Research on Effects of Paid Search Advertising Based on Customer loyalty Segmentation

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<u>**Short Research Paper**</u>

Research on Effects of Paid Search Advertising Based on Customer

loyalty Segmentation

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Abstract: For e-commerce enterprises, it can help enterprises adjust their advertising strategies more effectively by determining the impact of paid search advertising on different customer groups. Therefore, this paper constructs a comprehensive evaluation model of immediate effect and carry-over effect of paid search advertising, and empirically discusses the impact of paid search advertising on different loyalty-based market segments. The results show that paid search advertising has the greatest impact on high-loyalty customers, while the carry-over effect on potential customers is longer. Thus, we can find that the role of paid search advertising is not only to attract new customers, but also to maintain high-loyalty customers.

Keywords: Loyalty-Based Market Segment, Paid Search Advertising, Advertising Effect Evaluation, Immediate Effect, Carry-over Effect

1. INTRODUCTION

In recent years, the penetration of Internet in marketing and e-commerce environment has affected the development of commerce. Many e-commerce enterprises also maintain and compete for market share better through online advertising. Among them, paid search advertising is the advertising displayed in response to user's query on the search engine, which is more in line with the needs of consumers and is not easy to cause aversion. This also makes paid search advertising gradually develop into an important part of enterprise marketing strategy. In order to allocate enterprise resources scientifically, Assael and Lipstein [1] proposed that the loyalty segment must be used to test the market and determine the response of the segment to marketing variables (such as advertising). This can help enterprise managers to identify the target customer groups of advertising, so that they can adjust the advertising strategy more effectively according to the marketing objectives of the enterprise. Therefore, if an e-commerce enterprise wants to better maintain loyal customers, acquire new customers and improve marketing efficiency, it needs to more accurately evaluate the impact of paid search advertising on loyalty-based market segments.

There are many kinds of effects in online advertising. From the perspective of time characteristics, online advertising effects include immediate effect (short-term) and carry-over effect (long-term) [2-3]. However, in the existing research, most scholars only measure the immediate effect of online advertising, and do not consider the widespread carry-over effect of online advertising [3-6]. This may lead to the underestimation of the effect of online advertising, which leads to the unreasonable allocation of advertising budget. Therefore, in order to accurately grasp the advertising effect of paid search, it is necessary to comprehensively evaluate the immediate effect and carry-over effect of advertising. In addition, in the research involving the evaluation of advertising effect, the research tends to focus on the overall impact of advertising on the whole market, without distinguishing the differences in the impact of advertising on customer groups in different market segments, and it may lead to the deviation of enterprises' cognition of advertising effect. At present, there is no research to

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discuss the difference of paid search advertising effect among different customer groups with loyalty as a market segmentation variable, which is also worthy of further exploration.

Under the current Internet environment, e-commerce enterprises can obtain more data about customer behavior, which enables us to better quantify the impact of paid search advertising. Therefore, based on the comprehensive evaluation of the immediate effect, the duration and cumulative intensity of the carry-over effect of paid search advertising, this paper constructs a comprehensive evaluation model of paid search advertising effect. Then, we empirically verify the model based on the real-time behavior data and transaction data of an online insurance agent platform to distinguish the impact of paid search advertising on different loyalty-based customer segments. The comprehensive evaluation model and method proposed in this paper can help enterprises identify their target customer groups of paid search advertising, and reasonably adjust the advertising strategy to improve the effectiveness of budget allocation.

2.   RELATED LITERATURE

2.1 Evaluation of paid search advertising effect

On the issue of evaluation of paid search advertising effect, the existing research mainly focuses on the evaluation of immediate effect and carry-over effect of paid search advertising. The immediate effect of paid search advertising refers to the influence of customers on their website visit and purchase behavior in a short period of time after paying per click search advertising. Research on this aspect [7] is mainly based on the click through rate, conversion rate and other statistical indicators of paid search advertising to reflect the immediate effect of paid search advertising. The specific performance of the carry-over effect of paid search advertising is the impact of customers' click behavior in the current period on their later advertising click behavior and purchase behavior [8]. Based on this, scholars further study the carry-over effect of paid search advertising. Rutz and Buklin [9] use the Nerlove-Arrow goodwill model to evaluate the effect of paid search advertising, and construct a dynamic Bayesian linear model to verify the long-term impact of paid search advertising. However, this kind of research mainly focuses on the strength and long-term impact of paid search advertising carry-over effect, and cannot determine the duration of carry-over effect. In order to solve this problem, Breuer and Brettel [10] introduced the lag influence factor of advertising into the direct aggregation model of online advertising effect evaluation, and explored the duration and influence intensity of online advertising carry-over effect. The research compares the immediate effect and carry-over effect of banner advertising, paid search advertising, price comparison advertising and coupon advertising, and finds that the duration of carry-over effect of paid search advertising is the longest.

