Information Technology and Quantitative Management (ITQM 2015)

What Drives Click-Through Rates of Tourism Product Advertisements on Group Buying Websites?

Yanbin Liu[a], Ping Yuan[b]*, Wei Liu[c], Xingsen Li[d]

[a]Ningbo Institute of Technology, Zhejiang University, Ningbo, 315100, China
[b]Ningbo Institute of Technology, Zhejiang University, Ningbo, 315100, China
[c]School of Foreign Languages, Beijing Forestry University, Beijing, 100083, China
[d]Ningbo Institute of Technology, Zhejiang University, Ningbo, 315100, China

Abstract

Obtaining stable customer base has become the key mission to the development of group-buying platforms，improving the CTR of product ads on group-buying platform is necessary for formation of stable customer base. This research uses the data about 54 relevant variables covering 7,991 group-buying products of 171 days which from a large tourism group-buying platform in China, and explores the influence factors of click-through rates of group-buying products. The results show that: product name, product discount-level, time pressure showed on product page has significant effect on the CTR of product.

1. Introduction

With rapid development and popularization of internet, online shopping and e-commerce have also increased greatly in past ten years. Till December, 2014,361 million and the rate of online shopping had increased to 55.7%. As a rapid-developing mode of on-line shopping, group-buying boasts of 173 million users and a usage rate of 26.6 % among netizens [1]. Online group buying is a rapid development form of online shopping, it has a trade volume of 34.885 billion Yuan in 2012, in which the scale of group buying websites is 20.3 billion Yuan, occupying a market share of 58%, and group buying platform contributes 14.6 billion Yuan, taking up a share of 42%.

* Corresponding author.
E-mail address: lyb.nbt@gmail.com; yuanping1212@163.com.

Online group buying mode refers to an online shopping activity in which netizens trade with merchants on group buying websites, through the information exchange platform of internet and group buying websites will gain service charge or price difference of products from the transaction. Its core lies in demand aggregation and quantity discount. In another word, online group buying is a commercial activity in which users in a group with quantity members through the internet and buys the same commodity with a relatively low discount. The greatest difference between online group buying and common online shopping is that it is a cooperative business and consumers have to cooperate with each other, so as to form superiority in quantity and then acquire discount in product price and service.

Group-buying market and the rapid development of the group website /platform benefit from the following factors: firstly, group-buying satisfies young netizens' needs to service goods; it vigorously introduces localized consumption services, such as catering, leisure and entertainment, that is the main reason of the rapid growth of group-buying websites. Secondly, the rapid development of e-commerce in the last ten years, it has a greater influence. As internet shopping accepted by more and more netizens, group-buying mode caters to the speedy development stage of electronic commerce application, and group-buying service achieved reasonable growth in online consumption mode of China netizens. Thirdly, regionalization is becoming an important direction of the development of electronic commerce, the e-commerce environment of some key urban clusters is relatively mature, such as the Pearl River delta, the Yangtze River delta, and the beijing-tianjin-hebei region, and they have a large group of online users. In the same time, the combination of group-buying and LBS applications also strengthens the localization of group-buying services, and provides better application environment to the development of group-buying.

Rapid growth of group buying market has also resulted in some challenges to group buying websites / platforms when it brings about opportunities. According to Data Monitoring Report for Chinese Online Group Buying Market in 2012, till the end of 2012, 6,177 group buying websites / platforms had been established throughout the country and 3,482 websites / platforms had been closed; the death rate reached 56%; 2,695 websites / platforms were in operation, lower than 3,200 websites / platforms in the end of 2010.
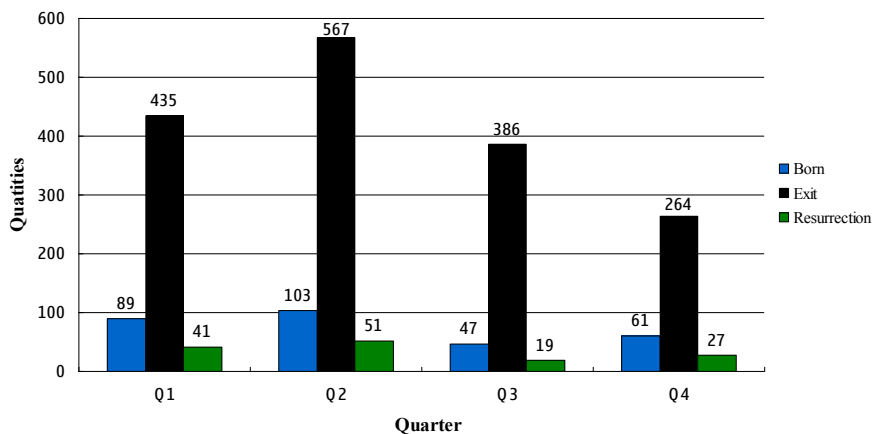

