

University of Essex

Department of Computing

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Initial Data Analytics Report on the Citizens' View on the Public
Transport System in Wales

Plans for Data Processing Pipeline and Evaluation

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1. Introduction

Public transportation, proper bike paths, walkable areas, and good roads are all essential to the ability of the individual to access the range of services necessary for their day-to-day life (Tsalamanis et al., 2018). With how important public transportation is, it is concerning that the general public rates their overall satisfaction with the state of public transportation in Wales at only 5.9 on a scale of 0-10, with 10 being extremely good and 0 being extremely bad (Welsh Government, 2014). In Wales, most transportation is done by car, with approximately 75-80% of all people travelling to work using their private vehicles (Welsh Government, 2020a). With many Welsh citizens using cars as their main form of transportation, congestion, crashes, and potholes have become major concerns for citizens (Summer, 2023a; Summer, 2023b). A just as pressing issue is the pollution caused by private vehicles. To counteract this issue, the Welsh Government has declared an intent to decrease the number of private vehicles on the roads in an effort to decrease carbon emissions (Welsh Government, 2020b).

An alternative to using private vehicles is the use of buses and rail. This is not only a more environmentally conscious alternative, but it would reduce the amount of congestion, crashes, and potholes experienced by people using Welsh roads. As the usage of bus and rail solves most of the current issues experienced by citizens, it would prove wise to incentivize and encourage their use. However, since 2008/2009, bus usage has decreased from 129.83 passenger journeys to only 91.00 in 2019/2020. (StatsWales, N.D.). This has decreased even more in the past few years. While some of this decline can be attributed to the COVID-19 pandemic, passenger numbers for both

bus and rail usage remain below pre-pandemic levels (Welsh Parliament, 2022). Other than the COVID-19 pandemic, this decrease can also be attributed to the rising cost of public transportation and the lack of transport in rural areas. According to a report by Sustrans (2022), ticket prices for bus, rail, and coach in Wales have increased by between 33% and 55.7% in the past decade, and bus vehicle numbers have decreased by 17.8% since 2010. The report also mentions that poor rural areas lack services more than other areas, and half of rail stations in Wales are not fully accessible to disabled people, and wheelchair users have no access to 34% of stations. Due to the issues discussed, satisfaction with the transportation system in Wales can be improved amongst those who use cars, individuals suffering from long-term illnesses, and individuals who live in areas with low access to services.

2. Body

This section includes an overview of the survey dataset and a critical discussion on the data analysis design choice and methodology.

2A. Data

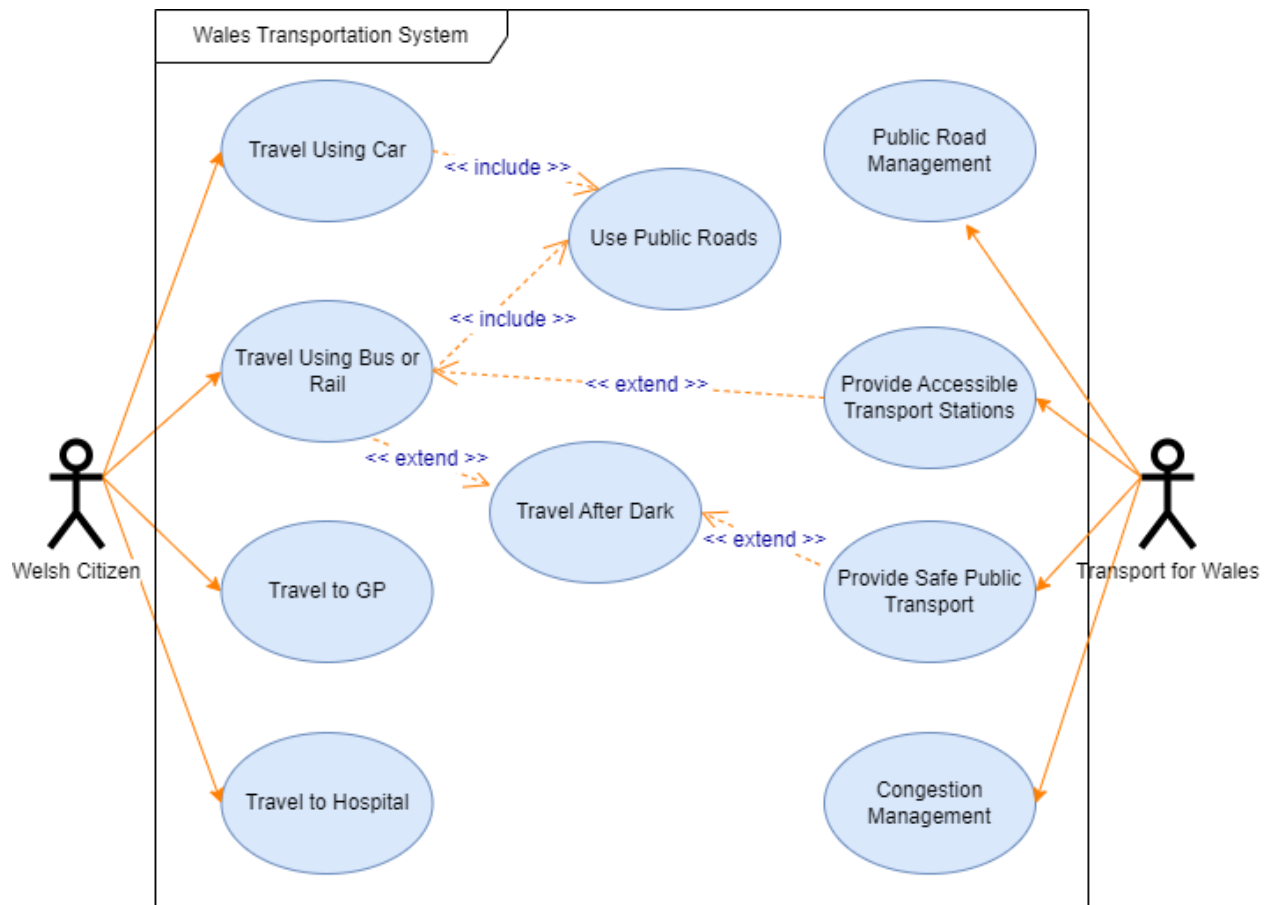
The survey dataset discussed in this report consists of 42 tables on the topic of transport based on National Survey interviews carried out between April 2013 and March 2014 by the Welsh Government. The data consists of nominal and ordinal variables that have been collected by telephone interviews and online questionnaires conducted on people across Wales. It was collected for the purpose of understanding

