

**A Cost Benefit Analysis  
of an Automated Circulation System  
for a Small Public Library**

**by**

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## CHAPTER I

### INTRODUCTION

A great deal has been written on the importance of automation in libraries. There is growing interest to automate the small public library. As the costs for computer hardware continue to decline, automation is becoming more of a reality for small public libraries. In the past, both mini computers and mainframe computers were cost prohibitive and beyond the ability of small public library to purchase. One reason for this situation was that the mainframe computers were extremely expensive and somewhat limited in scope and flexibility for library functions. The computer industry did not have the capacity of developing a specialized library system that was cost effective. The present technology includes integrated library systems, with ordering, serial control, cataloging and circulation capabilities. The present generation of computer systems can be very useful in bridging the demand for library services and the ability to provide these services. As a result, now is the time for smaller libraries to examine the possible utility of automation in their library.

In 1993, there were 9,097 public library jurisdictions in the United States. The majority of these libraries served populations of less than 10,000 and typically employed staffs of five full-time employees or less.<sup>1</sup> According to a survey done by the National Center for Educational Statistics, "64% of all public libraries serving

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<sup>1</sup>Gertzog, 1994, p. 52.

populations of 10,000 or less had operating budgets of \$50,000 or **less**.<sup>2</sup> This is an environment where everyone does everything, from shelving and checking out books to mopping floors. Due to these constraints, the administrators of most small public libraries may believe they cannot afford to automate. Perhaps the truth is the small public library cannot afford NOT to be automated.

Deciding the most effective program for establishing an automated circulation system is a task that confronts library administrators today. Automation services provided by a local system, or network, are becoming the heart of library and information services. Thus, it is important to the development of the small public library to make a rational decision regarding automation. Expensive equipment, very specialized software, training, consultant fees, continuous support and maintenance are some of the variables that drive the computerization costs up. According to **Bierman**, the planning of an automation system also requires the following:

“... a cost-benefit analysis should be undertaken to see if your library can afford automation and if so, on what basis. You must determine what you are currently spending on the area or service of the library under consideration for automation, ...Then evaluate the benefits in comparison with the net cost increases and make the management decision -  
- is it worth it or is it **not**?“<sup>3</sup>

There are two purposes for this applied research project; first, a cost-benefit analysis (CBA) and cost-effectiveness analysis (CEA) dealing with library automation in Taylor, Texas will be performed. It will be used to evaluate the costs and benefits of an

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<sup>2</sup>Sager, 1983, p. 1.

<sup>3</sup>Bierman, 1982, P. 7

automated circulation system. Secondly, the aforementioned CBA and CEA will serve as a template for library managers to utilize in evaluating costs and benefits of an automated circulation system for the Central Texas Library System. The analysis is intended to serve as a model. It may be duplicated or modified, and used as a guide for library administrators.

Technology has changed throughout the years and the belief that automation was only beneficial for larger libraries no longer holds true. The advancement in technology has grown so quickly that automation for small public libraries has become a necessity for the future. In the last twenty years, research has shown that **computers** continue to influence library and information science services and "it is safe to assume that the public will become more conversant with computers and better prepared to access the library's services through direct use of a automated **system**."<sup>4</sup>

This predictive research examines the costs and benefits of two different circulation systems. In this analysis, the benefits of an automated circulation system will be compared with those of a manual circulation system. The first alternative focuses on providing an online circulation system that keeps track of checkouts and checkins, automatically prints overdue and fine notices, catches delinquent patrons and frees staff time for better patron service.<sup>5</sup> In contrast, the manual circulation system provides the same service but requires more labor and becomes more cumbersome as growth occurs. The objective of providing automated library service is to reduce

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<sup>4</sup>Sager, 1983, p. 21.

<sup>5</sup>Bierman, 1982, p. 6.

**and/or** stabilize cost and to improve customer service. This is done by automating labor-intensive activities to save time and personnel cost.

"The administration must balance what automation can accomplish compared with the future maintenance of these manual files. If the collection or records can be effectively maintained manually and not deteriorate to the state they were in before the upgrading effort, then automation may not be needed. On the other hand, if growth in the collection or in usage is anticipated, or if it is anticipated that staff and revenues will not be sufficient to cope with existing or projected levels of use, then it would be well to **consider** automating that process to ensure that the effort is not wasted and to maintain the quality of records and services."

The role of the decision-maker is to try and achieve this objective in the most cost effective way. Severe budget constraints on library budgets have forced **decision-**makers to carefully analyze the different options that are provided within a program.

Limited resources force administrators to make difficult choices among competing projects. The most fundamental proposition of economics is that resources are always limited, compared with what people want. "These scarce resources must be allocated among competing wants, so that citizens of the community receive the largest benefits **possible**."<sup>7</sup> The allocation of resources involves comparing alternatives. **Cost-**benefit analysis has been used as a method for comparing the worth of competing projects. The objective of a cost-benefit analysis is to provide administrators with a criterion with which they can make choices among competing alternatives.

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<sup>1</sup>Sager, 1983, p. 8.

<sup>7</sup>Galambos, 1978, p. 3.

Administrators must decide if the gain to society (benefit) from the project is greater than the social sacrifice (cost) required to produce the project. If so, the project is recommended as a worthwhile project. A worthwhile project improves society's economic condition because these projects direct resources where their uses provide a greater return than would an alternative use. This is the essence of cost-benefit. The two key decision-making techniques pertaining to the costs of providing automated library service are cost-benefit analysis and cost-effectiveness analysis.

In Chapter II, Literature Review, cost-benefit and cost effectiveness analysis are discussed. This will include a historical discussion of these particular techniques as a decision-making criteria regarding the construction of dams, bridges, roads and other infrastructure during the early 1930's. However, the chapter also outlines a discussion of the different elements of both cost-benefit and ~~cost-effective~~ analysis.

Chapter III provides the organizational setting ~~under~~ which this analysis has been conducted. An overview of the literature pertaining to library automation and a review of the different applications of CBA and **CEA** to library services is presented. The Chapter provides a framework for making decisions among competing government programs based on the discussions of cost-benefit and cost effectiveness analysis. This chapter does not identify specific answers regarding the automation of public libraries, rather, the research presents a review of different applications of cost-benefit analysis methods in different studies. The research material provides the historical foundation for assessing the benefits and costs of automated library services in this analysis.

Chapter **IV** applies both cost-benefit analysis and cost-effectiveness analysis evaluation research methods to the data that was collected for this project. This involves determining the cost savings for an automated circulation system and comparing them to a manual system. The results of this analysis determines the feasibility of purchasing online automated circulation systems for the small public libraries in the Central Texas Library System.

Chapter **V** presents the summary of the cost-benefit and cost-effectiveness analysis of an automation system for the Taylor Public Library. Current costs, together with comparative costs for a computerized system suggests that automation is feasible alternative for the library. In times of restrained budgets, it becomes crucial to get the most value for the dollar. Although the analysis shows that an automated system may require a high initial outlay, over time, it saves money. In conclusion, the data analysis indicates that costs are no longer the barrier they once were, but are still high enough that a library should consider all its options in acquiring an automated system.



## CHAPTER II

### LITERATURE REVIEW

#### 2.1 SYSTEMATIC ANALYSIS

The purpose of this chapter is to review the literature on cost-benefit analysis and cost-effectiveness analysis and the need for systematic methods to evaluate alternative programs. These are techniques that are applicable across programs and across policy areas. Later on, these methods will be applied to library programs. What distinguishes these different forms of systematic analysis is that there is a logic that can be translated into specific steps. Systematic analysis is generally applied to resource allocation issues.

Systematic analysis can be an essential part of the decision-making process. It is a method that accounts for both **tangible** and intangible objectives. The analysis is a means by which information is presented and used to determine what can be accomplished with a specific level of resources. The results of the analysis feed into the political process. The need for this type of evaluation is self-evident. Evaluation enables the examination of investment proposals to ensure government accountability. This type of analysis presents information about what government plans to do and the costs associated with accomplishing a desired outcome.

There are many different forms of analysis, such as operations research and economic analysis. Much of the discussion in this chapter focuses on economic analysis, which is divided into two topics, cost-benefit and cost-effectiveness analysis.

Cost-benefit and **cost-effectiveness** analysis are management tools which are used to determine the costs and benefits of a particular project. After costs and benefits are determined these methodologies are used to choose between alternative projects. Hence, they represent a method to make decisions about funding among different types of library functions such as cataloging, circulation and collection **development**.<sup>8</sup>

Many small libraries cannot keep up with the rapid increase in technological advancements. The associated costs of expanding computerized library and information services increase faster than library administrators can incorporate such changes in their budgets.' This, coupled with an overall reduction in funds, makes it difficult for small libraries to consider automation an option. Currently, **45** percent of small libraries have operating budgets of **\$50,000 or less**.<sup>10</sup>

Public programs and services are funded by local taxes that are based on the value of local property. The escalating cost in all areas of public services continues to be a problem. This is especially true when considering the provision of automated services for small public libraries. It is not likely that public service budgets will be increased. Library administrators are thus faced with the task of incorporating new technology in a stressful fiscal environment. Priorities need to be identified, a continuum of services developed and program costs delineated. The issues surrounding costs for automation of small public libraries reflect a need for an effective

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<sup>8</sup>Van House, 1984, p. 408.

<sup>9</sup>Bierman, 1982, p.7

<sup>10</sup>Gertzog, 1994, p. 52.

method of outlining priorities and selection of those priorities. This method should also take into account efficiency. Benefit-cost analysis and cost-effective analysis are such methods.

The need for cost-benefit analysis in library and information services has become more important as the competition for dollars with other governmental agencies increases. This chapter discusses cost-benefit and cost-effectiveness analysis in general and delineate the steps that are needed to accomplish this type of analysis.

## **2.2 OVERVIEW OF COST-BENEFIT ANALYSIS**

Evaluation of public projects has occurred throughout history. The modern literature on cost-benefit analysis (CBA) dates back to an article published in 1844 by J. Dupuit. This essay, "On the Measurement of the Utility of Public Works," was written by Jules Dupuit, a French engineer, Dupuit stated:

Legislators have prescribed the formalities necessary for certain works to be declared of public utility; political economy has not yet defined in any precise manner the conditions which these works must fulfill in order to be really useful; at least, the ideas which have been put about on the subject appear to us to be vague, incomplete, and often inaccurate. Yet the latter question is more important than the former; inquiries - be they so numerous - laws and ordinances will not make roads, a railway, or a canal useful if it is not already. The law ought to confirm the facts demonstrated by political economy. How is such demonstration to be made? Upon what principles, upon

what formula, does it rest? How in a word is public utility to be measured?""

In the 1920's Professor A. C. Pigou refined this concept of public utility.<sup>12</sup> He introduced the concepts of social benefit and social cost and a need for measuring public utility. During this period of history, policymakers accepted the idea that projects, public or private, should have a broader social justification for public investment. Further, these justifications should include the positive and negative consequences of public decisions. This was the beginning of a new way of thinking, though actual applications of the CBA started much later. The United States Flood Control Act of 1936 was probably the first major legislation to mandate CBA.

### 2.3 THE THEORY OF COST-BENEFIT ANALYSIS

Cost-benefit analysis can be applied to a variety of proposals, such as, modification of equipment for a library's computer system, the purchase of a new phone system, construction of an airport or highway, or travel to an annual conference. The purpose of Table 2.1 is to illustrate the application of the cost-benefit formula which is the basis of this research. Table 2.1 shows how benefit-cost analysis might be performed and ranked. In this table, five hypothetical public programs are shown. Total benefits and total costs are highlighted and the criteria to choose between the programs are discussed. In interpreting the table, the use of (\$000) is a notation for

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<sup>11</sup>Newton, 1972, p. 228

<sup>12</sup>Newton, 1972, p. 229.

thousands, and the data presented is in thousands. Costs and benefits will be defined in another section.

Table 2.1

Benefit-Cost Analysis for proposed Library Activities (000's)						
Program	Benefit (B)	Cost (C)	Net Benefit (B-C)	Benefit-Cost		
				Ratio (B/C)	Rank (B/C)	Rank Net B
1	210	147	63	1.4	3	1
2	90	30	60	3	1	2
3	27	30	-3	0.9	5	5
4	3	2.5	0.5	1.2	4	3
5	0.03	0.2	0.1	1.5	2	4

The essence of cost-benefit principles is that public financial resources are best allocated to those programs which benefit the community. There are two decision criteria 1) net-benefit and 2) benefit-cost ratio. According to the net-benefit method, total costs are subtracted from the total benefits. When the difference between benefit and cost is greater than zero, society is better off. In the benefit cost ratio, the ratio is computed by dividing the total benefits (B) of a program by the program's total costs (C). If the ratio is greater than 1, then the benefits from the program exceed its costs and the program is **considered** acceptable. If the ratio is less than 1, then costs exceed benefits and the allocation of scarce resources to the program would be rejected. It would be inefficient to support the program. The decision criterion in both net benefit

and benefit cost ratio may yield different rankings; however, they both tell you if the project is acceptable or not.<sup>13</sup>

The usefulness of cost-benefit analysis, for example, is in determining whether it would be worth the public resources to purchase an automated circulation system, rather than continue to operate a manual circulation system, for a small public library. In this example, a library would purchase equipment and stabilize personnel cost to increase customer service. The benefits of the new equipment and fewer staff must be weighed against the current level of staff and against the cost of no system and more staff. Another example might be whether a library should purchase pay telephones to receive revenue. The analysis for this example would consist of comparing the revenue received from the pay phones to the cost of purchasing the new phone system.

The results of a hypothetical analysis, illustrated in Table 2.1, show that the benefits exceed the costs for all activities except for program three. In other words, the **cost-benefit** ratio is greater than 1 for all activities except for the third program. The benefit-cost ratio of the third program is  $27,000/30,000 = .09$ . Assuming there are not other valid reasons for keeping this program, it should be rejected because its costs exceed its benefits

Programs where benefits exceed costs could be ranked from the highest to lowest benefit-cost ratio. The ranking of the programs in this example would be 2, 5, 1, and 4. Program 2 has the highest benefit-cost ratio of all programs and the fourth program has the lowest. Another method of ranking the projects is the net benefit,

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<sup>13</sup>Galambos, 1978, p.36.

which is the numeric difference between benefits and costs (B-C) (Galambos, 1978 p.36). Using this method, the rank order changes. The order of choice using this second method is 1, 2, 4, and 5. If an administrator has ample resources, a choice based either on net benefit or the **benefit-cost** ratio is acceptable. Program 2 shows an investment of \$30,000, which results in three times the benefit per dollar of cost. However, choosing between the two criteria would depend on the different costs and benefits of the projects being compared even though in most cases the two criteria will lead to the same conclusion. According to Gupta, the literature prefers the net benefit approach over the ratio **method**.<sup>14</sup>

Cost-effectiveness analysis, like cost-benefit analysis, assumes that all costs of a project can be calculated. The differences arise in the determination of the denominator. Rather than using only a dollar amount, a meaningful unit of effectiveness measure (or unit of service) is attached (**e.g.** the value of lives saved) to the formula for cost-effectiveness. The utility of this kind of design is traditionally associated with the exploration of a number of different alternatives to a desired outcome. In cost-effective analysis, the results of a project are assumed to be worthwhile to society. This type of analysis predicts the efficiency of different inputs or approaches. Its primary advantage is in making a comparison among programs achieving similar objectives within given cost **restraints**.<sup>15</sup>

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<sup>14</sup>Gupta, 1994, p. 355.

<sup>15</sup>Levin, 1983, p. 18.

Both cost-benefit and cost-effectiveness deal with decisions about the allocation of scarce resources. These two approaches assume that society will compare costs and benefits, including time and money, to maximize utility or **well-being**.<sup>16</sup> One of the distinctions of cost-benefit analysis is to determine the **costs** and benefits and consider a monetary unit of measure for both. A cost-benefit analysis relates the benefits (outcomes) of a service to the cost (inputs) of providing that service. The problem within a government setting is the benefits tend to be social values and are not so easily expressed in the same dollar unit as the **costs**.<sup>17</sup>

Cost-effectiveness is concerned with efficiency of benefits and costs. In this method, the analyst assumes that all benefits are substitutes for each other, and considers them all equal. By holding all of the benefits constant, the objective becomes to choose the least expensive alternative. Cost-effectiveness evaluates the effectiveness of ongoing public programs to ensure the efficient use of resources.

