PROJECT APPRAISAL AND PRE INVESTMENT ANALYSIS

Project appraisal is a generic term that refers to the process of assessing, in a structured way, the case for proceeding with a project or proposal. In short, project appraisal is the effort of calculating a project's viability. It often involves comparing various options, using economic appraisal or some other decision analysis technique

Process

- Initial Assessment
- Define problem and long-list
- Consult and short-list
- Develop options
- Compare and select Project

Types of appraisal

- Technical appraisal
- Commercial and marketing appraisal
- Financial/economic appraisal
- organisational or management appraisal
    - Cost-benefit analysis
- Economic appraisal
    - Cost-effectiveness analysis
    - Scoring and weighting

Economic appraisal

Economic appraisal is a type of decision method applied to a project, programme or policy that takes into account a wide range of costs and benefits, denominated in monetary terms or for which a monetary equivalent can be estimated. Economic Appraisal is a key tool for achieving value for money and satisfying requirements for decision accountability. It is a systematic process for examining alternative uses of resources, focusing on assessment of needs, objectives, options, costs, benefits, risks, funding, affordability and other factors relevant to decisions.

The main types of economic appraisal are:

- Cost-benefit analysis
- Cost-effectiveness analysis
- Scoring and weighting

Economic appraisal is a methodology designed to assist in defining problems and finding solutions that offer the best value for money (VFM). This is especially important in relation to public expenditure and is often used as a vehicle for planning and approval of public investment relating to policies, programmes and projects.

The principles of appraisal are applicable to all decisions, even those concerned with small expenditures. However, the scope of appraisal can also be very wide. Good economic appraisal leads to better decisions and VFM. It facilitates good project management and project evaluation. Appraisal is an essential part of good financial management, and it is vital to decision-making and accountability.

Cost–benefit analysis

Cost–benefit analysis (CBA), sometimes called **benefit–cost analysis** (BCA), is a systematic process for calculating and comparing benefits and costs of a project, decision or government policy (hereafter, "project"). CBA has two purposes:

1. To determine if it is a sound investment/decision (justification/feasibility),
2. To provide a basis for comparing projects. It involves comparing the total expected cost of each option against the total expected benefits, to see whether the benefits outweigh the costs, and by how much.[1]

CBA is related to, but distinct from cost-effectiveness analysis. In CBA, benefits and costs are expressed in money terms, and are adjusted for the time value of money, so that all flows of benefits and flows of project costs over time (which tend to occur at different points in time) are expressed on a common basis in terms of their "net present value."

Closely related, but slightly different, formal techniques include cost-effectiveness analysis, cost–utility analysis, economic impact analysis, fiscal impact analysis and Social return on investment (SROI) analysis.

Theory

Cost–benefit analysis is often used by governments and other organizations, such as private sector businesses, to evaluate the desirability of a given policy. It is an analysis of the expected balance of benefits and costs, including an account of foregone alternatives and the *status quo*. CBA helps predict whether the benefits of a policy outweigh its costs, and by how much relative to other alternatives (i.e. one can rank alternate policies in terms of the cost-benefit ratio).[2] Generally, accurate cost-benefit analysis identifies choices that increase welfare from a utilitarian perspective. Assuming an accurate CBA, changing the status quo by implementing the alternative with the lowest cost-benefit ratio can improve pareto efficiency.[3]. An analyst using CBA should recognize that perfect evaluation of all present and future costs and benefits is difficult, and while CBA can offer a well-educated estimate of the best alternative, perfection in terms of economic efficiency and social welfare are not guaranteed.[4]

Process

The following is a list of steps that comprise a generic cost-benefit analysis.[5]

1. List alternative projects/programs.
2. List stakeholders.
3. Select measurement(s) and measure all cost/benefit elements.
4. Predict outcome of cost and benefits over relevant time period.
5. Convert all costs and benefits into a common currency.
6. Apply discount rate.
7. Calculate net present value of project options.
8. Perform sensitivity analysis.
9. Adopt recommended choice.

