

Comprehending Cost : Effectiveness ¹

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Last month's article shed some light on **Benefit/Cost (B/C) Analysis**. Although sometimes confused and conflated with **B/C Analysis**, **Cost:Effectiveness (C:E) Analysis is distinctly different**. Whereas Benefit/Cost determines whether a particular proposed Outcome is economically worthwhile, **Cost:Effectiveness** assists managers select **the most efficacious way to attain an acceptable Outcome within their resources compared to other alternatives where:**

1. **The End Objective (or Result) is not -- or cannot be -- monetized,**
2. **Cost is not always the overriding consideration, and**
3. **The 'resource budget' may also not even be in monetary terms.**

The C:E analysis first '*Ceiling estimates*' – i.e. guesses -- '**How Much** each option is likely to **entail**. Although several approaches may be **more effective than the current situation, they may not all be affordable or doable within available resources, and less effective ones may be all they can undertake**. Then, rather than a definitive "GO/NO GO" quantitative decision based on a pre-determined Benefit Cost Ratio (BCR) as in Benefit/Cost analysis, a **subjective decision** weighing economy, efficiency and effectiveness can be made **at what level 'the juice is worth the squeeze.'**

More often than not, **Cost:Effectiveness is used** to analyze **social development projects** during the **Planning Phase**; to review alternatives which, although abstract, can still be *subjectively* quantified – by rank-ordering -- in a variety of ways. Given a particular program or project **Outcome**, subject matter experts (SME's) -- occasionally brainstorming with 'out-of-the-box' stakeholders -- establish intermediate target levels, develop criteria for each level, then identify (or create) possible interventions to attain them. The program cost per incremental unit is then estimated. Where several alternative approaches are considered feasible, the focus in comparing options is to determine the '*Most Effective*' for the *Least Cost per "unit of output"* – colloquially known as getting the '*biggest bang for the buck.*' In some instances, the '*cost*' *per se* may be '*level of effort*' rather than monetary.

For example, in education projects, a **higher level of education** is perceived as a desirable objective. Salient, easily-quantified, variables could be

1. the '**Period of study**' by a particular approach to attain a **pre-determined level of understanding, or competence**; and
2. the **Cost** of each option for providing it.

Given a target of how much new knowledge might be acquired per approach, per unit of time studied, the yardstick for comparing options could then be calculated for each option in terms of

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either cost per unit level, or hours of study time per unit level. With respect to Cost:Effectiveness for instance, purchasing a book to read or a tape to listen to may be relatively low cost options to learn a foreign language, but considerably less efficient in terms of duration or effective than the higher cost of hiring a private tutor. Level of effort—i.e. study/contact hours -- per rank-order level of achievement may also be the more significant measure rather than monetary cost. Moreover, although the levels may be rank-ordered, they may not be equi-distant, so attaining successively higher levels may require considerably more resource inputs (the counterpoint to diminishing returns). Subsequently, a correlation study should be used to determine the actual amount of learning gained per time or cost unit of various options, for future planning use.

Since *both the “effectiveness” indicator as well as the “cost”* in Cost:Effectiveness Analysis *could be qualitative*, not simply monetary values, there is wide scope for creativity in model building. Moreover, the analysis can transcend sectors, so analysis can be undertaken on different combinations of options — *even between different sectors* — and “rational” subjective trade-off choices made in terms of either “*Least Cost*” or “*Maximum Effectiveness.*” For example, the relative merits and contributions of an integrated multisector project — including infrastructure, agricultural and social development (as means towards a common end or objective) i.e. “*Quality of Life*” — can be made explicit, measured, factored, weighed and evaluated in terms of one or two across-the-board indicators.

