Chapter 4 Conceptual Model of Choice Behavior

4.1 Concept of Retailing Delivery System

The B2C environment is unpredictable and dynamically changing customer orders. At the same time, reliable and timely delivery is one of the fundamental objectives for online shoppers. Online shoppers make their orders at their office or home anticipating quicker delivery than offline purchasing, and timely delivery at convenient times. In Taiwan, the electronic commerce delivery system can be divided by the type of services provided into home delivery (HD) and retailing delivery (RD). In comparison with other countries, the major difference in the logistics of e-commerce between Taiwan and other countries is the RD system. Taiwan's history of retailing delivery of e-commerce is not long. CVS.com (CVS.com is a joint venture by four families of convenience stores including Family.com, Hi-Life.com, Okcvs.com and Nikomart.com) is an RD provider that began service in the beginning of 2000 in Taiwan, while 7-11.com joined the market at the end of 2000. Because of safe method of payment way and the quick delivery, RD services by convenience stores have become a substantial provider of the electronic commerce logistics in Taiwan. Currently, over 1000,000 per month orders are completed by the electronic commerce with retail delivery model. Figure 3 shows the relationship of retailing structure.

In the Internet, consumers can place orders at any time through the Internet in the online B2C environment, so the orders are unpredictable, but the delivery service response is expected to be fast. Therefore, e-retailing needs a quick-response logistics system to support the order deliveries. The recent trend toward the outsourcing of logistics activities has given prominence to the concept of third-party logistics service providers (3PL). 3PL is defined as providers of logistics services that perform the logistics functions on behalf of their clients. In Taiwan, most of the e-commerce-related delivery is operated by 3PL. In most cases, these providers do not exclusively serve e-commerce firms but also offer distribution and warehousing services for a number of customers. Because of the need for timely delivery system, perfect information system and low logistics operations cost due to of economic scale, 3PL providers have had to improve the flow of information both internally and externally and integrate their logistics services into the retail delivery provided by convenience stores.

The RD system provides an easy on-line shopping process, safe pick-up points and quick delivery service for e-retailing. The retailing delivery includes four

functions: (1) e-map, (2) packing process, (3) delivery system and (4) pick-up point (see Figure 4.2).

