This annotated and preliminary bibliography emphasizes applications of cost-effectiveness (C/E) and cost-benefit (C/B) analyses to problems in the civilian economy. The entries are organized so that the user may identify works in which these techniques are applied to problems in specific areas such as transportation, communication, and health. No attempt has been made to include basic books on the theory of the subject, articles describing limitations of these techniques or methods, or discussions on costing and problems of establishing effectiveness criteria that do not combine these two study elements. C/B and C/E techniques are closely related to planning-programming-budgeting (PPB) and a host of other resource-allocation methods. Entries involving these subjects are included only when they emphasize application of C/B or C/E techniques. With a few exceptions, military-oriented references are excluded. Because of their broad coverage, including studies which may be useful in solving problems in the civilian economy, the most relevant volumes from Defense Documentation Center compilations are cited. (Author/AB)
COST-BENEFIT AND COST-EFFECTIVENESS ANALYSES:
A BIBLIOGRAPHY OF APPLICATIONS IN THE CIVILIAN ECONOMY

Norman J. Crum
Technical Information Specialist

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TEMPO
GENERAL ELECTRIC COMPANY
CENTER FOR ADVANCED STUDIES
SANTA BARBARA, CALIFORNIA
This bibliography was prepared under General Electric TEMPO Development Authorization Number 1308122. It is one of the continuing efforts by TEMPO's Technical Information Center to serve the Professional Staff.

An increasing need has been expressed by that staff for a convenient listing of representative cost-effectiveness (C/E) and cost-benefit (C/B) application studies. Awareness of the need for and interest in such a compilation are shared with such professional groups as the C/E Section of the Operations Research Society of America. Mr. Harry Hatry, a former TEMPO staff member and former Chairman of the C/E Section of ORSA, several years ago recognized the need for such control of the literature.

This work provides the nucleus for a more comprehensive work. Based on a highly selective and limited number of references, its format only suggests one of the possible alternatives. Suggestions for improvements in structuring the materials for more effective use will be appreciated.

David S. Fields
Member, TEMPO Professional Staff

April 1969
Santa Barbara, California
INTRODUCTION

This annotated and preliminary bibliography emphasizes applications of cost-effectiveness (C/E) and cost-benefit (C/B) analyses to problems in the civilian economy. The entries are organized so that the user may identify works in which these techniques are applied to problems in specific areas such as transportation, communication, and health. No attempt has been made to include basic books on the theory of the subject, such as those written by Charles Hitch and Roland McKean, articles describing limitations of these techniques or methods, per se, or discussions on costing and problems of establishing effectiveness criteria that do not combine these two study elements. Exclusion of these works is not meant to minimize their importance to the popularization and development of the subject. In achieving the present selection, a considerable amount of this other literature has been scanned and documented elsewhere.

C/B and C/E techniques are closely related to planning-programming-budgeting (PPB) and a host of other resource-allocation methods. Entries involving these subjects, however, are included only when they emphasize application of C/B or C/E techniques. With a few exceptions, military-oriented references are excluded. Because of their broad coverage, including many studies which may be useful in solving problems in the civilian economy, the most relevant volumes from the Defense Documentation Center compilations are cited.

This bibliography does not pretend to cover a substantial portion of all works on this subject. It does, however, include representative works in each of the 11 major application areas around which it is organized.

