressure pushes application service providers to seek for successive income streams. Grover et al. [11] indicated that “The business relationship between the outsourcing service receivers and the service providers in increasingly that of a partnership rather than merely that of customer and vendor.” Ma et al. [24] stated that the cost-effective feature of ASPs is not the sufficient condition for ensuring business success. There is a rising trend for empirically investigating relationship management of ASP targeted the important influence of relationship quality and service quality on long-term partnership, e.g., [24] and [38].

Keeping customer loyalty has been a necessary task for firms who try to pursue sustainable operations [5]. Enhancing customers’ loyalty is central to relationship management. Loyal buyers in a relationship incline to pay more attention on long-term benefits and are devoted to cooperative actions beneficial to both partners than disloyal buyers [9][26]. It is usually agreeable that the strong relationship between satisfaction and customer loyalty. However, a paradox that satisfied customers may defect and dissatisfied may remain loyal arouse many research interests. Researchers proposed that there are two fundamental methods to retain customers [16] [30]. One is to improve customers’ satisfaction [20] and then inspire their true attitudinal and behavioral loyalty, so that customers do not be distracted by competitive offering [7]. The other is to increase switching barriers to deter customers form using other suppliers, such as switching cost and changing to alternatives as disincentives [16][20]. Yet the intricate relationship of satisfaction, switching barrier and loyalty is still a heated debate. Besides, the research stream in customer satisfaction/dissatisfaction of business-to-business (B2B) relationships is still lagging behind consumer marketing [38]. It is worth being devoted to figure out customer loyalty from its essence – sustaining long-term relationship with industrial customer.

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In this study, we attempt to answer three two research questions.

- (1) What are the effective strategies of customer loyalty in ASP environment, relational or transactional/economic tactics or both?
- (2) Is this strategy varies from industrial characteristics? If yes, what differences are there among industrial characteristics?
- (3) What antecedents should be considered when ASPs make these effective strategies?

## II. RESEARCH CONTEXT

### A. Application Service Provider

Organizations with various legacy application systems and platforms are looking for external supports to reduce non-compliance liability and optimize technical operations and business processes [31]. IT outsourcing is getting a potential solution for organizations. Application service provider (ASP) is an emerging form [31][36]. Recently, the new term of Software-as-a-Service (SaaS) substitutes the term of ASP, since the generation of ASP was mainly traditional client-server with web front-end interface, rather than a net-native application with better performance and fast regular upgrades like SaaS [42]. SaaS is a model of delivering their own software or a partner's software as a hosted service, including maintenance, daily technical operation and support of the software [27][42]. However, the nature and business model between ASPs and SaaS is almost identical. Actually, emerging ASPs propose the same features of application, services and other support services, such as application upgrades, technical support, virus protection, data security, consulting, integration and staff training.

According to the recently released reports of IDC, the fastest growth rate among all IT services is the APEJ (Asia/Pacific excluding Japan) market of application outsourcing services, involving both the traditional outsourcing of applications and newer service provider model for outsourcing applications (i.e., hosted application management) [40]. It grows at a 2005-2010 five year compound annual growth rate (CAGR) of 19.7%, in comparison with software deployment and support of 11.2% CAGR and enterprise wide outsourcing of 7.0% CAGR [40]. IDC expects the worldwide market of SaaS reached \$4.2 billion in 2004 and will reach \$10.7 billion in 2009 with a 21% CAGR [14]. Furthermore, IDC indicates a strong SaaS overall CAGR growth in APEJ region with a 2005-2009 CAGR of over 25% [38]. The prosperous market of application outsourcing service (SaaS/ASP) is achieved by the trends that customers are trying their best to cut software costs and reduce management complexity, as well as service suppliers are keen to provide integrated services and develop long-term income streams [27].

ASP is defined as a business remotely managing and delivering application as services from a datacenter to multiple entities through Internet or private wide area network [41].

