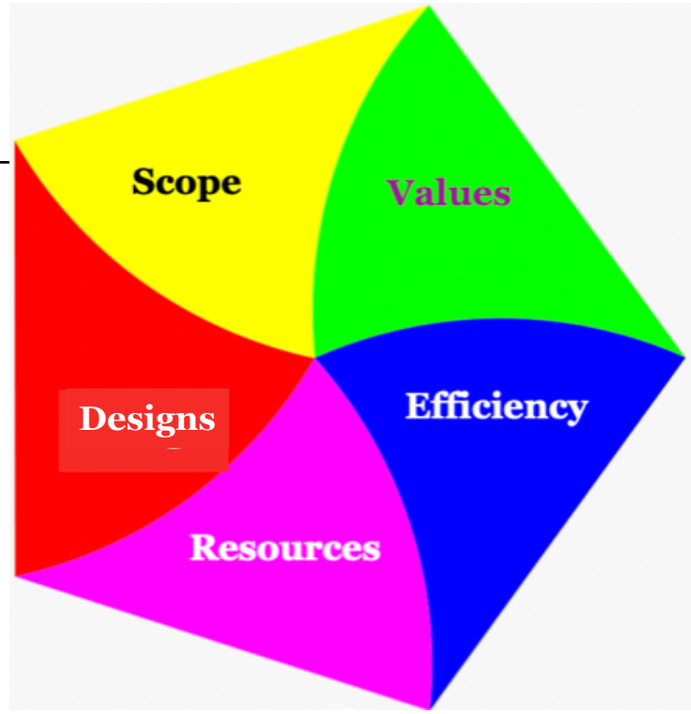
The 'Penta' Model

Penta concept Co-invented by Al Shalloway and Tom Gilb, 2022

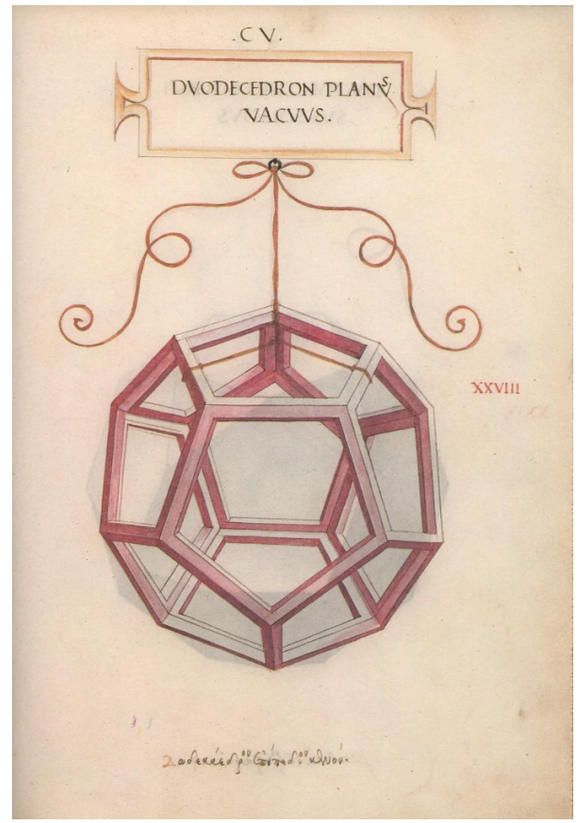


The Penta model with 5 top level 'Quints'

PENTA: Purposely Efficient Nodes for Top Attributes. May be spelled 'Penta'

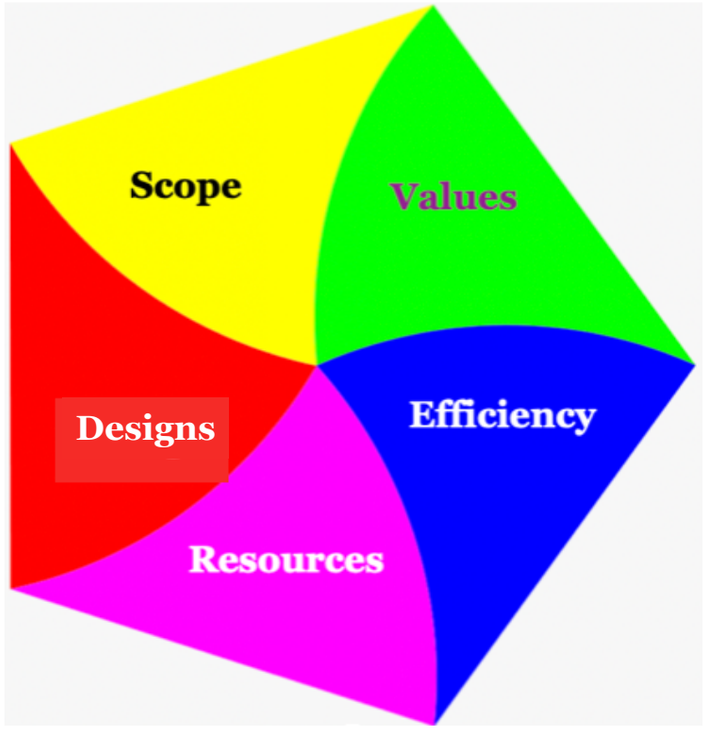
https://tinyurl.com/PentaPaper

Note: a close copy of this paper is included in the Book 'Simple' as Chapter 4. https://tinyurl.com/SIMPLEGilb



Leonardo da Vinci, Duodecedron published on the "**De Divina Proportione**" by **Luca Pacioli** (1497). It consists of 12 pentagons

‘Penta' Definitions: The Agile Penta Conflict Balance



- The PENTA is a simplified model of 5 basic *conflicting forces* in any system, which can be adjusted to give a more optimum balance.

- The **PENTA Forces** are: Scope, Values, Efficiency, Resources, and Designs. ‘SVERD’ (Norwegian for ‘Sword”).

1. **Scope**: is the specified set of stakeholder- and system-*functions* (what it must **do**) and *constraints* (what it must ***not*** do). Scope draws a border around a given system.

2. **Values**: is the specified set of *stakeholder* values (‘wants’, ‘needs’, ‘wishes’, ‘visions’) and *system* qualities, including system performance attributes (‘*potential* values’ for stakeholders).

3. **Efficiency:** is **‘effectiveness-to-costs ratio’**. *Effectiveness* includes all stakeholder-values actually *delivered*. The costs are life-cycle costs, not just ‘capital’ costs. This is a view outside the black box of Designs.

4. **Resources:** are any *critical* and *prioritized*, set of *limited* resources for the system lifecycle, such as time, money, people, space.

5. **Designs**: are any types of ‘implementable ideas’ (designs, strategies, architecture, solutions) which we use, in order to deliver a ‘best available’ balanced delivery of Values, Efficiency, Resources, and Scope. The other 4 Quints.

- **Imperfect**: The Penta model is never complete, updated or fully detailed. It can be simplified and summarized. It can view selected components, that are *useful* for consideration.

- **Planguage:** Planguage [CE] can be used to define concepts, and specify details, as well as to evaluate balance (Impact Estimation Tables).

- **Freeware**: The Penta ideas are Creative Commons for free non-exclusive exploitation for everyone.
  - Edited 260223, #4 for the

Penta Principles:

1. **Reality Limits**: there are some real limits to what is actually possible in the real world for products, services and process efficiency: The Penta is a tool to model those limits, and to allow us to plan *useful balanced realities*.

