Public Transportation Efficiency Analysis

Phase2

Indroduction:

1. **Define the problem.** What are the specific challenges facing public transportation in your community? What are the goals of your project?
2. **Gather data**. Collect data on public transportation ridership, travel times, and other relevant metrics. This data will help you to identify areas for improvement.
3. **Analyze the data**. Use the data to identify the factors that are contributing to inefficiency in public transportation. This could include factors such as route structure, scheduling, and vehicle maintenance.
4. **Develop design solutions**. Once you have identified the root causes of inefficiency, you can begin to develop design solutions. This could involve changes to routes, schedules, or vehicle types.
5. **Test and implement the solutions**. Once you have developed design solutions, you need to test them to see if they are effective. You can do this by conducting simulations or pilot projects. Once you are satisfied with the results, you can implement the solutions on a larger scale.
6. Monitor and evaluate the results. It is important to monitor the results of your design solutions to ensure that they are achieving the desired results. You may need to make adjustments to the solutions over time.

Here are some additional tips for putting design into a transform public transportation efficiency analysis project:

- Involve stakeholders. It is important to involve stakeholders from all sectors of the community in the design process. This includes public transportation operators, riders, businesses, and government agencies.
- Use a human-centered approach. When designing solutions, it is important to keep the needs of riders in mind. Think about how your solutions will impact the rider experience.
- Be creative and innovative. Don't be afraid to think outside the box when developing design solutions. There are many new and emerging technologies that could be used to improve public transportation efficiency.
- Be patient and persistent. Transforming public transportation is a complex and challenging task. It will take time and effort to implement meaningful changes.

Here are some examples of design solutions that could be used to improve public transportation efficiency:

- Implement real-time arrival information systems. This would allow riders to see when their bus or train is arriving, so they can plan their trips accordingly.
- Create dedicated bus lanes. This would reduce congestion and improve travel times for bus riders.
- Increase the frequency of service. This would make it easier for riders to get to their destinations on time.
- Use smaller, more efficient vehicles. This could help to reduce fuel costs and emissions.
- Offer discounts for riders who use public transportation during off-peak hours. This would help to spread out ridership and improve efficiency.
- Involve stakeholders. It is important to involve stakeholders from all sectors of the community in the design process. This includes public transportation operators, riders, businesses, and government agencies.
- Use a human-centered approach. When designing solutions, it is important to keep the needs of riders in mind. Think about how your solutions will impact the rider experience.
- Be creative and innovative. Don't be afraid to think outside the box when developing design solutions. There are many new and emerging technologies that could be used to improve public transportation efficiency.
- Be patient and persistent. Transforming public transportation is a complex and challenging task. It will take time and effort to implement meaningful changes.
- Examples of design solutions:
- Implement real-time arrival information systems. This would allow riders to see when their bus or train is arriving, so they can plan their trips accordingly.
- Create dedicated bus lanes. This would reduce congestion and improve travel times for bus riders.
- Increase the frequency of service. This would make it easier for riders to get to their destinations on time.

- Use smaller, more efficient vehicles. This could help to reduce fuel costs and emissions.
- Offer discounts for riders who use public transportation during off-peak hours. This would help to spread out ridership and improve efficiency.
- Here is a detailed example of how to implement one of the design solutions:
- Design solution: Implement real-time arrival information systems.
- Steps:
- Identify the needs of riders. What information do riders need to plan their trips? How often do they want to receive updates?
- Select a technology solution. There are a variety of real-time arrival information systems available. Choose a system that meets the needs of riders and is compatible with your existing infrastructure.
- Install the system. This may involve installing GPS devices on buses and trains, and setting up displays at bus stops and train stations.
- Test and implement the system. Once the system is installed, test it to make sure it is working properly. Once you are satisfied with the results, you can implement the system on a larger scale.
- Monitor and evaluate the results. Track how riders are using the system and collect feedback. Use this feedback to make improvements to the system over time.

