Flying Taxi Data Strategy MVP

Introduction

Flying Taxi has been massively successful. Results have beaten expectations and projections! This is good news for Flyber, but now it's time to plan for what's next. With success came some challenges. While we were able to grow, the original data pipelines to receive and process data are unable to keep up with the current and future growth.

As a Data Product Manager, working with multiple teams and stakeholders is imperative to success. To understand what our needs are, what scale we are growing at, and how we can build for the future, we need to consider all relevant stakeholders. In this proposal, present your findings along with the analysis and reasoning behind the choices made in order to help Flyber continue its success.

Section 1: Data Customers & Needs

Flyber is a two-sided platform. You have customers who are riders, and you have partners who are drivers/pilots (think Uber: riders and drivers). For the Minimum Viable Product, you will be focusing on the Riders side of the business. To build an end-to-end data pipeline the very first step is to understand who needs data and why they need that data. Within Flyber, identify who your primary data customers/stakeholders are, why they are your primary data stakeholders and how they want to use the data (primary use-cases).

Identify your primary internal stakeholders and their use-cases:

Stakeholder	**Why are they primary stakeholders?**	**Use-Case**
Engineering	Designs and creates a product	• Monitoring website and app performance • Data generated by site and app • Alerts • Machine Learning and load prediction • Dashboard
Product Management	Plan the product life cycle, including the roadmap. Operates	• Identifying customer pain-points

	in the domain boundaries of engineering, business and human behavior.	• Customer interaction data for site and app • Business Intelligence tool to analyze data • Big data use-cases • Tracking metrics to make product decisions. • Visualization tools to tell stories. • Understand your customers more effectively
Product Marketing	Identifies target customers and markets the product, including advertisement.	• Content creation • Targeted advertising • Virtual assistant • Customer profile and customer preferences • Just-sale, Business Intelligence, visualization and reporting
Sales	Sell the product. Need data to make sales forecasts monthly, quarterly and yearly.	• Sells and generates revenue. • Reports for business reviews – monthly business reviews • Understand your customers more effectively. • Drive performance and revenue • Identify sales trends. • Provide personalized service more easily. • Improve operational efficiency
Accounting	Responsible for keeping records of expenses and earnings.	• Reconciliation reports

Finance	Responsible for creating a financial outlook that will assist in making proper business decision	• Monitoring current Profit & Loss • Expense Report from Accounting, Business Intelligence and Visualization tool • Machine Learning for future finance predictions
Customer Service	Responsible for addressing customer needs as it relates to the product	• Provide personalized responses. • Customer data across systems • Visual summary • Visualizations • Reports
Security & Risk	Protects the entity from fraudulent activities or ensures the integrity of business and customer information.	• Fraud Prevention

Section 2: Data Collection and Data Modelling

To support our primary stakeholders' use-cases we need the following data:

Stakeholder	**Use-Case**	**Data**	**Why is this the primary use-case?**
Engineering	Monitoring website and app performance Data generated by site and app	Event dataTimestamp, Event	Design and develop the app. Access to app performance data is crucial

Product Management	Identifying customer pain-points	Event data	Need to understand the pain in order to create solutions to the problem. Also, planning and maintaining product life cycle
Product Marketing	Targeted advertising	Entity data	Need to reach the right audience at the right time using digital resources
Sales	Selling and generating revenue	Entity data	Must get the product to the consumer to generate revenue
Accounting	Keeping records of expenses and earnings.	Entity data	Track income and expenditure for the business
Finance	Profit & Loss	Entity data	This is essential for business performance measure
Customer Service	Personalized response to the customer	Entity data	Being available to respond to customer needs ensure retention and extracts more value
Security & Risk	Prevent fraud	Event + Entity data	Ensure the integrity of the business and its objective

The tables we need are:
Note: As a best practice, we should establish these relationships between tables from the very beginning. Focus on fundamental concepts of relational databases - tables, normalization and unique keys. Provide the table header row for each table, tables might be different lengths. You can create as many tables as you feel are necessary (copy and paste from one of the table sections):

[Customer]

Customer_ID [PK]	Name	Address	Zip	Email	Phone Number

Rationale for Choosing Primary and Foreign Keys for the Table 1:

The customer is at the center of the Flying Taxi business model. Customer information data is very crucial and necessary.

The relationship of the Customer_ID in “Customer” table is one-to-many between “Order” table and “Payment” table. The Primary Key field cannot accept NULL values. The value is and will always be constant.

Table 2:

[Order]

Order_ID [PK]	Customer_ID[FK]	Order_Date	Pickup_Loc	Dropoff_Loc	Employee_ID

Rationale for Choosing Primary and Foreign Keys for the Table 2:

[Following the use-case needs for transaction records, an “Order” table is required for booking Flying Taxi rides.