Industrial customers use these services selectively or totally by their demand on pay-as-you-go or rental basis. Through ASPs, complexities and costs of such software can be cut down [41]. Generally, the basic model of ASP focuses on providing services of common business application for all organizations, such as office suites and accounting. Suppliers of IT service gradually offer variations for attracting more customers and expanding ASPs market. There are four types of ASP business [41]. A functional ASP delivers a single application, such as credit card payment process or timesheet operation, just like the basic model. A vertical market ASP delivers a solution package for a specific customer type, such as healthcare or video rental. An enterprise ASP delivers broad spectrum solutions, such as Enterprise Resource Planning systems. The last type is local ASP, which delivers small business services within a limited area. This application software resides on the vendor's system and is accessed by users through a web browser using HTML or by special purpose client software provided by the vendor [41].

Most studies on ASP focus on the determinants of ASP adoption, e.g., [15], operational model e.g., [7], satisfaction e.g., [35] and success, e.g., [22]. Only a few studies of ASP pay attention on this important topic – relationship management. Some researchers in the area of IT outsourcing and ASP argued the critical role of partnership quality in maintaining good relationship e.g., [18][21][36][44]. For example, the result of Swinarski et al.'s [36] study shows that clients' power and partnership quality push IT service provider to invest additional resources and cooperate with clients for maintain IT outsourcing relationship. Lane and van der Vyver [21] proposed a typology of partnership quality for partnership type relationship between the client organization and outsourcing vendor. The dimensions contain trust, business understanding, shared risk and benefit, conflict, functional and dysfunctional conflict, and commitment. Ma et al. [24] developed an instrument scale for measuring service quality which is a critical success factor of successful ASPs relationship, since they thought that satisfied customers will spend more and refer new customers. Accordingly, the issue of relationship management is deserved to be further investigated.

### B. Logistics Information Service in Taiwan

The major business of logistics information service providers is to deliver customs services for industrial customers because of government regulations of customs related process, such as clearance, declaration, certification, etc. In addition, customs clearance is the critical process for importing and exporting goods. Accordingly, logistics information service providers usually extend their business based on customs related services. For example, customs brokers are capable to propose track-and-trace services for shippers based on a web-based module delivered by logistics information service providers. During a journey of importing/exporting goods, the basic task is to ship good among several Customs of foreign and home countries. Providing information related to customs related process to consignee and shipper is a fundamental

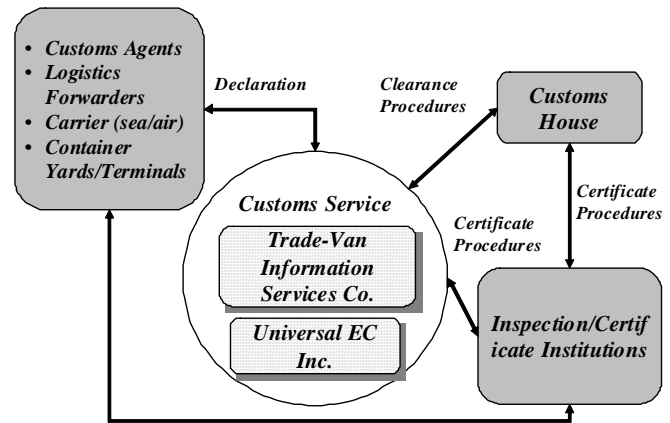
requirement. Hence, customs service is the selected context in this study because of its importance and widespread.

Customs clearance is an act that firms apply for customs' permission to export goods from Taiwan, unloaded and temporarily stored in warehouse or container yard designated by customs authority to overseas by sea/air, or import goods into Taiwan. Permissions are issued after transmitted goods of firms pass examination of customs requirements. Permissions represent physical control and certification with regards to the goods to be imported or exported. All of the transited goods must be declared and listed in manifests. The customs certificate procedure is to inspect the declared transited goods and then issue licenses and releasing notices. The system of Cargo Clearance Automation is to computerize a series of clearance processes and transmit data electronically. Now, 99% of declarations are processed via Cargo Clearance Automation. Trade Facilitation is a system of integrating a series of clearance and certificate processes which includes operations of inspection, licensing and passing through customs. Bureau of Foreign Trade, Bureau of Standards, Bureau of Animal and Plant Health Inspection and Directorate General of Customs firstly join Trade Facilitation System. Eight-five percentage of all application cases are from Bureau of Foreign Trade, Bureau of Standards and Bureau of Animal and Plant Health Inspection.

