Online Advertising Analytics for the Merage School

BANA 277 - Final Project

Group 10A

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1. Introduction

The Merage School has used a variety of online advertising methods for its programs. This project aims to analyze the dataset and key metrics and evaluate the advertising methods' effectiveness. Our final goal is to provide practical suggestions on improving the digital advertising strategies for the Merage School to attract more applicants through this project.

Our focus data set belongs from the Year 2019 Q4 to 2021 Q1. The data mainly focuses on the MBA and Speciality Master's program application data, and various social media campaigns carried out to promote these programs.

To achieve this goal, we will explore the dataset by thinking about the following questions:
- Are there significant differences between the international applicants and domestic applicants?
- What are some critical effects of the residence country of an applicant/inquiry?
- Which social media platforms and campaigns have performed well or not optimal in the given time period.
- Are there patterns in data, and how can it be leveraged?

To sum up, we reflect on the Paul Merage School of Business advertisement data to test effectiveness, find insights and deliver business takeaways. It is noticeable in our work that the primary focus is on all lead residency and google ads data analysis.

The methodology is divided into three steps.
- EDA/Visualization: explore and clean the dataset, and find insights and build visualizations.
- Modeling: build models to uncover trends such as t-test, chi-square test, logistic regression, and so on.
- Implications: interpret results and try to find solutions.

2. Exploratory Data Analysis & Data Visualization

2.1 Data Source

We use the dataset from the UCI Paul Merage School. The detailed dataset is as below.
- all_lead: 2019 Applicants - All Lead Sources

- inq_conv: All Inquiry Form Conversions

- search: UCI Google Ads FTMBA and FEMBA Search terms Report

- keyword: UCI Google Ads FTMBA and FEMBA Keyword Report

- campaign: UCI Google Ads FEMBA campaigns data

- media: Media Type Conversion - Google/Facebook/Linkedin

- web: Website Data x month

2.2 EDA and Data Visualization

Preprocessing steps that were carried out differed and depended on the models we created. Below is a list of preprocessing steps carried out for each method.
   a. Applicants Distribution (See Figure 1 and Figure 2)

   - Among all applicants, 78% are international students. Specialty programs such as MSBA and the Master of Finance are more popular. Only 16% of applicants apply for MBA programs.

   - 48 % of resident applicants selected MBA programs.

   - On the other hand, international students have a clear preference for one-year programs, and 86% chose one-year programs.

   b. Lead Sources for Applicants and Inquirers (See Figure 3)

   - We examine where and how people learn and get information about the Merage programs.

   - Top three lead sources: Web inquiry, online event registration, and online application.

   - The majority of inquirers obtains from the web inquiry form, and a small portion uses online event registration and application.

   - Most inquirers and applicants use the Merage websites rather than social platforms like Linkedin and Facebook.

c. Conversion for All Inquirers (See Figure 4)

- 95% of all inquiries use web inquiry forms which bring about 7% conversion.
- Online applications have the highest conversion rate, and it may be because people who start filling out the application form know which program they like and have a more robust incentive to apply.
- When we switch to see the conversion rate based on different programs, specialty programs have higher conversions than other MBA programs.
- The more applicants choose specialty programs, leading to higher conversion.

d. The Merage Website Data x Month (See Figure 5)

- The page views, users amounts, and sessions show very similar distribution. There is a clear seasonality trend that the websites have higher page views and users during the application period between October to march. Then it decreases when the application period ends and reaches the lowest during summer.
- In terms of website traffic, desktop traffic is more than mobile's one.

3. Business Analysis

3.1 Applicants

a. Chi-sq test

	Chi-square value	P-value	Result
Programs vs residency status	978.6	< 0.05	Significant

*Program : 1 = MBA, 0 = Any non-MBA programs

Residency status : 1 = Domestic, 0 = International

Table 1: Chi-Square Test - Program

	Chi-square value	P-value	Result
Application submission time vs. residency status	25.41	< 0.05	Significant

*Application submission time : 1 = before 2019, 0 = 2019

Residency status : 1 = Domestic, 0 = International

Table 2: Chi-Square Test - Application Submission Time

First, using Chi-square test to test any significant associations between program versus residency status and application submission time versus residency status. The Chi-square test results have a p-value smaller than 0.05, which means that they have significant associations. Therefore, programs and application submission time are significant predictors of residency status. It seems that international applicants and domestic applicants are different when it comes to program preferences and application submission time. It is reasonable under the residency restriction that international applicants have a tensive deadline, and domestic applicants are ample because international applicants need time to obtain a student visa.

