

Optimalization Analysis of TransJakarta Services

Rahma Aurellyya | JCDS 2204 007



TransJakarta Background

- The first Bus Rapid Transit (BRT) operated in Southeast Asian, start operated in 2004
- TransJakarta consist of 252 stops distributed across 14 main corridors.
- Divided into three types of fleets:
TransJakarta, RoyalTrans and JakLingko



Problem & Goals

- To optimize the TransJakarta services, need to analyze the travel pattern of transjakarta users in Jabodetabek
- Goals: To identify the travel patterns of TransJakarta users so that TransJakarta can create a better services and facilities to accommodate it users.

Data Cleaning

	columnName	dataType	nullValue	nUnique	sampleUnique
0	transID	object	0	37900	[EIIW227B8L34VB, LGXO740D2N47GZ, DJWR385V2U57T...
1	payCardID	int64	0	2000	[180062659848800, 4885331907664776, 4996225095...
2	payCardBank	object	0	6	[emoney, dki, flazz, online, brizzi, bni]
3	payCardName	object	0	1993	[Bajragin Usada, Gandhi Widodo, Emong Wastuti, ...
4	payCardSex	object	0	2	[M, F]
5	payCardBirthDate	int64	0	67	[2008, 1997, 1992, 1978, 1982, 1993, 1974, 199...
6	corridorID	object	1257	221	[5, 6C, R1A, 11D, 12, 17, JAK.18, nan, B14, 1Q...
7	corridorName	object	1930	216	[Matraman Baru - Ancol, Stasiun Tebet - Karet ...
8	direction	float64	0	2	[1.0, 0.0]
9	tapInStops	object	1213	2570	[P00142, B01963P, B00499P, B05587P, P00239, B0...
10	tapInStopsName	object	0	2602	[Pal Putih, Kemenkes 2, Gg. Kunir II, Taman El...
11	tapInStopsLat	float64	0	2587	[-6.184631, -6.2287, -6.133132, -6.195743, -6...
12	tapInStopsLon	float64	0	2458	[106.84402, 106.83302, 106.81435, 106.93526, 1...
13	stopStartSeq	int64	0	67	[7, 13, 38, 23, 5, 3, 25, 2, 1, 15, 17, 12, 4...
14	tapInTime	object	0	37079	[2023-04-03 05:21:44, 2023-04-03 05:42:44, 202...
15	tapOutStops	object	2289	2230	[P00253, B03307P, B04962P, B03090P, P00098, B0...
16	tapOutStopsName	object	1344	2248	[Tegalan, Sampoerna Strategic, Simpang Kunir K...
17	tapOutStopsLat	float64	1344	2237	[-6.203101, -6.217152, -6.133731, -6.183068, -...
18	tapOutStopsLon	float64	1344	2139	[106.85715, 106.81892, 106.81475, 106.93194, 1...
19	stopEndSeq	float64	1344	74	[12.0, 21.0, 39.0, 29.0, 15.0, 6.0, nan, 16.0...
20	tapOutTime	object	1344	35908	[2023-04-03 06:00:53, 2023-04-03 06:40:01, 202...
21	payAmount	float64	1007	3	[3500.0, 20000.0, 0.0, nan]

Missing Value

False Data Type

Raw Data Summary:

- 37.900 rows and 22 columns
- 10 columns have missing value
- 2 columns data type are false

Data Cleaning

	columnName	totalMissingValue	percentage%				
6	corridorID	1257	3.32	17	tapOutStopsLat	1344	3.55
7	corridorName	1930	5.09	18	tapOutStopsLon	1344	3.55
9	tapInStops	1213	3.20	19	stopEndSeq	1344	3.55
15	tapOutStops	2289	6.04	20	tapOutTime	1344	3.55
16	tapOutStopsName	1344	3.55	21	payAmount	1007	2.66

Change
Data Type

Treatment
on Missing
Value

Check on
Duplicate

Add New
Column

Data Cleaning

```
<class 'pandas.core.frame.DataFrame'>
Index: 36524 entries, 0 to 37899
Data columns (total 28 columns):
#   Column              Non-Null Count  Dtype
---  -
0   transID              36524 non-null  object
1   payCardID            36524 non-null  int64
2   payCardBank          36524 non-null  object
3   payCardName          36524 non-null  object
4   payCardSex           36524 non-null  object
5   payCardBirthDate     36524 non-null  int64
6   corridorID           36524 non-null  object
7   corridorName         36524 non-null  object
8   direction            36524 non-null  float64
9   tapInStops           36524 non-null  object
10  tapInStopsName        36524 non-null  object
11  tapInStopsLat         36524 non-null  float64
12  tapInStopsLon         36524 non-null  float64
13  stopStartSeq          36524 non-null  int64
14  tapInTime             36524 non-null  datetime64[ns]
15  tapOutStops           36524 non-null  object
16  tapOutStopsName       36524 non-null  object
17  tapOutStopsLat        36524 non-null  float64
18  tapOutStopsLon        36524 non-null  float64
19  stopEndSeq            36524 non-null  float64
20  tapOutTime            36524 non-null  datetime64[ns]
21  payAmount             36524 non-null  float64
22  ageGroup              36524 non-null  object
23  tripDuration          36524 non-null  int32
24  tripDay               36524 non-null  object
25  tapInHour             36524 non-null  int32
26  tapOutHour            36524 non-null  int32
27  vehicleType           36524 non-null  object
dtypes: datetime64[ns](2), float64(7), int32(3), int64(3), object(13)
memory usage: 7.7+ MB
```