2. **Tradeoffs**: in general, we can improve any system dimension (like cost, usability), up to a real-world limit, by reducing, modifying, or eliminating some other Value requirement, or Designs, anywhere in the Penta.

3. **Priorities**: If we decide to prioritize a Value performance level of any Penta requirement, we can potentially do so, by adjusting one or more other Penta requirements, and/or Designs, of lesser priority.

4. **Clarity**: The *clearer, and more detailed*, a Penta Requirement is, the more likely that we can logically decide on the necessary specifications, for other conflicting or co-operative requirements (Using Planguage [CE] logic, and specification).

5. **Interconnectedness**: we have to assume that any Penta requirement, if changed, can influence *several* other requirements, both negatively, positively, and in dynamically unpredictable ways.

A set of Penta portals

https://www.dahimo.com/it/wp-content/uploads/sites/2/2018/11/duodecedron-planus-vacuus-leonardo-da-vinci-1.jpg

6. **Computability**: to the degree we specify Values and Resources numerically, we enable *numeric engineering logic* to help us decide, about tradeoffs, and opportunities [DE].

7. **Feedback Adjustment**: the Penta Model can be a rough guide, to *hypothetical* decisions, about all Penta factors; but we will need to *confirm* reality, by incremental delivery of Designs, and then measurement of consequent Resources and Values.

8. **Dynamics**: <u>continuous</u> *measurement* (of Values and Resources) and *testing* of Scope, is our only protection against adverse changes in a system.

9. **System Views**: The **Penta Paradigm** can be applied to any interesting set of **Penta Portals**, to view and analyze a system, outside of the 'black box' containing a system.

Version 250822.1640 TsG

The ‘Iron Triangle’ is dead, and was never correct.

https://www.villanovau.com/resources/project-management/iron-triangle-project-management/

Problems with the Iron Triangle.

Here is Wikipedia [2]: *“The Project Management Triangle is used to analyze projects.[6] It is often misused to define success as delivering the required scope, at a reasonable quality, within the established budget and schedule.[7][8][9] The Project Management Triangle is considered insufficient as a model of project success because it omits crucial dimensions of success including impact on stakeholders,[10] learning[11] and user satisfaction.[12] Subsequently, several enhancements of the basic triple constraints have been proposed such as the diamond model, the pyramid model, six or multiple constraints and theory of constraints. Accordingly, the project success criteria have been enhanced as well from three to multiple parameters.”*

1. **General problems:** *poor definitions, insufficient scope, totally lacking critical factors*. Below are some specifics, but not the many pages we could use, to criticize the Iron Triangle.

2. **Poor definitions**: “Quality” is not defined at all. It is not referred to in the plural (qualities like *Usability, Security, Reliability*…. and many more). It is never defined **quantitatively** (like availability = 99.998%, MTTR= 2 minutes). See [CE] for a rich explanation of multiple quantified qualities. Qualities are critical characteristics of all systems, and the Iron Triangle people (like PMI) have *not got a clue*.

3. **Insufficient Scope**: *One* example: The Budget, or Financial Resources, is always defined and assumed to be the *financial cost of a project until successful delivery*. It never [1, 2, 3] even hints at the *life-cycle maintenance costs* (of great variety and magnitude). This is irresponsible narrow-mindedness of the most dangerous kind. These later costs are often 10x or more, greater than initial capital costs. And we ‘all' know that if you do not engineer the system up front, to have low maintenance costs, you *can* ‘save' on initial costs, and get disastrous maintenance costs, and failure rates, as a direct result.

4. **Totally lacking critical factors**: This is partly discussed above *(maintenance costs, multiple qualities)*. But the project management process is *critical*, and **missing** (some new models include it [3]). The notion of balancing multiple Stakeholder values, against all long-term and short-term resources [CE) is missing. The notion of a prioritization policy is missing (like lowest costs for quantified critical quality levels) [SEA, Chapter 5]. Critical stuff is absent.

Scope: To Do or not to Do, that is the question.

Edit 250822

1. **Scope**: is any prioritized set of system *functions* (what it *must* do) and 'binary' *constraints* (what it must *not* do).

2. Scope does *not* include the 'Values' delivered to the stakeholders (like Security, Privacy, Usability, Competitiveness) see below. It could! But we have good economic reason to separate these. *Values* drive costs!

3. The functions are **what the system must do.** They are present or absent in the system, and *testing* can ascertain their state and completeness. This can be viewed as defining the domain, or 'business the system is in'. See [CE] Functions chapter.

4. In a sense, functions are *trivial*: well known, and usually present, for decades and centuries, to the organization: long before a new project delivers a new system. But we do have to have them, to be in the *banking*, or *road building* process.

5. Functions must not be confused, as too many do, with 'features', (user perception of a system, sales talk) or **Designs** (strategies, architecture) - the 'technical' enablers for delivering stakeholder values, within constraints, including the budgeted and limited resources.

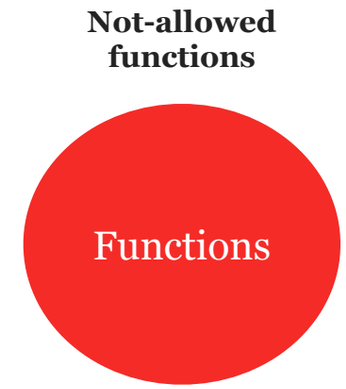
6. When modelling Functions in a Penta, we can usefully decompose functionality, into sub-functions, to get the level-of-detail we need, and are working with currently.

7. We can, make use of sub-functions, to *prioritize* and *deliver* specific functionality, in a 'Function Value Stream' to the project's new system, or to the improving system.

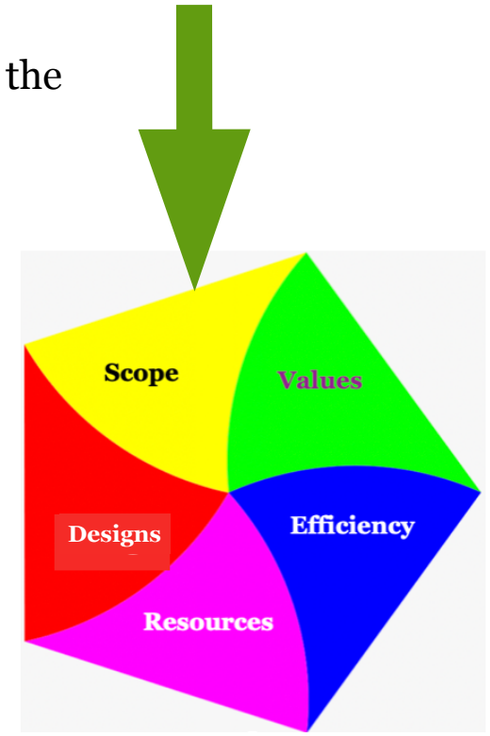
8. **Constraints, (a sub-set of Scope)** are a list of things that are ***not*** allowed, this can include disallowed functions *('you may not charge tax, on certain items', like books)*

9. Functions, specified as *requirements*, map out, what we *eventually expect* to be able to **do (inside our Scope)**, when the project is finished. This list can be in continuous change, as market needs, and other forces dictate. Constraints *draw a border* around the system, and specify what is *outside* of our border.