The arrangement is largely alphabetically by the major application area, e.g., COMMUNICATIONS, except for three instances. Bibliographies are given in the first category since these may be useful in seeking out additional sources of information. When a publication deals with a variety of applications, it is listed within the second category SEVERAL APPLICATIONS. The last category MISCELLANEOUS APPLICATIONS includes a variety of application areas wherein only an item or two were found for inclusion.
## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOREWORD</td>
<td>iii</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>v</td>
</tr>
<tr>
<td>BIBLIOGRAPHIES</td>
<td>1</td>
</tr>
<tr>
<td>SEVERAL APPLICATIONS</td>
<td>2</td>
</tr>
<tr>
<td>COMMUNICATIONS</td>
<td>3</td>
</tr>
<tr>
<td>ECONOMIC DEVELOPMENT</td>
<td>4</td>
</tr>
<tr>
<td>EDUCATION</td>
<td>6</td>
</tr>
<tr>
<td>HEALTH</td>
<td>8</td>
</tr>
<tr>
<td>HOUSING</td>
<td>10</td>
</tr>
<tr>
<td>POLLUTION</td>
<td>11</td>
</tr>
<tr>
<td>RESEARCH AND DEVELOPMENT</td>
<td>11</td>
</tr>
<tr>
<td>STATE AND LOCAL GOVERNMENT FUNCTIONS</td>
<td>12</td>
</tr>
<tr>
<td>TRANSPORTATION</td>
<td>13</td>
</tr>
<tr>
<td>VOCATIONAL TRAINING</td>
<td>15</td>
</tr>
<tr>
<td>WATER</td>
<td>17</td>
</tr>
<tr>
<td>MISCELLANEOUS APPLICATIONS</td>
<td>19</td>
</tr>
</tbody>
</table>
A list of about 50 briefly annotated articles on cost-effectiveness that appeared in 1966.

Public Management Sources (periodical). Bureau of the Budget Library/Executive Office of the President.
Most issues include references to some writings on cost-benefit analysis.

"The portion on cost-benefit analysis contains sections on general defense; health, education, and welfare; public investments; resource development; transportation; and urban development."*

Supplements and updates a bibliography with the same title in November 1966.
"New studies on cost-benefit analysis techniques and significant titles inadvertently omitted in the previous compilation have been included." Covers general applications as well as broad subject areas, e.g., community development; foreign aid; health, education, and welfare; highways; R&D; resource development; and transportation.

Identifies a number of studies related to nondefense areas: Community development and services; health, education, and welfare; highways; resource development; and transportation.

A compilation of references mainly concerned with R&D decision making, management problems, design tradeoffs, related cost estimates, and systems-value engineering. This is one of a series of Defense Document Center bibliographies on cost effectiveness and related areas. The emphasis is largely defense, and, accordingly, a number are classified.

*Material in quotations in the annotations originates from the respective documents.*
SEVERAL APPLICATIONS


References with annotations on cost-effectiveness analysis and cost references related to cost estimation and evaluation, cost effectiveness, cost analysis and methodology in research and development, management, decision making and systems-value engineering. Contains a collection of 160 unclassified references in the Defense Documentation Center data bank that have been cataloged since 1967.


Same as Volume I in scope and content. However, this volume has 166 unclassified-limited references. Volume I and Volume II are updates of Defense Documentation Center report bibliographies on cost-effectiveness analysis: AD-808 900, AD-808 901, AD-863 902, AD-379 600, AD-379 601, AD-379 602, and AD-379 603.


Published jointly with the Technical Library.

SEVERAL APPLICATIONS


Papers presented at a conference held at the Brookings Institution in November 1963. The seven contexts covered are R&D expenditures, outdoor recreation projects, education programs, federal aviation expenditures, highway programs, urban renewal projects, and public health programs.


"Section III deals with Particular Applications and discusses some of the detailed issues arising from the applications of cost-benefit analysis in various fields: water projects (irrigation, flood control, hydroelectric, multipurpose schemes); transport projects (roads, railways, inland waterways); land usage (urban renewal, recreation, land reclamation); and health, education, and other fields (research and development, defense)."


Full texts of papers presented at this symposium sponsored by the Washington Operations Research Council, 13-14 March 1967. Papers include applications of cost-benefit analysis to education, identification of hazardous highway locations, industry, and other civilian areas.


Concludes that the benefits of the Ford Foundation proposal would far exceed the costs.


"An economic evaluation of the costs and potential benefits of broadcasting radar information to general aviation aircraft via TV relay was performed. Benefits were equated to costs of general aviation accidents that might be prevented by broadcasting weather data, area route information, or positions of other aircraft."
ECONOMIC DEVELOPMENT


“One of the most significant findings of the study lies in the area of increased effectiveness and reduced costs which will result from centralization of communications services. Not unlike most other states, Mississippi agencies have attempted to solve communications problems on an individual agency basis.”


