

**ANLY482: Analytics Practicum**

*Project Proposal for  
Car Park Overspill Study Project*

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# Overview

Roads, today already take up 12% of Singapore’s total land area and with the limited land available, Singapore cannot afford to exhaust its land area by building more roads to accommodate vehicles and further expand the road network.

With these considerations in mind, Singapore Land Transport Authority (LTA) would like to understand the car park overspill situation in Singapore. Thus, LTA has requested Media Research Consultants Pte Ltd (MRC) to find out more through site survey and observation in theses car parks. The information collected is transformed into knowledge with MRC producing a detailed report and several info-graphics for each car park sites to summarize the findings. This information is crucial to LTA, as it will help it to better forward plan and handle the car park issues in Singapore.

The objective of this project is to assist Media Research Consultants Pte Ltd (MRC) in understanding the current parking situations in 65 different locations in Singapore. These 65 parking locations compromise of 30 retail malls, 15 retails and Food & Beverage (F&B) clusters in landed housing estates, 10 hawker centers, and 10 community clubs.

As of the initial meeting on 30th December 2015, MRC had completed and submitted 10 reports to LTA. Hence, there are 45 outstanding reports and info-graphics. MRC’s submission deadline for all the reports is 31st January 2016. Therefore, the team’s immediate job scope is to assist the team in MRC in meeting its submission deadline.

After the completion of the reports and info-graphics, the team will further process the data collected to coming up with new insights. The proposed initiatives include comparison of the different car park sites, as well as, a national average representation. This will allow the business owner, LTA, to better understand the situation nationwide rather than looking at each car park site’s situation independently. Additionally, working on the same perspective of data representation, the team would like to achieve an interactive dashboard that reports the data. However, this initiative is subjected to the time constraint of the project.

The aim of this proposal seeks to understand of the team proposed initiatives for an Analytics Practicum Project completing in **SMU AY2015/16 Term 2**.

# Background

Roads, today already take up 12% of Singapore’s total land area and with the limited land available, Singapore cannot afford to exhaust its land area by building more roads to accommodate vehicles and further expand the road network.

Moreover, Singapore’s population has been increasing over the years. With that, the scarcity must be allotted wisely. As Singapore continues to grow as a city, there is a need to increase the supply for housing, industrial and office estate. Therefore, it is not a realistic plan for every Singaporean household to own a car.

Having said that, car is not a basic necessity in Singapore since public transportation is well developed and easily accessible. However, Singaporeans seem to think otherwise as the number of households in Singapore that own a car increased to 45% in 2013 from 40% in 2008. In order to curb the amount of car ownership and to ensure the roads is smooth flowing and congestion-free, the authority affirmed that it would continue to emphasize the vehicle ownership and usage restraint measure.

Since 1990, the Certificate Of Entitlement (COE) system has enabled Singapore to exercise effective control of vehicle population growth. As Singapore becomes more urbanized, the social cost of car ownership will also increase. This is because land has to be set aside for parking spaces at not only where we reside, but also at the places where we work, study and play. Allocating more land for car parks means that there is less land for other developments, such as housing, schools or healthcare facilities. On top of that, illegal parking and congestion in local neighborhoods may also become more prevalent.

With these considerations in mind, Singapore Land Transport Authority (LTA) would like to understand the car park overspill situation in Singapore. Thus, LTA has requested Media Research Consultants Pte Ltd (MRC) to find out more through site survey and observation in theses car parks. The information collected is transformed into knowledge with MRC producing a detailed report and several info-graphics for each car park sites to summarize the findings. This information is crucial to LTA, as it will help it to better forward plan and handle the car park issues in Singapore.

# Objectives

The objective of this project is to assist Media Research Consultants Pte Ltd (MRC) in understanding the current parking situations in 65 different locations in Singapore. These 65 parking locations compromise of 30 retail malls, 15 retails and Food & Beverage (F&B) clusters in landed housing estates, 10 hawker centers, and 10 community clubs.

The study was conducted previously by MRC through parking occupancy surveys, human traffic counts, and interview survey at selected locations at stipulated times. The collected data will then be further processed before submitting it to the Land Transport Authority (LTA) to understand the current parking situation at these locations.

