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The Impact of the Year 2000 Date Change on Corporations and Their Computer Systems

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and testing would be done on a parallel system of software libraries on the same computer. The entire MIS department was needed because the longest the system could go completely down was over the weekend, so the manpower had to be utilized to the fullest.

Modules were worked one at a time, with the first few giving clues as to the kind of work that was going to be done. The programmers made a list of standard things to watch for and fix. Using that list and the list made the previous summer, the programmers worked their way through each module.

The software was tested for four months in the summer of 1996. During the last week, everyone involved work around the clock replacing the old software with the new. This took a lot of time and effort, but it allowed the ability to update the whole system in one stroke, rather than piece by piece.

Certain systems were not updated because they were found to be incompatible and they would be replaced prior to year 2000. A few others are currently in process (Meador 48).

The most important lessons learned in the Biamax year 2000 conversion are the need for excellent planning and total support from all levels of upper management in order to make it work. There were times when problems arose

and only a senior officer had enough clout in the company to make things happen when they were needed.

Conclusion

There have been some obvious trends based on the information researched. All companies no matter large or small will be affected and they are all fighting the same enemy. The three primary opponents are time, cost and education. They all revolve around each other.

Time is the nonmovable object and it keeps dwindling down day by day, minute by minute and it cannot be negotiated. As time diminishes the cost goes up and the possibility of being year-2000 compliant decreases. For big computer users, such as the Federal Government, it becomes less likely that they can complete the task in time, no matter how much money they spend.

Because of the massive size of the Federal Government and the magnitude of the problems that could be caused if the year 2000 problem is not corrected in time, it may be worthy of a separate study and review (Anthes 1996). There is a need to educate the Federal Government and corporate America, first and foremost, on how important it is not to underestimate the magnitude of the year 2000 problem. Furthermore, time is of the essence and every day is another

day closer to the deadline and finally, there are no silver bullets or quick fixes.

Just as Doug Batholimew says, "There is an invisible elephant in the kitchen and someone must let him out. Everyone, including information systems people, as well as business people have had a part in allowing the problem to get to this point. So there is enough blame for everyone" (Batholimew 34).

Despite the reasoning that there are many success stories similar to Bimax, it does not change the fact that they are the exceptions and not the rule (Meador 1996). When the year 2000 arrives, there will be many organizations that are not yet compliant and they will have to deal with the consequences. Their systems will not function properly, which could lead to the generation of erroneous data. It will not be business as usual.

Chapter III

SELECTIVE REVIEW AND EVALUATION OF RESEARCH

In the literature review in Chapter II, there were several authors who stood out as experts on the subject of the year 2000 computer glitch. However, as of the writing of this paper, there have not been very many traditional in-depth research studies completed. The year 2000 issue is relatively new and on-going, consequently, the true results will not be available until after December 31, 1999.

Most of the research being used in this thesis was generated by industry experts and consultants. The majority of the studies used questionnaires with very general questionnaires to collect their information. The companies sampled, ranged from very small to very large companies. Some of the researchers developed their own instruments and others used previously developed questionnaires. The results from the surveys provided ample information to the researchers for support of their conclusions.

As stated in the hypothesis, when the year 2000 arrives, there will be many organizations that are not yet compliant and they will have to deal with the consequences. The total numbers of non-compliant companies are not yet

known, but one thing is certain, the companies that did not take advantage of the early warnings will not be compliant by January 1, 2000.

Peter de Jager

There were several sources used for gathering information. The first is Peter de Jager. In the past five years, Mr. de Jager has been active in bringing the Year 2000 problem to the forefront of the information system community and the business world. He is perceived by many to be the worldwide leader in creating awareness for the year 2000 computer crises. He has written dozens of articles on the subject and focuses purely on making people aware of the problem, whether they are the senior executives and board members or the line people who keep programs running.

The Gartner Group

The second most prominent source of information has been the Gartner Group. It is the world's leading independent advisor of research and analysis to business professionals making information technology decisions.

According to the Gartner Group (Minken 72), many of the world's computer systems are already feeling the effects of this problem. This is because many computer systems make five-year projected calculations. In addition, by the end of 1997, only twenty percent of all computer systems in the world are expected to be year 2000 compliant and that number will increase to only fifty percent by 1998. The Gartner Group also believes that only seventy percent of mission-critical applications directly effecting customers will be supported by 2000.