b. Logistic Regression

	P-Value	Significant	Odds Ratio	
Program vs. Resident	2E-16	Sig	Intercept 0.076343	Resident 12.930472
Program vs. International	2E-16	Sig	Intercept 0.987152	International 0.077337
Program vs. Applicant	2E-16	Sig	Intercept 0.603047	Applicant 0.505247
Program vs. Inquiry	2E-16	Sig	Intercept 0.304687	Inquiry 1.979223

* Dependent variable: Program : 1 = MBA, 0 = 1 year program

** Independent variables

Residency Status: Resident: 1 = Domestic, 0 = International

International: 0 = Domestic, 1 = International

Student stage: Applicant: 1 = Applicant, 0 = Inquiry

Inquiry: 0 = Applicant, 1 = Inquiry

Table 3: Logistic Regression - Applicants

After that, we further perform a logistic regression to find the relationship between program and residence status, and the program and student stage include applicant and inquiry. Based on the p-value, it proves that in these four models, the relationship is significant and has a positive effect. Through Logistic Regression, taking the program as the dependent variable, the results are as follows:

- With one unit increasing in residents, the odds of applying for an MBA program rises by 12.93%.
- For every additional unit increase of international students, the odds of applying for an MBA program only increases by 0.08%.
- With one unit increasing in applicants, the odds of applying for an MBA program increases by 0.5%.
- With one unit increasing in inquiry, the odds of applying for an MBA program increases by 1.98%.

c. Media type

	P-Value	Significant	Odds Ratio	
Facebook and Instagram	1	No		
Google	2E-16	Yes	Intercept 0.526627	MBA 0.083569
	2E-16	Yes	Intercept 0.044010	1 Year Program 11.966139
Linkedin	NA	No		

*Dependent variable: Student stage: 1 = Applicant, 0 = Inquiry

**Independent variable: MBA : 1 = MBA, 0 = 1 year program

International: 0 = MBA, 1 = year program

Table 4: Media Type

Further running logistic regression for different media types, like Facebook and Instagram, Google, and Linkedin, to see the effectiveness of the campaign in an MBA program and one-year

program. As we can see, the p-value of Facebook and Instagram is 1, which is non-significant because, in this dataset, the sample size of a 1-year program is too small to test. For LinkedIn, the p-value is not available since the dataset only contains students who already applied or inquired in the MBA Program. When we look at Google, its performance is significant, especially for a 1-year program. With one unit increasing in an MBA applicant, the odds of Google inquiry increases by 0.08%. On the other hand, for every additional unit increase of one-year program applicants, the odds of Google inquiry increase by 12%. Since the Google Campaign has a more significant influence on applicants. Therefore, we would like to focus on the effectiveness of Google's campaign on the MBA program.

3.2 MBAs

Using Google ads data to see the relationship between all variables. From Figure 6, the correlations table shows cost, interactions, and conversion are positively correlated with most of the variables, and the distribution of all variables is highly skewed to the right.

After determining the highly correlated variables, run t-test and logistic regression for FTMBA and FEMBA respectively, to see significant differences. From the table below(Table 5), only cost, conversion, and conversion rate are showing to be significant among these two programs, which are similar to what we see for the whole data.

Program	Imp	Interactions	Interaction Rate	Avg Cost	Cost	Conversion	Cost/ Conv	Conv Rate
0 (FE)	7.19	1.66	0.82	12.35	19.23	0.075	1.96	0.05
1 (FT)	14.02	1.40	0.85	11.50	15.03	0.02	1.39	0.02
P-Value	0.18	0.06	0.17	0.06	0.004	0.00003	0.53	0.0003

Table 5: T-Test - FEMBA vs. FTMBA

Take log transformation for all continuous variables except the binary variable program because the distributions are highly skewed right. From Table 6, we can see that FTMBA has a stronger

impression, interaction rate, avg cost, and cost per conversion than FEMBA. And FTMBA has lower cost and a lower amount of conversion than FEMBA.

Through Logistic Regression, taking the binary variable program as a dependent, the results are as follows:

- One percent increase in the impression is associated with a 0.6% increase in Odds.
- One percent increase in interaction is associated with a 1.68% increase in Odds.
- One percent increase in avg cost is associated with a 0.68% increase in Odds.
- One percent increase in cost is associated with a 0.99% decrease in Odds.
- One percent increase in conversion is associated with a 4.16% decrease in Odds.
- One percent increase in conversion rate is associated with a 0.57% decrease in Odds.

