Quantifying Stakeholder Values

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Abstract: Here are some questions we need to ask about stakeholder value. How can we determine the overall value of a system? How is this value related to the performance characteristics of the system? How can we engineer the value to meet stakeholder expectations? How can we test and measure the real value? Can we contract for system payment by value, or do we have to restrict ourselves to payment for performance levels? Is there any way to quantify the overall value of a system as a function of a set of system attributes?

The performance-to-value relation.

- It is intuitively obvious that, as system performance attributes vary, the values of that system, to defined stakeholders, at defined times, under defined circumstances, vary.
- It is equally obvious that there are levels of performance so low that they give no value at all – or even make all other value attributes worthless (imagine zero availability); and increases in performance that give little or no improvement in value (imagine 99.999999999% availability).
- One central problem is that many engineers have not learned to quantify some performance characteristics, particularly some quality characteristics (for example usability, adaptability). They are indeed quantifiable but are treated 'qualitatively' with words ('very user-friendly', 'highly flexible') in most cases.
- There is no strong tradition for such attributes of being quantified (as there is with reliability and availability for example).
- This quality quantification problem must be confronted if we are going to be able to compute corresponding stakeholder value for those quality variations.

Here is my suggestion for the **fundamental principles** of *stakeholder value quantification.*

- 1. Stakeholder (implied hereafter) Value depends on a set of factors.
    - 1.1 Value depends on the level of single (performance, function, constraint, and cost) attributes.
    - 1.2 Value also depends on a defined set of such system attributes existing simultaneously.
    - 1.3 Value depends on a point in time synchronizing with a set of external circumstances (example markets, laws, transportation costs)
- 2. We can *usefully distinguish between* estimated value, calculated value, contractual value, potential value, realized value, and perceived value.
- 3. The systems engineering effort must *consciously manage* the necessary system characteristics, in order to deliver the minimum conditions (the system characteristics) for allowing a stakeholder to potentially derive the potential value.
- 4. The systems engineering effort cannot be responsible for *achieving* necessary stakeholder value conditions that are *outside* their control (like a 'willing market'). But, they should be responsible for identifying such outside conditions, for making stakeholders aware of such external conditions, and for designing the system so that the stakeholder has every opportunity to take advantage of, or deal with, the external conditions.
- 5. All binary conditions (like 'legal') can be specified in a testable manner
- 6. All scalar (variable) attributes that determine value can be specified quantitatively (in particular, all qualities), can be designed into the system consciously, and measured and tested as to the level actually attained. In particular all value-critical system qualities *can* be defined quantitatively. See the defined process in Gilb05, Ch 5 for quantification.
- 7. If the system characteristics necessary for delivering stakeholder value are clarified and quantified, then the basis for 'no cure no pay' contracting is laid. Or at least strong motivation to deliver the necessary levels of system performance on time, is present.

Here are some practical tools for managing stakeholder value:

Value Policy:

- *Here are some specific* <u>*policy*</u> *ideas that somehow need to become part of your corporate systems engineering culture.*

    1. The main purpose of our systems engineering work is to enable our stakeholders to get maximum value for cost.

    2. We will systematically identify and specify all relevant stakeholders, and all values we can influence for them, and will make a cost-effective effort to deliver the system attributes that will enable our stakeholders to derive maximum value for them.

    3. We will develop our systems engineering culture, training, motivation and tools so as to make value delivery happen in practice.

Planguage

- *The Planning language ('Planguage') detailed in my book 'Competitive Engineering' (CE, Gilb05) has dozens of practical specification tools for enabling us to analyze both system value-drivers, and value analysis and planning. Some of these tools will be hinted at in the rest of the paper (example, templates).*
- *Qualifiers: qualifiers are Planguage specification tools that allow us to be explicit about the necessary times, events and spaces that are a prerequisite for defining when, where, and if, value can be created.*
- *For example:*
    - **Usability:**

        <u>Stakeholders</u>: Local Olympic Committee.
        <u>Scale</u>: time to learn a typical task.
        <u>Goal</u> [China, Teenagers, At Olympics, If Our product is Purchased] less than 10 minutes.

            <u>Impacts</u> [If Training Paid for by Local Olympic Committee] Stadium Personnel Costs.

    - *The product quality requirement (named 'Usability') Goal (the level we require to get value) has a set of 'qualifier conditions' that must all be 'true' or valid, for the '*less than *10 minutes' Goal level to be a valid requirement.*
    - *The Goal level is designed to increase the value of the system we engineer, by reducing the 'Stadium Personnel Costs' for the Stakeholder 'Local Olympic Committee'.*

Templates

- *Performance Template.*
    - *A simple template for specifying a system performance characteristic, might correspond to the example above:*
        - *<name tag>*
        - *Stakeholders: <name the top few stakeholders who are impacted by this particular requirement>.*
        - *Scale: <define a scale of measure for this performance attribute>.*
        - *Goal [<when?>, <where>, <event>]: <specify the necessary, but practical and economic performance level>.*
        - *Impacts: <specify the stakeholder value specification that the Goal level is intended to impact>.*
    - *The <hints in fuzzy brackets> are digitally eraseable help for giving the intended information about the requirement.*
    - *A much more detailed template is published in my book [CE] at the end of each corresponding chapter,*

