NCACPA Member Engagement Project

Nidal Redpath, Andrea O'Connell, Lexy Garrett

April 21, 2017

Executive Summary

The Data Analytics Practicum is a component of the Data Analytics Honors program in the Poole College of Management at NC State University. In this Practicum we have had the opportunity to gauge membership engagement for the North Carolina Association of Certified Public Accountants (NCACPA). Throughout this three-month project, we utilized historical and current NCACPA membership data and completed our analyses using Tableau, Excel, and JMP.

The NCACPA Member Engagement Team has a mission to ensure the effectiveness of the member community, thereby increasing member engagement. With this in mind, our Practicum team used the provided key performance indicators (KPIs) for an engaged member and compiled an engagement score. By calculating these internal engagement scores, we can see how various members of the organization interact with the NCACPA and, ideally, determine which KPIs are most predictive of member renewal and active participation in various NCACPA activities. The KPIs covered five distinct categories, which include member online activity, organizational leadership roles, financial contributions, attendance at events, and involvement in NCACPA committees.

We began by cross referencing the data sources using our unique identifier, Customer Key, and brought together data from multiple sources to create an engagement score. By assigning point values (provided from the NCACPA) to various engagement activities, we could compile the information and create a dynamic total engagement score.

Using JMP and Excel, we tested the engagement score against actual measures of whether the member renewed NCACPA membership. We found that all the variables in the engagement score are significant but that the model can be improved to put more weight on developing more consistent data and focusing on donations and participation in CPE Events.

We recommend that the NCACPA continue to use the engagement score, but adjust weighting in order to enhance statistical significance. This can be accomplished by increasing the point values for CPE events and donations, since these two variables were considered the most significant by all three models that we ran.

Furthermore, the analysis is only as good as the data source, and we observed opportunities for data clean-up which we believe will provide a more accurate predictive model.

We would recommend sending out a survey to gather additional information from members to help fill in missing data, which will lead to a more accurate analysis. We believe targeting members that are in their third year of membership would be ideal since this group tended to have a greater likelihood of not renewing. We also recommend providing an opportunity for members to give feedback after events so they can state the aspects that they believed to be beneficial and where they think that event could use improvement.

Table of Contents

Introduction

The NC State Student Team

The student team is composed of Lexy Garrett, Nidal Redpath, and Andrea O'Connell. We are all seniors majoring in Business Administration and are enrolled in the Data Analytics Honors Program in the Poole College of Management at NC State University. The program is composed of a series of five courses that introduce us to a variety of analytical platforms. Along with gaining an understanding of the tools that are available to collect and manipulate data, we also develop the necessary skills to transform the analysis into business decisions for the end user.

The NCACPA

The North Carolina Association of Certified Public Accountants provides leadership training, networking opportunities, and connects members to their statewide professional community through regional, interest-based, and committee activities. They also offer their members CPE discounts, reduced rates on products and services, an on online job board, and many other benefit programs.

The NCACPA has over 15,000 members in their database. They market to over 18,000 CPA's in North Carolina, but also have members outside of North Carolina. The organization estimates that there is an untapped market of 8,000 CPA's within North Carolina that they would like to target. Based on the available data, their member community includes 4,733 males and 4,319 females, while the remaining are unknown. There are a total of 1,742 recorded CPA's, about 1,500 student members, and about 1,000 members that live out of state.

