project planning and management series

PNAAR-463
ISN: 37115

ACKNOWLEDGEMENT

The Project Planning and Management Series consists of a set of manuals and associated modules presenting practical approaches, tools and techniques for project planning and management. (See list on back cover). A product of the Government of Jamaica/USAID National Planning Project (1976-1980), the series was developed by the Project Development Resource Team (PDRT) of PAMCO for use in "action-training" workshops and reflects extensive experience in training and project development. All present PDRT members are contributing authors and have worked together in writing, revising and publishing the series. Special credits are due to Dr. Merlyn Kettering for design and development of the series; Dr. Bruce Brooks for writing final versions of many modules; Mrs. Marjorie Humphreys for assuming primary editing and production responsibility and for organizing draft papers into more useful materials; Mr. Lascelles Dixon, head of PDRT since 1979, for designing the cover and improving many of the illustrations; and Mrs. Christine Hinds and Miss Linette Johnson for typing the drafts and final manuscripts. Any comments on the series and its usefulness are welcome.

Marcel Knight
Managing Director
PAMCO
March, 1980

Contributing Authors

Merlyn Kettering
Bruce Brooks
Conrad Smikle
Lascelles Dixon
Michael Farr
Marjorie Humphreys

Published by:

The Project Analysis & Monitoring Co. Ltd. (PAMCO)
Inter-Continental Hotel, 4th Floor
Kingston, Jamaica, W.I.

MODULE 22

NET PRESENT WORTH ANALYSIS

Bruce Brooks

A. *PREREQUISITES:* MODULE 21 - Discounting

MODULE 23 - Cost Benefit Analysis

References: MODULE 25 - Internal Rate of Return

MODULE 28 - Project Accounting

B. *DISCUSSION:*

The net present worth of a project is the present worth of the cash flow stream of a project. It is a measure of a project's financial and economic viability which takes into account the time value of money using discounting procedures. The net present worth is derived from the discounted cash flows of a project. The net present worth is determined by computing the difference between the discounted annual benefits and the discounted annual costs. (SEE TABLE 1 IN MODULE 21 - DISCOUNTING, APPENDIX 21.1).

To compute the net present worth, the analyst must decide on the discount rate that is used to determine the present worth of the estimated flow of costs and benefits on the project. The estimated discount rate selection is based on the expected delayed benefits and the opportunity cost of investing in the project.

To arrive at the net present worth of a project the analyst must first estimate the annual gross payments and receipts, and the cash flow. Then apply the appropriate discount factor. (SEE MODULE 21 - DISCOUNTING, AND MODULE 23 - COST BENEFIT ANALYSIS).

A positive net present worth indicates that the estimated returns from the project investment are sufficient to justify the project, but this is only one of several project worth measurements criteria that should be used.

Net Present Worth reduces payments and costs occuring at different times during the life of a project to a comparable basis or their equivalent present value. As a result, this tool can be used to compare project investment alternatives and to determine if a project measures up in relation to a pre-determined "Net Present Worth Standard" for judging whether a project should receive the needed investment in comparison with alternative investments.

DO NOT DUPLICATE WITHOUT PERMISSION

The analyst using this tool will find it necessary to select a discount rate. Investment decisions that use net present worth as a criterion are often sensitive to the rate of discount. For example, some projects have a high initial investment but have equivalent total costs and the same benefit streams as another project. A high discount rate would favour the project with a lower initial investment cost but higher annual costs because higher annual costs are not weighed as heavily in the computation.

The use of net present worth does measure the magnitude of project benefits but it provides no indication of how efficiently the invested capital is used. Therefore, if project funds are limited, as they usually are, net present worth is not a valid measure for ranking projects in 1, 2, 3 order.

C. *PURPOSE:*

Net present worth evaluates project net benefits by comparing the streams of benefits and costs of different project alternatives over time. It measures a project's financial and economic viability by considering the estimated benefits and the time preference for money.

