Real Data Engineering

A serious, systematic, logical and quantified, value-driven ‘engineering’ approach to all data matters, as part of a larger systems engineering approach.

Monday, May 6, 2019
Teknologihuset Pilestredet 56 · Oslo

17:15 – Tom Gilb – Real Data Engineering – part 1
18:00 – break
18:15 – Tom Gilb – Real Data Engineering – part 2

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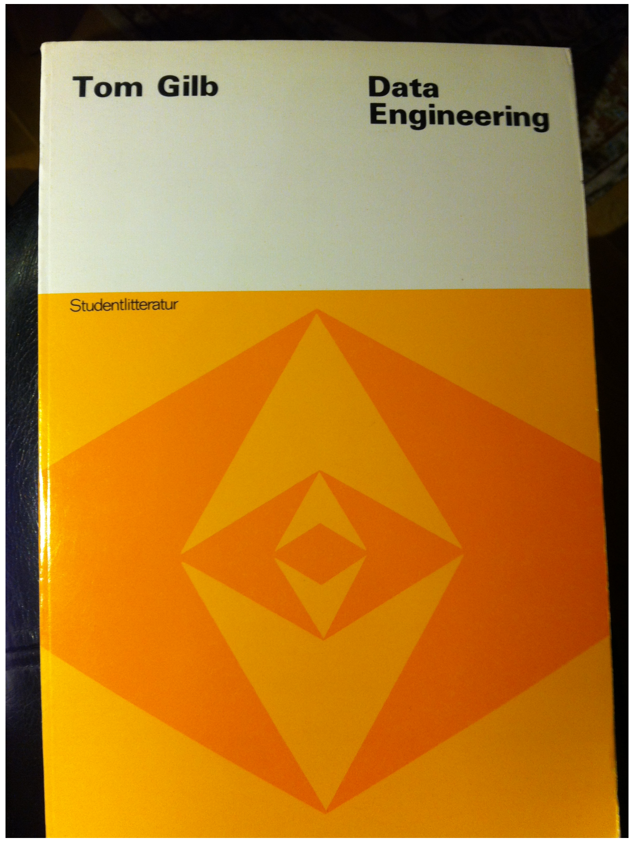


1976

Talk Plan:
45 + 45 minutes

1. Data Engineering as a subset of 'systems engineering' (i.e. with hardware, netware, logicware, dataware, and peopleware),

2. Defining ‘engineering’ - properly. The Prof. Billy Koen approach.

3. The components of a systems engineering process, and a Data Engineering process:
a. quantified multidimensional qualities requirements, and resource-constraints, (quantify ’security’, ‘AI decision transparency’, 'Big Data Portability')
b. detailed-enough data architecture, in order to understand corresponding data attributes,
c. estimates of potential data-architecture impacts on multiple requirements. Side effects.
d. computable, dynamic, priority of implementation, (a values-to-costs, wrt risks, decision)
e. data architecture decomposition methods, (to prioritize critical results early)
f. measurement of incremental data-architecture effects. (to keep the ship on course)
g. dynamic design-to-cost, agile, architecture-process, like 'IBM Cleanroom', Quinnan

4. A systems-engineering (= data engineering) language (Planguage) for modeling data-engineering processes and problems.

5. Examples of how to always quantify all critical data architecture qualities requirements.

6. How can you learn to qualify as a real data engineer? (Universities do not teach it!)

7. Understanding data engineering stakeholders as a source of requirements.

1. Data Engineering as a subset of 'systems engineering' (i.e. with hardware, netware, logicware, dataware, and peopleware),

	Dataware	Logicware	Netware
	Data Formats	Algorithms	Data Transfer Protocols
	Data Structures	Programming Languages	Network Package Formats
	Data Concept Glossaries	Logic Libraries	Network Rules Laws Agreements

Engineering Hierarchy

- Engineering *224
  - Systems Engineering *223
    - Systecture (Systems Architecture) *564
      - Data Structures Strategy
      - Application Portfolio Strategy
      - Platform Strategy
      - Methods Strategy
      - Standards Development
    - Program Management
      - Project
  - Other Engineering

Engineering Concepts

Processes

- Architecture Process *499
- Requirements Process *612
- Design Engineering *501
  - Design Process *046
  - Impact Estimation *283
- Evolutionary Project Management (Evo) *355

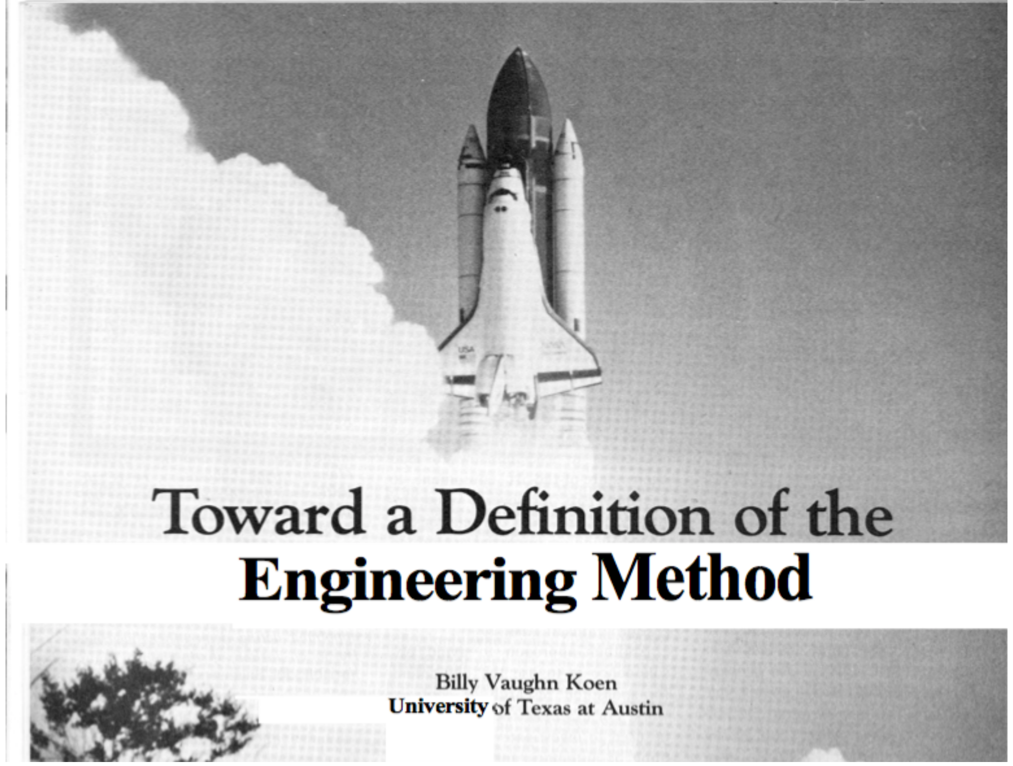
Specification Types

- (The) Architecture *192 (Artifacts)
- Architecture Specification *617
- Standards *138
  - Security Standards
  - Interface Standards
  - Requirement Specification Standards
  - Other
- Requirement Specification *508
- Design Specification *586
- Impact Estimation Table
- Evo Step Specification *370
- Evo Plan *322

WHAT IS REAL SOFTWARE ENGINEERING?

It is NOT about ‘coding’

2. Defining ‘engineering’ - properly. The Prof. Billy Koen approach.



Toward a Definition of the
Engineering Method

Billy Vaughn Koen
University of Texas at Austin

Engineering is

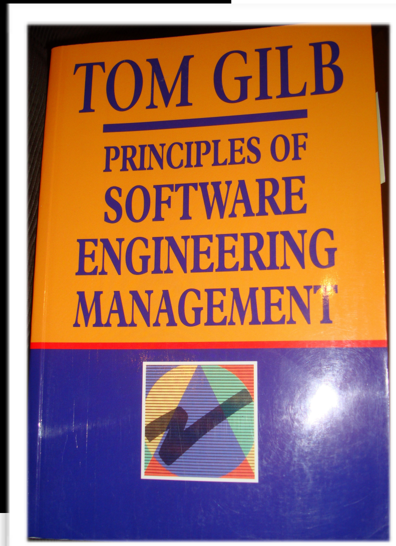
"The engineering method is
the use engineering heuristics
to cause the best change
in a poorly understood situation
within the available resources."

Prof. Billy Koen
http://www.me.utexas.edu/~koen/

The engineering method is
(Gilb, Planguage Glossary)
Concept *224 June 28, 2003

an Evolutionary Process,
- using practical Principles,
- in order to determine,
- and *identify the Means* to deliver,
- the best achievable Performance and Cost levels balance,
- for **optimal Stakeholder satisfaction,**

in a complex risk-filled environment.



TOM GILB
PRINCIPLES OF
SOFTWARE
ENGINEERING
MANAGEMENT

Software, subset: ‘Dataware’

Concept *570 March 12, 2003

Software refers to the ‘non-hardware’ aspects or components of a system.

It specifically includes
- computer programs,
- **data (computer readable files and databases),**
- and software documentation and
- plans (any form of specification or plans made by people concerning software).

•

Software Engineering

Concept *572

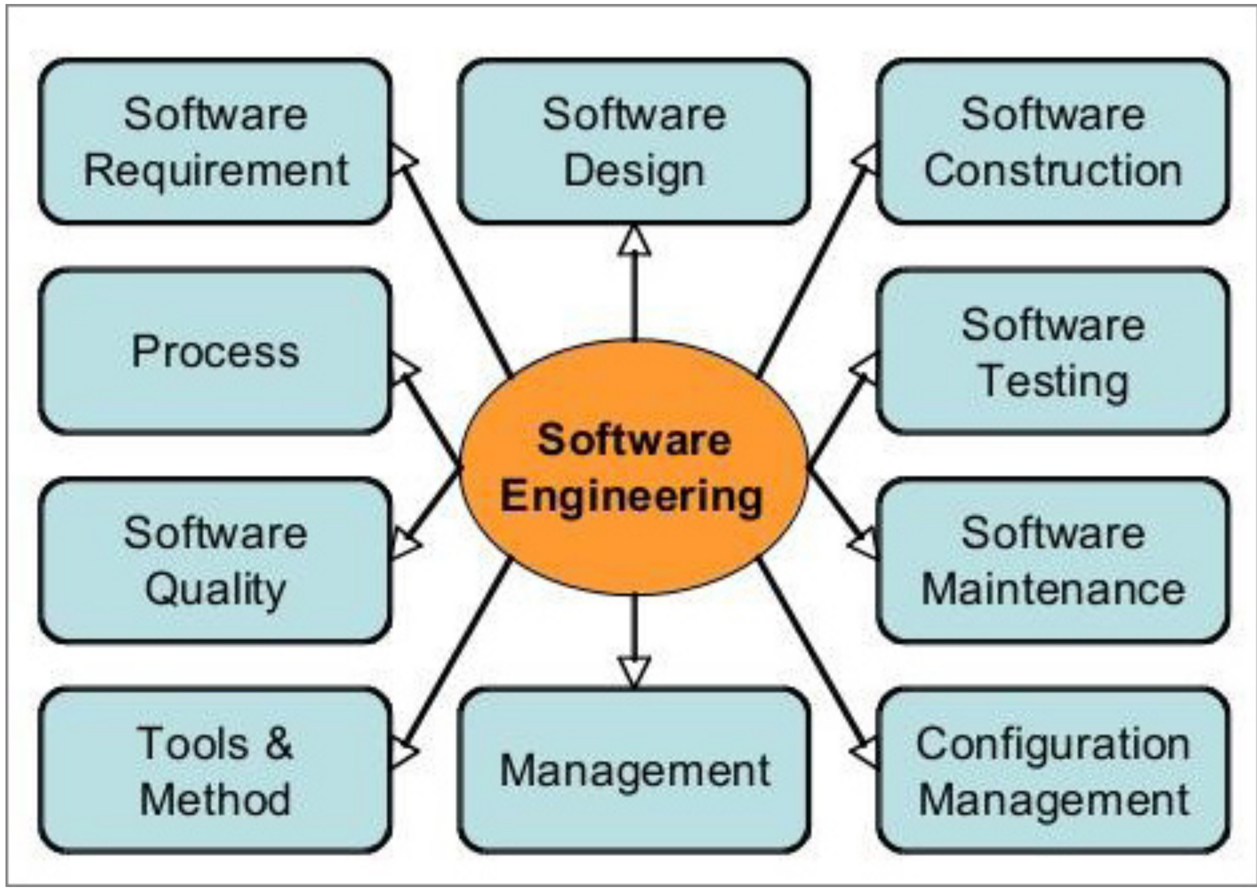
the discipline of making software systems deliver the <u>required value</u> to all stakeholders.

Software engineering includes

determining stakeholder requirements, designing new systems, adapting older systems, subcontracting for components (including services), interfacing with systems architecture, testing, measurement, and other disciplines.

It needs to control computer programming and other software related sub-processes (like quality assurance, requirements elicitation, requirement specification), but it is not necessary that, these sub-disciplines be carried out by the software engineering process, itself.

The emphasis should be on control of the **outcome - the value** delivered to stakeholders, not of the performance of a craft.



Software Engineer: Concept *571

- A software engineer is **an engineer with specialty in software.**

- They are characterized by the ability to
  - assemble software components **based on quantified attributes.**
  - This ability is aimed at the need to meet <u>multiple quantified requirement performance levels, within specified resource constraints</u>, and other constraint limitations.

- Consequently software engineers think in terms of
  - measurable system performance (including quality) characteristics, and costs for design, implementation, decommissioning, adaptation, and operation.
  - They know how to access the multiple quantified attributes of a **design** component
  - and how to **measure** these attributes in the systems they engineer.

A Data Engineer, ‘Dataware Engineer’
is a software engineer
with speciality in DATA,
as opposed to other software disciplines

3. The components of a systems engineering process, and a Data Engineering process:

‘System’ and thus Dataware *Requirements*

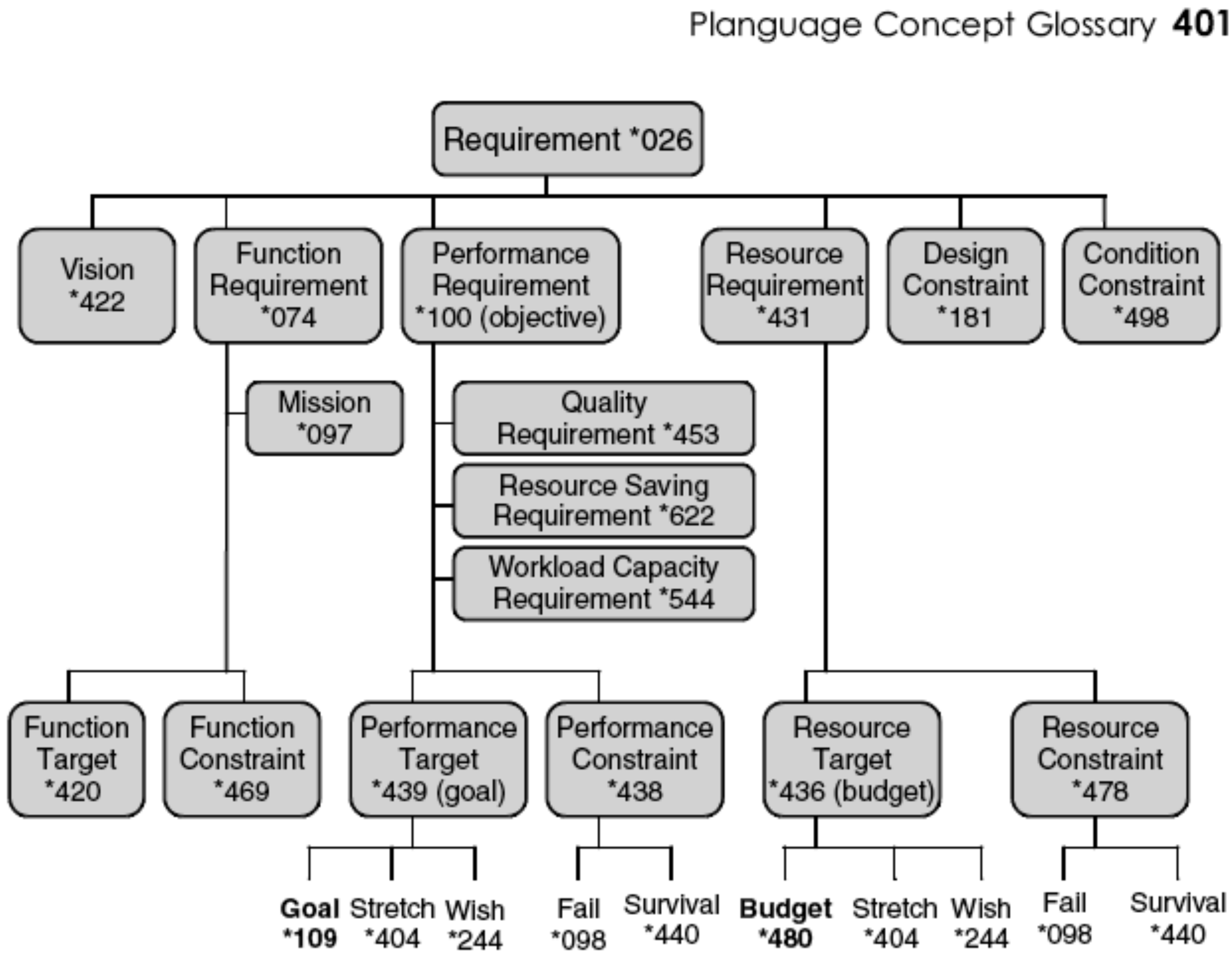
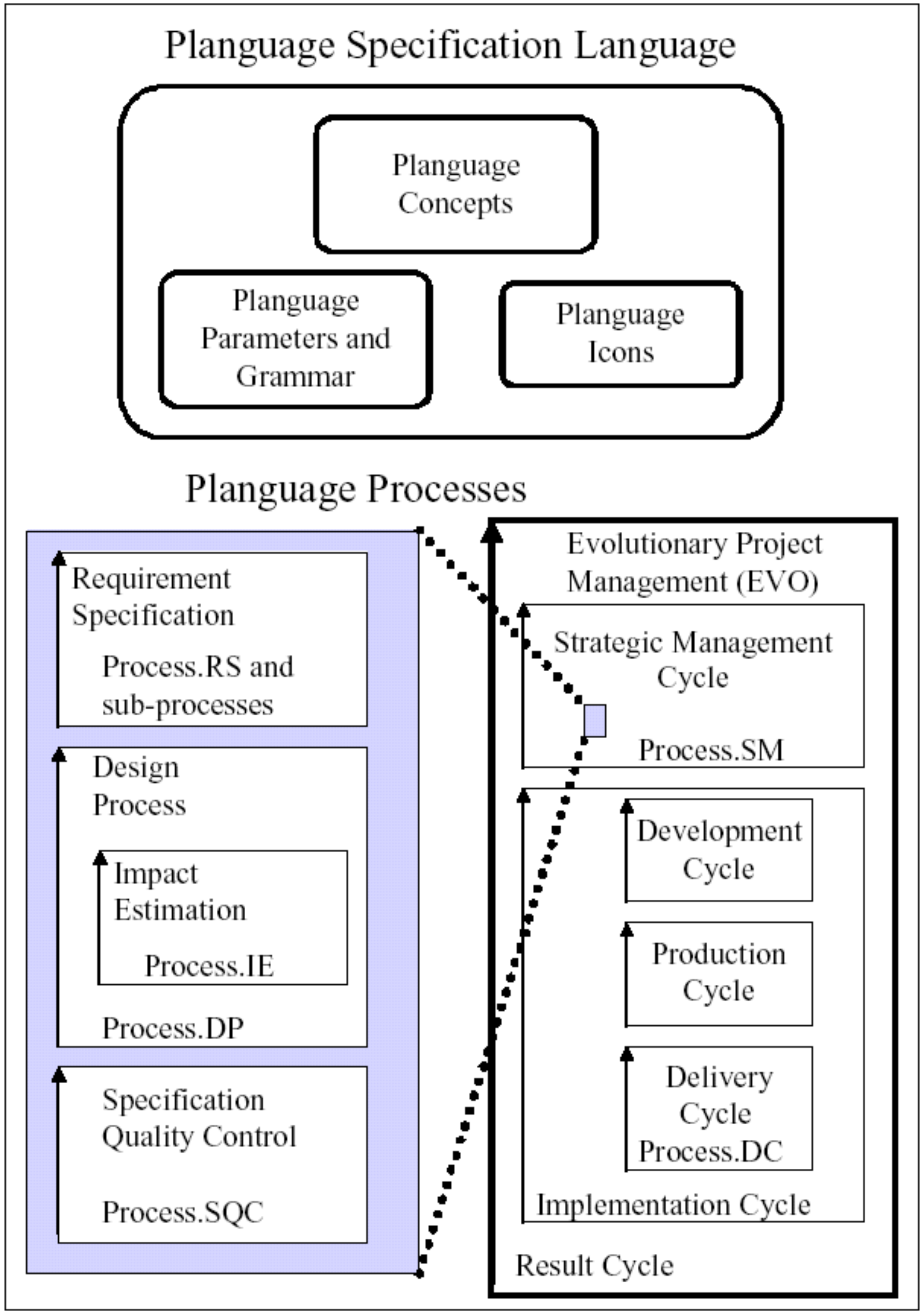


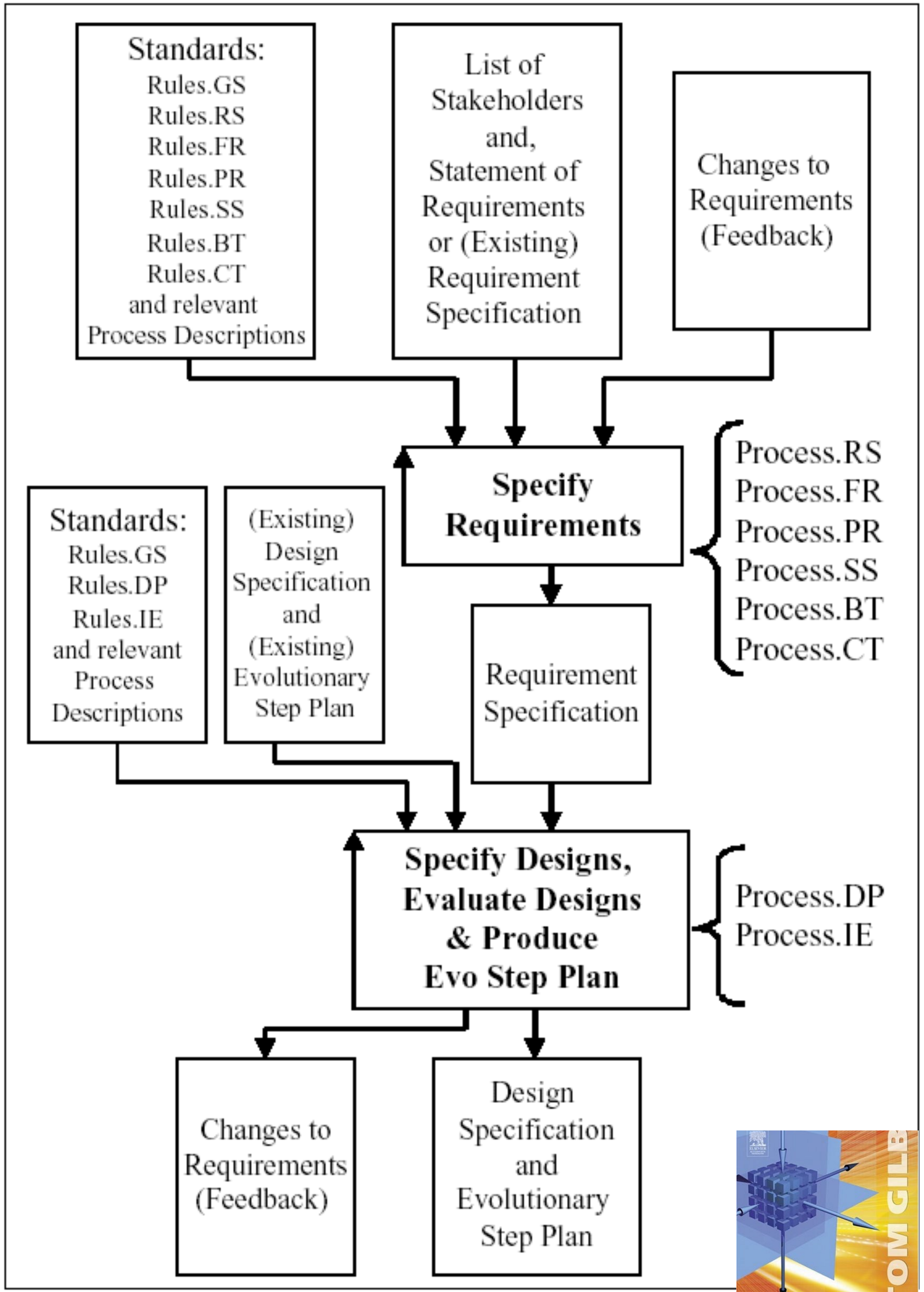
Figure G20
Requirement Concepts.