Dataset Summary After Cleaning:

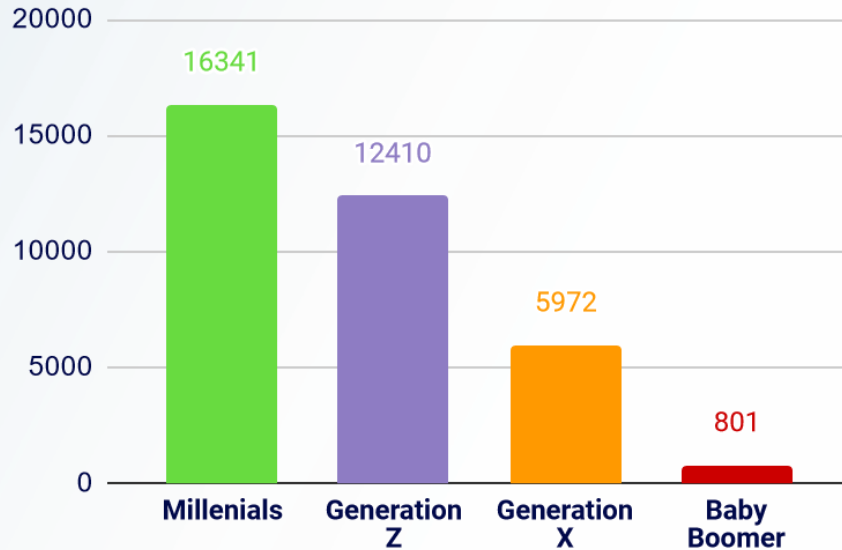
- Total rows from 37.900 to 36.524, dropping 3.6% of total entries from untreatable missing value.
- tapInTime and tapOutTime data type has been changed into datetime
- Add on 6 new columns, such as: ageGroup, tripDuration, tripDay, tapInHour, tapOutHour and vehicleType
- No duplicate entries in the dataset



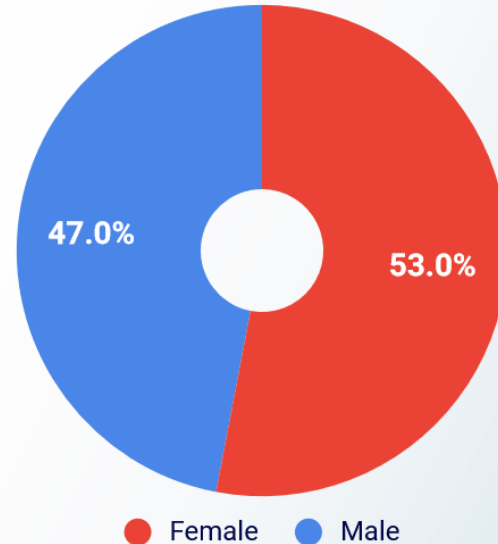
Data Analysis

User Demographic

Age Group Distribution



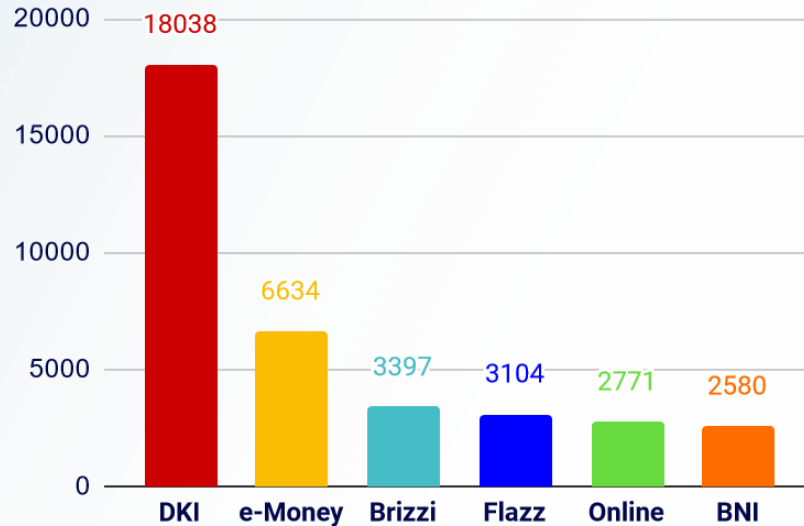
Gender Proportion



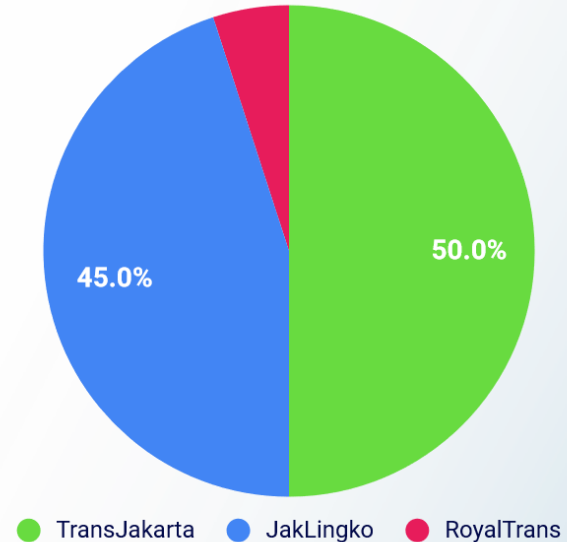
- Millenials and Gen Z are the top users of Transjakarta services
- By gender, female groups are dominating the passengers proportion rather than male groups.