Valuation

CBA attempts to measure the positive or negative consequences of a project, which may include:

1. Effects on users or participants
2. Effects on non-users or non-participants
3. Externality effects
4. Option value or other social benefits

A similar breakdown is employed in environmental analysis of total economic value. Both costs and benefits can be diverse. Financial costs tend to be most thoroughly represented in cost-benefit analyses due to relatively abundant market data. The net benefits of a project may incorporate cost savings or public willingness to pay compensation (implying the public has no legal right to the benefits of the policy) or willingness to accept compensation (implying the public has a right to the benefits of the policy) for the welfare change resulting from the policy. The guiding principle of evaluating benefits is to list all (categories of) parties affected by an intervention and add the (positive or negative) value, usually monetary, that they ascribe to its effect on their welfare.

The actual compensation an individual would require to have their welfare unchanged by a policy is inexact at best. Surveys (stated preference techniques) or market behavior (revealed preference techniques) are often used to estimate the compensation associated with a policy, however survey respondents often have strong incentives to misreport their true preferences and market behavior does not provide any information about important non-market welfare impacts.

One controversy is valuing a human life, e.g. when assessing road safety measures or life-saving medicines. However, this can sometimes be avoided by using the related technique of cost-utility analysis, in which benefits are expressed in non-monetary units such as quality-adjusted life years. For example, road safety can be measured in terms of *cost per life saved*, without formally placing a financial value on the life. However, such non-monetary metrics have limited usefulness for evaluating policies with substantially different outcomes. Additionally, many other benefits may accrue from the policy, and metrics such as 'cost per life saved' may lead to a substantially different ranking of alternatives than traditional cost-benefit analysis.

Another controversy is valuing the environment, which in the 21st century is typically assessed by valuing ecosystem services to humans, such as air and water quality and pollution. Monetary values may also be assigned to other intangible effects such as business reputation, market penetration, or long-term enterprise strategy alignment.

Time and Discounting

CBA usually tries to put all relevant costs and benefits on a common temporal footing using time value of money calculations. This is often done by converting the future expected streams of costs and benefits into a present value amount using a discount rate. Empirical studies and a technical framework[6] suggest that in reality, people do discount the future like this.

The choice of discount rate is subjective. A smaller rate values future generations equally with the current generation. Larger rates (e.g. a market rate of return) reflects humans' attraction to time inconsistency—valuing money that they receive today more than money they get in the future. The choice makes a large difference in assessing interventions with long-term effects, such as those affecting climate change. One issue is the equity premium puzzle, in which long-term returns on equities may be rather higher than they should be. If so then arguably market rates of return should not be used to determine a discount rate, as doing so would have the effect of undervaluing the distant future (e.g. climate change).[7]

Risk and uncertainty

Risk associated with project outcomes is usually handled using probability theory. This can be factored into the discount rate (to have uncertainty increasing over time), but is usually considered separately. Particular consideration is often given to risk aversion—the irrational preference for avoiding loss over achieving gain. Expected return calculations does not account for the detrimental effect of uncertainty.[*citation needed*]

Uncertainty in CBA parameters (as opposed to risk of project failure etc.) can be evaluated using a sensitivity analysis, which shows how results respond to parameter changes. Alternatively a more formal risk analysis can be undertaken using Monte Carlo simulations.[8]

History

The concept of CBA dates back to an 1848 article by Jules Dupuit and was formalized in subsequent works by Alfred Marshall. The Corps of Engineers initiated the use of CBA in the US, after the Federal Navigation Act of 1936 effectively required cost–benefit analysis for proposed federal waterway infrastructure.[9] The Flood Control Act of 1939 was instrumental in establishing CBA as federal policy. It demanded that "the benefits to whomever they accrue [be] in excess of the estimated costs.[10]

Public Policy

The application for broader public policy started from the work of Otto Eckstein[11], who in 1958 laid out a welfare economics foundation for CBA and its application for water resource development. Over the 1960's, CBA was applied in the US for water quality[12], recreation travel[13] and land conservation.[14] During this period, the concept of option value was developed to represent the non-tangible value of preserving resources such as national parks.