Includes positive and negative cost-effectiveness arguments for computer utility.


“Comparison is made of the cost to the FAA, of wireline remoting of digitalized radar and beacon data (and beacon only) to air-route traffic-control centers with the costs for microwave remoting of the same information in analog form.”

ECONOMIC DEVELOPMENT


A cost-benefit analysis of the feasibility of a low-rent public-housing project in the Pine Ridge Indian Reservation is presented. The benefits isolated for measurement are (1) improved productivity, hence earnings, via increased motivation and decreased absenteeism of the rehoused work force, (2) improved school attendance with its deferred impact on income, (3) improved health with lower costs of medical care, and (4) income to the sponsoring agency in the form of rents. The benefit-cost ratio was estimated as 1.35. A socioeconomic conflict arose however, because lower-income families were discouraged from raising their earnings in order to retain the housing.


“Various cost-benefit analyses suggest that the dollar return to governments on planned parenthood expenditures, in terms of saved welfare benefits, ranges upwards from 25 to 1. It is widely believed among many social workers that public funds to assist poor families to limit their progeny can be a more effective anti-poverty measure than any other in the long run. For those poor families that otherwise would have an additional and unwanted child within a year, birth control assistance brings some relief within 12 months.”

“This study analyzes, for the dynamic economy of a typical less-developed country (LDC), the significance for economic development over 30 years of gradual reductions in age-specific fertility rates (assumed to result from a government-supported birth reduction campaign).”


Explores some of the problems of formulating investment criteria for the public sector of a mixed-enterprise, underdeveloped economy (India).


Describes various approaches and shows how systems analysis and cost-benefit methods used in business and in solving defense problems can be adapted for development aid. Also suggests that methods adapted from economic analysis can be used for testing criteria for validity and for identifying the scarce resources that should be the basis for costing.


“An evaluation model is developed to assist the Economic Development Administration in allocating resources among requests for financial assistance from regions in the United States where high rates of unemployment chronically exist. The major criteria for accepting or rejecting a proposed project are the increase in flow of family income in the area because of the project, the ratio of this income increase to the cost of the project, and the project’s impact on unemployment.”


Policies covering the redistribution of labor among regions, industries, and occupations and redundancy problems resulting from the redistribution.


EDUCATION


Alternative measures of resource flows. Donors' cost approach; recipients' benefit approach.

EDUCATION


Report of work done under contracts HEW 05-67-55 (A Survey and Preliminary Cost-Benefit Analysis in Elementary and Secondary Education) and OEC-D-8-08042-3513 (Analyses of Compensatory Education within Schools from Five Major School Districts). Detailed findings of the first study are described in an earlier TEMPO report, Survey and Analysis of Results from Title I for Compensatory Education.


"Projected cost-effectiveness comparisons based on the assumption of equal effectiveness for CAI and TAI are discussed for both civilian and military instruction."


"Presents a general method of estimating the benefit-cost ratio of investment in schooling and draws some inferences concerning the development in farm areas in underdeveloped countries."


Estimates the effects on income of education expenditures.


Papers presented at the meeting on "Budgeting, Programme Analysis and Cost-Effectiveness in Educational Planning" held in April 1968 and attended by experts from OECD countries. Primarily focused on the integration of short-run and long-run aspects of educational planning and the relationship between objectives and implementation. Also considered were the use of cost-benefit and cost-effectiveness analyses in programme planning and in resource-allocation studies.


The model developed is applied to a Title I Elementary and Secondary Education Act program in San Francisco.


Progress report on an attempt to develop a framework for the evaluation of educational programs. This will be in the form of a mathematical model that will provide a method for the analysis of benefits derived from the Elementary and Secondary Education Act, Title I program. It is presumed that education is an industry that takes children with certain characteristics and embodies human capital (knowledge) in them.


Presents an empirical model for placing a monetary value on the influence of education in one generation.


Study of the extent to which education provides benefits to people other than students and to others in the community that provides the education. Includes methodology, consideration of various forms of social benefits, quantification, and application to a single case-study community. Chapter 10 summarizes the quantitative findings of the case study and extracts significance for efficiency in resource allocation, equity in educational finance, and implications for public policy.


