TORONTO

Memorandum

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November 17, 2011

TO: Gary Webster, Chief General Manager, Toronto Transit Commission

FROM: Joseph P. Pennachetti, City Manager

SUBJECT: **TTC Service Efficiency Study – Final Report**

At its meeting in April 2011, City Council adopted the Service Review Program, setting in motion a series of studies including the TTC Service Efficiency Study. The study was conducted over the past few months by consultants from Accenture. The study is now complete and I attach the final report.

I want to thank you for making key senior staff available in providing data and participating in consultations with the Accenture team and related meetings with City staff during the course of the study. Your participation has been invaluable.

Hard copies of the final report are enclosed for the members of the Board and senior TTC officials, and a digital copy of the final report is also being provided. Your assistance in arranging to have this study placed on the agenda for the Commission's November 23rd meeting is appreciated. This will provide the Toronto Transit Commission with an opportunity to review the report prior to the City's budget launch on November 28.

Note that City Council, at its special meeting in September, directed me to report the findings of the Service Efficiency Studies to the budget process. The TTC Service Efficiency Study will be before the City's Budget Committee for its meetings scheduled during December 2-9.

The TTC Service Efficiency Study examined a wide variety of topics in a short period of time. The report acknowledges that many of the service efficiencies that can be implemented for the 2012 budget cycle have already been incorporated into the proposed budget for 2012. The study highlights additional specific opportunities for further cost reductions, noting that a more in-depth analysis of each area will be required to test the feasibility and to provide more precise savings estimates.

Many Toronto Transit Commission staff participated in this study and provided significant input in a relatively compressed timeframe and I greatly appreciate their cooperation in this important corporate initiative.

Joseph P. Pennachetti
City Manager

Attachment: Toronto Transit Commission: Service Efficiency Study

cc: Cam Weldon
Vincent Rodo
Dave Dixon
Nancy Autton
Lance Alexander

City of Toronto
Service Efficiency Study
On the Toronto Transit Commission (TTC)

November 15, 2011

Final Report to the City Manager

Prepared by:

In consultation with the City of Toronto and the Toronto Transit Commission

Under Roster Assignment #9144-11-7001-Cat2MC07-11

Table of Contents

PLEASE NOTE:

It is public information that Accenture is currently engaged as the primary systems integrator and operator of PRESTO, the automated fare management solution managed by Metrolinx in the Greater Toronto and Hamilton Area or GTHA. Accenture was selected to perform the PRESTO work through an open and competitive procurement process. This report is based on the City of Toronto's Roster Assignment #9144-11-7001-Cat2MC07-11 (and related Statement of Work) and is not intended to deal with issues relating to PRESTO or any PRESTO discussions that the City or the TTC might be having with Metrolinx.

Executive Summary

This Service Efficiency Study Program report describes the current state of the City of Toronto's public transit service, known as the *Toronto Transit Commission (TTC)* within nine (and ancillary) focus areas. Within these nine areas, the report outlines a potential future operating model, considering industry best practices, and existing challenges. The statistics and information within the report refer to data-driven exercises, which are summarized within the Appendix at the back of the document.

The TTC operates the third most heavily used urban mass transit system in North America, after the New York City Transit Authority and the Mexico City Metro. As of 2010, the average daily ridership on the TTC is approximately 2,487,000 passengers, of which 1,254,600 travel by bus, another 285,600 by streetcar, and about 948,100 by rapid transit lines[1]. In addition to a comprehensive network of bus, streetcar and rapid transit lines, the TTC also provides door-to-door services for persons with physical disabilities via the Wheel-Trans operation. The TTC supports a comprehensive network across a full range of transportation modes (subways, streetcars and buses), unlike other large transit systems. It is primarily dependent on fare box revenue and less on City of Toronto subsidies to cover its operating costs, when compared to other transit agencies.

To support City Council's 2012 budget deliberations, the City Manager is undertaking *Service Efficiency Studies (SES)* of several City divisions, agencies, and cross-cutting functions, including this study of the TTC. This assignment was awarded as part of a competitive procurement process to conduct a review of TTC operations and identify areas for cost optimization. Through this SES, the City is looking for ways to improve the business model used by the TTC, to maximize savings while continuing to provide a good quality transit service.

As part of the SES process, the City and TTC identified nine focus areas:

a) Incident Management (Reporting and Response)
b) Capital Project Management
c) Bus Life and Maintenance
d) Management Structure
e) Shared Services
f) Charter Services
g) Peak Hour and Off Peak Service Efficiency
h) Ridership Growth Management Strategies
i) Wheel-Trans Operations
j) Other Areas (such as Absenteeism and Overtime)

In accordance with the statement of work, other areas were also studied over the course of the review process, such as Absenteeism and Overtime.

[1] Rapid transit refers to the Yonge-University-Spadina, Bloor-Danforth, Sheppard, and Scarborough Rapid Transit lines.

An initial review of the potential efficiencies, cost savings, new business methods and processes, revenue generation and other opportunities was completed across these Focus Areas. As part of the review process, more than 35 interviews were completed within the TTC and the administration of the City of Toronto, more than 40 reports were reviewed, and data was analysed from several sources including, but not limited to, external reports conducted by Booz Allen Hamilton Inc., KPMG LLP, IBI Group, and internal reports and documents, including monthly *Chief General Manager (CGM)* reports, the 2010 Annual Report for the TTC, Wheel-Trans reports, and service planning reports from most operating departments within the TTC. It was clear from all the interviews conducted that many people feel a close connection with and well-deserved pride in the TTC. As a result, in addition to discussing the TTC's successes, interviewees were eager to share ideas on how the TTC could be improved. In fact, we would recommend that this energy continue to be encouraged beyond the publication of this report.

This report outlines some recommendations for immediate action, with implementation steps which the City Manager and the TTC may wish to consider as input for the 2012 budget, as well as longer term opportunities. The intent of the report is to provide high-level savings opportunities and suggest next steps, such as outlining business cases and project plans in order to implement and achieve savings.

The summary table below provides a summary of the proposed recommendations. The recommendations are organized by each of the nine focus areas. A suggested timeline is provided at the end of the report. Potential savings are listed by each of the focus areas and where applicable, attributed to a specific recommendation.

Given the two-month timeframe of this assessment, the study's focus was to identify recommendations that would provide the necessary guidance for further action. In this report, we provide a first iteration of an overall implementation plan and expected benefits. It is recommended that further analysis be undertaken to develop detailed action plans to implement the recommendations

The report identifies a total savings of $101 million, with the potential for $31 - $33 million in short-term savings through immediate projects and efficiencies within fiscal 2012, and the potential for an additional $26 - $68 million in longer term savings. Of the potential short-term savings identified, the TTC has already identified about $31 million of those savings in the areas of Management Structure, Route Efficiency and Wheel-Trans as input to the 2012 budget process.

We view the potential savings, as identified in the 2012 column, as being achievable in the current fiscal year if these recommendations are followed. The savings in the long-term column are indicative estimates of savings. Further work will be required to conduct in-depth analysis and develop the specific action plans and business cases in order to determine more precise expected savings associated with each recommendation. Our view is that if a consistent focus is applied in, and through 2012 to develop the necessary business analysis to implement these recommendations, then further additional savings may be more precisely confirmed as part of the 2013 budget process.

Overall, in developing our recommendations, we observed the following:

- The TTC has a proud heritage of delivering transportation services in Toronto. This is reflected in its Ridership Growth Strategy and its diligent focus on timely service delivery especially as it relates to high volume services such as with the rail lines.

- The TTC recognizes the budgetary challenges that face the City and has taken action in parallel to this study to identify potential savings that could be applied in fiscal 2012. These actions are consistent with some of the recommendations in this report. The primary areas of overlap include a realignment of the span of control within management and supervisory layers as well as service adjustments, based on the TTC's own internal data linked to loading standards and headways, particularly on low productivity routes.

- The TTC would benefit from structured lifecycle management structures to manage capital funds. This would yield greater productivity and consistency in the application of capital resources.

- The TTC would benefit from better leveraging tools, and updating standards and processes that apply to bus maintenance management. TTC would benefit with simplified access to data to manage the total lifecycle costs of buses to more efficiently leverage information on maintenance activities that can be efficiently provided either in-house or by third parties.

- The TTC is investing in technologies that would improve services. We recommend that these initiatives – e.g., automated passenger counting, signal lane priority, IFS work order system – be accelerated to provide better on-street performance, and gain better operational efficiency.

- The TTC should accelerate focus on formalizing shared service initiatives with the City. For example, harmonizing technologies and joint procurement with the City would help the TTC reduce costs.

- The TTC should continue to broaden regional transportation service integration. In order to help share costs and provide additional regional transportation services, it could work with regional transportation service providers through Metrolinx.

- The TTC is effectively managing its partnership arrangements with third-party contractors who currently deliver the majority of Wheel-Trans services. We believe that further efficiencies can be realized by expanding these third party partnership arrangements.

- To the TTC`s credit, it has channelled its limited resources toward improving front-line services and "made do" with back-office systems support. However, there comes a time when investment in improved support systems is critical to further improving services in the most cost-effective way.

Recommendations	Time to Implement	Potential Annual Savings (M)	
		by 2012	Long-Term[2]
1. Incident Management	**6-14 months[3]**		**$0.2 - $0.4[4]**
A **Leverage Commercial-Off-The-Shelf (COTS)[5] technologies where applicable to Integrate data capture, storage and retrieval for all system users** To standardize and streamline incident capture/reporting processes			
B **Reduce controllable & uncontrollable incident hours, targeting overall reduction in recovery time** To reduce total incidents, time to delay resolution, and improve customer satisfaction			
C **Track bus incidents in a more comprehensive manner** To identify incident drivers that improve bus ridership and customer satisfaction			
2. Capital Projects Management	**9-10 months**		**$7 - $30[6]**
A **Apply Performance Management metrics using appropriate tools/software** To better manage funds, and improve project fund visibility and governance, consistently use Earned Value Management (EVM) metrics and improved application of contingency management rules based on project risk and complexity			
B **Review City's new Capital Budgeting system (SAP) where applicable to automate, streamline & consolidate reporting requirements across governmental agencies** Work with the City and other governmental bodies to improve reporting rules to manage capital projects, as the City itself shifts to an SAP based system			
C **Setup structured project lifecycle management structures and controls around contingency management *within* the TTC *before* approval is sought from City Council** To strengthen controls on how contingency is set and spent			
3. Bus Life Maintenance and Procurement	**6-7 months**		**$6 - $13[7]**
A **Accelerate implementation of IFS[8] work order system & determine optimal bus life** To gain visibility and start tracking into individual bus lifecycle costs to be able to determine optimal bus lifecycle[9]			
B **Review the opportunity to outsource repairs of bus and parts assembly[10] after benchmarking internal work standards against leading industry performers** To identify areas for productivity improvement and perform repairs and rebuilds at competitive prices of bus maintenance activities			

[2] Further business case development will be required to further substantiate savings associated with each recommendation.
[3] Pilot is 6 months, complete rollout 12-14 months
[4] Assuming you can achieve 40% of the cost (22,000 hours x$50/hr = $1M) to manually input incidents.
[5] "*Proofpoint*", "*Right Now*" and "*InSight BI*" are examples of commercial applications that the TTC may consider.
[6] Assuming 1% - 4% savings can be achieved over their annualized average capital budget of $750M ($7.5B over ten years), *not* operating budgets.
[7] Primarily from outsourcing, assuming 6% - 12% savings can be achieved from a total spend of $107M, that was spent in 2010
[8] IFS (Industrial and Financial Systems) software focuses on four core strategic processes: service & asset management, manufacturing, supply chain and projects. The TTC is primarily using IFS' enterprise asset management (EAM) software.
[9] The TTC is currently performing one engine overhaul, consistent with industry practices
[10] Assembly refers to installing or repairing salvageable bus parts (such as engines, transmission, drive-train etc.)

4. Management Structure		**Within 90 days for Phase 1**	**$15**	**$3 - $7**
A	**Implement scheduled TTC identified staff adjustments** From within management and operations[11] (based on Phase 1)	Q1/2012	$15[12]	
B	**Establish Span of Control (SOC) Ratios:** Operations to achieve SOC of **1:15** CGM's Office (**1:6)**, Executive Branch, Engineering and Construction Branch to achieve SOC of up to **1:8** ***After* implementation of proposed system and process improvements,** Continuously re-evaluate management structure for efficiencies	2013/2014		$3 - $7[13]
5. Shared Services		**9-10 months**	**$1 - $3**	**$3 - $8**
A	**Implement TTC identified savings through contracting out services** As part of its $60M spend on station/building services, bus service lines, metal works, upholstery and wood-working		$1 - $3	$2 - $5[14]
B	**Explore, develop and adopt shared IT services with the City** e.g. Network and service desk support, customer service, hardware/software			$1 - $3[15]
C	**Conduct joint procurement with the City and other transit agencies and Metrolinx** Particularly in office/cleaning supplies and services, uniforms, safety shoes etc.			
D	**Evaluate City's HR, in-house developed system "Quattro" as a model for TTC** Used to manage worker's compensation related incidents			
E	**Develop Centres-of-Excellence between TTC, and regional transport services** e.g. Fare Management, Integrated Vehicle-Borne Information Systems, joint vehicle parts and services procurement, Inter-line services			
F	**Co-ordinate with City on legal services/settlements and employee benefits** Such as payout of claims, life insurance premiums and administrative fees			
G	**Evaluate and perform gap-fit analysis of City's common payroll and financial reporting packages (SAP)** To replace the TTC's ageing corporate systems.			
6. Charter Services		**1 month**	**-**	**-[16]**
A	**Take necessary steps to operate all charter services on full cost recovery basis** To enable better visibility of sales, and ensure breaking-even on charter services			

[11] TTC committed headcount changes affect 381 positions

[12] TTC has committed to these savings that are coming from predominantly from TTC operations (Headcount of 381 impacted)

[13] Is associated with a phase 2 savings, to be evaluated after initial savings have been realized through process improvements

[14] Estimated savings based on 5%-12%, on a total spend of $60M

[15] Estimated savings with sharing services with the City

[16] Charter services are intended to be at least break even, or revenue positive, and therefore there are no cost savings

7. Peak Hour and Off Peak Hour Service Efficiency	**2 months**	**$14**	**$1.6-$2**
A **Implement service adjustment as identified by the TTC** Through revised bus loading standards and service headways		$14[17]	
B **Expedite installation of Automatic Passenger Counting / Signal Priority system** To realise savings by reducing total traffic checking staff & improve schedules			$1[18]
C **Reduce service change frequency to 4-5 changes per year** To reduce complexity involved with service planning and scheduling			$0.6 - $1[19]
8. Ridership Growth Management Strategy	**-**	**-**	**-[20]**
A **Accelerate signal priority installation, increased express bus service, increase priority lanes, optimize bus stop spacing, and track additional performance metrics** To improve on-street schedule adherence to maintain and attract ridership			
B **Increase use of articulated buses** To accommodate more riders			
C **Promote greater interline service between TTC and neighbouring transit** To improve system feeder route volumes by attracting greater suburban riders			
D **Focus on Fare Process Improvements** To enable greater ridership visibility & attract riders through electronic payment			
E **Continue with existing initiatives such as Next Vehicle Arrival System** To facilitate more detailed information for the customer			
F **Review the level of subsidy and service standards for Blue-Night routes** To determine the optimal level of service for the City in accordance with demand			
9. Wheel-Trans Operations	**6 months**	**$1**	**$5 - $8**
A **Accelerate training and implementation of Giro/Acess® scheduling software** To enable savings through same-day dynamic route scheduling	2012	$1[21]	
B **Review and adjust long-term service mix across para-transit providers, and outsource maintenance completely if appropriate** To potentially contract out more services while maintaining service quality			$5 - $8
C **Improve procedures to reduce No-Shows and Cancel-At-Door** Through proactive notification via Integrated Voice Recognition (IVR)			$0.2 – $0.5

[17] By adjusting loading standards and headways (service frequency) TTC identified savings of $14M
[18] Savings associated with fewer staff required to count passengers
[19] Savings associated with reducing their annual spend on service planning boards ($1.9M annually) by half
[20] Ridership Growth Strategies are positioned to increase ridership without adding costs, therefore there are no cost savings
[21] TTC has communicated they are going to accelerate using the full capability of *Giro/Acess*

10. Performance Management		**12-14 months**		
A	**1. Automate time-keeping activities leveraging COTS products where applicable**[22] To reduce impact of errors associated with manual input of data **2. Set targets to reduce both overtime and staff absences**			
B	**Develop a 5-year roadmap to modernize IT infrastructure at the TTC** Monitor project progress on a quarterly basis	Within 90 days		
C	**Develop an Operational, Management Transit Balanced Scorecard report** To demonstrate performance, reporting and facilitating improvement targets			
Total Potential Savings			**$31 - $33**	**$26 - $68**
Grand Total			**$57 – $101 million**	

In this report, we provide additional context and supporting data behind these recommendations. Given the two-month timeframe of this assessment, the report's focus was to identify recommendations that would provide the necessary markers for further in-depth analysis. The savings identified are broad estimates to provide a basis for establishing priorities among initiatives.

[22] "*PS Technologies*" and "*Kronos*" are examples of commercial products tailored to specific transit needs in the area of time management and crew management.

1. Incident Management (Reporting and Response)

The TTC is a large, multi-modal system and as such, TTC must be prepared to handle incidents. There are multiple types of incidents, such as: a passenger slipping at a station, mechanical issues on the subway, a bus collision, or employee injuries. Coordinating the response and resolution process for all incidents that occur in the field to ensure safety, security, and performance of the train system[23] starts with Transit Control. Logging the incident is the first step in any type of TTC response. It is the start of a process that can be complex and can slow the restoration of service of the affected vehicles and trains[24].

The first point of contact for a surface or subway incident is usually Transit Control. Incidents in Transit Control create an "Incident Slip" in its ICS application. Once an incident slip is closed out, it moves to an ICS archive database after three days. From our discussions with Transit Control it appears that the archive database is primarily used to lookup older incidents. This archive database has a wealth of information. For example, the data for the statistics reports that Health and Safety creates for surface and subway likely exists already in the ICS archive database.

In 2010, the TTC logged approximately 15,000 incidents, in 3 categories:

Surface: These are incidents involving Bus, Streetcars and Wheel-Trans, which may involve the general public. In 2010, approximately 6,800 incidents were Surface related.

Subway/SRT: These incidents include station-related incidents and onboard vehicle passenger incidents. In 2010, approximately 5,450 incidents were Subway/SRT related.

Occupational: These are employee health/injury-related incidents. In 2010, approximately 3,350 incidents were Occupational related.

Incident management includes the safe and speedy restoration of service to the rider community. The TTC continues to invest in defining clear operational practices and procedures associated with a variety of potential incidents. For further background details, refer to *Appendix A: Incident Management.*

A) Data capture, storage, retrieval and reporting

The TTC relies on manually-intensive processes for its incident management data capture and analysis. This creates additional effort for staff, risks data errors and lengthens analysis activities. Today, web-enabled, *Commercial-Off-The-Shelf (COTS)* solutions can be leveraged to support incident management[25]. These systems significantly reduce the cost and time required for implementation, while bringing enhanced functionality. These COTS systems can be running in weeks vs. months or years for in-house developed solutions. The City has used this approach when revitalizing a similar system.

For example, feedback about the duties of the Mobile Supervisors suggests that, on average, they spend between 30-60 minutes at the close of each shift completing and submitting incident data forms *(and there are multiple forms depending upon the category of the incident)*. Given the period studied (2010)

[23] A decentralized system is used for buses and street cars with limited central coordination

[24] For a detailed description of this process, please refer to Appendix B: Incident Management and Reporting.

[25] "*Proofpoint*", "*Right Now*" and "*InSight BI*" are examples of commercial applications that the TTC may consider.

this accounts for about 6000[26] labour hours (considering only operational hours) to complete and distribute the forms.