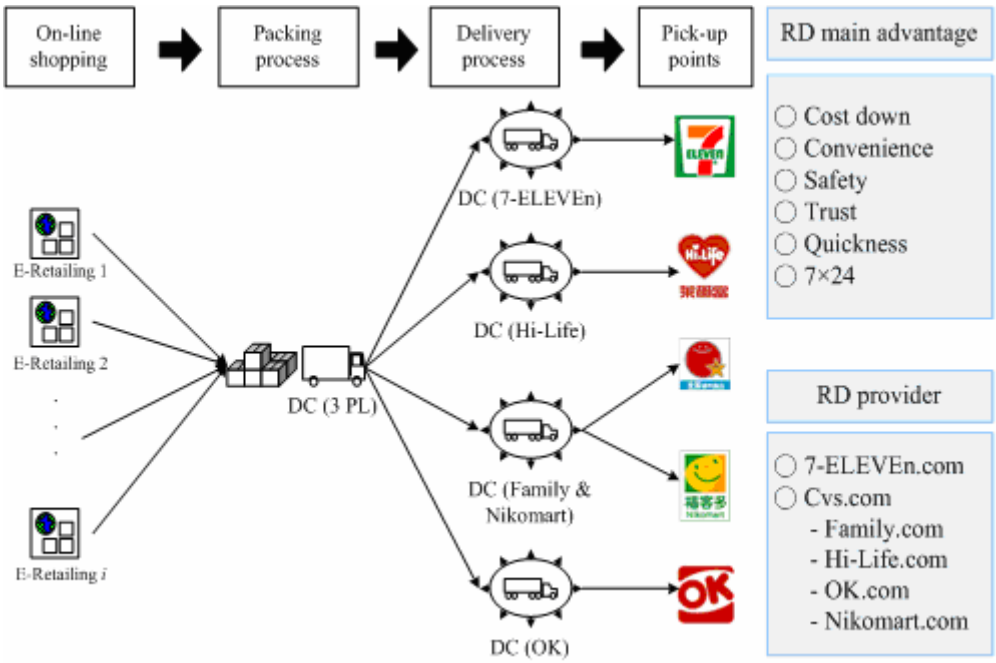

Figure 4.1 Relationship of Distribution Centre of Retailing Delivery

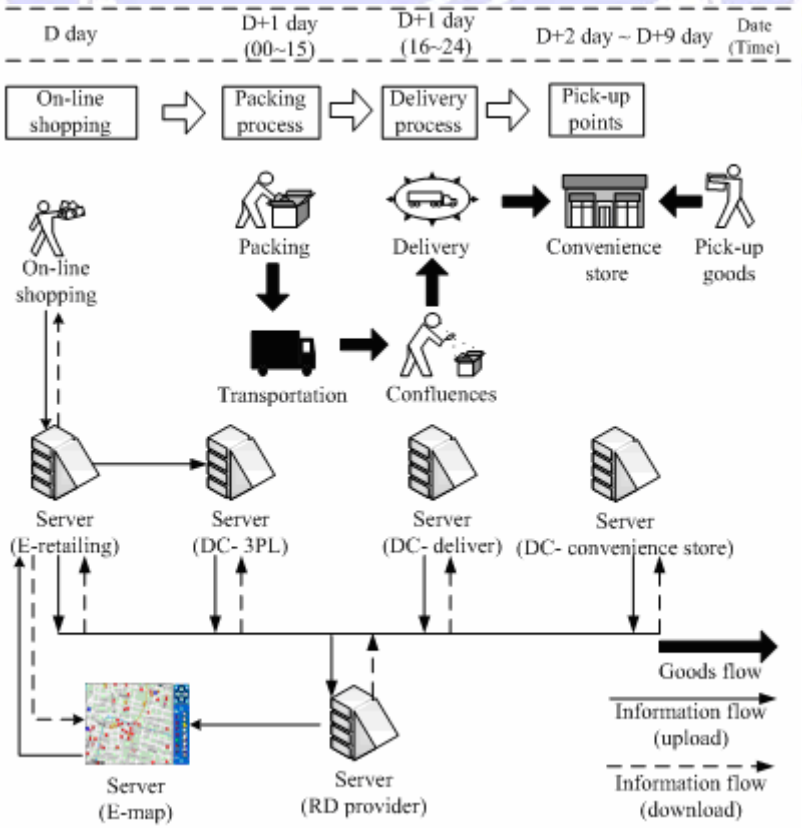

Figure 4.2 Goods Flow and Information Flow of Retailing Delivery

The RD system has two special features. First, consumers can shop on-line even without a credit card. This is important for young people who have no credit cards, or for those who are concerned about the safety of other payment methods for on-line shopping. The second special feature is that the RD service provides consumers with a self pick-up approach through convenience stores. This is popular for two different types of consumers, one is women who are concerned about the safety of home delivery (HD) systems, and the other is students who do not like home delivery because they do not like their parents will to know their purchases.

For on-line shoppers, the e-map website provides customercustomers a friendly way to choose one convenience store to pay the bill while picking up the goods. Next, the RD system delivers the good to the convenience stores of customers' choice. In other words, the RD system supplies an easy on-line shopping process, safe pick-up point, and a quick delivery service for e-retailing.

According to Figure 4, details about the goods flow and information flow of retailing delivery is presented in the following:

Step 1 (D day): An on-line shopper chooses one convenience store to pay the money and pick-up the merchandise via the e-map website.

Step 2 (D+1 day): The e-retailer uploads the order information to 3PL. Then 3PL must finish the packing process of all orders by 3:00 pm of the D+1 day and transport the orders to the delivery centre before 4:00 pm of the D+1 day.

Step 3 (D+1 day): The delivery centre collects the orders from different e-retailers and transports the orders to the different convenience stores before the 12:00 noon on the afternoon of the D+2 day.

Step 4 (D+2 day): According to the information uploaded from the convenience store delivery centre, the e-retailer will notify the customer by e-mail or cell phone about pick-up.

Step 5 (D+2 day~D+9 day): If on-line shopper picks the goods from the convenience store, the e-retailer can download the data from the server of RD provider. If not, the RD provider will return the goods to the e-retailer after D+9 day.

4.2 Hypothesis and Theoretical Model

Structural Equation Model (SEM) is a multivariate statistic method based on correlation. It served as extension of path analysis, and also contains covariance structural analysis and confirmatory factor analysis. The objective of SEM is to explore the casual relationship among latent variables while examining the underlying

theory. In SEM, latent variables are hypothesizing concepts that can only be approximated by observed, while observed variables are those whose values can be collected form respondents.