	Intercept	Impr	Interaction Rate	Avg Cost	Cost	Conversion	Cost/Conv
Coef	-1.3998	0.6019	1.6844	0.6783	-0.9990	-4.1628	0.5771
P-Value	0.014764*	0.0058**	0.004605**	0.027111*	0.00074***	0.001547**	0.024503*

Table 6: Logistic Regression - FEMBA vs FTMBA

Through Poisson Regression(See Figure 7), focus conversion, the results are as follows:

- 1% increase in avg cost is associated with a 1.49% decrease in conversion
- 1% increase in cost per conversion is associated with a 1.42% increase in conversion
- 1% increase in conversion rate is associated with a 5.52% increase in conversion

	Intercept	Avg Cost	Cost/Conv	Conv Rate
Coef	-3.9282	-1.4903	1.4213	5.5188
P-Value	3.98e-10 ***	1.35e-06 ***	9.73e-14 ***	1.32e-11 ***

Table 7: Poisson Regression - Conversion

Figure 8 and Figure 9 show the frequency of keywords and search terms common in our Google ads campaigns. For keywords, "UC Irvine MBA" and "Irvine university" have the highest frequency of searches. For search terms, the word "MBA" has the highest frequency among all, and full-time, part-time, and FEMBA related words are also some of the popular terms that are being searched. The word clouds in Figure 9, on the left, show the keywords after sentences were split and used in the campaigns. On the right, it shows potential students' search terms when trying to find more details about the program. It is not surprising that potential students do search for other location-based programs and specific competitor universities such as USC and UCLA.

3.3 Specialty Programs

The data for speciality program google ad word campaign was limited, with no independent variables to run statistical analysis models. We approached data with industry benchmarks for other education institute's Google ad performances. The campaigns are usually split between the below two categories;

- Display ad - When the Google ad campaigns including photo, video or text content are displayed on various websites. It has both display and retargeting sub groups of students.
- Search ad - These are ads where a student specifically searches for a program, and it matches with the campaign keywords. A list of options is shown on google search page, including the competitors . Campaign keywords are very important as well as the website performance in terms of SEO to be present in higher ranks in the search engine.
- It's also important to mention that the retargeting is done to specific audiences who have previously interacted with the content from the websites.

For analyzing the performance of effectiveness of any digital marketing campaigns there are few key KPI's that are used to gauge the performance. Given we had data just on the performance but not the financial outcome (students admitted through the campaign and profits made from it), we just did a benchmark analysis for both Display and Search ad types. The key KPI's that we looked into are;

- Click through rate
- Cost per Conversion
- Average Cost per click

- Conversions
- Impressions
- Clicks

The key finding from these analysis were;

❖ In the display ad category the retargeting campaigns have on average better performance than general display ads. The retargeting campaigns are almost at par with the CTR industry benchmark 0.53%. Whereas most of the direct display ads are within 20-25% click through rate which is just 50% of the industry standard.

❖ For the search ad types MPAC performed 2.5 times the industry benchmark of about 4%. All other programs are under-performing achieving between 1.5 to 2.9 % CTR.

❖ In general the idea is to keep cost per conversion low, but in the case of UCI advertising the ideal scenario will be to compare these numbers with the profit conversion and not just interactions. But it was interesting to see that for both search and display ads MIE & MPAC programs have higher cost than other programs, as well as 4x cost of industry benchmark for MIE campaigns, the campaign definitely needs optimization.

❖ The industry benchmark for display ads is 0.48$ and 2.40$ for search ads, most of the campaign costs are higher than the industry average. But as mentioned above, it will be critical for judging the performance of these campaigns by comparing them to the profit/revenue numbers from the conversion.

❖ Looking at the conversions it's evident that most of the conversions or students interacting are with the search campaigns. So even though the click through rates are lower for search ad types, they are leading to better conversion. A primary reason could be that the audience is more aligned with the campaign and has a need for the offerings from UCI.

❖ Impressions are a good way to generate the click funnel. The display ads have higher impressions but their click rates ratio is lower. It shows that the audience is not relevant for these types of campaigns, and maybe we need to focus to divert these costs to other more better performing options like the search campaigns.

4. Key Takeaways and Recommendations

For applicants, we found out that specialty programs are more popular among international students, whereas MBA programs are more popular among domestic students. For recommendations, we suggest that the online advertising team should include multiple languages on the tutorial video clips for international applicants to follow along with the application process efficiently. As to attract more international students to apply for the MBA programs, the school may include a specialized MBA program, where international students can have the hybrid option of studying in their home country and then transition to the campus later.