The Gartner Group does surveys on a regular basis to watch trends in order to determine what is hot in the technology industry. They monitor the information technology industry from top the bottom. The Gartner Group is a leading worldwide provider of market research and consulting for information technology vendors, manufacturers, and financial communities. They have four hundred analysts in seventy-five locations worldwide. Their marketing research background and their connections throughout the information systems community gives them special insight into the latest developments. The history and experience of that group give them the power and the name recognition to create a crisis. When the Gartner Group reports there is a year 2000 crisis, most companies in the technology industry at a minimum will stop and make an evaluation to attempt to determine if they will be effected by this problem.

The majority of the research from the Gartner Group in this thesis was derived from information similar to the information two paragraphs above, where they gave general examples of facts or predictions. One example would be quoting the percentage of computers compliant by 1997 and forecasted the amount by year 2000. The Gartner Group's data is usually supported by facts, due to their extensive marketing research department.

However, there is some potential for bias on the part of the Gartner Group. Most would agree, there is a financial incentive for the Gartner Group to heighten the awareness of the year 2000 computer glitch. It is reasonable to assume, that as the perception of a crisis increases in the business community, the potential for profits increase for the Gartner Group.

The Federal Government

Another principle source of information was the United States Federal Government. They probably will be impacted by the year 2000 computer glitch more than any other single user.

An internal survey conducted by the House Government Reform and Oversight Committee's Subcommittee on Government Management, Information, and Technology turned up disastrous information. It surveyed

twenty-four agencies and not surprisingly found that most were not prepared for the millennium crisis. Fourteen had not formulated detailed plans to address the problem. Four federal agencies (Federal Emergency Management Agency, Department of Labor, Department of Energy and Transportation Department) had no plan at all. Only six had calculated cost estimates (Holmes 32).

This survey was Congress' first attempt to measure how agencies have responded to the year 2000 problem and lately they have focused more attention on the problem with the agencies.

The research method used by the federal government consisted of a questionnaire mailed to twenty-four major departments and agencies. The responses received from federal agencies, in most cases, provided limited information on when and at what cost agencies plan to correct their problems. There was very little control in regards to who filled out the questionnaire, what level that person was in the department, and how much direct involvement that person had in the year 2000 computer issues.

As of today, the federal government has done very little detailed statistical analysis on the data received, however, there was a great deal of consistency in the answers to questionnaires throughout all twenty-four

agencies. Therefore, it can be assumed that the general conclusion that the federal government is not prepared for the year 2000 is factual.

Companies Surveyed within the Midwestern States

A regional survey was done in the management information systems department as part of a user's group assignment (Bledsoe 2). The survey was assembled to assess what companies within midwestern states are doing, if anything, to conquer the year 2000 crisis. For the most part, the survey was constructed around the key elements of the year 2000 century change crisis.

The survey consisted of fifteen questions in length and was distributed to several companies in the midwest, management and non-management. The survey and results may be found chapter IV of this thesis. Response rates (Table 1) and sample sizes were as follows:

Table 1

Midwestern Regional Year 2000 Survey

	<u>Surveys Distributed</u>	<u>Surveys Returned</u>	<u>Response %</u>
Management	170	50	29%
Non-management	90	30	33%
Combined Total	260	80	30%

SOURCE: Crisis. "Year 2000 Century Date Change" by S.A. Bledsoe (1996).

Most of the companies surveyed have been working on the scope of the year 2000 effort within their organizations. They have been reviewing third party support; scanning source code; estimating the programming effort; joining a year 2000 share group; purchasing conversion/testing software; using pilot applications and just general planning.

They all believe their organizations should be planning for the year 2000 initiatives by increasing the millennium project's awareness in at every level in their companies.

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The midwestern survey was distributed to 260 companies and had a response rate of thirty percent. It probably provided to the writer of this paper more detailed information than any of the studies.

The researchers' methods used were valid, due to the use of small and large companies, not limiting itself to any particular industry. This study chose companies randomly using banking, insurance, manufacturing and other service industry companies.

