

EVIDENCE BRIEF

The **Social Sciences and Humanities Research Council** in collaboration with the **Future Skills Centre**

SSHRC's Imagining Canada's Future initiative mobilizes social sciences and humanities research to address emerging economic, societal and knowledge needs for Canada, and help guide decision-making across all sectors toward a better future. This evidence brief addresses the Future Challenge Area of: **Mobility and public transit**

Two decades of transit research: The way forward

About the project

This project addresses the Changing Transit Needs theme identified in the Mobility and Public Transit Knowledge Synthesis Grant call. It is structured to synthesize the knowledge associated with four intertwined subthemes: 1) transit users' data collection; 2) users' profiles and service provision; 3) commuting pattern, disruption and ridership; and 4) the transition to zero-emission transit. These four themes are aggregated into two main research domains: transit electrification and transit quality.

The project is carried out through a mixed-method approach and integrates a scoping review (qualitative analysis) and machine-learning-based text-mining (quantitative analysis). The scoping review aims to rapidly map key concepts underpinning a research area and the main sources and types of evidence available. In contrast, machine learning (ML) based Knowledge Discovery in Textual Databases models focus on discovering unknown patterns of interest or extracting knowledge from large textual datasets. In this respect, integrating the two methods provides a unique approach for knowledge synthesis application. It could be seen as an integration of qualitative and quantitative knowledge synthesis models in one process.

Key findings

The project is carried out across two main knowledge domains: transit electrification and transit quality. Despite their intersectionality, the key findings are reported for each domain separately.

There is a plethora of research studies investigating the electrification of transit service, and there is well-established knowledge associated with various factors in the electrification process. However:

- The performance of a full e-transit network is yet to be reported in the literature. Current research is based on partial fleet replacement, which provides a limited perspective on full network operation.
- Service providers' perspective (e.g., barriers and enablers) toward transit electrification is understudied.
- There is an apparent lack of monetary support to incentivize transit electrification. The not-in-my-backyard (NIMBY) syndrome is still a key barrier.

- The performance of an e-transit network under disruption (e.g., electricity outage, equipment malfunction) is not studied at all.
- Last, there is a dire need to rethink transit provision models—including service provision, network design and procurement—with the advent of e-buses.

In relative terms, knowledge of transit quality is very saturated, and there is a rich knowledge associated with advancing the quality of transit systems. That said, there are vital issues that require further investigation:

- Most notable is the inclusive accessibility issue, especially for marginalized (economically, spatially and demographically) groups.
- Similar to transit electrification, there are palpable calls to rethink transit provision and network design. The advent of ride-share, on-demand and other flexible modes of operation necessitated significant network design changes. The mathematical formulation of network design should be revised. Ironically, this is similar to the findings extracted from the transit electrification domain.

- First- and last-mile accessibility and integration with active modes remain major issues to be resolved.
- It is clear that ridership during the COVID-19 pandemic favoured rail transit over buses (both declined, though). This is mainly attributed to the perceived physical distancing in rail compared to buses. Therefore, a limited bus occupancy associated with higher frequencies might be needed to maintain bus ridership during the pandemic.

Last, the intersection between transit modelling/design and ridership driving factors is lacking. This leads to a demand/cost-based network design. Such an approach will never satisfy users' desires for a higher-quality transit service and, in turn, will not attract new users.

Policy implications

Through targeted policy packages, there are tangible opportunities to jointly advance transit quality and system electrification. These include:

- Monetary incentives to enable transit providers to study, analyze and test electric buses in operation.
- Technology awareness, knowledge mobilization and educational programs are required to further educate stakeholders on the costs and benefits of transit electrification.
- Policies associated with the procurement process must be updated to facilitate different ownership models (e.g., leasing, owning, financing).
- At the operation level, policies and guidelines should include several safeguards to address the cascading impacts of service disruption.
- Transit service provision (spatially and temporally) must be sensitive to the inclusive accessibility of marginalized groups.
- Last, there is a dire need to establish partnership (transit providers and researchers) funding opportunities to investigate the integration of ride-share, on-demand and other flexible modes in transit services.

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FURTHER INFORMATION

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The Future Skills Centre (FSC) is a forward-thinking centre for research and collaboration, dedicated to preparing Canadians for employment success. As a pan-Canadian community, we are collaborating to rigorously identify, test, measure and share innovative approaches to assessing and developing the skills Canadians need to thrive in the days and years ahead.