



## Valuing Information

by Robert H. Van Mell

A proactive organization recognizes the importance of evaluating its information. Good managerial practices will have already led to identifying the various tasks of the organization, calculating the profitability of these tasks, and mapping organizational information flow. Expenditures for information must then weigh the benefits of potential increased returns from improved expertise versus the risks of misappropriation: substantial initial overruns, large upgrade annuities, and loss of productivity from wasted hours.

This paper demonstrates how information and information assets can be appraised using real option values. An option's implied volatility not only measures uncertainty but also how much can be learned before proceeding with or abandoning a task. A key input is the *ST-Index*, which measures the probability of success for an infosphere (set of task-specific knowledge).

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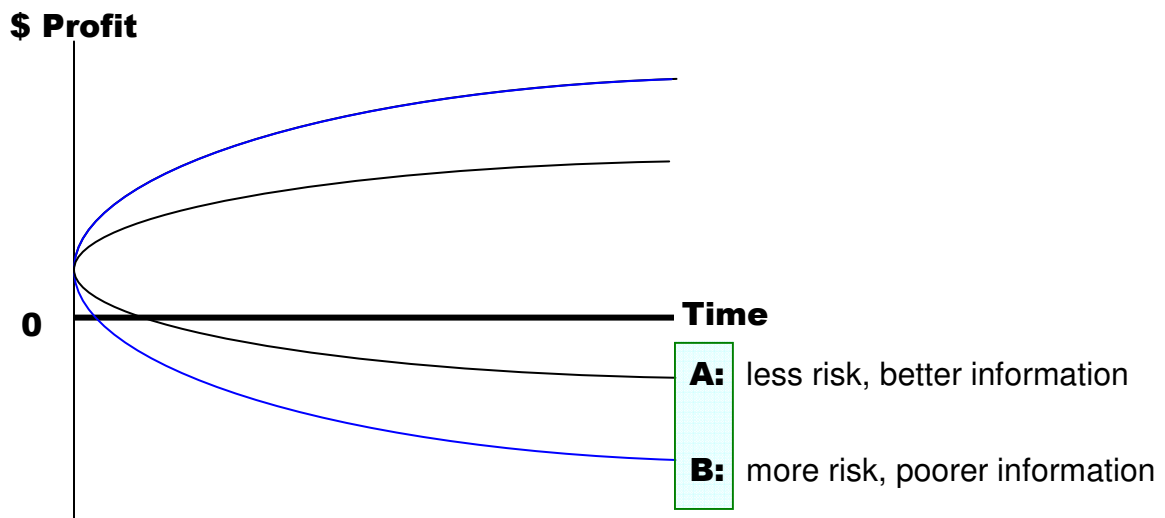
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## VALUING INFORMATION ASSETS

The Stop&Think approach to valuing an information asset has two steps: calculating the benefit of better information for each task served, and then apportioning the benefits to the asset. To calculate benefit Stop&Think causes changes in the *ST-Index* (probability of task success or the investment being in-the-money) in order to generate different volatility measurements for input into real options calculations of expected risk. The two *ST-Indices* quantify the infosphere's usefulness in understanding the task with and without the potential new asset's information.

To make the benefit calculation the client estimates parameters for the real options model during the period of opportunity. The information assets must also be identified; these are not limited to IT and could include documents, third party sources, and staff members.