Discusses limitations of benefit-cost studies as applied to education but accepts the analytical and practical potential of the approach to education as an economic activity. Recommends use of a variety of approaches, such as "market-oriented" studies concerned with the characteristics of the "knowledge industry" and studies concerned with the influence of changes in methods (as distinct from volume) of education provision.
HEALTH


"This paper will first review some of the work in applying economic analysis to public expenditure, which has been done under the rubrics of benefit-cost analysis, operational research, and systems analysis. After a discussion of the growing concern about efficiency in the National Health Service, it will consider the recent interest in operational research for the NHS as an example of the need for the quantitative analyses of operational research to be based upon economic reasoning."


"The author characterizes benefit-cost analysis as the collection and organization of data relevant by some meaningful criteria to determine the relative preferable-ness of alternatives. Welfare considerations applied to governmental expenditures for resource development are discussed."


First, compares health and education as types of investment. Second, deals with capital formation through health care and returns to investment in health.

"Some empirical work on specific diseases has been done; work has also been done on the overall problems of disease. Although I do not review these specific empirical studies, I attempt to summarize the basic assumptions underlying their estimates and to point to examples of the 'payoff on investment in eradication of disease.'"


Applies cost-benefit analysis to Michigan's tuberculosis-control program. Provides criteria for the use of the benefit-cost device and suggests some policy implications.


"Investigates ways in which concepts of model building and cost-effectiveness can be applied to the health planning process. The problem is described and
methodological implications drawn that recommend large-scale digital-computer simulation techniques. A study of effectiveness measures suggests that the system's basic purpose is to reduce the likelihood that individuals will be in a state of ill health. The proposed measure of ineffectiveness is defined as the expectation of the weighted sum of the population's expected duration of stay in each of m disability states. The applicability of this and other measures to specific health problems is also discussed. The paper deals with the problem of estimating costs. Distinctions are made among the various kinds of costs and among the various bearers of the costs."

RAND Corporation. *Cost-Benefit in Health* by A.W. Marshall. P-3274. 18 pp. December 1965. Reviews the relevant research on the problem of cost-benefit analyses in health (the focus is on the work of economists interested in the economic implications of improved health) and explores the likely requirements, difficulties, and opportunities for cost-effectiveness studies in government health programs. A sample program budget for health prepared by the Bureau of the Budget is included.

Stanford Research Institute. *Alternative Methods of Meeting Mental Health Needs in Rural Areas* by Gertrude D. Peterson and David A. Curry. Prepared for the California State Department of Mental Hygiene. SRI Project 5066. 93 pp. August 1965. Study's purpose was to "...determine how local resources within a specific rural area and resources outside the area could be combined to meet mental health needs of the rural population in California." Cost effectiveness of various programs is developed for three counties.

U.S. Department of Health, Education, and Welfare. Office of Assistant Secretary for Programs Coordination. *Maternal and Child Health Care Programs, October 1966.* 113 pp. 1968. Studies principally cost and effectiveness of various maternal and health-care programs, such as those concerned with vision and hearing defects. Issued by the Office of the Assistant Secretary for Program Coordination, this report is one of a series arising from discussions, suggestions, and comments of the Program Analysis Group on Child Health Care under Department Secretary Gardner.

U.S. Department of Health, Education, and Welfare, Office of the Assistant Secretary (Planning and Evaluation). *Program Analysis: Human Investment Programs—Delivery of Health Services for the Poor.* 135 pp. Government Printing Office, Washington, D.C., December 1967. Background data on who the "poor" are, their health status, their patterns of receipt of health services, and the major current health programs affecting them. Goals and objectives are proposed, followed by estimates of the costs and effectiveness of suggested programs designed to fulfill these goals.
HOUSING


Cost-benefit study of 14 projected disease-injury control programs.

HOUSING


Presents a theoretical framework for measuring costs and benefits to society of an urban renewal project. Also considers the practical problems of measurement through a case study of the East Stockton, California Urban Renewal Project.