In addition, for the three areas where Transit Control processes *operational* incidents, staff in the Safety and Environment Department spend an estimated additional 5000[27] labour hours *(20-30 minutes per form)* entering the data from the 347 "checkboxes" and 97 "blank/input fields" on the forms into a central database system. The database, in turn, is not necessarily compatible with the remainder of the user community *(i.e. - Claims and Legal, Security, Human Resources, etc.)*. Lastly, because the forms are hand-written, there is constant rework searching for missing data fields, illegible entries, inducing response gaps for the larger user community along with the associated labour required to track and complete all the "open" issues. From all the *operational* data reviewed, it is estimated that for the period studied (2010), approximately 19,000 to 27,000 hours in total were spent photocopying, mailing, faxing or manually inputting data to support the Incident Management process. [28]

Recommendation 1A: Leverage Commercial-Off-The-Shelf (COTS) technologies where applicable to Integrate data capture, storage and retrieval for all system users

Having a standardized process for data entry would enable quick and effective incident data capturing. Through this process, users within, and outside the TTC[29] will be able to easily share data, which is readily available in a standard format. Internally this would help reduce time for data entry, and improve time-to-resolution of incidents resulting in better customer satisfaction. Also, this will eliminate unnecessary redundancies where work is often re-done because it is not standardized, or stored in a particular way that is required by the different users of the data.

We recommend that the TTC leverage COTS technologies, where applicable, to improve their ability to mine the contents of their archive database and to examine what data-mining/reporting opportunities may exist. This should be part of the fresh process redesign of the incident reporting system. With this, leverage any commercially available COTS solutions where applicable, to standardize incident capture and reporting processes. These actions will drive improvement by eliminating front-end manual input processes, with a savings of up to $200,000 to $400,000 annually[30].

Additionally, it will help reduce worker related incidents by being proactive. For example the City has implemented safety projects which have generated results, such as the Musculoskeletal Disorder (MSD) Program that has reduced MSD in the City workforce by 35%, and generated a savings of over $3M.

[26] Calculated using 12,000 operational incidents x ~30 minutes each =6000 labour hours.
[27] Calculated using 12,000 incidents x ~25 minutes each = 5,000 labour hours
[28] Refer to Appendix A: Incident Management
[29] For example: Interfacing with the City's own HR Incidents Management Tool "Quattro", which is discussed in greater detail within *Section 5D: Human Resources Related Incidents,* will become easier with information management and standardization
[30] Assuming you can achieve 20% to 40% of the cost (22,000 hours x$50/hr = $1M) to manually input incidents.

B) Service Recovery Performance

The TTC assesses incidents in a variety of ways. This includes average time to resolution of delays as well as time to resolution for delays of 5 and 20 minutes[31]. Still, the TTC is working to reconcile a tremendous amount of data into clear and consistently applied "safe service recovery" procedures. For example, in rail transportation, the average time for service restoration is 8.5 minutes *(uncontrollable incident)* and 7 minutes *(controllable incident)* [32]. While the actual number of incidents is small compared with total operations on a given day (there are on average 15 disruptions per day 365 days/year on the subway), the frequency is such that a typical rider will experience one or more service interruptions or delays caused by the ripple effects from delays 1-2 times per month, given the TTC is a multi-modal system. Given the visibility of interrupted service to its customers, its impact on perceptions of service and reliability[33], it is clear this is a critical area to address.

Based on the data provided, we observed that total hours lost due to service interruptions, in 2010, increased by 10%, and 48% for streetcars and subways respectively, as illustrated in *Figures 1.1a* and *1.1b*.

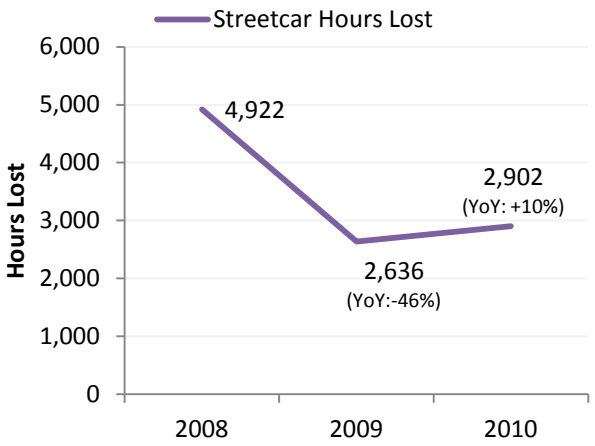


Figure 1.1a

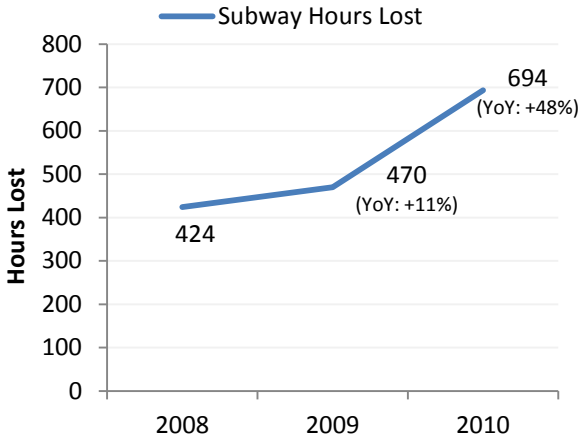


Figure 1.1b

Of the total number of hours lost due to controllable *and* uncontrollable incidents together, the TTC categorizes incident delays in the categories illustrated in Figure 1.2 below. Of these, *General Info, Cars, Staff* and *Passengers* contribute to the majority of the total hours of delay. We recognise the TTC has more granular data, within these buckets; and even though streetcar hours decreased from 2008 to 2009, total incident hours increased between 2009 and 2010. There is clearly some merit in re-evaluating where the focus should be targeted.[34]

[31] TTC tracks incidents of 20 minute delays as it is a comparable number to outside agencies
[32] Controllable Incidents refer to Track, Signalling, Trains, Staff and Power Supply
[33] The industry target to incident resolution is between 5 and 6 minutes.
[34] Refer to Appendix A: Incident Management for more information

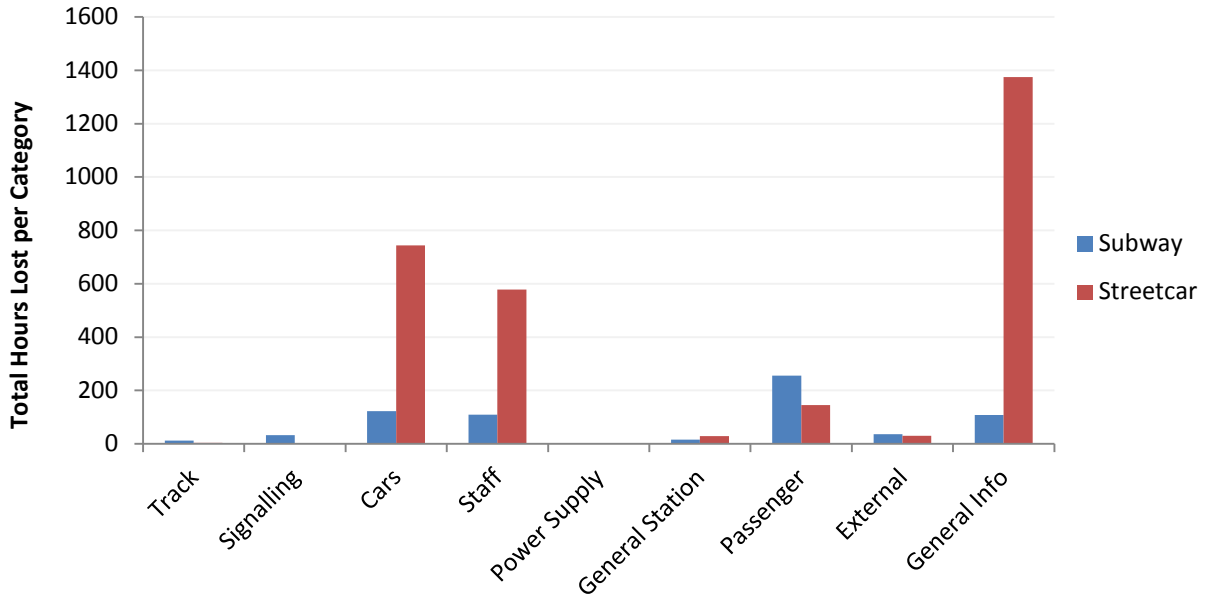


Figure 1.2: Categories of Incident Delays (in hours) by category, as defined by TTC, 2010 actual[35]

Recommendation 1B: Reduce controllable and uncontrollable incident hours, targeting overall reduction in recovery time

While the TTC collects excellent data, they have to leverage their data warehouse using COTS, as mentioned above, and further use the data effectively. The TTC continues to invest in systematic processes to manage uncontrollable and controllable incidents in order to restore service as safely as possible. We encourage the TTC to continue their efforts towards resolving incidents and bringing the overall time to resolution down, particularly with a focus on the buckets where most improvement can be found. This will ultimately bring down the total incidents, the resolution time per incident, and improve customer satisfaction at the street level.

[35] Refer to Appendix A: Incident Management for more information

C) Bus Incidents

Buses currently represent almost 60% of TTC operations; yet the TTC does not report on bus incident statistics,[36] in a manner that is consistent with trains and streetcars. While the current incident tracking system records the time of a single interruption on a single train or streetcar, the impact on affected vehicles behind bus incidents are just reported as "late".

It is understandable that delays on buses do not have system-wide ripple effects that stall the entire network (such as delays on trains or streetcars) and that traffic delays are not controllable by the TTC; however, late buses significantly affect transit convenience in the eyes of the rider and causes customers dissatisfaction[37].

Recommendation 1C: Track bus incidents in a more comprehensive manner that enables improved root-cause analysis of bus related delays

We recommend the TTC start tracking the frequency of delays, by route and categorize the types (controllable vs. uncontrollable) of bus delays going forward which should lower incident delays in the long-run, to improve on-time performance.

[36] The Bus Division only publishes in their CGM "Preventable On-board Incidents" involving passengers

[37] Section 8A: Route Management talks in greater detail into this. Bus on-time performance is currently at 65% headway (time elapsed between buses) adherence.

2. Capital Project Management

A) Performance and Contingency Management

The capital project budgeting and management process is typical for a rail-based transportation enterprise dependent upon public funding for sustained operations of the rolling stock and infrastructure. Any such process requires continuous status reporting and out-year planning based upon multiple variables to include system operations safety and state of good repair, funding sources directives and preferences, market conditions and changes, etc.

The TTC's capital budgeting and management process is built primarily upon desk top software applications (predominantly through a series of Microsoft Excel® spreadsheets). While templates and guidelines are used to manage each advancing budgeting cycle, the probability of data computation and transfer error is higher as a result.

Recommendation 2A: Apply performance management metrics using appropriate tools/software

We recommend that TTC consistently add performance management metrics to focus on EVM (Earned Value Management)[38] to its management reporting. Current and past performance is the best indicator of future performance, and therefore using trend data, it is possible to forecast cost or schedule overruns at an early stage in a project. The most comprehensive trend analysis technique is the Earned Value method. Consistently using these metrics across all capital programs will improve the TTC's ability to accurately monitor the schedule and cost variances for complex projects. Creating clarity about capital budget requirements will also enable the TTC to better manage its contingency fund to be based on project complexity and risk with greater precision.

In a nutshell, Earned Value is an approach where you monitor the project plan, actual work, and work-completed value to see if a project is on track. Earned Value shows how much of the budget and time should have been spent, compared to the actual amount of work done so far. EVM is particularly useful in assessing, understanding and quantifying what a contractor or field activity is achieving with program dollars. EVM metrics can be tracked using capital performance management tools and software that automate standardized reporting, as per the TTC's and City's reporting requirements.

B) Capital Budgeting Reporting Requirements and Rules

The performance management process uses the same underlying desk top application, not only raising the same data computation and transfer error concerns but requiring higher levels of labour hours to collect, manipulate and generate the multiple reports needed for management and oversight. This does not account for the various external report requests which must be processed and distributed.

While TTC's process includes the accepted practice of multiple-year forecasting, they are challenged by funding source policies which are provided in single year blocks. In addition, because of the high visibility of the funding and funding source parameters, the single-year funding blocks have a tendency to create

[38] EVM metrics provide management with objective, accurate and timely data for effective decision making

on-going planning rework and associated project performance adjustments. This process and performance churn[39] comes with a cost.

Recommendation 2B: Review new City's Capital Budgeting system (SAP) to automate, streamline and consolidate reporting requirements across governmental agencies

The TTC should co-ordinate with the City and other governmental bodies to streamline reporting requirements, to improving funding and governance rules associated with managing capital budgets.

The TTC is currently using simple, desktop applications to monitor its capital budget across numerous programs and projects. Given the complexity of some if its programs, and the numerous reporting requirements, the TTC must upgrade its management processes and supporting technology in order to efficiently comply with reporting requirements.

C) Internal TTC Capital Contingency Governance

The TTC allocates a fixed contingency amount for each project in its capital budget. However, when certain projects exceed their allocated contingency budgets, the TTC applies available projects' contingency elsewhere to the projects that are going over budget.

Recommendation 2C: Set up structure project lifecycle management structures and controls around contingency management *within* the TTC, *before* approval is sought from the City Council

We recommend that the approach for budget contingency management be reviewed with the objective of clearly assigning accountabilities and streamlining its management. We believe that the TTC should set up project lifecycle management structures to monitor contingency on a per-project basis. This process should be supported by clear metrics and dashboards for ease of reporting to TTC executives and for the TTC to use in its reporting relationships to the Commission, the City and other external stakeholders per the guidelines published by the TTC and the City.

While projects should have some latitude in managing contingency, the TTC should set up an internal committee or use existing committees to review project progress, and approve contingencies as well as significant contingency requests, where they are within their means as per City guidelines or seek approval from the City. This will enable them to better manage overall project budgets, and strengthen their controls as to how contingencies are set and spent.[40]

[39] Referring to work being repeatedly re-done
[40] For Further details refer to Appendix B: Capital Project Management

3. Bus Life, Maintenance & Procurement

A) IFS Work Order System

The TTC currently has limited visibility into the individual bus lifecycle costs. This is because the TTC does not track maintenance costs that include parts and labour assigned to specific buses. We were however, able to obtain parts and labour costs assigned to the bus fleet broken down by class. It should be noted that the TTC does plan to implement a new vehicle cost tracking system (IFS) [41] that would enable vehicle cost visibility in the future[42].

The TTC has a parts stock-out[43] rate target of 1.8%. In 2010 TTC's stock-out rate was 3.4% which is on the low side when compared with other transit organizations in North America that have stock-out rates which average 4%-6%. This is another area where additional analysis is needed to determine if these rates provide sufficient service levels. If stock-out levels are too high, they can "starve" the maintenance operations and delay repairs.

TTC has a bus fleet of 1831 buses. These are of varied ages, starting with GMC buses, which are approximately 20 years old, to a newer fleet of hybrid buses, Orion VII, Flyer low floor, and diesel powered buses. The average age of TTC's fleet is 6.2 years which compares with an average age of 7.9 years elsewhere in North America[44].

Recommendation 3A: Accelerate implementation of IFS work order system and determine optimal bus life

It is recommended that TTC fast-track its implementation of the IFS system in order to have accurate loading of parts and labour costs to individual buses. This would enable the TTC to complete a more detailed life cycle analysis by bus and fleet to make better decisions on appropriate bus life and better performing bus classes. For example, in an earlier study conducted by Booz Allen Hamilton[45], TTC reported that it was considering moving to one major engine overhaul going forward and is a practice we support. Through improved data and analysis, the TTC can make optimal decisions on how quickly each overhaul should occur (e.g., within 7 to 9 years). TTC would be able to provide improved data on the cost performance of various bus classes (e.g., hybrid versus diesel).

[41] The TTC is primarily using IFS' enterprise asset management (EAM) software
[42] We have received different estimates ranging between 30 and 180 days to system implementation at TTC.
[43] A stockout, or out-of-stock (OOS) event is an event that causes inventory to be exhausted i.e. unavailable when required
[44] National Transit Database 2009: United States Federal Transit Administration.
[45] TTC Bus Optimal Life Study, August 2010.

B) Maintenance Costs

Compared to its peers in the industry, TTC has an operating maintenance spare fleet of 13% of its total fleet, a contingency bus ratio of 4% of its total bus fleet (which is something TTC is looking to eliminate completely by 2016). However, the TTC's bus maintenance costs are in the order of 25%[46] of the total operating costs including fuel cost. This is relatively high in comparison with other North American transit organizations, for which the average ranges between 19% and 21% of operating costs for maintenance[47]. A key difference is that the TTC does provide a comprehensive set of maintenance services in-house.

TTC currently determines the time standards it takes to perform maintenance on its parts using historical data. Over time, parts and maintenance practices change and can possibly improve the Mean-Time-To-Repair (MTTR) for any particular maintenance activity.

Recommendation 3B: Review the opportunity to outsource repairs of bus and parts assembly after benchmarking internal work standards against leading industry performers

TTC should recalibrate its work standards and should benchmark itself with leading industry performers that provide similar service, or perform similar operations, if available[48]. In addition to providing insight into its maintenance efficiency, the information will provide baseline data that the TTC can use to assess out-sourcing options.

Further, we recommend that the TTC set outsourcing targets over a period of three years. Based on our experience with other heavy maintenance facilities, it can be expected that by doing this TTC can expect cost reductions of $6 - $13M (6% to 12% of the maintenance spend of $107M[49] annually in 2010) in the area of bus maintenance. More work and analysis needs to be conducted within this area to substantiate these savings estimates.

[46] The TTC claims this is because they are performing *back-shop* (independent contractor) maintenance. For further information please refer to Appendix C: Bus Life/Maintenance

[47] Report On Key Performance Measures, IBI Group, February 2003

[48] An example of this is the trucking industry

[49] Operating Maintenance Spend, less spend on Service Lines. Refer to Appendix C: Bus Life/Maintenance for more information

4. Management Structure and Span-Of-Control

A) TTC Staff Adjustments

Currently there are approximately 10,700 employees in the TTC operating division, 600 employees in the Wheel-Trans division and 1,800 employees in the capital budget division – for a total of more than 13,000 employees at the TTC. A span of control assessment was completed[50] to determine current supervisor to subordinate ratios. The span of control assessment does not include the recent planned changes in the TTC's organizational structure, which is estimated to adjust the headcount (over 350 people in the TTC budget for 2012) and equates to approximately $15M in savings annually. Organization wide, TTC employees are distributed into the following departments: CGM's Office, Engineering and Construction, Executive Branch and Operations Branch. The current span of control was then compared to the best practice[51] ratio of 1:6 to 1:8 (1:15 for the Operations area).[52]

Recommendation 4A: Implement scheduled TTC identified staff adjustments

These initial headcount adjustments have the potential to deliver $15M in savings annually. However, understanding the current organization structure is just the first step. Implementing major changes to organizational structure is a long term commitment and requires proper study before proceeding. There are also variables unique to TTC which influence the optimal span of control. These include formal organizational structure, available technology, functions being performed, and the competencies of the manager and staff. Figure 4.1 illustrates where the TTC is planning to make these adjustments[53]. TTC is further viewing Wheel-Trans, Capital, and Toronto Coach Terminal for opportunities to adjust headcount.