Impact Estimation Tables (IET)

- *IETs are for relating system attributes (as 'means') to Value Objectives.*
- *Impact Estimation Tables are Planguage tools that*
    - *Help us analyze and present the relationships between any useful set of technical system objectives, and any set of stakeholder values that these technical objectives are intended to impact.*
    - *The IE Tables can be constructed so that the basis for the estimates is clear, even though the connection may be weakly based, risky, or even more well-founded.*
- *The Impact Estimation table is a useful way of summarizing the degree of formal planning done thus far for satisfying stakeholder values. But even when the IE Table shows a strong plan is in place, it needs to be confirmed step by step through Evolutionary step measurement. It is not as reliable a tool as actual measurement of practical experience with real stakeholders.*

- *Here is an Impact Estimation Table framework for analyzing stakeholder values that are affected by engineered system performance attributes, such as system qualities.*

System Attributes --->	*SA1*	*SA2*	*SA3*	*SA4*	*SA5*	*Sum %*
Stakeholder Values (Vn)						
V1:	*SA1->V1*	*SA2->V1*	*100%*	*0%*	*?*	
V2:		*SA2->V2*				
V3:			*SA3->V3*			
Sum	*∑ SA1-n*					
Sum/Cost	*∑/€*					

- *Impact Estimation Table skeleton: this table format can be used to help us analyze the projected impacts, of engineered system characteristics, on a set of stakeholder values.*

- *The estimates can be rough or refined depending on circumstances and ability. SA1 -> V1 means that here is where we would place an estimate of the impact of System Attribute SA1 (example Usability) on Stakeholder Value V1 (example Staff Costs). We would use the 'percentage language' to indicate our estimate. 100% means that the Attribute Goal level, if attained in practice, would serve to meet 100% of the Stakeholder Value Goal level. 0% would indicate there was no expected impact at that intersection. A '?' would indicate that we did not understand the relationship, and indicate a risk until further study was done.*
- *The 'Sum %' horizontally would be a rough indication of the degree to which planned system attribute levels would satisfy the stakeholder value.*
- *The Sum/Cost estimate would be an indication of the efficiency of a given system performance attribute level in satisfying a set of stakeholder values.*

An impact estimate can be a subjective or consensus number for the sake of discussion. But an impact estimate can also have the following additional disciplines added in order to make it more useful.

  - *The 'Real impact' number on a defined scale (like 6.0 'minutes to learn a task') can be estimated*

    - *An uncertainty can be estimated based on the known range of experience, or a best-case/worst-case stipulation (50%±20% for example)*
    - *A source of the estimate can be documented ('<- The Times Jan 17 2006, p 23, James Whittaker')*
    - *The facts, or 'evidence' for the estimation, the 'estimate credibility' basis, can be cited ('1500 IT Systems investigated in UK in 2005')*
    - *The credibility level of the estimate can be specified, based on a scale from 0.0 (no credibility) to 1.0 (perfect credibility).*
- *The table is not intended to arrive at a final truth. The IET is intended to help us display our level of understanding in a systematic way, so that the next steps can be taken in a systematic way. For example, do some practical trials on all high-benefit but low-credibility estimates, first.*

Summary

- *Stakeholder values can be expressed quantitatively. Stakeholder values can be satisfied by an engineered system, through specific system attribute levels (such as qualities).*
- *It is possible to analyze the relationship between our systems engineering efforts, and the projected degree of stakeholder satisfaction.*
- *The stakeholder values themselves must be described quantitatively.*
- *The impacts of our system strategies, mostly the system performance characteristics, on specific stakeholder values, can be estimated.*
- *We can systematically manage the probable satisfaction of stakeholder values, by something better than verbal and qualitative communication.*

References

Gilb05: Gilb, Tom, Competitive Engineering, A Handbook For Systems Engineering, Requirements Engineering, and Software Engineering Using Planguage, ISBN 0750665076, 2005, Publisher: Elsevier Butterworth-Heinemann.

This book goes into considerable practical detail about how to specify and analyze stakeholder values and system requirements for impacting those stakeholder values. It contains 393 occurrences of 'stakeholder'. 304 occurrences of 'value'.

Gilb, Kai: Evo: Evolutionary Project Management & Product Development . Book Manuscript available free at www.gilb.com. This book goes into stakeholder issues in considerable detail.

Author Bio

Tom has been an independent consultant, teacher and author, since 1960. He mainly works with multinational clients; helping improve their organizations, and their systems engineering methods.

Tom's latest book is 'Competitive Engineering: A Handbook For Systems Engineering, Requirements Engineering, and Software Engineering Using Planguage' (Summer 2005).

Other books are 'Software Inspection' (with Dorothy Graham, 1993), and 'Principles of Software Engineering Management' (1988). His 'Software Metrics' book (1976, OoP) has been cited as the initial foundation of what is now CMMI Level 4.

Tom's key interests include business metrics, evolutionary delivery, and further development of his planning language, 'Planguage'. He is a member of INCOSE and is an active member of the Norwegian chapter NORSEC. He participates in the INCOSE Requirements Working Group, and the Risk Management Group.

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