User Demographic

Bank Card Distribution

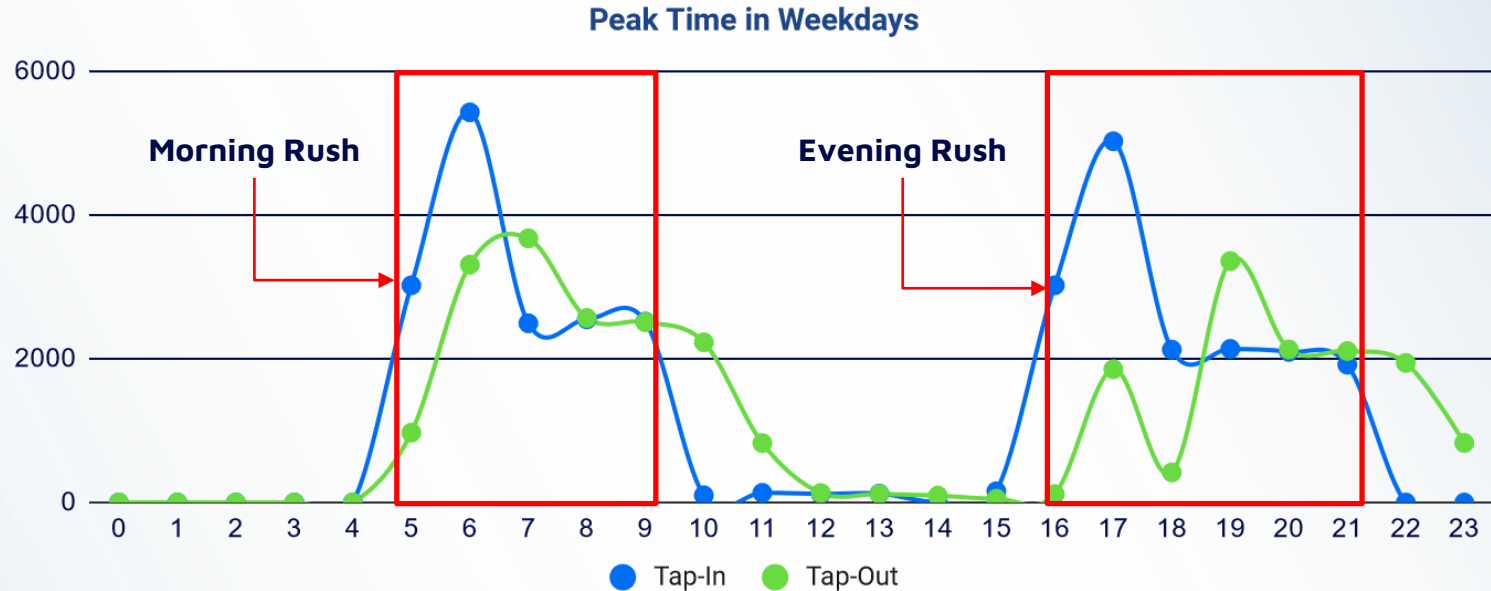


Vehicle Type Proportion



- Most user use DKI Card as their payment method.
- TransJakarta and JakLingko have the most passengers other than RoyalTrans

