

ADVISORY REPORT

An Analysis of Melbourne Parking

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1.0 Executive Summary

Data Design Solutions has agreed to work with VicRoads to address issues surrounding parking within Melbourne CBD and surrounding suburbs. Through the use of analytical tools and expertise, the team at DDS have formulated a number of recommendations for VicRoads to consider in order to address this issue and improve the strategies implemented by VicRoads.

2.0 Introduction

The purpose of this Advisory report is to present the analytical research methods that DDS used to provide useful results and findings while outlining recommendations on the given Metropolitan Melbourne Parking dataset in a project agreed upon by VicRoads and our company Data Design Solutions(DDS). This report is intended to exclude the detailed technical methodologies the team used in the technical report and provide a high level summary of the findings while recommending accurate solutions and insights.

3.0 Project Overview

DDS (Data Design Solutions) and VicRoads have a contractual agreement to conduct data analysis on Metropolitan Melbourne Areas regarding car parking research on a parking dataset supplied by VicRoads. Our consultation introduces the approach to address the issue of car park funding and how to solve this by delivering an analytics website, a technical report with detailed information and this report which will act as an advisory report for the stakeholders involved .

The project will consist of basic analytical tools and basic machine learning methodology.

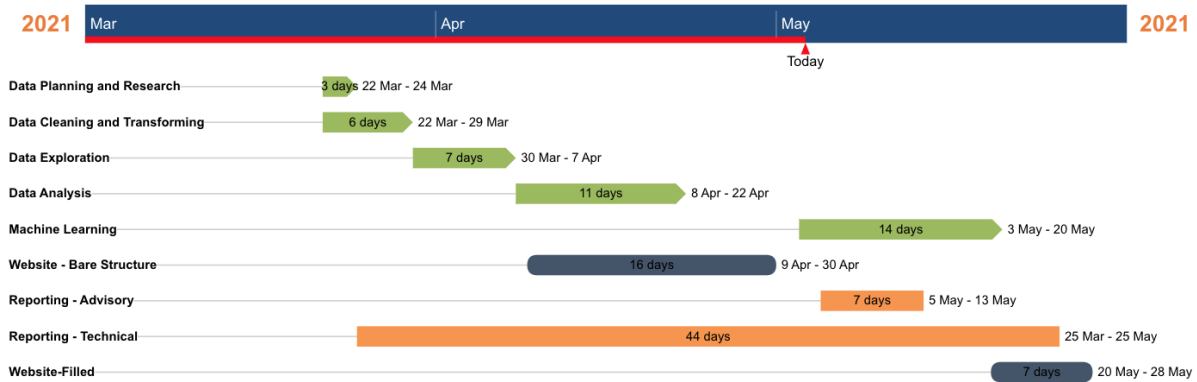
3.1 Project Goals

Parking violations have been a major issue for VicRoads in the current decade, especially in Metropolitan Melbourne where a lot of parking spaces are used by thousands of people every day. Many people visit the city for work, shopping, drinking and other activities where most of them drive their own vehicles to partake in these activities. However with the growing population and use of personal transport, even with the current rise in public transport use, these parking spaces are heavily fought over and are not sufficient in serving the general public. Therefore, public car park spaces have to be regulated and monitored daily by the use of parking signs, meters, ticketing systems while high numbers of parking violations have a negative impact on the public and their experiences on the road.

Taking this issue into consideration, Data Design Solutions(DDS) team has been contacted by VicRoads to perform research into Metropolitan Melbourne car park spaces by using the latest data analytics methodologies and tools that will facilitate the processes such as Data preprocessing, exploration and implementing machine learning into providing useful results and recommendations. The main goal of this project is to recommend solutions to VicRoads for the funding issues based on the results generated by the use of professional data analysis and consultation skills.

3.2 Project Timeline

The Gantt Chart below shows the main tasks DDS aims to undertake throughout the three months allocated for this project from 22nd Mar- 28th May 2021. There are 9 main tasks to complete which are allocated a suitable amount of time for the team to work on data analytics and front-end website development along with relevant documentation such as the advisory and technical reports.



4.0 Research Method

This section will include information on how the team used data analytics to conduct research in parking information. After the dataset was handed over to DDS , the analysts prepared the necessary tools and researched the technology that was best applicable for the provided large-scale database. Then a data quality assessment was performed to clean and arrange the dataset to prepare them for preprocessing.

During the transformation process several cleaning methods were performed to avoid errors that could be an issue in the future. Some columns were renamed , removed and observed for integrity. The team found that the dataset received already was of a high quality and so was not required to perform much preprocessing.

Following this, exploration of the dataset occurred, to find correlations and relationships between categorical and numerical attributes of specific areas such as streets, parking signs and areas of streets. This was to ascertain if there are high rates of infringements or violations along with any similar patterns in other areas of the dataset. In the next section DDS will outline a summary of the results and findings the team collected by exploratory data analysis.

5.0 Results and Findings

5.1 Area Exploration

Data collected in various areas differ significantly. Queensberry was the busiest area in terms of both the number of parking events and violations, yet it recorded a relatively low rate of infringement. On the contrary, West Melbourne, which recorded the lowest number of parking events, had the highest rate of infringement.

The same pattern could be found on streets: Queen Street, which had the highest number of parking events and infringement, had a relatively low rate of infringement. Meanwhile, the street with the highest rate of infringement, Anderson Street, had the 7th least number of violations recorded in all streets.