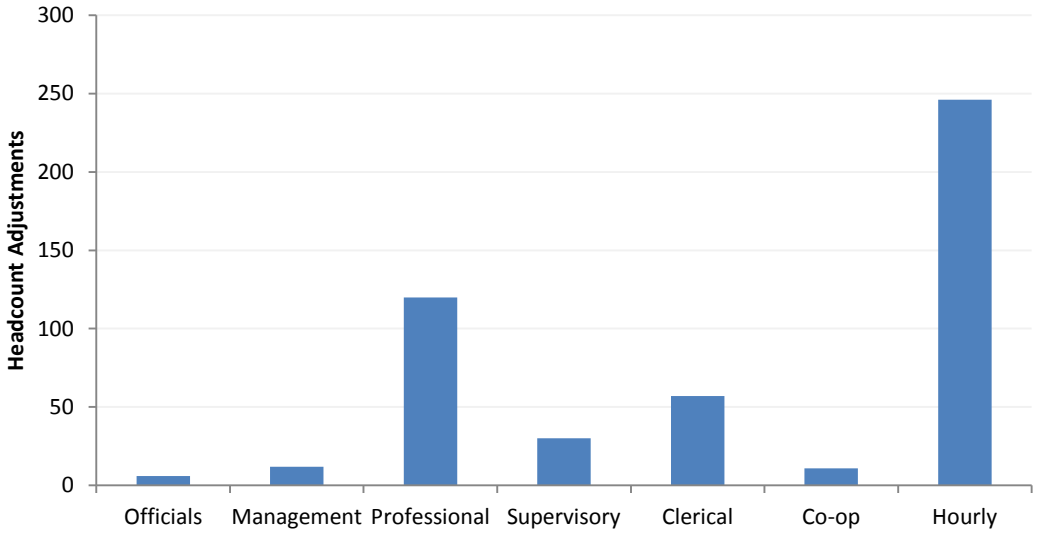


Figure 4.1 – TTC Proposed Headcount Adjustments (Phase 1) [52]

[50] Span of control is ratio of number of supervisors to subordinates

[51] These are a combination of private and public sector ratios

[52] Refer to Appendix D: Management Structure for more information

[53] Currently TTC identified reductions of 381 staff from the TTC budget, 74 from the Capital budget, 3 from the Wheel-Trans budget, and 24 from the Toronto Coach Terminal budget, for a total of 482

We recommend examining the rationale behind the current spans of control. Interviews with each department are required for further deep-dive studies. Analysis of the risks for the recommendations must be understood, and a comprehensive change management approach must be created in order to achieve the future state organization.

The proposed 2012 staff cuts would improve span of control ratio at TTC and we encourage TTC to continue with this exercise through 2013 and beyond (after new systems and processes have been implemented), to ensure compliance to industry standards. Furthermore, re-evaluating Spans of Control on an annual basis might prove beneficial for the TTC in understanding its requirements on an on-going basis.

B) Span of Control (SOC)[54]

The CGM's Office

The Chief General Manager's office consists of the CGM Office, Corporate Communications, Human Resources Department, Human Rights Unit, Internal Audit and the Transit Expansion. There are 466 resources in the CGM's office (120 Operating budget, 294 Capital budget and 52 consultants). The CGM's office has an average Span of Control of 1:4.

Recommendation 4B1: Implement Span of Control Ratio of 1:6

We recommend that the TTC work toward optimization of the span of control at the CGM's office, with the goal being a ratio of 1:6, for phase 2 (phase 1 being the proposed head-count adjustments starting in 2012 and phase 2 would be, after further analysis, to be implemented in 2013 or 2014 after TTC has put in required process and technology changes to enhance its operations).

The Engineering and Construction Department

The Engineering and Construction (E&C) department consists of the E&C Branch, Construction Department, Engineering Department and the Spadina Subway Expansion. There are 528 resources in the Engineering and Construction (E&C) department (11 Operating Budget, 353 Capital Budget and 164 Consultants). The E&C department has an average span of control of 1:5.

Recommendation 4B2: Implement Span of Control Ratio of 1:6 to 1:8

We recommend that the TTC move toward optimization of the span of control at the E&C Branch, with the goal being a ratio of 1:6 to 1:8, for phase 1 and phase 2 respectively. Further study would be required in these areas before reaching final recommendations.

The Executive Branch

The Executive Branch consists of the Executive Branch, Finance Department, General Secretary's Office, Information Technology Department, Legal & Claims, Marketing & Customer Service, Materials & Procurement, Pension Fund Society, Property Development Dept, Revenue Operations Department and the Safety & Environment Department. There are 933 resources in the Executive Branch department (793 Operating Budget, 8 Wheel-Trans Budget, 107 Capital Budget and 24 TCTI employees). The Executive Branch has an average span of control of 1:6.

[54] Refer to Appendix D: Management Structure for more information

Recommendation 4B3: Implement Span of Control Ratio of 1:6 to 1:8

The Executive Branch has already achieved the minimum best practice span of control of 1:6 to 1:8, for phase 1 and phase 2 respectively. Further refinements are possible with some remaining areas of the departments where the existing span of control is 1:4 or less.

The Operations Branch

The Operations Branch consists of the Operations Branch, Rail Operations, Bus Operations, Service Planning, Transit Enforcement & Security, Support Services and Training. There are 11,404 employees in the Operations Branch department (9781 Operating Budget, 524 Wheel-Trans Budget and 1099 Capital Budget). The Operations Branch has an average span of control ratio of 1:13.

Recommendation 4B4: Implement Span of Control Ratio of 1:15

For the Operations Branch, we recommend that the TTC strive to optimize the span of control, with the goal being a ratio of 1:15).

5. Shared Services

This part of the SES is focused on the opportunities that shared services may provide in improving efficiencies across the City and the TTC. There is a drive across all City agencies to improve service delivery to citizens, increase efficiencies and reduce costs. One mechanism to achieve these benefits is through shared services. However, experience indicates that significant step changes through shared services have been slow in appearing, except where there has been an immediate benefit and low interdepartmental barriers, e.g., joint procurements.

There are many possibilities for shared services in government and with City agencies. Standard practice is to start with procurement, back office and technology-based functions before progressing to other services.

Shared services can also include internalized outsourcing, creating Centres-of-Excellence, where expertise is put together for the benefit of several governmental units, without the requirement of a vendor. Shared service arrangement can improve efficiency and service delivery.

In reviewing shared service opportunities, we concluded that the TTC should consider shared services in the context of what are core and non-core services. While the line between core and non-core is subjective, we saw two distinct directions that shared services could take:

1. Non Core – Typically these are services that are common to most organizations, including the TTC. This would include corporate functions associated with human resources, payroll, procurement and finance as well as IT services such as primary support desks (or Tier 1) and desktop standards. However, further analysis would be required of these functions to define the sub-components that may be unique to the TTC. As the City has also invested in establishing shared services for corporate and IT functions, the TTC should look to the City to structure shared service functions in these non-core areas.
2. Core – These are direct transit service to the public. This would revolve around the provision of safe, reliable and courteous transportation services. As a result, we looked at shared services approaches which revolved around establishing regional transportation 'Centres-of-Excellence'. This reflects the fact that the TTC and City of Toronto are integrated in the broader Greater Toronto and Hamilton regions. With players such as Metrolinx, other regional transit agencies and third-party providers all providing transportation related services, our approach was to focus on how the TTC could work with these partners to put in place cost effective, leading solutions that could serve the broader transportation needs of both the TTC and the region.

For the purposes of this report, the concept of shared services is viewed broadly. In some cases there is currently no provision of service but improvements could entail collaboration of parties to achieve efficiency gains and improved local outcomes. Our intent is to not specify which entity should specifically operate a shared service. Instead our intent is to identify areas where collaboration is possible. Still, given the stated inter-governmental and inter-agency complexities, clear executive leadership will be required to make significant progress in these areas. The opportunities we looked at include the following six areas:

A) TTC Identified Contracting-Out opportunities

The TTC has identified potential areas that could be contracted to outside providers. Of the $60M spend on the following: station services, building services, bus service lines, sheet-metal, black-smith, upholstery and wood-working, the TTC estimates it can save approximately $3-8M.

Recommendation 5A: Implement TTC identified savings through contracting-out services

We concur that TTC will find potential savings in contracting out part of its $60M spend on station services, building services, bus service lines, sheet-metal, black-smith, upholstery and wood-working.

B) Shared IT Services

TTC spend in the area of IT services in 2010 totalled $22M[55]. TTC has been working with the City in the following areas to reduce costs by sharing resources with the City.

Network design with Cogeco

1) Create a shared network design with the City, Police and Libraries,
2) Replace leased fibre lines from Bell to reduce cost,
3) Allow network communications/connection between entities.

Shared Data Centre

1) Currently working on funding for a shared data centre. Plan for a new data centre to be in place by 2015,
2) This will eventually lead to a second shared data centre for disaster recovery

Recommendation 5B: Explore, develop and adopt shared IT services with the City

The TTC should continue to co-ordinate with the City in areas of IT, e.g. network support, service desk support (Tier 1), hardware/software standards and professional services.

C) Joint Procurement

The City has taken the lead in coordinating several high-value, joint purchases in the past few years that have yielded significant savings to the City and participating buyers such as the TTC. For example, the City managed the joint procurement of an Administrative Services Agreement to manage such services as dental, prescription and disability coverage for a number of City entities, including TTC. Other areas include IT Services, hardware and software etc.

Procurement of Software Licenses

1) Shared telephone (old, over 20 years shared)
2) Microsoft licensing
3) HR system (Quattro)
4) SAP (BOE) licensing – plan to share

Procurement of Hardware

1) Sharing of telephone lines between City and TTC
2) Joint procurement of computers

[55] This is based on data provided to us from the TTC: they spend $13M on IT Services, and $9M on IT Purchases.

Recommendation 5C: Conduct joint procurement with the City, other transit agencies and Metrolinx

This is an area which needs to be investigated further for collaboration between TTC, City of Toronto and Metrolinx. Currently the only new area where TTC and the City are working together is for the common purchase of diesel. The TTC has already identified additional opportunities with the City in areas including jointly procuring office supplies and cleaning supplies. Opportunities with Metrolinx need to be identified.

D) Human Resources Related Incidents

While consolidation of Labour Relations activities is not warranted at this time due to the complexities of labour contracts, we do see the need for better City-wide coordination of an overall labour strategy. While labour relations contacts across agencies are currently informal, we believe the City could benefit from a more strategic, coordinated view of its represented labour-contracts and labour relations.

There are opportunities for the City to share/consolidate worker's compensation activities across the various entities that represent the bulk of activity in this area, including common systems, processes, policies and procedures, claims investigation and processing. Additional analysis is required to further develop this area and quantify potential savings.

For example, the City has recently rolled out a new application called *Quattro* for their Occupational Incidents. This application is customized to include all the required legislative rules for the WSIB and can also be integrated into SAP.

With different programs in place at the City and TTC, and with different benefit structures and labour contract issues, we do not see any immediate advantage in combining programs. There may be an opportunity under a shared services structure to manage pension services, payments and enrolments, while keeping the two programs separate. Another example, outside the scope of this analysis, relates to efforts by the City and TTC to explore a centralized, internal service centre or, alternatively, consider expanding the use of an outside plan administration company to manage pension services.

Recommendation 5D: Evaluate City's HR, in–house developed system "Quattro" as a model for TTC

The TTC's and the City's process for reporting to the WSIB are similar, and we recommend examining whether this could be an area for a shared service or as an opportunity to leverage existing work. We recommend that the TTC and the City continue to collaborate and share their Health and Safety Programs which have worked and are proven to generate results.

The City should institute a formal labour relations working group consisting of the Chief Human Resources contacts/labour leads for the City and key members of its agencies with representation such as TTC, Police, Library, etc. The City of Toronto Executive Director of HR could act as chair. The working group should examine issues related to labour relations; pension and benefits; and HR business processes and systems. This would also provide an opportunity to help establish a senior level community of practice to help share best practices across agencies.

E) Centres-of-Excellence

Metrolinx is an agency of the Government of Ontario. It was created in 2006 to improve the coordination and integration of all modes of transportation in the Greater Toronto and Hamilton Area (GTHA). The organization's mission is to champion, develop and implement an integrated transportation system for our region that enhances prosperity, sustainability and quality of life.

As a result, Metrolinx represents an important partner to the TTC in considering any broader regional shared service approaches. This is a partnership that has the potential to provide significant two-way sharing of expertise and costs. The TTC, as the largest supplier of transportation services in the GTHA and one of the largest in North America, brings unique experience, expertise and scale that can benefit the broader region in the delivery of core transportation services. For example, we support continuing discussions with respect to integrating fare management systems[2], and interline services such as those with York Region (as long as TTC has net income gained from these services). Ultimately, we see these initiatives as benefiting customers that rely on regional transportation services and bringing cost benefits through the efficient deployment of assets and infrastructure. For example, instead of two independently managed bus routes operating on the same right of way[56], an integrated service can provide more coordinated service, better bus utilization and efficient travel time across regional boundaries.

We also see further opportunities for the TTC to work collaboratively across the region. For example, like many transit agencies, the TTC is focused on implementing Integrated Vehicle-Borne Information Systems. We see this as an example of an opportunity for the TTC to establish a Centre-of-Excellence in collaboration with Metrolinx and the regional transit agencies. The benefit for the TTC is that implementation costs could be shared across the region and for smaller transit agencies; they would realize the benefit of a cost effective, progressive new solution. We also see additional potential to coordinate shared services or joint procurement with other transit systems in the region, e.g. parts, fuel, IT and electronic systems. This would allow the TTC to enjoy additional economy of scale in purchasing and more significantly extend this purchasing power clout to smaller regional transit agencies.

Recommendation 5E: Develop Centres-of-Excellence between TTC, and regional transport services

TTC and Metrolinx should work together to create common transit infrastructure within GTA region to leverage scale of operations and sharing of services to reduce costs. Centres-of-Excellence could be instituted between TTC and Metrolinx around regional transportation services[57], e.g. Integrated Vehicle-Borne Information Systems.

[56] For example: TTC bus route 50 Burnhamthorpe, which operates in parallel to Mississauga Transit Route 11.
[57] This report is not intended to comment on the current discussions between Metrolinx and the TTC with regards to PRESTO.

F) Legal Services and Administration

While the TTC uses City legal staff for certain specialized case work such as land-use, property contracts and litigation involving City and TTC assets or personnel, there is limited capacity in the City to handle additional demand. We encourage the TTC to engage the City Solicitor in future discussions about legal staffing and additional opportunities to share resources.

While not a direct, shared service, we strongly recommend the TTC adopt the common financial reporting packages used by the City, including implementation of SAP. The TTC has the ability to leverage the City's master agreement with SAP and does not have to procure this on its own. With a 25 year old financial reporting package still in use, upgrading its hardware and software to SAP should be a key priority for the TTC. With significant implementation experience available within the City, the TTC should revisit the business case for SAP and refresh its assumptions around implementation costs and projected benefits. We also encourage the TTC to upgrade and modernizing its HR and payroll systems.

In addition to implementing SAP, TTC's staff would require re-training and TTC should ensure change management programs are put into place for the program to be quickly adopted.

Recommendation 5F: Co-ordinate with City on legal services/settlements and employee benefits

The TTC should coordinate with the City on legal services/settlements, life insurance premiums, administrative fees, procurement of office/cleaning supplies, uniforms/safety shoes, custodial services, etc.

G) Financial Reporting Packages

Currently the TTC has a home-grown financial application that is out-dated by today's standards. The City is moving towards SAP accounting in the near future and as such there may be opportunities where TTC and the City can use the same systems, pending a gap-fit analysis.

The TTC's timekeeping process is currently manual intensive and not integrated with its payroll/financial system[58]. This is a laborious process that can lead to errors. Each individual TTC operator has their own time agenda, which may require modification to meet standard COTS requirements.

Recommendation 5G: Evaluate & perform gap-fit analysis of City's common payroll & financial reporting packages (SAP)

There is opportunity to upgrade and modernise the financial packages used by the TTC. It should consider using the same application as the City's (SAP), but before the final decision is made the TTC should perform a detailed gap-fit analysis to ensure that City's SAP version meets their requirements. If not, TTC should consider purchasing additional modules as required. There may be additional module requirements for TTC, such as individual-time-management modules.

[58] This is discussed in detail within *Section 10A: Time-Keeping Activities, Overtime and Absenteeism*

6. Charter Services

The TTC leases out some of its vehicles, including buses, streetcars, and trains to the general public during off-peak hours to improve vehicle utilization while earning revenues from their rental. This is designed to be a profitable service.

Studying the last five years of revenue and associated costs, charter services have produced a combined loss between the years 2006 and 2009 of $300,000, with the exception of 2010 where it made marginal revenue of $2,500 as illustrated in Figure 6.1 below. Based on 2010 data we received, we estimated that chartered buses have a significantly higher operating cost ($186/hr) as compared to the normal ($132/hr). Similarly the cost of chartered streetcars is also significantly higher ($231/hr) than in normal operation ($184/hr). Furthermore, the older PCC streetcar that TTC reserves for special movie screenings, etc. has a high cost ($365/hr). [59]

While it is understandable that operating costs can be higher given that charter duties may be performed on an overtime basis, in the interest of at least breaking-even, rental prices should reflect the actual cost (ideally TTC should look at least breaking even by providing this service). From our observation, these vehicles have typically been underpriced. For example, in 2007 the PCC streetcar was leased out at a price of $151/hr, while it cost the TTC $624/hr to operate, at a net loss of $473/hr. The use of its fleet for special charters can generate positive publicity and goodwill, but the TTC should not under-price its charter service. [58]

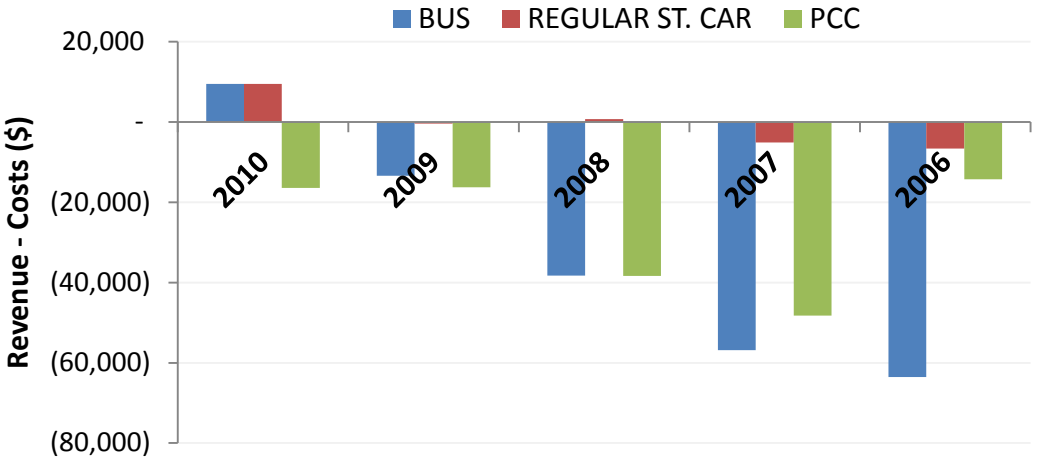


Figure 6.1 – Charter Service profitability over the last five years by type of mode

Recommendation 6A: Take necessary steps to operate all charter services on full cost recovery basis

We recommend that the TTC charter on at least a full cost recovery basis. Currently the TTC charters its vehicles on a minimum hourly term (2 hrs for buses, 3 hrs for streetcars), and we recommend increasing the minimum term where appropriate and tying that requirement to minimum labour requirements, if any. In addition, currently cost data (equipment costs and labour requirements) needs to be assembled from the three operating departments (bus, train and streetcar). A stronger cost accounting process and centralized charter request database will allow the TTC to improve its charter service pricing.

[59] Appendix E: Charter Services for more information

7. Peak Hour and Off Peak Service Efficiency

The TTC carefully manages passenger information in order to effectively plan and manage routes. It has a clear understanding of which routes are the most and least productive (ranked by *boardings per hour*, *cost per km* and other metrics) based on time of day and it applies a consistent approach for refining route plans.

The TTC system consists of 141 bus routes, 11 streetcar routes, three subway routes, and one Rapid Transit line serving more than 1,500,000 revenue passengers and more than 2,500,000 passenger trips, including transfers, each weekday. This means that a majority of passengers utilize more than one TTC vehicle or mode to complete their trip. Figure 7.1 below depicts how total service has increased (in terms of kilometres operated) over the last four years.

