Tolling, Road Charging and Public Transportation: Rethinking Toronto's Traditional Revenue Models
Urban transportation providers face two burning issues today: increasing congestion and uncertain funding. As these two challenges continue to escalate, many governments and agencies are rethinking the traditional models they have used to seek new funding and revenue sources.

Fortunately, some savvy regions are recognizing an alternative using open, flexible systems and emerging technology. This positions them to not only improve mobility and balance budgets, but also revolutionize their citizens’ transport experience.

The Paradox of More Congestion and Less Revenue

The Perils of Congestion

Time spent in traffic is costing commuters and businesses across North America untold amounts in lost revenue and wages. In Canada, the Toronto region faces gridlock issues that cost the economy an estimated $6 billion to $11 billion annually, with drivers facing among the longest commute times in North America. In addition to affecting millions of commuters and businesses each day, congestion has a damaging effect on the environment and on individuals’ health. Congestion also impacts public transport providers, which incur higher costs and reduced operating services in mixed-flow environments. Overall, Toronto’s transportation infrastructure is becoming severely worn out due to excessive use and calls for ongoing reinvestment.

The Revenue Disconnect

In the United States and Canada, governments are looking beyond fuel tax to fund transportation investments as current revenue sources do not keep pace with inflation and cannot fund the backlog of infrastructure spending. New revenue sources being considered include special tax measures, increases in general sales taxes and varied user-pay revenue sources. Municipal governments continue to rely on provincial and federal funding to maintain and expand infrastructure, with many municipalities seeking new local sources of revenue to meet their long-term funding demands.

Facing an uncertain fiscal climate of provincial debt and deficits, debt financing is made more acceptable if public infrastructure financing is tied directly to new revenue streams. This helps to bridge the gap between immediate project construction and full implementation, and operating costs.

Such examples communicate a clear message: the old funding models for transportation are no longer sustainable for supporting the overall quality, efficiency and safety of services.

The context in Ontario is equally severe. In June 2014, the provincial government won a majority re-election with one of its main platforms being a commitment to invest an additional $15 billion over 10 years in transportation in the Toronto region as well as $14 billion for the rest of the province.

The 2014 mandate letter to the Minister of Transportation on the priorities for 2014 focused on continuing to build a seamless transportation network and customer-focused solution. It also contained a specific priority to propose implementing high-occupancy toll lanes to supplement the dedicated funds allocated in Moving Ontario Forward.

New Ventures into Road Charging

Cities and their transport providers are increasingly turning to other revenue sources, notably road-user pricing, as a means to raise revenue while incentivizing travel behaviours that more efficiently use existing resources. While traditional tolling has long been accepted for certain facilities, other forms of road charging have, until recently, been viewed as a political death wish. Amid the looming crisis confronting road transport, once-discarded ideas are finding new life.

Many regions now finance new road capacity through the addition of high-occupancy toll (HOT) lanes, used for free by carpoolers. Increasingly though, regions are seeking to extend tolling to cover existing lanes. They are also pursuing innovative approaches to road charging, including congestion pricing, cordon pricing, value pricing and distance-based pricing.

In the cities most threatened by congestion, many leaders are recognizing that no single answer will alleviate the transportation crisis. Only multimodal strategies that view transportation options holistically will bring true relief. For this reason, cities are empowering public transport agencies to take a leading role to merge the age-old principles of mass transit with new ideas in road management.

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Case Studies: Where the Rubber Meets the Road

Explore how public transportation organizations in six regions are finding different ways to use road charging to incentivize the timing, frequency and mode of travel, while raising new revenue to support high-capacity public transport services.

Freeway Congestion Pricing
91 Express Lanes, Orange County, CA

Opened in 1995 under private ownership, the toll lanes along State Route 91 were bought by the Orange County Transportation Authority (OCTA) in 2003 and converted into one of the world’s first congestion-priced toll facilities. Tolling is conducted via electronic transponder. Vehicles with three or more riders pay half price during the peaks and nothing the rest of the time.

The facility currently averages more than 35,000 daily transactions and generates $40 million in annual revenue for OCTA, which is used to provide for ongoing capital improvements on all SR-91 lanes.

HOT-Transit Lanes
Metro ExpressLanes, Los Angeles

Operated by LA Metro, this federally funded demonstration program converted high-occupancy vehicle (HOV) lanes to HOT lanes on two Los Angeles freeways, which resulted in nearly $1 million a month in new revenue. All vehicles using the facility require an electronic transponder with a switch on the device used to identify the number of passengers. HOVs with transponders use the lane at no charge.