Unfortunately – just as with Benefit/Cost analysis – there are major limitations to Cost:Effectiveness analysis, as most of the data for the indicator variables are guesstimates. Although the “aura of certainty” which accompanies quantitative analysis is present, it can be misleading if the user is not alert to the limitations; and wrong choices can easily be made. However, data is not always available. Consequently, where no data exists and/or is not knowable, numerous assumptions are made about what is quantifiable. While the results from the Cost:Effectiveness analysis may be presented in an explicit, logical and objectively quantified format, the effectiveness indicator(s), and the factors selected for analysis tend to be highly discretionary. As the outcome is determined only by the variables analyzed, the results from the analysis are usually very subjective rather than based on standardized, or widely accepted "model" computations. Thus, computations can be made with highly speculative cause & effect assumptions, so the results should be equally suspect. Moreover, since ensuing decisions are based on recommendations of sector specialists – *many (if not all) of whom have a stake in the outcome* – their assumptions of cause-effect correlations, with competing claims of imaginary efficacy may be less than objective.

Again, although the data and results on a particular Cost:Effectiveness analysis may be internally consistent and replicable, comparative studies on the same situation by different analysts will probably be based on different model assumptions. Furthermore, it is not only the numerical Cost:Effectiveness results which are likely to differ from model to model -- the “trial options” for different conditions may be ranked differently even within each model. Thus decision-makers provided with the findings from more than one model may be faced with widely conflicting results -- all of which appear very convincing and purport to present the “real picture”. Nevertheless, despite the foregoing shortcomings, Cost:Effectiveness Analysis can still be a useful tool, and an invaluable starting point for systematic project assessment and consideration of alternatives.

Whereas **Decision Trees** can be used for assessing alternatives in Benefit/Cost Analysis to compare the Benefit Cost Ratio (BCR) of ‘Expected Monetary Values (EVM),’ in Cost:Effectiveness analysis there is tremendous scope for creativity at the “model construction”

stage. Hence, many abstract and exotic paths are usually pursued in the quest to “*scope the problem*” then identify and incorporate “*significant variables*” into a truly meaningful and comprehensive model. The cost-effective solution to this challenge is to ascertain the costs and effects on achievement of each alternative and to choose that alternative which has the greatest impact on raising achievement scores for any given resource outlay. Alternately, the “Cost for attaining a desired target Level” could be calculated by simulation trials. ***[There are numerous factors -- other than cost -- that could and should be considered.]***

The **scope of project coverage** is then a function of the **budget** amount – usually deemed ‘*an investment*’ in public sector programs -- that can be acquired through the political ‘*want’s*’ process, rather than objectively-determined ‘*needs.*’

For example, with ‘Language Fluency’ as their objective -- the US Foreign Service Institute (FSI) has a 6 Level rating system for Speaking (S) & Reading (R) languages:

0 – No Proficiency

1 – Elementary Proficiency

2 – Limited Working Proficiency

3 – General Professional Proficiency

4 – Advanced Professional Proficiency

5 – Functionally Native Proficiency

with predetermined criteria for each level. There are several alternatives for improving students’ language comprehension and reading levels -- such as new materials or curriculum, teaching tactics, educational television, computer-assisted instruction, smaller class sizes, deep immersion, etc. Given the methodology involved as well as the level of difficulty for various languages, FSI quantified the number of estimated hours of study required – on the average -- recognizing differential capabilities between individuals.

A step-by-step procedure for applying Cost:Effectiveness is outlined on the following pages. An illustrative Family Planning case example is also included in my **Project Management PRAXIS book** (Available from Amazon).

Remember, the Project Manager’s responsibility is not to be the Subject Matter Expert, but rather to oversee that the process is conducted reasonably logically and systematically.

Cost:Effectiveness Analysis Procedure

1. Given the project or program objective(s), identify the measure(s) of effectiveness

- a. Translate the objectives into measurable sub-objectives.
- b. Repeat until quantifiable sub-objectives are identified.
- c. Select quantifiable objectives that characterize the effectiveness of the project.

2. Determine the Effectiveness & Cost Measurements

- a. Determine units of measurement — i.e. Hours of Study, Kilos of Crop Harvested per Hectare, Miles per Hour Traveled, etc.,
- b. Establish a rank-ordered effectiveness scale (i.e. 1 to 10, 1 to 5, 0 to 100, etc.) [Range Optional]
- c. Determine the ‘cost’ for each level – if ranks in the range are not equi-distant

3. Construct the Model

- a. Construct a model — either a simple equation or a sophisticated analytical simulation model — to compute effectiveness for each alternative.