Fig. 1 Quarter statistical chart for quantity change of group buying websites in 2012

Bankruptcy of numerous group buying websites is not only caused by fierce competition triggered by business model convergence, quality problem of commodity and integrity problem of merchants, but the most important problem is that those websites do not gain a stable customer base. In order to solve this problem, the click-through rate of group buying websites or product advertisement should be increased at first. Only by increasing the click-through rate of products or group buying websites, the sales rate of products on group

buying websites or matching efficiency of group buying platforms can be increased. Click-through rate (CTR) means the proportion of product or advertisement click amount in product or advertisement exhibition amount during a certain period, and it is one of the frequently used evaluation indexes for online product attraction or advertisement quality. Click-through rate can reflect the estimated value for online products or advertisements to be paid attention to in a certain period. In order to increase sales rate of products on group buying websites or matching efficiency of group buying platforms, we have to know the key factors of influencing CTR and adopt targeted measures. As for product advertisement on group buying platforms, click of netizens has some pertinence and purposes, and information contained in the product advertisement will affect CTR to some extent. Such information covers product name, price information of the product, number of people that have attended in group buying, time pressure, etc. It is quite an important decision for merchants to select information to be put on group buying platforms and gain the highest CTR.

At present, scholars have already done many studies on influence factors of CTR that would affect online display advertisements. However, it is still unclear about influence factors of CTR of group buying products. Therefore, by cooperating with a large-scale tourism group buying platform in China, this paper obtained information about 54 relevant variables covering 7,991 group buying products for 171 days. Meanwhile, based on the data, empirical analysis was made for influence factors of CTR of group buying products. The analysis results will not only fill the blank of the study on group buying CTR, but also provide some practical guidance for the development of group buying websites or platforms.

2. Literature Review

Click-through rate (CTR) is one of the common terms in internet advertising industry, is an important indicator of online advertising effect. In general, internet users click on online advertising for two main reasons: one is internet users make a targeted search, consider ads information carefully and then click the ads; the other is when internet users surfing on Internet or getting entertainment, they are enchanted by ads, and then click the ads without actively exploring and thinking [2].

So far, a great deal of research has been conducted to explore various factors influencing the click-through rate of online display ads, and the influence factors can be divided into following aspects:

Firstly, the basic characteristics of online advertising itself, such as advertising, such as colour, size, style, have been proved to be the important factors influencing the network AD clicks[3], in the advertising platform for Google AdSense related study confirmed that such as the background of advertising, advertising text color and advertising links set to agree with advertisements in web page, all help to improve the CTR (Google Adsense blog), using the large size of banner ads, use the "skill" in the advertisement will help improve the CTR [4], and advertising is in the form of animation, or video, in general than static image or text can improve CTR.

Second, if the content of the ads and web page or site content is consistent, it also can improve the network advertisement of CTR [3].

Third, online advertising placement in a web page will also impact on Internet advertising CTR, Wei Jiang proposes that advertising position has significant effects of CTR, right column CTR is significantly lower than the first two columns CTR, middle row CTR is significantly higher than above line[5].

Fourth, add the price in the online advertising or promotional information to CTR has no significant influence and the product category has a strong influence on CTR.

