

Toronto Transit Commission

Report No.

Meeting Date: November 14, 2007

Subject: Information Technology Services' Strategic Direction

Recommendation

It is recommended that the Commission receive this report for information, noting that staffing changes and project information being referenced in this report have been factored into the 2008 Operating and 2008-20012 Capital Budgets. They will continue to be reflected in future budget submissions.

Background

During the lead up to Y2K, the Commission's Information Technology Services Department established a plan which reviewed and prioritized the current applications in operation supporting the business for the TTC. As a result of this review, it was determined that the prudent way forward was to turn off some systems and patch the others. Many of the current applications are extremely old however; patching the systems ensured the TTC would be able to function past Y2K, while a more comprehensive plan and schedule for system review and possible change out could be conducted on a managed basis.

The following chart indicates the current age of the Commission's major systems:

- Communication Information System (CIS) 24 years
- Materials Management System (MMS)
- Inventory module 18 years
- Purchasing module 18 years
- Accounts Payable module 11 years
- Financial Systems
- General Ledger (GL) 24 years
- Job Based Cost System (JBCS) 34 years
- Human Resources 27 years
- Payroll 27 years
- Plant Maintenance Scheduling (PMS) 10 years
- Vehicle Maintenance Systems
- VMS 15 years
- SMS 22 years
- Ticket Ordering & Purchasing System (TOPS) 15 years
- Divisional Operations Support System – Replacing ATOS 11 years
- Wheel Trans Information System (WTIS) 14 years

Staff recognizes that the patching approach only bought some time. However, the major systems continue to age, with technology support becoming problematical in some areas and business demands for the systems increasing. To better determine which applications were in need of replacement on a prioritized basis, a Technology Advisory Council (TAC) was established. Comprised of 14 Operations' Managers and Chaired by the Chief Information Officer, this group successfully evaluated the current major applications' factoring in technical supportability and business requirements. A plan was then established in 2001 and has formed the basis for the 10 year ITS Capital Budget. TAC members meet on an annual basis to re-assess the current strategy and systems priority thus ensuring ITS activities are applied appropriately to best meet the business needs of the organization.

Within the ITS Department, since 2001, staff have concentrated on providing technical standards and stability for the information technology environment. This has involved the application of Quality Assurance Principles; Technical Evaluations; Systems Security; User Communications on needs and problems; Daily Systems Support; Standards and Procedures and the establishment of a sound overall Strategic Direction for the Department. As a result of these activities significant improvements in the function and support for the Commission's IT investment have occurred. In this regard, most recently, the ITS Department has been recognized by the National Quality Institute of Canada (NQI), for its management and sound business practices, by being presented with the Gold Award for Excellence. NQI is an independent, not-for-profit organization committed to advancing excellence across Canada. Her Excellency, the Right Honourable Michaëlle Jean - Governor General for Canada, is the patron for this organization.

Discussion

Information Technology Strategic Direction:

In 2000, the Commission had just completed an extensive effort to prepare for Millennium Rollover – the infamous Y2K issue. Many Commission systems were “patched” to allow them to continue to function after December 31st 1999. Some smaller systems, such as desktop productivity aids (word processing, spreadsheets, etc) were replaced, but the aging core systems (ex. Payroll, Inventory) which support the Commission's operations were retained.

While this approach allowed the Commission's information technology assets to continue functioning, it did not provide improvements in the quality, level of integration or maintainability of these assets. In recognition of the need for improvement, a five-year Information Technology Strategic Plan was developed to guide the Commission's deployment of Information Technology.

The team of consultants engaged to prepare the IT Strategic Plan in 2000 made three “diagnostic conclusions”:

- “The IT infrastructure and applications need to be systematically replaced and life cycle investment planned”.
- “A strategic IT investment process should be implemented”.
- “An IT organization that can deliver the IT capital program should be put in place”.

Since 2000, the Commission has made significant progress in implementing some of these recommendations and less progress in others.