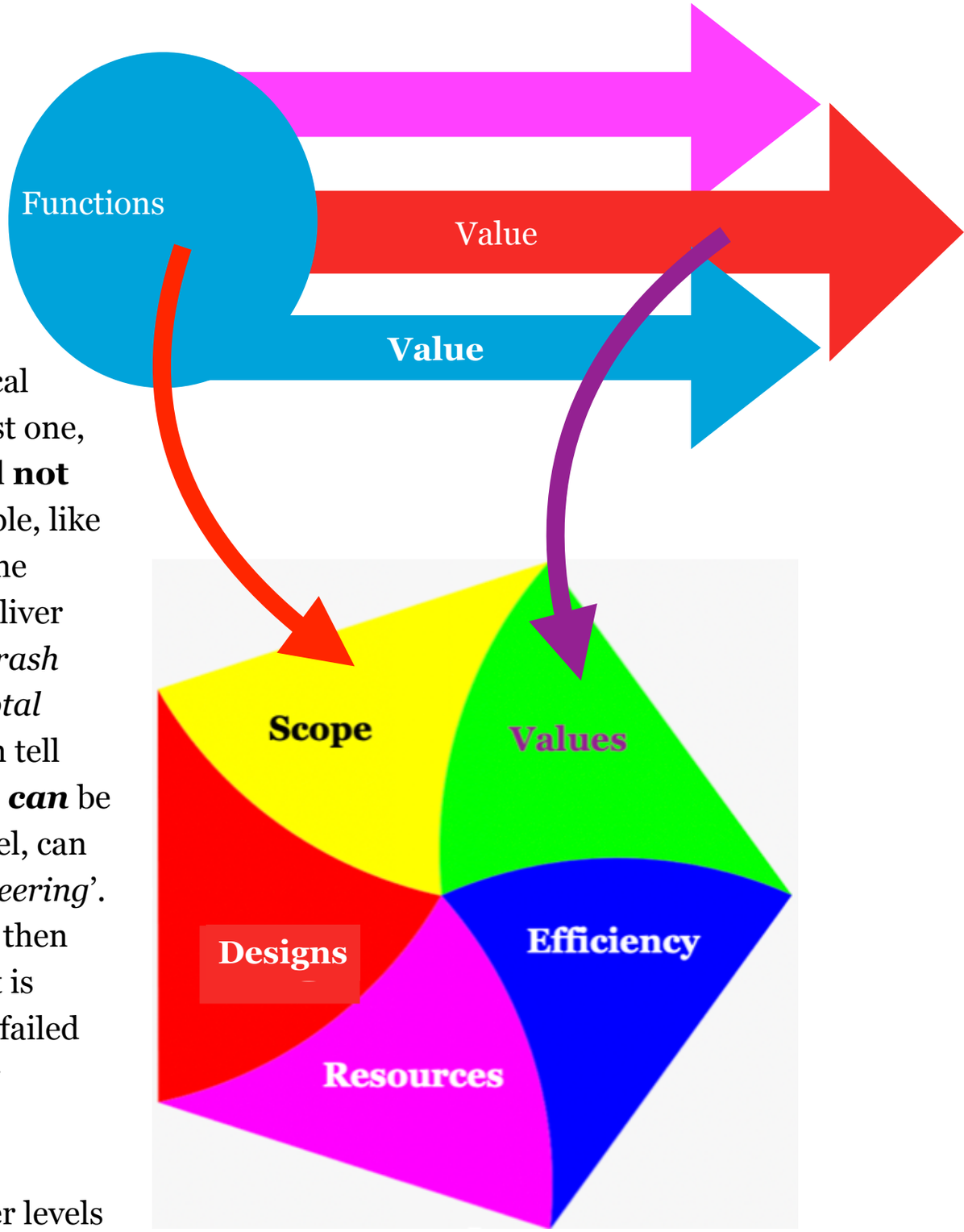
10. Functions are not a major player in the Scope/Resources tradeoff. Functions are, in principle, *without* Resource costs. They already exist. Our *costs* are a function of the *Values required for functions*, and the consequent costs of the '*Designs* available' to deliver those Values.



