DSO-545: Final Project

311 CALL CENTER TRACKING DATA FOR CITY OF LOS ANGELES

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EXECUTIVE SUMMARY

The city of Los Angeles tasked Marshall students from the University of Southern California with analyzing its 311 call center tracking data, which includes records of over 3.5 million service requests from 2016. Our objective was to explore the datasets provided and determine inequalities in the distribution of service requests and services delivered. Group 4 analyzed the data using statistical computing and data visualization methods, such as bar charts, line graphs, regression analysis, and heat maps to return an optimal evaluation of key performance indicators to our client.

PROBLEM STATEMENT

Traditional call centers rely primarily on person-to-person transactions, such as calls and walk-in appointments. While these types of interactions are imperative for businesses like the city of Los Angeles, they are also the most costly ways of recording a request in terms of labor hours, wages, and fixed assets. According to the data provided by the city of Los Angeles, customers have the option to place service requests from 16 different sources **(see Exhibit 1 for full list of request sources)**. In 2016, 60% of all service requests came from calls and only 18% came from digital channels.

Service Requests from Calls

According to the data provided by the city of Los Angeles, calls represented 60% of the total number of service requests in 2016 (MyLA311, 2016). Assuming that the average call time takes 5.97 minutes, the city of LA spends approximately 30,000 hours on calls per month and 355,000 each year (Carlaw, 2010). The time spent on calls represents $9 million in annual wages (Bureau of Labor Statistics, 2016) If even 10% of these calls result in customers receiving incomplete or inaccurate information, the impact to the city of Los Angeles is upwards of $900 thousand each year.

Service Requests from Digital Channels

In 2016, service requests from digital channels, such as the mobile app, Twitter, web forms, and email, accounted for approximately 18% of the total request volume. Mobile app

requests represented the highest volume category of the digital channels, but only accounted for 14% of the total volume. A key challenge we identified is the issue of the MyLA311 mobile app's position in the App Store. Currently, if a customer searches for "311" as an LA resident with location services on (so the software will know), the MyLA311 app occupies the third or fourth position, well below the fold, leading to a higher bounce rate of individuals already aware of and considering downloading the app **(see Exhibit 2 for search results)**. Similarly, the search term "myla" returns the MyLA311 app as the second result, which is also below the fold. Furthermore, there is a conspicuous absence of any ratings or reviews.

Digital requests can be completed quickly and conveniently, regardless of schedule. Considering that 95% of Los Angeles residents are employed, it is probable that most of those 7.6 thousand people do not want to take extra time to visit or call and potentially wait on hold to resolve an issue (Bureau of Labor Statistics, 2016). Many businesses that are reliant on call centers

OPPORTUNITY

We believe there is a significant opportunity for the City of Los Angeles to improve its digital service offerings in order to increase the number of crowdsourced maintenance requests, increase the average handle time, and improve customer satisfaction. Digital requests from Twitter, web forms, email, and the mobile app can all be submitted conveniently and cost effectively through a customers' smartphone, a device approximately 75% of all Los Angeles residents currently have and use (Nielsen, 2014). Digital requests can be completed quickly and conveniently, regardless of schedule. Considering that 95% of Los Angeles residents are employed, it is probable that most of those 7.6 thousand people do not want to take extra time to visit or call and potentially wait on hold to resolve an issue (Bureau of Labor Statistics, 2016).

ANALYSIS & KEY FINDINGS

To better understand the call center tracking data, we examined overall volume of requests from 2016, and then analyzed the request channels sources and request types. We used statistical computing and data visualization techniques to explore and display the data and illuminate hidden insights. In terms of our methodology, we began by exploring the channel types, services, and daily frequency before comparing calls and mobile app requests, and ultimately examining historical digital channel performance.

Exploration

Top 5 Request Channels by Volume

First, we wanted to understand the channels through which customers can place service requests, so we looked at the five largest channels by volume. Since the request channels are categorical variables, we used a bar chart to visualize the data **(see Figure 1)**.

