Research Article
Impact Factors of Choosing Willingness for Picking up Service

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Abstract: To obtain promotion schemes for picking up service in e-commerce logistics system, a regression analysis model of customer willingness was established with four types of independent variables including personal characteristics, parcel characteristics, environment characteristics and service evaluation on traditional home delivery. An empirical study with 479 samples collected from Taobao networks was conducted, if controlling gender and age, significant effects were confirmed such as perceived convenience on home delivery, age of online shopping, frequency of online shopping and parcel's value. However the anticipated effects of traffic congestion, parcel dimensions, service evaluation on home delivery and other factors were not proved. The results investigated that attraction of picking up service was limited, related firms should propose a targeted marketing plan focusing on customer characteristics and parcel properties.

Keywords: E-commerce, express industry, parcel delivery, picking up

INTRODUCTION

Delivering through pick-up point was a novel solution for "the last mile" in e-commerce. Contrasting to traditional method of home delivery, picking up parcels had advantages of releasing delivery pressure of express firms, providing additional payment, inspection service and so on, so it attracted much more attentions by large related firms in express industry. European countries established Collection and Delivery Point (CDP) for e-shoppers in the last decade (Kamarainen and Punakivi, 2002; Punakivi, 2003), as DHL and TNT increased investment for CDP in recent years, social cognition of this delivery method had improved remarkably. Service level of express carriers in United States was outstanding, however their conventional delivery systems could neither meet e-shopper's demands, thus some carriers had carried out Sustainable Networks Delivery (SND) which was operated over community's pick-up points (Kim *et al.*, 2008). Both Japan and Taiwan had developed a famous delivery way called "on-line shopping with pick-ups at convenience stores", it became the primary delivery channel for local electronic retailing industry (Chopra and Meindl, 2007). As a contrast, in mainland China, a couple of leading firms had also set up pick-up points to provide alternative delivery method for customers including 360buy, dangdang, sf-express and so on. Currently service abilities and network size of these picking up service networks were not comparable to overseas counterparts. For example 360buy maintained the largest picking up service network in China, however in Beijing there were only 24 points, as a result the handling capacity was rather limited.

Revealing customer's willingness of picking up parcels was a significant task both in theoretical and practical fields. It was a necessary step to estimate the application value of picking up point and was also helpful to guide the operation and optimization of picking up service networks. Related research works were insufficient, Rowlands (2006), Weltevreden (2008) and Xu *et al.* (2008) claimed that attended point (also called service point) was easily accepted by e-shoppers based on their survey data, we inferred that service quality of picking up point had a certain relation with customer's re-choosing willingness. Actually the above analysis was much useful to explain returning customer's loyalty, it could not explain why new customers chose this delivery method. Woo-Kung and Yena (2006) and Weltevreden (2008) reported several demographic characteristics of visitors in picking up points, they found that female, young people and full-time workers occupied distinct proportions, but these findings were lack of a wide and strict confirmation. Some researchers paid attention to customer's traveling to picking up point, McLeod and Cherrett (2006), Turner (2007) and Song *et al.* (2009) declared a remarkable proportion of walk, meanwhile (Turner, 2007; Edwards *et al.*, 2009) reported that there were over 40% customers picking up their parcels during the commuter time or on their shopping way. These proofs indicated traveling factors might affect customer's willingness of picking up parcels. Besides the above mentions, there was few empirical studies focusing on willingness or behavior in the context of picking up parcels.

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In China, several innovation ideas about delivery system had been proposed. Shi and Cui (2008), Kang (2008), Xu *et al.* (2011) and Yang and Tian (2011) tackled with specific operation mode of picking up point, however the feasibility of these schemes were doubtful because they all avoided the critical issue of customer's willingness. In the global scope, except in few districts most picking up service networks had not been popularized as we thought to be, so drawing out impact factors of choosing willingness of e-shoppers was urgent for Chinese applications of picking up service.

This study was dedicated to reveal the mentioned factors based on 479 questionnaires collected from Taobao network which was the most famous and primary C2C (Consumer to Consumer) e-retailing platform in China. In the following sections, we firstly introduced our regression model with variables, then empirical data and binary logistic regression would be described in detail, after that managerial implications were briefly discussed and the last section was a conclusion to the whole work.