CBA was later expanded to address both intangible and tangible benefits of public policies relating to mental illness,[16] substance abuse,[17] college education[18] and chemical waste policies.[19] In the US, the National Environmental Policy Act of 1969 first required the application of CBA for regulatory programs, and since then, other governments have enacted similar rules. Government guidebooks for the application of CBA to public policies include the Canadian guide for regulatory analysis,[20] Australian guide for regulation and finance,[21] US guide for health care programs,[22] and US guide for emergency management programs.[23]

Transportation Investment

CBA application for transport investment started in the UK, with the M1 motorway project in 1960. It was later applied on many projects including London Underground's Victoria Line. Later, the New Approach to Appraisal (NATA) was introduced by the then Department for Transport, Environment and the Regions. This presented cost–benefit results and detailed environmental impact assessments in a balanced way. NATA was first applied to national road schemes in the 1998 Roads Review but subsequently rolled out to all transport modes. As of 2011 it was a cornerstone of transport appraisal in the UK and is maintained and developed by the Department for Transport.

The EU's 'Developing Harmonised European Approaches for Transport Costing and Project Assessment' (HEATCO) project, part of its Sixth Framework Programme, reviewed transport appraisal guidance across EU member states and found that significant differences exist between countries. HEATCO's aim was to develop guidelines to harmonise transport appraisal practice across the EU.

Transport Canada promoted the use of CBA for major transport investments with the 1994 issuance of its Guidebook.

In the US, both federal and state transport departments commonly apply CBA, using a variety of available software tools including HERS, BCA.Net, StatBenCost, Cal-BC, and TREDIS. Guides are available from the Federal Highway Administration, Federal Aviation Administration, Minnesota Department of Transportation,[31] California Department of Transportation (Caltrans), and the Transportation Research Board Transportation Economics Committee.

Accuracy

The value of a cost–benefit analysis depends on the accuracy of the individual cost and benefit estimates. Comparative studies indicate that such estimates are often flawed, preventing improvements in Pareto and Kaldor-Hicks efficiency. Causes of these inaccuracies include]:

1. Overreliance on data from past projects (often differing markedly in function or size and the skill levels of the team members)
2. Use of subjective impressions by assessment team members
3. Inappropriate use of heuristics to derive money cost of the intangible elements
4. Confirmation bias among project supporters (looking for reasons to proceed)

Reference class forecasting was developed by professor Bent Flyvbjerg, University of Oxford, to increase accuracy in estimates of costs and benefits.[34] Daniel Kahneman, Nobel Prize winner in economics, calls Flyvbjerg's counsel to use reference class forecasting to de-bias forecasts, "the single most important piece of advice regarding how to increase accuracy in forecasting."

Interest groups may attempt to include or exclude significant costs from an analysis to influence the outcome.

In the case of the Ford Pinto (where, because of design flaws, the Pinto was liable to burst into flames in a rear-impact collision), the company's decision was not to issue a recall. Ford's cost–benefit analysis had estimated that based on the number of cars in use and the probable accident rate, deaths due to the design flaw would cost it about $49.5 million to settle wrongful death lawsuits versus recall costs of $137.5 million. Ford overlooked (or considered insignificant) the costs of the negative publicity that would result, which forced a recall *and* damaged sales.[36]

In health economics, some analysts think cost–benefit analysis can be an inadequate measure because willingness-to-pay methods of determining the value of human life can be influenced by income level. They support use of variants such as cost–utility analysis and quality-adjusted life year to analyze the effects of health policies.

In environmental and occupational health regulation, it has been argued that if modern cost-benefit analyses had been applied prospectively to decisions such as removing lead from gasoline, building Hoover Dam in the Grand Canyon and regulating workers' exposure to vinyl chloride, they would not have been implemented even though they are considered to be highly successful in retrospect. The Clean Air Act has been cited in retrospective studies as a case where benefits exceeded costs, but the knowledge of the benefits (attributable largely to the benefits of reducing particulate pollution) was not available until many years later.