Both methods attempt to relate costs of programs to performance and to quantify costs in dollar values. The major distinction between cost benefit and cost effectiveness analysis is how the outcomes are quantified. Cost effectiveness measures outcomes in a quantitative but nonmonetary unit of measure. For example, the unit of measure might be the number of lives saved or the amount of time saved. In a cost benefit analysis, outcomes are measured in a monetary unit. This allows for the development of the benefit cost ratio and net benefit. The advantage to this is the

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<sup>16</sup>Van House, 1984, p. 407.

<sup>17</sup>Lancaster, 1988, p. 8.



analyst is able to make comparisons across policy areas. In contrast, cost effectiveness would not be able to make such direct comparisons because the unit of measure is different.

Both methods attempt to assess the desirability of alternatives. Both have the same kinds of methodological problems in identifying and measuring costs and benefits. Many of the problems associated with these methodologies relate to the assumptions that must be made by the analyst. The analyst must determine cost and benefit data, and select a discount rate which can bias the final analysis. Despite the difficulties in conducting this type of analysis, it provides useful information about the use of resources.

When economists speak of costs, they are considering something more than explicit costs. Economists are concerned with full opportunity costs. The "opportunity costs" are the costs of using resources for one purpose rather than another. **CBA** refers to a specific technique for comparing the negative and positive consequences of alternative uses of resources, including money, manpower, facilities and preferences. The CBA method requires an analyst or evaluator to identify, measure and compare all the measurable significant costs and desirable outcomes of alternative programs. **CBA** is a method by which administrators can systematize the selection process of alternatives by offering specific steps and decision rules. This section outlines the main steps that are listed by Galambos (1978). These steps are 1) identify, 2) measure, 3) consider time, and 4) decide. Each of these steps are discussed in detail in the following section.

## 2.4 A DESCRIPTION OF THE STEPS IN A COST-BENEFIT ANALYSIS<sup>18</sup>

Public administrators must decide which services to provide, and how to allocate these resources. Cost-benefit analysis in the public sector is concerned with maximizing the community's welfare; therefore, the methodology and the technical application of CBA is an important part of the analysis. Cost-benefit analysis involves the following steps to determine whether a project is worthwhile. For the purpose of illustration, examples from the actual analysis are used to explain each step.

1. Identify the costs and the benefits that will result from a project or program;
2. Measure in dollars the costs and benefits so that both costs and benefits are stated in common denominator units that can be compared with potential alternative uses of revenues;
3. Incorporate the time dimensions in the evaluation, because costs and benefits must be examined for the entire life of the project, not just for the current fiscal year.
4. Decide whether the result of the first steps yield a large enough social profit (net social benefits) to justify the expenditures of limited funds.<sup>19</sup>

Public administrators make a variety of financial decisions that support program activities. Identifying the costs and the benefits sounds like a relatively simple process; however, it is often difficult to determine the actual costs and benefits.

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<sup>18</sup>Galambos, 1978, pp. 36-41.

<sup>19</sup>Galambos, 1978, pp. 36-39.

Determining which costs and benefits are relevant is very important to the analysis. Benefits can generally be classified as real benefits. Real benefits are described as direct and indirect as well as tangible and intangible. Direct benefits are closely related to the main project while indirect benefits are by-products of the project. The indirect effects are known as **externalities**.<sup>20</sup>

Sometimes we receive benefits or costs that nobody intended. These costs and benefits of by-products can be priced on the market." They represent added benefits or costs to the community as a whole. Some examples of external costs are: the hazards to rivers when business firms pour dangerous chemicals into rivers; construction of a convention center externalities could be identified in terms of increased levels of sales tax, parking fees, sales at retail stores and restaurants. These are the benefits and costs that spill over to the larger community. There are positive and negative **externalities**.<sup>22</sup> Examples of negative externalities for the construction of a convention center could be increases in traffic congestion, crime and pollution.

The various types of benefits and costs can be categorized as tangible or intangible.<sup>23</sup> The term "tangible" is applied to benefits and costs which can be priced in the market, while intangible benefits and costs cannot. Pollution would be considered

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<sup>20</sup>Gupta, 1994, p. 336.

<sup>21</sup>Mishan, 1973, p. 117.

<sup>22</sup>Gupta, 1994, p. 336.

<sup>23</sup>Musgrave, 1973, p. 141.

an intangible cost. Table 2.2 is an illustration of the different types of benefits and costs for public programs.

**Table 2.2 Illustration of Project Costs and Benefits\***

IRRIGATION PROJECT				
Real Direct	tangible	Increased farm output		Costs of pipes
	intangible	Beautification of area		Loss of wilderness
Indirect	tangible	Reduced soil erosion		Diversion of water
EDUCATION PROJECT				
Real Direct	tangible	Increased future earnings		Loss of student's earnings
				teachers' salaries
				cost of buildings, books
	intangible	Enriched life		Foregone leisure time
Indirect	tangible	Reduced costs of crime prevention		
	intangible	More intelligent electorate		
LIBRARY PROJECT				
Real Direct	tangible	Increased circulation output		Cost of books & materials
	intangible	Enriched life		Foregone leisure time
Indirect	tangible	Reduced costs of literacy programs		
	intangible	More literate community		

\*Source: Illustrative example from Musgrave and Musgrave, 1973, p. 142

Costs may be defined as the amount of money needed in order to provide a service or product. The sum of all costs associated with an activity is known as total cost. To determine total cost of a service or activity, two key cost elements are capital costs and operational costs. Capital costs relate to the purchase of physical infrastructure or equipment that is expected to provide benefits for several years. "More technically, a capital expenditure can be defined as an outlay that produces benefits ... in periods beyond the current accounting period."<sup>24</sup> Examples of capital expenditures are public buildings and highways, or motor vehicles and computers. The distinction of a capital expenditure is the life of the purchase. Operational costs relate to specific activities; examples of operational costs are personnel, materials, and supplies that are associated with an on-going project. Indirect operational costs cannot be related to specific activities. These costs are referred to as overhead. A local government performs many different administrative functions that incur costs that indirectly support program activities. If we want to know the cost of program activity, we must include this as part of the analysis.

#### 2.4.1 ESTIMATING COST AND BENEFITS IN DOLLARS

Step 2 is to measure in dollars the cost and benefits of the project. The problem with estimating dollar values for a CBA is that most governmental programs do not have corresponding market prices. There are some pricing standards for business-like goods and services but not for social values.

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<sup>24</sup>Mikesell, 1991, p. 167.

In a cost-benefit analysis, the dollar value of a program benefit is the sum of both direct and indirect benefits produced by that program. Direct benefits are easier to quantify than are indirect benefits. Examples of cost savings due to direct benefits are lower costs through reduced supply expenses, or reduced personnel expenses or reduced service hours. Examples of indirect items which cannot be assigned a monetary value are the pleasure children receive from a storytelling program, value of self-improvement received from an adult literacy program, and the value of new knowledge received through a seminar.

**Intangibles** have no market comparison; however, for the purpose of conducting a CBA, an analyst must estimate monetary values for these items. For example, a winning football team could include the intangible benefit of renewed enthusiasm for the home city. "Enthusiasm" is primarily a qualitative benefit and cannot be expressed in a monetary value. The analyst must develop a value for "enthusiasm." "Since market imperfections do exist, market prices and costs do not reflect true social values and costs, and they must be adjusted **accordingly**."<sup>25</sup> This practice is known as shadow pricing, a pricing technique to establish social values. Establishing monetary values for intangibles involves measuring these items as if they were bought and sold in open markets:

The total benefit of an intangible is the maximum amount of money that users would pay in order to have its service, and the total cost of an

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<sup>25</sup>Musgrave and Musgrave, 1973, p. 143.

intangible is the minimum amount that would be accepted by the bearers of the **cost** in order to agree willingly to bear it."<sup>26</sup>

Another way of dealing with these intangible effects is to describe their nature, and when possible, establish a minimum value of the unmeasurable effect. This allows for some sensitivity to intangible effects within a CBA **framework**.<sup>27</sup>

#### 2.4.2 INTRODUCTION OF THE TIME DIMENSION

Step 3 is the process of incorporating a time dimension within the analysis. The discount rate is what translates costs and benefits over time into present **values**.<sup>28</sup> This allows the analyst to take into account the benefits and costs that do not accrue instantaneously, but over time. The essential feature of the net present value method is to establish the value of money today. **The** time value of money is called a discount rate. This concept recognizes a time preference and that one dollar today is valued more highly than a one dollar in the future. Most investment projects involve an immediate cost of capital and in subsequent years increase in operating costs. Returns are small in the first few years and then increase through the expected life of the project. The comparison of costs to benefits over time make it necessary to discount over the life of the project. The benefits that occur later are valued less because of the time factor. Long-term projects are less desirable than short-term projects because

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<sup>26</sup>Boadway, 1984, p. 206.

<sup>27</sup>Haveman and Margolis, 1983, p. 97-98.

<sup>28</sup>Musgrave and Musgrave, 1973 p. 147.

distant benefits are discounted so heavily. Therefore, costs and benefits are usually compared from year to year, and the difference summed over the life of the project.

Once time is accounted for, the economic feasibility of a project or program is dependent on the net present benefit (discounted benefits exceeds discounted **costs**).<sup>29</sup> The purpose of the time dimension is to calculate the stream of benefits and costs over the life of the project. This is determines the net present value of a **project**.<sup>30</sup> The net present value can be calculated using the following formulas.

Public expenditures represent a movement of resources from the private to the public sector and a movement of resources from current consumption to investment in future returns. The premise of assigning a discount rate or an opportunity cost is that it is acceptable to invest in a government project only if the returns are greater than if the same funds were left in the private sector and if the future returns are worth the current sacrifice.

"The proponents of opportunity cost for investment argue that since government pays for its investments by taking money away from private citizens, unless the returns of these investments are at least equal to those of the private sector, it does not make any economic sense for the government to invest.""

The analyst must consider the value of the benefits forgone by not leaving the money in the private sector where it would have been consumed or invested. The assumption is that dollars removed from the private sector (consumption today) to the

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<sup>29</sup>Mikesell, 1991, P. 189.

<sup>30</sup>Gupta, 1994, p. 346.

<sup>31</sup>Gupta, 1994, p. 351.



public sector (future consumption) is not the same dollar value. That is to say that a dollar spent today is worth more than a dollar spent ten years from now. Therefore, in order to compare current consumption to a government's future returns on investment, we must translate these future streams of benefits and costs into their present values.<sup>32</sup> An interest charge must be made against that dollar investment in order to compare current values to future consumption. This is known as the discount rate.

The discount rate reflects the cost of removing a dollar from the private sector to be used in a public sector investment. The discount rate should reflect a rate of return consistent with the private sector

According to this point of view, while evaluating a public project, the analyst should take into account the opportunity of alternate investment opportunity in the private sector, and hence discount the project by a rate equal to the private rate of return. For example, suppose that the U.S. Space Agency is proposing building a new kind of space vehicle which will be able to deploy satellites with a greater degree of efficiency than the existing space shuttles. If the market is yielding 10 cents on a \$1 investment, unless it can be shown that the return from this project is going to be at least 10% (i.e., the project carries a positive net present value, when discounted at 10%), the project should not be undertaken.<sup>33</sup>

The net present value discounts future net benefits to their present value. The chosen discount rate will affect whether the net present value is greater or less than zero. High discount rates penalize projects with benefits occurring farther in the future. Therefore, the discount rate must reflect the cost of government borrowing. The interest rate at which the market is willing to lend money to the government is used to

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<sup>32</sup>Gupta, 1994, 9. 347.

<sup>33</sup>Gupta, 1994, p. 351.

determine whether to undertake a project. The discount rate selected for public sector investment can determine the outcome of the project. The Office of Management and Budget (1972) states its discount rate policy in the following terms:

The discount rates to be used for evaluations of programs and projects subject to the guidance of this Circular are as follows:

- a. a rate of 10 percent; and, where relevant,
- b. any other rate prescribed by or pursuant to law, executive order, or other relevant **Circulars**.<sup>34</sup>

The assumption here is that the prescribed discount rate of 10 percent represents an estimate of the average rate of return on private investment, before taxes and after inflation. A discount rate of 10% would be considered a conservative rate, and a case could be argued that it is too high since in 1978 interest rates were much higher than they are today. The literature supports no single best approach in selecting a discount rate. The analysis in this paper is directed toward improving the quality of the decision process and not aimed at finding the true social discount rate.

It is important to emphasize that the choice of a discount rate influences the decisions of a cost-benefit analysis. If the analyst uses a low discount rate, this favors investments in the future. A high discount rate favors consumption over future benefits. Therefore, the relative desirability of a project depends on the choice of a discount rate.<sup>35</sup> An analyst may employ several discount rates to determine a project's

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<sup>34</sup>Sassone, 1978, p. 123

<sup>35</sup>Gupta, 1994, P. 349.

## PRESENT VALUE CALCULATION

$$PVB = \frac{B_1}{(1+r)^1} + \frac{B_2}{(1+r)^2} + \dots + \frac{B_n}{(1+r)^n}$$

$$PVC = \frac{C_0}{(1+r)^0} + \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \dots + \frac{C_n}{(1+r)^n}$$

$$NPVB = PVB - PVC$$

$$\text{Where: } \sum_{i=0}^n \frac{(B_i - C_i)}{(1+r)^i}$$

This is the **formula** used in subsequent calculations. Simple mathematical manipulation reveal the equivalencies. The Net Present value **of** the benefits can be calculated on a year by year basis.

**B<sub>i</sub>** = Benefits in Year **i**

**C<sub>i</sub>** = Costs in Year **i**

**r** = Discount Rate

**n** = Number of years - **the** life **of** the project

**PVB** = Present Value **of** Benefits

**PVC** = Present Value **of** Cost

**NWB** = Net Present Value **of** the Benefits

sensitivity to discounting. On page 24-A outlines the calculations needed for present valuation.

The final **stage** of the **analysis** is to **identify** whether a **project** is accepted or **rejected**. CBA offers a two decision criteria: the **benefit-cost** ratio (present value of benefits divided by the present value of costs) and the net benefit (the present value of benefits less the present value of costs). If the benefit cost ratio exceeds 1, or if the net benefit is greater than zero, then the project passes the test of economic **efficiency**.<sup>36</sup> In many cases, the use of **these two** criteria will lead to the same conclusion. However, net benefit is the approach preferred by the economic **literature**.<sup>37</sup>

Cost-benefit is a very important tool to assist decision-makers. It allows an analyst to make comparisons among competing programs on the ways service is delivered. Care should be taken in interpreting the results. Some major ethical considerations should be made in the interpretation. Researchers must be extremely careful in assigning cost and benefits.

Cost-benefit is an easy process to conceptualize and appreciate. The researcher gathers all the costs of providing a good or service. If the benefits outweigh the **costs**, the good or service should be continued. If the costs exceed the benefits, the service should be terminated. In cost-effectiveness, the evaluator explores how

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<sup>36</sup>Miksell, 1991, P. 189.

<sup>37</sup>Gupta, 1994, P. 355. (A more detailed discussion of the criteria for choosing a discount rate can be found in Mishan, 1976, Chapters 30-34).

results might be efficiently achieved and which costs are attached to the results for reaching a desired outcome.

### 2.4.3 COST-EFFECTIVENESS ANALYSIS

In cost-effectiveness analysis, the benefits of a project are assumed to be worthwhile and are difficult to **measure**.<sup>38</sup> The benefit for using cost-effectiveness is that it integrates the results of activities with their costs in such a way that an individual can select those activities that provide the best results. This method emphasizes that both the costs and effectiveness aspects are important and must be **measured**.<sup>39</sup> Cost effectiveness analysis is the preferred method when it is impossible to measure benefits. It is used to evaluate two or more alternatives that will achieve the same objective without measuring the benefits. It may also be used in a situation where an objective is mandated and program termination is not a option.

Hence, the purpose of this type of analysis becomes to achieve a desired program goal or objective at minimum costs. Cost effectiveness is an analytical technique related to cost benefit analysis. Benefits, however, are not considered. If the benefits of each alternative are the same, it is not necessary to give them a dollar value. Cost-effectiveness analysis is a good substitute for cost-benefit analysis. The

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<sup>38</sup>Galambos, 1978, p. 51.

