Special Report of the
Provincial Auditor of Ontario
to the Legislative Assembly

Year 2000: The Millennium Bug

JUNE 1998

To the Honourable Speaker of the Legislative Assembly

I am pleased to transmit my Special Report on Year 2000: The Millennium Bug for submission to the Assembly in accordance with the provisions of section 12 (1) of the *Audit Act*.

Erik Peters, FCA
Provincial Auditor

June 16, 1998

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YEAR 2000:

THE MILLENNIUM BUG

There has been a considerable amount of media attention and publicity associated with the Year 2000 computer problem or what has been colloquially referred to as the "millennium bug." The bug results from the way dates have historically been recorded in many computer systems. Until the early 1990s, computer programmers often used only two digits to represent the year assuming that the year would be 19xx. Consequently, when a year 2000 date is recorded, the computer will recognize the date as 1900; thus, a year 2001 date will be treated as 1901 and so on. While this problem will not necessarily cause systems to crash, it can cause processing errors and corrupt databases.

The millennium bug affects not only computer programs but also computer hardware, ranging from large mainframes to personal computers, as these often have operating systems and embedded computer chips that are date-sensitive and use a two-digit code to represent the year. These computer chips are also key components in most telephone, fax and other telecommunications equipment and networks as well as in mechanical devices such as elevators, medical equipment and security systems.

Since it pervades all sectors of the Ontario government's operations and has an immovable deadline, fixing the millennium bug may be the most comprehensive information technology management project ever faced by the government. Because of the multitude of ministry programs that affect the day-to-day needs of the citizens of Ontario such as health services, public safety, emergency services and income support, the possible consequence of computer system failure is very serious for the government. Examples of significant systems that ministries must ensure are fixed on time include:

- The computerized ambulance response system which supports ambulance dispatching. As well, any medical equipment in the ambulances (or hospitals for that matter) which contains date-dependent computer chips will need to be Year 2000 compliant.

- The Ontario Municipal and Provincial Police Automation Cooperative system which is used by many municipal police forces and the Ontario Provincial Police to report incidents, dispatch calls and access information from a central database.

- The social assistance income benefits systems which process income support payments of over $400 million per month.

- The vital events registration system which is used to issue documents such as birth certificates that are needed for Ontario Health Insurance Plan coverage and social assistance benefits.

- The maintenance enforcement computerized accounting system used to process family and custody support payments.

- The systems used for monitoring the treatment of waste by sewage treatment facilities.

- The tax collection systems which process revenues amounting to hundreds of millions of dollars monthly.

As each ministry is responsible for ensuring its systems are Year 2000 compliant, the Secretary of Management Board of Cabinet (MBC) wrote to all deputy ministers in August 1996 recommending they begin investigating the Year 2000 problem. Each ministry has appointed a Year 2000 Coordinator, and an inter-ministry Year 2000 Coordination Council was established in late 1996 which meets monthly to share information and to discuss problems and possible solutions. Additionally, Management Board Secretariat (MBS) established a Corporate Year 2000 Project Office in mid-1997 that is responsible for coordinating ministry efforts, managing resource issues and reporting on overall progress to MBC. It also regularly provides status reports to information technology steering committees, made up of a cross section of deputy ministers and assistant deputy ministers.

In December 1997, based on information submitted by the various ministries, MBC approved 63 projects relating to ministry programs as being mission critical. Mission critical projects are defined as those ministry computer systems that are essential to a ministry's operations or its ability to provide service to Ontarians. These projects range in scope from a single desktop system to those with a multitude of components including mainframe systems, networks and desktop systems along with supporting technology infrastructure.

These ministry mission critical projects are being given first priority in the government's overall Year 2000 compliance efforts. MBC also directed ministries to submit a detailed project plan for each mission critical project by January 31, 1998, and set December 31, 1998 as the target date for conversion of all related computer systems including the first stage of system testing.