Cost-effectiveness analysis

Cost-effectiveness analysis (**CEA**) is a form of economic analysis that compares the relative costs and outcomes (effects) of two or more courses of action. Cost-effectiveness analysis is distinct from cost-benefit analysis, which assigns a monetary value to the measure of effect.[1] Cost-effectiveness analysis is often used in the field of health services, where it may be inappropriate to monetize health effect. Typically the CEA is expressed in terms of a ratio where the denominator is a gain in health from a measure (years of life, premature births averted, sight-years gained) and the numerator is the cost associated with the health gain.[2] The most commonly used outcome measure is quality-adjusted life years (QALY).[1] Cost-utility analysis is similar to cost-effectiveness analysis. Cost-effectiveness analyses are often visualized on a cost-effectiveness plane consisting of four-quadrants. Outcomes plotted in Quadrant I are more effective and more expensive, those in Quadrant II are more effective and less expensive, those in Quadrant III are less effective and less expensive, and those in Quadrant IV are less effective and more expensive. [3]

General application

The concept of cost effectiveness is applied to the planning and management of many types of organized activity.It is widely used in many aspects of life. In the acquisition of military tanks, for example, competing designs are compared not only for purchase price, but also for such factors as their operating radius, top speed, rate of fire, armor protection, and caliber and armor penetration of their guns. If a tank's performance in these areas is equal or even slightly inferior to its competitor, but substantially less expensive and easier to produce, military planners may select it as more cost effective than the competitor. Conversely, if the difference in price is near zero, but the more costly competitor would convey an enormous battlefield advantage through special ammunition, radar fire control and laser range finding, enabling it to destroy enemy tanks accurately at extreme ranges, military planners may choose it instead—based on the same cost effectiveness principle.

Cost effectiveness analysis is also applied to many other areas of human activity, including the economics of automobile usage.

CEA in pharmacoeconomics

In the context of pharmacoeconomics, the cost-effectiveness of a therapeutic or preventive intervention is the ratio of the cost of the intervention to a relevant measure of its effect. Cost refers to the resource expended for the intervention, usually measured in monetary terms such as dollars or pounds. The measure of effects depends on the intervention being considered. Examples include the number of people cured of a disease, the mm Hg reduction in diastolic blood pressure and the number of symptom-free days experienced by a patient. The selection of the appropriate effect measure should be based on clinical judgement in the context of the intervention being considered.

A special case of CEA is cost-utility analysis, where the effects are measured in terms of years of full health lived, using a measure such as quality-adjusted life years or disability-adjusted life years. Cost-effectiveness is typically expressed as an incremental cost-effectiveness ratio (ICER), the ratio of change in costs to the change in effects. A complete compilation of cost-utility analyses in the peer reviewed medical literature is available from the Cost-Effectiveness Analysis Registry website.

A 1995 study of the cost-effectiveness of over 500 life-saving medical interventions found that the median cost per intervention was $42,000 per life-year saved.[4] A 2006 systematic review found that industry-funded studies often concluded with cost effective ratios below $20,000 per QALY and low quality studies and those conducted outside the US and EU were less likely to be below this threshold. While the two conclusions of this article may indicate that industry-funded ICER measures are lower methodological quality than those published by non-industry sources, there is also a possibility that, due to the nature of retrospective or other non-public work, publication bias may exist rather than methodology biases. There may be incentive for an organization not to develop or publish an analysis that does not demonstrate the value of their product. Additionally, peer reviewed journal articles should have a strong and defendable methodology, as that is the expectation of the peer-review process.

The Weighting and Scoring Method

Introduction

There are a number of approaches to the appraisal of costs and benefits that are difficult to value in money terms. These include, for example, listing and describing them, developing a matrix or impact statement, and applying the weighted scoring method. As indicated in section 2.7 above, these various approaches should be considered carefully before choosing the method most suited to the case in hand. Listing and describing is often adequate in simple cases. The impact statement approach is adaptable to most circumstances. The weighted scoring method, explained here, is a possible alternative approach.