<sup>39</sup>Galambos, 1978, p. 51.

costs of each alternative must be identified and measured. Then, the most efficient alternative is **selected**.<sup>40</sup>

There are difficulties in performing a cost-benefit analysis. It is not always a totally objective procedure that can guarantee an evaluation free of error. Identifying the benefits and measuring them in dollars is the most difficult part of cost-benefit analysis. Choosing different discount rates to compute the present value of net social benefits can drastically affect the outcome of an analysis. Placing a dollar value on benefits can be very subjective, Inflation and other intangible items make placing dollar amounts on future and present value difficult. When many of the important benefits are intangible, cost-benefit analysis is probably not worthwhile. Also, if the needed information is not available at reasonable cost within the time period in which a decision must be made, a major cost-benefit effort is probably not a good **idea**.<sup>41</sup>

Politicians support cost-benefit analysis to make government decisions; administrators view it as a way of choosing between competing alternatives in light of declining budgets. Evaluators use it as a way of providing more complete information to decision-makers.

The cost-effectiveness approach has a number of strengths. Most important is that it merely requires combining cost data with the effectiveness data that should be readily available. Its one major disadvantage is that you **can** compare the **cost-**

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<sup>40</sup>Galambos, 1978, p. 77.

<sup>41</sup>Galambos, 1978, p. 75.

effectiveness ratios among alternatives only if they all have the same goal.<sup>42</sup> For example, it would not be possible to compare the cost-effectiveness of programs dealing with reading and mathematics, or education versus health. Cost-effectiveness analysis explores how results can be achieved and which costs are attached to them for reaching different levels of the desired outcomes. The steps in cost benefit and cost effectiveness overlap and there are also some differences. Table 2.3 illustrates the similarities and differences of cost benefit and cost effectiveness analysis.

Van House (1983) feels that the field of library and information services is appropriate for cost-benefit and cost-effectiveness analysis. Libraries have begun to redefine their services through cost analysis. Careful planning and evaluation are required to provide the most cost-effective programs. Local governments have a declining tax base and ever-increasing demands for public services. Local and State governments must make decisions that pertain to choosing among competing alternatives. Standard evaluation approaches take into account only the effects of alternatives, such as the number of citizens served. But, cost benefit and cost-effectiveness analysis take account of both the costs and effects of selecting alternatives. This makes it possible to choose the alternative that provides the best results for any given amount of resources, or that minimizes the resources that need to be used, for any outcome. Cost benefit and Cost-effectiveness analysis can lead to a more efficient use of Library and Information Science resources; it can reduce the costs of selected programs and of budget resources.

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<sup>42</sup>Levin, 1983, p. 18.

Table 2.3 A Description of Cost Benefit and Cost Effectiveness Analysis Techniques<sup>43</sup>

Cost Benefit Analysis

**Definition:** a technique for evaluating the social profitability of alternative uses of scarce resources

- Steps:**
- 1) **Identify** the costs and benefits that will **result** from a program or **project**
  - 2) **Measure** in dollars those costs and **benefits**
  - 3) Incorporate the **time dimension** in the evaluation, because costs and benefits must be examined for the entire life of the project
  - 4) **Decide** whether the results of the first three steps yields a large enough social **profit** to justify the expenditure of limited funds.

Advantaaes:

- 1) Assists decision makers in making decisions by providing better information
- 2) Helpful in deciding which major projects to under take
- 3) Helpful in analyzing **recurring** similar projects
- 4) Can determine whether or not alternative projects are socially profitable

Disadvantaoes:

- 1) Hard to identify all relevant costs and benefits
- 2) Erroneously including "transfers" that are not real costs or benefits
- 3) Hard to place dollar values on certain **benefits** and costs
- 4) impossible to convert some costs and benefits into dollar values (intangibles)
- 5) Hard to identify the proper discount rate
- 6) Considerable time, costs and **expertise** usually required to do a cost-benefit analysis
- 7) Some decisions have to be subjective

Definitions: used to evaluate two or more alternatives that will achieve the same objective without measuring the benefits

- Steps:**
- 1) **Identify** the costs of each alternative
  - 2) **Measure** the costs of each alternative
  - 3) Incorporate the **time dimension** in the evaluation, because costs and **benefits** must be examined for the entire life of the project
  - 4) **Decide** which alternative has the lowest cost

Advantages:

- 1) Assist decision makers in making **decisions** by providing better information
- 2) Much easier than a **cost-benefit** analysis because it does not require the measurement of **benefits**
- 3) Require less time, effort and expertise

Disadvantaaes:

- 1) Cannot tell whether or not alternatives are socially **profitable**
- 2) Assessment of additional alternatives requires analysis of additional functions and costs
- 3) **Cost-effectiveness** analysis is valid only if alternatives under consideration have the same objective and identical outputs
- 4) Frequently hard to define "**output**"
- 5) If it is not possible to identify all costs in dollars, subjective decisions may still have to be made
- 6) If alternatives are compared whose time **streams** are not all the same, determining the lowest cost alternative will involve choosing a discount rate and computing the present value of the alternative

Cost Effectiveness Analysis

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<sup>43</sup> Cowan, T., 1993, p. 33



## CHAPTER III

### THE ORGANIZATIONAL FRAMEWORK OF THE PUBLIC LIBRARY

#### 3.1 NATIONAL PERSPECTIVE

The American Library Association defines a public library as:

Any library which provides general library services without charge to all residents of a given community, district, or region. Supported by public or private funds, the public library makes its basic collections and basic services available to the population of its legal service area without charges. Products and services beyond the library's basic services may or may not be provided to the public at large and may or may not be provided without individual charges."

As to organizational framework, the public library functions as a firm, a firm that is financed primarily through local tax dollars. This firm offers a variety of services to the people of a particular community. The firm usually defines a geographical area that it serves. This area is the firm's legal jurisdiction and it is **able** to provide its services based on the taxes collected by that jurisdiction. Most public libraries operate many sites, **a** central branch with one or more branch units.

In 1993, the nation's largest public library, the New York Public Library, operated 760 libraries. California, the most populous state in the country, has only 168 libraries, while **Iowa** has 500. The typical library in the United States is categorized as a small library, serving populations of less than 25,000. In aggregate they employ 108,

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<sup>44</sup>ALA, Glossary, 1993, p. 181.

246 paid staff members, expend about 4.1 million dollars and circulate 1.4 billion items annually.<sup>45</sup>

According to the 1993 Statewide Public Library Statistics, there were 499 tax supported public libraries operating in Texas. In total, these libraries expended approximately 172 million dollars on their operations. They undertook almost 71 million transactions of library material. The largest public library in the state is the Houston Public Library, which in fiscal 1993 spent almost 30 million dollars on its operations and had transactions totalling slightly over 8 million. The Central Texas Library System (CTLS) serves a population of one million, expended about 15 million dollars and circulated over 6 million items in the same time period. System supported libraries in the state are identified in Table 3.1.<sup>46</sup>

### 3.2 PUBLIC LIBRARY DEVELOPMENT IN TEXAS<sup>47</sup>

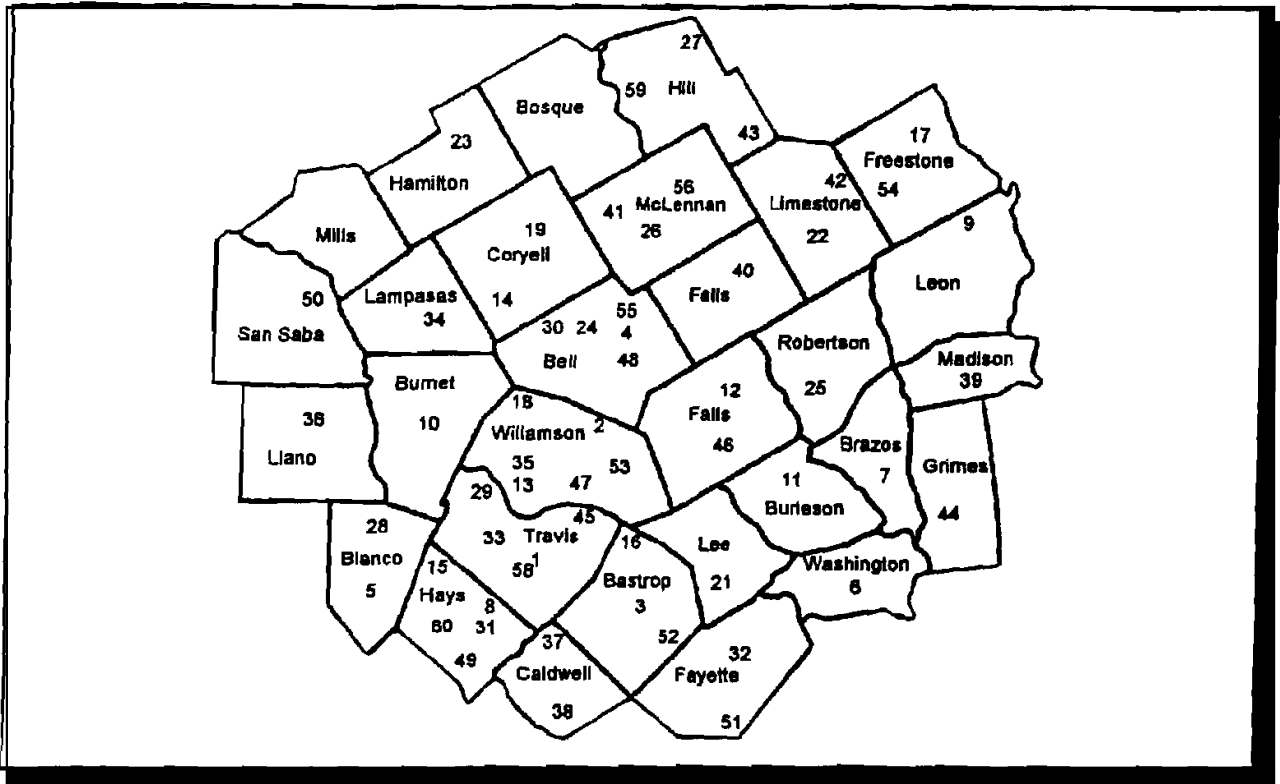
The Library Systems Act, adopted in 1969, enabled the Texas State Library and Archives Commission, acting through the Texas State Library, to establish a state library system consisting of a network of public library systems, related by contract, to the State. While the Act enabled the Commission to **encourage** and assist in the establishment of individual public libraries, the commission is not authorized or

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<sup>45</sup>Gertzog, 1994, p. 52.

<sup>46</sup>Texas Public Library Statistics for 1993, Austin, Texas: Texas State Library Library Development Division, 1994.

<sup>47</sup>The references from this section were taken from the Texas State Library System History, Library Development Division, October, 1988.



### CTLS MEMBER LIBRARIES

- |                      |                    |                  |
|----------------------|--------------------|------------------|
| 1. Austin            | 21. Giddings       | 41. McGregor     |
| 2. Bartlett          | 22. Groesbeck      | 42. Mexia        |
| 3. Bastrop           | 23. Hamilton       | 43. Mount Calm   |
| 4. Belton            | 24. Harker Heights | 44. Navasota     |
| 5. Blanco            | 25. Hearne         | 45. Pflugerville |
| 6. Brenham           | 26. Hewitt         | 46. Rockdale     |
| 7. Bryan             | 27. Hillsboro      | 47. Round Rock   |
| 8. Buda              | 28. Johnson City   | 48. Salado       |
| 9. Buffalo           | 29. Jonestown      | 49. San Marcos   |
| 10. Burnet           | 30. Killeen        | 50. San Saba     |
| 11. Caldwell         | 31. Kyle           | 51. Schulenburg  |
| 12. Cameron          | 32. La Grange      | 52. Smithville   |
| 13. Cedar Park       | 33. Lake Travis    | 53. Taylor       |
| 14. Copperas Cove    | 34. Lampasas       | 54. Teague       |
| 15. Dripping Springs | 35. Leander        | 55. Temple       |
| 16. Elgin            | 36. Llano          | 56. Waco         |
| 17. Fairfield        | 37. Lockhart       | 57. West         |
| 18. Florence         | 38. Luling         | 58. Westbank     |
| 19. Gatesville       | 39. Madisonville   | 59. Whitney      |
| 20. Georgetown       | 40. Marlin         | 60. Wimberley    |

required to establish such libraries itself. The commission is only authorized to bring existing public libraries together in a system formed to improve statewide library service and to serve, collectively, the entire population of the state. To accomplish this, the Act authorized the Commission to divide the state into geographical regions, each including at least 4,000 square miles, and to designate a large public library in each region as a **Major Resource Center (MRC)**.

The Commission was also authorized to establish standards as a prerequisite for system membership, with membership being on a voluntary basis. Within each region, the libraries which applied for membership and met accreditation standards were attached to the regional MRC for system services. These services were funded and provided through contracts made between the **MRC's** municipal government and the State Library.

Public libraries depend almost entirely on local support, most of which comes from city or county governing bodies through appropriation of local public funds. Historically, local government has been very reluctant to appropriate funds for library support in Texas, and this has substantially hindered library development at the local level. To accomplish its objective of improving statewide library service through a state system, the Commission first had to encourage increased local library support. This was done with a carrot and a stick technique. Local support efforts were necessary to meet system membership accreditation standards, but membership also provided services which, in many cases, could not be afforded at the local level.

In fiscal year (FY) 1983, 79% of the public libraries reporting to the Texas State Library had qualified for and accepted state system membership. By FY 1991, this figure had risen to 90% of the libraries reporting. During these eight years, the total number of public libraries increased from 428 to 471, or 10%. At the same time, the number of libraries qualifying for membership increased 25%, from 338 to 447. This suggests that system services are successful in improving the local libraries' services.

### 3.2.1 HOW PUBLIC LIBRARIES ARE ESTABLISHED IN TEXAS<sup>48</sup>

Many of the public libraries in Texas were formally established by women's clubs, then later formally and legally established as municipal public libraries, county free libraries, or libraries operated by nonprofit corporations but open to the public. Here is a brief summary concerned with the manner in which public libraries are legally established.

Local Government Code Section 315.005 (VTCA) enables city governing bodies to establish municipal public libraries. Adopted in 1874, this article is brief, broad, and permissive, allowing city government great latitude in the manner of library establishment. Local Government Code Sections 323.001 through 323.013 enables county commissioners' courts to establish county free libraries, to join with other cities **and/or** counties to provide library services, and to contract for library services with

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<sup>48</sup>The references cited here may be found by their section numbers in Vernon's Texas Code Annotated (VTCA) or Vernon's Annotated Civil Statutes (VACS).

already established libraries such as those operated by non-profit corporations, cities, or other counties.

Privately funded libraries open to the public may be established under the provisions of Article 1396, VACS, the Texas Non-Profit Corporation Act. A library established under the Texas Non-Profit Corporation Act must receive its financial support in whole or in part from public funds and be freely open to all persons to be designated as a "public library." Under the provisions of Article 44113 (32C), VACS, the Texas **Interlocal** Cooperative Act, cities and counties may also make agreements or contracts concerning library services, while both libraries continue to operate independently.

Under the authority given by the Library Systems Act (government code 441.121) through 441.138, VTCA), the State Library and Archives Commission adopts Rules for Adminstrating the Library Systems Act which establishes policy for the Texas Library System. These include standards which public libraries must attain to qualify for system membership. The issues that pertain to qualifying standards are annual per capita expenditures, library collections size, staffing, and hours of operation. These four standards are scaled according to the size of the population which the library serves.

The State Library Commission's policy has been to grant membership to individual public libraries, to consolidated library systems as systems, and to federated library systems as systems. Therefore, when we speak of a state system "member," it can denote one of three categories, an individual library, a consolidated local system,

or a federated local system. This difference identifies the type of governing authority in which the library operates. The individual library and the consolidated system operate under one local governing body, while the federated system does not. In addition, the Major Resource Center (MRC) provides service to the main library of a consolidated system, not to its branches, but service is given directly to each member of a federated system.

To test the viability of the system concept, the Texas State Library awarded \$1.8 million in Federal Library Services and Construction Act Title I funds to ten regional systems in FY 1975. In that year 233 public libraries serving 83.3 percent of the State's population participated in system programs. Then in FY 1976, the system received the first meaningful state appropriation in the amount of \$1.08 million. Together with the federal appropriation for that year of \$1.7 million, the system expanded their programs. The number of member libraries participating in the system increased to 247 with 86% percent of the state's population residing in communities served by member libraries.