4. Estimate the Data

- a. Determine the basis for ‘costing’ or measurement which is comparable across all alternatives.
- b. Obtain and process the operational data and costs

5. Compare Alternatives

- a. Compute ratios of effectiveness to cost for each alternative.
- b. Plot effectiveness vs. Cost. [Optional]
- c. Determine acceptable threshold levels for considering alternatives:
 - i. If a minimum level of effectiveness is required, ignore all options that fall below this level. If none exceed the level, either change the specification or identify new alternatives.

ii. If a maximum level of cost is permitted, ignore all alternatives that exceed this limit. If none has acceptable costs, consider scaling down the scope of the alternatives or identify less costly means for accomplishing the objective.

d. **Rank-order the remaining alternatives** using the ratio of effectiveness to cost. If two or more alternatives have identical ratios, select the “most effective” or “least costly”, depending on criteria i. or ii. above.

6. Test the Sensitivity of the Rankings

- a. Select any variable (either cost or effectiveness) for which the estimate is “most likely to be accurate”.
- b. Experiment. Change the value of the variable in the model, to estimate to what extent any changes in the level might affect ultimate computations of the Cost:Effectiveness ratio. [Computer simulation is helpful]
- c. Record the results.
- d. Trial and Error. Repeat the process for other variables, until satisfied you have a feel for the “cause-effect” magnitude implications of the model.

7. Present the Findings

- a. Tabulate some of the more significant alternatives recorded.
- b. Graph the data as “ranges of variation” in the Cost:Effectiveness ratio, as a band (or box) or quad-matrix which indicates the uncertainty of “Effectiveness vs. Costs”.
- c. Present the results to Management — brief them with charts and an oral explanation — for their decision-making action.

In conclusion, unlike Benefit/Cost Analysis, I have no pre-programmed templates for Cost:Effectiveness. However, despite the complexity of subjective variables involved in using Cost:Effectiveness, there are two major consolations;

- 1. Subject Matter Specialists (SME’s) and IT Programmers -- rather than Economists -- dominate the discussions, and**
- 2. At least you don’t have to worry about how to compute multiple ‘Future Values’ then derive ‘Present Values’ based on assumed future Discount Rates!**

About the Author



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Initially a US Civil Service Management Intern, then a management analyst & systems specialist with the US Defense Department, Ken subsequently had a career as a senior foreign service officer -- management & evaluation specialist, project manager, and in-house facilitator/trainer -- with the US Agency for International Development (USAID). Ken assisted host country governments in many countries to plan, monitor and evaluate projects in various technical sectors; working ‘hands-on’ with their officers as well as other USAID personnel, contractors and NGOs. Intermittently, he was also a team leader &/or team member to conduct project, program & and country-level portfolio analyses and evaluations.

Concurrently, Ken had an active dual career as Air Force ready-reservist in Asia (Japan, Korea, Vietnam, Thailand, Indonesia, Philippines) as well as the Washington D.C. area; was Chairman of a Congressional Services Academy Advisory Board (SAAB); and had additional duties as an Air Force Academy Liaison Officer. He retired as a ‘bird’ colonel. After retirement from USAID, Ken was a project management consultant for ADB, the World Bank, UNDP and USAID.

He earned his DPA (Doctor of Public Administration) from the George Mason University (GMU) in Virginia, his MS from Massachusetts Institute of Technology (MIT Systems Analysis Fellow, Center for Advanced Engineering Study), and BA & MA degrees in Government & International Relations from the University of Connecticut (UCONN). A long-time member of the Project Management Institute (PMI) and IPMA-USA, Ken is a Certified Project Management Professional (PMP®) and a member of the PMI®-Honolulu and Philippines Chapters.

Ken’s book -- **Project Management PRAXIS** (available from Amazon) -- includes many innovative project management tools & techniques; and describes a “**Toolkit**” of related templates available directly from him at kenfsmith@aol.com on proof of purchase of PRAXIS.

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