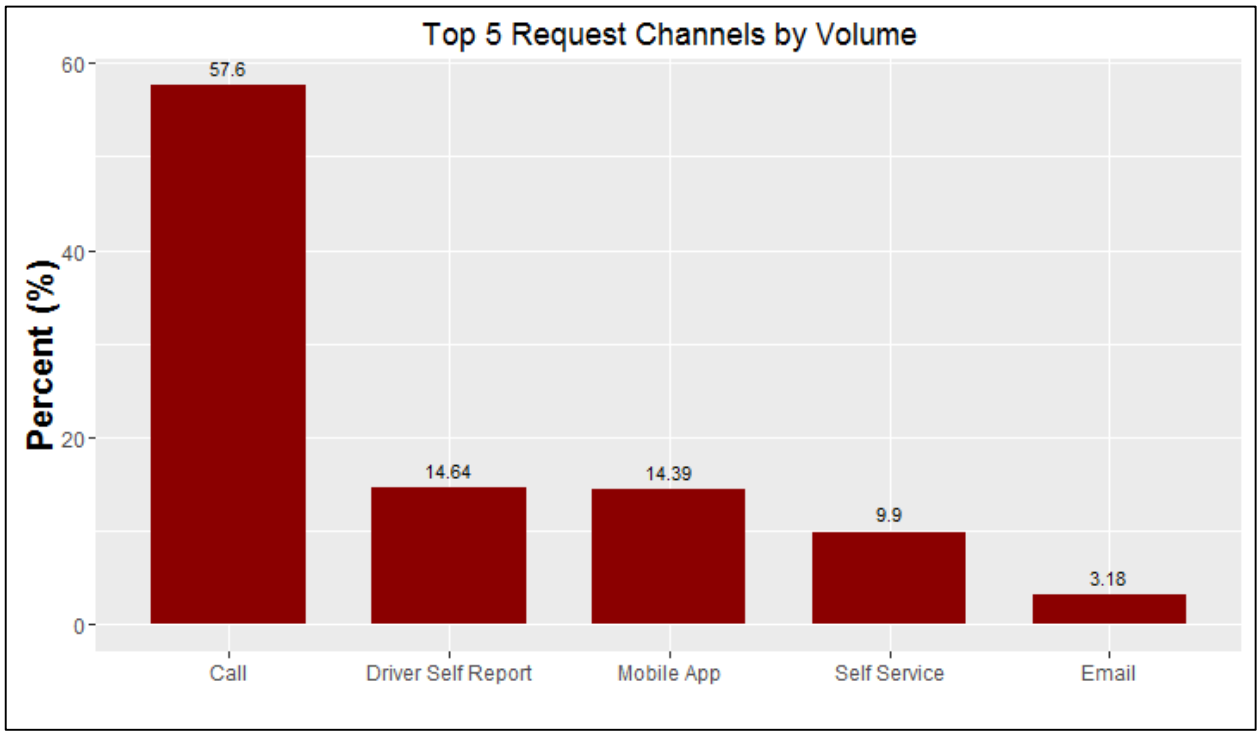


Fig. 1: Distribution of Customer Requests Among Top 5 Channels

From our analysis of the top 5 request channels by volume, it is clear that calls represent the largest proportion of the total request volume, followed by requests from driver self reports, mobile app, self service, and e-mail. The results of the analysis motivated our team to further delve into the types of services that drive these channels, but keeping focusing on the inequalities between call and mobile app requests.

Top Service Types by Request Source

To understand what types of services are driving requests within these channels, we created a stacked horizontal bar chart to visualize the data **(see Figure 2)**. We did not include graffiti removal, because most requests were driven by self reports, and therefore does not help us understand current inequalities in the distribution of call and mobile app requests.