The detailed statistical analysis done was limited, however the conclusions reached by the researchers corresponds with the findings of most of the research. However, there were some limitations acknowledged by the researcher. They are listed below.

- 1) The inability to control who filled out questionnaire.
- 2) Would have liked to ask more detailed question, but did not because too many questions would have caused some respondents not to respond.
- 3) Recent publicity on year 2000 issues could have swayed the way respondent have answered questions.



Chapter IV

RESULTS

The Gartner Group says its studies show eighty percent of the year 2000 problem is code, at a cost of \$1.65 per line and in some cases there are as many as 400 million lines. This estimate not only includes the cost of making people aware of the problem, it also includes managing the project, in addition to finding, testing and fixing the problems. These estimates do not include the extra processing power or storage required for year 2000 conversion or testing.

However the Gartner Group warns, "These estimates have an accuracy margin of plus or minus 40 percent (very wide margin of error) and should be used only for preliminary estimates. Actual costs depend on factors such as the complexity, age of affected applications and the skill level of the information system staff."

The primary question in this analysis is, how are companies progressing with their millennium conversions? In Table 2 are the results of four recent studies by the Gartner Group.

Table 2

Where Do they Stand Now?

- **APPLIED COMPUTER RESEARCH, PHOENIX, AZ**

Field: 117 respondents, largely managers of software development.

The results: 68% say their companies have started to convert or are planning to convert systems.

- **INTERNATIONAL DATA CORP., FRAMINGHAM, MA.**

Field: 503 top executives, including some year 2000 project managers.

The results: Nearly 75% of firms have begun or planned project.

- **RHI CONSULTING, MENLO PARK, CA**

Field: More than 200 CIOs from companies with more than 100 employees.

The results: 35% said their firms would be affected by the date problem. Of those respondents, 47% said they have taken action on it, 47% have not.

- **SOCIETY FOR INFORMATION MGMT WORKING GROUP**

The fields: 162 Information system executives.

The result: About 67% indicate their firms have begun inventory and impact analysis.

SOURCE: Computerworld. Exhibit from "Year 2000 Scoreboard," by Lawrence C. Tolson (1996).

Event Horizons: Seeing the Future

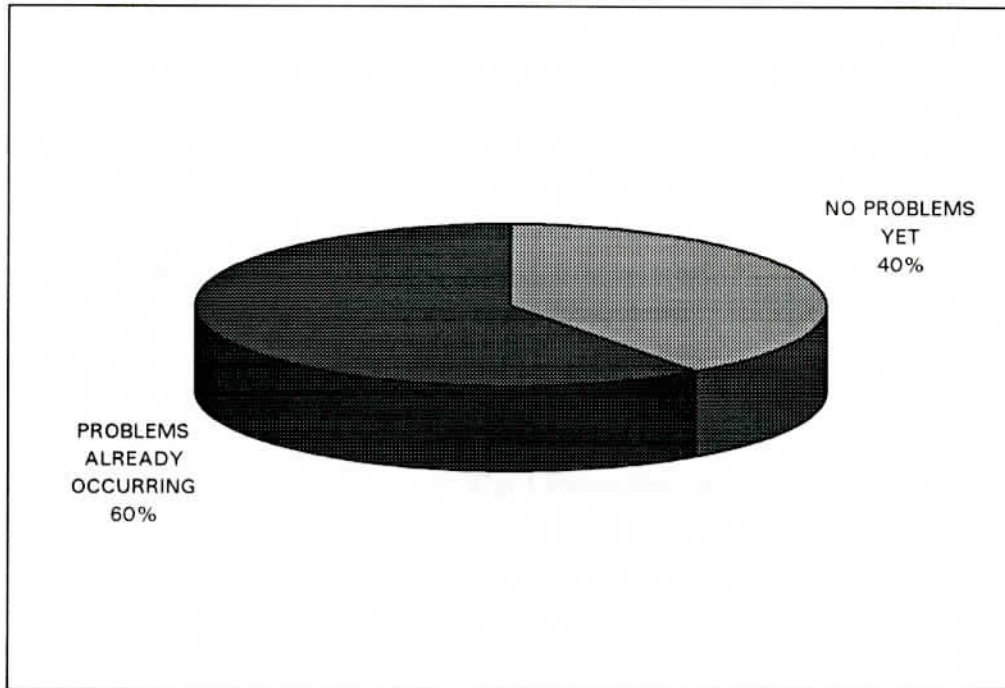
One unique problem is that systems may fail on any given date between now and the year 2000. The reason is that many applications process dates beyond the current date. Data Dimensions refers to the latest future date that will be processed to be the applications event horizon.