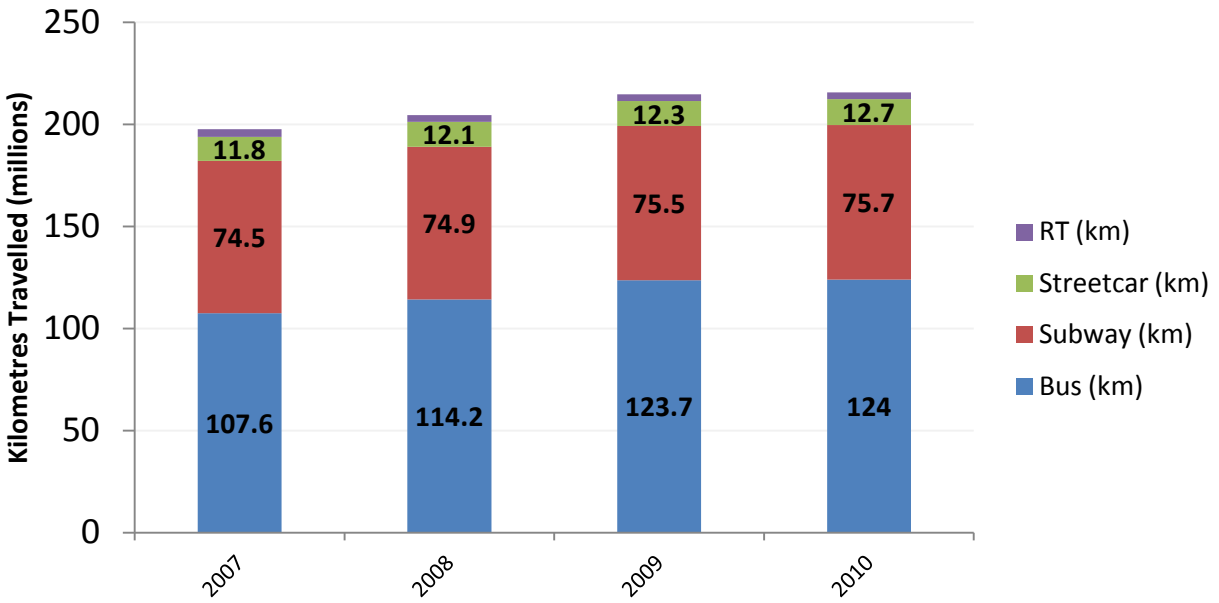


Figure 7.1 – Total kilometres operated by the TTC by mode of transport

Our analysis confirms that the TTC has clear visibility into its route performance and has re-evaluated route schedules for January 2012. It is clear that the Blue-Night has a high operating subsidy ($16M based on 2010 data about 31% cost recovery ratio), and that 50% of routes contribute 80% ($29M) of the TTC's subsidy required for bus operations on *day* routes ($37M) because supply significantly exceeds demand. However these routes are provided as a matter of public policy. Recommending changes to public policy is beyond the scope of this review and is not further addressed in this report. See Figure 7.2 below for a list of weekday routes that are not cost effective. However, this report recommends the TTC pay particular attention to scheduling of low-performing routes[60], while re-evaluating headways on high-performing routes to provide more consistent levels of service.

[60] We recognize low-performing routes as those requiring high subsidy, as calculated using riders, and total costs per route

A) Headway and Service Frequency Adjustments

In any large transit system, the operation of service is the highest line item in the budget. Also in most cases, the highest revenue line item is fare box revenue. The TTC is fortunate to have one of the highest recovery rates among major transit systems in North America. Yet, in difficult times even high recovery rates cannot support the breadth of a system the size of Toronto's and the City is looking at service realignment in order to reduce costs. Unfortunately, fare revenues generally fall when service is changed unless the service realignments are very carefully planned. Many transit systems across North America are facing large budget shortfalls in 2012. Low productivity routes are typically the first target for service realignments because of the high subsidies required.

At present, 21 of 42 Weekday, 27 of 56 Saturday and 31 of 64 Sunday routes *collectively* contribute about $29M in subsidy, from a total subsidy of $37M, for the TTC based strictly on costs of running those routes and the total passengers carried per day. Since the TTC serves the community interest, it would be impractical to assume that these subsidies could be eliminated without significant disruption to service, especially given its multi-modal network. However, a small amount of additional savings *can* be achieved, if required, through minute-by-minute changes in bus headways thereby reducing the need for route cuts.

One method the TTC uses to calculate route performance is the common metric: *boardings per hour.* Using this metric, there are 42 weekday surface routes with insufficient *boardings per hour* to cover costs. The same 42 routes also appear when calculating the amount of subsidy required per route, and this is illustrated by figure 7.2 below. Consistently, we saw that low passenger counts lead to higher subsidies. The amount of subsidy and/or low *boardings per hour* provides a starting point to determine any service adjustments.

The TTC is currently reviewing its routes in this context as part of its 2012 planning process and is planning on implementing significant changes to its routes in January 2012. This initial effort is expected to deliver $14M in savings, affecting 83 routes in total. Of the 83 routes that TTC is proposing to re-align, 11 routes were also found on the list of 42 subsidy-requiring weekday routes that the study identified. These service adjustments will be published in the normal planning cycle by the TTC in the next 30 to 45 days.

Figure 7.2 illustrates the 42 weekday routes identified above as routes requiring subsidy based on revenue generated from daily ridership and route day costs as stated by the TTC. Together they contribute a subsidy of $22M. The darker routes on the left hand side, 21 in total, contribute $18M subsidy which is approximately 80% of the total subsidy required to operate these routes. Those routes marked with arrows indicate those that the TTC identified for service adjustments in January.

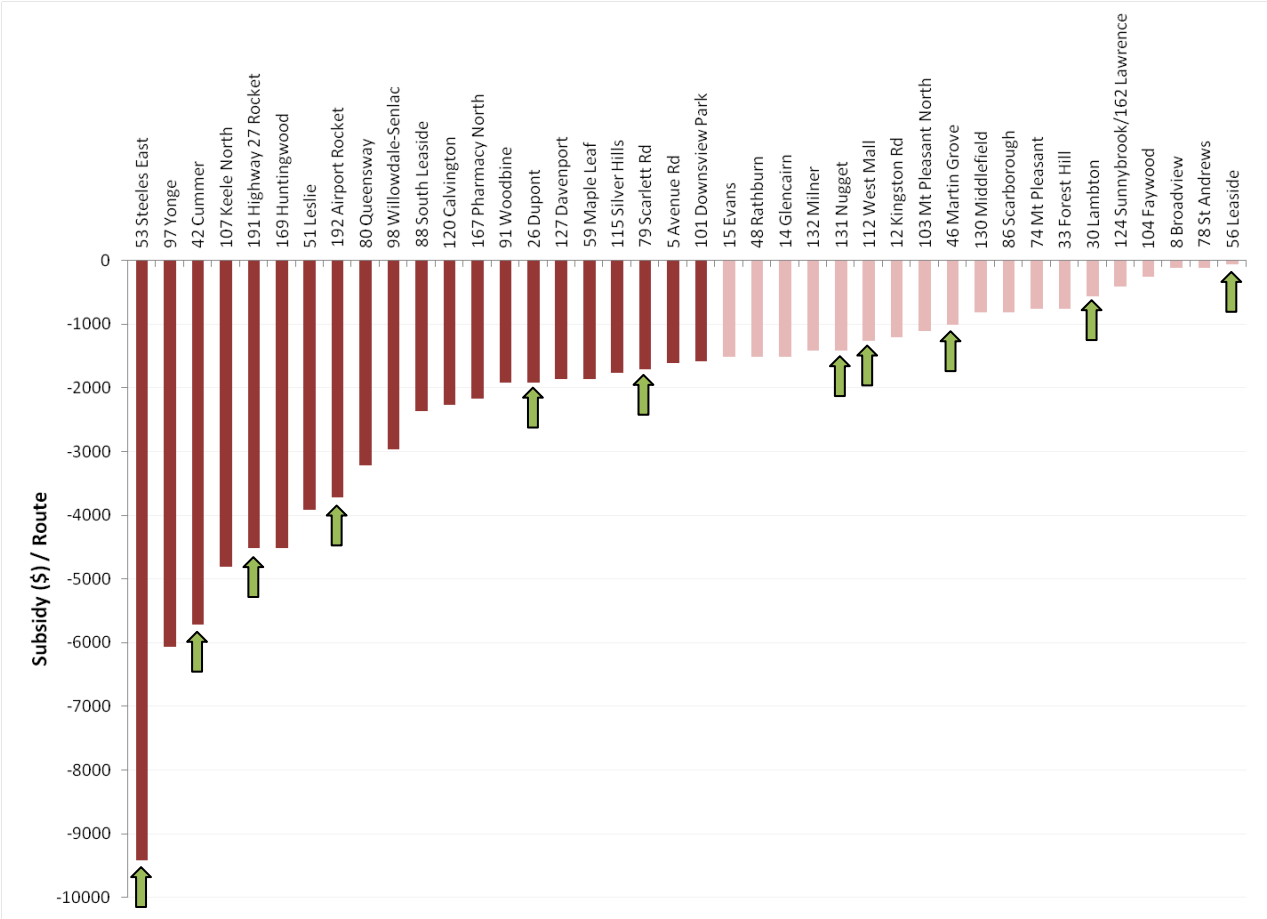


Figure 7.2 Weekday Routes requiring subsidies

Recommendation 7A: Implement service adjustment as identified by the TTC

The total subsidy required to operate all low productivity bus *day* routes amount to $37M a year. The TTC has already identified 38% of this amount, or $14M for re-alignment (by increasing load standards) beginning in 2012.

If additional service realignment is required during 2012, it is suggested that the TTC continue to focus on highly subsidized day-time routes. Other potential service realignments could be considered on routes that marginally breaking even. There are opportunities to use savings realized from reducing service on routes requiring subsidies, towards adding capacity on crowded routes, adding running time to routes that are consistently late, adding trips to expand non-rush hour service to areas of greatest demand and restructuring routes to streamline service.

It is important to note that operator wages and benefits and maintenance wages and benefits are the primary cost components of operating buses, streetcars and subways. In the past, TTC has used service rationalization to realign its existing staffing and support, and will need to do so in order to achieve the above estimated savings.

B) Projects to improve service efficiency

Automatic Passenger Counter

Many of the large North American transit systems are seeking more automated methods of obtaining passenger data. Generally these mechanical devices, Automatic Passenger Counters (APC's), are installed in the steps of the passenger entry doors on buses, streetcars, light rail cars or subway cars. APCs help transit systems determine with great accuracy the number of *boardings* (within a specified time period) on their routes and help improve service planning. Many transit systems have purchased APC's for installation on 10% - 25% of their fleets and then reduced or eliminated the traffic checking function accordingly.

Over the last decade, TTC has tested various types of APC's and after setting detailed performance requirements has jointly developed an APC application with a Canadian manufacturer. The purchase and installation process has begun and will extend over several years to equip 20% of its fleet[61].

Signal Priority Installation

An effective method of improving the efficiency of bus and streetcar operations as well as their schedule adherence is to implement traffic signal priorities for these vehicles in traffic congested areas around the system. These priorities can range from the extension of a green traffic signal to favour transit vehicles to more comprehensive approaches, such as signal priority combined with intersection-specific queue-jump lanes to allow buses to by-pass long traffic queues at busy intersections. Using signal priority combined with traffic lanes for buses and street cars can be an additional consideration in supporting higher productivity, faster travel times, and better schedule adherence. These types of changes help overall traffic flow on city streets and also help to improve usability for both transit and personal autos.

During the past decade, the implementation of traffic signal priorities and exclusive lanes for transit vehicles has become more prevalent in North America, as a way to improve transit operations. Signal priority results in more green time being provided on the main street – either by bringing the green phase on sooner when a transit vehicle is waiting at a red light, or by holding the signal on the green phase longer, until the bus or streetcar has travelled through the intersection. More green time on the main street also has the benefit of reducing delays for automobiles traveling along roadways that are transit-priority equipped. This has been confirmed in studies by the City of Toronto and TTC. Similarly, queue jump lanes, if created by widening the road also result in an improvement in capacity for other traffic on the roadway by removing right-turning traffic and buses from the main traffic flow.

The City of Toronto and the TTC are world leaders in the application of signal priority for transit with about 360 intersections equipped to date and the installation at another 32 intersections currently in progress**.** This directly reduces the amount of time buses and streetcars, and their customers, wait at red lights, with virtually no negative effects on other users of the road. This cooperative effort between

[61] The TTC currently rotates its APC enabled buses by route, to get accurate ridership information by route

the City and the TTC is most commendable. Yet, with studies[62] showing that the average one-way commute via public transit in Toronto is 49 minutes, vs. 33 minutes via car, continued focus on improving commute times should be a benefit to the City and its citizens while improving TTC's operational efficiencies.

The cost of equipping an intersection with transit-priority signalling is approximately $35,000, or to equip an entire large bus route with 40 intersections, approximately $1.4 million. The resulting reduction in transit round-trip times has allowed the TTC to achieve savings equal to two buses or streetcars per route, which manifests itself in both capital and operating cost savings. The payback period for a whole-route conversion is in the range of 4-6 years, with ongoing savings continuing in perpetuity. In past years, the City and the TTC have been able to equip a whole route's worth of intersections, about 40, in one year.

Recommendation 7B: Expedite installation of Automatic Passenger Counters (APC) system & Signal Priority implementations

We recommend an expedited procurement and installation for APCs with a corresponding adjustment in the traffic-checking group over the next two years. The sooner the procurement and installation of APCs is completed, the sooner traffic checking costs can be reduced. A much smaller traffic-checking group can be retained to conduct specific data collection functions not obtained from APC's. This will also help TTC maximize the benefits while it pursues a fare card solution.

Additionally, we would recommend that new transit signal priority projects be accelerated, given their overall low cost, effective benefit payback and the overall improvement to customers of faster trip times.

C) Service Changes

Service changes, or *Boards,* refer to setting a new set of system schedules for the TTC each time a set of service changes takes place, months of planning and schedule-making precedes implementation.

In the past, most large transit systems have obtained data pertaining to passenger loads, peak load points, and total route ridership by manually collecting the information through the employment of Traffic Checkers, sometimes called Service Monitors or Data Collectors. The TTC employs 28 traffic checkers and 4 resource staff to monitor a very large, multi-modal system.

The typical number of *Boards/Year* among the large transit systems in North America is 3 to 5, often driven by seasonal service requirements and labour contracts. Some minor service adjustments may be implemented between the major changes if labour contracts permit.

The TTC has between 8 and 10 *Boards* every year which is about twice as many as the industry standard. The TTC has told us that by adjusting service every six weeks, they are more responsive to passenger demands and needs. Frequent changes may leave the riders confused, and it does not appear that the

[62] From the Toronto Board of Trade Scorecard on Prosperity, May 2011

City's transit needs change as rapidly as the schedules, especially since so many of the scheduling parameters are known well in advance (e.g., school calendars, holidays, seasonality, etc.). The amount of detailed planning is not being reflected in on-time route performance on the street. Accurate and extensive planning requires sound implementation without which planning loses its relevance. With a high frequency of schedule changes comes a high amount of work, much of it manual. The TTC invests more than 42,000[63] annual work hours from 21 staff into creating and maintaining its *Boards* ($1.9M annually).

Recommendation 7C: Reduce service change frequency to 4-5 changes a year

We recommend the TTC should reduce the number of boards over a three year period with appropriate service planning and scheduling, making staff adjustments if appropriate. There may be an opportunity for TTC to streamline the process or gradually scale back this activity with appropriate staff adjustments over a three year period conducted in consultation with its stakeholders.

[63] Refer to Appendix F: Peak/Off-Peak Service Efficiency. This figure is calculated by assuming 21 people, working 2040 hours a year, at $44/hr of loaded cost.

8. Ridership Growth Management Strategy

One of the key elements of this review is the assessment of the Ridership Growth Management strategies. Over the past few years the TTC has made a conscious effort to build ridership through increasing service frequency across all modes, by adding capacity where ridership growth is anticipated.

Service standards determine how routes are sized (number, frequency and capacity of vehicles) and recognizes the current situation that proper management of ridership growth is necessary to avoid an imbalance in the system such as over-crowding in transit vehicles. It also recognizes the existence of pockets, or transportation deserts, in the city where public transportation options are extremely limited. The strategy correctly indicates that continuing investment is required to manage this growth, and that the subject of just how much investment is called for should be a public decision driven by a policy debate, given the City's overall fiscal challenges.

A) Route Management

The TTC's CGM report publishes overall service reliability compared to schedule, both for buses and streetcars[64]. This measure indicates how closely TTC vehicles adhere to published route schedules on a system-wide basis. In addition, the TTC also manages to headways. For example, on routes with frequent bus service (e.g., where each bus has a headway of a few minutes), the TTC does not post detailed schedules and manages to headways – i.e., the time between each bus.

Overall, for buses, on-time performance has been in the range of 65%, while for streetcar service, actual on-street performance has been around 70%. Schedule reliability at 65% means that, out of its annual 3.4 million bus runs, over 1.17 million runs miss their planned run times, affecting TTC's passengers and creating ripple effects throughout its system. Furthermore, these statistics are on-street adherence within a tolerance of 3 minutes on either side of the schedule.

In trying to compensate for missed schedules, the TTC may be compensating by adding more vehicles than needed to meet demand creating inefficiency, much like factories address inefficiencies and delays by adding more "work in process" into production, TTC may be adding more capacity (e.g., shorter headways) than is needed, thus increasing its costs, without addressing the underlying performance issues.

Faster bus travel times[65] generally mean lower operating costs and subsidies. Even though the average bus speeds at TTC are one of the highest across other transit systems, continued congestion will degrade performance over time.

[64] The percentage of trips which operate within +/-3 minutes of scheduled headway is the variable which is reported publicly in the monthly CGM reports, which is presented to the Transit Commission at every meeting

[65] Average bus speeds across systems range from NYC Transit at 12.07km/h (7.5 mph); Chicago 15.6km/h (9.7 mph); Washington(WMATA) 16.09km/h (10mph);In Boston,16.9km/h (10.5 mph); TTC is 19.6km/h (12.2mph)

Recommendation 8A: Accelerate signal priority installation, increased express bus service, increase priority lanes, optimize bus stop spacing, and track additional performance metrics

While much of the focus at TTC has been on route modifications, we believe that there is an opportunity for the TTC to accelerate improvements to in line and street management techniques to ensure timely service, recovery and minimize delays. We encourage the TTC to study these issues further before instituting additional service realignments. Adding additional performance metrics for high frequency routes may help TTC improve some of its other service issues. For example, as discussed previously, tracking waiting time may help better manage "bunching" and gaps. We recommend the TTC set targets for actions to steadily improve on time performance linked to both schedule and headway – e.g., towards 75% - 85% with a tolerance of 2 minutes. Besides systematic on-going efforts to track and improve, there are a number of techniques that can be employed to improve these targets, outlined below.

1. The TTC should accelerate the implementation of signal priority on their streetcars and buses, as was mentioned earlier. This would help vehicles at street-level to avoid street-light signal timing issues, e.g. by keeping the lights open slightly longer so that they can finish (off)-boarding passengers, for bus stops at lights.

2. The TTC should localize or limit bus routing by increasing express bus services. Cities such as New York are running local/limited (i.e., express) bus service on certain routes to improve efficiencies. One route makes all stops, and the limited service makes fewer stops such as main intersections and transfer points. This may be desirable as long as the schedule of the parallel local bus service does not overlap the limited-stop bus service. This increases service and improves customer satisfaction. The TTC currently operates 18 express routes of its 171 routes, and we would encourage them to look for additional opportunities to provide these kinds of direct routes.

3. Clear rush hour bus lanes and review restricted parking hours. We encourage the TTC and City traffic engineers to work proactively to find ways to give buses *more* priority on city streets during peak travel times. The City can support bus traffic by keeping existing lanes clear (through better enforcement standards) and reviewing rush-hour parking policies, for example, by extending the length of rush hour parking restrictions on crowded streets, especially in the PM rush to keep bus stops clear of parked cars. In addition the City should review the option of creating exclusive bus lanes to complement its work with signal priority projects.

