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The Economics of Academic Libraries

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and
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Library Trends

Summer 1979
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Each issue is concerned with one aspect of librarianship. Each is planned with the assistance of an invited advisory editor. All articles are by invitation. Suggestions for future issues are welcomed and should be sent to the Managing Editor.

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PRINTED IN THE U.S.A.
The Economics of Academic Libraries

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CONTENTS

Allen Kent
Jacob Cohen
K. Leon Montgomery

INTRODUCTION

Richard B. McKenzie

THE ECONOMIST'S PARADIGM

Jacob Cohen
Kenneth W. Leeson

SOURCES AND USES OF FUNDS OF ACADEMIC LIBRARIES

Donald W. King

PRICING POLICIES IN ACADEMIC LIBRARIES

Michael D. Cooper

THE ECONOMICS OF LIBRARY SIZE: A PRELIMINARY INQUIRY

Yale M. Braunstein

COSTS AND BENEFITS OF LIBRARY INFORMATION: THE USER POINT OF VIEW

Miriam A. Drake
Harold A. Olsen

THE ECONOMICS OF LIBRARY INNOVATION

Maurice B. Line

THE PSYCHOPATHOLOGY OF UNECONOMICS
Introduction

ALLEN KENT
JACOB COHEN
K. LEON MONTGOMERY

The concept that libraries are systems or organizations consuming and deploying capital and recurrent resources that can be optimized is a relatively recent one. Little in the structure of the college or university has given the librarian any incentive to think in economic terms. Indeed, there are some inducements not to economize. There is no profit motive to inspire the librarian, and no paying market for library services. These observations have been paraphrased from the final paper by Maurice Line, a career librarian. They state well the situation in which academic librarians find themselves.

In McKenzie's paper, the fundamental notions of economic choice and efficiency are explained in the context of a competitive market. He also points out what might be quite relevant to a study of libraries—that markets are not efficient if there are costs and benefits involving parties not directly involved in the transaction (i.e., third-party costs and benefits). Since these are difficult to measure (see King's and Braunstein's papers), this would seem to argue against modeling the library along market lines. Nevertheless, McKenzie's message is one of praise for application of the pricing system where it has not been tried before. The King and Braunstein chapters also suggest pricing policies.

According to Cohen and Leeson, during the period 1967-77 the total

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current funds for academic libraries increased from $416 million to $1250 million. In terms of real dollars, this increase is a less impressive 66 percent. A further negative note is that per capita student support began to decline in 1973.

While academic libraries get most of their money from their own universities, and in some instances have substantial gift and endowment incomes, the chapter by Drake and Olsen is pessimistic about such income in the future. Federal aid is noteworthy, particularly when total federal expenditures to libraries are considered.

Two main conclusions of Cohen and Leeson's analysis involve the allocations aspect of library budgets. While materials expenditures rose relative to salaries during the years 1960-69, the subsequent trend was in the opposite direction. Also, during the years 1970-76, materials budgets were redistributed in favor of serials at the expense of books.

According to King, the expense of materials to academic libraries has increased faster than allocated budgets. While these budgets were increasing at a rate of about 8-10 percent per year (1973-76), publishers of scientific and technical journals increased prices to libraries by nearly 12 percent per year (1975-77). King considers the economics of user charges. He distinguishes between average cost and marginal cost pricing policies for different information services, such as on-line searches, photocopying and interlibrary loans. The “externalities” of scholarly use of materials have to be considered in making pricing decisions. Economizing on journals through resource-sharing has a “catch-22” in that it may lead to higher publishers' prices and thus no net gain for the economizing library.

The influence of library size is probed by Michael Cooper. The observable outputs of a library include materials cataloged, reference questions answered, and items circulated. He reports on an empirical investigation of public library operations to determine whether economies or diseconomies of scale exist, thus providing an in-depth analysis of the cost side of library operations. How are these costs affected by a library's size? While his econometric estimation is based on public libraries, the results should be applicable to academic libraries. His findings are that costs are proportional to output levels. This means that average costs (costs per unit of output) are the same regardless of the size of a library and the population it serves. Of course, Cooper's study, as he acknowledges, has to set aside the important question of quality of output.

As pointed out by Braunstein, the library has a number of important competitors providing channels to information. These include on-line retrieval services and information brokers. Users are assessing the ways in
which these various sources meet their information needs and are making choices. Use of a library by an individual causes costs to be incurred by that individual, by the library and by other users. The kinds of invisible costs that the economist delights in making explicit are spelled out in this article, e.g., the time, money and effort spent going to the library and the loss of time caused by other users (marginal congestion costs). Braunstein concentrates on the costs to the library as the basis for pricing policies. Consumer surplus (the excess of benefits over cost) is greatest when prices are charged. An offsetting factor is the invisible "transaction costs" necessary to collect fees. Unfortunately, user (and third-party) benefits are more difficult to quantify than costs. In considering implications for library organization, Braunstein also notes that "production complementarities" may argue for integration of multiple library services. Pricing of individual services becomes more complicated, however, with costs necessarily being based on the combination of many different services. He points out that tailoring service to the needs of patrons is a cost-saving strategy.

The chapter by Drake and Olsen turns to the "nirvana" of economists and librarians alike — technology and innovation. Innovation makes the great leap possible — more output for the same expense, or the same output for less expense. Financial pressure will force libraries into innovative strategies. The likely result will be a substitution of capital for labor in the production function (a concept also discussed by Cooper). Future trends include declining relative costs of computer hardware and electronic communications, compared with rising prices of goods and services (including payroll). These will radically change the nature of the library industry. Networking will be more common, the range of services offered will be more diversified, and new financing arrangements, including fee-for-service, will evolve. The significance for libraries of the physical plant may also be modified as information is transmitted directly to work sites or residences. The risks inherent in innovation will not stem the tide of change.

Line's concluding chapter documents with gentle humor the responses of librarians to financial pressure. These are classified as traditional, perfectionist, cultural, passive resistance, mañana, political, psychological, mini-economic, pseudo-economic, marginal-economic, false economic, and overkill. While his caricatures are chiefly of those who resent economic reasoning, he also pokes fun at the relentless quantifier — the "hypereconomic librarian." Line reserves some of his satire for psychopathology of faculty, students and administrators. Despite this, he
urges that the ultimate goal of librarianship — the maximization of service to patrons — must be preserved; the means to this end, however, is economic behavior. The library must be run economically to provide the best possible services with limited financial resources.

Drake and Olsen state succinctly the principal message of this issue: changing economic conditions and pressure for greater productivity from resources in the public sector will be major factors in stimulating innovation. It is clear that institutions of higher education can no longer afford traditional libraries and comprehensive collections. Increasing wage rates, decreasing costs for technology and communication, and changes in consumer demand will force reallocation of library resources to provide funds for capital investment and more responsive service.

For these reasons, college and university libraries, as they have come to be known over the past century, may face revolutionary changes in their scope, nature and structure if they are to function as reasonably effective instruments in service to scholarship. In the end, it will be economics that will force this revolution. It is to this belief that this issue of Library Trends is dedicated.
"I don't rejoice in insects at all," Alice explained, "because I'm rather afraid of them — at least the large kinds. But I can tell you the names of some of them."

"Of course they answer to their names?" the Gnat remarked carelessly.

"I never knew them to do it."

"What's the use of their having names," the Gnat said, "if they won't answer to them?"

"No use to them," said Alice; "but it's useful to the people that name them, I suppose. If not, why do things have names at all?"

people in different disciplines have different perspectives from which they evaluate social conditions and policies aimed at remedying problems. Accordingly, as Alice had to do when she went through the looking glass, a student entering a new discipline frequently is forced to shift to a new analytical framework, to "think differently," and often to draw conclusions about the "state of the world" which are at odds with analyses developed in other disciplines. The contrast among the *modus operandi* of different disciplines is sometimes quite sharp; this may be the case regarding the disciplines of library science and the science of economics. At other times, however, the distinction between disciplinary boundaries is weakened by similarities in *approach* that researchers in different fields take to social issues; this may be true of the distinction between social philosophy or mathematics and economics.

Disciplines are large, amorphous, conceptual superstructures. Nevertheless, they have names because of their widely recognized, distinctive characteristics which largely proscribe the forms their analyses may take.

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and the conclusions that may be drawn. Realizing that readers of this issue may have a conceptual framework at variance with that of economics, the purpose of this chapter is to present, in brief survey form, the basic components of what may be called, for want of a better term, the "economist's paradigm." An important but subsidiary purpose is to show how economics has been and is being used to explore social problems far removed from the workings of the marketplace. A discipline like economics cannot be bounded by traditional notions of what constitutes its "proper" topics. Although economics has traditionally dealt with social issues insofar as they relate to private markets, money, unemployment and prices, the "paradigm" of economics also includes research in such diverse fields as crime, bureaucracy, politics, charity and interpersonal relationships. As this author has written elsewhere:

The unifying factor [in economics] is the approach which economists take toward the study of human behavior. They have a distinguishing set of presuppositions about human behavior — a different image of behavior — leading to a different mode of analysis and to conclusions which complement and, at times, appear to conflict with those of other social scientists investigating the same problem.

In the present paper, major elements of the economist's paradigm will be developed. Basic propositions are stated succinctly in italics and elaborations on those propositions follow.

ELEMENTS OF THE ECONOMIST'S PARADIGM

Individuals are assumed to have a consciousness which allows them to do more than merely respond to environmental constraints. Their consciousness enables them to imagine alternative courses of action, to evaluate them subjectively, and to take those actions which they perceive to be in their "best" interests.

In contrast to the theoretical perspective of other disciplines, economists do not view individual behavior as passive reaction to external forces of the immediate environment and internal forces of genetic structures and physical conditions. The individual is assumed to have wants, desires or preferences, which make his actions "directed from within," purposeful, and in part, capable of affecting the environment. As opposed to the individual reacting to the environment, the individual is perceived as operating, within constraints, on the environment in such a way
Economist's Paradigm

as to achieve to the greatest extent possible those goals which he himself envisions.

Freedom of choice in individual behavior has a strategic place in the economist's paradigm because it not only provides the "elbow room" for actions to be organized effectively (or efficiently, to use an economic term), but it also enables the individual to determine for himself what he wants and how he will go about getting it. Freedom is the substance of subjective evaluation. Subjective evaluation — the determination of specific wants — is of no consequence when freedom of action is denied. Similarly, in a conceptual framework in which all behavior is determined by environmental and genetic forces, freedom of action and responsibility for action have no place. B.F. Skinner, a psychologist who effectively denies that individuals have a "creative consciousness," makes this point with force: "Freedom and dignity illustrate the difficulty. They are the possessions of the autonomous man of traditional theory, and they are essential to practices in which a person is held responsible for his conduct and given credit for his achievements. A scientific analysis shifts both the responsibility and the achievement to the environment."6

The economist’s view of human behavior leads inevitably to the question of how individual evaluations and actions are coordinated. The economist expends a great deal of intellectual effort explaining the emergence of an "ordered anarchy" (such as a free market), describing the conditions under which individual efforts to achieve goals (or to maximize individually conceived utility) will or will not be tolerably efficient, and assessing the consequences of governmental policies. At this level, the paradigm of the economist is notable for what Friedrich Hayek calls the "pattern of outcome," that is, the semblance of order that is expected. To say more about the specific actions which people will take, more must be known than just that they attempt "to maximize their preferences," or what amounts to the same thing, that they are rational.5 Something must be known about what people want. However, even with that additional information — which is a great deal — economists have only been successful in indicating the directional movements of behavior in response to changes (for example, in prices), and only modestly successful in specifying by how much consumer purchases will increase or decrease under any given set of market changes.

Exchanges in a free market are mutually beneficial.

Trade involves the exchange of property rights, and people evaluate the rights they have to resources, goods and services differently. In attempting to maximize the utility of their property, people can be expected
to trade on the basis of these differences in their evaluations. A person who evaluates oranges very highly and apples very lowly can be expected to seek out and trade with someone who has an opposing assessment. By giving up apples, which have a low evaluation, and receiving oranges in return, the person increases his welfare. If people are able rationally and freely to choose whether or not and to what extent they make trades, it follows that, in the absence of deception or fraud, the traders gain by the trades. Otherwise, why do they make exchanges? In this sense, all voluntary exchanges are “profitable” to both traders.

Exchanges of “goods” — more specifically, “rights” or “property rights” — are predicated upon property rights being commonly recognized and legally enforced. The initial distribution of property rights may or may not be “just,” and the social conditions necessary for bringing about justice in this regard has recently been a major issue in social philosophy. However, regardless of the justice of the initial distribution, trades which may emerge in a free society improve the welfare of people from what it would otherwise have been. The resulting distribution of rights after trade may be construed as “unjust”; however, the economic proof that people are “better off” because of the emergence of trades has some value. The trades also tend to redistribute the rights in the direction of relatively more efficient uses.

*When alternative courses of action are known and subjectively evaluated, every action has a cost.*

Cost is the value placed on the most highly valued alternative forgone when a choice is made. The assumption that people have an almost infinite capacity to envision new wants and goals means that not everything that is wanted can be had. Therefore, the individual, if he is to maximize his welfare or “self-interest” (which can include giving aid to others), must make choices. By definition, when a choice is made, at least one alternative is not realized. The cost of the alternative taken is the value of the most highly valued alternative not taken.

Accordingly, there is a cost to buying a book, but there is also a cost to taking a walk, watching a sunset, or making use of a “free” public library. The cost to a library of a circulated book can be seen rather vividly in its purchase orders for new books or replacements for lost and stolen books, repair bills for old books, and salaries. Many of these costs are absorbed by the general public as taxes, and taxes for library services force the public to forgo other goods and services which they value. Some of the cost of checking out a book must, however, be borne by the user:
Economist's Paradigm

he is the one who has given up some other activity, which presumably has value, to be at the library desk. To that person, a library is rightfully "nonfree," and often he decides not to use it simply because the value of his alternative is greater than the perceived value of using the library.

The amount which people demand of any good is dependent upon the price they have to pay: the higher the price, everything else being equal, the lower the quantity purchased, and vice versa.

The relationship between prices and quantity can be graphically represented by a downward sloping curve, as in Figure 1. A reduction in price (the vertical axis) will cause a downward movement along the curve, i.e., more will be purchased. This is referred to as the demand

![Figure 1. Demand Curve](image)
curve because it illustrates the full relationship between the price people are asked to pay for each unit of a good and the amount they will demand (or buy).

The inverse relationship between price and quantity can be explained in two ways. First, a decrease in the price of any good increases the real income of consumers of that good and enables them to buy more, which they tend to do when they do not have all they want. Second, a price reduction induces consumers to buy more of that item in lieu of other items which probably were purchased before the price reduction. The explanation for this "substitution effect" is based on the assumption that people attempt to "maximize their welfare." The rational, maximizing person will allocate his income until the last cent spent on one good yields the same satisfaction as the last cent spent on other goods. Given this "consumer equilibrium condition," any price reduction will upset the balance that has been achieved. If the price of a book, for example, is reduced, the consumer will initially get more satisfaction from a dollar spent on that book than he can get from a dollar spent on another good whose price has not fallen. The consumer will then increase his purchases of books, reducing purchases of other goods.

Regardless of how the concept is explained, the inverse relationship between price and quantity has been so firmly fixed and repeatedly verified by empirical analysis that it is known as a "law" — the law of demand.

Again using the library as an example, the law of demand predicts that increasing the book rental fee from zero (the price in most public libraries) to some positive level will cause a reduction in the number of books borrowed. Similarly, an increase in the fines levied against overdue books will cause a reduction in the number of times books are kept overdue, because the greater fines increase the "price" of keeping books out on a daily basis. Furthermore, the law of demand predicts that an increase in the expected penalty imposed on people caught stealing books will lead to a reduction in books stolen; again, the greater penalty increases the expected price of "using" library books and causes a downward adjustment in the number of books library patrons will want to use through theft.

Within the relevant range of most production processes, the additional (or marginal) cost of additional units of a good produced will expand as the output level expands.

An important, observed technological law — the law of diminishing returns — states that as successive units of one resource, such as labor,
are added to a fixed quantity of another resource, such as a physical plant, there is a point beyond which additional units of labor will result in progressively smaller increments in total output. In other words, the returns to additional labor will diminish. It stands to reason that if additional labor, which presumably is paid a constant wage, contributes progressively less to output, additional units of output must cost progressively more. This means that beyond some point in the production process, the marginal cost of additional units of output must rise.

The law of diminishing returns does not state that the additional cost of all units of output must rise from the very start, but rather that beyond a certain point, the marginal cost of additional units rises and will continue to rise as production expands. However, this theory concludes that in competitive markets, firms will produce within the range of rising marginal cost. If they are not within that range, long-term reductions will be made in the quantity of the fixed factor of production, which in this discussion is a physical plant. In order to induce private (unsubsidized) firms to expand production, the price of the good must rise so that producers can cover the higher marginal cost of the greater output. Alternately, an increase in the price means that firms can more than cover the (marginal) cost of additional units and can, therefore, be expected to expand output. The direct relationship between price and quantity can be graphically described as an upward sloping curve, appropriately called the supply curve (see Figure 2).

Through subjective evaluation of alternatives, a rational person will extend his consumption of a good, such as books read, until the marginal benefit of the last unit is equal to its marginal cost.

Marginal benefit is the value of an additional unit of good consumed; marginal cost is the value of the rejected alternative. If the marginal benefit of a unit of good consumed is greater than its marginal cost, then it stands to reason that the person gains by the consumption. Even though, as additional units are consumed, the marginal benefit declines and the marginal cost increases, the maximizing person will continue to consume as long as the marginal benefit is greater than the marginal cost. A rational person will not extend his consumption beyond this point; a person will not knowingly consume a unit from which he receives less value than he loses from rejecting some other, more highly valued alternative. Consequently, a person will extend his consumption of the good up to, but not beyond, the point that the marginal benefit equals the marginal cost.

It can be concluded that as long as alternatives are subjectively evaluated, there is a self-imposed limit on behavior, which very often restricts
it to some point below one's physical and technological capabilities. For example, if a person is physically and intellectually capable of making extensive use of a university library, he or she may do extraordinarily well academically. However, a student may choose to restrict his studying to a point well below his capabilities simply because of the perceived costs and benefits of the activity. Beyond some point, the additional cost (that is, value of a forgone alternative) may be greater than the additional benefits anticipated in terms, for example, of a higher grade. In short, libraries may be empty on weekends because hours spent in the library then are simply not worth the costs, as subjectively evaluated by students and faculty; they have better things to do!
Economist’s Paradigm

There is a tendency for individuals within very large groups to fail to pursue “common goals” even when the goals are agreed upon by all group members. Therefore, voluntary collective action is not likely in very large groups.

In a large group, the actions of any individual are relatively insignificant. It is difficult for a person to perceive the impact of his own efforts and to realize the benefits from the costs he incurs. As a consequence, he has little or no incentive to do anything toward the accomplishment of collectively acknowledged goals, and may become a “free rider,” one who waits for others to take action and incur the necessary costs involved in achieving collective goals. If everyone attempts to become a free rider, then nothing will be done: voluntary action will fail to achieve what everyone wants.\(^\text{12}\)

For example, an individual’s tax payments are typically a minute part of the total taxes collected by the federal government. Consequently, an individual may correctly reason that his taxes, by themselves, will have no effect on the quantity or quality of public goods and services rendered by the government. He further understands that a total withdrawal of his tax payments will not reduce the public goods and services produced and the subsequent benefits he receives. As a result, each individual, although he may be in total agreement with what the government aspires to do, has no incentive to submit voluntarily his tax payment. In order to get everyone to pay their taxes, the government must threaten each potential taxpayer with a penalty for failure to pay. The penalty in this case provides the individual with the private incentive he needs to pay the taxes as proscribed by Internal Revenue Service rules.

Furthermore, individual competitors, like farmers, collectively have an incentive to restrict their individual output, thus materially reducing the market supply and increasing the price received for their crops. Collectively, farmers will then be better off. However, each farmer may reason that any restriction on his output will not affect the market price, dependent on what the others do. He, therefore, has no incentive to participate in a voluntary, collective action designed to improve the total income position of all farmers; indeed, he has a positive incentive to violate any collective agreement on voluntary crop restrictions.

Similarly, it may be in the interest of all students to read and learn as much as possible while in college; if all students study harder, the reputation of the school for quality graduates can be enhanced and all students may improve their economic positions by receiving better job offers. However, the efforts of each student individually will have little
impact on the overall reputation of the school; hence, the common interest of all students will have little or no effect on the behavior of individual students. All will tend to do what is in their private interest, narrowly defined.

*To the extent that competition exists, a market will be efficient.*

When combined on one graph, as in Figure 3, supply and demand curves form a model of market behavior. Under competitive conditions, the market price and quantity sold will move toward $P_1$ and $Q_1$, the intersection of the two curves. The reason for the intersection of price and quantity is straightforward: if the price is above $P_1$, producers want to sell more than consumers want to buy. Producers will "compete" the price downward as they attempt to find buyers for all that they want to sell.

![Diagram of supply and demand curves](image)

Figure 3. Competitive Conditions
As the price falls, consumers expand their purchases and producers reduce their output levels. At a price of $P_1$, the market clears and there is no reason for producers to cut the price further. If the price is below $P_1$, it means that consumers want to buy more than sellers want to produce. The consumers will “compete” the price upward as they attempt to get what they want. As the price rises, consumers want less and at the same time, the quantity which producers offer increases until the market clears.

Competitive markets are “efficient,” in the sense that economists use the term, in two respects. First, given subjective preferences and production costs, competition maximizes output (see Figure 4). The supply curve represents the minimum price at which producers are willing to sell each quantity of books. They would gladly, however, accept prices above these minimums. Consequently, the price/quantity combinations acceptable to producers lie either on or above the supply curve, in the shaded area of Figure 4A. Producers are not willing to go below that curve into the non-shaded area of the graph, as the price then would not cover the cost of production.

On the consumer’s side of the market, the demand curve indicates the maximum prices consumers are willing to pay for each quantity of books. They are, of course, willing to pay less. The price/quantity combinations acceptable to consumers, therefore, lie either on or below the demand curve, or in the shaded portion of Figure 4B.

Combining Figures 4A and 4B illustrates the price/quantity combinations acceptable to both consumers and producers (the crosshatched area in Figure 4C). Combinations outside that area are either inconsistent with the preferences of consumers, the willingness of producers to produce, or both. The quantity actually produced in the highly competitive market is $Q_1$. It appears at the extreme right of the crosshatched area, indicating the maximum production quantity acceptable to the combination of consumers and producers. This illustrates the reason economists argue that the competitive market maximizes output. It does not mean that more of the good cannot be produced; however, consumers are unwilling to cover the full cost of producing the additional units. To output quantities beyond $Q_1$ requires that producers be coerced into further production, or that consumer purchases be subsidized.

$Q_1$ is also an efficient level of production for another reason. At any point to the left of $Q_1$, the supply and demand curves indicate that consumers value an additional book at more than what it costs. The price, which is an indication of relative value, is greater than the marginal cost, which is an indication of the value of those things which are forgone.
Economist's Paradigm

Look, for example, at $Q_2$. Someone is willing to pay as much as $P_1$ for that unit, while the marginal cost is actually much lower ($MC_1$). The utilization of the resources in the production of that book raises the welfare of consumers: they receive more pleasure out of the additional book than they could have received from some other good that could have been produced. Furthermore, consumers of books can more than compensate the owners of the production resources for any loss they may have suffered by not using the resources in some other way: they can pay the producers a price in excess of $MC_1$.

The consumers are better off with the $Q_2$ book, or they would not have been willing to pay the price. The producers are also better off, or they would not have been willing to employ their resources in the production of that book. In the view of economists, this is a desirable outcome. This will follow with all other units of books up to $Q_1$ — the production level toward which competition will tend to push the market.

"Profit maximization" is the motivation which pushes the competitive market toward the intersection of the supply and demand curves. Therefore, profit maximization is not generally seen by economists as undesirable. Indeed, to the extent that it makes firms produce efficiently, profit maximization has socially desirable consequences. The individual producer, interested in maximizing his own profits, is induced to reveal to consumers the lowest price he is willing to charge. If the price is too high to attract consumers, the individual producer can increase his market share and profits by reducing his price below the level charged by others. If he does not reduce his price, other producers will and his customers will thus be attracted to other profit-maximizing firms.

A competitive system of profit-maximizing firms also tends to provide consumers with the types of goods and services they want. A firm which wants to expand its profits can do so by providing goods which consumers want more than those already available on the market. The consumer should be willing to pay a higher price for these goods, which is the inducement profit-maximizing firms need to enter the market. If there are no barriers to entry in a market, then higher prices on newly introduced goods will entice other firms into the market, and the price of the new products will tend to fall to competitive levels.