The Order_ID uniquely identifies all stored order information in the “Order” table. For that reason, Primary Key for this table. The Foreign Key, which is Customer_ID in this case is a Primary Key in the “Customer” table]

Table 3:

[Payment]

Payment_ID [PK]	Customer_ID [FK]	CreditCard_Info	Billing_Zip	Order_ID [FK]

Rationale for Choosing Primary and Foreign Keys for the Table 3:

In generating revenue, Payment is an entity of its own. For that reason a table is needed.

The Payment_ID is the unique identifier for payment information in the “Payment” table. For that reason, Primary Key for this table. Customer_ID and Order_ID are both Foreign Keys in this table.

Table 4

[Employee]

Employee_ID [PK]	Employee_Name[FK]	Department	Employee_Phone

Section 3: Extraction and Transformation

Now that you have the requirements from your stakeholders, you want to understand the current state of what data is collected. That is how you recognize which additional data you need to achieve the future state. You ask the engineering team what data they are currently collecting in the pipelines and they provide you with a section_3_event_logs template (which you can download from the classroom) generated by rider's activities on the Flying Taxi App. Also provided in the Project Resources.

Extraction and Transformation-1

ETL is performed on the provided Event Logs Template and results will be transferred to the proposal template. The project's ETL should be created inside of your copy of the Event Logs template in the tab titled, ETL. Clicking on the link above will create a copy of the Event Logs for you

After being provided with a CSV log file, use extraction techniques to be able to get the data into a usable form. Because this needs to be a repeatable process we need to document it in order to assess its feasibility. Below,

1. Write the steps you took to extract the data and provide reasoning for why you used this method *Note: Don't forget to include any file type changes*:
2. Perform cleaning and transformation of the data in the ETL tab and document.
3. Document and provide rationale for all of your steps below as well.

Steps for Extraction:

1. Inspect the data - Verify and understand the data entities.
    a. The data should be inspected to get a clear understanding of the condition or to be familiar with the structure and issues that may exist. Does it have a consistent structure (a CSV table) or is it unstructured (collection of email messages)?
    b. How is each data point identified? Is there an explicit, unique ID for each data point, or will one need to be created?
    c. Identifying bad data, superfluous columns (e.g., columns with only one value or missing an overwhelming amount of data), duplicate rows and things of that nature.

d. Count how many data points or rows exist. If the data is structured, count the number of columns and missing values in each column.
   Know the data type for each column, we want to know what the data type is and what the data type should be.

2. Plan
   a. After inspecting the data and understanding the overall condition, there needs to be a plan of what to fix and how to fix them. This requires articulating the problems clearly and creating a plan to modify and/or fix the problem.
   b. With clearly stated steps to fix the problem, we can make an informed decision about whether implementing the plan is worth the effort. Sometimes there are multiple viable resolutions to choose from. To decide, we weigh trade-offs and ultimately choose the best option.

3. Execute or Implement - Clean the data
   a. Once we have a detailed list of steps to modify our dataset, it is time to move forward with the implementation. This may involve developing the code to fix the problem being focused on.
   b. During the implementation, we might discover that the problem is more complicated than initially expected. It is anticipated that there could be unintended consequences that may arise in the process. A decision will have to be made whether to proceed or abandon the modification.

4. Inspect - Verify the data again.
   a. After implementing the changes, we need to return and inspect the data in a new iteration. This step is necessary when modifying data structure, which can lead to missing data points, thereby creating more bad data.

Transformation-2

Analyze the data from part 1 to answer the following questions:

1. How many events are being recorded per day?

Date	10/5/2019	10/6/2019	10/7/2019	10/8/2019	10/9/2019	10/10/2019	10/11/2019
Event Count							

2. How many events of each event type per day?

Date	10/5/2019	10/6/2019	10/7/2019	10/8/2019	10/9/2019	10/10/2019	10/11/2019
Choose Car	1498	2843	2953	2769	2725	2801	2804
Search	1484	2891	2824	2899	2749	2904	2821

Open	6594	11733	11767	11662	11531	11325	11371
Begin Ride	38	49	62	86	57	57	78
Request Car	277	540	596	547	538	607	521

3. How many events per device type per day?

Date	10/5/2019	10/6/2019	10/7/2019	10/8/2019	10/9/2019	10/10/2019	10/11/2019
IOS							
android							
Desktop Web							
Mobile Web							

4. How many events per page type per day?

Date	10/5/2019	10/6/2019	10/7/2019	10/8/2019	10/9/2019	10/10/2019	10/11/2019
Search Page							
Book Page							
Driver Page							
Splash Page							

5. How many events for each location per day?

Date	10/5/2019	10/6/2019	10/7/2019	10/8/2019	10/9/2019	10/10/2019	10/11/2019
Manhattan							
Brooklyn							
Bronx							
Queens							
Staten Island							

ETL Automation and Scalability:
Provide an analysis about this ETL process. Address and provide rationale for manually extracting, loading and transforming the data from the raw logs. Also address potential preliminary recommendations on improving this process.