System funding continued to grow through the rest of that decade and the early 80's, the total funding remained a constant \$3.92 million which included state funding of \$2,092, 764. In 1984, the systems began a period of cost reduction. Faced with high inflationary increases in materials, operating costs, and staff salaries, the development of new programs was halted. Systems began cutting back, limiting their costs, and sharing cost where possible. This began a series of reduced levels of funding starting with a 3.2% percent reduction in state funding and then in federal funding. The State

Library and Archives Commission receives funds for operation of the Texas System operation from both state and federal sources. After the expenses of the State Library itself have been met, the Library Systems Act requires that remaining state funds be allocated to the ten regional systems, with 25% being divided equally among the regions and with the other 75% being apportioned on a per capita basis. Available federal funds are allocated on a similar basis. The State Library informs each MRC of the approximate amount of funds which that MRC can anticipate for the coming state fiscal year, which begins September 1. With this as general guide, the MRC, with advice from its advisory council and regional system membership, updates its long-range plan of service and prepares a detailed proposed annual plan of service and budget estimate. When this has been approved by the State Library, it acts for the Commission to contract with the **MRC's** municipality to provide the services in question.

### 3.2.3 CRITERIA FOR MEMBERSHIP IN CENTRAL TEXAS LIBRARY SYSTEM <sup>49</sup>

The Library Systems Act assumes that a local community must give reasonable support to their library before the library can receive the benefits of System membership. Criteria for membership in CTLS is found in the current edition of Texas Library Systems Act and Rules for Administerina the Act, published by the State Library. A library may apply for membership at the time it sends its annual report to the State Library. The State Library evaluates the application on the basis of the

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<sup>49</sup>The references for this section were taken from working document provided by CTLS office to its members.



information supplied in the annual report. Membership becomes effective on September 1 of the next state fiscal year. Current members must continue to meet the criteria in order to maintain membership.

- Rule 1.72 The library must provide services on a free and equitable basis to the public in its tax supported area.
- Rule 1.73 The library must be legally established as department of the city or county government by character, resolution, or ordinance; or must be chartered as a non-profit corporation; or by contract as provided for by the **Interlocal Cooperation Act**.
- Rule 1.74 The library must maintain local effort annually by maintaining or increasing local operating expenditures or per capita local operating expenditures.
- Rule 1.75 The library must have a non-discrimination statement on file with the State Library.
- Rule 1.77 At least 50% of the annual local operating expenditures required to meet the minimum level of per capita support for accreditation (see table 3.5 ) must be from local tax sources. A public library that expends at least \$10.00 per capita is exempt from this membership criteria if it shows evidence of some library expenditures from local tax sources and is either established by the city or county government or is under contract to the city or county government as a public library freely open to citizens under identical conditions.
- Rule 1.78 If a library receives county funds, the librarian must have a county librarian's certificate.
- Rule 1.83 The library must have a telephone with a listed number.
- Rule 1.85 The library must file an annual report with the State Library.
- Rule 1.81 Depending on the population the library serves, it must meet the following additional criteria.

Table 3.5 Criteria for Membership \*\* 51

<u>POPULATION</u>	<u>PER CAPITA SUPPORT</u>	<u>MATERIAL COLLECTION</u>	<u>HOURS OF ACCESS</u>	<u>STAFF</u>
200,001 & over	<b>\$2.80</b>	■ item per capita or expend 25% of budget on library	64 hours per week	6 professional librarians and ■ additional for every 50,000 or more persons
<b>100,001 - 200,000</b>	<b>\$2.40</b>	1 item per capita or expend 25% of budget on library	54 hours per week  persons	4 professional librarians and ■ additional for every 50,000 or more
<b>50,000 - 100,000</b>	<b>\$2.20</b>	■ item per capita or expend 25% of budget on library	48 hours per week or more	2 professional librarians
<b>25,001 - 50,000</b>	<b>\$1.80</b>	■ item per capita or expend 25% of budget on library	40 hours per week or more	1 professional librarians
<b>10,001 - 25,000</b>	<b>\$1.80</b>	1 item per capita or expend 25% of budget on library	40 hours per week or more	1 professional librarians (full time)
<b>10,001 - less</b>	\$1.20 or \$5000 whichever greater	1 item per capita or expend 25% of budget on library	20 hours per week or more hours per week	1 head professional librarian at least 20

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<sup>50</sup>The State Library defines a "professional librarian" as one holding an ALA accredited fifth year degree in librarianship or a master's degree from an ALA-accredited program.

<sup>51</sup>The population served by the library is determined by the State Library

### 3.3 ORGANIZATION OF CENTRAL TEXAS LIBRARY SYSTEM (CTLS)

The Central Texas Library System is composed of 60 autonomous public libraries serving 1.7 million persons in 30 central Texas counties. The System is organized by the Texas Library Svstems Acts and the Rules for Administerinn the Library System Act, published by the State Library, and the System's own bylaws. It is funded by the State Library and the Federal Library Services and Construction Act. Membership is open to all public libraries which meet the minimum criteria stated in the Texas Library Svstems Act and the Rules for Administerinn the Library Svstems Act. The State Library has designated the Austin Public Library as the Major Resource Center Library for central Texas. The State Library contracts annually with the Austin Public Library to operate the Central Texas Library System. Table 3.6 is an illustration of the system libraries in the Central Texas area. The System staff is composed of five professional librarians, a business manager, an administrative aide, a media assistant, and an account clerk.

### COLLECTION DEVELOPMENT ALLOCATION FORMULA

The collection development formula for the Central Texas Library System member libraries was adopted in 1992 after extensive consultation with the entire membership. One third of the total allotment for collection development is allocated to the member libraries as an equal base grant. This third is divided by the total number of member libraries, so that each library gets the same amount from this third. **One-**third of the total allotment for collection development is a variable grant based on the

size of the population served by a member library. The total population served by CTLS member libraries is added and the percentage each library serves is computed. The percentage of population served is then multiplied by a third of the collection development allocation to give a population amount. One third of the total allotment for collection development is allocated to the member libraries based on the amount of local spending for collection development of a member library. The total amount of local collection development expenditures of all member libraries is determined and the percentage each library spends is calculated. The population percentage is multiplied by one-third of the collection development allocation to give a local collection development amount. In addition to this formula, a set of conditions were imposed on libraries which, if not met, could result in the loss of a portion of the collection development allocation.

### 3.3.1 SYSTEM GOALS AND PLANNING

The goal of CTLS is to strengthen library services and to equalize access to information for all Central Texas residents by encouraging cooperative efforts among members and by providing services which would be too expensive or too time consuming for local libraries to furnish on their own. All System services are provided to develop stranger local libraries, to encourage local governing bodies to give better support to their libraries, to promote cooperative library efforts and to cross political subdivisions. CTLS members adopted a long range plan in 1993 which specified strategies for System services for the next five years. That plan is now being reviewed

by the Long Range Planning Committee, and a revised plan will be published in August of 1996. The CTLS staff develops the Biennial Budget and annual Plan of Service under the direction of the System members and lay representatives. Services change as the needs of member libraries and their users change. The following are the services offered to all System members during the current fiscal year.

### Automation and Cooperation

On-site consultations are provided to assist librarians who are planning to share resources with other libraries or to automate their own libraries. Telephone consultation on computer and software questions is also available. The primary means for sharing resources is CaTaLySt, the CTLS Union Catalog, a CD-ROM catalog begun in 1990. CaTaLySt contains the holdings of 31 members, representing about 80% of the 1.3 million holdings of CTLS members. **As of 1995, 55** members and branches have a CaTaLySt installation. The System also provides three retrospective conversion units so that members can convert their paper catalog records into a machine-readable form, both to add to CaTaLySt and to prepare for a local automated system.

### Consulting Services

The three consultants and the coordinator maintain competencies in specific areas: youth services, collection management, library automation, and library management and planning. Assistance on other topics is also available from System

staff. On-site consultation visits are available upon request. Members may also use a toll free number to contact the consultants or the System Office.

### Collection Development

The System provides an allocation to each member to purchase books, audio tapes, compact disks, and videotapes. This allocation is determined in part by the amount of local funds spent on materials; it is intended to encourage local governments to increase library support and not to take the place of local funding. Because CTLS purchases several hundred thousand dollars of materials each year, members receive larger discounts than would be available to them individually. Consulting staff will assist a library's staff in evaluating their collection and services for specific user groups, and they will provide bibliographies for enhancing the collection.

### Media Services

Approximately 6,000 16mm films and VHS videocassettes are available to System libraries and their patrons from the CTLS Media program. Items may be reserved by mail, fax, or telephone a least two weeks prior to show date. Films and videocassette have public performance rights and may be used for library programs and by groups and individuals in the community. Under a reciprocal borrowing agreement between CTLS and the North Texas Regional Library System (Fort Worth) and the North East Texas Library System (Garland), CTLS libraries also have access to

those systems' collections of films and videos. The Media Librarian consults on film and video programming for all groups and age levels.

### Continuing Education

Continuing Education is a high priority among System members. More than 25 on-site, on-demand workshops on topics of greatest interest to members, such as automation or weeding of dated material on book shelves, are provided each year. One or two large-scale workshops on topics of general interest, such as the Summer Reading Program, are also offered. The System office maintains a small collection of library science materials. Self-instructional materials for staff development are also available from the CTLS Media Collection.

### Publicity

Publicity materials that support the statewide Summer Reading Program, such as individual flyers, are provided to each member library. A prize, such as a refrigerator magnet, is provided for children who complete the program.

### Services to the Visually Impaired and Elderly

Rotating packets of approximately forty large print books are provided to supplement local library collections. A deposit collection of large print books is available for periods of up to three months.

## Interlibrary Loan

Interlibrary Loan (ILL) is a resource sharing program. ILL is a library-to-library lending and borrowing program. During the past 20 years, this library to library sharing has become an essential service as the cost of books and other library materials have made self-collections a financial impossibility even for the largest libraries. All types of materials can be obtained through interlibrary loan, although the vast majority of the materials lent and borrowed are either books or photocopies of periodical articles. During the last year, over 7 million interlibrary loans were processed among libraries in the United States. Through interlibrary loan, the smallest, most remote library can provide the same access to its library users as a large metropolitan library can.

Parallel with the growth in interlibrary loan activity has been the development of a resources sharing network to encourage and facilitate ILL services. One such network is the Texas Resource Sharing Network, which offers a program of interlibrary loan services to Texas public, special, and limited a number of academic libraries. Ten regional Interlibrary Loan Referral Centers contract with the Texas State Library to offer interlibrary services. These centers operate out of large public libraries throughout the state. Funding for these services comes from a state grant which is comprised of LSCA funds. These funds have made it possible for interlibrary loan to be provided at no charge to borrowing libraries. The System contract calls for the Austin Interlibrary Loan Centers to handle 49,500 transactions and to fill 17,800 loans from its collections annually.



### 3.3.2 GRANT PROGRAM REQUIREMENTS

#### Maintenance of Local Support Requirement

To receive the population and local support grants, the member library must have spent at least as much of its local funds on collection development in the previous fiscal year as it would receive in System grants for population and for local support. This requirement is intended to help members persuade local funding sources to provide at least a minimal level of support and to discourage them from reducing support. Current CTLS members will have until FY 1996 to meet this requirement, and new CTLS members must meet this requirement by the beginning of their first year of System membership.

#### Continuing Education/System Participation Requirement

A monthly newsletter keeps librarians and supporters informed of System activities, as well as state and national news about libraries. Members are encouraged to contribute information about their special events and projects, staff vacancies, or about materials they wish to sell or donate. System membership meetings are held each fall and winter. In addition to transacting System business, such as selecting Advisory Council members, there are usually opportunities for continuing education, such as Lay Representative orientation or a grant-writing workshop. System members believe that a library's staff must take advantage of continuing education opportunities in order to provide high-quality service to their patrons. Participation in System meetings by the librarian and lay representative(s) is necessary to provide informed

direction to the System and to engender cooperation among System members. To encourage such participation and to help persuade local governing authorities of its importance, a library is required to send a representative to each of three specific types of CTLS-approved events during the preceding year to receive the entire amount of the population, local support, and base grants for which it is eligible. If the library attends only two events, each of its grants will be reduced by one-third. If the library attends only one event, each of its grants will be reduced by two-thirds. The library receives no grant if it fails to attend any events. The three types of events and the representatives who must attend are:

1. The head librarian must attend annually one CTLS general membership meeting, regional meeting, Advisory Council, or CTLS committee meeting.
2. Any library staff member must annually attend one CTLS-sponsored continuing education event.
3. Any representative of the member library must annually attend one event from the following list:
  - a. CTLS membership, regional, or Advisory Council meeting
  - b. CTLS committee meetings such as the Planning, Media, Collection Development, or any other standing or ad hoc committee created by the Advisory Council.
  - c. CTLS sponsored or co-sponsored workshops
  - d. Texas State Library sponsored workshops
  - e. Continuing education events sponsored by an ALA accredited school of library science
  - f. Workshops sponsored by another Texas library program
  - g. Small Community Library Network meetings

Any library may appeal to the Advisory Council at its meeting prior to the Fall Membership meeting for a waiver to the continuing **education/System** participation

requirement due to extenuating circumstances. The Advisory Council will make the final decision whether sufficient cause exists to grant a wavier from this requirement of the Collection Development Grant Allocation Policy.

### 3.3.3 TAYLOR PUBLIC LIBRARY<sup>51</sup>

The Taylor Public Library serves the community of Taylor, Texas which is located in southeast Williamson County about 34 miles northeast of Austin. The city is a farming and light industrial community with a population of 11,472. The population is growing slowly but steadily; the 1970 population was 9,616, and the 1980 population was 10,619. According to the Texas Data Center, Taylor's projected population for 1995 is 11,971.

The Taylor Public Library, which has been providing library services longer than any other public library in Williamson County, has always had strong community support. The original library building and the building extensions were constructed through fundraising efforts of the community with matching federal grants. The original library building consisted of 2170 square feet of floor space and the two additions added 6845 square feet. The second addition was completed in 1990; now the library operates 9,015 square feet of building.

The library has an annual budget allocation from the city of \$95,183. There is a building fund of \$19,338 for facility improvements and \$1,833 for books. These two

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<sup>52</sup>The reference for this section was provided by the Taylor Public Library and Bob Gaines CTLS automation consultant

funds are supported through donations, trusts and memorial gifts and fund raising projects sponsored by the Friends of the Taylor Public Library. The group currently has about 250 members. This is a volunteer group of community individuals who assist the library with not only fundraising activities, but also by volunteering their time in the library. The Friends coordinate the annual book sale and fund drive, in addition to the Summer Reading Program, "Children's Story Time".

The library recently extended their hours and is now open a total of **44** hours a week. The library collection contains 32,951 books, over 1,000 paperbacks, and 100 audio books on tape. The library has 4393 registered card holders, and circulation averages about 30,000 items annually. The staff consists of a library director, three assistant librarians and a library aide. The goals of the Taylor Public Library are to provide materials and services to support the informational, educational, and recreational needs of its citizens.

### 3.3 LIBRARY AUTOMATION SETTING

Before the study proceeds any further, a brief discussion on the history of library automation and information is pertinent. Since the term "library automation" can connote a wide range of ideas and images, it would be useful at this point to discuss what library automation is, where it has been and where it is now. Included under this umbrella are related technologies such as micrographics, video, facsimile transmission, and telecommunications.

The library community has long been interested in the application of computers to library functions. In the 1950's there were few attempts to use computers in libraries. The mainframe computers of this period made almost all computer applications unfeasible for small public libraries. During the 1960's, interest in using computers in library settings continued to grow. Most of the automation efforts of this period involved processes such as acquisitions, catalog and production, printed book catalogs and circulation control. Most systems were locally developed and invariably involved batch processing.<sup>53</sup>

Typically, large academic and public libraries experimented with these systems with indifferent success. Few small public libraries ever considered the possibility. By the 1970's the third generation computer technology began to exert its influence upon daily life on many levels and libraries were anxious to take the plunge into library automation. The three most influential factors making automation so much more attractive and feasible in the 1970's were 1) improved technology i. e., interactive systems, 2) improved communication systems that allowed on-line interactive systems to transcend great distances and 3) acceptance by the library community of a machine readable bibliographic record (the MARC format) as the standard for communicating bibliographic data. These three factors working in combination encouraged, aided, and abetted a tremendous growth in the application of computer technology to library

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<sup>53</sup>Bierman, 1982, p. 2

<sup>54</sup>Bierman, 1982, pp. 2-7

The focus of library automation changed from the individually operated system of the 60's to the cooperative networks of the 70's. The improved micro computer and communications technologies allowed both high development and operational costs of sophisticated library systems to be shared by many users. The major contributing factor of automation was the freeing of staff from many repetitive, labor intensive tasks. Computerization of libraries has given patrons throughout the world access to thousands of holdings, permitted the rapid transmission of information, and allowed interlibrary loan libraries to develop, access and share indexes and files with other information providers. Technology has completely altered previous held concepts regarding storage, retrieval and delivery of library and information services<sup>55</sup>. This process has evolved to such a degree that it is being considered by small public libraries. Automation has become more accessible and economically feasible to a wide range of smaller libraries. It is a tool small public libraries may use for these purposes: for extending to the administrator control over his/her work, improving the quality of service, and by offering a wide range of services to the public.

