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Greater Toronto and Hamilton Area Fare Integration - Stage 2 Report 1: Fare Integration Concept Development

Report January 2016

Metrolinx

Our ref: 22839402



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1 Introduction

Fare Integration Strategy Direction

The Big Move, the Greater Toronto and Hamilton Area's (GTHA) regional transportation plan, called for the implementation of an integrated regional fare structure as one of its ten strategic directions. This call for integration is based on improving regional journey opportunities by removing barriers to travel that the existing fare system may impose.

In line with this strategic direction, Metrolinx launched a series of studies that are working towards an overarching "Fare and Service Integration Strategy". A set of studies were launched that aim to:

Develop a recommended fare strategy for the GTHA, including a long-term transformational vision, and a medium term transitional strategy, to offer transit travellers a convenient, consistent, efficient fare structure across the region, while accounting for the different modes and levels of services that will be in operation in the future.

Fare Structure Development Process

To aid in the completion of the fare integration strategy, Metrolinx has prioritized the development of an overarching fare *structure* for the region. Metrolinx's work program has been set out to include both a transitional and a transformative strategy for applying the new fare structure to the GTHA.

Determining an optimal fare structure is a critical component of developing the overarching fare strategy for the GTHA, as the fare structure determines how to price trips as well as how customers transfer from one service to another. Metrolinx launched the 'Development and Selection of a Regional Fare Structure" component of the fare and service integration work program to select a single fare structure to be the foundational element of the transitional and transformative fare strategies.

This document summarizes work completed to date as part of stage 2 of the overall work program to develop an integrated fare structure for the GTHA, as noted in Figure 1.1. The output of this work is a set of concepts reflecting different approaches to fare structure which are the basis for future analysis, consultation, refinement, and evaluation.

Figure 1.1: GTHA Fare Structure Development Stages



Stage 1 Summary and Findings

Stage 1 of the fare integration study established vision, goals, and objectives for fare integration and a corresponding evaluation framework to guide option analysis. The vision, goals, and objectives are detailed in appendix A.

Stage 1 applied the vision, goals, objectives and evaluation framework to determine whether or not potential integrated fare structures should differentiate fares based on the type of service used and/or the distance travelled. This stage of the study was summarized in *"GTHA Fare Integration Strategy: Fare Structure Development and Initial Business Case"*, the stage 1 final report.

In order to analyze whether or not fares should vary by service type and/distance, a decision tree approach was used with two levels:

- 1. Should fares vary by service type?
- 2. Should fares vary by distance, and if so, using what broad approach?

This decision tree generated nine possible fare structure types, which were evaluated using a four-chapter business case approach to determine which of the nine types should be considered further. The findings of the decision tree analysis were then generalized into two overarching conclusions to guide stage 2:

- Fare structures should reflect service type
- Fare structures should reflect the distance a customer travels for some or all service types.

Figure 1.2 outlines the structure types that were carried forward for further analysis.

Figure 1.2: Stage1 Findings



Stage 2 Approach and Report Structure

Background and Objectives of Stage 2

The key objective of stage 2 is to develop and evaluate a set of potential specific fare structures in order to select a preferred alternative. This report covers the development of three potential fare structure concepts:

- Concept 1 Modified status quo
- Concept 2 Local and Rapid Transit Zones
- Concept 3 Hybrid

These fare structure concepts will be further developed into more detailed options and evaluated in a second stage 2 report.

In order to drive the design and analytical process, three design components were identified, as noted in Figure 1.3:

- Service Type Definitions
- Approach to Distance
- Pricing and Transfer Strategy

A four-step process was developed, as shown in Figure 1.4, to guide the development and evaluation process followed in stage 2. This report summarizes steps 1-3 of this process (with the fourth step to be summarised in a separate report).

Section 2: Sense Making

The sense making analysis is focussed on clarifying travel behaviour in the GTHA in order to clarify:

- Service types used in the GTHA
- Types of trips travellers take in the GTHA
- Distances travelled for trip types and service types

The sense making analysis is presented in section 2.

Section 3: Determine Fare Structure Design Principles

Using the outputs of the sense making analysis, a set of fare structure design principles were established. These principles shape how fare structure concepts can be developed

- Fare continuity
- Aligning fares with service usage
- Connected network
- Generalized cost
- Gradual Increments

Section 4: Concept Development

Concept development was then driven by applying fare structure design principles to propose three overarching fare structure concepts. The three concepts developed for this stage are included in section 4.

Section 5: Next Steps

Section 5 outlines future stages of work in order to complete the evaluation of each fare structure concept.

Figure 1.3: Fare Structure Design Components



Service Type Definitions

- •Answers the question: How should fares vary by service?
- Defines the service type for current and funded/committed GTHA transit service
- •Future work may refine categorization of service types

Approach to Distance

- •Answers the question: how should fares vary by distance for each service type?
- •Defines the mechanic, if any, through which the fare structure converts distance into cost for each service type
- •Three approaches may be considered in accordance with stage 1 findings: region-wide flat, zones, measured distance
- Approaches may be applied consistently to all service types, or a hybrid structure can apply different approaches to different service types

Pricing and Transfer Strategy

- •Answers the question: what prices should be set for trips on a service, and how much should it cost to transfer between services?
- •Transfers may be free or carry a cost.
- •Transfer validity may be time based or use other criteria.

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Figure 1.4: Stage 2 Study Approach



2 Sense Making

Section Overview

To develop an understanding of how transit customers travel in the GTHA and the customer travel impacts of fares, sense making analysis was conducted. This included both quantitative analysis of travel behaviour along with stakeholder engagement through a Technical Advisory Committee (TAC) that included representation of all municipal (transit) service providers (MSPs) in the GTHA.

This approach combined descriptive statistics (included in transportation data sets) with stakeholder insights, issues, and opportunities from an operational lens to ensure the sense making analysis included a wide array of factors.

The sense making analysis section is broken down into three sections:

- Analysis tools and approach
- Travel behaviour analysis to inform design components
- Key design component findings and implications

Analysis Tools and Approach

Background

Each day there are nearly 2 million transit trips in the GTHA. These trips are shaped by customer needs, such as origin, destination, trip purpose and time of travel, as well as service provision factors, such as service availability and the price of travel. Customer travel behaviour and use of transit service are key considerations for understanding how to develop a new integrated fare structure.

In order to understand how travel behaviour may shape or impact fare structures, the sense making analysis used two analysis approaches:

- Market segmentation
- Service structure

These approaches were applied at a level of detail commensurate to the needs of stage 2. The Transport for Tomorrow Survey (TTS) data was the key data set used for both analysis approaches. Stakeholder feedback was collected in TAC Meeting 7 in order to refine the analysis of TTS data and also include broader considerations.

Market Segmentation

Market segmentation is a common approach in transport demand analysis that groups trips by common themes, such as origin and destination, purpose of travel, and time of travel.

Market segmentation is used to understand travel behaviour in the region under the current fare structure and will also be applied in future phases for interpreting changes in travel demand resulting from potential new fare structures. For this study, a market segmentation approach was developed based on origins and destinations of travel and fare barriers.

Market Types by Geography

As discussed in the stage 1 report, a key consideration for fare integration is removing barriers that limit transit use due to:

- **Cost:** barriers resulting from sudden 'step changes' in fare, or fares that are significantly higher than other fares for a similar distance of travel.
- **Complexity:** barriers created due to difficulty understanding how much to pay or how to pay for transit.
- Captivity: barriers created by having products that apply to only one transit

service provider, which limit customer desire to use multiple service providers.

Two market categories have been defined to understand how these barriers impact different travellers based on their geographic origins and destinations:

- Trips within a single MSP service area
- Trips between MSP service areas ("Crossboundary trips").

Trips within a single MSP service area are assessed to understand how customers use transit within the service area of individual MSPs. These trips are divided into four markets:

- Trips entirely within downtown Toronto (defined as the area known as "planning district 1" or PD1)
- Trips between downtown and nondowntown Toronto (i.e. crossing the PD1 screen line)
- Trips entirely within non-downtown areas of Toronto
- Trips internal to individual 905 MSPs.