“Considers the validity and effectiveness of benefit-cost analysis, with particular application to selected redevelopment projects in Indianapolis, Indiana. Indianapolis has one of the oldest and perhaps most unique programs of urban redevelopment in the United States. Since 1945, this city has carried on an active slum clearance and redevelopment program without Federal aid or direction.”


Discusses objectives of urban renewal. Analyzes two projects in the light of these objectives and discusses the application of cost-benefit techniques to urban renewal.


A preliminary review of efforts in the Department of Housing and Urban Development to provide a useful analytic methodology for comparing the costs and benefits of housing assistance programs.
POLLUTION, RESEARCH AND DEVELOPMENT


Stresses residential redevelopment, the original focus of urban renewal. "The view of benefit-cost analysis is in terms of the allocation of national resources. The author illustrates his procedure by applying it to five renewal projects in Chicago. It should be emphasized that his basic concern is not with the before-and-after values of a particular site, but with its relative value in allocation of funds in a region and the nation."

POLLUTION

Baxter, Samuel S. "Economic Considerations of Water Pollution Control," *Journal of the Water Pollution Control Federation*, October 1965, vol. 37, pp. 1363-1369.

"The economics of the disposal of used water is discussed and the following four questions are considered: (1) what are the purposes and uses expected of receiving streams, (2) what benefits and improvements will occur in the stream if a higher degree of treatment is used, (3) what relation exists between the costs involved in, and the benefits derived from, different degrees of treatment, and (4) what is the relation of these costs and benefits to the costs and benefits of other civic programs."


Demonstrates the application of cost-benefit analysis to problems of air pollution abatement.


Deals with the relationship between ambient-air quality and economic loss and with the development and testing of methods of quantifying this relationship. Three methods for measuring the economic consequences of air pollution are applied in six case studies.

RESEARCH AND DEVELOPMENT


"Analysis of the social benefits resulting from the support given by the British National Research Development Corporation (NRDC) to the development of a potato harvester."

"Mission cost-effectiveness equations may be used to optimize research, development, test and evaluation expenditures according to a criterion of maximum net savings over the system life. The technique is applicable to any applied research which is funded to support a mission. Funds for basic research with absolutely no strings attached cannot be optimized by these techniques."


"In attempting to find the conditions that can be avoided, limited, or made more manageable in the problem of estimating benefits, the author examines the situations where the cost of an alternative project can substitute for or provide limits to benefit measurement. The basic strategy of this study was to set up a model in which two public projects and two private projects were considered. Then assumptions about the following were varied: what is alternate to what, what combinations of projects are compatible, what institutional rules govern the selection of projects, and what quantities and qualities of services are provided by individual projects."


Cost-benefit analysis is applied to the problem of relocating a road through the central business district of a small market town. The method involves a "Planning Balance Sheet," that lists the costs and benefit that will flow to particular sectors of the community from alternative projects. The procedure lays the basis for a value judgment by the decision makers.


"Examines the technique of cost-effectiveness analysis, including its advantages and limitations, and discusses its potential usefulness to the fire service."
TRANSPORTATION


Theoretical framework for allocating costs and benefits of metropolitan-wide services. Includes ACIR recommendations.


Economic criteria for allocation of urban functions.

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TRANSPORTATION


Includes proposed methods and techniques of measurement of direct and indirect benefits and costs associated with changes in the regional transportation network.


There are four volumes of this final report of a study performed for the U.S. Department of Housing and Urban Development under Contract H-777. Most of the cost-benefit work is in Volume III (*Network Flow Analysis*) and Volume IV (*Further Analysis*). Volume I is a summary volume and includes a guide to study organization and to the 44 individual research papers.


“In this analysis, alternative transportation systems are fitted to the future travel pattern for San Diego, California. The alternate modes are then quantified on the basis of user cost and construction cost. The transportation systems evaluated included a 200-mile system of freeways, a 160-mile system of rail transit, and a 160-mile system of busways (exclusive bus freeways). These modes established the limiting conditions for the range of transportation-system choice. Combinations of these principal modes were analyzed to determine intermediate points. Annual costs were calculated, and an incremental benefit-cost ratio analysis was undertaken.”


