

# **A BUSINESS CASE FOR SEARCH ANALYTICS**

by

**Seann G. Bernshaw**

The ultimate goal of any business investment is to quantify the cost-benefit of any specific strategy. This has been the great challenge for SEO practitioners, as the only measure of success being ranking levels. Click through rates and conversion rates offer an added measure of success but the latter data is often sparse or difficult to compute. However, it seems clear that historically, the study of ranking data failed to test the significance of changes in ranking data as a response to marketing approaches. This analysis sets the problem of accurately measuring changing average rankings in response to the implementation of a series of SEO tactics. The goal here is to establish a quantifiable positive correlation between SEO (the cost) and ranking levels (the benefit). The essential question is how we make a business case for SEO based on forecasted business results.

Company had shown a slow decline in rankings for their hotel travel guides. This occurred even with fresh content being added. What changes in content could be made to remedy this apparent paradox? The consideration of the refinement of content in conjunction with additional linking material was paramount in terms of increasing engagement as far as traffic, conversions and revenue.

The second issue was that crosslinking between lines of business was not as consistent as it should have been. Company has a number of lines of business (LoBs) reflected in their web locations. There are a number of “guides”, including Hotel Travel Guides (HTG), Flight Travel Guides (FTG), Car Travel Guides (Car), and City Destination Guides (CDG). These sites are further differentiated by destination or location. The focus on this segment was to verify that each landing page in each chosen destination had crosslinks, proper tags and the necessary support to increase rankings.

Technical updates were another focus of the project. There were a number of action items included in this group. These included SWXL toolbar updates, description tag updates (possible template update), Rel Canonical tag inspection, and content partnerships. Specifically with respect to content partners, we needed to develop content partners to Points of Interest (POI) and destination guide pages.

The general hypothesis was by optimizing destinations as a whole, we would expect to see a higher search rank for the LoBs in those locations. Further, through evaluating crosslinking, content and technical data we will see an improvement in user experience and therefore an increase in shoppers. This translates into increased conversion rates. Our focused objective was to increase rankings across all pages for high value destinations and to verify that each landing page in each chosen destination had crosslinks, proper tags and the necessary support to rank well.

## Methodology

Five destinations were targeted for a period of three months based on 1) STAT rankings between 5-15, and 2) BrightEdge Opportunity Forecasting. Each destinations HTG, FTG, Car, and CDG were evaluated and updated as needed. Performance was monitored before and after each destination's upgrades were completed.

### Content Updates Included:

#### HTG

- Content refresh – 1,000 word count goal
- Modifier reassignment
- Header optimization
- Upstream internal linking update from filters
- Remove downstream linking to themes/filters
- Insert SCT variables in content
- Update filter content, as needed

#### FTG, Car rental, CDG

- Massage content for keywords
- Upstream crosslinking to HTG and other key LoBs
- Viewfinder
  - Update city summary
    - Eg. Website
    - Reviewer data driven blog post for each destination
    - Eg. Most Comfortable Rooms in Boston
    - Events
      - Create blog posts if a relevant event is occurring in target destination. For example, Mardi Gras in New Orleans in February would get an extra post

#### POI and POI cards

- Evaluate POIs for each destination
- Add crosslinks when relevant
- Include TTD details and link to buy tickets
- Schema mark-up with address
- Add addresses where possible
- Add POI cards from relevant Viewfinder blog posts to CDG and POI pages

#### Technical Updates

- SWXL toolbar update
- Description tag update (Possible template update)
- Rel Canonical tag inspection (duplicate content issues)
- Content Partnerships
- Develop content partners to POI and destination guide pages
- Stat Tags

A STAT tag was identified as representative of the Strategy Project. This identified the sites where the various components of the strategy were implemented. Another tag was identified (**Project – Strategy – Control**) with keywords for Charlotte, St. Louis, Key West, and Virginia Beach. Given that we were not tracking “where to stay in [city]” keywords for these

geos, these were keywords were excluded from the analysis. “St. Louis hotel deals” wasn’t tracked in STAT, so it’s been added to the control tag (but excluded from the analysis).