- Uses =
  - Systems Analysis
  - Requirements
  - Contracting specs
  - Design - Architecture
  - Presentation
  - Spec Quality Control
  - Project Management



Standards, Best Practices, Defined Processes which apply to Data Engineering, as well as all other related engineering

- Generic Ends-Means process
- Well-defined standards
  - Specification rules
  - Requirements and design processes
  - One page - modules
  - Reuse of generic standards
- Suitable for
  - Top management strategy
  - Marketing product plans
  - Software engineering
  - Systems engineering
    - **Dataware Engineering**
  - Specific engineering
    - Aircraft for example



Standards:
Rules.GS
Rules.RS
Rules.FR
Rules.PR
Rules.SS
Rules.BT
Rules.CT
and relevant
Process Descriptions

List of Stakeholders and, Statement of Requirements or (Existing) Requirement Specification

Changes to Requirements (Feedback)

Specify Requirements

Process.RS
Process.FR
Process.PR
Process.SS
Process.BT
Process.CT

Requirement Specification

Standards:
Rules.GS
Rules.DP
Rules.IE
and relevant
Process Descriptions

(Existing) Design Specification and (Existing) Evolutionary Step Plan

Specify Designs, Evaluate Designs & Produce Evo Step Plan

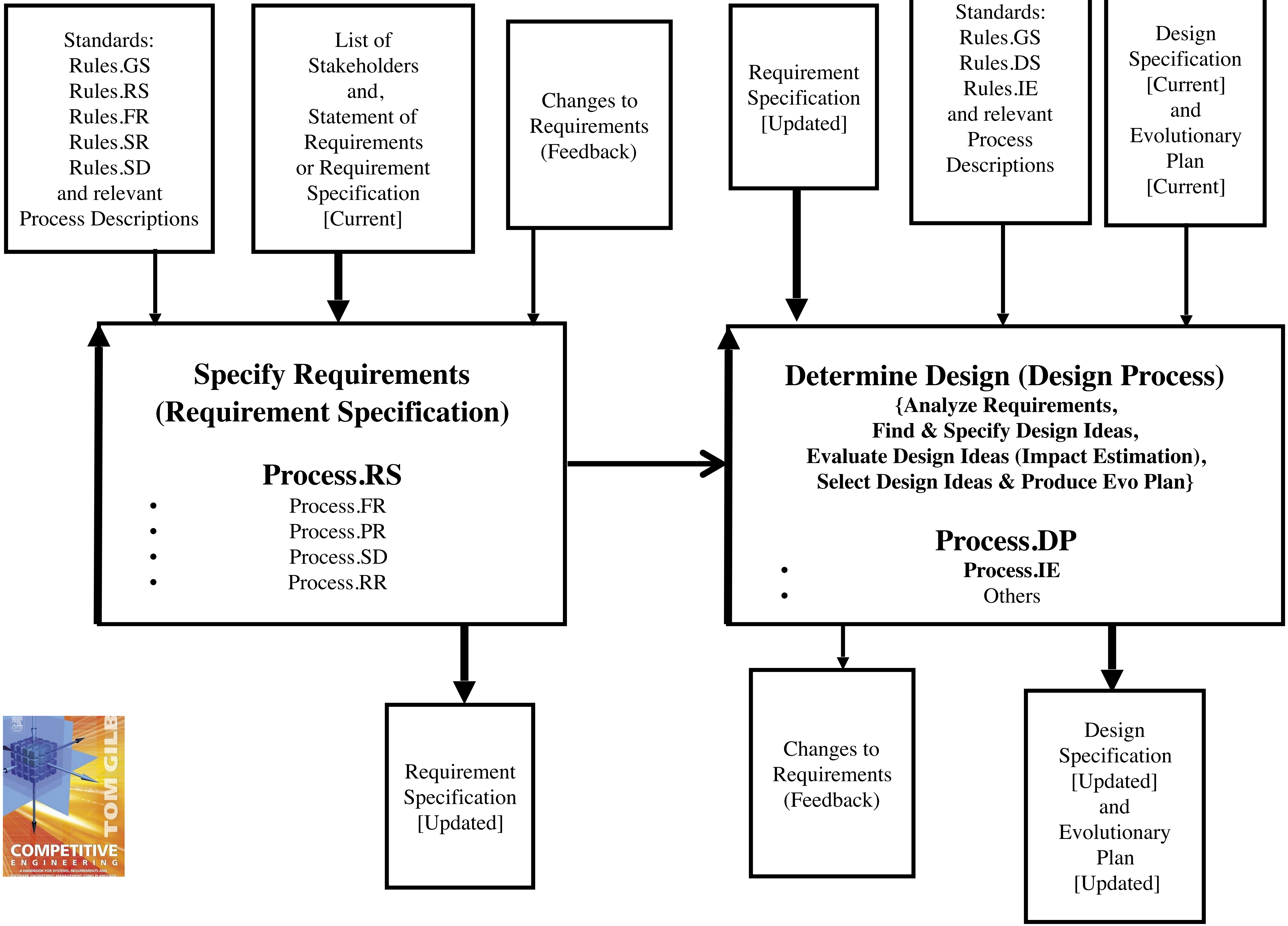
Process.DP
Process.IE

Changes to Requirements (Feedback)

Design Specification and Evolutionary Step Plan

Planguage standards

Requirements and Design



Standards:
Rules.GS
Rules.RS
Rules.FR
Rules.SR
Rules.SD
and relevant
Process Descriptions

List of
Stakeholders
and,
Statement of
Requirements
or Requirement
Specification
[Current]

Changes to
Requirements
(Feedback)

Requirement
Specification
[Updated]

Standards:
Rules.GS
Rules.DS
Rules.IE
and relevant
Process
Descriptions

Design
Specification
[Current]
and
Evolutionary
Plan
[Current]

Specify Requirements
(Requirement Specification)

Process.RS

- Process.FR
- Process.PR
- Process.SD
- Process.RR

Determine Design (Design Process)
{Analyze Requirements,
Find & Specify Design Ideas,
Evaluate Design Ideas (Impact Estimation),
Select Design Ideas & Produce Evo Plan}

Process.DP

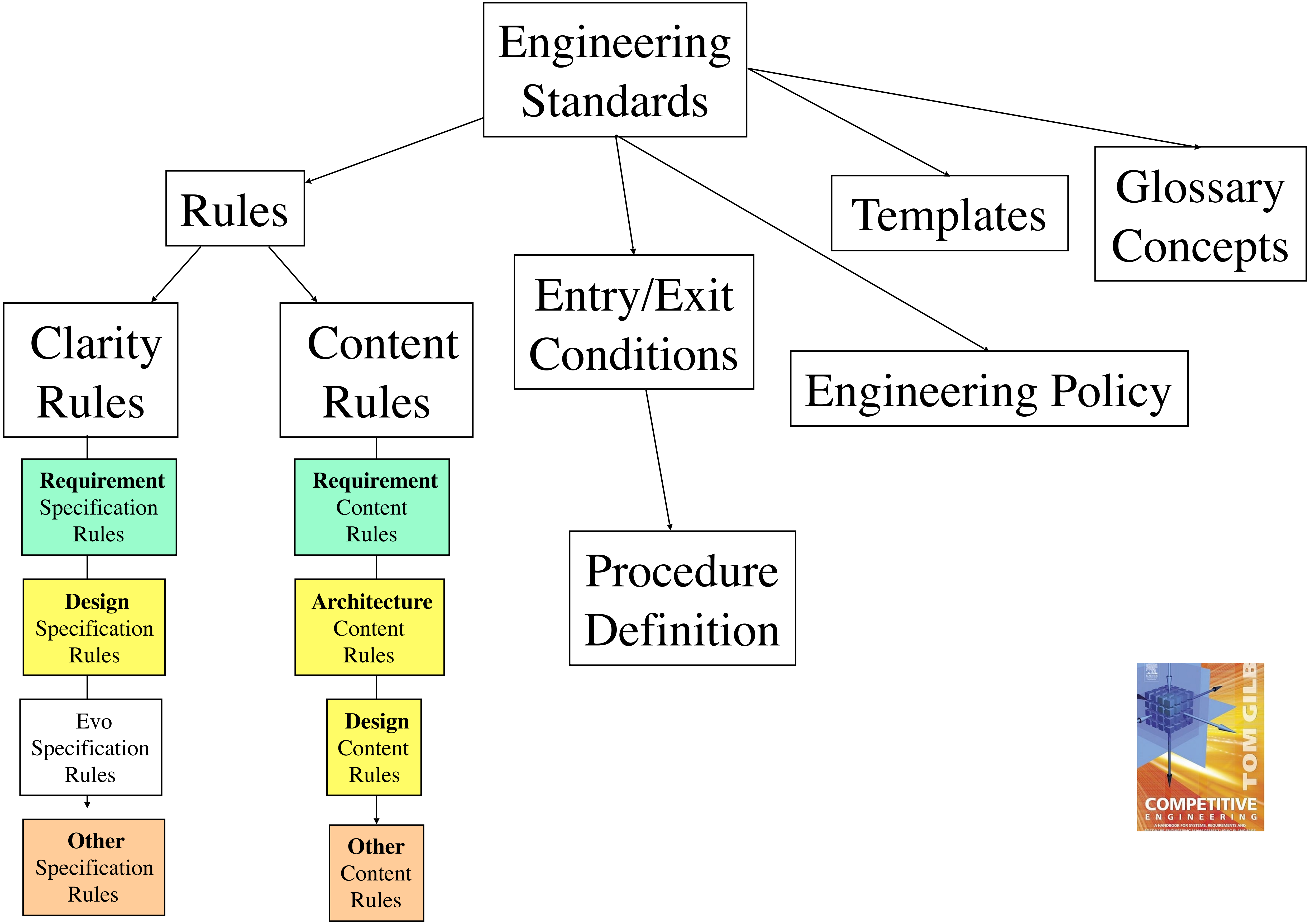
- **Process.IE**
- Others

Requirement
Specification
[Updated]

Changes to
Requirements
(Feedback)

Design
Specification
[Updated]
and
Evolutionary
Plan
[Updated]

Generic Standards Overview



Engineering Standards

Rules

Clarity Rules

Requirement Specification Rules

Design Specification Rules

Evo Specification Rules

Other Specification Rules

Content Rules

Requirement Content Rules

Architecture Content Rules

Design Content Rules

Other Content Rules

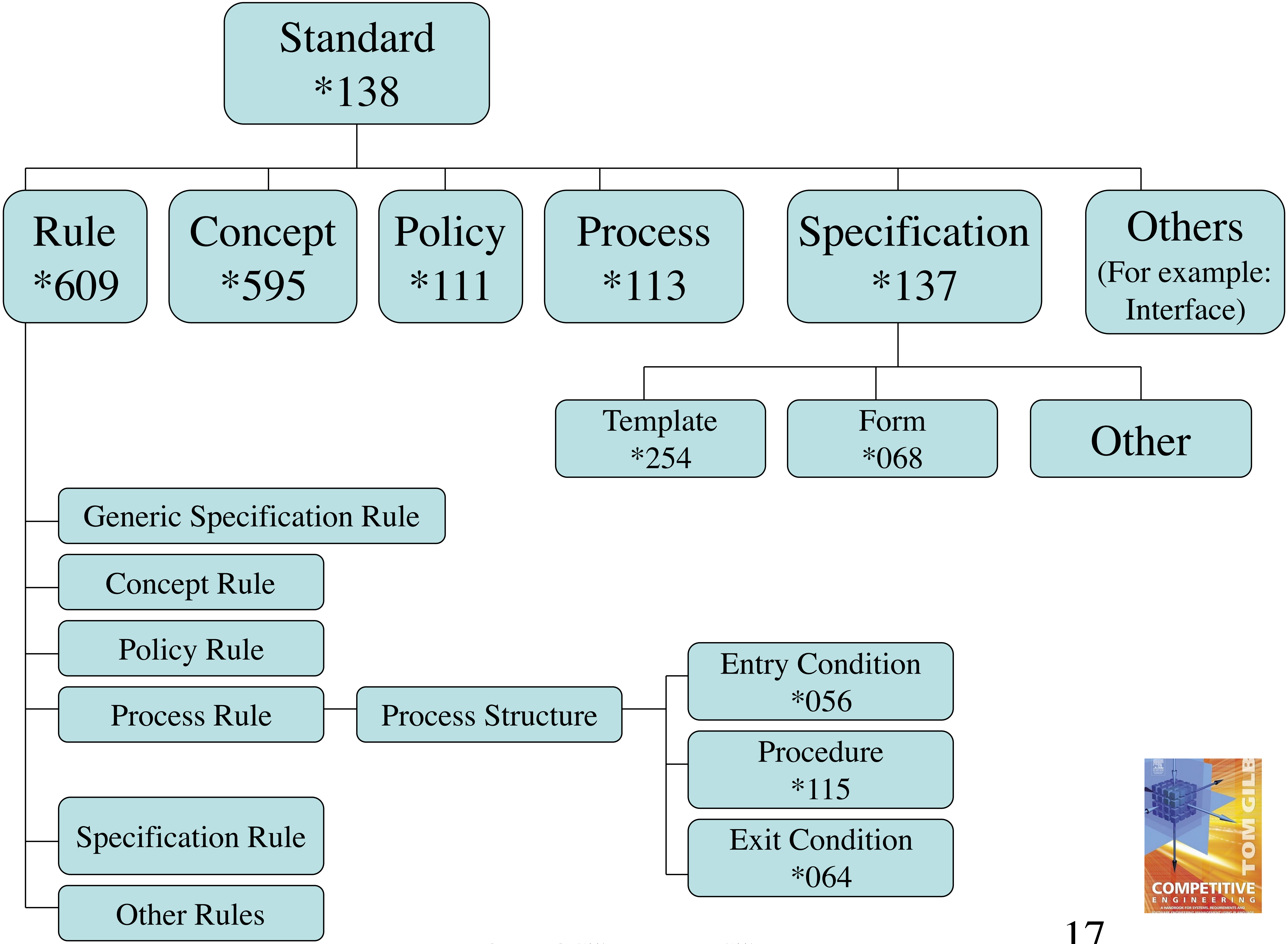
Entry/Exit Conditions

Procedure Definition

Templates

Glossary Concepts

Engineering Policy



Standard
*138

Rule
*609

Concept
*595

Policy
*111

Process
*113

Specification
*137

Others
(For example:
Interface)

Template
*254

Form
*068

Other

Generic Specification Rule

Concept Rule

Policy Rule

Process Rule

Process Structure

Entry Condition
*056

Procedure
*115

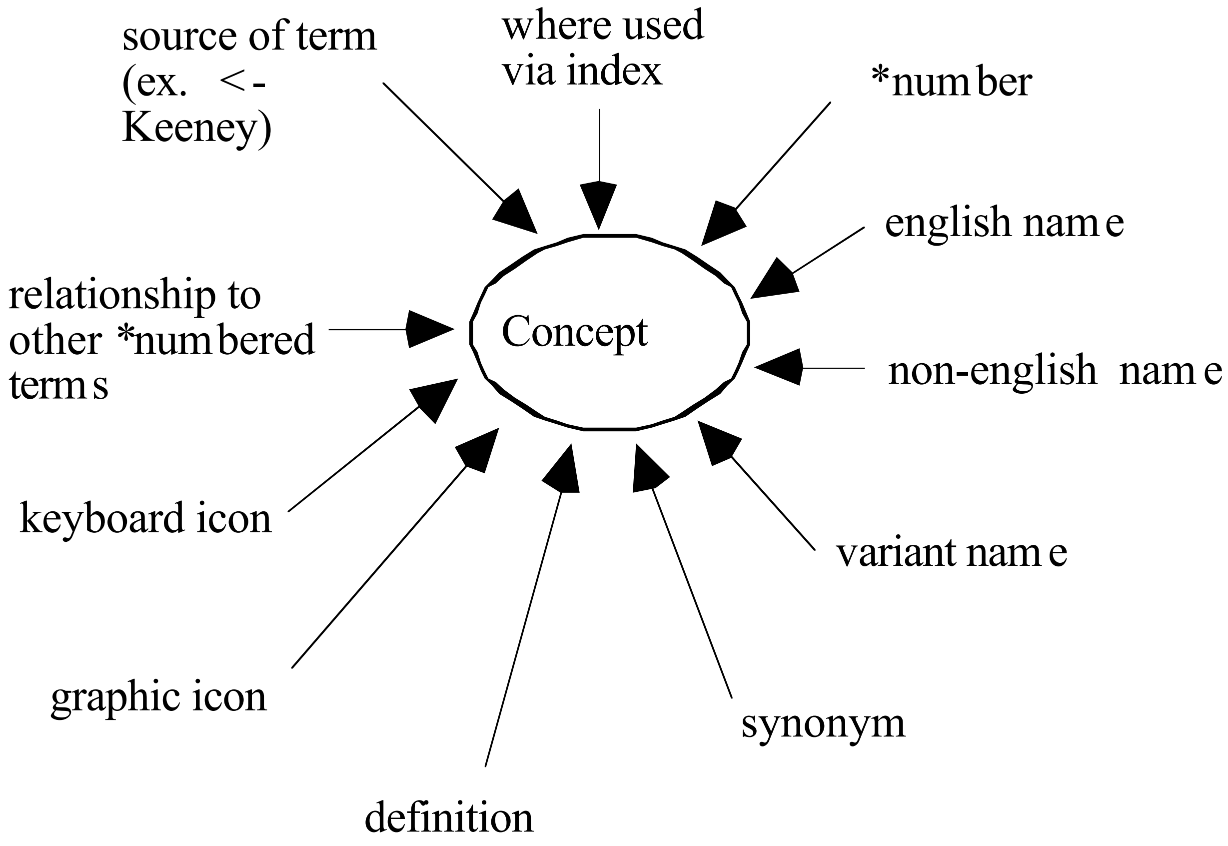
Exit Condition
*064

Specification Rule

Other Rules

Concept Glossary: Applies to Systems Engineering: and thus also to Dataware Engineering

- **Glossary Purpose.**
- The central purpose of this Planguage glossary is to define ‘Concepts’ – not words.
- These concepts have many ‘names’ (or ‘tags’ in Planguage) and attributes.
- The ‘names’ function as ‘pointers’ to the concept, but *names do not change or determine the concept itself*.
- Names, numbers and icons merely *cross-reference* the concept.
- The central, universal identification tag of a concept is its unique number, prefaced by an asterisk (*001 etc.).
- This device is designed to allow and enable full or partial translation to various international languages, and to corporate dialects.



Data:

the Planguage Glossary definition

Data **Concept *319 April 17, 2003,**

minor edit (‘including’) 19 Aug 2010

Data is any form of signal, which humans or machines can *usefully* distinguish from other signals.

Data is interpreted by some sensing agent, a reader, or a computer, which tries to convert it into useful information.

Data can be viewed as a necessary system resource. Data can also be viewed as a process input and as a process output. Data can be viewed in terms of its function (‘to warn’, ‘to give costs’), volume (bits), and in terms of both cost (cost to acquire, cost to store, cost to keep updated) and performance characteristics (including accuracy, updatedness, credibility, precision, correctness).

Notes:

1. Data is a primary form of input and output to intellectual, and computer-controlled, processes. Data includes {characters, symbols, words, expressions, statements, diagrams}.

2. Data is not random meaningless signals. It is organized for analysis, or for use to help make decision

a. quantified multidimensional qualities requirements, and resource-constraints,

(try to quantify ’security’, ‘AI decision transparency’, 'Big Data Portability')

- **Right to privacy.** Who owns our personal data and what are we or “they” entitled to do with it? What assumptions can we make about personal data we now share online?
- **The internet age.** We live our lives in a public and digital square where any person, company, or agency around the world can watch us, whether we want them to or not.
- **Security.** Between data breaches and aggressive hackers, will our data ever really be secure? As data continues to grow, so do the opportunities for data breaches.
- **Safety.** Face it, we live in a dangerous world. How do we balance safety with privacy and security at the data level?
- **Trust.** Trust is at the heart of the privacy issue and is the glue that is going to keep the data ecosystem together.
- **Ethics.** Technology has leapfrogged ethics, bringing us to the age-old question of what we can do versus what we should do. A good example is the tricky relationship between GDPR and artificial intelligence.
- **Context.** What is contextually important to you may not be important to me. Let me give you an example: Google Maps. We might both believe it makes our lives easier, but when the street views of our homes show up, my kids show up in the picture and I tell all my Facebook friends – and you become outraged because your dog was in the shot.
- **No borders.** Data, in and of itself, has no country, respects no law, and travels freely across borders. In the digital age, there are no geographical borders. And yet, most governments have attempted to put restrictions on how their citizens’ data is used – consider, for example, the General Data Protection Regulation.
- **Transparency.** If important decisions are being made about us based on an algorithm and big data, we have a right to know how the algorithm works and what data is being used. It’s outrageous that many of the ways big data is being used is shrouded in secrecy.
- **Global differences.** The internet is a big place, and treating privacy as a US issue ignores the global reach of technology companies, and the long arm of government agencies. When we hear about foreign issues, we treat them like they're strange and far away, ignoring the fact that those issues can very quickly come home to roost.

https://www.sas.com/en_us/insights/articles/big-data/big-data-privacy.html

Some Data Attributes

Data Quality	Data Accessibility	Data Costs	Data Trust-worthiness	Data Correlation
Correctness	Security	Acquisition	Transparency	Sensitivity
Updatedness	Privacy	Maintenance	Safety	Veracity
Error Detection	Accessibility	Retirement	Trustworthi-ness	Correlation
Error correction		Quality Control		Cultural Acceptability
Accuracy		Recover-ability		Legal Admissability
Intelligibity				

- Data Costs
  - Data Acquisition Costs
  - Data Maintenance Costs
  - Data Quality Control Costs
  - Data Recovery Costs
  - Data Retirement Costs
- Data Quality Attributes
  - Data Accessibility
  - Data Correctness
  - Data Correlation
  - Data Cultural Acceptability
  - Data Error Correction Capability
  - Data Error Section Capability
  - Data Intelligibility
  - Data Legal Acceptability
  - Data Privacy
  - Data Recoverability
  - Data Safety
  - Data Security
  - Data Sensitivity
  - Data Transparency
  - Data Trustworthiness
  - Data Updatedness
  - Data Veracity
- System Attributes Affecting DATA
  - System Availability
  - System Credibility
  - System Recoverability
  - System Safety
  - System Security
  - System Work Capacity

This is Step 1 in Data Engineering Identification of Critical Values and Costs

You might want to do a Step 0,

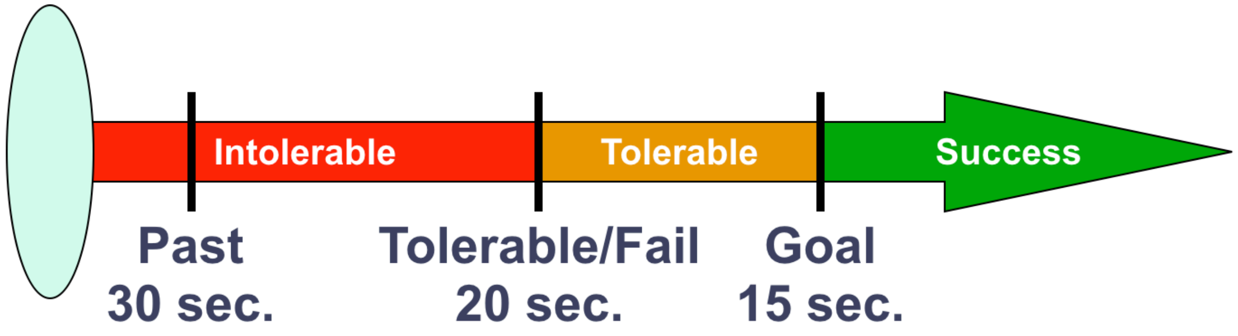
The identification of your Stakeholders (Example EU -> GDPR - Privacy

All Data Attributes can be **testably** defined, and **quantified**, as a basis for real data engineering

This simply follows the principle that all system qualities and costs can be well-defined and quantified as a basis for systems engineering

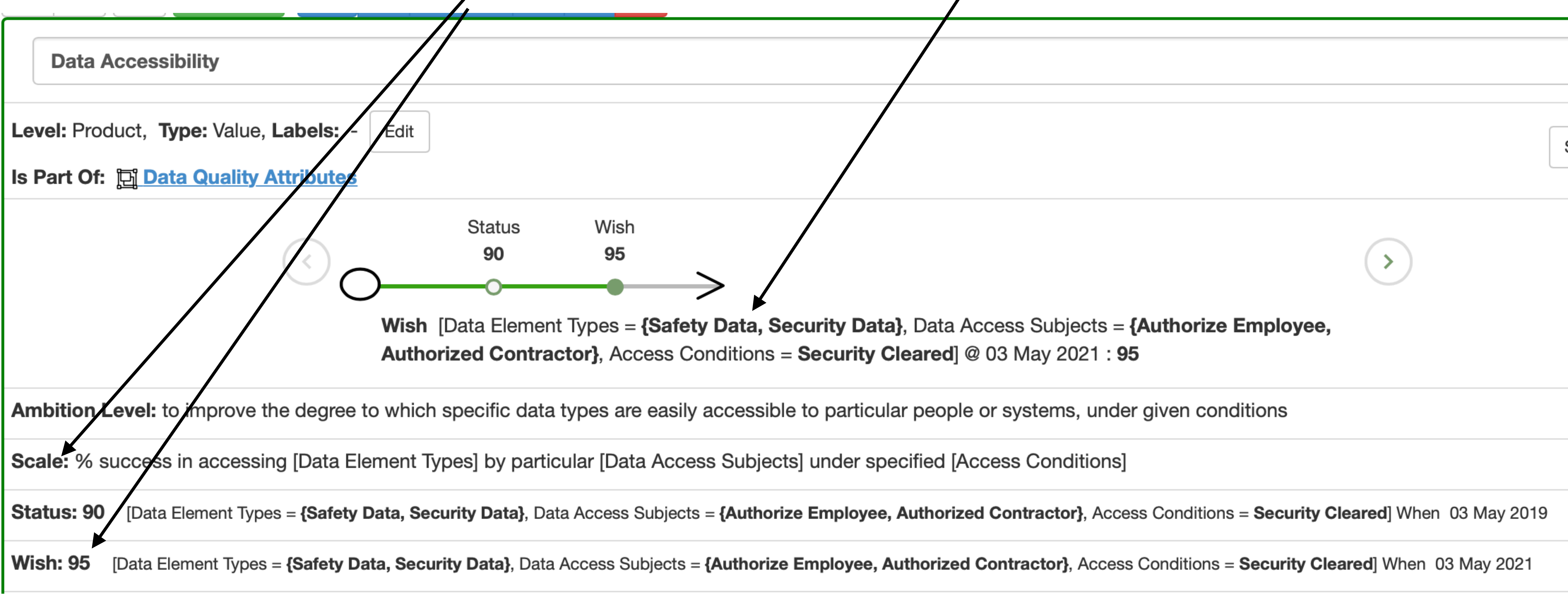
‘Testably Defined’:
we can unambiguously determine that the attribute is present or absent-

Quantified Data Attribute:
A numeric level of the attribute can be defined and measured