In March 1998, MBS stated that the Year 2000 problem was a top priority of the government and estimated that total spending between 1998 and May 2000 for both mission critical and all other systems and hardware would range from $200 million to $400 million for direct government programs, with a significant amount being spent in the current year.

OBJECTIVES AND SCOPE OF REVIEW

In view of the potential impact of the Year 2000 problem on the government's operations, our objective was to review the status of the government's Year 2000 efforts and project management process with a focus on the 63 projects defined by the government as being mission critical.

To determine the status of the work done to date on the Year 2000 problem, we sent a detailed questionnaire to all ministries requesting Year 2000 project information on systems that supported ministry programs and operations. We also used information reported by ministries to the MBS Corporate Year 2000 Project Office. We visited seven of the larger ministries to follow up on their responses to our questionnaire and reviewed pertinent documentation. In addition, we had discussions with other ministries and met with their Year 2000 Coordinators

as necessary to discuss certain questionnaire responses or information they had provided to MBS.

We held discussions with representatives of a number of large private and quasi-public sector corporations to discuss their Year 2000 strategies and the key factors they considered critical to successfully managing such a complex project. We also conducted extensive research on Year 2000 project management best practices in the public and private sectors. In addition, we engaged the services of three private sector consultants with expertise in Year 2000 implementation strategies to provide input during the key stages of our review.

While we did not specifically include Crown agencies in the scope of our review, for those agencies where the Provincial Auditor is the appointed auditor, we provided each agency's board of directors with a questionnaire for them to use to monitor Year 2000 compliance activities.

Our work was conducted between November 1997 and March 1998. As such, the information presented in this report is a snapshot of the status of the government's Year 2000 compliance efforts at that time.

Because ministry internal audit units had generally done limited work on the Year 2000 issue, we did not rely on their work for our review.

OVERALL OBSERVATIONS

We believe the government needs to significantly pick up the pace of its Year 2000 compliance efforts. Although we identified a number of sound Year 2000 project management practices which had been implemented, given the scarcity of experienced information technology resources, speeding up Year 2000 compliance efforts will be both difficult and costly and will require top notch technical and project management skills. Senior management attention and support, particularly at the deputy and assistant deputy minister levels, is equally important to ensure that all facets of the Year 2000 problem are appropriately addressed.

For large organizations, our research of Year 2000 best practices in Canada and the United States indicated that code conversion and renovation work should be completed by late summer 1998 to allow sufficient time for the testing of all converted or replaced system components. This much testing lead time is necessary as testing is the most problematic phase of a Year 2000 project and generally takes about 50% of the total time and resources.

As the chart on page 5 illustrates, the government will need to accelerate its efforts to meet this recommended timetable. As at March 31, 1998, 6 of the 63 mission critical projects were in the testing phase, 38 were in the code conversion phase, and 19 projects were still finalizing their assessment and conversion plans.

Although we concur with mission critical projects being given first priority, we noted that only limited work had been done in assessing the extent of the problem with respect to the thousands of less critical systems, telecommunications equipment, other equipment with date-dependent computer chips, and personal computers and related software. Our research and discussions with other organizations and our consultants indicate that resolving problems in these areas has been unexpectedly time consuming and difficult.

DETAILED REVIEW OBSERVATIONS

OVERVIEW

Our research on Year 2000 project management best practices indicates that there are typically five phases in a successful Year 2000 project. They are:

- Awareness and establishment of project team: Provide leadership at the board of directors or chief executive officer level to ensure that everyone in the organization, particularly business unit managers, understands the magnitude and business-critical nature of the problem. Establish a project team comprising staff experienced in both technical and business issues, and a responsibility and reporting structure for the team.

- Accurate and prioritized inventory: Compile a detailed inventory of all systems including computer infrastructure, personal computers and all other equipment with date-dependent computer chips. Develop an overall strategic plan that includes prioritizing critical systems.