Before explaining the weighted scoring method, some words of warning are appropriate.

- Firstly, DFP is generally content with the appropriate use of either the 'list and describe' or impact statement approaches, and does not require the use of the weighted scoring method.
- Secondly, where the weighted scoring method is employed, DFP expects the rationale for each weight and each score to be fully explained. Failure to do this can cause delays in the approval process.

What is the Weighted Scoring Method?

The weighted scoring method, also known as 'weighting and scoring', is a form of multi-attribute or multi-criterion analysis. It involves identification of all the non-monetary factors (or "attributes") that are relevant to the project; the allocation of weights to each of them to reflect their relative importance; and the allocation of scores to each option to reflect how it performs in relation to each attribute. The result is a single weighted score for each option, which may be used to indicate and compare the overall performance of the options in non-monetary terms.

This process necessarily assigns numeric values to judgements. These judgements should not be arbitrary or subjective, but should reflect expert views, and should be supported by objective information. To achieve meaningful results which decision-makers can rely on, it is important that:

1. the exercise is not left to the 'experts', but is undertaken by a group of people who represent all of the interested parties, including, for example, those who are directly affected by the project, and those who are responsible for its delivery;
2. the group possesses the relevant knowledge and expertise required to make credible measurements and judgments of how the options will impact upon the attributes;
3. the group is led by an independent chairman to steer the process, probe opinions, promote consensus and avoid prejudice; and
4. the justification for the group's chosen weights and scores is fully explained.

Appraisal reports should identify the personnel involved in the exercise, including an indication of their credentials, so that decision-makers are fully aware of whose views are represented. If there is a lack of consensus among members of the group regarding any of the weights or scores, the views of the dissenting individuals should be recorded.

The process of deriving weights and scores is explained below step by step, covering the following stages:

1. Identify the relevant non-monetary attributes;
2. Weight the attributes to reflect their relative importance;
3. Score the options to reflect how each option performs against each attribute;
4. Calculate the weighted scores;
5. Test the results for robustness; and
6. Interpret the results.

Step 1: Identification of Non-Monetary Attributes

Identifying the attributes may sound straightforward, but attributes must be clearly defined so that both appraisers and those reviewing appraisal reports have a clear understanding of them. To help in the scoring of options, attributes should be defined as far as possible in service or output-oriented terms, and they should generally relate closely to the service objectives and performance criteria established at the outset of the overall appraisal. Considerable care is also needed to ensure that:

1. there is no double counting caused by an overlap in the attributes (e.g. aesthetic qualities and attractiveness);

2. there is no double counting caused by attributes being covered by costs (e.g. including a 'reliability' attribute when reliability is already provided for by inclusion of maintenance costs); and
3. all relevant attributes are included, even if they are common to all the options.

Regarding point 3. above, it is important to include relevant attributes even when all the options appear to impact equally upon them. Omission of common attributes can distort scores and lead to an imbalanced comparison of the differences between the options. For example, Options X and Y may score 200 and 100 respectively, when common attributes are overlooked, giving the impression that X is twice as beneficial as Y. However, if common attributes are worth 300, the correct scores for X and Y should be 500 and 400 respectively, indicating that X has a significantly smaller advantage over Y when all the non-monetary factors are taken into account. Apart from distortion of scores, there is a general risk that the appraisal may focus on attributes that are relatively insignificant while overlooking the most important attributes.

Attributes are best defined so that the status quo or do minimum baseline option can be given a score other than zero. For example, if one of the project objectives is to improve access for the disabled, the attribute is better defined as 'accessibility for the disabled' rather than 'improvement in accessibility for the disabled'.

- The first definition allows all of the options, including the baseline option, to be scored, and thus enables the options to be compared in proportion to the baseline.
- The second definition necessitates a zero score for the baseline option, which means that the scores for the alternatives can not indicate how much better they perform than the baseline option.