Violations were more likely to occur in parking events with a long duration in comparison to those with a short duration. Short term parking events, despite outnumbering long term parking events significantly, only an extremely small percentage of which resulted in a violation. However, as the parking duration increases, the percentage increases considerably.

The majority of devices which committed parking violations committed less than 100 each, their contribution only accounted for a tiny fraction (7.7%) of the total number of violations. While devices which committed 100-1000 violations each contributed a disproportionately large number of infringements.

5.2 Individual Area Analysis

In this section the team looked at all areas of Melbourne that have violations and determined what the common factors are in these violations. About 23 Individual areas around the CBD were analysed and the team found the following solutions. DDS followed the process of ;

- Finding the number of streets that recorded violations.
- Finding the high priority streets.
- Testing the worst ranked signs.
- Finding solutions based on the statistics.

It is already known that Queensberry had the most violations compared to any other area from the previous data exploration methods, but this

individual area analysis goes in depth of why and how the violations occur by looking at the statistics. Street sides 1 and 2 seemed to record high infringements because of the busy nature and there were a lot of parking signs around those streets. When the parking signs were analysed it was found that they tended to have high margins for parking durations, where people stayed for almost a day and subsequently got fined because they drove their vehicles to work and stayed parked in these areas for more than 10 hours in an average 9-5 working time. This could also include other instances such as shopping and other activities such as going to bars or restaurants.

Princes Theatre had also similar instances related to car parking times where people stayed almost an entire day forgetting to pay fees or switch their parking locations. However another interesting observation has been found where some cars were parked for almost an entire day on weekends. This could be because some drivers did not want to drive back home after drinking or partying, therefore they rather took a taxi back home. Just like the other cases Southbank also recorded most violations on full work days. The same goes with Hyatt, specifically the 1 hr, 2 hr , 4 hr parking signs around these areas were the main culprit for many parking violations to occur. Exhibition, City Square , Victoria Market, The Mac , Courtney, Chinatown, Banks, Titles, Hardware, Spencer, Rialto etc.. were also analysed and they showed similar findings for high rates of infringements.

Since many of these areas are located in the Melbourne CBD, it is safe to assume that during both weekdays and weekends it would be pretty busy and congested while most people drive or take public transport for working purposes, shopping , tourism and other activities. Therefore most parking infringements occurred accidentally and due to negligence of paying for parking tickets or parking too long than the limit. Most working people have to choose between paying parking fees every hour or changing the parking spot in most ticketed areas which is a very tricky situation and most of them are likely to get parking violation notices. DDS will present solutions and recommendations for these issues in the next section.

5.2 Machine Learning

A supervised logistic model was chosen to learn from the dataset provided by VicRoads. The purpose of the dataset produced was to allow for the model to predict whether individuals would be fined based on the information related to their parking experience. This would be further modified in future projects with VicRoads, in order to stay relevant and accurately predict the ever changing state of transportation and parking in Melbourne CBD and surrounding suburbs.

6.0 Recommendations

DDS would like to outline recommendations based on the findings to VicRoads and the department of transportation.

Expand car park spaces to the busiest areas, streets in Melbourne Metropolitan area.

- The statistics clearly show that Queensberry is the busiest area in terms of parking events and violations, but recorded a relatively low rate of infringement.
- West Melbourne, which recorded the lowest number of parking events, had the highest rate of infringement.
- DDS recommends that increasing the car park spaces will help tremendously for drivers who are working, going to university or visiting the city socially.
- This move will help to lower the parking events in Queensberry and high infringement numbers in West Melbourne by establishing cheaper car park rates for local people.

Increasing car parking spaces to areas where there are many workplaces

- The statistics indicate that Street sides 1 and 2 are the busiest compared to 3-5. This can be resolved by increasing appropriate free car parking spaces to the busiest street or area for drivers who are working, going to university or visiting the city socially.
- Similarly, for those who park their vehicle for extended periods of time; leaving their vehicles unattended for almost a day or the vehicle is unattended until the following day, should have a reduced fine or receive a warning before a repeat offence serves a fine.

Implementing auto fees

-This would include removing prepaid parking spots and parking spots without limits. In place of this, drivers will have their number plates scanned by an automatic system, and the bill for the parking space charged either to their phone or sent to their address. This can also be applicable for any multi-storey car parking venues owned or produced by VicRoads.

-In this instance, users will need to pay at the gates when exiting, and the fee will be calculated based on the recognition of the number plate and the duration spent in the venue.

Removing the 1 and 1/2 hour limits from Monday to Fridays but keeping the ticketing system in busy areas such as Queensberry and Southbank (and other busy areas).

-This allows workers to use this space for their entire shift but allows for the owners of the parking spaces to still make money from the ticketing system.

-This will also allow people to use more sustainable, eco-friendly options like cycling, taking public transport or using ride-share apps.

7.0 Conclusion

Several notable patterns have been observed from the analysis. Various areas showed different statistics regarding the number of parking events, infringements and infringement rates. Violations in some areas had exceedingly long durations while those occurred in others were most short-term. Based on the findings, it is recommended that VicRoad should prioritise on increasing the number of parking lots in busy areas or areas with a large number of commuters. Besides, the council may consider replacing prepaid parking spots in some parking spaces with auto fees, and removing parking limits on weekdays, in order to reduce the chance of getting violations by accident. A machine learning model has been trained with the data set and showed outstanding performance when being tested, which could be of assistance in future analysis.