One important circumstance needs to be mentioned. At the time of the implementation of the Strategy tactic, Google changed their core ranking algorithm for the assessment of quality. From all reports, it is unclear what the specific impact this change had on ranking outcomes. The data has shown varied results but has indicated the impact may be more focused on “informational” sites. It is not clear whether Company falls into this category but surely there is an informational element in the way Company’s sites are organized.

## Statistical Analysis

The first step in the analysis was to calculate descriptive statistics for the two groups: Control and Strategy. There was a base period for which daily data was collected from April 14 to May 14. During this period, there was no implementation of any new SEO strategy for either group. The remaining data consisted of 60 days of ranking data for the two groups. Given that there was 30 days of base data, it was decided to aggregate the data into 3 three monthly periods. This had the advantage of setting a sample size that was large enough to satisfy basic assumptions about the derived statistics. It is important to note that implementation of the strategy was initiated at the beginning of month 2.

The descriptive statistics are presented in the table below. Upon inspection, it appears that both groups (Strategy and Control) saw declines in ranking across all three months. However, Strategy targets were down more than the control group. This appeared on the face a contradiction based on the new activity for the Strategy group.

Table 1. Control Group Descriptive Statistics

Control - Base Period Descriptive Statistics		Control - Month 2 Descriptive Statistics		Control - Month 3 Descriptive Statistics	
Mean	3.739784946	Mean	3.969892473	Mean	4.629722222
Standard Error	0.01988133	Standard Error	0.026203634	Standard Error	0.031327161
Median	3.733333333	Median	4	Median	4.6875
Mode	3.733333333	Mode	4	Mode	4.6875
Standard Deviation	0.11069456	Standard Deviation	0.14589566	Standard Deviation	0.171585928
Sample Variance	0.012253286	Sample Variance	0.021285544	Sample Variance	0.029441731
Kurtosis	0.09355321	Kurtosis	-0.08307824	Kurtosis	-0.451996245
Skewness	-0.397288009	Skewness	0.032348517	Skewness	-0.516493997
Range	0.466666667	Range	0.6	Range	0.608333333
Minimum	3.466666667	Minimum	3.733333333	Minimum	4.266666667
Maximum	3.933333333	Maximum	4.333333333	Maximum	4.875
Sum	115.9333333	Sum	123.0666667	Sum	138.8916667
Count	31	Count	31	Count	30
Confidence Level(95.0%)	0.040603092	Confidence Level(95.0%)	0.05351496	Confidence Level(95.0%)	0.064071238

Table 2. Strategy Descriptive Statistics

Danger Close - Base Period Descriptive Statistics		Danger Close - Month 2 Descriptive Statistics		Danger Close - Month 3 Descriptive Statistics	
Mean	4.866479346	Mean	4.996323529	Mean	6.073284314
Standard Error	0.030527408	Standard Error	0.042562322	Standard Error	0.054890357
Median	4.846153846	Median	4.9375	Median	6.125
Mode	4.75	Mode	4.875	Mode	6.25
Standard Deviation	0.169969416	Standard Deviation	0.236976978	Standard Deviation	0.300646869
Sample Variance	0.028889602	Sample Variance	0.056158088	Sample Variance	0.09038854
Kurtosis	3.209443949	Kurtosis	2.351039818	Kurtosis	1.86603289
Skewness	1.685372996	Skewness	1.419195973	Skewness	-0.335748207
Range	0.786764706	Range	1.084558824	Range	1.452205882
Minimum	4.625	Minimum	4.5625	Minimum	5.3125
Maximum	5.411764706	Maximum	5.647058824	Maximum	6.764705882
Sum	150.8608597	Sum	154.8860294	Sum	182.1985294
Count	31	Count	31	Count	30
Confidence Level(95.0%)	0.062345285	Confidence Level(95.0%)	0.086923857	Confidence Level(95.0%)	0.112263386

The next step in the analysis was to determine if the variances within a group differed across months. Specifically, did the variance of the ranking data differ from the base month to the first implementation month, then between the first implementation month and the second month? To examine this, F-statistics were calculated for the Control group as well as the Strategy group. The results are presented in the tables below.

