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GTHA Fare Integration

Concept Evaluation Backgrounder

Prepared for Metrolinx

June 2016

Evaluation Overview

- Three fare structure concepts proposed in the January 2016 Metrolinx board meeting were evaluated to determine their performance against the GTHA Fare Integration goals/objectives
- This deck is a high level summary of the outcome of this evaluation process
- It covers:
  - Evaluation Approach and Reference Case Development
  - Emergent Findings
  - Next Steps

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Evaluation Approach and Reference Case Development

Three Concepts Analyzed

1. **Modify the existing system**

   In this concept, we would retain the existing system, but reduce barriers for customers transferring between the TTC and other systems

2. **Create a new zone-based system**

   In this concept, we would create a new regional system where customers would pay a fare based on how many zones they cross on a trip

3. **Create a new hybrid system, using both fare-by-distance and flat fares**

   In this concept, we would create a new regional system where customers using local buses would pay a region-wide flat fare, while customers using subways, LRTs and GO Transit customers would pay based on distance travelled

Service Types

- The following service types continue to be assumed for analytical purposes:

Local	Rapid Transit (RT)	Regional
Includes bus, streetcar, express bus and BRT systems	Includes subway, current SRT and future LRTs	Includes existing and future frequent service on the GO rail network and GO bus

- The above service types are not a final recommendation. Further work will be completed in future stages to refine and expand upon assumptions :
  - Where do express buses and/or BRT systems fit? Are additional service types required?
  - Paratransit and rural services require specific consideration

Selecting Reference Cases

- Within each of three previously-developed fare structure concepts, an unlimited number of variations is possible
- Hundreds of different variations across all three concepts were modelled to show broad trends
- One "reference case" for each concept was selected to begin comparing the performance of the concepts to one another
- Reference cases were selected that achieved broadly similar ridership/revenue outcomes in the 2031 scenario
- These are illustrative scenarios intended to better understand the relative strengths and weaknesses of each concept. They are not proposed options for implementation, and the price levels are not recommendations.

		Reference Case for		
		Concept 1 Modified status quo	Concept 2 Zonal	Concept 3 Hybrid
Fare Parameters				
Base Fare	Local	Status quo - varies by MSP	$2.60	$3.00
	RT			
	Regional	$3.00	$3.38	
Distance Approach	Local	Travel within one MSP "zone" on flat base fare; additional fare with 50% discount when crossing from one MSP "zone" to another	Geographic zones ~7 km across. Fare increases by $0.78 per additional zone crossed	Region-wide travel on flat base fare
	RT			Base fare to 7km; incremental fare by distance beyond 7 km (see below).
	Regional	Base fare to 7km; incremental fare by distance beyond 7 km (see below)	Base fare for 2 zones; incremental fare by distance beyond 2 zones (see below)	
Transfers	Between Local & Local	Within same MSP: Free transfer Across different MSPs: Additional fare with 50% discount	Free transfer; fares are continuously priced, charging customers the appropriate zone fare for service used.	Free transfer
	Between Local & RT			Free transfer, total trip price is RT fare
	Between Local & Regional	Free transfer, total trip price is Regional fare		Free transfer, total trip price is Regional fare
	Between RT & Regional			Free transfer; fares are continuously priced, charging customers the appropriate fare-by-distance rate for service used.
Resulting Pricing				
7 km	Local	Status quo	$2.60	$3.00
	RT	Status quo	$2.60	$3.00
	Regional	$3.00	$3.38	$3.00
15 km	Local	Status quo	$4.16	$3.00
	RT	Status quo	$4.16	$3.45
	Regional	$3.45	$4.16	$3.45
Long	Regional	Similar to status quo with minor changes due to FBD (up to 10% increase)		