The first step to conduct SEM analysis is to develop SEM analytical models that include measurement models and structural models. The measurement models describe how each latent variable is measured or operable by corresponding manifest observed variables (exogenous and endogenous). Based on the related literature reviewed in Chapter 2, the following hypothesis are formulated as

H_1: Service quality has positive effects on loyalty

H_2: Service quality has positive effects on satisfaction

H_3: Higher levels of the satisfaction are associated with higher levels of loyalty

H_4: Switching cost has positive effects on loyalty

Figure 4.3 shows the structural model between the exogenous and endogenous (latent) variables.

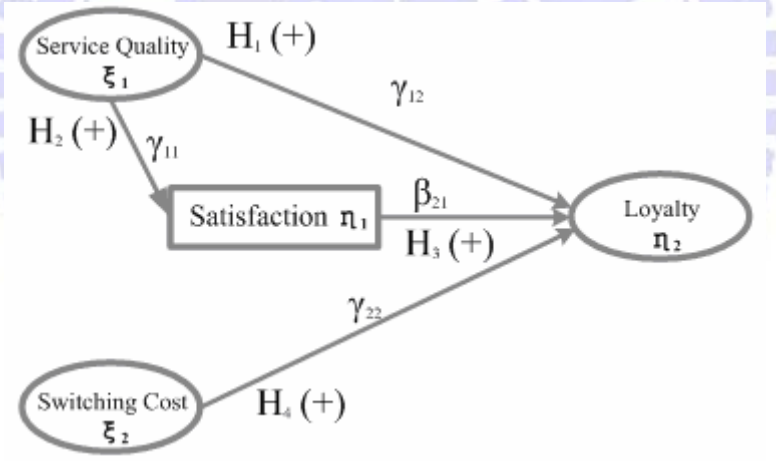

Figure 4.3 Structural Model

Based on the proposed research model and the notation described above, the measurement models are formulated for the exogenous variable and the endogenous variables as shown in Figure 4.4 and Figure 4.5, respectively. Table 4.1 lists the definitions of parameters in those models, and Table 4.2 lists the representations of variables in those models that are derived from the literatures discussed as in Chapter 2.