4. The TTC should optimize bus-stop spacing on existing and new routes. Older routes can be optimized where bus-stop spacing is too far, and decreasing these will improve customer satisfaction. For newer routes, keeping customer satisfaction in mind, routes should be spaced to provide convenient service optimally to ensure stop frequency does not impede on-time performance[66].

[66] Some cities go as far as 400m between stops. The TTC considers 300m to be the optimal distance between stops. This also depends on area population density.

5. Adding additional performance measures for high frequency routes may help TTC better manage its service issues. For example, tracking waiting time[67] may help better manage "bunching" and gaps. Other large transit systems, like London's have found this metric effective in improving its performance. By identifying and improving delay-prone bus lines, TTC can get people moving to their destinations more quickly by targeting improvements (such as those mentioned in points 1-4 above) specifically on those routes, and reduce operating costs. Faster travel speeds and regular, reliable schedules could be expected to increase ridership, improving TTC's bottom line while allowing more and better service for the funding provided.

B) Vehicle Load Standards

Vehicle load standards are very important to service planners as they determine peak and off-peak service levels on individual routes. Every effort should be made in the planning process to avoid exceeding the adopted standards which if exceeded may result in excessive overcrowding or vehicles passing waiting passengers because they are full, known as pass ups.

During these times of cost reductions, it is not uncommon for transit boards to modify vehicle load standards by increasing the permitted loads on vehicles thus enabling service planners to expand headways and reduce costs. Typically in North American systems, peak-hour bus load standards reach as high as 50% of passenger seats in determining the number of standees permitted. Of course the number of standees allowed can vary by each individual sub-fleet in the system.

In November 2008, TTC vehicle load standards were reduced to better accommodate the increases in services planned for 2009 and 2010 to comply with increased ridership goals. More recently, with cost reductions mandated, the Commission reinstated the previous load standards that were in effect prior to November 2008. The downside of elevating vehicle load standards further is the increased risk for overcrowding and possible pass-ups, bunching and gapping. The TTC is preparing service adjustments based on pre-Nov 2008 standards for implementation on January 8, 2012.

Recommendation 8B: Increase use of articulated buses

The TTC should reconsider adding articulated buses to high frequency/high density routes. For high density routes with headways less than 5 minutes, articulated buses have been a growing solution for transit agencies. We understand that in the late 1980s and early 1990s the TTC like many systems had a poor maintenance experience with its articulated bus. Since then, Canadian manufacturer New Flyer (and now Nova) has come out with the articulated buses with a different and successful design that is more winter-worthy. Today, Ottawa has approximately 200 in bus rapid transit (BRT) service and Montreal is about to acquire these buses. Other cold-weather cities such as New York and Chicago make extensive use of articulated buses to add significant capacity without adding commensurate operating costs. We support the TTC in its current efforts to acquire articulated buses.

[67] *Excess waiting time* can be tracked as buses pass by certain points on the network. Time spent waiting for a bus that is running late or is bunched with others is added up and averaged over the route, and the excess waiting time is compared to how long a customer would have to wait assuming random arrival at the bus stop.

C) Inter-line Services

TTC is the critical hub in a growing region supported by a multitude of transit agencies. The TTC has enjoyed prior successes in establishing interline agreements, such as with York Region, to connect York Students travelling from Downsview station to the main York University campus. The result is that routes are shared to the benefit of the customer and at lower cost to the TTC. Some lines are currently operated separately requiring through passengers to pay double fares. One example is at the Kipling station which is a transfer point for many Mississauga Transit passengers to the TTC.

There are several routes operated in the GTA that collect passengers in their jurisdiction, operate *closed door* in Toronto and then discharge passengers at Subway stations in Toronto. In the afternoon the reverse occurs. Passengers pay separate fares for each service.

In several cases, the primary carrier takes over and operates the service and collects a subsidy from the GTA community[68]. An option is to combine separate fares into a distance based fare and continue the operation by the GTA operator. Some TTC routes operate outside of Toronto boundaries into GTA communities. In these cases, TTC receives subsidies so that there is no cost implication for operating outside city limits.

Recommendation 8C: Promote greater interline services between TTC and neighbouring transit

We would recommend that the TTC continue to expand its network of interline agreements where it can offer cost effective passenger convenience. We see additional opportunities for fare coordination and suggest a long term review for the potential of a combined distance based fare structure for these special services.

TTC should initiate discussions with GTA operators to harmonise fare policies and operations for rider convenience. Another point is the closed door operation between city limits and the subway. We encourage the TTC to work with surrounding communities to allow GTA operators to board TTC passengers at the few stops between the city line and the subway. This strategy can be implemented over 1 – 2 years.

D) Fare Management

Implementing and managing a fare collection system for a large multi-modal transit system is a challenge that is being addressed by transit systems globally. Multi-modal systems across the world have implemented some form of automated fare collection solutions. Major cities in the United States with automated fare collection solutions include Washington DC, Chicago, Boston, San Francisco area, Atlanta and San Diego. In Quebec, the principal example is known as the Opus card. In Ontario, the principal example is known as the PRESTO Fare System.

The current TTC fare system is a pay-as-you-enter, pay-as-you board model, with seamless connections between buses, streetcars and the subway. Entry is by cash, token, paper ticket, valid pass or valid transfer. Some PRESTO fare card applications are also available at designated subway stations.

[68] For example: TTC bus route 50 Burnhamthorpe, which operates in parallel to Mississauga Transit Route 11.

Fare cards can assist in reducing fare collection costs and fare evasion, which is a problem for all transit agencies. Fare evasion results in lost revenue and causes disputes which can lead to risks for the operator and delays. Published articles on fare evasion highlight this as a recurring problem for the TTC. With estimates as high as $22M in lost revenue, and $2M in counterfeiting[69], fare evasion amounts to 1.6% of the TTC's revenues.

Automated fare collection systems also help to improve passenger counting, reduce fare collection costs and are convenient for passengers to use.

Recommendation 8D: Focus on Fare Process Improvements

Well deployed TTC Fare Inspectors can monitor fare compliance in order to increase fare revenue and reduce fare evasion. Options to consider include:

- Reduce fare evasion and increase fare revenue through targeted deployment of transit fare inspectors. The TTC should conduct a limited-duration demonstration of fare enforcement emphasis patrols by transit police/ticket inspectors. The results of this demonstration can be used in determining the effectiveness of this strategy, whether to revise procedures for assigning transit police or whether to propose the hiring of additional transit police or security officers for fare enforcement. This pilot would be in addition to the TTC's current enforcement program.
- Review operating procedures, such as the use of rear boarding on street cars. While the goal of these practices is rapid loading during peak travel times, un-supervised loading invites fare evasion. The TTC may want to expand the use of special fare collectors/supervisors to more high frequency boarding points to manage rear boarding and fare collection. Information on where to deploy additional fare collectors can come from the collection enforcement initiative described above.
- The TTC has also identified additional opportunities to reduce fare media counterfeiting, such as the elimination of adult paper tickets.
- We are aware that the TTC is currently in discussions with Metrolinx with regards to implementing the PRESTO fare card system across the TTC.

E) NextVehicle Arrival System

The TTC has been implementing its NextVehicle Arrival System (NVAS) since 2008. TTC fits its vehicles with a Global Positioning System (GPS) receiver, which transmits speed and location data to a central location where a computer running proprietary software calculates the projected arrival times for all stops in the system along with configuration information and historic travel times. These times are then converted to a 'wait time' and made available via TTC's NextBus website and electronic signs at bus stops and subway stops, as well as cell phones and other wireless devices via the Internet.

[69] http://news.nationalpost.com/2011/03/01/fare-evasion-cost-ttc-22m-last-year-report/

These systems help increase rider satisfaction and, once fully deployed, will help TTC better manage its service. For example, when the Chicago Transit Authority fully deployed the Next Bus software, they saw a significant jump in on-time service through increased visibility and transparency of its operations.

Recommendation 8E: Continue with existing initiatives such as NextVehicle Arrival System

We encourage the TTC to finish its NextVehicle information deployment to cover 100% of its operations (including all bus stops). It is critical that this data also be available to supervisors and controllers to facilitate more detailed on-the-street management, which the TTC is doing and we encourage swift completion of the rollout.

F) Blue-Night Service

These routes provide service to most areas of the City during overnight hours offering needed transportation to those who work late shifts or visit entertainment areas. Services are offered at normal TTC fares on the Blue-Night Network. Very few large transit systems in North America operate as extensive a system (24 routes) as the TTC Blue-Night Routes and some systems are gradually moving to discontinue overnight service.

The network consists of a basic grid of 22 bus and 2 streetcar routes, distributed so that almost the entire City is within 2 km of at least one route (based on the published standards by the TTC). Using the TTC's standards, this means that the 24 routes are within a 15-minute walk and serve 97% of the City's population. Most Blue-Night routes are operated as buses, allowing them to reach places where streetcar tracks do not run. The two remaining exceptions are the 301 Queen and 306 Carlton routes, which use streetcars. Most routes operate every 20 to 30 minutes, and the grid layout allows for timed connections at various points with intersecting routes. On the 300 Bloor-Danforth and 320 Yonge buses, which replace the most important sections of the subway, service is every 7.5 minutes throughout the night.

The 24 Blue-Night Service (300 series routes) all operate below breakeven levels, requiring a $16M annual subsidy with a recovery ratio from the fare box of 31%. There a five Blue-Night routes, on weekday and about three on weekend nights, that carry less than 100 passengers per *night*, which require high subsidies per rider ($1.3M/year). Toronto does not currently charge a premium for this service which is a consistent practice with other transit service providers in North America who continue to provide this service.

Recommendation 8F: Review the level of subsidy and service standards for Blue-Night routes

We would advise the TTC to work with the City in determining what level of subsidy they would like to apply towards Blue-Night service, and accordingly re-evaluate the level of service on routes based on minimum demand standards and public policy considerations.

9. Wheel-Trans

The TTC's para-transit system, Wheel-Trans, provides door-to-door accessible transit service for persons with physical disabilities using accessible buses, contracted accessible vans and sedan taxis. Wheel-Trans operates within Toronto with connections to accessible services in adjacent municipalities.

A) Giro/Acess® Scheduling Software

TTC uses *Giro/Acess*® software for its routing and scheduling needs. The current process trip scheduling/ planning is done based on customers' bookings done one day in advance. This means that re-routing/re-scheduling is difficult in case of short notice cancellations and no shows. The planning and scheduling software has the capability to do dynamic route planning as and when required.

Recommendation 9A: Accelerate training and implementation of Giro/Acess® scheduling software

It is recommended that TTC introduce dynamic route planning based on the customers' schedule. This will help TTC to have better productivity / utilization of its fleet. This would give customers the exact time plus also inform Wheel-Trans pre-emptively of last-minute cancellations by minimizing the trip length and time.

Customer calling is done a day in advance providing Wheel-Trans customer a 30-minute pick-up window which is then fine tuned the next morning giving customer exact pick-up time. Implement calling customer through the vehicle using *Integrated Voice Response (IVR)*, 30 minutes prior to pick-up time. This would reduce the current work load at the call centre, thus reducing the staff time requirement at the call centre. The use of IVR technology coupled with dynamic route planning would not only improve fleet productivity but also customer satisfaction and can yield a potential savings opportunity of approximately $1M.

Accelerate staff training and start implementing full capability of scheduling software (*Giro/Acess*®) to enable savings through same-day dynamic route scheduling as soon as possible.

B) Internal versus Contracted Service Mix

The TTC has been attempting to minimize its trip costs through a targeted mix of vehicle types and service providers. For example, lower-cost sedans and accessible taxis, which cost $21 per trip, and $17 per trip respectively, can effectively serve people with reduced mobility just as well as TTC's own fleet of low-floor conventional accessible buses at a cost of $52 per passenger trip. These costs are not inclusive of administration costs which are an additional $4 per trip that the TTC assumes wholly and includes scheduling and routing costs. Figure 9.1 below illustrates the cost comparison between internal and contracted Wheel-Trans trips.[70]

[70] Refer to Appendix G: Wheel-Trans for more information.

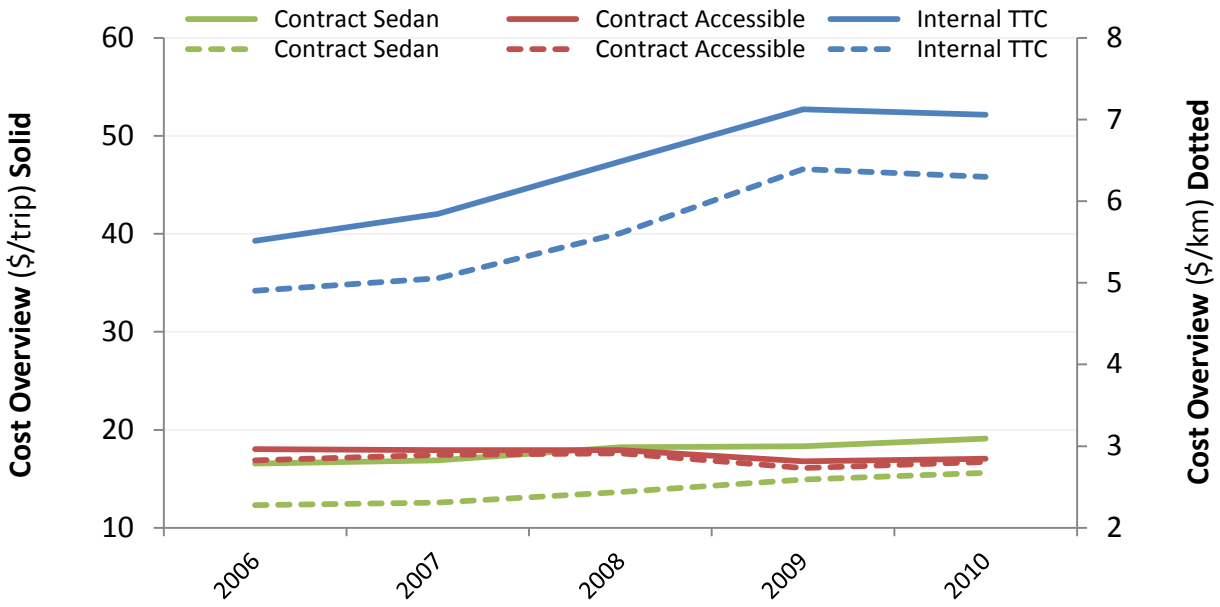


Figure 9.1 – Service cost comparison between Internal and Contractors, last five years

Service Parameters

When evaluating Para-transit systems, there are typically 10 cost drivers to the service:

Scale	Inadequate	Needs Improvement	Satisfactory	Performing	Performing Well

Issues/Drivers	Evaluation	Recommendations
1. Service Areas-Where service is/is not provided	●	Wheel-Trans provides service within the City and to connection points outside the City and to airport.
2. Eligibility Process-The application process and determining eligibility for services	◑	TTC manages the evaluation and registration of its riders. Follows consistent procedures for evaluation.
3. Recertification-frequency/process to recertify eligibility for service	◑	No issues identified.
4. Reservation/Scheduling/ Dispatch	◔	The system has the functionality for same-day scheduling, but is not used to the fullest extent possible.
5. Technology- Vehicle and customer services	◑	In process, needs to be deployed to 100% of fleet
6. Operational policies, such as pick-up locations, cancellations/no-shows	◑	Better management of cancellations and no-shows, improve via additional software and dispatcher training
7. Contracting-Agreements and 3rd party providers	◔	Consistent service and quality evaluations across all three modes of travel.
8. Service Monitoring-Contract and Performance Metrics	◑	Build consistent evaluation criteria for all providers and TTC. TTC currently evaluates its own service on only three of six performance measures.
9. Fixed Route Usage-Incentives and utilization of fixed route services	◑	Some North American transit systems provide limited voluntary incentives to encourage fixed-route alternatives to those who can use it. TTC can consider doing this as well.
10. Customer Training-Specialized training provided to new service users and fixed-route utilization	◔	Integrate fixed-route orientation training as required to encourage use if appropriate

Today, the four current providers of the contracted fleet services handle 55-60% of trips, at or above 90% on-time performance on the measures tracked by the TTC. The remaining trips are provided by the current TTC owned/managed larger vehicles. With the success of the contracted service in providing lower cost, high quality service[26], we would recommend that the TTC shift more of the rides to the contracted fleet and ultimately assess the feasibility of fully contracted services.

Figure 9.2 below indicates the quality parameters the TTC uses to gauge contractors. Quality levels between 0-69 percent are deemed unacceptable, 70-89% are acceptable, and 90-100% are excellent.

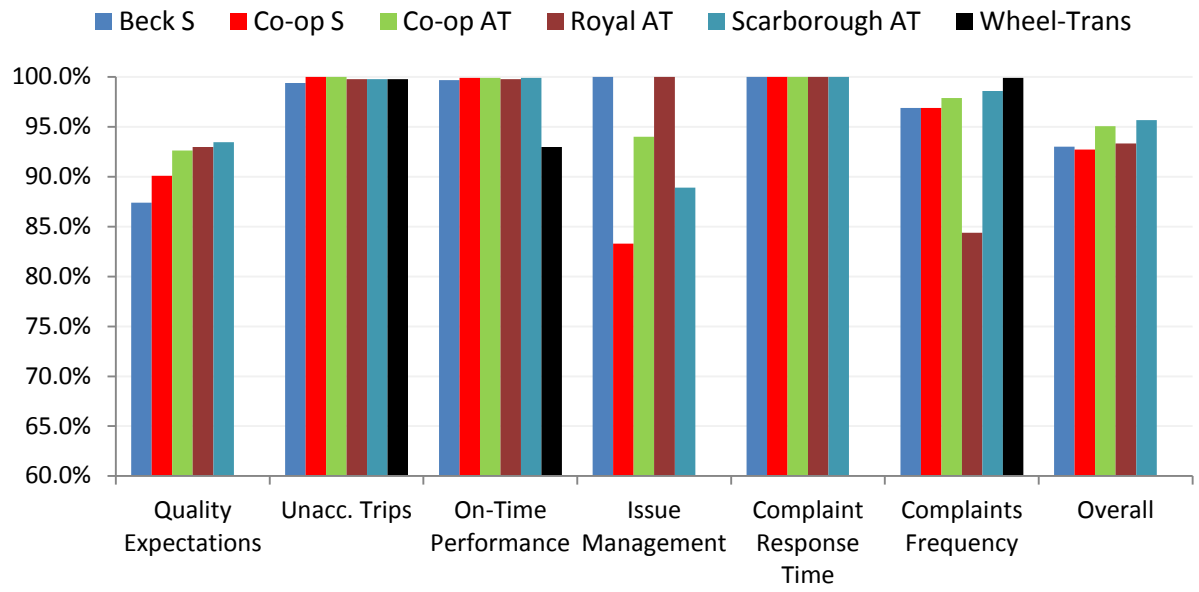


Figure 9.2 Quality Services Scorecard, 2010 actual

Currently Wheel-Trans operates its own dedicated maintenance facility and operates as a separate entity within the TTC. As TTC operates its service based on truck chassis, it requires less specialized service than other transit vehicles. Work standards are internally defined and currently not compared against leading industry service providers.

Recommendation 9B: Review and adjust long-term service mix across para-transit providers

We suggest adjusting the service mix across providers in the long-run, while ensuring current or better levels of service quality to Wheel-Trans passengers. The potential opportunity to contract out more services over the next three years could decrease the subsidy required to operate Wheel-Trans.

In order to achieve long term contracting success, we have two recommendations. First, key to the ongoing success of the contracted fleet is customer service. As a result, any changes in contracted services should be done in close consultation with the Advisory Committee on Accessible Transit (ACAT) to assure continuing high quality service. In reviewing quality data across all three modes of service, key measures point to high levels of customer satisfaction and service. Obviously, maintaining these high

service levels is an ongoing priority and the provision of Wheel-Trans services must continue to fully meet the mobility needs of individual passengers.