Recommendation	Achievement
1. Provide high speed, corporate wide access to IT systems	• Significant progress made
2. Provide a secure network infrastructure	• Significant progress made
3. Eliminate competing or obsolete technologies	• Some progress made
4. Manage data as a valuable corporate asset	• Limited progress made
5. Buy, not build, best-of-breed integrated application suites	• Good progress made
6. Establish an infrastructure that ensures business continuity	• Significant progress made
7. Continuous, cost effective improvements to the quality of IT service delivery	• Significant progress made

2006 Strategic Approach:

The Commission's information technology investment decisions need to be guided by the following principles:

- Maintain existing functionality in good operating condition before adding new functionality.
- Accept partial solutions if they represent a higher probability of successful implementation and/or a lower cost.
- Use established technology. Do not invent.
- Spend on analysis and planning before investing to ensure that impacts are adequately assessed.
- Accept business cases for replacement efforts that are not necessarily predicated on cost reductions.
- Accept that some assets will be kept longer than industry standard (but),
- Keep the asset base reasonably current – avoid reliance on orphans and museum pieces.
- Invest preferentially in cost reduction initiatives.

Lifecycle Management:

Major assets (or asset groups) need to be assessed regularly to determine where they fall in the technical lifecycle discussed in chapter 3. This assessment must consider the asset's functionality, maintainability, reliability, associated risks and costs. The assessment will result in the asset being assigned one of three lifecycle categories:

Status Quo

The asset generally meets current and near term (within the next 2 years, for example) needs and requires only standard maintenance support.

Enhance/Overhaul

The asset is beginning to fall behind in meeting current and near term needs, but is still a viable option if a significant investment in service life extension is made.

Replace/Retire

The asset is failing to meet current needs or has become too costly or difficult to operate and maintain. Changes to the asset should be frozen, and an exit strategy developed. The exit strategy should specify targeted out-of-service date, probable replacement solution(s), dependencies or other implications of retirement and begin the planning and budgeting process.

A “normal” timeline for this analysis is ten years, with replacement planning beginning in year eight. In some cases the timeline might be much shorter, especially in situations where outside forces drive decision making (an example might be Microsoft’s regular replacement of desktop software versions). Some assets may last much longer.

A Note on “System Replacement”:

The term “system replacement” typically brings to mind huge projects with a significant culture shock component. These projects have typically been approached with the same basic plan as a furniture replacement: purchase the new sofa, deliver the new sofa, and remove the old sofa. Consider a rail replacement program run along these lines: purchase 60 kilometers of new rail, lay 60 kilometers of new rail, switch service to new rail, remove 60 kilometers of old rail. Obviously, the disruption would be completely unacceptable.

While replacement efforts require a competent overall plan, they need not be implemented as a “big bang”. The components of the existing system must be analyzed to determine which are in need of immediate attention and which can wait. Appropriate scaffolding that would allow new components to work with the existing pieces should be put in place. The scaffolding can then be removed as new pieces are implemented. There will be additional costs for the scaffolding, but the savings in disruption should compensate.

Whenever possible, “system replacement” should be viewed as a goal, rather than an event.

Preferred Solutions:

Some solutions to information technology problems have historically proven to have the highest probability of success. In most cases, the choice of solutions falls into the following hierarchy of desirability:

1. Expansion of Current Facility

The fastest and least risky solution approach is to expand the use of an existing solution. An example of this approach would be adding a new section or department to an existing application. This approach reduces the number of unknowns in the implementation effort and simplifies ongoing operation and maintenance. It can also significantly reduce the training burden and allow transferred staff to become productive quickly.

Note that this approach applies to specific solutions that have already been implemented within the Commission. It should not be interpreted as a “carte blanche” to select additional products from a given vendor beyond those already installed.

2. Vanilla Commercial Off The Shelf (COTS)

If existing facilities cannot be expanded to meet a business need, the next most preferable solution would be to select a commercial product and use it as sold by the vendor (i.e. the vanilla version). Some configuration of commercial products is usually required and should be expected.

Extensive modification of commercial products should be viewed as a custom development project with the attendant increased risks, increased costs and future maintenance issues.