The circulation transaction is a lending operation, rather than a transfer of ownership operation. Materials charged out are expected to be returned to the library in good condition and in a timely manner. From the viewpoint of a data processing professional, circulation is somewhat similar to inventory control. Registration, charge and discharge, and overdue procedures are so cumbersome in many small public libraries that they are a constant source of public and staff dissatisfaction. This type of

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<sup>55</sup>Sager, 1989, p.203

activity handled on a online circulation system can provide instant information on the status of patrons and materials. The system would be able to automatically generate a variety of reports for management information.<sup>56</sup> An automated circulation system controls two majors problem categories: recording-keeping, and materials flow. Bad recording-keeping is the number one problem for most small libraries. Record-keeping problems encompass the maintenance of and access to patron records; bibliographic records; loan records of overdue, fines and other delinquencies; and statistical records. Materials flow problems are related to the physical movement of library materials out of or into the library. The single largest task that faces small libraries is the record keeping involved in the initial transaction of notifying overdue patrons of delinquent fees in any of several respects. Online circulation systems would automate this function and would be able to provide much more detailed management information. Kantor stated that short range automation techniques, applied to library operations, may produce substantial savings in time and effort, effect improvements in control, and suggest the reallocation of personnel and funds. They affect, as the intermediate outputs, the technical and management services of a library. The effects on service delivered to the user is likely to be improved quality rather than changes of cost or quantity."

Cost benefit analysis has been applied to some aspects of the library's operations. It has been used to either justify the continued existence of a library

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<sup>56</sup>Sager, 1989, p. 205.

<sup>57</sup>Kantor, 1981, p. 40.

service or as a framework for choosing between major library investment alternatives. "Policy making research is imperative for public library practitioners."<sup>58</sup> The need for this type of research is growing because of the dynamic changes that are associated with the information age. As knowledge has broadened and as society's needs change, public libraries have taken on new jobs. All agencies will have to compete for resources at every level. Public libraries are making institutional shifts and must find income for those shift, i.e., electronic access.<sup>59</sup> To present viable policy alternatives, policy makers need to know the costs of new programs. Libraries are expected to develop benefit cost ratios for library expenditures.<sup>60</sup> The following discussion will center around how libraries have used the application of cost benefit analysis to library functions. These studies are an attempt to demonstrate that the benefits derived from a service are worth the cost of providing the service. In conducting a cost benefit analysis, the object is to compare inputs (costs) and outputs (benefits) in monetary terms. There are three categories of costs which must be considered in automating a library system; 1) direct costs, which are determined and applied directly toward the purchase and operation of the automation system, 2) indirect costs, termed overhead, and 3) fixed costs, which are proportional to the volume of work done by the system. Assigning them an equivalent quantifiable weight as part of the analysis is a method used by most studies reviewed.

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<sup>58</sup>Holt, 1991, p. 5

<sup>59</sup>Holt, 1991, p. 13.

<sup>60</sup>Holt, 1991, p. 19



A major issue in a number of studies that have used cost-benefit analysis was the value of time and the unit of time. Some these studies have utilized cost-effectiveness and cost benefit analysis methodology in the costing of a reference transaction. In one study, Paul Kantor developed an hourly cost of \$10.80 per reference *transaction*.<sup>61</sup> Such studies depicted "reference" as expensive and exposed the activity for reduction.\* A disadvantage in using this type of *hourly/yearly* methodology was that it accounted for more than just the reference activity. Secondly, it provided benefits for libraries with a large volume and penalized the library with a lower volume. **Murfin** maintains that in order to accurately reflect a true cost to an activity, it is necessary to (1) decide the areas of cost that should be included, and (2) determine the different output and costs allocated to each output, (3) determine a methodology for measuring these *elements*.<sup>63</sup>

In the evolving electronic age, the way public libraries do business is changing. The need to access information and the advancement of technology to provide that need has changed how we look at libraries in the community. As libraries change from a provider of materials to a provider of information they begin to compete with other information services offered by the *market*.<sup>64</sup> There are several constraints which libraries must confront in the foreseeable future; one will be the demand for greater

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<sup>61</sup>Kantor, 1981, p. 5

<sup>62</sup>Kantor, 1981, p. 25

<sup>63</sup>Murfin, 1993, p. 7

<sup>64</sup>Holt, 1991, p. 8

accountability for funding decisions. Research that directly supports decision making is an essential for the continued development of library and information services.<sup>65</sup> The literature emphasized the importance of libraries to be able to analyze their own operations and to present themselves as competitive players for public funds. Libraries in general are still 85% percent locally funded and compete for support funds with other public services (i.e. parks, police, and fire). Cost-benefit analysis becomes a tool by which libraries can evaluate library operations to compete for local funds.

The problem of applying a cost benefit analysis within a library setting is that the benefits of information services tend to be intangible and not so easily expressed in the same dollar unit as the cost.<sup>66</sup> The studies that used cost benefit analysis with varying degrees of success could not develop a single method to determine the monetary value of different outputs. The time methodology developed by Kantor was used in other studies because it was considered the best available method." In addition to methods of costing by the hour and by the minute, another method was developed, known as a task analysis. This method based the cost of time on the actual time of the task, not a block of time, which is similar to the hourly methodology, except that the calculation was based on wages per minute. This method was used by Weech

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<sup>65</sup>Cormin, 1991, p. 127

<sup>66</sup>Lancaster, 1988, p. 8

<sup>67</sup>Murfin, 1993, p. 3

in a study at the Los Angeles Public Library and Beverly Hills Library resulting in a much smaller cost figure."<sup>68</sup>

The difficulty is in determining what costs to include and what costs not to include. According to Rothstein, costs can appear more costly when it is assumed that all costs went into one activity (i.e. reference transaction). This overstates costs because a good part of the personnel time was devoted to other outputs. The estimates of cost need to reflect real cost that relate to the activity.

An important issue raised by the literature is that collection size is a better explanatory variable for a library budget than is service delivery. This reflects an historic view of the library as a collection of books. Libraries that continue to be funded on this assumption will find it hard to maintain their budget levels as the nature of service changes. Public libraries need to make a paradigm shift in the way they do business. The addition of computer technology changes the library environment and libraries must adapt in order to compete in this changing world. Libraries will have a new role in this information age of technology, one that enables the public to learn how to use information technology within a library.

In the past twenty years, this nation has invested trillions of dollars in **computers** and communication technology, and we continue to see increases in productivity. Libraries will continue to invest in new technology so staff and patrons have access to current databases. Public libraries that do not invest in technology risk limiting future options.

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<sup>68</sup>Murfin, 1993, p. 5

Almost thirty years ago, Baumgardner emphasized the importance of library staff in the delivery of library services and argued that the possibilities for improved labor productivity are extremely limited. He further argues that library costs will rise relative to average cost increases in the economy. The possibility for improved labor productivity depends critically on the possibility of introducing labor-saving innovations in library technology. Thirty years later, automation of library services is still the answer for libraries. It is clear that there are automation techniques which are applicable to certain functions of library operations, in particular cataloging and circulation procedures. Other parts of library service, for example reference, depend more on personnel service by librarians and are therefore more difficult to automate.

For small libraries with annual transactions that exceed 30,000, the limitations of the typical manual system become increasingly evident. The preparation of overdue notices is a time consuming task. In this type of system, files must be searched manually and notices either typed or written out. Another time consuming task is filing. For example, if a library circulated 200 items on an extremely busy day, the staff knew that half of the next day would be devoted to filing. Usually, two people are needed to file previous day's book cards, which are separated into a number of categories. For example, children's fiction is separated from children's nonfiction. Using automated circulation, the library's filing is eliminated and overdue notices are mailed within 10 days rather than after four weeks. Fines are calculated automatically. Other benefits include: records show borrower's statistics, reservation of materials occurs automatically, delinquent borrowers are identified promptly and inquiries about the

status of a particular item may be answered without a manual search.

The ease of automation reduces time consuming clerical routines in order that staff may provide better service and exert greater control over the collection. In most cases, it has been determined that an automated circulation system would reduce staff by three or four full-time persons, an annual savings of between \$45,000 - \$100,000. In a comparative costs analysis of an automation system, Washington State University indicated that the automated system was about 20% percent less costly than a manual system.<sup>69</sup> In a manual circulation system, the borrower fills out a card, the card is filled and recalled when the material is returned. Books and cards are then matched to be shelved at a later date. A computer based circulation system performs similar functions as the manual system, but with substantially less effort. When a item is checked out, a computer creates a readable book card, and the borrower's card is read by machine. The computer creates a computerized record of the item. When the item is returned, the information is again entered into the computer. The computer can match returns with check outs, identify overdue materials, and print overdue notices using information in a computer file on borrowers.

The capability of the computer-based system exceeds that of the manual system. The computer can check the borrower's card against a list of borrowers with overdue materials. An item can be placed on reserve with the assurance that item is retrievable. Request for items from other libraries can be honored. The advantage of an on line system is that it is able to give rapid credit checks and updates the loan file

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<sup>69</sup>Druschel, 1980, p. 24

immediately. As the costs of small computers fall, the on-line circulation control systems are likely to become important.

Computer-based circulation control can produce very specific information about circulation as a by-product. Materials can be categorized by subject, level, and topic, making information more accessible for customer requests. Information on the kinds of items inventoried; can be used to evaluate acquisitions and policies; for example, multiple copies, length of loan period, damaged and lost materials.

### **3.4 GOALS FOR THE AUTOMATION PROJECT**

In order to better meet patron's needs, the library is planning to change from a manual system of performing routine library functions to an automated system of managing these tasks, thus providing better access to the collection and freeing staff time for other services. This automation project will include three functions: cataloging, circulation, and the public access catalog. The automation process will be accomplished through following steps: 1) weeding of dated material and an inventory of the library collection, 2) clean up of the shelf list, **3)** reviewing and rewriting policies, **4)** conversion of the library's record to MARC format, 5) barcoding the collection, 6) selecting and purchasing library automation software and hardware, 7) installing equipment and staff training, and 8) introduction of the new service to the community. Depending upon the efficiency of current operations, automation may offer opportunities for substantial cost savings for the Taylor Public Library.

The initial planning began by examining the library's needs. The objective was to identify the costs and benefits of an automation system that would free staff time for better patron service. Staff members from the Central Texas Library System (CTLS) and the Texas State Library participated in the planning and implementation of the automation project. As part of the planning process, site visits were made by the staff and interested library board members. The purpose of the site visits were to view installed automated systems similar to one that would be suitable for the Taylor Public Library.

The Central Texas Library System will help with the data conversion process. Data conversion will be done in house by library staff. CTLS will furnish a CD-ROM to match with Taylor Public Library's record. Staff training for weeding the collection and the conversion process will be provided by CTLS; the only data conversion costs will be for staff time. Worksheets developed by Bob Gaines, the automation consultant for CTLS, and its members were used to determine the number of hours needed for weeding, inventory and cleaning up the shelf list at 1555 hours. The worksheets are attached in Appendix A.

## CHAPTER IV

### ANALYSIS

#### 4.1 METHOD

The Central Texas Area is expected to add 600,000 new residents in the next twenty years. This will increase library services dramatically. Small public libraries in this area can only meet the demand for services by increasing labor or automation. The assumption is that an automated circulation system for libraries would cost less than a manual circulation system and provide more benefits per dollar spent. This chapter compares the benefits and costs of a manual circulation system with that of an automated circulation system.

Based on the theoretical discussions of cost-benefit analysis, those theories are used to determine which circulation system should be selected. Using the concepts and theories described in the Literature Review Chapter, the following elements of a CBA are identified, 1) the selection and quantification of the benefits, 2) the costs of two different automated systems, 3) the discount rate used in the analysis. The full cost of purchasing an automated system compared to the existing manual system is determined by taking the difference between the cost of present operations and those of the proposed new system over time. The application of the cost-benefit method reduces a stream of costs and benefits to a single number. These costs and benefits are compared over to determine if the project is acceptable. Implementation of an automated system involves start up costs and fluctuating operating costs for several



years. For the purpose of this study, the benefits and costs over time for two different automated systems will be identified and normalized into dollars. A 10% percent discount rate will be applied to this benefit cost analysis. The present value calculation of both the benefits and costs are to be accrued over a five year period. The basic criterion for choosing a desirable project among various alternatives is to select the one that maximizes the net present value of benefits. Table 4.1 presents a cost benefit analysis which shows the comparison between the two systems.

The second application of this study is a cost-effectiveness analysis presented in Table 4.2. Instead of measuring benefits, this technique measures the impact of an alternative (i.e. automation) in terms of the effectiveness of the program on a specific outcome.<sup>69</sup> A uniform objective function is assumed as part of the analysis. Cost-effective refers to the evaluation of alternatives based on their costs and effects with regard to producing some outcome or set of outcomes. In this study the outcome is library circulation or library use. Library use/circulation can be assessed in terms of how many visits; number of transactions per population; number of completed responses to references questions; number of juvenile transactions. Library programs can also be viewed in terms of the level of use by various target populations. Cost-effectiveness allows for the evaluation of alternative programs that have the same objectives. In different situations these two methods maybe appropriate. The outcome of both types of analysis is to provide information for decision making and to compare alternative programs.

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<sup>69</sup>Levin, 1983, p. 113

**TABLE: 4.1 Benefit Cost Analysis**  
Application to Automation Cost

**SOCIAL BENEFITS**

**SOCIAL COSTS**

Year	A Personnel Savings	B Circulation Operating Cost Saving	C Increase in Fee Collections	D Total	E Projected Capital Cost	F Maintenance Costs	G Total	Net Social Benefits	Time Discount 10%	Benefit Cost Ratio
1	\$10,012	\$17,346	\$7,500	\$34,858	\$31,452	\$0	\$31,452	\$834	\$758	1.11
2	\$10,313	\$24,852	\$7,725	\$42,890	\$0	\$4,230	\$4,230	\$38,660	\$31,950	10.14
3	\$10,322	\$32,373	\$7,957	\$50,652	\$0	\$3,298	\$3,298	\$47,354	\$35,578	15.36
4	\$10,322	\$39,888	\$8,195	\$58,405	\$0	\$3,200	\$3,200	\$55,205	\$37,706	18.25
5	\$10,322	\$47,397	\$8,441	\$66,160	\$0	\$2,238	\$2,238	\$63,922	\$39,691	29.56
Total	81,291	\$161,856	\$39,819	\$252,966	\$31,452	\$12,966	\$44,418	\$205,976	\$145,683	5.70

Column A calculations are based on Table 4.4  
 Column B are the combined cost of supplies, material & share resources Table 4.6  
 Column C are based on calculations on Table 4.6 and adjusted for 3% inflation  
 Source: Central Texas Library System

Table: 4.2 Cost Effectiveness Analysis

	A	B
	AUTOMATION	MANUAL
<b>COST EFFECTIVENESS ANALYSIS</b>		
1 Number of circulations annually	60,000	30,000
2 Circulations per hour	40	20
3 Total annual hours required 44hrs per week x 52 week	2,288	2,288
<b>ANNUAL CIRCULATION COST</b>		
4 Labor cost for circulation function 2 persons x \$5 per hour X Ln 4	22,880	22,880
5 Circulation operating cost	2,436	2,346
circ cards		1,138
patron cards		1,298
date due cards		261
plates		212
ribbons		183
244 site preparation		1,138
1,303 supplies		1,298
6 Capital Investment	29,016	18,000
Increased Personnel automation system		
7 Administrative costs	0	8,375
card filling 333hrs x \$5 per hour		1,665
overdues 65hrs x \$5 per hour		325
Inventory 170 hrs x \$10 per hour		1,700
catalog 42 hrs x \$5 per hour		1,700
catalog 167 hrs x \$10 per hour		420
catalog 83 hrs x \$5 per hour		1,670
reports 48 hrs x \$10 per hour		415
480		480
8 Total Costs	54,332	51,601
Difference between systems		-2,731
9 Circulation cost per unit	0.91	1.72

## 4.2 IDENTIFYING THE BENEFITS

There are five different categories where an automated system can provide potential benefits over an existing manual system. They are 1) cost reduction or avoidance, 2) error reduction, 3) shared resources, 4) increased speed of activity and 5) improved management and customer service. This section attempts to address each of these benefits, determine which system might provide better service, save money, or perhaps do both.