Second, in order to achieve a cost-effective transition, we would recommend that the TTC work with the contract service community to determine the appropriate timing and scope of transition. As a key consideration we could include the partial or full transition of the Wheel-Trans' internal 212-bus fleet to the contract community to serve individuals with more significant mobility needs that cannot be accommodated by vans or sedans. With significant capital dollars allocated for delivery of replacement and service-expansion buses for Wheel-Trans, their potential operation as contracted services should be a part of that discussion.

Furthermore, the interdependent nature of the current in house nature of the Wheel-Trans fleet may make it more difficult for the TTC to contract out more of this service. In other words, additional contracting out may further increase the per trip cost of the in-house Wheel-Trans service. If this is the case, the TTC may need to consider fully contracting out its Wheel-Trans services. This may also yield additional savings.[71]

C) Wheel-Trans Customers

With a growing number of riders who are unable to access the conventional system[72], the TTC has numerous options for delivering this service cost effectively. Still, the reality is that this service costs significantly more than conventional transit. In general, most transit agencies in North America only recover between 10-11% of fare box revenues per trip. At a cost per trip of $17 to $52, the TTC must continue to be diligent in assuring that this service is used responsibly for the continuing benefit of those who need it. [73] Internal Wheel-Trans operations are also significantly affected by *No-Shows*, people who cancel or don't show up for the Wheel-Trans appointment.

Recommendation 9C: Improve procedures to reduce No-Shows and Cancel-At-Door

TTC should re-look at its approach to notifying customers of their upcoming appointment. In 2010, *No-Shows* and *Cancel-At-Door (CAD)* cost the TTC a total $2.1M[74]. By implementing, an Integrated Voice Response (IVR) system, customers can be notified about 30 minutes prior to their trip and would have the option to cancel enabling the pro-active rerouting of the Wheel-Trans vehicle. A conservative estimate of potential savings would be $200,000 - $500,000 (based on 10-20% of total cost).

[71] At a current maintenance spend of $10.5M; a 5% to 10% reduction would provide an annual savings of $0.5 to $1M.
[72] 64,124 registrants used Wheel-Trans services for 2.7M trips in 2010, approximately 12% increase over the previous year
[73] Refer to Appendix G: Wheel-Trans for more information
[74] Cancelled trips calculated using average cost per trip of $32 per trip at total cancelled trips (66,900) = $2.14M

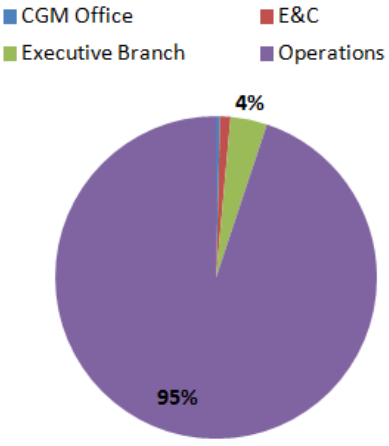
10. Other Areas and Performance Management

In our review of TTC operations, there were several additional areas warranting additional investigation for possible cost savings and efficiencies. While outside the formal scope of the assignment, we would encourage the City and TTC to review these areas further.

A) Time-Keeping Activities, Overtime and Absenteeism

The TTC currently uses several processes to record and manage its timekeeping for its approximately 13,000 employees. For its drivers' payroll, time collection is a manual process. Exceptions to scheduled information are handwritten on paper forms then keypunched for entry into a batch mainframe system for processing. Once keypunched the information automatically interfaces into the payroll and HR system. Calculations are a combination of manual entries on the forms and system generated values. For all non-driver employees including management, time is collected using an online mainframe CICS application. The information automatically interfaces into the payroll/HR system. It is a positive time reporting system with some default information. (i.e., not exception based). All of TTC's timekeeping systems are developed and maintained in house.

Today, absenteeism and overtime at TTC represent 3.5% of staff costs. This is a significant figure especially when compared to other divisions of the City such as police and fire services. TTC averages about 15.2 days of absenteeism[75] (6.3% agency average weighted absenteeism). In total, 202,000 days were lost due to absenteeism, for an average of 15.2 days per employee. Since the TTC and the City calculate absenteeism in different ways, comparisons are difficult. However, recent trends at the TTC indicate that the absenteeism rate is rising making it higher than the City's average. Figure 10.1 illustrates the total number of days lost by department at the TTC.



	Total Days Lost	Total Employees	Absenteeism (in days per employee)
CGM Office	780	466	1.7
E&C	2,131	528	4.0
Executive Branch	7,428	933	8.0
Operations	191,673	11404	16.8

Figure 10.1: Total Absenteeism (by department)

[75] Please see *Appendix H: Overtime and Absenteeism*: Based on data provided by the TTC, calculated using Absenteeism actual rate, multiplied by 260 working days per year, multiplied by the department headcount. Average is calculated as 202,012 days lost / 13,331 employees = 15.2 days lost per employee

Time keeping systems can automate the TTC's time consuming tasks involved with monitoring employee time and attendance. Installing time-management software and data collection devices can help control labour costs, manage compliance risk, and improve workforce productivity. Time management systems reduce the risks of errors common to manual processes. Better time keeping systems also have a direct impact on related areas such as overtime and absenteeism. Overtime actual in some departments significantly exceeds budget. In others, it is significantly under budget.

Figure 10.2 illustrates the relationship between department absences and overtime spends. It shows the correlation in three departments (bus transportation, rail transportation and rail cars and shops) where overtime spend is higher as well as having a high rate of employee absences. These departments would require further study by the TTC and there are opportunities to reduce overtime by reducing absenteeism in these departments.

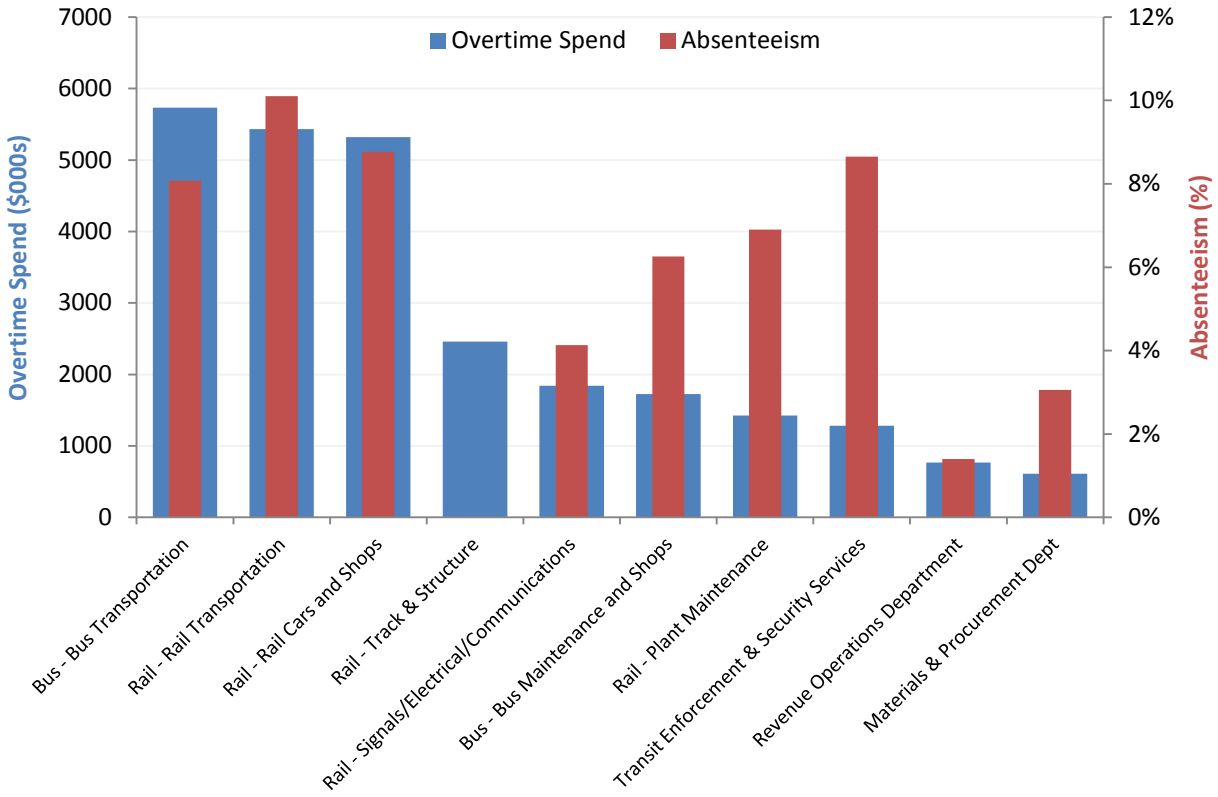


Figure 10.2 – Overtime and Absenteeism by department, 2010 actual[76]

[76] Absenteeism data for *Rail-Track & Structure* was not published in the CGM reports

Recommendation 10A1: Automate time-keeping activities using Crew Management COTS [77]

As TTC updates its core financial systems, automated time keeping should be part of the system architecture. Currently the TTC's time-keeping process is manual which can lead to errors and leakages. TTC would be able to reduce these errors by moving towards an automated time-keeping system. A fully-integrated time keeping system can yield substantive savings. Therefore it is recommended the TTC develop a business case to identify potential savings.

Recommendation 10A2: Set targets to reduce both overtime and staff absences

Overtime budgets must be set to accurately reflect the nature of the work. When departments are unable to work within their budgets, it should trigger a management discussion to address root cause. Setting and managing a tightly controlled budget should ultimately be linked to the measured performance of every supervisor and manager. Some overtime work at TTC is planned, in order to avoid hiring full-time personnel. We agree with the philosophy that using overtime is at times beneficial over hiring new people.

Existing policies with regards to absences should be consistently enforced. While the execution of policy needs to be sensitive to employees with legitimate absences, it should also hold to account those who do not follow the rules. We would recommend that the TTC set targets to reduce both overtime and staff absences and work collaboratively with management and staff in achieving these reductions. Overall, we would recommend that the TTC target a 15% reduction annually, for the next three years, until it reaches approximately 9.6 days absenteeism (or below 4% agency average absenteeism), by developing a comprehensive plan.

B) Five-Year roadmap on IT implementation

The TTC is currently putting in place the IFS system for procurement and vehicle work orders for bus maintenance. Giro/Access once fully developed will help TTC's Wheel-Trans operations to do same-day dynamic route planning and hence reduce costs.

However, it is seen that the TTC can benefit from modernizing several of its other IT systems. For example, TTC uses main-frame based in-house developed systems to manage its time-keeping and HR, its financial system is more than 25 years old with a large number of customizations, and management of capital projects is often through spread-sheets. These older systems are not only difficult to change but also need specialized resources to maintain them, thereby increasing the cost to maintain and upgrade.

Recommendation 10B: Develop a 5-year roadmap to modernise IT infrastructure at the TTC

It is therefore recommended that TTC establish a 5-year roadmap to upgrade its IT architecture, applications and infrastructure which would enable it to more effectively support its transit operations.

[77] "*PS Technologies*" and "*Kronos*" are examples of commercial products tailored to specific transit needs in the area of time management and crew management.

C) Transit Balanced Scorecard and Management Reporting

The TTC generates a significant volume of management reports and operating statistics every month. However, this volume of information has not been effectively serving the TTC senior management. For example, the CGM report is prepared monthly and consists of over 250 double-sided pages from each department in the TTC. This represents a tremendous amount of staff and management time used to generate the document. The document also places greater emphasis on the publication of statistics and less on providing root cause analysis and providing insight into potential management corrective actions. The time lag created by the compilation of all the information drives the focus to mainly historical, lagging indicators that are often too old to be actionable.

Recommendation 10C: Develop an Operational and Management Transit Balanced Scorecard report

Instituting a balanced score card approach to managing Key Process Indicators (KPIs) will greatly improve the ability of the TTC senior management to focus on the "critical few" measures discussed above. Balanced scorecards typically look at four areas: Financial, Human Resources, Customer, and Process. Within each area are 4-6 KPIs that are tracked and managed at the highest level of the organization that combine both historical, and leading/predictive measures. Each Department's metrics are aligned to the KPIs. A balanced scorecard can provide some significant benefits to TTC as it works to improve both the quality and utility of its KPIs.

The TTC needs to track its operational measures for both internal and external use, but the TTC should rethink both the frequency and the utility of this type of report as well as focusing on how to structure the report towards key performance indicators.

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The authors of the report acknowledge and thank the following individuals at the City of Toronto, Toronto Transit Commission and others for their contributions to this study:

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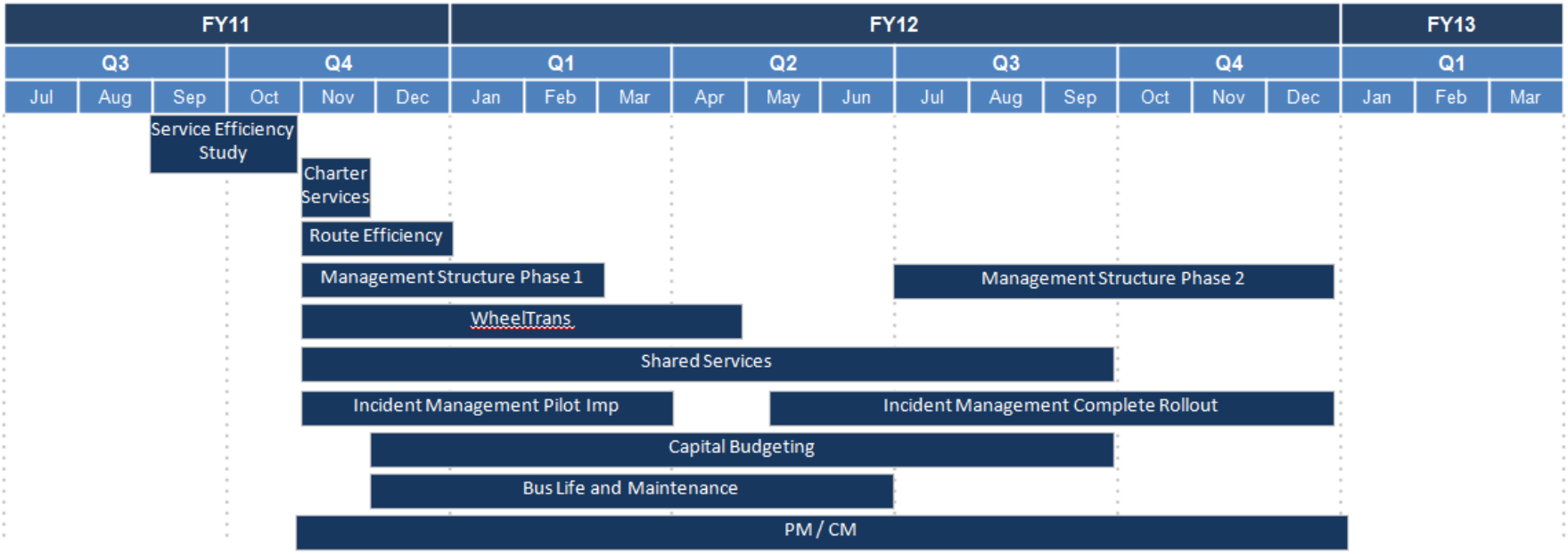
Recommendations Implementation Timeline



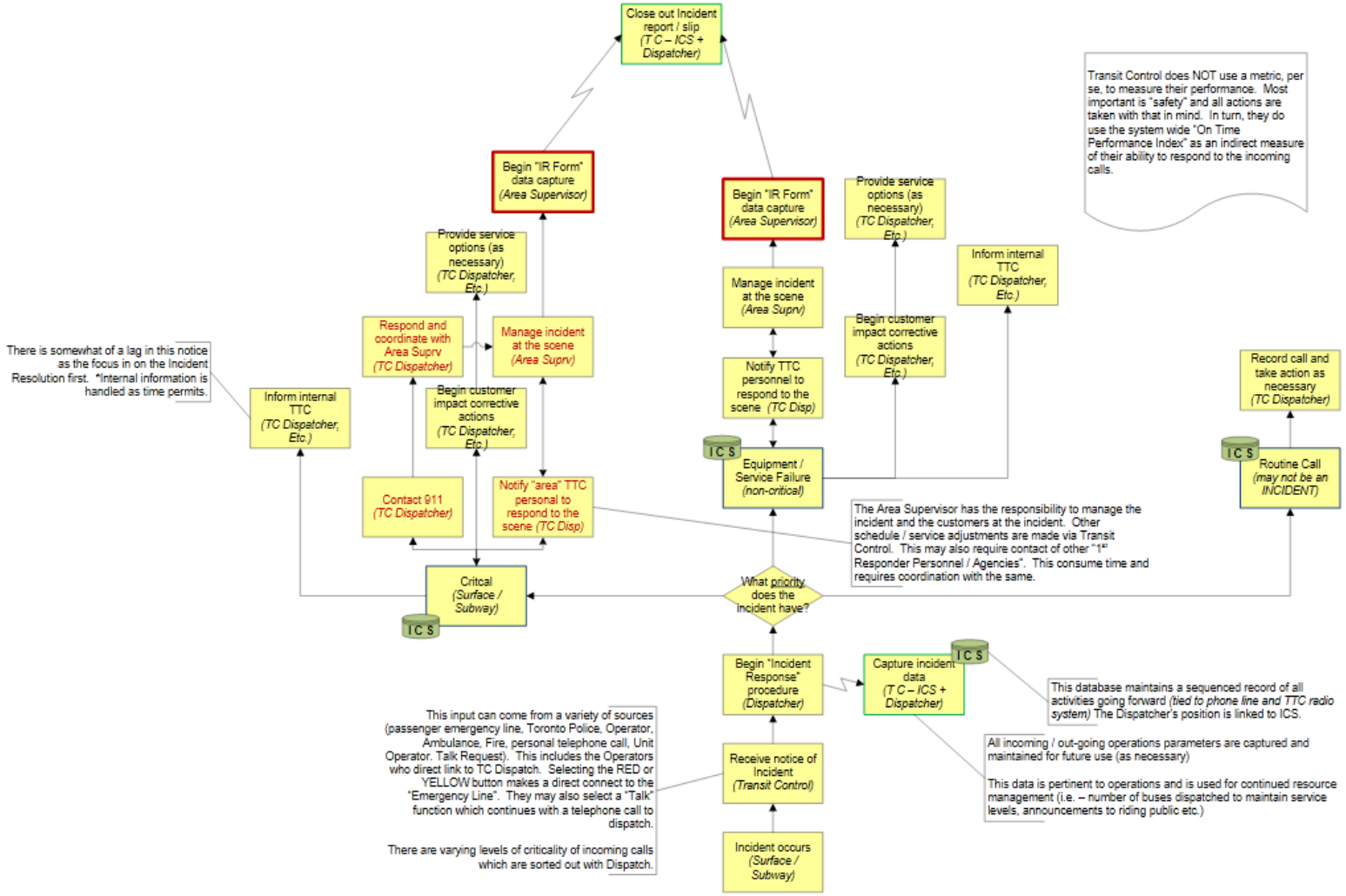
The implementation time line illustrated above indicates the proposed implementation of the recommendations outlined in this report. While most activities can be carried out in parallel, Management Structure and Incident Management require two phases. The TTC is already conducting phase one of its management structure adjustment, and phase two can be carried out once operational and IT improvements are put into place. The Incident Management process can be piloted for through an improvement exercise and after demonstrating positive results, a complete rollout of overhauling their incident management reporting system can be implemented.

Appendices

Appendix A – Incident Management

The Response Process

To understand the response process for Incident Management; we met with Transit Control. Through these discussions, we have created the Process flow shown below. There are multiple types of incidents which may occur. We have categorized them as Critical, Equipment/Service Failure and Routine. Depending on the incident; you can see that multiple tasks occur in the parallel at the Transit Control. Once an incident occurs, Transit Control will do the following in parallel as needed: 1) Dispatch supervisor and all necessary resources, 2) Contact 911, 3) Perform communication to riders, and 4) Co-ordinate any service disruption alternatives.



