

APPENDIX 1

GOVERNANCE AND MANAGEMENT OF CITY COMPUTER SOFTWARE NEEDS IMPROVEMENT

January 7, 2011



Auditor General's Office

Jeffrey Griffiths, C.A., C.F.E.
Auditor General
City of Toronto

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
BACKGROUND	4
AUDIT OBJECTIVES, SCOPE AND METHODOLOGY.....	6
AUDIT RESULTS.....	7
A. GOVERNANCE, RISK AND COMPLIANCE PRACTICES NEED STRENGTHENING	7
A.1 Centralize Oversight of Software Management.....	8
A.2 Software Asset Management Plan Should Be Developed	10
A.3 Software License Compliance Risks Need to Be Assessed	11
A.4 Policies and Procedures Are Incomplete.....	11
B. INVENTORY PRACTICES NEED IMPROVEMENT	12
B.1 Lessons Learned Need to Be Applied	12
B.2 Standard Inventory Practices Do Not Exist.....	14
C. MANAGEMENT OF SOFTWARE AGREEMENTS REQUIRES IMPROVEMENT	15
C.1 Non-Compliance With City Manager Directive	15
C.2 Software Contract Management Practices Not Promoted.....	16
C.3 Compliance With Software Agreement Terms Not Verified.....	17
D. ACCESS RIGHTS TO INSTALL SOFTWARE NEEDS REVIEW	18
CONCLUSION.....	19

EXECUTIVE SUMMARY

Software is a form of intellectual property and infringement of copyright can carry severe penalties

This review relates to the City's management of computer software licensing. Computer software is a form of intellectual property and protected by copyright laws. Infringement of copyright laws involving computer software can result in severe financial penalties. Commercially available computer software comes with a licensing agreement specifically stating the terms and conditions under which the software may be legally used.

In 2010, the City spent \$2.4 million on new software and \$22 million for maintenance and support of existing software

City hardware and software licenses have a replacement value of over \$100 million. In 2010, the City spent approximately \$2.4 million on new software and \$22 million for ongoing maintenance and support for existing software.

The challenges in managing software licenses in a large organization providing a wide variety of services are many. Maintaining compliance with licensing agreements and balancing the number of licenses and license costs are but a few of the challenges the City faces. The City maintains many computer systems and is constantly adding to its software inventory to meet the operational needs of City staff as well as the public.

Results of recent software audits carried out by software suppliers

Recently reported incidents of illegal software use are an indicator that non-compliance with software licensing agreements is an organizational risk. A recent example of financial penalties for software license infringement in Canada pertain to a school district. The school district was fined in the amount of almost \$200,000.

Although illegal use of software was not detected in our selected sample of software usage there is a need to improve management control practices.

Common risks associated with use of software

Common risks associated with the use of software include:

- Excessive software
- Excessive software license costs including maintenance
- Lack of sufficient licenses to meet operational needs
- Non-compliance with software agreements resulting in financial penalties
- Reputational damage

Compliance with generally accepted software asset management practices helps reduce these risks.

The objective of this audit was to determine what steps the City has taken to address risks related to information technology software owned by the City.

Strengthen Oversight of Software Management

From a governance perspective, the City needs to take a more assertive approach to purchasing, managing and overseeing the development and implementation of City software. City Divisions should be required to follow software management standards established by the Chief Information Officer. Exceptions to these standards should follow a generally accepted review process within the overall information technology governance framework.

No single point of authority to manage software

As responsibilities and processes exist in the City today, there is no single point of authority to ensure a City-wide program exists to manage software.

Steps should be taken to ensure software management undertaken by all divisions is consistent with the City's information technology governance framework.

City ABCCs manage software independently

City Agencies, Boards, Commissions and Corporations such as the Toronto Police Service and the Toronto Transit Commission independently manage and purchase information technology software.

The Auditor General in a number of previous Information Technology related reviews has commented on the need for a closer working relationship between the City and its Agencies, Boards, Commissions and Corporations. While the Chief Information Officer and the City Manager have limited authority at these entities, steps need to be taken to develop closer co-operation in terms of software sharing and software management standards and practices.