Unique to LA Metro’s tolling program is the link to the bus service operating on the HOT lanes. Riders taking bus trips on the freeways with their smart cards can earn credits in a separate tolling account to use when traveling on the HOT lanes by car. Further, a major portion of initial funding and additional toll revenue is being used to improve the quality and capacity of bus service on the freeways.
Bridge Tolling

Bay Area Toll Bridges, San Francisco Bay Area

Tolls collected on the eight major bridges across the San Francisco Bay Area act akin to cordon pricing for vehicles travelling across the Bay between city centers. The Bay Area Toll Authority (BATA) provides integrated tolling services for the San Francisco Bay Area bridges.

San Francisco–Oakland Bay Bridge tolls vary by time of day, with all others operating on a fixed-fee, per-axle basis. BATA generates nearly $615 million from 122 million vehicles annually, with about 18 percent of that used to fund public transit and the rest to support bridge operations and maintenance.

BATA will soon be adopting an all-electronic tolling model, already in place on the Golden Gate Bridge, where tolls are collected only by transponder or on a pay-by-plate basis. This helps to improve mobility and reduce costs by eliminating the need for cash plazas.

Cordon Pricing

Congestion Charge Zone, London

Through London’s Congestion Charging Zone (CCZ), emissions-generating vehicles pay a fee for driving into the central London area during daytime hours on weekdays. Vehicles are recorded by plate, and users can chose to pay in advance or on the day of travel via web, phone, text or walk-in locations, with hefty penalties for noncompliance.

In operation since 2003, the CCZ is administered by Transport for London (TfL) and generates annual revenue of £227 million. This revenue has supported a substantial increase in bus service for TfL. A 30-percent drop in traffic volumes was reported after three years.

Citywide Congestion Pricing

Electronic Road Pricing, Singapore

This long-lived cordon charging program is perhaps still the most precisely managed. Singapore began charging fees to vehicles entering the Central Business District (CBD) in 1975 and saw an immediate halving of traffic volumes and doubling of traffic speeds. In 1998, the Land Transport Authority (LTA), Singapore’s public transportation planning body, replaced the manual system with the Electronic Road Pricing (ERP) program.

ERP relies on a smart card inserted by the driver into a card slot on the transponder that is mounted in the vehicle. Tolls are electronically deducted from the card when the vehicle passes a toll gantry, with the fee varying by level of congestion, time of day and type of vehicle. A recent innovation allows for dual-mode smart cards that consumers can use to pay for ERP, transit fares and small retail purchases.

The introduction of the ERP system saw a further reduction in traffic by 15 percent over the original charging scheme, a 20 percent spike in public transport ridership (to a 65 percent mode share) and a commensurate reduction in emissions. ERP generates about $50 million annually for LTA, for a profit of about $40 million. Revenue from the program funds both roads and public transportation spending.

Multifunctional Tolling

Via Verde Toll Collection System, Portugal

In 1995, Portugal became the world’s first to universally apply a single system to all of its toll facilities. This allows vehicles to use the same electronic transponder and customer account to pay for any toll road or bridge in the country—from any bank in the country—and reduces system costs by using the same back office to process more than 200 million annual transactions.

Today, the system is truly multifunctional, as customers can charge non-tolling purchases to their tolling account. Using their Via Verde toll transponder, customers can pay electronically for parking, use gas stations, access restricted city zones and use McDonald’s drive-thru services at select locations. With more than 2,350 points of sale now available to Via Verde users, the network is still expanding with new products, services and billing schemes.
Delivering Customer Choice with HOV Toll Lanes

The public in the Greater Toronto and Hamilton Area (GTHA) have indicated they are looking for choice and convenience in paying for transit and moving around the GTHA region. In fact, respondents to a Transit Panel recent poll indicated that individual revenue tools for transit investment could be a promising option for revenue generation. Approximately 52 percent found it very acceptable/acceptable to allow one-person vehicles to use HOV lanes for a toll of 30 cents/km.²

The Conference Board of Canada found that commuters were willing to pay direct charges for road use if they see value gains in terms of time savings, reliability and vehicle-operating cost savings.³

While implementing toll-roads on the major GTHA expressways would create a significant revenue stream, a traditional tolling model would be complex to set up and may not be feasible until transportation investments yield viable alternatives for urban mobility. One way to address this is to implement a variable-rate tolling scheme coupled with new mobile technology. A variable-rate model would allow users to opt in to pay for use on HOV toll lanes where rates differ depending on the time of day. Using new mobile technology would greatly simplify the in-field set-up. Connecting this solution to the existing PRESTO back-office system to serve as the customer payment platform for transit and tolling revenue collection and revenue settlement would further simplify the implementation.
Many transportation providers have learned hard lessons after investing millions in technology solutions only to find that within a short time, these systems were either too insular or inflexible to evolve with changing needs and newer technologies. Agencies must seek out partners and solutions to deliver innovation over the long term, with the scalability to grow with the region and the pliability to support multiple revenue streams.