For the product advertising on the group-buying platforms, the clicks of Internet users have certain pertinence and objectives. Therefore, the information contained in the product advertising, which may include the name and the price information of products, the number of group-buying consumers as well as the time pressure, etc., will exert an influence on the CTR of products [6-7]. While for businesses, it is extremely crucial for them to make a decision on what kind of information should be put on the group-buying platforms so as to

harvest the highest CTR. But it remains not clear about what and how information will have an influence on CTR.

For this reason, the study on the influence of the CTR on the group-buying platforms is still lacking. This paper obtains proper data for the study by establishing cooperation with large-scale group-buying platforms. Then based on this data, it conducts both empirical and quantitative analysis to come up with some the results with practical significance.

3. Data and Method

The data comes from the click stream data of a group-buying channel on an advance Chinese travelling search engine site, after being collected and sorted. This travelling site uses its convenient, humanized and progressive price ratio search technology to provide deep and integrate information of air tickets, hotels and the vacation and visa services at home and abroad. All these information can provide customers with in time service on product price inquiry and information comparison during travelling. In addition to price ratio search and flow collection, more kinds of advertising forms are positioned on brand promotion and also facilitate sales opportunities. The pay-per-click not only helps advertisers to achieve accurate marketing by effectively aiming at these travelers who own high-value consumption potentials, but also contributes to a more precise promotion and sales of products or services in the market. The time of data was from January 1, 2012 to June 19, 2012. And the dataset was data, with each one recording the intraday relevant information of online group-buying products. The whole dataset summed to 181,727, including the information of relevant variable of 7, 991group-buying products. The table below is the Products and the Relevant Variables on January 1, 2012.

Table 1. The Products and the Relevant Variables on January 1, 2012

Product ID	Product Name	Displays	Clicks	Time Online	Start Time	End Time	Discount
15020	Preferential Traveling Package from Hong Kong to La Plantation Mauritius	2321	20	60	2012/1/1	2012/2/29	0.7
15195	Free Line from Beijing to Vietnam for 5 nights and 6 days	2198	90	8	2012/1/1	2012/1/8	0.5
13753	Leisure trip to Yuan Wang Cave in Nine Huang Mountain	5435	18	55	2011/12/23	2012/2/15	0.5
13318	350MLJapanese Vacuum Flask！ For only RMB 37 Yuan!	4936	112	16	2011/12/24	2012/1/8	0.1
12792	One Night at the Haohanpo Hotel +the ticket for Shenquangu Hot spring	38534	246	46	2011/12/17	2012/1/31	0.2
...	…	…	…	…	…	…	…
14041	Rescuers TAD III 40L Backpack	4751	23	16	2011/12/24	2012/1/8	0.5

The product display page on the group-buying platform presents the information for visitors, including the product name, product price discount, the time remaining for the group-buying product, etc. All these information may have an influence on product clicks. And the information which is not directly displayed in the data needs to be cleared up for a second time.

In order illustrate the process of data sorting; we firstly give a declaration for the variables.

Table 2. Declaration for Relevant Variables

Name of the Variable	Corresponding formula	Variable clarification
Product ID	$id(x)$	The only ID of product x
Product name	$N(x)$	The only name of product x, but sometimes the name of a small number of products will be changed to promote sales.
Shelf-display-quantity	$S(x_i)$	The cumulative display quantity of product x within its display time. Shelf-display-quantity refers to the times visitors browse the display page of a product when they enter a group-buying channel.
CTR	$C(x_i)$	The cumulative visits or clicks on product x within its display time. When a consumer accesses a group-buying channel, clicks on an advertisement and reads the detailed information of a product, there comes one click.
Start Time	$TS(x)$	The date for product x to display on the group-buying channel for the first time.
End Time	$TE(x)$	The date for product x to display on the group-buying channel for the last time.
Discount	$DS(x)$	The corresponding discount with $DS(x)$ product x.
Time of the Date	T_i	The corresponding date with the i day.