Moreover, for the MBA programs, Google Ads seems to have a cost of inefficiency, where the ad cost is high, but the conversion rate is low. To improve this problem, we may either try to change Google Ads' strategy or create content on other social platforms, such as Youtube and Tiktok, to see if other platforms work better than Google Ads. Besides, we want to improve on organic search by creating referral programs and optimizing the channel budget. Organic traffic is a kind of referral traffic, defined as visitors that arrive from search engines. Therefore, this will enable an increase in the number of visitors and pageviews.

Lastly, for specialty programs, the digital effectiveness is much lower than the industry benchmark, and the cost is relatively high. We suggest that various enhancements on the SEO should be optimized, and the bid strategy should be revisited. It is interesting to see that only 33% of the traffic visit from mobile, compared to 60 -70% across the industry. For the Merage school website's mobile site, we noticed a few issues, such as some of the drop-down menus' links are not functioning correctly or are confusing to use. We believe that the mobile site should be improved to become more user friendly.
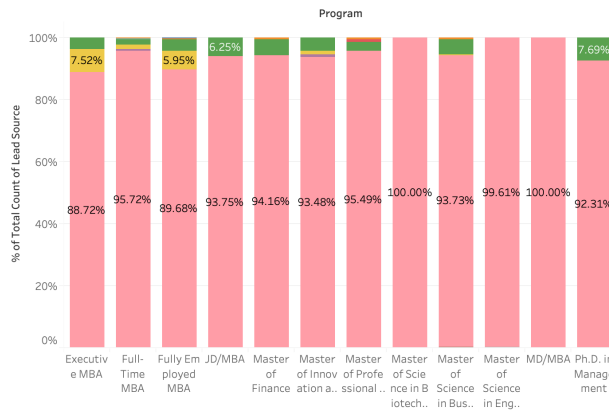
Appendix
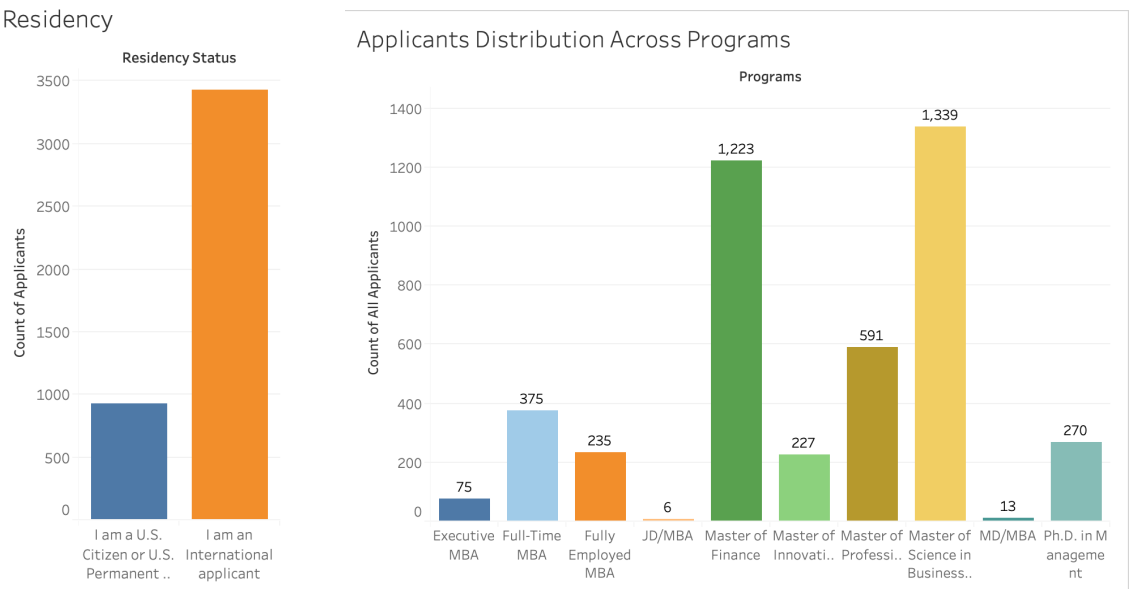
Figure 1: Applicants Distribution
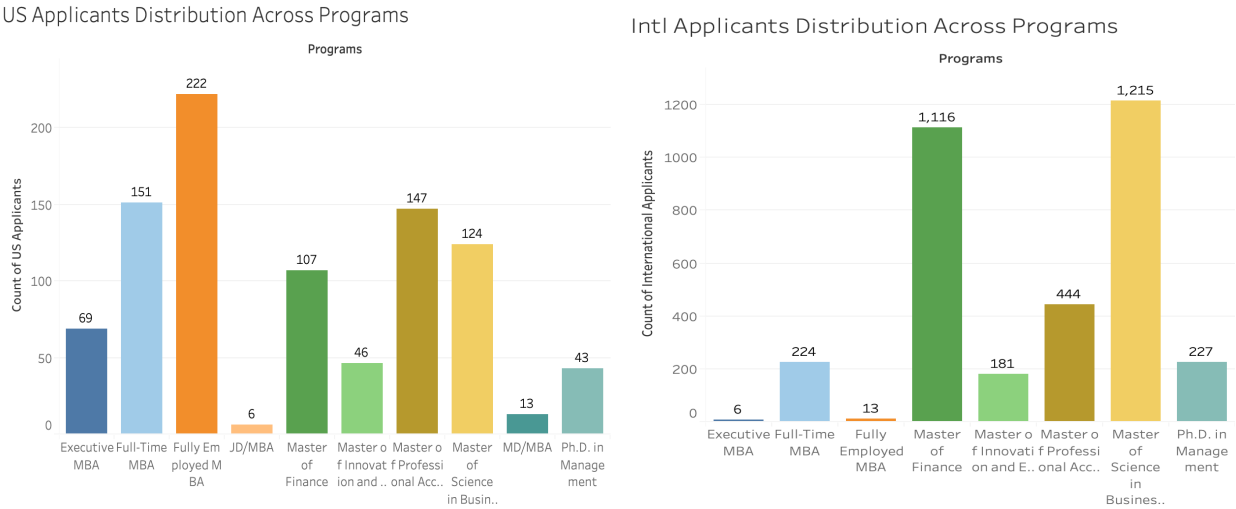
Figure 2: Program Preference by residency
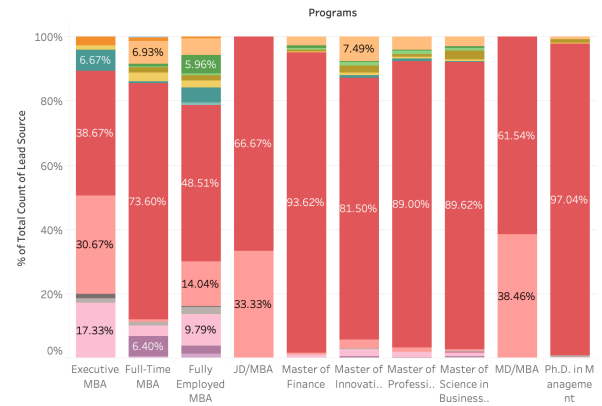
Figure 3: Lead Sources
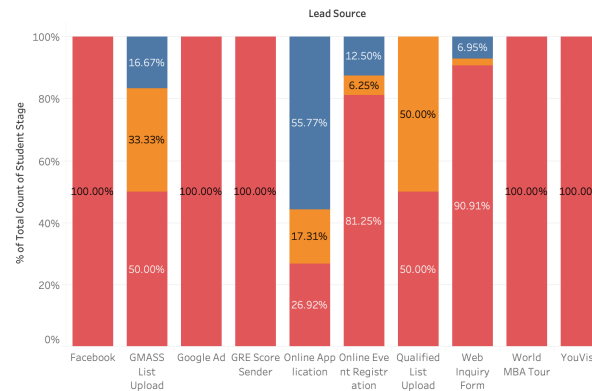
Figure 4: All Inquiry Lead Source Conversion
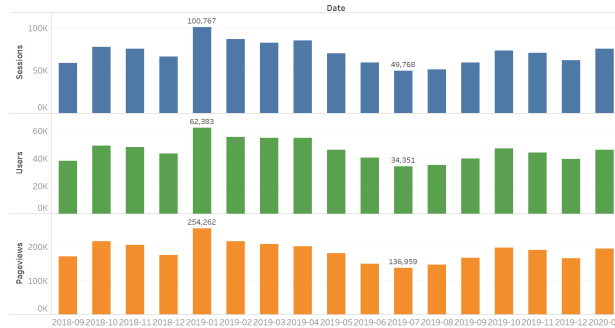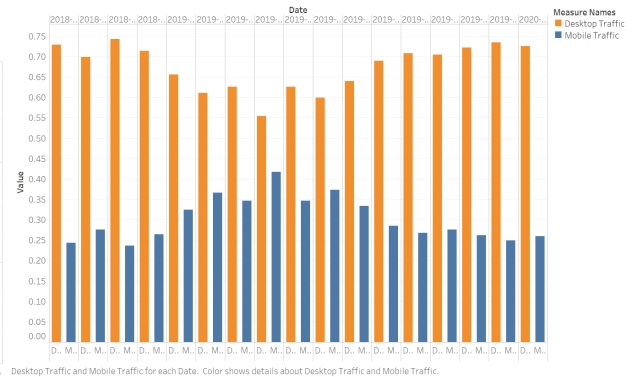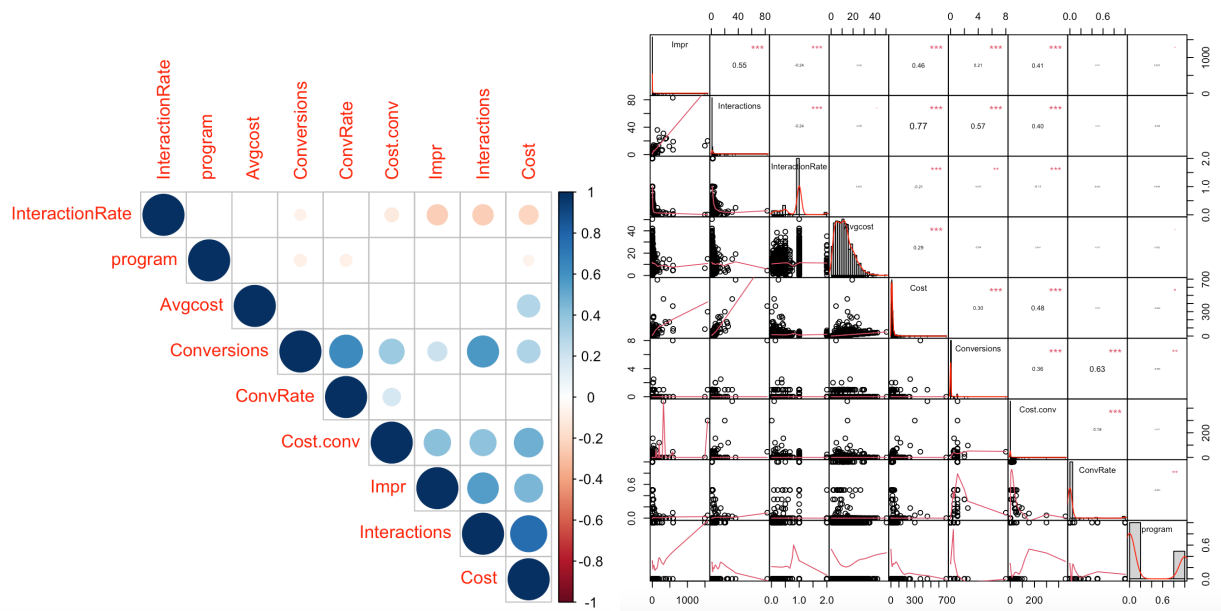