Speed
Scale: seconds to do task

Data Accessibility Quantified and Structured



Data Accessibility

Level: Product, **Type:** Value, **Labels:** - Edit

Is Part Of: Data Quality Attributes

Status 90 Wish 95

Wish [Data Element Types = **{Safety Data, Security Data}**, Data Access Subjects = **{Authorize Employee, Authorized Contractor}**, Access Conditions = **Security Cleared**] @ 03 May 2021 : **95**

Ambition Level: to improve the degree to which specific data types are easily accessible to particular people or systems, under given conditions

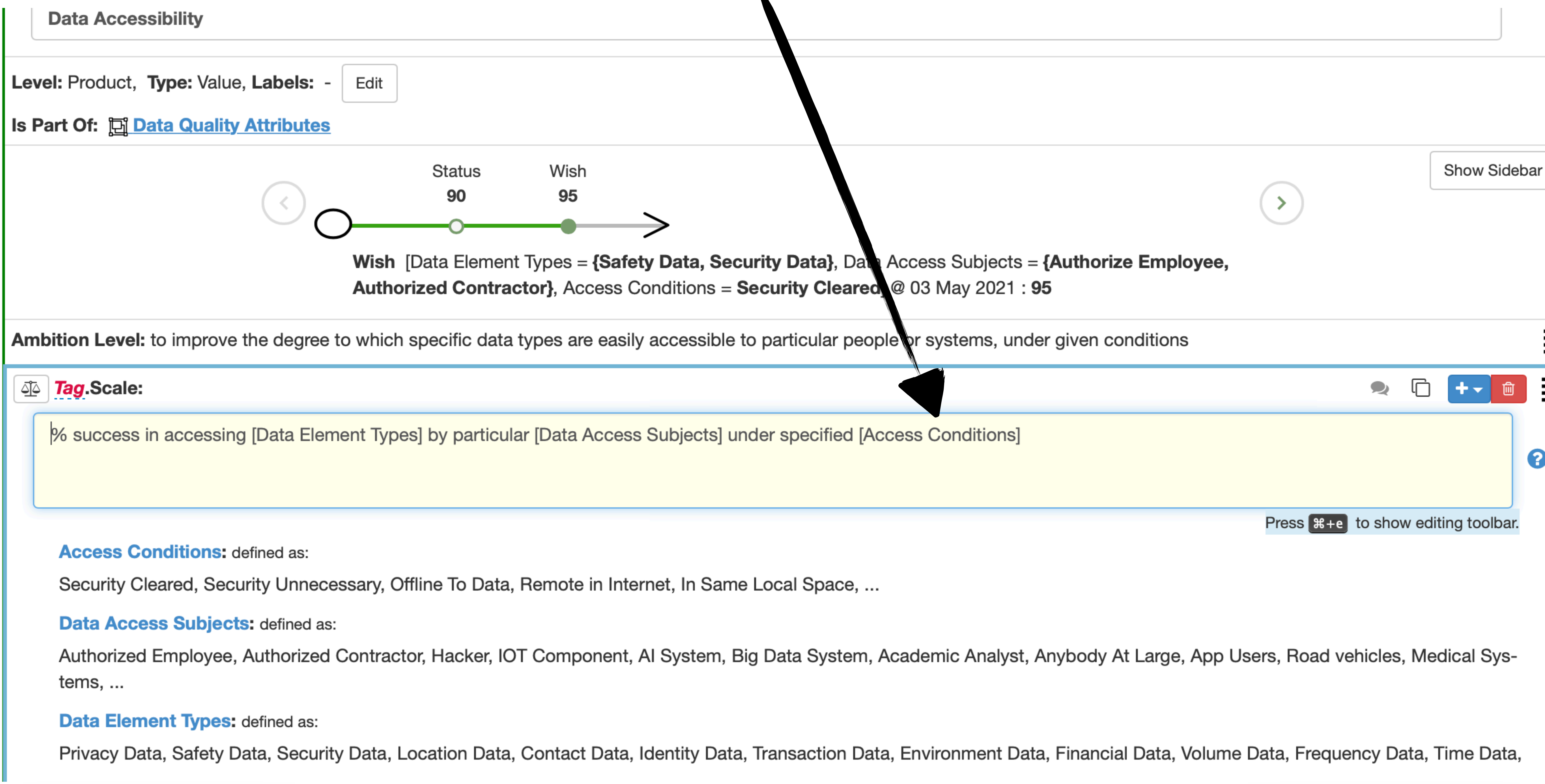
Scale: % success in accessing [Data Element Types] by particular [Data Access Subjects] under specified [Access Conditions]

Status: 90 [Data Element Types = **{Safety Data, Security Data}**, Data Access Subjects = **{Authorize Employee, Authorized Contractor}**, Access Conditions = **Security Cleared**] When 03 May 2019

Wish: 95 [Data Element Types = **{Safety Data, Security Data}**, Data Access Subjects = **{Authorize Employee, Authorized Contractor}**, Access Conditions = **Security Cleared**] When 03 May 2021

ValPlan

Data Accessibility
Scale detail and [Scale-Parameters] (‘Structure’)



Data Accessibility

Level: Product, **Type:** Value, **Labels:** -

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Ambition Level: to improve the degree to which specific data types are easily accessible to particular people or systems, under given conditions

***Tag*.Scale:**

% success in accessing [Data Element Types] by particular [Data Access Subjects] under specified [Access Conditions]

Access Conditions: defined as:

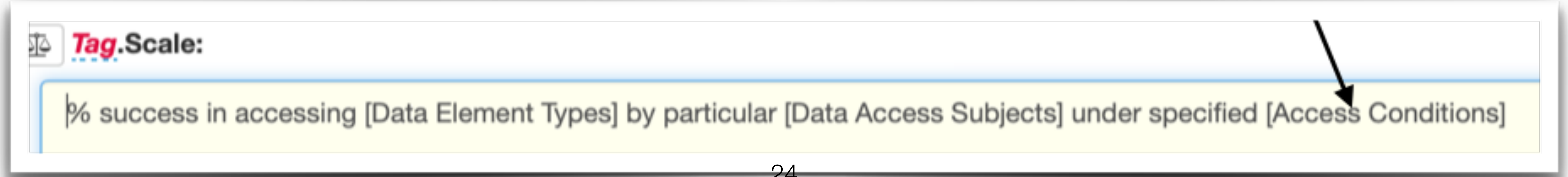
Security Cleared, Security Unnecessary, Offline To Data, Remote in Internet, In Same Local Space, ...

Data Access Subjects: defined as:

Authorized Employee, Authorized Contractor, Hacker, IOT Component, AI System, Big Data System, Academic Analyst, Anybody At Large, App Users, Road vehicles, Medical Systems, ...

Data Element Types: defined as:

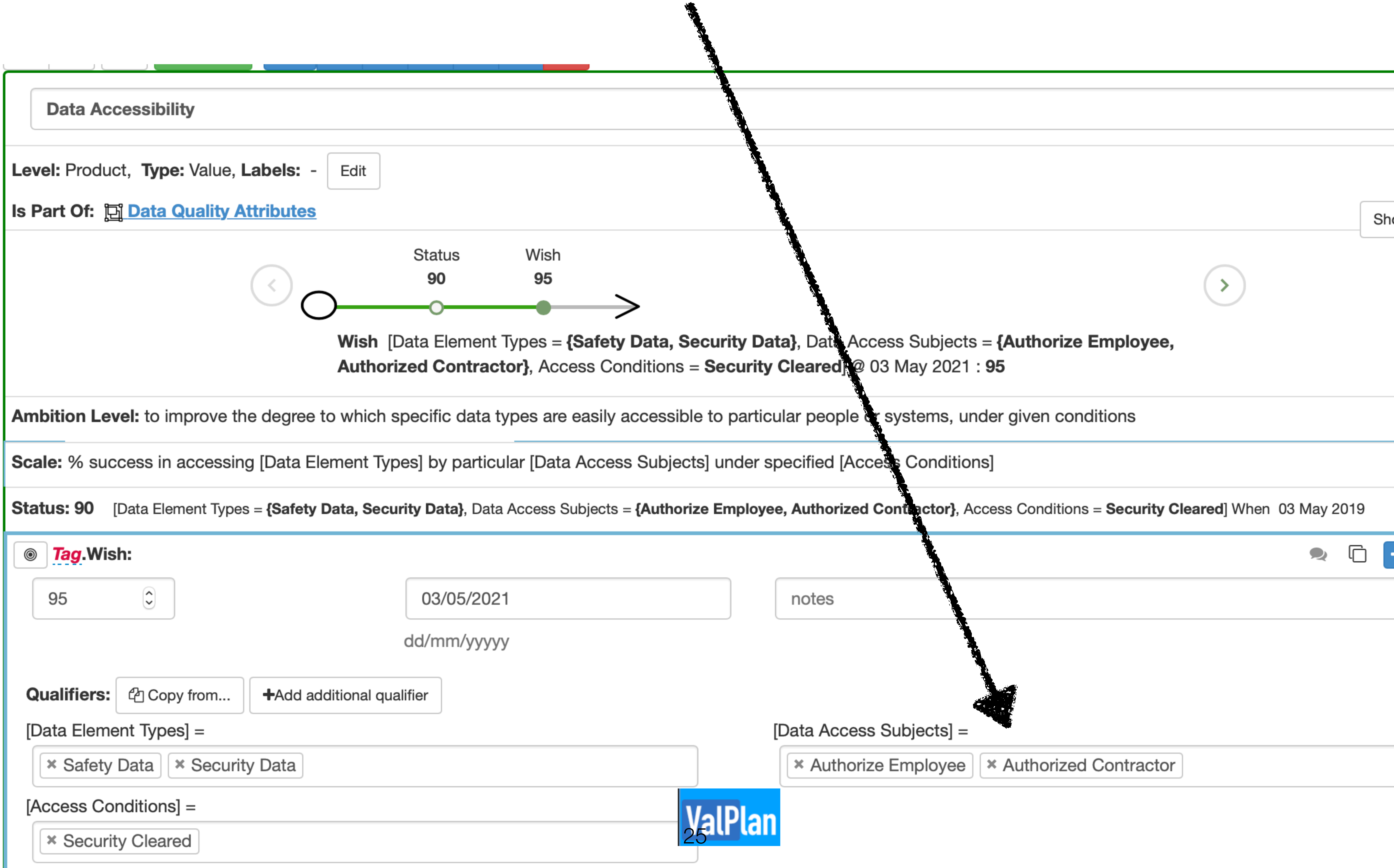
Privacy Data, Safety Data, Security Data, Location Data, Contact Data, Identity Data, Transaction Data, Environment Data, Financial Data, Volume Data, Frequency Data, Time Data,



***Tag*.Scale:**

% success in accessing [Data Element Types] by particular [Data Access Subjects] under specified [Access Conditions]

Data Accessibility
Detail of a ‘Wish’ level of ‘Accessibility’
The selection of Scale-Parameter Dimensions is a way of deciding priorities



Data Accessibility

Level: Product, **Type:** Value, **Labels:** - Edit

Is Part Of: Data Quality Attributes

Wish [Data Element Types = **{Safety Data, Security Data}**, Data Access Subjects = **{Authorize Employee, Authorized Contractor}**, Access Conditions = **Security Cleared**] @ 03 May 2021 : **95**

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Status: 90 [Data Element Types = **{Safety Data, Security Data}**, Data Access Subjects = **{Authorize Employee, Authorized Contractor}**, Access Conditions = **Security Cleared**] When 03 May 2019

***Tag*.Wish:**

95

03/05/2021

dd/mm/yyyyy

notes

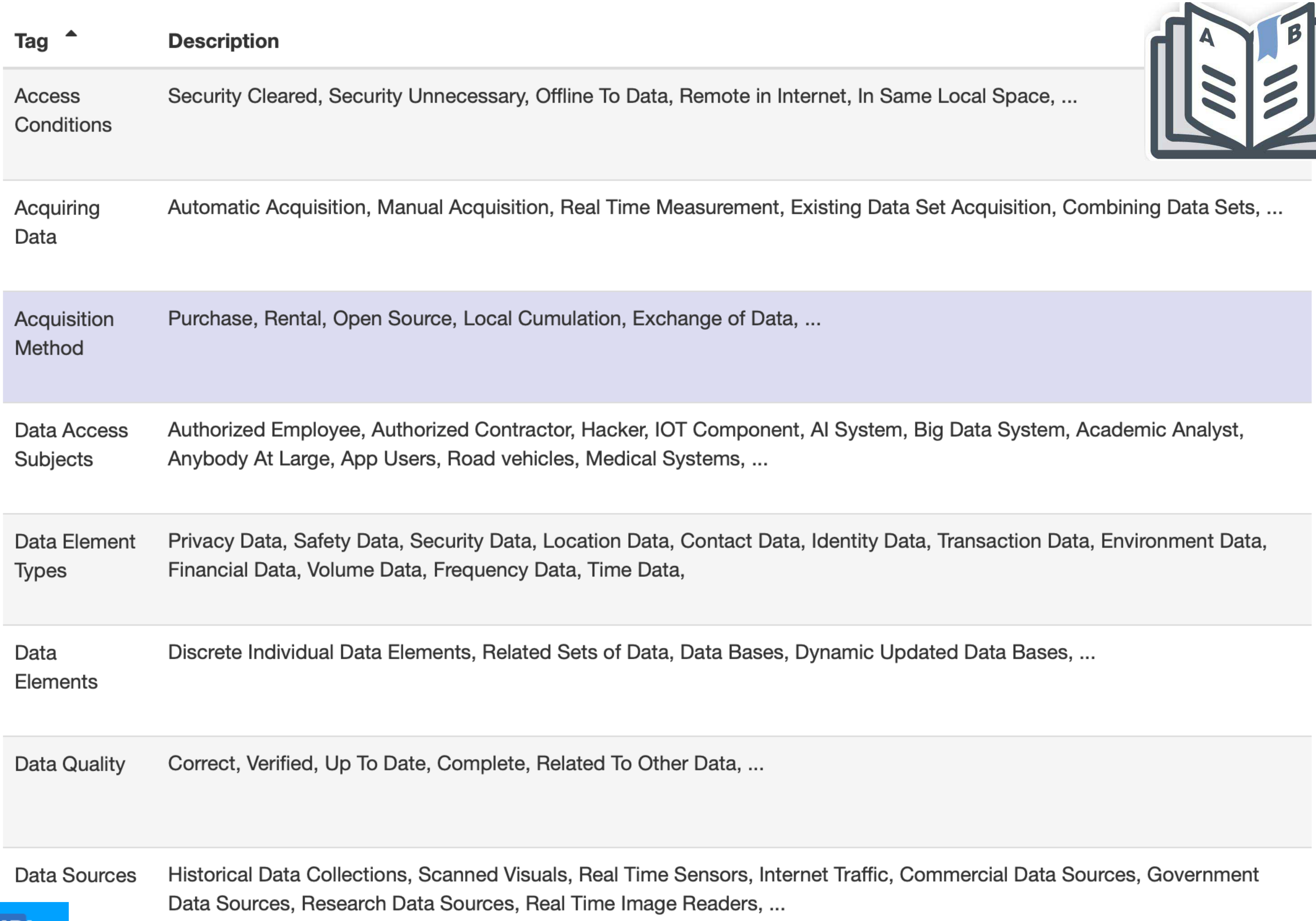
Qualifiers: Copy from... +Add additional qualifier

[Data Element Types] = × Safety Data × Security Data

[Data Access Subjects] = × Authorize Employee × Authorized Contractor

[Access Conditions] = × Security Cleared

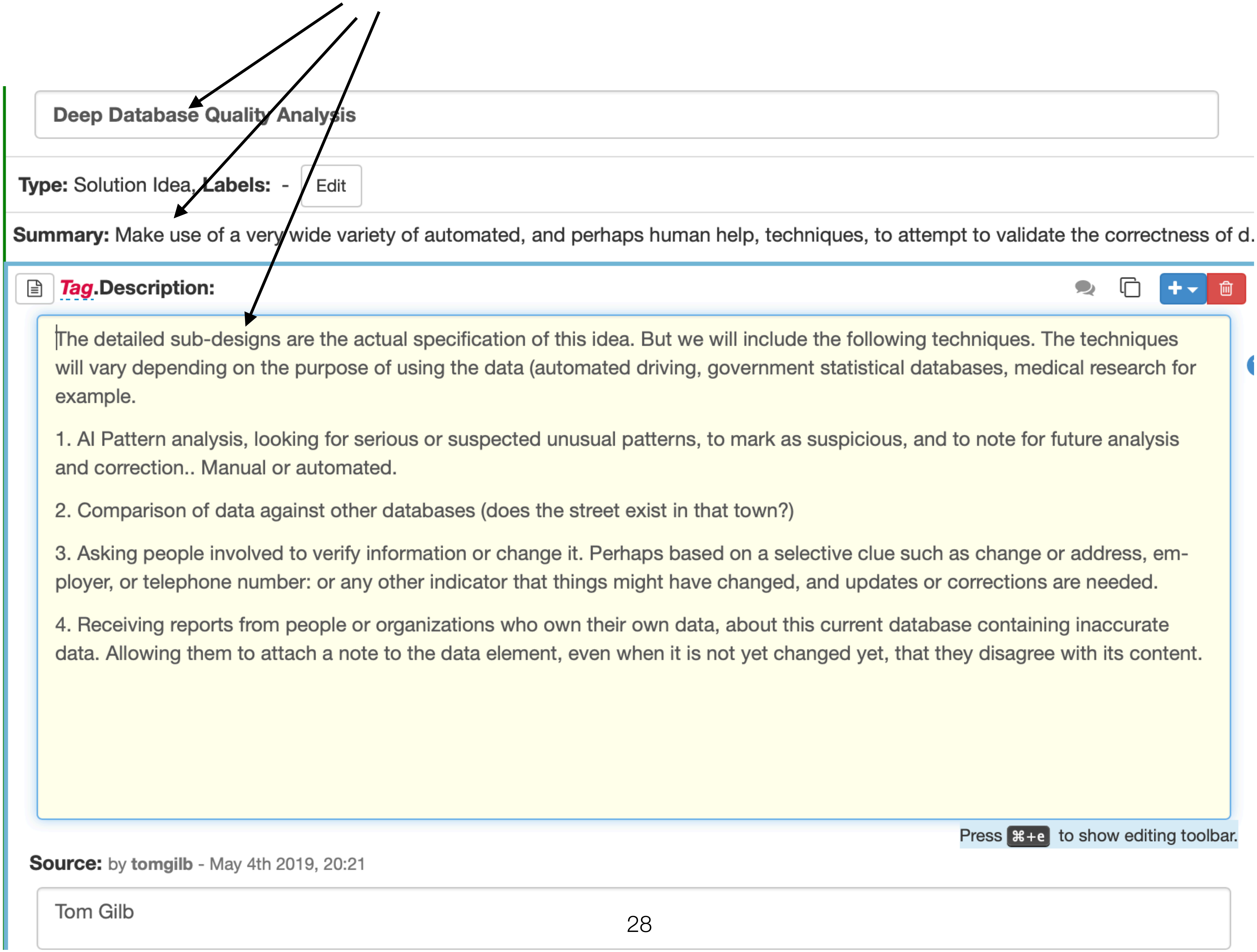
A re-usable Glossary of Terms
for developing standard and rich definitions of Scale Parameters



Tag ▲	Description
Access Conditions	Security Cleared, Security Unnecessary, Offline To Data, Remote in Internet, In Same Local Space, ...
Acquiring Data	Automatic Acquisition, Manual Acquisition, Real Time Measurement, Existing Data Set Acquisition, Combining Data Sets, ...
Acquisition Method	Purchase, Rental, Open Source, Local Cumulation, Exchange of Data, ...
Data Access Subjects	Authorized Employee, Authorized Contractor, Hacker, IOT Component, AI System, Big Data System, Academic Analyst, Anybody At Large, App Users, Road vehicles, Medical Systems, ...
Data Element Types	Privacy Data, Safety Data, Security Data, Location Data, Contact Data, Identity Data, Transaction Data, Environment Data, Financial Data, Volume Data, Frequency Data, Time Data,
Data Elements	Discrete Individual Data Elements, Related Sets of Data, Data Bases, Dynamic Updated Data Bases, ...
Data Quality	Correct, Verified, Up To Date, Complete, Related To Other Data, ...
Data Sources	Historical Data Collections, Scanned Visuals, Real Time Sensors, Internet Traffic, Commercial Data Sources, Government Data Sources, Research Data Sources, Real Time Image Readers, ...

b. detailed-enough data architecture, in order to understand corresponding data attributes,

A Design for 'Data Correctness'
is it detailed enough to understand the effects and costs?



Deep Database Quality Analysis

Type: Solution Idea, **Labels:** -

Summary: Make use of a very wide variety of automated, and perhaps human help, techniques, to attempt to validate the correctness of d.

***Tag*.Description:**

The detailed sub-designs are the actual specification of this idea. But we will include the following techniques. The techniques will vary depending on the purpose of using the data (automated driving, government statistical databases, medical research for example.

1. AI Pattern analysis, looking for serious or suspected unusual patterns, to mark as suspicious, and to note for future analysis and correction.. Manual or automated.

2. Comparison of data against other databases (does the street exist in that town?)

3. Asking people involved to verify information or change it. Perhaps based on a selective clue such as change or address, employer, or telephone number: or any other indicator that things might have changed, and updates or corrections are needed.

4. Receiving reports from people or organizations who own their own data, about this current database containing inaccurate data. Allowing them to attach a note to the data element, even when it is not yet changed yet, that they disagree with its content.

Press ⌘+e to show editing toolbar.

Source: by **tomgilb** - May 4th 2019, 20:21

Tom Gilb

g. dynamic design-to-cost, agile, architecture-process, like 'IBM Cleanroom', Quinnan

DESIGN
The first guarantee of quality

“The first guarantee of **quality in design**
is in well-informed, well-educated, and well-motivated **designers**.

Quality must be built into designs, and cannot be inspected in or tested in.

Nevertheless, any prudent development process **verifies quality** through **inspection and testing.**

Inspection by peers in design, by users or surrogates, by other financial specialists concerned with cost, reliability, or maintainability
not only increases confidence in the design at hand,
but also provides designers with valuable lessons and insights to be applied to future designs.

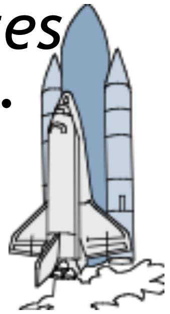
The very fact that **designs face inspections**
motivates even the most conscientious designers
to greater care, deeper simplicities, and more precision in their work.”

inIBM sj 4 80 p.419
In

Mills, H. 1980. The management of software engineering: part 1: principles of software engineering. IBM Systems Journal 19, issue 4 (Dec.):414-420.
Direct Copy
http://trace.tennessee.edu/cgi/viewcontent.cgi?article=1004&context=utk_harlan
Library header
http://trace.tennessee.edu/utk_harlan/5/

In the Cleanroom Method, developed by IBM’s Harlan Mills (1980) they reported:

- *“Software Engineering began to emerge in FSD” (IBM Federal Systems Division, from 1996 a part of Lockheed Martin Marietta) “some ten years ago [Ed. about 1970] in a continuing evolution that is still underway:*
- *Ten years ago general management expected the worst from software projects – cost overruns, late deliveries, unreliable and incomplete software*
- *Today [Ed. 1980!], management has learned to expect on-time, within budget, deliveries of high-quality software. A Navy helicopter ship system, called LAMPS, provides a recent example. LAMPS software was a four-year project of over 200 person-years of effort, developing over three million, and integrating over seven million words of program and data for eight different processors distributed between a helicopter and a ship in 45 incremental deliveries [Ed. Note 2%!]s. Every one of those deliveries was on time and under budget*
- *A more extended example can be found in the NASA space program,*
- *- Where in the past ten years, FSD has managed some 7,000 person-years of software development, developing and integrating over a hundred million bytes of program and data for ground and space processors in over a dozen projects.*
- ***- There were few late or overrun deliveries in that decade, and none at all in the past four years.”***

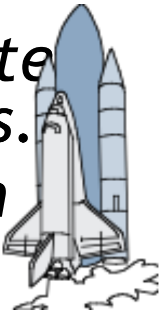


In the Cleanroom Method, developed by IBM’s Harlan Mills (1980) they reported:

- *“Software Engineering began to emerge in FSD” (IBM Federal Systems Division, f … out 1*
- *T … cts – cost overruns, late deliveries, unreliable and incomplete software*

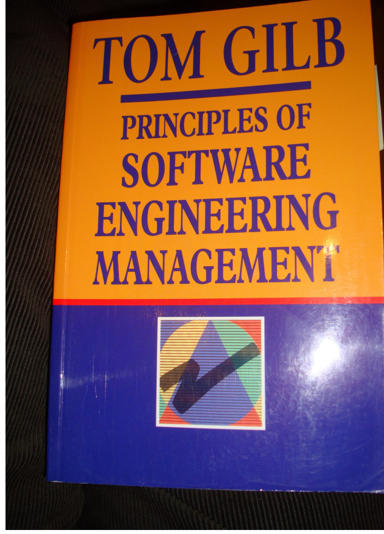
in 45 incremental deliveries

- *Today [Ed. 1980!], management has learned to expect on-time, within budget deliveries of high-quality software. A Navy helicopter ship system, called LAMPS, provides a recent example. LAMPS software was a four-year project of over 200 person-years of effort, developing over three million, and integrating over s … processors distrib … veries [Ed. Note 2 … dget*
- *A mor … ,*
- *- Whe … -years of softw … million byte of pro … en projects.*
- *- Ther … ne at all in the p …*



were few late or overrun deliveries in that decade, and none at all in the past four years

Quinnan: IBM FSD Cleanroom *Dynamic Design to Cost*



Quinnan describes the process control loop used by IBM FSD to ensure that cost targets are met.