The calculation of CTR is divided into the $CTR(X)$ on the product and the $CTR(x_i)$ on the date of the product, here is the formula:

$$CTR(X) = \frac{\sum C(x_i)}{\sum S(x_i)} \times 100\% \tag{1}$$

$$CTR(x_i) = \frac{C(x_i)}{S(x_i)} \times 100\% \tag{2}$$

The Calculation of time pressure: Time pressure means the time remaining for the group-buying products showed in the display page (advertising page). It will generate some psychological sense of urgency to the visiting clicks. The formula is as follows:

$$TP(x_i) = TE(x_i) - T_i \tag{3}$$

4. Data Analysis

4.1. The influence of time pressure of group-buying products on the CTR

To analyze the influence of "the end time of group-buying" showed on the display page of the group-buying products on the CTR, I conduct the following research hypothesis: H1. The time pressure of "the end time of group-buying" had obvious negative influence on the CTR, i.e. the more "time remaining", the fewer of the time pressure, the fewer the CTR, the larger whereas.

We here equate "the end time of group-buying" with the time pressure feel by consumers. The longer the end time, the fewer consumers feel about the time pressure. "The end time of group-buying" change with the variation of dates. Therefore, it will only exert an influence on the date of the CTR. Figure 2 is The CTR Distribution of the Product on the Date.
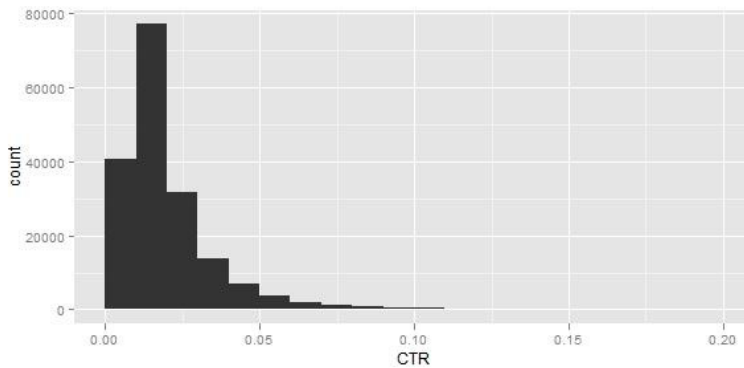

Figure 2 The CTR Distribution of the Product on the Date

According to the CTR and Time Pressure Distribution of the Product on the Date, we take the CTR on the date as a dependent variable and the time pressure (TP) as an independent variable to construct a model of generalized linear regression based on the draft mode of Poisson distribution. The results are shown in the Table 3 and Table 4.

Table 3. Deviance Residuals

Min	1Q	Median	3Q	Max
-0.150	-0.146	-0.137	-0.065	45.360

Table 4. Coefficients

Dependent Variable: CTR	Estimate	Std. Error	Z value	Sig.
(Intercept)	-3.3994157	0.0229651	-148.026	0.0000***
(TP)	-0.0023679	0.0009226	-2.566	0.0103 *
Null deviance	17855 on 139278 degrees of freedom			
Residual deviance	17848 on 139277 degrees of freedom			
AIC	Inf			
Number of Fisher Scoring iterations	6			
Signif. Codes: '***' 0.001, '**' 0.01, '*' 0.05.				

The results show that the time pressure of "the end time of group-buying" on the consumers has a prominent influence on the CTR. The longer the time remains, the fewer the influence on the CTR is, and the larger whereas. Therefore, H1 is tenable.

4.2. The influence of the group-buying products' discount on the CTR

To analyze the influence of the group-buying products' discount in the display page on the CTR, we conduct the following research hypothesis: H2. The discount of the group-buying products has a prominent influence on the CTR. The lower is the discount, the more the CTR is.