Profit maximization and competition provide consumers with a degree of protection from producers who are unconcerned about consumer welfare. Such a producer may reason that he can cut his costs and raise his profits by providing products which are "shoddy" or which quickly become obsolete. However, if consumers actually want better-quality or
more enduring products than those provided and are actually willing to pay for them, then new firms will enter the market, provide products of the quality desired and force the existing producer either to leave the market or to produce what consumers want and are willing to pay for. Granted, competitive markets will not fully protect consumers from the perils of daily existence; that is an impossibility. In addition, consumers will not always buy perfectly reliable or safe products simply because they cost too much, and consumers prefer to spend their money on other things.

*Monopoly firms will tend to restrict output and increase the price of the products they sell.*

A pure monopoly is a sole seller of a product. Accordingly, the pure monopolist does not have to worry about being outmaneuvered or undersold by close competitors. It can, therefore, restrict its production and ask a higher price for its product without fear that some other firm expanding production will take over its market. There is no producer which can force or induce the monopolist to charge a competitive price.

Although the monopolistic firm is constrained by the market demand for its product and the costs of production, it can demand any price/quantity combination along the demand curve; generally, the monopoly price will be higher and the quantity lower than exist under competitive market conditions. The necessary condition for the long-term survival of a monopolist is the presence of barriers to entry into the market; without barriers, firms interested in maximizing their profits will be attracted into the market by the profits that the high monopoly price spells. The barriers to entry may be technological, which is the case when a production process cannot be duplicated; or man-made, which occurs when the government grants exclusive franchises to bus companies or airlines to operate along certain routes, for example.

Private firms can be expected to take full advantage of any monopoly position they attain. Similarly, government bureaus interested in expanding their power, budgets and employee benefits can be expected to make full use of their monopoly positions in the supply of public goods and services. The monopolist nature of many bureaus is not fully recognized, but it can nonetheless be felt in terms of higher taxes (prices) and reduced quantity and quality of goods and services provided for public use. Therefore, the elimination of "duplication" of services by government bureaus or units will not necessarily be beneficial, as it can create a bureaucratic monopoly which can use its "market position" to reduce output and raise its tax-price.
The same is true of libraries. To have several independent libraries in a metropolitan area, for example, may be desirable. In some strict technological sense, there may be duplication of services; however, the cost of library service to the public may be lower in such an environment because the libraries are forced to compete in terms of their services for funding, which normally comes from local or state government. The library which offers quality service at the lowest price will have that many additional funds for expansion and increasing employee salaries and fringe benefits. Without such competition among libraries, it may be impossible for funding agencies to know the true cost of library services. It is librarians, not politicians who are far removed from the daily operations of libraries, who are in the best position to know the technology of library services and the minimum prices that must be paid for labor, equipment and supplies. However, it may not be possible to utilize the available technology fully or to secure the minimum funding (e.g., for labor) unless libraries are forced to compete, that is, to attempt to outdo one another in order to survive and advance the welfare of librarians.

*To the extent that costs are imposed on or benefits are received by persons not directly involved in market transactions, the market is not efficient.*

When a producer imposes costs — in the form of smoke pollution, for example — on someone who is not a buyer and who is not compensated for the harm done, the perceived costs of production to the producers will be lower than they actually are. The producer will be willing to offer his products at a lower price and will be able to sell more than otherwise. There will be "overproduction" because of what are called "external costs" — in this case, pollution.\(^\text{15}\)

On the other hand, sometimes people outside the market transactions benefit from exchanges that are made. This is often the case in town beautification projects. When people do not have to pay for the benefits they receive, producers will not be compensated for the full value of their products. As a result, they will be unable to charge as high a price as otherwise and, consequently, will produce less. These "external benefits" lead to "underproduction" in a free market. In the case of town beautification, merchants unable to charge passersby for the improved appearance of their stores will be less inclined to make such improvements.

The inefficiencies of external costs and benefits can be corrected by two forms of government action. The first is enforcing a set of standards of performance for consumers and producers. Examples of such standards placed on producers are pollution control laws and building codes which
regulate the size, shape and color of storefronts. Second, inefficiencies can be corrected through taxes and subsidies. A tax on polluters can cause the price of a product to rise and the quantity sold to fall, thus eliminating "overproduction." Alternately, a subsidy can be given to store owners which lowers the net cost of beautification and, therefore, the prices store owners must charge to cover the cost. This, in turn, can eliminate "underproduction."

ECONOMIC PRINCIPLES AND QUESTIONS IN POLITICAL ECONOMY

The elements of the economist's paradigm have been used to explore many diverse social issues. The following questions and answers illustrate this range of issues within one subject area: that of education.

How should a library allocate its limited number of book lockers and study carrels?

A limited supply of lockers and carrels can be distributed in a variety of ways: first come, first served; lottery; class status; or the personal preferences of the allocators. One allocation mechanism often overlooked by libraries is the pricing system. A price charged for the use of a locker can be raised until the available number of lockers exactly matches the number of lockers demanded. That such a match will occur is the law of demand. As the price is raised the number of lockers demanded will fall for two reasons: (1) the price increase will force people with insufficient income out of the market, and (2) it will induce some people to substitute other goods and services, which they consider relatively more valuable, for library lockers. At some point, this decreasing demand will exactly equal the number of lockers available.

This pricing system is not a perfect allocation mechanism; it discriminates against people with limited income. On the other hand, it has much to recommend it. First, it allows people to express the relative intensity of their preferences: those who want the lockers most, and are willing to pay for them, can effectively bid for them. Those people with low income, who want to raise their earning power through education, may have a higher demand for lockers than people with higher incomes. Second, the pricing system eliminates the need for what are often rather arbitrary rules for such allocation. Third, the charges collected for the use of lockers can induce the library to increase the number of lockers it has, or these funds can be used to subsidize other library functions which the staff considers more important. Similarly, market shortages of such diverse
Economist's Paradigm

commodities as natural gas, water and even “rights to pollute” can be effectively eliminated by appropriate upward adjustments in their prices.

Should school districts be consolidated?

An argument frequently heard in educational circles is that cost savings (economies of scale) result when the geographical area covered by a school system is expanded. Supposedly, consolidation of school systems eliminates duplication of administrative offices and enables them to offer a greater variety of programs. There may actually be economies of scale in education, but studies show that consolidation leads to higher costs per student. One possible explanation for this is that there actually are “diseconomies of scale” in school system expansion and that educators who propose consolidation are unaware of them. Another explanation, drawn from economic analysis, is that the consolidation of school systems gives educational authorities monopoly power; the consequence is higher tax-prices and expenditures and lower quantities of educational services provided. Armed with monopoly market power, it cannot be presumed that public employees will act any differently than private employees.

SUMMARY AND CONCLUSIONS

The preceding discussion has been a necessarily terse description of the theoretical basics of economic analysis. Although much has been left unsaid, even this brief description of the economist's paradigm suggests the course which much analysis within the discipline tends to take; it also suggests the likely dimensions and form of the analysis which will follow. I have related basic components of economic analysis to education, not so much because it may be a subject of interest to most readers, but because it emphasizes an important purpose of this issue of Library Trends: to demonstrate that economics can be usefully applied to bureaucratic as well as to private institutions.

References


8. An implicit assumption in this analysis is that the probability of capture and punishment is not affected by the increase in the penalty levied against those caught in library thefts. An increase in the probability of capture can have the same impact on theft as an increase in the penalty. For an extended discussion of the economics of crime, see McKenzie and Tullock, *The New World of Economics,* op. cit., pp. 129-80.


15. Ibid., pp. 227-41, 340-57.

Sources and Uses of Funds of Academic Libraries

JACOB COHEN
KENNETH W. LEESON

WHERE DO UNIVERSITY LIBRARIES get their money and how do they spend it? While the expenditures of academic libraries are relatively well documented, this is not true of the sources of funding. For example, much more is known about how expenditures are divided between salary and materials than about the relative importance of foundation support versus gifts in kind. In this paper, the analysis of the uses of funds relies heavily on the Machlup and Leeson study of the dissemination of information. The portion on sources of funds is drawn from the results of a questionnaire sent to members of the Association of Research Libraries.

SOURCES OF FUNDS

To provide an initial perspective on the magnitudes involved, Table 1 shows total operating expenditures (excluding capital outlays) for all college and university libraries. These figures represent funds from all sources (excluding those for capital expenditures).

With no adjustments for inflation, total funds in current dollars are seen to have steadily increased, in fact, tripling over the 11-year period studied. By 1975, academic libraries had become a "billion-dollar industry." In real terms, however, the increase is a less impressive 66 percent— from $528 million to $877 million. On a per student basis (with allowances made for growth in the student population), the overall increase is 80 percent in nominal dollars. In real dollars, funds per student are vir-

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SUMMER 1979
TABLE 1. AGGREGATE SOURCES OF FUNDS OF ACADEMIC LIBRARIES, 1967-77

<table>
<thead>
<tr>
<th>Year</th>
<th>Total funds in current dollars (millions)</th>
<th>GNP deflator for printing and publishing (1972 = 100)</th>
<th>Funds in real dollars (1/2)</th>
<th>Annual percentage change in 3 funds per student in current dollars (millions)</th>
<th>Annual percentage change in 6 funds per student in real dollars (5/2)</th>
<th>Expenditures as percentage of total educational and general expenditures*</th>
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</thead>
<tbody>
<tr>
<td>1967</td>
<td>$416</td>
<td>79</td>
<td>$528</td>
<td>16.1</td>
<td>11.6</td>
<td>3.7</td>
</tr>
<tr>
<td>1968</td>
<td>510</td>
<td>83</td>
<td>613</td>
<td>9.9</td>
<td>2.8</td>
<td>3.7</td>
</tr>
<tr>
<td>1969</td>
<td>585</td>
<td>87</td>
<td>674</td>
<td>3.7</td>
<td>1.1</td>
<td>4.3*</td>
</tr>
<tr>
<td>1970</td>
<td>650</td>
<td>93</td>
<td>698</td>
<td>8.5</td>
<td>5.8</td>
<td>4.2*</td>
</tr>
<tr>
<td>1971</td>
<td>737</td>
<td>97</td>
<td>757</td>
<td>5.1</td>
<td>2.6</td>
<td>4.2*</td>
</tr>
<tr>
<td>1972</td>
<td>796</td>
<td>100</td>
<td>796</td>
<td>1.4</td>
<td>-8.9</td>
<td>4.8</td>
</tr>
<tr>
<td>1973</td>
<td>867</td>
<td>113</td>
<td>838</td>
<td>-.12</td>
<td>-4.4</td>
<td>4.8</td>
</tr>
<tr>
<td>1974</td>
<td>960</td>
<td>129</td>
<td>850</td>
<td>4.5</td>
<td>-8.2</td>
<td>4.7</td>
</tr>
<tr>
<td>1975</td>
<td>1,092</td>
<td>133</td>
<td>849</td>
<td></td>
<td></td>
<td>3.9</td>
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<td></td>
<td>887</td>
<td></td>
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<td>3.9</td>
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</table>

The method of computing the library expenditures index was changed significantly in 1968. In that year, an institution's educational and general expenditure figure was redefined in accordance with recommendations of the National Association of College and University Business Officers. Of the changes made, the one of most importance was the deletion of federally sponsored organized research from the educational and general expenditures category. Hence, the mean library expenditure index was higher than usual years.

Sources & Uses of Funds

The annual percentage increase in funds per student was positive until 1973, and negative thereafter (except for 1976). This suggests rising revenues during the first half of the period under study, followed by a decline. Without an allowance for student growth, percentage increases in real dollars do not become negative until 1977. The decline in per capita support after 1972 roughly coincides with a decline in library expenditures in proportion to total university expenditures. Library support from the university budget (by far the library's major source of funds, as later discussion will show) declined from a high of 4.8 percent in the years 1972-73, to 3.9 percent for 1975-77.

THE OVERALL OPERATING BUDGET

The thirty university libraries responding to the questionnaire were divided into three categories—north public, north private and south public, with the bulk of the respondents falling into the second category (see Table 2). Clearly, the sample is not adequate for all these categories.

The change in budget size for the years covered in the questionnaire responses indicates a larger percentage increase in southern public universities due primarily to the library budget increases of universities 29 and 30. University support of the library is analyzed in the last two columns of Table 2. That "financial effort" is not a determinant of budget size is evidenced by the weak relation between library budgets and percentages of support from the total university budget (the rank correlation is -.01). The responses indicate a weakening in university support; the weighted average change in this area was a -.66 percent for north public universities. Nevertheless, budgetary growth is correlated with a change in the percent of university support (the rank correlation is a significant 44 percent). While the size of library budgets is apparently more a function of the size of the institution's overall budget than of the degree of support, growth of the budget has depended on an increased percentage of support.

Many of the libraries exceed the 5 percent level of support (expressed as a percentage of university budget) suggested by the Committee on Standards of the Association of College and Research Libraries in its 1959 statement. On the average, however, they fall short, even the north public universities. The revision of this statement calls for 6 percent outlays. These percentages of support can be compared with data compiled by the Association of Research Libraries. The results of their 1975 questionnaire show the median percentage of support for eighty-eight libraries to be 3.5 percent; the maximum, 8.3 percent; and the minimum, 1.1 percent.
### TABLE 2. OVERALL LIBRARY BUDGETS

<table>
<thead>
<tr>
<th>University Number</th>
<th>Library Budget (latest complete year figures)</th>
<th>Change in % over Years Covered</th>
<th>% of University as % of Univ. Budget</th>
<th>Change in % of Univ. Budget</th>
</tr>
</thead>
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<td><strong>North Private</strong></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>$5,773,339</td>
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<td>1970-77</td>
<td>3.51</td>
</tr>
<tr>
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<td>12,083,000</td>
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<td>1970-77</td>
<td>4.10</td>
</tr>
<tr>
<td>3</td>
<td>3,016,407</td>
<td>79.1</td>
<td>1970-77</td>
<td>4.72</td>
</tr>
<tr>
<td>4</td>
<td>3,494,000</td>
<td>46.9</td>
<td>1974-77</td>
<td>1.51</td>
</tr>
<tr>
<td>5</td>
<td>3,951,140</td>
<td>58.3</td>
<td>1970-77</td>
<td>3.60</td>
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<tr>
<td>6</td>
<td>6,189,466</td>
<td>41.7</td>
<td>1972-77</td>
<td>4.10</td>
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<tr>
<td>7</td>
<td>5,945,000</td>
<td>44.9</td>
<td>1973-77</td>
<td>2.00</td>
</tr>
<tr>
<td>8</td>
<td>2,575,920</td>
<td>48.1</td>
<td>1973-77</td>
<td>5.00</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>5,378,534</td>
<td>60.6</td>
<td>1970-77</td>
<td>3.48</td>
</tr>
<tr>
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</tr>
<tr>
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<td>6,404,000</td>
<td>89.4</td>
<td>1970-77</td>
<td>2.43</td>
</tr>
<tr>
<td>10</td>
<td>11,654,873</td>
<td>77.8</td>
<td>1969-77</td>
<td>4.31</td>
</tr>
<tr>
<td>11</td>
<td>3,726,188</td>
<td>9.4</td>
<td>1974-77</td>
<td>1.90</td>
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<tr>
<td>12</td>
<td>2,258,869</td>
<td>83.4</td>
<td>1970-77</td>
<td>6.60</td>
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<tr>
<td>13</td>
<td>4,627,619</td>
<td>24.6</td>
<td>1972-77</td>
<td>5.20</td>
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<tr>
<td>14</td>
<td>3,254,762</td>
<td>18.7</td>
<td>1973-76</td>
<td>2.13</td>
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<tr>
<td>15</td>
<td>7,406,990</td>
<td>82.1</td>
<td>1969-77</td>
<td>4.84</td>
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<td>16</td>
<td>4,417,475</td>
<td>35.4</td>
<td>1970-77</td>
<td>3.00</td>
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<td>17</td>
<td>2,469,198</td>
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<td>2,264,074</td>
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<td>19</td>
<td>2,985,264</td>
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<td>1970-77</td>
<td>6.60</td>
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<tr>
<td>20</td>
<td>8,026,280</td>
<td>106.9</td>
<td>1970-77</td>
<td>3.30</td>
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<tr>
<td>21</td>
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<td>60.7</td>
<td>1970-77</td>
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<td>5,508,000</td>
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<td>1970-77</td>
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<td>3,623,988</td>
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<td>1974-77</td>
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</tr>
<tr>
<td>24</td>
<td>11,865,876</td>
<td>92.8</td>
<td>1970-77</td>
<td>4.80</td>
</tr>
<tr>
<td>25</td>
<td>2,707,566</td>
<td>121.5</td>
<td>1970-77</td>
<td>4.20</td>
</tr>
<tr>
<td>26</td>
<td>8,960,000</td>
<td>49.6</td>
<td>1970-77</td>
<td>4.54</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>5,406,279</td>
<td>64.4</td>
<td>1970-77</td>
<td>4.55</td>
</tr>
<tr>
<td><strong>South Public</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>4,814,800</td>
<td>18.8</td>
<td>1974-77</td>
<td>3.00</td>
</tr>
<tr>
<td>28</td>
<td>978,555</td>
<td>-20.8</td>
<td>1973-77</td>
<td>2.53</td>
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<td>29</td>
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</tr>
<tr>
<td>30</td>
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<td>106.4</td>
<td>1970-77</td>
<td>4.92</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>3,826,230</td>
<td>74.8</td>
<td>1970-77</td>
<td>3.64</td>
</tr>
</tbody>
</table>

Source: Replies to questionnaire sent to ARL members.
Table 3 shows a breakdown of the library budget. Respondents were asked to provide historical data for the years 1970-77, and earlier if available, on sources of funds from the university; from federal, state and local grants; gifts in kind; endowment income (including consumption of capital); and fees and fines. In a number of libraries, fees and fines revert to the university budget. Nevertheless, when these data were supplied, they were included. The most recent year's figures were used for each library consistent with the comprehensiveness of the data supplied. Initially, averages were used for the years covered in the responses, but this seemed to have had a distorting effect due to frequent data omissions.

The problems of comparing these libraries are, of course, enormous due to the uniqueness of each responding institution. More campus libraries may have been included in one response than in another. Some special revenues received may have been reported under different headings. Data indicated as not available had to be treated as a zero value for averaging purposes. The notes accompanying the table partially indicate the diversity of budgetary practices.

Several generalizations emerge from analysis of Table 3. The dominance of university funds is overwhelming. Southern public universities show the highest dependence (97 percent), followed by northern public universities (92 percent). Those least dependent on such funding are northern private universities (83 percent). The obverse aspect is the significance of gifts and endowment income for private universities. The weighted average (probably understated because "not available" amounts are treated as zero) for northern private universities is 13 percent, compared with 3 percent and 1 percent for northern and southern public university libraries, respectively. The 27 percent figure for a leading eastern private university (no. 2) is particularly noteworthy.

Cash gifts include foundation support. Table 4 provides a statistical view of the uses to which this support is put. Books and other materials rank relatively low; the bulk of foundation funds is used for construction, special studies, faculty research grants and other purposes. Some prominent support foundations are Ahmanson, Kresge, Danforth, Lilly, Mellon, Rockefeller, and the Council on Library Resources.7

Most public grants are state funded. The figures for two Illinois academic libraries that are members of ILLINET reflect state reimbursement for their interlibrary loan activities. The four research and reference centers, specified in Illinois law, and three special resource centers, both of which categories include academic libraries, earned a total of $678,440.
### TABLE 3. INDIVIDUAL SOURCES OF FUNDS AS A PERCENTAGE OF TOTAL LIBRARY BUDGET

<table>
<thead>
<tr>
<th>University Number</th>
<th>University Funds</th>
<th>University Grants Federal</th>
<th>State</th>
<th>Local</th>
<th>In Kind</th>
<th>In Cash</th>
<th>Endow. Income</th>
<th>Fees &amp; Fines</th>
<th>Total Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>North Private</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1</td>
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<td>0.3</td>
<td>0.3</td>
<td>11.2</td>
<td>0.2</td>
<td>5.9</td>
<td>0.9</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>70.8</td>
<td>1.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>85.8</td>
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<td>0.1</td>
<td></td>
<td></td>
<td>1.3</td>
<td>12.1</td>
<td>0.6</td>
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<td>4</td>
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<td>3.5</td>
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<tr>
<td><strong>Average</strong></td>
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<td>2.7</td>
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<td></td>
<td></td>
<td></td>
<td>13.3</td>
<td></td>
<td>100</td>
</tr>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>93.0</td>
<td>1.5</td>
<td>3.3</td>
<td>0.3</td>
<td>1.6</td>
<td>0.3</td>
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<tr>
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<td>0.3</td>
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<td></td>
<td></td>
<td>1.3</td>
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</table>

**Notes to Table 3:**

No. 1 — Local Grant comes from Venezuela, for only one year
No. 2 — Fees and Fines included under Gifts in Cash
Sources & Uses of Funds

TABLE 3. — Continued

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
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<tbody>
<tr>
<td>4</td>
<td>Endowment Income includes small grant from U.S. DHEW</td>
</tr>
<tr>
<td>5</td>
<td>One major group of libraries is excluded</td>
</tr>
<tr>
<td>11</td>
<td>Gifts in Kind were indicated as “gifts”</td>
</tr>
<tr>
<td>12</td>
<td>Fees and Fines are really “fees and cost recovery”</td>
</tr>
<tr>
<td>15</td>
<td>The 10.8 percent shown under Fees and Fines reflects largely “institutional funds” and, to a lesser extent, “auxiliary enterprises.” Institutional funds are an allocation to the library of a portion of total indirect cost funds coming to the university from outside grants and contracts. “Auxiliary enterprises” represents profits from copying machines in the library.</td>
</tr>
<tr>
<td>17</td>
<td>State Grants refers to money earned through ILLINET for state inter-library loan</td>
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<tr>
<td>22</td>
<td>Fees and Fines includes sales and services</td>
</tr>
<tr>
<td>24</td>
<td>Fees and Fines includes book replacements, publication programs and self-supporting programs</td>
</tr>
<tr>
<td>25</td>
<td>Federal Grants includes state and local grants</td>
</tr>
<tr>
<td>27</td>
<td>Gifts in Cash included in Endowment Income</td>
</tr>
<tr>
<td>29</td>
<td>Endowment Income includes miscellaneous trust funds and cash gifts</td>
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TABLE 4. FOUNDATION GRANTS TO ACADEMIC LIBRARIES FOR 1976-77

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<tr>
<th></th>
<th>1976</th>
<th>1977</th>
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<tbody>
<tr>
<td>Total number of colleges and universities</td>
<td>111</td>
<td>102</td>
</tr>
<tr>
<td><strong>Uses of Funds</strong></td>
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<td></td>
</tr>
<tr>
<td>Construction</td>
<td>$4,200,000</td>
<td>$2,619,489</td>
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<tr>
<td>Books</td>
<td>1,210,000</td>
<td>801,652</td>
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<tr>
<td>Other materials</td>
<td>817,400</td>
<td>641,424</td>
</tr>
<tr>
<td>Special studies</td>
<td>942,731</td>
<td>4,141,526</td>
</tr>
<tr>
<td>Faculty research grants</td>
<td>5,751,418</td>
<td>1,710,276</td>
</tr>
<tr>
<td>Other purposes</td>
<td>4,215,359</td>
<td>2,674,407</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$17,149,408</td>
<td>$12,588,774</td>
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</tbody>
</table>


in FY 1978. The New York State Interlibrary Loan Program (NYSILL) has contracts with twelve libraries, including academic libraries. Each referral library receives an annual participation grant plus a unit fee for each request that is searched and/or filled.

The importance of federal grants to academic libraries is probably understated in Table 3. The Higher Education Act of Nov. 1965 has provided financial support for materials purchases (Title II-A), library training and research (Title II-B), and resource-sharing (Title II-C). The grants under Title II-A are relatively trivial from the standpoint of the large research library. Three to four thousand flat grants of between $3500 and $4000 are made annually to every eligible academic library in
the country. The distribution of funds for fiscal years 1968-75 is shown in Table 5.

Title II-B funds cover two programs. The first, funded at $1 million annually, provides grants for research and demonstration projects, some of which may have gone to academic libraries. The other program finances fellowships for library school students, and supports workshops and institutes to update the skills of practicing librarians. Neither of these programs adds to the unrestricted revenues of academic libraries since they are earmarked for these specific purposes. Data on library education programs are given in Table 6.

Title II-C was first funded in FY 1978, and provides grants to research libraries to stimulate resource-sharing. Twenty major grants, chiefly to large university libraries, were made that year; federal legislation has authorized 150 grants per year.

When allowance is made for federal library expenditures, federal support is enormously increased. It has been estimated that federal "use" expenditures for 1977 totaled $2.3 billion. This includes expenditures of $193 million for scientific and technical libraries; $82 million in direct federal subsidies, such as the Library Services and Construction Act of 1964 (LSCA) and the Higher Education General Information Survey (HEGIS); an estimated $45 million for abstracting and indexing services; $768 million for federally supported search services; and $120 million for other library services.

THE CAPITAL BUDGET

A record of construction expenditures for 1966-76 indicates a total cost of $1.9 billion, two-thirds of which applies to the first half of this period. From 1966 to 1971, library projects were principally funded by federal grants and loans. In the second five years, financing was largely through local public or private funds. The average cost of projects after 1966 suggests the increasing involvement of larger institutions, with smaller ones dropping out.