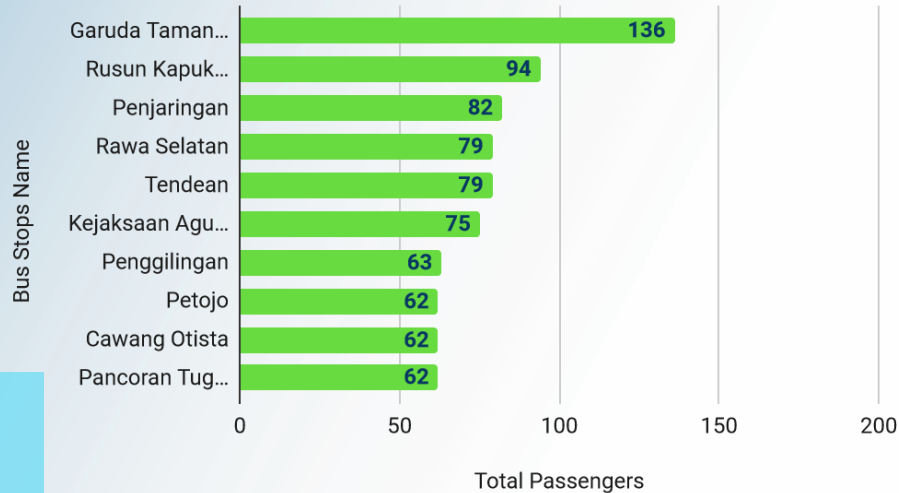
Weekdays Peak Time



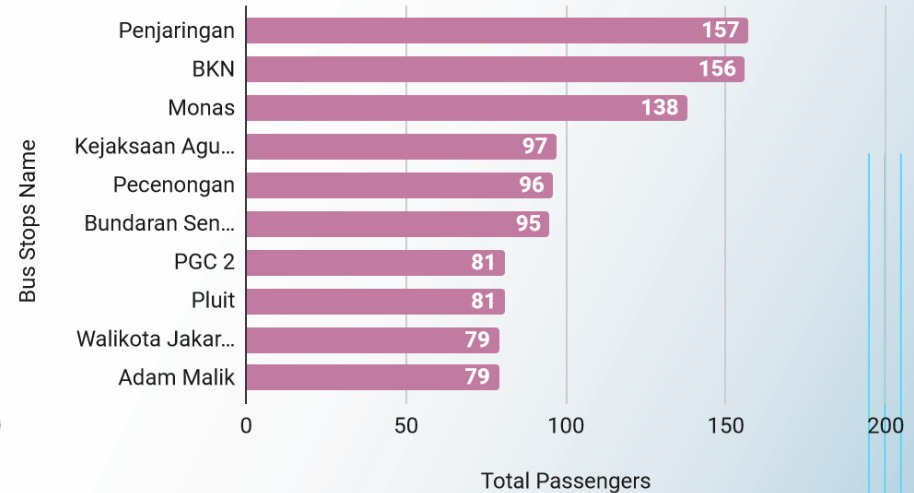
- Peak Time in Morning start on 05.00 to 09.00 and in Evening start on 16.00 to 21.00

Weekdays: Morning Rush

Top 10 Tap-In Stops Morning Rush



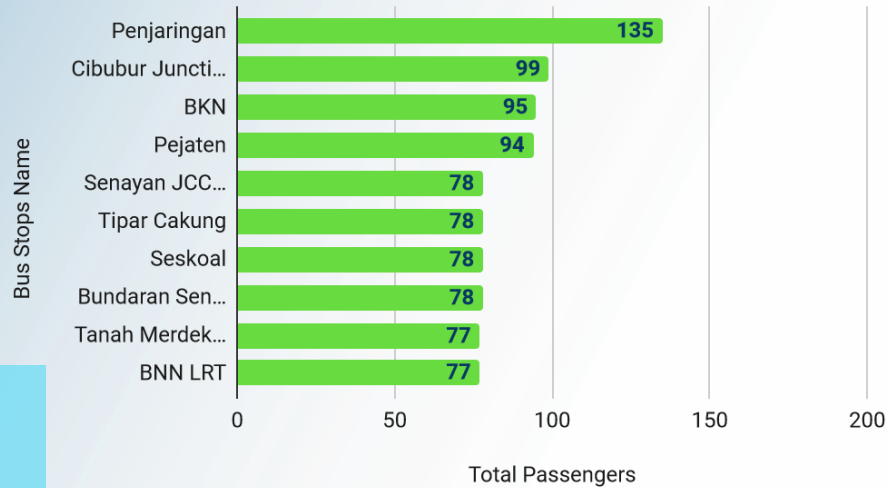
Top 10 Tap-Out Stops Morning Rush



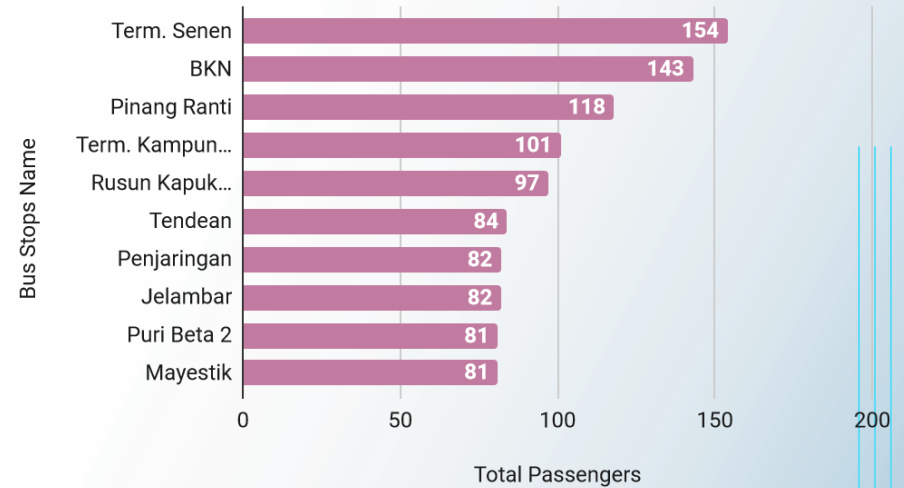
- Garuda Taman Mini are the most tap-in during morning rush, and Penjaringan are the most tap-out stop.
- Penjaringan and Kejaksaan Agung both in top 10 tap-in and tap-out stop, indicating both stops are quite busy and likely to be a transit stops.