(This is not to say that the baseline option should never be given a zero score. In the accessibility example, the baseline option will deserve a score of 0 if the current provision is completely inaccessible to the disabled. However, the more likely position is that the disabled can access it with a degree of difficulty, in which case a suitably positive score would be appropriate).

Example*: In a certain health service appraisal, the relevant attributes are identified as*:

- *number of cases treated;*
- *waiting time;*
- *patient access; and*

- *disruption to services.*

Step 2: Decide the Weights for Each Attribute

The second stage is to decide on the weights to be attached to each of the attributes identified. This should reflect the group consensus about the relative importance of the attributes, which is a matter for judgement based on, for instance, relevant policy statements. The most common approach, and the one which is most readily comprehended, is to express the weights in percentage terms so that they sum to 100.

Justification for the weights ascribed should be recorded. Such an explicit approach helps to ensure that the basis of the weights is fully understood and accepted by all those participating in the exercise as well as those using its results.

Example*: The group appraising our hypothetical health services project has decided that the following weights are appropriate:*

- number of cases treated - 40%
- waiting time - 30%
- patient access - 20%
- disruption to services - 10%

Step 3: Scoring the Options

The third stage is to score each option against each attribute on a suitable scale. The approach described here uses a *cardinal* scale. This means that if Option A is considered to perform three times as well as Option B, then Option A is given a score that is three times that of Option B. Simpler alternatives to cardinality are possible, for example an *ordinal* scale may be used. This provides a simple ranking of options against each attribute, which enables one to say that Option A is better than Option B, but it does not indicate *how much* better A is than B. Such an approach may be useful in some circumstances, but a cardinal approach, if sustainable, is more informative.

Options are scored against the attributes by reference to a scale, say from 0 to +20. A score of 0 will indicate that the option offers no benefits at all in terms of the relevant attribute, while a score of +20 will indicate that it represents some "maximum" or "ideal" level of performance. Scores between 0 and +20 will indicate intermediate levels of performance. The scale used does not have to be from 0 to +20, but mathematical consistency demands that the same scale is used for all attributes. The meaning of the maximum and minimum score should always be clearly defined and the whole scoring system should be documented clearly in the appraisal report. Group members should have a common understanding of it.

To achieve cardinality, the group needs to think carefully about the differences in the scores awarded to the options, and to provide meaningful justification for them. Suppose, for example, that the attribute 'waiting time' refers to the speed of delivery of a particular service, and that options are scored on a scale from 0 to +20. The group has decided that a score of 0 represents a waiting time that is completely unacceptable e.g. 12 months or more; while a score of 20 represents a waiting time at or close to zero. If Option C delivers in 3 months, while Option D delivers in 6 months, then, using the scale as defined, it would be reasonable to award Options C and D scores of 15 and 10 respectively. In another example, where the attribute is 'accessibility' it may be possible to justify different scores on the basis of objective information about differences in distances travelled.

The weighted scoring method should not be used to avoid the effort of measuring differences between options in measurable non-monetary units. Nor should it be used to substitute vague subjective judgments of comparative performance for hard measurement. The credibility of the scores depends upon the provision of a rational justification to support them, including measurement where possible. In any case, project sponsors must be able to provide justification for each and every score that is awarded, and DFP will expect this to be recorded in full detail.

Scores should be allocated to all of the options, including the baseline option (i.e. the status quo or 'do minimum'). A common error has been to overlook the baseline, but it is important to include it. However inadequate it may seem, the existing or 'do minimum' level of service will normally impact on the attributes to some extent, and scoring this helps to give a sense of proportion to the scores of the other options, and to compare their performance to that of the current or minimum level of provision.

Example: The health service group scores four options against the attributes as follows:

	Option P (Status Quo)	Option Q	Option R	Option S
No. of cases treated	5	10	12	15
Waiting Time	8	12	14	16
Patient access	10	10	15	15
Disruption to services	10	5	5	10

Step 4: Calculate the Weighted Scores

15.17 This simply involves multiplying each score by the weight for the relevant attribute. Thus weighted, the scores are totalled to obtain an aggregate weighted score for each option.