“This paper reviews techniques that have been used in a particular variety of highway benefit studies. The objective of these studies is to estimate the..."
value of travel-time savings achieved by improving an old road or building a new one. The theoretical structure underlying these studies is scrutinized, exclusive attention being given to work trips.”

Partial contents: The measurement of vehicular benefits by G.P. St. Clair and others; a new approach to benefit-cost analysis by Robinson Newcomb.

Among the many possible forms of cost-benefit analysis, three approaches seem to be the most pertinent for evaluation of motor-vehicle accident countermeasures. These three approaches are herein called (1) “complete range analysis,” (2) “expected effect analysis,” and (3) “break-even analysis.”

Discusses the costs and benefits of given alternative transportation systems for each of three major elements in the community—users, operators, and the community itself.

“The study determines the costs and benefits resulting from implementation of category II and category III all-weather systems during the 1967-1980 time period and establishes the optimum practical ground-airborne implementation schedule, including the priority-ranked order for equipping 40 individual airports.”

“The manual presents data and methods for computing economic indexes of desirability for highway improvement projects. It is intended for highway studies in the United States and in other countries having well-developed economies and road systems and does not cover problems that are frequently encountered in developing countries. It focuses on the effects of highway construction upon users and operators of highways and does not include secondary or indirect effects, such as changes in land values. This emphasis is consistent with current economic theory, which concludes that in developed countries, substantially all net changes in real income and economic welfare caused by highway improvements are covered by the resulting savings in transportation costs (including the value of travel time savings).”
VOCATIONAL TRAINING


"Effective new programs for coping with aircraft noise problems around airports will probably involve new expenditures. If such costs are passed on to airline traffic, they will affect traffic growth through price elasticity of demand. A 1-percent increase in fares and rates is estimated to decrease traffic by 1.3 percent; a 5-percent increase would reduce traffic by 6.3 percent. Separate elasticities are estimated by major airline groups: -1.28 for domestic travelers, -1.6 for international passengers, -1.0 for local service passengers, and -1.5 for cargo traffic."


"This review of benefit-cost analysis as a tool for evaluating alternative courses of action describes the technique, discusses a number of benefit-cost studies, and indicates the difficulties inherent in this area of applied economics. The author concentrates on the application of the technique to large-scale transport problems, reviews the literature, and indicates in his conclusions where the technique can be helpful and where there is little chance for its success."

VOCATIONAL TRAINING


Attempts to develop an analytic framework for evaluating the work-experience component of the Work-Experience and Training Program and seek to estimate its potential effectiveness in improving the capability for self support.


Based upon interviews with 373 Connecticut workers who were involved in retraining courses. (Ph D thesis completed at Yale University.)

The Manpower Improvement Through Community Effort (MITCE) is the first large-scale project designed for the needs of the poor. A benefit-cost analysis of MITCE is important to the proposed reorientation of the poverty program and the Manpower Development and Training Act of 1962 so as to take more account of the rural population. The proposal is summarized and discussed in Monthly Labor Review, September 1967, pp. 45-51.


Deals with economic problems caused by disabilities and economic benefits of vocational rehabilitation.


Outlines a cost-benefit study of Aid to Families with Dependent Children programs.


Prepared for the U.S. Office of Education Bureau of Research.

Stromsdorfer, Ernst W. "Determinants of Economic Success in Retraining the Unemployed: The West Virginia Experience," Journal of Human Resources, Spring 1968, pp. 139-158.

"An analysis of the costs and benefits of government-sponsored retraining of the long-term unemployed in West Virginia from 1959 through 1964, based on the post-training experience of trainees."


"Outlines the research project now under way with respect to cost-benefit evaluation of the Bernalillo County, New Mexico, Work Experience and Training program conducted by the New Mexico Department of Public Welfare."


Costs were measured as per-pupil expenses for state and federal governments. Both long-run and short-run benefits were covered.

