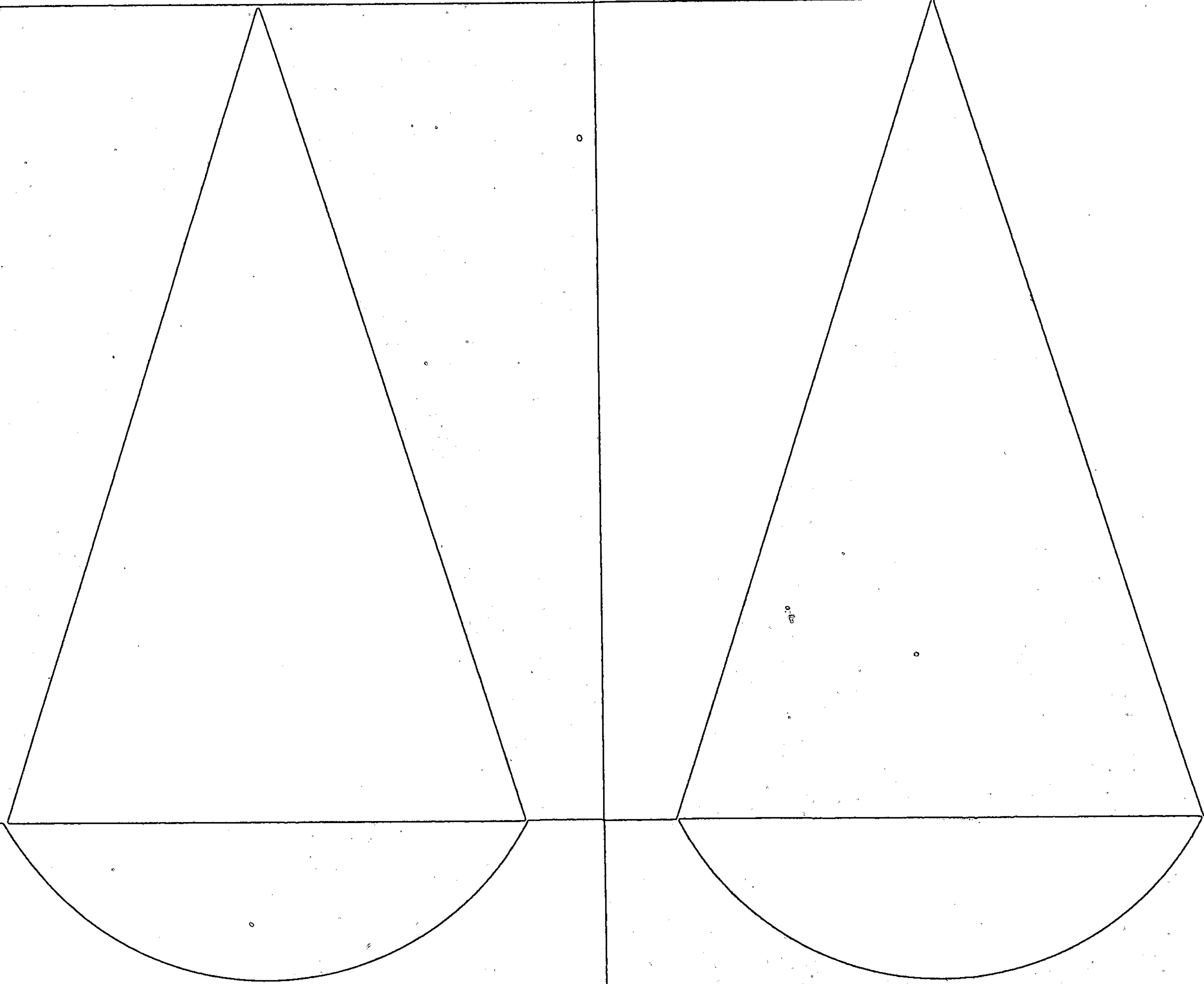

The Evaluation of Intangibles in Benefit-Cost Analysis: A General Method

by

M. Maniate

d C. Carter

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Policy Branch

Environnement
Canada

Direction de la Politique

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A GENERAL METHOD

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Peter M. Maniate

and

Donald C. Carter

Policy Branch
Environment Canada
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F O R E W O R D

This is the second paper in the Policy Branch's benefit-cost series. The first paper, The Basics of Benefit-Cost Analysis set the stage. Now we are examining one of the problems in benefit-cost analysis which is encountered in the fields of environmental protection and renewable resource development, that of treating intangible effects.

Although the General Method is a further step in the process of giving intangibles their proper place in formal analyses, it must be stressed that this technique is presented here as a framework on which to build and discuss further.

V.V. Spence
Director
Policy Branch

A C K N O W L E D G E M E N T S

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T A B L E O F C O N T E N T S

THE EVALUATION OF INTANGIBLES IN BENEFIT-COST ANALYSIS:

A GENERAL METHOD

Introduction:

The purpose of this paper is to present a general method for evaluating intangibles in the context of a benefit-cost analysis. This method was developed in response to the demand in Environment Canada for various methods of evaluating a wide range of intangible benefits and costs. Methods for evaluating particular types of intangible effects are being developed continuously (mostly in the field of recreation) but the list of techniques is far from being exhaustive. In addition, the effects that are evaluated can not always be presented in a form that is comparable with the tangible effects, i.e. in dollar terms.