**Step 1: Calculating the Benefit of Better Information**

*Better information means less risk (smaller losses)*

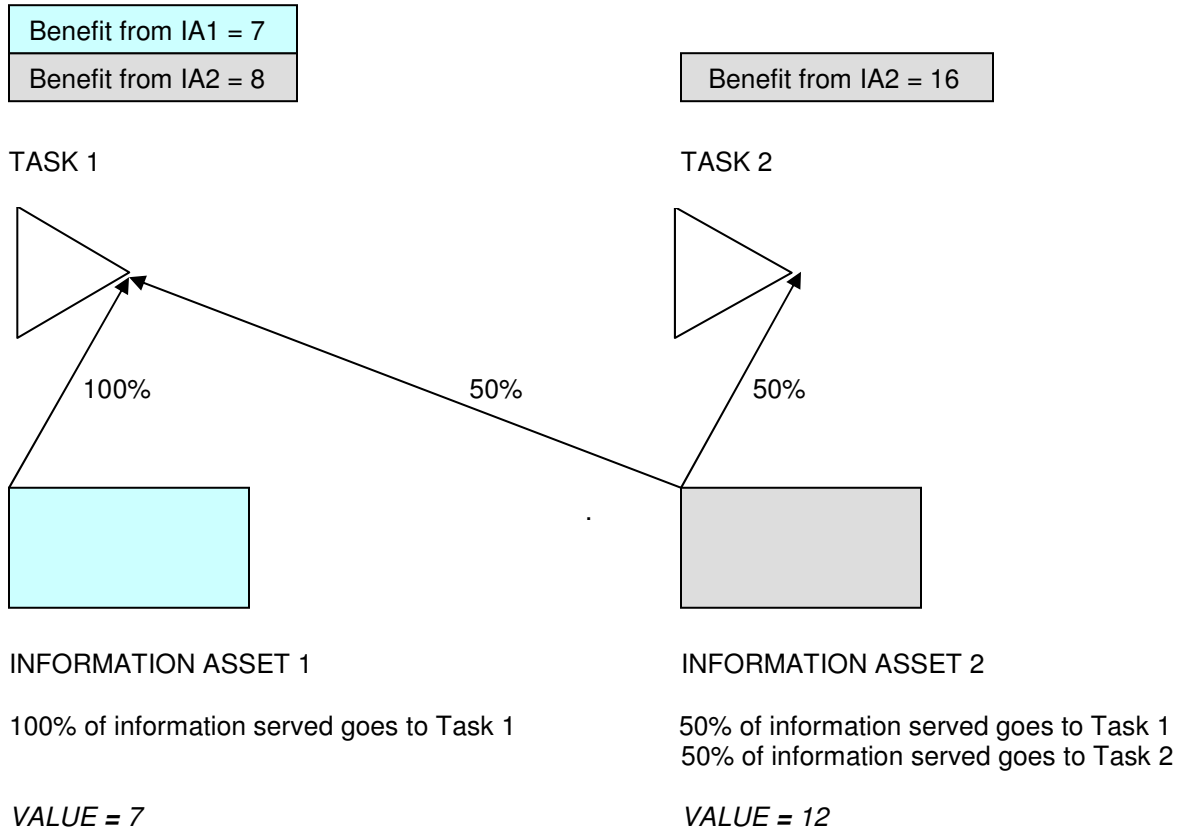
- The bands enclose the range of possible values for profits over time.
- Poorer information, quantified by a lower *ST-Index*, increases the width of the bands since less is certain (higher volatility).
- Since the task is expected to be profitable, risk is negative profit (loss) quantified in the real option put<sup>1</sup> value.

If the asset yields better information then the benefit is **A-B**, the reduction in risk (difference in real put values).

<sup>1</sup> In this example NPV > 0 meaning that the project is expected to be profitable. If NPV < 0 so that abandonment is the primary consideration, then better information will reduce the risk of foregone opportunity represented by real option *call* values.

**Step 2: Apportioning Benefits**

An information asset's value is the sum of all of its weighted benefits<sup>2</sup>. The weight is the proportion of the asset's information served to the particular task.



<sup>2</sup> Better information increases the chances of success from proceeding with a profitable task or abandoning an unprofitable one. An information asset could provide information yielding both of these benefits.

## VALUING INFORMATION

The better the infosphere is, the less the uncertainty (volatility) and hence risk of a poor result (losing all or part of the investment). In this case there is little value in learning since we are confident in the knowledge we have. However, a low *ST-Index*, indicating higher risk, increases the value of learning ("wait and see") as opposed to making the investment. A real option's time premium, the price of the out-of-the-money option, is the amount we are willing to pay for additional knowledge to remove all risk before investing.

If the expected return, or net present value, of an investment is negative, then the usual decision is to abandon the project – not invest – or terminate an on-going activity. However, if the *ST-Index* is high, i.e. there is a sufficient uncertainty to suggest a possibility of success even given the initial negative expectation, then learning first may be a better decision. The probability of a successful abandonment is  $1 - [ST-Index]$ ; the call price represents the risk (or value of additional knowledge) for opportunity lost if the task were to be successful.