Mayor's Fiscal Review Panel recommended more coordination with ABCC's

Further, in February 2008, the then Mayor's Fiscal Review Panel report entitled "Blueprint for Fiscal Stability and Economic Prosperity – a Call to Action" includes a recommendation related to improving the alignment, cooperation and increased oversight of the City's Agencies, Boards, Commissions and Corporations. The Review Panel report further states that such a process would lead to opportunities for savings and joint initiatives.

Aligning City Divisions with Corporate software management practices should be regularly considered with a long term view toward aligning practices of the Agencies, Boards, Commissions and Corporations.

Comprehensive Governance Plan Needed for Managing City Software

Little City-wide oversight, leadership or guidance provided

Improvements to the City's software management program are required. Currently, there is little City-wide oversight, leadership, or guidance provided to divisions related to software management.

City-wide software governance plan doesn't exist

A comprehensive governance plan for managing City-wide computer software does not exist. City efforts have focused primarily on hardware assets with little attention to software license management.

Greater focus on software license management and compliance needed

The City Information and Technology Division manage software used across divisional lines such as SAP and GroupWise. City divisions and all of the City's Agencies, Boards, Commissions and Corporations use their own in-house expertise to manage specialized software designed to fulfill the unique needs of their respective organizations.

A comprehensive plan for managing computer software should be developed

The City should develop a comprehensive software governance plan to address the Information and Technology Division's overall program for acquiring and managing computer software used throughout the City. The plan should provide for increased focus on coordinating City-wide and divisional software license management and compliance throughout the City.

Other areas needing improvement

Our review identified several other areas pertaining to software license management requiring management attention. These include:

- Software asset management plan does not exist
- Software license compliance risks need to be assessed
- Software policies and procedures are not complete
- Software inventory practices need improvement
- Management of software agreements need strengthening
- Access rights to install software needs review

Report contains 14 recommendations

Implementation of the 14 recommendations contained in this report will align City processes more closely with best practices related to computer software management, increase efficiency, and improve management control.

Strengthening software management practices will avoid excessive and wasteful spending and prevent potentially severe financial penalties for non-compliance with license agreements.

All City divisions and major City Agencies, Boards, Commissions and Corporations should review these recommendations for relevance to their organizations.

BACKGROUND

City hardware and software licenses have a replacement value of over \$100 million. In 2010, the City spent approximately \$2.4 million on new software and \$22 million for ongoing maintenance and support for existing software.

***City Council
adopted an ITAM
Strategy in 2005***

In 2005, City Council adopted an Information Technology Asset Management (ITAM) Strategy. The purpose of the Strategy was to take steps toward achieving the best possible match of information technology assets with City service demands while simultaneously reducing long-term costs and establishing accountability for technology assets.

The objectives of the Information Technology Asset Management Strategy were to ensure:

- proper hardware and software inventory control
- compliance with hardware and software license agreements
- proper financial management of IT assets
- compliance with IT standards
- IT assets provided expected benefits

***License terms and
conditions
stipulate how the
City can use
software***

A software license is an agreement between the software supplier and the City stipulating how the City can use the software. Software license agreements can vary in type. For example, some software installed on multiple computers may be limited to only one use at a time. Others may be installed on only one computer.

***Software licensing
agreements
contain a number
of terms and
conditions***

Typically, most software license agreements include:

- scope of the agreement
- user rights and permissions
- ownership rights
- warranty and liability items
- length of agreement
- renewal options
- costs and compensation
- confidentiality
- regulatory compliance

Software licensing agreements often contain a clause allowing the supplier to conduct a periodic audit of purchaser software use to verify compliance with licensing terms and conditions. In addition, many agreements also include a provision for an independent third party to hold in trust a copy of the latest software release.

The Information and Technology Division manages general use software but not division-specific software

The City Information and Technology Division manages general use software such as SAP and the GroupWise email system. Divisional information technology staff manage the administration of division-specific software. Likewise, Agencies, Boards, Commissions and Corporations manage their own software.