The event horizon for a budgeting system is typically five years. The present (1996) event horizon for the budgeting system is 2001, that is why a mid-1995 (Table 3) survey of mainframe users by ADPAC reveals that problems are already occurring at many shops (Townsend 74).

It is sometimes difficult to predict when a system will fail, however it is desirable to have system conversion completed at least one year before the business area indicates the date is a problem. Based on that scenario, all systems should be converted before January 1, 1999. Table 4 indicates the approximate number of working days available to complete the update.

Table 3

Mainframe Applications Already Beginning to Fail



SOURCE: *Federal Computer Week*. Exhibit from "Panel Cites Lack of Preparedness" by Nathan Hendricks (1996).

Table 4

WORKING DAYS TABLE

(Based on May 1, 1995 - Workdays only; Holidays and vacation estimated)

<u>Application Horizon in 1995</u>	<u>Examples</u>	<u>Days Left to Convert</u>
7 Years (2002)	Archiving 7 year instruments	0
5 Years (2000)	Budgeting systems Planning systems 5 year instruments Subscriptions	0
4 years (1999)	Car License Renewals Credit Card Renewals Most record keeping systems	145 days
3 years (1998)	All financial systems 3 year instruments	375 days
2 years (1997)	Most record keeping systems	605 days
1 years (1996)	Most record keeping systems	835 days

SOURCE: The Millennium Journal. Exhibit from "A Review of Information Processing Requirements for the Year 2000 Conversion" by Orlando S. Townsend (1995).

Federal Government's Current Status

Preliminary findings from a congressional survey indicate that most federal agencies have only just begun to develop plans to tackle that problem of reprogramming their computers to accept the year 2000. These findings are prompting major concerns among lawmakers about the possible consequences. The survey sent to agencies this spring by the House Government Reform and Oversight subcommittee on Government Management, Information and Technology, chaired by Rep Steve Horn (R-Calif.), shows that most agencies have yet to begin the first step in conducting an inventory of their systems (Holmes 21).

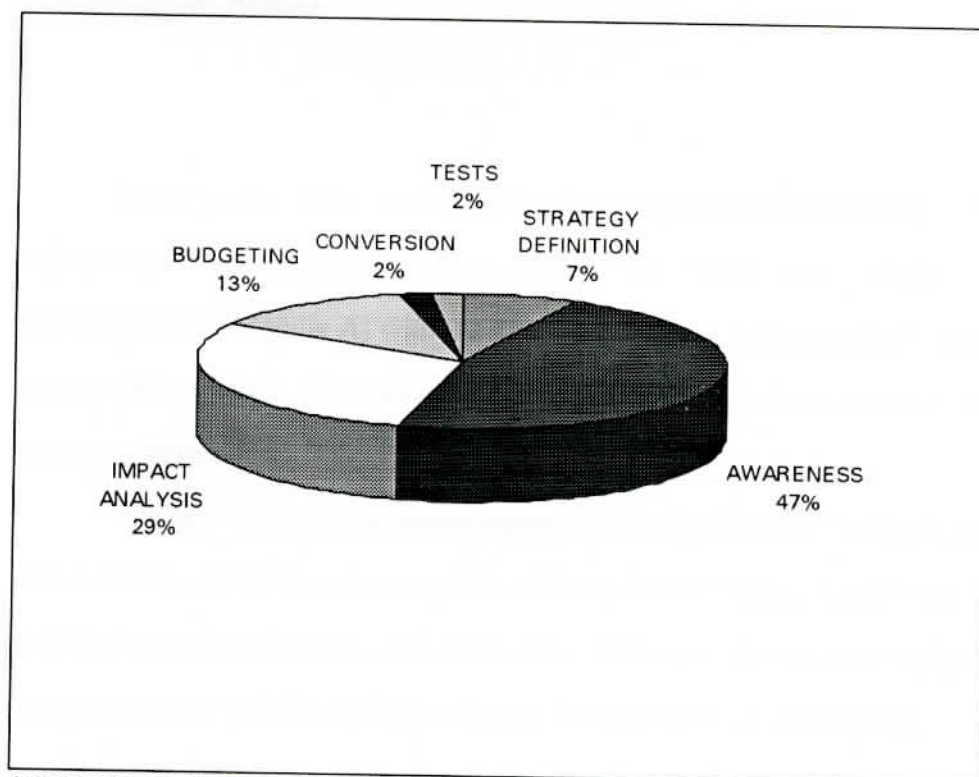
“There is no agency that has gotten to point where they have conducted an inventory, identified a fix and then are in the (Table 5) testing phase,” said Susan Marshall, a staff member on the subcommittee who is compiling the results of the survey. “According to what we are being told, agencies need to be in that testing phase by 1998, which is only a year and a half away. But no one is even close to it. Even the Defense Department, which is considered a leader, just started working on this issue last year” (Holmes 22).