Constraints



Stakeholder *Values* are the main priority, and main cost-drivers

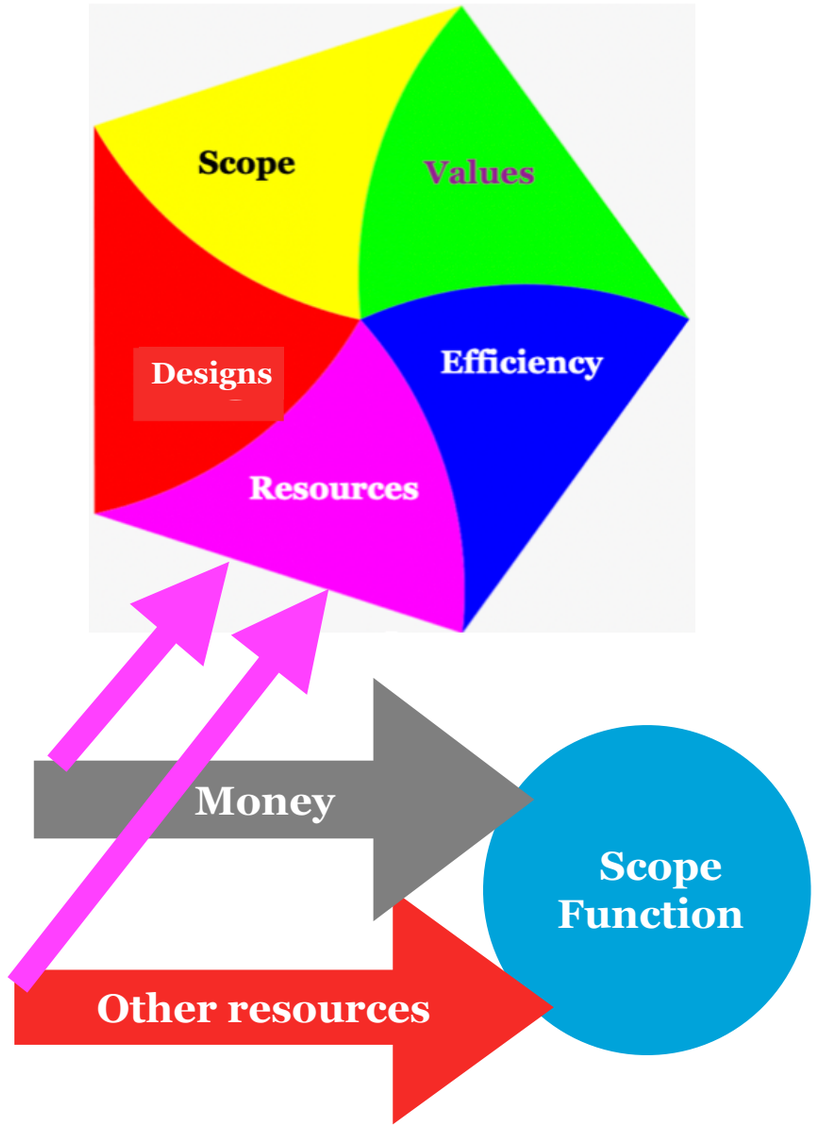


The second fifth (quint) of the Penta, is 'Values', which is short for '*Stakeholder* Values' and '*Product* Values'. The nearest we get to 'Values' in Iron Triangles is 'Quality', which never has, in the literature [1, 2, 3] an acceptable definition, is **not** plural (Qualities), and is **not** defined measurably. In a typical average real project, we easily identify over 50 critical stakeholders [SE] (like the CTO, and EU Law), each one of which has at least one, usually more, 'Values' that they want, dealt with, in your project (or they will **not** buy it, **use** it, **recommend** it, or *allow it to be legal*). There is nothing simple, like '***The** Quality*'. It is more like 'over 200 Critical Stakeholder Values', define the **measurable**, and deadline-driven, deliverables of the project. Failure to deliver one single critical Value (like system *availability* for a telecoms service, or *crash safety* for a car, or *usability* for an app) is enough to doom your project to *total* failure. In case that word **measurable,** above, escaped your attention. I can tell you that all known stakeholder values, that can be 'improved' or 'get worse', ***can*** be defined **quantitatively** (numeric levels of performance) [QU]. And this level, can be measured, in many practical and economic ways. This is known as '*engineering*'. If you fail to clarify, and agree on, critical stakeholder 'Success' Values [SU], then you are absolutely 99% certain to *not* achieve them, except by accident. That is called 'project failure'. No matter how quickly, or cheaply, you delivered the failed project functions. There are plenty of failed projects: Google *'Failed Projects Causes'*. A major underlying cause is given as 'poor requirements'. Most professionals, and most taught methods, are in my opinion, *total failures at quantification of their critical objectives*. The problem is that *slightly* higher levels of Values (example 'availability' up from 99.980% to 99.998%, [DtC]) can influence total costs by at least ten times. High qualities are *geometrically shocking* big-drivers of costs. That is why 'space flight' is so expensive, for example. If *you* want to 'manage project costs', you must *up your game*, and manage all critical values, like a serious 'rocket scientist'. [MM], Like Musk.

Edit 250822

Multiple, long-term and short-term *resources*

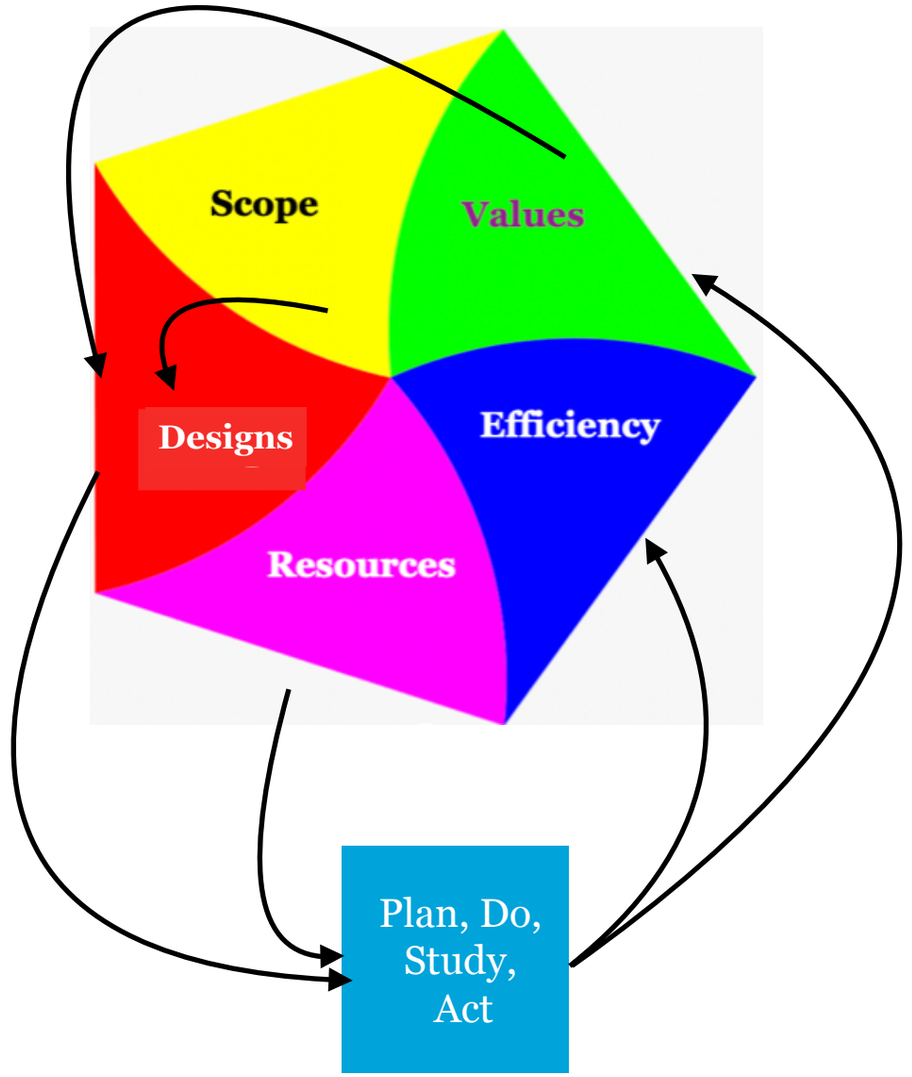
Resources play a number of different roles in project management. And everybody knows how to quantify resources, like time, money, space. Most people do *not* know how to quantify resources *like reputation, brand image, confidence, credibility, sustainability, digital transformation, AI Ethics*: but marketing people, and others, do. If a *resource* is *infinite*, the project does not have to worry about it. But few resources are really infinite, as we are experiencing planetarily. That is why we set **budget** limits on money, and time, and other resources, often *too early* in a project, *before* the 'Values that consume resources' are *known, agreed, quantified, and designed for*. The next stage, after 'budgeting too early', is **estimation.** The Iron Triangle literature [1, 2, 3] spends considerable space discussing various ways of estimating resources; most of which strike me as bad and obsolete. Then there is project resource consumption **accounting**. 'How much over budget' are we today? As mentioned earlier the *resource management methods* are a total joke if they, as is common, only consider the '*construction* project', but not the *consequent life cycle costs*, like *maintenance*. Then, you get a false sense of control over something like only 10% of the *true* resources. There are, in our opinion, two related ways to get control over resources, to keep within constraints (budgets, deadlines) and to minimize them, for a given set of Value-level requirements. **They are:** *1. Incremental* ***feedback*** *in small steps, and* ***adjustment*** *when feedback tells you something is wrong with expectations*. And, *2.* ***Design to Cost*** (to resource constraints). [DtC]. These ideas are not mentioned 1n Iron Triangle thinking [1, 2, 3]. Yet they are clearly, the most powerful and successful ideas for gaining control of resources. (Example IBM Cleanroom, '***always*** *on time and under budget'* [4]). In short we need to increase our maturity level, regarding resources, *far* beyond Iron Triangle oversimplifications.



Edit 240822

Designs: Design-to-Value and Design-To-Cost

The '**Designs**' is our simple word for any '**implementable ideas**' we choose; to reach our ***ends*** (Values, Efficiency, Scope, Resources). 'Designs' has many synonyms, such as **means, architecture, strategies, tactics, solutions, engineering specification.** In addition it is too common, that Designs are incorrectly designated as 'functions', and 'objectives', by people who do not have a well-considered glossary [CE, Concept Glossary]. The danger there (of confusing Functions and Objectives, with Designs) is that they are taken as fixed requirements, instead of the more-agile 'Design' concept of *opening up the design-process options,* of a rich proliferation of emerging Design options (options which have *better* Values and Resources, than *previous* options) to solve the eternal problem of Product 'Efficiency': sufficient Values for lowest Resources costs [SEA]. To confuse us, one person's 'Designs' can be delegated to sub-supplier levels, and 'become' *their* 'requirements' ('we require you to build our design', and DO NOT 'improve' our design, however bad it is'). It all depends on the eyes that see, and the position they are in the supply-chain. Let us assert that the intellectual power of a qualified, motivated and imaginative designer ('a great architect, or engineer') has a potentially huge (10x, 100x, 1,000x) influence on both Values and Resources. Unimaginative designers and project managers try to estimate what their unimaginative solutions will cost [2]. First-class Project Management (Like Mills, [4], or Musk [MM]) will employ imaginative designers, architects, and strategy planners - to find designs, which will guarantee to deliver necessary Value levels, with all constraints satisfied, including all Resource Budgets. And