- Detailed assessment and project planning: Develop a detailed project plan for each major system. This plan should cover each phase of the work and include a description of the internal and external interfaces, the management and staff responsible for system assessment, conversion, testing and implementation, and the milestone completion dates for each step in the process. It should also indicate the quantity and nature of affected code and databases, the conversion and testing methodologies, and resources required.

- Conversion: Convert the program code and, if necessary, any related databases to ensure that transactions with post-Year 2000 dates can be processed. The conversion can often be automated with software tools. Conversion also includes replacing or upgrading hardware, date-dependent equipment and vendor-supplied software packages.

- Testing and implementation: Test the converted program modules separately and then the related programs together. Conduct a user acceptance test on the entire system using comprehensive scenarios. This phase should test all software and hardware that has been converted, upgraded or replaced. Develop contingency plans to ensure the continuity of mission critical business processes in the event of operational failure.

Our research indicated that the first three phases generally take about 25% of the budgeted Year 2000 time and resources with the conversion phase also taking about 25%. The final testing and implementation phase takes the remaining 50% because of the complex interdependencies of Year 2000 problems and the labour intensity of testing.

STATUS OF MISSION CRITICAL PROJECTS

In our questionnaire to all ministries, we asked for the status of their Year 2000 work on the 63 mission critical projects as at January 1, 1998. At that time, we were advised that 2 projects had completed conversion and were in the testing phase, 15 projects were in active conversion and 46 of the projects were in the assessment and project planning phase.

After completing our fieldwork, we asked MBS to provide us with an update as at March 31 based on the monthly progress reports submitted to MBS by the ministries. MBS advised us that significant progress had been made since January. Six projects were in the testing phase,

38 were in the active conversion of the affected program code, and the remaining 19 projects were finalizing the assessment and planning phase.
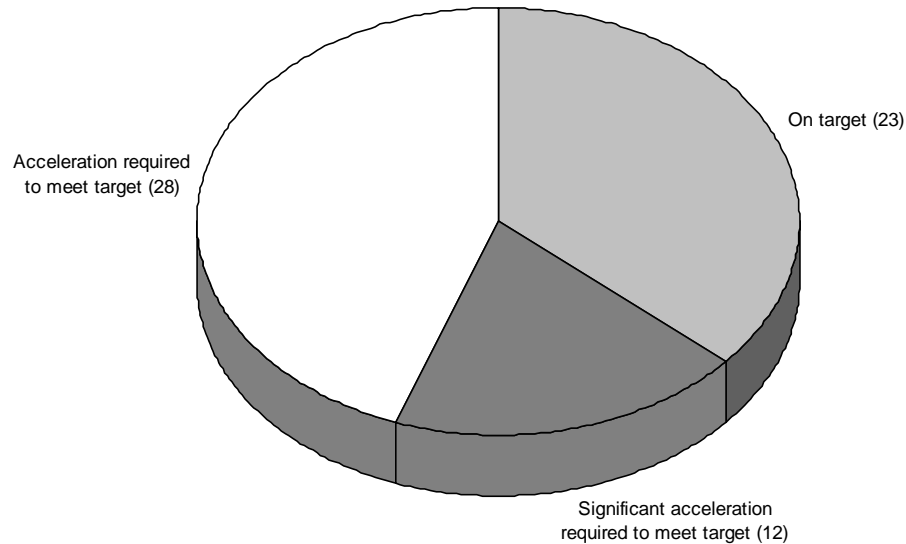
We compared the government's progress with the level of progress that Year 2000 experts recommend be completed as at March 31, 1998 for large public and private sector organizations. To illustrate this comparison, the following chart depicts the average of the suggested rates of progress for key project phases as recommended by a number of sources such as the recent report of The Industry Task Force on Year 2000 established by the federal Minister of Industry (*SOS 2000*) and the United States General Accounting Office (U.S. equivalent to the federal Auditor General), against the government's progress for mission critical projects.