Table 3. Control Group F Tests for Equal Variances

F-Test Two-Sample for Variances			F-Test Two-Sample for Variances		
	<i>Control Base Month</i>	<i>Control Month 2</i>		<i>Control Month 2</i>	<i>Control Month 3</i>
Mean	3.739784946	3.969892473	Mean	3.969892473	4.629722222
Variance	0.012253286	0.021285544	Variance	0.021285544	0.029441731
Observations	31	31	Observations	31	30
df	30	30	df	30	29
F	0.575662326		F	0.722971892	
P(F<=f) one-tail	0.068044133		P(F<=f) one-tail	0.190959045	
F Critical one-tail	0.543220913		F Critical one-tail	0.541293135	

Table 4. Strategy Group F-Tests for Equal Variances

F-Test Two-Sample for Variances			F-Test Two-Sample for Variances		
	<i>Danger Close Base Month</i>	<i>Danger Close Month 2</i>		<i>Danger Close Month 2</i>	<i>Danger Close Month 3</i>
Mean	4.866479346	4.996323529	Mean	4.996323529	6.073284314
Variance	0.028889602	0.056158088	Variance	0.056158088	0.09038854
Observations	31	31	Observations	31	30
df	30	30	df	30	29
F	0.514433508		F	0.621296552	
P(F<=f) one-tail	0.03679583		P(F<=f) one-tail	0.100396293	
F Critical one-tail	0.543220913		F Critical one-tail	0.541293135	

From the results above, we can determine whether the variance in the rankings across months varied significantly within a group. From Table 3 above for the Control Group between the base month and month 2, we can see the critical value of the F-statistic is .54. The calculated F-statistic is .58. Therefore, we conclude that the variance for the Control Group changed from the base month to month 2. The variance was higher in month 2 versus the base month.

Looking at the comparison between month 2 and month 3 for the Control Group, we see a similar result. The critical F value is .54. With a calculated F-statistic of .72, it is clear again that the variance increased for the Control Group from month 2 to month 3.

Moving to the Strategy Group, we performed the same analysis. The critical F value between the base month and month 2 is .54. The calculated F-statistic is .51. Therefore, we concluded that there was no change in the variance from the base month to month 2.

The F-statistics for Strategy between months 2 and 3 have a critical value of .54. The calculated F-statistic is .62. Based on these numbers, we can safely say the variance did change for Strategy group from month 2 to month 3.

The results of the F tests above are important for the next step in the analysis. In order to perform a test on whether the average (mean) ranking has changed from month to month we

have to make basic assumptions about the underlying variances. If they are equal, it changes the degrees of freedom used in the calculation of the t-statistic used in comparing the ranking means. Given that we have different results across different month on month combinations, we were able to make the correct assumptions in calculating the t-statistics for the difference in means.

Finally, we come to the essential component of our analysis. The fundamental question is whether the deployed stratagem has impacted on the average ranking data. To answer this question we used a t-statistic comparing means. This is a basic test utilized to identify whether an intervention has had any impact on outcomes. Two different t-tests were indicated from the results of the F tests above, one for equal variances and one for unequal variances. The F statistics above indicated which statistic was to be used for which pairing. The results of the t-tests are presented below.

Table 5.1 t-tests for Control Group Base Month – Month 2

<b>t-Test: Two-Sample Assuming Unequal Variances</b>		
<b>Control Group Base Month versus Month 2 (.05 significance)</b>		
	<i>Control</i>	<i>Control</i>
Mean	3.739784946	3.969892473
Variance	0.012253286	0.021285544
Observations	31	31
Hypothesized Mean Difference	0	
df	56	
t Stat	-6.995805444	
P(T<=t) one-tail	1.75826E-09	
t Critical one-tail	1.672522303	
P(T<=t) two-tail	3.51652E-09	
t Critical two-tail	2.003240719	

Table 5.2 t-tests for Control Group Months 2 - 3

<b>t-Test: Two-Sample Assuming Unequal Variances</b>		
<b>Control Group Months 2 - 3 (.05 significance)</b>		
	<i>Control</i>	<i>Control</i>
Mean	3.969892473	4.629722222
Variance	0.021285544	0.029441731
Observations	31	30
Hypothesized Mean Difference	0	
df	57	
t Stat	-16.155897	
P(T<=t) one-tail	3.05577E-23	
t Critical one-tail	1.672028888	
P(T<=t) two-tail	6.11153E-23	
t Critical two-tail	2.002465459	