The majority of the NCACPA members reside in the cities seen in the graph to the right, with Raleigh and Charlotte almost evenly matched for the most members. The age range for NCACPA members spreads from 16 to 80+ with a normal distribution, however the majority of their members range from 45 to 65 years old.
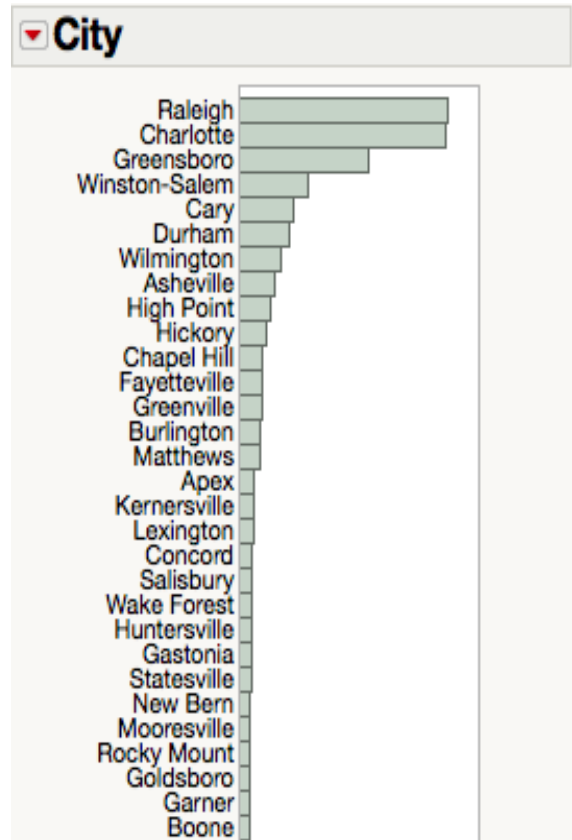
Member Region

Project Background

The Member Engagement Team has a mission of cultivating an involved and satisfied member community. The NCACPA's first goal is to retain current members, while the second priority is to attract new members and reconnect with members who have not renewed. With more members joining the organization every year (see graph below), it is important to understand

how best to retain and engage these members. In order to assist the NCACPA team with their vision, the NC State Practicum team has analyzed the provided data to form an engagement score. An engaged member understands the mission of the NCACPA and supports the growth of the CPA profession by investing their time and/or money with the association.

With this in mind, our team used the provided key performance indicators (KPIs) for an engaged member and compiled an engagement score. By knowing these internal engagement scores, we can see where various members of the organization fall.

The KPI's included Events, Volunteers, Digital Engagement, Contributions, and Leader Points. The distribution of point values are as follows:

- Events (this includes CPE, non-CPE, community service) – 50%
  - 0 events = 0 points
  - 1 event (or up to 8 hours CPE) = 10 points
  - 2 events (or 9-16 hours of CPE) = 20 points
  - 3 events (or 17-24 hours of CPE) = 30 points
  - 4 events (or 25-32 hours of CPE) = 40 points
  - 5 events (33-40 hours of CPE) = 50 points

- Volunteers – 25%
  - Committees/Groups
  - No committees/groups = 0
  - 1 committee/group = 10
  - 2+ committees/groups = 25

- Digital Engagement – 15%
  - Connect – Activate account = 5 points
  - Volunteer Match – opting in = 5 points

- Contributions – 10%
  - No donations = 0 points
  - $1-$200 = 5 points
  - $201+ = 10 points

- Leader Points = +5 points for each (up to 10 total)
  - Board of Directors
  - Committee Chair

Project Deliverables

Member Engagement Score - Tableau

Through the NCACPA server, we cross-referenced multiple data sources in Tableau using our unique identifier, Customer Key. We then created calculated field dimensions to total up an engagement score for each NCACPA member. The dimensions used to create these fields can be found in the Appendix. Each member's engagement score is composed of five categories, which include their online activity, undertaking of leadership roles, financial contributions, attendance at NCACPA events, and committee involvement. Each member has been assigned points that correlate with the amount they have contributed to the aforementioned categories.

The online points are assigned based on whether members have activated their account and opted in for volunteering within the organization. If a member has activated their account they were assigned 5 points and if they also signed up to volunteer they were assigned an additional 5 points. Leadership points are assigned based on whether a member currently holds a leadership role. The member is assigned 5 points for each leadership role, however there is a limit of 10 points. Donation points are assigned based on the total amount a member has donated to the organization. If a member has donated between $1 and $200 dollars, they would be assigned a total of 5 points, and if the member has donated greater than $200 dollars they would be signed 10 donation points.