Modelling

- "2011" and "2031" simulations:
  - 2011 based on actual GTHA travel patterns as captured in 2011 Transportation Tomorrow Survey
  - 2031 shifts the 2011 numbers to incorporate:
    - 2031 population, employment and land use projections for Greater Golden Horseshoe
    - An expanded regional transit network that includes committed projects to be completed from 2011 to 2025 (see sidebar)
    - Other planned rapid transit projects that might potentially be in service by 2031 but currently lack implementation funding have not been included
- Model includes built-in adjustments for concession fares and passes; for simplicity, all figures quoted are adult single-ride cash fare

Assumed Future Transit Network

- GO Regional Express Rail service concept as detailed in 2015 Initial Business Case
- Changes to the GO Bus network as specified in the GGHM
- Spadina and Scarborough subway extensions
- Eglinton, Finch, Sheppard, Hurontario and Hamilton LRTs
- VivaNext BRT program and Mississauga Transitway

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Emergent Findings

Overview

- This section summarizes emergent findings from the concept business case evaluation:
  - Service type lessons – what did we learn about the long term benefits and use of different structures from the 2031 modelling?
  - Overall lessons and findings – what did we learn about designing fare structures from the overall business case analysis?
- Except where noted, modelling outputs are 2031 simulations
- The lessons shared are based on a thorough review of the three concepts conducting a qualitative and quantitative evaluation
- All values shared in this deck are considered draft and are subject to changes as the modelling and calculation approach improves. These values should be used as ‘representative’ performance and are shared to inform and discuss the benefits and costs of fare integration

Key Barriers (2031 Projections)

- Existing barriers require certain markets to disproportionately pay more.
- Removing a barrier results in a revenue loss, however new ridership can recover some of this loss
- In the long term, ridership may continue to grow based on induced demand and other long range elastic effects. This growth may help further recover revenue lost from addressing the barrier

	Toronto to 905 (Local/RT)	Regional <15km	Regional Rail – MSP
Barrier	Double Fare	High Fare Compared to Other Services	Double fare for transfers between GO and MSPs
Market size	322,500	39,700	101,940
Market % of total	11%	1%	3%
Annual Revenue	$433M	$43M	$197M
Revenue % of total	18%	2%	8%
Potential Ridership Growth	10-17%	14-16%	16-22%
Net Revenue Loss	18-32%	16-20%	7-12%
Revenue Loss Recovery From New Ridership	43-50%	65-70%	70-84%

Emergent Findings

- By design, all three reference cases achieve broadly similar ridership/revenue outcome in the 2031 scenario while delivering on objectives
- Evaluating reference cases determined each concept has strengths and weaknesses; further work is required based on learnings

Change from 2013 baseline	Reference Case 1 (Modified Status Quo)	Reference Case 2 (Zonal)	Reference Case 3 (Flat/Fare-by-Distance)
Daily transit ridership	+ 26,360 (+ 0.9%)	+ 42,880 (+ 1.5%)	+ 32,760 (+ 1.1%)
Trips combining multiple service types	+ 5.6%	+ 4.2%	+ 4.8%
TTC/905 cross-boundary trips	+ 3.6%	+ 4.7%	+ 5.9%
905/905 cross-boundary trips	– 2.6%	+ 4.3%	+ 5.2%
Boardings on RER	+ 7.4%	+ 5.7%	+ 4.8%
Short trips (0-7km)	+ 0.2%	+ 2.4%	+ 0.2%
Vehicle-km-travelled	– 0.6%	– 0.4%	– 0.7%

Six Key Findings Summarized (1/2)

1. All three concepts result in customers using transit more seamlessly
   - Multi-modal trips increase 4-6%, with a corresponding decrease in single mode trips