Table 6.1 t-tests for Strategy Group (.05 significance)

t-Test: Two-Sample Assuming Equal Variances		
Danger Close Base Month versus Month 2 (.05 significance)		
	<i>Danger Close</i>	<i>Danger Close</i>
Mean	4.866479346	4.996323529
Variance	0.028889602	0.056158088
Observations	31	31
Pooled Variance	0.042523845	
Hypothesized Mean Difference	0	
df	60	
t Stat	-2.478974638	
P(T<=t) one-tail	0.008002082	
t Critical one-tail	1.670648865	
P(T<=t) two-tail	0.016004165	
t Critical two-tail	2.000297822	

Table 6.2 t-tests for Strategy Group (.01 significance)

t-Test: Two-Sample Assuming Equal Variances		
Danger Close Base Month versus Month 2 (.01 significance)		
	<i>Danger Close</i>	<i>Danger Close</i>
Mean	4.866479346	4.996323529
Variance	0.028889602	0.056158088
Observations	31	31
Pooled Variance	0.042523845	
Hypothesized Mean Difference	0	
df	60	
t Stat	-2.478974638	
P(T<=t) one-tail	0.008002082	
t Critical one-tail	2.390119473	
P(T<=t) two-tail	0.016004165	
t Critical two-tail	2.660283029	

Table 6.3 t-tests for Strategy Group (.05 significance)

t-Test: Two-Sample Assuming Unequal Variances		
Danger Close Group Months 2-3 (.05 significance)		
	<i>Danger Close</i>	<i>Danger Close</i>
Mean	4.996323529	6.073284314
Variance	0.056158088	0.09038854
Observations	31	30
Hypothesized Mean Difference	0	
df	55	
t Stat	-15.50506597	
P(T<=t) one-tail	4.95638E-22	
t Critical one-tail	1.673033965	
P(T<=t) two-tail	9.91276E-22	
t Critical two-tail	2.004044783	

Inspecting the results of the t-tests we have some interesting results. First, with respect to the Control Group, we find that there was a significant increase in the mean ranking from the base month to month 2. Further, there was a significant increase in the mean ranking from month 2 to month 3. It is important to note that with the control group, no tactic was deployed in order to improve the ranking performance.

The Control Group also demonstrated an increase in the variance across the months. This is in contract to no change in the variance in the Strategy Group from the base month to month 2. The first month of the implementation seemed to have a stabilizing effect on the variance of the mean ranking.

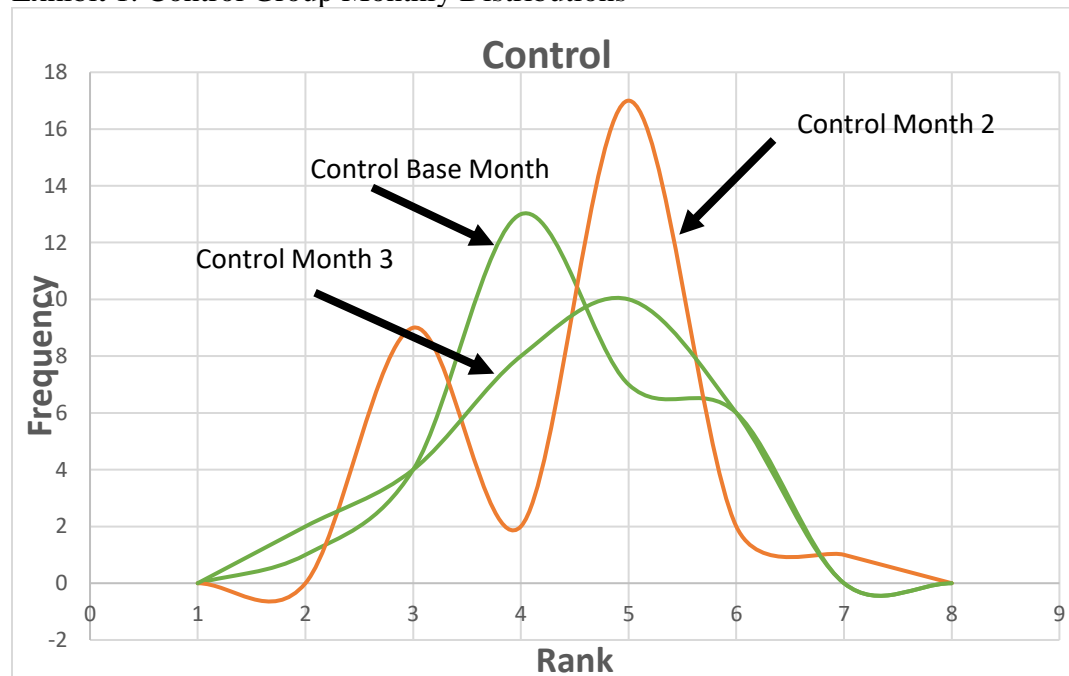
The Strategy Group is more interesting. Looking at the t-statistics, with the increase in the degrees of freedom from the F-statistics result, we see that there has been an increase in the mean ranking from the base month to month 2 (implementation month). This result was at the 5% level of significance. However, when tested at the 1% level of significance, we see a different result. With a critical t-value of 2.66 and a calculated t-statistic of -2.49, we cannot reject the null hypothesis that there is no change in the mean ranking from the base month to month 2.