Event points are distributed based on the total amount of CPE hours the member as attended. The range of points a member is able to acquire from the events category ranges from 0 points to 50 points, which is available for reference in the Points Formula Table in the Appendix. The volunteer points are calculated based on the number of committees or groups in which a member participates. If a member has joined at least one committee or group they were assigned 10 volunteer points, however if they were in two or more committees or groups, then they were assigned 25 points in this category. Each category has been customized with their own point formulas and filters, which can be seen in the Point Formula Table in the Appendix.

The table also shows the date filters that were applied in order to populate current members. Each category in Tableau is fully adjustable, in that the NCACPA is easily able to alter the date ranges for the data and reallocate the points assignment for each member.

A screenshot from our engagement dashboard can be found below. In this visualization, all the customer keys are aligned with each of the 5 KPI's and the total engagement score. The customers are sorted in descending order, so that the members with the highest total score are currently being shown in the screenshot. The columns are shaded so that the darkest columns contain the highest values. Based on this, we can see that members with a high total engagement score typically have most of their points residing in the categories of events, volunteering, and, donations.

We aggregated each member's points for all five categories into a dynamic dashboard filtered by date (see Appendix) that can be used to evaluate engagement scores. Using the filters on the right, members can be sorted by whether or not they renewed. The filters on the right side of the dashboard can be used to view different versions of the dataset. By selecting all boxes, the user will see every member in the database. If "0" is selected for each filter, then only data for members who did not renew will appear. On the other hand, selecting "1" on each of the filters will populate data for members who did renew.

The screenshot below provides insight into how many points each customer received for the individual categories. While only volunteer and donation points are shown below, the structure is the same for the remaining point categories. This view allows the user to observe the distribution of point values for each category by member.

Volunteer Points

Customer Name (NCACPA ..	
Alex Lehmann	25
Allan Clayton Kitchen, CPA	25
Carol Lynn Kirchhoff, CPA	25
Charles Raymond Powell, ..	25
Daniel Ross Overcash	25
Darin Lee Curtis, CPA	25
Dr. Andrea K. Biddle, PhD	25
Dr. Kevin J. Misenheimer	25
Dr. Linda L. Poulson, CPA	25
Dr. Pamela J. Strickland	25
Dr. Robert Deutsch, PhD, ..	25
Dr. Roby B. Sawyers, CPA,..	25
Han Sun, CPA	25
Joseph Barton Stone	25
Kevin Michael Maxwell, C..	25

Donation Points

Customer Name	
AICPA	10
Alabama Societ..	10
Dixon Hughes ..	10
James E. Garve..	10
John D. Adams ..	10
L. Samuel Willi..	10
Mr. Andy Jacobs	10
Mr. Arthur McK..	10
Mr. Austin Pen..	10
Mr. Brian A. Da..	10
Mr. Charles Ed..	10
Mr. David Jess..	10
Mr. David Lee A..	10
Mr. David N. Sn..	10

Renewals - Excel and JMP

Please reference the charts below in order to see an aggregation of how many members fell into each point bin based on our KPI's. The first chart shows the point distribution for all members that are in the database. The chart on the right is filtered by year, so that only those who were classified as members in the past year (FY 17) are shown.

All Time

Donation		Volunteer	
0	7,215	0	17,316
5	11,130	10	1,116
10	856	25	769

Digital Engagement		Events	
0	18372	0	2590
5	829	10	508
10	20	20	618
		30	521

Leader			
0	17,317	40	383
5	1,115	50	14581
10	769		

Filtered by Year

Donation		Volunteer	
0	3794	0	8528
5	4854	10	271
10	436	25	285

Digital Engagement		Event	
0	8235	0	1206
5	829	10	255
10	20	20	298
		30	255

Leader			
0	8527	40	160
5	271	50	6910
10	286		

When looking at how many years a member stays at the NCACPA, we noticed several trends. The first is that an overwhelming number of members have been with the organization for 13 years. We believe that this may be the result of customer data being imported into the database