Weekdays: Evening Rush

Top 10 Tap-In Stops Evening Rush



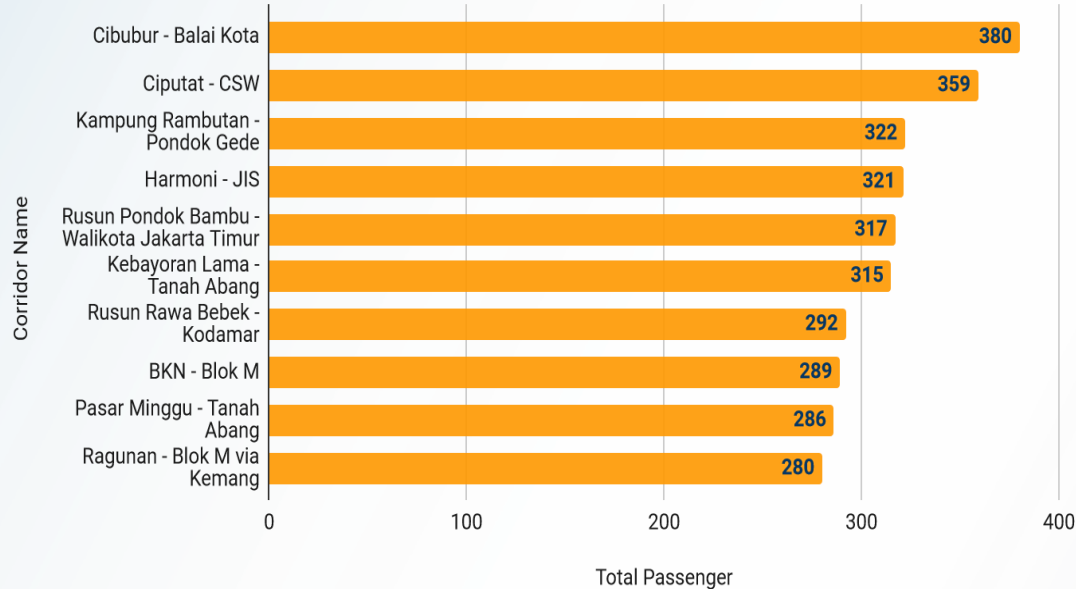
Top 10 Tap-Out Stops Evening Rush



- Penjaringan are the most tap-in during evening rush, and Term. Senen are the most tap-out stop.
- Penjaringan and BKN both in top 10 tap-in and tap-out stop, indicating both stops are quite busy and likely to be a transit stops.

Weekdays: Top 10 Corridors

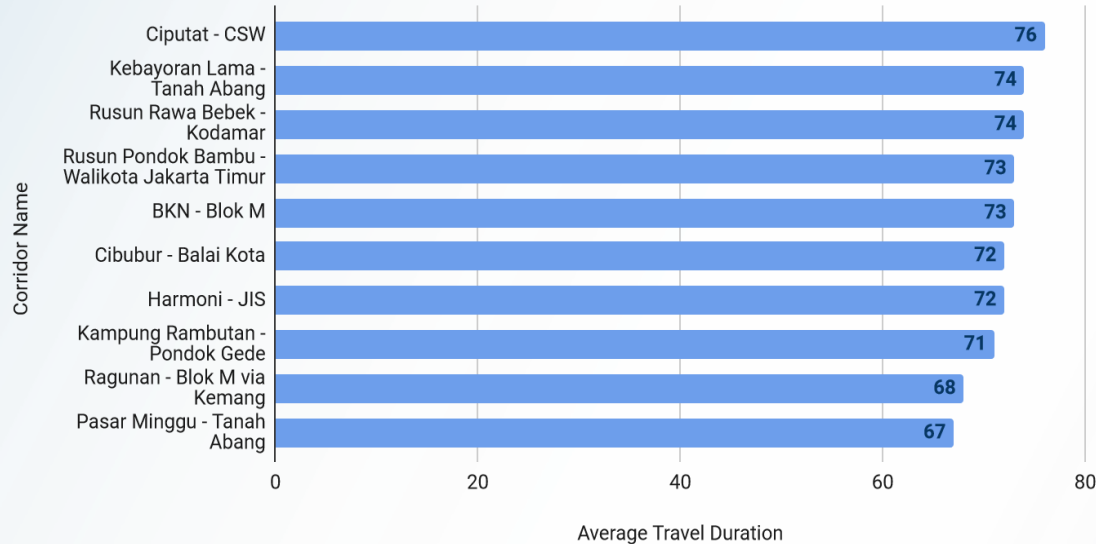
Top 10 Corridor in Weekdays



- This top 10 corridors suggest that they are essential routes, likely connecting to residential areas with workplace, commercial district, or educational institutions.