USES OF FUNDS

CHOICES AMONG ALTERNATIVE USES

Several choices have to be made by librarians when they plan how to make the most efficient use of the funds available to them. They must decide how to divide disbursements among broad categories of expense, including salaries and wages, equipment and supplies, binding, building
### TABLE 5. DISTRIBUTION OF FUNDS UNDER TITLE II-A

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<td>1966</td>
<td>$50</td>
<td>$50</td>
<td>$10</td>
<td>$8,400,000</td>
<td>1,830</td>
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<td>1967</td>
<td>50</td>
<td>100</td>
<td>25</td>
<td>24,500,000</td>
<td>1,989</td>
<td>1,266</td>
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<tr>
<td>1968</td>
<td>50</td>
<td>150</td>
<td>25</td>
<td>24,900,000</td>
<td>2,111</td>
<td>1,524</td>
<td>60</td>
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<tr>
<td>1969</td>
<td>25</td>
<td>175</td>
<td>25</td>
<td>24,900,000</td>
<td>2,224</td>
<td>1,747</td>
<td>77</td>
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<tr>
<td>1970</td>
<td>75</td>
<td>250</td>
<td>12.5</td>
<td>9,816,000</td>
<td>2,201</td>
<td>1,783</td>
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<td>1971</td>
<td>90</td>
<td>340</td>
<td>9.9</td>
<td>9,900,000</td>
<td>548</td>
<td>531</td>
<td>115</td>
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<td>1972</td>
<td>18</td>
<td>358</td>
<td>11</td>
<td>10,993,000</td>
<td>504</td>
<td>494</td>
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<td>1973</td>
<td>52.5</td>
<td>410.5</td>
<td>12.5</td>
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<td>2,061</td>
<td>65</td>
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<tr>
<td>1974</td>
<td>59.5</td>
<td>470</td>
<td>9.985</td>
<td>9,980,000</td>
<td>2,377</td>
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<tr>
<td>1975</td>
<td>70</td>
<td>540</td>
<td>9.75</td>
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</table>

Totals $150,635 $135,869,200 15,845 7,345 470

Source: Figures on appropriations, obligations, and numbers of grants from: Stevens, Frank A., and Carl, Herbert A. "Higher Education Act, Title II A." In Bowker Annual, 1975. New York, Bowker, 1975, p. 139, "Table 2, Number of Grants Issued."

### TABLE 6. LIBRARY EDUCATION PROGRAMS

#### FELLOWSHIPS/TRAINEESHIPS

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Institutions</th>
<th>Doctoral</th>
<th>Master's</th>
<th>Associate</th>
<th>Total</th>
<th>Fellowships/Traineeships</th>
<th>Total Participations</th>
<th>Appropriations</th>
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<td>1966/67</td>
<td>24</td>
<td>52</td>
<td>25</td>
<td>62</td>
<td>139</td>
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<td>1967/68</td>
<td>38</td>
<td>116</td>
<td>58</td>
<td>327</td>
<td>501</td>
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<td>3,750,000</td>
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<td>1968/69</td>
<td>51</td>
<td>168</td>
<td>47</td>
<td>494</td>
<td>709</td>
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<td>1969/70</td>
<td>56</td>
<td>193</td>
<td>30</td>
<td>379</td>
<td>602</td>
<td>1,347</td>
<td>8,250,000</td>
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<tr>
<td>1970/71</td>
<td>48</td>
<td>171</td>
<td>15</td>
<td>200(a)</td>
<td>386</td>
<td>1,557</td>
<td>4,000,000</td>
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<td>1971/72</td>
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<td>116</td>
<td>6</td>
<td>(\ast)</td>
<td>122</td>
<td>981</td>
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<td>1972/73</td>
<td>14</td>
<td>39</td>
<td>3</td>
<td>(\ast)</td>
<td>42</td>
<td>654</td>
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<tr>
<td>1973/74</td>
<td>39</td>
<td>21</td>
<td>4</td>
<td>159(b)</td>
<td>201</td>
<td>1,346(c)</td>
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<td>1974/75</td>
<td>50</td>
<td>21</td>
<td>3</td>
<td>171(d)</td>
<td>5</td>
<td>200</td>
<td>2,850,000</td>
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<tr>
<td>1975/76</td>
<td>2,000,000</td>
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Total 339 897 191 1,792 22 2,902 363 12,409 $39,572,000

\(a\) Twenty traineeships were awarded in each of these years in an experimental program at SUNY-Albany.

\(b\) Includes 14 traineeships.

\(\ast\) Includes 45 traineeships.

\(d\) Includes 3 traineeships.

operation and maintenance, and library materials. With regard to their collections, they have to decide how the funds set aside for materials will be divided between purchases of books and purchases of serial publications, including newspapers, magazines, newsletters, research journals, and so on. They have to decide how much money to spend on newly published book titles and current subscriptions to serials, and how much to spend for the purchase of backlist titles of books and for old issues of serial publications that are needed to fill gaps in the collection. They must decide how many of their publications shall be purchased in the conventional hard copy form and how many in microform. They must also decide how much to spend on books and serials in physics, philosophy, economics, urban studies, art and all of the other subject areas in which they maintain collections. Though not as a result of deliberate choices, some material will come from university presses, some from commercial publishers, and some from professional societies and associations; some will come from foreign publishers, and some from publishers located in the United States.

This is only a partial list of the choices facing librarians in their decisions regarding use of funds, but it has already raised more questions than could be dealt with adequately here. Attention shall be focused on the following four questions:

1. Over the period 1970-76, how did a sample of academic libraries distribute available funds among three major expenditure categories — materials, wages and salaries, and all other expenses?
2. Over the same period, how did the librarians divide their expenditures on materials between books and serials, and how much of each were they able to buy in "real" terms (number of book titles, number of serial subscriptions)?
3. In 1976 how did these libraries divide their total expenditures on materials between current and backlist books and serials?
4. How did they divide their total expenditures on materials between imported and domestically produced books and serials?

In formulating answers to these questions, we shall rely most heavily on the findings of a recent study of library operations that included a survey of collection development in academic libraries.15

A RECENT SURVEY OF LIBRARIES

The Machlup and Leeson survey of collection development in libraries relied on an elaborate random-sampling plan to try to obtain various kinds of information from a "representative" sample of academic,
Sources & Uses of Funds

public, special, and federal libraries in the United States. Here we shall
discuss only the findings pertaining to academic libraries.

Altogether 329 academic libraries (out of a total of nearly 3000 in the
United States at the time) were selected and sent questionnaires. Of these,
131 returned at least partially filled out forms for a rate of response just
under 40 percent. Considering the length of the questionnaire — 5 major
parts in 26 pages containing over 400 questions — and the great detail
in which data were sought, this can be considered a rather gratifying rate
of response. Nevertheless, because some 60 percent of the chosen sample
did not respond, the extent of “representativeness” of the responding sam-
ple may be questioned and there may be biases present in the results, some
known, but most unknown. One known bias can be mentioned at once.
The responding group of 131 libraries contains a disproportionate number
of large academic libraries. This is due primarily to an extremely high re-
sponse rate from member-libraries of the Association of Research Li-
braries. Thanks to the endorsement and cooperation of that association,
75 of the 105 members completed the questionnaires they had been sent.

Although 131 academic libraries returned usable questionnaires, many
failed to answer some of the questions posed or to provide annual data
for some of the years for which they had been requested, 1970 through
1976. Hence, in order to have, for the presentation of annual data, a
consistent sample containing the same libraries from year to year, only
those that were able to provide data for all seven years requested are
included in the statistical tables. There were seventy-five such libraries.

Providing definitive answers, that is, conclusive findings, to all four
questions posed would require a good deal more quantitative data than
are at present available. By drawing on the findings of the Machlup and
Leeson study, however, partial or tentative answers can be provided. They
will be based in some instances on more or less dependable “measured”
magnitudes of dollar outlay, and in other instances on less dependable
rough estimations and “impressions” obtained from the librarians.

MAJOR EXPENSE CATEGORIES

In order to see on a nationwide scale how librarians at academic insti-
tutions have been allocating their total funds among the three major
expense categories — materials (books, serials, and other materials), sala-
ries and wages, and all other (plant operation and maintenance, supplies
and equipment) — data compiled by the National Center for Education
Statistics (NCES) and reported for benchmark years in Library Statistics
of Colleges and Universities may be examined. The left side of Table 7
### TABLE 7. EXPENDITURES BY ALL U.S. ACADEMIC LIBRARIES

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Libraries</th>
<th>Total Expenditures (excluding capital outlays, in thousands)</th>
<th>Materials (in thousands)</th>
<th>Wages &amp; Salaries (in thousands)</th>
<th>All Other (in thousands)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>1,951</td>
<td>$137,200</td>
<td>$40,700</td>
<td>$84,100</td>
<td>$12,400</td>
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</tr>
<tr>
<td>1964</td>
<td>2,140</td>
<td>246,000</td>
<td>79,000</td>
<td>145,000</td>
<td>22,000</td>
<td>8.9</td>
</tr>
<tr>
<td>1968</td>
<td>2,370</td>
<td>509,800</td>
<td>187,900</td>
<td>274,100</td>
<td>47,800</td>
<td>9.3</td>
</tr>
<tr>
<td>1969</td>
<td>2,431</td>
<td>584,800</td>
<td>212,900</td>
<td>317,400</td>
<td>54,500</td>
<td>9.3</td>
</tr>
<tr>
<td>1971</td>
<td>2,535</td>
<td>737,500</td>
<td>247,700</td>
<td>417,300</td>
<td>72,500</td>
<td>9.8</td>
</tr>
<tr>
<td>1973</td>
<td>2,887</td>
<td>866,800</td>
<td>282,200</td>
<td>496,500</td>
<td>88,100</td>
<td>10.1</td>
</tr>
<tr>
<td>1975</td>
<td>2,972</td>
<td>1,058,800</td>
<td>327,900</td>
<td>654,100</td>
<td>76,800</td>
<td>7.2</td>
</tr>
</tbody>
</table>

Percent change: 52.3% increase, 81.1% increase, 54.0% increase, 106.1% increase, 40.9% increase.


This table shows NCES data on total expenditures and expenditures in each of the three subcategories for all academic libraries in the United States for the years 1960, 1964, 1968, 1969, 1971, 1973, and 1975. The number of academic libraries grew by 1021 institutions over the period, from 1951 in 1960 to 2972 in 1975, an increase of 52.3 percent. Over the same period total expenditures, excluding capital outlays, increased by 81.1 percent, from $137.2 million in 1960 to $1058.8 million in 1975. This increase reflects the combined effects of a growing population and a growth in expenditures by individual libraries that had occurred over the period. We can obtain some idea of how the expenditures of individual libraries had grown by calculating the average expenditures per library for 1960 and 1975. Thus the “average” academic library spent $70,300 in 1960, and $356,300 in 1975, an increase of over 400 percent.

The increase would be far less than this if the expenditure figures were adjusted to account for price inflation in the goods and services purchased by the libraries over the period in question. Thus, if we express both figures in terms of 1977 dollars by using the GNP implicit price deflator applying to the industrial category “printing and publishing,” we find that the average library in 1960 had, in constant 1977 dollars, total expenditures of $139,400; in 1975 the average library had, in 1977
Sources & Uses of Funds

dollars, total expenditures of $394,600, an increase of 183 percent. Since we are primarily interested in the *distribution* of funds among the three categories rather than the absolute amounts, we shall not bother to correct the remaining figures for inflation, an adjustment that would have no effect on the percent distributions of expenses among the three subcategories.

Table 7 shows that the percentage of total expenditures going for materials, primarily books and serials, was 29.7 percent in 1960 and 31.0 percent in 1975; salaries and wages accounted for 61.3 percent of total expenditures in 1960 and 61.8 percent in 1975; and all other categories accounted for 9.0 percent in the earlier year and 7.2 percent in 1975. Comparisons of the observed distribution of funds for the first and last years shown on the table would by themselves suggest a remarkable stability in spending patterns over the period. This was not the case in actual fact. There was a gradual increase in the proportion of funds spent on materials between 1960 and the end of the decade, and a corresponding decline in the proportion spent on salaries and wages. By 1968, expenditures on books, serials and other materials had reached 36.9 percent of the total, and expenditures on salaries and wages had fallen to 53.8 percent. By 1969 the gradual redistribution of funds from salaries and wages to materials had ended and a shift in the opposite direction had begun. The figures for the years 1969, 1971, 1973 and 1975 show clearly that the reversal that began in 1968 continued and remained uninterrupted through 1975, bringing the relative amounts spent on the two categories very near to the distribution observed for 1960. The "all other" category seemed to remain relatively stable in the 1960s, accounting for some 9 percent of total expenditures. The percentage rose to 10.1 percent in 1973, and then fell by 1975 to its lowest point, 7.2 percent, for any of the years shown. This category is a residual, and accounts for a relatively small proportion of expenditures. Our main interest lies with the other two categories discussed.

Although we cannot offer hard data or conclusive evidence, we are prepared to venture a few guesses as to what caused the observed shifts in the distribution of expenditures between the two major categories. Government support for colleges and universities is known to have increased in the 1960s, particularly in the second half of the decade. As beneficiaries of a portion of the new funds flowing into educational institutions, librarians were able to spend more on all categories of expense. It is likely, however, that their immediate reaction was to use the funds to purchase more books and serials, rather than to increase significantly the size of their staffs. The former alternative would quickly help accommodate a
and would involve no long-term obligations. Spending on materials could easily be reduced in subsequent years. The latter alternative, however, would require some fundamental adjustments. The decision to increase staff is one that may take a good amount of time to make, and even more time to put into action.

By the late sixties and into the early seventies, however, these adjustments would have had time to work themselves out. Moreover, reduced funding, tighter budgets, rapid price inflation and falling college enrollments were probably felt by that time, causing a more immediate cutback in expenditures on materials than on staff and explaining the reversal in the trends observed for the earlier years.

The trends observed for the data in Table 8 will help in the interpretation of the data in Table 7. The annual expenditure figures shown in Table 8 are for a sample composed of seventy-five libraries, the same seventy-five each year, and span the period 1970-76. Although on the average, the sample contains larger libraries than does the population as a whole — in 1975 total expenditures for the average library in the sample was $2.3 million compared with only $356,000 for the whole population of libraries — the distribution of total expenditures among the three major categories is strikingly similar and exhibits the same trend over the period — a decline in the percentage of funds spent on materials, from 32.8 percent in 1970 to 29.2 percent in 1976, and an increase in the

### TABLE 8. EXPENDITURES BY A SAMPLE OF SEVENTY-FIVE ACADEMIC LIBRARIES

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Expenditures (excluding capital outlays, in thousands)</th>
<th>Materials (in thousands)</th>
<th>Materials % Total</th>
<th>Wages &amp; Salaries (in thousands)</th>
<th>Wages &amp; Salaries % Total</th>
<th>All Other (in thousands)</th>
<th>All Other % Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>$117,800</td>
<td>$38,600</td>
<td>32.8</td>
<td>$66,200</td>
<td>56.2</td>
<td>$13,000</td>
<td>11.0</td>
</tr>
<tr>
<td>1971</td>
<td>124,400</td>
<td>38,400</td>
<td>30.9</td>
<td>73,000</td>
<td>58.6</td>
<td>13,000</td>
<td>10.5</td>
</tr>
<tr>
<td>1972</td>
<td>130,600</td>
<td>38,700</td>
<td>29.6</td>
<td>78,100</td>
<td>59.9</td>
<td>13,800</td>
<td>10.5</td>
</tr>
<tr>
<td>1973</td>
<td>139,900</td>
<td>41,100</td>
<td>29.4</td>
<td>83,400</td>
<td>59.6</td>
<td>15,400</td>
<td>11.0</td>
</tr>
<tr>
<td>1974</td>
<td>154,600</td>
<td>45,000</td>
<td>29.1</td>
<td>92,500</td>
<td>59.8</td>
<td>17,100</td>
<td>11.1</td>
</tr>
<tr>
<td>1975</td>
<td>169,400</td>
<td>48,100</td>
<td>28.4</td>
<td>102,100</td>
<td>60.3</td>
<td>19,200</td>
<td>11.3</td>
</tr>
<tr>
<td>1976</td>
<td>181,400</td>
<td>53,000</td>
<td>29.2</td>
<td>109,300</td>
<td>60.3</td>
<td>19,100</td>
<td>10.5</td>
</tr>
</tbody>
</table>

Percent change | 54.0 | 37.3 | 65.1 | 46.9

percentage spent on salaries and wages, from 56.2 percent in 1970 to 60.3 percent in 1976. Without the benefit of the longer time series, we might be tempted to infer that the observed decline signified a departure from earlier spending patterns, rather than a return to earlier patterns. Of course, a look at even longer time series might suggest yet another interpretation.

The question of whether these spending patterns are returning to, or departing from, historical norms may be put aside, and trends of the recent past shall be considered by themselves. For all academic libraries, expenditures on materials rose by 54.0 percent from 1969 to 1975, while expenditures on wages and salaries rose by 106.1 percent. For the sample of 75 academic libraries, expenditures on materials rose by 37.3 percent from 1970 to 1976, while expenditures on wages and salaries rose by 65.1 percent. Thus, funds spent on wages and salaries grew at a rate nearly double that of funds spent on materials, during a period when the prices of books and serials rose rapidly. What effect did this comparatively lethargic growth in the materials budgets have on the way librarians apportioned their funds among the various types of materials, and what did it mean in terms of the physical quantities of materials they were able to acquire? We shall consider these questions in turn.

CHOOSING BETWEEN BOOKS AND SERIALS

The data presented in Tables 7 and 8 suggest that librarians have been compelled to spend an ever-increasing proportion of their total budgets on wages and salaries over the first half of the current decade, and consequently a decreasing proportion on materials. With the prices of published materials increasing rapidly over the same period, some difficult choices had to be made about how to allocate funds available for acquisitions among the various kinds of material—principally between books and serials. The figures pertaining to the seventy-five academic libraries reveal a startling picture of the choices that were made (see Table 9).

Total expenditures on materials for the seventy-five libraries are reproduced in Column 1 of Table 9. Columns 2, 3, and 4 of the table show, respectively, how much of the total went for the purchase of books, how much for the purchase of serials, and how much for the purchase of other materials. Even in terms of current dollars (that is, dollars not adjusted for changes in prices), the amounts spent by the sample on books actually fell
Table 9. Expenditures on Materials by Seventy-five Academic Libraries, Average Prices of Books and Serials, and Number of Books and Serial Subscriptions that could have been Purchased with Available Funds, 1970-76

<table>
<thead>
<tr>
<th>EXPENDITURES (in millions)</th>
<th>Books</th>
<th>Serials</th>
<th>Other</th>
<th>Average Price of Hardbound Books</th>
<th>Average Price of Serial Subscriptions</th>
<th>No. of Books that could have been bought with available funds (in millions)</th>
<th>No. of Subscriptions with available funds (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>$38.6</td>
<td>$23.8</td>
<td>$13.2</td>
<td>1.6</td>
<td>4</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Total % Total</td>
<td>62</td>
<td>57</td>
<td>34</td>
<td>5</td>
<td></td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>1970</td>
<td>38.4</td>
<td>21.8</td>
<td>14.8</td>
<td>1.8</td>
<td>5</td>
<td>13.25</td>
<td>1.6</td>
</tr>
<tr>
<td>1971</td>
<td>38.7</td>
<td>21.0</td>
<td>16.3</td>
<td>1.4</td>
<td>4</td>
<td>12.99</td>
<td>1.6</td>
</tr>
<tr>
<td>1972</td>
<td>41.1</td>
<td>21.6</td>
<td>17.3</td>
<td>2.2</td>
<td>5</td>
<td>12.20</td>
<td>1.8</td>
</tr>
<tr>
<td>1973</td>
<td>45.0</td>
<td>22.1</td>
<td>20.6</td>
<td>2.3</td>
<td>5</td>
<td>14.09</td>
<td>1.6</td>
</tr>
<tr>
<td>1974</td>
<td>48.1</td>
<td>22.1</td>
<td>23.0</td>
<td>3.0</td>
<td>6</td>
<td>16.19</td>
<td>1.4</td>
</tr>
<tr>
<td>1975</td>
<td>53.0</td>
<td>23.5</td>
<td>26.4</td>
<td>3.1</td>
<td>6</td>
<td>17.39</td>
<td>1.4</td>
</tr>
<tr>
<td>1976</td>
<td>45.0</td>
<td>22.1</td>
<td>20.6</td>
<td>2.3</td>
<td>5</td>
<td>14.09</td>
<td>1.6</td>
</tr>
<tr>
<td>Percent change</td>
<td>-7.6</td>
<td>-3.4</td>
<td>-2.7</td>
<td>-5.9</td>
<td>-11.3</td>
<td>-10.41</td>
<td>1.0</td>
</tr>
</tbody>
</table>

by 1.3 percent, over the period, from $23.8 million in 1970 to $23.5 million in 1976. The figures for the intervening years are all lower than either of those at the end points. Over the same period, expenditures on serials increased by 100 percent, from $13.2 million in 1970 to $26.4 million in 1976. Expenditures on other materials increased by over 90 percent as well, but they account for a comparatively small proportion of total expenditures.

These figures constitute significant, almost incredible, shifts in the buying patterns of the libraries. Over the period shown, the proportion of total expenditures on materials going for books fell from 62 percent to 44 percent, while the proportion going for serials rose from 34 percent to 50 percent, demonstrating that when confronted by an economic pinch, the librarians opted to maintain their serials collection at the expense of books.

This point is made more vividly by the figures shown in Columns 5 through 8 of Table 9. Column 5 contains the average prices of hardbound books for the years 1970-76 and Column 7 contains the average prices for serial subscriptions. The former increased by 49.1 percent over the period, the latter by 116.3 percent. If we divide the dollars spent on books and serials by the average price of each, we obtain a measure of the number of books and the number of serial subscriptions that could be purchased with the money. From Column 6 of the table we see that the number of books purchased annually dropped drastically by 30.0 percent, from 2.0 million in 1970 to 1.4 million in 1976. Column 8 shows that for serial subscriptions, the prices of which had risen much faster than the prices of books, the number of subscriptions dropped by only 7.6 percent, from 1.3 million for the 75 libraries in 1970 to 1.2 million in 1976.

Why the librarians demonstrated such a strong preference in favor of maintaining their serials collections even if it means making severe cutbacks on book purchases is not revealed by the data. We can speculate, however, that books may have been considered more expendable than journals, chiefly because the latter are generally thought to contain the "newest" knowledge, and hence to be indispensable for maintaining an up-to-date, comprehensive collection. There may also have been a reluctance to discontinue subscriptions to journals that had been held for years and years. Perhaps the librarians believed that they could, at some time in the future when budget pressures eased up, replenish their book collections by buying from the publishers' backlists some of the book titles that were not purchased when first published. Judging from the
apparent backlog of such postponed purchases, however, it seems that a great deal of "catching up" would be required.

BACKLIST PURCHASES AND IMPORTS

There are two final aspects of the use of funds we should like to consider: the amounts spent on backlist material and the amounts spent on imported material. Unlike the preceding discussions, however, we are unable to provide annual figures of dollars spent, chiefly because librarians do not usually record their purchases of materials by year of publication or country of origin.

To try to obtain some idea of how much backlist and imported materials the librarians believe they are purchasing, Machlup and Leeson posed the following questions separately for books and for serials: "Indicate what percent of your 1976 book (serial) expenditures was for books (serials) published prior to 1970 (to 1976)," and "Of your library's total book (serial) expenditures for 1976, ... please estimate the percent that went for the purchase of volumes published outside the United States." In Table 10 the responses are shown for the various samples of libraries that responded broken down into four ranges of their total expenditures in 1976.

On the question of purchases of backlist books, the seventy-five responding libraries indicated that approximately 11 percent of their expenditures on books in 1976 were for books published prior to 1970. There seems to be a tendency for the largest and smallest libraries in the sample, in terms of total expenditures, to purchase slightly higher proportions of backlist books than the libraries falling in between. For a sample of seventy-eight libraries, containing most of the members of the sample of seventy-five plus a few more, the proportion of expenditures in 1976 on issues of serials published prior to 1976 is 4.6 percent. Again, there is nothing particularly striking about the practices of libraries of different size. What these results for books and for serials seem to suggest is consistent with the speculations advanced earlier when reasons were being sought to explain the shifting of funds from book purchases to serial purchases. Apparently, a good deal more purchasing of backlist books is necessary than of back issues of serials. This would be the case if librarians tended to sacrifice the purchase of new books each year in order to maintain the serial subscriptions they wanted.