Olga Grkavak, vice president of the Information Technology Association of America's Systems Integration Division, said the survey

confirms our own observations, from our continual contact with the agencies, that we are concerned about how far behind they are. They know there is a serious problem, but they are having problems coming up with a plan to solve it (Hendricks 8).

Table 5

Six Stage Process



SOURCE: Federal Computer Week. Exhibit from "Panel Cites Lack of Preparedness" by Nathan Hendricks (1996).

In addition, "One of the primary problems facing all government agencies is the cost of reprogramming systems to accept the year 2000. The reprogramming sometimes causes errors to the data that is currently in use causing problems that will increase the cost tremendously. Federal agencies, which now are preparing fiscal 1998 budgets, have indicated that they will be requesting additional money from Congress to pay for year 2000 conversions, which are estimated to cost up to thirty billion dollars (Holmes 22)."

Regional Study Results

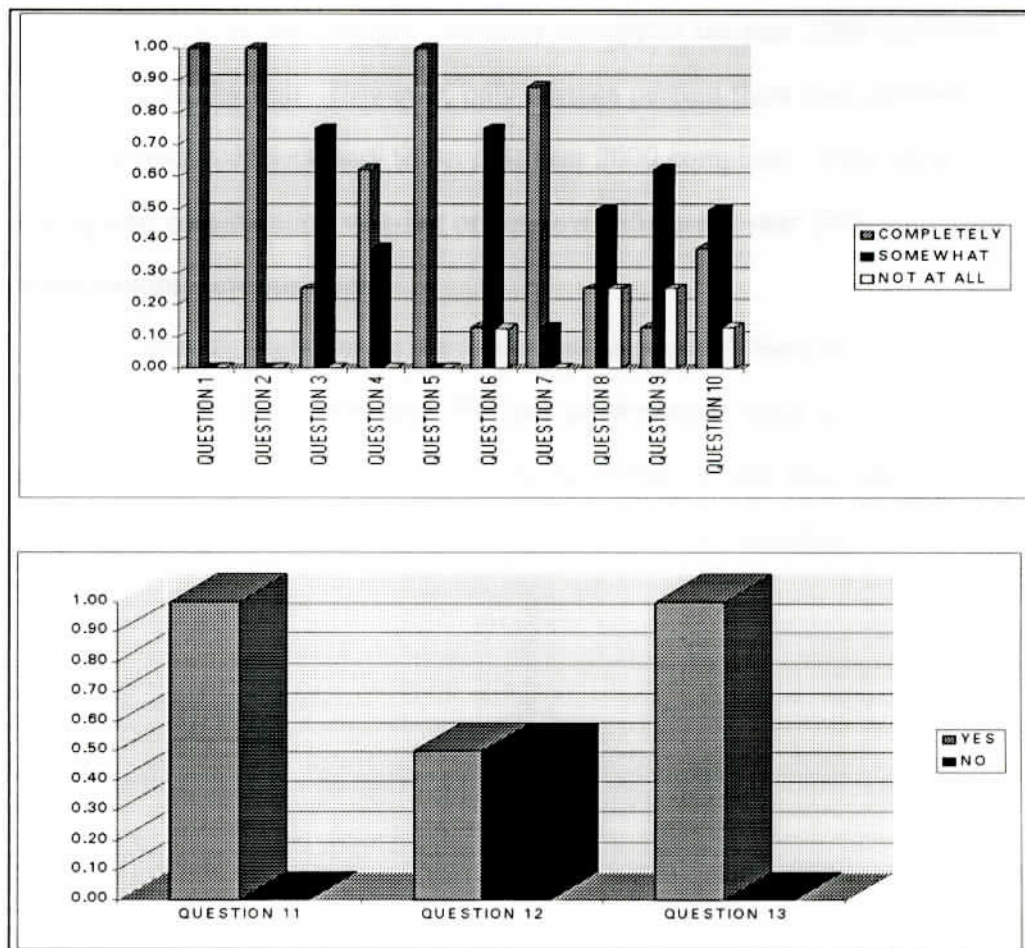
In a regional study two hundred sixty companies were surveyed and eighty of those companies responded to the survey. There were thirteen questions (see Appendix A) with the first ten questions having multiple choice answers (Completely, Somewhat, or Not at All). The last three questions had yes or no answers.

