

A Comparison of Google and Yahoo: Which is More Cost Effective When Using Sponsored Links for Small Companies?

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The following paper examines a small manufacturing company's data from a Pay-per-click (PPC) campaign with Google and separately with Yahoo. For seven campaigns, the company allowed the same amount of money in the budget with both search engines during the same time period. Management wanted to identify the most cost effective search engine for their particular company. This is a crucial question to the small company working with a very tight budget and a small staff. Along with designing a proper web page, management has the control to develop good key words. They questioned whether their choice of keywords would lead to top billing on a pay-per-click venue of a search engine. They believed that top billing would lead to a better return-on-investment. The management of the company had the "gut feeling" that they got more for their money with Yahoo; the results highlighted in this paper tend to support that thesis. The paper is accessible to readers with a wide range of statistical expertise.

1. Introduction

Today it is imperative that all businesses, large and small, have an internet presence. With over 1 billion users in 2006 spending an estimated \$102.1 billion in online sales, it can hardly be ignored (Burns 2007). For many small businesses, developing an effective web site that allows online transactions or drives customers to a physical location is often the easy part. The difficulty is getting seen by potential customers, and companies want to do everything they can to track this information. The key to being found by the right people at the right time lies with search engines. There are essentially two ways a customer will find a business site via a search engine, through an organic or a pay-per-click listing.

The organic listing is generated at no cost to the business

owner. The search engine generates a ranked listing of sites relevant to the key word used by the customer. The sites listed first are those deemed most relevant by the search engine based on factors such as site content, links, and current updates. Typically organic listings are the bulk of the copy on the screen, and each search engine has their own algorithm for ranking the list of sites. Indeed this algorithm can often change.

Pay-per-click advertisements (PPC) are listed on the side, usually shaded or noted as "sponsored" links so that a customer will understand that the link was purchased by the web site business. This purchased listing is dichotomous to a listing that is organically ranked, and it puts forth a different message to the customer, not

necessarily a negative message, but certainly different. The price paid per click is determined on an auction basis. For example, if a business wants the top spot for the term “gold ring”, it will bid up to a certain amount “per click”. Whenever the search engine displays an advertisement for a business web listing and a customer clicks on it, that action leads the customer to the business web site, and the company is charged an amount of money by the search engine company. Since this charge occurs each time a customer clicks through to a business web site and since this cost is changed regularly on an auction basis, it is obvious that this can be an expensive process, especially to a small company. Two questions come to mind. Is the PPC cost necessary to the business, or is the organic listing just as productive to the small business? Can it be shown that Google or Yahoo is a more cost effective search engine for a small company?

At first glance, it appears that the PPC option would be very productive for small businesses. Although it can be costly, sometimes it is the only way a company’s web site will be seen by customers. Also it is difficult for small companies to compete with the giants in the organic click venue, because in the organic stream, the larger companies will generally land on top of the list. For example, a small manufacturer of gold jewelry will probably not get top billing over Tiffany’s on the organic list, unless they spend a significant amount of time and money on developing their web site design and advertising. Furthermore, most web designers generally agree that money spent on PPC is well-spent money. It affords a company the opportunity to see where the company is placed on the sponsored link with the use of certain key words. At the very least, spending some money on PPC campaigns can help management design their web site to be optimized for organic search engine rankings. Once a company decides to commit to a PPC program, then how does management decide which search engine is the most cost effective one for that particular company? This can be a crucial question to the small company working with a tight budget and a small staff. At a time when budgets are very tight, the small business wants to invest its advertising dollars carefully.

Recently it was reported that Google is reporting a flat growth rate on their PPC program. Sanders (2008) reported that Google generates virtually all of its revenue from the PPC program of sponsored links. In January 2008, Google’s paid click growth fell by seven percent and in February, it grew only by three percent. The growth rate was completely flat when measured against the previous year. In the past, Google has boasted a 25 percent growth just in one quarter (Sanders 2008). Google management, to its credit, is trying to initiate

some quality controls that will cut down accidental or fraudulent clicks.

The following paper examines a small manufacturing company’s data from a PPC campaign with Google and separately with Yahoo. For seven campaigns, the company allowed the same amount of money in the budget with both search engines during the same time period. The management of the company had the “gut feeling” that they got more for their money with Yahoo, and the results highlighted in this paper tend to support that thesis, which was initially established with Kennedy and Kennedy (2007).

2. Statistical Review

The management of Kennedy Incorporated was interested in examining whether Google or Yahoo returned better average positions for keywords. They believed that selecting good key words is within their control, and that properly selected key words can lead to top billing on a PPC venue. The management also felt that top billing on a PPC advertisement was crucial in order to attract customers who might result in a sale. The company had data from April to October of 2006. These data from seven campaigns are summarized in Table 1. The campaigns were run on the exact same days with both search engines for comparison sake. July was omitted due to company vacation and closure. The data set is a relatively small. However, small companies often make business decisions with small data sets, or the data they themselves have at hand.