Weekdays: Average Travel Duration

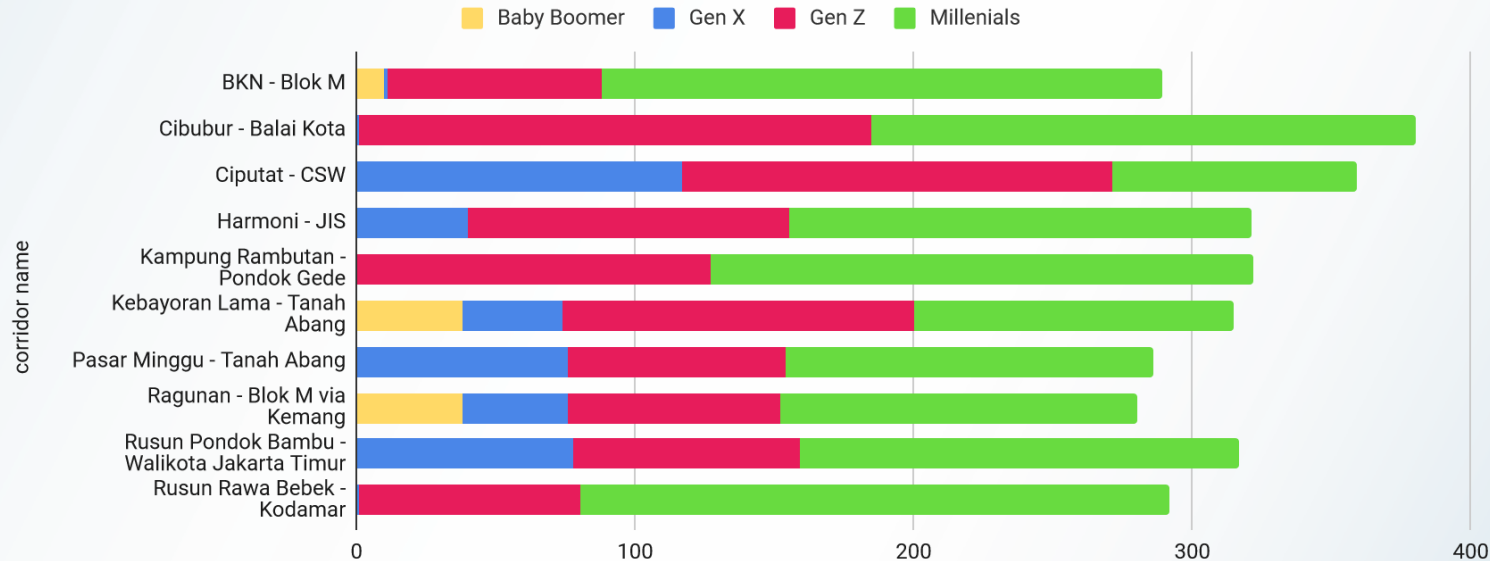
Average Travel Duration Weekdays (in Minutes)



- The average travel durations for the top 10 corridors, ranging from 67 to 76 minutes.