The CTR distribution on the group-buying products is shown in the Figure 3. The distribution after logarithm transformation is shown in the Figure 4.
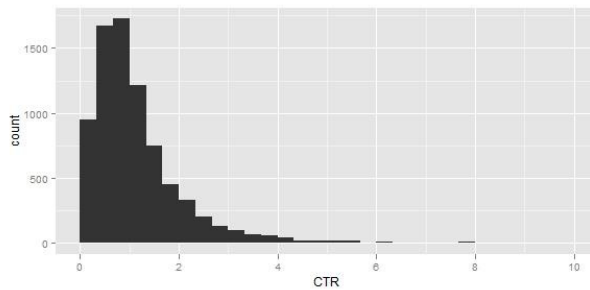

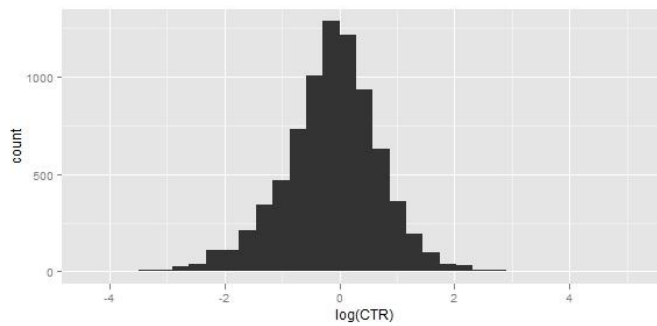Figure 1 the CTR Distribution on the Product

Figure 2 the Distribution of CTR on the Product after Logarithm Transformation

The CTR on the product after logarithm transformation is normally distributed. Thus, we have established a log-linear model, taking the CTR on the product as dependent variable and the discount as the independent variable. The analysis results are shown in the Table 5 and Table 6.

Table 5. Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	F value	Sig.	Durbin-Watson
.174a	.030	.030	.843	246.818	.000***	1.727

Table 6. Coefficients

Dependent Variable: Log CTR	Unstandardized Coefficients		Standardized Coefficients	T value	Sig.
.174a	B	Std. Error	Beta	246.818	.000***
(Constant)	.310	.030		10.343	0.000***
Discount	-.768	.049	-.174	-15.710	0.000***
Signif. Codes: '***' 0.001, '**' 0.01, '*' 0.05.					

The analysis results show that the discount has a prominently negative influence on the CTR on the product, i.e. the higher the discount is, the lower of the CTR on the product. Whereas the lower the discount is, the higher the CTR is. Therefore H2 is tenable.

4.3. The influence of the group-buying product on the CTR

To analyze the influence of the changes of product name on the CTR, we analyze the products which have some changes on the product information in the data. Except for the change of name, there is no other information changed for these products. These products are totally 69, including 3527 data with an average online time of 51.12 days.

The above mentioned products with name changed can be divided into two types, one is to add price information in the product information, accounting for 31 in total, such as the product "Maple Leaf Hotel accommodation + the hot spring at the Celebrity Hotel" is renamed as "RMB 498 Yuan Package for Maple Leaf Hotel accommodation and the hot spring at the Celebrity Hotel!"; the other type is to add more detailed and descriptive information to the product name, accounting for 38 in all, such as the product " Mount Emei Shangshe Hotel" is renamed as "double traveling at the Mount Emei Shangshe Hotel, the giant Buddha Temple, for pray, nourishing and comfort".

(1) The influence of the price information in the product name on the CTR

Will adding the relevant price information to the product name have an influence on the CTR? In order to make it easy in analyzing, we conduct the following hypothesis: H3. Whether the price information is included in the product name has an obvious influence on the CTR.

Due to the inconsistency of the product online time before and after adding price information, we take the average clicks on each day to conduct analysis in order to eliminate the divergence caused by the differences on the online time.

We use the average CTR of the product before and after adding price information to the product name and conduct a T test on a single sample. Analysis results are in the Table 7 and Table 8.

Table 7. The One-Sample Statistics of the CTR Difference after Adding Price Information

	N	Mean	Std. Deviation	Std. Error Mean
CTR Difference	31	-1.774	2.232	.401

Table 8. The One-Sample Test of the CTR Difference after Adding Price Information

		df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
CTR Difference	-4.425	30	.000	-1.774	-2.593	-.955
Signif. Codes: '***' 0.001, '**' 0.01, '*' 0.05.						

The analysis results indicate that adding information to the product name has an obvious influence on the CTR of the product, whose average difference is 1.774, i.e. adding price information to the product name can promote the CTR. Thus H3 is tenable.