## 4.3 PERSONNEL SAVINGS

Cost Reduction or Avoidance. Most costs in a manual system are staff costs.<sup>70</sup>

Labor costs are the single most expensive item in Taylor's operations budget. On average, libraries have .50 FTE per thousand population. Staff are employed to provide direct public service. They perform such tasks as selecting materials, controlling circulation and responding to reference questions. Technical service staff are involved with the acquisition and cataloging of materials. Therefore, if a library can provide as much service as possible within a given budget, it will substitute less expensive for more expensive activities. In particular, small libraries that face rising costs may economize on the use of labor by automating. In reducing a specific time consuming task; (i.e. files with catalogs, overdue files, customer files) existing positions can be eliminated from the budget. A library would realize benefits from a reduction in personnel costs. Table 4.3 identifies the type, the year and the number of positions the

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<sup>70</sup>Nash, 1980, p. 80

**TABLE 4.3** Position Cost Savings - Annual Projections

CIRCULATION	A		B		C		D		E		F		G	
	YR1	YR2	YR2	YR3	YR3	YR4	YR4	YR5	YR5	TOTAL	AVERAGE	TOTAL	AVERAGE	
1) Title	0.50	0.75	0.50	0.50	0.50	0.50	0.25	0.25	2.50	0.83				
2) Page	0.50	0.75	0.50	0.50	0.50	0.25	0.25	2.25	0.75					
3) LTA	0.25	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.25				
4) SLA														
6) TECHNICAL	0.00	0.50	0.50	0.50	0.50	0.50	0.00	0.00	1.50	0.50				
6) LCA	0.50	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.25				
7) SCA														

Page - SHELVES BOOKS	Hourly Salary
LTA - LIBRARY TECHNICAL ASSISTANT	\$5.00
<b>SLA - SUPERVISING LIBRAY ASSISTANT</b>	\$6.80
LCA - LIBRARY CATALOGING ASSISTANT	\$11.88
SCA - SUPERVISING CATALOGING ASSISTANT	\$6.80
	\$11.88

NOTE: Position Savings are reflected as a budgeted Full-Time Equivalent.

Source: **Central Texas Library System**

library would need if automation did not occur. Without an automated circulation system, a growth in both technical services personnel is anticipated over the next 5 to 7 year period. Table 4.4 shows the salary cost savings that these positions represent. This is an illustration of the personnel costs over time if the library would continue with a manual circulation system. In contrast, automation would eliminate the need for additional positions.

Improved Management and Customer Service. Automation of this type would improve the reporting of library indicators. Information on customer files, circulation occurrences, collection utilization and inventory control are a few of the indicators that would be more accessible on a automated system than a manual system. Management and customer service represents an area where benefits can be recognized but are incalculable.

Error Reduction. The increased accuracy of an automated system will free up work time of current staff. This allows for redirection of staff time to provide direct public service with the location of material, and selection and interpretation of material. Automated systems identify bottlenecks and other problems areas, i.e. record-keeping and identifying peak times. Identification of such factors enables remedial measures to be taken which will improve productivity. This type of benefit has a significant impact on the way work is performed; however, the value of such a function can not be calculated.

**TABLE: 4.4 Salary Cost Savings: Annual Projections**

Position Title	A YR1	B YR2	C YR3	D YR4	E YR5
1) PAGE	\$14,224	\$14,651	\$14,664	\$14,664	\$14,664
2) LTA	\$18,239	\$18,786	\$18,803	\$18,803	\$18,803
3) LCA	\$18,239	\$18,786	\$18,803	\$18,803	\$18,803
4) SLA	\$24,710	\$25,451	\$25,474	\$25,474	\$25,474
6) SCA	\$24,710	\$25,451	\$25,474	\$25,474	\$25,474

**TOTALS** \$100,122 \$103,126 \$103,216 \$103,218 \$103,219  
**ASSUMPTION** \$10,012 \$10,313 \$10,322 \$10,322 \$10,322

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*DIRECT SALARIES PLUS 23% FRINGE BENEFITS AND FICA , 3% RATE OF INFLATION IF WORKED 100% ON CIRCULATION FUNCTION  
 ASSUMPTION IS BASED ON 10% OF THE TOTAL SALARY COST SAVINGS. THIS ASSUMES THAT 10% IS DEVOTED TO THE CIRCULATION FUNCTION*

**Source: Central Texas Library System**

#### 4.4 CIRCULATION OPERATIONAL SAVINGS

Shared Resources. The use of an automated system allows the library to participate in cooperative activities now rendered impossible by a manual system. An automated system allows bibliographic data to be transported and merged with other libraries' data for resource sharing purposes. Direct benefits to the library would be the facilitation of future resource sharing, whether by reciprocal borrowing, interlibrary loan or special co-operative projects. This allows for individual libraries to focus their resources for their community interests i.e. high usage materials like best sellers and still address the needs of the smaller requests by providing titles through cooperative activities.<sup>71</sup>

Supplies and Materials. An ability to decrease damaged and lost materials by the installation of anti-theft devices provides more control of material at the time of discharge. The current estimate for replacing a lost or damaged book is \$25.00 per item, including cataloging and processing. In addition to these savings, the library would no longer need supplies for manual circulation. Material, (i.e. circ cards, patron cards, book pockets, plates and ribbons) needed to maintain the existing manual circulation system are no longer used. These are replaced by barcodes in an automated system. If one assumes conservatively that one percent of the collection is damaged or lost annually and consider a base collection of 30,000 items, the estimated cost savings would be \$7,500 annually. Table 4.5 summarizes the cost savings of

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<sup>71</sup>Nash, 1980, p. 81



**TABLE: 4.5 Social Benefits of Automation  
Forgone Cost of Manual System: Annual Projections**

	A YR1	B YR2	C YR3	D YR4	E YR5
1) PERSONNEL	\$10,012	\$10,313	\$10,322	\$10,322	\$10,322
SUPPLIES					
2) CIRC CARDS	\$244	\$245	\$246	\$247	\$248
3) PATRON CARDS	\$1,303	\$1,304	\$1,320	\$1,330	\$1,334
4) DATE DUE CARDS	\$261	\$262	\$263	\$264	\$265
5) BOOK POCKETS	\$212	\$213	\$214	\$215	\$216
6) PLATES	\$163	\$164	\$165	\$166	\$167
7) RIBBONS	\$163	\$164	\$165	\$166	\$167
8) TOTAL	<b>\$2,346</b>	<b>\$2,352</b>	<b>\$2,373</b>	<b>\$2,388</b>	<b>\$2,397</b>
9) MATERIALS	\$7,600	\$7,600	\$7,600	\$7,500	\$7,600
10) RESOURCES	\$7,600	\$7,600	\$7,600	\$7,600	\$7,600
11) DELQ. FEES	\$7,600	\$7,600	\$7,600	\$7,600	\$7,600

Line 1 is based on the assumption that wages are calculated at 10% percent of salary cost saving of the circulation function. This was used as not to overstate salary cost savings.  
 Lines 2-7 itemized list of supply cost associated with a manual system  
 Lines 9- 10 are based on the assumption that an item is valued at \$25.00 multiplied by 1% percent of 30,000 volume collection (300 X 25.00). See Chapter IV

**Source: Central Texas Library System**

cooperative purchasing lending activities and quantifies recaptured delinquent borrowers' fines and materials losses used for this analysis.

#### 4.5 INCREASE IN FEE COLLECTIONS

Increased Speed of Circulation activity. A circulation transaction previously taking several minutes to complete can now be completed in a matter of seconds. Benefits realized in this area would increase the collection of delinquent fines. An automated system would have the ability to automatically check on borrower's transactions. The automation of delinquencies would result in a 50% percent increase in the collection of overdue books and materials.<sup>72</sup> The anticipated cost savings from this benefit is shown on Table 4.6.

#### 4.6 IDENTIFYING THE DOLLAR VALUE OF BENEFITS

It is necessary to know the relationship between a library's output and cost before any meaningful examination can be undertaken. The American Library Association, in defining a library, indicates that an output can be identified in three forms: information, education, and recreation. Unfortunately, these outputs are not easily quantifiable. The primary means by which these functions are identified is through the utilization of library materials, i.e. books/materials. The output of a library can be indentified as books used or circulation of materials. Two types of measures maybe used to assess functional areas. These vary along four different levels from

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<sup>72</sup>Nash, 1980, p. 81

**TABLE: 4.6 Summary of Benefits: Annual Projections**

BENEFITS	A					B					C					D					E					
	YR1	YR2	YR3	YR4	YR5	YR1	YR2	YR3	YR4	YR5	YR1	YR2	YR3	YR4	YR5	YR1	YR2	YR3	YR4	YR5	YR1	YR2	YR3	YR4	YR5	
1) PERSONNEL	\$10,012	\$10,313	\$10,322	\$10,322	\$10,322	\$10,012	\$10,313	\$10,322	\$10,322	\$10,322	\$10,012	\$10,313	\$10,322	\$10,322	\$10,322	\$10,012	\$10,313	\$10,322	\$10,322	\$10,322	\$10,012	\$10,313	\$10,322	\$10,322	\$10,322	\$10,322
2) SUPPLIES	\$2,346	\$2,352	\$2,373	\$2,388	\$2,397	\$2,346	\$2,352	\$2,373	\$2,388	\$2,397	\$2,346	\$2,352	\$2,373	\$2,388	\$2,397	\$2,346	\$2,352	\$2,373	\$2,388	\$2,397	\$2,346	\$2,352	\$2,373	\$2,388	\$2,397	\$2,397
3) MATERIALS	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500
4) DELQ. FEES	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500
6) SHARED RESOURCES	\$7,500	\$15,000	\$22,500	\$30,000	\$37,500	\$7,500	\$15,000	\$22,500	\$30,000	\$37,500	\$7,500	\$15,000	\$22,500	\$30,000	\$37,500	\$7,500	\$15,000	\$22,500	\$30,000	\$37,500	\$7,500	\$15,000	\$22,500	\$30,000	\$37,500	\$37,500
TOTALS	\$34,858	\$42,665	\$50,195	\$57,710	\$65,219	\$34,858	\$42,665	\$50,195	\$57,710	\$65,219	\$34,858	\$42,665	\$50,195	\$57,710	\$65,219	\$34,858	\$42,665	\$50,195	\$57,710	\$65,219	\$34,858	\$42,665	\$50,195	\$57,710	\$65,219	\$65,219

LINE 1: ASSUMPTION IS BASED ON 10% OF THE TOTAL SALARY COST SAVINGS. THIS ASSUMES THAT 10% IS DEVOTED TO THE CIRCULATION FUNCTION  
 LINE 2,3, & 4: CALCULATIONS BASED ON TABLE 4.5  
 LINE 5: CALCULATION IS ON THE ASSUMPTION THAT COOPERATIVE LENDING WILL INCREASE BY 300 ITEMS BORROWED A YEAR VALUED AT \$25.00

Source: Central Texas Library System

input to output measures, as shown on in Table 4.7. The information shown in Table 4.7 should answer a variety of questions concerning the cost of outputs. In identifying the output, the next step is to examine their flow of benefits in an effort to determine costs.

Table 4.7 Library Performance Measures

Examples of Functional Performance Measures

<u>Unit of Measure</u>	<u>Element</u>	<u>Circulation</u>
Measure of input	1. Dollars expended 2. Resources Personnel Full-time/Part-time Materials/books	Dollars Proportion of Budget Number and Type of Staff Cost per circulation Cost per overdue notices
Measures of output	3. Service delivered	Circulation figures per capita per borrower circulated reserves filled
	4. Patron satisfaction	Patron evaluations Survey

Public library benefits should be quantified in terms of dollars that in turn result from units of output --- evaluated at some price. For example, What are the material costs for subfunctions of circulation? What is the unit cost per overdue notices? What is the cost to catalog each title? Information about these different functions and their costs can be collected in different ways. The techniques used in this analysis to collect this information include: document collection, personal interviews, and observation.

The next step in quantifying benefits is to try to find a market price for a comparable output in the private sector. In producing market values for library outputs;

Pfister and Millman suggests two rules of thumb: 1) that the benefit of the intangibles can be considered as being worth no more than cost, 2) that the intangible benefits can be valued at a figure at least as much as the cost of producing them. However, not all dimensions of benefits are quantifiable in dollar terms. Benefits which are not easily quantifiable are conceptually as important as those easily measureable in dollars and have been included in this analysis. These type of benefits are more difficult to interpret and require a greater amount of judgement on the part of the decision-maker.

Many assumptions are used in estimating benefits and calculating the value of those benefits for this analysis. For example, percentage increases in personal positions; percentage increase in workload; percentage increase in circulation usage; percentage increase in cooperative lending. These assumptions influence the resulting dollar evaluation and provide the underlying foundation for this analysis. Each table has its own set of notes that provide a listing of contributing variables on which estimations for that table were based.

#### 4.7 IDENTIFICATION OF AUTOMATION COSTS

Costs for an automated circulation system can be identified in two major categories: 1) start up costs; these are one-time costs associated with the initial implementation of the project, 2) operational costs; these are recurring costs that support and maintain the circulation system. For the purpose of this analysis, a list

provided by Walton identifies initial costs, operating costs, and special costs (see below).<sup>73</sup>

### One Time Costs Elements

- 2.1 Computer equipment
- 2.2 Telecommunications
- 2.3 Computer software
- 2.4 Site preparation
- 2.5 Consultant fees
- 2.6 Training
- 2.7 Legal expense
- 2.8 Shipping and installation
- 2.9 Finance charge

### Onoia Annual Cost Elements

- 2.10 Personnel
- 2.11 Personnel benefits
- 2.12 Hardware maintenance (computer and telecommunications)
- 2.13 Software support
- 2.14 Supplies and computer consumables
- 2.15 Travel
- 2.16 Postage (if system produces large mass mailings)
- 2.17 Dues (user groups etc.)
- 2.18 Site rental/lease, if appropriate
- 2.19 Insurance
- 2.20 Management support costs
- 2.21 Telecommunications costs
- 2.22 Indirect costs

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<sup>73</sup>Walton, 1984, p. 4

## Special Costs Associated with Some or all Modes

- 2.23 Special vendor assumed costs (vendor agrees to perform)
- 2.24 Retrospective data conversion
- 2.25 Special vendor discounts
- 2.26 Performance bonding fees.

In this analysis, not all of these costs identified were part of this analysis. Table 4.8 identifies the specific costs connected to this analysis. The impact of automation depends on the efficiency of the library's current operations compared to the costs of an automation system. Each of these two systems, whether manual or automated will offer different degrees of service delivery. The objective here is to identify the costs of both systems to determine the best alternative.

To have a consistent set of information on which to make informed choices, data must be gathered about the library's current manual operations. A project team was formed to gather information on Taylor's current practices. Then after the current practices were reviewed, the project team began to focus on the areas with the greatest potential for improvement. This was done by systematic gathering of data about each function area and breaking down each area. In this case, the area of concern was circulation. The goal was to break up this broad area into manageable units so that problem areas were easily identified. The units that were identified were based standard units of check-out activities, check-in and return areas, reserve lists and overdue notices and fines. The project team prepared a task activity analysis. This analysis was performed to determined how much time was spent on various

**TABLE: 4.8 Automation Costs- 5 Year Projections**

COSTS	A	B	C	D	E
	YR1 95-96	YR2 96-97	YR3 97-98	YR4 98-99	YR5 99-20
1) HARDWARE	\$17,278	\$0	\$0	\$0	\$0
2) MAINTENANCE	\$0	\$750	\$750	\$750	\$750
3) SOFTWARE	\$8,411	\$1,145	\$1,145	\$1,145	\$1,145
4) SITE PREPARATION	\$1,138	\$0	\$0	\$0	\$0
5) FURNITURE	\$3,327	\$0	\$0	\$0	\$0
6) SUPPLIES	\$1,298	\$1,305	\$343	\$1,305	\$343
7) TRAINING	\$0	\$1,030	\$1,060	\$0	\$0
<b>TOTAL</b>	<b>\$31,452</b>	<b>\$4,230</b>	<b>\$3,298</b>	<b>\$3,200</b>	<b>\$2,238</b>

Calculations based on Worksheet #6 Equipment & Supply Budget Appendix A  
 Source: Central Texas Library System



activities dealing with circulation. This is not a precise information gathering tool, but provides readily available data for cost comparison of the two systems.