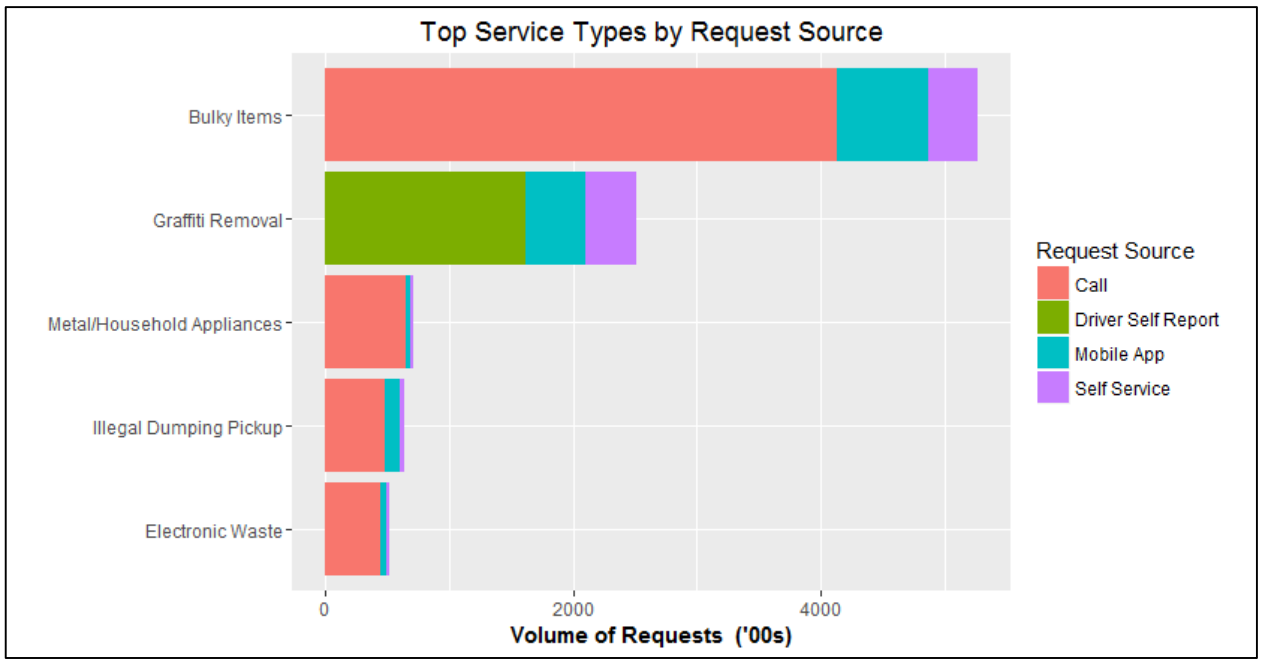


Fig. 2: Distribution of request sources by most requested service types

The categorical variables along the y-axis represent the five most frequently requested services and the colors represent the method of requesting the service. The service types are represented from most requested to least requested, with bulky items being the most requested and electronic waste as the least. Bulky items represent nearly 50% of total requests, graffiti removal accounts for 25%, metal/household appliance had 7%, illegal dumping with 6% and electronic waste with 5%.

From the graph, we can see that four of the five most requested services are most frequently requested via phone calls, except for graffiti removal, which is mainly requested by driver self reports. Mobile app requests are the second largest request source for all service types, but its relative size to calls makes observing its prominence difficult. Overall, mobile app requests are still low and indicate an opportunity for improvement.

Daily Requests of Top 5 Request Sources

To better understand the distribution of requests by day, we created a bar graph to show the percentage of request sources by day **(see Figure 3)**. Each day displays grouped bar graphs that correspond to a specific source according to color and volume of requests for that day.

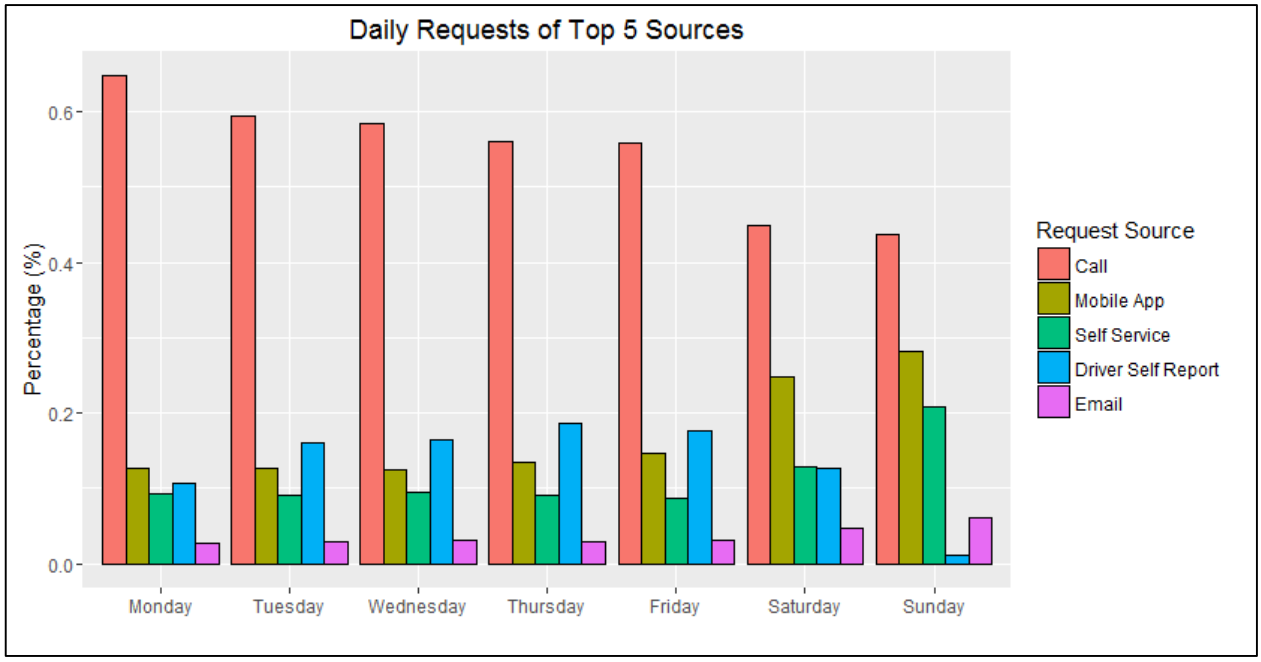


Fig. 3: Distribution of top request source volume by day

In an analysis of the daily requests from the top five sources, calls are still clearly the most frequently utilized form of placing a service request for each of the seven days of the week. However, the change in the proportion of request sources per day changes drastically during the weekend. During the weekend, the proportion of 311 calls drop to 40% of total request volume, while that of mobile app requests increases to approximately 30%. Similarly, self service and driver self reports drop on Saturdays and Sundays, while email requests increase during this time.

Calls versus Mobile Requests

2016 Monthly Changes in Call and Mobile App Request Volume

After understanding the top performing service channels and most frequently reported service types, the team decided to take a deeper look at the top performing request source (calls)

and the source of interest (mobile app). To visualize the volume of call and mobile app requests during 2016, we created a line graph to show the performance of these channels over time **(see Figure 4)**.

