Iowa Legislative Fiscal Bureau
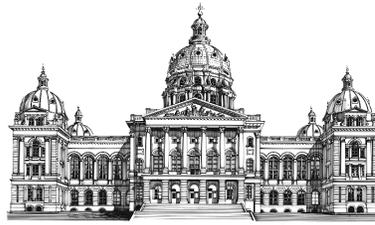
Computer Costs for the Year 2000

ISSUE

The Year 2000 presents unique challenges to the State's information systems. This problem dates back to the 1960s, when programmers wrote applications using a standard date format of DD/MM/YY to conserve then expensive storage space. When the Year 2000 arrives, the "2000" will be read by computer systems as "00," potentially causing a complete system failure or producing incorrect calculations in time-sensitive programs.

AFFECTED AGENCIES

At risk are all State government applications, mainframe systems, personal computers, networks and peripherals.

BACKGROUND

The Year 2000 problem is that years stored by their last two digits will overflow from "99" to "00" when the year passes from 1999 to 2000, causing miscalculations. To save storage space most programmers have allocated two digits to the year. For example, "1996" is stored as "96" in data files, and "2000" will be stored as "00". This two-digit date affects data manipulation, primarily subtractions and comparisons. The following are two examples of the problem:

- If a person was born in 1955 and the computer calculates how old that person is today, it subtracts 55 from 96 and calculates 41. However, in the Year 2000 the computer will subtract 55 from 00 and calculate 55. This error will affect any calculation that produces or uses time spans.

- If data records are sorted by date (e.g., 1965, 1905, 1966), the resulting sequence would be 1905, 1965, 1966. However, if a date record such as 2015 is added, the computer, which reads only the last two digits of the date, sees 05, 15, 65, 66, and sorts them incorrectly.

An individual program is not very difficult to fix, date fields must be changed to four digits or a "work around" put in place. The task becomes complicated and costly when the number of lines of code written and the relationship of programs and data between systems is examined. Many government computers are interwoven electronically with those of other governments and the private sector.

The basic approach to addressing the problem has been:

- Educate and inform affected people of the problem.

- Inventory the affected systems.

- Reconcile the time horizon with cost and prioritize the systems which need to be corrected.

- Implement and test the needed changes.

Gartner Group, a computer consulting firm, estimates the Year 2000 date change will cost enterprises between $300 billion and $600 billion worldwide through 1999. Governing magazine reported the estimated cost at $1.10 per line of code with costs expected to rise 20 percent to 50 percent next year. In a paper entitled the "Legal Issues Confronting The Federal Government And The State Governments Due To The Year 2000", Jeff Jinnett reported:

> "The estimated cost of correcting all of the affected computer systems of the federal agencies is approximately $30 billion. The $30 billion estimate for the federal government is not surprising, since (a) the federal government is reportedly the largest single purchaser of information technology, spending approximately $25 billion per year on IT services and products and (b) in a recent International Data Corp (IDC) study, it was reported that 83 percent of federal mainframe sites surveyed reported moderate or high degrees of date sensitivity.

> It is likely that state governments also have substantial Year 2000 problems, since state governments also are significant information technology purchasers. In fact, the governments of 46 states, six cities, three counties and two school districts have greater annual revenues than Dow Corning, which ranks as number 500 on the Fortune 500 list. As an example of the preliminary budgets some states already have adopted for their Year 2000 corrective work, Nebraska and North Carolina reportedly have each budgeted $30 million for their conversions."

CURRENT SITUATION

The current efforts by state agencies are varied, some have already fixed the problems and others are just starting to assess the problem. The following paragraphs outline the current status of the various entities of State government:

Courts

The Courts have already begun addressing problem. They are expending $70,000 during FY 1997 and are requesting another $70,000 for FY 1998 to correct the problems they have identified to be associated with the Year 2000.

Legislature

The Legislative Computer Support Bureau has done an initial assessment of the programs impacted by the Year 2000 problem. The costs associated with the conversion have been identified as opportunity costs (something else will not be done). The impact is anticipated to be minimal and current staff will be used for the conversion process.

Executive Branch - Regent Institutions portion

The Regent institutions have estimated the following general fund costs for Year 2000 conversion:

Regent Estimated General Fund Costs

Attachment 1 has a report from each institution on the current project status and cost estimate.