Example: Combining the last two examples results in the following weighted scores:

	Option P (Status Quo)	Option Q	Option R	Option S
No. of cases treated	5x40 = 200	10x40 = 400	12x40 = 480	15x40 = 600
Waiting Time	8x30 = 240	12x30 = 360	14x30 = 420	16x30 = 480
Patient access	10x20 = 200	10x20 = 200	15x20 = 300	15x20 = 300
Disruption to services	15x10 = 150	5x10 = 50	5x10 = 50	10x10 = 100
Total Weighted Score:	790	1,010	1,250	1,480

Step 5: Test the Robustness of the Results

It is important to examine how robust the results are to changes in the weights and scores used. This can be done with the aid of sensitivity analysis. For example, the weighted scores can be recalculated to demonstrate the effect upon them of changing the weights. Similarly, they can be recalculated to show the impact of different scores.

Judgement should be used to select suitable variations in assumptions to subject to sensitivity analysis. For example, where there have been differences in opinion within the group about certain weights or scores, it will be helpful to explore the impact of using the different weights or scores advocated by different group members.

Details of the sensitivity analysis should be recorded, and the robustness of the results confirmed. Where appropriate, attention should be drawn to circumstances in which the ranking of options, or the differences in weighted scores, are particularly sensitive to plausible changes in certain weights or scores.

Step 6: Interpret the Results

Non-monetary factors are generally important in public sector appraisals therefore weighted scores can have a crucial influence upon option selection. It is vital that they are compiled and interpreted carefully, and that the reasoning behind the figures is clearly presented in appraisal reports.

The results will consist of a set of weighted scores, including one for each option. These should act as indices for comparing the options' overall performance on non-monetary factors, indicating not only how the options rank but also how great are the differences between them. Thus they should serve a similar purpose in respect to non-monetary factors as NPVs do in respect to monetary factors. For example, if Options E, F and G have weighted scores of 2000, 1000, and 950 respectively, this indicates that Option E is significantly better (about twice as good) as either Options F or G, while Option F is slightly better than Option G. This is more informative than the use of an ordinal scale, which can only indicate the rank order of E, F and G.

Weighted scores can be directly compared with NPVs, to help assess trade-offs between costs and non-monetary performance. This is illustrated by the following example.

1. Option	**2. Net Present Cost**	**3. Weighted Score**	**4. Total Cost per Unit of Weighted Score**	**5. Marginal Increase in Weighted Score *compared to Option P***	**6. Marginal Cost per Extra Unit of Weighted Score *compared to Option P***
	(£M)		(£)		(£)

1. Option	**2. Net Present Cost**	**3. Weighted Score**	**4. Total Cost per Unit of Weighted Score**	**5. Marginal Increase in Weighted Score *compared to Option P***	**6. Marginal Cost per Extra Unit of Weighted Score *compared to Option P***
P	3.0	790	3,797		
Q	4.5	1,010			
R	4.0	1,250	3,200	460	2,174
S	5.0	1,480	3,378	690	2,899

Columns 2 & 3 show the Net Present Costs (NPCs) and Weighted Scores of Options P, Q, R and S. The information in these columns is sufficient to indicate that Option R dominates Option Q. In other words, Option Q is both more costly and less beneficial than Option R, and, other things being equal, can be dismissed from further consideration.

The figures in columns 4 to 6 help to compare the cost-effectiveness of Options P, R and S. Column 4 implies that Option R is the most cost-effective in terms of total cost per unit of weighted score. Columns 5 & 6 help to indicate the differences between Options R and S and the least cost option, Option P. The figures suggest that Options R and S offers significant extra benefits than P, and that Option R does so at the lowest marginal cost.

Such calculations need to be handled with care. It is important to bear in mind that weights and scores are based on judgements. They are not precise measurements against an interval scale, such as the measurement of temperature against the Fahrenheit or centigrade scales. The importance of explaining the weights and scores fully, and interpreting the results carefully, can not be over-stressed.