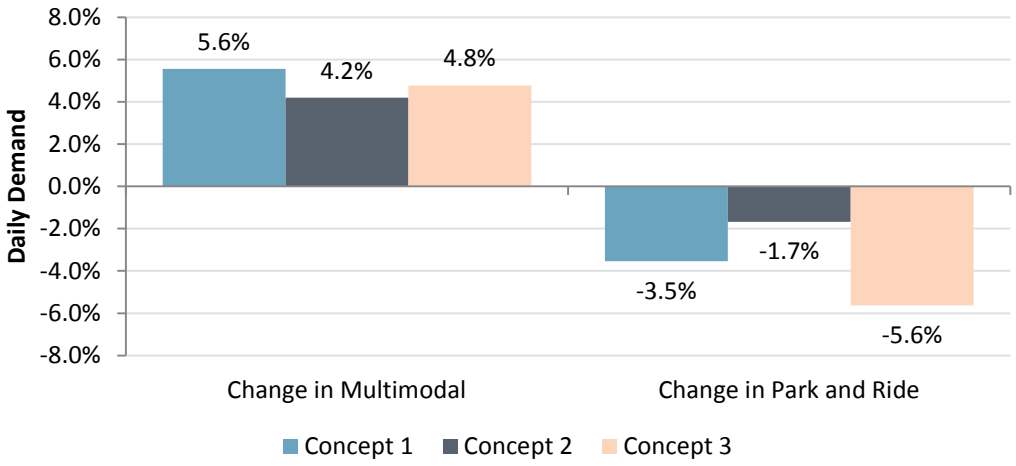
2. Building a more integrated fare system generates substantial social, economic and environmental benefits.
   - Auto travel (2031 projection) is reduced by between 170 and 320 million vehicle km (0.4-0.7%) annually with resulting reduction in emissions of 2-4 million tonnes
   - Benefit cost ratio over 60 years (for comparison with infrastructure projects) is between 3.3 and 5.0

3. It is not possible to achieve both ridership and revenue growth simultaneously in the short (1-5 year) term
   - Each 1% in new ridership requires short term revenue reduction of 5-7%
   - In the longer term (5-10 year), greater ridership increases are possible due to travel adjustments and development of the transit network over time

Six Key Findings Summarized (Continued)

4. Addressing cross-boundary fares between Toronto and its neighbours results in key impacts:
   - Reducing the cross-boundary fare increases the volume of transit trips of all lengths across the boundaries by 9.5-16.5%.
   - Auto trips across the Toronto boundary to TTC park and ride lots decrease by 20-25% in favour of bus service to the subway
   - Customers shift from GO to local transit for longer trips to the downtown due to lower fares, increasing ridership on the subway by 12,000-16,000 peak period trips, an increase of 1.2-1.6% .
5. Fare-by-distance should continue to be considered because it enables
   - Appropriate pricing of long trips as cross-boundary fares (a crude zone fare) are reduced
   - Greater customer choice between subway, LRT and GO Transit service
   - Improved value for short-distance trips
   - Revenue decreases from fare reductions elsewhere to be offset
6. Significant benefits can be achieved with modifications to the existing system without the complications of centralising fare-setting and revenue allocation.
   - Lower cost to develop and implement fare system changes
   - Fares could continue to be set by existing authorities
   - Allocation of revenue among agencies is simpler
   - Less change to existing customer experience

(1) All three concepts result in customers using transit more seamlessly



Boardings	Status Quo	Reference Case 1	Reference Case 2	Reference Case 3
Multimodal trips (trips combining multiple service types)	1,014,487	+ 56,316	+ 42,533	+ 48,387
% increase		+ 5.6%	+ 4.2%	+ 4.8%
Boardings with P&R	271,438	– 9,593	– 4,536	– 15,286
% decrease		– 3.5%	– 1.7%	– 5.6%