These markets have been selected to understand how fare barriers may impact travellers who only use one MSP or stay within one MSP's service area. Trips between MSP service areas, or cross boundary trips, are assessed to understand how fare barriers may impact trips that use multiple MSPs and may therefore pay multiple fares. These trips include trips between 905 MSP service areas (that cost a single fare if using municipal transit), and trips between 905 MSP service areas and each of downtown and non-downtown Toronto (that cost a double fare if using municipal transit).

GO Transit trips, whether internal to the territory associated with a single MSP or cross-boundary, were also sorted into the corresponding market type. Transit users who cross an MSP service area boundary while they are in the process of accessing or egressing transit via active transportation or automobile were segmented into the cross-boundary market category. These customers do not face the same cost barriers as those who cross boundaries using municipal transit and may in some cases have adjusted their travel patterns for this reason. Table 2.1 summarises the market category and types.

Table 2.1: Market Segments

Market Category	Market Type
	Trips internal to downtown Toronto (PD1)
	Trips between downtown and non-
Trips within one	downtown Toronto
MSP service area	Trips between areas of non-downtown
	Toronto
	Trips internal to 905 MSPs
	Trips between 905 MSP areas
Cross boundary trips	Trips between 905 MSP areas and non-
	downtown Toronto
	Trips between 905 MSP areas and downtown Toronto

Each market type was assessed using a common analysis process using the factors identified in Table 2.2.

Table 2.2: Market Travel Factors

Market Factor	Units
Market Size/Number of Trips	Trips
Average distance travelled in market	Km
Average cost of travel in market	\$
Unit cost of travel in market	\$/km

Market Types by Distance

Markets were also sorted into distance bands to aid in analysis. Their selection was informed by an analysis of TTS data as being indicative of differing patterns of GTHA transit use. These distance bands may be refined in future analysis.:

- Short distance (<7km)
- Medium distance (7-15km)
- Long distance (>15km)

At this time, these distance bands are intended to aid in market analysis only. Fare structure design has yet to advance to a point where any potential distance threshold that determines fare pricing has been set.

Service Type Definitions

Background

The stage 1 report concluded that fares could be differentiated by service type and stage 2 analysis must therefore determine how to effectively set different fares for services within the GTHA. In order to explore how travel varies by service used in the GTHA, a service typology was established – shown in Table 2.3. This service typology is used to understand if there are differences in market factors (Table 2.2) between the modes used for travel, which will inform how modes of travel should be positioned with respect to each other as part of the fare structure design process (Figure 1.3). The final categorization of transit services for the purposes of applying fares may differ from the typology presented here.

Service Typology for Analysis

A representative three tier service typology was developed based on grouping transit modes in the GTHA based on shared typical performance under a set of parameters:

- Stop spacing
- Route length
- Speed
- Right of way

Table 2.3: Representative Service Typology for Market Analysis

Service Type	Stop spacing	Route Length	Typical speed	Right of way
Local	<750m	<20km	Low (10-20 km/h)	Generally in mixed traffic; occasional separation
Rapid Transit	500 m – 2.5 km	<25 km	Medium (20-45 km/h)	>90% Separate
Regional	>2 km	>20 km	High (>45 km/h)	Separate (rail) Mixed traffic (highway coach)

The three service types build upon the service typology used in stage 1. Values to define each service type were drawn from an assessment of transit systems in the GTHA as well as in other Canadian and international municipalities. These service types reflect the physical characteristics of each mode that is included, which in turn reflect the types of trips they are designed to primarily serve. In stage 1, the services were described as:

- Local: services providing lower speed travel with denser stopping patterns best suited for shorter trips, or connections to higher order transport
- Rapid Transit (RT): high speed services optimized for medium to long distance trips with more consistent travel times than local services due to a fully or largely segregated right of way

 Regional: high speed services with more widely-spaced stations primarily intended to connect different communities within a region

Transit modes in the GTHA were allocated to each service type within this framework.

- Local: includes buses and streetcar services
- **Rapid Transit (RT):** includes subways, Scarborough RT, and future LRT systems
- Regional: includes GO Rail and GO Bus and future higher-frequency rail services operating on GO corridors

Future Service Considerations

Rapid Transit services currently only operate in Toronto. In the future, a number of planned and funded projects will create new LRT systems in Hamilton and Mississauga, and also new LRT lines in Toronto. These lines will be of critical consideration in future stages of analysis.

The role of regional services is expected to evolve as RER is implemented. More medium distance trips are intended to be served by RER as frequencies increase. These impacts will be discussed in future working papers and reports that address future ridership.

In addition, the existing mode split for those accessing regional stations is unlikely to be sustainable as ridership grows faster than park and ride capacity can be affordably or feasibly supplied. Attractive feeder local and RT service is critical to RER's success, which has significant implications for fare structure design.

Service Allocation

Services within the TTS data have been allocated to this service structure to aid in analysis, as shown in Figure 2.1.

The data used in this analysis was drawn from the 2011 TTS data and therefore predates the

opening of dedicated bus rights of way in York Region and Mississauga. As fare structure design advances, the appropriate classification of these bus services for the purposes of applying fares is an area of ongoing examination.

Specific services not clearly positioned in the service typology will need to be considered at a later stage of analysis. These include: express bus services, rural services, and specialized services.





Travel Behaviour Analysis

Figure 2.2: Total Daily Demand By Market Type

Background

Market segmentation and the service hierarchy were used to analyze travel behaviour in the GTHA. Key findings from this analysis were shared with stakeholders at TAC Meeting 7 as well as through one-on-one engagement. The analysis included in this report reflects comments and feedback received from TAC members.

The following sub sections outline analysis of the markets and service structures, including:

- Number of trips and average distance for each market
- Cost of travel in each market
- Distance distributions for each service type

Market Size and Service Use Analysis

The number of trips within each market type have been estimated using TTS data. All TTS data presented in this analysis uses daily totals for transit demand. This estimate includes the three main service types as well as 'combinations' of services. The total trips by market type are shown in Figure 2.2 and Figure 2.3 shows the percentage of each service type's total trips in each market.





Figure 2.3:Total Daily Travel Demand by Service Type

Market Category	Market Type	% of total GTHA transit trips	Local	RT	Local-RT	Regional	Local-Regional	RT-Regional
Trips within one	Downtown Toronto	4.4%	33,800	32,700	16,900	200 ¹	-	-
MSP service area	Between Downtown and Non- Downtown Toronto	28.9%	62,600	198,200	265,300	18,900	-	1,200
	Non-Downtown Toronto	31.9%	352,700	54,900	192,400	1,800	1,200	400
	Internal to One 905 MSP area	12.6%	231,900	-	-	4,700	2,400	-
	Between 905 and Downtown Toronto	13.1%	1,500	29,800	32,100	138,300	14,700	31,000
Cross boundary trips	Between 905 and Non-Downtown Toronto	7.4%	71,900	5,400	26,400	17,800	9,900	8,400
	Between 905 MSP areas	1.8%	21,500	-	-	6,500	4,900	-
	% of total GTHA transit trips		41.0%	17.0%	28.2%	9.9%	1.7%	2.2%

¹ Includes trips between Union and Exhibition

Trips Internal to one MSP service area

Under the current fare system, most transit travel occurs in internal transit markets (77.8% of all transit trips). Toronto markets have access to local and rapid transit, both of which are used heavily. With the exception of the downtown Toronto internal market, each market also has access to regional in addition to the local services offered by MSPs.

Trips within downtown Toronto account for 4.4% of all trips in the GTHA. Local and RT serve 40.4% and 31.9% of the market, with the remainder being served by local-RT chained trips.

Trips between downtown and portions of Toronto outside downtown are a large market with 28.9% of all GTHA transit trips. These trips are more reliant on rapid transit, with 36.3% of trips using RT and 48.6% using RT and local as part of multi service trips. This highlights the critical role that integrated RT and local fares play in providing service to these parts of Toronto, where RT isn't readily accessible to all OD pairs.