Examples of division-specific software include the priority dispatch system used by EMS and Toronto Water's industrial control computer systems that monitor and control industrial, infrastructure, or facility-based processes commonly known as PCS/SCADA systems.

AUDIT OBJECTIVES, SCOPE AND METHODOLOGY

Why we conducted this audit

The Auditor General's 2010 Audit Work Plan included a review of software licensing management. The area was selected for audit due to the significant annual costs spent on software purchases and associated maintenance and risks related to the complexity of software agreements, the increase in the number of software compliance audits conducted by software suppliers, and a number of reports indicating software compliance is a challenge for many organizations.

Audit Objective

The objective of this audit was to determine what steps the City has taken to address risks related to information technology software owned by the City. Specific areas reviewed include analysis of existing software related policies, general management and operational practices in effect, and safeguards used to ensure compliance with software licensing agreements.

Audit Scope

Our review focused on management practices of the Information and Technology Division and an assessment of the purchase and management of software licenses administered by Emergency Medical Services, Fire Services, Employment and Social Services, Toronto Public Health and Toronto Water.

The audit covered the period from January 1, 2009 to September 30, 2010.

Compliance with generally accepted government auditing standards

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence that provides a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

AUDIT RESULTS

A. GOVERNANCE, RISK AND COMPLIANCE PRACTICES NEED STRENGTHENING

2005 Council adopted an ITAM Strategy

In 2005, Council adopted an Information Technology Asset Management (ITAM) Strategy. The purpose of the Strategy was to take steps to ensure appropriate information technology assets are used in meeting City service demands, while simultaneously reducing long-term information technology costs and establishing accountability for technology assets.

Implementation of the ITAM Program less than successful

Since inception of the strategy in 2005, management has not taken significant action to implement an overall software management strategy. Management's focus has been on installing and maintaining computer hardware and implementing computer systems. As such very little has taken place to implement the Strategy from a software management perspective.

The Chief Information Officer needs to take a more assertive approach to managing and overseeing the purchase, use, maintenance and disposal of computer software. Improvements are needed in the governance, management and administration of City software assets. Management pays significant attention to computer hardware resources, however little attention is given to City-wide software management.

A.1 Centralize Oversight of Software Management

Software management crosses divisional lines

Information technology software management crosses divisional lines. Software management includes establishing roles, responsibilities, accountability, maintaining accurate inventory records, ensuring compliance with license agreements and making cost effective decisions in allocating software use.

No single point of authority exists to ensure a coordinated City-wide program

As responsibilities and processes exist in the City today there is no single point of authority to ensure a City-wide program exists to direct, guide and bring accountability to managing software.

The current governance model mandates that the Chief Information Officer provide leadership for City-wide software but not division-specific software. This results in independent and inconsistent divisional software management practices.

Controls over software vary from division to division

Control exercised over software assets vary from division to division. For example we noted differences in documentation retained to support evidence of proof of purchase, differences in inventory practices, and differences in the degree of usage monitoring for license compliance. In many cases, divisions do not reconcile actual software use to the number of software licenses purchased.

“Community of practice” approach is promoted

The Chief Information Officer currently promotes a “community of practice” approach to encourage divisions to identify common needs, develop common requirements and implement shared solutions.

“Community of practice” provides no authority or accountability

This method encourages divisions to apply consistent management practices, but doesn’t provide the Chief Information Officer with the authority or accountability to ensure consistent application of software practices throughout the City. Consequently, software management practices vary significantly.

Further work needed to clarify the mandate, role and responsibility of the Chief Information Officer

The final report on the City's Information Technology Governance and Organization Design Review issued in 2006 recommended that the City address and align the mandate and leadership for information technology across the City. Further work is required to clarify the mandate, role and responsibility of the Chief Information Officer with regard to City software management. Such roles and responsibilities would include defining software management policies and practices related to governance, accountability, transparency and oversight. For such a program to be effective divisions must adopt and align software management practices with Corporate guidelines and direction established by the Chief Information Officer.