**Recommended Rate of Progress for Large Organizations
vs. Progress of Ontario Government on Mission Critical Projects
March 31, 1998**
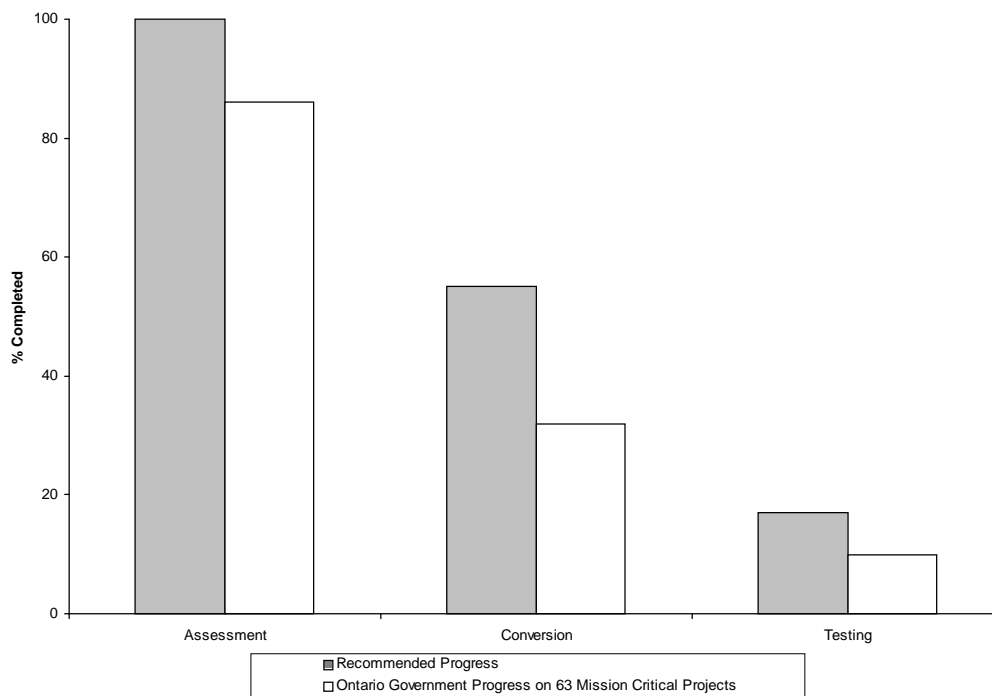
While the rate of progress had improved in the last month or two of our fieldwork, the above comparison clearly indicates that the Ontario government needs to accelerate its Year 2000 efforts. The government also recognized that some projects needed to be expedited. Based on its review of the 63 mission critical project plans and the ministry progress and financial reports, the MBS Corporate Year 2000 Project Office did an assessment of the status of the 63 projects as at March 31, 1998.

**MBS Corporate Year 2000 Project Office Assessment of
Likelihood of Meeting December 31, 1998 Conversion Target Date
for the 63 Mission Critical Projects
as at March 31, 1998**

Acceleration required
to meet target (28)

On target (23)

Significant acceleration
required to meet target (12)

Source: Management Board Secretariat

Much remains to be done, and the government must ensure that executive leadership and sufficient resources are dedicated to this critical business issue. Also, contingency plans should be developed and tested well in advance of December 1999 to ensure key government services will continue to be provided in the event that a mission critical system does not achieve Year 2000 compliance in time.

Recommendation

In order to minimize the potential impact of Year 2000 computer problems, the government should significantly accelerate its compliance efforts.

The government also needs to develop and test realistic contingency plans to ensure the continuity of major business processes in the event of unexpected operational problems.

Government Response

The government's priority through Management Board Secretariat has been to focus on 63 Ontario Public Service mission critical projects first.