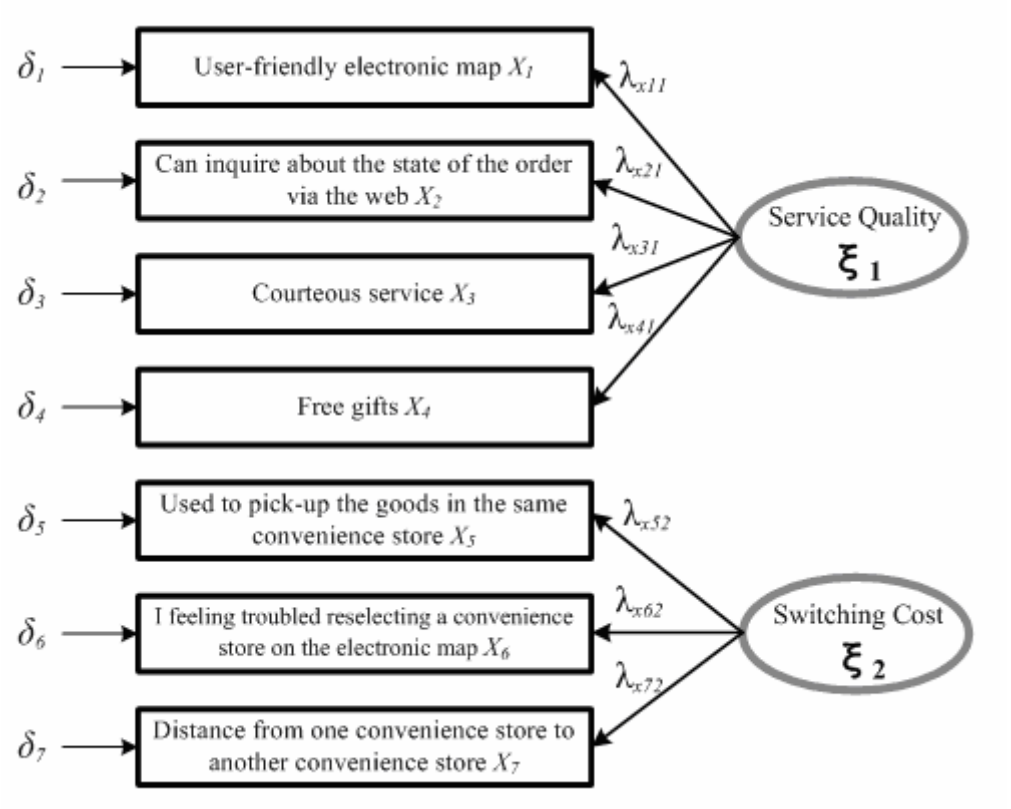

Figure 4.4 Measurement Models of Exogenous Variables

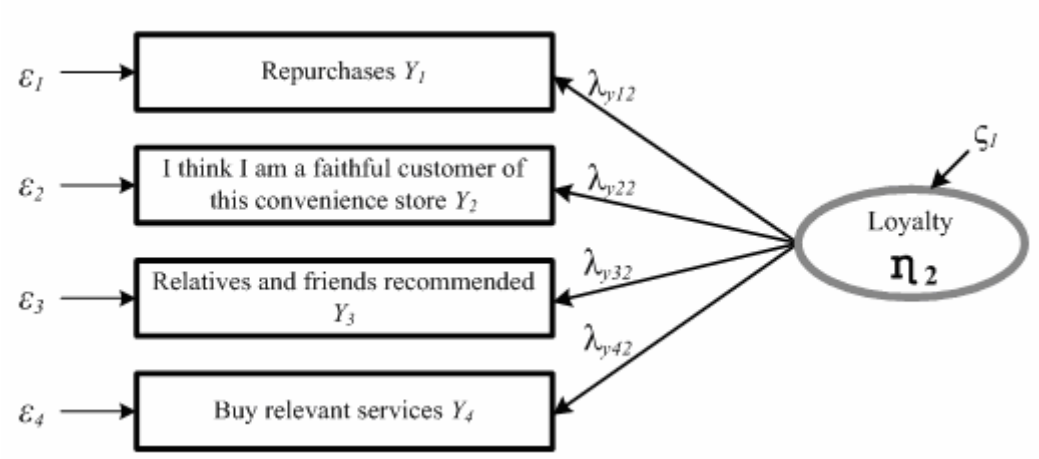

Figure 4.5 Measurement Model of Endogenous Variable

The latent variable service quality is measured through four indicators: user-friendly electronic map, inquiry about the state of order via web, courteous service, and free gifts. Another three indicators describe the latent variable switching cost: used to pick-up the goods in the same convenience store, tired of reselecting a convenience store on the electronic map, and a distance from one convenience store to another convenience store. Finally, the latent variable loyalty is measured through four indicators: repurchases faithful to a convenience store, relatives and friend's recommendation, and the indicator of purchasing relevant services.

Table 4.1 Definition of Parameters

Parameter	Definition
η	Endogenous latent variables
ξ	Exogenous latent variables
ς	Disturbance
y	Observed variables of η
x	Observed variables of ξ
λ	Coefficient between latent variables and observed variables
γ	Coefficient between exogenous and endogenous variables
ε	Measurement error of Y
δ	Measurement error of X

Table 4.2 Representation of Variables

Parameter	Definition
x_1	User-friendly electronic map
x_2	Can inquire about the state of the order via the web
x_3	Courteous service
x_4	Free gifts
x_5	Used to pick-up the goods in the same convenience store
x_6	I feeling troubled reselecting a convenience store on the electronic map
x_7	Distance from one convenience store to another convenience store
y_1	Repurchases
y_2	I think I am a faithful customer of this convenience store
y_3	Relatives and friends recommended
y_4	Buy relevant services

4.3 Questionnaire Design and Data Select

The questionnaire is consists of four parts. On the first part, the profile of selected community members were selected, and the characteristics or variables are

consisted of two areas such as demographic characteristics and online shopping behavior. Demographic characteristics include age, sex, education, and location. Online shopping behavior characteristics include number of years by using online shopping. Then, the data for the study were collected from an on-line survey that a pop-window invitation contained an embedded URL linkage to the website hosting.