The time spent on each task was multiplied by the appropriate salary rate plus fringe benefits then multiplied by number of times done in a year providing a yearly cost for each activity. This information, together with data about the equipment, maintenance and supply costs provides a fairly accurate account of how much various activities currently cost. If the calculations show that total time spent on a activity exceeds one full-time employee, the library has the option of eliminating positions or reassigning the time for other library activities. The following is a standardized costing for a manual circulation system based on a 30,000 item collection.<sup>74</sup>

Card Filing. The library clerk can file and unfile 4 cards per minute, 240 per hour. With 40,000 annual circulation transactions, 80,000 cards are filed per year. Dividing 80,000 cards by 240 cards per hour, equals 333 hours, then multiplying the results by the clerk's wage of \$5.00 an hour equals annual cost savings of \$1,665 if the card filing was automated.

Overdues Production. The circulation clerk types 20 notices per hour. Based on a 3 percent overdue rate, 1,200 notices are typed annually. Dividing 1,200 by 20 notices per hour equals 60 hours. Then each patron averages 2 notices per envelope,

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<sup>74</sup>C. Rebecca Garcia and Frank R. Bridge, Small Libraries OnLine, Automating, Circulation and Public Access Catalog, Texas State Library, August, 1991.

which equals 600 envelopes at a rate of 120 per hour. Dividing 600 envelopes by 120 equals 5 hours and the previous 60 hours for a total of 65 hours for processing overdue notices. Multiplying 65 hours by \$5.00 hourly wage equals annual cost savings of \$325 if the overdue production process was automated.

Monthly Statistics. Monthly circulation statistics reports required approximately 4 hours a month for the librarian to compile, equaling 48 hours per year multiplied by \$10 hourly wage equals annual cost savings of \$480 if the reporting of monthly statistics were automated.

Inventory Report. The librarian and one library clerk compiled the inventory in approximately one month over the summer. They spent approximately 170 hours on the inventory. First, multiplying 170 hours by \$10 hourly wage of librarian equals \$1,700 plus the clerk's 170 hours multiplied by \$5.00 hourly wage equals an annual costs savings of \$2,550 if the inventory report was automated.

Card Cataloging Filing. The librarian filed an average of 2 cards per minute, or 120 per hour. The library adds 1,000 titles per year. Each card set averages 5 cards, so 5,000 cards are filed annually. Dividing 5,000 cards by 120 cards per hour equals 42 hours needed for filing, multiplied by \$10.00 hourly wage equals a annual cost savings of \$420 if the card cataloging filing were automated.

Catalog Card Production. The librarian cataloged the materials and typed the main entry card at a rate of one every 10 minutes, or 6 per hour. The clerk then photocopied the card and typed the remaining added entry cards at a rate of one every 5 minutes, or 12 per hour. The Librarian processes 1,000 titles divided by 6 titles per hour equals 167 hours, multiply by \$10.00 hourly wage equals \$1,670. The clerk processes 1,000 titles divided by 12 titles per hour equals 83 hours, multiplied by \$5.00 hourly wage equals \$415, added to the librarian cost of \$1,670 for annual cost savings of \$2,085 if the catalog card production was automated.

Administration Production. The librarian spends about 4 hours per week or about 200 hours annually, in supervision and management duties related specifically to the manual circulation and card catalog processes. Multiplying 200 hours by \$10.00 hourly wage equals an annual cost savings of \$2,000 if the the circulation and card catalog processes were automated.

The method used in this analysis produced a net present value and a **benefit-cost** ratio calculation of the benefits and costs of an automation circulation system. The present value of net benefits is the difference between the discounted value of the benefits streams and the cost streams. The program with the largest net present value is the accepted project. The benefit cost ratio uses benefits as the numerator and the costs as the denominator. **A** project should have a benefit cost ratio larger than or equal to one in order to be considered worthwhile. The higher the ratio, the greater the

payoff. The benefit cost ratio is used to measure effectiveness. In this analysis the benefit cost ratio and the net benefits of this library project is examined.

It is necessary to analyze the net present value of future benefits and costs that will accrue with an automated circulation system. To do so requires that time value of both costs and benefits be calculated for the year in which they accrue. Construction of the net benefit value must be done so that the net present values can be determined for each year of the project's life. These yearly net present values must then be summed and an overall net present value for the project determine. This formula is translated into a net present value in Table **4.1**. The use of the cost effectiveness analysis is depicted in Table 4.2. The analysis compares the efficiency of a manual circulation system to that of an automated system. The computations were based on the cost figures in Tables **4.4**, **4.5** and **4.6**.

Personnel savings benefits were measured in terms of reduction. There was a general assumption that the implementation of an automation system would provide time savings. The number of employees needed per year as shown in Table **4.3** could be eliminated. It is estimated that as circulation increases the circulation function could expect to add on average 1 FTE a year. Table **4.4** estimates the dollar value of the different positions. Either the entire salary amount or the dollar amount connected to a specific task could be used in the analysis. The value of the personnel cost savings is based on **10%** percent of wages. Table **4.4** gives the estimated dollars in personnel time. This value was used in order not to overstate the personnel calculations.

The second category of benefits is identified as circulation operating cost savings; which include materials, supplies, and shared resources. These benefits are estimated on Table 4.6. Shared resources, delinquent fines and material losses are calculated on the following premise given by the State Library; shared resources, fines, and material losses can be calculated at 1% percent of the collection. A study done by Teh-Wei Hu in 1975 maintained that the average lost rate was 3 percent and the average price per book was \$5.00.<sup>75</sup> Based on several discussions with librarians within the System, a 3% percent loss rate was fairly accurate but so as not to overstate the cost, the analysis used a rate of 1% percent of the collection to define shared resources, fines and materials losses. In the process of collecting data for this analysis, it was found that there is not a standard form or unique definition of various costs and benefits for the circulation function. The participating library could not provide information on the monetary value of the benefits, only automation costs. The determining of benefit values were based on a series of conversations with Bob Gaines and Mark Smith, experts within the field of library automation with the State Library. They estimated, for example, a collection of 30,000 would experience a loss of 1% percent of their collection which equals 300 items a year. The average cost of a book is \$25 dollars, this includes processing and cataloging. The cost savings is calculated at 300 times \$25, which equals \$7,500 as shown in Table 4.6. This annual benefit is carried over to Table 4.1 and adjusted at 3% percent inflation. Because of greater control of the circulation function, the library has greater control of collecting

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<sup>75</sup>Hu, 1975, p. 149

fines, monitoring damages, and the ability to share resources. The estimated value for shared resources which translates into an increased collection for patron use is shown in Table 4.6. The estimated value for supplies is shown in Table 4.5 this information was given by the participating library. Appendix A gives a detailed summary of the cost figures prepared by the participating library. The detail of the adjustments are described on each table.

The analysis reveals the automation project has a positive net present value of \$834 the first year, with cumulative savings of \$205,976 for the five years. The benefits of an automated system over a manual circulation system is estimated to be \$205,976. Based on total net benefits, the automation alternative appears to be the best economic choice for Taylor Public Library. It should be recognized that the actual overall benefits of an automation system are larger than the three categories presented here. There are other benefits which could not be measured in monetary values of, i.e. the value of community satisfaction was not included. The next step in the analysis is the application of the benefit-cost ratio criteria shown in Table 4.1. The program has a benefit cost ratio greater than one. The implication of the benefit cost ratio is that the program is worth the investment.

Table 4.2 presents a cost effectiveness analysis on the examination of the two different systems. The assumption in this case is that the project is intrinsically worthwhile. This type of analysis explores the difference of cost per unit measurement between programs. The objective in this analysis is to determine how much of an objective can be obtained within a given amount of resources. Comparing costs

between both circulation systems shows that the automation is more efficient at a cost of .91 cents per circulation compared to a manual system cost at 1.72 per circulation. The analysis predicts this cost based on the assumption that the automation can handle a 50% percent increase in circulation. The performance indicators use for this analysis are shown in Table 4.2. The analysis indicates that this cost increase for automated services is affordable. The notion that a library can afford less in the way of services because technology has driven the cost up is not true. While services will undoubtedly continue to grow more expensive, the analysis shows that the community will be able to afford to pay for these rising costs if they choose to do so. The analysis offers an explanation of what is expected, in terms of relative cost for library automation in the future. The analysis indicates that automation of a significant portion of library operations may perhaps have become more affordable. The point of this analysis is not to argue that computerization of services will replace all library functions, but to acknowledge that as the cost for computers becomes more feasible, they become more cost effective in a library environment.

## CHAPTER V

### SUMMARY

As shown in this analysis, the benefits and costs that are associated with an automated on-line circulation system can be identified and quantified. Those quantifiable benefits and costs can be measured in monetary values. In order to completely understand the full impact of an automated system, other considerations should also be taken into account. The qualitative factor and the improvements of efficiency weighed together support an automated circulation system for small public libraries, and the automation option should be seriously considered. The following are the empirical findings of the analysis.

This analysis is based on a limited observations of one small public library, Taylor Public Library in Taylor, Texas. Because this analysis is based on supported data, it is impossible to make generalizations about the efficiency of an automation system. While the **benefit-cost** ratio implies that the system is an efficient use of resources, it would strengthen the analysis to show how much efficiency was increased. The results suggest that libraries should track their inputs and outputs as part of the program evaluation.

One way to improve efficiency is to automated the circulation function. This is true because the cost-effectiveness analysis showed a lower per unit cost in circulation function with automation. The library should be able to expand services for relatively small cost increase. An increase in book circulation would further reduce the average



circulation cost and this would raise the benefit-cost ratio for the program. If the goal of the library is to provide the most efficient use of resources, then based on the results, an automated system is more effective than a manual system. This argument could be made for public funds to finance such a program.

The increased timeliness and accuracy of information will enable patrons to make use of a variety of services not presently available or presently functioning well. Immediate access to items of information allows library staff to respond to patron inquiries, such as to on-shelf availability of titles. Reserves and holds are possible, as are renewals of materials by telephone. Turn around time for the shelving of items returned from circulation is decreased considerably, as there is no necessity of manually checking each title for holds. Circulation staff can check the status of each patron at the time of the transaction. Information on delinquent patrons, expired cards, and duplicate registrations can be determined and acted upon as necessary. The library can categorize items available for interlibrary loan as well as control items from other collections. The use of portable equipment facilitates the taking of regular inventory to identify items missing from the collection. An automated circulation system would be capable of producing a wide variety of management information with either scheduled or on-demand reports. Detailed analysis of all aspects of circulation: control, holds, interlibrary loan, **overdues** and borrower activity. Tracking to identify the types of patrons using library services and the types of **materials** they use would be possible with an automated system.

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# **APPENDIX A**

## **SOURCE WORKSHEETS**

- 1. Automating Small Libraries - How Long Will It Take**
- 2. Automating Small Libraries - Time Table Exercise**
- 3. Time Line**
- 4. Staff Time Budget**
- 5. Automating Small Libraries - How Much Will My Automation Project Cost?**
- 6. Equipment and Supply Budget**
- 7. City of Taylor Budget 94-95**
- 8. Hardware and Software Specifications**

## AUTOMATING SMALL LIBRARIES

### How Long Will It Take?

#### Weeding and Inventory

Step 1: 32,000 titles divided by 100 equals 320 hours

Step 2: 14 Hours per week a pair of your staff can work on weeding/inventory

Step 3: Step 1 320 divided by Step 2 14 equals 23 weeks to complete

Step 4: 23 weeks divided by 4 equals 6 months to complete the project

#### Retrospective Conversion

Step 1: 32,000 titles divided by 40 equals 800 hours

Step 2: 32 Hours per week you and your staff can work on recon

Step 3: Step 1 800 divided by Step 2 32 equals 25 weeks to complete

Step 4: 25 weeks divided by 4 equals 6 months to complete the project

#### Barcoding Collection \*

Step 1: Label and link 32,000 volumes divided by 40 equals 800 hours

Step 2:      Hours per week you and your staff can work on barcoding

Step 3: Step 1      divided by Step 2      equals      weeks to complete

Step 4:      weeks divided by 4 equals      months to complete the project

#### Entering Patron Data

Step 1: 4,500 patrons divided by 100 equals 45 hours

Step 2: 4 Hours per week you and your staff can work on data entry

Step 3: Step 1 45 divided by Step 2 4 equals 12 weeks to complete

Step 4: 12 weeks divided by 4 equals 3 months to complete the project

\* Preliminary plans are to close the library for barcoding.

# AUTOMATING SMALL LIBRARIES

## TIME TABLE EXERCISE

### Sample Automation Project Time Table

Prepare 5-year plan and budget	September - October 1990
Weeding and inventory	November 1990 - February 1991
Retrospective conversion	March - September 1991
Re-register patrons	August - November 1991
Select hardware and software	October 1991
Barcode collection	October - December 1991
Install and test hardware and software	November 1991
Enter patron data	November - December 1991
Train staff in new circulation procedures	December 1991
Begin automated circulation	January 1991

### Time Table for My Automation Project

Prepare 5-year plan and budget	March - August 1995
Weeding and inventory	March - August 1995
Retrospective conversion	May - October 1995
Re-register patrons	September - November 1995
Select hardware and software	November 1995
Barcode collection	January - February 1996
Install and test hardware and software	February 1996
Enter patron data	November - December 1996
Train staff in new circulation procedures	February 1996
Begin automated circulation	March 1996



**Staff Time Budget**

Task	Quantity	Unit	Unit Cost	Cost	Person(s)
1. Conversion					
1.1 planning	35	hour	\$6.00	\$210.00	library director and staff
1.2 training	80	hour	\$6.00	\$480.00	library staff and student assistants
1.3 weeding & inventory	640	hour	\$6.00	\$3,840.00	library staff
1.5 retrospective conversion	640	hour	\$6.00	\$3,840.00	library staff and student assistants
Subtotal	1395	hour	\$6.00	\$8,160.00	
2. Implementation					
2.1 planning	100	hour	\$6.00	\$600.00	library director and staff
2.2 re-register patrons	45	hour	\$6.00	\$270.00	library staff
2.3 vendor selection	25	hour	\$6.00	\$150.00	library director and library board of directors
2.4 site preparation	25	hour	\$6.00	\$150.00	library staff and city staff
2.5 barcoding	800	hour	\$6.00	\$4,800.00	library staff and volunteers
2.6 patron data entry	45	hour	\$6.00	\$270.00	library staff
2.7 network training	32	hour	\$6.00	\$192.00	vendor and library staff
2.8 software training	32	hour	\$6.00	\$192.00	vendor and library staff
2.9 circulation training	32	hour	\$6.00	\$192.00	vendor and library staff
2.10 publicity	50	hour	\$6.00	\$300.00	library director and staff
2.11 policy development	60	hour	\$6.00	\$360.00	library director and library board of directors
Subtotal	1246	hour	\$6.00	\$7,476.00	
<b>TOTAL</b>				<b>\$15,636.00</b>	

\* Figures for this form are from Bob Gaines' worksheets and estimates based on the time line.

AUTOMATING SMALL LIBRARIES

How Much Will My Automation Project Cost?

Step 1 Indicate the following for your library:

34,211 number of volumes (not titles)  
30,034 number of circulations per year  
4,393 Number of registered borrowers

Step 2 Indicate the number of workstations you will need by 1993:

1 circulation station  
1 second circulation station (for high circulations or as backup)  
4 public access catalog stations (PACs)  
1 staff workstation

Step 3 Now pick a budget that seems closest to your circumstances. This will give you a middle-of-the-road figure (expect a variation of plus or minus 25%, depending on the software vendor you choose) with which to start your planning. Note that the cost of staff time is not included.