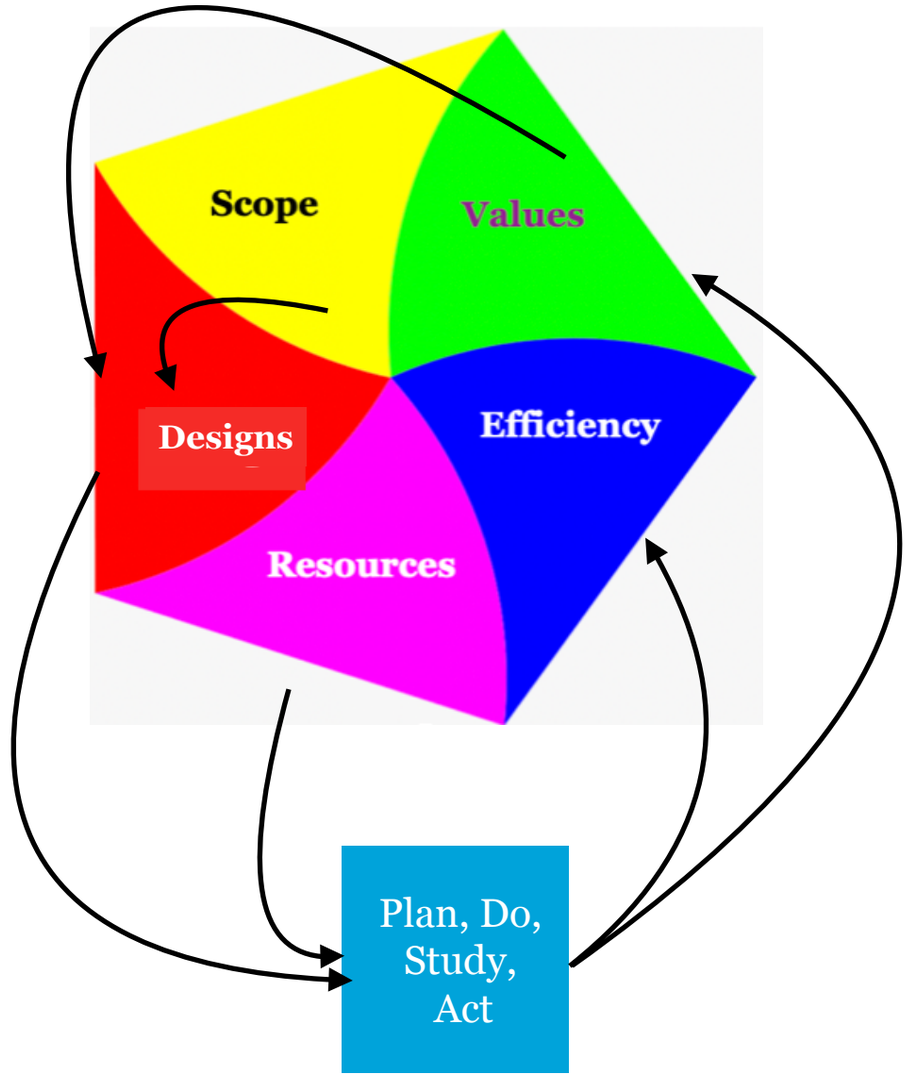
Project Process [5, PDSA]

when initial architecture is 'sensed as disappointing', through incremental feedback, the architect will i*ntervene incrementally* and re-tune the design [4, DtC] to deliver better values, with lower Resources. With these facts in mind, we point out that the total *exclusion* of *any notion whatever* of *the utility of a Design*, to solve the problem of Project Management (of Values and Resources) is the highest order of negligence by PMI [1] and many other such teachers of Project Management ideas. The 'Designs' and its design *process* is a vital component of the most basic, successful, Project Management models [4].

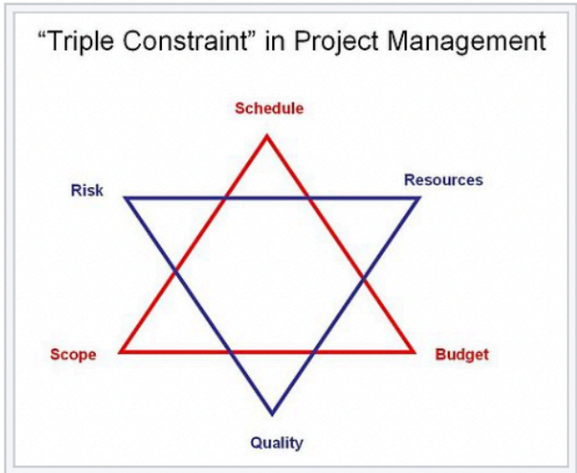
Process *Efficiency*: Reducing costs to achieve critical Value levels. Managing the Project Process.

Musk [MM] is very clear on his expectations to working teams. They are expected to *both* improve their **process speed and resource use** (their *production* Value levels) , while simultaneously also improving their ***product* costs, and qualities** (like safety levels, the *product* level system Values): and are expected, and empowered, to do this on a *daily* work-cycle, incremental time-frame: delegated to the work-team level (not by outside consultants, or in-house specialists). And this *really* happens! It is *not* easy: but, do you *really* want to be successful and rich?

This is our '**Efficiency**' quint (1/5]) It contains management of the Efficiency of both the Project Outputs (Products, Services, Systems) and of **all** processes (like Project Management, Architecture, QA, Funding, Maintenance) needed to create, and maintain, the Project Outputs. Even if there is no process we call a 'Project', involved. Maybe just 'continuous improvement'.