Weekdays: Age Distribution

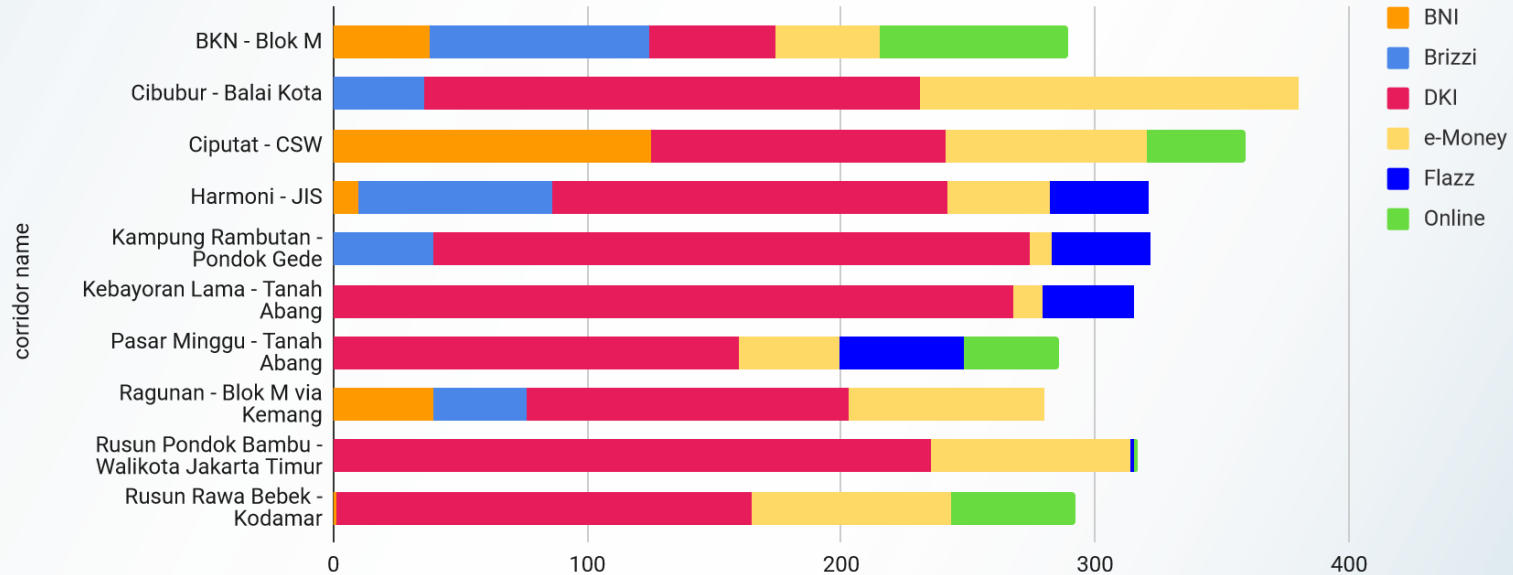
Age Distribution by Corridor



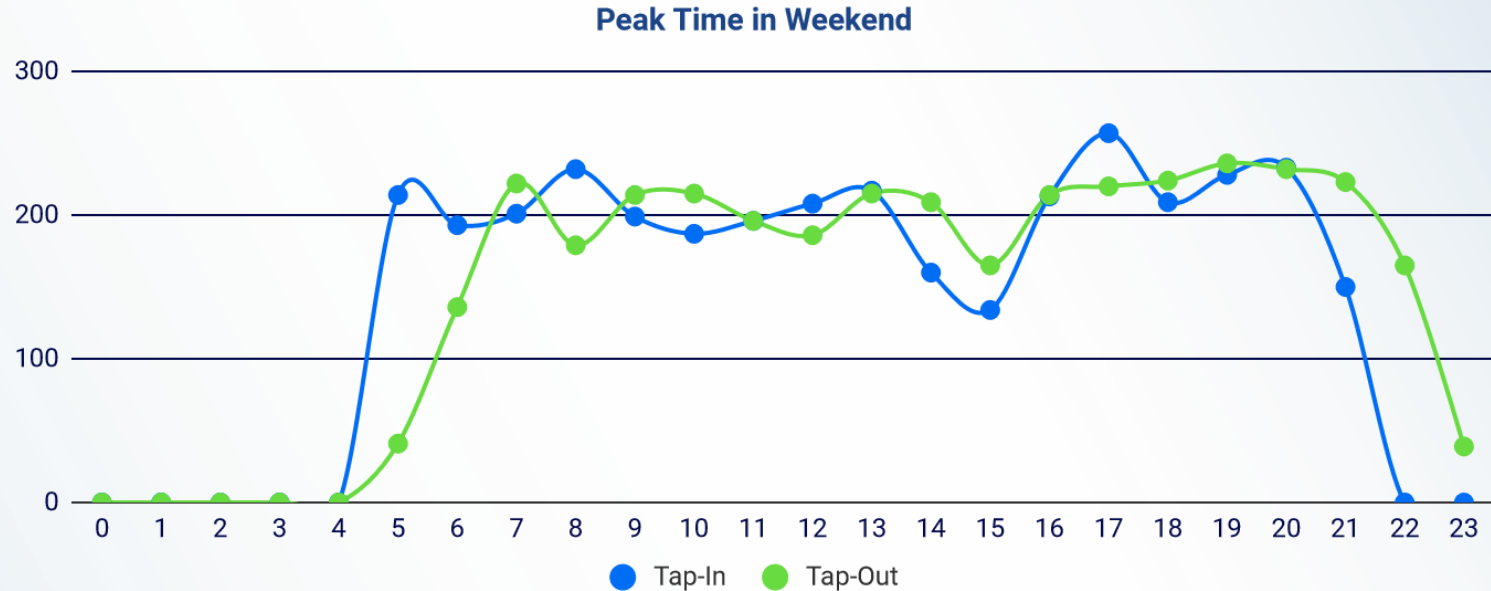
- Millennials and Gen Z are dominating every corridor, while Gen X and Baby Boomer appears to be relatively smaller compared to the younger generation.

Weekdays: Payment Card Distribution

Payment Card by Corridor



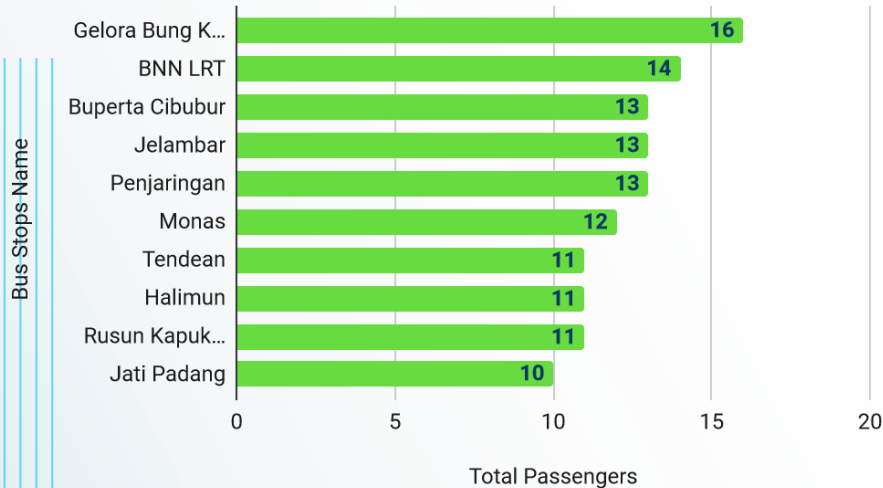
Weekend Peak Time



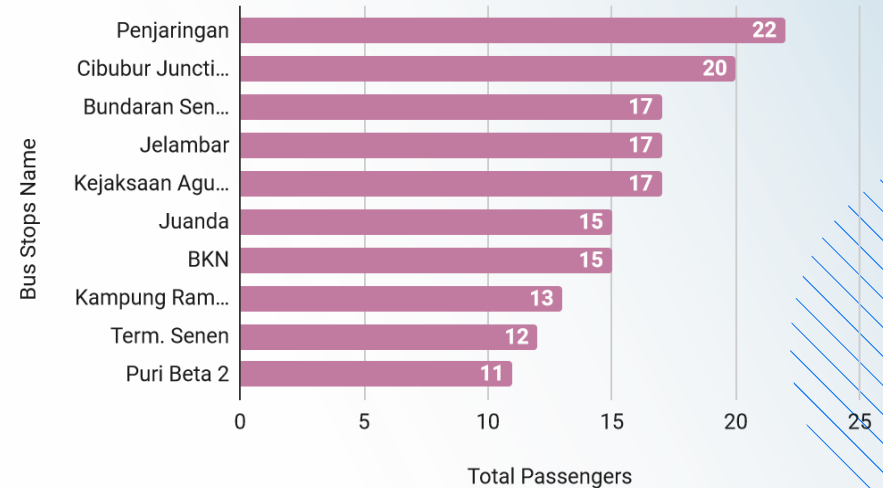
- Most Tap-In at 17.00 and Tap-Out at 19.00, the amount of passenger each hour are fluctuative.