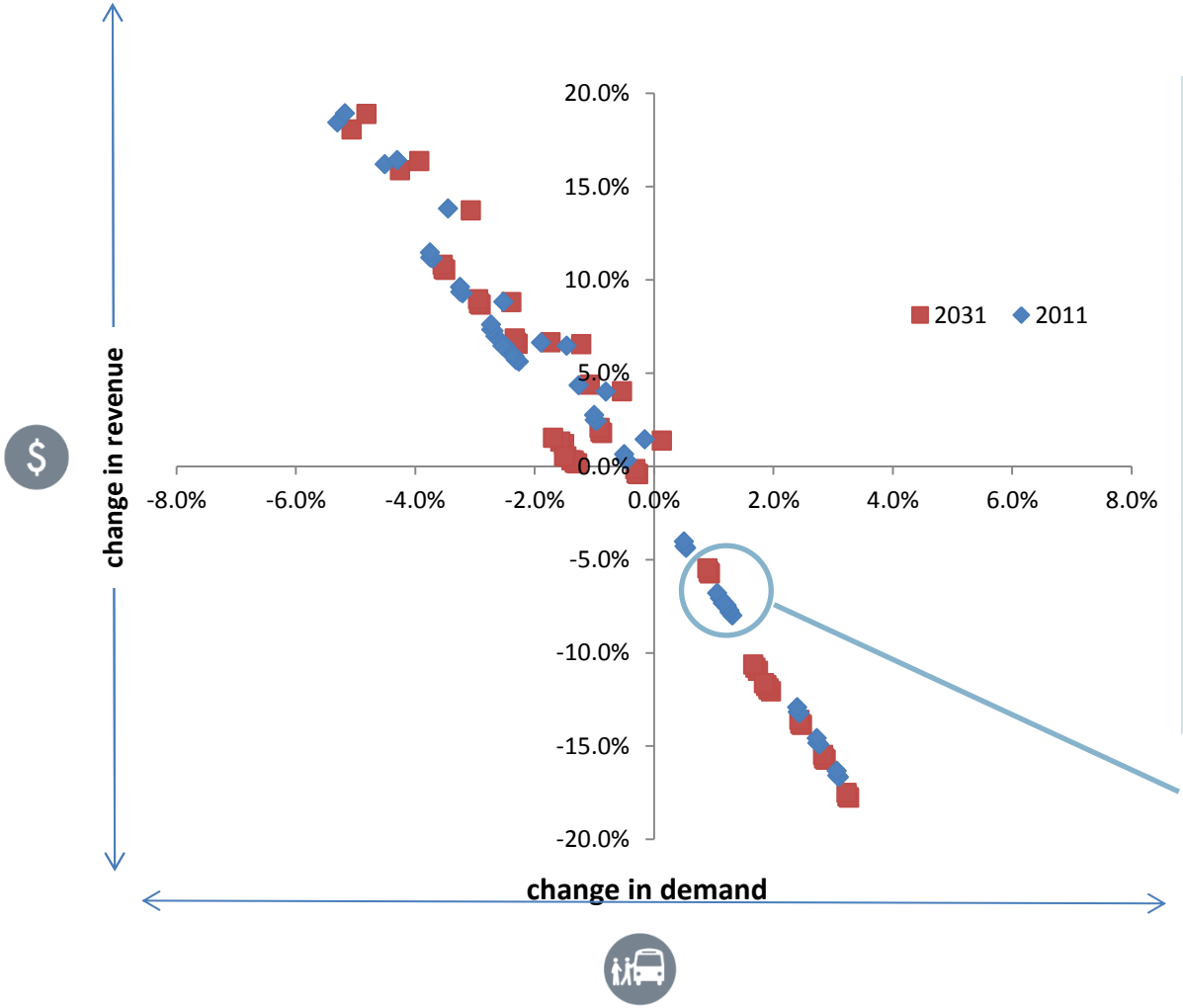
- Each concept reference case could be used to significantly improve how different service types in the GTHA could be used as 'one network' – the vision for fare integration
- Key drivers of improved network use are:
  1. Reduced or free transfers between service types
  2. Similar fares for alternative service types to offer customers choice between services

(2) Building a more integrated fare system generates substantial social, economic and environmental benefits.