Member Length
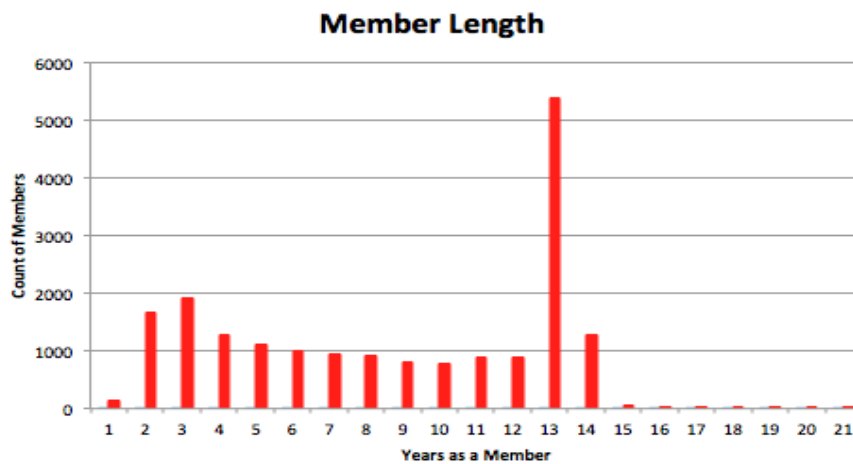
13 years ago, or simply the occurrence of a data error. We also found that people are most likely to discontinue their membership with the organization after three years. We suspect that this could be attributed to the fact that many professionals leave the field of public accounting at this stage of their professional careers.

Using a data set of the engagement score and actual event data (donations in dollars, number of CPE hours, online activity, number of committees, and number of leadership positions) with the date filters in the appendix, we ran a logistic regression in JMP. We began analyzing the data by running a model that showed us how each of the 5 categories that we defined as KPI's affect member engagement. These results allow us to discern what contributes to the likelihood that a member will renew their membership with the NCACPA.

The results of the first model showed us that donation points, event points, and online points are the significant variables in determining whether a member is more likely to renew their membership with the NCACPA.

Parameter Estimates

Term	Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept	-1.432392	0.0428617	1116.8	<.0001*
Donation Points	-0.1583644	0.0121101	171.01	<.0001*
Event Points	-0.050075	0.0117919	18.03	<.0001*
Online Points	-0.1669615	0.0538503	9.61	0.0019*
Volunteer Points	-0.0503557	0.1037134	0.24	0.6273
Leadership Points	0.02688191	0.2436952	0.01	0.9122

We also discovered that leadership points and volunteer points were directly related to each other, shown through the correlation matrix below. In order to eliminate multicollinearity, we took out the variable leadership points.

	Donation Points	Event Points	Online Points	Volunteer Points	Leadership Points
Donation Points	1.0000	-0.0829	0.0426	0.1186	0.1152
Event Points	-0.0829	1.0000	-0.0155	-0.0173	-0.0175
Online Points	0.0426	-0.0155	1.0000	0.0159	0.0164
Volunteer Points	0.1186	-0.0173	0.0159	1.0000	0.9965
Leadership Points	0.1152	-0.0175	0.0164	0.9965	1.0000

The results of the second version of the model we ran can be seen below. With this model we used the NCACPA's raw data for each of the 5 categories.

Parameter Estimates

Term	Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept	-0.8361666	0.0410911	414.09	<.0001*
CPE Events	-0.1561358	0.0074925	434.26	<.0001*
Volunteer Events	-0.4106706	0.1490909	7.59	0.0059*
Online Events	-0.4225306	0.2799472	2.28	0.1312
Donation Events	-0.0292174	0.0061534	22.54	<.0001*

The second model showed similar results, however, it revealed that based on the original data, volunteer events is actually a more significant predictor than online events in determining if a member will renew. This model produced a higher R-Squared Value (which tells us how well the model interprets the data). The second model also had a lower standard deviation of error, and a lower root square mean error than the first model, which reinforces the conclusion that the second model that we ran was more predictive of membership renewal. The reason behind the second model producing slightly better results than the first is due to the increased detail of the raw data. The first model used data that was simplified in order for the data to be more easily interpreted.