(2) The changes of clicks and clicks rate before and after adding specific information to the product name

Will adding specific information to the product name have an influence on the CTR? In order to make it easy in analyzing, we conduct the following hypothesis: H4. Whether the specific information is included in the product name has an obvious influence on the CTR.

Due to the inconsistency of the product online time before and after adding specific information, we take the average clicks on each day to conduct analysis in order to eliminate the divergence caused by the differences on the online time.

We use the average CTR of the product before and after adding specific product information to the product name and conduct a T test on a single sample. Analysis results are in the Table 9 and Table 10.

Table 9. The One-Sample Statistics of the CTR after Adding Product Name Information

	N	Mean	Std. Deviation	Std. Error Mean
CTR Difference	38	-1.919	1.135	.184

Table 10. The One-Sample Statistics of the CTR after Adding Product Name Information

			Test Value = 0		
		df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference
					Lower	Upper
CTR Difference	-10.429	37	.000	-1.919	-2.292	-1.546
Signif. Codes: '***' 0.001, '**' 0.01, '*' 0.05.						

The analysis results indicate that adding specific information to the product name has an obvious influence on the CTR of the product, whose average difference is 1.919, i.e. adding specific product information to the product name can promote the CTR. Thus H4 is tenable.

5. Conclusion and Implication

When entering the product page of the group-buying product platform, consumers do not think that all products can obtain same attentions because they are probably attracted by the certain information of a product and then click it. However, what leads to the differences of the CTR even if the products are in the same page? Due to the limitation of the relevant research data, this problem has not been studied before. This study is based on the operation data of a large domestic group-buying platform and it conducts empirical analysis on the influence factors to the CTR of network group-buying products through collecting, analyzing and excavating the data. The main conclusions are as follows: (1) Time pressure of group-buying products has an obvious negative influence on the CTR. It means that group-buying product suppliers can design a shorter group-buying term when displaying a product, which will contribute to the higher CTR of the product; (2) discount of products has an obvious negative influence on the CTR. It means that the product suppliers can increase the market price to a proper extent when designing the product price, so as to decrease the discount of the product and get high CTR; (3) adding price information to the group-buying product name will promote the CTR remarkably. For product suppliers, it means to add some price information to the name of product, which will be beneficial for obtaining a higher CTR; (4) after adding more specific information to the product name, the CTR will be remarkably increased. It also means that product suppliers can consider adding more detailed information when naming one product for it will do some help to the increase of the CTR.

The contribution of this study can be reflected on: (1) studies of CTR on the group-buying platform are in relevant shortage in the academic circles at home and abroad. And the studies on the crucial influence factors to the CTR of group-buying products are even more deficient. While this study does some beneficial attempts; (2) due to the shortage of the first-hand data, empirical studies on the CTR of group-buying products are quite few. Therefore, the data and data analysis in the study is of some novelty.

Acknowledgements

References

[1]   China Internet Network Information Center.35th Statistical Report on Internet Development in China. China; 2015.
[2]   Chang H, Hongsik J C. Why do people avoid advertising on the internet. Journal of Advertising 2004;33 (4):89-97.
[3]   Cho C H .Factors influencing Clicking of banner Ads on the www. Cyberpsyehology &Behavior 2005; 6 (2) :201-215 .
[4]   Chtourou M S, CHandon J L, Zollinger M. Effect of price information and promotion on click-through rates for internet
      banners .Journal of Euromarketing 2001; 11(2):23-41.
[5]   WEI Qiang, RUAN Nan, SHAN Yi. An Empirical Study on Internet Display Ads Positions Influencing CTR.China Journal of
      Information Systems 2010;4(1):43-52.
[6]   TAN Rucong. Analysis on China Online Group Purchase′s Problems and Countermeasure. Journal of Guangdong Industry
      Technical College 2012;11(3):68-71.
[7]   Krishnan S.Anand and Ravi Aron,Group Buying on the Web:Group Buying on the Web:A Comparison of Price-Discovery
      Mechanisms .Management Science 2003;11: 1546-1562.