'Cost management. . . yields valid cost plans linked to technical performance. Our practice carries cost management farther by introducing design-to-cost guidance. Design, development, and managerial practices are applied in an integrated way to ensure that software technical management is consistent with cost management. The method [illustrated in this book by Figure 7.10] consists of developing a design, estimating its cost, and ensuring that the design is cost-effective.' (p. 473)

He goes on to describe a design iteration process trying to meet cost targets by either redesign or by sacrificing 'planned capability.' When a satisfactory design at cost target is achieved for a single increment, the 'development of each increment can proceed concurrently with the program design of the others.'

'Design is an iterative process in which each design level is a refinement of the previous level.' (p. 474)

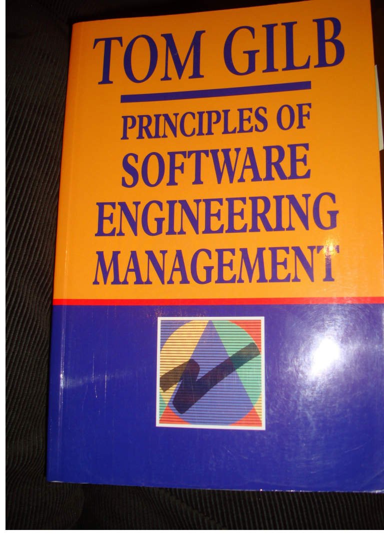
It is clear from this that they avoid the big bang cost estimation approach. Not only do they iterate in seeking the appropriate balance between cost and design for a single increment, but they iterate through a series of increments, thus reducing the complexity of the task, and increasing the probability of learning from experience, won as each increment develops, and as the true cost of the increment becomes a fact.

'When the development and test of an increment are complete, an estimate to complete the remaining increments is computed.' (p. 474)

Source: Robert E. Quinnan, 'Software Engineering Management Practices', IBM Systems Journal, Vol. 19, No. 4, 1980, pp. 466~77

This text is cut from Gilb: The Principles of Software Engineering Management, 1988

Quinnan: IBM FSD Cleanroom
Dynamic Design to Cost



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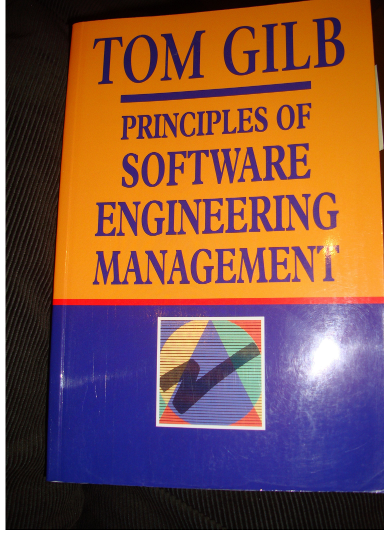

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1980, pp. 466~77

This text is cut from G

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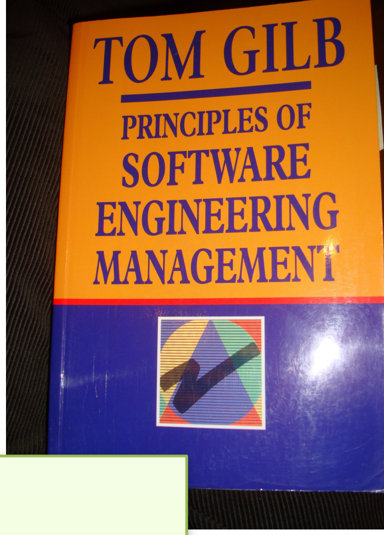
Quinnan: IBM FSD Cleanroom
Dynamic Design to Cost



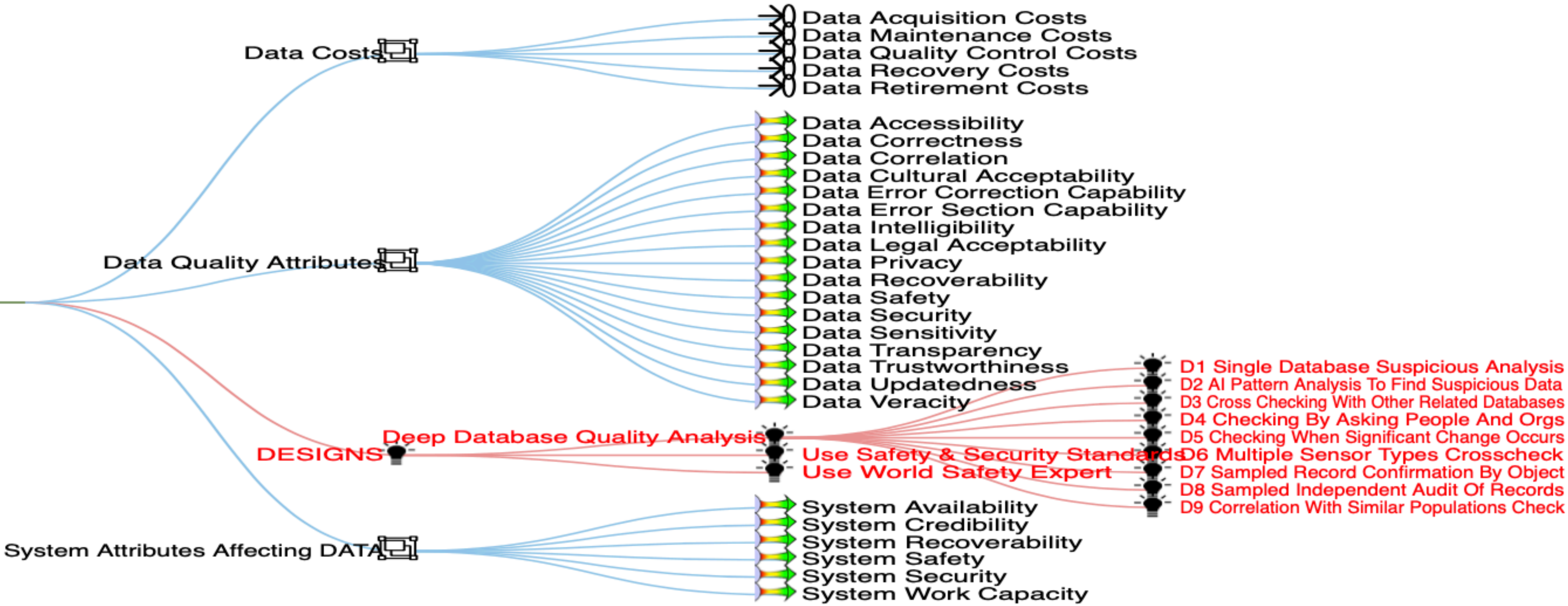
Design is an iterative process

ed

of

)

4. A systems-engineering (= data engineering) language (Planguage) for modeling data-engineering processes and problems.



Data Costs

Data Acquisition Costs
Data Maintenance Costs
Data Quality Control Costs
Data Recovery Costs
Data Retirement Costs

Data Quality Attributes

Data Accessibility
Data Correctness
Data Correlation
Data Cultural Acceptability
Data Error Correction Capability
Data Error Section Capability
Data Intelligibility
Data Legal Acceptability
Data Privacy
Data Recoverability
Data Safety
Data Security
Data Sensitivity
Data Transparency
Data Trustworthiness
Data Updatedness
Data Veracity

DESIGNS

Deep Database Quality Analysis
Use Safety & Security Standards
Use World Safety Expert

D1 Single Database Suspicious Analysis
D2 AI Pattern Analysis To Find Suspicious Data
D3 Cross Checking With Other Related Databases
D4 Checking By Asking People And Orgs
D5 Checking When Significant Change Occurs
D6 Multiple Sensor Types Crosscheck
D7 Sampled Record Confirmation By Object
D8 Sampled Independent Audit Of Records
D9 Correlation With Similar Populations Check

System Attributes Affecting DATA

System Availability
System Credibility
System Recoverability
System Safety
System Security
System Work Capacity

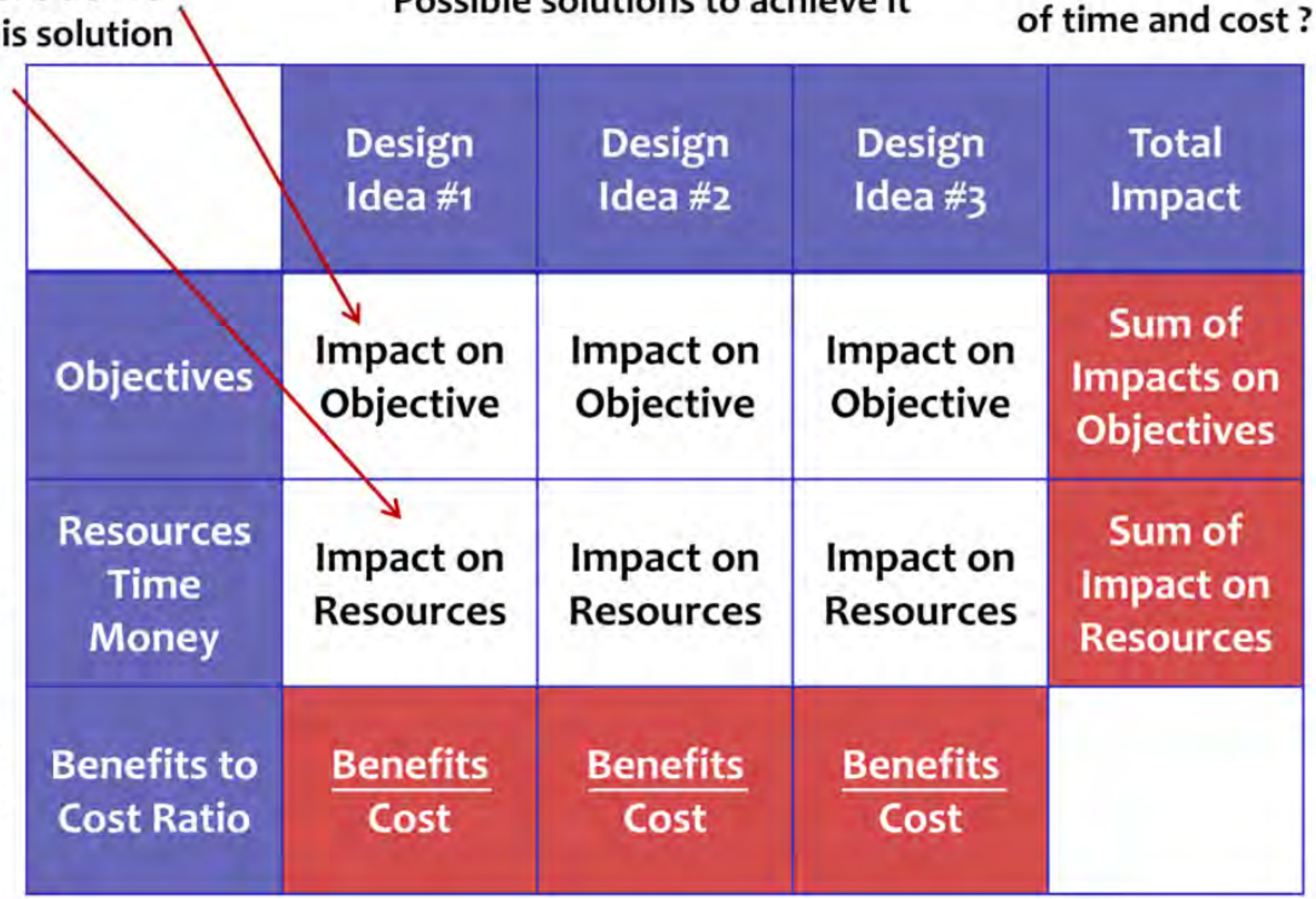
5. Examples of how to always quantify all critical data architecture qualities requirements.

IMPACT ESTIMATION TABLES FOR OVERVIEW OF ALL STRATEGIES, ARCHITECTURE IN RELATION TO OBJECTIVES, CONSTRAINTS AND RISKS

quantify the relationship between technology and business

(radically improve communication with your clients and managers)

Impact Estimation principle



How much % of what we want to achieve do we achieve by this solution

At what cost ?

Possible solutions to achieve it

Could we get all, within the budgets of time and cost ?

		Design Idea #1	Design Idea #2	Design Idea #3	Total Impact
What to achieve	Objectives	Impact on Objective	Impact on Objective	Impact on Objective	Sum of Impacts on Objectives
Cost to achieve it	Resources Time Money	Impact on Resources	Impact on Resources	Impact on Resources	Sum of Impact on Resources
Return on Investment	Benefits to Cost Ratio	$\frac{\text{Benefits}}{\text{Cost}}$	$\frac{\text{Benefits}}{\text{Cost}}$	$\frac{\text{Benefits}}{\text{Cost}}$	

From Scales to Solutions

	Solution 1	Solution 2	Solution n	Total Impacts
Objective	Impact on Objective	Impact on Objective	Impact on Objective	Total Impact on Objective
Resources	Impact on Budget	Impact on Budget	Impact on Budget	Total Impact on Budget
Benefits-to-Cost Ratio	Ratio	Ratio	Ratio	

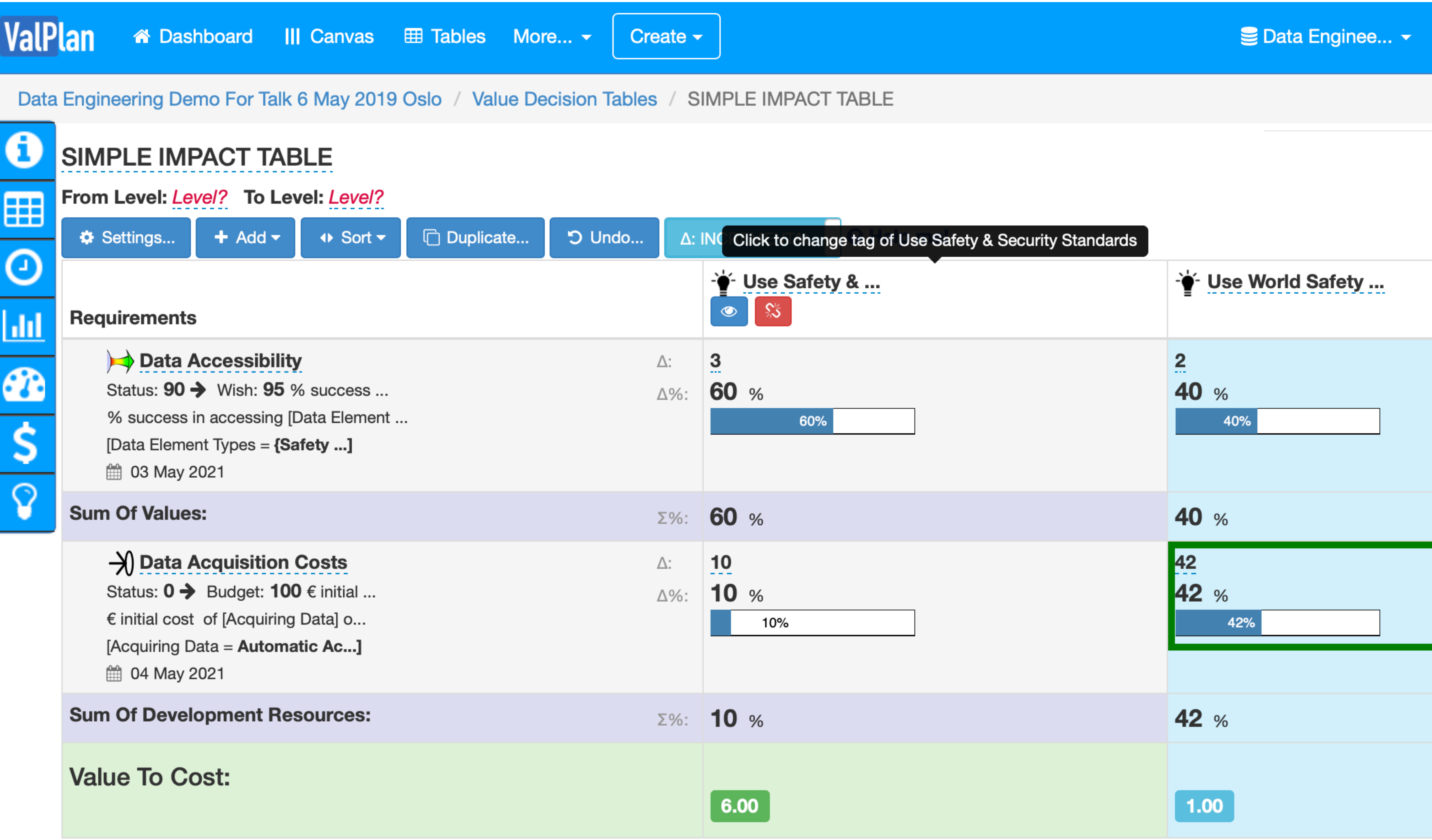
Courtesy Rolf Goetz

Impacts on Objectives

	Facebook	Profiler	Umantis BM	Total Impacts on Objectives
Attract Talents 271 -> 700	**70%** ± *10%*	**0%** ±*10%*	**50%** ±*5%*	**120%** ±*25%*
Win Talents 53 -> 100	**30%** ± *20%*	**50%** ± *10%*	**30%** ± *10%*	**110%** ±*40%*
Perfect Match 25% -> 75%	**10%** ± *10%*	**30%** ± *10%*	**30%** ± *10%*	**70%** ±*30%*
Total Impact of Solutions	**110%** ± *40%*	**80%** ± *30%*	**110%** ± *25%*	

Courtesy Rolf Goetz

UNDERSTANDING DATA ENGINEERING
Design by estimating value effects and costs



Data Engineering Demo For Talk 6 May 2019 Oslo / Value Decision Tables / SIMPLE IMPACT TABLE

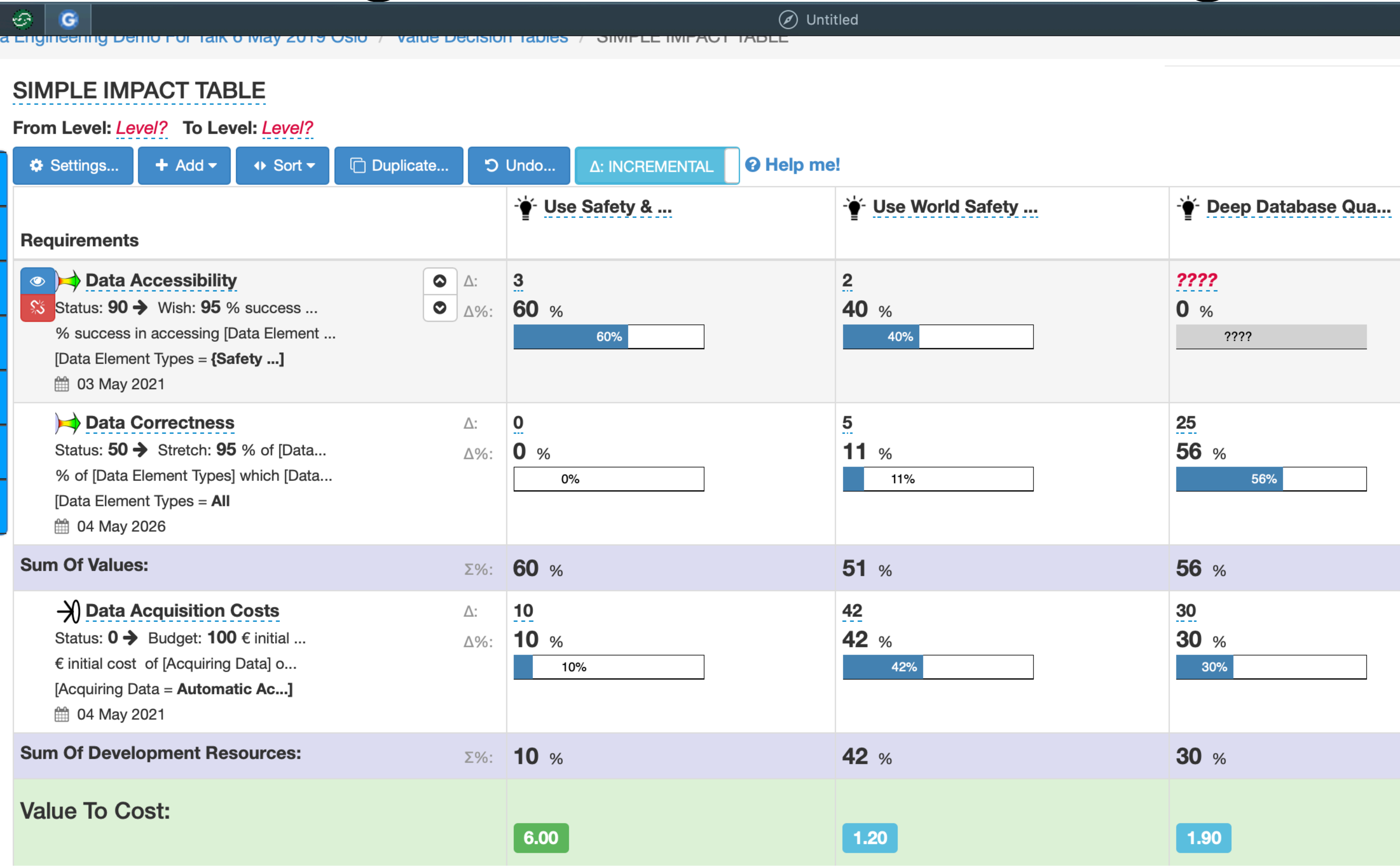
SIMPLE IMPACT TABLE

From Level: *Level?* **To Level:** *Level?*

Click to change tag of Use Safety & Security Standards

Requirements		Use Safety & ...	Use World Safety ...
Data Accessibility Status: **90** → Wish: **95** % success ... % success in accessing [Data Element ... [Data Element Types = **{Safety ...]** 03 May 2021	Δ: Δ%:	3 60 % 60%	2 40 % 40%
Sum Of Values:	Σ%:	60 %	40 %
Data Acquisition Costs Status: **0** → Budget: **100** € initial ... € initial cost of [Acquiring Data] o... [Acquiring Data = **Automatic Ac...]** 04 May 2021	Δ: Δ%:	10 10 % 10%	42 42 % 42%
Sum Of Development Resources:	Σ%:	10 %	42 %
Value To Cost:		6.00	1.00

Adding 1 Value and 1 Design



Untitled

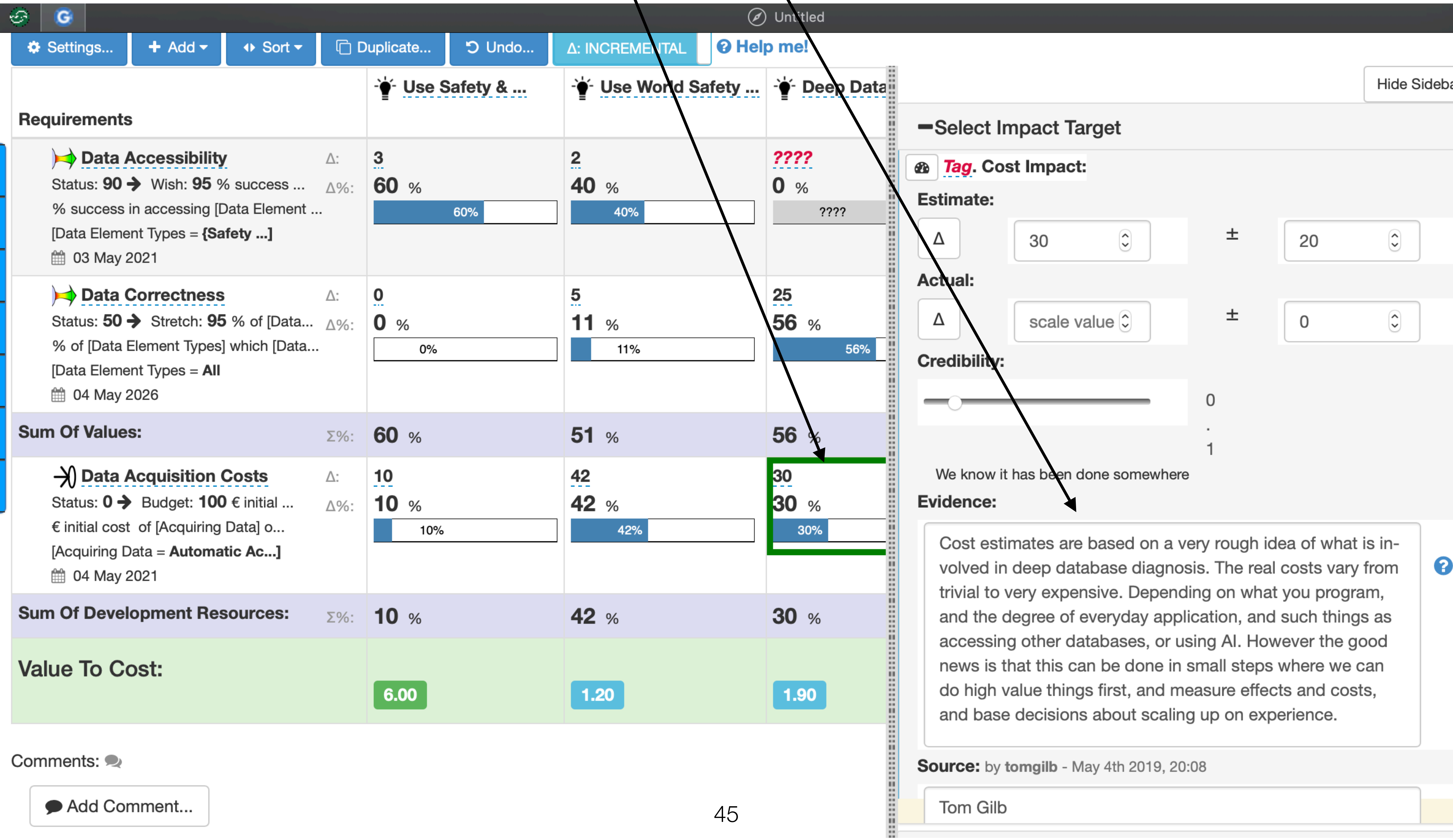
a Engineering Demo For Talk 6 May 2019 Oslo / Value Decision Tables / SIMPLE IMPACT TABLE

SIMPLE IMPACT TABLE

From Level: *Level?* **To Level:** *Level?*

Requirements		Use Safety & ...	Use World Safety ...	Deep Database Qua...
Data Accessibility Status: **90** → Wish: **95** % success ... % success in accessing [Data Element ... [Data Element Types = **{Safety ...]** 03 May 2021	Δ: Δ%:	3 60 % 60%	2 40 % 40%	???? 0 % ????
Data Correctness Status: **50** → Stretch: **95** % of [Data... % of [Data Element Types] which [Data... [Data Element Types = **All** 04 May 2026	Δ: Δ%:	0 0 % 0%	5 11 % 11%	25 56 % 56%
Sum Of Values:	Σ%:	60 %	51 %	56 %
Data Acquisition Costs Status: **0** → Budget: **100** € initial ... € initial cost of [Acquiring Data] o... [Acquiring Data = **Automatic Ac...]** 04 May 2021	Δ: Δ%:	10 10 % 10%	42 42 % 42%	30 30 % 30%
Sum Of Development Resources:	Σ%:	10 %	42 %	30 %
Value To Cost:		6.00	1.20	1.90

Explaining why you estimated an impact



Requirements		Use Safety & ...	Use World Safety ...	Deep Data
Data Accessibility Status: **90** → Wish: **95** % success ... % success in accessing [Data Element ... [Data Element Types = **{Safety ...]** 03 May 2021	Δ: Δ%:	3 60 % 60%	2 40 % 40%	???? 0 % ????
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Sum Of Development Resources:	Σ%:	10 %	42 %	30 %
Value To Cost:		6.00	1.20	1.90

Select Impact Target

Tag. **Cost Impact:**

Estimate: Δ 30 ± 20

Actual: Δ scale value ± 0

Credibility: 0 . 1

We know it has been done somewhere

Evidence:

Cost estimates are based on a very rough idea of what is involved in deep database diagnosis. The real costs vary from trivial to very expensive. Depending on what you program, and the degree of everyday application, and such things as accessing other databases, or using AI. However the good news is that this can be done in small steps where we can do high value things first, and measure effects and costs, and base decisions about scaling up on experience.