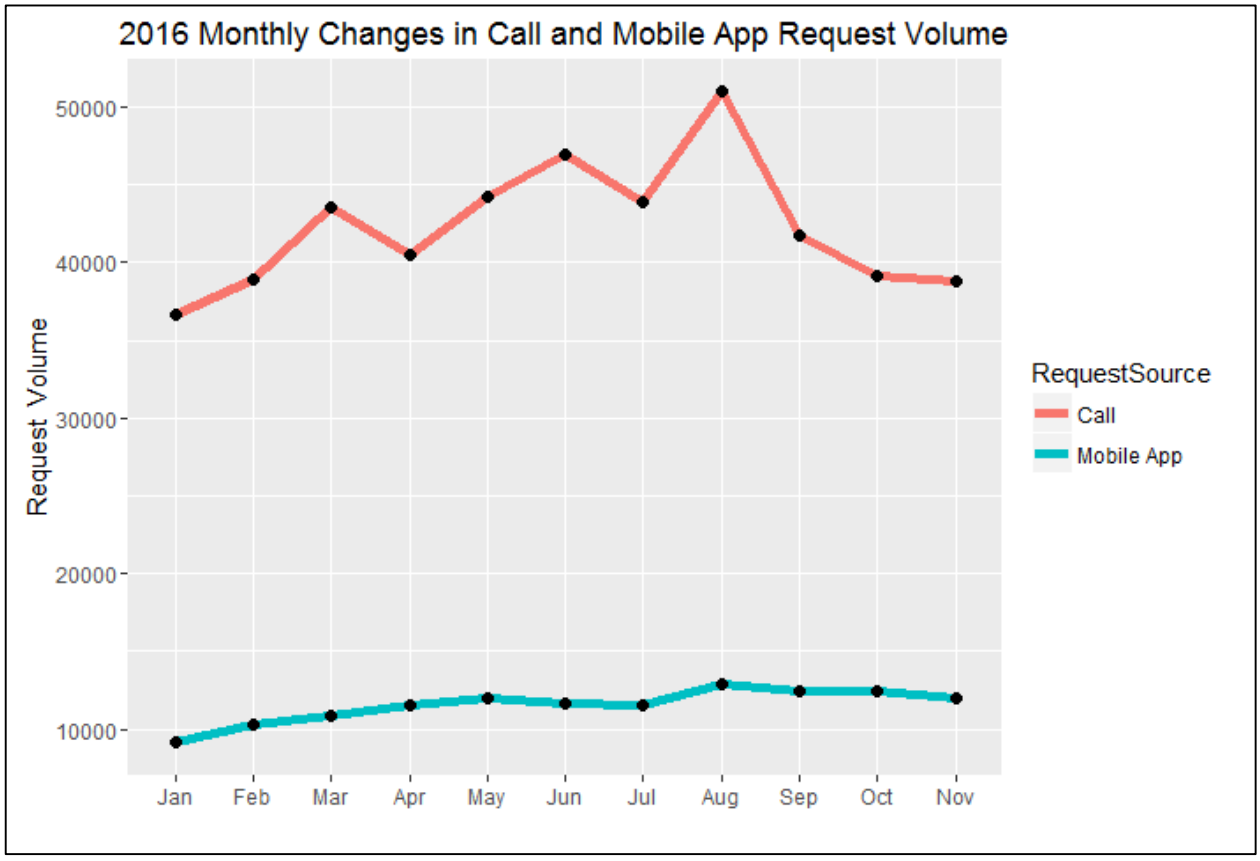


Fig. 4: Distribution of monthly call and mobile requests in 2016

From the graph, we can see that both calls and mobile app requests follow an overall upward trend, with a decline in requests from June through July and from October through the end of the year. The pattern of the overall graph reflects the seasonality of overall requests, implying Los Angeles residents are perhaps out of town or on vacation during these times and therefore cannot request or do not care to request.

Request Volume by Service Type

Looking further into the request volume via phone calls and the mobile app, we generated a histogram to compare the distribution of services requested for both channels **(see Figure 5)**.

The graph contains color coded bars to reflect the service type requested and plots the number of requests for each type.