- Background

as well asdata, becauserequire workingperformed periodically

Section 4: Choosing Relevant Dataset

The previous exercise gave you a sneak peek into the Extraction and Loading aspects of ETLs in data pipelines. For making business decisions, a data consumer would like to have all the data they want. However, for any ecosystem, it is impossible to collect or provide everything that the customers need. In this exercise, you will get a taste of real-world scenarios wherein:

- All the resources are not always available to get what you need.
- You have to get creative and get the most insights with a minimal data set.

Oftentimes your stakeholders/customers will “ask for the moon”, but you’ll have to push them to work with the small amount of information you have and get creative.

After the analysis in section 3, we made sense of the numbers, and realized the total number of events seems to be too small (this was a week's worth of data, but you need at least a month). Further investigation reveals that this was a subset of logs, but the actual data that is being collected is much bigger. Working through this small data set was tedious and repeating this exercise on a much bigger data set manually won’t be feasible. Considering the time constraints of this project, engineering is willing to help with some automation. They also have limited bandwidth and are busy scaling systems up.

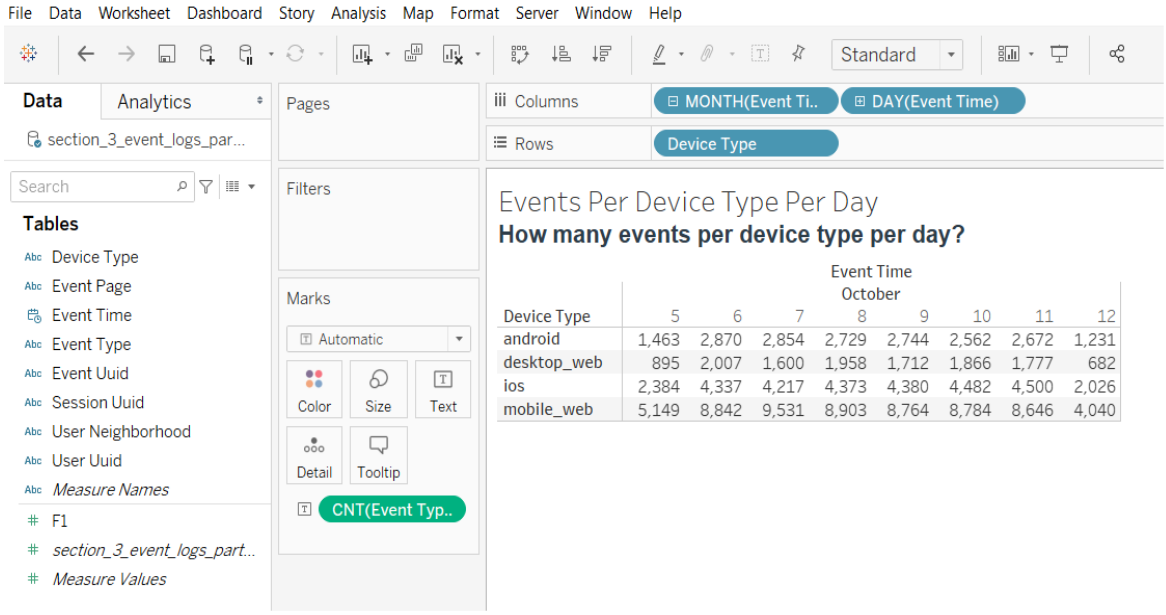
Engineering is willing to provide some data, but they have asked for the criterion that is most important. To First provide your business question and provide a rationale for why this is the most important.

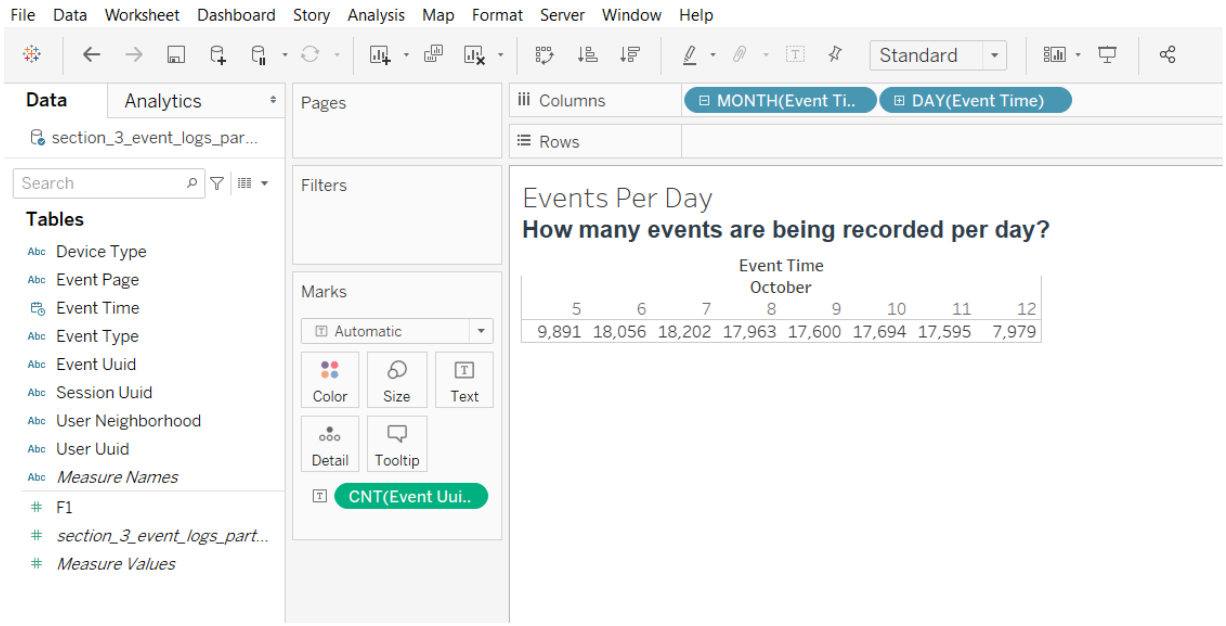
Choose one of the following prompts that you think can get you the most relevant information to proceed further.