On the question of imported books and serials, the respondents indicated that some 29.8 percent of their total expenditures on books in 1976
TABLE 10. PURCHASES OF BOOKS AND SERIALS THAT ARE BACKLIST OR BACK ISSUES AND IMPORTED, SHOWN BY SIZE OF TOTAL EXPENDITURES FOR 1976

<table>
<thead>
<tr>
<th>Total Expenditures</th>
<th>No. Reporting</th>
<th>% Expenditure for Books Published Before 1970</th>
<th>No. Reporting</th>
<th>% Expenditure for Serials Published Before 1976</th>
<th>No. Reporting</th>
<th>% Expenditure for Imported Books</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4,000,000+</td>
<td>13</td>
<td>12.4</td>
<td>13</td>
<td>4.8</td>
<td>20</td>
<td>38.9</td>
</tr>
<tr>
<td>2,000,000–3,999,999</td>
<td>21</td>
<td>9.6</td>
<td>25</td>
<td>4.3</td>
<td>25</td>
<td>23.7</td>
</tr>
<tr>
<td>1,000,000–1,999,999</td>
<td>14</td>
<td>8.2</td>
<td>15</td>
<td>4.9</td>
<td>16</td>
<td>18.1</td>
</tr>
<tr>
<td>Less than $1,000,000</td>
<td>27</td>
<td>12.8</td>
<td>25</td>
<td>5.5</td>
<td>26</td>
<td>6.5</td>
</tr>
<tr>
<td>Expenditure brackets</td>
<td>75</td>
<td>10.8</td>
<td>78</td>
<td>4.6</td>
<td>87</td>
<td>29.8</td>
</tr>
</tbody>
</table>

Note: Reported average percentage figures weighted by each library's expenditures on books or serials.

went for purchases of imported books and 34.0 percent of their total expenditures on serials went for serials published abroad. Here we see a clear relationship between the size of the libraries and the proportion of total material expenditures going for imports. The largest libraries, those with total expenditures of $4.0 million or more in 1976, devoted the largest percentage of their funds to imports, 38.9 percent and 39.8 percent for books and for serials, respectively. As we move from the largest libraries to the smallest, the percentages shown become smaller as well.

These results seem to be consistent with what might be expected. The libraries with the largest expenditures are simply able to purchase more material and hence can both satisfy their appetites for "homegrown" materials and acquire some of the usually more expensive overseas products. Libraries with smaller budgets cannot.

REMAINING ISSUES

We have been able to present some information on a few of the questions raised in an earlier section on the way librarians use their funds. Several other interesting issues, however, have not been covered in this paper. Among these is how librarians have been purchasing materials in the various subject areas. On this topic we shall offer nothing at this time, partly because an adequate discussion would require a separate article, and partly because of the weakness of the available data on purchases by field. The interested reader can, however, refer to the Machlup and Leeson study for a discussion of the problems involved in research in this area, and even for some interesting, though rather soft, data regarding the libraries' acquisitions broken down by field.

CONCLUSIONS

The generalization from a study of sources of funds based on questionnaire responses is that academic libraries, particularly public ones, depend on their universities for the bulk of their financial support. Library budgets seem to be more of a function of size of institutional budgets than high percentage allocations to the library, although budgetary growth in recent years seems to reflect increased financial effort. Decline in real support on a per student basis since 1972 is also evident from a study of aggregative data.

On a direct basis at least, federal grants to academic libraries are minuscule compared to the federal government's total level of transfer payments. In 1976, for example, the amount transferred to individuals
Sources & Uses of Funds

and state and local governments was well over $150 billion.\textsuperscript{17} Tables 4 and 5 reveal total appropriations under the Higher Education Act over a 10-year period of less than $200 million. On the other hand, the picture changes drastically if credit is given to the federal sector for its total library expenditures and subventions for library construction.

On the uses side, two main generalizations are suggested by the Machlup and Leeson sample data and by “population” data for academic libraries. The latter data indicate that between 1960 and 1969, rising dollar expenditures were redistributed from salaries and wages to materials (primarily books and serials), and thereafter a shift began in the opposite direction. The sample results covering the 1970-75 period confirm the latter shift.

A possible linkage between sources and uses may explain these successive shifts. An increase in government support in the second half of the 1960s encouraged relatively more spending on materials since this adjustment could be achieved faster than staff expansion. Moreover, an increasing student population encouraged building up the materials collection.

The second major trend in uses, based on the sample survey, is the redistribution of the materials budget in favor of serials acquisitions, 1970-76. The figures reveal a drastic drop (in physical units) in books purchased annually, with only a relatively slight drop in subscriptions.

From the standpoint of rational decision-making, do these historical choices make sense? Similarly, was (and is) the degree of university library support the optimal one? Hopefully, the other chapters in this volume will suggest some approaches to evaluation.

References

1. Jacob Cohen is largely responsible for the discussion on sources of funds, and Kenneth Leeson for the discussion on uses of funds. Thanks are owed to Fritz Machlup for his helpful comments on the material pertaining to uses of funds. Research assistance was provided by Wim Vijverberg, Ms. C. Chen, Michael Bardos, Richard Weiss, Trude Kronwinkler and Sharon Spellman. We are indebted to those members of the Association of Research Libraries who responded to our questionnaire on sources of funds. Special thanks are due Dean Thomas J. Galvin, University of Pittsburgh, for saving us from many errors. The remaining errors are those of the authors.


3. Twenty-six usable observations underlie the first rank correlation and 23 the second.
5. ACRL Ad Hoc Committee to Revise the 1959 Standards. "Draft: Standards for College Libraries; 1975 Revision," *College & Research Libraries News* 35:304-05, Dec. 1974. We are indebted to Thomas J. Galvin, University of Pittsburgh, for these references on library standards.
12. LSCA money goes almost entirely to public libraries except where states elect to use these funds to support multiple networks. The Illinois and New York network programs discussed earlier probably receive support from a combination of LSCA and state funds.
16. Using unweighted averages list prices, that is, averages calculated without weighting the components by the sales volume of books of each list price, to calculate "real" purchases is a somewhat questionable practice. Unfortunately, unweighted averages are all that is available. Even though the results in terms of numbers purchased calculated with unweighted prices are not very accurate measurements, they will be of a reasonable order of magnitude.
Pricing Policies in Academic Libraries

DONALD W. KING

ECONOMIC PRESSURE ON LIBRARIES in the United States is approaching a critical stage.¹ Academic libraries in particular are vulnerable to this pressure because of tightened budgets coupled with rapidly increasing costs. Academic institutions have been hurt economically by the need to increase tuition, while enrollment is decreasing due to lower birthrates in the 1950s and early 1960s, less interest from youth and reduced pressure to attend college. These trends should continue over the next ten years,² so there is little relief in sight. In universities and colleges, some costs, such as those for facilities and tenured faculty, are relatively fixed compared to enrollment, necessitating budget cuts in other areas, such as libraries. Evidence suggests that academic library budgets are rising more slowly than the overall university budgets.³ For example, in 1973-76, most academic libraries' budgets increased at a rate of about 8-10 percent per year.⁴ Publishers of scientific and technical journals increased prices to libraries nearly 12 percent annually from 1975 to 1977.⁵ Even though the difference from year to year is not great, it must ultimately force some drastic changes in library operations.

As a result of these economic pressures, libraries have sought ways to reduce costs through such means as not subscribing to new periodicals, not renewing subscriptions, canceling duplicate subscriptions, reducing book purchases, automating cataloging, and participating in consortia and networks.⁶ Further reduction in periodical subscriptions is likely to result in increased interlibrary lending and photocopying, which shifts some of the cost burden from the borrowing library to the lending library. Obvi-

Donald W. King is President, King Research, Inc., Rockville, Maryland.
ously, another possible solution is to charge for the use of materials and services. In this way, costs can be partially (or totally) recovered from users.

This article deals with economic considerations of user charges. Some economic principles are discussed, and the implications of charging for specific academic library materials and services are presented. Finally, for those academic libraries deciding to charge, alternative pricing policies and their implications are described. A numerical example is also given for interlibrary loans in order to illustrate the complexity and subtle effects of charging for such a service.

Two principal questions must be answered when considering charging for library materials or services. First, who should pay for these materials and services? This seems to depend, at least to some degree, on who benefits from them. Clearly, at one end of the spectrum is the possibility that direct users should pay because they are the principal beneficiaries. At the other extreme is the philosophy that society should pay for library services through taxes, since everyone shares in the benefits provided by libraries. There are many possible variations and options to consider when deciding who contributes to or pays for library materials or services. The second question is how much each contributor should pay. Economists have applied these questions to many kinds of goods and services. They begin by classifying goods and services into categories which help to clarify the economic issues involved.

The first category of goods is private goods. This includes goods such as food or cosmetics which primarily benefit the individual purchaser. There are two principal conditions of private goods. First, a person can be excluded from purchasing this type of good by either the price or the limited supply. Also, purchase (or use) of these goods must deplete their supply (i.e., there is one less apple in the barrel) and there is a cost associated with providing each unit purchased. Generally, it is felt that the user (and principal beneficiary) of private goods should pay for them. At the opposite extreme is public goods. In a purely economic sense, public goods benefit an entire community or society. Examples are the air people breathe, public parks, national defense, and scientific knowledge. Presumably, everyone benefits from these goods or services, use does not deplete their supply (i.e., one person using a park does not deplete its availability), the cost of each additional use is zero, and no one is excluded from their use or benefit. Everyone in society can benefit by scientific discovery in some areas; therefore, one can argue that the costs of pure science should be shared by everyone through taxation.
Pricing Policies

Most library materials and services do not fall clearly into either of the above categories. A major reason is that most library materials and services involve scholarly knowledge. It is important to distinguish between knowledge itself and the various forms in which knowledge is found, e.g., in the mind and in print. Each form of information has a different set of economic conditions. Knowledge in the mind, although often funded by government, is not really a public good since it is exclusive (in the sense that a scientist can choose whether or not to reveal the knowledge) and it costs the scientist in terms of time required for communication. Yet knowledge in this form is nondepletive. When recorded in a manuscript, the information remains nondepletive; however, unless reproduced, exclusion still takes place due to lack of access to the information. Even though publishers incur substantial cost producing a master copy, the information lacks the nonexclusion condition for the same reason; however, the information comes closer to being a public good in this form. When the master copy is reproduced, the copies (not the information) become very much like a private good. Users can be excluded from purchasing copies of books or journals because of the purchase price or limited supply, each copy produced has a small (but nonzero) cost, and purchase of copies depletes the supply.

After the copies are distributed, an entirely different set of economic conditions holds. It can then be argued that materials found on the shelves of an open library are more like public goods, since they are nondepletive, each additional use has a cost close to zero, and the condition of nonexclusion is present. Exception to the last condition exists when a book is on loan, stolen, or when exclusion is caused by distance or hours of operation. If a photocopy (for personal use or interlibrary loan) is made of a journal article, it again becomes more like a private good: there is a cost associated with reproduction, and possible exclusion exists due to a charge or unequal access to photocopying equipment.

Another economic classification is merit goods. This includes private goods that are considered by some to be of such benefit that they should be supplied by the public. It is assumed that such goods would not be purchased if left to the ability or preference of potential purchasers. Examples include free lunches for schoolchildren, low-income housing for the poor, and free education for all children. The argument is that the advantages of a merit good are more apparent to the informed (i.e., an elitist, moral or pressure group with power) than to the uninformed general public, and therefore should be provided. Cooper argues that information is generally like education, and therefore should be considered
a merit good. However, he also points out that on-line search services do not fall into this category.

Another important economic consideration is the indirect effects of goods or services. Often persons other than the original purchaser or user are positively or negatively affected by a purchase decision. Such effects are called externalities. The construction of an elementary school can have positive externalities because the building and its land can be used for adult education, business and recreational purposes that extend beyond its primary purpose of housing children’s education. Each of these uses in turn yields a benefit to the community or society. An example of negative externalities is the purchase of large automobiles whose size aggravates pollution, hinders traffic flow, requires more parking space and uses more gasoline. The externalities of library materials and services vary a great deal. Use of scientific information may yield substantial social benefits, such as the cure or prevention of diseases. On the other hand, information from a novel read for recreational purposes probably does not yield external benefits that are nearly as great. In all instances, the value of externalities is difficult, if not impossible, to measure.

There have been a number of papers dealing with pricing or user charges in public libraries, academic libraries or information systems in general. This article is concerned only with academic libraries, which differ from public libraries in several important ways. First, academic library patrons differ from public library patrons in that they are members of institutions which have well-defined goals. Thus, it is easier to determine who is served and for what purpose. Furthermore, students partially pay for the services provided by a library, and the faculty, research and administrative staff are usually funded under the same budget as the library. Public libraries serve a much broader spectrum of patrons, including the public, industry and the research community, as well as students and teachers. They use the library for purposes ranging from recreation, education and scientific research to business. Thus, the direct beneficiaries are widely dispersed and externalities are much more difficult to identify than for academic libraries.

The economic discussion that follows is limited to scholarly materials (e.g., books or journals) used by university or college students, faculty, researchers and administration. Consideration will be given to several library services including provision of these materials for reading, performance of on-line searches for either local patrons or outside users, photocopying by or for patrons, and interlibrary loans or photocopying for other libraries.
Pricing Policies

In order to understand the implications of user charges, some discussion of costs is necessary. Library costs can be categorized into three general parts:

1. Most library materials or services have one-time, fixed costs associated with them. These costs are fixed because they are incurred whether or not any use takes place. Examples of fixed costs associated with periodicals include their price, as well as costs associated with acquisition, annual maintenance, storage and weeding.

2. Variable costs are related to each use of library materials or services. For periodicals, these costs include such things as replacement or photocopying.

3. Indirect costs are insensitive to amount of usage. These include rent, administration and other overhead items.

These three types of costs define the relationship between total cost and number of uses, as shown in Figure 1. As the number of uses increases, the total cost is raised by an amount equal to the unit cost per use. Generally, the average variable cost per unit of use remains nearly constant over a range of number of uses. However, when one adds either the fixed or the indirect costs associated with materials and services, the average unit cost per use decreases as the number of units used increases. This decrease may be substantial over a small number of uses, but it ultimately approaches the variable cost, as shown in Figure 2. The average

![Figure 1. Cost and Quantity Demanded Relationship](image-url)
cost per use begins to increase at some point because of large incremental increases in indirect or fixed costs. For example, as amount of use increases it may be necessary to rent additional space, thereby increasing average cost per use.

If a user is charged for library materials or services, the number of purchases will vary depending on the price. If the price is increased, the number of purchases will decrease, and vice versa. This relationship, known as the demand curve, is shown in Figure 3. However, there is a limit to the number of purchases that will be made even if materials or services are provided without charge. This is denoted as maximum quantity demanded \( (D_M) \). Also, there is some maximum price above which no one will make a purchase \( (P_M) \). It must be emphasized that such a demand curve is hypothetical and very difficult, if not impossible, to measure.

When the demand and average total cost curves are superimposed, as in Figure 4, there are two points at which the average cost equals the price. These two “break-even” points are designated as \( P_{BE} \) and \( P'_{BE} \). At prices above \( P'_{BE} \), the cost curve is above the demand curve, i.e., a loss would be incurred by the producer. At all prices on the curve between the two points the demand exceeds the cost, so excess income, or profit, would result. At prices below \( P_{BE} \), a loss is incurred because the cost curve again exceeds the demand curve. Thus, by charging for material and services,
the library will either break even, incur a loss or make a profit. It is very difficult to establish a price to achieve any of these outcomes purposely.

Another consideration when charging for use is the amount of benefit to be derived from ultimate use of the materials or services. There is little question of the positive externalities of scholarly materials. More use of these materials should yield increased benefit to society. Thus, if user charges are required for these materials or services, there will be less use and some benefit to society will therefore be lost. The suggestion arises of giving away all materials or services to achieve maximum use of them and thereby maximum benefit from them. The principal argument against this is that the materials and services may be subject to frivolous uses. For example, if there is no charge for on-line searches, some scientists (or libraries) might use the system unnecessarily. However, even without a direct charge for searches, the users will incur a cost in terms of their time, and so will not be as inclined to use searches as frivolously as some might think. Also, the maximum net benefit may not be at zero price (the net benefit is the total value achieved minus the total costs).
There are two extreme positions concerning user charges in academic libraries. One is that patrons must pay for each use, while the other is that the cost should be completely shared and paid as part of the university budget. Choosing between these alternatives depends on several factors, including the type of materials or services involved, their externalities, the cost of provision, and the cost of administering user charges. As mentioned previously, scholarly materials found in academic libraries have some conditions of a public good serving a common community, the university. Once on the shelves, there is little additional cost for increased use (except in terms of the user’s time), the information is nondepletive, use is nonexclusive, and externalities seem to be highly positive. These are all strong economic arguments to provide scholarly materials without charge. Three other factors mitigate arguments for user charges for such materials: (1) it would be very difficult to allocate the fixed costs (i.e., price, acquisition, storage, maintenance and weeding) to individual uses because of the uncertainty of amount of use; (2) the cost of administering user charges would be very high; and (3) the question of frivolous use has little or no bearing here.

Local academic patrons are those who already pay indirectly for the library service (students), and those who are funded from the same source.
Pricing Policies

as the library (faculty, researchers and administrators). Both these classes of patrons use the library to varying degrees. Thus, the question arises of how to allocate budgets to different departmental collections. This and similar questions involve issues not unlike those found in pricing, but they are not considered central to the pricing theme of this article.

A recent problem in academic libraries concerns charging for on-line services. Cooper gives an excellent discussion of user charges for on-line services provided by public libraries. He indicates that on-line services in this environment do not clearly fall into any of the economic categories of private goods, public goods or merit goods and points out that the type of user has some bearing on whether such charges should be made. He contends that professional users, such as doctors, lawyers, scientists or businessmen, should be able to pay for the service, and a charge would therefore not have much effect on the amount of their use of this system. It is not argued that the use of information is not beneficial to society, but rather that this segment of the population would probably use on-line searches with or without charge. He also argues that users who do not contribute to revenue through taxes, such as residents of another town, should pay for the on-line services.14

This last point holds for academic libraries as well. Since they derive their budget from the university, many believe they should charge for services to users not affiliated with the university to help defray the costs; however, in universities where much of the budget is derived from public funds, this logic may not hold. The cost of an on-line search is not trivial. Thus, a charge that recovers a major portion of the cost could minimize frivolous use. Finally, user charges would not be dominated by the cost of administering them.

The case for charging university patrons for on-line searches is weaker than that for charging outside users. Manual reference searches are provided without charge even though the costs are about the same as for on-line searches, although the costs of manual searches are not highly visible in the budget. Most on-line searches would be consistent with the mission and goals of the university, making externalities favorable and demonstrable. However, since system equipment and other costs appear as new items on the budget, the question of charging to recover costs is raised. Arguments for charging local patrons are: the costs of service are relatively high; the beneficiaries, i.e., the direct users, are easily identified; frivolous use is reduced; and the cost of administering charges is relatively low.
For situations in which it is decided to charge users for on-line searches, several alternative price policies may be employed (excluding that of making a profit). It may be desirable to recover all of the fixed, indirect and variable costs; this policy is called average cost pricing. This price would cover such fixed and indirect costs as terminals, furniture, rent and unused personnel time. Another policy is to charge only for the variable costs related to each use; this is referred to as marginal cost pricing. The variable costs include such factors as connect-time, direct personnel time and supplies.

Average cost prices would always be higher than marginal cost prices and, therefore, the number of uses of an on-line search facility would be fewer. Thus, some social benefit would be lost through use of average cost pricing. One other practical problem with average cost pricing is that it is very difficult to predict what the break-even point will be. This is particularly true with on-line search systems since their fixed and indirect costs are high. This pricing policy could lead to large losses or unwanted profits, though with lower fixed costs there is less risk. With marginal cost pricing the risk is not as great because the choice of prices can be made from a relatively small range of costs. To use this policy, a library must recognize that the fixed and indirect costs must be recovered in some other way. Economists have shown that when a user is charged for things like on-line searches, the net social benefit is greatest when marginal cost pricing is utilized.

Another pricing policy is merely to charge what is considered to be a fair market value. In other words, a price may be established in terms of the worth of the on-line searches and what others (i.e., search brokers) charge for them. The problem with this pricing policy is that without substantial experience in the marketplace, the unknowns and risks are very great. Thus, it becomes difficult for most libraries to budget for either excessive or inadequate demand that may occur at fair market value price. Price discrimination can also be used by libraries that charge some user groups differently than others, e.g., user groups are charged based on the sensitivity of amount of use to price (price elasticity). For example, professional users may be less sensitive to price than students; thus, they would be charged more. There are other purposes of price discrimination as well, such as to develop loyalty. Prices may also be established to accomplish an objective. For example, a price may be purposely set low to encourage use of an on-line system that might not otherwise be used.
Pricing Policies

Another library service that can involve a user charge is photocopying. Again, this service has some characteristics of both private and public goods. It is like a public good in that the information found in the photocopied material is nondepletive. However, the photocopy itself is more like a private good in that the particular user is the principal beneficiary. The positive externalities could also be equally gained from the information through reading the article in the library or by taking notes from it. Thus, the externalities are the benefits of having a personal copy. Moreover, each use (photocopy) has a nonzero cost. Here, marginal cost pricing makes some sense, particularly since the potential for frivolous use is great. For this type of library service, frivolous use has more influence on the pricing assessment, perhaps, than for the other examples. Since the cost and price of photocopying are low, the relative cost of administering user charges could actually be more than the price. However, the existence of coin-operated machines in many academic libraries seems to be an adequate way of coping with this issue.

A related service for which a user fee may be considered is photocopying done for another library. Interlibrary loans also fall into this category. Information given in Table 1 illustrates some of the difficulties and subtleties involved in deciding whether to charge the user, which in this case is another library. In order to demonstrate the implications of such a decision, the example shows the effect on the borrowing library and the lending library, and the total cost to both, i.e., the cost to society. Data provided from several studies yield the following typical costs to borrowing and lending libraries:

<table>
<thead>
<tr>
<th>Borrowing Library</th>
<th>Lending Library</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed cost* per journal</td>
<td>Variable cost* per use</td>
</tr>
<tr>
<td>Annual subscription price</td>
<td>Interlibrary loan</td>
</tr>
<tr>
<td>Acquisition (new journal only)</td>
<td>95.91</td>
</tr>
<tr>
<td>Annual maintenance (check-in, binding, file maintenance, etc.)</td>
<td>31.92</td>
</tr>
<tr>
<td>Storage</td>
<td>6.00</td>
</tr>
<tr>
<td>Weeding</td>
<td>.90</td>
</tr>
<tr>
<td>Variable cost* per use</td>
<td></td>
</tr>
<tr>
<td>Internal use &amp; circulation</td>
<td>2.00</td>
</tr>
<tr>
<td>Interlibrary loan</td>
<td>11.60</td>
</tr>
</tbody>
</table>

* Costs include an allocation of indirect costs.
A library must periodically decide whether to renew a journal subscription or rely on interlibrary loan to fulfill patron needs. One can see that the total fixed cost of renewing the subscription is roughly estimated at $76.54. If there is only one use of that journal, the cost per use would be $78.54 (adding the internal use variable cost). This cost is much higher than the cost of borrowing a photocopy, which is $11.60. For two uses, the average cost per use of purchasing a subscription would be $40.27, which is still substantially greater than the average cost of borrowing the copies. Thus, the average cost per use to the borrowing library is less to borrow for up to nine uses, at which point it becomes less expensive to purchase. However, a cost burden is placed on the lending library, since the cost to them is $8.40 per loan. The cost for eight loans is $67.20.

What would be the effect if the lending library charged the borrowing library $8.40 for its loan? This is best answered by an illustration using data provided by a University of Pittsburgh study in which the number of uses of scientific journals in several university libraries was estimated. A composite of observations is given in Table 2 for 1645 journals found in physics, chemistry and life sciences libraries at Pittsburgh. From these data one can determine the number of journals that

<table>
<thead>
<tr>
<th>Number of Uses*</th>
<th>Number of Journals</th>
<th>Total Number of Uses</th>
<th>Total Cost</th>
<th>Cost Per Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>49</td>
<td>0</td>
<td>$3,750</td>
<td>—</td>
</tr>
<tr>
<td>1</td>
<td>86</td>
<td>86</td>
<td>6,754</td>
<td>$78.50</td>
</tr>
<tr>
<td>2</td>
<td>84</td>
<td>168</td>
<td>6,765</td>
<td>40.30</td>
</tr>
<tr>
<td>3</td>
<td>77</td>
<td>231</td>
<td>6,320</td>
<td>27.40</td>
</tr>
<tr>
<td>4†</td>
<td>67</td>
<td>268</td>
<td>5,664</td>
<td>21.10</td>
</tr>
<tr>
<td>5</td>
<td>63</td>
<td>315</td>
<td>5,452</td>
<td>17.30</td>
</tr>
<tr>
<td>6</td>
<td>58</td>
<td>348</td>
<td>5,135</td>
<td>14.80</td>
</tr>
<tr>
<td>7</td>
<td>53</td>
<td>371</td>
<td>4,799</td>
<td>12.90</td>
</tr>
<tr>
<td>8‡</td>
<td>48</td>
<td>384</td>
<td>4,442</td>
<td>11.60</td>
</tr>
<tr>
<td>9</td>
<td>44</td>
<td>396</td>
<td>4,160</td>
<td>10.50</td>
</tr>
<tr>
<td>10</td>
<td>41</td>
<td>410</td>
<td>3,958</td>
<td>9.60</td>
</tr>
<tr>
<td>10†</td>
<td>975</td>
<td>38,601</td>
<td>151,829</td>
<td>3.90</td>
</tr>
<tr>
<td>Total</td>
<td>1,645</td>
<td>41,578</td>
<td>$209,028</td>
<td>$5.00</td>
</tr>
</tbody>
</table>

* Uses here are defined as readings. There could be other uses as well.
† Break-even with charge
‡ Break-even with no charge

Pricing Policies

have one, two, three or more uses, as well as the total number of uses for these journals. Furthermore, based on the costs shown above, one can estimate the total costs for these journals at each level of use. Of the 1645 journals, it is estimated that 45 have had no use at all. These journals would cost about $3750 to renew and maintain. An estimated 86 journals have one use each at a cost of $6754 or $78.50 per use, 84 have two uses (168 total uses) at a cost $6765 or $40.30 per use, and so on. There are an estimated 41,578 uses of the entire collection at a total cost of $209,028, or $5.00 per use.