The NC State Team also decided to run the raw data through another model using decision trees in order to verify the results, which can be seen in the Appendix. The decision tree model verified that members who spend less than one hour in CPE Events and donate between 10 and 25 dollars are less likely to renew their memberships with the NCACPA. Overall, the most important variables the NCACPA staff must focus on should be the amount a member donates and the number of CPE Event hours they have accumulated.

NC STATE UNIVERSITY
POOLE COLLEGE OF MANAGEMENT

Conclusions

Overview

Overall, the engagement score system provided from the NCACPA is an accurate predictor for member engagement. However, since all of the variables were not statistically significant predictors of renewals, we suggest increasing the point value assignment for events and donations since these were the only two variables that consistently showed up as significant predictors of likelihood of renewal across all three models that we ran. We also recommend a further analysis be completed on the reasoning behind leadership and volunteer points being directly correlated to each other.

Limitations

As with most large data sets, we ran into some inconsistencies between several of the dimensions and measures. For example, the "CPE bins" field would populate as zero for some customers, but when we cross referenced that with the "Total CPE" field, it was found that the customers actually had completed CPE hours. Furthermore, we found that the "New Renewed Calc" field was not complete in that it would show a blank for whether or not a customer renewed, but when we checked the "membership pay date" field we saw that they had completed their payment for the year.

As shown in the image below, a similar issue arises in which a customer is identified as "New," however they are not categorized as a "Current Member" and are shown to have expired in 2015. Due to this situation, we frequently tested many alternatives in order to find the fields that are the most accurate and complete. Based on our tests, we believe we are currently running our analysis using the fields that most thoroughly and accurately capture each customer's information.

Renew VS. Non Renew

Customer Key	***RENEWE..	Year of Join..	Year of Expi..	Membershi..	Current Me..	Null	Lapsed	New	Past Due	Pro-Rate	Rejoin	Renewed
0E8F142-6827-4D70-..	0	2016	2016	2016	*					50		
70FC8863-65EF-469A-..	1	Null	Null	Null	0	55						
71B73948-1FD4-481D..	1	2009	2017	2017	*							55
71BAE390-D1F6-4219..	1	2005	2017	2017	*							55
71E53EE5-E866-4040-..	0	1998	2015	*	*							70
	1	1998	2017	2017	*							70
71F9B852-5A47-4AEA..	1	2010	2017	*	*							50
71F9D3F1-B4B4-4771..	1	2011	2017	2017	*							90
72BBD9FA-1DD5-4C8..	0	2007	2015	*	*							75
	1	2007	2017	2017	*							75
72E4DCD3-4D3D-42D..	0	2014	2015	*	*			50				
73D976BF-5B2E-4B83..	1	2007	2017	2017	*							55
73E452BA-A9D7-42A1..	0	2001	2015	*	*							55
73E72844-AAAD-4A69..	0	1996	2015	*	*							55
	1	1996	2017	2017	*							55
73F5ABB2-B448-4A37..	0	1991	2016	2016	*							90
	1	1991	2017	2017	*						90	
74E8BA47-F680-4029-..	0	2006	2015	*	*							55
	1	2006	2017	2017	*							55
74FBA4B2-3AFA-4703..	0	2001	2016	2016	*							55
	1	2001	2017	2017	*							60

New Renewed Calc (column group header above Null, Lapsed, New, Past Due, Pro-Rate, Rejoin, Renewed)