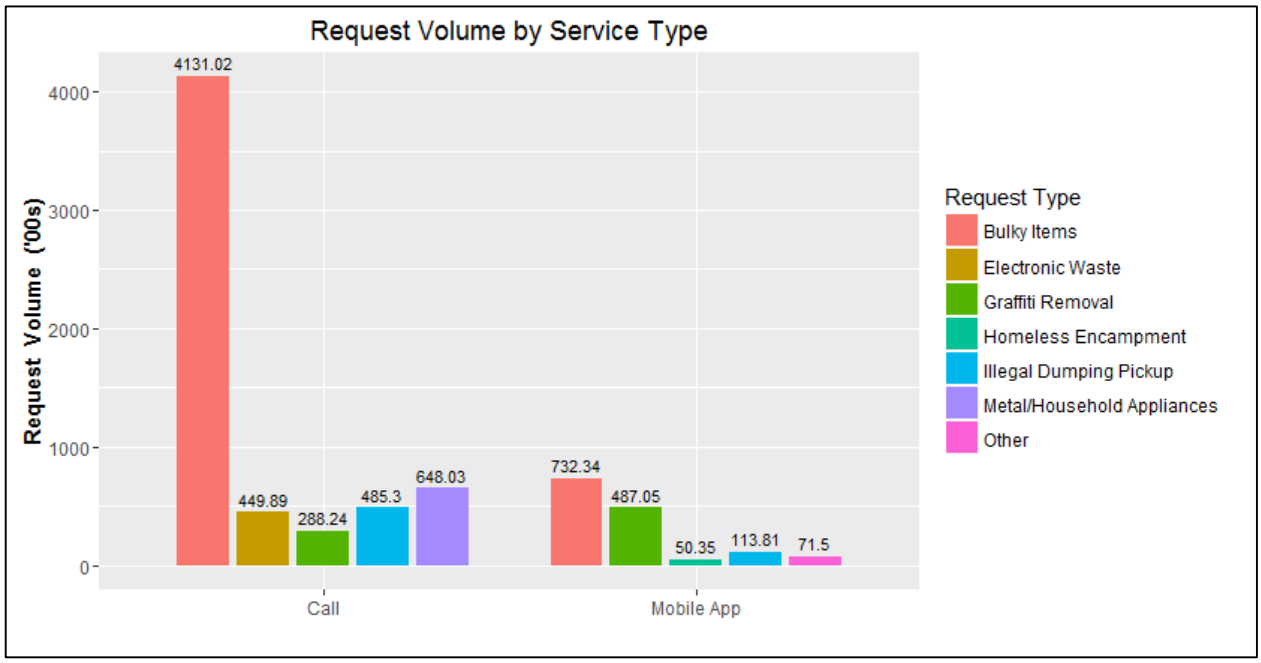


Fig. 5: Comparison of the number of service type requests via calls and mobile app requests

According to the graph, bulky items represent the highest volume of requested service types—this finding is not surprising given that bulky items account for half of all requested service types across all methods of requesting a service. Graffiti removal is the second largest requested service type, accounting for 25% of total requests, and after removing the driver self reports, it is clear that this service is more frequently reported via the mobile app instead. In fact, mobile app requests of graffiti removal are nearly double that of call requests. The second highest ranking service type for calls is electronic waste removal, which is virtually unrepresented by mobile app requests.

Geographical Distributions of Request Volume for Calls and Mobile

In order to see the geographical distribution of service requests made through calls or the mobile app, we created heat maps for both request sources **(see Figure 6)**. The graphs are plotted over a Google Map of Los Angeles County and display the relative frequency of requests by location, indicated by the strength of the tile color. The graphs are shown side-by-side for ease of comparison.