citizens' views on the current state of the transportation system in Wales. The values within the tables come in the forms of mean values, percentages, and confidence intervals.

The tables within the dataset consist of 5 major groups:

- Tables 1-14, on the topic 'overall satisfaction with state of transport system in Wales'. Participants were asked to rate the transport system using an ordinal rating scale of 0 (extremely bad) to 10 (extremely good).
- Tables 15-22, on the topic 'have use of a car'. Participants were asked to answer either yes or no to whether they have use of a car, resulting in nominal variables.
- Tables 23-30, on the topic 'ease of getting to and from GP surgery'. Participants were asked to rate the difficulty they had in getting to and from GP surgery using an ordinal rating scale of very easy, fairly easy, fairly difficult, and very difficult.
- Tables 31-38, on the topic 'ease of getting to hospital'. Participants were asked to rate the difficulty using the same ordinal rating scale as the survey concerning ease of travel to and from GP surgery.
- Tables 39-42, on the topic 'feeling of safety travelling by public transport after dark'. Participants were asked to rate how safe they felt using an ordinal rating scale of very safe, fairly safe, fairly unsafe, and very unsafe.

1) Figure 1: UML case diagram of Wales Transportation System



2B. Analysis

The objective of this exploratory data analysis is to understand the concerns citizens have with the public transportation system in Wales in order to improve the transportation systems within the country. From the initial investigation into the transportation system in Wales, it can be hypothesized that the major concerns of the

citizens and the cause for decreased overall satisfaction with the transportation system in Wales are related to increased car usage, decreased access to services, and poor accommodation for those with limiting long-term illnesses – such as those that might lead to a person being wheelchair bound. Using tables related to these topics from the dataset provided by Transport for Wales will allow for hypothesis analysis and give a clearer view on whether the concerns that are prevalent in our research affects overall satisfaction with the transportation system in Wales. Therefore, the tables that have been chosen from the dataset are: 2, 4, 8, 12, 15, 18, 20, 22, 23, 25, 26, 31, 33 and 34. These tables do not have any missing data and all data estimates are within an acceptable range. The tables will be concatenated into 4 different tables by which major group they belong to (refer to section 2A for table groupings). This will allow us to better compare within categories when visualizing the data.

For data visualization, the charts used must be proficient at comparing values across categories, as the data within the dataset consists of ordinal and nominal variables, which are categorical. For all tables that contain ordinal variables, the method of data representation will be a horizontal or vertical bar chart. Bar charts do have some limitations: they lack detail, they require an added explanation attached to fully convey and understand what they display, and they can fail to reveal patterns. However, they also have some strengths that will be beneficial: they allow for easy comparison between categories, are easy to understand, and are visually simple and appealing. While other charts – such as pie charts – also allow for comparison between categories, a pie chart is more difficult for the reader to interpret and more visually cluttered. When

comparing many variables, the thinner pieces of the pie chart also suffer from being illegible. Pie charts are not a good choice for data representation when it comes to representing ordinal variables. However, for nominal data, pie charts can be a great way to display simple comparisons. For example, table 15 in the dataset asks all participants in the survey to respond yes or no to whether they have a car. This data would be best represented in a pie chart.

3. Conclusion

The initial investigation into the citizens' views and current issues of the transportation system in Wales revealed that most citizens in Wales use cars as their main form of travel. They are therefore mostly concerned with transportation issues involving private vehicles such as congestion, potholes, crashes, and on a lesser note, pollution. When it comes to public transport, a lack of service for individuals who live in poorer rural areas and a lack of accessibility to stations for individuals with disabilities has likely contributed to an increase in car usage and increased dissatisfaction within these groups with the public transportation system in Wales. The increase in car usage has also likely contributed to an increase in all the main transportation issues citizens are concerned over, which has likely led to a decrease in satisfaction for car users. The data analysis planned out in this report will attempt to prove these ideas correct or attempt to discover new relationships between citizens and the transportation system.

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