- *These mission critical projects should be converted and the first stage of system testing completed by December 31, 1998, leaving 1999 for more comprehensive testing and for contingency activities.*

- *Each project's progress is assessed monthly toward meeting the December 31, 1998 target date for conversion.*

- *The first three months of 1998 showed great progress: on December 31, 1997, 25 projects were identified as needing to be significantly accelerated to meet the target date of December 31, 1998. By March 31, 1998, this had been reduced to 12.*

- *Each Ontario Public Service mission critical project consists of a complex collection of systems, which may include mainframes, departmental systems, desktops and their supporting technology infrastructure.*

With the priority systems being addressed, the focus is now expanding to business critical systems, the broader public sector and external relationships.

Risk management strategies are recognized as a priority. The Ontario Public Service has already had contingency plans in place for its key operating systems for some time. We recognize that these plans need to be reviewed for completeness and updated to reflect the unique characteristics of Year 2000.

YEAR 2000 BEST PRACTICES

As part of our review, we conducted extensive research to identify some of the Year 2000 project management best practices being used in the public and private sectors. We also met with Year 2000 specialists from other large private and public sector organizations to discuss the critical success factors they believed were essential in managing a Year 2000 project.

Based on this work and our review of the government's project management practices, we observed areas where improvements could be made (as discussed in the following sections of this report). At the same time, we noted a number of areas where the government had implemented sound Year 2000 project management practices. The following were some of the best practice strategies we noted.

- MBS had established a Corporate Year 2000 Project Office. While initially understaffed, the Office subsequently strengthened its technical and managerial capabilities to provide better on-site advice to ministries. For instance, the Office had increased its capacity to provide assistance in determining the appropriateness and extent of system testing. This should be particularly helpful to the smaller ministries that have limited internal specialized resources.

- Ministries had established an inter-ministry Year 2000 Coordination Council comprising the Year 2000 coordinators from all ministries. The Council was meeting monthly to discuss progress and common problems and to share information on approaches and solutions.

- Mission critical projects were identified and are being given first priority in the overall Year 2000 compliance efforts.

- MBS had pre-qualified a selected number of preferred vendors of record to be used by all ministries. Doing this on an up-front, centralized basis helps ensure that only qualified contractors are hired, avoids duplication of effort in qualifying vendors and, in some cases, enables ministries to expedite the process of engaging external Year 2000 technical expertise.

- Each ministry is submitting a detailed monthly progress report to the Corporate Year 2000 Project Office which then assesses and reports on the overall progress being made to senior line management and to Management Board of Cabinet.

- The funding process has been streamlined and is handled centrally rather than each ministry making separate requests to Management Board of Cabinet.

EXECUTIVE LEADERSHIP AND SUPPORT

We believe that full support and commitment at the deputy minister and assistant deputy minister levels is essential for the government to successfully address the many business risks associated with the Year 2000 problem. Our research indicated that the support and commitment of the chief executive officer (CEO) was one of the critical success factors in a successful Year 2000 project. Without a clear statement from the CEO that achieving Year 2000 compliance is a top business and information technology priority, an organization faces the risk that scarce resources will be allocated to competing business priorities. The following are some of the examples of Year 2000 CEO leadership we noted.

- The Prime Minister of Canada and Privy Council Clerk are sending letters to all ministers and deputy ministers advising them that Year 2000 is the "No. 1 priority and all other business is secondary."

- The governors of some U.S. states have issued memoranda to make it clear that Year 2000 work has top priority and other projects are to be put on hold until Year 2000 problems are resolved.

- The boards of directors and CEOs of some of the large organizations we met with had written to business unit heads to advise them that Year 2000 work is considered a top business priority and is to be dealt with accordingly.

However, we noted that many ministries had not issued formal statements of a similar nature. Formal regular reporting of project progress to senior management is also considered a key management tool to ensure problems are recognized, addressed and escalated to the appropriate level so that they can be dealt with in an effective and timely manner. We noted that this reporting mechanism was not in place in some ministries.