The result of the midwestern survey (Table 7) shows all companies are aware of the year 2000 software glitch and they know it affects both large mainframes and smaller personal computers. However, the majority of the companies surveyed did not know the legal issues involved concerning customers and vendors. They do not totally understand who is responsible

when there is a problem caused by the year 2000 glitch. Is it the company that created the software?

Table 6

Survey Results (Midwestern Region)



SOURCE: Crisis. "Year 2000 Century Date Change" By S. A. Bledsoe (1996)

Is it the company where the computer glitch originated, or since data sometimes passes from company to company, is the responsible party the company where the problem shows itself?

The results of the survey show all (one hundred percent) of the companies think they will have a plan in place that will allow them to begin the implementation on any changes necessary to support the year 2000 conversion by the end of the year. However, only thirteen percent think they currently have the resources necessary to become year 2000 compliant. They all are taking into consideration whether or not new software is year 2000 compliant when making new purchases.

Currently, eighty-eight percent of the respondents have not fully estimated the cost of conversion. Yet, the good news is, most are starting to set priorities in terms of what needs to be fixed first, in case time runs out and they are not able to become compliant by the established deadline.

Chapter V

DISCUSSION

Computers use dates to perform many important functions. These include basic processes like sorting, comparing, validating, calculation and similar computations. Computers also use dates to perform complex calculations, everything from sales projections and mechanical simulations to loan schedules and weather forecasts. Dates appear at virtually every conceivable level of computing, from mainframes to personal computers, as well as their operating systems, compiler and applications. As a result, every organization in every industry should be taking steps now to respond to the year 2000 software conversion crisis (Gilbert 23).

The year 2000 conversion will not change the way an enterprise does business, but the numerous steps involved in assuring a successful end result are likely to place enormous pressures on the conducting of business as usual. This is particularly true in information-system organizations. Top down commitment and support of the conversion is essential. Executive management must play a very important role, including CEOs, CFOs and CIOs. This group will be very interested in issues like budget, business impact and conversion time frames. The conversion process may also require a new set of understandings with end users, customers and vendors. The first

question to be answered is, of course, what will happen if the organization does nothing about the problem? Can the whole subject be avoided and, if not, when and how will the effects of this problem begin to appear? Will incremental fixes do the job? If not, will the very nature of such fixes and the influx of change requests cause the year 2000 situation to spread (Gilbert 23)?

Business Issues

The century date change is not just a technical problem, it is a business problem as well. Businesses utilize computer based systems as tools to successfully complete business activities. The century date change puts the business at risk by impacting its ability to deliver products and services to its customers.

Systems built in the 1960s, 1970s and 1980s, were created under the assumption that they would be replaced by the year 2000, therefore, they were not designed to handle the century date change. However, many of these systems still exist today and are celebrating their 20th anniversary without replacement as assumed in their initial designs. For most organizations, these systems are too large and complex to be replaced by year 2000.

