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Data Processing Analysis and Recommendations for the City of Gothenburg, Nebraska

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DATA PROCESSING ANALYSIS
AND RECOMMENDATIONS
FOR THE CITY OF GOTHENBURG,NEBRASKA

April, 1984

CAUR

Center for Applied Urban Research
University of Nebraska at Omaha

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Acknowledgements

I. Scope and Purpose

This report presents an analysis with recommendations regarding the data processing needs of the city of Gothenburg, Nebraska. The analysis was undertaken pursuant to an agreement dated November 7, 1983 between the Center for Applied Urban Research (CAUR) of the University of Nebraska at Omaha and the city of Gothenburg.

This report provides Gothenburg officials with information on the current status of data processing in their city government and the city's information management data processing needs. The report also discusses the applicability of computer technology, the probable configuration and cost of a computer system to meet these needs, and recommendations concerning future action by the city in the area of data processing.

II. Contemporary Computer Technology

Recent advances in technology have brought computers within the reach of many local governments in America. These advances have substantially reduced the cost of computer systems and have also made possible effective computer use by local government personnel who are not data processing experts.

One such advance has been a tremendous reduction in the physical size and cost of computers coupled with dramatic increases in their functional capabilities.

In addition, the current generation of application programming or software available to local governments is characterized by flexibility and "user-friendliness." That is,

the programming is designed for interactive use on video terminals by personnel who have little or no knowledge of computer technology or programming. One result of these changes is that local governments today can acquire and use computer systems to aid in performing everyday activities and can do so with a high degree of confidence and at relatively low cost.

III. Acquiring the Technology

Regardless of the type of hardware, a computer system should be viewed as a tool to be used like any other piece of office equipment. It is an integral part of the work routine, just like the typewriter, the telephone, the adding machine, or the filing cabinet.

Computer usage is technically feasible in almost all organizations. Technical feasibility, however, is often less important to local governments than several other factors, including:

* Cost. Cost is perhaps the best understood and most definitive means of determining the feasibility of any new system. Is the new system more or less expensive than current methods? Although cost may be the best understood criterion for determining feasibility, accurate cost estimates, especially in relation to benefits that may not be quantifiable (e.g., service improvements) are often difficult to obtain. This is so particularly in cities with limited current data processing capabilities.

   A word of caution is in order here. Few local governments that implement computer technology can expect to

reduce overall costs. Thus, a strict cost justification for an electronic data processing system may be impossible. At best, a local government can anticipate cost displacement (e.g., the moving of costs from one place in the budget to another), cost avoidance (e.g., the use of more efficient technology to prevent, avoid, or move into the future costs that would otherwise occur), and/or service improvements.

* Ease of Operation. Some computer systems can be operated only by technically trained personnel. A factor in favor of many systems based on the current technology, especially the present generation of mini- and microcomputers, is that local government personnel who are not trained in the technology can easily operate these systems, and a technical staff of programmers is not required.

* Available Programming. The availability of proven, easy-to-use software or programming to make a computer system do what a local government wants, when it wants, and how it wants is crucial to system feasibility. Without adequate software, a computer is only an expensive box that fulfills no useful purpose. Software is available in most functional areas of local government from a variety of sources and needs to be considered prior to hardware considerations.

* Growth. An important factor in the feasibility of an electronic data processing system is the extent to which it can grow to meet future government requirements. Not only should the system be capable of accepting more sophisti-

cated uses (software) and equipment (hardware) but also of accommodating normal growth in the volume of city activities.

* <u>Staff Considerations</u>. The degree of acceptance of computer technology within a local government is a significant consideration in system feasibility. Similarly, the degree of staff ability to perform specific local government functions (e.g., payroll, utility billing, etc.) and staff aptitude and enthusiasm for the use of computers can be constraints on system effectiveness. To put it more plainly, staff support for computerization, competence in positions that will rely on computer technology, aptitude for using automated equipment, and interest or enthusiasm for automation are very important to the effective implementation of a computer system in local government.