Through the review of the related research on the effect of paid search advertising, it is found that there are few research results on the aspect of carry-over effect, which may lead to the underestimation of the effectiveness of paid search advertising. In order to evaluate the effectiveness of paid search advertising more accurately, it is necessary to evaluate the effectiveness of paid search advertising comprehensively from the two perspectives of immediate effect and carry-over effect.

2.2 Advertising effect evaluation based on customer segmentation

In the past research on advertising effect evaluation, scholars usually focus on the overall impact of advertising on the whole market, but do not distinguish the difference of the impact of advertising on different customer groups in different market segments, which may lead to the deviation of enterprises' cognition of advertising effect. In the traditional environment, scholars have verified that loyalty is a useful segmentation variable in the study of advertising effect. Tellis [11] finds that the influence of repeated advertising exposure is different among customers with different loyalty, which indicates that the influence of advertising on purchase volume is moderated by loyalty.

In contrast, the research on the influence of online advertising effectiveness among different customer groups in e-commerce environment is relatively less. Blake et al. [7] explored the influencing factors of paid search advertising effect and the differences among new customers, inactive customers and active customers based on the data obtained from a series of large-scale field experiments on eBay. It is found that paid search ads with non brand keywords have a positive impact on the purchase behavior of new customers and inactive customers, but no significant impact on the purchase behavior of active customers is observed. However, due to the large proportion of active customers in enterprises, the impact of paid search advertising on customers' purchasing behavior is not significant on the whole. The results also show that the impact of non segmented paid search advertising on different customer groups will lead to cognitive bias of paid search advertising effect.

After literature review，we find that the research data used by scholars is mainly obtained through customer diary records or advertising expenditure and product sales data obtained from advertisers in the traditional environment. The problem of research based on such data is that it is unable to distinguish whether customers' purchase behavior is caused by advertising or not. Therefore, it is difficult to accurately reflect the actual impact of advertising on individual customers. In contrast, few studies have distinguished the impact of online advertising on different customer groups, and no study has discussed the difference of paid search advertising effect among different customer groups with loyalty as a market segmentation variable. Therefore, based on the evaluation of paid search advertising effect, this study further explores the difference of paid search advertising effect among different loyalty customer groups.

3. HYPOTHESIS

Based on previous research on advertising effects, Vakratsas and Ambler [12] proposed that advertising investment will bring about three kinds of intermediate advertising effects: influence, cognition and experience, and further affect customers' purchase behavior. Based on the characteristics of paid search ads and different loyalty types of customers, this paper puts forward some hypotheses about the immediate effect, duration of carry-over effect and ultimate cumulative effect of paid search advertising on different loyalty customer groups (high-loyalty customers, medium-loyalty customers, low-loyalty customers and potential customers).

Paid search advertising is an advertisement displayed when customers search for keywords related to their expected products on search engines driven by their own needs and interests. Therefore, it can be considered that paid search advertising has a positive impact on customers' purchase behavior. Generally speaking, customers with higher loyalty have more experience in purchasing and visiting, so they have a higher understanding of the enterprise and its products and services. It can also be considered that the access path from pay per click search advertising to purchase is relatively short. So we propose the following hypotheses:

H1a: Paid search advertising has a strongest positive immediate effect on high-loyalty customers.

H1b: Paid search advertising has a stronger positive immediate effect on medium-loyalty customers.

H1c: Paid search advertising has a relatively weak immediate effect on low-loyalty customers.

H1d: Paid search advertising has a weakest positive immediate effect on potential customers.

On the other hand, customers usually have specific needs before searching, however, the content presented by paid search ads is not constant, and the ranking of search engine presentation will be adjusted according to specific strategies or algorithms. Therefore, customers may not repeatedly contact the same paid search advertisement for a long time, that means the duration of the carry-over effect of advertising is relatively short. For customers, customer with relatively lower loyalty usually have a lower degree of cognition of the enterprise, but it takes longer time to understand the cognition in order to finally transform the purchase. Then we propose the following hypotheses about the duration of the carry-over effect:

H2a: Paid search advertising has a shortest duration of carry-over effect on high-loyalty customers.

