Generating value from transport evidence

April 2022

Te Manatū Waka Ministry of Transport is currently developing a model that will simulate how people use the transport system. The model, known as an agent-based microsimulation model, will help us understand how transport affects the economy, the environment and our society.

Getting the most out of transport evidence requires a basic understanding of what analyses are used for what purposes and their limitations. We need to have access to the right data, evidence and insights so we can make better decisions.

Having access to the right tools and capabilities, and a well-governed data system are equally important to convert information into meaningful insights.

Looking at the past to understand what happened and why

There is no one-size-fits-all approach to turning data into information; and for turning information into insights.

For situational awareness, we can use **descriptive analysis** to find out what is happening. A transport example is the road crashes and injuries statistics that Te Manatū Waka Ministry of Transport publishes regularly. There are a range of publications updating the trend in road traffic crashes and injuries, either at the national level or by user type or other characteristics. Descriptive analysis is easy to show through using simple tables or charts.

In many cases, further **diagnostic analysis** is needed to understand why something happened, what causes it to happen and whether the situations might be getting worse over time.

In the previous example, to better understand how a risky behaviour contributes to a road crash, there are additional insight reports on risky behaviours such as drink driving or speeding. Diagnostic analysis often requires in-depth analysis of multiple sources of data. Increasing availability of data and advanced analytical tools has increased the demand for more frequent and sophisticated analyses.

Using advanced analytics can further increase the value of data and information

To enable transport decision-making, we need to estimate the effects of interventions. This requires carrying out **predictive analysis**, which builds on the findings of descriptive and diagnostic analyses.

A **quantitative cost benefit analysis** typically requires combining all three types of analyses.

Transport planning and operation are other situations that require predictive analysis. Examples of related work include funding projections for investment planning and projections of transactions for operational planning.

Development of strategies also often requires predicting what could happen in the future based on the current known policies or trends.

The quality and reliability of the projections depends on the quality of inputs. But the level of stability or uncertainty of the detected relationships and the degree of complexity of the topic being investigated are also crucial in determining the types of analyses needed and the reliability of the outputs.

When the levels of uncertainty and complexity are low, predictive results may be presented using confidence ranges. When the level of complexity is high while the level of uncertainty is low, more advanced models would be needed to ensure various factors, their interactions and any feedback loops are accounted for adequately. For example, the Ministry has incorporated Monte Carlo analysis in key cost benefit analyses to help communicate the level of uncertainty and complexity involved.

When both the levels of uncertainty and complexity are high, it typically requires **prescriptive analysis** such as scenario planning and microsimulation modelling. Prescriptive analysis can improve decision making by helping to tie outcomes to specific situations, which are especially useful for strategic planning purposes. The key learnings from this type of analysis are around better understanding the feedback loops and how complicating factors interact dynamically, rather than producing accurate projections.

For example, to understand the emissions reduction requirements, we need to know what future emissions look like with and without further policies.

Tools such as the Vehicle Fleet Emissions Model provide a broad view of the makeup of the future vehicle fleets, their kilometres travelled, fuel and electricity used and the corresponding greenhouse gas emissions. The model contains historic data from 2001 and projections up to 2055, which can be broken down by a range of vehicle characteristics.

Related projections provide a robust foundation block for preparing the Hīnka te Kohupara report. This report developed different possible pathways to guild policy development around the possible mixes and speed of interventions needed to achieve the transport emissions reduction targets proposed by the Climate Change Commission.

Microsimulation model

The microsimulation model Te Manatū Waka Ministry of Transport is developing will simulate how people (agents) interact with the transport system.

As the simulation progresses through multiple runs, the agent “learns” which mode and route works best for them in completing their plan and maximising their utility.

This model can help to estimate how an intervention might change travel behaviour, and its effect on transport outcomes.

Because this model tracks each agent and understands the characteristics associated with each part of the population, the model would make it possible to analyse how impacts from intervention could be distributed, such as across population characteristics or locations.

A robust data system is a key building block

All the tools and analyses discussed above require good quality and, often, highly disaggregated data. With increasing availability of digital traffic and mobility data, it is

necessary to develop a robust data system to enable advance analytics that gather, collate and analyse a range of multiple and large datasets.

This requires a range of skills and knowledge that can turn advanced data analytics tools into real interventions. The data system needs to ensure sharing, integration, appropriate dissemination and governance of emerging private and public information or products such as digital traffic and mobility data.

How you can get involved

The Transport Knowledge – Data Hub runs regular events and seminars to help identify data and information needs and gaps. The Data Hub aims to widen the channels for information sharing to improve visibility and application of data and related research. If you are interested in attending the Data Hub events or taking part in related discussion on data needs and gaps, please email Knowledgehub@transport.govt.nz.

Reference

Lepenioti, K, Bousdekis, A, Apostolou, D and Mentzas G (2020), Prescriptive analytics _ Literature review and research challenges, International Journal of Information Management, 50, pp. 57-70.