THEORETICAL MODELS

Dependent variable: We took customer's choosing willingness as dependent variable (Y), it was designed in a binary form (respondents might answer Yes or No to the query). As a lot of e-shoppers in China knew little about picking up service, we applied the research method of scenario building in the questionnaire. Concretely speaking all points were assumed to meet the following requirements:

- Inspection guarantee
- Supporting COD (Cash on Demand)
- Return of goods
- Proper position
- Proper business hour

At present, most points did support the first three assumptions, so these hypotheses were acceptable in practice. The last two assumptions were premises for respondents to make the choosing decision and these assumptions had decisive influences for carrying out this investigation.

Independent variables: There were four types of independent variables in this model:

- Personal characteristics including convenience perception of home delivery (X_1), prior means of trip (X_2), online shopping age (X_3) and frequency of online shopping in a specified period (X_4). As we pointed out before that full-time workers had shown more interests in picking up service (Woo-Kung and Yena, 2006; Weltevreden, 2008) and

generally college students would choose this delivery method with greater enthusiasm, the common feature of these customers was a regular movement between living place and working place (for students the later was substituted for classroom) in working day, they often missed the delivery time and then had to agree unreliable parcel collection in practice or they would probably be required to picking up parcels from a certain distribution branch. For e-shoppers, the main defect of unreliable parcel collection was the risk of parcel damage, in this circumstance they would be difficult to defend their legal rights because usually receivers would not perform the inspection carefully. So we assumed the convenience perception would affect customer's willingness in a reverse manner. If private vehicle was token in advance, the obstacle of trip from/to pick-up point would probably be eliminated and as a result e-shoppers were assumed to try picking up service with more probability than those who took public transportation system or walk way. The approved picking up point provided reliable guarantee for delivery, it was thought to enhance sense of trust of new e-shoppers (seeing is believing), so we assumed that new e-shoppers would show greater interests in picking up service. In addition, e-shoppers who brought frequently missed the delivery time with higher probability and disputes derived from collection were an inevitable result in a long term, hence we assumed these customers would show relatively higher interests in picking up service.

- Parcel characteristics consisting of parcel's value (X_5) and parcel's dimensions (X_6), here parcel's value referred to purchasing cost. To get accurate scaling for these variables in a survey was impossible, we adopted binary forms and let respondents choose the proper type for their parcels, that was high/low for value scaling and big/small for dimensions scaling. Since inspection guarantee was promised in picking up point, we reckoned that choosing willingness of e-shopper would be positively promoted if the parcel was "expensive". The dimensions of parcel would affect the convenience experience for carrying, we assumed a negative relationship between parcel dimensions and choosing willingness of e-shoppers.

- Environment characteristics such as congestion degree of their living district (X_7) and classes of cities (X_8). For serious congestion situation, the traveling cost of picking up a parcel was difficult to estimate, the choosing willingness of e-shopper was deemed to be suppressed. In this study cities were classified into six types according to population size in urban district. Generally service level of express carrier in big city was higher than

that in small city (outcome of marketing competence), customers in big cities were assumed to have less motivations for new delivery method.

- Service evaluation of traditional home delivery including service satisfaction (X_8) and experience of complaint (X_9). We proposed a hypothesis that service satisfaction of traditional home delivery would show a negative effect on customer's choosing willingness of picking up service due to the substitutional relation between them. If an e-shopper satisfied with traditional home delivery he/she would not change delivery method if extremely necessary. Furthermore, if customers once complained home delivery they would grasp the defects of traditional delivery method more clearly than others; in this study we assumed complaint experience had a positive effect on customer's choosing willingness. In the questionnaire, period of valid was explicitly stipulated to the last two months for complaint behavior.

Controlling variables: There were two controlling variables, one is gender (X_{11}) and the other is natural age (X_{12}). For the purpose of research we divided the age into four ranges, the boundaries were 22, 27 and 32 years old successively. Causes of this division consisted of two aspects, firstly the majority of respondents in this survey were young people, respondents under 34 years old reached about a high percentage of 83.9%, so a broad division was not necessary. Secondly a remarkable proportion of e-shoppers in China had high educational background (as published in CNNIC announcement, totally 72.1% e-shoppers had college degrees), so in the above division a typical e-shopper would display different attitude for picking up service because of potential changing in social role, family role and consumptive habit.