Another risk particular to governments was highlighted by The Industry Task Force on Year 2000 established by the federal Minister of Industry. In its recently released report, *SOS 2000*, the Task Force recommended that governments in Canada assess the impact of any proposed policies or legislation on Year 2000 projects before implementing any major changes.

> **Recommendation**
>
> **To help ensure that scarce resources are not diverted from Year 2000 projects:**
>
> - **deputy ministers should issue a directive to senior and line management stating that Year 2000 work is a top ministry priority. The directive should also require significant system changes to be approved by the ministry's assistant deputy minister responsible for Year 2000 compliance;**
> - **formal regular reporting of Year 2000 progress should be a regular agenda item at ministry senior management committee meetings; and**
> - **ministers and ministry senior management should assess whether proposed policy or legislative changes will necessitate significant changes to current systems and the possible effect this may have on Year 2000 work.**
>
> ### Government Response
>
> *The Secretary of Management Board of Cabinet has emphasized the priority of the Year 2000 project. Internal government communications have reinforced the importance of this work. The annual planning process for ministry information management and information technology identified Year 2000 compliance efforts as the first of three key issues ministries were directed to consider in preparing their plans.*
>
> *Management approval for systems changes is an industry best practice. It is delegated to the appropriate program executive.*
>
> *We concur with the recommendation to make Year 2000 a standing agenda item on senior management committees, as is already the case in several ministries. It should be noted that Year 2000 is a standing agenda item at both of the government's senior management steering committees for information and information technology.*
>
> *We concur with the recommendation. We acknowledge that deputy ministers have responsibility for balancing policy and legislative initiatives with Year 2000 priorities.*

PROJECT PLANS

Given the complexity of Year 2000 mission critical projects, a detailed step-by-step project plan is considered to be one of the key components of sound project management. Management Board of Cabinet recognized and communicated the importance of this by requiring that detailed project plans be submitted to Management Board Secretariat for each mission critical project by January 31, 1998, and that updated plans be submitted if significant changes occur.

We reviewed a sample of the submitted plans. We noted that many of the project plans contained insufficient information. Our more significant concerns were as follows:

- Strategies to resolve interfaces with other systems were lacking and key user contacts for system interfaces were seldom identified. Since many critical systems interface with other systems both internal and external to the ministry, it is critical that data be compatible between the sending and receiving systems as conflicting data formats can propagate errors from one system to another.

- Insufficient information was provided on strategies to deal with personal computers and related applications that formed part of a mission critical system. A whole system can be affected if these personal computers contain embedded date-dependent chips that are not compliant or the applications are not compliant.

- Plans contained minimal identification of possible Year 2000 software tools to be used to isolate and fix problematic lines of code.

- Assessment and conversion activities needed to be better delineated into specific stand-alone steps to facilitate accountability and the determination of required resources and milestone completion dates.

- Little information was provided on how and when the testing phase was to be conducted and what testing tools and facilities were needed.

- Arrangements for updating user procedures were seldom addressed.

- Contingency planning was not addressed.

Given the size and interdependencies associated with many of the 63 mission critical projects, we believe a thorough analysis of all possible components and a well-documented plan addressing the conversion and testing strategies to be used is critical in early identification of potential problems. The risk of inadequate planning is that problems may not surface until the conversion and testing phases when they become much more difficult to resolve efficiently.

Recommendation

Given that thorough planning is key to project success, ministries should ensure their Year 2000 project plans for ministry mission critical projects include detailed steps for each phase of the project including deliverables, assigned responsibilities and milestone completion dates. The plans should also adequately address hardware infrastructure, personal computers, embedded systems, data and computer interface issues, conversion and testing methods, and contingency planning.

Government Response

We agree with the recommendation. Plans for Ontario Public Service mission critical projects have been developed and are continually refined and enhanced as required.