Source: by **tomgilb** - May 4th 2019, 20:08

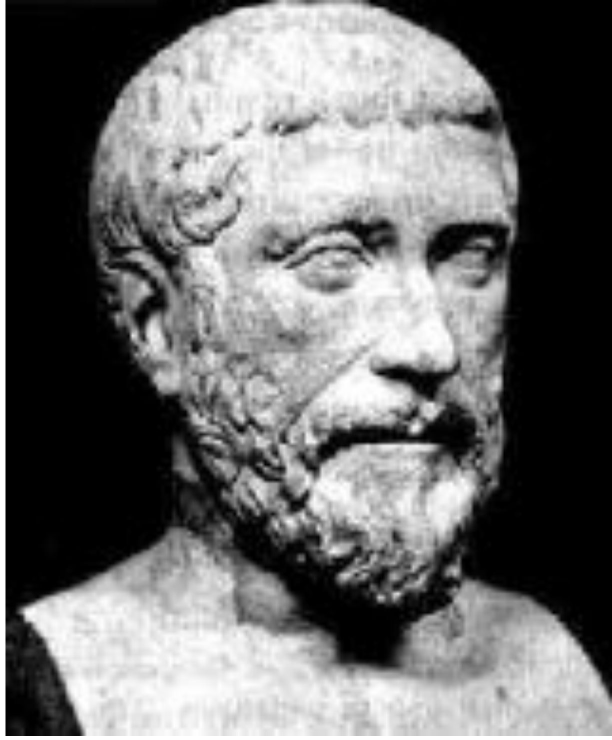
Tom Gilb

6. How can you learn to qualify as a real data engineer? (Universities do not teach it!)

Google it
Domain Common Sense
Look it upon a book

QUANTIFICATION OF ALL CRITICAL VALUES AND QUALITIES

no management bullshit
no user stories
all improvements quantified/estimated/tracked
all qualities quantified/estimated/tracked



Philolaus on Numbers

- Over four hundred years BC,
- a Greek by the name of
- **Philolaus** of Tarentum said :
- ” *Actually, everything that can be known has a Number;*
  - *for it is impossible to grasp anything with the mind or to recognize it without this (number).”*

Best regards (Aug 2005),
N.V.Krishnawww.microsensesoftware.com

How to Quantify any Qualitative Requirement

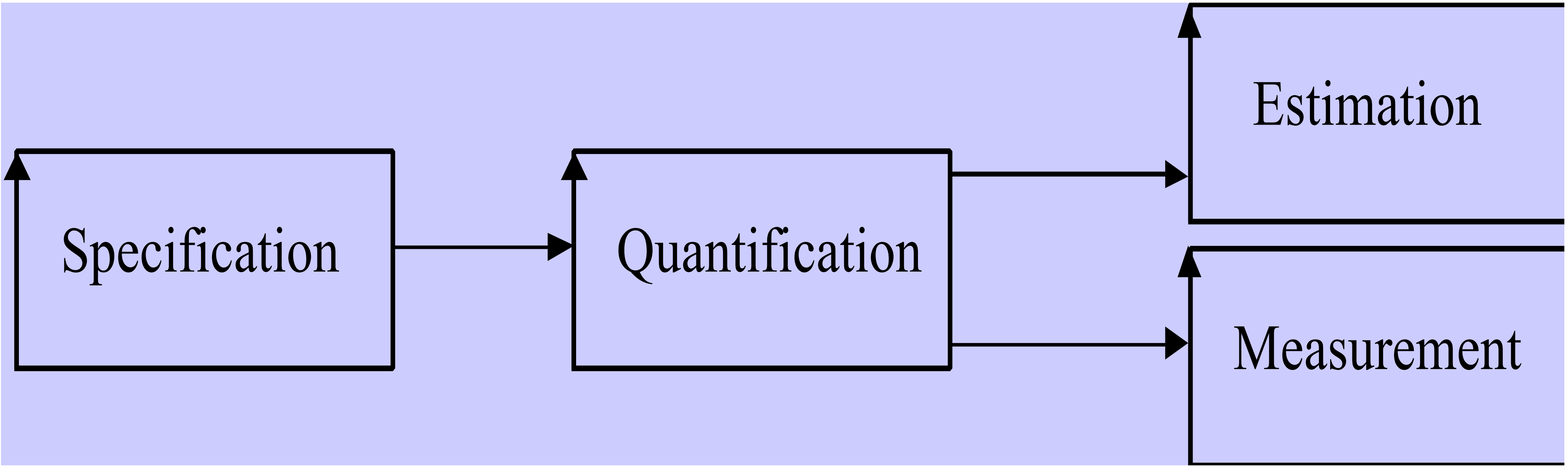
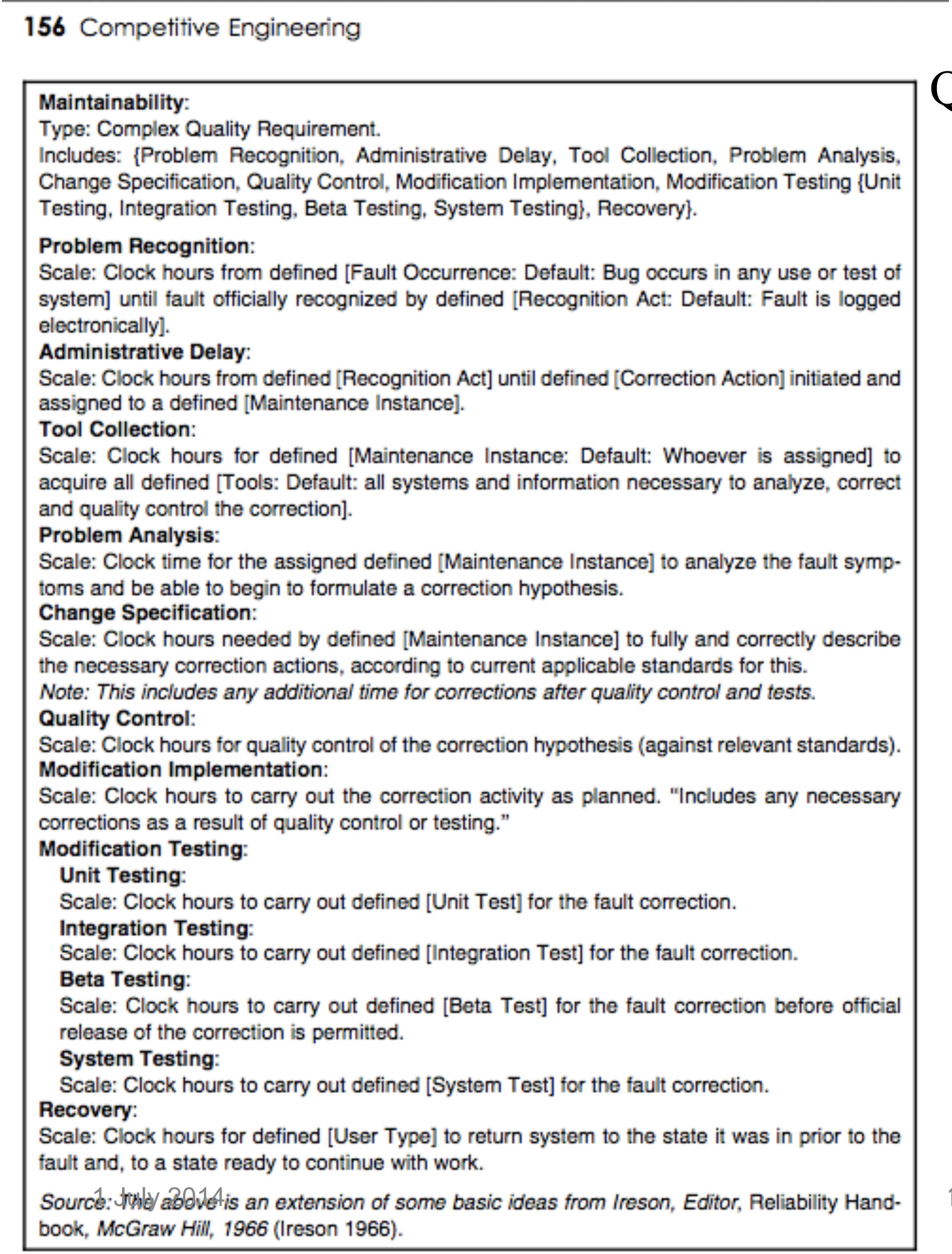


Diagram from 'Competitive Engineering.' book.

Quality Quantification Methods #**1**

- Common Sense, Domain Knowledge
  - – Decompose "until quantification becomes obvious".
  - – Then use Planguage specification:
    - **Scale**: define a measurement scale
    - **Meter**: define a test or process for measuring on the scale
    - **Past**: define benchmarks, old system, competitors on the scale
    - **Goal**: define a committed level of future stakeholder quality, on your scale.

Quality Quantification Methods #**2**, **Look it up in a book**



156 Competitive Engineering

Maintainability:
Type: Complex Quality Requirement.
Includes: {Problem Recognition, Administrative Delay, Tool Collection, Problem Analysis, Change Specification, Quality Control, Modification Implementation, Modification Testing {Unit Testing, Integration Testing, Beta Testing, System Testing}, Recovery}.

Problem Recognition:
Scale: Clock hours from defined [Fault Occurrence: Default: Bug occurs in any use or test of system] until fault officially recognized by defined [Recognition Act: Default: Fault is logged electronically].

Administrative Delay:
Scale: Clock hours from defined [Recognition Act] until defined [Correction Action] initiated and assigned to a defined [Maintenance Instance].

Tool Collection:
Scale: Clock hours for defined [Maintenance Instance: Default: Whoever is assigned] to acquire all defined [Tools: Default: all systems and information necessary to analyze, correct and quality control the correction].

Problem Analysis:
Scale: Clock time for the assigned defined [Maintenance Instance] to analyze the fault symptoms and be able to begin to formulate a correction hypothesis.

Change Specification:
Scale: Clock hours needed by defined [Maintenance Instance] to fully and correctly describe the necessary correction actions, according to current applicable standards for this.
Note: This includes any additional time for corrections after quality control and tests.

Quality Control:
Scale: Clock hours for quality control of the correction hypothesis (against relevant standards).

Modification Implementation:
Scale: Clock hours to carry out the correction activity as planned. "Includes any necessary corrections as a result of quality control or testing."

Modification Testing:

- **Unit Testing**:
  Scale: Clock hours to carry out defined [Unit Test] for the fault correction.
- **Integration Testing**:
  Scale: Clock hours to carry out defined [Integration Test] for the fault correction.
- **Beta Testing**:
  Scale: Clock hours to carry out defined [Beta Test] for the fault correction before official release of the correction is permitted.
- **System Testing**:
  Scale: Clock hours to carry out defined [System Test] for the fault correction.

Recovery:
Scale: Clock hours for defined [User Type] to return system to the state it was in prior to the fault and, to a state ready to continue with work.

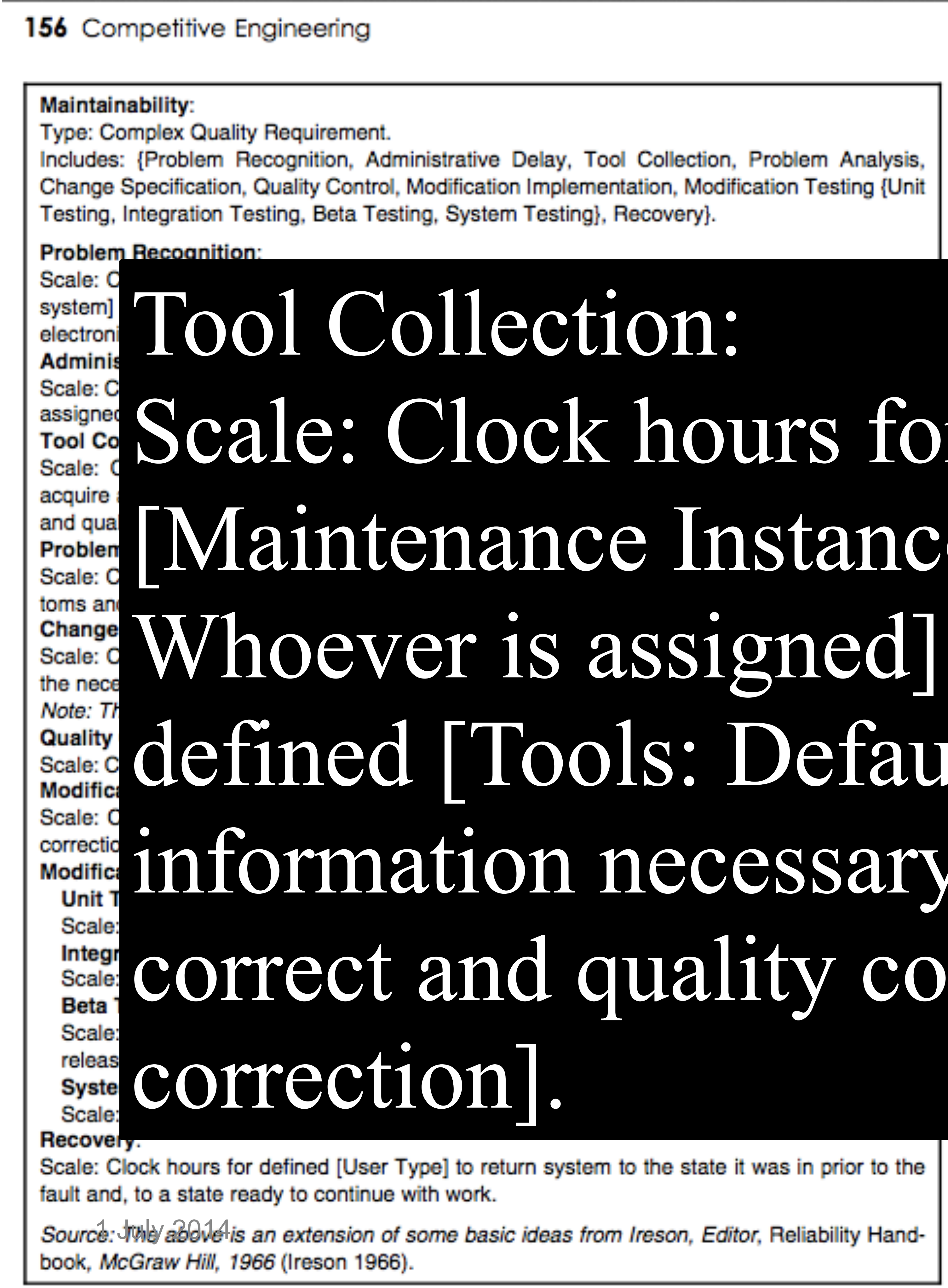
Source: The above is an extension of some basic ideas from Ireson, Editor, Reliability Handbook, *McGraw Hill, 1966* (Ireson 1966).

Chapter
5

SCALES OF MEASURE

How to Quantify

Quality Quantification Methods #2, **Look it up in a book**



156 Competitive Engineering

Maintainability:
Type: Complex Quality Requirement.
Includes: {Problem Recognition, Administrative Delay, Tool Collection, Problem Analysis, Change Specification, Quality Control, Modification Implementation, Modification Testing {Unit Testing, Integration Testing, Beta Testing, System Testing}, Recovery}.

Problem Recognition:
Scale: C
system]
electroni
Adminis
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Change
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the nece
Note: Th
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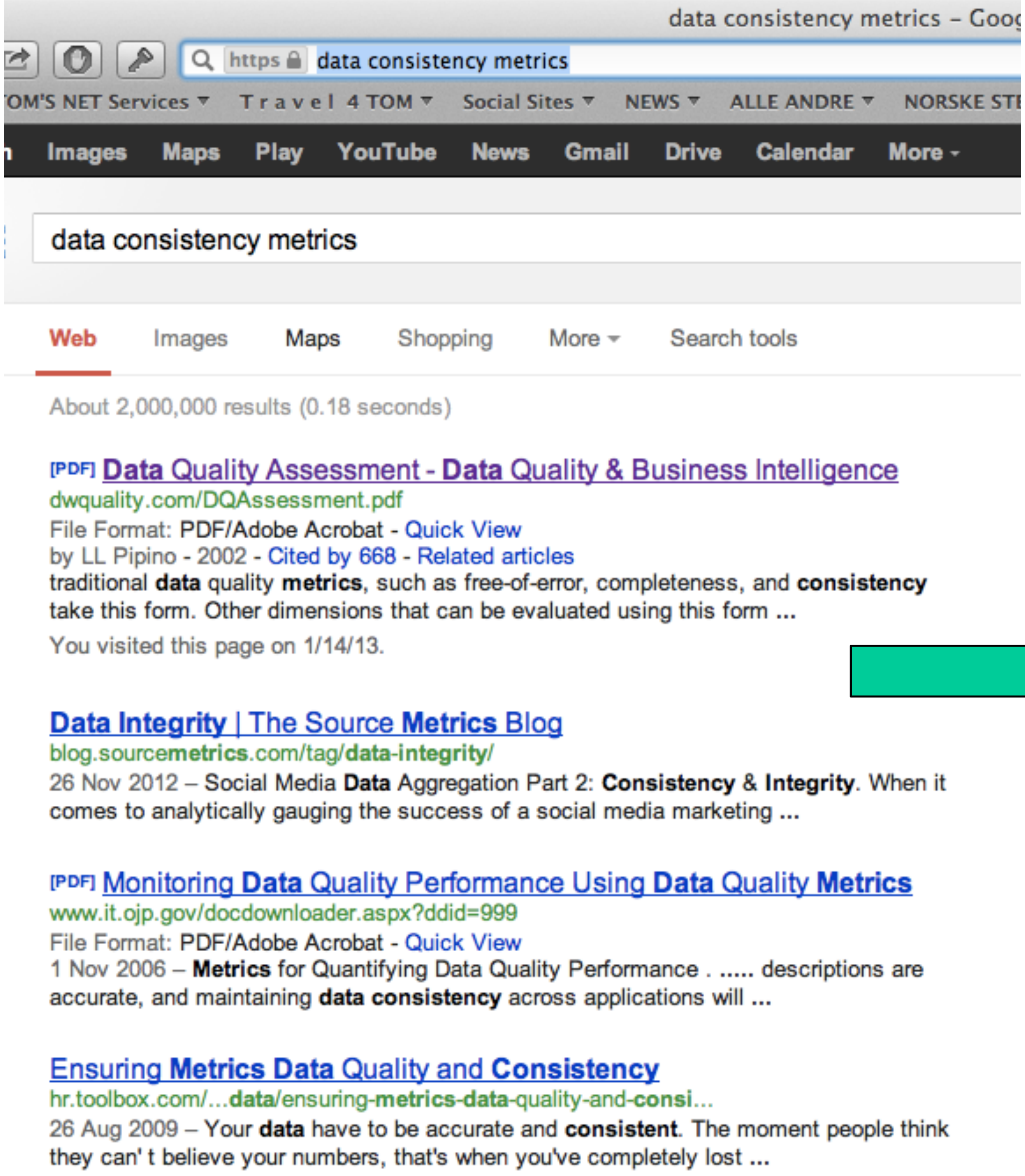
Recovery:
Scale: Clock hours for defined [User Type] to return system to the state it was in prior to the fault and, to a state ready to continue with work.

Source: The above is an extension of some basic ideas from Ireson, Editor, Reliability Handbook, *McGraw Hill, 1966* (Ireson 1966).

Tool Collection:
Scale: Clock hours for defined [Maintenance Instance: Default: Whoever is assigned] to acquire all defined [Tools: Default: all systems and information necessary to analyze, correct and quality control the correction].

Quality Quantification Methods #**3**, Google It



data consistency metrics

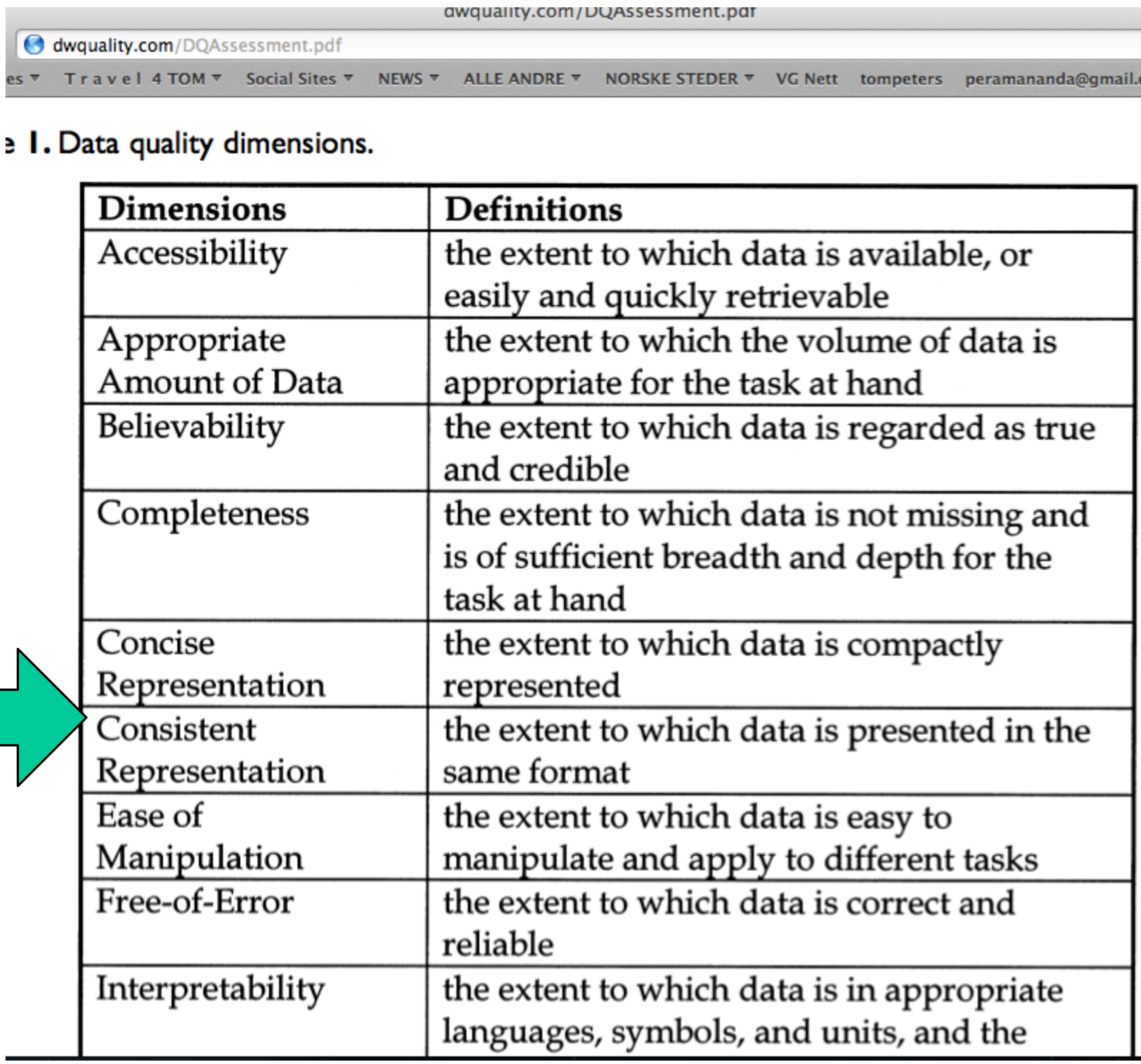
About 2,000,000 results (0.18 seconds)

[PDF] Data Quality Assessment - Data Quality & Business Intelligence
dwquality.com/DQAssessment.pdf
File Format: PDF/Adobe Acrobat - Quick View
by LL Pipino - 2002 - Cited by 668 - Related articles
traditional **data** quality **metrics**, such as free-of-error, completeness, and **consistency** take this form. Other dimensions that can be evaluated using this form ...
You visited this page on 1/14/13.

Data Integrity | The Source Metrics Blog
blog.sourcemetrics.com/tag/data-integrity/
26 Nov 2012 – Social Media **Data** Aggregation Part 2: **Consistency** & **Integrity**. When it comes to analytically gauging the success of a social media marketing ...