* <u>Political Feasibility</u>. Finally, political feasibility may be the single most critical element in the success of computerization in a local government. It is also the most difficult factor to understand and manage. Political feasibility means the extent to which local elected officials and administrators understand and support the need for an electronic data processing system. In the absence of such support, a local government would be well advised not to proceed with system procurement. On the other hand, the support of these persons can help immeasurably to ensure the smooth acquisition, installation, and operation of a system.

Once a local government has reviewed these factors and determined both the need for and feasibility of acquiring new or enhancing existing automated data processing technology, a step-by-step procurement plan should be adopted. This study of Gothenburg's current data processing requirements is the first step in such a plan. It will, in turn, lead to the following activities, in order of occurrence:

* A decision by city officials whether to acquire a computer system based on the recommendation contained in this report. This decision should follow shortly after review of this report by city officials.

* In the event the city decides to acquire a computer system, CAUR will assist in development and submittal to data processing vendors of a Request for Bid or Proposal (RFP) for a system to meet the requirements identified in this study.

* Proposals received by the city will be evaluated, and a limited number of finalists (usually two or three) will be selected for additional consideration from among all of the proposals received.

* City officials will be asked to approve the selection of finalists and to authorize further evaluation of these proposals, including visits to local governments or other organizations having systems installed by the finalists.

* CAUR will conduct a detailed evaluation of the remaining proposals and will recommend a system vendor for consideration by the city.

* CAUR will assist the city to negotiate a contract with the selected vendor.

* Finally, system installation, testing, and acceptance will complete the procurement plan.

This step-by-step plan is recommended for use by the city of Gothenburg as a method proven effective for computer system acquisition in numerous local governments throughout the country.

IV. Current Data Processing in the City of Gothenburg

The current level of data processing in an organization, whether manual or automated, is an indicator of the organization's need for improved technology. It also provides insight into potential problems that may arise with implementation of newer technology. A review of an organization's data processing activities also allows the development of a cost analysis that can be used, in part, to suggest whether new or enhanced data processing capabilities are justifiable.

The following is a brief discussion of the data processing activities in the city of Gothenburg. Data for this section of the report were provided in interviews with the mayor, the assistant to the mayor, the city clerk, and other city staff persons.

Gothenburg currently owns an NCR 499 ledger-card bookkeeping machine that was purchased in 1978 for an estimated $25,000. Current hardware maintenance costs exceed $2,600 per year.

Projecting future costs and uses for an NCR 499 is difficult. To begin with, the NCR 499 represents essentially antiquated

technology. It is at least three models removed from the manufacturer's current offering on the marketplace. As a result, both hardware maintenance and software support can be expected to become increasingly expensive and difficult to acquire. In fact in interviews with the study team, city staff persons noted that maintenance of the NCR 499 is a major concern and that hardware breakdowns are becoming increasingly frequent.

Current low-cost computer systems are far more flexible, easy to use, and responsive than older generation equipment. This is especially true in comparison with an NCR 499 or similar machine. Bookkeeping machines of this vintage can be used only by one person at a time to perform one function at a time (such as data entry or check printing but not both simultaneously), and even minor changes in activities (such as a new utility billing rate) require programming changes that can cost a minimum of $250.00 each. Gothenburg has spent over $5,600 on programming or program modifications for this system since May, 1980. Combining purchase cost, current annual maintenance charges, and programming costs since 1980 results in an estimated total system cost of this machine of $43,600.

Gothenburg currently uses this machine for accounting functions, including accounts receivable, accounts payable and general ledger accounting, payroll, and utility billing. Budgetary accounting and budget preparation are performed manually. In addition, none of the functions automated on the system is integrated.

The age and technological limitations of this machine strongly suggest that the automation of additional functions on it is not feasible. Hence, Gothenburg's options regarding automated data processing are: (1) continue existing use of this equipment until the system becomes obsolete, until it breaks down and can no longer be repaired, or until support costs force a decision to abandon or replace it; or (2) plan for an orderly transition to a more effective and efficient computing system in the relatively near future. This report strongly recommends the second alternative.

V. Recommended Applications

A. Introduction

The use of automated data processing in the city of Gothenburg is extremely limited at the present time. This is understandable if for no other reason than the size of the city and its operational requirements. The equipment presently in use, the NCR 499, represents a generation of technology that does not permit integration of the city's major administrative functions, e.g., accounting, budgeting, payroll, utility billing and accounting, and others.