Logistics information service provider is a kind of a vertical market ASP, which is one of four type of ASP business and is defined as delivering a solution for a specific customer type by Wikipedia [41]. Logistics information service providers proposed a platform through Internet or value-added network, so that industrial customers can deal with process of customs clearance of goods without any burden for maintaining and managing application systems. In Taiwan, customs service is almost forced to be performed through logistics information service providers according to government's policy. Shippers, customs brokers and logistics forwarders have to apply clearance and certificate process by connecting to a web system hosted by a specific application service provider.

There are two logistics information service providers in this market, including Trade-Van Information Services Co. and Universal EC Inc. The roles of these two logistics information service providers are similar to the role of post offices, which is responsible for transferring declared documents from shippers, customs brokers or logistics forwarders to customs house with the seal unbroken and then customs house reads the received declared documents and resends to other inspection institutions if necessary, as shown in Fig. 1. Clients have to install a dedicated system for connecting to logistics information service providers. Clients need to pay out fees of system installation and maintenance as well as transaction. Six software companies are in charge of installing turnkey systems for clients. Recently, a web-based system of certificate procedures is offered to shippers, logistics forwarders and customs agents because a regulation that the government can

not provide any service only though one manner is enacted. However, most clients abandon this web-based system, since they have to take 20 minutes for finishing a declaration on average. Clients would issues declaration via logistics information service provider rather than do to by themselves for pursuing convenience and efficiency.



*Clients declare clearance procedures via Internet by themselves*

Fig. 1 The structure of Cargo Clearance Automation and Trade Facilitation

### III. LITERATURE REVIEW AND HYPOTHESES

We propose that both of psychological and economic considerations are important. We follow the perspective of relationship management to issue psychological consideration. We consider switching barrier as the primary economical factor.

#### A. Commitment

The main thrust of relationship marketing is toward establishing and maintaining long-term successful relational exchange [26], that is, high level of customer loyalty. Commitment is central to the perspective of relationship marketing [26]. Commitment represents a belief that the ongoing relationship with an exchange partner is worthy to be devoted in maintaining it [26]. Commitment is a multi-dimension construct in the perspective of relationship marketing. Meyer and Allen [25] propose that commitment contain affective and continuous commitment. Affective commitment refers to the emotional attachment to a relationship. Customers with affective commitment will "want to" maintain the relationship. Continuous commitment derives from the cost associated with quitting or the profit associated with staying. Customers with continuous commitment will "need to/have to" maintain the relationship. Continuance commitment is the result that customers evaluate their magnitude of investments and perceived attractiveness or availability of alternatives.

Bendapudi and Berry [4] emphasize that the effective strategy for maintaining a long-term relationship with customers is to focus on either the desire for a continuous relationship based on a psychological perspective (affective

commitment), or the dependency in relationships based on an economic perspective (continuous commitment). Thus, we propose:

**H1:** *Affective commitment of application service provider is positively associated with Loyalty.*

**H2:** *Continuous commitment of application service provider is positively associated with Loyalty.*

#### **B. Relationship Quality**

Relationship quality is the core concept in relationship marketing and determines the probability of customers' repurchase intention and continuous exchanges [6]. High relationship quality creates value, including increasing the benefit or decreasing the sacrifice and be viewed as critical factor for successful relationship [27]. Crosby et al. [6] indicated that relationship quality is primarily comprised of trust and satisfaction. Kern and Willcock [18] stress the critical role of trust in maintaining long-term relationship in IT outsourcing. Zucker [48] proposed three mode of trust production, including process-based, characteristics-based, and institutional-based trust. Process-based trust is related to past or expected exchange, such as in reputation or accumulated understanding [48]. Most researchers in inter-organizational relations focus on process-based trust and tend to view trust as confidence or predictability in one's expectation about trustees' behaviors, goodwill, and reliability in transaction [9]. Building trust through repetitive transactions is a precondition of relational commitment [32]. The more the customer trusts the supplier, the higher the perceived value of the relationship by the customer [38]. Only trustworthy partners can lower the threats of vulnerability and opportunism entailed from relational commitment [26]. Crosby et al. [6] proposed that relationship quality had a significant influence on the customer's anticipation of future commitment. It is obviously acceptable is that the influence of satisfaction on trust, in turn increase the level of commitment. Thus, we propose:

**H3:** *Trust of application service provider is positively associated with affective commitment.*

#### **C. Satisfaction and Service Quality**

Customer satisfaction is the main objective for most firms, since it could stimulate more customer transaction and bring more revenues. Satisfaction is defined as "a positive affective state resulting from an appraisal of all aspects of a firm's working relationship with another firm" [1]. The overall satisfaction perspective views customer satisfaction as a cumulative evaluation that customer perceive during a series of interaction with specific products, services, and relationship [44]. Satisfaction with past experience assists customers in evaluating providers' integrity, honesty, benevolence, reliability and competence. Accordingly, customers believe that providers do not take advantage of customers because of their short-term benefits. The greater the satisfaction with past experience, the greater the customer's trust in service provider should be [4]. Service quality is represented as customer

satisfaction for firms of which core business is providing services, rather than physical products. For example, Yang and Peterson [44] argued that satisfaction represents customers' cumulative impression of a firm's service performance and is a good predictor of customer loyalty. Their focus of service performance reflects the customers' perception of service quality. Zeithaml and Bitner [44] proposed that customers' perception of service quality is the fundamental determinants of customer satisfaction. Service quality is defined as cumulative subjective evaluation of a specific service [29] or the personal perceived experience during the process of consumption [21]. Bell et al. [3] emphasize the necessity of concerning how customers' view of service quality changed over time, especially in pursuing long-term relationships. Thus, we propose:

**H4:** *Service quality of application service provider is positively associated with trust.*

Furthermore, consumers with cumulative satisfied experience may remain loyal to the relationship, recommend the product/service, say positive remarks about the product/service, and pay more for the product/service [47]. Customers' intention to revisit is primarily determined by their satisfaction with prior use of service [12]. Empirical studies show the positive association between satisfaction and loyalty, e.g., [1], [18]. The relationship of service quality and loyalty is also supported in empirical studies [1][3]. Thus, we propose:

**H5:** *Service quality of application service provider is positively associated with customer loyalty.*

#### **D. Switching Barrier**

Social exchange theory indicates that individual expects to gain maximum benefits with minimum costs and weighs gains and losses anytime. Thibaut and Kelly [35] indicated that whether an individual retains a relationship depends on the comparison of current relationship, past experience and potential alternatives. It is possible that an individual highly satisfied with a certain subjects but would not like to commit to this relationship, vice versa. A satisfied customer might switch to another supplier to receive more qualified service/product or to just make a trial use without any potential loss. A dissatisfactory customer may stay with the same supplier because s/he has no better choice or would incur substantial loss when leaving [31]. Continuous commitment stems from an anticipation of high termination costs or high switching costs associated with quitting a given relationship [4]. Continuous commitment is economical-based dependence which results from a calculation of cost and benefit and perceived cost-benefit ratios of the service provider relative to competitors [4]. Empirical studies reveal that the higher the switching barrier, the more a customer is forced to remain with his or her existing carriers because of difficulty and costs [30]. Thus, we propose:

**H6:** *Switching barrier of a firm in current relationship is positively associated with continuous commitment.*

A significant non-linear relationship between core-service satisfaction and customer loyalty without considering switching barrier is validated in literatures [16] [17]. Jones et al.'s [16] research concludes that the influence of service satisfaction on customer loyalty varies by different levels of switching barriers. A dissatisfactory customer will still maintain current relationship because of high switching barriers. High switching barriers mitigate the influence of service quality with the core service by forcing customers to remain with their service providers, irrespective of the degree of core-service satisfaction [17]. On the contrary, the association of service quality and loyalty is less influenced by low switching barriers. Thus, we propose:

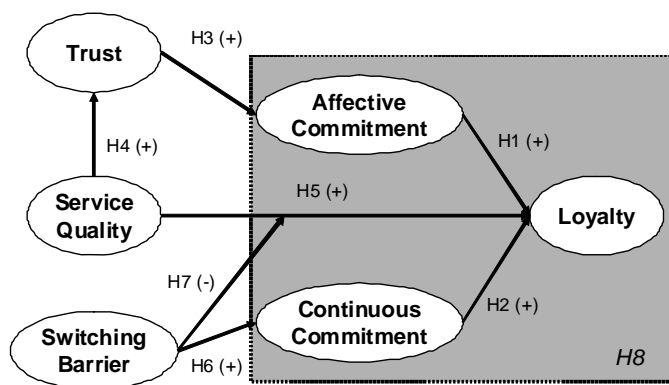
**H7:** *The effect of service quality on loyalty is stronger for low switching barrier than for high switching barrier.*

#### E. Moderating effect of business types

Furthermore, this study would like to explore the influence of business types. The characteristics between sea shipment and air cargo are different, so we proposed that the relationship of commitment and loyalty will be distinct. The time pressure of processing customs service in the area of sea shipment is less urgent than in the area of air cargo. So, the value chain of sea shipment is fragmented. Each segment is in charge of a small piece of logistics. Business scale of each firm is small. In opposition, logistics by air cargo face great time pressure, so they are usually responsible for lots of tasks in one process. Business scales and sales volumes are usually large. Besides, the application and scope of charters between sea shipment and air cargo is different. Accordingly, this study tries to figure out which type of commitment, i.e. affective and continuous commitment is the main contributor to loyalty formation. Thus, we propose:

**H8:** *The relationship of commitment and loyalty varies from business type, including sea shipment and air cargo.*

Consequently, our research model was proposed, as shown in Fig. 2.



H8: The relationship of commitment and loyalty varies from business type, including sea shipment and air cargo, as shown in the shadow square.

Fig. 2 Research model

## IV. RESEARCH DESIGN

### A. Customs service providers

The process of applying to customs for transiting goods in logistics industry is the chosen context in this study. There are two reasons. The first is that nearly all logistics companies outsource this process to application service providers in Taiwan. The customs service is the most mature ASPs environment in Taiwan. Shippers, customs brokers and logistics forwarders have to apply clearance and certificate process by connecting to a web systems hosted by a specific application service providers because of the policy of government. Customs clearance procedures is applied for export goods in the territory of our country, unloaded and temporarily stored in warehouse or container yard designated by customs authority to overseas by sea or air or import goods into the territory of our country. The certificate procedure is to inspect the declared transited goods and issues certificate documents and releasing notices. The second is that custom brokers and forwarders have to build up their service level of providing accurate, timely and diverse services for shippers, especially integrated and value-added services when they are facing fierce global competition from international logistics service integrators. Customs brokers and logistics forwarders will evaluate whether they will switch service suppliers for pursuing maximum benefit from application service providers. Accordingly, how to retain their customers for increasing revenue and keeping their competitive position is being a critical tactic for customs service providers. The relationship management is especially important for logistics application service providers.

### B. Methodology

The instruments for all constructs are adapted from the literature and are revised to fit our research context. All items were anchored on seven-point Likert-type scales, from strong disagreement to strong agreement. In order to reduce the measurement error, we adopt a pretest to refine the measurement items in our questionnaire design. Collected data will be analyzed through SEM (Structural Equation Modeling) techniques.

Preliminary interviews were conducted to thoroughly understand the context of collaboration between logistics industry and logistics information service providers. A package of questionnaires comprised of a cover letter which states the research objective, compliant questionnaire and a prepaid envelope were mailed to the managers who are responsible for customs transactions in customs brokers and logistics forwarders. In order to pursue the uniformity of responses, we asked respondents to choose a specific customer information service provider with whom they were currently involved.