**Typical Budget A**

(Assumes 20,000 volumes, 20,000 circulations/year, 2,000 borrowers)

Hardware (1 circulation station. 1 PAC)	\$4,500
Circulation/catalog software	3,200
Dumb labels and paper borrower's cards	<u>1,000</u>
	<b>\$8,700</b>
Staff time (1,250 hours for recon, labeling, and implementation)	
Annual cost for maintenance and materials	\$1,000

Alternate Budget A

(phase 1 is circulation only, Phase 2 adds PAC; not recommended because you must maintain card catalog during Phase 1)

Phase 1

Hardware (1 circulation station)	\$2,300
Circulation software only	900
Dumb labels and paper borrower's cards	<u>1,000</u>
	<b>\$4,200</b>
Staff time (1,250 hours for recon, labeling, and implementation)	
Annual cost for maintenance and materials	\$1,000

Phase 2

Hardware (1 PAC station, network hardware)	\$2,200
Catalog/network software upgrade	<u>2,300</u>
	<b>\$4,500</b>

»



**Typical Budget B**  
(Assumes 25,000 volumes, 40,000 circulations/year, 3,000 borrowers)

Hardware (2 circulation stations, 2 PACs, 1 staff station)	\$9,500
Circulation/catalog software	3,200
Dumb labels and paper borrower's cards	<u>1,500</u>
	\$14,200
Staff time (1,500 hours for recon, labeling, and implementation)	
Annual cost for maintenance and materials	1,250

**Typical Budget C**  
(Assumes 35,000 volumes, 75,000 circulations/year, 5,000 borrowers)

Hardware (2 circ stations, 3 PACs, 1 staff station, file server)	\$11,500
Circulation/catalog software	3,200
Dumb labels and paper borrower's cards	<u>2,000</u>
	\$16,700
Staff time (2,000 hours for recon, labeling, and implementation)	
Annual cost for maintenance and materials	\$1,750

**Added Costs**

**Step 4 Workstations:** If you require more workstations (PACs, etc.) than the typical budget shows, add \$1,000 for each additional workstation. \$ 1,000

**Step 5 Bar Code Labels:** Add (or subtract) \$40 per 1,000 volumes or patrons as required. \$ 1,560

**Step 6 Electrical Circuits:** If you do not have dedicated 30 amp electrical circuits specifically for computers and printers (that is, the circuits were installed according to electrical code specifications for computer circuits, and non-computer equipment such as photocopiers or microwaves won't also be using them), add \$200 for each location below where you will need one:

- circulation desk
- 4   PACs (if they are widely separated, one circuit for each PAC)
- staff workstation/file server

Total for electrical circuits \$ 800

**Step 7 Data Cabling:** You must run data cabling from the main computer (which will be either at the circulation desk, as in Typical Budget A or B, or in the workroom, as in Typical Budget C) to the other workstations. Add \$100 for each location below where the cabling must be run from the main computer:

- 2   circulation desk
- 4   PACs (if they are widely separated, one cable for each PAC)
- 2   staff workstation

Total for data cabling \$ 800

**Step 8** Add the amounts in Steps 4-7 to the typical budget total (omit annual cost)

**Grand Total:** \$ 20,860 (for first year only)

Equipment and Supply Budget      1995-1996

	Quantity	Unit Cost	Cost	Vendor
<b>1. Hardware</b>				
1.1 File server	1	\$2,295.00	\$2,295	Micro-VTLS
1.2 workstation unit	6	\$1,540.00	\$9,240	Micro-VTLS
1.3 hard drive for workstation	6	\$215.00	\$1,290	Micro-VTLS
1.4 Epson LQ-870 24pin printer	1	\$610.00	\$610	Micro-VTLS
1.5 10' printer cable	1	\$13.00	\$13	Micro-VTLS
1.6 HP 5P Laser printer	1	\$1,075.00	\$1,075	Micro-VTLS
1.7 hub for Lantastic	1	\$245.00	\$245	Micro-VTLS
1.8 Lantastic, UTP, and Ethernet cards	1	\$1,044.00	\$1,044	Micro-VTLS
1.9 barcode scanners	2	\$358.00	\$716	Micro-VTLS
1.10 hardware maintenance	1	\$750.00	\$750	Micro-VTLS
<b>Subtotal</b>			<b>\$17,278</b>	
<b>2. Software</b>				
2.1 Micro-VTLS software (LAN version)	1	\$4,975.00	\$4,975	Micro-VTLS
2.2 Foxpro 2.6 (for Windows)	1	\$125.00	\$125	Micro-VTLS
2.3 Carbon Copy (for DOS)	1	\$166.00	\$166	Micro-VTLS
2.4 software support & maintenance	1	\$1,145.00	\$1,145	Micro-VTLS
2.5 installation and training	1	\$2,000.00	\$2,000	Micro-VTLS
<b>Subtotal</b>			<b>\$8,411</b>	
<b>3. Site preparation</b>				
3.1 extra UTP Plenum cable/500 feet pk.	1	\$124.00	\$124	Data Comm
3.2 single outlets (ACOs) with RJ-45 connectors	7	\$1.25	\$9	Inmac
3.3 punch down wiring block	1	\$85.00	\$85	Inmac
3.4 Isobar 4 Ultra surge supsressor	3	\$49.95	\$150	Data Comm
3.5 Smart UPS 600	1	\$369.95	\$370	Data Comm
3.6 site preparation labor			\$400	S.W. Bell
<b>Subtotal</b>			<b>\$1,138</b>	
<b>4. Other supplies</b>				
4.1 smart barcode labels	30	\$39.15	\$1,175	Data Comp.
4.2 dumb barcode labels /priced per 1000	3	\$50.95	\$153	Brodart
4.3 patron cards	5000	\$0.32	\$1,600	Brodart
4.4 set up charges for patron cards	1	\$150.00	\$150	Brodart
4.5 bookmarks and borchures			\$250	Merchant's Pr.
<b>Subtotal</b>			<b>\$3,327</b>	
<b>5. Furniture</b>				
5.1 PAC table wheelchair height 36" x 60"	2	\$399.00	\$798	Brodart
5.2 Wooden chairs, adult	2	\$125.00	\$250	Brodart
5.3 Wooden chairs, youth	2	\$125.00	\$250	Brodart
<b>Subtotal</b>			<b>\$1,298</b>	

## Equipment and Supply Budget

### Automation Budget for 1996-1997

	Quantity	Unit Cost	Cost	Vendor
1.1 software maintenance	1	\$1,145.00	\$1,145	Micro-VTLS
1.2 hardware maintenance	1	\$750.00	\$750	Micro-VTLS
1.3 patron cards	2500	\$0.39	\$975	Brodart
1.4 barcode labels /priced per 1000	1	\$57.63	\$58	Brodart
1.5 tapes /2 pack	2	\$36.00	\$72	Dell Ware
1.6 MARC records	1000	\$0.20	\$200	Ingram
1.7 staff training	1	\$1,030.00	\$1,030	Micro-VTLS
<b>TOTAL</b>			<b>\$4,230</b>	

- The 1996-1997 budget includes a 3% increase for inflation over the 1995-1996 budget not including maintenance contract costs.  
The patron cards item is a 2 year supply.

### Automation Budget for 1997-1998

	Quantity	Unit Cost	Cost	Vendor
1.1 software maintenance	1	\$1,145.00	\$1,145	Micro-VTLS
1.2 hardware maintenance	1	\$750.00	\$750	Micro-VTLS
1.4 barcode labels /priced per 1000	1	\$59.36	\$59	Brodart
1.5 tapes /2 pack	2	\$37.00	\$74	Dell Ware
1.6 MARC records	1000	\$0.21	\$210	Ingram
1.7 staff training	1	\$1,060.00	\$1,060	Micro-VTLS
<b>TOTAL</b>			<b>\$3,298</b>	

- The 1997-1998 budget includes a 3% increase for inflation over the 1996-1997 budget.

CITY OF TAYLOR  
BUDGET 94-95

LIBRARY DEPARTMENT-CONTROL NO. 77		BUDGET 93-94	AMENDED BUDGET	BUDGET 94-85
<b>100-SALARIES AND WAGES</b>				
77-	Salaries	58.1 11.00	58,111.00	<b>61,593.00</b>
77-111	Career <b>Ladder</b>	580.00	0.00	616.00
<b>200-SUPPLIES</b>				
77-202	Office Supplies	1,200.00	<b>1,800.00</b>	<b>1,800.00</b>
77-204	Natural <b>Gas/Propane</b>	700.00	700.00	700.00
<b>77-206</b>	<b>Food</b>	100.00	100.00	100.00
77-214	Minor Tools	<b>120.00</b>	120.00	120.00
77-216	Cleaning and <b>Toilet Supplies</b>	100.00	150.00	150.00
<b>300-MAINTENANCE OF BUILDINGS</b>				
77-302	<b>Maintenance of Buildings</b>	200.00	500.00	500.00
<b>400-MAINTENANCE OF EQUIPMENT</b>				
77-402	<b>Furniture and Fixtures</b>	1,000.00	<b>1,000.00</b>	<b>1,000.00</b>
<b>77-416</b>	Library Books	0.00	0.00	0.00
<b>500-SERVICES AND FEES</b>				
77-501	<b>NEMI Contract</b>	0.00	395.00	<b>1,570.00</b>
<b>77-502</b>	Telephone <b>Equipment</b>	1,000.00	1,000.00	1,000.00
77-506	Insurance and Bonds	<b>2,570.00</b>	3,600.00	<b>3,600.00</b>
<b>77-508</b>	Special Services	180.00	190.00	190.00
77-522	<b>Light and Power</b>	<b>4,980.00</b>	3,800.00	<b>3,000.00</b>
<b>600-CONTRIBUTIONS AND BENEFITS</b>				
<b>77-601</b>	<b>"125" Agreement</b>	0.00		
<b>77-607</b>	Administration <b>"125"</b>	<b>66.00</b>	860.00	66.00
<b>77-608</b>	<b>FICA-Social Security</b>	<b>4,450.00</b>	<b>3,800.00</b>	4,700.00
<b>77-610</b>	<b>Retirement - TMRS.</b>	<b>1,500.00</b>	1,500.00	<b>1,000.00</b>
<b>77-612</b>	state <b>Unemployment Taxes</b>	533.00	533.00	533.00
77-616	Workers <b>Compensation</b>	1,142.00	220.00	<b>1,100.00</b>
<b>77-618</b>	Health Insurance	4,000.00	<b>3,600.00</b>	4,000.00
<b>700-CAPITAL OUTLAY FACILITIES</b>				
<b>77-702</b>	Capital Outlay - <b>Buildings</b>	0.00	<b>0.00</b>	0.00
<b>800-CAPITAL OUTLAY EQUIPMENT</b>				
<b>77-802</b>	Capital Outlay - Furniture and <b>Fixture</b>	300.00	300.00	<b>1,800.00</b>
77-816	Capital Outlay - <b>Boob</b>	<b>6,000.00</b>	<b>6,000.00</b>	6,000.00
TOTAL			<b>87,485.00</b>	95.1 38.00

## HARDWARE AND SOFTWARE SPECIFICATIONS

### File Server

486 **DX2/66** Mhz computer with 486 processor,  
8 MB RAM memory expansion to 32 MB  
528 MB hard drive  
3.5" 1.44 MB floppy drive  
keyboard  
14" VGA color monitor  
Jumbo 350 **internal** backup with 1 tape  
Asynchronous communication port  
Parallel printer port  
38.8 internal modem  
Ethernet local **area** network card - 16 bit, 10 Mbs with 10 base-T RJ-45 ready

**CD-ROM** player

**Barcode scanners** (workstation or **fileserver** compatible)

### Workstations

486 **DX2/66** Mhz computer with 486 processor, 8 MB RAM  
428 MB hard drive  
3.5" 1.44 MB floppy drive  
**Printer** port  
Asynchronous **communications** port  
Ethernet local **area** network card - 16 bit, 10 Mbs with 10 base-T RJ-45 ready

### Printers

HP 5P **Laser** printer  
Epson LQ-870 24 pin printer  
10' printer cable

## Software

LANTastic networking software

Micro-VTLs, Lan version

DOS 6.22 (7 copies)

Dial-in support software

Foxpro 2.6 (for Windows)

Carbon Copy (for DOS)

## Network Equipment

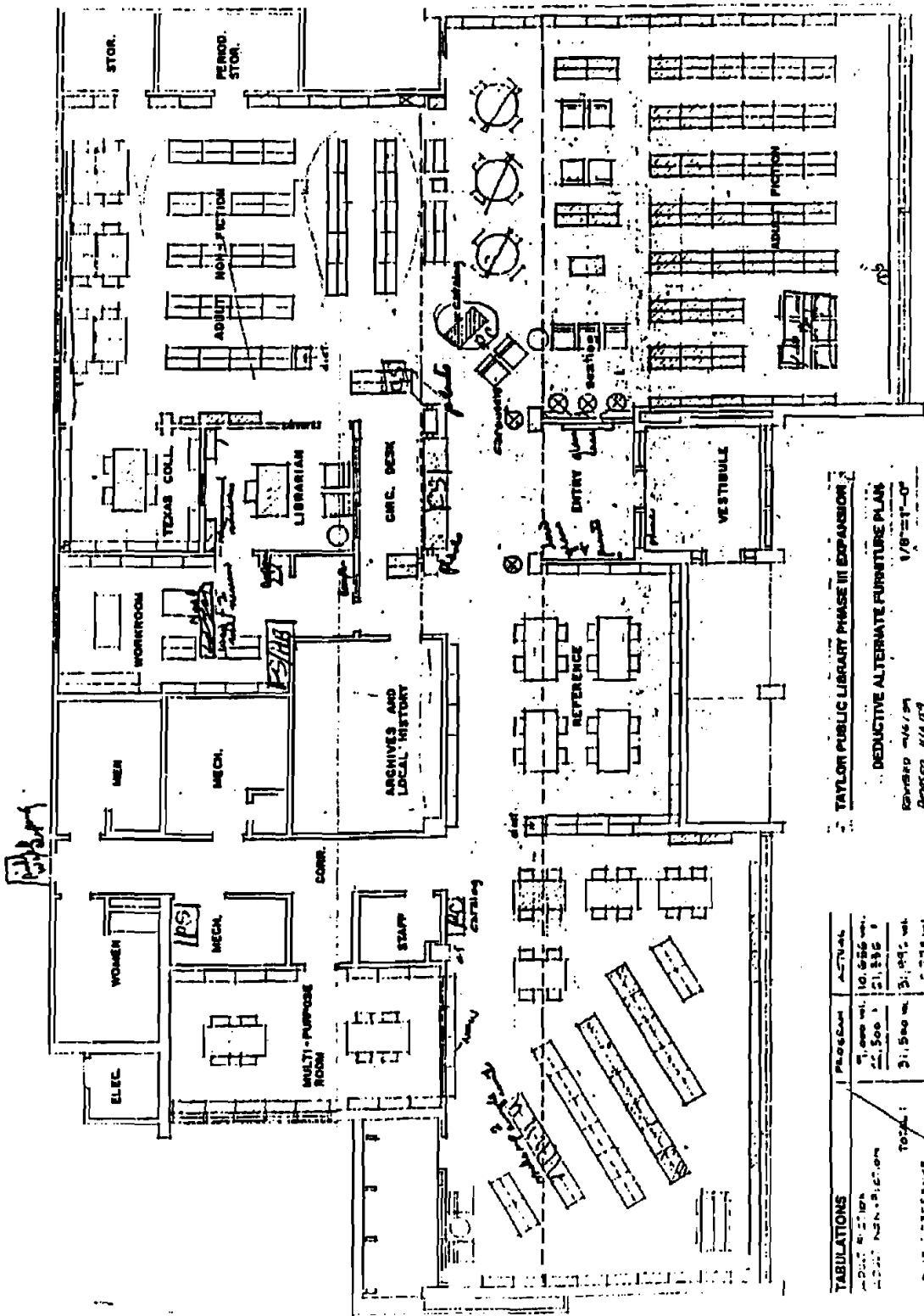
Hub for Lantastic

445 feet of Unshielded twisted pair (UTP) cable (category 5)

250 feet with package + 195 feet additional cable

Standard AT&T punchdown blocks

Amp communication outlets with RJ-45 jacks



Cable from:

- power source to hub and file server 35 ft.
- hub to circulation 1 35 ft.
- hub to circulation 2 45 ft.
- hub to PACs 1 and 2 120 ft.
- hub to PACs 3 and 4 140 ft.
- hub to future work stations 70 ft.

**TOTAL 445 ft.**