It should be noted that the cost per use is $11.60 at eight uses, which is the same as the cost to the borrowing library of an interlibrary loan. Thus, for all of the journals with eight or fewer uses, it is less expensive to borrow copies than to purchase the journals. There are 585 journals with 8 or fewer uses, for a total of 2171 uses. The cost of purchasing these 585 journals is estimated to be $49,897, compared to a cost of $25,184 for interlibrary loans. The borrowing library would therefore save about $24,713. On the other hand, the cost to the lending library is $18,236. Thus, if the borrowing library acquired all journals with eight or fewer uses through interlibrary loan, and purchased the rest, the total cost to both libraries is $203,367, which is $5661 less than if the borrowing library purchased the 585 journals. Thus, use of interlibrary loans yields considerable savings to the borrowing library at the expense of the lending library. Society also achieves modest savings. This analysis, of course, ignores the effect of inconvenience to users of delays caused by interlibrary loans. It also assumes that a library can reasonably estimate amount of use. Finally, there may be a quid pro quo arrangement among borrowing and lending libraries so that the cost burden of lending is shared.

However, consider the effect if the lending library charged for their variable costs of $8.40, making the total cost to the borrowing library $20 per use. Thus, the break-even point of borrowing versus purchasing for the borrowing library would now be between four and five uses. A total of 363 journals have 4 or fewer uses accounting for 753 uses. Thus, there would be a decrease of 1418 interlibrary loans due to the increased charge. The cost to the borrowing library (which now includes the charge by the lending library) is $15,060, and the net cost to the lending library is zero. The total cost of all journals to both libraries is reduced to $194,835, yielding a savings to society of $14,193.

One of the most intriguing outcomes of this analysis is that the optimum strategy for minimizing overall costs to both the borrowing and lending libraries is to set the break-even point with costs to both libraries
included, whether or not a charge is actually made by the lending library. The problem is that the cost to the borrowing library increases from $125,131 to $188,470. If there is a quid pro quo arrangement among libraries so that each borrows and lends, however, it appears to be to their advantage to set the break-even point in terms of costs to both the borrowing and lending libraries.

The analysis above does not include the costs to both libraries of administering the charges. These costs could greatly change the picture. If these administrative costs were $4.00 per transaction, and if they were borne entirely by the borrowing library, the break-even point would drop to between three and four uses. The number of journals below that number is 296 and they have a total of 686 uses. The cost of borrowing (including charges of $12.40) is $16,464, so that the total cost of all journals would be $201,903 compared to $209,028 (if no borrowing took place), or $189,483 (if no charges were made and the borrowing library incurred $2.00 in administrative costs per transaction).

A further issue deals with the negative externalities of a system that encourages more borrowing and less purchasing. First, borrowing creates a delay in receipt of a needed article which could hinder research, teaching, writing or whatever purpose the article is to be used for. A possibly more serious negative externality is the effect on publishers. If interlibrary lending takes place without a charge, about one-third of journal subscriptions would be cancelled if all libraries followed the decision rule above. In order for publishers to recover their large fixed costs, the costs would either have to be reduced which would perhaps result in poorer quality, or journal prices would have to be increased. Royalties will not provide sufficient revenue to publishers since fair use and other eligibility conditions do not require royalty payment in many instances, and because the CONTU guidelines suggest that borrowing libraries need not pay royalties if fewer than six articles are made over a period of five years following publication. Over half of the interlibrary loans made without charge fall into this category. In situations where loans are made with charges, all of them are exempt from royalty payment under the CONTU guideline. Journals with a low number of subscriptions are likely to be hurt more than those with larger circulation, because their proportion of costs which are fixed is greater. Moreover, library subscriptions account for a larger portion of the revenue of small subscription journals, which have fewer nonsubscription sources of revenue such as advertising and sale of reprints.
Pricing Policies

Pricing policies in academic libraries have been discussed from the standpoint of whether or not charges should be made, and if so, what those charges should be. It has been demonstrated that these questions depend on the type of materials or services involved, their externalities, the type of user, the cost of the materials or services, and the cost of administering user charges. In the case of scholarly materials used for reading, there is little doubt that they have some conditions of public goods in that they are nondepletive, the cost of use is near zero, and they are nonexclusive with some exceptions. Thus, the usual practice of not charging should continue. On-line search services are somewhat more difficult to assess. In many libraries, manual reference searches, as well as on-line searches, are considered a nonessential service to patrons; they do not fall easily into economic categories of private, public or merit goods. If the patrons are not part of the library’s institution, there may be some merit to charging them for the variable costs (i.e., marginal cost pricing). However, if the patron is part of the library’s institution, there is less reason to charge. In either case, there is unlikely to be frivolous use as the cost to a user is relatively high anyway. With an increase in interlibrary loans and a possible new National Periodicals System, search capabilities must be improved. Thus, the issue in academic libraries may not be one of pricing, but rather reallocation of budget from materials (or other services) to manual or on-line reference searches. Decision of whether or not to charge for these services should reflect this possibility.

An example was given concerning the effect of charging borrowing libraries for interlibrary loans. The practice of borrowing (or photocopying) articles shifts some cost burden from borrowing libraries to lending libraries. However, the total cost savings to society is modest at best. If lending libraries charge for the loans, the cost to the borrowing library is still less than purchasing journals with fewer than five uses. In this instance there is also a large cost savings to society as well. However, there are some negative externalities to users in the form of slower service, and to publishers in a substantial reduction in library subscriptions. If all libraries canceled periodicals which are less expensive to borrow than to purchase, the canceled subscriptions would require reduced journal quality, content or some other change to lower costs, or the price would have to increase. If prices are increased accordingly, libraries would end up paying nearly as much, on the average, as was necessary before borrowing took place. Thus, librarians must keep such externalities in mind when deciding whether or not to charge for materials or services.
DONALD KING

References


3. Fry and White, op. cit.

4. Ibid.

5. King, et al., op. cit.

6. Fry and White, op. cit.


10. Machlup, op. cit.


15. Baumol and Ordover, op. cit.


The size of a library can be measured in a number of ways: (1) by the quantity of material in its collection, (2) by its circulation, (3) by the size of the population it serves, (4) by the amount of material added to its collection over time, (5) by the size of its staff, or (6) by the area of its physical facility. Obviously, this list is not exhaustive.

Regardless of the measure one uses, a basic question facing an administrator is how large a particular library should become. This paper examines that issue primarily from the standpoint of economics. It explores the relationship between the size of a library and the total cost of operating it in an effort to reach an initial understanding of the economic implications of variations in library size. This analysis will not deal with the question of quality differences between libraries, simply because there are no generally accepted measures of quality.

Attempts have been made to suggest how the maximum or ideal size of a library is established. Gore, for example, delineates three approaches: (1) the "Alexandria" idea, wherein one acquires everything and keeps it forever; (2) the "philosophical" answer, which holds that only items necessary to meet the objectives of the library are retained; and (3) the "scientific" approach, in which formulae are developed to determine the "correct" size of a collection or facility. Examples of the last approach may be found in the work of Clapp and Jordan, McInnis, and Douglass. Buckland and Hindle elaborate on Gore's second strategy by suggesting that one's objectives do, in fact, influence size and that these objectives in-

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SIZE AS A UNIFYING CONCEPT

While appropriate institutional size is the most obvious size question, it is not the only one. The concept of size can also unify many separate library research and problem areas.

Consider, for example, depository storage facilities to hold the little-used portion of a library collection. These facilities are created because space and financial limitations prevent housing the entire collection in one place. Models of use, scattering and obsolescence of materials are attempts to identify characteristics of core collections. The primary purpose of that research is to help develop procedures for economizing on the quantity of materials needed and to eliminate certain materials from a collection as their use declines.

The current plans of a number of libraries to close their card catalogs, stemming from the initiative of the Library of Congress, are presumably related to problems in catalog inconsistencies, changes in cataloging and filing rules, and the size of the catalog which prevents any meaningful maintenance and revision, let alone effective access.

Cooperative library efforts, such as library consortia and networks, result in several activities. Among these are the construction of centralized common facilities; joint acquisition, cataloging and processing of library materials; division of collecting responsibilities; production of union lists and catalogs; shared staff; and joint storage of materials. These activities are motivated by a number of considerations, including politics, economics and effectiveness, and often lead to changes in an organization's size.

The library as an organizational unit is itself subject to size analysis. The impact of size on the library's organizational structure must be considered in terms of the relationships between size and division of labor, size and bureaucratization, and size and complexity of the library. Also important is the impact of size on the organization's members: how do morale, productivity, performance, absenteeism, job satisfaction, and stress on an individual change as the organizational size changes? Finally, the impact of organization size on its administrative component must be considered.

Architectural questions can also be considered within this analysis. The placement and layout of a library building, and the personal space
Economics of Library Size

needs of the users are physical, psychological and sociological factors related to size.

Locational requirements constitute the final dimension to an analysis of library size. Locational analysis pinpoints concentrations of potential library users, determines the types of demands these users will place on a library facility, and considers the transportation costs to and from user population centers. This information is useful in resolving issues such as the number of libraries (or branches) required, and the location and size of each branch.

THE CONCEPT OF ECONOMIES OF SCALE

Of these many size considerations, emphasis here is on the economic implications of changes in library size. One approach is to analyze how the cost of operating a library varies with its size. Specifically, consider that a library has some observable output. This includes materials cataloged, reference questions answered, and items circulated. The total cost of operating a library includes salaries and wages, as well as book purchases and many other factors. The average cost of a unit of output for a particular library over a specific period of time can be calculated by dividing total cost by the number of units of output. This simple step requires that an appropriate measure of output be defined and that the measure be as representative of the library’s functions as possible — no trivial task.

The sources of cost data for such studies are normally accounting records, but may also be engineering studies. The problem with accounting data is that materials and labor are valued according to legal and tax regulations rather than economic rationale. Engineering cost data are inadequate in that not all organizational costs are normally included, but only those costs related to the process being studied.

The average cost per unit of output for one library over a specified time period can be compared to the same library’s average unit cost for successive time periods to ascertain the general trend over time. This is time-series analysis, as opposed to cross-sectional analysis which compares the unit costs for many libraries for one time period. The latter approach is used in this paper.

The results of cost analysis can be displayed by plotting the cost per unit of output on the y-axis of a graph and the measure of output on the x-axis. In cross-sectional analysis, a unit cost/output value is plotted for each library. Three generally accepted hypotheses concerning the long-run average cost curve result from such a display. The first is that the
average cost curve is U-shaped: at small levels of output average costs are high, and as output increases the average cost declines to some minimum value (the bottom of the U), and beyond that level of output the average cost rises. The second hypothesis is that the average cost curve is linear: as output increases, average cost decreases at a constant rate. The third hypothesis is that the curve is roughly L-shaped: for small output levels the average cost is high, but as output levels increase the average cost declines and approaches some asymptote.

In a comparison of libraries of different sizes, the U-shaped curve will indicate a level of output at which costs are minimized. If the average cost curve were linear, the implication would be that large output levels are less costly per unit than small ones. Finally, an L-shaped curve indicates that beyond a certain level of output, unit costs cannot be expected to decline appreciably.

An alternate approach to the evaluation of scale economies is through the use of a production function rather than a cost function. The production function relates input factors, such as labor, materials and capital, to a measure of output. A cost function, in contrast, relates the total cost of operating the organization to measures of output. Both models are useful in determining whether scale economies exist.

Analysis of organizations in terms of their long-term average cost curves began in the private sector where the emphasis was on determining the size of a firm having the lowest average cost of production or the highest level of profit. The motivation for such analysis has broadened to include determination of a size which allows productive resources to be used more efficiently. The use of economies of scale analysis is not, however, confined to private enterprise. In public organizations it is used to determine: (1) how big a facility (e.g., hospital, school, recreational facility, or sewage plant) should be; (2) what size a service area (e.g., centralized or decentralized employment office facilities, educational facilities, refuse collection or purchasing) should be; and (3) how the responsibility for public programs and activities should be divided (e.g., allocated among government agencies).

The application of this technique is not without its difficulties. In-depth comparisons of organizations must take into account variations in quantity and quality, as well as variations in the prices paid for labor and materials. In analysis of government agencies, a frequent problem is that not all relevant costs will show up in an organization's books. For example, sometimes a library's billing for overdue book fines is done by a finance department outside the library without direct recharge to the library.
Economics of Library Size

Sources of Economies and Diseconomies of Scale

Scale analysis has three possible outcomes, depending on whether long-run average costs increase, decrease or remain the same as size increases. If the average cost increases more than proportionately to size, diseconomies of scale are present. Should average cost decrease more than proportionately to size, economies of scale exist. When the relationship remains the same, returns to scale are constant.

A number of factors explain why economies and diseconomies of scale occur. One is the indivisibility (or "lumpiness") of certain equipment or special skills. A manufacturing plant cannot purchase half of a large computer-controlled milling machine even if only half the machine's output is needed. To a certain point, this indivisibility results in higher average cost, but then excess capacity is absorbed and average costs decline. At some point, however, the machine cannot be utilized further and its comparative advantage ceases.

Increased specialization of equipment and labor also contributes to economies and diseconomies. The scale of one library's technical processing operation may allow the luxury of a full-time Slavic cataloger, while in another, one person may catalog all materials. The inefficiencies of a general-purpose employee must be weighed against the need for special skills and the economies of such an arrangement.

The move toward increased specialization is limited by problems of coordination and management. As an organization increases in size, its administrative component may grow in complexity and inhibit economies that might otherwise result. While a large administrative staff may have special skills which allow it to deal with problems more effectively, a small staff may be more flexible in meeting user and customer needs. This flexibility may extend into the area of research and development, where there is some evidence that in smaller firms the technical capabilities of people are higher, research and development costs are of more concern, and communication and coordination problems are fewer.

The absolute size of an organization may also have advantages and disadvantages with respect to the number of customers served, the distribution requirements, and the procurement and inventorying of supplies. The more customers an organization has, the more stable the demand for its products and services. Distribution of services is usually more costly when the service area is large, but along with management, is usually more efficient. Purchasing in large quantities can result in increased discounts, and a large facility may need proportionately fewer repairs and maintenance personnel than a small one.
Another factor which can influence the economies of operation is the extent of vertical integration, i.e., the integration of preceding and succeeding productive processes. In industry, a company that performs all tasks from the production of the raw material through the distribution of the final product is an example of extreme vertical integration. This concept is applicable to library technical processing operations. Economies or diseconomies can result when materials processing is fragmented due to a branch library structure or the intervention of outside vendors (for example, in catalog card production). The scale of the library is changed as functions are added or removed from its operations.

REVIEW OF EMPIRICAL STUDIES OF SCALE ECONOMIES

A number of studies in both public and private organizations have attempted to determine the shape of the average cost curve using both cost and production functions. Mansfield summarizes many of the results reported by Walters as well as those of a few more recent studies. Hirsch does the same for public enterprises. Cohn reviews the applications in the field of education. Mansfield’s summary of cost function studies covers industries ranging from manufacturing firms, retailing, and raw material production (steel, coal and cement) to utilities (gas and electric) and transportation (railways, airlines and roads). The results are as varied as the industries themselves, and the only semblance of a trend is found in the cross-sectional studies of public utilities where long-run average costs seem to be either constant or declining. Hirsch’s summary shows the same lack of pattern, and conclusions about the shape of the curve differ even among studies of the same governmental function. In general, however, there is little evidence to support the idea that most long-run average cost curves are U-shaped; the results seem to indicate an L-shaped or flat curve.

Two studies of economies in library-related fields are worthy of note. The first, by Baumol and Braunstein, examines scale economies in the journal publishing industry. The authors analyzed data from 168 publishers producing from 1 to 36 journals each, and found that the average costs of the largest publisher were about 80 percent of those of the smallest. A second part of their analysis attempted to determine if a publisher who issued both original research journals and translations of foreign language journals experienced economies. From a small number of observations, they concluded that little was to be gained by changing the scale of operation.
Economics of Library Size

The second study is by Ross who used the Cobb-Douglas form of the production function to ascertain the existence of scale economies. Unfortunately, the paper has technical flaws which cast some doubt on Ross's conclusions. For example, as a measure of labor input he used the number of library assistants but omitted librarians. Also, he used circulation as the only measure of output, ignoring reference service, interlibrary lending and borrowing, and technical processing.

SCALE ECONOMIES IN PUBLIC LIBRARIES

An empirical investigation was undertaken to determine whether economies or diseconomies of scale exist in public library operations. Cross-sectional institutional data from the reports of California public libraries were analyzed separately for two fiscal years, 1974/75 and 1975/76. The shape of the total cost curve was estimated and from it the average cost curve was mathematically derived in an attempt to determine the shape of these curves.

The equation used to analyze the public library statistics related measures of output to the cost of providing library service. A number of output measures were used in the study, including number of volumes added; total circulation (including books, periodicals, pamphlets, nonbook materials, motion pictures, audio recordings and artwork); number of items borrowed and lent through interlibrary cooperative activities; and number of reference transactions. Total operating expenditures for the California public libraries included salaries and benefits for library and maintenance staff; expenditures for library materials (including books, periodicals, microforms, and audiovisual materials); operating costs and supplies; contract services; transfers within jurisdictions (such as payments to cities or counties for accounting services); and reimbursements to other jurisdictions (e.g., a county reimbursing a city library for services to county residents).

The data were analyzed to determine which of five models fit best. The total operating expenditures (total cost) was termed \( y \); the number of volumes added during the year, \( X_1 \); the number of volumes borrowed through interlibrary loan (ILL), \( X_2 \); the number of volumes lent through ILL, \( X_3 \); the number of reference transactions, \( X_4 \); and the total circulation of all materials for the year, \( X_5 \). The five equations used were as follows (a and b are constants):

1. \( Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 \)
2. \( Y = a + b_1 X_1 + b_2 X_1^2 + b_3 X_2 + b_4 X_2^2 + b_5 X_3 + b_6 X_3^2 + \ldots \)
3. \( Y = a + b_1 \log X_1 + b_2 \log X_2 + \ldots + b_n \log X_n \)

4. \( \log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + \ldots + b_n \log X_n \)

5. \( Y = a + b_1 X_1 + b_2 X_1^2 + b_3 X_1^3 + b_4 X_2 + b_5 X_2^2 + b_6 X_2^3 + \ldots \)

Equation 1 implies a linear relation between output measures and cost. As the output measures increase, there will be a proportionate increase in the total operating expenditures. In general, if the total cost function is linear, the average cost function will decline as output increases. If the data fit this model, economies of scale are probably present.

The curve represented by equation 2 is a parabola. Total cost increases to some maximum value as size increases, and then declines. The average cost curve derived from this equation exhibits economies of scale since it also declines as output increases; however, the decline is not linear.

The third and fourth equations transform the measure of output into a logarithmic form. The effect is to make what would have been a curve into a straight line. Unfortunately, there is a possibility that some of the original information is lost when taking the logarithm of a number. For a simple form of equation 3, such as \( Y = a + b \log X \), the curve is concave from below if the value of \( b \) is positive and convex when \( b \) is negative. (Ezekiel and Fox provide a convenient summary of the forms of many such curves.)

Equation 4, a simple extension of the previous three models, can be transformed so that its shape may more easily be determined. Taking the antilogs of both sides yields:

6. \( Y = aX_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} X_5^{b_5} \)

To determine what type of scale economies exists in this function, the coefficients \( b_1, b_2, \ldots, b_n \) are summed. If the sum is greater than one, there are diseconomies of scale. If the sum is less than one, economies of scale exist; if it equals one, returns to scale are constant.*

* Equation 6 here is a cost equation. Note that when factors of production (inputs) are related to outputs, a common form that results is the Cobb-Douglas production function:

\[ Q = aI_1^{b_1} I_2^{b_2} I_3^{b_3} \]

\( Q \) is the rate of output; \( I_1, I_2, I_3 \) are the quantities of labor, material and capital required to produce the output; and \( a \) and \( b_1 \) are constants. Under certain assumptions it can be shown that a cost equation can be derived from a production function. See Walters, A.A. "Production and Cost Functions: An Econometric Survey," *Econometrica* 31:1-66, Jan.-April 1963.
Economics of Library Size

The traditional form of the cost function is given in equation 5. This cubic function has two points of inflection and a general upward trend. The average cost function derived from this curve takes on the classic U-shape of a parabola, with average costs declining and then rising as output increases.

Scale economies are most clearly observed in the average, rather than the total, cost function, but this research fits total rather than average cost curves, and then derives average cost implications from them. There are two reasons for this. By far the most important is that fitting an average cost curve implies one measure that can be divided into total cost to compute average cost. This approach seems feasible, but was not attempted. The most likely method of creating a single output measure would be to weight each of the unique output measures and add them together to create a combined measure. For example, if each output variable could be weighted by the staff time required, the number of units of reference activity completed could be compared with the number of circulation transactions. However, development of such weights must await further research. The second reason for fitting total cost curves with separate independent variables, rather than a single combined output variable, is that the former approach preserves more information. Reporting the values of the regression coefficients for each output measure separately retains a better awareness of the statistical importance of these measures.

Empirical Results

The FY 1974/75 California public library data fitted to the linear total cost function (equation 1) yielded:* 

\[ Y = -2,530.23 + 22.70X_1 - 64.79X_2 + 27.27X_3 
\] 
\[-.0049X_4 + .71X_5 
\]

\[ R^2 = .9799 \quad F = 1,570.71 \quad n = 167 \]

This equation, while exhibiting a high F value and a high coefficient of determination \((R^2)\), has a constant term \((a)\) which is not significant. This 

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* The t statistics are given in parentheses below each coefficient in this and succeeding equations. Also, significance of the coefficients at the \( \alpha = .05 \) level is indicated by a dagger. The F statistics for all equations reported is significant at \( \alpha = .05 \).
MICHAEL COOPER

suggests that the equation is not adequate as an explanatory tool. When the same equation was used with the FY 1975/76 data, however, the results indicated a reasonable fit:

8. \[ Y = -74,791.06 + 24.94 X_1 - 10.38 X_2 - 5.25 X_3 \\
    (-2.63)\dagger (9.10)\dagger (-.98) (-1.03) \\
    -.0031 X_4 + .65 X_5 \\
    (-.13) (11.44)\dagger \\
\]

Here the constant term in the equation is significant. However, while only the constant (a) and the number of reference transactions (X,) were not significant in the FY 1974/75 equation, in the equation for FY 1975/76, X, (interlibrary borrowing), X, (interlibrary lending), and X, were not significant. This suggests that the later variables add nothing to the explanatory power of the equation, even though there is a theoretical basis for their inclusion. This theoretical basis is, of course, that the library does expend its efforts on interlibrary transactions and reference activities as well as on acquisitions and circulation. The preliminary nature of the research and the need to report such results for further analysis (as was discussed earlier) justify inclusion of such variables in the equation.

When observed data points are compared with values computed from a regression equation, the two may not coincide. Analysis of the residual difference between the observed and expected values provides a clue to how closely the equation fits the observed data points. Possible results of analyzing the residuals is autocorrelation or serial correlation.

There are several ways to detect autocorrelation. The simplest is to plot the observed and estimated values to ascertain any pattern of divergence between the two. Such an analysis depends on the observed values being ordered in some meaningful way. In this study of public library data, the libraries were ranked from lowest to highest, based on a measure of work load derived from the sum of the X, values. The autocorrelation analysis then showed how well the data fit the curve according to a rough measure of library work load. This visual analysis for both years indicated that the linear curve fit libraries with smaller work loads reasonably well, but as the size of the work load increased, the fit grew worse.