Of the 1,845 questionnaires sent out, 17 could not be delivered. Questionnaires were mailed during a week from March 19, 2007. The time of data collection lasted for five weeks. During this period, two hundred and seventy six

respondents were received with a 15.1% response rate. After scrutinizing returned questionnaires, 223 with completed and reasonable answers were used. The response rate of usable returns is 12.2%. Most respondents are from small corporations which have been operated for many years. Respondents come from sea shipment and air cargo. Some respondents run both of business. The characteristics of respondents fit with the profile of logistics industry related to customs service.

## V. DATA ANALYSIS AND RESULTS

### A. The measurement model

This study performs VisualPLS to examine measurement model. The formative construct of “switching barrier” are excluded in the measurement examination because reliability and validity of formative constructs are not tallied as suggested by Hulland [13]. We drop seven items with insignificant factor loadings and low factor loading as compared to the suggested 0.5 threshold. These items come from the constructs of “service quality,” “trust,” “affective commitment,” and “continuous commitment.” The values of composite reliability ranging from 0.81 to 0.97 and average extracted variances ranging from 0.60 to 0.73 are both above the threshold: 0.7 and 0.5 respectively, which indicates acceptable internal consistency and convergent validity, as shown in Table. 1. Discriminant validity is also acceptable based on the result which the values of square root of average extracted variance of each construct are all larger than inter-construct correlations, as shown in Table. 2. Briefly, the measurement model seems to be adequate based on the assessment of internal consistency, convergent validity and discriminant validity.

Table. 1 Reliability and Convergent Validity

Construct	Composite Reliability	AVE	Cronbach's Alpha
Service Quality	0.967	0.643	0.948
Trust	0.894	0.630	0.861
Switching Barrier	0.824	0.613	0.723
Affective Commitment	0.909	0.714	0.863
Continuous Commitment	0.812	0.595	0.675
Loyalty	0.931	0.730	0.947

Table. 2 Covariance Matrix and Discriminant Validity (diagonal denotes square root of AVE of each construct)

	SQ	TR	SB	AC	CC	LO
SQ	<b>0.802</b>					
TR	0.747	<b>0.794</b>				
SB	0.041	0.127	<b>0.783</b>			
AC	0.510	0.570	0.303	<b>0.845</b>		
CC	0.010	0.081	0.396	0.098	<b>0.771</b>	
LO	0.789	0.685	0.162	0.508	0.105	<b>0.854</b>

Note: LO: loyalty; AC: affective commitment; CC: continuous commitment; TR: trust; SQ: service quality; SB: switching barrier

### B. Hypotheses testing

The SEM analysis using VisualPLS was employed to examine hypotheses. Two steps were conducted. First, main effects and the moderating effect of switching barriers were assessed by testing path coefficient, their significant level and explained variance ( $R^2$ ). Second, the effect of business type on the relationship of affective commitment, continuous commitment and loyalty was tested by comparative analysis of multi-group. We divided samples into two groups according business type, include sea shipment and air cargo and then compared the statistical significance of path coefficients of a group with different business type.

The result of structural model testing is shown in Fig. 3. Except for the moderating effect of switching barrier on the relationship of service quality and loyalty, all hypothetical paths are statistically significant at the level of  $p < 0.05$  and coincided with hypothetical direction, as shown in Table. 3. The relationship among variables derived from the perspective of relationship management is statistical significant. Trust positively affects Affective Commitment. Service Quality positively affects Trust. Along the path of economical consideration, switching barrier significantly influence Continuous Commitment. Yet, the effect of affective commitment on loyalty is greater than of continuous commitment. Besides, switching barrier positively enhance the relationship of service quality and loyalty. This result is contrary to the result of empirical research and our hypothetical direction.