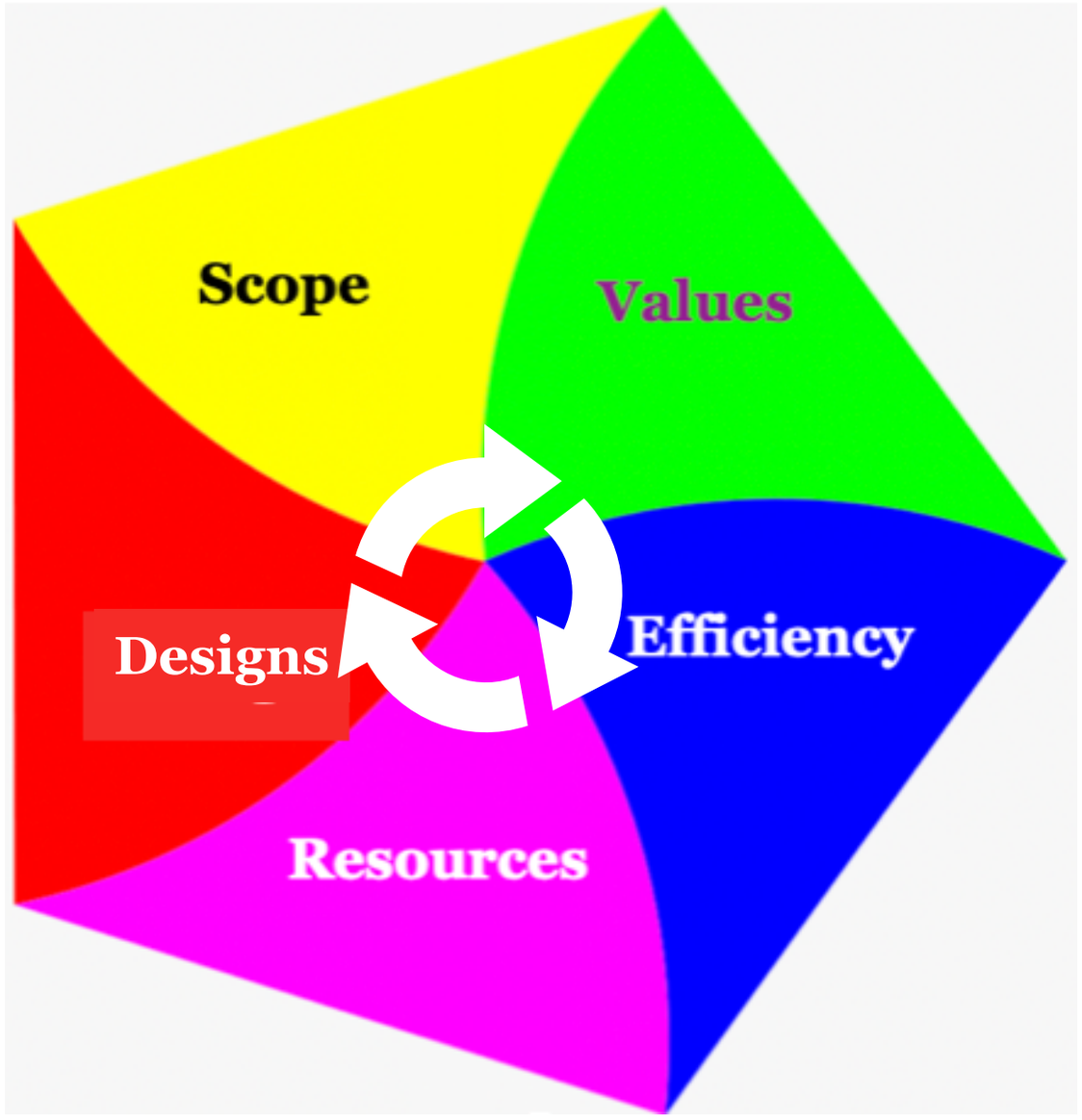


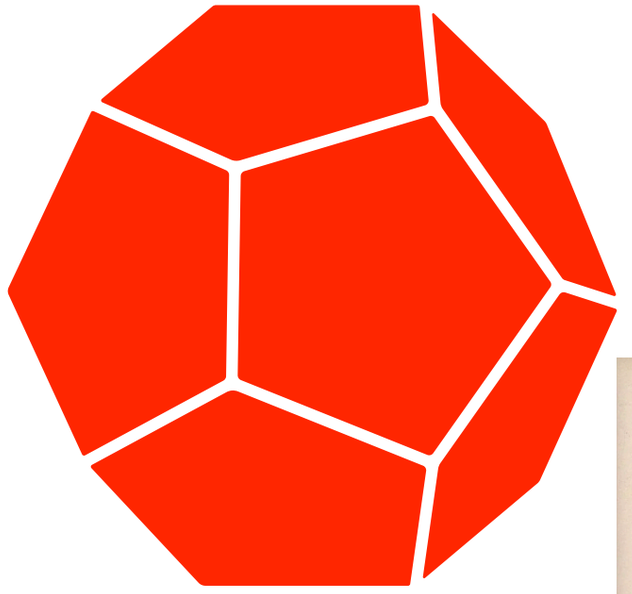
Project Process [5, PDSA]



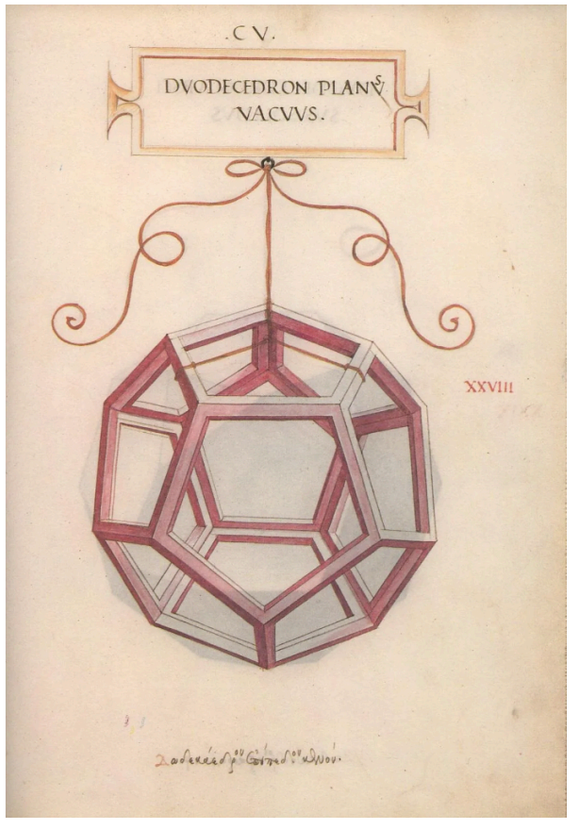
The Project Management Star per PMBOK

Edit 250822





Any set of PENTAs can be concurrently, or as needed, applied as a 'lens' , by different stakeholders, to enable us to see a specific and selected viewpoint of the system, which is emerging and changing



Leonardo da Vinci, Duodecedron
published on the "**De Divina Proportione**" by **Luca Pacioli** (1497). It consists of 12 pentagons. Da Vinci was duodecedronic, too.

The PENTA can be applied as a 'process cycle', where our focus moves from any quint to another, skipping as desired, to consider areas of interest. This is a **systems engineering** [CE] process (not *merely* a Project Management process). As Dr. W. Edwards Deming also orally confirmed my hypothesis, re PDSA [5], **there is no designated start point**. You can dive in anywhere, at any time, for any reason.

This is more true, when the cycles are *rapid* (daily, weekly) rather than in some 'big bang Waterfall' process, with years for a cycle. Yes, this is a very advanced engineering view of process *agility* [AG, AE] compared to simpler popular 'agility' methods, which lack **Value**, **Design**; and most of the ideas in the PENTA.

Strong Logical Relations

There are some **immutable relations** between the Pents.

1. **Values** are a relationship between **Stakeholders**, and the **Scope**.