H2b: Paid search advertising has a shorter duration of carry-over effect on medium-loyalty customers.

H2c: Paid search advertising has a longer duration of carry-over effect on low-loyalty customers.

H2d: Paid search advertising has a longest duration of carry-over effect on potential customers.

The ultimate cumulative intensity of paid search advertising need to combine the two above-mentioned effects to analyze. Because paid search advertising can't be as memorable as traditional advertising (such as TV advertising), it has certain limitations, and the duration of its carry-over effect will not be significantly different between different loyal customer groups. This also means that the immediate effect may dominate the cumulative effect of paid search advertising, so we believe that paid search advertising has the strongest cumulative impact on high-loyalty customers. Secondly, considering that the duration of the carry-over effect of potential customers is significantly higher than that of the other three types of customers, we assume that the cumulative impact of paid search advertising on potential customers will be second only to high-loyalty customers. However, there is no significant difference between the medium-loyalty customers and the low loyal customers. However, the immediate effect of paid search advertising on medium-loyalty customers is significantly higher than that on low-loyalty customers. This paper also believes that the cumulative impact of paid search advertising on medium-loyalty customers is stronger than that on low loyalty customers. So we put forward the hypotheses：

H3a: Paid search advertising has the strongest cumulative effect on high-loyalty customers.

H3b: Paid search advertising has the weaker cumulative effect on medium-loyalty customers.

H3c: Paid search advertising has the weakest cumulative effect on low-loyalty customers.

H3d: Paid search advertising has a stronger cumulative effect on potential customers.

4. RESEACH METHOD

This paper constructs the model as formula (1) for evaluating the immediate effect and the carry-over effect of paid search advertising, which is mainly based on the evaluation model proposed by Srinivasan and Weir [13]. The basic idea of the model is to model the inventory of clicks and sales of advertisements through direct aggregation, that is, the effect of advertisements is expressed through the influence of inventory of advertisement clicks on purchases.

$$S_t = b + \beta SEM_t + \varepsilon \tag{1}$$

S_t represents the sales generated by the paid search advertising channel on day t, that is, the purchases made by customers who enter the website through paid search ads; SEM_t represents the number of clicks on paid search ads on day t, that is, the number of clicks; β represents the immediate effect of paid search advertising which expressed by the impact of clicks on paid search ads on sales. Taking into account the carry-over effect of paid search ads, that is, the click stock of paid search ads on day t may be affected by the click stock before that day. Therefore, if we directly regress the number of clicks and purchases per day, the results will have bias on the judgment of immediate effect of paid search advertising. In order to avoid this deviation, it is necessary to add the lag factor λ of paid search advertising in the model, and reconstruct the click stock SEM_t^* of paid search advertisement on day t by recursion. The specific construction method is shown in formula (2):

$$SEM_1^* = SEM1$$
$$SEM_2^* = (1-\lambda)SEM2 + \lambda SEM_1^*$$
$$SEM_3^* = (1-\lambda)SEM3 + \lambda SEM_2^* \tag{2}$$
$$\cdots\cdots\cdots\cdots\cdots$$
$$SEM_t^* = (1-\lambda)SEMt + \lambda SEM_{t-1}^*$$

where λ represents the lag influence factor of paid search advertising, which is used to reflect the

relationship between the click stock of paid search advertising on day t and the click stock of every day before day t. According to the research of Bass and Leone [14], the lag impact factor only represents the percentage of paid search advertising stock transferred from day $t-1$ to day t, while the duration of paid search advertising and the cumulative effect of carry-over effect need to be further calculated by lag impact factor λ and immediate effect parameter β. The specific calculation methods are as following formula (3) and (4):

$$T=\log(1-p)/\log\lambda \tag{3}$$
$$\gamma=\beta/(1-\lambda) \tag{4}$$

where p means the percentage of the total cumulative effect of paid search advertising unit pulses, λ is the lag impact factor of paid search advertising, T is the duration of the residual effect of paid search advertising, that is, the number of days required for the cumulative effect of paid search advertising unit pulse to reach p. According to previous research experience, if the cumulative effect of paid search advertising reaches 90%, the effect of paid search advertising is considered to be exhausted [14], so we set p to 90% for calculate the duration of paid search advertising. In formula (4), γ represents the cumulative strength of immediate effect and carry-over effect of paid search advertisement. According to the verification of the model by previous scholars [15], the advantage of this model is that it will not be affected by intercept deviation, and it still converges even if the lag time obtained from the lag influence factor is more than one month. So although the computational cost of the model is large, it is still used by many scholars in the study of ads' carry-over effect.