[PDF] Monitoring Data Quality Performance Using Data Quality Metrics
www.it.ojp.gov/docdownloader.aspx?ddid=999
File Format: PDF/Adobe Acrobat - Quick View
1 Nov 2006 – **Metrics** for Quantifying Data Quality Performance . ..... descriptions are accurate, and maintaining **data consistency** across applications will ...

Ensuring Metrics Data Quality and Consistency
hr.toolbox.com/...data/ensuring-metrics-data-quality-and-consi...
26 Aug 2009 – Your **data** have to be accurate and **consistent**. The moment people think they can' t believe your numbers, that's when you've completely lost ...



e **1.** Data quality dimensions.

Dimensions	**Definitions**
Accessibility	the extent to which data is available, or easily and quickly retrievable
Appropriate Amount of Data	the extent to which the volume of data is appropriate for the task at hand
Believability	the extent to which data is regarded as true and credible
Completeness	the extent to which data is not missing and is of sufficient breadth and depth for the task at hand
Concise Representation	the extent to which data is compactly represented
Consistent Representation	the extent to which data is presented in the same format
Ease of Manipulation	the extent to which data is easy to manipulate and apply to different tasks
Free-of-Error	the extent to which data is correct and reliable
Interpretability	the extent to which data is in appropriate languages, symbols, and units, and the

7. Understanding data engineering stakeholders as a source of requirements.

Definition
A stakeholder is any person, group or object, which has some direct or indirect interest in a defined system.

Stakeholders can exercise control over both the immediate system operational characteristics, as well as over long-term system lifecycle considerations (such as portability, lifecycle costs, environmental considerations, and decommissioning of the system). [4]

Notice:

‘or object’.

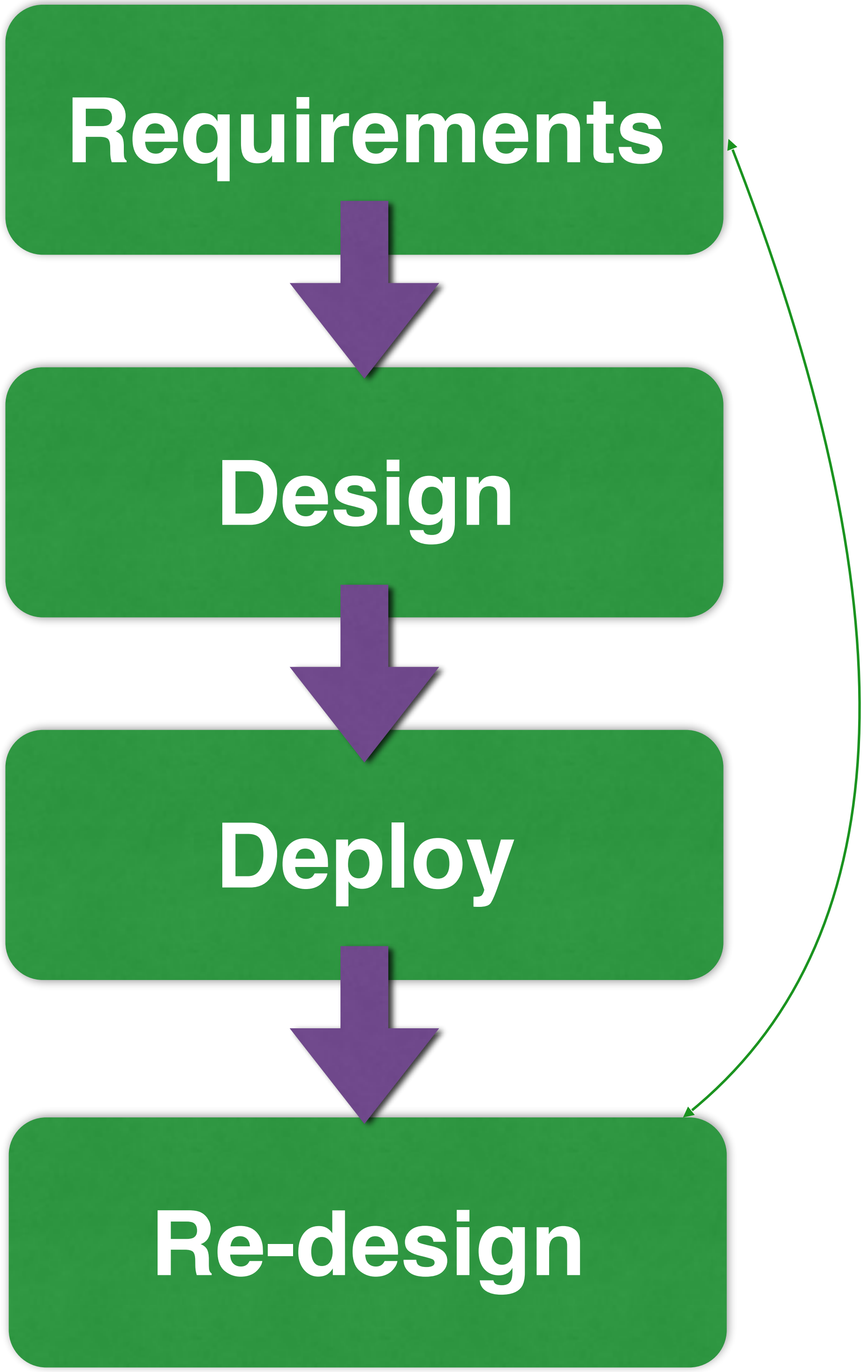
This includes laws, regulations, plans, policies, customs, culture, standards. Inanimate. you cannot ask them or discuss with them. But you can analyze them, their priority, the degree of relevance. They can determine if your system is illegal, or acceptable. Determine success or failure.

Identify Stakeholders

Who and what cares about the outcome of our project?

The Basic Design Steps Logic: a summary

1. **Environment Scope helps identify stakeholders.**
2. **Stakeholders have values and priorities**
3. **Values have many dimensions**
4. **Stakeholders determine value levels**
5. **Design hypotheses should be powerful and efficient ideas, for satisfying stakeholder needs**
6. **Design hypotheses can be evaluated quantitatively, with respect to all quantified objectives and resources**
7. **Designs can be decomposed, to find more efficient design subsets, that can be implemented early**
8. **Designs can be implemented sequentially, and their value-delivery, and resource costs, measured**
9. **Designs that unexpectedly threaten achievement of objectives, or excessive use of resources, can be removed or modified.**
10. **Designs that have the best set of effects on objectives, for the least consumption of limited resources, should generally be selected for early implementation.**
11. **A design increment can have unacceptable results, in combination with previous increments, and they, or it, might need removal or modification**
12. **When all objectives are reached, the process of design is complete: except for possible optimization of operational resources, by even-better design.**
13. **When deadlined and budgeted implementation-resources are used up, it might be reasonable to negotiate additional resources; especially if the incremental values are worth the additional resources.**
14. **When deadlined and budgeted implementation-resources are used up, it might be reasonable to negotiate additional resources; especially if the incremental values are worth the additional resources.**



Requirements

Design

Deploy

Re-design

The Logic of Design: Design Process Principles.
Tom Gilb, 2016, Paper.
http://www.gilb.com/dl857

Gilb's Stakeholder Principles.

1. Some stakeholders are more critical to your system than others.

2. Some stakeholder needs are more critical to your system than others.

3. Stakeholders are undisciplined: they may not know all their needs, or know them precisely, or know their value. But they can be analyzed, coached, and helped to get the best possible deal.

4. Stakeholders may be inaccessible, unwilling, inanimate, oppositional, and worse: but we need to deal with them intelligently.

5. Stakeholders might well ask for the wrong thing, a 'means' rather than their real 'ends'. But they can be guided to understand that. Or their requests can be interpreted in their own real best interests.

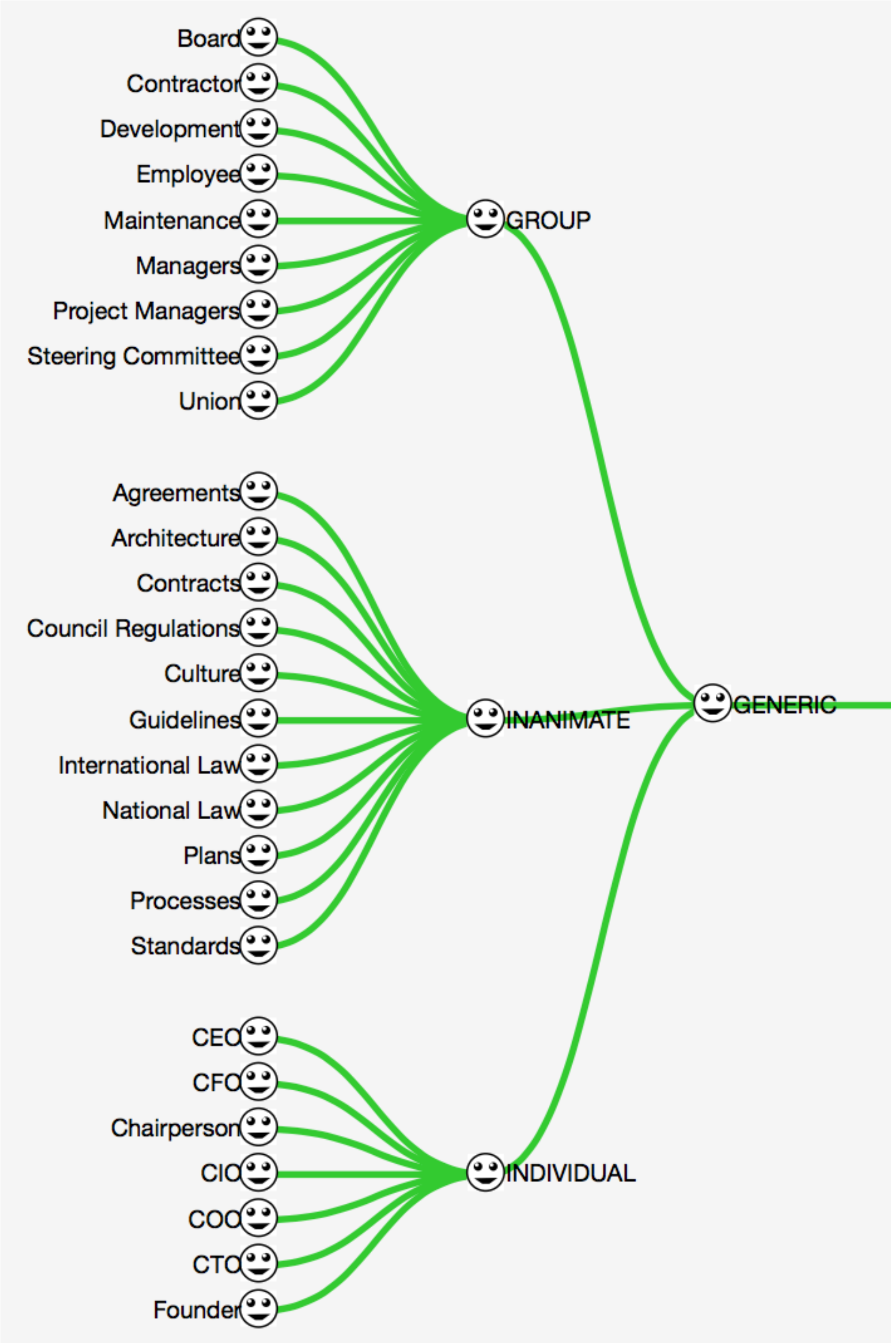
6. Stakeholders do not want to wait years, get delays, invest shitloads of money, and then little or no value. They want as much 'value improvement' of their current situation, as they can get, as fast as they can get it. For as little cost as possible,

7. Stakeholders cannot have any realistic idea of what their needs and demands will cost to satisfy. So their adopted requirements need to be based on value for costs, not on value alone. Delivering small increments, based on high value-to-cost, is one smart way to deal with this.

8. If you think you have found 'all critical stakeholders', I think you should assume there is at least one more, and when you find that one, …. They will emerge, and they are not all there at the beginning.

9. If you think you have found all critical *needs* of a stakeholder, there will always be *at least one more* need 'hiding'.

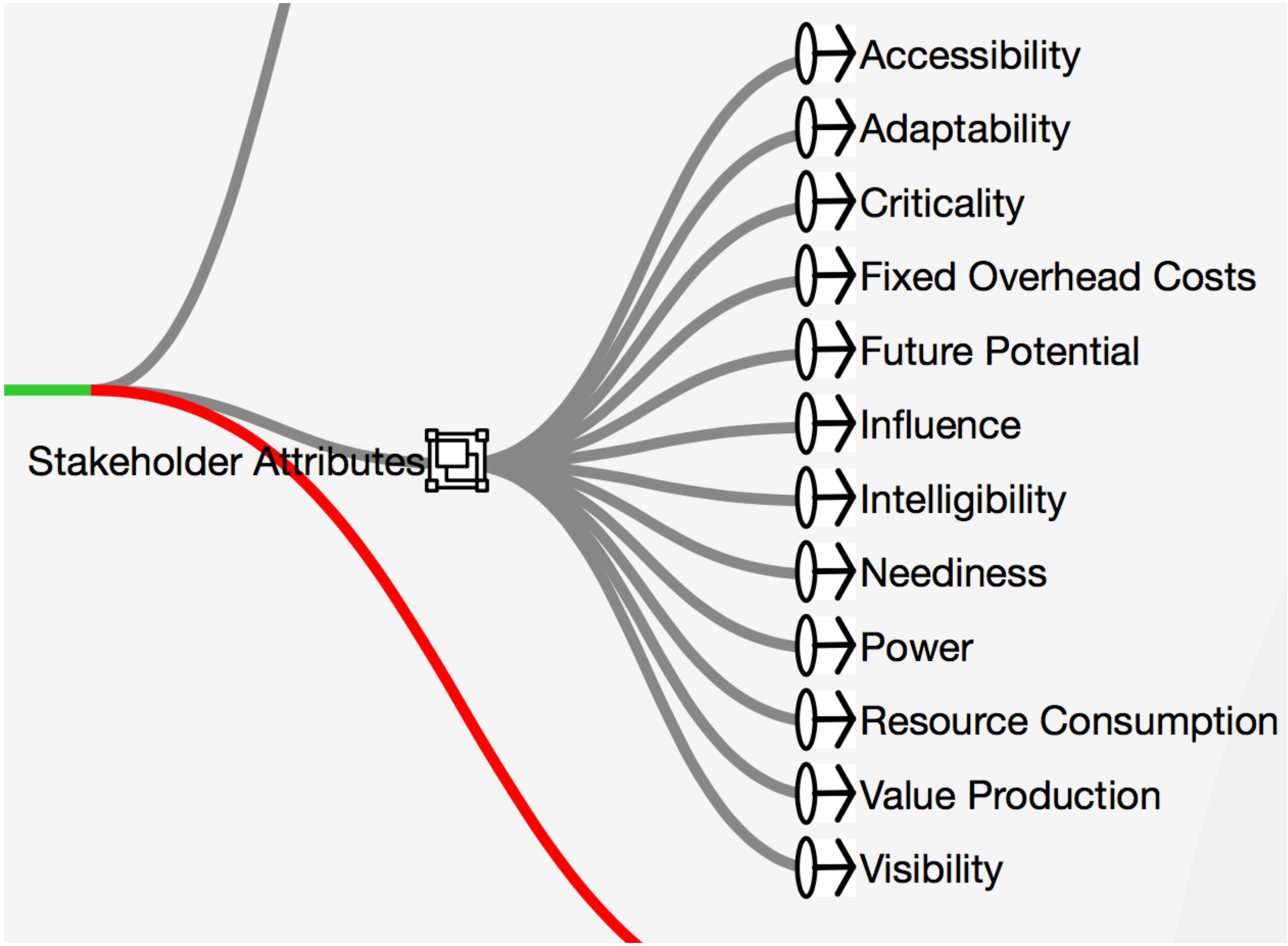
10. If you do not understand, and act on the principles above; you might blame your failure on 'system complexity', and the unexpected and wicked problems. But in reality, it is your own fault and responsibility; deal with it - up front and constantly.



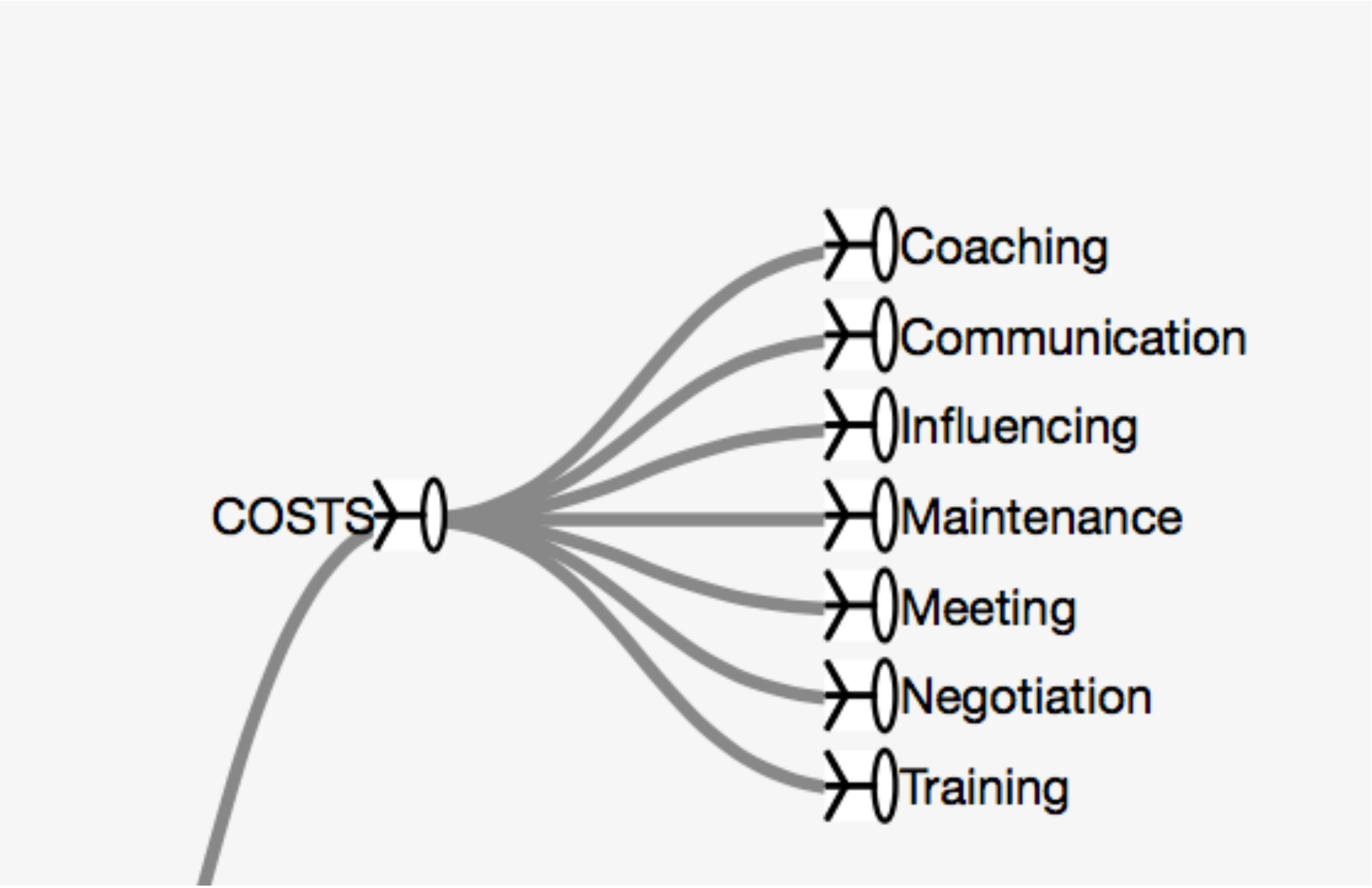
•SOURCE, 2016 Paper
"Stakeholder Power:The Key to Project Failure or Success"
including 10 Stakeholder Principles
http://concepts.gilb.com/dl880 (COPY FEB 2017)
http://concepts.gilb.com/dl872 (FEB 2016)

Stakeholder Attributes

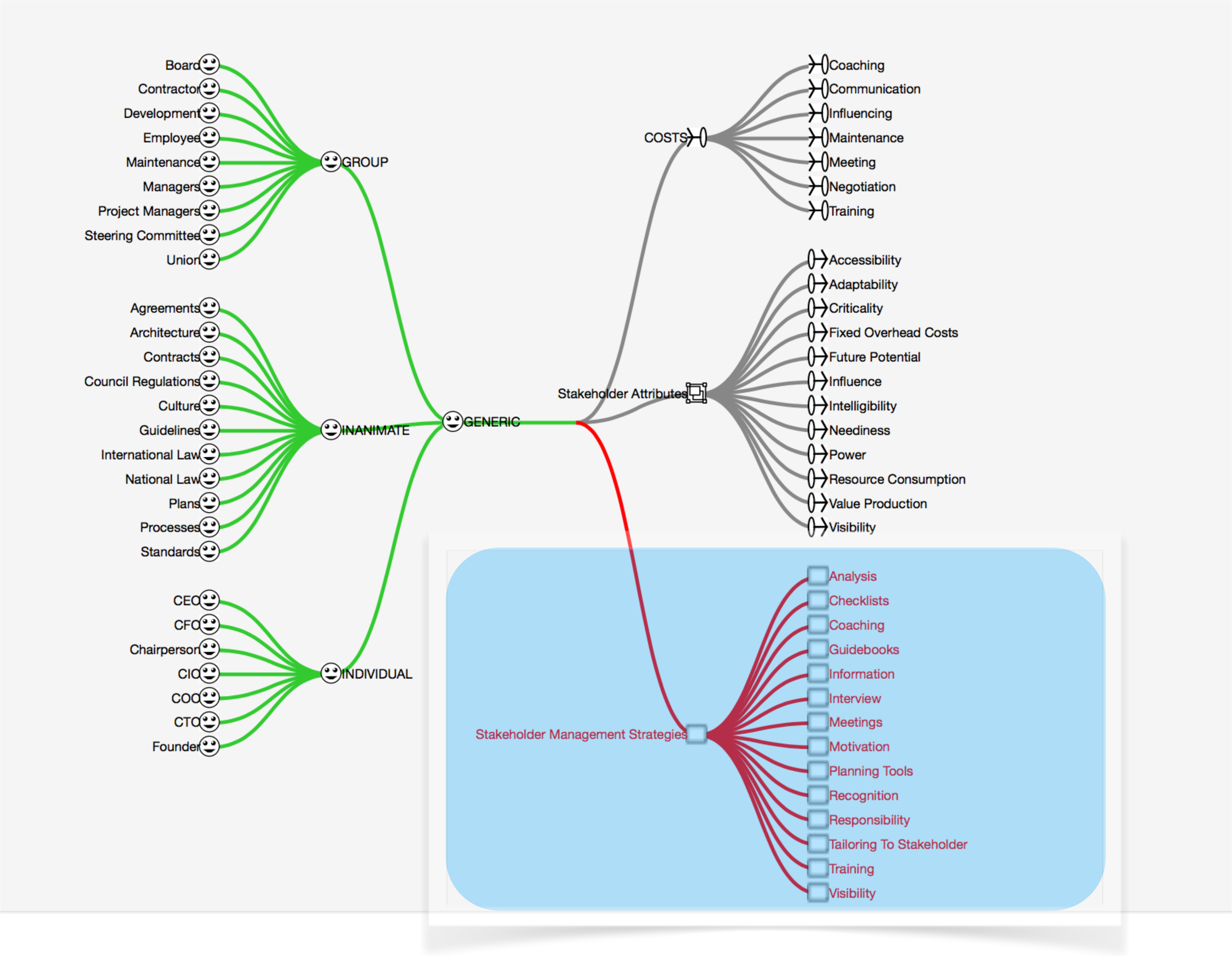
- Some attributes of stakeholders
- which can be defined in more detail,
- and can be quantified
- status estimated
- and potentially *improved*

