

THE YEAR 2000 COMPUTER PROBLEM

Bella Soares, Southeastern Louisiana University

Mary Blalock, Southeastern Louisiana University

INTRODUCTION

SICOR came up with six wrong stereotypes that people have on the year 2000 problem:

1. It's a simple technical problem... just expand the date fields.
2. We've got plenty of time...
3. All our systems will be replaced by the year 2000...
4. We don't have the problem... all our applications are new
5. Someone will invent an automated solution...
6. We will outsource our entire conversion effort...

Identifying the Problem.

With computers mistaking the year 2000 for 1900, virtually all businesses that use dates will be affected. Not only will the companies be affected, but they are paying millions and millions of dollars in order for computers to recognize the difference between the years 2000 and 1900. The year 2000 computer bug is now one of the most important issues facing businesses, governments and other institutions worldwide.

What is the year 2000 problem? Before bringing any solution to the problem, we have to define exactly what the "millennium bug" is. In the early days of computers, computer programmers sought to save space by abbreviating years such as 1998 to 98. Experts programmed computers to store the date in the following format: dd/mm/yy. This only allows two digits for the year. January 1, 2000 would be stored as 01 /01 /00. But the computer will interpret this as January 1, 1900 not 2000 (De Jarger 1997). The "19" is "hard-coded" into computer hardware and software, which means that the "19" is not changeable. Since there are only two physical spaces for the year in this date format, after "99", the only logical choice is to reset the number "00".

Why is the millennium bug a problem? Computers have changed our lives so radically that nowadays we depend on information provided by these computers as much as we depend on electricity or running water. The problem has a critical issue on many things affecting our everyday lives. If for instance year 2000 problem is not solved, there could be no air traffic, traffic lights, no lights in companies, companies could not produce goods, no goods delivered to the stores, stores could not send bills to anyone else.

The cost of fixing the bug. The cost of fixing the year 2000 (or Y2K) is extravagant. The Gartner Group estimates the costs per line of code to be between \$1.50 and \$2.50. It is very common for a single company to have 100,000,000 lines of code (Conner 1997). Worldwide, the bug will cost the companies some \$300 billion to \$600 billion to fix. It could even go up to \$1 trillion, if the replacements of hardware and other expenses such

as lawsuits are taken into account (Bylinsky 1998). The industry that will be the worst hit by the year 2000 bug is manufacturing, not only because its systems are more complex but also because the sector has been slow to recognize the importance of the problem. In Orange County, the cost is estimated to be \$840 million to fix the year 2000 bug that affects older computers. The Department of Information Technology reports that this amount includes \$500 million in staff time and \$100 million in legal expenses (Chmielewski 1998).

Other important dates. The year 2000 is not only limited to what happens with the computers between December 31, 1999 and January 1, 2000. There are several other important dates that are essential. Last October was considered to be the last point where a large company could start fixing the problem with any chances to finish before the deadline. Furthermore, all computers have to be fixed by January 1, 1999. There are two major reasons for having the fixes done a year early. The first is that there are many "special dates" during 1999 that mean special things. For example, September 9, 1999 (09/09/99) has been commonly used as the expiration date for references and data that have no expiration date. The computer required that a date must be entered in, and in many cases, 9/9/99 was this one. Also, it has been established that an entire year's cycle of events should be used to test all of the modifications that have been made to a system. Also, one should be sure to test to see which day of the week is 01/01/00. January 1, 1900 was a Monday, but January 1, 2000 will be a Saturday (Martin 1997).

MAJOR SOLUTIONS

Experts from around the world have been working on ways to solve this problem. We will discuss further down five major solutions:

Changing the dates from two to four digits. According to IBM, the most straightforward approach to solving Y2K is to simply change the two-digit date fields to four-digit ones. This is considered to be the only complete solution to the problem, allowing businesses to benefit from endless range of dates for the future. This approach also can make it easier for the company to reformat the display screens with a hard-coded format present (IBM 1997).

However, changing from two to four digits has several drawbacks. The most obvious is that in order to convert the dates, every program and database that references to date data will have to be modified. These modifications are for most of them made by men and not through an automatic process. Also, this requires display screens to be formatted manually, as well as increasing record lengths in databases (IBM 1997).

The date logic approach. Another common method for eradicating the millennium bug involves what is called "date logic", or "windowing techniques". This procedure involves having a separate program to determine which millennium certain dates are in. For example, the program could determine that if the year ends in numbers between 00 and 20, the date is in the second millennium. If the year ends in 21 to 99, the date is in the

first millennium. This technique avoids some of the massive changes and coordination associated with the expansion approach (Martin 1997).

This date logic approach also has some downsides. The most important is that the "time window" can never be more than 100 years, and the length of the time window cannot change in the future. Also, all the assumptions and logic must be the same for all the programs that will use it.