Recommendation:

- 1. The City Manager provide clarification to City divisional management regarding the role and responsibility of the Chief Information Officer as the single point of authority for managing City-wide and division-specific software.**

While we appreciate that the Chief Information Officer currently has no authority over the City's Agencies, Boards, Commissions and Corporations, there are ongoing opportunities for cost savings in regard to the coordination of software purchases and management practices with each of these entities. While we have not reviewed the management of software at the Agencies, Boards, Commissions and Corporations, there is a need at the City Manager level to at least review and consider the potential for closer coordination between the City and each one of these entities.

This issue has been raised in previous audit reports as well as the Mayor's Fiscal Review Panel, but at the moment progress has been limited. We suggest that in view of potential cost savings this matter be given priority.

Recommendation:

- 2. The City Manager, in consultation with the Chief Information Officer and the City’s Agencies, Boards, Commissions and Corporations, review the need for the development of closer coordination in the acquisition and management of software. Closer coordination with the Agencies, Boards, Commissions and Corporations has the potential for significant cost savings.**

A.2 Software Asset Management Plan Should Be Developed

Software Asset Management Plan is needed

A City-wide software management plan does not exist. Such a plan establishes policies, procedures, practices, and organizational responsibilities for City computer software. The plan also strengthens coordination with the City Information and Technology Division and divisional users and ensures software purchases are:

- cost effective
- necessary
- avoid duplication
- comply with licensing agreements

Without a guiding plan, it is difficult to manage software purchases, compliance with licensing agreements, software maintenance and disposal.

Software management practices have not been effective

Management practices have not been effective in managing software assets. The lack of effective software management practices has resulted in incomplete software inventory records, limited monitoring of software usage, and an absence of software license compliance monitoring.

Recommendation:

- 3. The Chief Information Officer prepare a Software Asset Management Plan. Such plan to address the role of information technology governance committees, accountability, policies, procedures, practices and divisional coordination related to managing software.**

A.3 Software License Compliance Risk Needs to Be Assessed

The Information and Technology Division has a mandate to conduct periodic risk assessments

The Information and Technology Division has a mandate to ensure a process is in place to identify, assess and implement measures to reduce or eliminate software asset related risks. This mandate includes providing City-wide direction to ensure compliance and consistency with internal controls, to determine risks related to regulatory compliance, and to develop strategies to reduce identified risks.

Our sample review of software usage did not detect illegal use of software. However, we did observe a number of weaknesses in management control practices, including limited monitoring of software usage, lack of a software license inventory, and no reconciliation of software purchased to software actually installed on City computers.

The absence of these controls increases the City's exposure to financial penalties in the event of an external software audit.

Recommendation:

- 4. The Chief Information Officer ensure the City Information Technology Risk Management Program includes a periodic risk assessment to identify, assess and implement processes to address software related risk.**

A.4 Policies and Procedures Are Incomplete

Need to enhance existing City policies and procedures

Policy, procedure and guideline management should be consistent with governance, risk and compliance. City policies and procedures need strengthening in order to improve management control over City software assets.

Corporate purchasing policies and procedures for acquiring software and the City's *Acceptable Use* policy are examples of where management has been proactive. However, there are a number of areas such as inventory management, software license compliance, vendor and contract management, and security management where divisional and Corporate responsibility are not clearly defined and documented processes do not exist.

Additional policies with a common set of procedures are required to promote accountability and consistent use of software management practices to protect the City's investment in software assets.

Recommendation:

5. **The Chief Information Officer review existing City information technology related policies, procedures and software asset management best practices. Additional policies, procedures and processes should be implemented where needed, to ensure City software is managed in a consistent, cost-effective and controlled manner.**

B. INVENTORY PRACTICES NEED IMPROVEMENT

Inventory control is important in enabling sound financial and technology decisions

The City's Sustainment Program was established to manage information technology assets from acquisition to disposal. The Program identifies inventory control as necessary to ensure software assets are purchased as needed, are in use and accounted for. The Sustainment Program considers fully accountable inventory control a critical factor in making good financial and technology decisions.