While the various techniques are being developed and revised, there is an ever increasing need to include intangible effects in benefit-cost analyses in a form more useful than simply a brief description of the intangible effects. Decisions in the fields of "environmental protection" and "renewable resources" must continue to be made by decision makers at all levels even if the tools available to assist in such decisions are not ideal.

In response to this problem, we have devised a general method of evaluating intangibles. It is simple in concept, quite simple to use, and can be applied almost universally. This paper will follow the process shown in Flow Chart 1 (see back insert).

For simplicity, we shall assume that the evaluation is being dealt with only by a decision maker and an analyst. The decision maker represents management and is responsible for any decisions made.* The analyst provides the information necessary for the decision maker to make these decisions, both objective and subjective.

1. <u>The Basics of the General Method</u>:

To initiate the evaluation, the decision maker must determine the exact nature of his objective or set of objectives for the project(s). At this point, the analyst may begin. He determines the general areas of the project(s) from which primary benefits will be derived. Then after compiling a list of all these benefits, he sorts them out into two basic types: tangibles and intangibles. Those benefits, or factors** which can be quantified into dollar terms are called tangibles. A good example is hydro-power which can produce a dollar value because the quantity of the new power produced and the market price of that power are usually well established before the project begins. The others, intangibles, can be separated into two groups: those that can be quantified in terms other than dollars by using conventional evaluation techniques, and those that cannot be quantified by any conventional technique. An example of an intangible factor which may be quantified in non-dollar terms would be recreational benefits measured in <u>day trips</u>. A non quantifiable intangible could be the value of eco-system protection or the value of an aesthetic view.

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* The term "decision maker" includes everyone in the decision making hierarchy. It is used in this paper as a generalization for the individuals and committees at the level or levels in the management hierarchy with which the analyst must interact. Thus the term "decision maker" would include such forms of decision making as brainstorming sessions, Delphi studies, as well as the conventional committees. In some cases, the decision maker and the analyst will be one and the same.

** Factors are areas of study from which benefits are derived. For example, sport fishing is a factor, a part of a project and it contributes benefits to this project.

The net benefits of all the factors are to be considered. For each factor one subtracts the costs from the benefits to arrive at a net benefit for that factor. One must be careful to fully identify all the relevant factors. Problems can arise if the factors are not clearly delineated and subdivided. A factor which may at first appear to be wholly quantifiable may turn out to have a non-quantifiable aspect to it. For example, the value of "recreation" to a region. The expenditures made by the users of the facility are usually considered as an approximation of the factor's value; but what of the value derived by local users who do not incur any expenditures?

The analyst, using all the available data then arrives at the discounted net benefit of each tangible factor as per the usual benefit-cost methodology.* These benefits are expressed in dollars. The intangibles (both types) are described as fully as possible either quantifiably or qualitatively, whichever way they can best be presented.

Now the decision maker is presented with the list of factors, both tangible and intangible, and proceeds to rank them in terms of their net benefits (see chart 1). The method of ranking which we suggest will be described in Appendix 1. The accuracy of the ranking is crucial, but the method of ranking is not. Once the factors have been ranked to the satisfaction of the decision maker, each intangible factor is examined and the first tangible factor ranked below it is found. Then the first tangible factor ranked above it is found. Since these two tangible factors have previously been attributed net benefits in dollars, the examined intangible

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*For a description of the usual benefit-cost methodology, see The Basics of Benefit-Cost Analysis, by the same authors. Chart 2 (insert) summarizes this methodology.

which has been ranked between these two factors can now be accorded a dollar value somewhere in the range of these two known dollar values. Sometimes the factors directly above and below the intangible factor in question will also be intangibles. This would result in several intangibles having the same range of values. Then the distinction between these intangibles would have to be determined by their rank order. Example two found in Section 2 illustrates this problem. The procedure of examining each intangible factor is carried out until all have been given an imputed value or range of values. A single value will result if an intangible factor has been ranked equal to a tangible factor (an equal ranking implying an equal value).

What we have done is given the intangible factors an imputed value or shadow price. Once the shadow pricing has been completed, all the factors will have been given a dollar value or range of dollar values which represent their contribution of net benefits to the project.

Since in most cases, the intangible will be given a range of values rather than a single value (except in the event of a tie) the decision maker can consider the dollar value of the intangibles from a low, medium, or high point of view. The values in the lower range would show a conservative estimate of the intangibles' worth while the values in the high range will present an optimistic look at the intangible benefits. The medium value may be used to give an "expected" value.

2. Examples:

Factor*	$ Value	Ranking
Fisheries (tangible)	120,000	2
Recreation (tangible)	75,000	6
Transportation (tangible)	25,000	11
Hydro-Power (tangible)	150,000	1
Industrial Water Supply (tangible)	15,000	12
Municipal Water Supply (tangible)	45,000	8
Agricultural Water Supply (tangible)	30,000	9
Aesthetic views (intangible)	-------	7
Erosion Control (intangible)	-------	10
Eco-system Protection (intangible)	-------	2
Water Quality Standard (intangible)	-------	5
Security from Floods and Droughts (intangible)	-------	4

Example one:

1. Consider the factor "Aesthetic views", an intangible, which is ranked seventh.
2. Find the factor which is ranked sixth. This is "Recreation", a tangible with a dollar value of $75,000.
3. Now find the factor which is ranked eighth. This is "Municipal Water Supply", a tangible with a dollar value of $45,000.
4. From these facts we conclude that the factor "Aesthetic views" has a value somewhere between $45,000 and $75,000.