Participants who completed the questionnaires were given coupons of 100NT through cellular phone announcements. Survey responds were rated on a five-point Likert scale. The first scale represents the least important/satisfied, and the fifth scale represents the most important/satisfied. The survey lasted for six weeks and was collected 11,462 responds in total.

There were 9,278 respondents selected from the database, and the respondents had the experience of on-line shopping and pick-up goods in a convenience store. In this chapter, SPSS 12.0 was used for basic statistical analysis, factor analysis and reliability analysis, and LISREL 8.2, and it was adopted for analysis of the structural equation model. The demographic characteristics of the respondents to this survey are summarized as follows. Table 4.3 summarizes the demographics of the samples in the data.

As shown in Table 4.3, among the sample data, more than half of the respondents are unmarried, 72.4% are females, 84.9% are in the 19-39 age groups, and 62.4% of the respondents indicate that 7-11.com is their main pick-up point.

Confirmatory factor analysis (CFA) is employed to develop a measurement model that achieved an acceptable fit to the data. Reliability is assessed at first, and then convergent validity is analyzed. Reliability may be understood as the internal consistency of the items that are used to measure a latent construct. Cronbach's alpha coefficient is the most commonly used technique for evaluation. Nunnally suggested that Cronbach's alpha coefficient over 0.6 is adequate for basic research. Then Cronbach's alpha is calculated for the scale items to ensure that exhibits satisfactory levels of internal consistency as shown Table 4.4 is summarized the instrument reliabilities and validities. The reliability of each construct was assessed by using Cronbach's alph measure which is in the experiment ranging from 0.75 to 0.88 (see Table 4.4), indicating that the scale are internally consistent and reasonably free of measurement error.

Table 4.3 Demographic Profile

Classification	Number of respondents	Percentage	Classification	Number of respondents	Percentage
Sex			Martial status		
Male	6718	72.4%	Unmarried	6324	68.2%
Female	2560	27.6%	Married	2954	31.8%
Age			Location of Taiwan		
Under 14	35	0.4%	North	5570	60.0%
15-18	562	6.1%	Middle	1621	17.5%
19-24	2470	26.6%	South	1778	19.2%
25-30	3083	33.2%	East	303	3.3%
31-39	2329	25.1%	Others	6	0.1%
40-49	652	7.0%	Purchasing on-line experience (year)		
50-59	129	1.4%	Over 3	1183	12.8%
Over 60	18	0.2%	2-3	2076	22.4%
Purchasing on-line frequency (month)			1-2	3184	34.3%
1/6	217	2.3%	0.6-1	1877	20.2%
1/3	882	9.5%	Under 0.6	958	10.3%
1-2	2295	24.7%	The main pick-up point		
Over 3	1057	11.4%	7-11.com	5791	62.4%
Uncertain	4827	52.0%	Cvs.com	3487	37.6%

Validity can be considered as whether the measure is actually. There are three kinds of validity, such as content validity, convergent validity, and discriminate validity, are commonly used. The function of content validity is to test whether the content of questionnaire items can measure the variables correctly. Since the questionnaires of the study are developed that based on the variables defined by relevant researches, it has content validity.

From the above, the results suggest that an appropriate fit between the data and the measurement model. In other words, the results support the overall reliability and validity of the scale items used to measure the hypothesized dimensions.

Table 4.4 Internal Consistency Analysis of Reliability

Latent variable	Description of items		Factor loadings	Cronbach alpha
Satisfactory	y_1	Overall satisfaction	-	-
Loyalty	y_2	Repurchase	0.84	0.88
	y_3	I think I am a faithful customer of this convenience store	0.86	
	y_4	Relatives and friends recommended	0.86	
	y_5	Buy relevant services	0.89	
Service Quality	x_1	User-friendly electronic map	0.75	0.78
	x_2	Can inquire about the state of the order via web	0.81	
	x_3	Nice service attitude	0.82	
	x_4	Free gifts	0.65	
Switching Cost	x_5	Used to pick-up the goods in the same convenience store	0.80	0.75
	x_6	I feeling trouble to reselecting the convenience store in the electronic map	0.84	
	x_7	Distance between another convenience store	0.76	

4.4 SEM Analysis and Result

The conceptual model is used and shown in Figure 4.3 to explain the relationships among loyalty, satisfaction, service quality, and switching cost. To analyze the relation between these factors, a structural equation modeling approach to the analysis of collected data was proposed.