Clearly, there was an increase in the mean ranking data for the Strategy Group from month 2 to month 3. Looking at table 6.3 we see a critical t-value of 2.00 with a t-statistic of -15.51. It could be said that the impact of the deployed strategy had “worn off.”

If we look at the Control Group t-statistics, even if we evaluated at the 1% level, we would still reject the null hypothesis of the equality of the mean rankings. In other words, mean ranking increased month on month for the Control Group.

Often it is interesting to visually inspect the distributions of data in order to better understand the relationships between variables or over time. Exhibit 1 shows the relationships of the distributions of the mean ranking daily data over the three monthly periods.

Exhibit 1. Control Group Monthly Distributions

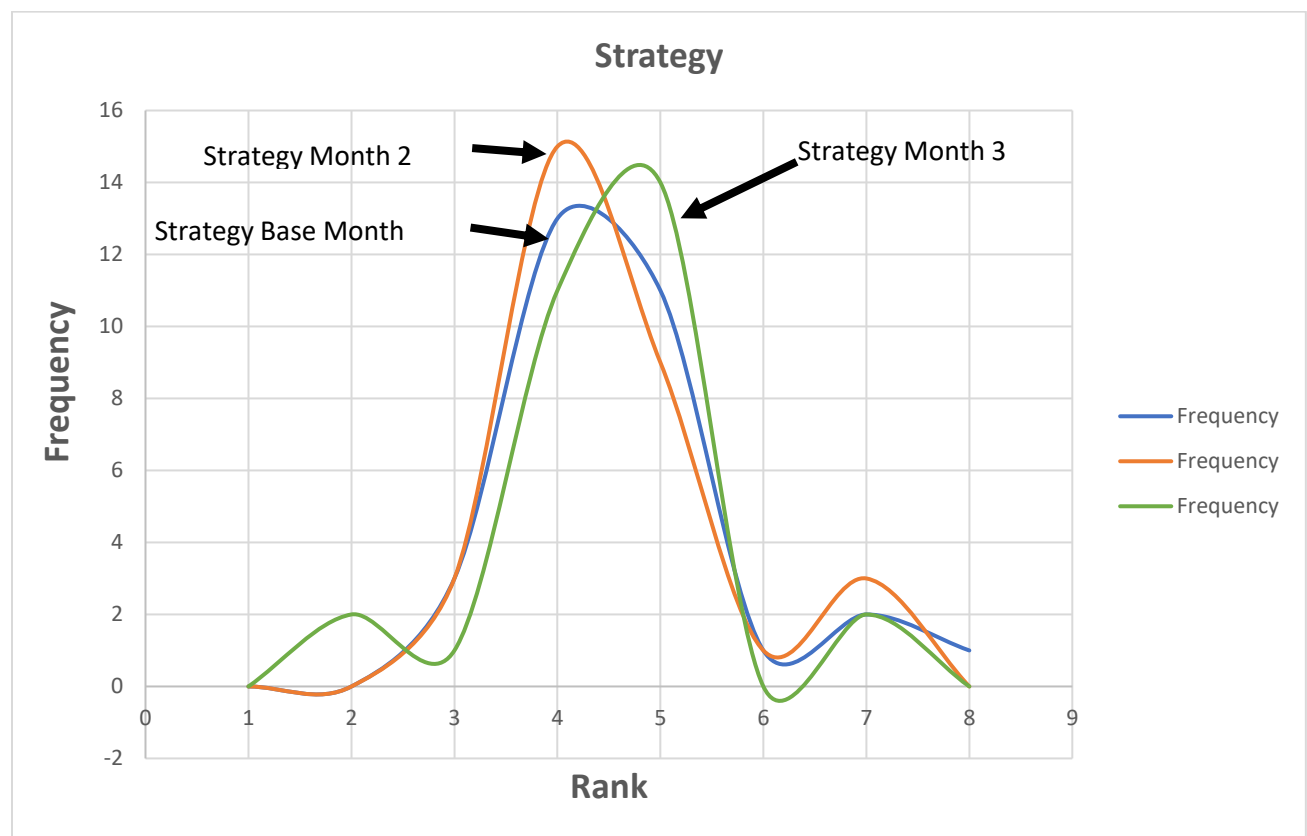


The visual inspection of the Control distributions are quite instructive. Looking at the data in the context of the descriptive statistics, including the first four moments (mean, variance, skewness, and kurtosis) we see that there were significant changes in the distributions month on month. The base month demonstrates a slightly left skewed distribution with a single mode. As we look to the month 2, we see a non-skewed but with a fairly significant (visually) bi-modal element. Month 3 yields a negatively skewed and flattened (negative kurtosis) with a single mode.

Generally, without the impact of the Strategy methodology, we can see great fluctuations in the distribution of the Control Group ranking data. There are significant changes, increases, in the mean ranking concurrent with these changes in the other distribution characteristics.

Exhibit 2 gives us a picture of the three, monthly distributions of the Strategy data.

Exhibit 2. Strategy Monthly Distributions



The visual inspection of the Strategy distributions is illustrative of a number of factors. We have demonstrated that the mean ranking did not change significantly from the base month to month 2. Looking at the distributions above, we can see this statistical result is validated by the picture. The other “moments” of the distributions across the months are also illuminating.

We see that overall, the level of skewness has been reduced from a positively value of 1.69 in the base month to 1.42 in month 2 to a negatively skewed value of -.34 in the third month. The kurtosis values are also trending in a negative direction from 3.21 in the base month to 1.86 in month 3. These figures are clearly reflected in the distributions in Exhibit 2.