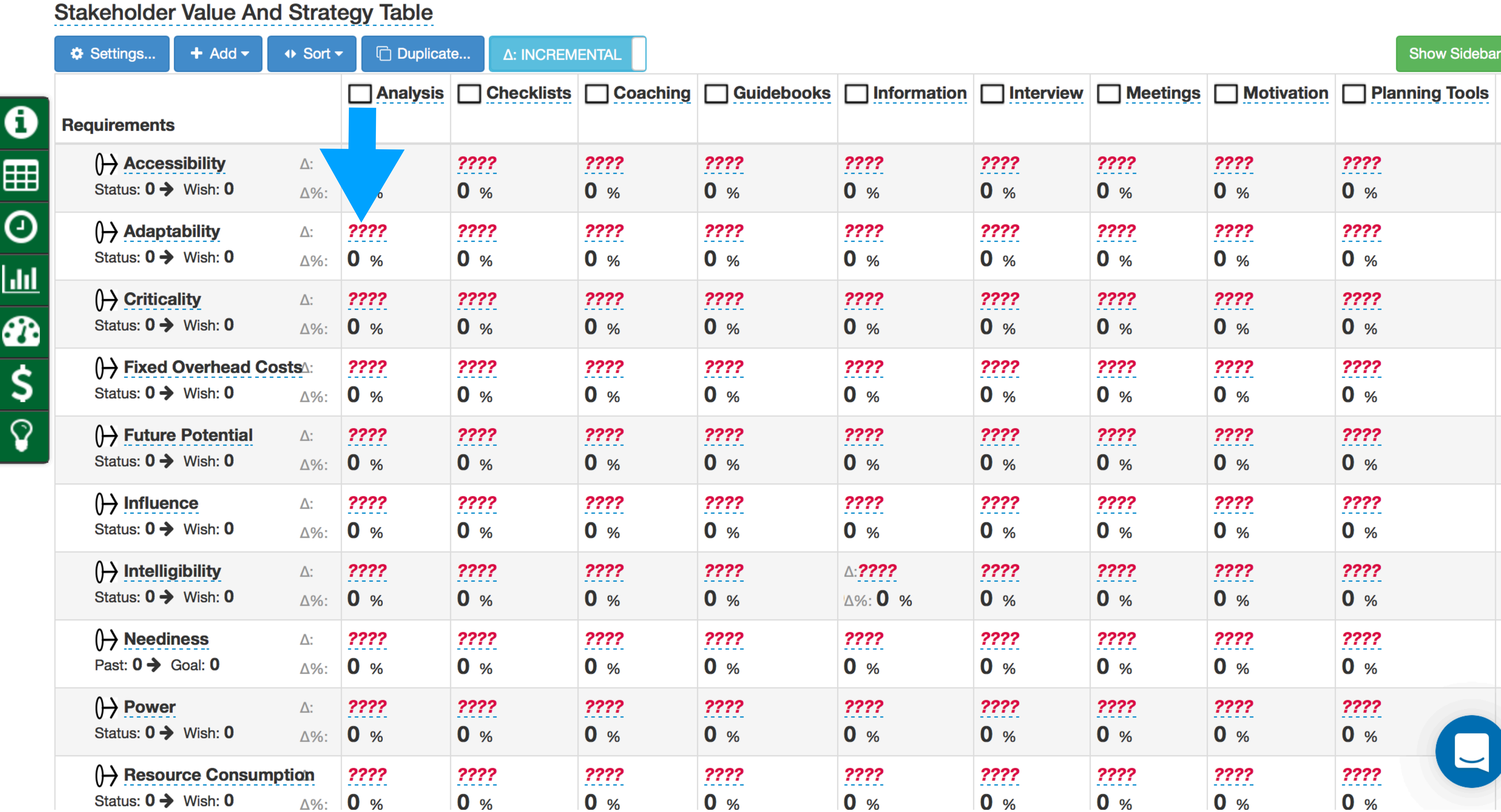


Stakeholder Costs



Adding Strategies for Improving Stakeholder Attributes





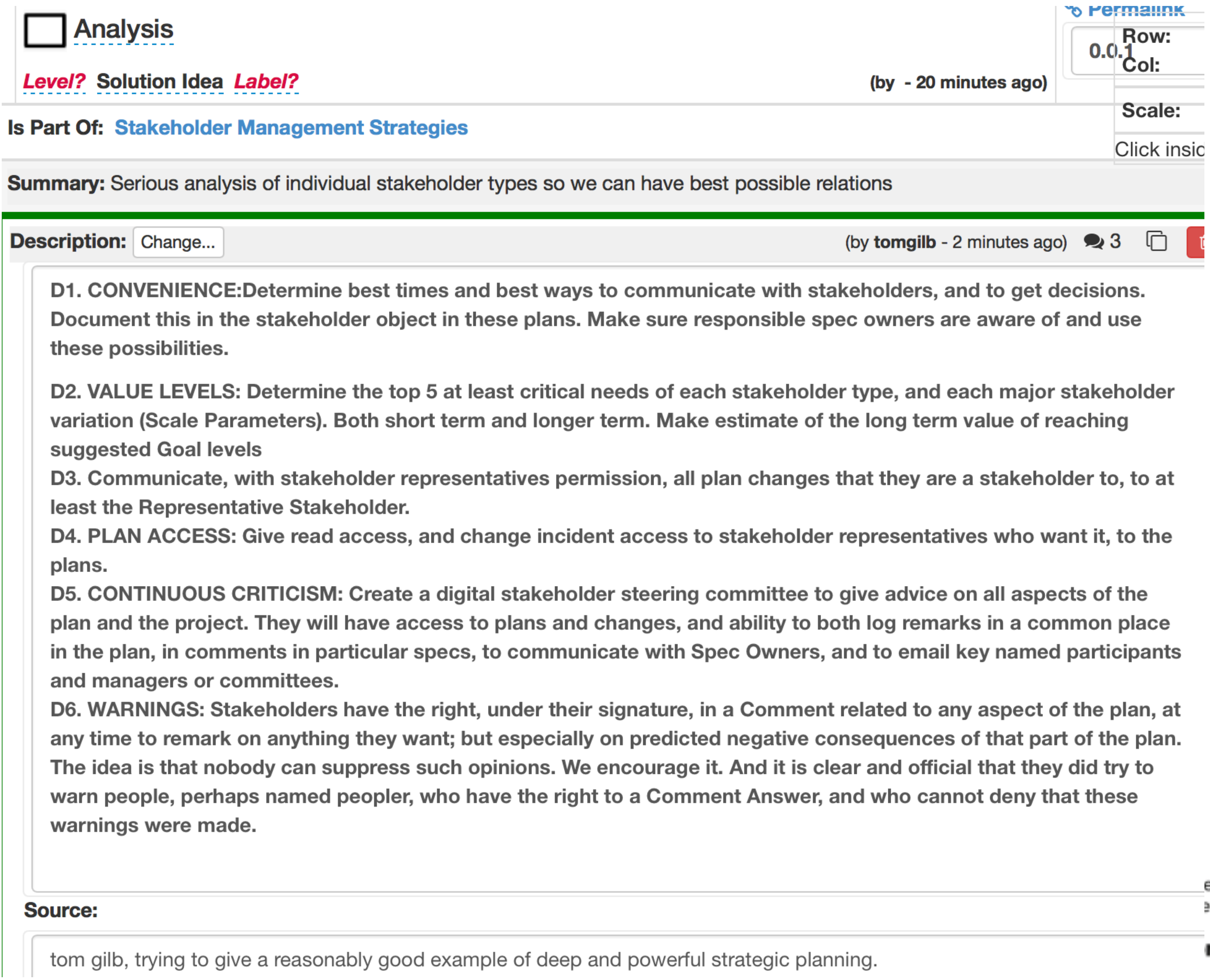
Stakeholder Value And Strategy Table

Requirements		☐ Analysis	☐ Checklists	☐ Coaching	☐ Guidebooks	☐ Information	☐ Interview	☐ Meetings	☐ Motivation	☐ Planning Tools
Accessibility Status: 0 → Wish: 0	Δ: Δ%:	%	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Adaptability Status: 0 → Wish: 0	Δ: Δ%:	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Criticality Status: 0 → Wish: 0	Δ: Δ%:	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Fixed Overhead Costs Status: 0 → Wish: 0	Δ: Δ%:	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Future Potential Status: 0 → Wish: 0	Δ: Δ%:	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Influence Status: 0 → Wish: 0	Δ: Δ%:	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Intelligibility Status: 0 → Wish: 0	Δ: Δ%:	???? 0 %	???? 0 %	???? 0 %	???? 0 %	Δ:???? Δ%: 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Neediness Past: 0 → Goal: 0	Δ: Δ%:	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Power Status: 0 → Wish: 0	Δ: Δ%:	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Resource Consumption Status: 0 → Wish: 0	Δ%:	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %

Stakeholder Ends and Means

the ???? signifies that we did not yet estimate the effectiveness of the ideas for getting better

The leftmost strategy - ‘**Analysis**’ *detailed*



☐ Analysis

Level? Solution Idea *Label?*

(by - 20 minutes ago)

Permalink

0.0.1

Row:

Col:

Scale:

Click insic

Is Part Of: Stakeholder Management Strategies

Summary: Serious analysis of individual stakeholder types so we can have best possible relations

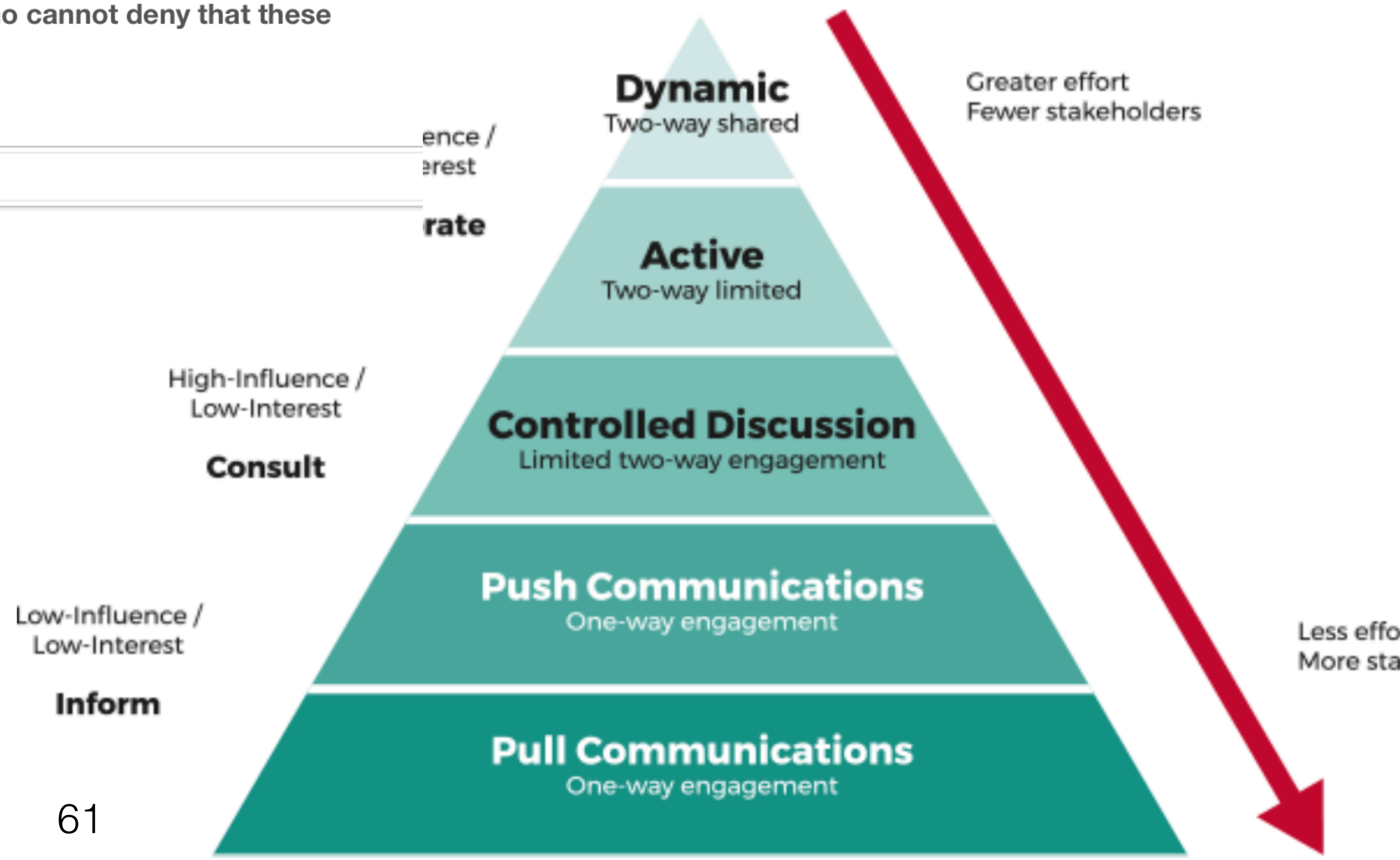
Description: Change... (by **tomgilb** - 2 minutes ago) 3

D1. CONVENIENCE:Determine best times and best ways to communicate with stakeholders, and to get decisions. Document this in the stakeholder object in these plans. Make sure responsible spec owners are aware of and use these possibilities.

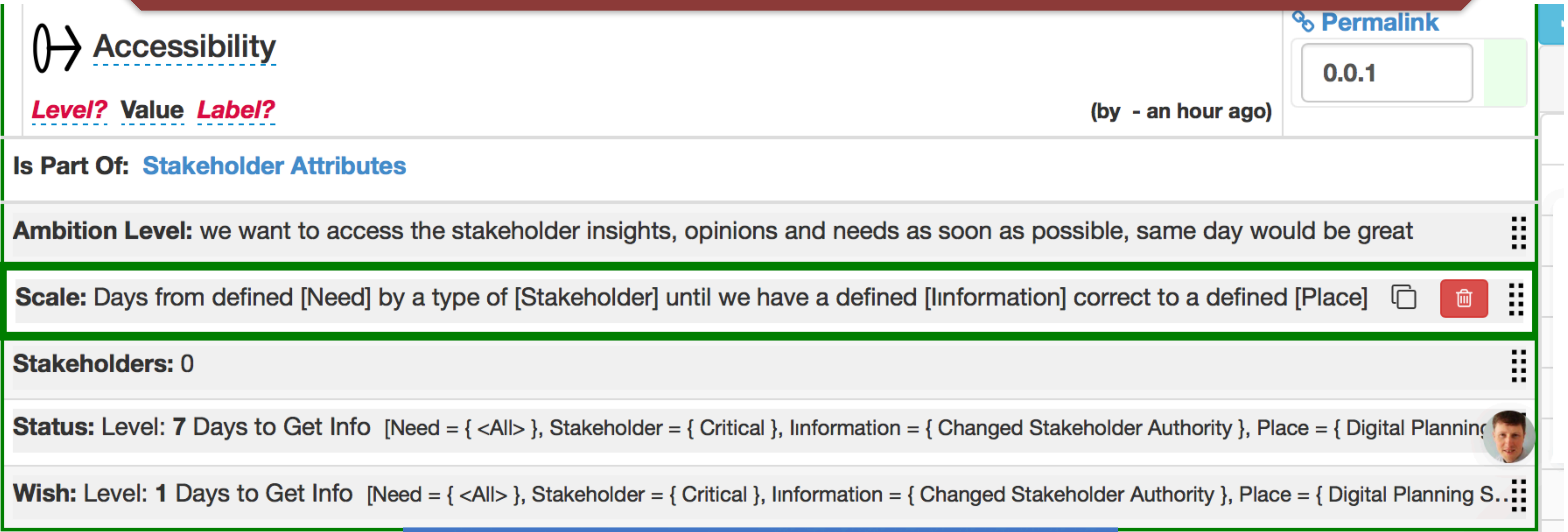
D2. VALUE LEVELS: Determine the top 5 at least critical needs of each stakeholder type, and each major stakeholder variation (Scale Parameters). Both short term and longer term. Make estimate of the long term value of reaching suggested Goal levels
D3. Communicate, with stakeholder representatives permission, all plan changes that they are a stakeholder to, to at least the Representative Stakeholder.
D4. PLAN ACCESS: Give read access, and change incident access to stakeholder representatives who want it, to the plans.
D5. CONTINUOUS CRITICISM: Create a digital stakeholder steering committee to give advice on all aspects of the plan and the project. They will have access to plans and changes, and ability to both log remarks in a common place in the plan, in comments in particular specs, to communicate with Spec Owners, and to email key named participants and managers or committees.
D6. WARNINGS: Stakeholders have the right, under their signature, in a Comment related to any aspect of the plan, at any time to remark on anything they want; but especially on predicted negative consequences of that part of the plan. The idea is that nobody can suppress such opinions. We encourage it. And it is clear and official that they did try to warn people, perhaps named peopler, who have the right to a Comment Answer, and who cannot deny that these warnings were made.

Source:

tom gilb, trying to give a reasonably good example of deep and powerful strategic planning.



‘Accessibility’ defined quantitatively



Accessibility

Level? Value *Label?*

(by - an hour ago)

Permalink

0.0.1

Is Part Of: Stakeholder Attributes

Ambition Level: we want to access the stakeholder insights, opinions and needs as soon as possible, same day would be great

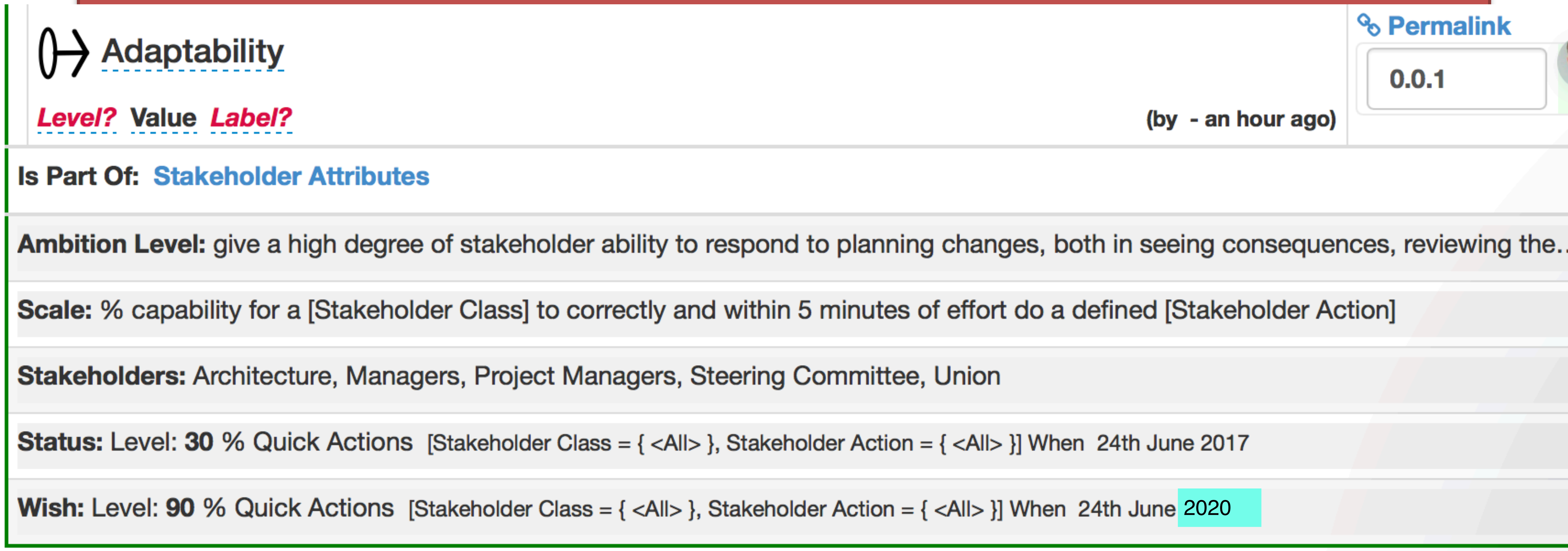
Scale: Days from defined [Need] by a type of [Stakeholder] until we have a defined [Iinformation] correct to a defined [Place]

Stakeholders: 0

Status: Level: **7** Days to Get Info [Need = { <All> }, Stakeholder = { Critical }, Iinformation = { Changed Stakeholder Authority }, Place = { Digital Plannin

Wish: Level: **1** Days to Get Info [Need = { <All> }, Stakeholder = { Critical }, Iinformation = { Changed Stakeholder Authority }, Place = { Digital Planning S..

‘Adaptability’ Value defined



Adaptability

Level? Value *Label?*

(by - an hour ago)

Permalink

0.0.1

Is Part Of: Stakeholder Attributes

Ambition Level: give a high degree of stakeholder ability to respond to planning changes, both in seeing consequences, reviewing the..

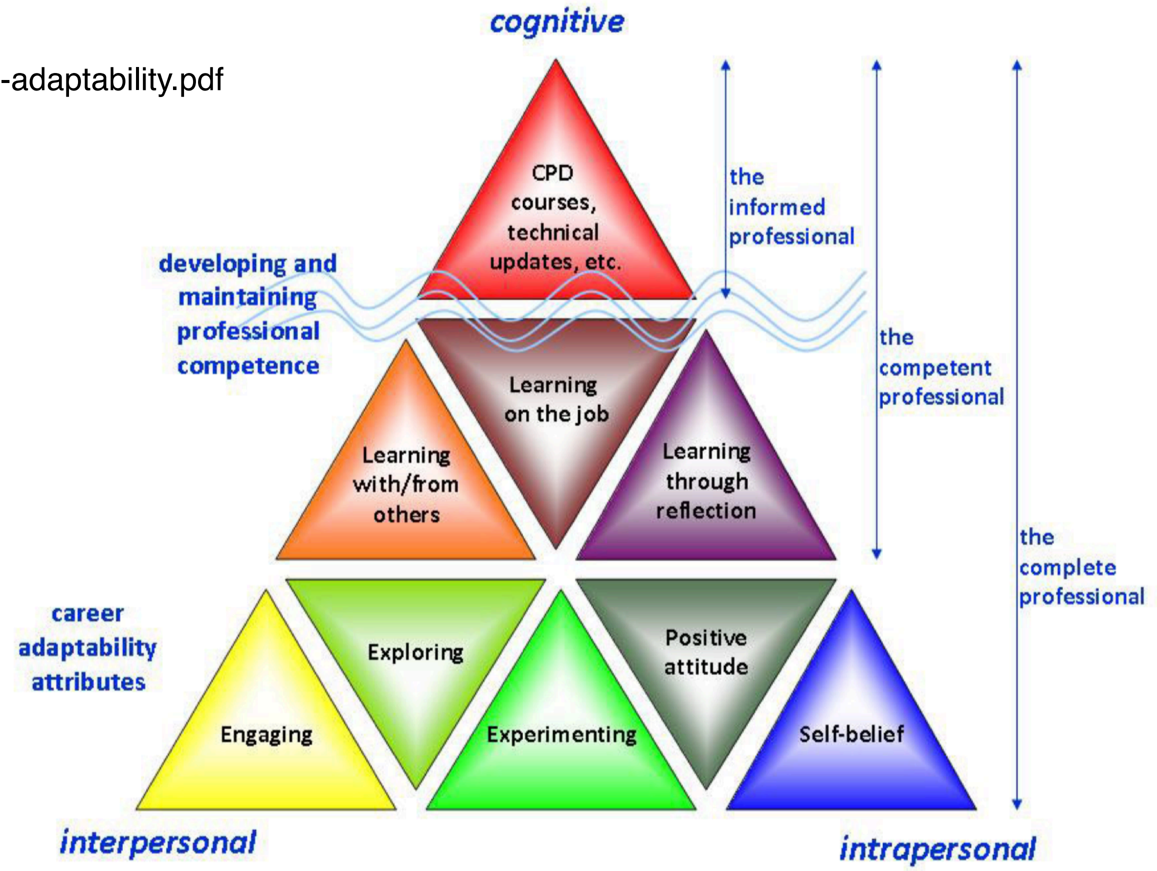
Scale: % capability for a [Stakeholder Class] to correctly and within 5 minutes of effort do a defined [Stakeholder Action]

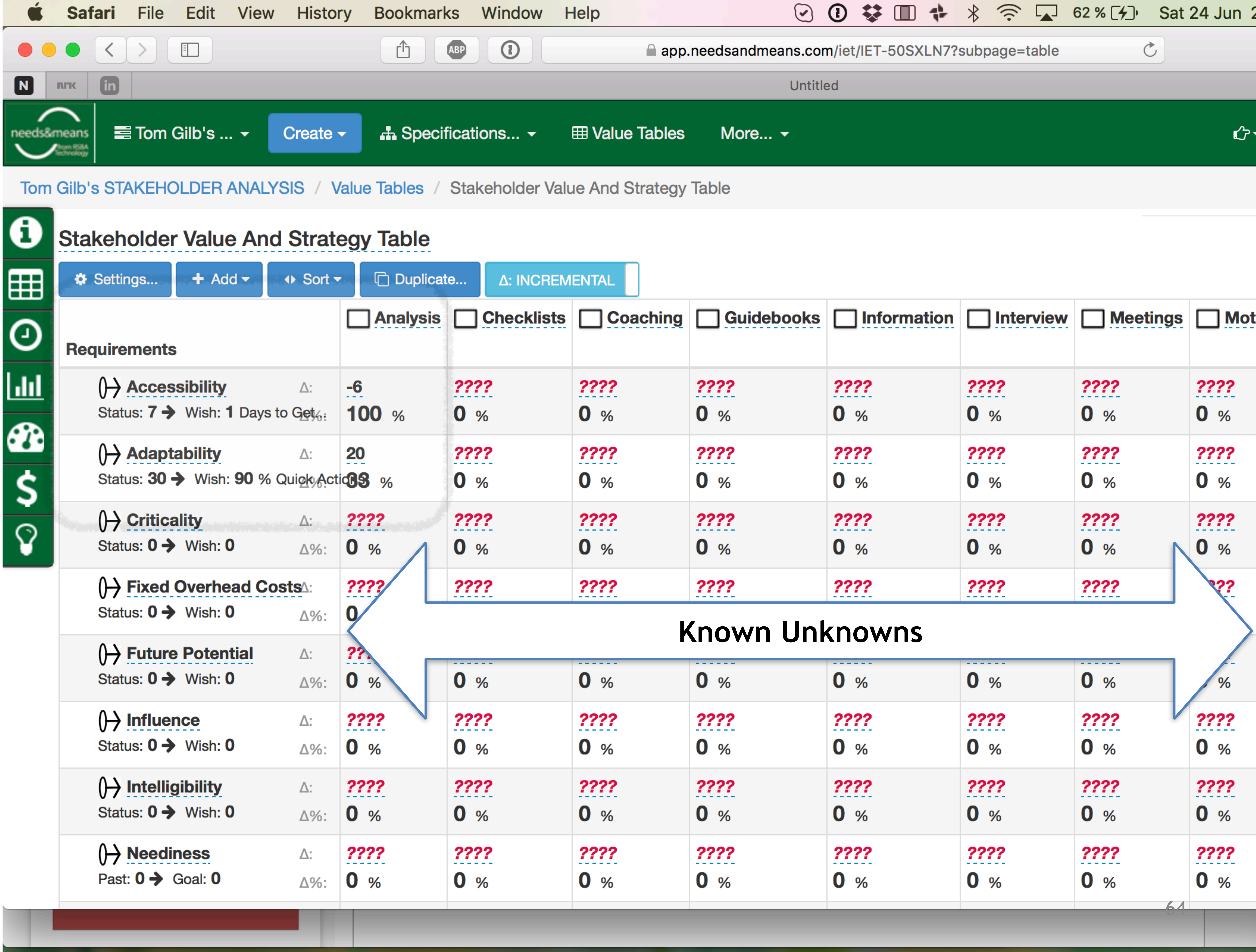
Stakeholders: Architecture, Managers, Project Managers, Steering Committee, Union

Status: Level: **30** % Quick Actions [Stakeholder Class = { <All> }, Stakeholder Action = { <All> }] When 24th June 2017

Wish: Level: **90** % Quick Actions [Stakeholder Class = { <All> }, Stakeholder Action = { <All> }] When 24th June 2020

http://www.alisonmaitland.com/wp-content/uploads/2016/12/The-importance-of-career-adaptability.pdf





Tom Gilb's STAKEHOLDER ANALYSIS / Value Tables / Stakeholder Value And Strategy Table

Stakeholder Value And Strategy Table

Requirements	☐ Analysis	☐ Checklists	☐ Coaching	☐ Guidebooks	☐ Information	☐ Interview	☐ Meetings	☐ Mot
Accessibility Δ: Status: 7 → Wish: 1 Days to Get... Δ%:	-6 100 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Adaptability Δ: Status: 30 → Wish: 90 % Quick Actio... Δ%:	20 33 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Criticality Δ: Status: 0 → Wish: 0 Δ%:	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Fixed Overhead Costs Δ: Status: 0 → Wish: 0 Δ%:	???? 0	????	????	????	????	????	????	??
Future Potential Δ: Status: 0 → Wish: 0 Δ%:	?? 0 %	0 %	0 %	0 %	0 %	0 %	0 %	%
Influence Δ: Status: 0 → Wish: 0 Δ%:	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Intelligibility Δ: Status: 0 → Wish: 0 Δ%:	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %
Neediness Δ: Past: 0 → Goal: 0 Δ%:	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %	???? 0 %

Known Unknowns

Critical ={Stakeholders, Requirements}

- prioritization tactic

- **Critical Factor Concept *036**
- A critical factor is an attribute level or condition in a system,
- which can on its own,
- determine the **success or failure** of the system
- under specified conditions.