The current generation of data processing technology permits and encourages both functional and data base integration. In fact, the type of system that should be considered by Gothenburg should have the following characteristics:

Transaction oriented--When a transaction such as updating the accounts receivable file is made, the system accepts the

transaction and also updates all affected ledgers and funds. This would, for example, permit automated rather than manual distribution of the entry throughout the system and would also provide for an audit trail of the transactions.

On-line--Computer terminals and printers in one or more physical locations in city hall would be connected to the computer central processing unit. This would enable more than one person at a time to have access to the city's computing power and to the information contained in its various files and records.

Real time--Processing on the system occurs at the time a user begins to work at a terminal, and no need exists to create punch cards, ledger cards, computer coding forms, or other input type documents to run through the system at a later time.

Interactive--This means that users communicate directly and immediately with the computer through video display terminals.

User-friendly--Computer programming or software is written in such a way that the programming itself instructs users in its operation. At the minimum, user-friendly software is "menu driven," meaning that hierarchical lists of choices of actions appear on the video monitors, and users instruct the system in the completion of required actions by selecting the correct choices.

Multiprogramming--This means that the computer is capable of accommodating the performance of several functions by several

users at the same time. For example, a utility clerk could enter meter readings at one terminal, an accounts receivable clerk could enter payments at another terminal, and the printer could print payroll checks all at the same time.

Capable of unique inquiry and report generation--The system should include software that will enable users to make unique inquiries across all data bases, to create unique files, to combine data from various files, and to generate unique (not pre-programmed) reports, all using standard English language commands.

B. Applications

All persons interviewed in Gothenburg were quite helpful to the study team. They not only provided clear and concise information about existing activities but also demonstrated that they had given serious consideration to the city's future data processing and information management needs. Many of the suggestions made by city personnel regarding future automation are reflected in this report.

The study team's analysis of Gothenburg's current data processing activities and knowledge of available cost-effective automated data processing systems for small communities suggests that the following functions be given consideration for automation on a modern computer system in Gothenburg. They are:

1. Integrated financial management, including:
   general ledger accounting
   budgetary accounting
   budget preparation
   vendor accounting

accounts payable
check reconciliation
cash handling
investment tracking
special assessment billing and accounting

2. Payroll/personnel

3. Utility accounting and billing (for water, sewer, and electricity)

4. Word processing

5. Data management/inquiry.

Software packages in these areas should be fully integrated. For example, an activity in the accounts payable system should automatically update the general ledger and all subsidiary ledgers and the budgetary accounting system. A similar level of integration should be available in other software packages acquired, and related packages (e.g., payroll and financial management) should interface and also be fully integrated.

VI. Hardware Configuration and Estimated Cost

For a city the size of Gothenburg, a small minicomputer or a multi-user microcomputer, with additional hardware devices as indicated below, will be required. This type of equipment will provide data processing and information management capabilities far beyond those currently available on the city's NCR 499.

(1) Microcomputer alternative

1 Disk storage unit
1 Tape backup (or alternative)
1 System printer
1 Word processing printer
3 Work stations—one each for utility activities, the city clerk, and the cash receiving counter. (The work station at the cash receiving counter can be used for data entry, inquiry, or other functions when

not in use to receive cash. In addition, vendors should also be asked to provide costs for a fourth work station for use by the mayor and the assistant to the mayor.)

(2) Minicomputer alternatives

1 Central processing unit
1 Disk storage unit
1 Tape backup (or alternative)
1 System printer
1 Word processing printer
3 Terminals (CRT's), located as in the microcomputer alternative, with vendors asked to provide cost data for a fourth CRT.