Trips within non-downtown Toronto represent the largest transit market, with 31.9% of all transit demand. This market is also reliant on local/RT chained trips, with 31.9% of all demand. The majority of trips (58.5%) are, however, on local services. This highlights how RT is not available for most OD pairs, however the streetcar and bus network provides access to the core. Single use of RT only provides 9.1% of all trips in this market.

Trips internal to individual 905 MSP service areas represent 12.6% of all transit trips in the GTHA. Local services are used for 97% of all trips in this market. This proportion is expected to change in the future as new and expanded RT systems are delivered in Hamilton, Mississauga and York.

Cross Boundary Trips

Cross boundary trips represent 22.2% of all transit trips in the GTHA; of these trips, more than 90% are between 905 MSP service areas and Toronto.

Trips between downtown Toronto and 905 MSP service areas represent 13.1% of all GTHA transit trips. These trips are primarily served by regional services (55.9%) or regional services chained with local (5.9%) or RT (12.5%). Local trips only account for 0.6% of all trips, while 12% of trips use RT with auto drop off, walking, or parking access. Local and RT chained trips account for 13% of trips and require a double fare. Given the structure of transit in the GTHA, the heavy use of regional transit is as expected. Trips between non-downtown portions of Toronto and 905 MSP service areas represent 7.4% of all transit trips in the GTHA. These trips are heavily served by local (51.4%), while local and RT chained trips provide 18.9% of trips. All local and RT trips require two fares (first 905 MSP and TTC). The dominance of local services for this market is as expected due to the large areas of outer Toronto that are not served by rapid transit.

Trips between 905 MSP service areas make up 1.8% of all GTHA transit trips. These trips are primarily served by local services (64.6%). Regional services and regional/local chained trips account for 34.2% of trips. The regional service trips is largely provided by GO Bus, however for east/west trips, the GO Rail system also plays a role.

Key Insights

Figure 2.3 and the accompanying analysis suggest the following key conclusions for consideration in the development of design components:

- Local: heavily used in all markets except for 905 to downtown Toronto, which is expected due to the long distances travelled. 41% of all transit trips are served solely by local.
- **RT:** 47.3% of all trips use RT for one or more leg of a trip and 17% of all GTHA trips are served solely by RT. Primary role is connecting parts of non-downtown Toronto as well as allowing travel between downtown and non-downtown Toronto. Market share is heavily reliant on local transfers, with 28.2% of all transit trips in the GTHA using local and RT. RT is used solely in Toronto, however this will change as new RT systems are developed and expanded in communities such as Hamilton and Mississauga.
- **Regional:** 13.9% of all GTHA transit trips use regional services, with 9.9% of trips using only regional. The role of regional is specific to long distance markets, such as 905 to downtown Toronto where it has the largest market share (74.4%). As the RER network is developed, it is expected that regional services will play a larger role in other markets, in particular within Toronto. 1.4% of

all internal trips use regional services, likely due to the comparatively higher fare relative to municipal transit options and limited availability of stations.

• **Cost Barriers:** 7% of all GTHA trips may pay a double fare between 905/TTC. These include local and local RT trips. Additionally, 2.2% of trips use rapid transit and regional. These mode combinations may be suppressed due to double fares. An additional 1.7% of trips use local and regional, while some of these trips have a co-fare agreement between 905 operators and GO rail, those between TTC and GO do not.

Customer Travel Variations Between Market Types

An analysis of travel distances was conducted to determine how travel distances vary between markets. Average travel distances for each market type are shown in Figure 2.4 by service used. Combinations of service types are also noted. All distances used in the analysis for local transit were drawn from the TTS, while distances on right of way were calculated based on boarding and alighting station for rapid transit and regional trips.

Trips Internal to one MSP Service Area

As expected, Figure 2.4 notes that internal trips in geographically smaller markets, such as downtown Toronto, have shorter distance distributions for all service types.

For this market, all services are used for comparable distances of travel.

As markets increase in geographic size, such as trips between downtown and non-downtown Toronto, or trips within non-downtown Toronto, trip lengths increase. For these markets RT and regional service typically serve the longest distance trips. Combination trips that use local and rapid transit are typically longer distance than rapid transit trips. This occurs because the rapid transit network does not serve every OD pair on its own and many trips require local and rapid transit to complete their trips.

Trips within individual 905 municipalities are reliant on the local network or in some cases regional services. As these municipalities do not have rapid transit services, mode choice is limited and does not vary as heavily between distances travelled.

Cross Boundary Trips

For cross boundary trips, the longest trips are between 905 MSP service areas and downtown Toronto and between 905 MSP service areas. For downtown Toronto bound trips, the longest trips use regional or a combination of regional and local or RT services. Within the 905, mode choice is constrained to local and regional services. Local services cover shorter cross boundary trips, while longer cross boundary trips use the GO network.

Key Insights

The analysis of average distance for markets provides the following insights and conclusions:

- Average distance travelled typically increases following the expected service hierarchy (local, RT, regional).
- Average local distances increase in markets with no RT access
- Distance distribution by market type varies as expected, with longest distance trips typically falling in the 905 to downtown Toronto market

Figure 2.4: Average Travel Distances for GTHA Travel Markets



Average and Unit Fare (\$/km) for Travel

Average fares and unit fares (\$/km) have been calculated for each market type and are shown in Figure 2.5.

Average Fare

Average fares are the same for local, RT, and local/RT trips that are entirely internal to the city of Toronto due to the common flat fare in place on those portions of the TTC network south of Steeles and east of Pearson Airport. Internal trips in the 905 have a higher average fare for local, as most MSP base fares are higher than in Toronto and a limited number of trips internal to York Region make use of zones.

Average fares for regional, regional/RT, and regional/local are typically higher because regional includes a higher base fare and reflects distance using zones. Additionally, transfers from TTC to regional require a full TTC fare, while 905 MSP transfers have a co-fare. This data was collected using TTS data and reflects 2011 fare levels and customer behaviour – future analysis should identify the impact of Presto and product usage on average fares.

Typically, the longer distance markets (cross boundary trips) have the highest average fare. This occurs for two reasons:

- Regional fares are based on distance travelled through a zonal system
- Local and Local/RT trips require two fares when connecting from a 905 MSP to the TTC

Local fares within one MSP service area and between 905 service areas are equal due to the free transfer agreement between 905 MSPs. The highest average fare is for trips that use RT/Regional, which are a small proportion of regional trips. These trips require use of both the GO network and TTC subway, with full fares paid for each service. Local/Regional trips using a 905 MSP also have a discounted co-fare; however the fare is still higher compared to trips that exclusively use regional services.

Unit Fares (fare/km)

Unit fares are highest for short distance markets, including all internal markets. Downtown Toronto has the highest unit fares as the distances are short and all TTC services use the same flat fare. Local has the highest fare for internal trips because it typically serves shorter trips. Unit fares are lower in non-downtown parts of Toronto and trips between downtown/non-downtown Toronto due to the increased distances using the same fare. Unit fares in 905 MSP areas are lower than downtown Toronto despite a higher base fares due to longer average trips.

For 905 to Toronto markets, the highest unit fares are those that include double fares (local-to-local, local-RT) or co-fares (regional/local).

Despite double fares, cross boundary trip unit fares are the lowest for local and RT trips. Most RT-only users counted in this segment are likely driving across the fare boundary, using park and ride facilities, and paying a single TTC fare for a lengthy RT journey, which reduces unit fare. Because of this longer distance, the local/RT analysis shows unit fares between 905 MSP areas and downtown and outer Toronto to be lower than unit fares within all Toronto markets.

Key Insights

The analysis of average and unit fares suggests the following key insights:

- Flat fares for local in 905 MSPs and for RT and local for the TTC allows for a consistent average fare for internal trips
- Fare by distance for regional trips results in a higher average fare
- Average fares increase where transfers cost an additional fare (TTC to GO) or when a cofare policy exists (905 MSP to GO)

- Unit fares are highest for short distance markets and trips where fares do not reflect distance travelled
- Longer distance trips that cross into Toronto have a similar unit fare between regional and local/RT, suggesting that travellers on local/RT pay nearly as much as a regional traveller without receiving the same service.