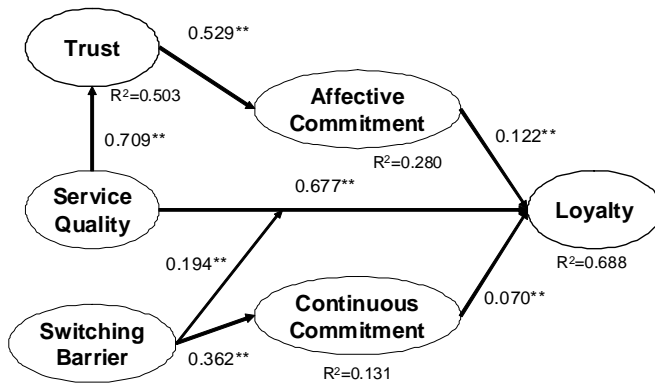


Fig. 3 Parameters of structural model

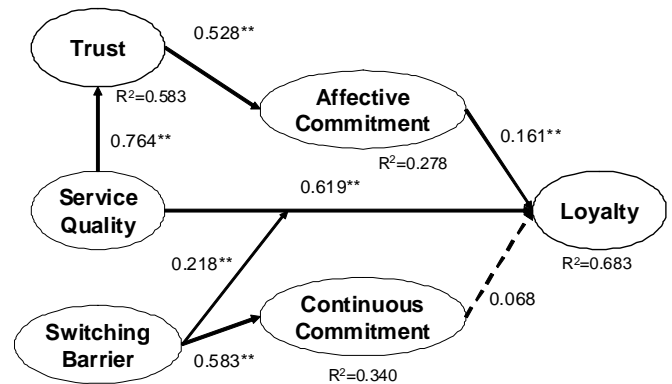


Fig. 5 Parameters of full model – Air Cargo (n=104)

### C. Moderating effect of business type

Samples were classified by business types. These two groups were examined by VisualPLS respectively. In the case of sea shipment, 166 of respondents were tested. The result reveals that continuous commitment is the major contributor to loyalty, instead of affective commitment, as shown in Fig. 4. On the contrary, in the case of air cargo, affective commitment is the major contributor to loyalty, as shown in Fig. 5. As a result, H8 is supported and indicated that the influences of psychological and economical consideration of loyalty varies from business types.

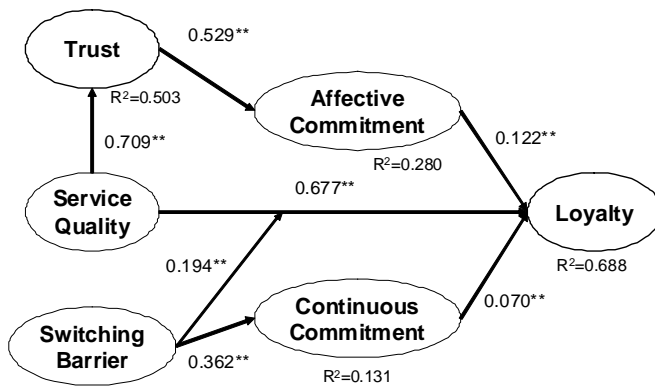


Fig. 4 Parameters of full model – Sea Shipment (n=166)

Table. 3 Summary of the research results

Hypotheses	Results
H1: AC → LO (+)	Supported
H2: CC → LO (+)	Supported
H3: TR → AC (+)	Supported
H4: SQ → TR (+)	Supported
H5: SQ → LO (+)	Supported
H6: SB → CC (+)	Supported
H7: SQ × SB → LO (+)	Not Supported
Contrary to the hypothesis	
H8-1: CC → LO (+)	Business Type: Sea Shipment
H8-2: AC → LO (+)	Business Type: Air Cargo

LO: loyalty; AC: affective commitment; CC: continuous commitment; TR: trust; SQ: service quality; SB: switching barrier

## VI. DISCUSSIONS AND IMPLICATIONS

Findings in this study enrich our understating of relationship management in customs service setting and highlight the importance of relationship management during the process of loyalty formation. Usually, the research stream of customer loyalty emphasizes economical factors and satisfaction, such as switching barrier rather than psychological factors. Yet, trust and affective commitment are primary antecedents of loyalty formation in our research setting. Along a psychological path, delivering good service quality not only enhances trust, but also directly improves the probability of loyalty. Along an economical path, setting up switching barriers raises the level of continuous commitment and influence the association of service quality and loyalty. The most important is the critical role of service quality in the service industry. Service quality not only direct affects loyalty maintenance, but also influences customer loyalty mediated through trust and affective commitment. Moreover, relationship among affective commitment, continuous commitment and loyalty is subtly distinct by business types.