1. How many events are being recorded per day?
2. How many events of each event type per day?
3. How many events per device type per day?
4. How many events per page type per day?
5. How many events for each location per day?

For your chosen question also answer the following using the data from section 3 to support your answer:

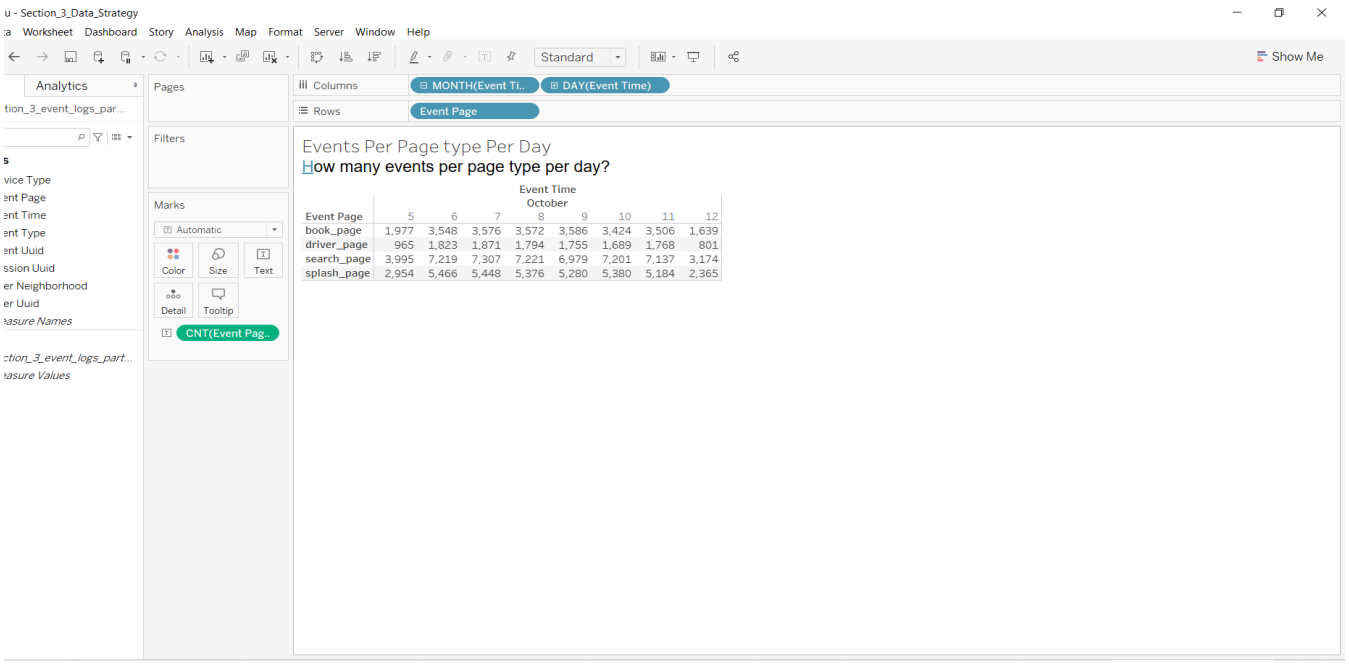
1. How much is the customer data increasing?
2. How much is the transactional data increasing?
3. How much is the event log data increasing?





Which of the following data is ***most*** important to answer this question? Why?

- Event Log Data
- Transactional Data
- Customer Data



How many events per page type per day?

Event Log Data is the most important to answer the question.

The reason being the fact that the Event Log consists of a representation of most aspects of the data in some form. There may be a need for extraction.

Section 5: [Optional] Loading and Visualization.

After sharing your criterion with engineering, they give you a new set of data: Section 5 Event Type Log also available in the classroom resources. Also provided in the project resources section.