The question then is whether the implementation of the Strategy had an impact on the mean ranking for the Company sites under examination. From the above analysis, we saw that the Control Group demonstrated more variation in the absence of any deployed methodology than the Strategy group. The distributions across the three months varied more greatly including an increase in the mean ranking values across the three months.

The Strategy group maintained its mean ranking from the base month to month 2. The distributions showed less variation (equal variance base month to month 2) as well as an improvement in the distribution parameters reflecting a characteristics trending towards normality. Lastly, a stable mean ranking from the base month to month 2 is reflective of positive outcome in the context of the erratic behavior of the Control Group distributions.

One factor that has not been considered from a statistical point of view is the effect of the “Google Quality Update.” We have seen some unusual behavior in the distribution of rankings for the Control Group in the second month. This is concurrent with the “update.” However, there was no corresponding radical behavior in the Strategy distribution in the second month. An argument could be made that the effect of the Strategy tactic tended to ameliorate the effect of the quality update.

The conclusions drawn from this study indicate that merely reviewing the mean (average) ranking data month on month may lead to false indications of changes in either direction. In this case, we saw that by inspecting the mean ranking data we were led to the conclusion that the Strategy methodology was ineffective. By the use of fairly basic statistical analysis, we have demonstrated the early conclusions were incorrect. While we cannot say the tactic was successful in improving ranking data, we can say that in the absence the Strategy, we may have seen more unstable behavior in the Strategy distribution of mean rankings. Essentially, there was a stabilizing effect that prevented the erratic effects observed in the Control Group.

This is the first effort in understanding the intricacies of SEO applications. Naturally we need to look at causality and what specific efforts are yielding what results. This then leads to answering the ultimate question of cost benefit analysis for the practitioner and the client: what identified tactics do we deploy and what is our expected return.