Figure 2.5: Average Fares and Unit Fares for GTHA Travel Markets



Customer Travel Variation Between Service Types

A second analysis was conducted to determine how customer travel varies between service types. This analysis is used to understand the role each service plays, based on the types of trips it serves.

Assessing Distance Distributions

Distance distributions were generated for each service type to provide further analysis beyond the average distance travelled. Each service type was assessed by the distance of trips served in Figure 2.6 and Table 2.4. Each market is served by one or more service types:

- Short Distance (0-7km): primarily served by local services (81.6%), with some trips served by RT (18.1%) where local is not available.
- Medium Distance (7-15km): served by RT, (49.34%) with a similar number of trips (54.4%) served by local where RT is not available
- Long Distance Market (>15km): primarily served by regional (68%), with some trips served by local (18.1%) and RT (13.5%) where regional is not available or is more expensive. These local and RT trips are typically between 15 and 25 km.

Figure 2.6: Service Types and Distance Markets



Service	Distance Market (km)	% of total service trips	% of service trips without competition in distance market	% of total trips reliant on service
Local	<7 (short distance market)	75%	97%	72.8%
	7-15 (medium distance market)	20%	98%	19.6%
	>15 (long distance market)	5%	92%	4.6%
RT	<7 (short distance market)	44%	85%	37.4%
	7-15 (medium distance market)	45%	98%	44.1%
	>15 (long distance market)	11%	96%	10.6%
Regional	<7 (short distance market)	1%	85%	0.9%
	7-15 (medium distance market)	9%	82%	7.4%
	>15 (long distance market)	90%	97%	87.3%

Table 2.4: Total Distance Market Trips by Service Type

	Short Distance Market	Medium Distance Market	Long Distance Market
Local	81.60%	54.40%	18.5%
Rapid Transit	18.10%	49.34%	13.5%
Regional	0.30%	2.30%	68.0%

While 75% of trips on local services are short distance, 20% of local trips are in the medium distance market and 7% are in the long distance market. Of the local trips in the medium and long distance markets, almost all trips are from ODs without competition, meaning there are no RT or regional services available.

RT trips are distributed nearly evenly through the short (44%) and medium distance markets (45%). However, 85% of all trips in the short distance market have no local alternative.

Regional trips are almost entirely in the long distance market, and when used in short distance markets it is because there is limited competition available. In the long distance market, nearly all trips (97%) do not have an RT or local alternative.

This analysis suggests that while each service type may serve all three markets, there are preferred

service types for each market. Other services are used where a preferred service is not available.

Distance Analysis by Service Type

Figure 2.7 - Figure 2.9 outline distance distributions by distance travelled and percentage of trips at each distance for local, RT, and regional services. Figure 2.8 represents RT distances for RT trips as well as RT and local chained trips. For this figure, distances only represent the RT leg of the trip.

Local Service Key Insights

As shown in Figure 2.7, local services follow a similar distance distribution between all MSPs. Differences emerge based on MSP service area size and types of routes provided, however a comparison of distribution between TTC and the total 905 distribution suggest that regardless of the provider or geography, local trips follow a similar distribution.

Out of all local trips in the GTHA, 83% are below 7km and 95% are below 15km. In general, local services serve three key roles:

- Provide service for short distance trips
- Play a feeder role for RT and regional services

 Provide service for longer distance trips that have no RT alternative, potentially because RT may not be cost-effective for that corridor

The role played by local varies by market, and is dependent on the presence of higher order transit services.

25% of all trips in the GTHA use local exclusively within the city of Toronto. Within Toronto, 49% of all trips use local and of these trips, 78% are shorter than 7km and 98% are shorter than 15km.

15% of all GTHA trips are local trips within the 905 MSP service areas. Of these trips 77% are below 7km and 98% are below 15km.

This has two key implications for fares:

- Since trip distributions are comparable between all MSPs, if a similar distance fare structure were applied to all local services, there would likely be similar impacts
- When designing potential zone systems, the size of the zones will affect the proportion of trips that cross zone boundaries and incur higher fares. Because 83% of all local trips are less than 7km (78% in Toronto, 77% in the 905), as zones grow significantly larger than 7km the system could be expected to behave increasingly similar to a flat fare.





Rapid Transit Service Key Insights

17% of trips in the GTHA use RT and 28% of trips use RT and local services. These trips are focussed in Toronto and represent 62% of all trips within the city.

As noted in Figure 2.8, RT services provide transit for short and medium trips. 42% of all RT are less than 7km. Of these short trips, 70% (29% of all RT trips) have no viable local alternative. 43% of all RT trips are medium distance trips between 7 and 15km (85% of all RT trips are below 15km).

The distance distribution for local/RT trips does not significantly vary from the RT distribution, suggesting that local is used to access RT when direct access may not be feasible for the customer. Chained trips are facilitated by the existing fare structure, where TTC provides free transfers between local and RT services.

From this travel distribution, RT plays the following key roles:

- Short distance trips where no local option is available (example: short distance trips on Bloor)
- Rapid/higher speed travel for medium distance trips across the City of Toronto
- Long distance travel in Toronto where few regional alternatives exist (15% of trips)

In the future, as more RT systems are built in the 905, it is expected they will play a similar role:

- Short distance travel on bus routes replaced by RT
- Medium distance rapid travel across a municipality

The role played by RT presents the following implications for fares:

- When RT systems are implemented they often replace local routes. As 70% of RT trips below 7km do not have a local alternative, an alignment between local and RT fares should be considered so that customers who must use RT for short trips are not disadvantaged.
- Existing flat fares do not reflect the distance distribution within RT. As shown in Figure 2.5, the average fare is the same for all RT trips and the highest unit fare is incurred for short distance trips.
- Fare does not vary from local regardless of whether customers benefit significantly from the use of higher speed RT services over longer distances.
- Fares may better reflect distance travelled by setting a comparable fare between local and RT for short distance markets, while allowing more differentiation by distance for medium distance markets.

 Because RT and local/RT chained trips play a similar role in terms of distance of travel, local/RT transfer policies should not disadvantage customers who must use local to access RT for a similar trip that a customer with direct access may take.



Figure 2.8: Rapid Transit Service Distance Distributions



Regional Service Key Insights

9.9% of total transit trips in the region use only regional services and 3.9% of total trips use regional services in concert with local or RT for access/egress. Of these trips, 97% are over 15km.

As presented in Figure 2.9, regional services are the primary provider for long distance trips. Distances travelled vary based upon stop/station location, and as there are comparatively fewer station pairs with significant usage than seen on the RT network, the stop locations result in peaks in the distance distribution.

1.7% of all GTHA trips use Local and Regional services, compared to 9.9% that use regional exclusively. This would suggest there is a stronger role for local services to play as feeders for regional transit, especially in light of the RER corridor improvements. Fares play a critical role in shaping feeder service effectiveness and future stages of analysis should consider the role of transfers in growing the local-regional market.





Figure 2.9: Regional Service Distance Distributions



Sense Making Summary

The sense making analysis yielded key insights into travel behaviour across the GTHA between key markets as well as for each service type.

Markets Summary

The key issues identified in the analysis for travel markets in the GTHA are identified in Table 2.5. Analysis results are summarized by market factor.

Table 2.5: Sense Making Summary – Markets

Market Factor	Analysis Summary
Number of trips	Internal market trips account for 77.8% of trips. Within internal trips, the largest market is travel between downtown and non-downtown Toronto, which includes 31.9% of all GTHA Trips. Travel within Toronto includes 65.2% of trips.
	Cross boundary trips account for 22.2% of current transit travel. The large majority of these trips are to Toronto, 20.5% of GTHA trips, while 1.7% is between 905 municipalities.
Average Distance	Average distances match expectations – cross boundary trips have typically higher average distances compared to internal trips
	Average fare is highest for regional or regional/Local or regional/RT. These trips include a fare by distance component using GO's zones.
Average Fare	Average fares from 905 to Toronto are also higher due to double fares regardless of whether the trip is local or local/RT.
	Average fare is lowest in Toronto due to lowest base fare and free transfers.
Unit Fare	Unit fare is highest in short distance markets, while longer distance markets have lower unit fare
	Unit fare for long distance 905 to Toronto trips is lowest despite the double fare.