D. *USES:*

The net present worth measure of a project can be used to:

1. assist the project planners and decision makers to decide if a single project should be funded;

2. choose between projects that are mutually exclusive. Mutually exclusive projects are those that have incompatible alternatives for implementing them, i.e., if one alternative is pursued it precludes implementing any other alternative simply because the physical resources are not available to do both; and

3. provide the intermediate calculations that are needed to calculate the project's internal rate of return.

E. *DEFINITION:*

1. *Rank order of projects* is the relative positioning of projects which are being weighed against one another based on financial measurements which have been applied to them, e.g., Internal Rate of Return, Benefit-Cost Ratios, etc.

2. *Project Cash Flow* is the estimated net benefits accruing to a project annually.

DO NOT DUPLICATE WITHOUT PERMISSION

3. *Discounted Project Cash Flow* is the value that represents the present worth of the estimated net annual benefit for each year of the project. The present worth of the estimated net annual benefit is computed by applying a discount factor to each net annual benefit.

4. *Net Project Benefits* are the annual increments to total project benefits. They are computed by subtracting the annual estimated project costs from the annual estimated project revenues (receipts). Some years may show negative net benefits. These are subtracted from the total net benefits.

5. *Project Annual Estimated Costs* are all of the relevant costs for the project summarized into one figure for the specified year.

6. *Project Annual Estimated Revenues* are all of the receipts or payments received by the project for the specified year.

F. *LIMITATIONS:*

The obvious problem associated with the use of Net Present Worth as a measure of project worth is the identification of the discount rate used so that it is a satisfactory measure of the opportunity cost of capital. This is the case because the selection of a discount rate that is too low will result in acceptance of a project that results in net benefits that are lower than could be received by investing the funds in other projects.

No ranking of alternative projects is possible when Net Present Worth is used as the criterion. Net Present Worth is an absolute measure not a relative measure. If a choice must be made between two or more projects that have acceptable Net Present Worths, choosing the one with the highest NPW is unreliable and other measures for assessing project worth are needed before making a choice.

G. *ASSUMPTIONS:*

The Net Present Worth measure of project worth assumes that the discount rate used to discount the costs and benefits flow is equal to the opportunity cost for tying up project resources for the life of the project.

DO NOT DUPLICATE WITHOUT PERMISSION

ILLUSTRATION 1

An Example of NPW (Net Present Worth)[1] of a Project (000's of monetary units)

Year	GROSS COSTS			Discount Factor at 15%	Present Worth of Gross Costs	Gross Receipts or Benefits	Present Worth of Benefits	Cash Flow	Present Worth of Cash Flow
	Investment	Other	Gross Total						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	800	-	800	.870	696	0	0	(800)	(696)
2	200	150	350	.756	265	740	559	390	295
3	0	150	150	.658	99	720	474	570	375
4	0	150	150	.572	86	640	366	490	280
5	200	150	350	.497	174	570	283	220	109
6	0	150	150	.432	65	620	268	470	203
7	0	150	150	.376	56	600	226	450	169
8	0	150	150	.327	49	550	180	400	131
9	0	150	150	.284	43	500	142	350	99
10	0	150	150	.247	37	420	104	270	67
Total	1,200	1,350	2,550	5.019	1,570	5,360	2,602	2,861	1,032

NPW = sum of Net Present Worth of Receipt - sum of Net Present Worth of Costs

NPW = 2,602 - 1,570 = 1,032,000

or NPW = sum of Present Worth of Cash Flow stream

NPW = 1,032,000

1) All costs and receipts are in thousands of monetary units.

DO NOT DUPLICATE WITHOUT PERMISSION

The Net Present Worth of the project shown in ILLUSTRATION 1 can be computed in two ways:

(a) by subtracting the sum of the annual net present worth of project costs from the sum of the annual net present worth of the project benefits or the total of Column (6) from the sum of Column (8); or

(b) by discounting the cash flow and summing the discounted values.

If either of these techniques is used the Net Present Worth of this project is 1032(000) monetary units. Given this magnitude of Net Present Worth (NPW) this project certainly has a positive net worth and would be acceptable if the decision were based on this criterion alone.