SEM is a multivariate technique which combines confirmatory actor analysis modeling from psychometric theory and structural equations modeling. The primary aim of SEM is to explain the pattern of a series of inter-related dependence relationships simultaneously between a set of latent (unobserved) constructs, each measured by one or more manifest (observed) variables.

By using LISREL, the simultaneous estimation of: (1) a measurement model can

be obtained that items in each scale to the construct represented, giving factor loadings for each item; (2) a structural model that related constructs to one another, providing parameter value. The LISREL model represents a series of hypothesis, and how the variables are related.

Sample size plays an important role in estimating and interpreting SEM results as well as estimating sampling errors. Although there is no any correct rule for estimating sample size for SEM, recommendations are for a size ranging between 100 and 200 (Hair, Rolph, Ronald and William, 1998). Hayduk (1987) indicated that a sample size should also between 50 and 500. According to Hair *et al*. and Hayduk, a random sample of 320 responses generated from those who had experiences of picking up on-line ordered merchandises at convenience stores was selected from the database.

LISREL-based SEM allows researchers to choose the input matrix from two types of matrices: the variance-covariance matrix and the correlation matrix. Because the results from each type of matrix are the same and it is more difficult to interpret the variance-covariance matrix, the correlation matrix is chosen and shown the relationship between items and constructs. The purpose is showing the correlation matrix is to check whether there is an overly high correlation among items and constructs. In SEM, an overly high correlation coefficient between constructs and items indicates that the matrix could be reversed and so parameter could not be estimated. Based on the data collected, the model in Figure 4.3 can be estimated that a SEM statistical technique can calculate values for each of twelve variables and values in the performance level and the degree for the relationship between the variables. A confirmatory factory analysis test system for the causal relationships is employed and defined by hypotheses H_1-H_4 with the LISREL 8.2 software package. To estimate the model, the "Generalized Least Squares (GLS)" method is selected because it typically provides valid parameter estimates (Joreskog and Sorbom, 1996). Two exogenous constructs dealing with service quality and switching barrier and tow endogenous constructs, including the variable of satisfaction and loyalty were analyzed with structural equation modeling procedures. The correlation matrix of the constructs and the means and standard deviations are summarized in Table 4.5.

Overall model validation often refers to the goodness-of-fit test. The purpose of such test is to assess whether the theoretical model could explain the real observable data, that is, the difference between theoretical model and real data. Before assessing the goodness of fit, offending estimates should be considered. Offending estimates refers to the estimates of parameters beyond acceptable limits either in structural models or measurement models. It shows that the estimated correlation coefficients

are neither close to 1 nor their standard errors are very large, which indicates no violation of offending estimates.

Table 4.5 Correlation Matrix for the Hypothesized Model

	Mean	Std.	y_1	y_2	y_3	y_4	y_5	x_1	x_2	x_3	x_4	x_5	x_6	x_7
y_1	1.83	0.59	0.345											
y_2	1.62	0.64	0.147	0.410										
y_3	1.87	0.79	0.180	0.325	0.624									
y_4	1.95	0.78	0.189	0.300	0.400	0.612								
y_5	1.82	0.70	0.174	0.296	0.375	0.390	0.490							
x_1	1.76	0.69	0.145	0.170	0.195	0.197	0.184	0.475						
x_2	1.90	0.76	0.149	0.158	0.188	0.207	0.182	0.273	0.575					
x_3	2.01	0.80	0.172	0.190	0.229	0.243	0.220	0.270	0.319	0.642				
x_4	2.58	1.10	0.137	0.211	0.316	0.325	0.293	0.154	0.193	0.229	0.705			
x_5	2.59	0.94	0.154	0.201	0.327	0.352	0.294	0.159	0.204	0.249	0.549	0.879		
x_6	2.61	1.13	0.145	0.178	0.272	0.327	0.258	0.115	0.169	0.206	0.498	0.579	1.285	
x_7	2.72	1.09	0.091	0.129	0.228	0.233	0.188	0.077	0.12	0.146	0.388	0.412	0.571	1.178

Goodness-of-fit test in SEM can be classified into three types. The first one is absolute fit measures, which assess the fit of the overall model without adjustment of the over-fitting degree. Typical chi-square test value, goodness-of-fit index (GFI), root mean square residual (RMSR), and root mean square error of approximation (RMSEA) are used to indicate the absolute fit. The results are shown in Table 4.6 with suggested values listed. It shows that the absolute fit measures are acceptable in the case.