Describes output of first year and a half of activity of cost-effectiveness analysis of manpower programs in the Manpower Administration of the U.S. Department of Labor, initiated in 1966. First pilot study compares costs and benefits of institutional and on-the-job training under the Manpower Development and Training Act. The second study deals with an illustrative cost-goal analysis in U.S. Employment Service area and was designed to estimate the benefits to the GNP that would result from a dollar of expenditure on Employment Service activities. The third study was an attempt to assess the "costs" as related to the anticyclical objectives of unemployment insurance and of failure to enact the proposed 1966 amendments to the unemployment insurance legislation.


"The question examined in this study is 'Does the investment in Job Corps pass the economic test of efficiency?' Alternatively, we ask, 'Does the program earn a rate of return at least equal to some average rate earned by other private and governmental investments?' The best simple answer to this question that this study offers is 'yes,' but there are a number of qualifications that go along with this favorable verdict."


"Training programs, like other objects of public or private spending, ordinarily involve both benefits (advantages) and costs (disadvantages). This article discusses the forms of such effects in the manpower training area and presents some suggestions regarding measurement methods. The need to evaluate training programs in terms of their effects on efficiency of resource allocation and on the distribution of income is underscored."


"A simplified problem in budgeting between water reclamation and recreation is used to illustrate the treatment of incommensurables in a cost-benefit analysis. It is assumed that all costs and benefits are exhaustive and certain and that the benefits due to recreation are incommensurable (cannot be measured in the same units) with the benefits (measured in dollars) due to water reclamation. The recreation benefits are not intangible, however, in that they can be measured quantitatively, in units of user-hours." Tables that display the trade-offs involved are presented.

"Benefit-cost criteria for the evaluation of water resource development projects are developed. Procedures for application of these criteria to various types of projects are given. Historical and political aspects of project selection are discussed."


Especially pertinent is Chapter 8 on "Technological Features and Costs of Alternative Supplies of Water."


"The conflict of fish-versus-power is discussed in this article as one of the greatest obstacles to river basin development. The authors view this problem in the context of the contribution of fish and power to the total development of a given river basin rather than as two mutually exclusive and discrete alternatives. Attention is given to the economics of fish preservation."


"Two of the objectives for optimal development of watershed programs are (1) maximizing discounted net returns from watershed resources and (2) allocating development costs equitably among various private or public participants." Discusses their achievement within a comprehensive planning framework, combining benefit-cost analysis and linear programming.


"Concerned with the relationship of money value to municipal water supply improvements. A simplified approach is presented for ascertaining municipal water supply benefit-cost ratios for underdeveloped regions of the world. The authors' methodology is applied to Puerto Rico as an example."


Deals with benefit-cost analysis in general and water pollution problems in particular. The work, under contract to the Department of Health, Education, and Welfare, discusses, first, benefit-cost analysis with major attention given to historical development and, second, the water pollution problem and evaluation of investment in pollution control.
MISCELLANEOUS APPLICATIONS


Technical report dealing with the problems of assessing the benefits from various types of flood protection. Discusses the nature of the benefits from flood protection and relates the various types of benefits to five different measures for coping with flood losses. Develops a theory of land use as it relates to the structure of rents and employs it to develop "the proper measure of benefits from land enhancement." Deals finally with the effects of alternative programs of insurance on the cost of risk-bearing associated with flooding.

MISCELLANEOUS APPLICATIONS


Cost-benefit analysis and its application to strip and auger mining.


"This paper examines the usefulness of benefit-cost analysis as a means of making more informed decisions regarding public expenditure for traffic safety programs. No attempt is made to develop actual quantitative estimates of benefits and/or cost of alternative traffic safety programs. But the development of an analytic framework for making such estimates, the identification and measurement of the major components of benefits and costs, and the drawing of conclusions concerning the methodology, research and data collection needs for further progress in applications to traffic safety problems are attempted."


"Mounting expenditures for marketing research have emphasized the need for better standards and methods of setting research budgets. The cost-benefit model offers an improved technique for planning such expenditures. It deals explicitly with the problem of uncertainty associated with such analysis and relates it to certainty as a norm to arrive at a better method of making decisions about marketing research possibilities."
MISCELLANEOUS APPLICATIONS


Argues that economic resources devoted to reducing population growth are more effective in raising per capita incomes in underdeveloped areas than are the same resources applied to accelerating production, and estimates the cost of an adequate birth control program.