The results of a weighted scoring exercise are specific to individual cases, and are not readily transferable to others. However, the attributes relevant to one project are likely to be relevant to other projects of a similar type. The weights given to these attributes may not be the same, but the principles for deciding the weights should show some consistency across similar projects. There should also be some consistency in the principles used for scoring options within similar categories of project.

Decision analysis

Decision analysis (**DA**) is the discipline comprising the philosophy, theory, methodology, and professional practice necessary to address important decisions in a formal manner. Decision analysis includes many procedures, methods, and tools for identifying, clearly representing, and formally assessing important aspects of a decision, for prescribing a recommended course of action by applying the maximum expected utility action axiom to a well-formed representation of the decision, and for translating the formal representation of a decision and its corresponding recommendation into insight for the decision maker and other stakeholders.

History and methodology

The term *decision analysis* was coined in 1964 by Ronald A. Howard,[1] who since then, as a professor at Stanford University, has been instrumental in developing much of the practice and professional application of DA.

Graphical representation of decision analysis problems commonly use influence diagrams and decision trees. Both of these tools represent the alternatives available to the decision maker, the uncertainty they face, and evaluation measures representing how well they achieve their objectives in the final outcome. Uncertainties are represented through probabilities and probability distributions. The decision maker's attitude to risk is represented by utility functions and their attitude to trade-offs between conflicting objectives can be made using multi-attribute value functions or multi-attribute utility functions (if there is risk involved). In some cases, utility functions can be replaced by the probability of achieving uncertain aspiration levels. Decision analysis advocates choosing that decision whose consequences have the maximum expected utility (or which maximize the probability of achieving the uncertain aspiration level). Such decision analytic methods are used in a wide variety of fields, including business (planning, marketing, and negotiation), environmental remediation, health care research and management, energy exploration, litigation and dispute resolution, etc.

Decision analysis is used by major corporations to make multi-billion dollar capital investments. In 2010, Chevron won the Decision Analysis Society Practice Award for its use of decision analysis in all major decisions. In a video detailing Chevron's use of decision analysis, Chevron Vice Chairman George Kirkland notes that "decision analysis is a part of how Chevron does business for a simple, but powerful, reason: it works."

Controversy

Decision researchers studying how individuals research decisions have found that decision analysis is rarely used.[2] High-stakes decisions, made under time pressure, are not well described by decision analysis.[3] Some decision analysts, in turn,[4] argue that their approach is prescriptive, providing a prescription of what actions to take based on sound logic, rather than a descriptive approach, describing the flaws in the way people do make decisions. Critics cite the phenomenon of paralysis by analysis as one possible consequence of over-reliance on decision analysis in organizations.

Studies have demonstrated the utility of decision analysis in creating decision-making algorithms that are superior to "unaided intuition".[5][6]

The term "decision analytic" has often been reserved for decisions that do not appear to lend themselves to mathematical optimization methods. Methods like applied information economics, however, attempt to apply more rigorous quantitative methods even to these types of decisions.

Pre investment analysis

The purpose of the services - confirmation of the declared data on the commercial activities of the company (not the company's valuation, but only a confirmation or refutation of the declared data)

Areas of analysis:

- overall investment strategy fit;
- managerial team quality & expertise;
- product & market analysis;
- associated macroeconomic & industry specific risks;
- product & process technology;
- competitive advantages/disadvantages;
- projections & cash flow;
- level of professionalism of the management team;
- presence or absence of a unique business concept, a clear understanding of the company's development strategy, a detailed business plan;
- the presence or absence of competitive advantage, ie, the potential for market leadership;
- degree of financial transparency, compliance with corporate governance principles or the company's commitment to transparency;
- presence or absence of potential high yields on invested capital.

Among our clients were: pharmaceutical companies, investing funds, investment banks, pharmaceutical distributors, wholesalers and pharmacy chains.

- Commercial Audit

- Marketing Audit
- Exporting Audit
- HR Audit
- Strategy Evaluation
- Management
- Financials

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