Table 4.6 Summary Results of Absolute Fit Measures

Measure	Value	Suggested value
Chi-square of estimated model	84.46/49	Greater than 0.05
Goodness-of-fit index (GFI)	0.96	Greater than 0.9
Root mean square residual (RMSR)	0.045	Below 0.05
Root mean square error of approximation (RMSEA)	0.048	Below 0.05

The second type is the incremental fit measures, which compare the proposed

model to a null model and indicate the improvement degrees. The null model is a single-factor model with no measurement errors. The adjusted goodness of fit (AGFI), non-normed fit index (NNFI), normed fit index (NFI), comparative fit index (CFI) and Crtical N（CN）are used to indicate the incremental fit. The results are shown in Table 4.7 with suggested value listed. It shows that the incremental fit measures are acceptable in the case.

Table 4.7 Summary Results of Incremental Fit Measures

Measure	Value	Suggested value
Goodness of fit (AGFI)	0.93	Greater than 0.9
Non-normed fit index (NNFI)	0.98	Greater than 0.9
Normed fit index (NFI)	0.97	Greater than 0.9
Comparative fit index (CFI)	0.99	Greater than 0.9
Crtical N（CN）	286.45	Greater than 200

The third type is the parsimonious fit measures, which indicate the over-fitting degrees in the model. Their main idea is to select the simplest model that achieves similar goodness of fit among others. The parsimonious goodness of fit index (PGFI) is used to indicate the parsimonious fit. The results are shown in Table 4.8 with suggested values listed. It shows that the parsimonious fit measurement is acceptable in the case.

Table 4.8 Summary Results of Parsimonious Fit Measures

Measure	Value	Suggested value
Parsimonious goodness of fit index (PGFI)	0.60	Greater than 0.5

The different indices of model fit are computed and included from Table 4.6 to Table 4.8. As suggested by the fit indices, the model generally met the standards of a good-fitting model. All of the index values approach the general standards for index of fit. A summary consideration of the results indicates that all the parameters estimated are signification at $p < 0.5$ in the predicted direction.

Once the model is validated, the SEM analysis is performed by running LISREL and obtained the estimation results for all parameters in the model. Figure 4.6 presents the estimated correlation coefficients in the model. Eq (4.1) ~ Eq (4.3) presents the measure model and structural model in the SEM.

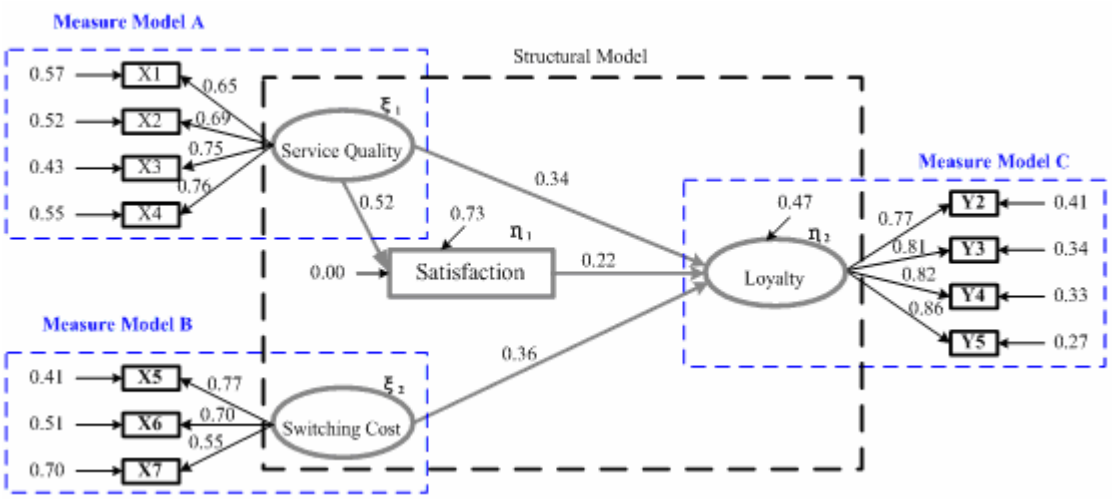

Figure 4.6 Completely Standardized Solution of the Empirical Causal Model

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \\ x_7 \end{bmatrix} = \begin{bmatrix} 0.65 & 0 \\ 0.69 & 0 \\ 0.75 & 0 \\ 0.76 & 0 \\ 0 & 0.77 \\ 0 & 0.70 \\ 0 & 0.55 \end{bmatrix} \begin{bmatrix} \xi_1 \\ \xi_2 \end{bmatrix} + \begin{bmatrix} 0.57 \\ 0.52 \\ 0.43 \\ 0.55 \\ 0.41 \\ 0.51 \\ 0.70 \end{bmatrix} \quad (4.1)$$