Weekends: Busiest Bus Stops

Top 10 Tap-In Stops Weekends



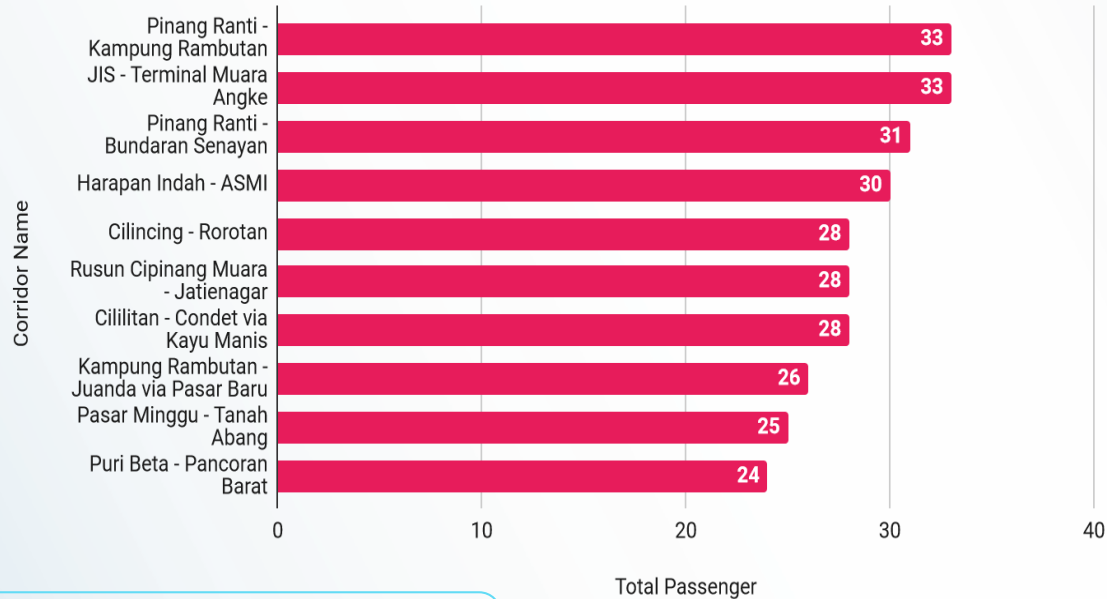
Top 10 Tap-Out Stops Weekends



- Gelora Bung Karno are the most tap-in during morning rush, and Penjaringan are the most tap-out stop.
- Penjaringan and Jelambar both in top 10 tap-in and tap-out stop, indicating both stops are quite busy and likely to be a transit stops.

Weekends: Top 10 Corridors

Top 10 Corridor in Weekdays



- This top 10 corridor are indicated to lead the commuters to recreational destinations on weekends.

Weekends: Average Travel Duration

Average Travel Duration Weekends(in Minutes)



- Average travel duration tend to longer during weekends than weekdays, assuming that more people use private vehicles for travel on weekends, leading to increased traffic congestion on the roads.

Conclusion

WEEKDAYS:

- Most Tap-In at 17.00 and Tap-Out at 19.00, the amount of passenger each hour are fluctuative.
- **Penjaringan** and **Kejaksaan Agung** both in top 10 tap-in and tap-out stop, indicating both stops are quite busy and likely to be a transit stops during morning rush in weekdays.
- **Penjaringan** and **BKN** both in top 10 tap-in and tap-out stop, indicating both stops are quite busy and likely to be a transit stops during evening rush in weekdays.
- The **top 10 corridors** in weekdays suggest that they are essential routes, likely connecting to residential areas with **workplace, commercial district, or educational institutions.**
- The average travel durations for the top 10 corridors, ranging from **67 to 76 minutes** or more than 1 hour to reach a destination.

Conclusion

WEEKENDS:

- Peak Time in Morning start on **05.00 to 09.00** and in Evening start on **16.00 to 21.00**
- **Penjaringan** and **Jelambar** both in top 10 tap-in and tap-out stop, indicating both stops are quite busy and likely to be a transit stops.
- The **top 10 corridors** in weekdays suggest that they are essential routes, likely connecting to residential areas with workplace, commercial district, or educational institutions.
- Most **Tap-In at 17.00** and **Tap-Out at 19.00**, the amount of passenger each hour are fluctuative.
- The top 10 corridors are indicated to lead the commuters to and **recreational destinations** on weekends.
- The average travel durations for the top 10 corridors, ranging from **67 to 85 minutes**, average travel duration are longer than weekdays.

Recommendation

- Revitalization Penjaringan, Jelambar, and BKN stops with better facilities to prevent overcrowding.



- Consider adding more buses or adjusting schedules to reduce overcrowding and improve passenger comfort in most busy corridors.
- Ensuring that the dedicated Transjakarta lanes are used optimally, and imposing severe penalties on drivers who traverse those lanes in order to reduce Transjakarta duration time.
- Promoting the usage of online payment toward the Millennials and Gen Z demographic.

Thank You!