Each parking site result that was collected must be tabulated into a single Microsoft Excel spreadsheet file according to each survey type and also included in the final report. The final report shall include a write-up, all location maps and captured images (if any). Lastly, the final report will be structured as per the format shown below:

1. Executive Summary
2. Site Background
3. Site Characteristics
4. Site Assessment
5. Survey Deployment Plan
6. Survey Findings
7. Conclusion
8. Appendices

8.1 Site Map of the parking locations

8.2 Car park characteristics

8.3 Pre Survey Observations & Results

8.4 Info-graphic to summarize the results collected

8.5 Survey Questionnaire Template

# Business Problem & Motivation

From our understanding, MRC had completed the data collection process and compiled the results. Its current focus is to work on the analysis and to report the findings of the 65 car park sites. Additionally, they had also created clusters by grouping the nearby car park sites together. For instance, the car parks of Punggol Plaza and Punggol 21 CC are grouped together, as they are geographically located next to each other.

The allocation of the reports required for all of these car park sites are as shown below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Retail Mall (RM)** | | **Retail & F&B cluster (F&B)** | **Hawker Center (HC)** | **Community Center (CC)** | **Cluster Grouping** |
| 112 Plaze | Anchorpoint | Casuarina Road | Block 17 Upper Boon Keng Market & Food Center | Anchorvale | Ang Mo Kio Hub (**RM**), Ang Mo Kio Food Center (**HC**) |
| Boon Lay Shopping Centre | Causeway Point | Clementi Arcade | Hougang Block 105 | Gek Poh Ville | Bedok Point (**RM**), New Upper Changi 208B HC (**HC**) |
| Changi City Point | Clementi Mall | Frankel Avenue | Marsiling Lane Blk 20/21 | Marine Parade | Century Square (**RM**), Tampines 1 (**RM**) |
| East Point | Heartland Mall | Hillcrest Road | New Upper Changi Road Block 58 | Tampines West | Compass Point (**RM**), Sengkang CC (**CC**) |
| Hougang Mall | Jem | Jalan Merah Saga | Yuhua Market & Hawker Center | Tanglin | Holland Drive Market & Food Center (**HC**), Buona Vista CC (**CC**) |
| Jurong Point | NEX | Jalan Selaseh |  | Ulu Pandan | Parkway Parade (**RM**), Marine Parade Central 84 (**HC**) |
| North Point | One KM Shopping mall | Rail Mall |  | Woodlands Galaxy | Punggol Plaza (**RM**), Punggol 21 (**CC**) |
| Pioneer Mall | Seletar Mall | Jalan Mata Ayer |  |  | Serangoon Gardens (**F&B**), Serangoon Market and Food Centre (**HC**) |
| Thomson Plaza | Vivocity | Jalan Salang |  |  | Square 2 (**RM**), Velocity (**RM**), United Square (**RM**) |
| West Coast Plaza | West Mall | Simon Road |  |  |  |
|  |  | Tanjong Katong Road |  |  |  |
|  |  | Teck Chye Terrace |  |  |  |
|  |  | Upper Bukit Timah Road |  |  |  |
|  |  | Wishart Road |  |  |  |

As of the initial meeting on 30th December 2015, MRC had completed and submitted 10 reports to LTA. Hence, there are 45 outstanding reports and info-graphics. MRC’s submission deadline for all the reports is 31st January 2016. Therefore, the team’s immediate job scope is to assist the team in MRC in meeting its submission deadline.

After the completion of the reports and info-graphics, the team will further process the data collected to coming up with new insights. The proposed initiatives include comparison of the different car park sites, as well as, a national average representation. This will allow the business owner, LTA, to better understand the situation nationwide rather than looking at each car park site’s situation independently. Additionally, working on the same perspective of data representation, the team would like to achieve an interactive dashboard that reports the data. However, this initiative is subjected to the time constraint of the project.

# Data Collection and Datasets

## Data Collection

LTA traffic planners’ objective is to review the current parking situation in 4 different types of developments in 65 different locations (30 RM, 15 F&B, 10 HC and 10 CC). Due to the different nature of each premise, different methods are used to gather the count data of the vehicles and patrons. Additionally, intercept survey was also carried out to gather sample data. In an extremely access point, automated counters were deployed to assist the count process. The entire data collection process occurred between May 2015 and October 2015.