Regression equation: We utilized SPSS 15.0 to build a binary logistic regression equation. Supposing the probability of choosing picking up service to be P and that of the contrast circumstance is 1-P, we assumed P to be a linear function of independent variables and controlling variables as follows:

$$Logit(P) = \beta_0 + \sum_{i=1}^{12} \beta_i X_i \qquad (i = 1,2,...,12) \qquad (1)$$

In Eq. (1) β_0 was a constant, β_i was the regression coefficient for the *i*-th variable. Then we performed a logit transformation:

$$Logit(P) = \ln(\frac{P}{1-P}) \qquad (2)$$

In Eq. (2) P/ (1-P) was usually defined as odds or relative risk. Apparently we could also obtain the logistic function:

$$P = \frac{1}{1 + e^{-(\beta_0 + \sum_{i=1}^{12} \beta_i X_i)}} \qquad (i = 1,2,...,12) \qquad (3)$$

RESULT ANALYSIS

Questionnaire and survey: We recruited buyers from Taobao networks to join this survey and it was confident that all respondents had e-shopping experience. In this survey buyers were requested to assess the possibility of picking up parcels for their present deals, of cause these parcels would be transferred to their destinations via home delivery actually. The research group designed the questionnaire as well as reward scheme firstly, then we contacted over one hundred sellers for assistance and finally 56 sellers responded to this plan. The actual collection period was from Aug. 25, 2012 to Sep. 17, 2012 and totally 725 pieces of initial samples were gathered in this survey.

To refine the quality of the research samples, we performed two procedures to distinguish invalid questionnaire. Firstly four questions were duplicated in the questionnaire; we rejected 186 pieces of samples in which the answers were not consistent. Secondly we examined the remaining samples to remove unreliable questionnaire according to answers to particular questions (for example, X_4 in a few questionnaire were reported over 40 and it was impossible in common sense), in the later procedure 60 pieces of samples were rejected. Our subsequent research was conducted on 479 pieces of samples (66.1% in whole initial samples) in which 223 pieces indicated positive willingness (46.6% in 479 pieces). Descriptive statistics of valid samples were shown in Table 1.

Regression result: In this study, we transferred categorical variables into dummy variables by specifying the last classification to be a reference as the default deployment in SPSS 15.0. The controlling variables were forced to enter the proposed equation while the rest independent variables entered in the way of Forward (Wald). Finally four variables passed test of significance (5% level) including X_1, X_3, X_4, X_5 (Table 2). The eventual value of -2 Log Likelihood was 53.161 (passed chi-square test, p<0.001), Nagelkerke R^2 was 0.440, Hosmer-Lemeshow was 4.316 (p = 0.828>0.5) and total correct predicted percentage reached 85.1%. In a word the proposed regression model was acceptable.

With the above regression coefficients, we could rewrite logit regression equation as:

$$\ln(\frac{P}{1-P}) = 0.768 - 0.531X_1 - 0.416X_3 + 0.427X_4 + \\ + 0.392X_5 + 0.696X_{11} + 0.076X_{12(1)} + \\ + 0.413X_{12(2)} + 0.305X_{12(3)} \qquad (4)$$

Table 1: Descriptive statistics of valid samples

Variable	Scaling	Samples	Mean
X_1	1 = yes	428	0.89
	0 = no	51	
X_2	1 = public	277	1.50
	2 = private	166	
	3 = walk	36	
X_3	1 = over 3 years	361	0.75
	0 = 0~2 years	118	
X_4	1 = over 3 times	409	0.85
	0 = 0~2 times	70	
X_5	1 = high	245	0.49
	0 = low	234	
X_6	1 = big	244	0.49
	0 = small	235	
X_7	1 = yes	369	0.77
	0 = no	110	
X_8	1 = rural area	26	3.82
	2 = small city	70	
	3 = medium city	88	
	4 = large city	145	
	5 = mega city	80	
	6 = huge city	70	
X_9	1 = very dissatisfied	3	3.71
	2 = dissatisfied	30	
	3 = uncertainty	107	
	4 = satisfied	300	
	5 = very satisfied	39	
X_{10}	1 = yes	62	0.13
	0 = no	417	
X_{11}	1 = male	212	0.44
	0 = female	267	
X_{12}	1 = lowest to 22	98	2.47
	2 = 23~27	156	
	3 = 28~32	125	
	4 = 33 to highest	100	