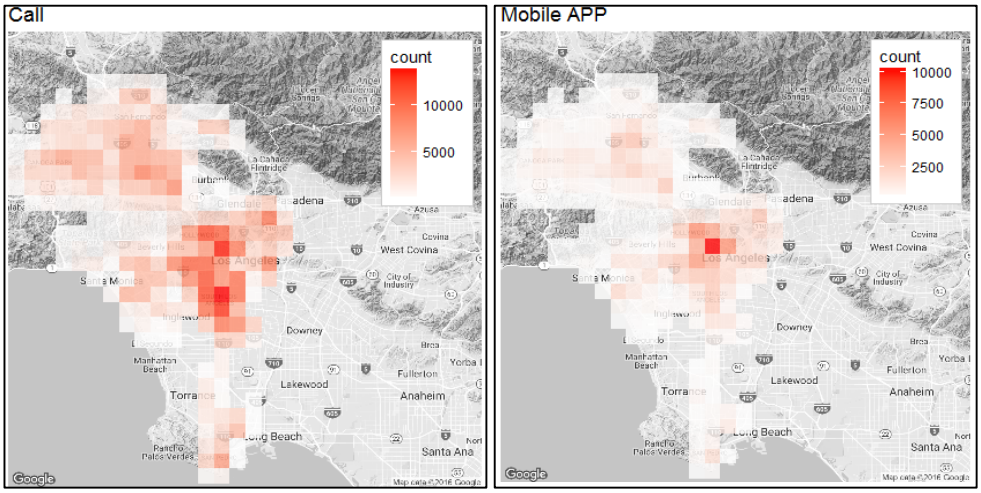


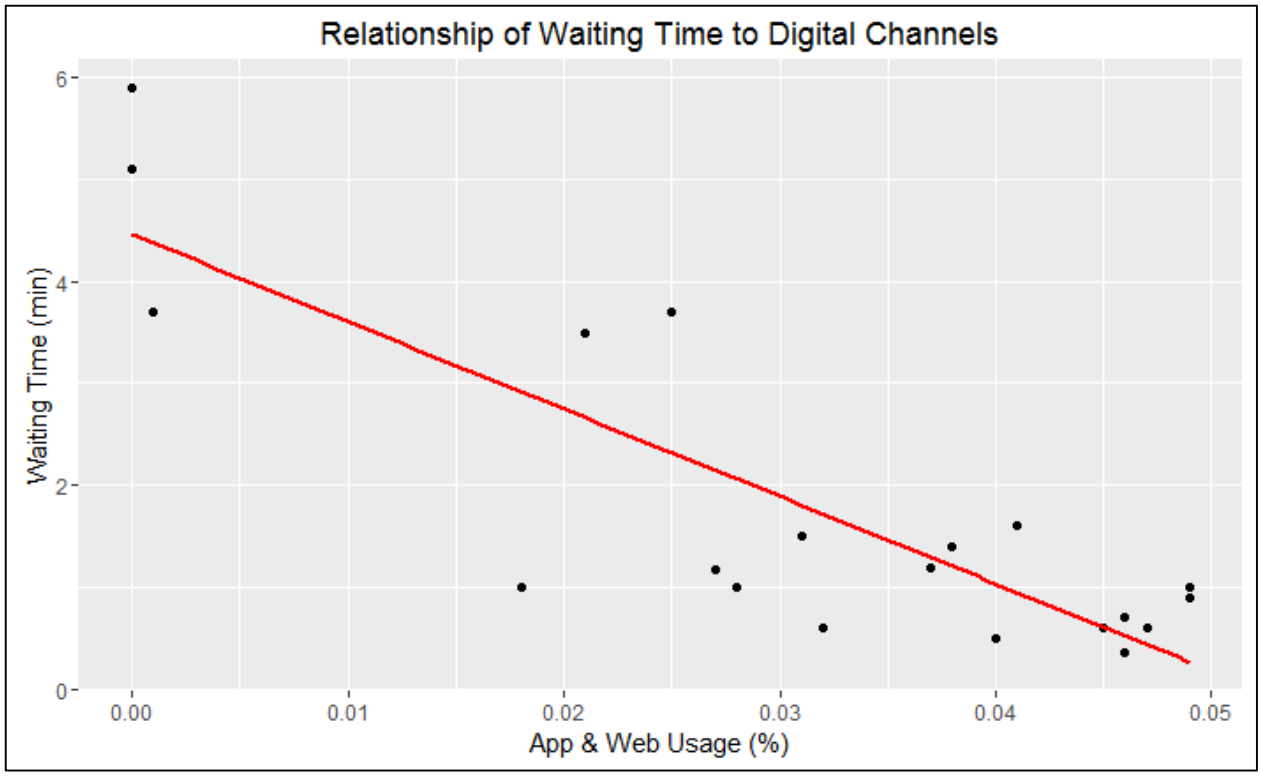
Fig. 6: Comparison of the request volume for calls and mobile app

According to the graphs, both call and mobile app usage were highest in Northeast Los Angeles and in Downtown Los Angeles; however, call request volume is more widely distributed throughout the county, while mobile app requests centralize around Downtown Los Angeles. From the comparison, it is clear that mobile app is better received in Downtown Los Angeles as opposed to other areas throughout the county, as usage is highest, indicating a greater willingness to try the app. Since requests are infrequently placed through the mobile app in Northeast and Southwest Los Angeles, these locations represent an opportunity to target potential new users.

Digital Deep Dive

Relationship of Waiting Time and Select Digital Channels

In order to further understand the potential of digital channels, we combined the request data from the mobile app and web form sources for analysis. To analyze the relationship between the rate of requests from the selected digital channels and the average customer wait time, we generated a simple regression model **(see Figure 7)**. A simple regression models show the degree of correlation between the independent variable (in this case, the selected digital channels) and a response variables (in this case, the average waiting time).




```
Call:
lm(formula = WaitTimesseconds ~ RequestsbyAppWeb, data = line)

Residuals:
     Min       1Q   Median       3Q      Max
-115.129  -34.209    4.688   38.565   86.417

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)        267.58      26.56  10.075 7.95e-09 ***
RequestsbyAppWeb -5136.32     762.68  -6.735 2.59e-06 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 53.76 on 18 degrees of freedom
Multiple R-squared:  0.7159,    Adjusted R-squared:  0.7001
F-statistic: 45.35 on 1 and 18 DF,  p-value: 2.595e-06
```

Fig. 7: Regression analysis of rate of requests from two digital channels and waiting time

According to the model, the independent and response variables are highly correlated, as evidenced by the multiple R-squared of 0.72. The relationship between the rate of requests from the digital channels and the waiting time explains 72% of all changes in waiting time. The negative sloping regression line illustrates the trend that as the rate of digital requests increase, the waiting time decreases. More specifically, a customer will have an average waiting time of

under 50 seconds, if the rate of digital requests is 45% of total request volume. Therefore, in can be inferred that increasing the number of requests through digital channels can significantly improve key performance indicators, such as customer satisfaction and the city of Los Angeles' average handle time.

Monthly Request Volume from Web Forms and Twitter

Stemming from our regression analysis of the impact of increasing requests through digital channels on wait times, the team was interested in the relative volume of requests through web forms and tweets. To visualize the relative request volume from these two sources over time, we created a line graph plotting the number of requests each month of 2016 **(see Figure 8)**.

