

# The millennium effect, a logical time bomb

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In computing terms, a logical time bomb is a process or programme within a computer system which is executed when a logical condition such as the absence or presence of a name, a certain time or date or a set of simultaneous conditions is met, causing harm to that computer system.

At the present time all computer systems harbour a logical bomb: the millennium effect, which will be activated after Dec. 31, 1999. The damage which may arise is unforeseeable.

## THE ORIGIN OF THE PROBLEM

Due to the high prices of computer hard discs in the Seventies and Eighties, in order to save storage space and achieve higher data access speeds, many companies used only the last two digits of the year in order to store information related to dates.

When the millennium changes dates will no longer be clear, the year 99 is 1999, and the following year will be believed by some computers to be 1900, others will immediately give an error condition and only a few will say that it is the correct year: the year 2000.

There is also the problem of knowing when the new millennium starts, on 1-1-2000 or 1-1-2001, for programmes which deal with historical data and which store the date of the millennium. Historically the count starts with the birth of Christ, but when was Christ born, in the year 0, or the year 1? Depending on the reply to this question, the millennium would either start on 1-1-2000 or on 1-1-2001. This is however more a philosophical question than a technical one. With rare exceptions it is generally assumed that the millennium starts on 1-1-2000.

In addition to this, computers internally count one year as the whole part of 365.25 days, in other words they add 1 day to the year every four years, producing a leap year of 366 days. The year 2000 will be a leap year, but 1900 was not. Many manufacturers have not taken this into account and therefore even though these companies may have solved the problem of converting the two figures into the four figures of the year both in their programmes and in their data, allowing everything to work correctly after 1-1-2000, the system will surely fail or function incorrectly after 29-2-2000, as this will be read as 1-3-2000.

This problem does not only affect the company which is using the software, but also the manufacturer of that software (if they is not the same), the manufacturer of the operating system, the manufacturer of the computer or network of computers and the companies to which these computers are connected. As a general rule, it may be assumed that the hardware and software produced in the Seventies and Eighties will give rise to problems and that there is also a possibility (although lower) of problems occurring in hardware and software produced in the Nineties. The problem must therefore be resolved as soon as possible. There is very little time left.

All of this work which is related to the 2000 effect coincides with the entrance of the Euro, at least in Europe. This means that a large proportion of software applications which deal with money will have to be modified.

## IMPLICATIONS AND POTENTIAL HAZARDS

These problems may arise in any business activity which to a certain extent is based on information technology (and which business does not use computers nowadays?)

Some effects of the date being expressed in two figures have been felt for some time now (although in many cases these have now been solved):

When trying to obtain a printout of the policies which expire between 10 May 1998 and 10 May 2005 the system processes between 10-5-98 and 10-5-05 and gives an error, or, in the best case, processes between 10-5-1905 and 10-5-1998 giving an incorrect printout. Some companies are at present provisionally circumventing this problem and are requesting two printouts, one until 31-12-99 and another starting from 1-1-00.

On some occasions when an attempt has been made to withdraw money from a Cash Dispenser with a credit card issued by certain banks and with an expiry date after 31-12-1999 (for example 15-05-2002) the system has rejected the request, assuming that the card has expired (15-05-1902). Recently the company managing a well known international credit card was forced to recall cards which expired after 31-12-1999 as many banks' Cash Dispensers supposed them to have expired. The company had to issue new cards with the expiry date 31-12-1999.

Storage systems which reject goods after expiry are also affected. When dealing with expiry dates after 31-12-1999, for example 20-06-2004, the system assumes that the product has expired (on 20-06-1904).

In general, when ordering information by date, those dates posterior to 31-12-1999 appear first (00 is before 99).

After 29-2-2000 interest calculations for bank accounts could be in

error due to the calculation of an incorrect number of days. Between 28-2-2000 and 1-3-2000 the system will say that there are two days when in reality there are three.

The expiry and/or renewal date of a policy could be wrong.