In order to solve the unknown parameters β and λ contained in the model, it is necessary to determine the value of λ. in this study, the grid search method is adopted. Grid search is an exhaustive search method, that is to cycle through all candidate parameters, try every possibility, and select the best performance parameters. In this study, we set the value range of λ between 0 and 1, with the increment of 0.05, to conduct grid search, that is, 19 values from 0 to 1 were used for multiple linear regression fitting. As for the fitting effect of the model, we need to introduce the total sum of square (TSS) to evaluate. The smaller the TSS value is, the higher the fitting degree of the model is. Thus, the parameter λ with the minimum TSS obtained by the fitting model is the optimal value of λ. After getting the value of the optimal lag influence factor, it is substituted into the model to get the estimated value of the immediate effect coefficient β.

5.   EMPIRICAL RESEARCH

5.1 Data

The data in this paper are from an online insurance agency platform in Nanjing, where consumers can browse, consult and purchase all kinds of products independently. In order to improve the popularity of the platform and increase product sales, the platform guides consumers to the website by putting paid search advertisements in search engines (Baidu, Sogou, 360). Because the purpose of this study is to explore the impact of paid search advertising on different-loyalty customers, we use the user visit behavior log table in the log database to extract the click behavior characteristics and purchase behavior characteristics of paid search advertising based on single visit. The specific steps are as follows: firstly, according to the relevant keywords set in the website URL, we select the customers who enter the website through pay per click search ads, and extract the click behavior and purchase behavior of these customers in a single paid search ad; secondly, we select the relevant data of the whole year of 2018 to analyze the click times and purchase times of paid search ads of the same customer on the same day by day A total of 63741 records were obtained by data aggregation and data cleaning; finally, we associate these records with the existing customer loyalty classification table in the enterprise for subsequent analysis (customers that do not match any customer loyalty group are identified as potential customers).

5.2 Research results

According to the evaluation model of immediate effect and carry-over effect of paid search advertising, this study takes the click times of daily paid search ads as the independent variable and the daily purchase times as the dependent variable to conduct linear regression on the data grouped by loyalty. Through the grid search method, by calculating the TSS value, we find the optimal lag influence factor λ which makes the model achieve the best fitting effect. Table 1 shows the optimal lag influence factors obtained by integrity grouping.

Table 1. Optimal lag influencing factors of paid search advertising in each customer group

Parameter	Parameter interpretation	Optimal value	Standard error	Minimum standardized residual	Minimum TSS value
$\lambda_{potential}$	Potential customers	0.45	0.016***	6.53578	0.134128
λ_{low}	Low-loyalty customers	0.15	0.015***	0.43408	0.034581
λ_{medium}	Medium-loyalty customers	0.2	0.024***	0.222556	0.024864
λ_{high}	High-loyalty customers	0.3	0.028***	0.504425	0.037329

Note: * $p<0.10$, ** $p<0.05$, *** $p<0.01$

In Table 1, we can see the value of lag influence factor of paid search advertisement in potential customer group is the largest, which is 0.45, followed by high-loyalty customer group, and the lowest value of paid search advertising lag influence factor of low-loyalty customer group is 0.15. Based on the optimal lag influence factor of paid search advertising in the above loyalty groups, it is substituted into the evaluation model of immediate effect and carry-over effect of paid search advertisement to obtain the unknown parameter β which represents the immediate effect of paid search advertisement. The results are shown in Table 2.

Table 2. Immediate effect of paid search advertising in each customer group

Parameter	Parameter interpretation	Estimated value	Standard error	T value	Pr(>|t|)
$\beta_{potential}$	Potential customers	0.23563	0.01619	14.557	<2e-16***
β_{low}	Low-loyalty customers	0.22494	0.01583	14.211	<2e-16***
β_{medium}	Medium-loyalty customers	0.24145	0.02358	10.241	<2e-16***
β_{high}	High-loyalty customers	0.41716	0.02782	14.994	<2e-16***

Note: * $p<0.10$, ** $p<0.05$, *** $p<0.01$

According to Table 2, we can see that paid search advertising has a significant and positive impact on customers' short-term purchase behavior. And the intensity of immediate effect of high-loyalty customer group(β_{high}=0.41716) is significantly higher than that of other groups, while there is no significant difference between potential customer group ($\beta_{potential}$=0.23563), medium-loyalty customer group (β_{medium}=0.24145) and low-loyalty customer group (β_{low}=0.22494). Thus, it support hypothesis H1a and H1c, and negate hypothesis H1c and H1d. This shows that paid search advertising can effectively promote the immediate purchase behavior of high-loyalty customers. Therefore, when high-loyalty customers enter the E-commerce enterprise site through paid search advertising, enterprises can provide certain marketing measures (such as short-term coupons) to maximize the transformation ability of paid search advertising in the short term.