H. OUTPUT: A NET PRESENT WORTH ANALYSIS OF A PROJECT

I. STEPS IN DETERMINING THE NET PRESENT WORTH OF A PROJECT

STEP 1. Estimate the gross revenues and gross costs for each year of the project. These are sums of the annual estimates of all costs and the sum of all revenues that are expected to result if the project is undertaken.

STEP 2. Specify the discount rate. This estimate is based on what the rate of return would be if the project funds were invested in the best alternative investment. The discount rate is expressed in (%).

STEP 3. Determine the discount factors to be used for each year to the end of the project. This is accomplished by using the discount tables found in MODULE 21.

STEP 4. Apply the discount factor for each year to the gross costs for the same year to arrive at the present worth of the gross costs.

STEP 5. Apply the discount for each year to the gross receipts for the same year to arrive at the present value.

STEP 6. Sum all of the discounted costs and receipts and subtract the sum of these costs from the sum of the receipts. The result is the Net Present Worth.

DO NOT DUPLICATE WITHOUT PERMISSION

STEP 7. If the Net Present Worth is greater than zero, the project is financially acceptable and if it is less than zero it is not financially acceptable. When the Net Present Worth is zero, the project's internal rate of return is equal to the discount rate. (SEE MODULE 25 - INTERNAL RATE OF RETURN).

STEP 8. When projects are mutually exclusive, the project with the highest positive Net Present Worth should be selected. Net Present Worth should be the sole criterion.

Earlier PDRT working papers relevant to this topic include "Criteria to test Project Worthiness: Project Analysis and Appraisal", M. Kettering, 1977. (25 pages).

DO NOT DUPLICATE WITHOUT PERMISSION

EXERCISE 1

Given the following information, compute the Net Present Worth of this project using a discount rate of 20%

Year	*Total Gross Costs*	*Total Gross Receipts or Benefits*
1	580	200
2	80	200
3	80	200
4	80	200
5	80	200
6	80	200
7	80	200
8	80	200
9	80	200
10	80	200

(a) Does this project qualify for funding based on NPW criterion?

DO NOT DUPLICATE WITHOUT PERMISSION

Project Planning and Management Series

MANUAL - I Planning for Project Implementation
MANUAL - P Project Planning
MANUAL - M Project Management
MANUAL - PF Pioneer Farm Implementation Planning

MODULES

1. Defining Project Objectives (Objective Trees)
2. The Logical Framework
3. Work Breakdown Structure
4. Activity Description Sheets
5. Project Organization
6. Linear Responsibility Charts
7. Project Scheduling - Bar Charts
8. Bar Charting for Project Control/Scheduling
9. Project Scheduling - Network Analysis
10. Milestones Description Charts
11. Resource Planning & Budgeting
12. The Role of PAMCO
13. Project Technology Analysis
14. Demand Analysis
15. Market Strategy Analysis
16. Project Area Analysis
17. Project Costs & Benefits
18. Project Profile
19. Financial Analysis
20. Cash Flow Analysis
21. Discounting
22. Net Present Worth Analysis
23. Cost-Benefit Analysis
24. Benefit-Cost Ratio Analysis
25. Internal Rate of Return
26. Social Analysis of a Project
27. Economic Analysis of Projects (including Border Pricing)
28. Financial Statements & Ratios
29. Project Selection & Ratios Analysis
30. Brainstorming
31. Decision-making System for Projects
32. Project Institutional Environmental Analysis
33. Ecological Analysis for Projects
34. Introduction to Contracts, Jamaican Contract Documents & Tendering Procedures
35. Selection & Use of Consultants
36. Project Documents for Planning & Implementation
37. Report Writing for Projects
38. Project Files
39. Formats for Pre-Feasibility & Feasibility Studies
40. Motivation of Employees and Personnel Evaluation
41. Design of a Project Management Control System
42. Evaluating & Forecasting Project Progress & Performance
43. Project Termination
44. Introduction to Lending Agencies
45. Organizing and Conducting Conference Meetings
46. Withdrawal of and Accounting for Loan Funds in the Financing of Projects