B.1 Lessons Learned Need to Be Applied

In 2006 management assigned top priority to implement an enterprise IT Asset Management system

In 2006 management assigned a high priority to implementing an enterprise Information Technology Asset Management System. The system would enhance control over City owned information technology assets by allowing management to track IT assets including software from a physical, financial and contract management perspective through the software life cycle. Such a system would also provide a reconciliation process between authorized software and actual software used by City staff.

Data related to software assets on IT Asset Management system are incomplete, outdated and unreliable

Software information contained in the Information Technology Asset Management System was incomplete, outdated and unreliable for making management decisions. The lack of an effective and reliable City-wide inventory of approved software licenses purchased is a significant barrier to exercising sound management control over City software assets. A complete and accurate inventory is essential for an accurate accounting of software purchased and ensuring software license compliance.

In 2010 City Council provided management with the authority to obtain the necessary hardware, software and required software maintenance over the next five years to implement the 2005 City Council adopted Information Technology Asset Management Strategy.

Additional \$1.35 million needed to replace the current IT Asset Management System implemented in 2006

According to management, this will cost an additional \$1.35 million. This system will replace the previous information technology asset management system implemented in 2006.

The system developed in 2006 was implemented without formal operational processes or established roles, responsibilities and accountability necessary to maintain data in the system. In addition, the system was never rolled out to City divisions. Consequently, management's expectation to have a fully functioning system to track and manage information technology assets throughout the City was not achieved.

Management should leverage lessons learned from the previous experience and increase the likelihood of a successful system implementation by ensuring:

- management supports City-wide system use
- clear and measurable project goals are documented
- availability of resources necessary to enter and maintain data on the system
- processes exist to maintain the reliability of system information.

The City's Business Advisory Panel provides governance and advisory guidance for information technology projects designed, developed and implemented across the City. Specifically, the Business Advisory Panel provides strategic direction, establishes business priorities and guides City investment in information and technology. Steps should be taken to ensure the Business Advisory Panel is provided regular progress reports on the implementation of the City's Information Technology Asset Management System.

Recommendations:

- 6. The Chief Information Officer determine resources and processes necessary to update and maintain the Information Technology Asset Management System prior to implementation.**
- 7. The Chief Information Officer ensure project goals, benefits and expectations for the Information Technology Asset Management System are clear, measurable and documented.**
- 8. The Chief Information Officer provide regular reports to the Business Advisory Panel on project progress.**

B.2 Standard Inventory Practices Do Not Exist

Divisional inventory practices vary

A central software inventory system does not exist. Some divisions maintain inventory records for software license agreements under their control, while other divisions do not. There is no standard approach with respect to inventory practices carried out at the division level.

Although a new information technology asset management system is scheduled to be implemented in 2012, development of interim standard inventory practices will help align City-wide practices when the new information technology asset management system is implemented.

Recommendation:

- 9. The Chief Information Officer review current practices followed by divisions and take steps to standardize management controls to ensure effective processes are in place to track, reconcile and monitor City-wide software compliance.**

C. MANAGEMENT OF SOFTWARE AGREEMENTS REQUIRES IMPROVEMENT

C.1 Non-Compliance With City Manager Directive

City Manager directive to summarize contract terms and conditions

The City Manager issued a directive in 2007 requiring staff to summarize key contract terms and conditions between the City and vendor.

The required contract summary is designed to reduce the City's risk of:

- contract non-compliance
- incorrect payment of maintenance fees
- late renewal of software maintenance agreements and payments

Terms and conditions are not summarized

Our review of a sample number of contracts indicate key terms and conditions are not extracted and summarized as required by the City Manager's directive. Software license agreements can be lengthy, complex and remain active for a number of years.

Steps should be taken to ensure compliance with the City Manager's directive, and ensure knowledge of key contract terms and conditions.