Regions incorporating road-charging models should consider their technology options at three junctions (see Figure 1):

- **Event Capture**: The trend is towards fewer hardware-intensive options. In less than a decade, there has been a shift from toll booth operators to transponders; now options such as pay-by-plate, mobile tolling apps, and connected vehicles offer new choices for HOV toll collection.
- **Operational Back Office (OBO)**: Systems must be scalable to handle image review, pricing and transportation management and should be able to support multiple modes and vendors for event capture hardware and complex pricing strategies that may be necessary in the future.
- **Commercial Back Office (CBO)**: These systems handle customer accounts, financial management, violations processing and inventory management. Off-the-shelf, back-office financial systems have reached a level of maturity in the last 20 years. As a result, a single CBO is stable enough to be used for both tolling and transit settlement and one unified customer accounts system.

Given the shifts in transportation policy and move to more centralized services, having a unified CBO becomes the critical component an operator needs to be prepared for a seamless future with new front-end technologies. Despite this fact, many transportation providers have so far failed to capitalize.

**Figure 1.** Tolling solution systems platforms
Finding new Sources for Revenue Generation

Public agencies and toll operators are becoming more creative in generating incremental revenue from more than the core group of users. Agencies are looking at attracting new customers and revenue sources. For example, a number of tolling agencies are investing in and expanding electronic tolling to provide barrier-free access to roads. These investments are accompanied by systems using mobile technology that improves license plate recognition and customer conveniences such as prepaid and mobile accounts that are easy to load and maintain. Creative toll agencies are also seeking to raise revenue by repurposing assets and moving into complementary services. Initiatives include leasing booths and billboards for advertisements; leasing rights of way and underutilized offices; and partnering with other levels of government, parking or transport operators to offer package deals.4

The Province has the option of using PRESTO to process HOV toll road transaction in a cost-effective manner with low administration and implementation costs. Today PRESTO has more than 1.3 million customers who use the system and have an account to support their urban mobility within the GTHA region. Similar to what is being done for transit users and operators, PRESTO could ensure accountability and transparency over the revenue collected, provide transportation alternatives, and encourage a positive change in transit behaviour—one with less reliance on the automobile.

PRESTO is capable of playing a larger role in Metrolinx’s “The Big Move” and truly enabling the agency to achieve its vision of integrated regional transportation. The result is a win-win for customers and transit agencies.
Metrolinx Poised for Transformation

Toronto is a region that has recognized the importance of a unified back office. In 2006, when the leaders of Metrolinx, Toronto’s regional transportation agency, created the architecture for PRESTO, the regional transit fare card, it chose to build the system on an open, scalable platform with a CBO that can accept multiple operators, vendor equipment and revenue streams. By implementing a CBO that prioritizes openness, PRESTO has effectively created a common set of features and functionality that can extend to support new services.

Metrolinx has already invested in the features fundamental to the road charging and tolling process. Features such as creating accounts and loading value via the website, deducting value based on travel events, transferring funds between distinct business units, and robust financial reporting are already supported. By looking to the future, Metrolinx is poised to seamlessly infuse road charging, and other new ways to pay, into its systems at minimal cost and maximum benefit to customers.

By taking lessons from the new explorations in road charging and applying region-specific solutions built on holistic policies, a customer focus and open technology, urban transportation providers can overcome today’s challenges and prepare for the promise of a more mobile tomorrow. PRESTO is capable of playing a larger role in Metrolinx’s “The Big Move” and truly enabling the agency to achieve its vision of integrated regional transportation. The result is a win-win for customers and transit agencies (see Figure 2).

Figure 2. PRESTO improves the customer experience and transit and tolling agency operations
Open & Flexible System
PRESTO is based on the Accenture Fare Management Solution (AFMS), a digital payment platform that manages fare collection and customer service across multiple transit authorities and modes of transport.

The AFMS product has been built upon a robust, commercial, off-the-shelf ERP solution. Its modular design includes modules required to implement HOV tolls and can integrate with in-field equipment (see Figure 3).

Whether passengers are riding a bus or a train, crossing a river by ferry, driving through toll points, parking their car, or using a bike or car-sharing service, AFMS enables a seamless experience.

Accenture Fare Management Solution (AFMS) enables a seamless experience.
Conclusion

Faced with the double whammy of growing congestion and diminished funding, the road ahead for urban transportation providers is clear: road charging. And new technology solutions are making this path even easier for transportation providers and travellers alike. The GTHA already has HOV lanes—and PRESTO, an open, flexible and scalable system that can be paired with mobile technology to enable sophisticated tolling programs. Using these technologies to boost revenue and reduce congestion promises greater profitability and mobility for transport providers while creating a seamless, convenient travel experience.

References

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