Another method of analyzing autocorrelation is computing the Von Neumann ratio. For both years' data, the computations indicate that autocorrelation is present in the equations as measured by the Von Neu-
The parabolic curve of equation 2 produced the following results:

**FY 1974/75**

9. \( Y = 34,787.21 + 8.70X_1 + .000097X_1^2 + 20.70X_2 - .0023X_3^2 \)
   
   \[ (1.09) (1.53) (2.32) \]
   
   \[ -16.08X_3 + .00085X_3^2 + 1.45X_4 - (.842 \times 10^{-7})X_4^2 \]
   
   \[ (-1.14) (1.59) (6.78) \]
   
   \[ + .715X_5 - .436 \times 10^{-7}X_5^2 \]
   
   \[ (5.04) \]

\( R^2 = .9870 \quad F = 1,187.23 \quad n = 167 \)

**FY 1975/76**

10. \( Y = 4,703.52 - .592X_1 + (.192 \times 10^{-3})X_1^2 + 32.35X_2 - .00175X_3^2 \)
    
    \[ (.189) (-.105) (3.89) \]
    
    \[ - 10.62X_3 + (.380 \times 10^{-3})X_3^2 + 1.52X_4 - (.822 \times 10^{-7})X_4^2 \]
    
    \[ (-.982) (1.21) (9.38) \]
    
    \[ + .757X_5 - (.644 \times 10^{-7})X_5^2 \]
    
    \[ (6.52) \]

\( R^2 = .9879 \quad F = 1,272.24 \quad n = 167 \)

In both cases, the constant term is not significant at the \( \alpha = .05 \) level, indicating a poor fit. Furthermore, even though the coefficients of the more important quadratic terms in the equations (volumes added, reference transactions and circulation) are generally significant, the values of the standardized regression coefficients \( (\beta_s) \) indicate that the linear terms are relatively more important in the equation than the quadratic terms, and autocorrelation is present in both equations. In summary, it appears that the data do not conform to a quadratic equation.

The third equation computes total cost as a function of the sum of the logarithms of each output measure. The computational results suggest a relatively poor fit. For FY 1974/75, only 44 percent of the variation in the dependent variable is explained by changes in the independent variable, and for FY 1975/76 the figure is 45 percent.

The results for equation 4 are as follows:

* The value of the ratio is 2.74 for FY 1974/75 and 2.53 for FY 1975/76. Since the sample size was greater than 60, a tabled Normal Distribution was consulted and the test was performed at the .05 level for this and succeeding Von Neumann ratio tests.
Michael Cooper

FY 1974/75

11. \( \log Y = 0.433 + 0.283 \log X_1 - 0.0062 \log X_2 + 0.0086 \log X_3 \\
(2.65)^\dagger \quad (4.70)^\dagger \quad (-.427) \quad (.874) \)
\[ + 0.0073 \log X_4 + 0.726 \log X_5 \]
\[ (0.802) \quad (11.51)^\dagger \]
\[ R^2 = 0.9228 \quad F = 384.95 \quad n = 167 \]

FY 1975/76

12. \( \log Y = 0.736 + 0.551 \log X_1 - 0.00058 \log X_2 - 0.0062 \log X_3 \\
(5.41)^\dagger \quad (9.19)^\dagger \quad (-.041) \quad (-.753) \)
\[ + 0.0170 \log X_4 + 0.467 \log X_5 \]
\[ (2.43)^\dagger \quad (7.93)^\dagger \]
\[ R^2 = 0.9491 \quad F = 600.31 \quad n = 167 \]

While both of these equations have slightly lower coefficients of determination than equations 7 and 8, the values are still very high. In addition, both equations have constant terms which are significant and the coefficients of volumes added and circulation are also significant. For the FY 1975/76 equation, the coefficient of reference transactions is significant as well. No autocorrelation was found in the equation for either year, based on the Von Neumann ratio test. It appears that the data for both years most closely fit this form of the equation.

Adding the \( b_1 \) values in equations 11 and 12 yields 1.0382 for FY 1974/75 and 1.0287 for FY 1975/76. As explained before, if the coefficients add up to one, this indicates constant returns to scale, and if the sum is greater than one, diseconomies of scale are present. The values here are so close to one that all that can be said with any certainty is that there are no strong indicators of economies or diseconomies of scale, and there is some indication of constant returns to scale.

The data were also tested against the cubic equation, number 5. The results for both years indicated a poor fit, with constant terms not significant and autocorrelation present in each equation.

Correlation Analysis

One question that arises is whether the same result could be obtained using fewer variables in the models. To investigate this issue it is useful to examine the correlations among the five key variables. These variables for FY 1974/75 are reproduced in Table 1. The correlation matrix shows strong relationships between total expenditures and volumes added, reference transactions, and total circulation. The independent variables have
TABLE 1. KEY VARIABLES FOR FY 1974/75

<table>
<thead>
<tr>
<th></th>
<th>Total Expenditures</th>
<th>Volumes Added</th>
<th>ILL Requests</th>
<th>ILL Borrowing</th>
<th>Reference Transactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volumes added</td>
<td>.981</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ILL Requests</td>
<td>.511</td>
<td>.458</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ILL Borrowing</td>
<td>.204</td>
<td>.207</td>
<td>.595</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Trans.</td>
<td>.716</td>
<td>.757</td>
<td>.073</td>
<td>-.014</td>
<td></td>
</tr>
<tr>
<td>Total Circulation</td>
<td>.985</td>
<td>.980</td>
<td>.500</td>
<td>.228</td>
<td>.724</td>
</tr>
</tbody>
</table>

high correlations among themselves (e.g., reference and volumes added, .757; total circulation and volumes added, .980; and total circulation and reference transactions, .724). To what extent is one independent variable simply a surrogate for another? Specifically, could circulation be used instead of all the other variables with the same results? Calculating the partial correlations between the variables sheds some light on the question. For example, when the partial correlation between total circulation and volumes added is computed, controlling for the effect of reference transactions, the correlation drops slightly to .957 — still very high. The partial correlation of total circulation and reference transactions, after removing the effect of reference transactions, drops to —.063. Circulation does appear to dominate the process. The results are similar for FY 1975/76. However, the results may be due to the measure of output used. It must be remembered that the outputs are unweighted, and the results might be quite different if they were adjusted.

SUMMARY AND CONCLUSIONS

This paper is an initial investigation of the economies of library size. It has been shown that the concept of size can serve as a useful departure point from which to examine and integrate many past and current research efforts in information science. This process, however, is not without its limitations. For example, a major deficiency is the lack, in the equations, of any variables designed to measure the quality of a particular library's service. Another deficiency is the relatively straightforward measures of outputs that are used. Obviously, not all the outputs of a library are considered and, furthermore, the ones that are used are incorporated into the model in a simple manner. In other words, a unit of circulation is considered to have the same relative importance as, for example, a reference transaction. Weighting of output measures will be a next research step.
The empirical research on public libraries in California has shown that the classical U-shaped average cost curve does not exist. Rather, the evidence suggests that the best fit comes from the logarithmic model of equation number 4. This model demonstrates nearly constant returns to scale. As output levels increase, total cost increases almost proportionately, with average costs almost constant.

The policy implications of the empirical research are that larger libraries cost approximately the same to operate as smaller ones. This conclusion obviously must be balanced with the needs of the user groups, locational requirements, bibliographic access problems, and personnel considerations. It would be naïve to consider the results in isolation; they must be considered as one of many factors in the library size decision-making process.

References

1. I am very appreciative of the help of Susan Adkins, Nancy A. DeWath, Mary Kay Duggan, Gale G. Hannigan, Ann Irschick, Robin Levin, Stuart Scofield, and Alice Wilder, who assisted in various parts of my inquiry into library size issues.
Economics of Library Size


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MICHAEL COOPER


Costs and Benefits of Library Information: The User Point of View

YALE M. BRAUNSTEIN

It is important to recognize the conceptual difference between the value of information itself and the value of the medium by which the information is obtained. This distinction is useful for two reasons: first, the value of information is often nebulous or difficult to ascertain, or both; and, second, by making it explicit that one is comparing information channels one can often avoid these more difficult problems. This is not to say that it is unimportant to understand why information has value; however, once the decision has been made to seek or acquire information, it is possible to determine independently which channel or channels to use in the process.

For the decision-maker, information has value because it may enable a better decision to be made. This is true both for the manager seeking information about potential markets, competitors, etc., and for the consumer planning a major purchase. On the other hand, some information is valued as a final product, a commodity to be consumed. Examples here might include best sellers, biographies, and so on. Certain types of information fall in both categories; for example, art history might be valued for consumption by some and others might use the information to increase their understanding of the market in the paintings of old masters.

CHOICE OF MEDIA: COSTS AND BENEFITS OF LIBRARIES AND OTHER INFORMATION SOURCES

Recently increasing attention has been paid to the emergence of competitors to both public and special libraries. For example, Kalba discussed

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SUMMER 1979 79
special interest magazines, on-line retrieval services, and information brokers as competitors to libraries. A more traditional view is represented by the recent studies of the pricing and use of individual and library copies of journals. Each of these studies highlighted the fact that the library is but one of several possible channels by which a seeker might obtain the desired information. In view of the existence of the alternate channels and the fact that consumers are, to a significant degree, rational in choosing among competing sources, it is important to examine the costs and benefits associated with each of the feasible alternatives so that one might understand how choices are made.

The existence of libraries and their use by individuals will result in both costs and benefits to society over and above the costs and benefits to the individual user. Some of these costs, such as congestion-induced waiting time, would occur even if the user paid a fee to the library for the services it provides. Others result from the avoidance of a fee-for-service system of operation. Examples of the benefits to society include the systematic creation of depositories of written works and the provision of library services to those who may be unable to pay. The detailed examination of the costs and benefits of library usage that follows considers those "private" costs and benefits directly attributable to the individual's use of a library and ignores many of the broader societal effects. (It is assumed that the library currently exists and that each use does not influence the size or scope of the collection.)

<table>
<thead>
<tr>
<th>Costs</th>
<th>Borne by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time, money, effort spent going to the library</td>
<td>User</td>
</tr>
<tr>
<td>Delivering item sought to user</td>
<td>Library</td>
</tr>
<tr>
<td>Delays in obtaining service caused</td>
<td>Other users</td>
</tr>
<tr>
<td>by presence of user</td>
<td></td>
</tr>
</tbody>
</table>

Benefits

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Received by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced need for private collection</td>
<td>User</td>
</tr>
</tbody>
</table>

PRIVATE COSTS OF LIBRARY USE

Use of a library by an individual causes costs to be incurred by that individual, by the library and by other users (as illustrated above). Each of these separate costs can be measured or at least approximated. The cost to the user depends on the value of his time (the opportunity cost), the convenience and efficiency of the library, and his efficiency in using the library's collection or in making his needs known to the librarian. There are many estimates of this cost.
Costs & Benefits: User Point of View

The cost to the library can also be measured. It depends on the organization of the collection (open or closed stacks, for example), the efficiency of the staff, and similar factors. Baumol and Ordover have estimated the costs incurred by a major university library in fulfilling requests for a book to be circulated from its closed stack collection, to be accessed from its reserve collection, and to be acquired through interlibrary loan. They calculated the marginal costs of each of these three types of usage. (The marginal cost is the cost of an additional use, given the currently existing level of usage.) These costs are summarized in Table 1.

Baumol and Ordover also estimated the cost of the increased congestion (the loss of time by other users) caused by an additional use of a popular item in a busy library. They analyzed data on the usage of physics journals at the MIT library which showed a highly skewed distribution of usage. At that time the library had 229 physics journals in its collection. The eight most popular of these caused 47.9 percent of the use; eighty-two (37.3 percent) of the journals were not used at all during the 3½-month survey period. Combining these data with a standard queuing model and assuming that waiting time is valued at five dollars per hour, Baumol and Ordover found that the only instances where the marginal congestion costs are above ten cents are those cases where there is only a single copy of one of the five most heavily used journals (see Table 2).

From the above it can tentatively be concluded that the major costs of using a library collection are borne by the user, but that the user does impose a nontrivial cost on the library even for rather standard types of usage. (For example, the marginal cost for circulating an additional

### Table 1. Marginal Costs of Circulation, Reserve and Interlibrary Loan Usage

<table>
<thead>
<tr>
<th>Type of Use</th>
<th>Estimated Marginal Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circulation</td>
<td>$ .98 - 1.58</td>
</tr>
<tr>
<td>Reserve</td>
<td>.35 - .44</td>
</tr>
<tr>
<td>Interlibrary loan</td>
<td>9.21 - 12.26</td>
</tr>
</tbody>
</table>

Note: All estimates were statistically significant at the p < .05 level except the low estimate for interlibrary loan costs.

YALE BRAUNSTEIN

TABLE 2. MARGINAL CONGESTION COSTS FOR PHYSICS JOURNALS IN THE MIT LIBRARY

<table>
<thead>
<tr>
<th>Journal Number*</th>
<th>Marginal Costs in Cents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single Copy</td>
</tr>
<tr>
<td>1</td>
<td>65.00</td>
</tr>
<tr>
<td>2</td>
<td>42.50</td>
</tr>
<tr>
<td>3</td>
<td>20.60</td>
</tr>
<tr>
<td>4</td>
<td>17.44</td>
</tr>
<tr>
<td>5</td>
<td>12.30</td>
</tr>
<tr>
<td>6</td>
<td>10.15</td>
</tr>
<tr>
<td>7</td>
<td>7.10</td>
</tr>
<tr>
<td>8</td>
<td>6.07</td>
</tr>
</tbody>
</table>

* Ranked by frequency of use from highest to lowest


item from a closed-stack university library was in the range of $1-$1.50.) On the other hand, the cost imposed by an additional user on the other users that results from the increased congestion is likely to be quite small (less than ten cents) in most cases.

IMPLICATIONS FOR PRICING

The fact that usage imposes a nontrivial marginal cost on the library and that, in the usual case, there is no usage charge, causes an inefficient overutilization of library resources. The magnitude of this inefficiency can be measured by the standard economics tool of consumer surplus (a measure of economic welfare) and is illustrated in Figure 1.

To compare the efficiency of having a usage fee or price that covers the marginal cost versus that of allowing free use, a few assumptions about the nature of the demand for library services and the marginal costs of serving additional users must be made. In Figure 1 the marginal cost is assumed to be a constant $1.00 per use, and the demand curve is assumed to have a normal downward slope (i.e., per unit costs do not change with small changes in the number of uses, and imposing a usage fee will reduce the number of uses).

With these assumptions the consumer surplus with the $1.00 fee is triangle ABE (the area under the demand curve BN and above the $1.00 price), and rectangle OAEM reflects the costs (and charges) paid by the
Costs & Benefits: User Point of View

Figure 1. Measurement of the Inefficiency of Zero Price for Library Use

users. Changing to a system of free use increases consumer surplus to triangle OBN, but the costs have increased to rectangle OAFN (because more users are being served). Comparing the increase in costs (EFNM) and the net increase in consumer surplus (OAEN less the transfer in costs OAEM equals triangle EMN) shows that there is an overall welfare loss resulting from allowing free use, represented by the shaded triangle EFN.9

Two additional considerations should be mentioned at this point. First, to increase the degree of realism in this analysis, one may wish to consider the transaction costs accompanying the mechanisms that would need to be established if usage fees were collected. If these were relatively high, it is possible that the efficiency gains from having a fee charged
could be reduced or even lost. The second point is that allowing fees to be collected may also enable different prices to be charged to different classes of uses. This price discrimination may be used to increase efficiency or for the purposes of subsidizing certain classes of users.

PRIVATE BENEFITS OF LIBRARY USE

If the only benefits the user receives from using the library are from obtaining the same information that is available from alternate sources, it is merely necessary to compare the costs of the various sources and choose the one with the lowest cost. However, there are often differences in the benefits. For example, the reliability, currency and form of the information may differ. Also, there may be differences in the likelihood of obtaining the information. If the values of some of these considerations can be calculated, they should be included in the cost/benefit analysis. It is likely, however, that many of these will be difficult to measure or compare in anything other than a subjective manner. As a result, it is often necessary to revise the results of the cost/benefit calculations so that, to some degree, these additional factors are included. Although there has been some recent work in this area, the measurement of benefits continues to be much less exact than the measurement of costs.

IMPLICATIONS FOR LIBRARY ORGANIZATION

COSTS OF MULTIPLE SERVICES

Although there are many reasons to reduce costs by efficiently organizing and operating a library, the cost/benefit analysis approach highlights the fact that if costs were passed on to the user, their level would influence the decision of whether to use the library or a competing source of information. In the absence of institutional arrangements where users are charged the operating costs, the effects of cost changes are only indirect. If this is the case, the scale, organization and efficiency of the library will affect the quality of service to the user and the level of costs that are to be covered by the library or its parent organization. Nonetheless, it is obvious that someone has to pay for the costs incurred in operating a library and, as a result, the cost implications of different organizational structures are often important considerations in library planning.

The organization decision has several interrelated components. The question of library size and the economies of scale which may result are addressed in the article by Cooper in this volume. A similar set of choices
exists in consideration of whether certain functions should be done separately or integrated with others in a single operational structure. In making this decision one should consider whether cost savings will result. For example, a technical library may find it less costly overall to have an information-on-demand service integrated into the library operations rather than to have it operate as an independent service. The existence and implications of such cost savings, known as "production complementarities," have been the subject of recent theoretical and empirical research.\textsuperscript{11}

One result of cost savings from the integration of multiple services in the library is that it is no longer possible to determine the average cost of any single service or function. This is because the total costs now depend on the levels (and the mix) of all the services.\textsuperscript{*} An implication of this situation is that if costs are to be charged to the user, the level of these charges will depend not only on the volume of usage of the particular service in question, but also on the usage levels of the other services.

THE ROLE OF UNCERTAINTY AND RELATED CONSIDERATIONS

In deciding whether or not to use a library, a person evaluates the expected costs and benefits. Both of these are uncertain; for example, one could estimate the probabilities that the library will have the desired material and thus obtain some indication of the amount of time required for a search for the information and fulfillment of the request. Also, it should be noted that procedures or actions which increase the likelihood that the desired information will be available, or that reduce the expected waiting time, will make the library a more competitive option for the potential user. (It is also necessary to make these improvements known to potential patrons if one wishes to influence their decision.) Some disadvantages may accompany the benefits of certain library operational changes. A policy that stops all searches for material after reaching a set cutoff time can reduce the expected time that a search will take, as well as reduce the probability that the search will be fruitful. To determine whether such policies are desirable, it is important to understand both the distribution of search time and the value users place on this time.

Similarly, it is useful to consider the nature of the product or service provided to the user. Certain users might be satisfied with a citation or a

\textsuperscript{*} The marginal cost concept used above, however, does still apply.
copy of the monograph or serial they are seeking. Others might need to be
directed to a particular reference work. Still others might desire data or
certain historical facts and be indifferent to the physical nature of the
source (but not to the reliability). Efforts on the part of the library to
help match the form of the output to the needs of the user can reduce the
additional time the user must spend to obtain the desired information and
put it into a usable format. This, and similar types of activity, can lower
the true costs of library usage and thus make libraries more competitive
relative to the alternative sources of information.

One final point that should be made is that from the user's point of
view there is not necessarily a contradiction between service improve-
ments and cost reductions by the library. Automating historically labor-
intensive library functions such as cataloging and circulation has the
potential for both reducing library costs and improving service to the
users. Such improvements would enhance the competitive stance of li-
braries whether they operated under the regime of universal free pro-
vision of services or of charging fees for usage.

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   William J., and Ordover, Janusz A. "Public Good Properties in Reality: The Case
   of Scientific Journals." In Susan K. Martin, comp. Information Politics: Proceed-
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   (NSF Contract No. DSI75-06942)
7. For other estimates, see Palmour, Vernon E., et al. "Costs of Owning,
   Borrowing and Disposing of Periodical Publications." Arlington, Va., Public Re-
   Pittsburgh, Pa., University of Pittsburgh Office of Communications Programs, April
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Costs & Benefits: User Point of View


9. If there would still be a financial loss for the library with marginal cost pricing, it may be optimal to have a fee that is greater than the marginal cost; see Baumol, William J., and Ordover, Janusz A. "On the Optimality of Public-Goods Pricing With Exclusion Devices," *Kyklos* 30:5-21, 1977. Additional pricing considerations are discussed by King elsewhere in this issue (pp. 47-62).


The Economics of Library Innovation

MIRIAM A. DRAKE
HAROLD A. OLSEN

Basic changes in the economics of libraries are forcing librarians to look at innovative strategies to achieve cost-effective operations. A major problem confronting librarians is how to allocate resources, reduced by budget cuts and inflation, to satisfy an increasing user demand for more responsive library service. The economics of information and the economics of innovation are relatively new fields of study. There are no theories or recipe books to which one can turn for solutions to problems in library resource allocation or library innovation.

In the past, innovation in libraries was focused primarily on products of technology. Three recent developments—automation, low-cost rapid communications capability, and demands for better managerial performance—have led to a broader concept of innovation, which is centered on processes, functions and human behavior. Drucker states: "Innovation is not a technical term. It is an economic and social term. Its criterion is not science or technology, but a change in the economic or social environment, a change in the behavior of people as consumers or producers, as citizens, as students or as teachers, and so on."1

Innovation does not happen by chance. It is a deliberate and specific change which is introduced in response to changes in the library's external environment, or to help the library accomplish its objectives more effectively.

This paper is concerned solely with the economics of innovation in academic libraries. The social and managerial aspects, while important

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to the use of innovative strategies in libraries, will not be considered. The purposes of this paper are to present: (1) a review of the economic literature dealing with innovation, (2) a review of the economic environment and structure of libraries and their relationship to innovation, (3) a discussion of sources of capital for libraries, (4) the economic character of innovation, and (5) innovation in libraries.

THE LITERATURE OF INNOVATION

The literature of innovation reflects study from two major perspectives: economics and sociology-psychology. Economics treats innovation as a matter of the diffusion of technology, technology transfer, economic development and growth, etc. Past studies typically aimed at determining the optimal scale for business firms engaged in the manufacture of some product, or at exploring the most effective industrial organization in terms of its structure/conduct/performance features with respect to standard economic criteria. The second approach, that of sociology-psychology, examines the processes of social change and cultural diffusion. Typical studies examined these processes in developing nations, within mature societies, or as a part of organizational development in bureaucracies or government. The type of innovation generally discussed is a shift in the structure and function of human relationships in a social system, and in the institutional sector or organization.

Rarely have these two perspectives been unified, nor has either perspective been used extensively and directly in the analysis of innovations affecting the information industry. This lacuna is puzzling, because in many ways information activities are a major factor in the innovation process.

The current consensus among economic theorists is that while the topic of innovation is receiving important and systematic analysis, a general theory has yet to emerge from prior and current work. Until very recently, technological and social changes were treated as exogenous variables in standard economic analysis. However, the impact of technological change has become so pervasive and is such a major determinant of economic conditions that innovation is a topic now in demand, as evidenced by the increasing number of publications by economists attempting to analyze innovative phenomena.

That innovation is an important factor in today's society is evident in the amount of attention the government is paying to this issue. The Carter administration has initiated a policy study regarding industrial
innovation, with a top-level committee charged with developing a set of policy options aimed at removing barriers to innovation. This was recently announced by Dr. Frank Press, science advisor to President Carter and Director of the Office of Science and Technology Policy.2

Librarians should find the following brief review of the literature on the economics of innovation useful background for increased understanding of library innovation.

A concise, informative review of the literature of innovation from the economist's perspective is found in the recent article by Nelson and Winter. The authors concluded that current understanding of the subject is far from the "handbook" stage, with major policy issues unresolved and theory deficient in explanatory power.3 However, this wide-ranging and thorough review constitutes a good introduction to economic thinking about innovation.

One of the best general introductory works to the topic as treated by economists is by Heertje;4 he takes a historical approach at a level which librarians unfamiliar with economics can follow without encountering excessive mathematics. Heertje's discussion of public policy issues relating to guidance and control of technical development is especially relevant to library innovation.

The managerial implications of the process of technological change are covered by Gold, with an especially interesting chapter by Pierce on the unexpected ripple effects accompanying shifts in technology.5 Pierce notes that second-order consequences often go far beyond the initial frame of economic analysis regarding a proposed innovation.

Parker6 provides a more advanced treatment of the economics of innovation in manufacturing industries, the typical focus of most economic studies up to this time. Innovation in the public sector is given relatively short shrift, although Parker's introduction and general treatment of the topic suggest broader implications.

Other studies include a wide-ranging review of technical innovation stemming from the initial three years of the National Science Foundation's research and development incentive program, published as a set of twenty-six papers edited by Cunningham and others.7 Myers and Sweezy have reported on a recent study of 200 cases concerning the reasons innovations fall short of commercial development.8 Roessner discussed the incentives for innovation in both public and private organizations.9 The process of diffusion of innovation in the public sector is discussed by Feller and Menzel,10 as well as by Bingham,11 and in a
A good introduction to the sociology-psychology perspective on innovation and social change can be found in Zaltman and Duncan, who survey what is known about diffusion of innovation and organizational change, especially the change-agent approach to innovation, and principles or guidelines for facilitating social change. A collection of readings by Zaltman and others offers further background on the general topic. Of special interest to librarians is his application of this perspective to the education sector. Gree$^{17}$ uses the same general approach in studying health care — another public sector activity in which innovation studies offer librarians useful lessons. An article by Garvey and Gottfredson treats social changes in scientific communication.