	Reference Case 1 (Modified Status Quo)		Reference Case 2 (Zonal)		Reference Case 3 (Flat/Fare-by-Distance)	
Change in Vehicle-Kilometres-Travelled (VKT) (annual, 2031)	-246,052,000	-0.60%	-170,486,900	-0.40%	-322,897,200	-0.70%
Change in Emissions (annual reduction in 2031 tonnes)	-54,130	-0.60%	-37,510	-0.40%	-71,040	-0.70%

- Draft analysis completed to date indicates each's concept reference case generates significant economic benefits (benefits to society as a whole) over a 60 year period, with high Net Present Values and Benefit-Cost Ratios between 3.3 and 5.0
- Key benefit drivers are reduction in VKT (health, environment, reduced user operating costs) as well as user benefits due to reduced fares
- Key costs include lost revenue, new transit operating costs, and system development costs

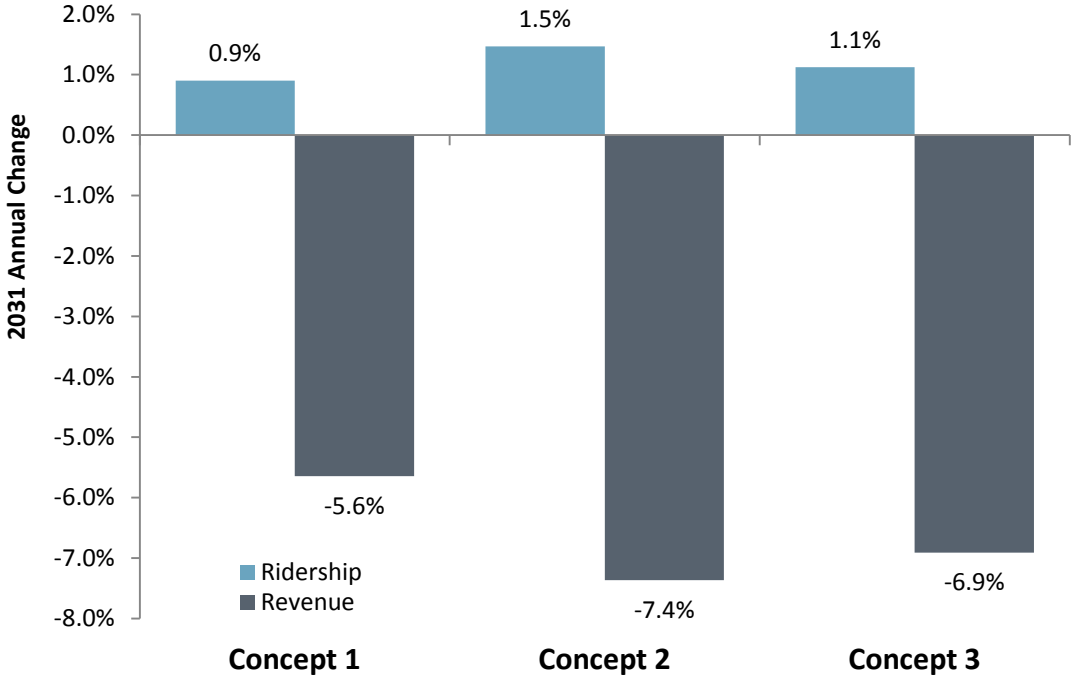
(3) It is not possible to achieve both ridership and revenue growth simultaneously in the short (1-2 year) term



- Results from a large number of scenarios of all 3 fare structure concepts with a broad range of performance against objectives shows a consistent relationship between ridership and revenue
- Each additional 1% growth in ridership requires fare discounts that produce a 5-7% decrease in revenue

Reference Cases

(3) It is not possible to achieve both ridership and revenue growth simultaneously in the short (1-2 year) term



Financial Analysis	Reference Case 1	Reference Case 2	Reference Case 3
Annual Revenue Loss (2015$)	$137 m	$179 m	$168 m
60 year Revenue Loss in Financial Terms (2015$)	$6,740 m	$8,800 m	$8,080 m