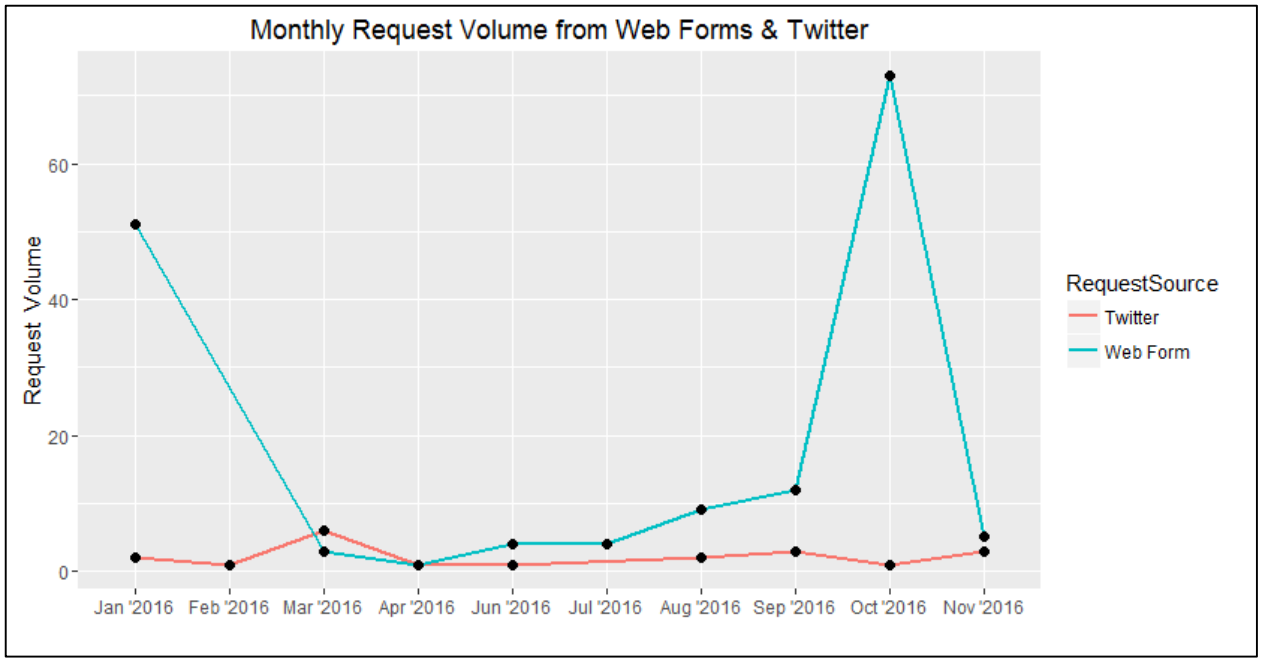


Fig. 8: Comparison of the monthly request volume of web and twitter during 2016

The graph of service request volume from web forms and Twitter shows an inverse relationship between the two request sources. As Twitter requests reached its highest point in March, requests from web forms were continuing to decline—the lowest point of which, surprisingly converges with Twitter's request volume in April. As requests from Twitter continue to generate a relatively low volume of requests throughout the remainder of the year, requests from web forms continually increase, with the steepest increase occurring in October. However, the total volume from both sources combined only account for 0.02% of total request

volume, so more requests through these channels are needed in order to provide a meaningful analysis.

RECOMMENDATIONS & CONCLUSION

Recommendations

Recommendation 1: Increase Awareness of MyLA311 Mobile App

As consumers search for apps in the App Store and Google Play, key search terms should be optimized to assist in moving customers through the funnel. Since push notifications have already been enabled, encourage users to rate and review the app after downloading. Additionally, an awareness campaign in bus stations, metro stations, and other public areas where people are on their phones and not in their cars would be beneficial. By directing people to the app store to download and featuring key functionality in the app, downloads and placement in the App Store and Google Play will undoubtedly improve.

Recommendation 2: Increase Engagement of MyLA311 Mobile App Users

Because of the MyLA311's popularity in Downtown LA and the prevalence of graffiti in the area, the city of Los Angeles should launch an engagement campaign to encourage increase app usage. Highlighting key capabilities, such as requesting graffiti removal, in the Downtown Los Angeles area, would encourage users who have downloaded to increase the rate of requests on this easy-to-manage channel. Furthermore, Downtown Los Angeles has significant foot traffic and more businesses than other parts of the county, so residents in the area represent an opportunity to convert business professionals through traditional and cost effective media, such as posters and flyers, throughout the area.

Recommendation 3: Increase Conversion of Web Form and Twitter Requests

Because of the correlation between selected digital channels and the average customer waiting time, the city of Los Angeles should leverage the utility of all digital channels. Although we were not able to prove the efficacy of Twitter with respect to the current volume of requests, many firms have found the social media channel to be effective for handling customer service

requests. Similarly, the city of Los Angeles' Twitter account could be a significant driver of service requests in the future. Because of its virtually zero downtime and upkeep, encouraging residents to use this platform could reduce the labor and average handle time.