Figure 5: Paul Merage School Website Data

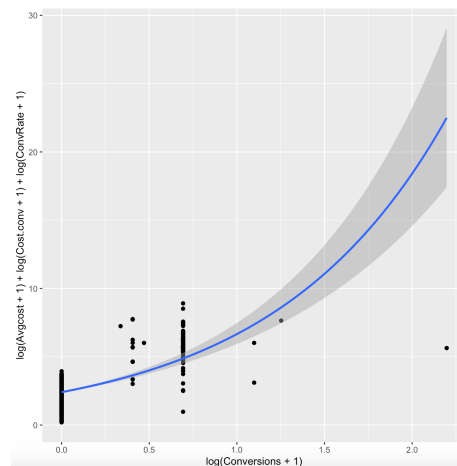Figure 6: Correlation Table - MBA

(*FEMBA = 0, FTMBA = 1)
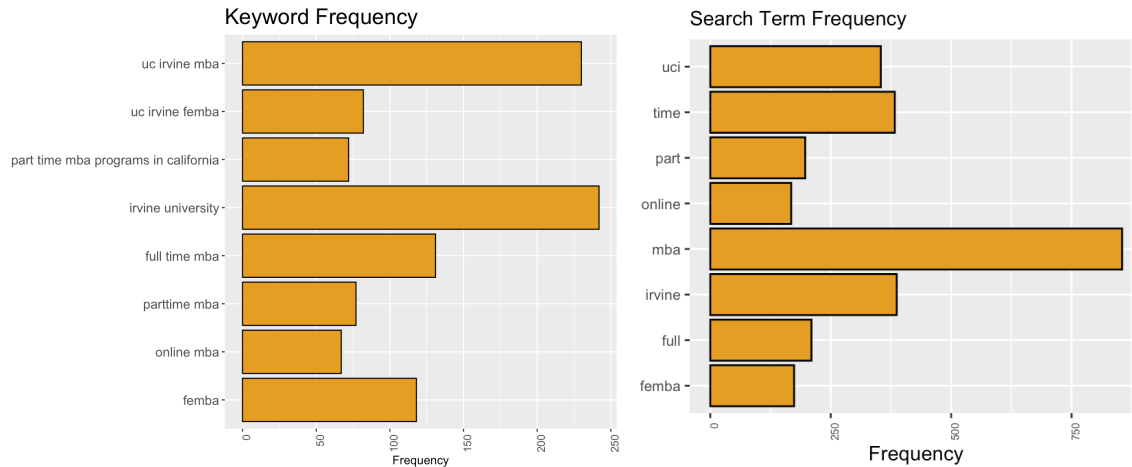

Figure 7:Poisson Regression - Conversion

Figure 8: Frequency of Keyword vs. Search Term
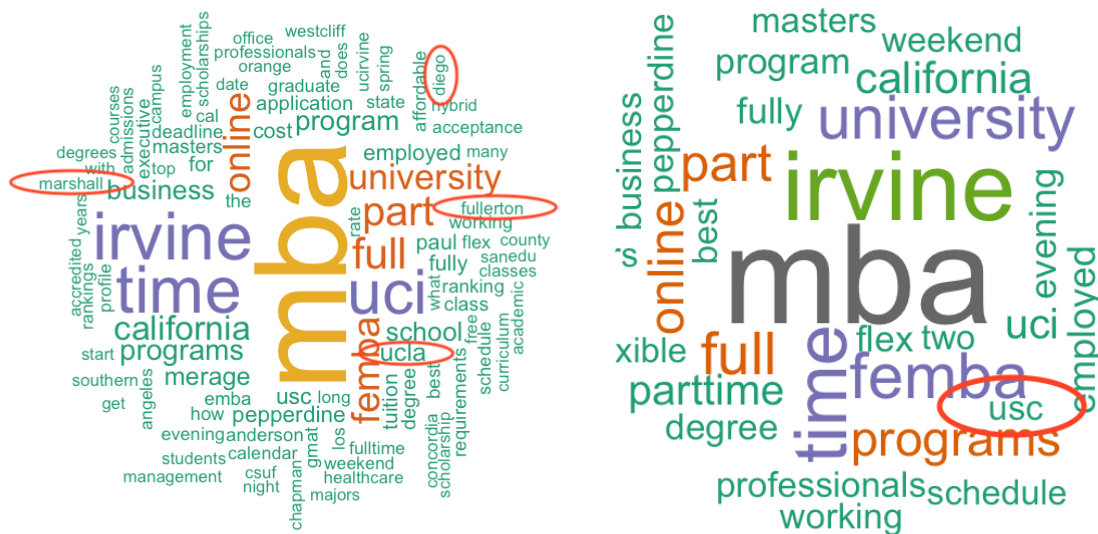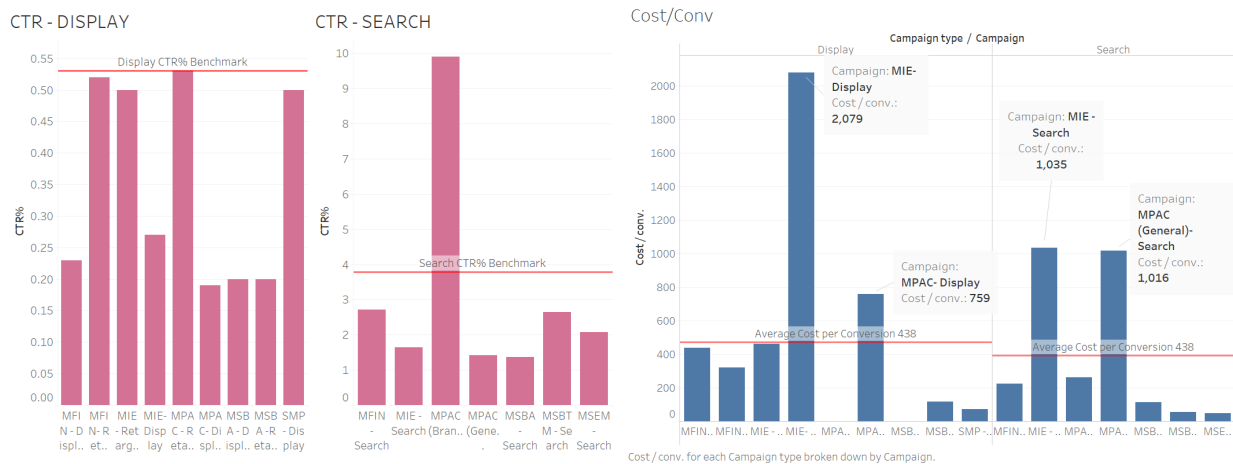