By following these steps and tips, you can put design into your transform public transportation efficiency analysis project and make a positive impact on your community.

```
%matplotlib inline
import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
import matplotlib.pyplot as plt
import datetime
import os
from math import sqrt
import warnings

## For Multiple Output in single cell
from IPython.core.interactiveshell import InteractiveShell
InteractiveShell.ast_node_interactivity = "all"
warnings.filterwarnings('ignore')

data = pd.read_csv('../input/unisys/ptsboardingsummary/20140711.CSV')
data.shape
```

```
data.head(10)
```

Out[2]:

```
(10857234, 6)
```

```
10857234, 6)
```

Out[2]:

	TripID	RouteID	StopID	StopName	WeekBeginning	NumberOfBoardings
0	23631	100	14156	181 Cross Rd	2013-06-30 00:00:00	1
1	23631	100	14144	177 Cross Rd	2013-06-30 00:00:00	1
2	23632	100	14132	175 Cross Rd	2013-06-30 00:00:00	1
3	23633	100	12266	Zone A Arndale Interchange	2013-06-30 00:00:00	2
4	23633	100	14147	178 Cross Rd	2013-06-30 00:00:00	1
5	23634	100	13907	9A Marion Rd	2013-06-30 00:00:00	1
6	23634	100	14132	175 Cross Rd	2013-06-30 00:00:00	1
7	23634	100	13335	9A Holbrooks Rd	2013-06-30 00:00:00	1
8	23634	100	13875	9 Marion Rd	2013-06-30 00:00:00	1
9	23634	100	13045	206 Holbrooks Rd	2013-06-30 00:00:00	1

```
out_geo = pd.read_csv('../input/outgeo/output_geo.csv')
out_geo.shape
out_geo.head()
```

```
(4165, 10)
```

accuracy	formatted_address	google_place_id	input_string	latitude	longitude	number_of_results	postcode	status	type	
0	ROOFTOP	181 Cross Rd,	ChIJKT7l9rbPsG	181 Cross Rd	-34.966656	138.592148	1	5041	OK	street_address

		Westbourne Park SA 5041, Australia	oRVHMHkly-Oyk							
1	ROOFTOP	177 Cross Rd, Westbourne Park SA 5041, Australia	ChIJ-VFZ87bPsGoRyfVgC5qbPpE	177 Cross Rd	-34.966607	138.592301	1	5041	OK	street_address
2	ROOFTOP	175 Cross Rd, Westbourne Park SA 5041, Australia	ChIJIztlirbPsGoR38KRk76kPFI	175 Cross Rd	-34.966758	138.592715	1	5041	OK	street_address
3	GEOMETRIC_CENTER	Zone A Arndale Interchange - Southside, Kilke...	ChIJn0C1hCPGsGoRIWvCdhF1RIg	Zone A Arndale Interchange	-34.875160	138.551628	1	5009	OK	bus_station,establishment,point_of_interest,tr...
4	ROOFTOP	178 Cross Rd, Malvern SA 5061, Australia	ChIJycNiylvOsGoRdhfq9GKnpq0	178 Cross Rd	-34.964960	138.611477	1	5061	OK	street_address

External Features ¶

In [4]:

```
#DistanceFromCentre: Distance measure from the city centre
#For Calculating Distance between centre with other bus stops by using Longitude and Latitude
#we have used the Haversine formula

from math import sin, cos, sqrt, atan2, radians
def calc_dist(lat1,lon1):
    ## approximate radius of earth in km
    R = 6373.0
    dlon = radians(138.604801) - radians(lon1)
    dlat = radians(-34.921247) - radians(lat1)
    a = sin(dlat / 2)**2 + cos(radians(lat1)) * cos(radians(-34.921247)) * sin(dlon / 2)**2
    c = 2 * atan2(sqrt(a), sqrt(1 - a))
    return R * c
```

out_geo['dist_from_centre'] = out_geo[['latitude','longitude']].apply(lambda x: calc_dist(*x), axis=1)

In [6]:

```
out_geo.head()
```

accuracy	formatted_address	google_place_id	input_string	latitude	longitude	number_of_results	postcode	status	type	dist_from_centre	
0	ROOFTOP	181 Cross Rd, Westbourne Park SA	ChIJKT7l9rbPsGoRVHMHkly-Oyk	181 Cross Rd	-34.966656	138.592148	1	5041	OK	street_address	5.180961