Service Type Summary

The key issues identified for each service type are outlined in Table 2.6.

Table 2.6: Service Type Summary

				Distance Distribut	ion (% of trips)	
Service Type	Optimal Role	Other Roles	Key Issues	Short <7 km	Medium 7-15 km	Long >15 km
Local	Short Distance Access to RT/Regional	Medium Distance trips with no RT	Most trips are below 7km, zone considerations should reflect this	75%	20%	5%
RT	Medium Distance	Short distance trips with no Local service Long distance trips with no Regional service Feeder to Regional services	RT serves some customers in short distance markets who have no alternative local service. Existing flat fare does not reflect distance distribution. RT services rely on local feeder services.	44%	45%	11%
Regional	Long Distance Trips	RER will increasingly serve medium distance trips	RER will position regional services to also serve medium distance trips. As ridership grows, pressures to achieve a greater share of station access via feeder transit	1%	9%	90%

3 Fare Structure Design Principles

Overview

This section outlines the 'fare structure design principles' that were developed from the outputs of the sense making analysis. Design principles are evidence-based statements for how a fare integration concept should be developed.

Design principles have been set to guide the development of the potential fare structure concepts in section 4. This section includes design principles based on:

- Service Type Definitions
- Approach to Distance
- Pricing and Transfer Strategy

Service structure principles are presented first as each service type could have its own fare structure. Each fare structure may also have its own pricing and transfer strategy, which in turn is influenced by the service type.

Service Type Definitions

Background

As discussed in section 1, the categorization of service types determines how each transit service type in the GTHA is represented in an integrated fare system. Design principles have been developed based on the service type analysis in section 2. The service typology used for the analysis is composed of local, rapid transit (RT), and regional service types, and has been retained as the starting point for service categorization due to three factors:

- Customer travel behaviour is clearly differentiated by service typology
- Each service type clearly served one or more markets
- Existing and future services in the GTHA are clearly represented in the service typology

The final recommended categorization of services for the purpose of applying fares will emerge from further refinement undertaken as detailed design of options occurs.

Principle 1: Continuity

The analysis of service and distance markets in section 2 noted insights for each service type:

- Local: local services primarily serve short distance markets and also serve many medium distance market trips. For medium distance markets, these trips occur where there are no RT options available.
- RT: RT trips also serve both medium and short distance markets. However, most RT trips in the short distance market have no local alternative. These trips are often along routes that previously were served by local routes, which were replaced by a subway.
- Regional: regional services primarily serve the long distance market; however, as RER is developed it is expected that regional services will also be a strong viable alternative to RT for medium distance markets.

The key conclusion from these insights is that customer service choice is primarily driven by service availability. Not all services are available for all trips, despite their operational parameters being best suited to one market (example: high stop density, local services being best suited for short distance trips). In some instances, lower order services may be replaced by higher order services.

As not all trips have access to the preferred service type, fares should reflect the availability of transit when setting out a service structure. This leads to the design principle of fare continuity(Figure 3.1):

Figure 3.1: Fare Continuity

Fare continuity ensures customers will pay a comparable fare for services that provide travel over the same distance market so that customers do not pay more because a transit service type is not available.



Distance of trip

Approach to Distance

Background

A fare structure's approach to distance determines how fares should be set for each service type. The stage 1 report identified that for each service type there may be one or more preferred approach to distance worthy of further investigation, as noted in Table 3.1.

These three approaches to distance were used as a starting point to develop design principles. Design principles should aid in crafting a fare structure that offers an appropriate approach to distance for each service type based on the distance distribution.

Table 3.1: Approaches to Distance Applicable to Each Service Type

Approach to fare by		Applicability by Service Type			
distance	Description	Local	Rapid Transit	Regional	
Region-wide Flat Fare	A single flat fare allows an unlimited transit journey until the edge of the transit-served area is reached				
	Transfers may be directional and/or time based (example: 2 hour transfer window for all local services)	~			
Geographic Zones	Zones are drawn across the GTHA				
A CONTRACTOR	Fare increases based on number of zones passed through	√	1	•	
Measured Distance	Fares are set based on distance travelled				
A Province	All costs are communicated to customers as 'station to station' costs		 Image: A start of the start of	•	

Principle 2: Align fares with service usage

This design principle specifies how fares should vary by distance travelled. It draws upon the distance distributions for each service type to clarify how fares may be set based on the distance a customer travels. Section 2 concluded that:

- Local services are primarily used for trips less than 7km
- RT services are used heavily for trips less than 7km and for trips that are 7-15 km. All trips are between stations with fixed and known distances.
- Regional services are mainly used for long distance trips greater than 15km. All trips are between stations with fixed and known distances.

These distance distributions provide insight into how each distance measurement approach (flat, zones and distance) can be used to differentiate fares by distance, as shown in Table 3.2.

Fare structures should be developed based on how far customers travel and the parameters and should be aligned with service type constraints.

Table 3.2: Differentiating Fare by Distance Travelled in a Service Specific Manner

Approach to Distance	Local	Rapid Transit	Regional
Region-wide Flat Fare	Independently of fare structure, long distance use of local transit is self-limiting due to its uncompetitive travel times and reliability compared to rapid transit and regional transit services as well as non-transit modes. Fewer than 5% of local transit trips are over 15km long. Potential implementation of a region-wide flat fare for local services was identified as potentially feasible in stage 1; this would eliminate existing fare zone barriers between 905 and Toronto but would otherwise leave existing local transit unchanged.	The current contiguous network made up of the rapid transit service type covers a comparatively small portion of the GTHA. Although this service type will expand to the 905 area in the future, continuous rapid transit-only trips across the full span of the region are unlikely to become a feature of GTHA travel patterns that a fare structure needs to accommodate.	Trips are distributed between 15 and 60 km, which is the largest range of trip distances. Globally, flat fares are almost never applied to trips with such a degree of variability in trip length. Excluded from further consideration in stage 1.
Geographic Zones	The current fragmented GTHA fare environment has local trips adhering to a <i>de facto</i> regional zone system aligned largely with municipal boundaries. As these zones are very large geographically, a comparatively small proportion of trips cross zone boundaries, giving the appearance of a 'flat' system to most local transit users. As over 75% of trips are less than 7km, a potential replacement zone system with zones larger than 7km may increasingly demonstrate this characteristic as zone sizes grow. Small zones were removed from further consideration in phase 1 because they are complicated for customers to understand and typically require tap off payment.	The current fragmented GTHA fare environment has rapid transit adhering to a <i>de facto</i> regional zone system aligned largely with municipal boundaries, which places the entire existing subway/RT network into a single zone. Trips are distributed largely between 0 and 15 km, with nearly equal trips less than 7km and greater than 7km. A single zone cross-subsidizes long trips with short trips. Rapid transit may use small or large zones. Because trips are distributed nearly evenly in short and medium distance markets, smaller zones are better suited if differentiating those fares from one another is desired	Regional systems currently use large geographic zones. These zones emulate fare by distance; however because stations have large distances between them, zones with multiple stations may lead to step changes in fare.
Measured Distance	Measured distance was removed from consideration in stage 1 due to its tap off requirements and level of complexity.	Rapid transit has fixed and known station to station distances, which are ideal for fare by measured distance.	Regional transit has fixed and known station to station distances, which are ideal for fare by measured distance.

Pricing and Transfer Strategy

Background

The pricing and transfer strategy is used to determine fares based on each service's approach to distance, as well as additional costs, if any, for transferring between service types. The design principles for a pricing and transfer strategy draw upon the analysis of how each service is used by customers to determine:

- How each service type should be priced relative to other services based on markets served and typical uses
- How transfers between services should be priced based on how customers use multiple services for single trips

Two principles have been developed:

- Connected network
- Generalized cost

Principle 3: Connected Network

As discussed in section 2, the GTHA transit network is reliant on transfers between modes. The transit network has been developed based upon using transfers where no direct route is available. For example, 28.2% of all trips use both rapid transit and local service types. Based on this analysis, the principle of a 'connected network' sets rules for how transfers between services should be handled – as shown in Figure 3.2.