The ICS application

Transit Control uses an application called ICS – this software is heavily customized specifically for the TTC, and is integrated with its tracks and signals, phone lines, pagers, announcement/intercom system and emergency buttons. For security, ICS is not connected to the outside world. Behind the scenes, it is running on an Oracle database. For application performance, ICS only holds "incidents" which have not been closed for longer than 3 days. Once an incident has been closed for 3 days, it is moved to the ICS Archive database. The only way to access the archive database is through a simple web-based query tool.

The Incident Management Reporting Process

As mentioned in the report, the current process to capture, enter and manage incident reports is a very consuming, manually-intensive process. This can be seen through the entire process. For example, at the Capture stage, for a surface occurrence, the 185L form which gets filled out has 347 checkboxes and 97 blank/input fields.

For the File/Store stage, the form will be photocopied and/or faxed and sent out to multiple departments as needed. Each department will either file the copy and/or manually enter the data into their own respective system. There may be some re-work and follow-up needed if the form is not filled out properly, or is illegible.

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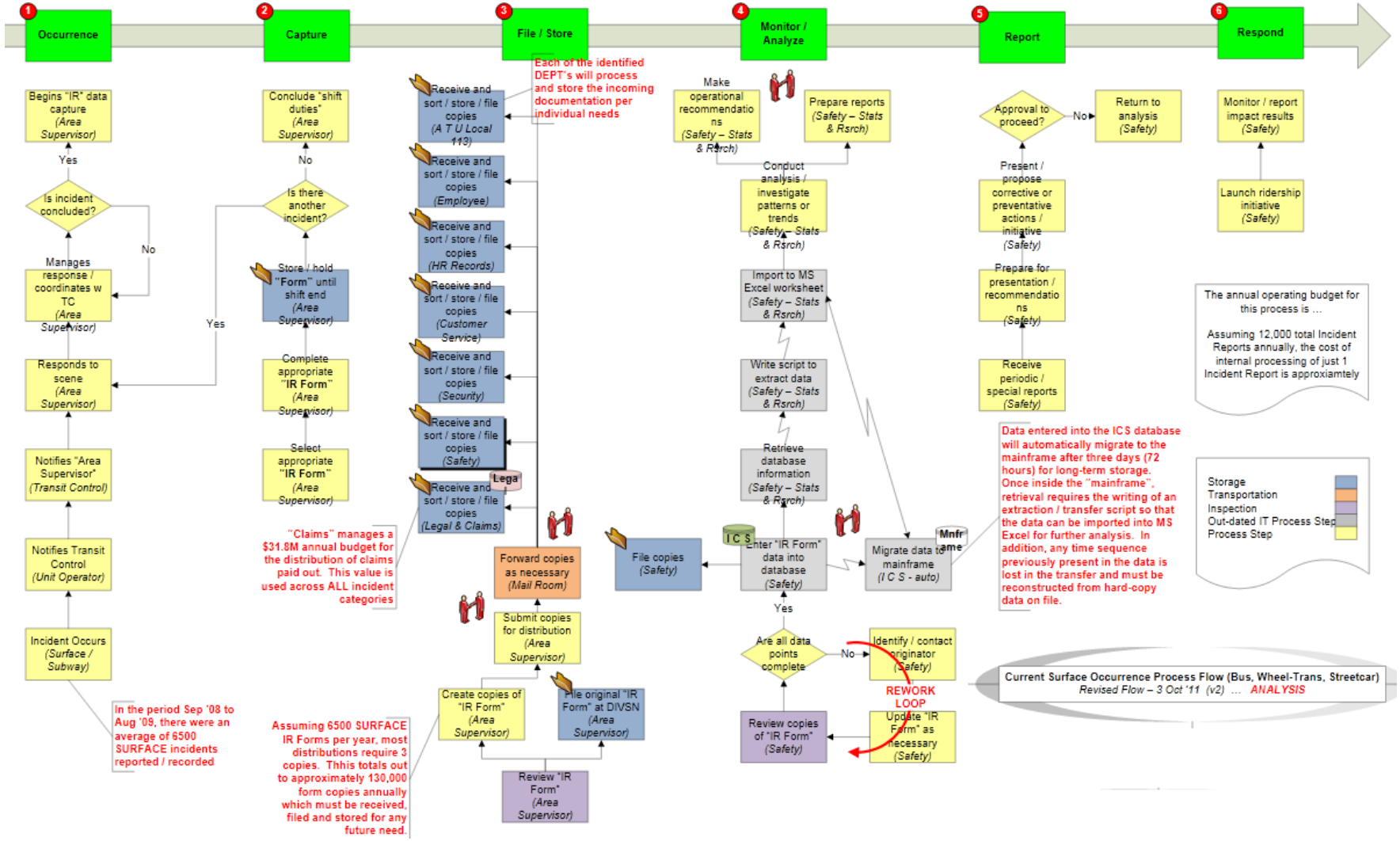


Time Spent Analysis

In 2010, between 7,000 to 15,000 hours was spent by supervisors to manually photocopy/fax/mail incident forms to the various departments.

Supervisor time spent / Incident	2010 Incidents	Incident Percentage	.5 Hours spent on each incident	.75 Hours spent on each incident	1 Hour spent on each incident
Subway	5,424	35%	2,712	4,068	5,424
Surface	6,805	44%	3,403	5,104	6,805
Occupational	3,360	22%	1,680	2,520	3,360
	15,589		7,795	11,692	15,589
* Each Supervisor spends .5 Hours photocopying/faxing/mailing forms					

An additional 12,000 hours was spent by multiple departments manually inputting the data from these forms into its respective systems

Manual Input spent / Incident	2010 Incidents	Avg Data Entry (Min)*	Safety & Environment Time (Hours)	Legal & Claim Time (Hours)	Transit Control Time (Hours)	HR / WSIB Time (Hours)	TOTAL
Subway - Passenger	1,850	25	771	730			1,501
Subway - All Others	3,574	25			1,489		1,489
Surface	6,805	20	2,268	2,268	2,268		6,805
Occupational	3,360	20	1,120			1,120	2,240
	15,589		4,159	2,999	3,758	1,120	12,035
* assumption, average data entry taken from Safety & Environment.							
* assume same data entry time for Legal & Claims, HR/WSIB and Transit Control							
** does not include time needed for follow-ups due to illegible and/or missing information							

This totals to approximately 19,000 to 27,000 hours spent in 2010 on the incident management process paperwork and data entry.

Total Supervisor Time Spent	7,795	15,589
Manual Input Time Spent	12,035	12,035
TOTAL HOURS	19,830	27,624

As seen from the graph above, streetcars, rail cars and staff contribute to the highest number of controllable incident hours that can possibly be mitigated with proper incident management.

Cost Analysis

Subway				
Controllable	Percentage	# Incidents	Hours*	Cost @161.44/hr
Power Supply	0.006	15	1.725	$ 2,021.78
Track	0.045	109	12.535	$ 5,166.78
Signalling	0.115	278	31.97	$ 19,768.54
Trains	0.44	1065	122.475	$ 17,701.83
Staff	0.394	953	109.595	$ 269.57
		2420	278.3	$ 44,928.50
* Average length of delay = 6.8 minutes				

Uncontrollable	Percentage	#Incidents	Hours*	Cost @161.44/hr
Passenger	0.616	1850	255.9	$ 2,616.38
General - Station	0.039	117	16.2	$ 41,325.31
General - Info	0.26	781	108.0	$ 5,769.44
Other External	0.086	258	35.7	$ 17,442.50
		3004	415.8	$ 67,086.55
* Average length of delay = 8.3 minutes				

Streetcar				
Controllable	Percentage	# Incidents	Hours*	Cost @161.44/hr
Power Supply	0	0	0.0	$ -
Track	0.003	16	4.0	$ 641.77
Signalling	0	0	0.0	$ -
Cars	0.561	3014	743.4	$ 120,010.84
Staff	0.436	2342	577.7	$ 93,270.46
		5372	1325.1	$ 213,923.07
* Average length of delay = 14.8 minutes				

Uncontrollable	Percentage	#Incidents	Hours*	Cost @161.44/hr
Passenger	0.092	394	145.1	$ 23,425.38
General - Station	0.018	77	28.4	$ 4,583.23
General - Info	0.872	3734	1375.3	$ 222,031.87
Other External	0.019	81	30.0	$ 4,837.85
		4282	1578.8	$ 254,878.33
* Average length of delay = 22.1 minutes				

Appendix B – Capital Project Management

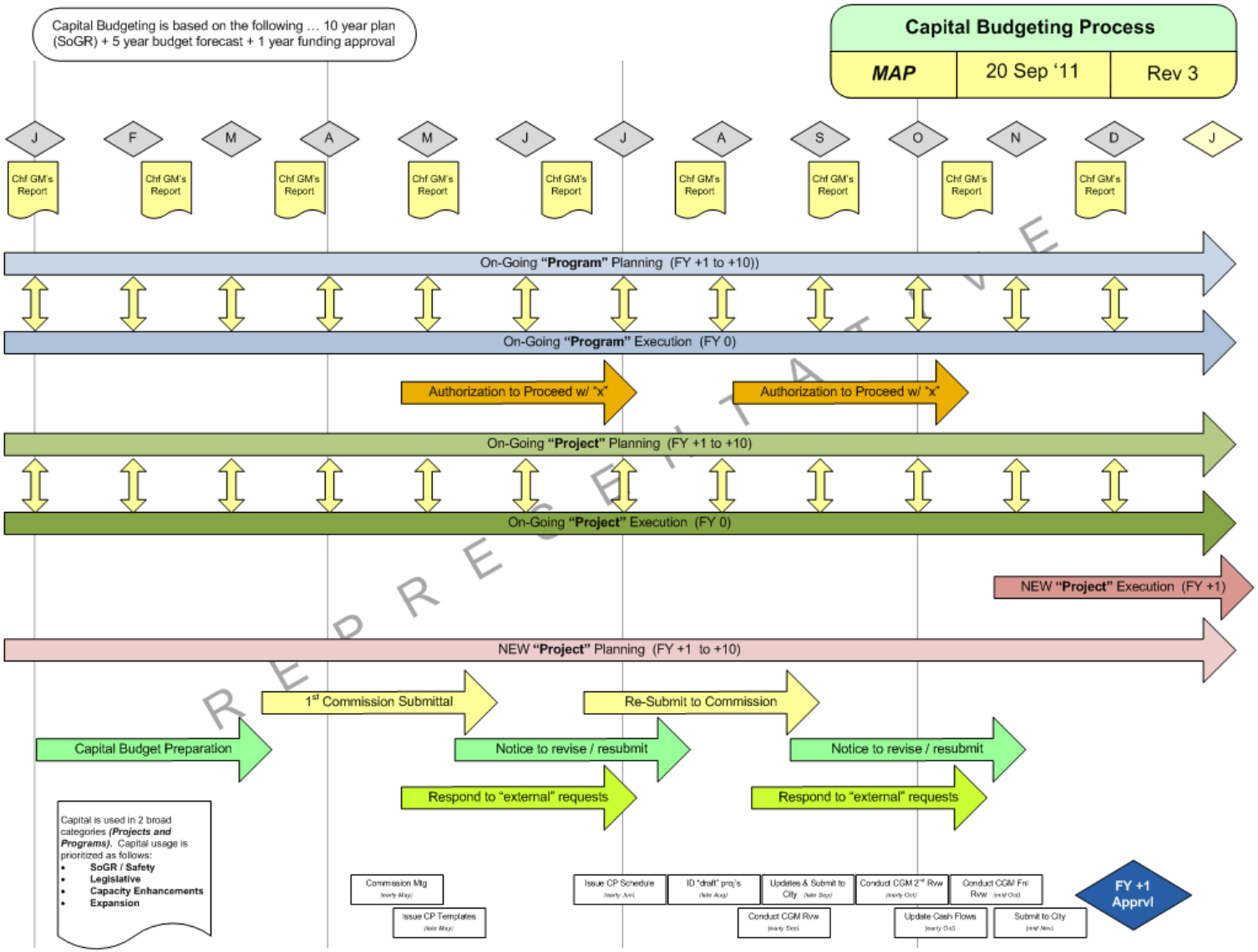
To understand the Capital Project Management at TTC, we met with the Chief Accountant of Capital Projects, the General Manager of Engineering & Construction and the Program Manager for Transit Expansion. We understood that the priority for the budget follows the below order:

- State of Good Repair
- Legislative
- Capacity Improvements and Enhancements
- Expansions

There are types of projects, finite projects and programs (on-going, for example roofing). 90% of the overall budget falls under State of Good Repair.

The TTC maintains a "Blue Book", which is a 5 year budget and a 10 year plan. The TTC sends this budget to the commission for approval. Once commission approves, the budget is then sent to the City of Toronto for approval. Through this process, there will be on-going planning rework and associated project performance adjustments. Also throughout this process, there is on-going "program" execution, and multiple Chief General Manager reports being generated

Service Efficiency Study Program: Toronto Transit Commission



Appendix C – Bus Life/Maintenance

Bus Maintenance Costs

Based on the data provided to us, the above graph provides the maintenance cost structure for the different types of buses. Our findings indicate that maintenance costs, both per km and per bus, for hybrid buses are the lowest. This data does not take into consideration the battery replacement costs under warranty for hybrid buses. Further analysis would be required to be performed to get accurate maintenance/ operating costs per bus for each bus type.

Number	Purchase Dates		Name	Maint Costs	Km	Maint Cost/Bus	Maint Cost/Km	Km/Bus
90[78]	*1983*	*1996*	*GMC/MCI Standard Floor, Diesel*	*$1,540,000*	*2,700,000*	*$17,111*	*$0.57*	*30,000*
185	*1991*	*1996*	*Orion V Standard Floor, Diesel*	*$4,501,000*	*10,500,000*	*$24,330*	*$0.43*	*56,757*
52	*1998*	*1998*	*Nova RTS Standard Floor, Diesel*	*$1,302,000*	*2,000,000*	*$25,038*	*$0.65*	*38,462*
51	*1999*	*1999*	*Flyer Low Floor, Diesel*	*$2,231,000*	*2,400,000*	*$43,745*	*$0.93*	*47,059*
782	*2003*	*2011*	*Orion VII Low Floor, Diesel*	*$19,895,000*	*54,700,000*	*$25,441*	*$0.36*	*69,949*
693	*2006*	*2009*	*Orion VII Low Floor, Hybrid (Diesel/Electrical)*	*$13,074,000*	*54,900,000*	*$18,866*	*$0.24*	*79,221*

Key Bus Financials

Bus Maintenance Financial (Actual Spend)	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Labour Cost	$51,840,000	$54,193,000	$56,447,000	$62,463,000	$70,551,000	$73,749,000
Non-Labour Cost	$28,896,000	$33,368,000	$34,490,000	$37,898,000	$44,238,000	$48,652,000
Number of Buses	1495	1492	1603	1682	1744	1806
Total Kilometres Travelled	102,900,000	105,900,000	107,600,000	114,200,000	123,700,000	124,000,000
Total Hours Travelled	5,200,197	5,396,059	5,488,140	5,809,598	6,264,857	6,241,669
Total Maintenance Cost	**$80,736,000**	**$87,561,000**	**$90,937,000**	**$100,361,000**	**$114,789,000**	**$122,401,000**
Cost/Bus	$54,004	$58,687	$56,729	$59,668	$65,819	$67,775
Cost/km	**$0.78**	**$0.83**	**$0.85**	**$0.88**	**$0.93**	**$0.99**
Cost/hour	**$15.53**	**$16.23**	**$16.57**	**$17.28**	**$18.32**	**$19.61**
Vehicle Fuel Costs			$61,207,000	$65,192,000	$78,155,000	$72,924,000
Total Bus Operation Costs	**$314,293,000**	**$336,612,000**	**$353,154,000**	**$343,011,000**	**$388,221,000**	**$412,879,000**
Total Bus Operation Costs (inc Fuel)			$414,361,000	$408,203,000	$466,376,000	$485,803,000
Cost/km			**$3.85**	**$3.57**	**$3.77**	**$3.92**
cost/hour			**$75.50**	**$70.26**	**$74.44**	**$77.83**
Bus Maintenance as % of Total Bus Spend	**25.7%**	**26.0%**	**25.7%**	**29.3%**	**29.6%**	**29.6%**
Bus Maintenance as % of Total Bus Spend (incl Fuel)			**21.9%**	**24.6%**	**24.6%**	**25.2%**

[78] This number is an average number of buses as many were discontinued since 1983

Appendix D - Management Structure

For Management Structure, we used the span of control to understand the current organization structure, and their current levels of span of control. The results for span of control are shown below. We'd like to re-iterate that these results do not show the recent changes at TTC, which is expect to reduce the headcount by 300 resources.

Overall

Function	Total Headcount (HC) Adjustment	HC as % of Total	Current Managers	Current Secretaries	Current Vacancies	Current Span of Control (SOC)	Proposed SOC (Phase 1)	HC Adjustment (Phase 1)	Phase 1 Savings
CGM's Office	466	3%	126	34	193	4	6	47	$ 4,117
Engineering & Construction	528	4%	107	31	77	5	6	19	$ 2,005
Executive Branch	933	7%	155	10	37	6	6	6	$ 465
Operations Branch	11,404	86%	848	33	79	13	15	83	$ 7,031
TOTAL	13,331		1,236	108	386	23		155	$ 13,618

Function	Porposed SOC (Phase 2)	Additional HC Adjustment (Phase 2)	Additional Phase 2 Savings
CGM's Office	8	19	$ 1,664
Engineering & Construction	8	21	$ 2,216
Executive Branch	8	43	$ 3,334
Operations Branch	15	-	$ -
TOTAL		83	$ 7,214

CGM's Office

						Benchmark	1: 6	
Function	Headcount	Span of Control	Overall Managers	Overall Reports	Average LCR	HC Reduction	% HC Reduction	Savings (000s)
Overall	466	1: 4	126	465	$ 88	47	10%	$ 4,117
CGM's Office	12	1: 1	8	11	$ 133	-	0%	$ -
Corporate Communication	6	1: 3	2	5	$ 84	1	17%	$ 84
Human Resources Department	98	1: 7	14	97	$ 80	(2)	-2%	$ (160)
Human Rights Unit	7	1: 6	1	6	$ 87	-	0%	$ -
Internal Audit	18	1: 3	6	17	$ 92	3	17%	$ 276
Transit Expansion	330	1: 3	100	329	$ 95	45	14%	$ 4,275

Engineering & Construction

						Benchmark	1: 6	
Function	Headcount	Span of Control	Overall Managers	Overall Reports	Average LCR	HC Reduction	% HC Reduction	Savings (000s)
Overall	528	1: 5	107	528	$ 106	19	4%	$ 2,005
Engineering & Construction Branch	6	1: 1	5	5	$ 154	-	0%	$ -
Construction Department	190	1: 8	25	189	$ 88	(7)	-4%	$ (616)
Engineering Department	201	1: 4	51	200	$ 83	18	9%	$ 1,494
Spadina Subway Extension	135	1: 4	30	134	$ 97	8	6%	$ 776

Executive Branch

						Benchmark	1:6	
Function	Headcount	Span of Control	Overall Managers	Overall Reports	Average LCR	HC Reduction	% HC Reduction	Savings (000s)
Overall	933	1: 6	155	919	$ 78	6	1%	$ 465
Executive Branch	12	1: 1	11	11	$ 80	9	75%	$ 720
Finance Department	91	1: 4	23	90	$ 73	8	9%	$ 584
General Secretary's Office	9	1: 3	3	8	$ 80	2	22%	$ 160
Information Technology Services Dept	223	1: 7	30	222	$ 84	(7)	-3%	$ (588)
Legal & Claims Dept	66	1: 3	19	65	$ 88	8	12%	$ 704
Marketing & Customer Service Dept	78	1: 7	11	77	$ 58	(2)	-3%	$ (116)
Materials & Procurement Dept	244	1: 7	33	243	$ 73	(8)	-3%	$ (584)
Pension Fund Society	14	1: 2	6	13	$ 82	4	29%	$ 328
Property Development Dept.	36	1: 4	10	35	$ 78	4	11%	$ 312
Revenue Operations Department	124	1: 14	9	123	$ 68	(12)	-10%	$ (816)
Safety & Environment Dept	46	1: 5	10	45	$ 89	-	0%	$ -