Engineering provided you with the data you want, but you still have yet to achieve your ultimate goal as a Data Product Manager. Now, utilize the data to make business decisions. Your executives do not want you to give them a bunch of data tables; instead, they prefer visualizations to help convey

the key insights succinctly. Visualizing this data will help you understand the underlying trends and help you determine the story that needs to be told in your proposal to executives.

In this section, you can load and visualize the data into whatever platform you would like. A Python Notebook, Tableau or any other visualization tool you are familiar with. Create two visualizations that might help you to better understand your data trends and place either a screenshot or exported image of your visualizations and the details of each below. Please provide the steps you took to visualize your data and what the visualization tells you about your data.

Visualization 1:

[Insert Visualization Here.]

Data Story: This graph tells us:

[Insert Response Here.]

This graph was created using the following steps:

1. *[Insert Step Here.]*
2. *[Insert Step Here.]*
3. *[Insert Step Here.]*

Visualization 2:

[Insert Visualization Here.]

Data Story: This graph tells us:

[Insert Response Here.]

This graph was created using the following steps:

1. *[Insert Step Here.]*
2. *[Insert Step Here.]*
3. *[Insert Step Here.]*

Section 6: Business Insights

The Data is loaded and ready for analysis. We want to use this data as evidence to support our recommendations. It is important that we understand this data and the underlying trends and nuances that these visualizations show us. As you already know, any proposal backed up by data is always better received and considered more robust.

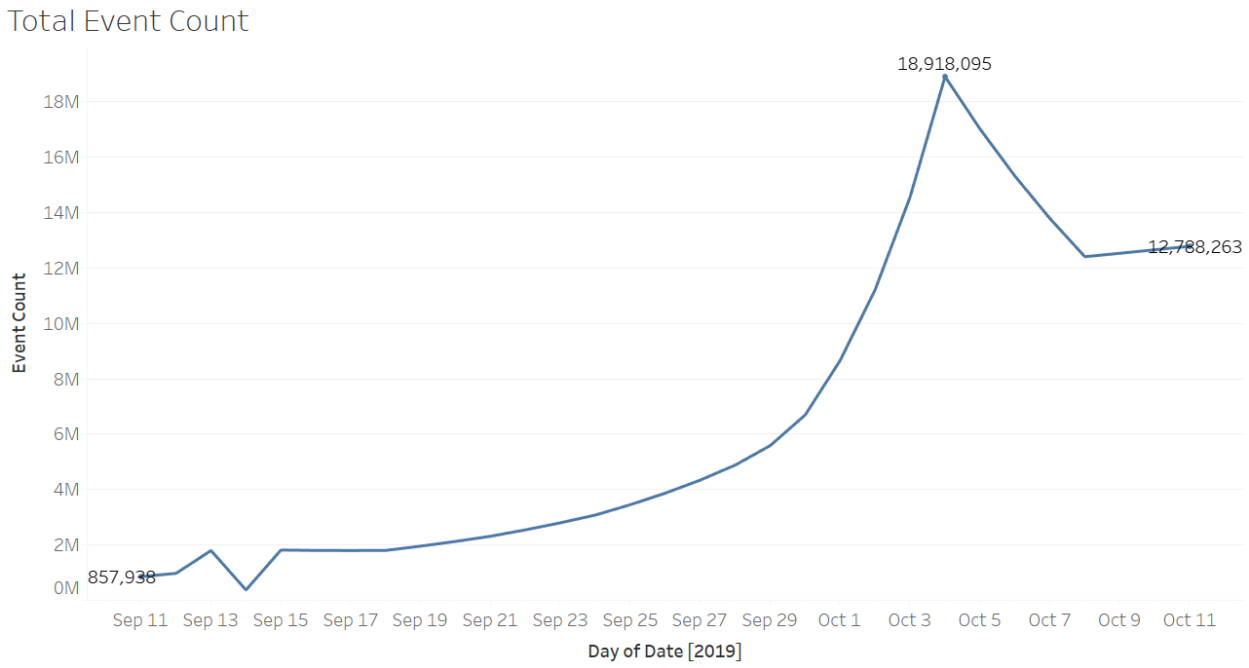
What is the story the data is telling you about Flyber's data growth? If you created Visualizations, you can use them as well, but they are not required. Include any data and calculations that were made to help tell that story and quantify the data growth.

Data Growth for Last Month

Visualization:

[Insert Visualization Here] If you didn't create your own, please use the images in the appendix to guide you through this section.

Data and calculations used for quantifying of Flyber's Data Growth:



Insert Response Here.]

What is the fastest growing data and why?