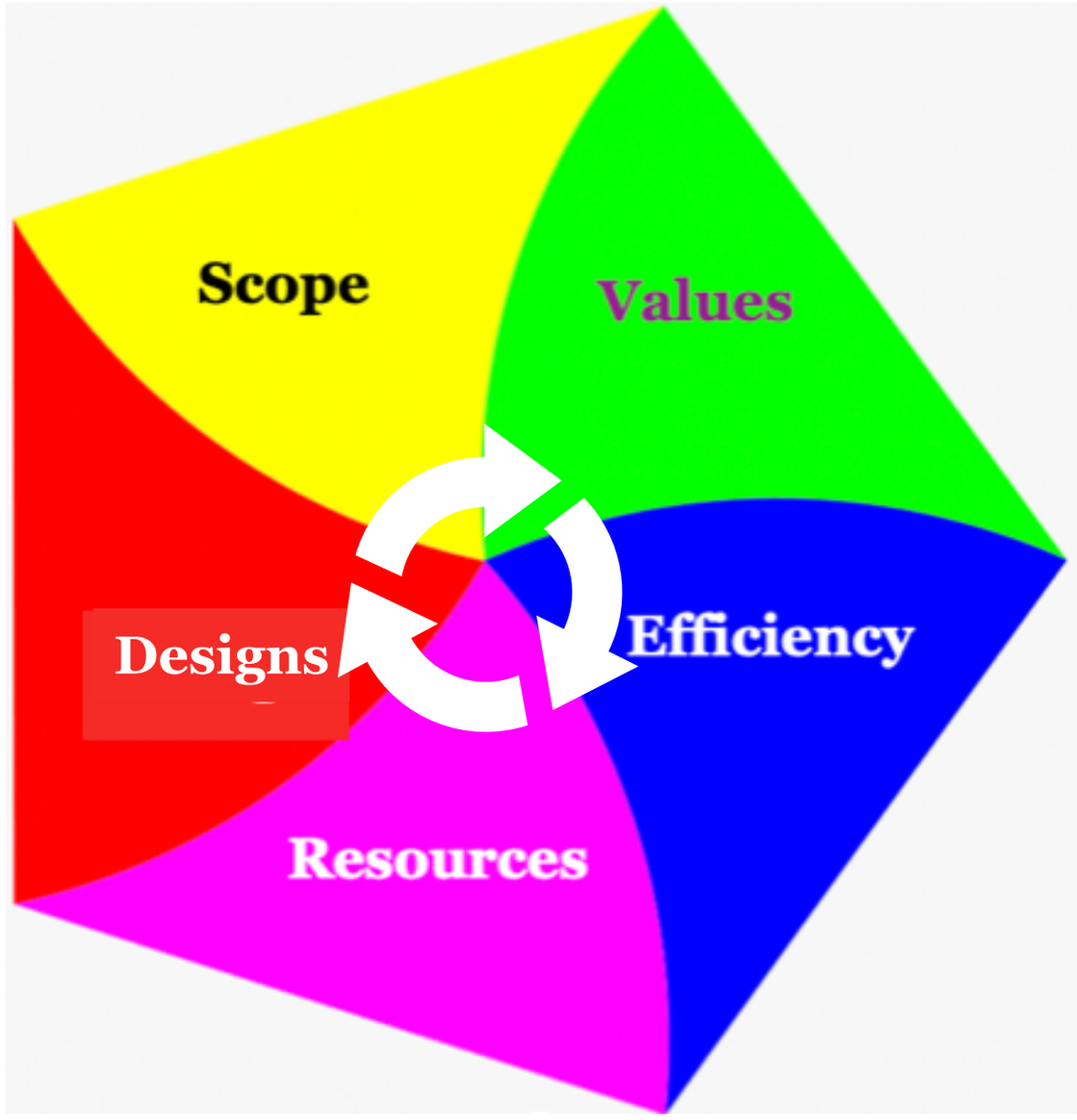
2. **Designs** are the necessary mechanism for delivering any **Values.**

3. **Designs** determine the necessary level of all **Resources** needed, of all types, at all times in the system lifecycle.

4. **Efficiency** can be viewed in many various, but useful, ways; but is always computed as some ‘set of **Values’** over some 'set of **Resources**’.

5. **Scope** determines **Resources** needed, but only as a multiplier for a given Values-level set. If Values are negligible (like 0% availability) the resources needed for an ‘infinite Scope system' is zero.

6. **Efficiency** is **Values/Resources** which is determined by **Designs.**



Caption

7. **Designs** cannot (should not) change **Scope**, but a conscious change in Scope (a ‘Scope sacrifice’) can enable different valid **Designs;** which enables better **Values/ Costs = Efficiency**

Innovation

How does the Penta relate to Innovation? A very detailed answer is in the reference [IN] which includes the book, ‘Innovative Creativity’ [IC Book].

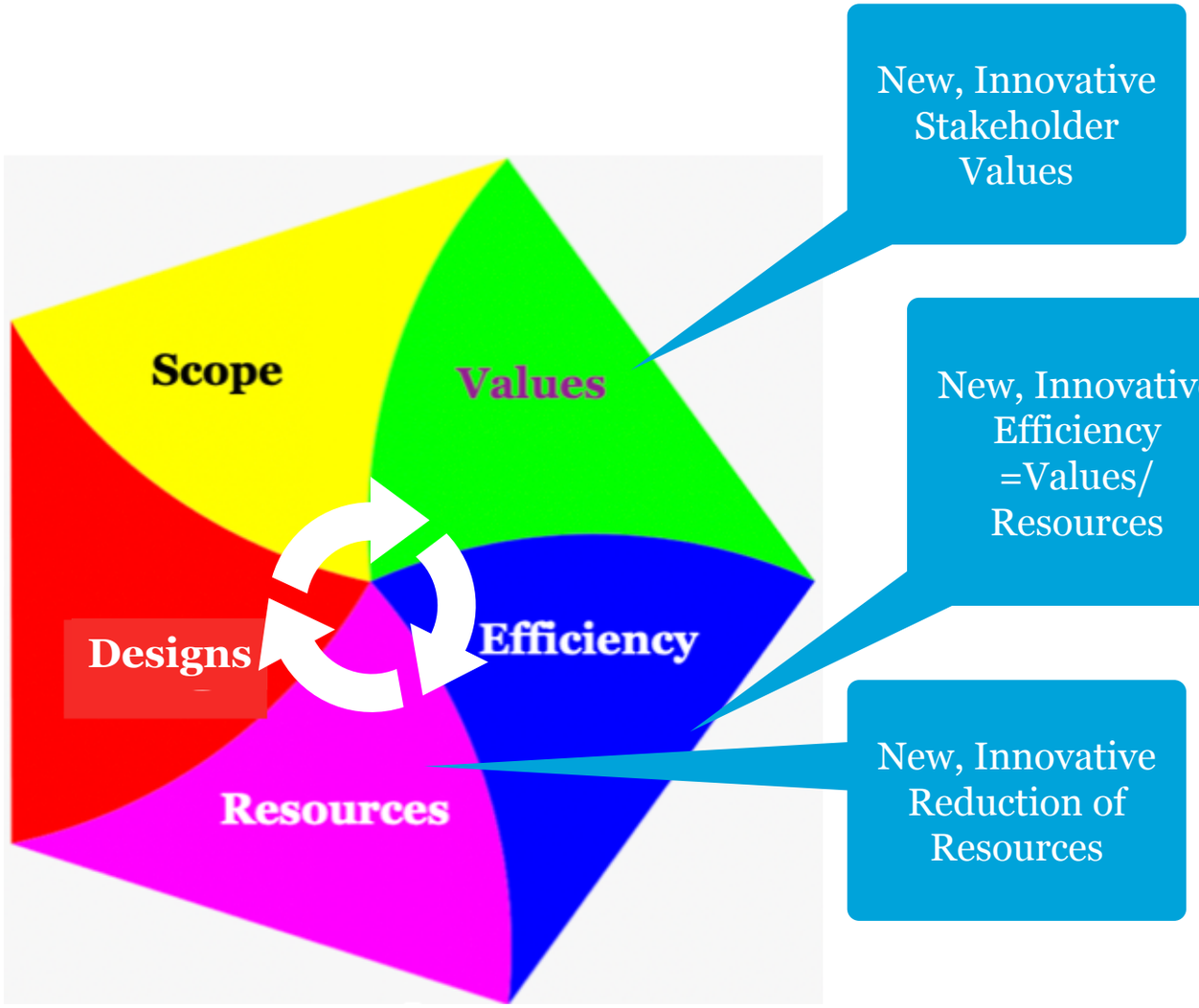
Here is a necessary definition from the book:

Innovative: *significant* improvements in qualities, values and costs, compared to previously.