Table 2: Regression results of the proposed model

Variable	B	S.E.	Wald	Sig.	Exp (B)
X_1	-0.531	0.324	2.678	0.037	0.588
X_3	-0.416	0.267	2.430	0.001	0.659
X_4	0.427	0.286	2.232	0.035	1.533
X_5	0.392	0.198	3.931	0.047	1.480
X_{11}	0.696	0.201	11.999	0.001	2.005
X_{12}			2.821	0.420	
$X_{12(1)}$	0.076	0.314	0.059	0.808	1.079
$X_{12(2)}$	0.413	0.274	2.278	0.131	1.511
$X_{12(3)}$	0.305	0.283	1.165	0.280	1.357
Constant	0.768	0.486	2.497	0.114	2.156

$X_{12(i)}$: The dummy variable for X_{12}

The research demonstrated a significant gender difference on the willingness of picking up parcels between male and female, however unlike reports from overseas surveys, we found higher willingness on male respondents (70.3% for male, but only 56.6% for female). We inferred that female e-shoppers in overseas markets paid more attention to privacy protection, so they were interested in adopting picking up service to hide the internet transactions and their residential addresses. But in Mainland China, awareness of privacy protection was far away from ordinary people, the choosing willingness of females were relatively lower than the counterpart because they put more emphasis on convenience of receiving parcels. Furthermore, the regression results showed that young e-shoppers had strong willingness for picking up service but the variable of age (X_{12}) did not pass the test of significance.

Based on the empirical studies, if gender (X_{11}) and age (X_{12}) controlled, we discovered that convenience perception of home delivery (X_1), online shopping age (X_3), frequency of online shopping in a specified period (X_4) and parcel value (X_5) were significant independent variables in our theoretical model. Here were further comments for those variables:

- If an e-shopper had no convenience perception for traditional home delivery, his/her choosing willingness for new delivery method would be promoted. According to this opinion a "busy" e-shopper would probably try picking up service due to desire for signing personally.

- Along with the growth of online shopping age, the choosing willingness for alternative delivery service would be depressed. A possible explanation was that e-shoppers had already gained much experience of handling discrepancies in this circumstance. In addition to that they were also confident to deal with courier. The effect mechanism of online shopping age was consistent with our assumption. In this study, we divided online shopping age into two ranges, the cut-off point was specified to 2 years and frankly speaking there was no deep consideration for this figure.

- The frequency of online shopping was one of the positive factors for choosing willingness of picking up service, as inferred in above discussions. We deemed the possible conflicts in previous experience to be the cause for this impact mechanism. This study also transformed the reported figure into binary variable and the cut-off point was twice in the specified period (the last two month).

- Choosing willingness of picking up service increased as the growth of parcel's value (interpreted as purchasing cost for buyer) as we anticipated. It reflected that e-shoppers did not trust traditional home delivery if the parcels were expensive to them, so they were ready to try a relatively safe delivery method in despite of traveling trouble.

MANAGERIAL IMPLICATIONS

We would like to propose three implications based on the theoretical research:

- Marketing schemes of picking up service should focus on particular transactions. Related firms were suggested to formulate a customer segmentation plan in order to effectively find early adopters. Personal characteristics such as gender, frequency and age of online shopping were the important clues as we had revealed. Meanwhile order system of e-shop was anticipated to intelligently give picking up suggestions for expensive commodities if existing alternative delivery method around the destination.

- Customer satisfaction of traditional home delivery was not a significant factor for choosing willingness of picking up service. It reflected that seeking higher service quality was not the initial motivation to choose new delivery method. Based on this opinion, we could even forecast that it would be difficult to maintain customer loyalty for picking up service.