- While each concept can deliver strong economic performance, none of them can grow ridership without losing revenue in the short term
- Financial costs are high over a 60 year window, without any conventional financial benefits
- Long term ridership growth may improve financial picture

(3) It is not possible to achieve both ridership and revenue growth simultaneously in the short (1-2 year) term

- Evidence from multiple studies indicate substantial differences between short run ridership changes immediately following a fare change (1-2 years), and the longer term effects (5-10 years)
- The effect appears to be connected with the churn in population and opportunities for relocation or mode change, with the long term difference being more marked in major cities than more rural areas

- The table opposite summarises the comparison between short and long run fare elasticities by mode and type of operation.
- It is proposed to apply these ratios to the locally derived elasticities (revealed by modelling) by mode to assess the long term effects.

	Short run elasticity	Long run elasticity	Ratio LR v SR
Bus - dense urban	-0.26	-0.54	2.1
Bus - rural	-0.49	-0.66	1.3
Subway	-0.3	-0.65	2.2
Rail	-0.46	-0.65	1.4

(4) Addressing cross-boundary fares between Toronto and its neighbours results in key impacts

Factor	Impact
Market Size (2031) (Daily Ridership)	322,500
Market Size (% of total)	11%
Revenue Size (annual Revenue)	$433,743,700
Revenue Size (% of total)	18%
Range of market ridership growth	9.5 to 16.5%
Change in Park and Ride 905-Toronto demand	20-25%
Change in peak subway boardings	12,000-16,000
	Market increase of 16-20%
	Overall RT increase of 1.2-1.6%
Net Loss of Market Revenue	17.8% to 32.9%
Revenue loss recovery from new ridership	43% to 50%

- Discounting the cost of transferring between TTC and 905 transit agencies leads to significant increases in transit demand for local and local/RT trips
- In addition, a portion of auto trips across the Toronto boundary to TTC park and ride will now use local as a first/last mile connection
- A key area for further investigation is setting a cross-boundary transfer co-fare that results in an appropriate balance between trips to the Toronto core on local-RT and on regional transit

(5) Fare by distance requires further study

- Fare by distance has been shown to be a high potential fare structure, however it requires further analysis.
- Results to date suggest the benefits of fare by distance are:
  - Appropriate pricing of long trips as cross-boundary fares (which provide a reasonable price for these long trips) are reduced – allowing a more equitable fare per kilometre and overall fare for travellers across the region.
  - Offer similar pricing and strengthen customer choice between subway, LRT and GO Transit service –which can encourage use of new RT and regional systems being built in the next 10 years.
  - Offers improved value for short-distance trips by reducing fares – short distance trips are important for low income travellers and have been shown to have supressed demand. Fare by distance can enable the use of transit for short trips and reduce the price paid by current short distance travellers.
  - Offset revenue decreases from fare reductions elsewhere – the status quo system overcharges some passengers and undercharges others. Fare by distance can allow more equitable pricing of trips and regain revenue from removing barriers where current customers pay more for a short trip.

(6) Significant benefits can be achieved with modifications to the existing system without the complications of centralising fare-setting and revenue allocation

- Lower cost to develop and implement fare system changes – fewer changes to the system result in capital cost savings of up to $100 million
- Fares could continue to be set by existing authorities
- Allocation of revenue among agencies is simpler
- Less change to existing customer experience

Next Steps

1. Continue to share and discuss findings with the Metrolinx board, partner agencies, and stakeholders
2. Refine and assess concepts, including investigation of feasibility of implementation. Based on study findings, develop a variation on concept 1 for deeper evaluation considering short, medium, and long term opportunities
3. Refine the strategy through additional analysis and collaboration with municipal partner agencies and stakeholders
4. Provide findings in an update to the Metrolinx Board in late fall 2016