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* These factors are chosen strictly for example purposes and should not be considered as a valid absolute tangible-intangible split as the allocation of factors into one category or the other depends upon the individual project.

Example two:

1. Take the factor "Eco-system Protection" an intangible which is ranked second.
2. Notice that "Fisheries" a tangible with a dollar value of $120,000 is also ranked second.
3. Therefore, we can conclude that "Eco-system Protection" also has a value of $120,000.

Example three:

1. Take the factor "Security from Floods and Droughts", an intangible which is ranked fourth.
2. Find the factor which is ranked third. There is no third ranking, since two factors are tied for second. Therefore, the value of the second place factor is selected, i.e., $120,000.
3. Now find the factor that ranks fifth. It turns out to be an intangible with no dollar value. Therefore the sixth ranked factor is taken. It is "Recreation", a tangible with a dollar value of $75,000.
4. From these facts we conclude that the value of "Security from Floods and Droughts" is between $75,000 and $120,000.
5. It is noted that the factors ranked fourth and fifth both lie in the same range - $75,000 to $120,000. It is assumed that the fourth ranked will have a value greater than the fifth ranked but no numerical distinction between the two can be made.*

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* We have not yet dealt with this problem but feel that the analyst should be able to make this distinction between the two factors. Perhaps by delegating a third of the range to each factor or some other delegation which he determines as suitable. Note also that the larger the number of factors, the smaller the chance of this occurrence.

3. Multi-Project Ranking*:

So far we have dealt with only a single project. This reflects the situation encountered in benefit-cost analysis when only one alternative has been proposed and the aim of the analysis is to check for economic feasibility. A more common situation, however, is the consideration of two or more projects, which are ranked in terms of their net benefits or rate of return, as well as checked for economic feasibility.

In the latter case, the factors are still ranked as in the single project case; however, the factors in each project should also be ranked with respect to the factors in all the other projects as well. The net benefit ranges implied for each intangible should then be recorded. At this point, we return to a project by project basis. The net benefits accruing to all the factors in each project are now totalled. This yields a total net benefit figure or range for each project under consideration.

If the ranges of net benefits are sought rather than a high, low or median figure, then one must face the possibility that the range of net benefits for some projects will overlap. Such an occurrence suggests a less clear result for the decision maker at the end of the process. It is also a reflection of the uncertainties that underlie the subjective decisions made in the particular analysis despite the methodological treatment. Of course, if none of the ranges overlap, the decision maker can accept the results of the analysis with much more confidence. On this account, we recommend that the analyst, when using high, low or median figures, always prepares the results in terms of the ranges as well. This will be a definite aid to the decision maker in his final analysis of the results.

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* The procedure for multi-project ranking (using the pairing method) is illustrated in Appendix 2.

4. Disadvantages:

There are two difficulties that may be encountered when using the General Method. First, the "net benefit" concept with respect to intangibles is not an easy concept to work with in practice. In theory, it is quite simple: the decision maker must subtract his subjective evaluation of the costs from his subjective evaluation of the benefits. In actual practice, he is more likely to consider either the costs (e.g. deterioration of aesthetic beauty) or the benefits (e.g. increased recreational potential) alone, for any particular factor.

This problem might be overcome by having the decision maker rank costs and benefits separately rather than just the net benefits. It would then be a simple matter for the analyst to complete the net benefit ranges.

Whether or not the benefits and costs are ranked separately or jointly, the analyst can assist the decision maker in this respect by insuring that he has all available data on the intangible factors arranged so that the positive and negative aspects of each intangible factor effected can be readily compared.

The second difficulty that may be encountered is the problem of open-ended ranges. An open-ended range occurs when one of the intangible factors is ranked higher or lower than all the tangible factors. In such a case the intangible factor usually cannot be evaluated adequately. There are two exceptions: an open-ended range on the high side would still permit the collection of "minimum" evaluations and an open-ended range on the low side would still allow the collection of "maximum" evaluations.

There is no simple method of solving this second difficulty. However, one could simply limit the analysis to minimum or maximum values of the ranges as suggested in the previous paragraph. Another possibility would be the use of another method of evaluating intangibles to assist in valuing the factor in the open-ended range.

Two considerations should be mentioned here: one, the more factors that are being ranked, the less likely the possibility of running into the problem of an open-ended range; and two, if the highest ranked factor is an intangible factor, then a formal benefit-cost analysis may not be the best method to use.

5. Advantages:

There are three main advantages in using the General Method for evaluating intangibles. First, a unit of comparison is provided for all factors. Second, the decision maker is instantly involved in all steps of the decision making process. A third, the interactive and factor by factor characteristics of this method help to clear up the ambiguities that are often found when evaluating subjectively.

Looking more closely at the first advantage, it can be seen that while the shadow prices are not real dollars, they are a unit of comparison compatable with the market values assigned to the tangible factors. This enables a relative assessment to be made of the intangible factors vis-à-vis the tangible factors. It also enables such an assessment to be made between the intangible factors themselves. Thus, the General Method provides a means of assessing the total utility of a project or program.