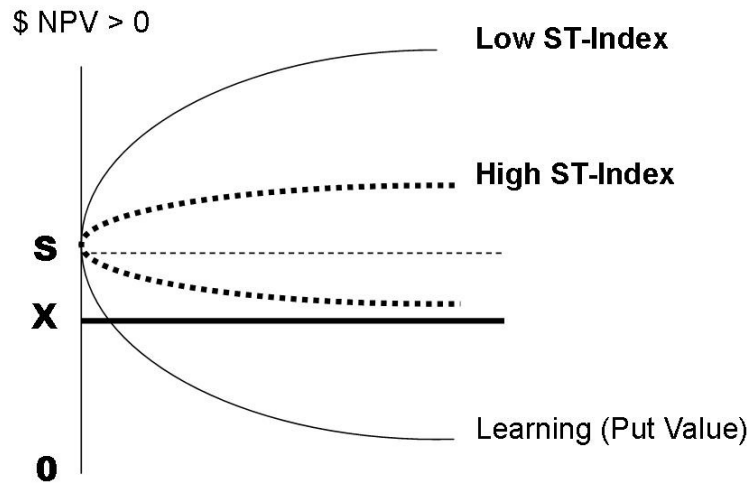
<b>Proceed?</b>	<b>Abandon?</b>
NPV > 0, put (P) out-of-the-money, call (C) in-the-money	NPV < 0, put (P) in-the-money, Call (C) out-of-the-money
<i>Low ST-Index</i>	
High Volatility	Low Volatility
<b>Learn</b>	<b>Abandon</b>
\$ Learning Value (Put) = X	\$ Learning Value (Call) = 0
\$ Info Value (S-X-P) = (S-X)-X	\$ Info Value (X-S-C) = X-S
	(negative NPV saved)
<i>High ST-Index</i>	
Low Volatility	High Volatility
<b>Proceed</b>	<b>Learn</b>
\$ Learning Value (Put) = 0	\$ Learning Value (Call) = S
\$ Info Value (S-X-P) = S-X	\$ Info Value (X-S-C) = (X-S)-S
(positive NPV gained)	
X is investment amount; S is value of investment activity; NPV = S-X. <i>ST-Index</i> is the probability of task success (Proceed? infosphere value). For the Abandon? decision, volatility is determined by $1 - [ST-Index]$ .	

For NPV = 0 and opportunity cost = 0 the investment decision table is:

<i>ST-Index</i> > .5 <b>Undetermined</b>	
<i>ST-Index</i> < .5 <b>Learn</b>	
.5 or above	0 * X
.4	.2
.3	.4
.2	.6
.1	.8
0.0	1.0

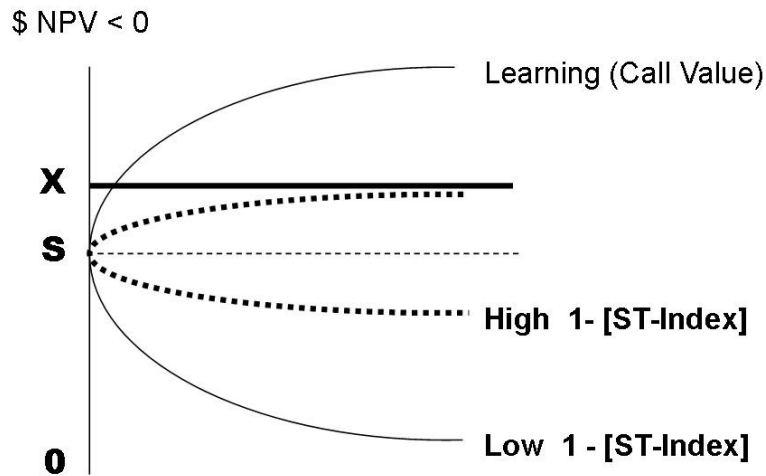
The maximum amount to pay for knowledge is  $(1-2*ST) * X = P=C$  regardless of time. As opportunity cost rises the cost ratio of current / future education also increases.

**PROCEED?**



The lower the *ST-Index*, the more there is to be gained from learning before deciding whether to invest.

**ABANDON?**



The higher the *ST-Index* the greater the advantage of learning before deciding whether to abandon the investment (Low 1 - [*ST-Index*]).

## Conclusion

Competent management practices are based on an enumeration of an organization's functional areas and the distribution of underlying informational support. Creating and valuing task-related infospheres allows risk be correctly matched to reward, enabling the measurement of changes in information quality. The Stop&Think method maps the *ST-Index* into volatility, which in turn is used to price real options.

An information asset can be valued by measuring the changes in risk (real option call or put values) that it generates. Information value itself is the difference between outcome or investment and the amount left to be learned (additional knowledge) quantified in the real option time premium. The decisions to proceed with or abandon investments are mirror-images of each other.