Each dataset contains the vehicle count and human count of the particular premises. For instance, in the Retail Mall settings, there were a handful of enumerators deployed at the entrance point and the exit point of the building as well as the car park. These enumerators were deployed in pairs or trios. There was a pair of enumerators that was in-charged of counting the number of people entering and exiting the building. One of them was in-charged of counting the inbound traffic of people entering the building while the other counting the outbound of human traffic exiting the building. Then, a trio of enumerators was deployed to count the vehicles (motorcycles included). One of them was assigned to count the number of vehicles inbound into the premises and also the passenger(s) on-board, the other was in-charged of counting the outbound vehicles and passenger(s) on-board exiting the premises and the last enumerator was in-charged of finding out the overspill demand through counting the number of vehicles queuing to enter the car park and observing and noting down the number of vehicles parking or waiting illegally along the side streets. The same data collection process was done for both the Community Centers settings and Retails and F&B clusters.

However, for the Hawker Centers, the trio enumerators that were counting the vehicles entering and exiting goes through the same process as mentioned in the previous paragraph. The pair of enumerators that was in-charged of the human count patrolled the Hawker Centers instead of stationing at the entrance or exit point. One of them was assigned to count the number of seated patrons while the other counted the number of patrons queuing at the stalls. The enumerators made their rounds every 15 minutes to count the human occupancy of the Hawker Centers.

These data were collected between 10am to 9pm. Each data was recorded in blocks of 15 minutes timeframe. In the other words, between the periods of an hour, there would be 4 records (12pm, 12.15pm, 12.30pm and 12.45pm) being documented. Lastly, the data collection process for each car park site locations lasted for two days; one on a weekday (non-peak day) and one on a weekend (peak day).

Last but no least, a dedicated team of people were deployed on the ground carrying out intercept survey, interviewing patrons and collecting survey results. All these information are been compiled into a single spreadsheet for the core project team members to analyze before they report their findings to LTA.

## Datasets

### Pre-Survey Report

Pre-surveys reports are used to collate each site’s information, such as its unique characteristics and assess eligibility. This will allow us to better understand the surrounding of that particular premise and the nature of business and uniqueness of that premise. Hence, helping us to determine the most appropriate survey methodologies to achieve the results.

### Human Count

The enumerators will count the total number of patrons and passenger(s) on board of the vehicle. Thus, with this information, we will be able to determine the total number of human entering the premises in that particular time.

### Vehicle Count

Likewise for the total vehicle count, the results gathered from the enumerators show the number of inbound and outbound vehicle, roadside parking and overspill count.

### Interview Survey

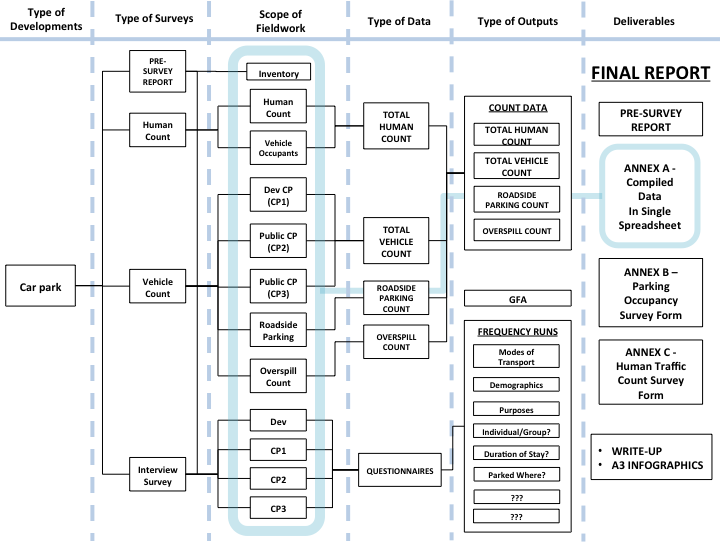
As for the interview survey, demographic profile and the travel behavior are recorded. Demographic profiles capture the citizenship, gender, age and ethnicity of the patrons whereas the travel behavior survey takes note of the number of patrons visiting the amenities that particular day, their frequency of visit, the main purpose of visitation, duration of visit, their form of commute to the premise that day and their companion for their trip there. Additionally, for drivers, they will need to input in more information such as their vehicle parking place, the reason for parking there, as well as their accessibility from where they parked to the amenities they are visiting on that particular day.