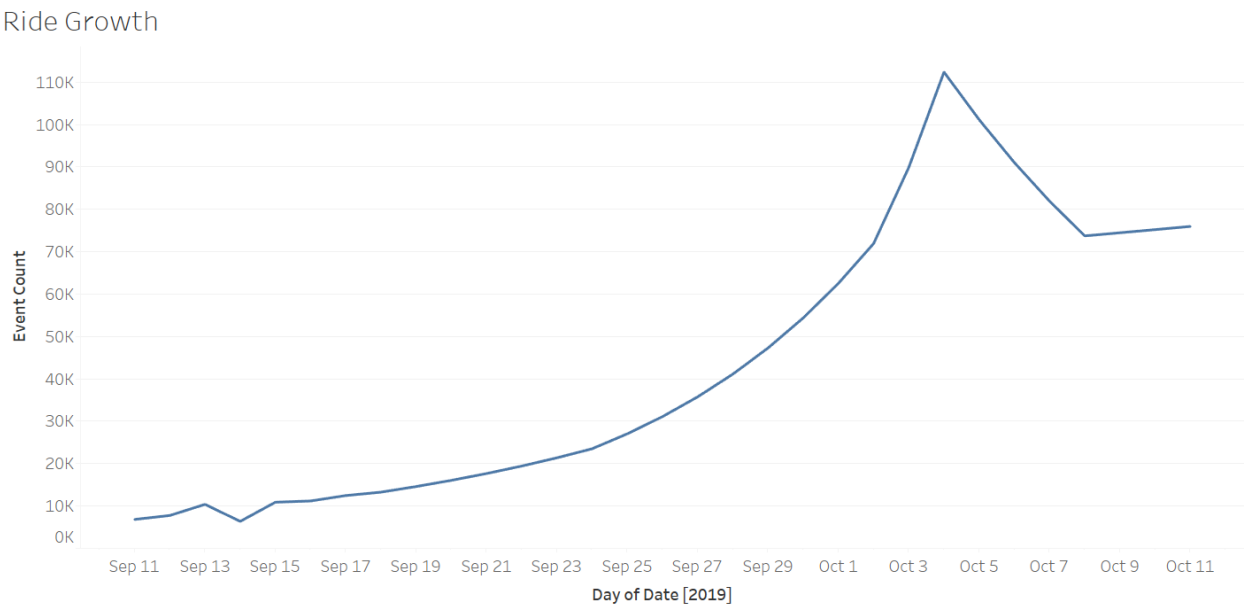
Mobile Web is the fastest growing data

The data showed consistent growth throughout the period. It is a confirmation of the fact that users are more engaged online with mobility.

Insert Response Here.]

All Event Type Data

Visualization:



[Insert Visualization Here] If you didn't create your own, please use the images in the appendix to guide you through this section.

What is the Data Story our data tells for each of the following:

- Graph Pattern
- Good or Bad
- October Marketing Campaign
- Marketing Campaign Impact
- Importance of Relationship Between Marketing Campaigns and Data Generation

- Graph Pattern

Ride Growth showed consistent increase from September 11 and peaked on Oct. 3/4. Then, followed by a dip on Oct 8.

- Good or Bad

The indication is Good based on the result and contribution to Ride Growth.

- October Marketing Campaign

The October Marketing Campaign yielded higher increases in Ride Growth.

- Marketing Campaign Impact

The impact of marketing campaigns is significantly important in generating data. Increased advertising is needed during the month of October to maintain upward trend Ride Growth.

- Importance of Relationship Between Marketing Campaigns and Data Generation

Users need to be effectively engaged during advertising, That increases user retention rate, which in turn increases data generation.

Section 7: Data Infrastructure Strategy

Thus far we have:

- identified data stakeholders and their data needs.
- Identified what data is currently being collected and what data needs to be collected.
- Identified data insights and growth trends.

Now, it's time to tie all the loose threads together and bring this process to its logical conclusion by suggesting which Data Warehouse (DWH) Flyber should invest in and why. Using data warehouse options below, suggest whether Flyber should choose an on-premise or Cloud data warehouse system and which specific data warehouse would best serve Flyber's data needs.

Data Warehouse Options:

Cloud:
- Amazon Redshift
- Google BigQuery
- Snowflake
- Microsoft Azure

On-Premise:
- Oracle Exadata
- Teradata, Vertica
- Apache
- Hadoop

You will address the following factors with a rationale as to why the DWH chosen is the best for Flyber:
- Cost
- Scalability
- In-house Expertise
- Latency/Connectivity
- Reliability

Cloud vs On-Premise
Provide an evidence based solution as to why Flyber would be best served by a Cloud or on-premise DWH. In this response, you don't need to specify *which* specific Cloud or on-premise DWH product you will choose, just if it will be Cloud or on-premise. Remember to address the factors above.

- Flyber will be best served with a Cloud based system.

Cost - There is no need to purchase and maintain any hardware for the system. Significant

cost saving advantage. It's quicker and cheaper to set up Cloud Data Warehouse system

Scalability - easy to scale up or down as needed. Demand tends to change seasonally, weekly, and hourly. The Consequences of not having enough compute or storage resources are dire. First come performance issues, then users start getting error messages and getting locked out of the application. The Cloud architecture prevents all of these.

In-house Expertise - Flyber company should focus on its core area of expertise and outsource Cloud services to the experts on that. Developing in-house expertise tends to take more time and resources.