Kennedy Incorporated established a limited budget to examine which search engine would perform the best for them. The management of the company believed that if a search engine often returned an average position that was near the top of the list, then that search engine was working well for them. In reality, as customers clicked on keywords for manufacturing companies, the returned lists were quite long. If Kennedy Incorporated landed in the middle or towards the end of a long list, management felt that the chance of a click through by the customer would be very low.

The click through rate (CTR) in Table 1 is an important number, and it is discussed by Kennedy and Kennedy in a previous paper (2007). In fact, the CTR values led to a belief from the management that Kennedy, Inc. was getting a better return on Yahoo. With the exception of one month, the CTR was better with Yahoo. Since management believed that having a good return on the average position of the keywords was imperative, it felt that a statistical review of how their keywords were

comparing in Google and Yahoo would be beneficial. If both search engines returned poor average positions, then management should change the words. If one search engine returned, on average, better positions than the other engine, then management felt that that search engine was performing better for the company.

Quickly reviewing the last column of Table 1, we can see that Yahoo more often returned a better average position than Google; however there was not a huge range between the averages. An average position of two would be very good, and Yahoo returned an average closer to two than Google did. Only the two trials in June indicated that Google surpassed Yahoo. Moreover, the original raw data of average positions for keywords, listed in an Excel spreadsheet, seemed to indicate that the average position for each keyword that Kennedy Incorporated used had a significantly higher variance of position with Google. This is important information to management. Keywords that return a good position are of value to the company. They translate into visibility to the customer. If the average position of keywords had a greater variance with Google than Yahoo, then the company would be concerned that although the overall average positions appeared similar from month to month, within the month the company was losing visibility to customers by using Google.

Each of the seven runs, highlighted in Table 1, was a

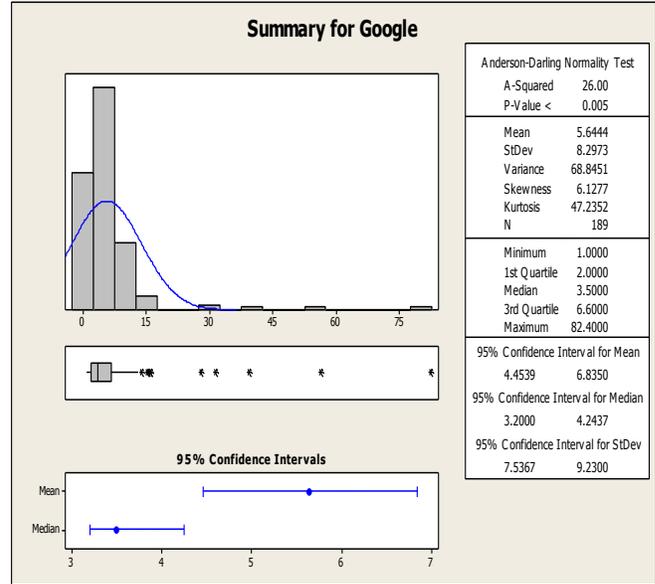


Figure 1. Google position data: exploratory analysis

Both the Google and Yahoo data were skewed to the right and uni-modal on the left portion of the graph. The graphs did not suggest strict normality.

The authors therefore decided to use two parametric tests and a third non-parametric test of the equality of variances, means and medians to see if any of the results pointed to equality.

Table 1. Summary of 7 Campaigns for Google/Yahoo

Campaign Period	Impressions	Click	CTR	Avg CPC	Cost	Avg Position
Google/Yahoo	Google/Yahoo	Google/Yahoo	Google/Yahoo	Google/Yahoo	Google/Yahoo	Google/Yahoo
April Test	1,991/3,281	62/44	3.11%/1.34%	\$.79/\$.21	\$48.84/\$9.04	4.5/1
10Day June 4	104,370/9,624	275/200	.26%.2.08%	\$1.08/\$.28	\$298.35/\$56.61	4.5/1
10Day June 20	9,012/6,242	102/197	1.13%/3.16%	\$1.62/\$.68	\$164.99/\$134.79	2.7/3
June 21-30	8,668/5,909	102/222	1.18%/3.76%	\$1.47/\$.71	\$150.22/\$156.78	2/3
August 2006	17,082/4,694	109/180	0.64%/3.83%	\$1.40/\$.85	\$152.18/\$152.98	2.8/2
September 2006	10,776/4,071	62/178	0.58%/4.37%	\$1.37/ \$.85	\$85.08/\$151.62	3.1/2
October 2006	15,285/2,639	69/164	0.45%/6.21%	\$1.57/\$1.01	\$108.62/\$165.94	3.6/2

small sample set. To try to ensure valid results, all of the position data for Yahoo and Google were collected into one sample with two sets of average position data, one column for Yahoo and one for Google. That is the data accompanying this paper in the Excel spreadsheet. Note that the data from Google constitute a larger set, because Google considers plural words as separate keywords. Thus the keywords “gold chain” and “gold chains” are the same in Yahoo, but they represent two keywords in Google.