# Analytics Methodology

## Phase 1 (Jan 2016):

In order to gain insights from the current parking situation at these 65 selected location, we have to gather all the information collected previously and further process the information. The 4 key components, as mentioned in the previous section, are Pre-Survey Report, Human Count, Vehicle count and Interview Survey.

An illustration of the analytics methodology is as shown below:



Hence, with that, we will be able to derive both the qualitative and quantitative results findings. Qualitative results help us to gain an understanding of the underlying reasons, motivations and behavioral for visiting the premise. Results from survey questionnaires are considered qualitative results findings. On the other hand, quantitative results are facts and figures that quantify data and generalize results from a sample population. As such, the total number of human count, vehicle count, roadside parking count and overspill count are considered quantitative findings.

With the analysis from both the qualitative and quantitative figures, we will be able to draw insights from the current parking situations in that particular car park. Therefore, a report and info-graphics will be created to complement the key findings in each particular parking sites. The team will be using Microsoft Excel to work on the analysis and findings and using other tools like Microsoft Word and Microsoft PowerPoint to create the final report and info-graphics.

In conclusion, the team will be assisting MRC on phase 1 of the project, which is to work on reporting the analysis and findings from each site observation. This will help the team to better appreciate the datasets and able to further work on the second phase of the project.

## Phase 2 (Feb 2016 – Apr 2016):

In phase 2, the team will be working on advanced analysis. Phase 1 of the project focuses on a particular car park site individually in 65 different locations. The team would like to extend the scope of work of the project to include comparison with other car park sites in phase 2. For instance, comparing the car park occupancy of AMK hub (Retail Mall) with NEX (Retail Mall) on weekend or comparing the human traffic between Frankel Avenue (F&B cluster) and Rail Mall (F&B cluster) at 7pm on a weekday. The purpose of this feature will allow the business users (LTA) to better appreciate the data collected previously and also gain new insights that can be used as a reference in refining its future planning provisions. In order to do this, the team will be using SAS Enterprise Miner programming language to create the visualization for this analysis. Additionally, the team will continue to work on a time series clustering and classification, grouping the similar pattern of time series together. With that, the team will do a further analysis based on the site characteristic of the different clusters.

The team’s other initiative will be building an interactive dashboard to visualize the data. This is achieved also using R programming language. However, the second initiative is subjected to the time constraint of project timeline. Nonetheless, this is a possible avenue for the project to move towards in the future.

# Tools & Technology

## Reporting Tools:

1. Microsoft Word
2. Microsoft PowerPoint

## Analysis Tools:

1. Microsoft Excel
2. SAS Enterprise Miner

## Visualization Tools:

1. Microsoft Excel
2. R
3. Tableau

## Collaboration tools:

1. Dropbox
2. Google Drive

# Scope of work

## Phase 1:

Phase 1 of the project will take place till end of January or when all the project reports and info-graphics are completed (whichever is earlier). We will be focusing on helping our project sponsor (MRC): -

* To ascertain parking demand and thereafter, to revise parking planning provision for sites
* To check for data errors and anomalies
* To generate charts and tables
* To generate infographics with the data given
* To identify significant trends (if any) and across relevant key categories
* To compare data percentages and correlations between car park demand and human traffic count
* To compare data percentages and correlations between the use of public transport and human traffic count
* To compile all generated data, charts and infographics into a written report

## Phase 2:

Phase 2 of the project will take place from February till the end of the course. We will be building a platform for data representation: -

* To compare the differnece occupancy rate between the sites
* To check for data errors and anomalies
* To generate charts and tables
* To generate infographics with the data given
* To identify significant trends (if any) and across relevant key categories
* To compile all generated data, charts and infographics into a written report

# Project Stakeholders

## Project Sponsor

Jason Soriano (Assistant Manager of Media Research Consultants Pte Ltd)