EMBEDDED SYSTEMS AND DATA INTERFACES

By identifying the computer systems that support its core businesses, designating these systems as mission critical and assigning top priority to them, the government has adopted a generally accepted Year 2000 strategy. However, this is only the first step in the critical process of developing an enterprise-wide inventory and assessment of all systems that support the government's operations. A critical success factor mentioned by the organizations we met with was the need for an accurate and all-encompassing inventory. They advised us that identifying embedded systems and data interfaces with other systems was especially important.

An embedded system is a device used to control, monitor or assist the operation of equipment. Many embedded systems have clocks built into computer chips and if the computer clock is not Year 2000 compliant, the entire chip or piece of equipment may have to be replaced. Examples include ambulance dispatch control units, telephone switching equipment, telecommunication and local area networks, personal computers and even building equipment such as elevators and security systems. Representatives from most of the organizations we met with and our consultants advised us that resolving problems in these areas was turning out to be much more time-consuming than they had initially expected.

To date, the government's emphasis has been on the mission critical areas and little attention has been paid to completing a government-wide detailed inventory of all personal computers and related software, embedded systems and data interfaces. Even if these systems do not form part of mission critical projects, many are still integral components of important ministry operations and need to be assessed for compliance risk and prioritized, and appropriate project plans should be developed.

Recommendation

To ensure that all affected systems are identified with sufficient lead time for action, each ministry should complete a thorough inventory and assessment of all hardware and software components and prepare appropriate project plans as quickly as possible. Particular attention should be paid to personal computers and software, embedded systems, and data interfaces both internal and external to the ministry.

Government Response

The Corporate Year 2000 Project Office's initial focus was to address the 63 Ontario Public Service mission critical projects. The next phase has been initiated, and the Year 2000 focus is now expanding to business critical systems, the broader public sector and external relationships.

We concur with the requirement to complete an inventory and assessment. This work will be done during the second phase of the Year 2000 initiative, which began in May 1998.

SHORTAGE OF SKILLED STAFF

Many of the 63 mission critical projects in the Ontario government consist of mainframe legacy applications, programmed in older languages such as COBOL, which are heavily date-dependent due to the nature of most government programs. Accordingly, the extent of the required computer program changes is significant. This requires a large number of staff skilled in systems development, which includes analysis, programming, system testing and project management.

Unfortunately, the Year 2000 problem has exacerbated an already serious shortage of skilled information technology resources in both the private and public sectors. Governments are even more susceptible to shortages of skilled personnel as they generally have less flexibility to offer incentives and competitive pay scales than do private sector organizations.

The Ontario government is no exception. Based on statistics provided to us by MBS, the number of information technology staff has decreased by about 20% over the last two years. In response to our survey of all ministries, only four ministries indicated that they had sufficient qualified staff to convert their systems. Consequently, most ministries have contracted out much of the required Year 2000 work to private sector consultants. The shortage of qualified staff in the government may escalate over the next year as private sector organizations are increasingly willing to pay what is necessary to attract qualified staff.

While the shortage of programmers who have expertise in the older programming languages has had considerable media attention, there is also a critical shortage of experienced system development project managers, both to manage internal projects and to knowledgeably monitor private sector contractors. The need for experienced project managerial skills is aptly illustrated by the following comment by a major international information technology firm recognized for its expertise in Year 2000 issues:

> *The year 2000 is not rocket science, but it is the largest project ever to be undertaken by the IT organization. The complexity of the project is not in the solution itself but rather in the size and scope of the project itself. This means year 2000 requires "world class" project management.*
>
> *Source: GartnerGroup Conference Presentation, April 1996*

Our research indicated that in order to cope better with staff turnover, some organizations had initiated formal staff migration risk assessments. This involves identifying the key personnel on all mission critical Year 2000 projects and developing back-up plans so that staff departures can be dealt with more proactively. As well, to minimize turnover, organizations were ensuring that pay scales were competitive and some were adopting "stay bonuses" to encourage staff to remain until successful completion of Year 2000 projects.