All businesses are at risk, especially large corporations, who have long ago integrated mainframe computers into their core operations.

Most businesses today cannot survive very long without their computer systems. Failures in the systems, large or small can cost millions of dollars in lost revenue and has tremendous residual impact for the corporation.

The first step for businesses to deal with the potential century date change impact is to assess the scope of the enterprises technical and business impacts to develop a plan for resolving the year 2000 problem. It will be easier to assess the feasibility of alternate resolution strategies, once the scope of the problem is known. This means conducting a year 2000 impact assessment (Martin 3).

Businesses that operate in a 10-year, 15-year or longer business cycles have already experienced problems processing next century date information. Some have taken the initiative to upgrade their code and have resolved their legacy portfolios' year 2000 problems. Others have opted for a "patch" approach to fix specific problems as they occur. Quick fixes work for the short-term, but they themselves can introduce additional century date change problems (Martin 7).

In tandem with the technology advances, businesses have made a significant investment in their computerized application portfolios. For large

organizations, this investment is in the hundreds or millions of dollars. Not only does this portfolio contain hardware investments, such as mainframes and personal computers, it contains millions of lines of code representing the programmed data processing rules of the business.

As businesses transition into the 21st century, their dependence on information technology will continue to increase. Because of the dependency that corporations have on information technology, business executives must ensure the integrity of the organization's data processing assets and investments. This is an ongoing and ever expanding responsibility. Failure to adequately protect and manage the firm's systems portfolio puts the business at risk (Martin 23).

There is no silver bullet or magic wand for solving the year 2000 situation. Tools and methods exist today, that can enable corporations to take inventory and assess their legacy system portfolios, to establish a knowledge base from which intelligent decisions can be made.

Summary

This research overwhelmingly supports the hypothesis, there will be many organizations that are not compliant by January 1, 2000, and they will

have to deal with the consequences. Their systems will not function properly, which could lead to the generation of erroneous data. It will not be business as usual.

The research in this thesis has found that many organizations believe that the year 2000 date change will cause a crisis, since applications must be converted to accommodate the change in the date fields in order to recognize four-digit year dates. However, few firms are addressing this problem with the enthusiasm needed. Year 2000 projects are projected to be the biggest driver of mainframe shipments during the next few years. Making the change to accommodate the year 2000 will require additional CPU power, although some observers believe the need is overstated. Everyone agrees that there is a substantial amount of work to be done.

Research has also found that organizations believe that they get nothing out of converting their systems to be year 2000 compliant. They feel they will get nothing for fixing year 2000, because the cost and hassle of fixing the date change may be sufficient reason to purchase and install client-server software that is year 2000 compliant. Some companies simply are not willing to spend the money for something that promises no tangible payback.

The year 2000 could be financially rewarding for many software suppliers and consulting agencies. There are many agencies that are already

offering solutions for this problem, but organizations need to be aware that not all these agencies are legitimate and as they select vendors they should be cautious.

The bottom line of this research is that help is clearly available. Still, for anyone concerned about getting their systems ready for the year 2000, time is running out. The time to start is now, if not sooner, and be prepared to pay big bucks!

Recommendation

This thesis suggests that companies have several options to consider in dealing with the year 2000 date change problem.

One recommendation is to do nothing about the problem. This recommendation of course would put a business at risk and maybe even put some companies out of business.

A second recommendation would be to replace the current systems. This would allow companies to get some tangible payback for the year 2000. If companies do decide to go this route, they must make sure that the vendors are year 2000 compliant.

A third recommendation would be to conduct a date change assessment. This will allow an organization to examine the business and technical impacts of the century date change.

The final recommendation is to upgrade current systems. This recommendation would be good for systems that have been developed in the last three to five years.

Conclusion

Many information system professionals are aware that when the date changes in the year 2000, it will cause problems on systems, but more than a few firms are not addressing this problem. Most programs store year data in two digits, and the systems assume the digits are prefaced with a 19, as in 1996. When the year becomes 00 as in 2000, nearly all applications will assume it is 1900, causing invalid reports and system failures. Under twenty percent of firms worldwide are addressing the year 2000 problem, based on several articles from trade magazines, and surveys that were conducted nationally. Even those who are taking steps to address this problem are only at the first stage of planning. Solving the problem is not really a small exercise for a programmer, but savvy programmers will also need to take into account the fact that the year 2000 is also a leap year. The challenge is that many

companies have over 50 million lines of code to search to locate the date problems (Bledsoe 12).