3. External Custom Development

In some cases, there is no available commercial product that meets requirements. In this case, an external expert may be engaged to develop a custom solution. Such an external expert should always have a demonstrated history of developing similar solutions. The deliverable of such a contract should be a complete, working solution plus appropriate knowledge transfer to internal staff, and where appropriate, ongoing maintenance. This alternative does not encompass the engagement of temporary technical assistance working under the direction of TTC staff.

4. Internal Custom Development

Except in the case of small bodies of work, custom solution development by internal resources should be the solution of last resort. This approach offers the highest risks, longest lead times and highest maintenance burden. In the absence of an established custom development workforce, it also draws resources away from their regular duties.

Other Solutions:

Another approach that may be appropriate in certain circumstances is the use of an external service provider. In this case the vendor delivers a service on an ongoing basis (ex. payroll processing) rather than a product (ex. payroll software).

This approach has implications far beyond the technical arena, and would need to be considered on a case by case basis. For example, the Province’s plans for the GTA Fare System call for high levels of contracting out for fare collection activities.

Life Cycle Reviews of Current Systems:

An evolving process has developed in I.T.S since 2001 for evaluating the current effectiveness of a system, both from a technical and business requirements perspective.

The factors involved in this evaluation are:

	Factor	Measurement
1	Performance	Is the application operating according to business needs / technical specifications
2	Stability	Can the application be counted on to run as required to meet business demands
3	Maintenance	Can the application be appropriately maintained with current technical skills and hardware availability
4	Internal Support	Are unique and specialized support requirements needed to keep the application functioning.
5	Vendor Support	Is vendor support readily available for the application in the industry
6	Incident Reports	What types and frequency of problems are being reported against the application
7	Security	Can the application be operated securely in today's environment of hackers and viruses
8	Administration of Data	Are unique and special requirements needed to maintain the data generated by the application
9	Technical Support	Are there any special technical requirement needed to keep the application running.
10	Reporting Capabilities	Can the application provide the necessary reports from data to meet the business needs
11	User Knowledge	Are there any unique and special requirements by the user in order to use the application
12	Improvements	What improvements are being requested by either the business or the technical areas for the application
13	Request for Service / Upgrades	What necessary service or system upgrades are pending or outstanding for the application

Using these factors, ITS have evaluated the major legacy systems currently in operation and have established its Capital Budget plan on the results of the reviews. As a result, the following timetable for systems changes / replacement or further life cycle reviews has been created to ensure a State of Good Repair is maintained for our major systems:

SYSTEM NAME	INITIAL LIFE CYCLE REVIEW	COMPLETION OF CURRENT WORK	NEW LIFE CYCLE REVIEW PLANNED	CURRENT WORK (FIGURES IN \$MILLION)	SYSTEM REPLACEMENT COSTS (FIGURES IN \$MILLION)
	DONE				
CIS	2002	2012	2020	\$12	\$90
MMS	2004	2010	2018	\$18	*
VWO	2001	2010	2018	\$25	*
FMMS	2001	2009	2017	\$ 7	*
DOSS	1998	2009	2017	\$10	*
WTIS	2004	2009	2017	\$ 4	\$10
FIN. SUITE	2006	2010	2012	\$ 7	\$28

- Replacement of system accomplished under “Current Work”

Full replacement of all these applications will cost in the range of \$185M over the next 10 to 20 years. Due to the complexities of changing out major applications it is not possible to replace all the systems simultaneously.

The CIS project is an example where the Life Cycle Review indicated to staff that the current functionality of the application was sufficient to meet the needs of the Commission. However, several changes and upgrades, such as the move of emergency communications back-up support from analogue to digital cellular, and replacement of the current ‘sign-post’ technology with GPS for vehicle tracking, were technically necessary to maintain the system in a state of good repair. The costs of the upgrades are projected to be \$12M, compared with approximately \$90M+ to replace the system outright, giving the Commission a working system that should be supportable until 2020, at a significantly lower cost.