In order to only show sample data for current customers, we had to filter by date. As seen in the Appendix, there was not a date field that corresponded with all dimensions. In order to combat this, we applied the appropriate date fields into our filter that matched with each field we were using. The use of various date fields may have influenced how the data populated and the overall outcomes.
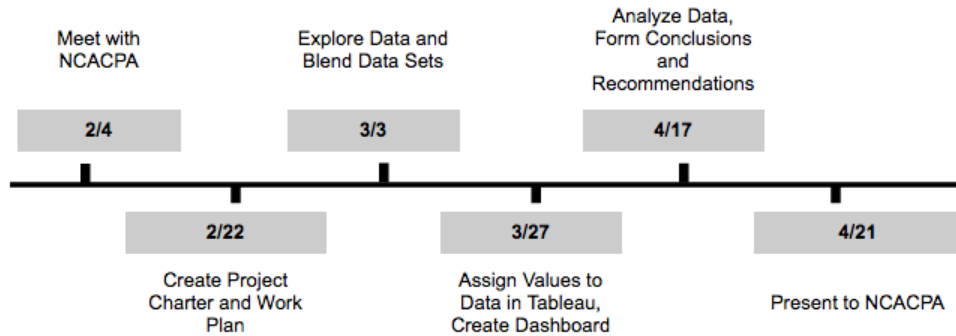
With any project, there are constraints with time and money. Due to the structure of the school year, our analysis was limited to a two-month time frame, which limited the extent of data cleanup and variable analysis we could complete. Although the software was only available on one device, we were able to find a few times each week to review and analyze the data. In regard to the analytical platform being used, our knowledge is still developing, so we reached out to many resources (including professors and online forums) in order to optimize the insights we were able to develop. While our team did not have an allocated budget for the project, we did not feel that this factor contributed to the outcomes we were able to produce.

Recommendations

- Improve point assignment system
  - We suggest increasing the point assignment for CPE and Donations since these two variables were considered significant by all three models.

- Data Cleaning
  - We recommend a more extensively defined data dictionary
  - Standardize year dates to either fiscal year or calendar year
  - Evaluate which fields are the most accurate and comprehensive and consider removing or editing the fields that have superior alternatives (Ex. "Total CPE" is more exhaustive than "CPE Bins")

- Consider sending out a survey to get more information from members to help fill in missing data
  - Incentivize members by telling them that those who complete the data will be entered into a giveaway/drawing

- Target members that are in Year three of their membership
  - Offer a discount for the following year
  - More heavily market the benefits of the organization outside of CPE to this group

- Get feedback from events that the organization holds and use that to gauge whether similar events should be scheduled. This can help identify what members find useful about the events, and what they think should be improved. Adding the data to Tableau can also allow further analysis on the success of events.

Appendix

A. Project Timeline

B. Project Scope

ncaCPA ®   **Measuring Membership Engagement**

Project Background
NCACPA is currently working with their membership database vendor, Abila, to implement an A-Score for their staff to be able to measure membership engagement in order to retain current members, while being able to attract new and old members.

Objectives
- Measure membership engagement of current and past members
- Determine how to retain memberships
- Offer recommendations for attracting and retaining new memberships.

Deliverables
- Create a tool in order to measure membership engagement
- Recommendations for measuring current and future membership engagement.
- Develop a dashboard that allows the team to easily view and manipulate current membership variables

Scope
- Analyze which factors will most accurately determine who will be an active ncaCPA member
- Work based on historical and current ncaCPA membership data

Result:

Determine the most efficient way to retain members and attract new and old members.

Team Members
- **NCACPA Sponsor:** Jennifer
- **NCACPA Lead:** Nikki Vann
- **NCACPA Team Members:** Mark Soticheck, Holly Bazemore, Kelly Baker
- **NCSU Faculty Advisor:** Bruce Branson
- **NCSU Student Team Members:** Alexis Garrett, Andrea O'Connell, Nidal Redpath

C. Points Formula

Unique Identifier: Customer Key			
Name	**Formula**	**Date Filter**	**Date**
Online Points	Sign up Volunteer = 5pts Activate Account = 5pts	Recent Activity Date	Null, 2016, 2017
Leadership Points	Leadership Role YN Count > 1 = 10 pts Count > 0 = 5 pts	End Date	Null, 2017, 2018, 2019, 2020
Donation Points	Sum > 200 = 10 pts Sum >= 1 = 5 pts	Pay Date	Null, FY 2017
Event Points	CPE Bin 1-2 = 5 pts CPE Bin 3-4 = 10 pts CPE Bin 5-8 = 20 pts CPE Bin 9-16 = 30 pts CPE Bin 17-24 40 points CPE Bin 25-40 50 pts	Event End Date	Null, FY 2017, FY 2018
Volunteer Points	Committee >=2 = 25 pts Committee = 1 = 10 pts	End Date	Null, 2017, 2018, 2019, 2020

D. JMP Decision Tree