Companies should follow a three-step program to prepare for Year 2000. Those steps are as follows:

Plan

- Identify all functions that depend on date arithmetic.
- Estimate the cost of conversion.
- Determine which functions must be fixed first.

Implement

- Do detailed analysis of how code must be changed.
- Change code, or,
- Insert calls in code to date server.

Test

- Run all modified applications with systems set to the year 2000. Whether or not the world ends for IS managers on the first day of January in the year 2000 remains to be seen (Bledsoe 15).

Limitations

This research was restricted by the types of documented resources available. Since the topic being discussed is currently evolving, there are no absolute answers. There are only guesses and forecasts by the so-called experts. There probably will not be any comprehensive studies done until after

the year 2000. The majority of the information gathered is from either user groups or consultants. These two groups have a vested interest in promoting a crisis, because without a crisis there would not be a great need for either in this area. However, gathering information from groups that are biased in a particular direction would not create as much of a problem, if there were other groups supporting the other side. The main flaw is there is no balance of information. Most sources echo the same words, and the majority of these sources stand to gain financially if they create a crisis.

The numbers of authors who think most companies were prepared to handle the year 2000 computer problem are few. It would have been desirable to have more research done by bipartisan groups with no potential for financial gain.

Suggestions for Future Research

Since it has been determined in this thesis that many companies will not be completely prepared for the millennium date change by January 1, 2000, those companies that will meet the challenge and are year 2000 compliant, are faced with an additional problem. How vulnerable are they to other companies? Even a company that believes it is on top the problem, ought to be asking its suppliers, major customers, bankers, creditors and regulatory

agencies what their plans are for year 2000 compliance. An area for future research might be to determine how much of an impact a non-compliant company has on a year 2000 compliant company when they transmitting data back and forth.

Another area of concern would be the lack of control of the research population. It would have been more accurate if the study could have had separate studies for executives and information system professionals.

The final area of research could be to determine how companies handled their year 2000 problem. Did they fix their current systems, or did they trash their old systems and buy completely new systems? Did they fix their problems with current in-house people, or was an increase in staff necessary? Did they hire consultants to manage the project or did they manage it themselves? There are many options and many possibilities for future research.

Appendix A

Survey on Year 2000 Conversion

Please circle the appropriate response.

1.	I understand the importance of planning for the year 2000.	Completely 1 2	Somewhat 3 4	Not at All 5
2.	I'm aware of the significance of the century change to all our computer systems both large and personal computers.	Completely 1 2	Somewhat 3 4	Not at All 5
3.	I'm aware of the legal issues involved in service contracts for year 2000 compliance.	Completely 1 2	Somewhat 3 4	Not at All 5
4.	My department will be year 2000 compliant by 1999.	Completely 1 2	Somewhat 3 4	Not at All 5
5.	By the end of this year my department will have a plan to analyze and begin the implementation of any changes necessary to support current processing of date fields after the turn of the century.	Completely 1 2	Somewhat 3 4	Not at All 5
6.	My department has the staff and resources available to handle year 2000 compliance.	Completely 1 2	Somewhat 3 4	Not at All 5
7.	Are you approaching your new projects with year 2000 compliance in mind.	Completely 1 2	Somewhat 3 4	Not at All 5
8.	My department has identified all functions that depend on date arithmetic.	Completely 1 2	Somewhat 3 4	Not at All 5
9.	My department has estimated the cost of conversion.	Completely 1 2	Somewhat 3 4	Not at All 5
10.	My department has determined which functions must be fixed first.	Completely 1 2	Somewhat 3 4	Not at All 5
11.	Do you believe your systems are exposed to the millennium problem ?	Yes	No	
12.	Will your department be looking for outside support to help you become year 2000 compliant ?	Yes	No	
13.	Have you been working on the scope of this effort within your organization ? If yes, How ?	Yes	No	

SOURCE: Crisis. "Year 2000 Century Date Change" By S. A. Bledsoe (1996)

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