Elaborating on the second advantage, unlike most other methods of evaluating intangibles (e.g. Hotelling Method or Expenditure Method) the decision maker actually makes all the subjective decisions. In the other methods, the analyst usually makes all the decisions, and simply presents the decision maker with a final solution, which he can either accept or reject. Therefore, the General Method allows the decision maker to hold a real decision making role.

Finally, the interactive process, coupled with factor-by-factor decision making helps to clear up the ambiguities in a decision maker's mind by having him examine and re-examine each component part of each project in detail. While this is more time consuming for the decision maker than letting his analyst look after the details, it enables him to fully understand that for which he is going to be responsible.

6. Conclusions:

The General Method of evaluation, is just that: a general method. It can be applied to any type of intangible benefits or costs. In some fields, such as recreation or aesthetics, specialized techniques have been devised. In the situation where one of these specialized techniques exists and is deemed acceptable, the analyst should use it in preference to the method presented here. But where no method exists, or the accepted method is felt to be insufficient by the decision maker and/or the analyst, this General Method ought to be considered. It is a definite step above mere description and could, with the refinements that come with frequent use, develop into a first rate methodology.

APPENDIX I - THE PAIRING METHOD

1. Description of the Method:

The method of ranking the factors that we recommend is the Pairing Method. The technique enables the breakdown of a project not only into its component factors, but also into the basic decisions that must be made either directly or implicitly.

An examination of matrix 1, which is found at the end of this appendix, is essential at this time to enable us to work through the steps of the Pairing Method.

The matrix itself is completed with the use of three symbols. To fill in the matrix, one works across the columns in rows, one factor at a time, using a "✓" to indicate a greater value than, an "○" to indicate an equal value, and an "X" to signify a lesser value.

Example:

	Fisheries	Recreation	Transportation	Hydro-power	Ind. Water Supply
1. Fisheries	○	✓	✓	X	✓
2. Recreation	X	○	✓	X	✓
3. Transportation	X	X	○	X	○
4. Hydro-power	✓	✓	✓	○	✓
5. Industrial Water Supply	X	X	○	X	○

Once the matrix is complete, the preference scores for the factors are calculated. Tabulation of these scores must be made across the tables in rows. The "✓" is one point, the "○" is a half a point, and the "X" is no points.

Example:

	Preference Score		Fisheries	Recreation	Transportation	Hydro-power	Ind. Water Supply
1.	$3\frac{1}{2}$	Fisheries	O	✓	✓	X	✓
2.	$2\frac{1}{2}$	Recreation	X	O	✓	X	✓
3.	1	Transportation	X	X	O	X	O
4.	$4\frac{1}{2}$	Hydro-power	✓	✓	✓	O	✓
5.	1	Industrial Water Supply	X	X	O	X	O

Upon completion, the summation of the rows becomes the preference score*.

First, look at matrix 1. It is the work sheet used for the Pairing Method and is usually completed in the following manner. All factors are listed across the top and then again down the left hand side of the matrix. Usually these factors are separated into two groups - tangibles and intangibles. Sometimes three groups are used with the intangibles being split into quantifiable intangibles and non-quantifiable intangibles. This distinction is for convenience and of minor importance as it has no bearing on the outcome of the ranking.

The idea is to compare the net benefits of every factor listed against the net benefits of every other factor. Some of these comparisons, the ones not involving subjectivity can be made by the analyst. This is because the tangible factors have already been accorded net dollar values

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* From the example matrix it can be seen that each factor is compared to itself. Of course no preference can be indicated in this situation, therefore, the tied preference, "O", has been used. In effect, this procedure gives every factor at least one half of a point.

so that the preference of one factor over another is merely a mechanical operation. The greater the net benefits, the higher the ranking. These comparisons (see the top left side of the matrix) are usually completed first.

The decision maker will then complete the rest of the matrix. The comparisons he makes will involve a degree of subjectivity; but one must remember that the decision maker will always have to make some subjective decisions, no matter what methodology is used. This process, however, simplifies these decisions to a "greater than", "equal to", or "less than" choice. His choices can then be recorded in the matrix. It should also be noted that the decision maker does have several guides in removing the subjectivity from his decisions. He already has an idea of the magnitude and the relative importance of each intangible since each was described in qualitative terms in an earlier step of the analysis. A second guide is that many of the intangible factors have been designated a quantitative value in terms other than dollars by some suitable method at an earlier date.

One must be careful not to misinterpret the preference score. The common mistake is to assume that we are dealing with a ratio scale which gives the weight of the factors. In fact, the scale produced is only an ordinal scale and therefore, any weighting of the factors is mathematically invalid. However, what is valid, is to rank the factors according to their preference scores. This is done inversely. The highest preference score is equal to the first ranking, etc......

A question could arise over a tie in the number of preference points, i.e. tied rankings.* The answer is that if two factors have been ranked the same, then they must have the same value. This would result if the decision maker was unable to choose one factor over another when completing the matrix. If one of these factors is an intangible and the other, a tangible factor, then instead of a range of values, the decision maker can assign the intangible a single value equal to the value of the tangible factor.