Similarly, the life cycle review of the TTC Financial Systems showed that although the technology was old and not user friendly, the core business requirements for the application were still being met. With some technical enhancements, these ‘workhorse’ applications (enormous volumes of transactions) will be able to function for several more years at considerably less cost than outright replacement would call for. Because these applications are critical, where normally a life cycle review would commence in year 8 of an applications life, which would mean 2016, staff will do an earlier life cycle review in 2012.

It should be noted that major projects such as DOSS and the VWO, which are both purchased from vendors but requiring customization, have proven to be much more complicated, requiring a larger effort from the user departments, and costing considerably more than originally thought. These experiences have shown a portent of what we can anticipate with future major application replacement initiatives. It is for this reason that the processes, procedures and methodologies, which are detailed further in this report, are essential to moving forward with any future major projects.

The ITS Capital Budget includes initiatives for “Current Work” activities. Provision has also been made, post 10 years, for those items that are not currently scheduled for major replacement. Future budget submissions will incorporate the “New Life Cycle Review Planned” timelines and potential cost implications to ensure a clear understanding by all as to what may be required in the outer years for appropriate IT systems support / replacement.

Project Management:

Closely connected with the Life Cycle Management of the ITS infrastructure and applications support is the manner in which changes are implemented. In 2001 an initial project plan was established by the Technology Advisory Council which was then left to the ITS Department to act upon.

A Project Management Office was established in ITS in 2002 to appropriately manage the implementation process for the identified IT project initiatives. A “Project Methodology” document was created to assist in this regard, providing industry standards that must be adopted as the organization moves forward, while also taking into account many of the unique situations and requirements of the TTC. This document has continued to be refined, as lessons are learned from experiences of current projects, which are then being applied to new undertakings. Common factors have been determined exist for all major IT initiatives which are: they tend to be very complex, involving multiple modules, affecting several users across the various departments in the organization. Further, in view of the increasing demands and reliance on technology solutions in the world today, TTC staff is looking for changes and improvements in the current suite of applications to better facilitate their ability to quickly and effectively respond to the needs of the organization.

Several other initiatives and requirements have also been put in place. All current Project Managers in the ITS Department are certified by the Project Management Institute (PMI) as Project Management Professionals (PMP). This facilitates a common basis for all to move forward with TTC related initiatives. This requirement has now been established as a job requirement for all future IT Services Project Managers.

Further, the ITS Department has undertaken an internal program to clearly establish working relations / processes. This has manifested itself through the creation of a matrix under the title Accountability, Responsibility, Consulting and Informed or ARCI. Through this process, the 5 major sections of the department have participated in determining at which stage of a project, various persons, groups of persons or sections have a role to play in the successful review and roll-out of an application. This entails everything from the initial Project Identification, through the Feasibility Study phase to the Implementation and Ongoing Support phases.

A critical component for successful technological project implementation is appropriate testing practices. Testing principles have been applied and refined in ITS, based upon industry best

practices, to help ensure an application is properly vetted for bugs and operational issues prior to it being introduced into production. This is a critical component in ensuring the business needs of the TTC are not compromised through the introduction of new / replacement technology.

Due to the significant investment of time and resources associated with related projects, the ITS Department invited representatives from the Gartner Group, a group comprised of experts in the IT industry, to evaluate some of our major Project initiatives and activities. Staff received feedback from the Gartner representatives that the TTC programmes fit well within those expected and accepted within the industry.

A representative from our Internal Audit Department also participates on the various project Steering Committees to help ensure up-front diligence to plans, processes and fiduciary responsibilities. All the above methodologies, programmes and processes have been reviewed and endorsed by the TTC Internal Audit Department as being appropriate.

Project Estimating:

Staff in ITS recently has been working to improve the level of project estimation being applied to their related initiatives. Prior to 2001 very rudimentary estimations were being made as to project costs. Since that time, staff has developed standard templates for the valuation of effort and support for a Project, not only for implementation but also for ongoing support costs. However, better refinements to this level of estimation were still required.