Operations Branch

						Benchmark	1: 15	
Function	Headcount	Span of Control	Overall Managers	Overall Reports	Average LCR	HC Reduction	% HC Reduction	Savings (000s)
Overall	11404	1: 13	848	11403	$ 85	83	1%	$ 7,031
Operations Branch	9	1: 1	7	8	$ 130	6	67%	$ 780
Rail Operations	5375	1: 11	496	5374	$ 71	138	3%	$ 9,798
Bus Operations	5679	1: 19	295	5678	$ 72	-84	-1%	$ (6,048)
Service Planning	93	1: 5	19	92	$ 68	13	14%	$ 884
Transit Enforcement & Security Services	90	1: 5	18	89	$ 91	12	13%	$ 1,092
Support Services	25	1: 4	6	24	$ 80	-	16%	$ 320
Training	139	1: 20	7	138	$ 81	-2	-1%	$ (162)

Appendix E – Charter Services

Year	Platform Hours	Revenue	Total Cost	Profit (Loss)	Est. Rev per Hour	Est. Cost per Hour	Cost Difference per Hour
BUS							
2010	629	$126,212	$116,709	9,503	201	$186	15
2009	481	$84,872	$98,273	(13,401)	176	$204	(28)
2008	1,187	$166,816	$205,071	(38,255)	141	$173	(32)
2007	905	$104,189	$161,008	(56,819)	115	$178	(63)
2006	1,040	$108,560	$172,072	(63,512)	104	$165	(61)
REGULAR ST. CAR							
2010	130	$39,502	$30,052	9,450	304	$231	73
2009	98	$23,467	$23,860	(393)	239	$243	(4)
2008	51	$12,435	$11,708	727	244	$230	14
2007	82	$12,856	$17,985	(5,129)	157	$219	(63)
2006	119	$19,985	$26,606	(6,621)	168	$224	(56)
PCC							
2010	99	$19,696	$36,149	(16,453)	199	$365	(166)
2009	95	$20,103	$36,341	(16,238)	212	$383	(171)
2008	75	$14,370	$52,732	(38,362)	192	$703	(511)
2007	102	$15,365	$63,642	(48,277)	151	$624	(473)
2006	140	$17,457	$31,735	(14,278)	125	$227	(102)
TOTAL							
2010	858	185,410	182,910	2,500	216	$213	3
2009	674	128,442	158,474	(30,032)	191	$235	(45)
2008	1,313	193,621	269,511	(75,890)	147	$205	(58)
2007	1,089	132,410	242,635	(110,225)	122	$223	(101)
2006	1,299	146,002	230,413	(84,411)	112	$177	(65)

Appendix F - Peak/Off-Peak Service Efficiency

Overall Route Analysis

Weekday	Costs	Hours	$/hour	Kilometres	$/km
Day	$668,928,000	4,976,140	$134	98,521,800	$6.79
Night	$16,352,269	106,063	$154	4,329,932	$3.78
TOTAL	**$685,280,269**	**5,082,203**		**102,851,732**	
Saturday					
Day	$74,526,400	643,396	$116	13,205,400	$5.64
Night	$3,267,509	21,187	$154	863,061	$3.79
TOTAL	**$77,793,909**	**664,583**		**14,068,461**	
Sunday					
Day	$56,074,252	480,116	$117	10,161,840	$5.52
Night	$4,581,072	30,020	$153	1,223,681	$3.74
TOTAL	**$60,655,324**	**510,136**		**11,385,521**	

Service Planning

Service Planning Department Traffic Checkers

		Year-End Workforce	Person -Years	Dollars ($000's) Labour	Non-labour	Total
Traffic Checkers	Union	28	28.0	1,407.0	51.7	1,458.7
Overtime				13.2		13.2
Stat. Holiday Premium				0.0		0.0
Sunday Premium				17.0		17.0
Shift Premium				10.2		10.2
Sub-Total		28	28.0	1,447.4	51.7	1,499.1
Fringe Benefits	(i)			550.0		550.0
Senior Traffic Checkers	Staff	3	3.0	196.5	5.0	201.5
Asst Suprv - Data Collection		1	1.0	71.6	1.5	73.1
Fringe Benefits	(ii)			74.5		74.5
Total		**32**	**32.0**	**$2,340.0**	**$58.2**	**$2,398.2**

Employees Involved with the Service Monitoring and Adjustment Process

Position	Number of Employees in Position	Annual Salary Per Employee - Third Step of Wage Scale	Annual Value of Benefits Per Employee	Total Annual Cost of All Employees in this Position
Senior Planner - Transit Services	1	90.5	25.2	115.7
Transit Planner	3	71.3	19.8	273.3
System Planner	1	71.3	19.8	91.1
Director - Schedules	1	101.5	28.2	129.7
District Schedule Co-Ordinator	2	78.5	21.8	200.6
Chief Scheduler - Rapid Transit	1	78.5	21.8	100.3
Senior Schedule Writer - Rapid Transit	1	71.3	19.8	91.1
Schedule Writer	11	63.0	17.5	885.5
Sub-Total ($000's)	**21**			**$1,887.3**

Fringe Benefits

(i) Fringe benefits for Salaried employees excluding Vacation, Statutory Holiday and Short Term Disability Plan because included above.
Fringe benefits for Union employees excluding Vacation and Statutory Holiday because included above

(ii) Above dollars based on the third step of the wage scale.

Above data is based on the 2011 approved Budget.

The two tables above show the costs associated with the traffic checking, and service planning departments respectively.

Appendix G – Wheel-Trans

Quality Key Performance Indicators[79]

2010	Quality Expectations	Unacc. Trips	On-Time Performance	Issue Management	Complaint Response Time	Complaints Frequency	Overall
Beck S	87.4%	99.4%	99.7%	100.0%	100.0%	96.9%	**93.0%**
Co-op S	90.1%	100.0%	99.9%	83.3%	100.0%	96.9%	**92.7%**
Co-op AT	92.6%	100.0%	99.9%	94.0%	100.0%	97.9%	**95.1%**
Royal AT	93.0%	99.8%	99.8%	100.0%	100.0%	84.4%	**93.3%**
Scarborough AT	93.5%	99.8%	99.9%	88.9%	100.0%	98.6%	**95.7%**
Wheel-Trans		99.8%	93.0%			99.9%	

2009	Quality Expectations	Unacc. Trips	On-Time Performance	Issue Management	Complaint Response Time	Complaints Frequency	Overall
Beck S	89.9%	100.0%	99.9%	89.0%	99.8%	62.5%	**86.4%**
Co-op S	91.6%	100.0%	99.6%	100.0%	99.8%	87.5%	**93.3%**
Co-op AT	88.7%	100.0%	99.6%	100.0%	99.8%	87.5%	**91.8%**
Royal AT	85.4%	100.0%	99.5%	68.2%	99.8%	62.5%	**81.9%**
Scarborough AT	88.7%	100.0%	99.4%	88.5%	100.0%	87.5%	**90.6%**
Wheel-Trans		99.9%	93.0%			99.9%	

The graphs above indicate the quality parameters the TTC uses to gauge contractors. Quality levels between 0-69% are deemed unacceptable, 70-89% are acceptable, and levels between 90-100% are considered excellent.

Comparison of Internal and Contractor Service Costs

	2006	2007	2008	2009	2010	2011
Expenses $Millions	**63.298**	**68.274**	**74.983**	**81.26**	**89.314**	**96.228**
Contract Services Spend Includes 60% Admin Allocation	**23.296**	**25.0516**	**28.4648**	**34.6524**	**39.6714**	**38.6434**
Sedan Taxis	4.643	5.127	6.52	8.665	12.507	9.999
Accessible Taxis	12.626	13.984	15.514	19.199	20.151	21.466
Internal TTC Includes 40% Admin Allocation	**40.002**	**43.2224**	**46.5182**	**46.6076**	**49.6426**	**57.5846**
Bus Operation	**35.984**	**39.262**	**42.231**	**42.082**	**44.967**	**52.799**
Operators	20.396	22.254	23.749	23.363	26.3	30.354
Divisional Staff	0.588	0.6	0.675	0.719	0.743	0.73

[79] Data obtained from TTC Contractor Evaluation G1 Reports

Mobile Supervision	0.881	1.066	1.065	1.204	1.261	1.273
Equipment Maintenance	10.534	11.773	13.113	13.111	12.696	15.296
Vehicle Fuel	1.968	2.48	2.429	2.432	2.64	3.756
Lakeshore Garage Costs	1.617	1.089	1.2	1.253	1.327	1.39
Administration	**10.045**	**9.901**	**10.718**	**11.314**	**11.689**	**11.964**
General Superintendent's office	0.832	0.78	0.814	0.866	0.972	0.783
Dispatch & Reservations	4.62	4.713	4.961	5.272	5.343	5.558
Accessible Services	0.587	0.534	0.55	0.74	0.634	0.547
Customer Service	0.924	0.963	1.26	1.197	1.605	1.622
Other Employee Costs (redistributed to labour accts)	0	0	0	0	0	0
Non-Departmental Costs	3.082	2.911	3.133	3.239	3.135	3.454
Trips	**1,992,040**	**2,103,459**	**2,199,247**	**2,497,730**	**2,770,851**	**2,839,500**
Contract Sedan AMB	273,983	297,785	351,688	465,592	645,283	477,204
Contract Accessible AMB	570,738	631,233	695,724	926,223	959,980	1,056,799
Internal TTC	442,858	470,497	452,204	367,534	409,828	527,454
Total AMB	**1,287,579**	**1,399,515**	**1,499,616**	**1,759,349**	**2,015,091**	**2,061,457**
Contract Sedan NONAMB	6,746	5,827	6,036	7,697	9,161	5,796
Contract Accessible NONAMB	129,533	148,704	169,643	218,836	221,636	174,901
Internal TTC	472,894	463,793	438,887	430,817	452,254	**504,746**
Total NONAMB	**609,173**	**618,324**	**614,566**	**657,350**	**683,051**	**685,443**
Community Buses	95,288	85,620	85,065	81,031	72,709	**92,600**
Kilometers	**13,846,879**	**14,821,458**	**15,531,210**	**16,955,056**	**19,002,233**	**19,543,009**
Contract Sedan	2,040,574	2,219,976	2,672,835	3,342,780	4,678,695	3,622,500
Contract Accessible	4,469,025	4,833,536	5,326,252	7,029,550	7,185,477	7,353,249
Internal TTC	7,337,280	7,767,946	7,532,123	6,582,726	7,138,061	8,567,260
Cancelled Trips	**348,464**	**388,375**	**411,305**	**434,839**	**454,110**	
Day before AMB	96,772	106,133	118,745	148,412	169,529	
Same Day AMB	97,347	113,750	115,168	103,511	107,352	
CAD AMB	9,769	10,532	11,269	20,118	11,748	
No-show AMB	34,405	38,819	42,098	35,992	39,358	
Total AMB	**238,293**	**269,234**	**287,280**	**308,033**	**327,987**	
Day before NONAMB	48,571	50,592	54,719	66,392	68,790	
Same Day NONAMB	46,382	51,590	51,667	44,248	41,549	
CAD NONAMB	4,387	4,930	5,295	4,678	4,475	
No-show NONAMB	10,831	12,029	12,344	11,488	11,309	
Total NONAMB	**110,171**	**119,141**	**124,025**	**126,806**	**126,123**	
Cost/Trip						
Admin	**5.04**	**4.71**	**4.87**	**4.53**	**4.22**	4.21
Contract Sedan	**16.54**	**16.89**	**18.23**	**18.31**	**19.11**	20.70
Contract Accessible	**18.03**	**17.93**	**17.93**	**16.77**	**17.05**	17.43
Internal TTC	**39.29**	**42.02**	**47.39**	**52.71**	**52.16**	51.15
Other Costs (Included in Admin Costs)	0.00	0.00	0.00	0.00	0.00	0.00
Operators	22.27	23.82	26.65	29.26	30.51	29.41

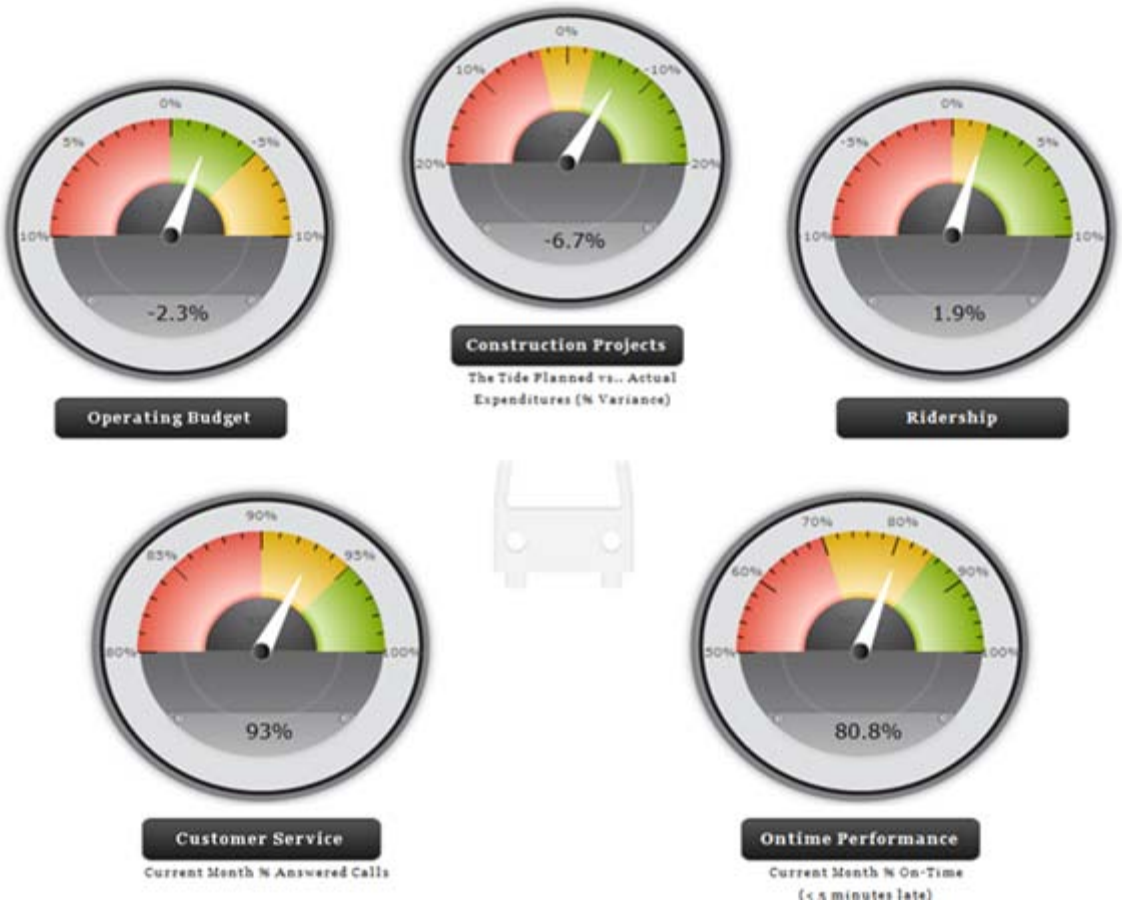
Divisional Staff	0.64	0.64	0.76	0.90	0.86	0.71
Mobile Supervision	0.96	1.14	1.20	1.51	1.46	1.23
Equipment Maintenance	11.50	12.60	14.72	16.42	14.73	14.82
Vehicle Fuel	2.15	2.65	2.73	3.05	3.06	3.64
Lakeshore Garage Costs	1.77	1.17	1.35	1.57	1.54	1.35
Cost/km						
Admin	**0.73**	**0.67**	**0.69**	**0.67**	**0.62**	**0.61**
Contract Sedan	**2.28**	**2.31**	**2.44**	**2.59**	**2.67**	**2.76**
Contract Accessible	**2.83**	**2.89**	**2.91**	**2.73**	**2.80**	**2.92**
Internal TTC	**4.90**	**5.05**	**5.61**	**6.39**	**6.30**	**6.16**
Other Costs (Included in Admin Costs)	0.00	0.00	0.00	0.00	0.00	0.00
Operators	2.78	2.86	3.15	3.55	3.68	3.54
Divisional Staff	0.08	0.08	0.09	0.11	0.10	0.09
Mobile Supervision	0.12	0.14	0.14	0.18	0.18	0.15
Equipment Maintenance	1.44	1.52	1.74	1.99	1.78	1.79
Vehicle Fuel	0.27	0.32	0.32	0.37	0.37	0.44
Lakeshore Garage Costs	0.22	0.14	0.16	0.19	0.19	0.16

Appendix H – Overtime and Absenteeism

	Department	Total Headcount	Overtime Actual	Absenteeism Actual	Days Lost per Department[80]
CGM's Office	CGM's Office	7	5.6		0
	Corporate Communication	6			0
	Human Rights Unit	7			0
	Human Resources Department	98	12.8	2.5%	590
	Internal Audit	18		4.4%	190
	Transit Expansion	330			0
E&C	Engineering & Construction Branch	2			0
	Construction Department	190		1.7%	789
	Engineering Department	201		2.1%	1,008
	Spadina Subway Extension	135		1.0%	334
	Transit City Department			1.8%	8
Executive	Executive Branch/General Secretary's	11	12.8	9.7%	209
	Finance Department	91	144.4	2.6%	557
	Information Technology Services Dept	223	263.5	3.4%	1,814
	Legal & Claims Dept	66		5.2%	819
	Marketing & Customer Service Dept	78	39.9	6.0%	1,123
	Materials & Procurement Dept	244	610.1	3.1%	1,792
	Pension Fund Society	14	4.9	4.1%	139
	Property Development Dept.	36		1.8%	152
	Revenue Operations Department	124	768.1	1.4%	417
	Safety & Environment Dept	46	213.0	3.6%	397
Operations	Operations Branch	3			0
	Rail - DGM's Office	8	8.4		0
	Rail - Plant Maintenance	791	1,425.4	6.9%	13,099
	Rail - Rail Cars and Shops	1381	5,318.6	8.8%	29,067
	Rail - Signals/Electrical/Communications	552	1,841.1	4.1%	5,471
	Rail - Rail Transportation	1809	5,434.3	10.1%	43,850
	Rail - Track & Structure	834	2,457.5		0
	Bus - DGM's Office	4	0.9		0
	Bus - Bus Maintenance and Shops	1118	1,724.8	6.3%	16,797
	Bus - Bus Transportation	4018	5,732.6	8.1%	77,917
	Bus' – Wheel-Trans	539			0
	Service Planning	93	137.6	6.8%	1,511
	Transit Enforcement & Security Services	90	1,283.2	8.7%	1,469
	Support Services	25	21.5	2.1%	123
	Training	139	103.5	7.1%	2,369
TOTAL		**13,331**			**202,012**

[80] Calculated using Absenteeism actual rate, multiplied by 260 working days per year, multiplied by the department headcount. Average is calculated as 202,012 days lost / 13,331 employees = 15.2 days lost per employee. Similarly weighted absenteeism is calculated by multiplying the actual absenteeism percentage with the headcount (weighted absenteeism), and then averaged over all employees. This yields 6.3% annually.

Appendix I – Sample Transit Performance Dashboard



In April 2010, Hampton Roads Transit introduced the Performance Dashboard, an online performance measurement tool that indicates where the agency stands with regard to operating costs, project completion, customer service, on-time performance and ridership. (http://www.gohrt.com/dashboard/) Each "dial" has backup data and individual metrics down to individual routes/services. Red, yellow, green are calibrated to the targets for each individual metric