Estimated Cost

Hardware

	Microcomputer		Minicomputer	
	low	high	low	high
purchase	$25,000	$45,000	$40,000	$ 60,000
maintenance (5 years)	12,000	20,000	15,000	25,000
Total	$37,000	$65,000	$55,000	$ 85,000

Software

	Microcomputer		Minicomputer	
purchase	$ 8,000	$20,000	$12,000	$20,000
support (5 years)	4,000	10,000	6,000	10,000
Total	$12,000	$30,000	$18,000	$ 35,000

System total (5 years)	$49,000	$95,000	$73,000	$120,000

Average (of the five-year range) $72,000 $96,500

The range of first-year (or initial) costs for these systems can be estimated as purchase cost plus 20 percent (one year) of maintenance and support costs. These figures are:

	Microcomputer		Minicomputer	
	low	high	low	high
Hardware				
purchase	$25,000	$45,000	$40,000	$ 60,000
maintenance	2,400	4,000	3,000	5,000
Software				
purchase	8,000	20,000	12,000	20,000
support	800	2,000	1,200	2,000
Total	$36,200	$71,000	$56,200	$ 87,000

Average $53,600 $71,600

These figures, especially those for the microcomputer based system, compare favorably to Gothenburg's current investment of $43,600 on essentially antiquated technology. This is particularly so when the range of programming and ease of use of a new system are considered.

VII. Alternative Methods of Acquiring Computer Technology

A. Alternatives

The city of Gothenburg can acquire the required computer technology by one of three alternative methods, including:

1. Rely on outside service bureaus for data processing. These agencies can be used to provide either "batch" or "on-line" data processing services.

2. Acquire in-house computer hardware and also develop application software (programming) for the system.

3. Acquire a fully programmed and supported system, including both in-house computer hardware and packaged application software. Such a system would be operated by existing city personnel.

B. Evaluation of Alternatives

1. Service bureaus

    a. Advantages

- Software and hardware are maintained by the service bureau.

- A qualified staff is available in certain functional areas.

- The transition to automation from current operations would be relatively easy.

    b. Disadvantages

- Limits are imposed by cost and expertise available at service bureaus regarding initiation of additional or more sophisticated data processing capabilities.

- Service bureau software may not provide much flexibility for the local user.

- Communication breakdowns and attendant costs can occur, and communication costs can be high if an on-line connection to the service bureau is used.

- In Nebraska, no service bureaus are known to exist that offer a full range of local government data processing.

2. In-house hardware/in-house software development

This alternative is not deemed acceptable for the following reasons:

- The length of time required to create the required software will be excessive.

- The personnel and cost requirements of in-house software development and support are excessive.

- The limited availability of qualified programmer/ analysts with experience in municipal government would result in difficulty in hiring and retaining a qualified programmer(s).

This alternative would take too long, cost too much, and involve too much risk for a small local government to implement a data processing system.

3. <u>In-house computer and packaged software</u>

   a. <u>Advantages</u>

      - The city would own and control its own system.

      - The software is tested and reliable, and most packages can be modified by the vendor to meet the city's specific requirements.

      - The system can be operated easily by existing personnel.

      - The system provides a relatively easy transition and introduction to electronic data processing.

      - A procurement contract can be executed under which a vendor is fully responsible for system (hardware and software) performance according to the city's specifications.

   b. <u>Disadvantages</u>

      - Certain problems are associated with ownership and control of a computer system, including system depreciation and obsolescence, equipment failure, and use scheduling.

      - Unanticipated vendor problems can occur.

      - Personnel problems can arise involving both training of personnel and personnel fear of and/or opposition to a system.

C. <u>Recommendation</u>

This study recommends that a Request for Bid or Proposal (RFP) be developed to solicit proposals for in-house computer hardware and packaged software per the configuration outlined in this report. The RFP should place particular emphasis on the microcomputer alternative for reasons of cost.

Three compelling reasons exist for the city of Gothenburg to proceed with this recommendation. First, the equipment that it

currently operates for purposes of accounting, payroll, and utility billing is antiquated, has essentially no expandability or enhancement potential, and maintenance on this equipment can be expected to become increasingly difficult and expensive.

Second, the current generation of computer technology is relatively inexpensive, highly reliable, easy to use, and will provide the city with a considerably enhanced capability to perform needed data processing tasks.

Third, the city can proceed with the recommendation made to submit RFP's for a new system at virtually no risk. That is, no decision regarding acquisition of a replacement system will be made until bids have been received and evaluated and cost comparisons made.