An Assessment of Steve Devaux's DIPP Indicator

This note presents an assessment of Devaux's *DIPP* indicator from his book *Total Project Management*. The *DIPP* indicator is given by,

$$DIPP = \frac{EMV}{ETC} \tag{1.1}$$

where *EMV* is the Expected Monetary Value and *ETC* is the Estimate to Complete. [1] These expressions are:

$$EMV = \sum_i \left((\text{Pay off Value})_i \times P\{\text{Success}\} \right)_i - \left((\text{Failure Value})_i \times P\{\text{Failure}\} \right) \tag{1.2}$$

and

$$\begin{aligned} ETC &= \frac{\text{Budgeted cost for work remaining}}{\text{Performance factor for remaining work}}, \quad \text{or} \\ &= \frac{(\text{Budgeted Cost at Completion} - \text{BCWP})}{\text{Cost Performance Index}} \end{aligned} \tag{1.3}$$

Since *TPC* provides no references or bibliography, the background for Eq. (1.2) and Eq. (1.3) can be found in [2]. In both examples the past performance index is used to calculate *ETC*. As a result there are several issues with Eq. (1.1),

1. The denominator creates a "divide by zero" error as the project reaches the end and the estimate to complete approaches zero. This is poor behavior of a performance indicator.
2. The units of measure vary through the life of the project. The result is an indicator that is not a ratio of two values drawn from the same time sample. *ETC* is a scalar value and *EMV* is a summation of a series of probabilities.
3. The indicator has nonlinear behavior over its life cycle. Since the *ETC* is presented as a scalar and *EMV* as a series summation, *EMV* is static while *ETC* is a variable as a function of time.
4. The *ETC* value in Eq. (1.1) needs to be the sum of multiple estimates to complete, since *EMV* is the sum of all possible outcomes. Eq. (1.1)'s *ETC* is a point value with no index *i* to correlate with *EMV*'s sum across the indices of possible outcomes.

Missing the Sunk Costs Concept

The primary issue here is that *DIPP* does not include the sunk costs of the project. Devaux states these are not necessary for the assessment of completion decisions. In fact, any viable *Estimate to Complete* is based on the *previous* project performance. Without understanding the previous performance, the estimate has no basis of validity. Previous performance can not be ignored. The "performance factor for remaining work" is most often derived from the performance of the previous work. *Past is a predictor of the future*.

Sunk costs are accruals and therefore burden the net profit of the project. Ignoring sunk costs is not only poor financial management it is poor project management. The sunk costs must be paid by "someone." The project manager must consider who pays and how much they pay in assessing future decisions for the project. Ignoring these is like *driving in the rear view mirror*. It can be done, but not recommended.

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1 Devaux does not acknowledge there are two distinct probabilities when computing *EMV*. The *A Priori* and the A *Posterior* probability. As well there are joint, marginal, and conditional probabilities for each of the *ETC* and *EMV* values that should be considered in any non–trivial example. When Devaux states *EMV* and *ETC* are used, no further details of the underlying probability distributions from which the choices are drawn are identified, how they are related, or how cost and completion times are seperated in a conditional probability.

2 wInsight Formulas, CS Solutions, www.cs-solutions.com.
"A Monetary Value for Initial Information in Portfolio Optimization," *Finance and Stochastics*, 7(1), January 2003, Springer Verlag.

An Alternative to DIPP

An alternative the Devaux's *DIPP* can be easily derived from the earned value framework. [3]

$$\text{Performance Index} = \frac{EMV}{\text{Total Cost}},$$
$$= \frac{\sum_j \left(\text{Payoff}_j \times \text{P}\left\{\text{Payoff}_j\right\}\right)}{ACWP_{cumm} + \sum\left(ETC \times \text{P}\left\{ETC\right\}\right)} \quad (1.4)$$

The Performance Index contains the elements needed for decision making. The total cost of the project to date; the estimate to complete, *ETC*, based on the past performance of the project for various delivery states; the estimated value of the project at various delivery states – *EMV*. Both *EVM* and *ETC* are based on the same underlying statistical estimating processes and sampling distributions.

Statistical Decision Making

Using *DIPP* for decision ignores two critical aspects of decision making. The past performance of the project and the various *ETC*'s at each delivery state. Past performance is critical to the estimate to complete, as well as the probability of success associated with each *EMV* state. The primary role of any performance index in decision making is to determine the impact of "choices" on the overall project. In this case, the economic value of the project. Cost to date, cost to complete, and resulting project value are needed for the assessment of each decision. These decisions include:

1. Adding or removing a deliverable and determining its impact on the project's value
2. Rearranging, postponing, or accelerating deliverables
3. Changing the scope of a deliverable

In each case calculating *EMV*, *ETC*, and accumulating the sunk costs allow an assessment of the decision on the total project value. A simple arrangement of these parameters are:

Features	Costs To Date	Expected Delivery Date	Expected Value at Delivery [4]	Expected Cost to Delivery Value [5]	Expected *Net* Value [6]
Set 1	$300,000	90 days	$1,000,000	$200,000	$500,000
Set 2	$300,000	120 days	$900,000	$100,000	$500,000
Set 3	$250,000	60 days	$750,000	$50,000	$450,000

Conclusion

Without considering the accumulated cost of the project (the sunk costs), the project manager has no basis for validating the *Estimate to Complete* or assessing the probability of recovering these sunk costs from the projected project "profit."

Ignoring sunk costs hides the past from the decision makers, prevents an informed decision, and "cooks the books" on the net value of the project at completion.

All these outcomes are contrary to the roles and responsibilities of the professional project manager.

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3 Earned Value asks two fundamental questions "how much return is derived for evry dollar invested in this project," and "how much will this project cost when it is completed?" If the decision process is augmented with "alternative" finish states, then DIPP can be replaced with a true performance index.

4 The "expected value at delivery" includes payoff and probability of payoff values. The probability is a random variable drawn from some unknown distribution.

5 This cost would include the probability of achieve the cost number on the planned date. Without this expectation, the *ETC* value does not match the probabilistic basis of *EMV*. The same is true for the Expected Net Value, since it includes both expected cost and expected value random variables. In addition there are two probabilities here – the date and the cost on that date.

6 In this example "net" means total value minus total cost. This is the value the funders of the project are interested in, not some "cooked" value that does not account for the "all in" cost. At the end of the day someone has to pay, why hide this cost?