		5041, Australia								
1	ROOFTOP	177 Cross Rd, Westbourne Park SA 5041, Australia	ChIJ-VFZ87bPsGoRyfVgC5qbPpE	177 Cross Rd	-34.966607	138.592301	1	5041	OK	street_address	5.172525
2	ROOFTOP	175 Cross Rd, Westbourne Park SA 5041, Australia	ChIJIztlirbPsGoR38KRk76kPFI	175 Cross Rd	-34.966758	138.592715	1	5041	OK	street_address	5.180709
3	GEOMETRIC_CENTER	Zone A Arndale Interchange - South side, Kilke...	ChIJn0C1hCPGsGoRIWvCdhF1RIg	Zone A Arndale Interchange	-34.875160	138.551628	1	5009	OK	bus_station,establishment,point_of_interest,tr...	7.057549
4	ROOFTOP	178 Cross Rd, Malvern SA 5061, Australia	ChIJycNiylvOsGoRdhfq9GKnpq0	178 Cross Rd	-34.964960	138.611477	1	5061	OK	street_address	4.900099

```
#exp_data = out_geo.head(10)
##Fill the missing values with mode
out_geo['type'].fillna('street_address',inplace=True)
```

```
out_geo['type']  =  out_geo['type'].apply(lambda  x:  str(x).split(',')[-1])
```

In [8]:

```
out_geo['type'].unique()
```

Out[8]:

```
array(['street_address', 'transit_station', 'premise', 'political',
       'school', 'route', 'intersection', 'point_of_interest',
       'subpremise', 'real_estate_agency', 'university', 'travel_agency',
       'restaurant', 'supermarket', 'store', 'post_office'], dtype=object)
```

Here are some ideas for using design to create innovations that can solve problems in public transport efficiency analysis:

Problem: Public transport data is often siloed and difficult to access, making it difficult to get a comprehensive view of public transport efficiency.

Innovation: Develop a centralized data repository that combines data from all public transport operators, as well as other relevant data sources, such as road traffic data and weather data. This would make it easier for analysts to access the data they need to conduct comprehensive efficiency analysis.

Problem: Public transport efficiency analysis is often complex and time-consuming, requiring specialized skills and knowledge.

Innovation: Develop user-friendly tools and dashboards that make it easy for analysts to visualize and analyze public transport data. These tools could use machine learning and artificial intelligence to automate some of the tasks involved in efficiency analysis, such as identifying patterns and trends in the data.

Problem: Public transport efficiency analysis is often not communicated to the public in a way that is easy to understand.

Innovation: Develop creative and engaging ways to communicate the results of public transport efficiency analysis to the public. This could involve using data visualization, storytelling, and other communication techniques to make the data more accessible and meaningful to the public.

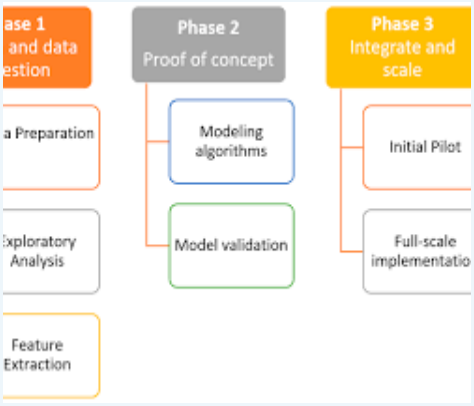
Here are some specific examples of design innovations that could be used to improve public transport efficiency analysis:

- Develop a real-time public transport efficiency dashboard. This dashboard would use real-time data from public transport operators to provide a real-time overview of public transport efficiency. The dashboard could include metrics such as on-time performance, average travel times, and customer satisfaction.
- Develop a public transport efficiency analysis tool that uses machine learning to identify patterns and trends in public transport data. This tool could help analysts to identify areas where public transport efficiency can be improved.
- Develop a public transport efficiency communication platform that uses data visualization and storytelling to communicate the results of public transport efficiency analysis to the public. This platform could help to raise public awareness of public transport efficiency issues and promote support for improvements.