Before any statistical analysis on the average position comparing Google and Yahoo, the authors first wanted to check if the data were approximately normally distributed. Figures 1 and 2 display graphs and summary statistics for both data sets.

All statistical tests were performed with Minitab. We note p-values to determine significance. To test if the variances were equal or not, we used the Levene test that does not assume normality, since the above graphs suggested non-normal data. The p-value was significant ($p = < 0.001$). Therefore the variances are not equal. Yahoo had a standard deviation of 1.9 and Google a standard deviation of 8.3, quite different, and the confidence intervals for these standard deviations are quite far apart; also the Google standard deviation is wider than that of the Yahoo standard deviation (Figure 3).

For the test of means, we used a two-sample t-test, assuming non-equal variances. Once again the p-value

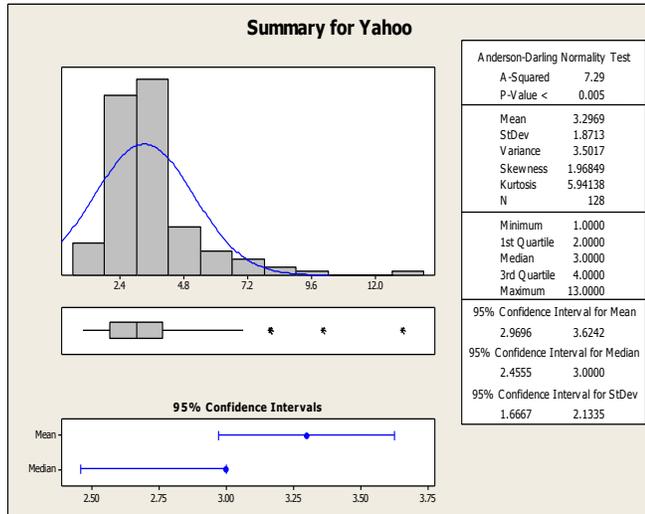


Figure 2. Yahoo position data: exploratory analysis

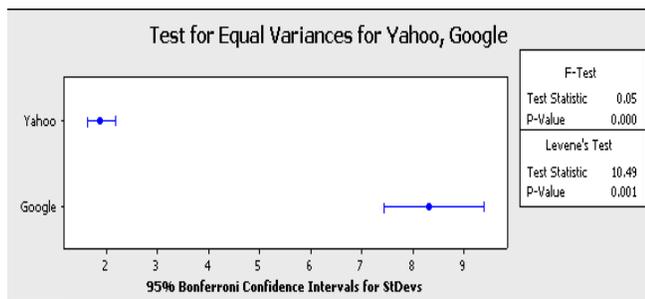


Figure 3. Test for equal variances for Yahoo and Google

was significant ($p = < 0.000$), and thus the two means are not likely to be equal. The mean for Yahoo positions was 3.3, while Google had an average position of 5.64. Noting that means are pulled to extremes with the data, we see that the Google average position is much higher, because some Google positions were outliers. This also contributed to a higher variance for Google relative to Yahoo's.

The last test performed was the non-parametric Mann Whitney test for medians. The non-parametric test was used to try to capture any discrepancy in results that could be found because of the lack of normality. The two medians for Yahoo and Google were 3 and 3.5 respectively. The p-value was significant ($p = < 0.0034$). The two medians are not likely to be equal, and they are not pulled to extremes as the means are. We recall that both data sets are skewed to the right, which is good from the point of view of Kennedy, Incorporated. Indeed, most values of the data are skewed in the direction of lower positions, for both Yahoo and Google, which is what the company needs.

In scanning the raw data and noticing that the Google data did contain several outliers that might affect the results, the authors ran the same three tests again with the obvious outliers removed.

The next two figures summarize the 95% confidence intervals for the mean and median for both Yahoo and Google.