- We thought heavy congestion would reduce the choosing willingness of picking up service due to uncertain traveling time, but it was not proved in this study. Hence picking up service could be carried out in both huge city and small city. We also investigated the expected time used for picking up service (one-way) and found out the median reported figure to be 15 min (upper bound). While in Netherlands most e-shoppers expected the traveling time to be controlled within 5 min (Weltevreden, 2008).

CONCLUSION

This study discussed potential impact factors of choosing willingness for picking up service based on 479 pieces of samples which were collected from Taobao network. If we controlled gender and age factors, four independent variables showed significant impacts on customer's choosing willingness including convenience perception of traditional home delivery, age of online shopping, frequency of online shopping and parcel's value, but congestion degree of the living district, service satisfaction of home delivery, parcel's dimensions and the rest factors did not make a significant impact on dependent variable. We inferred that seeking better service quality was not a fundamental cause of picking up service for e-shoppers, picking was still regarded as an alternative delivery method in particular situations. This study implicated that picking up service had no overwhelming advantages comparing to traditional home delivery at present. It should be admitted that our research scheme was not rigorous because service promises in this survey was also potential factors to stipulating customer's willingness, in later works we would take into account more variables such as service promises and service expectations.

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REFERENCES

Chopra, S. and P. Meindl, 2007. Supply Chain Management: Strategy, Planning and Operation. Upper Saddle River, New Jessey.

Edwards, J., A. McKinnon, T.J. Cherrett, F. McLeod and L. Song, 2009. The impact of failed home deliveries on carbon emissions: Are collection and delivery point's environmentally-friendly alternatives. Proceeding of 14th Annual Logistics Research Network Conference, Cardiff, pp: 102-108.

Kamarainen, V. and M. Punakivi, 2002. Developing cost-effective operations for the e-grocery supply chain. Int. J. Logis., 5(3): 285-298.

Kang, S.Z., 2008. Study on the operation pattern of logistics node in residential area. China Logist. Purchas., 14: 66-67.

Kim, J., M. Xu, R. Kahhat, B. Allenby and E. Williams, 2008. Design and assessment of a sustainable networked system in the US: Case study of book delivery system. Proceedings of IEEE International Symposium on Electronics and the Environment, San Francisco, CA, pp: 1-5.

McLeod, F. and T.J. Cherrett, 2006. Optimising vehicles undertaking waste collection. Final Report for the Department for Transport.

Punakivi, M., 2003. Comparing alternative home delivery models for e-grocery business. Doctoral Dissertation, Helsinki University of Technology.

Rowlands, P., 2006. Unattended delivery solutions-Finally picking up?. Fulfill. E. Logis., 39: 19-20.

Shi, L. and Y. Cui, 2008. Research on new model for logistics distribution of e-commerce shopping website. Logist. Sci. Tech., 31(8): 5-7.

Song, L.Y., T.J. Cherrett and W. Guan, 2009. Addressing the last mile problem-transport impacts of home delivery. J. Transport. Res. Rec., 9-18, DOI: 10.3141/2097-02.

Turner, M.W., 2007. Sorry, we tried to deliver but you werenot in' Quantifying the impacts of failed first time deliveries. M.Sc. Thesis, Transportation Planning and Engineering, University of Southampton.

Weltevreden, J.W., 2008. B2c e-commerce logistics: The rise of collection and delivery points in the Netherlands. Int. J. Ret. Distrib. Manag., 36(8): 638-660.

Woo-Kung, H. and S. Yena, 2006. E-shopping and off-line delivery systems in korea: Real space still matters. Networks Commun. Stud., 20: 219-235.

Xu, M., B. Ferrand and M. Roberts, 2008. The last mile of e-commerce-unattended delivery from the consumers and eTailers' perspectives. Int. J. Elec. Mark. Retail., 2(1): 20-38.

Xu, J.J., L. Hong and Y.L. Li, 2011. Designing of collection and delivery point for e-commerce logistics. Proceeding of 2011 International Conference of Information Technology, Computer Engineering and Management Sciences, Nanjing, 3: 349-352.

Yang, X. and L.J. Tian, 2011. Assumptions about automatic delivery equipment for eyoubao. Res. Post, 27(6): 15-16.