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 0.77 \\ 0 & 0.81 \\ 0 & 0.82 \\ 0 & 0.86 \end{bmatrix} \begin{bmatrix} \eta_1 \\ \eta_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 0.41 \\ 0.34 \\ 0.33 \\ 0.27 \end{bmatrix} \quad (4.2)$$

$$\begin{bmatrix} \eta_1 \\ \eta_2 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0.22 & 0 \end{bmatrix} \begin{bmatrix} \eta_1 \\ \eta_2 \end{bmatrix} + \begin{bmatrix} 0.52 & 0 \\ 0.34 & 0.36 \end{bmatrix} \begin{bmatrix} \xi_1 \\ \xi_2 \end{bmatrix} + \begin{bmatrix} 0.73 \\ 0.47 \end{bmatrix} \quad (4.3)$$

The SEM included one or more linear regression equation that describes how endogenous constructs depend upon the exogenous constructs. Their coefficients are called path coefficients, or sometimes regression weights. However, it can be seen that all hypotheses of the relationship between behavioral intentions and the antecedent factors are supported. This means that the results are inconsistent. The second step in model estimation was examining the path significance of each association in the model and variance explained by each path.

The results show that user-friendly electronic map contributes 65% to service

quality, can inquire about the state of the order via the web, courteous service and free gifts contributes 69%, 75% and 76%. It presents that these four indicators have sufficient interpretation toward service quality construct. Similarly, used to pick-up the goods in the same convenience store tired of reselecting a convenience store on the electronic map and distance from one convenience store to another convenience store contributes 77%, 70%, and 55% to switching cost. It reveals that the three indicators have the sufficient interpretation toward switching cost construct. Finally, repurchases, faithful to a convenience store, relatives and friend's recommendation, and purchasing relevant services contribute 77%, 81%, 82%, and 86% to loyalty construct. It indicates that these four indicators have sufficient interpretation toward loyalty construct.

Moreover, the correlation is inspected between the service qualities, switching cost, satisfaction and the loyalty performance construct, respectively. It shows that the service quality and switching cost are the most important factors which positively significant impact to loyalty. All the above statements lead to the hypothesis-testing results as listed in Table 4.9. In the resulting structural equation model, four hypotheses were supported. The implications for RD service provider are discussed.

Table 4.9 Results of Hypothesis Test

Hypothesis	Content	Analysis results
H_1	Service quality has positive effects on loyalty	Support
H_2	Service quality has positive effects on satisfaction	Support
H_3	Higher levels of the satisfaction are associated with higher levels of loyalty	Support
H_4	Switching cost has positive effects on loyalty	Support

After using Structural Equation Modeling to test the relationship between loyalty and the antecedent factors, some summaries can be in accordance with the research hypotheses and detail below.

1. Direct effects

Table 4.7 shows the standardized regression weights of structural model. It is evident that service quality, satisfaction and switching cost affect loyalty.

2. Indirect effects

As presented in Figure 4.6, service quality not only direct affects loyalty but also indirect affect loyalty by satisfaction. Table 4.11 shows the standard indirect effects of

the estimates. The total effect of service quality to loyalty is 0.4544 (0.34+0.1144).

Table 4.10 Standardized Regression Weights

Path	Standardized regression weight
Service quality → Loyalty	0.34
Satisfaction → Loyalty	0.22
Switching cost → Loyalty	0.36

Table 4.11 Standardized Indirect Effects

Path	Standardized indirect effects
Service quality → Service → Loyalty	0.52*0.22=0.1144

From these coefficients discussion above, it is shown that the switching cost and the service quality are the two major factors that can influence the loyalty of a pick-point. Therefore, service quality and switching cost will be used as two controllable variables in the cusp catastrophe model in the next chapter.