Recommendation:

10. The City Manager:

- a. communicate to staff regarding the need to comply with the 2007 directive to summarize software license agreement terms and conditions; and**
- b. instruct divisional management to provide contract summaries to the Corporate Information and Technology Division.**

C.2 Software Contract Management Practices Not Promoted

The Information and Technology Division Finance and Administration Unit is responsible for assisting in the purchase and management of information and technology contracts.

A number of software contract management practices not implemented

The Unit has not been able to promote good contract management practices for software license agreements. Specific areas of concern include:

- ensuring software license agreement details are recorded in a reliable contract management system
- ensuring hard copies of signed agreements are held securely in a document management system
- lack of clarity on the type of documentation to be retained
- lack of guidance regarding document storage.

The Unit is currently in the process of preparing a master list of all active software agreements. There were considerable delays in responding to our requests for documentation related to software agreements. Divisional expectations regarding document management and the role of the Finance and Administration Unit are not consistent with actual services provided by the Finance and Administration Unit.

Recommendations:

- 11. The Chief Information Officer develop a plan for the Finance and Administration Unit to effectively promote good contract management practices for software license agreements.**

12. The Chief Information Officer include software management service level expectations in formal service level agreements between operating divisions and the Information and Technology Division.

C.3 Compliance With Software Agreement Terms Not Verified

A number of agreements include software storage and custody arrangements

The City has a number of software license agreements that require the vendor to place a copy of the source code in the custody of a third party. The vendor is also required to provide the third party with a new copy of the source code whenever the software undergoes major changes.

The purpose of this contract requirement is to provide the City with protection in the event the software vendor is unable to continue operations. If a vendor fails to meet its obligation as stipulated in the software license agreement, the contract requirement gives the City the right to obtain the source code held by the third party. In order to protect City interests, the City must ensure the source code stored with the third party is current and usable.

Our review of software license agreements including this requirement indicates further action is required to ensure vendor compliance with this contract provision. Although these contract provisions usually involve custom application software critical to City operations, management does not verify compliance with this contract provision.

Lack of initiative in verifying contract compliance

There is a lack of understanding regarding who is accountable for ensuring compliance with this contract provision. Divisional staff do not have a clear understanding of their accountability in ensuring software contract compliance.

Recommendation:

13. The Chief Information Officer clarify the respective roles and responsibilities of divisional and corporate staff responsible for managing compliance with software agreement provisions.

D. ACCESS RIGHTS TO INSTALL SOFTWARE NEEDS REVIEW

The City maintains over 2,000 software applications and approximately 600 Microsoft servers

To reduce the risk of having unauthorized software on City computers, management limits the number of individuals provided access to install software. The City maintains over 2,000 applications and over 600 Microsoft servers. Each server has from one to six individuals with administrative rights that include the privilege to install software. Individuals with administrative rights have considerable system control.

Individuals with administrative rights have considerable system control

The more individuals with administrative access control, the greater the risk of damage or system downtime. System damage or downtime can be caused by intentional or unintentional error. In either case, steps should be taken to minimize risk through managing and minimizing the number of individuals with administrative access.

No formal procedure for granting administrative rights

There is no formal procedure for granting individuals with administrative rights. We found granting administrative rights is routinely carried out through an exchange of emails between the requesting individual and the system administrator responsible for implementing the request.

The City information technology environment is too large and complex to allow for an informal system for granting system access. A formal procedure for granting administrative rights will strengthen access controls used to manage system access rights and privileges and reduce the risk of unintentional or intentional system damage or downtime.

Recommendations:

- 14. The Chief Information Officer implement:**
 - a. a formal City-wide process for granting system administrative rights and privileges; and**
 - b. formalize a system for reviewing system administrative access rights and privileges on a periodic basis.**

CONCLUSION

This report contains 14 recommendations related to improvements required in the governance, management and administration of City software.

Recommendations made in the report relate to improving governance, leadership and management control over software assets and licenses. Additional effort is required in managing City-wide information related to software the City owns, how it is used and determining whether or not the City is in compliance with software license agreements.

Addressing the recommendations in this report will align City processes more closely with software management best practices, increase efficiency, ensure cost effective purchasing decisions and avoid negative consequences from non-compliance with software license provisions.