After obtaining the immediate effect parameter β and the optimal lag influence factor λ of paid search advertising in each loyalty group, we can calculate the duration of carry-over and ultimate cumulative effect according to formula (3) and (4), which shown in Table 3.

Table 3. Carry-over effect of paid search advertising in each customer group

Customer group	Immediate effect	Lag factor	Duration of carry-over effect	Cumulative effect
Potential customers	0.23563	0.45	2.883610395	0.428418
Low-loyalty customers	0.22494	0.15	1.213726655	0.264635
Medium-loyalty customers	0.24145	0.2	1.430676558	0.301813
High-loyalty customers	0.41716	0.3	1.912489289	0.595943

As can be seen from Table 3, the impact of paid search advertising on potential customers is the longest, the impact on high-loyalty customers is longer, while the impact on low-loyalty customers and medium-loyalty customers is relatively low and at the same level. This showed that the hypothesis H2a, H2b and H2c are negated while H2d is verified. This means that the current click through of paid search ads is more likely to promote the purchase behavior of potential customers in the later stage. In order to improve the potential customers' recognition of new products, we can consider the possibility of new customers' access to new products when they purchase new products.

Combining the two effects, the cumulative strength of paid search advertising reaches the highest in the high-loyalty customer group, about 0.59, followed by the potential customer group. This shows that although the impact of paid search advertising on potential customers' immediate purchase is relatively weak, its carry-over effect is strong. The cumulative impact of paid search advertising on potential customers is second only to its impact on high-loyalty customers, indicating that potential customers and high-loyalty customers are more likely to search for products that meet their own needs through search engines after generating purchase demand, and more often visit enterprise websites through paid search advertising channels. Therefore, the hypothesis about cumulative effect passed the test. This means that the main customer groups of paid search advertising impact are potential customers and high-loyalty customers, and its role is to attract new customers and maintain high-loyalty customers. E-commerce enterprises can use paid search advertising as a marketing tool for potential customers and high-loyalty customers. When they put the keywords of paid search advertising, they can put the keywords according to the preferences of potential customers and high-loyalty customers, so as to save the cost of paid search advertising and improve the marketing effect.

6. CONCLUSIONS

This paper constructs a comprehensive evaluation model of the immediate effect and carry-over effect of paid search advertising. By modeling customers with different loyalty groups, we explores the differences in the impact of paid search advertising on loyalty segments. The results show that in terms of immediate effect, paid search advertising has the strongest short-term impact on high-loyalty customers, and is much higher than other customers; in terms of carry-over effect, the duration of paid search advertising's impact from long to short is potential customers, high-loyalty customers, low-loyalty customers and medium-loyalty customers；comprehensively considering the immediate effect and carry-over effect of paid search advertising, the cumulative intensity of paid search advertising to high-loyalty customers is the strongest, followed by potential customers, and the cumulative effect to low-loyalty customers is the weakest. Enterprises can refer to these characteristics, adjust the keyword delivery strategy of paid search advertising, so as to optimize the allocation of advertising resources and further improve the advertising effect.

In addition, in the previous studies on the effect of paid search advertising, most of them focused on the immediate effect of paid search advertising, while there was a lack of research on the carry-over effect of paid search advertising. Moreover, most of the research on paid search advertising effect is to evaluate its overall effect. There is no research on customer market segmentation through loyalty segmentation variables to test the impact of paid search advertising on different loyalty customer groups, and few studies based on customer behavior data in e-commerce enterprise database. Therefore, this paper further enriches the existing research on

the effect of paid search advertising, and plays a certain reference role for enterprise managers for the adjustment of paid search advertising and marketing strategy.

And there are still some limitations in this study, which need to be studied in the future:

(1) Due to the limitation of data sources, this paper only uses loyalty as a customer segmentation index to explore, and we can also use other segmentation indexes to explore the impact of paid search advertising on different customer groups in the future;

(2) This paper only studies paid search advertising, considering the need of enterprises to adjust the overall advertising strategy, we can consider more channels of advertising for comparison in the future research.

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