Darren Lum (Co-Founder, Director of kl:kk urban solutions)

* Provide relevant data for the team to explore and analyze
* Provide business expertise and guidance to the team
* All project data and deliverables are copyrighted to the sponsors

## Project Supervisor

Professor Kam Tin Seong (Associate Professor of Information Systems)

* Supervise and assess the team progression
* Provide feedback to ensure team is on track
* Ensure overall quality of the project, both the methods used to develop it and the end product
* Approve key deliverables

## Project Team Members

Yan ShaoHong Chris (Project Manager)

* Interact clearly, constructively and positively with all the relevant stakeholders
* Develop and implement project work plans and review them as deemed appropriate to meet changing needs and requirements
* In charge of Data Collection and Data Cleaning process

Yo Wee King (Business Analyst)

* Conduct quality control of the work done
* Recording and managing project progression
* In charge of Data Integration and Exploratory Data Analysis process

Macus Khoo JunHao (Data Analyst)

* Providing functional expertise in the project
* Interpreting data, analyzing results using statistical techniques and provide ongoing reports
* In charge of Analysis and Modeling and Insights Discovery process

# Limitations and Assumptions

|  |  |
| --- | --- |
| **Limitations** | **Assumptions** |
| Insufficient records of data for better analysis and modeling | Data given are assumed to be complete and accurate. |
| Data recorded are deficient, as the records do not show the type of cars and the number of passenger onboard of the each car; Data was recorded as a batch count of 15 minutes. | Using the average number of passenger on board for each timeframe for further analysis. |
| Incomplete range of data recorded, there are missing entry inside the datasets. | Make do with the data we have and assuming it to be |

# Risk Assessment

The team has identified technical competency, project management and stakeholder management as the highest impact risks, as shown below:

|  |  |  |  |
| --- | --- | --- | --- |
| Risk | Impact | Likelihood | Mitigation |
| Technical Competency | | | |
| Not proficient in technologies required | High | Medium | Assign a team member to learn and then organize frequent knowledge sharing sessions amongst the group for that member to teach the rest of the teammates. |
| Project Management | | | |
| Project delay due to the inaccurate planning | High | High | Discuss with team members on the allocation of tasks. |
| Stakeholder Management | | | |
| Managing requirements of multiple departments | High | High | Speak to our sponsor and supervisor to mitigate the issue. |

# Milestones & Deliverables

1. Team Wiki page [<https://wiki.smu.edu.sg/anly104/Group_7_Atom>]
2. Project Proposal (Week 1 – 2)
3. Mid-Term Report (Week 8 – 9)
4. Mid-Term Presentation (Week 8 – 9)
5. Project Dashboard
6. Final-Term Report (Week 14 – 15)
7. Final Term Presentation (Week 14 – 15)
8. Poster (Week 14 – 15)

# Possible avenues for extension of project in the future

The team believed that the following ways would help improve the current project analysis and findings:

* Increase the scalability of the datasets without hindering on time and performance
* Increase the number of car park sites and other developments (HDB estate and etc.) into the analysis
* Increase the number of the days for observations

# References

1. Aldridge, K., Carreno, M., Ison, S., Rye, T., & Straker, I. (2006). Car parking management at airports: A special case?. *Transport Policy*, *13*(6), 511-521.
2. Barter, P. A. (2010). Parking policy in Asian cities. *Lee Kuan Yew School of Public Policy Research Paper No. LKYSPP*, 10-15.
3. Code Of Practice. (2011). Retrieved January 2, 2016, from <https://www.lta.gov.sg/content/dam/ltaweb/corp/Industry/files/VPCOP2011.pdf>
4. Land Transport Masterplan 2013. (2013). Retrieved January 2, 2016, from <https://www.lta.gov.sg/content/dam/ltaweb/corp/PublicationsResearch/files/ReportNewsletter/LTMP2013Report.pdf>
5. Sheller, M., & Urry, J. (2000). The city and the car. *International journal of urban and regional research*, *24*(4), 737-757.
6. Stubbs, M. (2012). Car Parking and Residential Development: Sustainability, Design and Planning Policy, and Public Perceptions of Parking Provision.

# Appendix A: Project Timeline