Latency/Connectivity - Data is needed for real-time use-cases. Speed is an advantage with the Cloud. Cloud-based data warehouse architectures can typically perform complex analytical queries much faster because they use massively parallel processing (MPP)

Reliability - Having a Cloud based system is more reliable. Accessing an app or service in the cloud by so many users and so many resources can be demanding. With the Cloud, you can reasonably expect that the app or service is up and running. You can access what you need from any device at any time from any location. There will be no interruptions or downtime.

Insert Response Here.]

Suggested DWH

Provide an evidence based solution as to which DWH product is best for Flyber. Remember to address the factors above.

- Amazon Redshift will be most suitable for Flyber Flying Taxi business

We have to ensure that the choice we make meets the requirements of the Flyber now and in the future.

Amazon Redshift has what is known as RA3 nodes, which allows you to scale, compute and only cache the data you need locally. You cannot separate workloads. While you can only run Redshift as an isolated workload on AWS, it has the most options on AWS, including the ability to deploy it in your own Virtual Private Data Center.

Cost - Redshift is considerably cheaper than alternatives or an on-premise solution. Redshift has two pricing models that give you the flexibility to categorize the expense as an operational expense or capital expense.

Scalability – Scalability is crucial for any data warehousing solution, and Redshift performs well in this arena too. It is horizontally scalable, meaning whenever you need to increase the storage or need it to run faster, you can add more nodes using AWS console or Cluster API, and it will upscale immediately.

Latency/Connectivity — When it comes to loading data and querying it for analytics and reporting, Redshift is extremely fast. MMP allows you to load data at fast speeds. The Redshift Query Engine has the same interface as PostgreSQL, which means developers who are already familiar with SQL won't have a steep learning curve to get going. Since Redshift uses SQL, easily connecting to other business intelligence tools.

Security — Redshift comes packed with security features, including various ways to handle access control, Virtual Private Cloud (VPC) for network isolation, data encryption etc… You can launch Redshift clusters inside your VPC so you can define security groups and restrict inbound or outbound.

Supporting research resources
Snowflake vs Amazon Redshift

Pros and Cons of Amazon Redshift

Insert Response Here.]