### A. Academic Implications

Some academic implications are drawn based on research results. First, constructs derived from relationship management which are usually used in individual-level research are appropriate for firm-level studies as well, such as trust and commitment, except for continuous commitment. The explained variance of some endogenous variables in the models of main effect and moderating effect of relationship strength is acceptable, such as loyalty (68%), affective commitment (28%~40%), and trust (50%~58%). Although the influence of service quality is prominent, the effects of affective commitment and continuous commitment should also be noticed, especially in the contexts of different business types. It is possibly due to the intention of maintaining long-term relationship at present and gradual appearance of these constructs in firm-level literatures. Second, results reveal the important influence of psychological factors derived from relationship management on loyalty to ASPs. It responds to the argument that social interaction and affective influence are also important in industrial area. Third, path coefficients of continuous commitment and loyalty are significant, but small numbers. Switching barrier significantly affects continuous commitment, but the explained variance is low. The reason may be that other significant factors exist but be neglected, such as setup cost in initial phases or operating cost during the development process. Fourth, the influence of switching barrier on loyalty includes main and moderating effects. But, the result is opposite to literatures, e.g. Jones et al. [16]. Our finding reveals that switching barrier heightens the relationship of service quality and loyalty. In the case of high switching barrier, increasing a bit of service quality could improve customer loyalty a lot. Customers are getting more sensitive about service quality when they perceive more difficulties of switching service providers. It is deserved to be investigated in the future. Finally, the major contributor of loyalty varied from business types. Business scale and time pressure of air cargo is large and they can not afford any time delay in the process of logistics. So, they hope to make long-term relationships with worthy trusted partners and do not switch partners arbitrarily. Accordingly, firms running business with air cargo emphasize affective commitment. On the contrary, firms in the area of sea shipment are small business scale and face little time pressure. So, they have to pursue cost efficiency for survival. Accordingly, firms running business with sea shipment emphasize continuous commitment.

### B. Practical Implication

Analysis results lead to practical implications for ASPs, who hope to retain customers based on the empirical result of this study. We hereby propose some suggestions. First, the determinants of affective commitment include service quality and trust. Service quality both directly and indirectly affects loyalty. The indirect influence of service quality on loyalty is mediated by trust and affective commitment. The determination of continuous commitment is switching barrier. Thus, manager should be devoted to cultivation of service quality and

establishment of switching barriers, so as to enhance industrial customers' affective and continuous commitment, which are the critical determinants of loyalty formation. Second, industrial long-term relationship should be cultivated by considering both relational and economic factors simultaneously. Furthermore, it is interesting that the effect of affective commitment is much greater than continuous commitment. Firms should pay more attention on affective commitment when they are managing a long-term relationship, such as increasing service quality level or building up trusting belief of customer. Third, the moderating role of switching barrier should be noticed. It is not enough for firms to build up switching barrier. Service quality is central to relationship management. Finally, the main method of enhancing customer loyalty depends on business type. Empirical result demonstrates that continuous commitment is primary determinates for maintaining customer loyalty in the case of sea shipment business, whereas affective commitment is dominant determinants in the case of air cargo business. Hence, ASPs must give different incentives to firms based on firms' business types. For firms running air cargo, cultivating affective trust and commitment could maintain and improve customer loyalty. These firms would like to keep long-term relationship with ASPs who can tough their feelings. For firms running sea shipment, ASPs could build up switching barrier to prevent customers from changing service providers easily.

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