Executive Branch (excluding Regents)

The Executive Branch has established a Year 2000 Project Office to coordinate the efforts. This

University of Iowa	$ 1,100,000
Iowa State University	905,000
University of Northern Iowa	625,000
Iowa School For The Deaf	25,000
Iowa Braille & Sight Saving School	500
Total	**$ 2,655,500**

office is housed within the Information Technology Services entity created by the Governor. The Project Office is currently compiling estimates of the costs. It is anticipated the Governor will utilize this information to make his FY 1998 and FY 1999 budget requests.

The preliminary General Fund request from the Information Technology Services entity is $10.0 million in FY 1998 and $20.0 million in FY 1999. This is the initial estimate for the three Executive Branch data centers. The preliminary assessment is that corrective action will need to be taken on 27.5 million lines of code. The cost assumptions are based upon programming at $120,000 per year to fix 100,000 line of code per year (see **Attachment 2**). This request does not distinguish between which lines of code are attributable to non-General Fund sources.

The Year 2000 Project Office will be refining the cost estimates. They hope that a contract with a vendor for an assessment of the major operations will provide the information needed to accurately identify the scope of the project. The Year 2000 Assessment Request for Proposal (RFP) has been issued by the Department of Human Services, Department of Revenue and Finance, and the Information Technology Services entity. The RFP requires the vendor to provide the following deliverables:

- An executive overview of the assessment containing a scope and magnitude of work for corrective action, a recap of work performed during the assessment, and a summary of action items that need to be completed for century date compliance.

- A detail program inventory for each participating agency and their current level of Year 2000 compliance. The vendor will be required to assess every line of code on every platform operated and maintained by the agency. Sampling will not be allowed. Executable modules with no known source code must be identified as well as all proprietary software packages in use.

- An assessment of automated tools necessary to deal with the century date change must be included. It must disclose the tools evaluated, vendor name, and information on whether or not the tool is currently licensed to the State. It must include recommendations for tools by computing platform and details of the functionality provided.

- A list of alternatives for successfully completing all century date change activities in a timely manner. This will include a breakdown of programs that require maintenance only; major revision or rewrite; or total replacement to become compliant. The vendor must indicate the priorities of each alternative.

- A comprehensive cost estimate to resolve the century date change for the agencies being assessed.

- The vendor's assessment and compliance review must be complete by March 2, 1997. Acceptance tests will be run to validate the vendor's work.

CONSIDERATIONS

The Year 2000 Project Office coordinator, Tom Shepherd, has identified the following additional considerations for the Executive Branch:

- Existing programming resources, already severely constrained, will be asked to correct whatever programs they can. It is estimated the existing resources in state government that are technically qualified to work on these issues would be able to complete less than 20% of the century date change work on time.

- The State also needs to take the market forces for computer programmer supply and demand into account. Industry estimates the median annual salary for experienced senior Cobol computer programmers in the $70,000 to $90,000 by late 1997. This reflects a 40% to 60% increase over current annual salaries. Principal Financial is already offering a $3,000 signing bonus for computer programmer employment contracts. Unless we get a vendor under contract for a fixed price (per line of code, per program function point, etc.), the State may very well be in the position of not having internal or external resources to perform this work.

With limited resources (both money and programmers) at some point the State will be forced to prioritize those systems to be corrected. This will involve identifying those which are essential to the ongoing operation versus those which are beneficial but not essential. In addition, the decision will need to be made whether to fix an existing system or replace it. The problem is similar to the decision facing a homeowner fixing a 20-year old 60% efficient furnace for $750 or replacing it with a 95% efficient furnace for $1500.

The Year 2000 problem also will impact local government and private industry in Iowa, those costs have not been addressed.

STAFF CONTACT: Glen Dickinson (Ext: 14616)

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Computer Costs for the Year 2000

Regents Institutions
Summary of Year 2000 Computer Conversion Costs

REGENTS INSTITUTIONS ESTIMATED COSTS $5,498,500

The following details the anticipated costs and procedures related to the computer conversion for the year 2000 at each of the institutions.