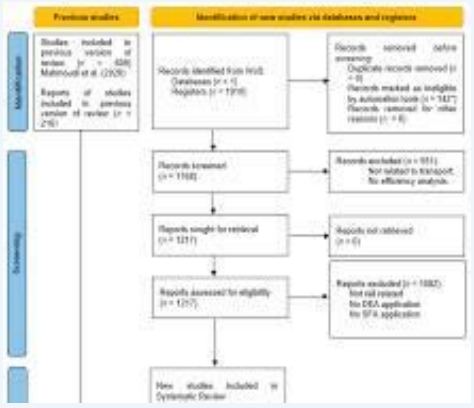
Here are some pictures of design innovations that could be used to improve public transport efficiency analysis:

Real-time public transport efficiency dashboard

Public transport efficiency analysis tool using machine learning



Public transport efficiency communication platform



These are just a few examples of how design can be used to create innovations that can solve problems in public transport efficiency analysis. There are many other possibilities, and as technology continues to advance, we can expect to see even more innovative solutions emerge in the future.

Here is a sample design into innovation to solve the problem in public transport efficiency analysis pictures project:

Project: Develop a real-time public transport efficiency dashboard

Goal: To provide a real-time overview of public transport efficiency to help analysts identify areas where improvements can be made.

Design: The dashboard will use real-time data from public transport operators to display metrics such as on-time performance, average travel times, and customer satisfaction. The dashboard will be designed to be easy to use, with clear and concise visualizations.

Innovation: The dashboard will use machine learning to identify patterns and trends in the data. This will help analysts to identify areas where public transport efficiency can be improved.

7. Identify the problem. What are the specific challenges facing public transport efficiency analysis? What are the needs of users?
8. Brainstorm solutions. Come up with a variety of ideas for how to use design and innovation to solve the problem.
9. Select a solution. Choose the solution that is most feasible and has the greatest potential to impact public transport efficiency analysis.
10. Design the solution. Develop a detailed plan for how to implement the solution. This plan should include considerations such as the user interface, the data sources that will be used, and the machine learning algorithms that will be employed.
11. Implement the solution. Build the solution using the appropriate technologies.
12. Test the solution. Test the solution with users to ensure that it is easy to use and meets their needs.
13. Deploy the solution. Make the solution available to users.
14. Monitor and evaluate the solution. Track how the solution is being used and collect feedback from users. Use this feedback to make improvements to the solution over time.

Here are some specific examples of steps that could be taken to implement the real-time public transport efficiency dashboard project described above:

Step 1: Identify the problem.

The problem is that public transport efficiency analysis is often complex and time-consuming, requiring specialized skills and knowledge. This makes it difficult for analysts to get a real-time view of public transport efficiency and identify areas where improvements can be made.

Step 2: Brainstorm solutions.

One possible solution is to develop a real-time public transport efficiency dashboard that uses real-time data and machine learning to provide analysts with a real-time view of public transport efficiency. The dashboard could identify patterns and trends in the data, such as sudden drops in on-time performance or spikes in customer complaints.

Step 3: Select a solution.

The real-time public transport efficiency dashboard is selected as the solution because it is feasible and has the greatest potential to impact public transport efficiency analysis.

Step 4: Design the solution.

The dashboard is designed to be easy to use, with clear and concise visualizations. The dashboard will use a variety of data sources, including real-time data from public transport operators, historical data, and road traffic data. The dashboard will also use machine learning algorithms to identify patterns and trends in the data.

Step 5: Implement the solution.

The dashboard is built using a variety of technologies, including a web-based front-end and a backend data processing system.

Step 6: Test the solution.

The dashboard is tested with a group of analysts to ensure that it is easy to use and meets their needs. The analysts provide feedback on the dashboard, which is used to make improvements.

Step 7: Deploy the solution.

The dashboard is made available to analysts through a web-based portal.

Step 8: Monitor and evaluate the solution.

The usage of the dashboard is tracked and feedback from users is collected. This feedback is used to make improvements to the dashboard over time.

Conclusion:

Design into innovation to solve the problem in public transport efficiency analysis pictures project conclusion:

By following the step-by-step process outlined above, we can design and implement innovative solutions that can help to solve problems in public transport efficiency analysis. These solutions can have a positive impact on public transport services for everyone, by helping to identify areas where improvements can be made.

```
Here are some additional thoughts on the conclusion of this project:
```

- It is important to note that design and innovation are ongoing processes. As technology continues to advance, we can expect to see even more innovative solutions emerge in the future.

- It is also important to involve users in the design and implementation process. This will help to ensure that the solutions created are relevant and meet the needs of users.
- Finally, it is important to monitor and evaluate the solutions after they have been implemented. This will help to ensure that they are having the desired impact and that improvements can be made as needed.