DATA ANALYTICS AND VISUALISATION PROJECT PROPOSAL

Name: Patrick Dowe - S00278387

Date: 01/12/2025

Title: Data-Driven Insights for SPSV Licensing and Compliance: Development of an Analytics & Visualisation Dashboard

Background and Rationale:

Transport regulation is essential to ensuring safe, accessible, and well-functioning public mobility systems. In Ireland, the National Transport Authority (NTA) oversees the Small Public Service Vehicle (SPSV) sector, which covers taxis, hackneys, and limousines. This system plays a critical role in urban mobility, accessibility for vulnerable users, and public confidence in regulated passenger transport.

In recent years, the volume of regulatory data generated within transport systems has grown substantially, driven by digital licensing processes, increased customer engagement, and expanded compliance activity. The OECD (2021) emphasises that modern regulators must transition from reactive decision-making to a proactive, data-driven model, one that leverages analytics, automation, and forecasting to identify risks earlier and improve regulatory outcomes.

However, research shows that regulators often face challenges such as fragmented datasets, inconsistent data quality, manual reporting processes, and limited forecasting capabilities (European Commission, 2023). These limitations can hinder timely decision-making, obscure emerging risk patterns, and reduce the efficiency of enforcement resourcing.

A data-driven SPSV Compliance & Licensing Dashboard would address these gaps by integrating licensing data, compliance outcomes, inspection trends, and complaints into a unified visual interface. International experience demonstrates that dashboards support better regulation by providing actionable insights, real-time monitoring, and predictive analytics (ITU, 2022). For the SPSV sector, this could enhance public safety, improve service availability, increase transparency, and support policy development.

By applying data visualisation, analytics, and machine learning tools, this project will create an interactive platform enabling regulators to explore trends, monitor risks, and forecast future licensing and compliance patterns.

Objective and Research Questions:

Objective:

To design and develop an interactive SPSV Licensing & Compliance Analytics Dashboard that visualises key regulatory trends, improves data transparency, and provides predictive insights to support evidence-based transport regulation.

Research Questions:

- What are the key trends in SPSV licensing volumes, renewals, and geographic distribution over time?
- How can compliance and enforcement data be analysed to identify high-risk operators or areas with repeated non-compliance?
- Can machine learning methods forecast future licensing demand or predict compliance risks?
- How can a dashboard help regulators and policymakers make more effective, data-driven decisions?

Methodology:

Data Sources

The project will use publicly accessible datasets and simulated data where required, including:

- NTA SPSV Statistics (public reports and open datasets, where available).
- CSO datasets related to transport, population density, and urban mobility.
- Open data from data.gov.ie relating to transport and regulatory activity.
- Manually constructed simulated datasets to represent licensing, inspections, and complaints where real datasets are restricted.

Data Pre-Processing

- **Data Cleaning:** Handle missing values, structure dates, normalise categories, and remove inconsistencies across licensing and compliance datasets.
- **Feature Engineering:**
  - Licence renewals rates
  - Regional availability indice
  - Complaint categories
  - Compliance scores
  - Time-based service trends

Data Integration: Combine licensing, inspection, and complaint datasets to create a complete regulatory view.

Dashboard Features

- **Licensing Trends:**
  Interactive charts showing licence volumes, renewals, expiries, and regional distribution.
- **Compliance & Enforcement Insights:**
  Heatmaps, bar charts, and trend lines highlighting non-compliance patterns, inspection results, and enforcement actions.
- **Consumer Feedback & Complaints:**
  Visual summaries of complaint types, frequency, geographic clustering, and resolution timelines.
- **Predictive Insights:**
  Machine learning models forecasting:
  - Licensing demand
  - Potential non-compliance
  - Regional service gaps
- **User-Friendly Interface:**
  - Filters by year, region, licence type, and operator status
  - Drill-down capability
  - Exportable charts and KPI summaries

Plan of Work:

Step	Tasks
1	Conduct literature review and gather/compile data from available sources.
2	Clean, preprocess and integrate datasets; develop feature sets.
3	Build initial dashboard layout and core visualisations.
4	Implement machine learning models and integrate them into the dashboard.
5	Conduct usability testing; refine dashboard design and performance.
6	Finalise documentation, create project presentation, and upload to GitHub.

Deliverables:

1. Fully functional SPSV Licensing & Compliance Dashboard.
2. Python scripts for data pre-processing, visualisation, and machine learning.
3. Complete technical and methodological documentation (PDF).
4. GitHub repository with all scripts, datasets, and documentation.
5. Final presentation summarising insights and recommendations.

References:

European Commission (2023) EU Mobility and Transport: Digitalisation of Transport Systems. Available at https://transport.ec.europa.eu (Accessed: 28 November 2025).

International Telecommunication Union (ITU) (2022) Digital Regulation Handbook. Available at https://www.itu.int (Accessed: 1 December 2025).

OECD (2021) Regulatory Policy Outlook 2021. Available at: https://www.oecd.org (Accessed: 1 December 2025).

Government of Ireland (2024) Data.gov.ie – Transport and Mobility Datasets. Available at: https://data.gov.ie (Accessed: 1 December 2025).

Central Statistics Office (2024) Transport Statistical Releases. Available at: https://www.cso.ie (Accessed: 1 December 2025).