University of Iowa

Only 7% of the University's administrative computer systems have been converted for the year 2000. The University has a six month plan to identify and address the conversion issues with an estimated cost of $2,000,000 that will:

- Analyze all on-line and batch programs for date usage;

- Provide management with date-impacted systems/programs/files, conversion plans for each, time lines, and resource requirements;

- Define a methodology for upgrading all systems;

- Standardize date routines;

- Create an inventory of vendor supplied software for conversion information; and

- Educate the university community about the conversion issues.

The hospital estimates are related to the mainframe software which comprises the bulk of hospital information systems for the Year 200 conversion including:

- A project to ensure that all computer systems are compatible with the Year 2000 and beyond over two years with 9.25 committed FTEs. $972,000

- Conversion of over 8,000 application programs $840,000

- Updating mainframe vendor software packages $105,000

- Overall coordination of changes to programming, associated data bases, and files $26,000
      Hospital Subtotal $1,943,000

The costs associated with approximately 4,000 desktop personal computers and 50 servers has not yet been addressed.

SUI ESTIMATED COSTS $3,943,000

Iowa State University

About ten years ago, the University developed a standard for processing a four-digit year to aid in the conversion for the year 2000. Because of this standard, about 95% of the programs can process dates compatible through 9999. Most systems developed within the last six years use the four-digit standard. A University committee has been meeting over the last twelve months and is focusing its attention on systems without the four-digit year processing.

Computation Center and the Administrative Data Processing Center have developed estimated costs based on current understandings of the changes needed for program code, data files, and vendor software and hardware.

<u>Computation Center</u>

- Add memory & disks, upgrade to a newer version $150,000
  of the operating system on the mainframe if still needed by library

- Staff time $75,000

- Check of various application programs $75,000
  on the UNIX operating system

- Basic Input/Output System revisions/installation/work-arounds........................ $175,000
  (does not includes new versions of software)

    Computation Center Total $475,000

<u>Administrative Data Processing Center</u>

- Conversion of all non-compliant computer programs...................................... $400,000
  (estimate 4508 application programs)

- Staff costs for reformatting digit fields... $30,000
  (approx. 6,000 data files)

    Total Administrative Data Processing Center $430,000

ISU ESTIMATED COSTS $905,000

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University of Northern Iowa

The University began planning two years ago for the year 2000 by reallocating staff which postponed or delayed several key technology needs on campus. During this time, analyses were conducted on each system, solutions and techniques were researched and a conversion plan was developed.

Approximately 20% of the changes have been completed to date, with plans for 50-60% completion by the end of fiscal year.

- Total internal staff reallocation .... 72 person months/6 person years

- Cost of reprogramming and conversions $625,000
  (6 yrs x 2080 hrs/yr x $50*)

  * Based on average analyst/programmer salary, benefits and overhead costs.

Most PC based information systems are purchased by the university with the burden of this conversion on the vendor. The university has maintenance contracts for most of these systems which should cover the conversion.

The costs associated with the unknown number of PC based systems that have been developed by staff and student in departmental offices, have not been factored in to these cost.

UNI ESTIMATED COSTS $625,000

Iowa School for the Deaf

The School's existing IBM System 36 unit is approximately 10 years old and presents difficulty in securing replacement parts and appropriately trained technicians, therefore it may be necessary to upgrade the system at the same time as the programming modifications. *

ISD ESTIMATED COST $25,000

Iowa Braille and Sight Saving School

Computers and software programs are presently being upgraded to include provisions for the millennium with anticipated replacement of old computers prior to the year 2000. Other associated conversion costs are estimated at $500, with the work to be done internally as part of the technical coordinator's job.

IBSSS ESTIMATED COST $500

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* The potential upgrade of hardware to accomodate the conversion is estimated at $75,000 and is not included in the listed cost.

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STATE OF
IOWA

TERRY E. BRANSTAD, GOVERNOR

INFORMATION TECHNOLOGY SERVICES
JAMES R. YOUNGBLOOD, DIRECTOR

To: Glen Dickinson

From: Tom Shepherd

Subject: Response to Questions

Date: 11/25/96

Memorandum

I wanted to respond to your questions with as much information as I have before I leave for vacation. I will be gone from October 31 through November 11, 1996. If you need information relating to the Year 2000 issues while I am gone, please contact Ron Strother at 281-8981.