For the fare strategy to enable use of the complete GTHA transit network, it should not penalize trips that require the use of multiple service types.

Figure 3.2: Connected Network



Principle 4: Generalized Cost

Design principle 4 provides guidance for how services should be priced relative to one another. It is based on analysis presented in section 2 that discussed how multiple services may provide transit to the same distance markets. For example, medium distance trips may be completed on both local and/or rapid transit.

However, in general, because each service type travels at a different speed, similar distance trips on different services will have different travel times based on the service used. Typical medium distance trips on local services have a higher travel time than similar trips on rapid transit. For example, a trip from Bloor to Sheppard may take 35 minutes (bus on Bay) to 51 minutes (bus on Bathurst) and less than 20 minutes by subway. A 4km local trip from Liberty Village to downtown may take 27 minutes by local service and 11 minutes by regional.

In effect, passengers travelling on slower services pay more in 'travel time', than those on faster services. If fares are equivalent for two service types, the passenger on the slower service will have a higher 'generalized cost' when compared to a passenger on a faster service. These differences in travel time have a

noticeable impact on specific markets: medium (local is slower than RT) and long (RT is slower than regional). The generalized cost design principle informs how to ensure fares across these service types aim to standardize generalized cost as much as practical (Figure 3.3).

Figure 3.3: Generalized Cost

Fare

When travel times vary between two services that provide transport over similar journeys, fares should be lower for slower service types than for faster service types in order to ensure overall generalized costs are comparable.







Principle 5: Gradual Increment

Design principle 5 provides guidance for how fares should change when using fare by distance systems. As discussed in section 2, the current fare system in the GTHA causes large step changes in fares when moving between 905 MSP service areas and the TTC. Travellers must pay multiple fares, which nearly doubles the cost of travel. These issues may be relocated if the new fare structure still prices transit with large jumps.

A second issue arises in zone/distance pricing when customers may choose a less ideal access station to avoid paying a higher fare. This occurs when passengers living adjacent to a GO zone boundary choose a further away GO station for park and ride trips in order to reduce their fare.

The two fare by distance approaches proposed in this study may be priced to avoid sudden increments:

- **Zones:** ensuring the price change when crossing zones is not a disincentive to travelling multiple zones
- Measured distance: ensuring fare increases gradually without sudden steps or inflections

Fares should use small increments and gradual changes to ensure pricing is not a disincentive for passengers to access transit services.



Fare Structure Design Principle Summary

The design principles outlined in this section of the report provide guidance for the development of fare integration concepts based on design components (service structure, fare structure, pricing and transfer strategy). These principles are summarized in Table 3.3.

Table 3.3: Principle Summary

Design Component	Design Principle	Implications for Structure Design
Service Type Definitions	Continuity	 Because service choice is heavily shaped by service availability and not all services are available for trips within their primary markets, fares for different service types should be comparable where two different service types serve similar trips or where customers have no choice but to use a higher order service type as if it were a more local one
Approach to Distance	Align fares with service usage	 Travel behaviour and trip distribution in the GTHA focus certain trips into specific service types. Fares should match the types of travel and travel distances typically served by service types. Local zones should be based on typical travel distances, and RT/regional trips should avoid fare steps by aligning fares with network characteristics
Pricing and Transfer Strategy	Connected network	• Travel in the GTHA is reliant on seamless transfers between service types, therefore trips that require the use of more than one service types should have fares comparable to a trip that only used the highest order service type to travel the same distance
	Generalized cost	 Due to service availability, some trips must use a service type that has a longer travel time than a higher order service would take for a trip of the same distance. These trips should generally have a lower fare to offset increased travel costs ensure the generalized cost between the slower and quicker trips is comparable
	Gradual Increment	 To encourage customers to use the service that best meets their travel needs, fares that vary by distance should escalate as gradually and consistently as possible, without large or sudden jumps

4 Fare Structure Concepts

Overview

This section of the report summarizes the application of design principles to generate three distinct fare structure concepts for the GTHA. It is composed of two sub sections:

- Concept Design Logic a description of the design process used to create options
- Fare Structure Concept Summary an overview of the concepts to be analyzed in future stages of work

Concept Design Logic

Background

Each concept is developed based on a design logic that specifies:

- The relationship of fares between service types
- The sequence for applying approaches to distance for each service type

In general, each concept has been developed by taking the service type definitions, then assigning approaches to distance for each service type, and finally pricing and transfer strategy. All concepts have been developed at a 'high level' and will be refined into options with actual fares and prices in the future evaluation stage of the project.

Design Logic for Service Structures and Fare Structures

As noted in section 2 and 3, because multiple service types serve the same markets, the fares for each service type are heavily influenced or shaped by the fares for other service types. For example, local and rapid transit both serve the short distance market, which means local fares and rapid transit fares must be developed in concert based on the design principles. Based on this consideration, a design logic has been set out based developing the fare structure by looking at each service type in sequence. The sequence is:

- (1) Local Services: local services play a role in each market and serve the most trips in the GTHA. Because they are the 'default' service when higher order transit is not available, their fares are the starting point for developing all potential structures.
- (2) Rapid Transit Services: these services also play a role in all markets, but are best suited for middle distance markets. They also serve short distance trips where a local service is not available. RT serves the second largest share of trips. Because of these considerations, RT is the second service to have its approach to distance assigned.

• (3) Regional Services: regional services serve only the long distance market; however, as RER is developed they will also serve the medium distance market. Because of this, their fares must be set to be comparable for RT in the medium distance market to ensure continuity. As a result, regional services are considered last.

Based on this development sequence, a design logic has been set out for each service type that draws upon findings from sense making, design principles, and the stage 1 analysis. This logic is outlined in Figure 4.1 and Figure 4.2.

Figure 4.1: Service Type Design Logic

Fare Structure Design Logic: Approach to Distance for Local

- A region-wide flat fare does not reflect the value of distance but it is simple.
- A zone structure can decrease fares for shorter distance markets, which may grow ridership, but increases complexity.

Fare Structure Design Logic: Approach to Distance for Rapid Transit

- If local transit uses a bespoke set of non-municipal zones, rapid transit must use the same zone boundaries to reduce complexity.
- If local transit uses a region-wide flat fare or municipal zones and it is desired to better reflect the value of distance in rapid transit fares, a hybrid structure could use small zones or measured distance station-to-station fares for rapid transit. Fare price should consider continuity with local fare for short distance trips.

Fare Structure Design Logic: Approach to Distance for Regional Transit

- Does not need continuity with short trips or local services due to travel time advantage
- Must have continuity with rapid transit for medium distance trips, especially as RER is developed.
- Long distance fares must represent the value the customers receives beyond the travel time advantages of rapid transit, so continuity for long distance trips is not required.

Figure 4.2: Fare Integration Concept Design Tree



Proposed Concepts

Overview

The design logic illustrated in Figure 4.1 and Figure 4.2 can be applied to develop two concepts based on the two choices for setting local fares. Each of these options provides a transformative fare structure for the GTHA that is aligned with the design principles to varying degrees. In addition, an incremental solution may also be considered that modifies the status quo fare structure. As a result, three concepts have been proposed for further evaluation. The remainder of this section outlines the following fare concepts for consideration:

- Business as Usual/Status Quo
- Concept 1 Modified Status Quo
- Concept 2 Local/RT Zones
- Concept 3 Hybrid

Each of these concepts is articulated using the design component process defined in section 1:

- Service Type Definitions
- Approach to Distance
- Transfer and Pricing Strategy

Business as Usual/Status Quo

Overview

The existing conditions – or business as usual/status quo – concept is provided to have a common point of comparison for the three proposed concepts. It is outlined in Figure 4.3.

Service Type Definitions

The status quo service structure includes two major service categories:

- Local/RT
- Regional

The local/RT category includes all buses, streetcars, the subways, the SRT and is assumed to include future LRTs. The regional category includes GO rail, GO bus, and is assumed to include future higher-frequency services on GO corridors.

