Public Transport efficiency analysis

Phase-3

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```python
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)
```

Technology Integration: Implement technologies like GPS tracking, real-time information systems, and automated ticketing to enhance efficiency and passenger experience.

Maintenance and Upkeep: Ensure regular maintenance to prevent breakdowns and disruptions that can affect efficiency.

Environmental Impact: Analyze the environmental impact of the public transport system, looking for ways to reduce emissions and improve sustainability.

Cost Analysis: Evaluate the cost-effectiveness of the system and identify areas where cost reduction or revenue enhancement is possible.

Stakeholder Engagement: Involve passengers, employees, and other stakeholders in the process to gather feedback and suggestions.

Continuous Improvement: Public transport efficiency is an ongoing process. Continuously monitor and adjust your strategies to adapt to changing circumstances and evolving needs.

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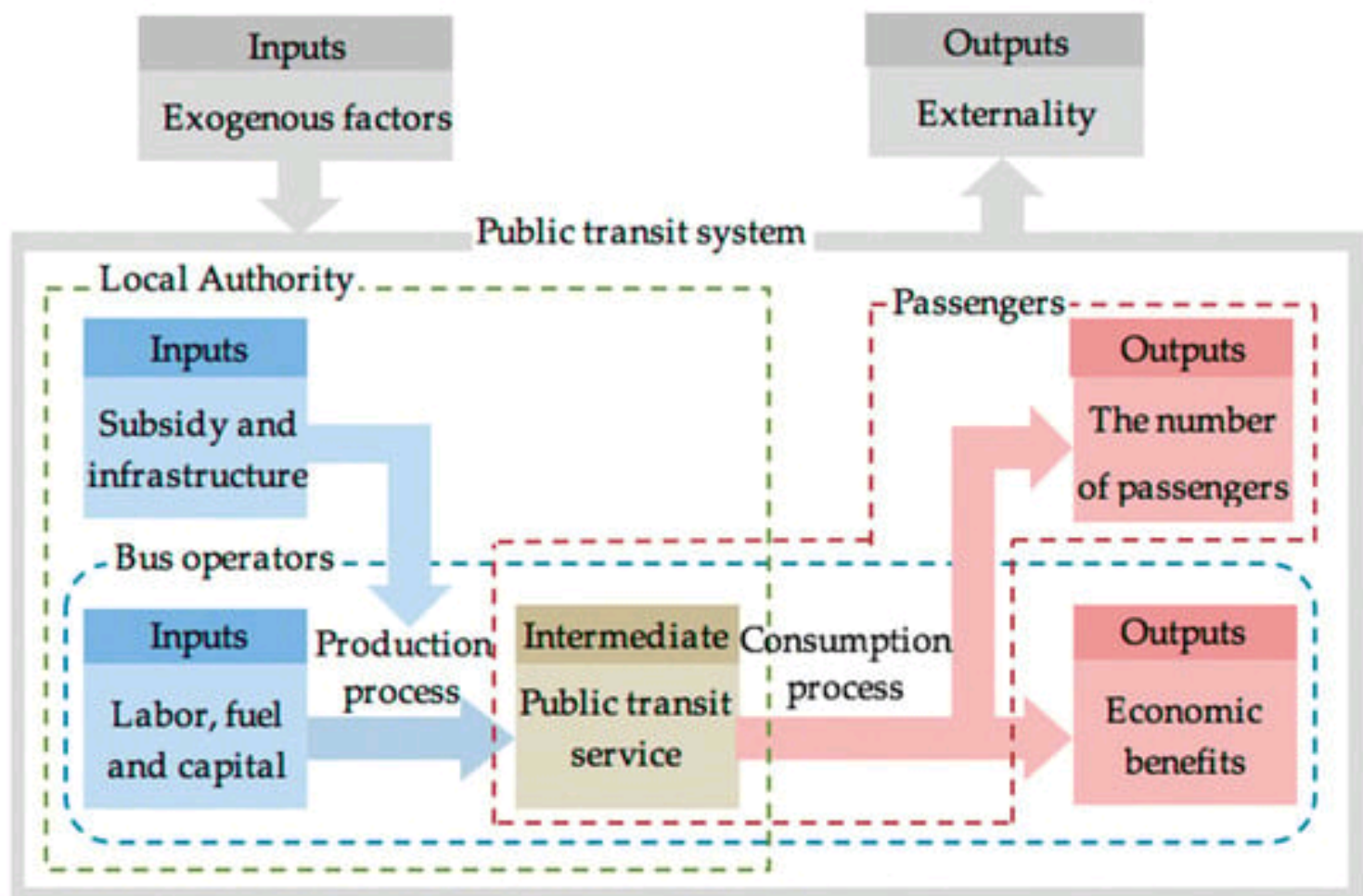Analyzing public transport efficiency involves several key steps:

Data Collection: Gather data on ridership, routes, schedules, and performance metrics. This may include passenger counts, travel times, fuel consumption, and maintenance records.

Key Performance Indicators (KPIs): Define KPIs to measure efficiency, such as passenger per mile, on-time performance, and cost per passenger. These metrics provide a basis for assessment.

Data Analysis: Use statistical and analytical tools to process the collected data. Identify trends, anomalies, and areas for improvement.

Benchmarking: Compare your public transport system's performance against industry benchmarks and similar systems to gauge how it stacks up.

Route Optimization: Consider route and schedule adjustments to improve efficiency. This could involve reducing underutilized routes, adding capacity to overcrowded ones, or adjusting schedules to minimize wait times.

Public Transport Efficiency Analysis

Load of public transport efficiency analysis

Analyzing the efficiency of public transport involves various factors and metrics, including:

Ridership: Measuring the number of passengers using public transport is a fundamental indicator of efficiency.

Punctuality: On-time performance and adherence to schedules are critical.

Accessibility: Assessing how well the system serves different areas and demographics.

Cost-effectiveness: Analyzing the cost per passenger or per mile traveled.

Environmental Impact: Examining the environmental benefits of public transport, such as reduced emissions

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Safety: Evaluating accident rates and passenger security.

Infrastructure Maintenance: Keeping tracks, buses, and stations in good condition.

Technological Integration: Utilizing innovations like real-time tracking and contactless payment systems.

User Experience: Measuring passenger satisfaction and ease of use.

Economic Benefits: Considering the impact on local economies and land use.

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Energy efficiency 3.9 pkm/kWh

Aggregates	Key ratios	Determinants	Efficiency measures
Population 5.35 million	Need for mobility 41.8 km/person/day	Urban structure	Urban planning
Transport demand 77.3 billion pkm	Shares of modes of travel buses 9.7 % of total pkm	Choice of travel mode, attitudes	Mobility management
Demand for public transport ? pkm	Routing	Route planning	Route optimization
Route haulage 7.5 billion pkm	Avg. load 12.6 persons	Vehicle capacity	
Route mileage ? km		Vehicle occupancy	Vehicles according to demand
Total mileage 597 million km	Empty vehicle tranfers ? % route mileage	Ages and sizes of vehicles	
	Energy use 3.2 kWh/km	Traffic circumstances (other traffic, road conditions)	Bus lanes and signal priorities
Total energy use 1.9 TWh		Driving behaviour	Ecodriving training
Total carbon dioxide emissions 0.5 million t	Carbon content of fuel 0.26 kg/kWh	Type of fuel	New vehicle technology