Upon completion of the matrix, the decision maker can check to ensure that he has made consistent decisions throughout the pairing exercise. This verification of the transitivity or logic of the decision maker is possible because each decision made has been recorded in the matrix. For example, if factor A is greater than factor B, and factor B is greater than factor C, then factor A must be greater than factor C. In practice, mistakes of this nature occur quite frequently, especially when several projects with multiple factors are being considered.**

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* It has been suggested by some users of this methodology that the possibility of ties be eliminated. In other words, to force the decision maker to make a preference choice for every pairing. This concept is useful if the object of the method is to determine which factor pairings add to the knowledge of a project. For example, the importance of certain physical characteristics to an understanding of an ecosystem. The authors can see no clear cut advantage for including this proposal into the methodology presented in this paper.

** A computer program which will scan the completed matrix and point out any logistic errors has been developed.

2. Disadvantages:

Time is often of critical importance to the decision maker. The Pairing Method could therefore prove cumbersome since the large number of decisions to be made and the verification process can be time consuming. However, the analyst can shorten the time involved by filling in the automatic decisions beforehand and the use of a computer checking program will render the verification process a simple task.

The other constraint is the strict and ordered format that the pairing method forces on the decision maker. The method may not be suitable to the temperment of some people who have trouble dealing with precise factors in a strictly logical fashion, and yet can still arrive at valid conclusions by considering only the aggregated factors. This underlies the importance of relating the method of decision making as closely as possible to the decision maker's thought process. It is the analyst's job to assist the decision maker in his task and to help him express his thinking, but it is not for him to make the decisions or to tell him how to think. However, it is felt that most decision makers do go through a rough facsimile of the pairing method in their heads or in some type of written form and this method simply helps to put some order into the process.

3. Advantages:

The main advantage of the Pairing Method is that all the subjective decisions that the decision maker must make have been identified and reduced to their simpliest form: "greater than", "equal to", or "less than". Also, a record of every decision made will exist once the matrix is complete. This is an invaluable aid for checking and for afterthoughts the decision maker might have. It also enables a checking of the transitivity or consistency of the decisions made.

A second advantage of the method is that factors can be added or removed from the matrix without affecting the rest of the matrix, thus saving the task of redoing the matrix every time the factors to be considered are changed.

Another important advantage of using the Pairing Method is that the intermediate step of weighting the factors is eliminated. Thus the arbitrary system, which results in factor weighting independently of the particular project(s) in question, used by conventional weighting schemes is not encountered. This means that the mathematical consistency throughout is maintained and the problem of assigning weights without bias is reduced.

TABLE FOR RANKING FACTORS BY THE PAIRING METHOD

MATRIX 1

RANK	PREFERENCE SCORE	FACTOR DESCRIPTION	NO.	1 FISHERIES	2 RECREATION	3 TRANSPORTATION	4 HYDRO-POWER	5 INDUSTRIAL WATER SUPPLY	6 MUNICIPAL WATER SUPPLY	7 AGRICULTURAL WATER SUPPLY	8	9 AESTHETIC VIEWS	10 EROSION CONTROL	11 ECO-SYSTEM PROTECTION	12 WATER QUALITY STANDARDS	13 SECURITY FROM FLOODS AND DROUGHTS	14	15
2	10	FISHERIES	1	O	✓	✓	X	✓	✓	✓		✓	✓	O	✓	✓		
6	6½	RECREATION	2	X	O	✓	X	✓	✓	✓		✓	✓	X	X	X		
11	1½	TRANSPORTATION	3	X	X	O	X	✓	X	X		X	X	X	X	X		
1	11½	HYDRO-POWER	4	✓	✓	✓	O	✓	✓	✓		✓	✓	✓	✓	✓		
12	½	INDUSTRIAL WATER SUPPLY	5	X	X	X	X	O	X	X		X	X	X	X	X		
8	4½	MUNICIPAL WATER SUPPLY	6	X	X	✓	X	✓	O	✓		X	✓	X	X	X		
9	3½	AGRICULTURAL WATER SUPPLY	7	X	X	✓	X	✓	X	O		X	✓	X	X	X		
			8															
7	5½	AESTHETIC VIEWS	9	X	X	✓	X	✓	✓	✓		O	✓	X	X	X		
10	2½	EROSION CONTROL	10	X	X	✓	X	✓	X	X		X	O	X	X	X		
2	10	ECO-SYSTEM PROTECTION	11	O	✓	✓	X	✓	✓	✓		✓	✓	O	✓	✓		
5	7½	WATER QUALITY STANDARDS	12	X	✓	✓	X	✓	✓	✓		✓	✓	X	O	X		
4	8½	SECURITY FROM FLOODS AND DROUGHTS	13	X	✓	✓	X	✓	✓	✓		✓	✓	X	✓	O		
			14															
			15															

APPENDIX II - ILLUSTRATION OF MULTI-PROJECT RANKING

Illustrated here is the Pairing Method as applied to multi-project ranking. At first glance it appears a maze of "✓'s" and "×'s". However, there is a logical procedure for completing the matrix.

First, each project is examined individually. The factors are paired, each against the other, as if only the single project is being considered. This is done for each of the three projects. At this point, half of the matrix will be complete.

To finish the matrix, begin by comparing project one to project two. By using the known dollar values of the tangible factors and the imputed values of the intangible factors of each project, preference between factors of the two projects can be made. This procedure is then repeated for projects two and three; and then for projects one and three. This will fully complete the matrix and is illustrated on the following page.