This literature review did not uncover any articles which treat innovation in libraries per se. However, some efforts have been made to inventory reports of research projects featuring innovation in libraries and librarianship or related institutions. Perhaps the best known of these is the compendium by Wasserman. McLean compiled a directory of field experience in academic library innovation in Ohio. A 4-volume forecast of technology for the scientific and technical information communities is provided by Nisenoff and Clayton, who developed a unified body of data representing “best judgment” forecasts of communication system performance, cost and availability over the next twenty-five years, also considering usage patterns and needs of representative user groups in the scientific community. A doctoral dissertation by Howard explores relationships between organizational factors and the rate of innovation in university libraries, drawing primarily on the sociological perspective as the basis for analysis.

Recent library topical conferences are among the most effective means of surveying actual cases of innovation, as well as the pressures and opportunities for innovation in libraries. Among the most relevant, recent in-print proceedings are those edited by Kent and Galvin in which the chapter by Cohen is particularly interesting in its application of economic analysis to help guide library change, and by Divilbiss which also provides considerable economic perspective regarding library innovation. Appropriate chapters in the Annual Review of Information Science and Technology serve as an excellent source of leads regarding innovative efforts in libraries and related organizations.
ECONOMIC ENVIRONMENT OF THE LIBRARY

This section will discuss the economic environment of the library in terms of the critical factors affecting library operations and their relationship to innovation. The economic environment of the academic library is defined in three areas: (1) the external environment, in which economic factors are beyond the immediate control of the library; (2) the university setting, in which the library has input and influence; and (3) the internal operational environment, in which the library has varying degrees of control over the allocation of economic resources.

External Economic Factors

The economic elements in the external environment which have the greatest impact on academic libraries are population, government funding, prices and technological developments. The size of the college-age population has had and will have a significant impact on the quantitative demand for library services. Estimates by the National Center for Education Statistics indicate that total enrollment in 4-year institutions of higher education will peak at just over 8 million in 1981 and decline to 7.6 million in 1985.\(^25\) Enrollment declines are likely to continue beyond 1985 because of continuing low birthrates and trends toward smaller families. The number of instructional staff also will decline.\(^26\) These decreases will result in smaller primary client populations for most colleges and universities and a reduction in quantity of instructional material and services demanded. In some academic institutions the demand may be altered rather than reduced because of increased volume of research or continuing educational activities.

Federal funding for academic libraries cannot be projected with accuracy at this time. Tax cuts at the federal level will force public policy priorities which may not leave large amounts of funding for libraries. State-supported colleges and universities may be subject to severe financial hardship as enrollments decline and state tax levels are frozen or reduced. There is no clear definition of the responsibility of each level of government to fund libraries.

At the same time, there appears to be no end in sight to inflation of wages and library materials prices. Halstead has estimated that prices paid by colleges and universities for goods and services have increased 101.3 percent since 1967. During the same period, the average price of U.S. periodicals increased 210.9 percent, and the average price for hardcover books, 165.7 percent.\(^27\) This loss of purchasing power, coupled with prob-
able decreases in funding, will force librarians to seek innovative strategies to satisfy demand with increased efficiency.

Within the foreseeable future, computer hardware will be available to most libraries. It has been estimated that over the next decade computer logic costs will drop 25 percent per year and computer memory costs will decline 40 percent per year. Advances in data base management systems and networking will make computer-based systems affordable even for the small library.

Faster and cheaper communications will facilitate resource-sharing among libraries. Communications costs are expected to drop 11 percent per year. This decline is likely to result in greater use of both facsimile transmission of documents between libraries and electronic communication, with a corresponding decrease in paper communication.

Institutional Setting

As income from tuition declines, colleges and universities will be seeking additional funding. Gifts, endowments and sponsored research will be the primary sources. In the past, the volume of corporate and alumni gifts has been closely tied to the state of the general economy. The uncertain economic outlook, especially in areas of inflation and corporate profits, indicates that gifts may not be a reliable and steady source of funds. Income from endowments also may be insufficient to offset revenue losses. Competition for limited research funds will be greater. The gap between actual revenue and needed revenue is likely to grow.

Colleges and universities will be forced to examine their resource allocations among teaching, research and support activities. All units within an institution will be forced to adopt more efficient, cost-effective methods. Cyert has pointed out that: "The only source of increased resources is likely to result from the internal management. The technique is to find ways of achieving approximately the same quality level of services or activities ... but achieve it with fewer resources." Librarians need to be aware of both the political and economic thinking taking place in university administration. In a highly competitive and political environment, increased library funding may be difficult to justify. Libraries caught in the double bind of reduced funding and continuing inflation will have no choice but to adopt innovative strategies to increase internal resources in order to satisfy user demand.

Internal Library Operations

The increase in internal resources for the library will depend on the library’s ability to increase staff and user productivity. While the quan-
Economics of Innovation

tity of demand for traditional services may decline, the quality of service demanded may be greater. As faculty spend more time writing grant proposals and journal articles, they will have less time to spend in the library. They will require easier, less time-consuming access to bibliographic and substantive data. Library operations which are highly labor-intensive will have to be converted to computer-based systems to reduce the rate of increase in unit costs and to increase productivity. With labor costs increasing 6-7 percent per year, it will not be possible to continue operation of purchasing, cataloging, bibliographic information, document delivery or communications systems in a manual mode.

It should not be inferred that technology alone will solve the library's operational problems. There is a great need to understand more fully the fundamentals of library service and the nature of user needs. Librarians will have to become more knowledgeable about consumer demand, the uses of information and the value of information to the user. In his statement of the problem, De Gennaro said, "It is becoming increasingly clear that the long-term solution to the chronic fiscal, staff, space, and other problems besetting research libraries lies in setting aside the old models of Harvard and Yale and developing new and more realistic sets of goals."8

Initial applications of technology will provide substitutes for manual methods of processing, filing, accessing, etc. Zisman states: "The emphasis will be on the development of tools... We will mechanize tasks that people perform... but not automate the functions that they perform."32 As automation develops, it will be necessary to focus attention more on library processes and goals and less on books and devices.

Resource allocation in many institutions of higher education has been based on tradition and politics, and has lacked rational planning. In the past, colleges and universities have not articulated goals, priorities or a framework for resource allocation. In some institutions, libraries have received a consistently generous share of available funds, while in others the share has either been small or varied from year to year. Cyert points out that, "Without a clear understanding within the organization of a set of goals and the set of priorities designed to implement those goals, there will always be ambiguity and arbitrariness in the resource allocation process."33

The economic conditions discussed earlier could force a change in decision-making processes at colleges and universities. Administrators will be looking for ways to increase productivity and efficiency while reducing overhead. Since libraries are part of overhead and likely candidates for reduction in funding, it will be essential for librarians to under-
stand the internal economics of the library, the relationship between input and output, and the concepts of investment and innovation.

SOURCES OF CAPITAL

As indicated earlier, libraries will have to change with the environment. High labor-intensity and massive collection-building are no longer affordable even by the richest library. Innovative strategies to reduce the rate of increase in unit costs and to make off-site resources available are essential. Resource-sharing and automation are two strategies likely to be integrated into the library of the future. Both strategies require capital which may not be available in the traditional library budget. In order to produce necessary capital, libraries will need to change their approach to budgeting, seek capital from the administration, and possibly charge user fees.

While various library programs have been government-funded, it is not certain that this funding will continue. Libraries must compete with other programs for funding at all levels. While librarians and the public may believe that libraries are socially good, the amount of money that policy-makers are willing to commit to libraries may be severely limited.

Many college and university libraries have instituted user fees to provide revenue for services such as bibliographic data base searching, interlibrary loan and photocopying. The fees may cover all or only a portion of the cost of these services. A study conducted by Forecasting International indicated: “Both librarians and users regard it as more acceptable to charge for automated services. The rationale is that one is paying not for basic service, but for improved speed or efficiency, new products, or expanded access capability.” The extent to which libraries utilize service fees in the future will depend on institutional policy decisions.

THE ECONOMIC CHARACTER OF INNOVATION

Innovation entails major shifts in economic activity, usually driven by changes in the technology or economic environment of an industry or organization. The economic impact of innovation may be in one or more of three areas:

1. Shift in production function, i.e., a change in the mix of inputs needed to produce a particular output. The typical pattern has been to substitute some capital good (new technology involving machines) for
Economics of Innovation

some labor input, with the net effect of increasing the productivity of
the unit time of labor.
2. Shift in outputs, usually with an increase in the choice of products and
services available to consumers. This phenomenon can be dramatically
pervasive: for some industries, over half their current range of goods
and services did not exist a decade ago. Some innovations (e.g., lasers,
computers, etc.) spawn entire new industries.
3. Shift in linkage of supply and demand regarding the funding
mechanisms used to sustain an economic sector. Such innovations in-
clude improvements in market transactions via more efficient operation
of the pricing mechanisms, or improvements in funding of nonmarket
activity, via government policies regarding subsidy and taxation, or
activities of private philanthropists who often perceive their role as
promoting socially beneficial innovation. Often, nonmarket funding in-
novations focus on a more responsive linkage of supply to changes in
demand.

The analysis of innovation often involves modeling the innovation
process with a sequence of developmental stages: (1) the innovative idea,
(2) innovation at one point, (3) subsequent adoption or diffusion else-
where, and (4) emergence of second-order or "ripple" effects. Much of
the literature focuses on efforts to accelerate the process of innovation
(the adoption and diffusion stage). More recent analysis tends to dis-
tinguish the probable overall impact of a particular innovation beyond
its initial source (the second-order effects).

Measuring the impact of innovation on economic activity is typically
done through standard economic analysis. Recent studies have expanded
the scope of analysis to include the impact of an innovation from new
perspectives, e.g., how people spend their time, or the environmental
conditions under which people live. Also, the ripple effects of technolog-ical
change on the overall environment and on the interactions of one industry
with another are topics of increasing interest. Recent economic studies
suggest that an innovation's secondary effects are often more significant in
the long run than its primary (initially expected) effects.

From a managerial perspective, librarians need to be aware that in-
novation involves uncertainty and risk. In seeking capital for investment,
libraries compete with other academic services and teaching/research
departments. The critical questions to be answered in the program se-
lection process involve amount of money requested, expected payoff, risk
associated with the project, and uncertainty with regard to the future environment.

Managerial effectiveness is a major determinant of an innovation’s success or failure. The ability of libraries to cope with uncertainty and to take risks is a key issue here, because the literature of librarianship suggests that librarians are averse to risk and antipathetic to the entrepreneurial role. Yet risk-taking behavior by librarians is certainly evident in recent literature: witness the large number of articles proclaiming how a particular library intends to automate in order to improve service or to attain more efficient operation. Unfortunately, these proclamations are rarely followed by articles detailing the success of these innovative projects in attaining their goals. Nor is the commercial sector immune to innovative risk in attempting to supply advanced technology to libraries. The most dramatic evidence of the risk involved in such innovation is the recent experience of Princeton University Library with 3M’s automated circulation system which apparently ended in failure this past year. As a result, the system is being withdrawn from the market.

The innovation process needs to be based on a firm understanding of the investment required, the economic or social impact on the library and its users, and the payoff for the college or university. For example, automation of some library activities will have greater impact on the production function than on the quality or quantity of output. Other innovations, such as document delivery services, will have the greatest impact on users.

The projected investment in and impact of innovation can be measured from a cost/output or cost/benefit perspective. The lack of precise measures of output need not be a stumbling block to addressing this issue. Anthony and Herzlinger point out that:

Benefit/cost analysis is feasible in only a small proportion of the problems that arise in nonprofit organizations, and these tend to be the well-structured and less important problems. By contrast, a benefit/cost way of thinking is feasible in approaching a great many problems. One of the characteristics of competent managers is that they look at proposals, at least in a general way, in terms of whether the benefits are probably worth more than the costs. They may not be able to quantify the relationship, nor do they need to do so in many cases. This way of looking at problems tends to distinguish the factors that are relevant from those that are not relevant.35
There are few innovative strategies or technologies which are "sure things." Any change in operations, goals or functions involves uncertainty and risk. While forecasts can provide fairly reliable data regarding the college-age population sixteen years hence, projections of the number of people who will actually attend college are more uncertain. A variety of economic and social factors could cause dramatic shifts in the proportion of college-age people who will enroll. The success of an administrative or technological innovation cannot be projected with certainty. While innovation may be directed toward more effective use of resources, there is no guarantee of success. Careful planning in innovation can reduce uncertainty to a risk which can be described in terms of probabilities.

INNOVATION IN LIBRARIES

The lack of a general theory of innovation inhibits any definitive statements regarding the future course of innovation in libraries. It is useful, however, to review expert opinion regarding the probable course of innovation in the publishing, communications and information industries and to note current trends.

Using the Delphi technique, Borko pioneered a study of research prospects regarding libraries and publishing in predicting the probable course of innovation. Also, a practitioner's guidebook regarding current innovation in primary publication has been compiled by Capital Systems Group under contract to the National Science Foundation. Unfortunately, no similar manual has been compiled concerning libraries. In general, such efforts focus broadly on the information industry, rather than on the particulars of libraries per se. With the exception of the Ackoff study, which dealt with scientific and technical communications, very little use has been made of economic analysis in dealing with innovation in libraries on a broad scale.

A few instances can be found of economic analysis applied to particular innovations in libraries. Perhaps the most interesting recent example is an analysis of user fees as an innovation, done by Forecasting International, again under contract to the National Science Foundation. This project is supplemented by the recent work of Cheryl Casper in analyzing the impact of fee-for-service for particular library operations, and the work of Michael Cooper and Nancy DeWath in analyzing the impact of fees on an innovative service itself—data base searching in public libraries. Dougherty and Blomquist have done a pioneering study analyzing the impact of an innovation in library service (telephone re-
quest with at-office delivery of items) on consumer demand, although only a modest degree of economic analysis was used.  

The economic environment of libraries described earlier, coupled with current and planned activities, suggests trends concerning the probable pattern of innovative activity for the near future. These trends are organized within a supply and demand context. Supply changes relate to inputs and prices of resources used by libraries to produce output. The most significant factors in innovation concerning supply are the size of the market and the sources of innovation.

The library market base for innovative research and development investment is too small to warrant major independent research and development effort for libraries. The sources of innovation are likely to be by-products or extensions of innovations created by or for the publishing, communications and computer industries. Innovations such as electronic mail and telefacsimile were developed primarily for industry and are being adapted for libraries.

Technological innovation will be provided to libraries — primarily by specialty suppliers adapting innovative techniques and devices to the particular needs of the library market — rather than pioneered within libraries. There are a few libraries located within large universities which can call upon the skills of engineers, computer scientists and others who will work with the library in developing new processes, techniques or devices.

Retrenchment of the economic base of higher education will constrain library program growth but accelerate innovation for efficiency. The name of the game is, do as much (or more) with less through labor savings. The current labor-intensive character of library service, and the propensity of wage rates to rise faster than the cost of computers and communications systems, will bring pressure to shift the library production function toward greater capital intensity.

Pressure for greater staff productivity will also push libraries toward increased reliance on consumer self-service as a primary mode of operation. Thus, currently popular programs of bibliographic instruction will be given economic impetus to expand and be changed to computer-based instruction as a means of increasing staff productivity.

Demand changes relate to shifts in output, consumer need and prices paid for library services. Changes in social, technological and instructional factors will generate a different but dynamic demand for information. The pattern and nature of these changes will vary among institutions. However, the ability of libraries to respond to these changes
in demand will greatly determine the size of the resource base which libraries can command through the market mechanism (fee-for-service) or nonmarket (subsidy) channels. In the past, most academic libraries enjoyed a monopoly position, with patrons using the library on the library's terms. Consumer awareness and competition from information brokers and free-lance librarians have eroded the monopoly position. A key issue will be whether the impact of advanced technology and the use of information brokers will so free users from the necessity of going to the library that they can manage to acquire necessary information at work sites or at home. Another issue will be the determination by each institution of the type of library service needed. Some libraries will lean more toward a self-service concept and limit professional activities to locating needed materials in other libraries. Others will build smaller working collections and provide more service in finding information. In either case, emphasis will be placed on reducing user cost and increasing labor productivity.

Supply/demand relationships can be controlled through either market pricing or nonmarket planning and by balancing immediate user needs with postponable needs. The trend toward fee-for-service will continue and expand so that libraries can increase their revenue base. Institutions of higher education will probably continue to fund basic library services from overhead, but special services are likely to be funded from user fees.

Interlibrary loan activity and the use of balance-of-trade accounts by members of library networks are trends which will accelerate. The rise of library networks is clearly linked to the technological innovation of machine-processible on-line bibliographic files coupled with electronic communications and the need for resource-sharing. In large measure, networks are an organizational vehicle for adopting a new technology appropriate to the provision of library service. As such, networks have become a means for spreading both social and technical innovations among libraries, thus serving as institutional change agents. From an economic perspective, library networks can be viewed as market-perfecting institutions. Thus, networks themselves are institutional innovations promoting more efficient linkages of supply and demand.

With respect to supply, networks provide the means for a redivision of labor and specialization of function among libraries and their suppliers and users. Currently this process operates through distribution of library activity among geographic levels (local, regional, national and international), and by subject interest lines (creation of special files and related services for highly specialized sets of clients which are geograph-
ica]ly dispersed). This should lead to new patterns of interaction among libraries and publishers, with potential changes in the scope of library activity.

With respect to demand, networks provide a means for aggregating market demand. By concentrating diffuse demand, networks permit more specialization in the provision of information to smaller market segments. A higher percentage of customer satisfaction can be achieved by the resource-sharing facilitated and provided by networks.

In addition, networks provide a vehicle for resource-pooling to fund research and development effort. By having a more stable economic base for research and development, networks can promote innovations which are more efficient in the use of resources and more responsive to the needs of library consumers. This market-perfecting characteristic of networks is probably the single most significant feature of current innovation in library activity. The existence of multiple networks also can permit greater variation in innovation at modest cost, thus increasing the ability to learn from the innovative process by testing a variety of alternatives under field conditions.

CONCLUSIONS

Changing economic conditions and pressure for greater productivity from the public sector will be the major factors stimulating innovation in libraries. It is clear that institutions of higher education can no longer afford traditional libraries and comprehensive collections. Increasing wage rates and changes in consumer demand will force reallocations of library resources to provide funds for capital investment, more efficient operations and more responsive service. Library innovation will be an accelerating process.

The present level of understanding with regard to innovation is insufficient to provide clear guidance to library policy-makers. There is no general economic theory of innovation to provide the needed framework within which research and development efforts can be evaluated or innovation success predicted.

The likely future for most, and perhaps all, academic libraries will involve increased automation of a variety of labor-intensive processes and greater reliance on network-provided communications and resource-sharing facilities. The goals for libraries will be increased labor and user productivity and efficiency.

Academic libraries will be operating in an increasingly competitive
Economics of Innovation

environment. They will be competing, in some instances, with information brokers for business and with other academic activities for funds. The trend toward charging user fees will accelerate as libraries seek ways to increase their resources.

Finally, it is apparent that economics of library service need further study. Librarians will need to set aside outdated attitudes about library service, risk-taking, money and numbers, and rise to the need to innovate.

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Economics of Innovation


The Psychopathology of Uneconomics

MAURICE B. LINE

This paper makes no pretense to be a scholarly review of the literature on uneconomic things done in, by and for libraries, and the attitudes responsible for and resulting from them. I am not an economist nor a psychologist (let alone a psychopathologist), but a librarian who spent all his working career in university libraries until a few years ago; this paper is a set of personal observations.

The subject of this paper could hardly have been chosen twenty years ago, and if it had been chosen it would hardly have been understood. The idea that libraries should pay much attention to economics is a relatively recent one. Librarians have, of course, always complained of insufficient money to buy all the books they wanted to buy, and to this complaint was frequently added demands for more staff. A big library was, almost by definition, a beautiful library — the bigger the more beautiful. What is relatively recent is the concept that libraries are systems or organizations consuming and deploying capital and recurrent resources that can be optimized — as is the discovery that not only was optimization attained, if at all, only by accident, but that some libraries actually approached "pessimization" by using their resources in almost the least effective way possible. Little in the structure of the university has given the librarian any incentive to think in economic terms. Indeed, there are some inducements not to economize. For example, if he does not spend all his budget in one fiscal year — even if in the process he knowingly wastes money — his budget for the following year may be reduced. There

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SUMMER 1979 107
is no profit motive to inspire the librarian, and there is no paying market for his services. Moreover, many of the most costly elements of the library operations, such as storage, heating and lighting, do not have to be funded from the library budget.

The changes have come about for several reasons. Most obvious is the combination of the increasing growth of published material, with its implications for acquisition and storage costs, and increasing restrictions on funds. This is only an aggravation of a problem that has always existed, but when the problem is aggravated beyond a certain point it almost begins to constitute a new problem. At least as powerful a factor has been an unparalleled increase in demands from users, as their numbers have grown at an enormous rate and as traditional disciplines have given birth to new subdisciplines and broken their boundaries to constitute numerous interdisciplines. Increase in user demand has also been greatly stimulated by improvements in bibliographic control, both in comprehensiveness of coverage and in speed of notification.

These changes in libraries are paralleled by, and are in part the consequence of, changes in their parent institutions. Academic institutions have developed from cottage industries to large and complex organizations absorbing ever-increasing portions of the national (or state) budget. Inevitably, a more careful watch has been kept on the money they spend and how they spend it; and attempts have been made to measure the contribution they make to the economy. Universities have therefore been forced to think in economic terms, to justify their estimates in detail, to allocate their resources with great care, and to measure their outputs. Not only have they had to consider how best to use new resources, but in many cases how to allocate reductions in resources. Various techniques and approaches have burgeoned, such as PPBS and, most recently, zero-based budgeting, which demand that every expenditure be justified from scratch, as if it were entirely new.

These developments have affected the library, as they have every other part of the university. For librarians to say in such circumstances merely that they need more money to buy more books, more staff to serve more readers, and more capital to build new buildings to house more books and readers, is clearly not enough. The apparently fundamental truth that libraries must expand to buy the books available has been challenged by hard reality. Some librarians have still not accepted this fact, maintaining that the hard reality is temporary, while the need for growth is eternal. Other librarians, perhaps making a virtue of necessity or perhaps by a happy coincidence, have challenged the very concept of
"big is beautiful," arguing that the criterion by which libraries must be judged is not their size but their service. By this reasoning, the library is no longer a thing-in-itself but an integral element in the university, in scholarly communication, in education and in society itself; it can be understood only in relation to its context, and the main commodity in which it deals is not books but information. There has been a gradual but profound shift from the book-oriented library to the user- and information-oriented library, from the more or less self-sufficient collection to the switching center, from the storehouse of knowledge and cultural heritage to the information broker. The conventional objectives of the library have thus been challenged. It is not, of course, axiomatic that the information center is always cheaper than the conventional library; it is quite possible to save money on books and waste it in other ways.

The question of the library's objectives is vital to economic considerations, because economies cannot sensibly be discussed except with reference to objectives. To run the library as economically as possible is not a meaningful objective unless the "library" is defined, any more than economy in itself can be a principal aim; otherwise, the most economic library would be one that was closed down and its contents dispersed. Economic success or failure depends on what one is trying to achieve.

Almost all librarians have been forced by economic pressures to re-examine not only their functions, but also the methods by which they try to achieve them. Here, too, recent years have seen some fundamental questioning, striking at the roots of traditional theory and practice. In this case, librarians have not generally had to conduct their reexamination in public in order to justify their estimates; rather, they have been obliged to try to economize in order to keep within their reduced budgets, and the debate has been an internal and private one. The question "How can we reduce the costs of the present catalog on its present lines?" must have been asked by many librarians for many years. "Do you need a catalog at all, and if so, what sort?" is a much more fundamental question, which librarians have been most reluctant to answer, let alone ask. Skipping the first part of the question, they have tended to answer, "One with the fullest details, of course." This answer is not necessarily true, even if the need for a catalog is assumed and the time and convenience of use taken into account; the fullest catalog is not necessarily the one that serves readers best. However, again assuming that a catalog is needed, it is reasonable to ask: "What is the best catalog that can be provided at the least cost?" In the attempt to answer this question, a better catalog — one that serves more readers more adequately — may be designed than if no costs are
taken into account. Similar questions may be, and have been, asked about classification and subject indexing, issue systems, acquisition systems, and other routine practices and operations.

Among the various economies that might be made in a library with more or less conventional objectives are the following:

1. Cataloging is a very labor-intensive operation. Costs can be cut, perhaps by half, by the use of records from an external data base, use of lower-level staff, and shorter records.

2. Classification in most libraries is at least as costly as cataloging, and often more so. The more detailed it is, the more costly it is to use, and still greater costs are incurred when changes are introduced into the scheme. For browsing purposes, extreme detail may be more confusing than helpful, while for information retrieval, few classifications are sufficiently detailed or convenient to use.