In general, after 31-12-1999, computer systems could function imperfectly, give errors, simply crash and not work, or it is even possible that the problems or circumstances which may arise are at the present time unforeseeable.

There may be faults in both the software and the hardware (the hardware contains an element of software which is stored in read only memory (ROM)) of computer systems. We are surrounded by hardware, even though we may not be conscious of this. Microprocessors with an element of software are used for the control of industrial machinery, telephone exchanges, automatic doors, satellites, nuclear power stations etc.

### **POSSIBLE IMPACT ON THE INSURANCE SECTOR**

A large number of companies will have problems with their computer systems after the turn of the century. These will lead to material and financial losses (apart from possible detrimental effects on image), which may be the cause of claims for compensation to their respective insurance companies. The types of losses which may occur are of two types:

a) Incorrect functioning of the computer system leads to loss of data, erroneous results or the systems crash and halt business. There are economic losses without the occurrence of material damage (this will be the case in the majority of instances).

b) Incorrect functioning of the computer system leads to material damage (in extreme cases fire and/or explosion) which may or may not lead to business interruption. This is a less probable case and may give rise to possible claims due to machinery breakdown, fire or explosion and loss of profits.

In the first case, and although in principle neither the data nor the computer programs are «tangible assets» and therefore their loss is not subject to compensation (although in some cases they are explicitly included in a policy or are part of an all-risks package), if these lead to a fault or hardware interruption this could be interpreted as material damage. In the second case, and assuming an accidental event, everything would be subject to compensation.

In the light of all the information which exists about this subject, one could be led to think that the loss might be considered not to be «accidental» and would therefore not be subject to compensation. These possible claims will however be associated with the inability of many companies to solve the problem, even though they may anticipate it, as it does not only depend on them themselves. In the case of litigation, if the policy conditions are not very specific (and in many cases even though they are), they will normally be interpreted «in favour of the consumer».

It is of course possible to argue that the millennium effect had not been foreseen when the conditions of policies which is in use at the present time were drafted, and therefore automatic cover was not intended with the consequence that this problem is not therefore covered.

Apart from the claims which the affected companies may make to their respective insurers, many of these companies (or their respective insurers) could file lawsuits against the suppliers of their equipment or programmes, and these in turn may claim compensation for third party liability.

### **SOME STEPS IN ORDER TO TRY TO MITIGATE THE PROBLEM**

Given the fact that it is foreseeable that a large number of claims for compensation affecting a high number of policies will be made after 1-1-2000, this accumulation of claims will have an effect similar to that of a catastrophe for the insurance and reinsurance sector.

The advantage in this case is that the catastrophe is known about in advance, and therefore attempts can be made to reduce its effects on a portfolio. It would be possible to start technical aid initiatives in the critical areas affecting policyholders. In order to do this the insurance and reinsurance companies should have human resources with technical knowledge relating to information technology, security and insurance who are able to give this type of assistance. The critical areas which need to be dealt with in each company are the following:

- Data: structures should be modified in order to have a capacity of four figures available for dates, and fields of two figures should be substituted by fields of four.
- Programmes: these should be modified so that they can access the new format of four figures in the data banks and in the date variables which are subject to modification.
- The interconnections with other computer systems (of the same company or of other companies with which there is a computer connection): to ensure that the reception of incorrect data (2 figures, or non-validated dates) do not cause errors in the company's own computer systems.
- The operating systems on which the computer systems are based: verifying their functioning and, if necessary, upgrading them or changing them.
- The computers and other hardware: verifying their correct functioning, together with the operating systems and applications, carrying out various check tests.

For many companies this will be a unique opportunity to update their old programmes and computer processes based on old systems, and replace them with more modern technology which is more flexible and easy to maintain in the future. In addition to this, many companies will need to modify their computer systems in order to adapt to the Euro. If we add some outside technical help to this factor, then it could well be that the policyholders themselves would be the parties most interested in taking any necessary steps. ■