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COMPUTERS AND THE YEAR 2000 PROBLEM

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INTRODUCTION

In an increasingly integrated global economy, both knowledge and information are vital resources. Essential to the information age are digital data and the ubiquitous computers, both large and small, that manipulate them.

Many of the data and many of the computers and computer programs that use them were created decades ago. At that time, most computer processing was done on "mainframes" and computers were relatively slow; both computer memory and storage were at a premium. To simplify computer processing many shortcuts were taken, one of which was to use only two digits to represent the year. The question of what would occur in the year 2000 was not even thought of and only in this decade has it been seriously considered.

With the arrival of the year 2000, many organizations, such as insurance companies, financial institutions and governments, which have been collecting and using digital information for decades, will confront major problems with respect to their computer systems, particularly the older ("legacy") systems. This paper will discuss computers and the "year 2000 problem" and the Canadian federal government's attempts to address it.

THE PROBLEM AND ITS IMPACT

Many programs operating on both mainframes and personal computers use only two digits for the year. When the year changes from 1999 to 2000, the routines used to determine the differences in dates, etc. will result in errors. A large number of databases store their dates using only two digits for the year. When they change from 12/31/99 to 01/01/00, the result will be a wide range of errors for billings, renewals, etc. For example, we could see planes being grounded because they are 99 years overdue for maintenance, phone calls just after midnight billed for 53 million minutes, or VISA balances skyrocketing into millions of

dollars due to haywire interest calculations. Similarly, a car insurance system logs all driving convictions and calculates the date, five years hence, on which they will expire. A conviction in January 1995 expires in January 2000, which shows as January 00. The uncorrected system could compare January 00 to the conviction date, deem it to be smaller, assume that the five years had expired, and delete the conviction.

Most programs that calculate the day of the week using only the last two digits of the year will get wrong answers after January 2000, because their formulas implicitly assume that all dates are in the 1900s. Thus, a bank vault opening system will interpret January 2000, which is a Saturday, as 1 January 1900, which was a Monday, and the system will mistakenly open the vault.

Many of the BIOS (Basic Input Output System) built into personal computers with Read Only Memory (ROM) will revert automatically to 1980 after the year 1999. Even if the date is corrected when the computer is working, the error will recur next time the computer is turned on. Spreadsheets, accounting packages, day-timers, E-mail systems, even backup cycles could all be affected. Newer computers address this problem; IBM has indicated that its personal computers built in 1996 and later will not have it. Similarly, though some of the operating systems used on personal computers (such Windows 3.1 and DOS) and much application software cannot yet automatically accept a change from the year 1999 to 2000, Microsoft has announced that post-1997 versions of its software will be able to do so.

Such normal upgrading and replacement of application software/systems, operating systems, and computers could be a partial solution, but the many systems not scheduled for routine renewal prior to the year 2000 will also need to be corrected. The overall impact of resolving the problem is difficult to quantify. A company can correct its own year 2000 problem, but unless the companies it deals with have also done so, difficulties could arise. Solutions will cost governments and businesses a great deal of time and money.

FIXING THE PROBLEM

The solution to the year 2000 problem can be broken into three basic steps. The first step consists of preparing an inventory of applications, discovering which of them will have year 2000 problems, deciding how to correct these, and then prioritizing the work. The second step is to make the necessary changes outside a production environment. The third step is to move the tested systems into production.

In the past eight to ten months, numerous conferences have been held on this issue, suggesting that informatics system (IS) professionals are starting to take this problem more seriously. Going to conferences and dealing with realities are two very different things, however. The impending date change is forcing technology managers to warn their CEOs and chief financial officers that millions of lines of computer code now being run in their organizations will cease to work in just a few years. Depending on the estimates, the cost to change one line of code can be between $.4 and $.5 (US). Analysts estimate that the typical costs for a large corporation will be in the area of $40 million (US), and between $50 and $100 million (US) for a typical Fortune 1000 company. Worldwide, the cost of fixing the year 2000 problem will reach $400 billion to $600 billion (US), the Gartner Group predicts.

Some groups have started to address the problem. One large semiconductor manufacturer has estimated that a year 2000 conversion will cost $56 million and require 20 full-time people per year until the year 1998. The New York Stock Exchange began its year 2000 project in 1987; it eventually involved more than 100 programmers and cost approximately $29 million (US). A Canadian financial corporation spent 24 weeks evaluating five applications and estimated that 22,000 staff hours would be needed to implement necessary changes.

In the United States, two Congressional subcommittees have recently examined this issue. Technical experts have warned the House Government Reform and Oversight Subcommittee on Government Management, Information and Technology that the year 2000 conversion will cost the government about $30 billion. The panellists stressed that government and industry had been slow to respond and that work must start immediately. Agencies will have to raise funds and find time to redo all software running on mainframes and PCs. To assist agencies in their efforts, an Interagency Working Group on the Year 2000 has been set up.

Information on this subject abounds and is available in computer journals and magazines as well as on the Internet (see references at the end of this review). As well, new software tools and methods are being developed to assist informatics professionals to rectify the problems and, it is hoped, reduce the costs.

THE FEDERAL GOVERNMENT'S PLANS

Treasury Board staff, under the Chief Informatics Officer, are coordinating the federal government's efforts to correct year 2000 problems. A working group with representatives from all major departments (part of the Advisory Committee on Information

Management) has been monitoring the issues and options since 1994, with another review scheduled late 1996. At a more concrete level, an interdepartmental working group consisting of the IS project managers responsible for solving year 2000 problems has been meeting monthly since May 1996 to exchange ideas and solutions. The range of problems varies greatly by department, the main variable being the number of legacy systems that will not be replaced prior to the year 2000. The projected costs to the federal government should be better known within six months.

Other actions that have been taken or are planned are given below.

- In late May 1996, Treasury Board sent a letter to all federal departments and agencies asking them to define their year 2000 problems; over 80 responses had been received by early September 1996. Agencies in general were concerned only about replacement of their non-compliant PCs. Large departments are assessing the problem and have assigned resources.

- Treasury Board has set up a year 2000 Intranet site for federal government employees. It provides information on the project office, the interdepartmental working group, best practices, etc.

- Government Services and Public Works Canada has sent out over 900 letters asking its information technology suppliers whether they are in compliance with year 2000 requirements.

- Government Telecommunications and Informatics System (GTIS), a branch of Government Services and Public Works Canada, is considering setting up a main frame test site to allow government departments to test out their "solutions" without disrupting their normal operations.

- GTIS will likely be sending out a request for proposals for year 2000 goods and services to assist departments by having the necessary additional expertise available.

CONCLUSION

All users of computers - governments, companies, and individuals - will be affected by the year 2000 problem. Given the complexity of the issue, it will be some time before the full costs and many of the operational implications are known. All we can say is that solving it will be costly.

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