This paper first describes the theory by which a buyer aligns his utility with that of the seller, creating the incentive structure. This can be simplified when cost-effectiveness analyses can help relate increments of performance and time (delivery) to dollars of incremental cost. When this approach cannot be employed, a utility function must be developed by other means, such as an iterative comparative preference method. An extensive example of such an application is described using a method that employs a computer to help the decision-maker develop an analytic utility function in three dimensions. The mathematical approach can be extended for analytic utility functions in additional dimensions.


Specifically, the purposes of this paper are (1) to explore briefly the general area of production design essentials for a background understanding of plant layout, (2) to suggest a systems approach to the facilities configuration problem, and (3) to suggest a cost-effectiveness methodology for evaluating alternate layout proposals from the systems-analysis viewpoint.


“Develops a cost-benefit analysis of pesticide use based on an aggregate production analysis for the 1960s, but concludes that much more analysis and information are needed to evaluate pesticide technology and intelligently form Federal policy.”


Includes selected bibliography.
MISCELLANEOUS APPLICATIONS


“This text is the result of a 1-year study sponsored by the U.S. Department of Commerce to determine the feasibility of applying cost-effectiveness methodology to the pressing traffic-safety problem. A good portion of the book is devoted to cost-effectiveness methodology, per se. Regarding traffic safety, the following subjects are treated at length: collecting, categorizing, and evaluating data; measurements relevant to evaluating program cost and effect and for design of experiments; and accident costs.”


“A generalized model of a digital computer system with a workload drawn from proffered infinite workload was investigated to determine the factors that affect throughput and cost effectiveness to allow optimization of the system parameters.”


“The objective of this research project is to develop an appropriate transformation between system effectiveness and dollar costs of operating distribution systems. Newly developed techniques for analyzing risk in distribution logistics and computing the cost effectiveness of various distribution-system structures are described.”


Discussion of classic studies with introduction.


“Guidelines for use in selecting locations for Federal regional facilities. The study deals particularly with the increases in system cost attributable to establishing a regional facility in a designated economic redevelopment area rather than at the most efficient location in terms of office administration. In the example chosen for detailed analysis, the Pacific Coastal Area, the Small Business Administration has made a reasonable choice of field headquarters location on cost-effective grounds; regional facilities such as these, however, could make a significant contribution to economic advance in depressed areas without substantially affecting agency costs.”


“A discussion and preliminary cost-analysis showing that an aircraft reconnaissance system is highly preferable to proposed satellite systems.
MISCELLANEOUS APPLICATIONS

for surveying earth resources. The cost per square mile covered would be one-eighth that of the most nearly comparable (but markedly inferior) coverage possible with satellites. Also, aircraft can be easily reassigned as needed and can avoid politically sensitive areas.”


“The characteristics of forest fires are described mathematically considering wind velocity, resulting fire patterns, and advance rates. Fire fighting tactics during water bombing are discussed and equations developed for drop height, range of water volume and drop density. The cost of forest fires is developed as a function of loss of land value, direct operating cost of aircraft, depreciation of aircraft, and cost of ground forces. A model is developed to compare water bomber, on a cost-effectiveness basis. The data are analyzed in a simulation using FORTRAN and a Univac i107.”


Presents a summary of progress: “A preliminary cost-effectiveness formula is presented with an evaluation of the sources and availability of the data inputs required by the formula. Using the preliminary formula and methodology as a basis for the analysis, it was concluded that adequate measures of variable effectiveness have not yet been developed due to the complexity of the cost-effectiveness formula and methodology and to the lack of accessibility of input data.”


“Costs of alternative land-retirement programs aimed at controlling supply in U.S. agriculture are estimated by applying interregional competition linear programming models to problems of production allocation under conditions of production capacity in excess of that necessary to meet specified demand levels. The crops considered are wheat, the four major feed grains, soybeans, and cotton.”
A selective and annotated listing of representative studies applying cost-benefit methodology to communications, education, health, and other parts of the civilian economy. Arrangement is by broad category except for bibliographies and applications of a miscellaneous or mixed nature.

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