Image Appendix

Image 1: Log Growth

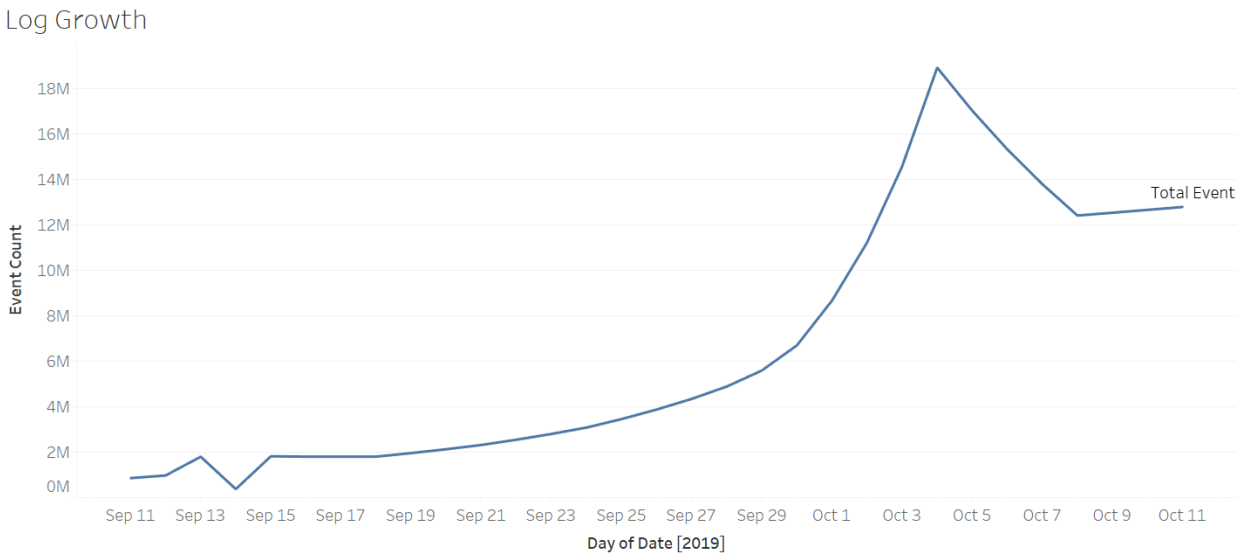


Image 2: Ride Growth

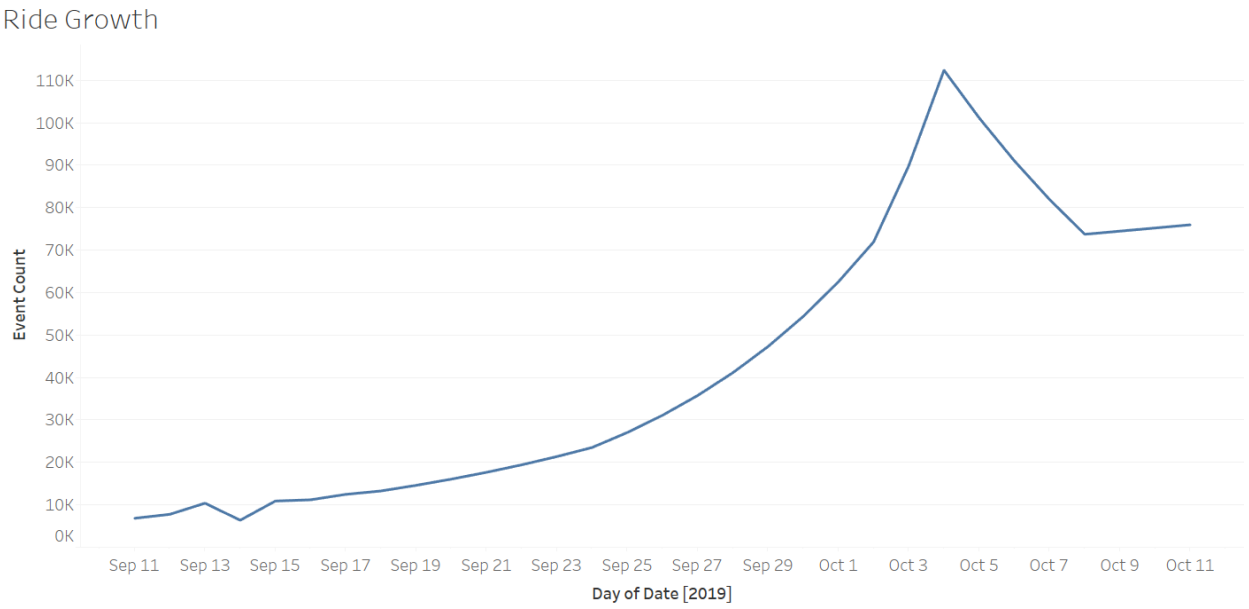


Image 3: Total Event Count

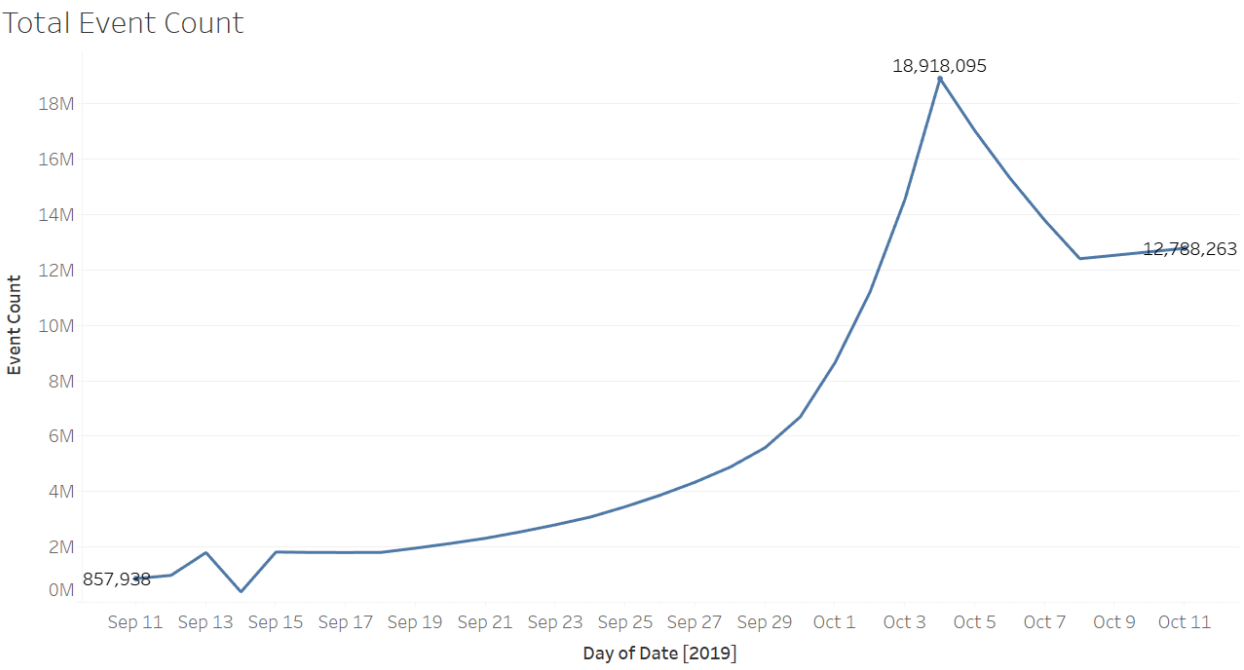


Image 4: All Events Log Scale

All Types of Events on a Logrithmic Scale.