Maritime College
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Department of Global Business and Transportation

Value Analysis

Value analysis is a concept I first encountered in a project with a major American railway some 30 years ago.

Synopsis of the Project

The project, The Waybilling MAEP, aimed to address issues of labor productivity, and information quality and accessibility. It had as its objective the mechanization of the complex railroad processes associated with rate application and quotation. Up until this time the application of information systems to these processes was conceded to be so difficult as to be considered impractical.

The design that emerged from this effort subsequently was implemented at five major North American railways.

September - November 1972 -- Phase I: Definition of scope, plan and schedule.

November 1972 - July 1973 -- Phase II: Study of present system, the environment through 1981, and the requirements through 1981.

July 1973 - November 1973 -- Phase III: Design of business system solution approach and data processing support system.

The final project review in December of 1973 indicated that if the implementation was begin in January 1974 and a fully operational system would be attained in April 1978.

Annual potential benefits were estimated through 1981 and amounted to $20.1M on expenses of $6.8M. The internal rate of return was 131 percent and break-even was achieved in 39 months.

Timing

The issues I wish to bring out in this note concerns the manner in which time affects the effectiveness (doing the right thing) and efficiency (doing it well) of solutions.

Several things happen as time goes on.

1. The business issues being addressed by the solution can change in importance. For example, albeit a minor one, I had my septic system pumped this summer. In doing so, the services company found that the outlet pipe in the tank was too short and a baffle plate was missing. They recommended correction of the problem.

   Shortly thereafter surveying began for a sewerage system on my street. It will likely be installed next year.

   The issue of the septic tank is going away and I will likely not make an investment in its repair.
2. The effectiveness of solutions has the possibility of improving over time as our knowledge of the issue and potential solutions increases, and as our capability of devising and implementing solutions improves.

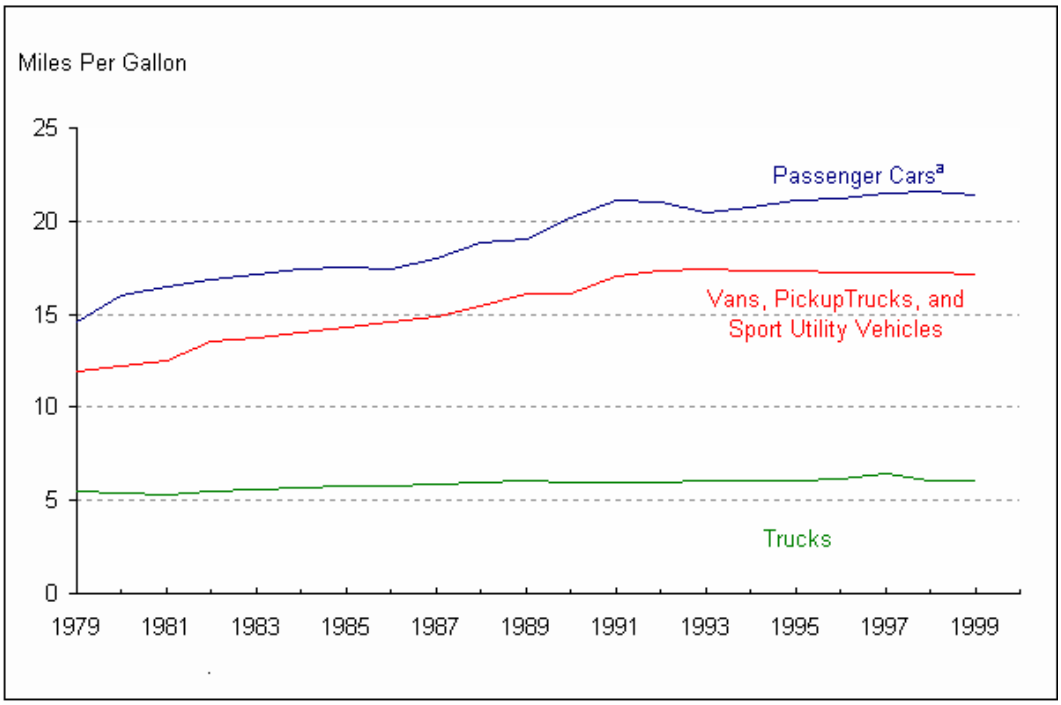
   Also, try as we might, our first solution may not always be the best solution. Think here of the old story of the Dutch boy with his finger in the dike.[1]

[1] http://www.thehollandring.com/hans-brinker-story.shtml

3. The efficiency of solutions has the possibility of improving over time. Perhaps the best current example of this is the automobile industry.[2]

AVERAGE MOTOR VEHICLE MILES PER GALLON

Average Motor Vehicle Miles Per Gallon (annual data)



[a] Includes motorcycles through 1989.

Hence, the maximum potential value of a solution can change over time. The amount of this value we can capture is dependent on the effectives and efficiency of our solutions.

The project cited above took this into consideration. What follows is an extract from a project working report[3]

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[2] http://www.bts.gov/publications/transportation_indicators/september_2001/Environment/html/Average_Motor_Vehicle_Miles_Per_Gallon.html

[3] Value Analysis and the Structured Approach to Business Systems Analysis, December 1973

VALUE ANALYSIS
"The Four Phases of V.A."

Present System Value Potential - This phase assumes a "perfect" business information system in which all shortcomings and deficiencies presently existent are eliminated. The incremental value, or worth, of these improvements is determined and documented. No consideration is given to the practicality of such improvements nor the means by which they could be implemented. We are simply fixing the upper limit of value for the purposes of identification, quantification of total potential, and prioritization of investigation. Each discrete area of potential is documented on separate forms. (See attachment for examples of blank forms.)