What is the anticipated cost of the year 2000 date change assessment?

The estimate is $250K to $500K. This is the best we can put together with the limited information I have. The agencies initially contracting for services under this RFP will be Human Services, Revenue and Finance, and Information Technology Services on behalf of the General Services data center. The RFP requires the vendor to provide the following deliverables:

- An executive overview of the assessment containing a scope and magnitude of work for corrective action, a recap of work performed during the assessment, and a summary of action items that need to be completed for century date compliance.

- An inventory detail that documents the program inventory for each participating agency and their current level of Year 2000 compliance. The vendor will be required to assess every line of code on every platform operated and maintained by the agency. Sampling will not be allowed. Executable modules with no known source code must be identified as well as all proprietary software packages in use.

- An assessment of automated tools necessary to deal with the Century date change must be included. It must disclose the tools evaluated, vendor name, and information on whether or not the tool is currently licensed to the state. It must include recommendations for tools by computing platform and details of the functionality provided.

- A list of alternatives for successfully completing all century date change activities in a timely manner. This will include a breakdown of programs that require maintenance only; major revision or rewrite; or total replacement to become compliant. The vendor must indicate the priorities of each alternative.

- A comprehensive cost estimate to resolve the century date change for the agencies being assessed

The vendor's assessment and compliance review must be complete by March 2, 1997. Acceptance tests will be run to validate the vendor's work.

How will the costs be allocated between the participating agencies?

A breakdown of each agency's costs will be made when the RFP's are evaluated and the contract is awarded. The RFP contains provisions that will allow other state agencies to contract for such services, if they choose.

Any and all detail relating to the FY98 $10 million and FY99 $20 million cost estimates for the Year 2000.

The legacy mainframe environments in the three executive branch mainframe data centers have an inventory of 80,000 programs consisting of 55 million lines of code. Industry averages indicate that 80% of a computer program inventory of this type is reliant on dates and is coded with only a two digit year. Our preliminary assessment indicates that corrective action will need to be taken on approximately 27.5 million lines of code (or about 50%). This is based on two factors.

About 30% of the state's code amounts to redundant copies of code, older versions of current programs (that will not be updated), and programs that are obsolete or are no longer in use. Approximately 20% of the programs in the inventory are already Year 2000 compliant.

Factors Used In Estimating Cost of Corrective Action*

- The cost of the corrective action should be calculated at $10,000 per staff month.

- Corrective action for every 1 million lines of code is equal to 10 staff years.

* Based on Gartner Group Industry Assessments

Corrective Action Calculation:

55 million lines of code **X** 50% = 27.5 million lines of code

27.5 million lines of code   X   10 staff years/1M lines of code   = 275 staff years

275 staff years **X**   12months / year   =   330 staff months

3,300 staff months   X $10,000 / staff month = **$33,000,000**

When we contract for corrective actions, we will have to cash flow the total cost across FY98 and FY99. A more accurate assessment will be available on or about March 2, 1996.

A brief discussion from my prospective what will need to occur if funding is not received.

If funding is not received, state government will be faced with a disaster of the first magnitude. Existing programming resources, already severely constrained, will have to be tasked to correct whatever programs they can. It is estimated that the existing resources in state government that are technically qualified to work on these issues would be able to complete less than 20% of the century date change work on time. There will be systemic program failures in virtually all systems throughout state government severely impacting or cutting off service from most automated systems.

We also need to take the market forces for computer programmer supply and demand into account. Several industry estimates place the median annual salary for experienced senior Cobol computer programmers in the $70,000 to $90,000 by late 1997. This reflects a 40% to 60% increase over current annual salaries. Principal Financial is already offering a $3,000 signing bonus for computer programmer employment contracts. Unless we get a vendor under contract for a fixed price (per line of code, per program function point, etc.), we may very well be in the position of not having internal or external resources to perform this work.

Do we have a budget person with whom you could schedule some time to discuss the detail of the budget request?

Our Chief Financial Officer is Jackie Pullen. She can be reached at 323-4709.

We also discussed a presentation at your staff meeting on November 13, 1996. If you would like for ITS to do this, please call Diane VanZante at 281-5503 to arrange the time and a list of topics you would like to have covered.