One may ask whether this procedure is worth the extra time and effort expended by the decision maker. We feel the answer is yes for several reasons. One, it is felt that if the decision maker is willing to follow the methodology and fill in the single project matrix, the extra effort required to fill in the multi-project matrix will be minimal. Two, the multi-project ranking enables a more accurate definition and narrower range limits for the intangible factors in each project. Three, the larger number of known dollar value factors lessens the chance of open-ended ranges and reduces the occurrence of several intangibles falling within the same range. The result of these improvements in accuracy is that the decision maker will have more confidence in his results.

TABLE FOR RANKING FACTORS BY THE PAIRING METHOD

MATRIX 2

RANK	PREFERENCE SCORE	FACTOR DESCRIPTION	No.	1 RIVER BASIN ONE	2 Hydro Power	3 Fisheries	4 Water Supply	5 Recreation and Tourism	6 Transportation	7 Industrial Development Potential	8 Water Pollution	9 Erosion Control	10 Eco-system Protection	11 Aesthetic Value	12 Protection from floods and droughts	13	14 RIVER BASIN TWO	15 Hydro Power	16 Fisheries	17 Water Supply	18 Recreation and Tourism	19 Transportation	20 Industrial Development Potential	21 Water Pollution	22 Erosion Control	23 Eco-system Protection	24 Aesthetic Value	25 Protection from flood and droughts	26	27 RIVER BASIN THREE	28 Hydro Power	29 Fisheries	30 Water Supply	31 Recreation and Tourism	32 Transportation	33 Industrial Development Potential	34 Water Pollution	35 Erosion Control	36 Eco-system Protection	37 Aesthetic Value	38 Protection from flood and droughts
		RIVER BASIN ONE	1																																						
22	11	Hydro Power	2		O	X	✓	X	X	X	X	✓	X	X	X			✓	X	✓	X	✓	X	X	✓	X	X	O			X	X	✓	X	✓	X	X	✓	X	X	✓
14	19	Fisheries	3		✓	O	✓	X	✓	X	O	✓	X	X	✓			✓	X	✓	X	✓	X	X	✓	X	X	✓			X	✓	✓	X	✓	X	✓	✓	✓	✓	✓
25	8	Water Supply	4		X	X	O	X	X	X	X	O	X	X	X			✓	X	✓	X	X	X	X	✓	X	X	X			X	X	✓	X	✓	X	X	✓	X	X	✓
3	30	Recreation and Tourism	5		✓	✓	✓	O	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	X	✓	X	✓	✓	✓	✓	✓			O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
21	12½	Transportation	6		✓	X	✓	X	O	X	X	✓	X	X	X			✓	X	✓	X	✓	X	X	✓	X	X	✓			X	X	✓	X	✓	X	X	✓	X	X	✓
7	26½	Industrial Development Potential	7		✓	✓	✓	X	✓	O	✓	✓	✓	✓	✓			✓	✓	✓	X	✓	X	✓	✓	X	X	✓			X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
14	19	Water Pollution	8		✓	O	✓	X	✓	X	O	✓	X	X	✓			✓	X	✓	X	✓	X	X	✓	X	X	✓			X	✓	✓	X	✓	X	✓	✓	✓	✓	✓
25	8	Erosion Control	9		X	X	O	X	X	X	X	O	X	X	X			✓	X	✓	X	X	X	X	✓	X	X	X			X	X	✓	X	✓	X	X	✓	X	X	✓
9	24	Eco-system Protection	10		✓	✓	✓	X	✓	X	✓	✓	O	✓	✓			✓	✓	✓	X	✓	X	✓	✓	X	X	✓			X	✓	✓	X	✓	O	✓	✓	✓	✓	✓
13	20½	Aesthetic Value	11		✓	✓	✓	X	✓	X	✓	✓	X	O	✓			✓	X	✓	X	✓	X	X	✓	X	X	✓			X	✓	✓	X	✓	X	✓	✓	✓	✓	✓