Figure 9: WordCloud of Keyword and Search Term

Figure 10: Click-Through Rate
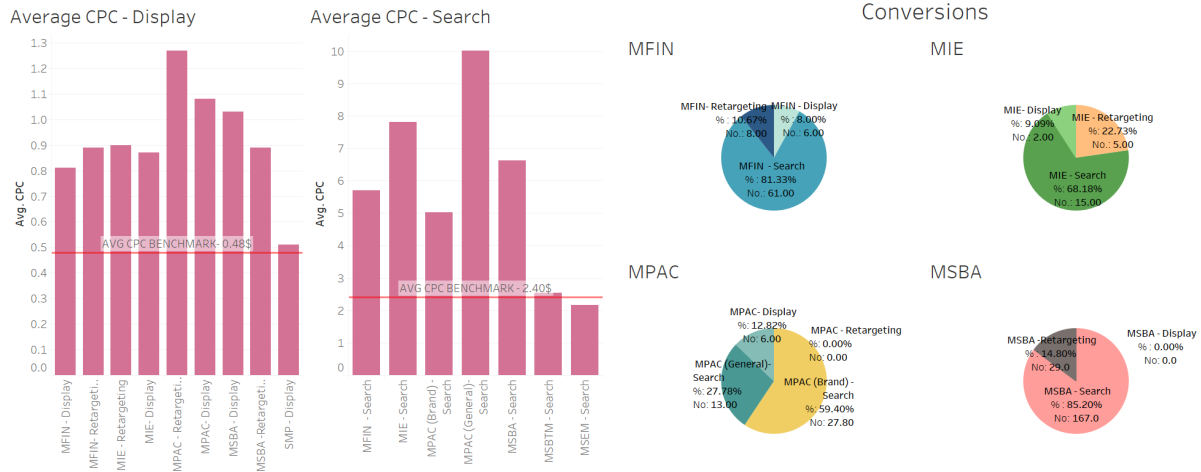
Figure 11: Average Cost Per Click
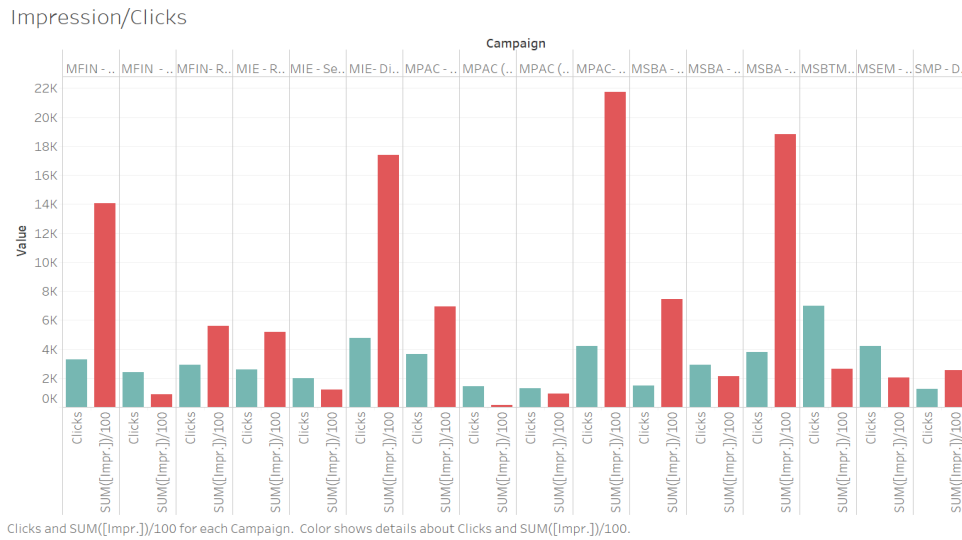
Figure 12: Impression/Clicks

Sources & Bibliography;

1. https://www.wordstream.com/blog/ws/2016/02/29/google-adwords-industry-benchmarks

2. https://www.wordstream.com/blog/ws/2020/06/02/new-data-google-ads-benchmarks-during-covid-19

3. https://www.wordstream.com/blog/ws/2016/02/29/google-adwords-industry-benchmarks

4. https://www.wordstream.com/blog/ws/2018/08/13/google-ads-mobile-benchmarks

5. https://blog.hubspot.com/marketing/most-expensive-keywords-google