QUALITY ASSURANCE

In a large systems development project, the project manager typically focuses on problem solving, managing staff, project administration and meeting deadlines. Users are primarily concerned with whether the project will meet their own business requirements. This presents an inherent risk to senior management since competing priorities may result in the expected system development controls not being implemented, especially when time pressures are significant, as is the case with most Year 2000 projects.

Quality assurance is one strategy often used to mitigate this risk. A quality assurance review typically assesses whether a project has been sufficiently scoped and planned, that actual progress is consistent with reported progress and, most importantly, whether appropriate systems development practices and standards have been followed.

While quality assurance can be performed by the development team itself, this role is typically performed by a party not involved in that particular systems development project such as:

- systems development staff from other areas;

- a dedicated quality assurance unit;

- technically qualified internal auditors; or

- an independent consulting firm.

We found that most ministries have not initiated an independent quality assurance review of their Year 2000 compliance projects. As well, to date there has generally been limited

involvement of internal audit in Year 2000 projects. Given the critical nature and tight timeframes associated with these projects, we believe the benefits of implementing quality assurance procedures could well outweigh the associated costs. This can be done either internally or centrally administered through the MBS Corporate Year 2000 Project Office.

Recommendation

To ensure appropriate system development controls including objective reporting of Year 2000 progress, Management Board Secretariat and the ministries should strongly consider implementing an independent quality assurance process.

Government Response

Some independent quality assurance is being done. We continue to enhance the quality assurance process. For example, we are undertaking a third party review of conversion and testing activities. A key deliverable of this review will be tools and best practices to assist in future assessments. In addition, corporate internal audit and a number of ministries have initiated a review of the Year 2000 project as a priority.

SYSTEM TESTING

Timely completion of system conversion, in itself, gives little assurance of a system's readiness for the year 2000 if the changes have not been completely tested. As indicated earlier, testing typically consumes about 50% of the total project time and resources. This is primarily due to the widespread impact of date sensitive functions that are often intertwined throughout the entire system, meaning that the occurrence of one date can activate a series of system functions either simultaneously or sequentially. Most large government systems comprise numerous interdependent programs and the failure of even a minor part of any one of these programs can wreak havoc on the system as a whole. Consequently, all changes must be thoroughly tested.

Proper testing requires a joint effort of the programmers and the users. The programmers have to test each program module separately and go through the process of deciding which interlocking modules of code should be tested together. Finally, the various programs making up the overall system have to be integrated and tested. The users have the final responsibility for testing the system to ensure that it delivers the desired results including assessing the impact of data exchanged with other external or internal systems. Our research indicates that 10% to 20% of the problems often do not turn up until this final user testing stage.

Because of the complexities associated with Year 2000 testing, a detailed test plan should be developed to outline who is responsible for doing what testing, the test cases to be used and expected results, the handling of interfacing systems, timing and deadlines, and the computer and staff resources required.

MBS has established a mainframe test facility that most ministries plan to use. Because of the deadline for converting all mission critical systems by December 31, 1998, a significant amount of system testing will be carried out in early 1999. Consequently, there could be a high degree of competition for testing facility resources. It is critical that a process for scheduling test facilities be developed to ensure that the amount of testing time allotted is sufficient.

Recommendation

Given the complexities and interdependencies associated with Year 2000 testing, ministries should develop a detailed test plan for each mission critical project as soon as possible. This plan should outline who is responsible for doing what and by when, the test cases and computer facilities to be used, and how data interfaces with other systems are to be tested.

Management Board Secretariat should develop a test facility plan with ministries to ensure that sufficient computer facilities are available for testing mainframe systems.

Government Response

We agree with this recommendation. Detailed test plans are critical to the success of achieving Year 2000 compliance. Testing for Ontario Public Service mission critical projects started as early as July 1997. Most ministries intend to begin testing in 1998. Year 2000 testing will be a particular focus of the quality assurance reviews and audits being performed.

Computer and Telecommunication Services has implemented a mainframe test facility and is currently working with ministries to develop a schedule and protocols for using this facility.