The bridge program. Another way of getting around two-digit dates involves a bridge program. This type of solution is used to convert data from one record format to another. This allows a system to convert two digit to four-digit dates as they are needed. This also allows a business to have very little down time for year 2000 renovations. Instead of converting all the data at one time, it is instead converted gradually. Moreover, this technique is very cost effective and fairly easy to do (Moffitt and Sandler 1997). Nevertheless, this bridge program can ruin a computer system. By removing the bridge before all data has been converted, two-digit dates may become mixed with four-digit dates, creating a larger problem than in the beginning.

The replacing method. Replacing the systems is probably the most straightforward method of solving Y2K. By simply discarding old systems and purchasing new systems that are year 2000 ready, a business can eliminate the year 2000 problem altogether (Martin 1997). This avoids the dilemma of coming up with solutions to the problem, but presents the difficulties of starting everything from scratch. This solution should be considered only if a company's system is too costly to fix, or if there are not very many systems that need to be fixed. Another idea is for one company to merge with or buy another company that has the Y2K compliant systems.

The laissez-faire approach. The last alternative is to do nothing to current computer systems that a business may use. This is not the same as ignoring the millennium bug and hoping that it will go away. Instead, it involves analyzing exactly what will happen to a company's computer systems and determining that the effect it will have is either none or very little. This solution will work if employees could work around any damages that may be caused as little as it could be.

The Planning of a Strategy

Before implementing any solution, a careful planning of the strategy has to be considered by any business in order to be successful. Companies have to follow these four steps if they want to overcome the year 2000 difficulty.

The awareness. Although it is the shortest step, the awareness is considered to be the most important. This involves a detailed description of the problem to CEOs and the other decision-makers for the company. Also, the management must be informed of the impact that is likely to occur if Y2K is not solved. Without informing successfully the company executives, it will be challenging to get appropriate funding. As we already mentioned above, the CEOs' commitment and support are primordial in order to have a project on the millennium bug succeed.

Just 22 months before 2000 begins, only one in five organizations has launched a strategy for achieving year 2000 issue, and only one in three companies has a detailed plan in place (Hoffman 1998). Many companies have assigned "millennium project managers" to work on some solutions, however a majority of them has troubles in having their CEOs committed to their plan. This is particularly true for companies with less than \$25 million in annual revenues. A recent year 2000 conference, sponsored by the Software Productivity Group, impressed upon corporate management the gravity of the problem. The main problem underlined is that executives at the highest levels of the company don't have the patience with technical explanations. The mission of these millennium project managers is to translate technical crisis into a business imperative, speaking in terms of delayed billing and cash flows, corporate and personal liability, and above all, a decline in stock price (Gibson 1998).

According to a CIO Magazine survey of 400 top executives of those responding to the poll:

- nearly 70% are not confident the millennium bug will be fixed by December 31, 1999 deadline.

- a full 60% recommend that Americans need to investigate their bank's year 2000 compliance to ensure the safety of their personal assets.

- nearly 50% are concerned their job will be in jeopardy if they are unable to fix their company's year 2000 problem. (Virtual Dynamics Corporation 1998)

These statistics show that a majority of these top executives is concerned about the millennium bug, the issue is to inform them on the problems involving their companies.

The planning. Preparing and planning involve finding all applications that use dates and choosing the right combination of solutions to result in a successful attempt. A business also has to consider any other outside systems it could be dependent on. In addition to this, a priority schedule should be created to determine which systems are absolutely necessary to the operation of the business, and then fix them according to their importance (Conner 1997). Companies which are interrelated should agree on a common date during which changes could be done. During this phase, an estimation of the costs as well as the length of the fixes have to be evaluated.

The implementation. This is probably the most tedious part of the year 2000 compliance. This involves taking proposed solutions and incorporating them into a business' computer systems. Depending on the solutions chosen, and how the solutions affect everyday business, a company's commerce could be impacted due to the need for various systems to be down at all times (Moffitt and Sandler 1997).

The control. The testing of the solutions is also a critical phase in the conversion process because it is the only way to assure that a business will start smoothly a new century. This procedure involves making sample databases and records to verify that the fixes

were made correctly, and that all systems work correctly. During this phase, a few defects will most likely be found.

There are two common approaches to testing the solutions. The first involves making sure the systems work correctly in the twentieth century, testing the computer for the twenty-first century, and then putting the systems back into everyday use. An advantage of this method is that all of the tests are done at the same times, allowing quicker feedback. The drawback is that the amount of down time will be pretty high. The other approach is the same as the first, except switching the second and third steps. The systems are first put back into production, and then they are tested for year 2000 compliance while they are ensuring the flow of business at the same time. The advantage of this method is that down time is much shorter. However, getting results will take longer time (Pollner 1998).

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