Two additional service categories—municipal premium express bus and airport rail link—have differentiated fares. These service types make up a comparatively minor share of total regional transit trips.

Approach to Distance

If the current GTHA fare system is thought of a single entity, a hybrid approach to distance is

observed, with the approach to varying fares by distance varying by service category.

The Local/RT approach to distance is a *de facto* zone system aligned largely with municipal boundaries, with YRT making use of further zone boundaries subdividing its service area

As these zones are very large geographically, a comparatively small proportion of the GTHA's trips using local service types cross zone boundaries. The existing rapid transit network in Toronto does not cross zone boundaries at all, remaining within a single zone along with the TTC's local services. This gives the appearance of a 'flat' system to many local/RT transit users.

The regional approach to distance is based on geographic zones that contain one or more stations. A base fare is applied for short/medium distance trips that is significantly higher than local/RT fares for similar distances. Fares increase by zones crossed following a fare table that is intended to approximate measured distance.

Pricing and Transfer Strategy

Each MSP prices its services differently.

All MSPs permit free transfers between two services operated by them. Second fares are required for transfers between 905 MSPs and the TTC, or for users riding TTC bus routes across zone boundaries. 905 MSPs have free transfers to and from other 905 MSPs and no additional fares for travel on continuous cross-boundary routes, although YRT charges a premium on multi-zone trips internal to it. There is a discounted local cofare for transfers between 905 MSPs and regional service. There is no disocunted co-fare between TTC and regional services and both full fares must be paid by the customer.

905 MSPs use a time based transfer for local service pricing, while the TTC uses a directional transfer with a time limit.

Figure 4.3: Status Quo



Concept 1 – Modified Status Quo

Overview

The modified status quo option seeks to provide incremental benefits from the status quo, including addressing key issues:

- Provide a common transfer rule between all MSPs including the TTC – effectively removing the double fare between 905 MSPs and TTC. The new transfer could either be free or be a consistent co-fare in line with the connected network principle.
- Provide a common co-fare between all local/RT MSP services and regional services in line with the connected network principle
- Re-price services to reduce the fare differential between regional services and local/RT services and support RER. This new pricing would need to consider continuity and generalised cost principles.

Concept 1 is summarized in Figure 4.4.

Service Type Definition

The modified status quo service structure includes the same service categories as are in place today.

Approach to Distance

The modified status quo continues to take a hybrid approach to distance, with the approach varying by service category.

The Local/RT approach to distance remains a *de facto* regional zone system aligned largely with municipal boundaries. The Toronto subway network and connecting LRT lines would comprise a single zone. A limited proportion of the region's local trips would cross zone boundaries and incur additional fares.

In Toronto, the subway network and new LRT lines connected to it would continue to share a single zone with the TTC's local services. New LRT lines in Hamilton and on Hurontario Street would likewise share a fare environment with their community's respective local services. A limited proportion of the region's trips using MSPs would cross zone boundaries and incur additional fares. As such, local/RT fares would continue to appear 'flat' for most transit users.

Regional services use a measured distance-based rate with a flat fare over the short distance market set to ensure greater costcompetitiveness with local/RT. A distance rate is applied in the medium distance market to gradually increase the differential with local/RT. A higher distance rate is applied in the long distance market to set fares for long distance trips to remain broadly comparable with current fares.

Pricing and Transfer Strategy

Consistent transfer pricing policies between all MSPs and between MSPS and regional services are set. These transfers could be a co-fare or a free transfer.

Figure 4.4: Concept 1 – Modified Status Quo



Service Categories	Approach to Distance	Pricing and Transfer Strategy	
Local/RT	Zones (municipal)	Consistent transfer policy between all MSPs Consistent pricing policy for continuous cross- zone trips	
Regional	Measured Distance	Consistent co-fare between all regional and MSP services	

Concept 2 – Local and RT Zones

Overview

The goal of concept 2 is to develop a new fare structure that allows for fares by zone for local and RT, which adds flexibility to pricing. This in effect creates one regional network where pricing is not determined by the service provider used.

Key changes include:

- Local and RT use the same set of geographic zones to ensure the system is simple for customers. The fare paid per zone may be the same or differ based on service type.
- Regional fares are set at comparable levels for medium distance trips as RT, but return to a measured distance approach once continuity with RT is no longer desired in order to allow for more gradual increments for regional trips

Concept 2 is summarized in Figure 4.5.

Service Type Definitions

The concept 2 service structure includes three service types:

- Local
- RT
- Regional

The local type includes conventional buses and streetcars. The RT type includes the subways, the SRT and future LRTs. The regional type includes GO rail, including future higher-frequency services on GO corridors, and GO bus. Further analysis is required to appropriately categorize higher-speed MSP bus services, such as BRT and other express routes, as either local or RT.

Approach to Distance

Local services use zones to set fares. Zones are expected to be approximately 7km across to limit need for tap off and manage complexity for customers. However, additional zone sizes will be tested in future work. Additionally, zones larger than 7km may be 'virtually' flat for a large portion of trips, as 75% of local trips are less than 7km.

RT shares the same zone boundaries as local services to manage complexity for customers. One-zone trips have a common fare to ensure the continuity principle. Multi zone trips may have a common fare or RT may be priced higher based on the generalized cost principle.

Regional services use a distance-based rate with adaptations for the short and medium distance market: short distance fares are most likely set slightly higher than local/RT, while fares are a comparable value to RT trips in the middle distance market to ensure continuity principle for RER and RT. Long distance trips use a measured distance rate that ensures long distance fares remain broadly comparable to the status quo.

Pricing and Transfer Strategy

Transfers within service types are 'free'. Transfer rules are applied between all service types consistently:

- Local to regional transfers are either free or have same co-fare regardless of operator
- Local to RT transfers are either free or have same co-fare regardless of operator
- RT to regional transfers are either free or have same co-fare regardless of operator
 Each service-to-service co-fare may vary, for example the co-fare for local to RT may be lower than the co-fare between regional and local.
 Future stages of work will test multiple co-fare or free transfer policies.



Distance

Service Types	Approach to Distance	Pricing and Transfer Strategy
Local	Zones	Free transfer or consistent co-fare between local and RT. Free transfer or consistent co-fare between local and regional.
RT	Zones	Free transfer or consistent co-fare between RT and local. Free transfer or consistent co-fare between RT and regional.
Regional	Measured Distance	Free transfer or consistent co-fare between regional and RT. Free transfer or consistent co-fare between regional and local.

Concept 3 – Hybrid

Overview

The goal of concept 3 is to develop a new fare structure that allows for all design principles to be applied, while allowing flexibility for RT and regional services.

Key changes include:

- Local has a region-wide flat fare, while RT and regional use distance-based fares (fare structure aligned with service usage principle)
- Local and RT fares are comparable for short distance trips
- Regional fares are comparable to RT for medium distance market trips (continuity and generalized cost principles)
- Consistent transfer rules are provided between service types (connected network principle)

Concept 2 is summarized in Figure 4.6.

Service Type Definitions

The concept 3 service structure includes three service types:

- Local
- RT

Regional

The local type includes conventional buses and streetcars. The RT type includes the subways, the SRT and future LRTs. The regional type includes GO rail, including future higher-frequency services on GO corridors, and GO bus. Further analysis is required to appropriately categorize higher-speed MSP bus services, such as BRT and other express routes, as either local or RT.

Approach to Distance

This fare structure concept takes a hybrid approach to distance, with the approach varying by type of service.

Local services use a flat fare across the region. This flat fare is expected to provide a simple fare for local travellers and also meet the generalized cost principle. Because medium and long distance trips on local take longer, a flat fare accounts for the overall difference in generalized costs.

RT shares a flat fare with local in the short distance market and uses distance rates for medium and long distance markets.

The regional fare structure uses a distance-based rate that ensures fares match RT in the medium distance market in support of RER. Fares are flat in the short-distance market. Long distance trips are priced to ensure fares remain broadly consistent with long distance trips in the status quo.