As such, an internal project has been undertaken, lead by a Project Manager with specific expertise in this area, in order to improve the accuracy of Project estimations. The plan calls for the introduction of consistent and standard approaches to determining costs through the introduction of a software tool. This tool will help ensure that all are compelled to follow the same process for cost determination and also improve the project scheduling aspect. All Project Managers receive training, not only on the use of the tools but on the structured approach to cost estimation techniques.

Workforce Review:

Commencing in 2002, staff identified the need for augmented skill requirements for Project related work. In order to obtain the necessary skill sets, arrangements were made to establish a series of 8 contracts with vendors to supply technical expertise to ITS. These contacts have permitted ready access to the market for the needed skills, normally for short duration.

However, some lessons have been learned over the years, such as:

- Some skills are common among Projects
- Some contractors are being rehired from Project to Project
- Continuity of skills between Projects and post Project support are missing
- Skills learned by the contractors acquired while working on the Project leave the Organization when the contractor leaves

All these factors have led ITS Management to reconsider the method for some staffing of Projects. In 2007, as part of the 2007 ITS Operating Budget Goals and Objectives which were developed in the spring of 2006, a detailed workforce review was provided for, to not only look at the contractor situation in more detail, but to fundamentally review the Department's resource alignment for the strategic direction of the department. Internally to assist with this review process, staff undertook a zero based budget approach, rolling up and assessing all necessary work requirements and determining the time / resource requirements to accomplish them. As well, the Directors reviewed the future technological demands they anticipated the department will face over the next 5 – 10 years, with newer technology coming into the organization through systems' upgrades and replacements. Finally, to assist staff in the overall review, an outside consultant firm, Compass, was hired.

Compass maintains a database of I.T. skills and organization structures gathered from throughout North America. They were contracted to conduct a review of the current resources and skills currently in place in the ITS Department and compare it against their database.

Key findings from the Compass review were:

- A number of contractors were augmenting the IT projects – consideration should be given to replacing some of these resources by hiring employees.
- The overall structure and allocation of the Department was generally in line with the industry – some opportunities for re-allocation of resources between areas should be explored.
- The full time equivalent (FTE) staffing of the Department was in line with the industry – noting this was only accomplished by considering contractor resources as FTE (i.e.: ITS approved workforce is 150 – Compass suggests this should be in the range of 200).
- There were opportunities for outsourcing some work done within the department.

Based upon all the reviews, ITS have now incorporated a plan in the 2008 budget that calls for commencing the conversion of up to 36 contractor positions into regular staff positions. It is anticipated that it will take up to 2.5 years for the full conversion to be completed, as the integrity of work requirements on current projects must be maintained. Consideration was given to hiring of temporary or contract employee resources. However, in view of the salary differential between an employee and a contractor, it was not deemed likely that a skilled contractor would give up their current lucrative arrangement for a temporary contract job offer.

A period of overlap of the contractor with the newly hired employees has been factored into the conversion plan as well to allow for information exchange on Project activities before the contractor is released. It is projected that the conversion program will result in a net budget reduction of \$200K in 2008, eventually rolling up to approximately \$1.5M (\$1.2M Capital and \$300K Operating) over time.

The approach being taken will allow for assessments on the expected benefits from the conversion process. Should these benefits not be forthcoming, staff will stop the process and re-assess. Further, for any future IT Project initiatives, consideration will be undertaken up front to determine if the necessary skills requirement are best met by a contract position or through the hiring of an employee. Again, this will be undertaken prudently to ensure any proposed increase to staff is necessary and sustainable for the long term and not to meet an immediate skills shortfall.

As well, some minor re-allocation of staff resources between sections to better align the skills within the department, as recommended by Compass, have been incorporated into the 2008 budget. No net workforce increase results from these changes.

Conclusion:

In conclusion, the strategic direction for the ITS Department has been clearly established, providing the groundwork for continuing to move the Department forward in the best interests of the Commission. ITS Management will continue to assess and refine the current program, methodologies and practices as deemed appropriate.

A formal update to the strategic direction for the Department is planned for 2011. A report on the outcome from this next level of deliberations will be provided to the Commission at that time.

October 31, 2007

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