20	13½	Protection from floods and droughts	12		✓	X	✓	X	✓	X	X	✓	X	X	O			✓	X	✓	X	✓	X	X	✓	X	X	✓			X	X	✓	X	✓	X	X	✓	X	X	✓
			13																																						
		RIVER BASIN TWO	14																																						
31	2½	Hydro Power	15		X	X	X	X	X	X	X	X	X	X	X			O	X	✓	X	X	X	X	✓	X	X	X			X	X	X	X	X	X	X	X	X	X	X
11	22½	Fisheries	16		✓	✓	✓	X	✓	X	✓	✓	X	✓	✓			✓	O	✓	X	✓	X	✓	✓	X	X	✓			X	✓	✓	X	✓	X	✓	✓	✓	✓	✓
33	½	Water Supply	17		X	X	X	X	X	X	X	X	X	X	X			X	X	O	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X
2	31½	Recreation and Tourism	18		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	O	✓	X	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
24	9½	Transportation	19		X	X	✓	X	X	X	X	✓	X	X	X			✓	X	✓	X	O	X	X	✓	X	X	X			X	X	✓	X	✓	X	X	✓	X	X	✓
1	32½	Industrial Development Potential	20		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	O	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
12	21½	Water Pollution	21		✓	✓	✓	X	✓	X	✓	✓	X	✓	✓			✓	X	✓	X	✓	X	O	✓	X	X	✓			X	✓	✓	X	✓	X	✓	✓	✓	✓	✓
32	1½	Erosion Control	22		X	X	X	X	X	X	X	X	X	X	X			X	X	✓	X	X	X	X	O	X	X	X			X	X	X	X	X	X	X	X	X	X	X
5	28½	Eco-system Protection	23		✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	X	✓	X	✓	✓	O	✓	✓			X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	27½	Aesthetic Value	24		✓	✓	✓	X	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	X	✓	X	✓	✓	X	O	✓			X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
22	11	Protection from flood and droughts	25		O	X	✓	X	X	X	X	✓	X	X	X			✓	X	✓	X	✓	X	X	✓	X	X	O			X	X	✓	X	✓	X	X	✓	X	X	✓
			26																																						
		RIVER BASIN THREE	27																																						
3	30	Hydro Power	28		✓	✓	✓	O	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	X	✓	X	✓	✓	✓	✓	✓			O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
18	15	Fisheries	29		✓	X	✓	X	✓	X	X	✓	X	X	✓			✓	X	✓	X	✓	X	X	✓	X	X	✓			X	O	✓	X	✓	X	O	✓	X	X	✓
29	4	Water Supply	30		X	X	X	X	X	X	X	X	X	X	X			✓	X	✓	X	X	X	X	✓	X	X	X			X	X	O	X	X	X	X	O	X	X	X
8	25½	Recreation and Tourism	31		✓	✓	✓	X	✓	X	✓	✓	✓	✓	✓			✓	✓	✓	X	✓	X	✓	✓	X	X	✓			X	✓	✓	O	✓	✓	✓	✓	✓	✓	✓
28	5½	Transportation	32		X	X	X	X	X	X	X	X	X	X	X			✓	X	✓	X	X	X	X	✓	X	X	X			X	X	✓	X	O	X	X	✓	X	X	X
9	24	Industrial Development Potential	33		✓	✓	✓	X	✓	X	✓	✓	O	✓	✓			✓	✓	✓	X	✓	X	✓	✓	X	X	✓			X	✓	✓	X	✓	O	✓	✓	✓	✓	✓
18	15	Water Pollution	34		✓	X	✓	X	✓	X	X	✓	X	X	✓			✓	X	✓	X	✓	X	X	✓	X	X	✓			X	O	✓	X	✓	X	O	✓	X	X	✓
29	4	Erosion Control	35		X	X	X	X	X	X	X	X	X	X	X			✓	X	✓	X	X	X	X	✓	X	X	X			X	X	O	X	X	X	X	O	X	X	X
16	17½	Eco-system Protection	36		✓	X	✓	X	✓	X	X	✓	X	X	✓			✓	X	✓	X	✓	X	X	✓	X	X	✓			X	✓	✓	X	✓	X	✓	✓	O	✓	✓
17	16½	Aesthetic Value	37		✓	X	✓	X	✓	X	X	✓	X	X	✓			✓	X	✓	X	✓	X	X	✓	X	X	✓			X	✓	✓	X	✓	X	✓	✓	X	O	✓
27	6½	Protection from flood and droughts	38		X	X	X	X	X	X	X	X	X	X	X			✓	X	✓	X	X	X	X	✓	X	X	X			X	X	✓	X	✓	X	X	✓	X	X	O