- We prioritize critical factors like **critical stakeholders** and their **critical requirements**
  - until all are satisfied
  - then we should probably stop

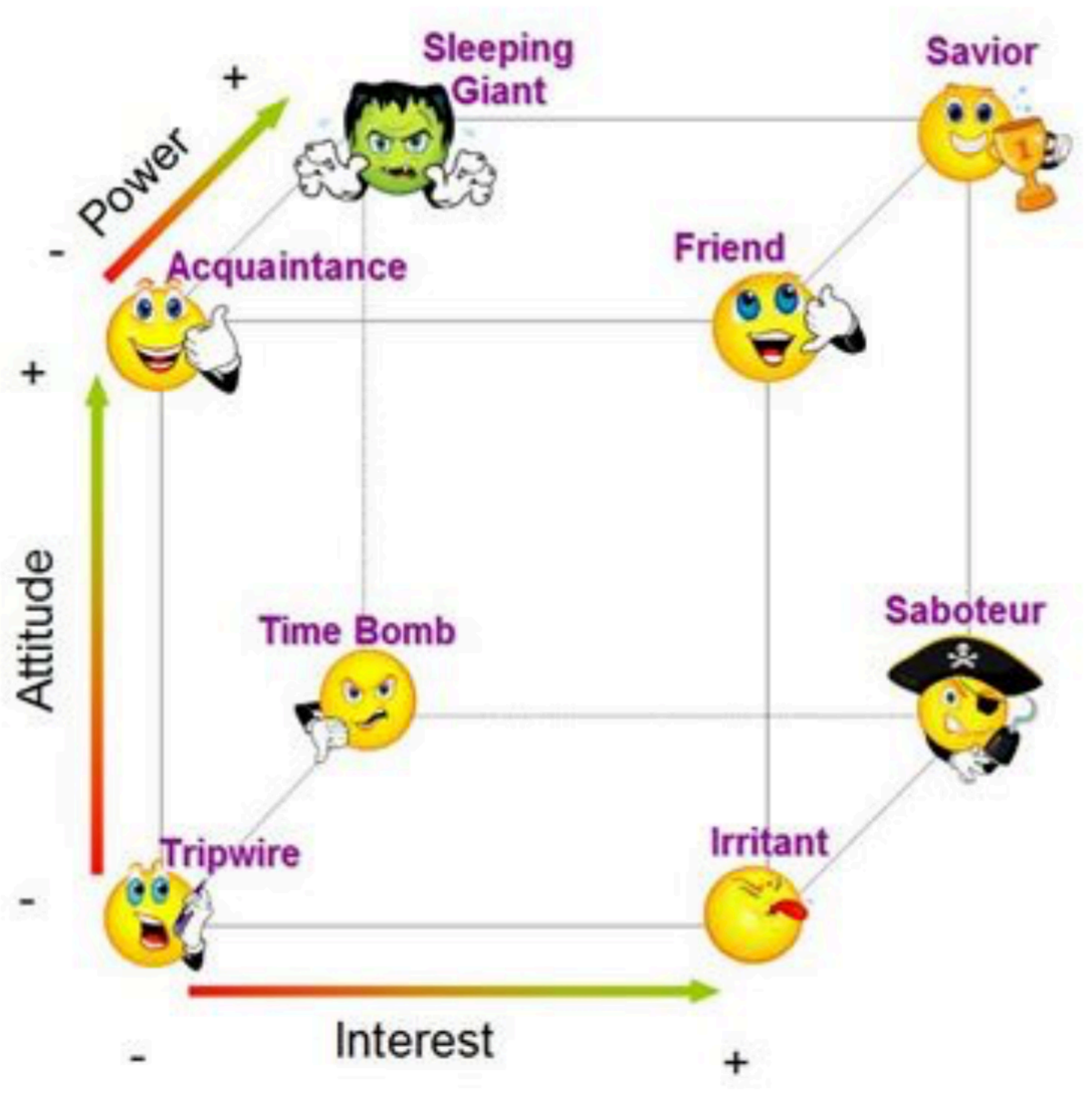
Stakeholder Rights

- Stakeholders should have the
  - **Right to have a voice**
  - **Right to be consulted**
  - **Right to be warned**
  - **Right to suggest**
  - **Right to review**
  - **Right to measure**
  - **Right to complain**
  - **Right to be informed**
  - **Right to change their mind**
  - **Right to understand costs**
  - **Right to understand value/resources**
  - **Right to understand risks**
  - **Right to set their priorities**

https://humanrightsmeasurement.org/methodology/measuring-civil-political-rights/

Stakeholder Power in 3D

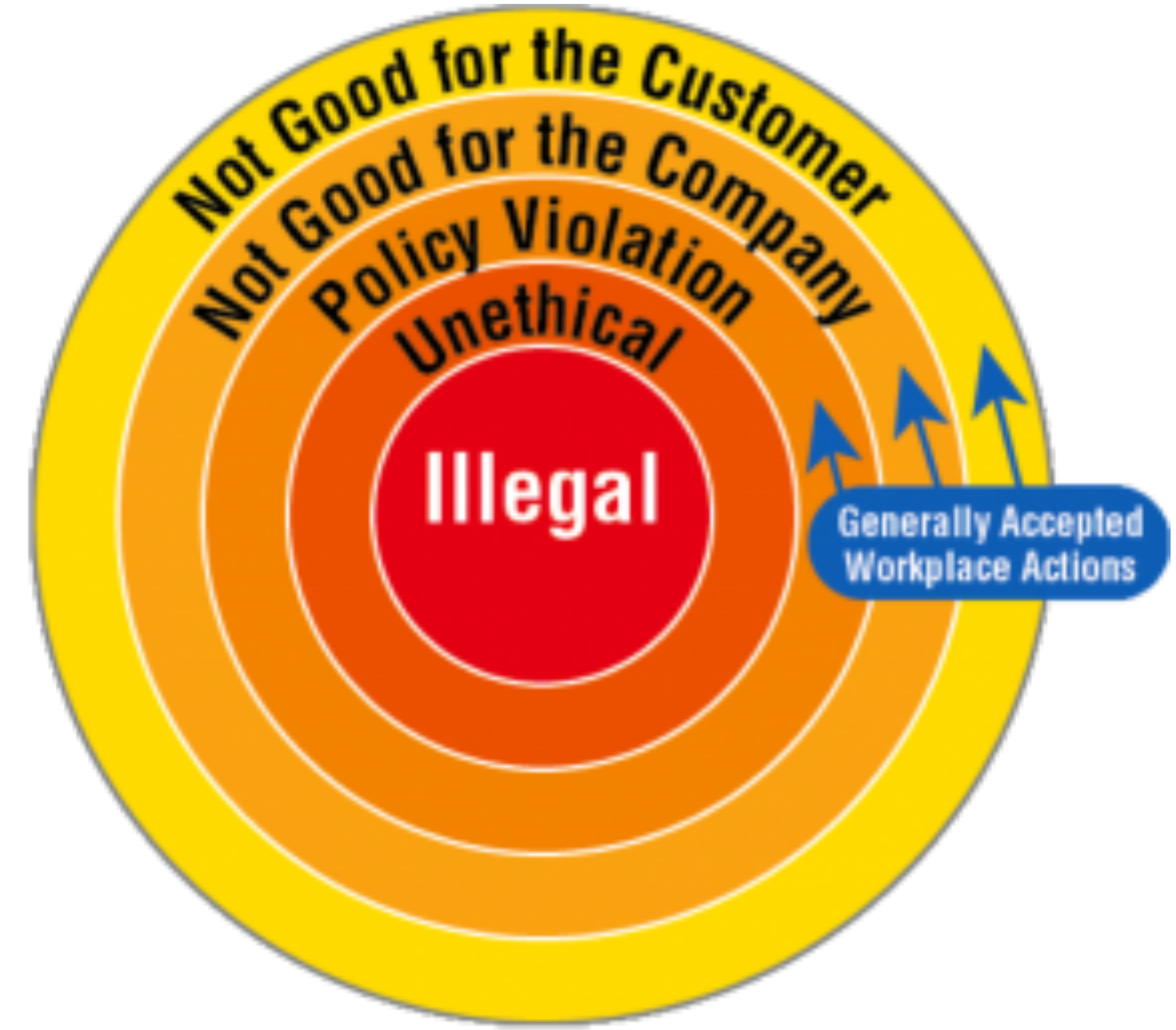
- Stakeholder power is *rarely absolute*
- Stakeholder power needs to be balanced with all other stakeholders
- Stakeholder power will vary through time
- Stakeholder power is less relevant when their needs are satisfied



https://www.brighthubpm.com/project-planning/23481-stakeholder-analysis-spheres-of-influence/

Stakeholder Ethics

- Stakeholders will have highly varied ethics, and motivations
- We can influence stakeholder ethics by a variety of actions



The Unethical Continuum

https://www.chuckgallagher.com/2013/04/16/business-ethics-theories-which-theory-of-ethics-do-you-follow-stockholder-stakeholder-and-social-contract-theories-part-one/

Stakeholder Feedback Types

- Stakeholders have a variety of ways to feedback, react, and influence the process
- gradual measurement of value delivered versus value expected
- complaints
- ‘Sensemaker’ ™ feedback

UX ACTIVITIES IN THE PRODUCT & SERVICE DESIGN CYCLE

DISCOVER

METHODS

Field studies/user interviews
Diary studies
Stakeholder interviews
Requirements & constraints
Sales & support interviews
Support call monitoring
Competitive testing

ACTIVITIES

Find allies
Talk with experts
Follow ethical guidelines
Involve stakeholders
Hunt for data sources
Determine UX metrics

EXPLORE

METHODS

Competitive analysis
Design review
Persona building
Task analysis
Journey mapping
Human-centered design
Design diversity exploration
Pluralistic walkthrough
Prototype feedback & testing
Write user stories
Card sorting

ACTIVITIES

Follow Tog's principles of IXD
Use evidence-based guidelines
Design for universal access
Give users control
Prevent errors
Improve error messages
Provide helpful defaults
Check for inconsistencies
Map features to needs
Make software updating easy
Plan for repair and recycling
Avoid waste
Consider diverse contexts
Look for perverse incentives
Consider social implications

TEST

METHODS

Qualitative usability testing
Training research
User group outreach
Social media monitoring
Forum post analysis
Benchmark testing
Accessibility evaluation
Test instructions & help

ACTIVITIES

Protect personal information
Keep data safe
Deliver both good and bad news
Track usability over time
Include diverse users
Track usability bugs
Make training information

LISTEN

METHODS

Surveys
Analytics review
Search-log analysis
Usability bug review
Feedback review
FAQ review
Conference outreach
Q&A at talks and demos

ACTIVITIES

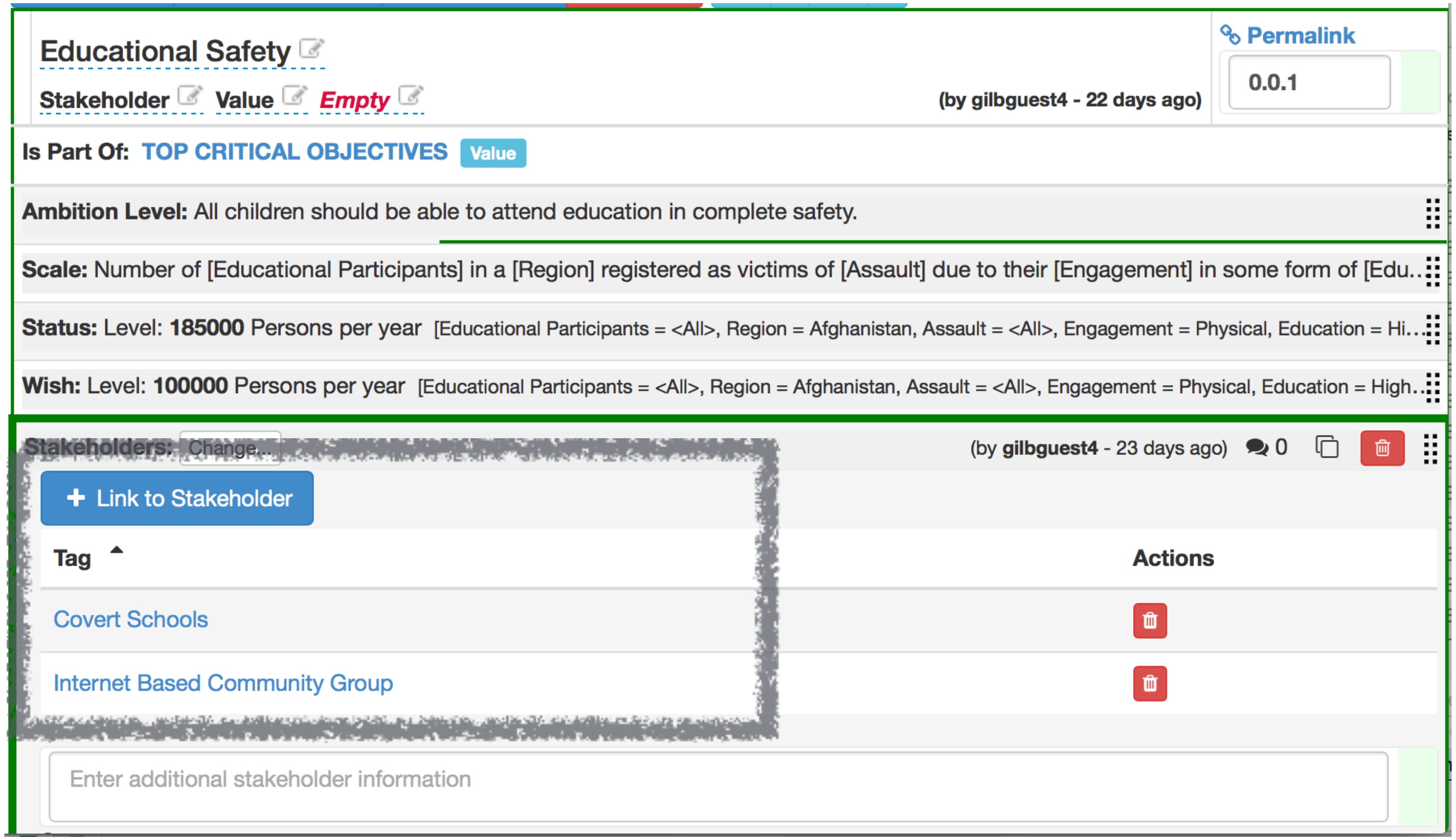
Pay attention to user sentiment
Reduce the need for training
Communicate future directions
Recruit people for future research

Bold methods are some of the most commonly used.

NNGROUP.COM NN/g

https://www.nngroup.com/articles/ux-research-cheat-sheet/

Defining a list of stakeholders which are related to an Objective



Educational Safety

Stakeholder Value *Empty*

(by gilbguest4 - 22 days ago)

Permalink

0.0.1

Is Part Of: TOP CRITICAL OBJECTIVES Value

Ambition Level: All children should be able to attend education in complete safety.

Scale: Number of [Educational Participants] in a [Region] registered as victims of [Assault] due to their [Engagement] in some form of [Edu...

Status: Level: **185000** Persons per year [Educational Participants = <All>, Region = Afghanistan, Assault = <All>, Engagement = Physical, Education = Hi...

Wish: Level: **100000** Persons per year [Educational Participants = <All>, Region = Afghanistan, Assault = <All>, Engagement = Physical, Education = High...

Stakeholders: Change...

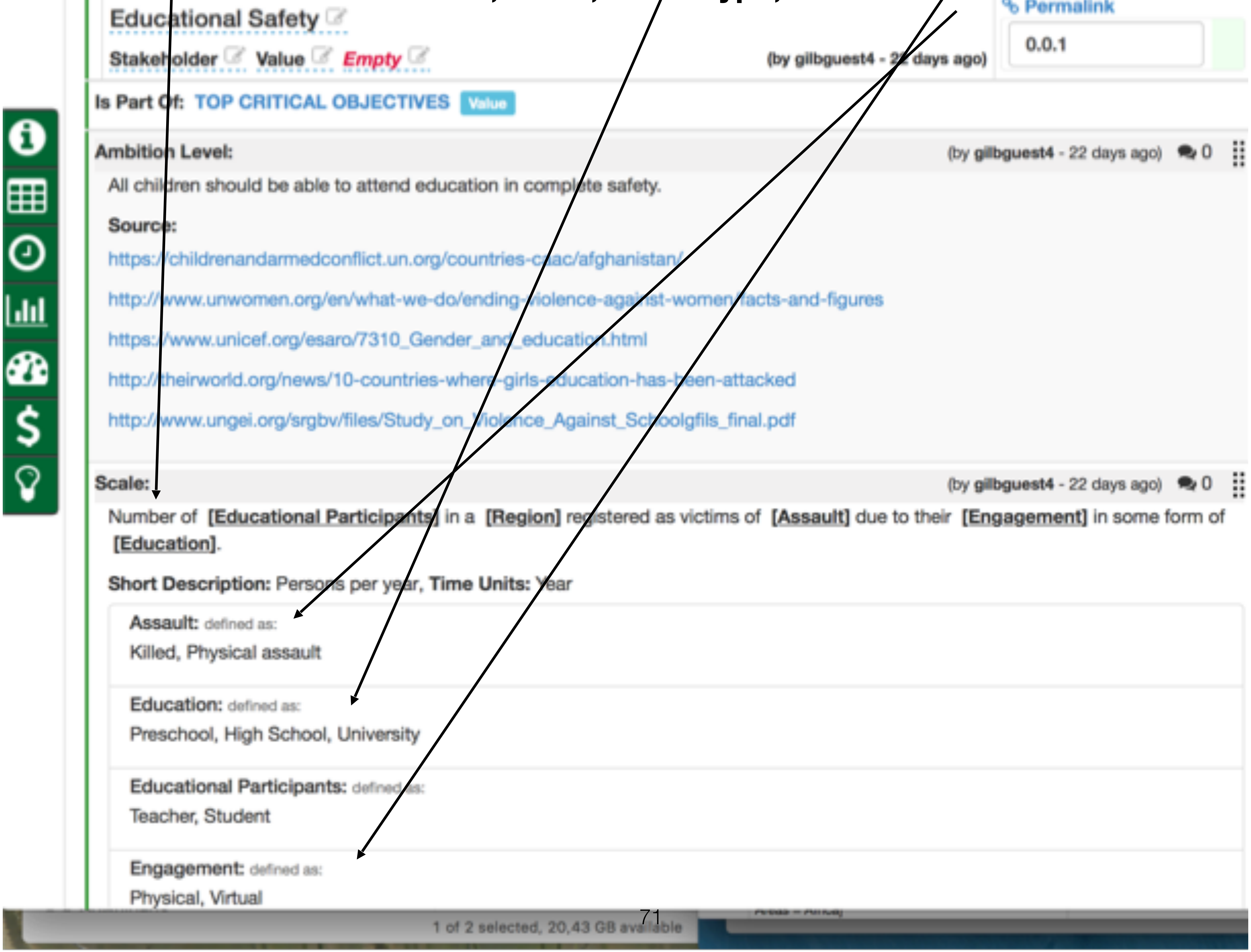
(by **gilbguest4** - 23 days ago) 0

+ Link to Stakeholder

Tag	Actions
Covert Schools	
Internet Based Community Group	

Enter additional stakeholder information

The Scale definition, scale ‘parameters’ - give additional information regarding stakeholders: such as where, when, which type, under what circumstances



Educational Safety

Stakeholder Value *Empty*

(by gilbguest4 - 22 days ago)

Permalink

0.0.1

Is Part Of: TOP CRITICAL OBJECTIVES Value

Ambition Level: (by gilbguest4 - 22 days ago) 0

All children should be able to attend education in complete safety.

Source:

https://childrenandarmedconflict.un.org/countries-caac/afghanistan/

http://www.unwomen.org/en/what-we-do/ending-violence-against-women/facts-and-figures

https://www.unicef.org/esaro/7310_Gender_and_education.html

http://theirworld.org/news/10-countries-where-girls-education-has-been-attacked

http://www.ungei.org/srgbv/files/Study_on_Violence_Against_Schoolgfils_final.pdf

Scale: (by gilbguest4 - 22 days ago) 0

Number of **[Educational Participants]** in a **[Region]** registered as victims of **[Assault]** due to their **[Engagement]** in some form of **[Education]**.

Short Description: Persons per year, **Time Units:** Year

Assault: defined as:
Killed, Physical assault

Education: defined as:
Preschool, High School, University

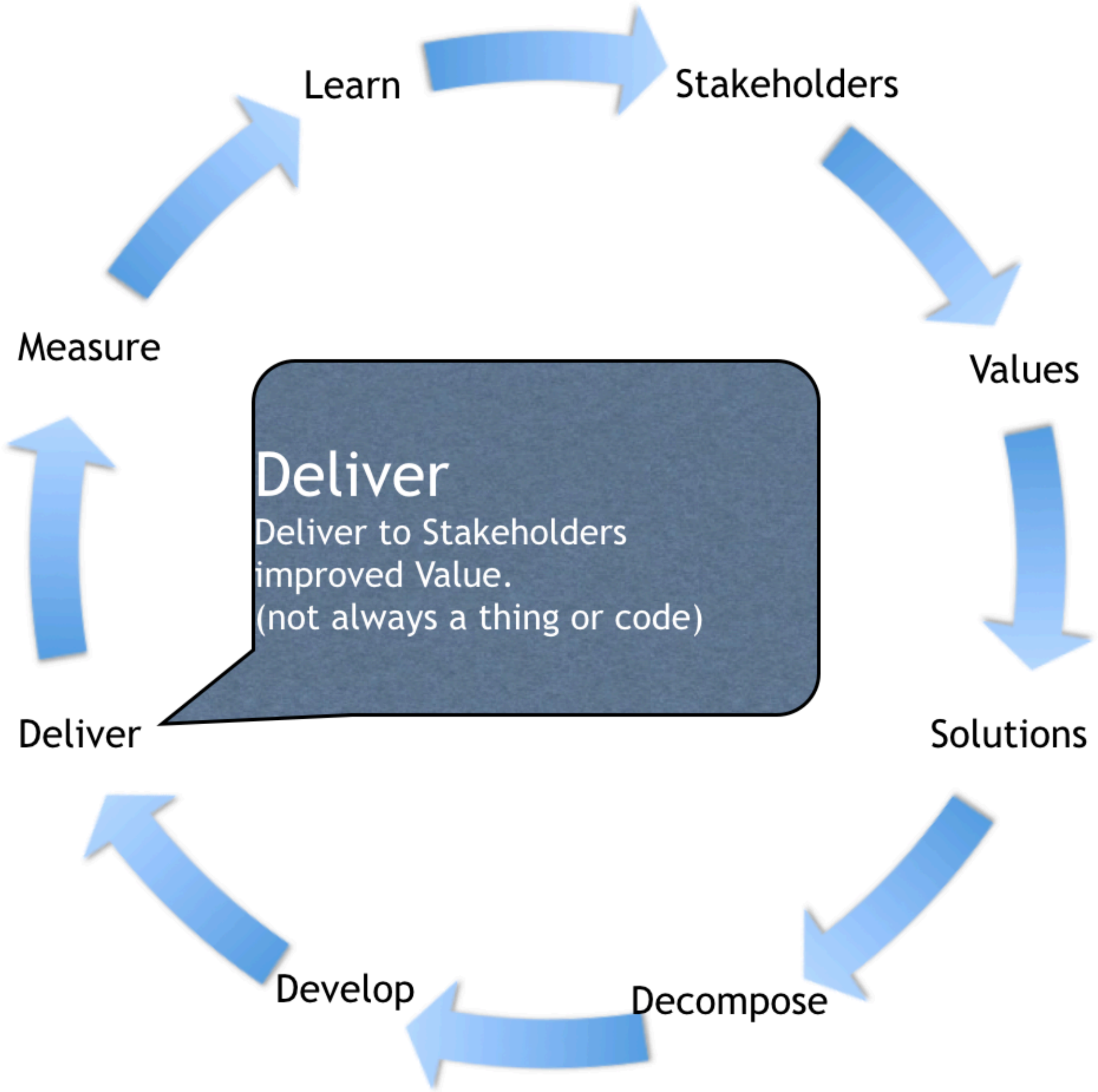
Educational Participants: defined as:
Teacher, Student

Engagement: defined as:
Physical, Virtual

1 of 2 selected, 20,43 GB available

Stakeholder-Driven Value Delivery

- all projects
  - are about
  - *delivering values*
  - to **stakeholders**



Deliver

Deliver to Stakeholders improved Value.
(not always a thing or code)

End of Talk.

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‘Competitive
Engineering’ book.
https://www.gilb.com/p/competitive-engineering

these slides are at
http://concepts.gilb.com/file24

Pictures from Spring edition of the Masterclass
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https://www.gilb.com/store?tag=books