Pricing and Transfer Strategy

Transfers within service types are 'free'. Transfer rules are applied between all service types consistently:

- Local to regional transfers are either free or have the same co-fare regardless of operators
- Local to RT transfers are either free or have same co-fare regardless of operators
- RT to regional transfers are either free or have same co-fare regardless of operators

Each service to service co-fare may vary, for example the co-fare for local to RT may be lower than the co-fare between RT and local. Future stages of work will test multiple co-fare or free transfer policies.



5 Next Steps

Overview

This section of the report outlines the next steps for the fare integration study project. It provides a high level overview of:

- Concept Refinement and Detailed Design of Options
- Option Evaluation

Concept Refinement and Detailed Design of Options

Each concept identified in this study will undergo further development. This concept refinement process will include:

- Calibrating each concept with priced fares and co-fares to model the impact on ridership and revenue for various scenarios, creating one or more options from each concept prepared for full business case evaluation
- Scoping/prototyping potential methods for delivering the options or implementing the options in the GTHA, including cost estimates

This work will consider further data analysis in the GTHA as well as a review from other jurisdictions that have successfully applied fare by distance and zone structures, or have differentiated fares by service type

Option Evaluation

Background

The second stage 2 report will include a business case for options associated with each concept identified in this report. This process will build upon the evaluation framework and business case approach outlined in stage 1 and the findings of this report to suggest a preferred alternative for further refinement and development.

This evaluation will follow Metrolinx's four chapter business case approach and provide evidence to support the strategic, financial, economic, and deliverability case for each concept.

Analysis Approach

In order to develop evidence to support the business case for each concept, a five-step analysis approach has been set out as noted in Table 5.1. Stage 1 identified 27 objectives that guide the evaluation of each fare concept. Each objective requires significant analysis to determine concept performance. In order to guide this process, one or more tools have been mapped against each objective in Table 5.2 and each of Metrolinx's four business case chapters in Table 5.3.

Table 5.1: Stage 2 Analysis Tools

Analysis Approach	Description	Approach
Barrier Analysis	 Assessment of how the structure removes fare barriers (cost, complexity, captivity) including assessment of changes to fares for each market/sub market, representative origins and destinations, and trip lengths 	 Change in fare, average fare, and unit fare for each market/sub market and representative ODs Review of additional approaches that may be applied to further reduce barriers
Customer/ Structure Interaction	• Assess how customers interact with the structure at various stages of different trip types.	 Development of customer experience maps and potential benefits/impacts of each concept along a customer journey Practice review of experiences with each fare structures in other jurisdictions
Modelling	• Application of built for purpose ridership response model to 2011 and 2031 for multiple scenarios for each option in order to support empirical/quantitative analysis	 Use of ridership response model to estimate for the region and market: Change in ridership and demand distribution throughout network Change in revenue Change in Vehicle Kilometers Traveled (VKT)
Implementation, Maintenance, and Adaptability	 Assessment of implementation impacts including fare collection requirements (tap on/tap off, enforcement), costs (capital/op/life cycle costs) and benefits (data and planning) 	 Scoping likely requirements based on GTHA and other jurisdiction experience Stakeholder engagement on implementation requirements
Equity assessment	• Review and clarification of potential impact of fare structure options on economically disadvantaged communities	 Assessment of: Change in fare for economically disadvantaged communities Change in fare to access low income employment centres

Table 5.2: Analysis Tools for Fare Strategy Objectives

Category	Label	Objective	Barrier Analysis	Customer Analysis	Modelling	Implementation Maintenance Adaptability	Equity Analysis
	C1	Enables travellers to perceive the GTHA's various transit options as one network	 ✓ 				
	C2	Delivers a fare structure that is readily understood by customers		✓			
	C3	Convenient and suitable for different trip and traveller types	✓				 ✓
Simplicity	S1	Adaptable to changes in agency service provision, operations, and infrastructure		✓	✓		
	S2	Has manageable requirements for implementing, maintaining and revising/enhancing the fare strategy over its lifecycle				✓	
	S3	Allows for use of fare data for monitoring and service planning				✓	
	G1	Provides a flexible fare system that is practical to implement				✓	
	G2	Supports transit planning and management across the GTHA including integrated transit services and data collection				✓	
	G3	Creates a readily understandable fare system		✓			
	C4	Creates fares that travellers perceive as reflecting the value for service received		✓			✓
	C5	Promotes equity by fair pricing of trips.	 ✓ 				
	C6	Provides the customer a user friendly point of purchase experience		✓			 ✓
	S4	Supports competitive services, ridership development, and service development and promotion			,		
		policies/preferences/guidelines	✓		~		
Value	S5	Provides value for money on investment in fare infrastructure/assets and related operating costs.			✓	✓	
	S6	Generates revenue required to meet cost recovery plans and minimizes fare underpayment and avoidance				✓	
	G4	Supports transit ridership development within services and across the GTHA	✓		✓		
	G5	Generates revenue in support of cost recovery plans across the GTHA.			✓	√	
		Support strategic policy for the GTHA, including economic growth, built form, social inclusion, and environmental			,		
	G6	sustainability.	✓		~		· ✓
	C7	Allows for common fare concessions and products that meet a range of traveller needs		✓			 ✓
	C8	Creates standardized fare payment and transaction experience for travellers using one fare medium		✓			
	C9	Provides easy fare payment for trips involving multiple services and/or modes.	 ✓ 				 ✓
Consistency	S7	Allows service providers to adapt to meet changing customer needs	 ✓ 				 ✓
	S8	Enables seamless transfer between agencies through the implementation and use of common fare media	~				
	S9	Distributes demand efficiently throughout the network and supports the roles of differing service types	 ✓ 		✓		
	G7	Supports consistent fare media and products across the GTHA		✓		✓	
	G8	Implements a common approach to fare management that enables regional planning/investment				√	
	G9	Supports future service developments			✓	✓	

Table 5.3: Four Chapter Framework Using Fare Integration Objectives

Case	Label	Objective
	C1	Enables travellers to perceive the GTHA's various transit options as one network
	S8	Enables seamless transfer between agencies through the implementation and use of common fare media
	C8	Creates standardized fare payment and transaction experience for travellers using one fare medium
	C2	Delivers a fare structure that is legible and readily understood by customers
	C6	Provides the customer a user friendly point of purchase experience
	G3	Creates a readily understandable fare system
	G4	Supports transit ridership development within services and across the GTHA
	C3	Convenient and suitable for different trip and traveller types
	C4	Creates fares that travellers perceive as reflecting the value for service received
ase	C7	Allows for common fare concessions and products that meet a range of traveller needs
ic C	S9	Distributes demand efficiently throughout the network and supports the roles of differing service types
teg	S4	Supports competitive service, ridership development, and service promotion policies, preferences, and guidelines
Stra	G9	Supports future service developments
	G5	Generates revenue in support of cost recovery plans across the GTHA.
a	S6	Generates revenue required to meet cost recovery plans and minimizes fare underpayment and avoidance
Financi Case	S5	Provides value for money on investment in fare infrastructure/assets and related operating costs.
Case	G6	Supports strategic policy for the GTHA, including economic growth, built form, social inclusion, and environmental sustainability.
Economic	C5	Promotes equity by fair pricing of trips.
	G1	Provides a flexible fare system that is practical to implement
ase	S2	Has manageable requirements for implementing, maintaining and revising/enhancing the fare strategy over its lifecycle
s ca	S1	Adaptable to changes in agency service provision, operations, and infrastructure
tion	S7	Allows service providers to adapt to meet changing customer needs
erat	S7	Allows service providers to adapt to meet changing customer needs
odo bu	G7	Supports consistent fare media and products across the GTHA
	C9	Provides easy fare payment for trips involving multiple services and/or modes.
itya	G8	Implements a common approach to fare management that enables regional planning/investment
Deliverabil	G2	Supports transit planning and management across the GTHA including integrated transit services and data collection

Next Steps

Analysis and evaluation for each concept will commence in February 2016 and continue into spring 2016. At this time a preferred option will be selected for further evaluation and development into the summer of 2016. This further development will focus on phasing, governance, and deliverability. Greater Toronto and Hamilton Area Fare Integration - Stage 2 Report 1 | Report

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