3. Subject indexing along traditional lines is also very costly. It can be reduced by the use of keywords in titles, enhanced where absolutely necessary. The cost can be eliminated entirely if bibliographies are used to guide readers to books on specific topics, just as abstracting and indexing services are used for subject access to journal articles.

4. Book selection can absorb a great deal of staff time and effort, although it appears that many books are still selected that are never used at all. Crude selection might be just as effective and a lot cheaper.

5. Acquisition budgets, especially for journals but also for books, can in many cases be greatly reduced with only a minimal reduction in service. Since in any large library the vast majority of demand falls on a small proportion of the collection, trimming the fringes does no harm and can produce great savings in staff, processing and binding costs as well as in purchase costs.

6. Permanent retention of stock that need never have been acquired in the first place, or that served its entire purpose long ago, is expensive because of the space it occupies. Even if discarding costs are not negligible, they should be easily outweighed by space savings over a period of ten or twenty years at the longest.

Most of the above examples concern methods of providing access to books that have been acquired, but the last two represent an attack on acquisitions and disposal—a more fundamental attack, because the stock, according to the traditional concept, is the heart of the library, without which it would not be a library at all. To suggest that cataloging and classification can be simplified is bad enough; to suggest that fewer books
Psychopathology of Uneconomics

might be bought and more discarded is much worse. The ultimate blasphemy is to suggest that the library need not even ask for as much money as it does, either for staff, books or buildings. The largest savings can usually be made in the area of staff, since several tasks could be eliminated or simplified, or carried out by lower-level staff than at present.

The application of economics need not, of course, concern only a reduction of existing costs. The increased utilization of capital resources of stock, and of the skill and expertise of staff, is an economic good, and this can be encouraged by improved circulation practices and policies, and by opening the doors of the library more readily to outsiders. It may even be possible to earn money for the library by selling services to industrial organizations.

Money saved in one or more of the above ways can be used in various ways—if indeed the reason for saving in the first place is not a reduced budget. For example, more can be spent on services and less on processing; a wider variety of current books may be bought, cheaply processed and drastically weeded after four or five years; and so on. The question must always be what kinds of services users really need, and how best to provide them.

When the attackers are from "outside" the library—from the university or its funding bodies—they can be dismissed as ignorant barbarians, appeased as angry gods, or submitted to as irresistible conquerors. However, much of the assault in recent years has come from within the library community itself, and this has been more difficult to deal with. Wherever the attacks and pressures have come from, librarians have generally been singularly unprepared for them. In few cases have they even known what the true costs of their existing operations are. This ignorance has had some strange results. For example, gifts of books, however useless, have been welcomed as "free," although the costs of processing books are high (indeed, considerably higher than the purchase price of most deliberately acquired books). Journals are all bound and stored permanently, when it may be far cheaper to discard some of them unbound after two or three years and rely on interlibrary loans for the occasional requirement. Numerous other examples could be given of uneconomic things done in unwitting or willful ignorance.

The reactions and responses of librarians to economic pressures may take a variety of forms, not necessarily mutually exclusive. Some of these are described below.

The simplest response is the traditional. This response takes the form not of an argument, but of an assertion that the library is by definition a
collection of books, as large as possible, cataloged, classified and indexed according to traditional standards. “We must be very careful before we change established practices” is a common expression of this attitude.

Allied to the traditional response is the perfectionist response: “Only the best is good enough; we must maintain our standards.” “Best” and “standards” are undefined, but are usually assumed to mean “most detailed and elaborate.” One manifestation of the perfectionist attitude is the urge toward constant improvement, whatever its cost. It is cause for some amazement that new and “improved” cataloging rules and revised classification schemes can be, and frequently are, devised and adopted without full prior consideration of the costs of implementing them.

Also related is the cultural response: “The library is a storehouse of culture, and to damage or erode it in any way is to damage or erode the cultural heritage.” This is indeed true of national archival collections and portions of many other libraries, but not of the generality of libraries, which are funded by institutions in order to serve them here and now. Some librarians appear all too ready to sacrifice the needs of the present, which can be known and largely met, to the dead needs of the past and the unknown needs of the future.

Allied with any of the above may be passive resistance: “Don’t do anything and it may go away; it’s only a fad that will go the way of other fads.” This response may be deliberate (and sometimes quite effective), or it may represent the paralysis of the rabbit confronted by the snake. It may be expressed openly as the mañana approach: “Make my library economic, or University, but not yet.”

The above attitudes do not enable libraries to avoid the hard facts of economics, but they can easily result in their sub-optimizing — doing the same thing, only a little less expensively: buying fewer rare books, spending a little less on rebinding, and so on. More commonly, these attitudes are combined with some of those below, or those below are used as “fronts” for those above.

The political response appeals to prestige and status: “To reduce our acquisitions would gradually make our library smaller than X or Y, and we might even fall behind Z.” The fact that the most prestigious universities tend to have the biggest libraries is adduced in support of this argument, although the most obvious reason for this fact is that the most prestigious universities usually have the most money to spend on libraries, as on other things. (They also tend to have the oldest buildings, to enhance their university status.)
Psychopathology of Uneconomics

The psychological or pseudo-altruistic response is also quite popular: "Users won't stand for it/won't adjust to it/shouldn't be expected to accept it"; "You can't recruit staff to work in a library with reduced acquisitions/a withdrawal policy/simplified processing"; "Libraries must be thought of in terms of individual users whose needs are all different—optimization is concerned only with groups and averages." The obvious answer to this is that a library that tries to satisfy everyone is in danger of satisfying no one; and that a library whose basic procedures are geared to the greatest good of the greatest number can still aim to serve individual needs as exceptions.

Another group of responses apparently concedes something to the economic approach, and can carry some superficial and temporary conviction. The first is the mini-economic response: "But I am economizing—I saved $1000 last year by using a different printer for bookplates." The implication is that the librarian has looked at all details of his operations to see where economies might be made.

More impressive is the pseudo-economic, expressed in "cooperation" and "resource-sharing." On investigation, most exercises in resource-sharing appear to save little or no money, but cost quite a lot to operate. Very often, more money is spent on making more extensive resources available to a group of libraries, though the use of these resources, and the costs of satisfying the occasional needs through other channels, are rarely compared with the cost of this additional provision. (In the United Kingdom, the argument that resource-sharing saves money has now been virtually abandoned, and it is admitted that more money is needed for it, though little or no evidence is offered that the need for it is there in the first place.)

The marginal-economic approach argues that while some aspects of libraries can and should be costed, these are only minor, and the most important things cannot be measured, let alone costed. "What is the value of information?" is a popular question with this school, as are assertions about the value of browsing, which is usually confused with serendipity. (Incidentally, serendipity would be best served by the random arrangement of books on the shelves, which would avoid classification and thus save a great deal of money.) It can easily be shown that some things cannot be measured, and the implication is that the economic approach should therefore be used only in marginal ways, and then very carefully.

The false economy riposte is also common: "It costs too much to change procedures; discarding costs more money than new buildings; interlibrary borrowing costs more than acquisition," and so on. If these
statements are not made as mere assertions, they are supported by one-sided and shortsighted costings. One can make procedural change, discarding or interlibrary borrowing cost whatever one likes, within limits, just as other costs, such as those for storage (including the cost of half-empty buildings), can be ignored or minimized. This is not to say, of course, that change should not be costed before it is decided upon, that discarding is cost-free or that it should be applied to any but very little-used stock, or that it is not more economical to buy books of which more than minimal use can be expected. The full economic facts are needed in all cases.

The overkill response is less often encountered, but not unknown: “There is no point in altering the present system because the whole pattern of primary communication will change in the foreseeable future”; or “We have a very big automation program ahead which will change all our procedures anyway” — whether for the better or worse, or at what cost, is rarely stated. This is in fact a subtle variant, albeit starting from different premises, of the mañana approach. It can carry some conviction because the librarian appears to be forward-looking; indeed, his eyes are looking so far forward that he is in danger of falling into an economic pit a few yards in front of him.

Most of these responses have something to be said for them, and a reasonable, or at least plausible, case can often be made in their support. However, they can also be rationalizations for attitudes based on deep and often primitive emotions. Of these, insecurity is probably the main one, leading to fear of change, acquisitiveness, reluctance to shed possessions, and clinging to the past. Also, many librarians are not ready to accept that their past training — in history, literature or philosophy — is an irrelevant anachronism. To recognize oneself as a dodo on the way to extinction cannot be a happy experience.

Emotions such as these are so universal that it may seem hard to refer to them as pathological. They are pathological only if their existence and strength are not recognized and if they intrude into decisions that should be made on rational grounds. The personal emotions of librarians have no place in running an efficient library service. However, the personal emotions, and likely reactions, of users certainly must be taken into account. Moreover, a wise library director would not attempt to ride roughshod over the primitive emotions of his own staff: they too have to be persuaded. A rational librarian has, as part of the process of reaching a rational decision and implementing it, to consider the psychopathology of others as one essential fact, as real as library procedures and costs. In
other words, he should be an amateur psychologist as well as an amateur economist.

So far I have considered the responses of those who oppose or resist change, arguing that many of them have a psychopathological basis. However, it is equally true that there is a psychopathology of excessive change. The conservative traditionalist is, or was, a more common type in libraries than the restless “change-for-change’s-sake” librarian, but the latter has gained much ground in recent years. Automation programs in the 1960s provided many striking examples of bandwagon jumping. Some experiments undoubtedly had to be conducted in order to find out how best to use the power of the computer, and in the process some mistakes were bound to be made. Deliberate experimentation is, however, something different from the exceedingly incautious programs embarked upon in some libraries—programs on which much money was wasted. There must be numerous other, less spectacular, examples of forward plans that were never properly costed but were entered into as facts of faith. There is some danger that massive withdrawal programs will fall into this category, though the obstacles to such programs are so great, and withdrawal decisions involve so many people besides the librarian, that overly hasty action is less likely than with automation.

A different pathological type is the hypereconomist. This is the librarian who tries to reduce everything to numbers and costs, who considers that what cannot be measured either does not exist, or should not exist, or is not worth bothering about if it does exist. The term “cost effectiveness” is ever on his lips, and value judgments are alien to his conceptual world. He may appear at first to be at an opposite extreme to the overcautious traditionalist concerned with the perfectibility of cataloging, but in fact he is a mutation of the same species. Like the professionalist cataloger, he is an obsessional, insecure individual who seeks security, not in catalog entries but in numbers. The one catalogs and classifies experience; the other counts and costs it. Both feel safer because they have reduced the infinite range and variety of knowledge and life to something visible, filable or measurable. The hypereconomist is merely a perfectionist who has learned a bit of economics, or perhaps a second-rate economist who has strayed into libraries and seen easy pickings there. There may in fact be a place for these people, for a time at least. If it had not been for obsessional counters like Sir Francis Galton, the science of statistics would have developed more slowly (though it may still be doubted whether Galton’s efforts to measure the protuberance of Hottentot women’s bottoms or the efficacy of prayer constituted great advances in the field).
in knowledge). Likewise, a few obsessional hypereconomists may be a useful counterbalance to the uneconomists of the past.

Discussion to this point has made the uneconomic or hypereconomic librarian the object of scrutiny. However, libraries do not exist without users (in spite of the efforts of some librarians), and the total ecology and economy of libraries must take users into account.

The attitudes of faculty toward an economic approach to libraries are likely to be ambivalent. On the one hand, the library is competing with departments for limited institutional funds, and it is in the faculty's interest to resist increases, or even to seek reductions, in the library's budget. On the other hand, one of the main resources of research — in the humanities and many of the social sciences, the main resource — is the book collection, and every department wants as good a collection as possible. The department may react to this clash of interests with confusion, or by arguing different ways on different occasions, or by pressing for more library funds for books in their subjects and for fewer in other subjects. Attitudes may be partly determined by the nature of the discipline. A historian is less likely to take, or accept as valid, the economic approach than an economist, a technologist or even a physicist; his values will be different, and he will be less likely to view resource allocation in a systematic or scientific way.

However, faculty reactions are not generally predictable. What can usually be predicted is that if the librarian cuts resources or services in particular subjects or areas, there will be an angry response, even if the cuts are the direct result of budgetary reductions approved by the faculty itself. Similarly, if the librarian reallocates resources from stock to services — sacrificing, say, some acquisitions in order to pay for better information services in the form of access to computer data bases — there may well be an outcry. Even if it can be shown that the service aids faculty in its research and teaching more than stock, faculty still tend to prefer stock; and if they have the choice of sacrificing primary literature or secondary services such as indexing and abstracting journals, they will sacrifice the latter. If a suggestion is made that some stock could be disposed of or relegated to low-use storage, there are protests from faculty, even when it can be shown that none of the present faculty has used any of the stock in question, or that much of it has never been used by anyone.

The desire to maintain the stock in a department's own subject is understandable enough; the unwillingness to accept services instead of stock, or to accept relocation of unused material is not rational, and comes at least partly within the realm of psychopathology. The possessive instinct
familiar to nearly everyone is one obvious explanation. No one likes to throw away household goods acquired years ago or inherited, even though they have never been used; after all, “it may become useful some time.”

Apart from possessiveness about stock, faculty do not exhibit much psychopathology. They may want or expect the library to do uneconomic things, but this rarely becomes a major issue. Also, faculty can use libraries in uneconomic ways unwittingly. For example, they may ask for some documents on interlibrary loan that they would not request if they were aware of the true cost of borrowing. Indeed, faculty use of libraries takes place in almost total ignorance of the actual and relative costs of different activities, so that uneconomic behavior is inevitable. Education in the economic facts of libraries rather than psychological treatment is indicated for faculty; and this is the responsibility of the librarian.

The attitude of students is less easy to identify or categorize because it varies so much, both within and between generations (student generations are very short), and because students are generally not much concerned with the economic operation of the university. The only time they want the library to economize is when they take up some particular cause, such as free contraception for themselves or Stetsons for poor Peruvian Indians, which they consider to be a more important use of funds.

More often, students want more books on their subjects, more copies of books, more space in which to work and, in general, more of everything. There may be some conflict with faculty, since with a limited budget it may not be possible to provide enough textbooks for all students as well as serve faculty research needs adequately.

One quite common student attitude is a reaction against hypereconomics, not on traditional and conservative grounds but on antiscientific grounds. The spirit, emotions and senses are everything; reason, particularly as exemplified in science, economics and statistics, is nothing. Indeed, the whole library may be seen as a storehouse of the knowledge and reason they detest, and acts of arson and other forms of destruction have not been unknown. These are truly pathological.

The university administrator must not be ignored. It is from or through him that pressures to economize come, and he is much more likely to be concerned with economy than effectiveness, let alone cultural values. He may, however, be open to conviction that the library is a valuable cultural asset to the university, and hence worth defending. He may within himself contain the conflict between various warring elements in the university at large—the admirer of size and prestige versus the cost-con-
scious administrator, the preserver of culture versus the servant of modern science and technology.

With all these existing conflicting attitudes and values, the ensuing debate is bound to bring forth some prime examples of psychopathology. The net result may be the worst of all possible economic worlds, but is more likely to be a sad compromise between hard economic facts, entrenched attitudes, the needs of the majority, and the wishes of the powerful. There is all the more need for a librarian to have appropriate knowledge and apply it carefully and rationally. The forces of unreason have much more chance of victory when a rational case is not argued fully or carefully presented.

Library directors may presently be pulled in two different directions: toward the humanistic and cultural approach, in which many of them were bred and which can seem antipathetic to an economic approach; and toward a half-baked economic approach which can be destructive as well as superficial. The solution surely lies in better education and a more comprehensive vision. Library education must not merely teach a few economic techniques, but inculcate as deeply as possible an economic and systematic approach. This is all the more vital because libraries, as non-profit organizations, offer very little economic motivation — no extra money is to be earned by economizing. Library administrators, at whatever level, spend most of their time in problem-solving — small day-to-day problems as they arise, and much larger, long-term problems (which really must be solved first if wise day-to-day decisions are to be made). The automatic approach to any problem should be to analyze it, identify possible solutions, and compare the various options for costs and effectiveness. Librarians do not all need to be economists or systems analysts, but the economic and systematic attitude toward the library should be second nature.

This alone is not enough, and a comprehensive vision is needed that embraces cultural and humanistic values as well as economics and systems analysis. Far from being in fundamental conflict, the two should be seen as complementary. The library needs to be run economically and effectively in order to provide the best possible service with the resources available. If it is not run economically and effectively, a few may receive a good service at the expense of the many. Nor is designing the basic system to satisfy the most common needs speedily and efficiently in conflict with serving special and individual needs; these can in fact be served better, if the main system runs smoothly and there is spare capacity to provide individual service where it is needed. In place of the commercial objective
Psychopathology of Uneconomics

of the maximization of profit, the librarian's objective should be the maximization of service.

Economics must be seen as the servant of the library user, and of the objectives of the university, including cultural and even traditional objectives. To question radically the means by which values are served is not necessarily to question the values themselves. The implication of this is that some economics certainly must be taught to librarians but only in a much wider context. And librarians need to be constantly reminded that they are supposed to be serving users, not books, shelves, catalogs or buildings. Finally, none of these skills is of much practical use unless the library director develops political skills: he can learn from Machiavelli as well as Panizzi.
ACRONYMS

ARL — Association of Research Libraries
CONTU — National Commission on New Technological Uses of Copyrighted Works
FY — Fiscal Year
GNP — Gross National Product
ILL — Interlibrary Loan
ILLINET — Illinois Library Network
MIT — Massachusetts Institute of Technology
PPBS — Program Planning and Budgeting System
Essential reading for librarians involved in the economic considerations of automation:

Recent Proceedings of the Annual Clinic on Library Applications of Data Processing

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Published by the University of Illinois Graduate School of Library Science

Available from:
Publications Office/249 Armory Bldg.
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<td>V. 11 N. 1 Library Boards</td>
<td>J. Archer Eggen</td>
<td>July 1962</td>
</tr>
<tr>
<td>V. 11 N. 4 Financial Administration of Libraries</td>
<td>Ralph H. Parker</td>
<td>April 1963</td>
</tr>
<tr>
<td>V. 12 N. 1 Public Library Service to Children</td>
<td>Winifred C. Ladley</td>
<td>July 1963</td>
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<tr>
<td>V. 12 N. 2 Education for Librarianship Abroad in Selected Countries</td>
<td>J. Clement Harrison</td>
<td>Oct. 1963</td>
</tr>
<tr>
<td>V. 12 N. 3 Current Trends in Reference Services</td>
<td>Margaret Knox Goggin</td>
<td>Jan. 1964</td>
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<tr>
<td>V. 12 N. 4 European University Libraries: Current Status and Developments</td>
<td>Robert Vesper</td>
<td>April 1964</td>
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<tr>
<td>V. 13 N. 1 Research Methods in Librarianship</td>
<td>Guy Garrison</td>
<td>July 1964</td>
</tr>
<tr>
<td>V. 13 N. 2 State and Local History in Libraries</td>
<td>Clyde Walton</td>
<td>Oct. 1964</td>
</tr>
<tr>
<td>V. 13 N. 3 Regional Public Library Systems</td>
<td>Hannis S. Smith</td>
<td>Jan. 1965</td>
</tr>
<tr>
<td>V. 13 N. 4 Library Furniture and Furnishings</td>
<td>Frazer G. Poole</td>
<td>April 1965</td>
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<tr>
<td>V. 14 N. 1 Metropolitan Public Library Problems Around the World</td>
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<td>Jul 1965</td>
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<tr>
<td>V. 14 N. 2 Junior College Libraries</td>
<td>Charles L. Trinkner</td>
<td>Oct. 1965</td>
</tr>
<tr>
<td>V. 14 N. 3 Library Service to Industry</td>
<td>Katharine G. Harris</td>
<td>Jan. 1966</td>
</tr>
<tr>
<td>V. 14 N. 4 Current Trends in Branch Libraries</td>
<td>Eugene B. Jackson</td>
<td>Apr. 1966</td>
</tr>
<tr>
<td>V. 15 N. 1 Government Publications</td>
<td>Thomas S. Shaw</td>
<td>July 1966</td>
</tr>
<tr>
<td>V. 16 N. 1 Cooperative and Centralized Cataloging</td>
<td>Esther J. Piercy</td>
<td>July 1967</td>
</tr>
<tr>
<td>V. 16 N. 2 Library Uses of the New Media of Communication</td>
<td>Robert L. Talmadge</td>
<td>Oct. 1967</td>
</tr>
<tr>
<td>V. 16 N. 3 Abstracting Services</td>
<td>C. Walter Stone</td>
<td>Jan. 1968</td>
</tr>
<tr>
<td>V. 16 N. 4 School Library Services and Administration at the School District Level</td>
<td>Foster E. Mohrhardt</td>
<td>Apr. 1968</td>
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<tr>
<td>V. 17 N. 1 Group Services in Public Libraries</td>
<td>Sara K. Strygle</td>
<td>Jul 1968</td>
</tr>
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<td>V. 17 N. 2 Young Adults Service in the Public Library</td>
<td>Audrey Biel</td>
<td>Oct. 1968</td>
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<tr>
<td>V. 17 N. 3 Development in National Documentation and Information Services</td>
<td>H. C. Campbell</td>
<td>Jan. 1969</td>
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<tr>
<td>V. 17 N. 4 The Changing Nature of the School Library</td>
<td>Mae Graham</td>
<td>Apr. 1969</td>
</tr>
<tr>
<td>V. 18 N. 1 Trends in College Librarianship</td>
<td>H. Vail Deale</td>
<td>July 1969</td>
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<tr>
<td>V. 19 N. 1 Intellectual Freedom</td>
<td>Everett T. Moore</td>
<td>July 1970</td>
</tr>
<tr>
<td>V. 19 N. 3 Book Storage</td>
<td>Mary B. Cassata</td>
<td>Jan. 1971</td>
</tr>
<tr>
<td>V. 19 N. 4 New Dimensions in Educational Technology for Multi-Media Centers</td>
<td>Philip Lewis</td>
<td>Apr. 1971</td>
</tr>
<tr>
<td>V. 20 N. 1 Personnel Development and Continuing Education in Librarians</td>
<td>Elizabeth W. Stone</td>
<td>July 1971</td>
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<tr>
<td>V. 20 N. 2 Library Programs and Services to the Disadvantaged</td>
<td>Helen H. Lyman</td>
<td>Oct. 1971</td>
</tr>
<tr>
<td>V. 20 N. 3 The Influence of American Librarianship Abroad</td>
<td>Cecil K. Byrd</td>
<td>Jan. 1972</td>
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<tr>
<td>V. 20 N. 4 Current Trends in Urban Main Libraries</td>
<td>Larry Earl Bone</td>
<td>Apr. 1972</td>
</tr>
<tr>
<td>V. 21 N. 1 Trends in Archival and Reference Collections of Recorded Sound</td>
<td>Gordon Stevenson</td>
<td>July 1972</td>
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<tr>
<td>V. 21 N. 3 Library Services to the Aging</td>
<td>Eleanor Phinney</td>
<td>Jan. 1973</td>
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<tr>
<td>V. 22 N. 1 Analyses of Bibliographies</td>
<td>H. R. Simon</td>
<td>July 1973</td>
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<tr>
<td>V. 22 N. 2 Research in the Fields of Reading and Communication</td>
<td>Alice Lobner</td>
<td>Oct. 1975</td>
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<tr>
<td>V. 22 N. 3 Evaluation of Library Services</td>
<td>Sarah Reed</td>
<td>Jan. 1974</td>
</tr>
<tr>
<td>V. 22 N. 4 Science Materials for Children and Young People</td>
<td>George S. Bonn</td>
<td>Apr. 1974</td>
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<tr>
<td>V.</td>
<td>23 N. 1</td>
<td>Health Sciences Libraries</td>
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<td>23 2</td>
<td>Library Services in Metropolitan Areas</td>
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<td>23 4</td>
<td>Resource Allocation in Library Management</td>
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<td>24 2</td>
<td>Library Cooperation</td>
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<tr>
<td></td>
<td>24 3</td>
<td>Community Analysis and Libraries</td>
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<td>24 4</td>
<td>Commercial Library Supply Houses</td>
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<tr>
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<td>25 N. 1</td>
<td>American Library History: 1876-1976</td>
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<tr>
<td></td>
<td>25 4</td>
<td>Trends in the Scholarly Use of Library Resources</td>
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<td>26 N. 1</td>
<td>Library Services to Correctional Facilities</td>
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<tr>
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<td>26 2</td>
<td>Trends in the Governance of Libraries</td>
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<tr>
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<td>26 3</td>
<td>Institution Libraries</td>
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<td>26 4</td>
<td>Publishing in the Third World</td>
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<td>27 N. 1</td>
<td>Films in Public Libraries</td>
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<td>27 2</td>
<td>State Library Development Agencies</td>
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<td>27 3</td>
<td>Libraries and Society</td>
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<tr>
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<td>27 4</td>
<td>Study and Collecting of Historical Children's Books</td>
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<td>V.</td>
<td>28 N. 1</td>
<td>Economics of Academic Librarians</td>
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