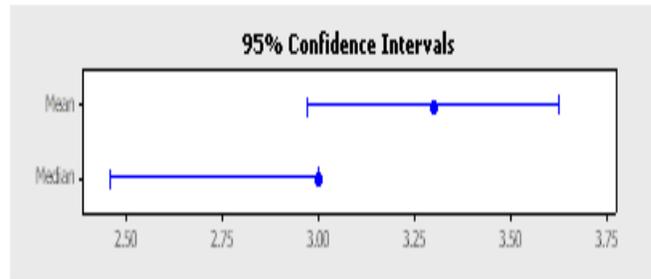


Figure 4. Mean and Median 95% Confidence Intervals for Yahoo

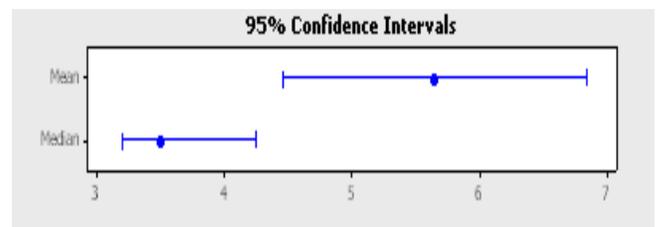


Figure 5. Mean and Median 95% Confidence Intervals for Google

The original data from Yahoo had a range from 1 to 13. The original data from Google had a range of 1 to 82.4. No outliers were removed from the Yahoo data set. Five outliers (28, 31.3, 31.5, 56.4, and 82.4) were removed from the Google data, which reduced the Google range to 1 to 16.

On the test the equality of variances using the Levene test, a p-value of 0.000 was returned; variances are still not likely to be equal. Compared to Figure 3, Figure 6 below shows some change in the confidence intervals, but not enough to change the significant outcome.

Using a t-test for the equality of means, a p-value of 0.000 was returned; the sample means were not likely to be equal. Finally, using the Mann-Whitney test for medians, the returned p value was 0.0099; the medians were still not likely to be equal. Thus even after removing several obvious outliers, a big discrepancy remained among the average positions for Google and Yahoo. It appears that

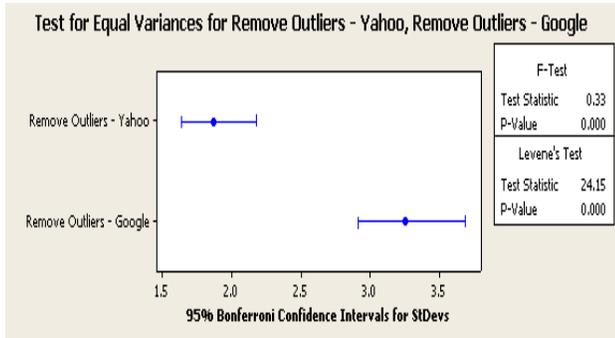


Figure 6. Test for Equal Variances with Outliers Removed

in these campaigns, Yahoo is outperforming Google by returning significantly better average positions.

Examining some of the other data in Table 1, we see in column 2 that there were usually more impressions listed on Google. The occurrence of “impressions” means that the ad was displayed; however, an ad may have been so low on the list that the customer may not have even seen it . We recall that the campaigns were set up to run for a specific time period, with the same dollar amount set for Google and Yahoo. For example, in September, a budget was set of \$150 for each. However, Kennedy Incorporated reported that in September there were not enough clicks on Google to spend the allocated dollars for that period even though there were significantly more impressions on Google. Thus the high number of impressions did not help the sales of Kennedy Incorporated.

For each campaign in the test period, the cost-per-click (CPC) on Yahoo was lower than on Google. Furthermore, in all but one campaign (April test), the click-through-rate (CTR) was also higher on Yahoo. In 5 out of the 7 runs, Yahoo had a CTR that was higher than 3%. Remember that the CTR is the number of clicks divided by the number of impressions. In those same runs, Yahoo provided more clicks for the same budget dollars. That suggests that Kennedy Incorporated received greater return-on-investment from its advertising dollars spent on Yahoo, because more traffic was generated from the advertisements on Yahoo per dollar spent.

3. Conclusions

The management of Kennedy Incorporated reached an impression that Yahoo is a better search engine for their company; management feels that they get a better ROI on Yahoo, since the average position on a PPC venue was better with Yahoo and the variance of the average position with Yahoo was lower than with Google.

Small companies must be very protective of every dollar spent. Kennedy, Incorporated wanted to step back from its internet advertising last summer to review their numbers. Management was hoping to get more data from companies that were similar to Kennedy in terms of industry and size. To date, they have not been able to retrieve similar data from other companies. Management now faces two choices: 1) continue to work with both companies and collect more data or 2) spend their entire budget on Yahoo. On the basis of this small analysis, management has more confidence in Yahoo.

As a continuance of this paper, the authors would like to examine some data from other small to medium sized companies. Do the data from other companies illustrate similar findings, whether they are manufacturing companies or not? Furthermore, in 2007 Yahoo restructured its search marketing bidding process. We would like to see whether the new format of Yahoo advertising will change the results for the company.

The real intent of the advertiser though is not simply to generate traffic, but to generate sales. So the question remains: does the higher CTR on Yahoo result in higher conversion to a sale? Unfortunately, at this time, sales conversion data are not available. The management of the company was interested in learning whether the keywords they are using are landing fairly high average positions, and they were interested to learn that Yahoo is performing better than Google with the same keywords.

Acknowledgements: The authors would like to thank Alan Olinsky for statistical consultation and guidance.

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