Design Year Value Potential - Since deficiencies change in severity over time (and thus their associated value), and because improvements are made over time, the Present System Value Potential for each discrete value area identified and quantified in Phase I is next extrapolated for each year up to and including Design Year (See Design Year Environment). Thus, each of the determinant factors appearing in the algorithms developed in Phase I are projected in accordance with the Design Year Environment. These extrapolations of value potential are documented on the same forms used in the Present System Value Potential.

Solution Value Contribution - Following the development of the Functional Architecture for the Design Year System, determination is made of its value contribution. That is, of the total value potential in each of the ensuing years through Design Year, how much does the proposed system contribute in each of the value areas?

Financial Analysis/Economic Justification - In order to actually realize the calculated Solution Value, incremental costs must be incurred for development, conversion, operation, maintenance, training, etc. These incremental costs must be offset against solution value to determine economic justification, or the relative "attractiveness" of the proposed system as an investment opportunity. After implementation plans have been developed addressing when applications will be installed and when costs are to be incurred, analyses are performed to determine break-even points, discounted value of future savings, etc. Financial analysis tools should be employed in this phase, whenever available, to assist in portraying the most accurate and pertinent financial analysis possible.

VALUE ANALYSIS

FOUR SOURCE FACTORS OF V. A.

- TIME
- SCOPE
- QUALITY
- RESOURCE

A few explanatory words are in order here.

Time and its impact we have discussed on page 1.

Scope concerns the breadth and depth of both the problem and the solution.

Quality concerns the problem and solution definitions.[4]

Resource concerns the resources devoted to the project.

VALUE ANALYSIS EXAMPLES

The two forms immediately following this page are examples of the worksheets used in Value Analysis. While format may vary, the data content shown should be preserved.

The next three pages are examples of output from the "potential" phases of V.A. in one study involving railroad waybilling. One such page is written/published for each benefit area defined.

[4] Compare this with the statement on uncertainties contained in the paper Information Economics.

SAVINGS/VALUE ANALYSIS

Page ___ of ___
Reference No. _____

SAVINGS/VALUE AREA:

ITEM:

DESCRIPTION

ASSOCIATED TASKS:

PRESENT SYSTEM POTENTIAL SAVINGS/VALUE

ASSUMPTIONS

DATA SOURCE

TOTAL | CONFIDENCE FACTOR | PREPARED BY

PROJECTED SAVINGS/VALUE

ASSUMPTIONS

DATA SOURCE

TOTAL | CONFIDENCE FACTOR | PREPARED BY

REMARKS

SAVINGS/VALUE ANALYSIS

Page _____ of _____

Reference No._____

ITEM:

STEP	DETERMINING FACTORS						COMPUTATION
1.	POTENTIAL SAVINGS/VALUE						

Another principle of value analysis as it was introduced to me in this project was that there was no such thing as an intangible benefit. If a benefit was identified as important then it was important enough to apply the effort to turn the intangible benefit into a tangible (i.e., measurable benefit). An example follws.

IMPROVED QUALITY OF WAYBILL DATA

DESCRIPTION: IMMEDIATE EDITING OF SPECIFIC DATA ENTERED IN THE PREPARATION OF WAYBILLS BY THE AGENCIES WOULD IMPROVE THE QUALITY OF THE WAYBILL DATA, THEREBY ELIMINATING THE ONE-DAY DELAY IN BILLING DUE TO ERRORS IN THE DATA.

ASSUMPTIONS: OF THE ERRORS CAUSING THE WAYBILLS TO BE REJECTED IN THE BILLING CYCLE, Z PERCENT ARE DUE TO SOURCE DOCUMENT ERRORS WITH THE REMAINING DUE TO DATA INPUT ERRORS.

REJECTED WAYBILLS ARE CORRECTED BY REVENUE ACCOUNTING AND REKEYED BY THE DATA INPUT DEPARTMENT THE NEXT DAY.

CALCULATION: MPS = NWR x Z x PZ ((LAC x FR+MAC) = AVW x ASIR/365)

WHERE:

MPS = MAXIMUM POTENTIAL SAVINGS IN DOLLARS

NWR = NUMBER WAYBILLS REJECTED

PZ = PROPORTION OF ACCRUED WAYBILLS ORIGINATED BY A RAILROAD

LAC = LABOR COSTS TO CORRECT AND REKEY A WAYBILL

MAC = MATERIAL COSTS TO CORRECT AND REKEY A WAYBILL

AVW = AVERAGE VALUE OF AN ACCRUED WAYBILL

FR = FRINGE BENEFITS EXPRESSED AS A FACTOR GREATER THAN 1

ASIR = AVERAGE SHORT TERM INVESTMENT RATE

LIMITATIONS

1. Use only present system (flow, narr., descr., value) as the base. Do not extrapolate Development Projects or proposals.

2. Determine the direction the 'problems' in the present system will take by design year (increase, decrease, stay the same, etc.).

3. Define/identify new 'problems' emerging as a result of environmental change (growth, labor change, character of traffic, industry standardization, regulation, etc.).

4. Quantify the degree of increase/decrease in severity of 'problem' by design year. Should be referenced to functions/tasks.

5. Rank/prioritize those tasks in which limitations exist. These rankings will serve as the basis for development of the General Systems Specification.

Points 2-4 summarize the essence of value analysis as practiced on this project.

My advice is that you is to reckon that we live in a dynamic world, on the one hand, and the solutions are neither perfect nor implemented instantaneously, on the other. Our knowledge may be imperfect and our reasoning faulty. These factors should not deter us from tackling the difficult problems, but should prompt to do so with a measure of common sense, attention to and systematic reasoning about the facts, and a willingness to learn as we go along.

This suggests that the planning and implementation of information technology systems in support of improving business performance is an ongoing task.

James Drogan
July 24, 2005