Conclusion

The city of Los Angeles provides a series of valuable services to its residents, of whom it relies on to crowdsource requests through various service request sources. This reinforcing cycle will only be made stronger by enhancing its multi-channel contact center model through the implementation of enhancing its digital offerings. As more users are converted and more requests are funneled to digital channels, the city of Los Angeles will be better equipped to handle requests—knowledge sharing becomes easier and small requests are handled quicker, allowing the city of Los Angeles employees to focus on meaningful in-person and on-the-phone interactions.

APPENDICES & EXHIBITS

Appendix I:

Population	10,170,292
Employed	95%
Smartphone Users	75%
Median Hourly Wage	$25.90

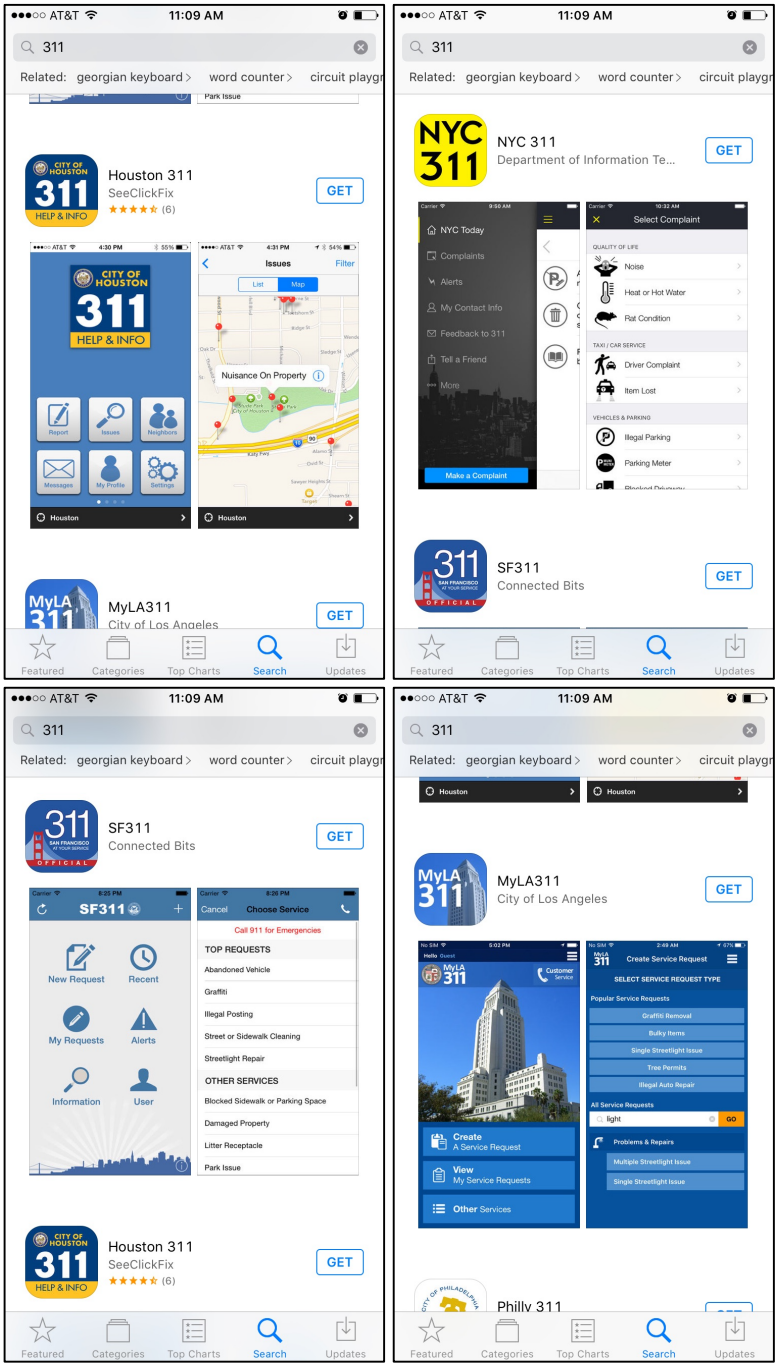
Source: Neilsen (2016) & Bureau of Labor Statistics (2016)

Exhibit 1: Source Requests

Source	%	Volume
TDD/ NexTalk	0.00%	3
Radio	0.00%	24
Mayor's Office	0.00%	37
Letter	0.00%	58
Twitter	0.00%	82
Walk-in	0.01%	432
Queue Initiated Customer Call	0.01%	503
Web Form	0.02%	622
Fax	0.02%	660
Voicemail	0.11%	3,992
Council's Office	0.12%	4,233
Email	3.35%	119,364
Self Service	9.68%	345,128
Mobile App	14.33%	510,886
Driver Self Report	14.34%	511,127
Call	58.01%	2,068,325
Total:	*100.00%*	*3,565,477*

Source: MyLA311 (2016)

Exhibit 2: MyLA311 "311" App Store Placement



Source: App Store Search Results for "311"

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