Flow Chart : An Evaluation of Intangibles in the Context of a Benefit-Cost Analysis

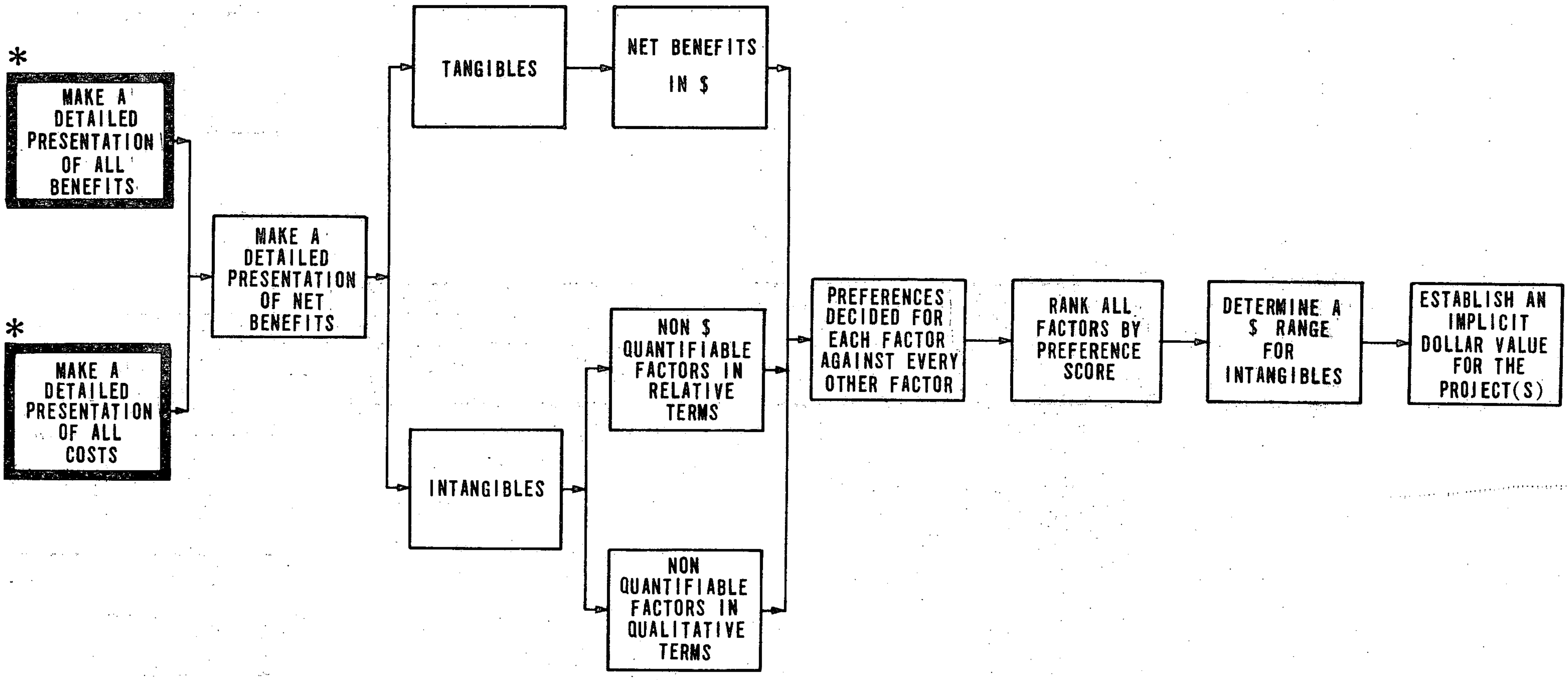
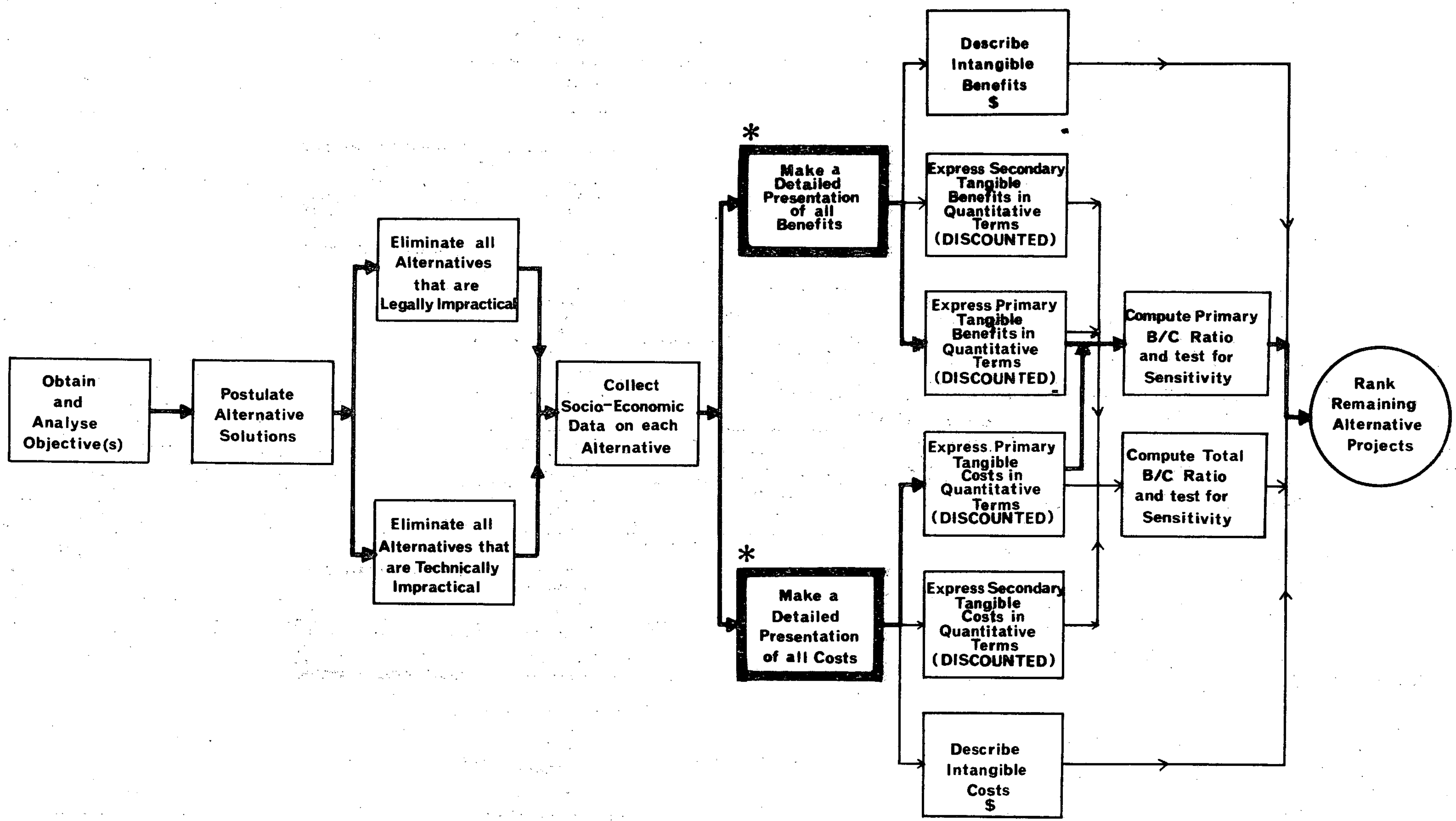


Chart 2

A Simplified Flow Chart of a Benefit-Cost Analysis



Date Due