- novus: ‘new’, Latin
- but the main shift in thinking here is that, it is **not the ‘Designs'** which are 'new' it **is the 'Values** for people', that are ‘new’
- In addition, to Innovative Stakeholder Values is the desire for reduction in the resources needed to develop and maintain those values, which is dealt with by Resources, and Efficiency (Values/Resources)

- another term, more specific: is **'Value Innovation’**
- our main focus, is not 'innovation' generally, in itself ('new stuff') but it is 'Value(s) levels', that we would *like to have, as* '*new*' in the future.

So the Penta provides a framework for defining the real Innovation (**New Stakeholder Values**) while avoiding the *illusion of innovation* (simply looking for ‘new technology’ itself).



Risk: How does Penta Deal with Risk

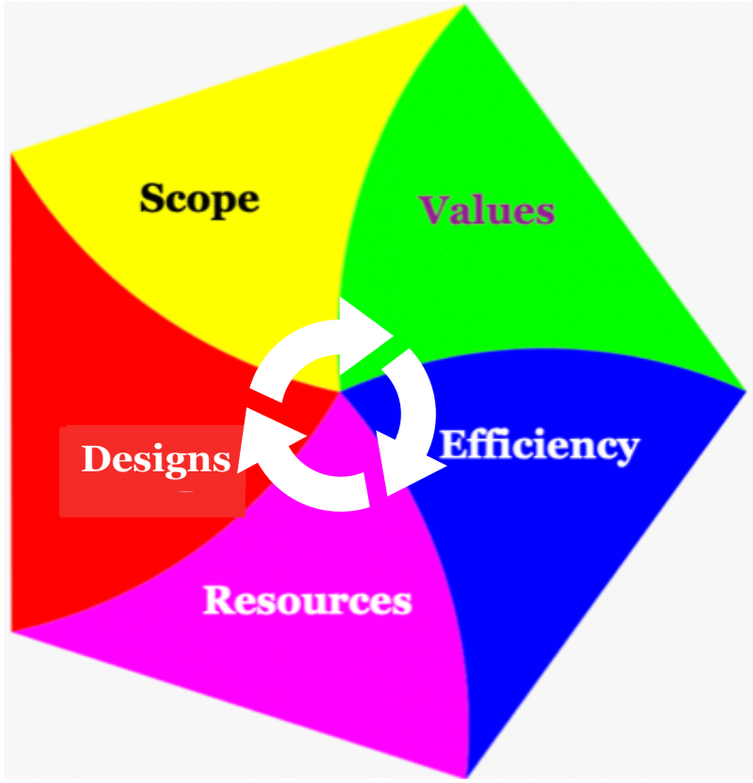
An extensive answer are the writings on Risk [RM, RMVP]. The Success [SU] book is also detailed answer to handling the risk of not getting successful results. But here is a summary of the essential risk management ideas available in the Penta Model.

1. Risk is managed, in Penta by using an **Engineering** approach. Explicit, digital, quantitative, structured. (See B V Koen quote)

2. Risk is managed by **synergistically and explicitly connecting all related components** (The 5 Quints of the Penta), both in planning models (Impact Estimation, [VIE], gilb.com/ValPlan modelling tool, and Planguage [CE]

3. Risk is managed by **explicit incremental change and measured feedback and correction**. Big problems cannot emerge in the shadows (Evo method, [CE].

4. Risk is managed by taking a ***systems*** **engineering** perspective, not merely a *software*/coding perspective.

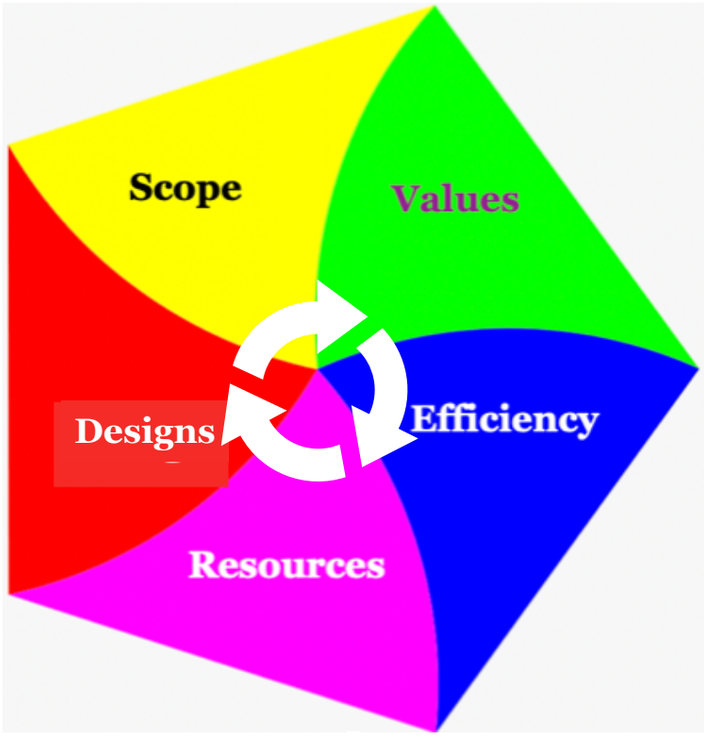


"The engineering method is the strategy for causing the best change in a poorly understood situation within the available resources."

Discussion of the Method: Conducting the Engineer's Approach to Problem Solving" Prof. Billy V. Koen

Edit 250822 AS

Synergy: How does Penta manage it?



Synergy is when 2+2 ≠ 4. Maybe 5 , maybe 2.5. who knows.

Synergy is when two or more forces interact to give a result that is not a simple additive effect. Normally we are interested in geometric effects where 2+2 > 4. But on occasion we have to *suffer* Negative Synergy (Tom also likes to call it 'Thrashing'): either because we are unaware of it, or because it allows us to reach an higher priority (a trade-off), or because we do not know how to eliminate it, without penalties (negative side-effects), yet.

Penta offers several tools to manage synergy, which are essentially the same as risk management tools, because Negative Synergy is risk. Positive Synergy is Opportunity.

1. Incremental value delivery, with small increments, result and cost measurement expose synergistic effects early, so they can be avoided or exploited. (Evo method, [CE, Evo Chapter])

2. Planguage [CE] and Modelling in gilb.com/ValPlan help us keep track of relations, between all the Penta Factors; with synergy potential.

3. Penta **Efficiency** keeps explicit track of the **Values**/**Resources** ratios, which indicate synergistic relations.

4. Changing the **Designs** is an opportunity (a forcing function) for synergistically improving overall results.

5. **Resources**: if viewed, not as fixed 'budgets and deadlines' but as useful variables to adjust, can give us opportunities to deliver better overall results by constraining or enabling us to use better Designs, or to adjust Values.

Constraints can be synergistic by putting pressure (a forcing function) on other issues, to live within all of the constraints present.

Principles of Resources

Source 6.6

[CE] Principles: Resource Requirements

1. **The Principle of 'Many Critical Risks'**
There are many resource, performance and condition dimensions critical to any system, not just one or a few.

2. **The Principle of 'You Can't Have It All, Trade-offs are a Necessity'**. Fixing the required level of one resource dimension arbitrarily, can only be done at the probable expense of *other* attributes.

3. **The Principle of 'You Get What You Pay For'**
It is really the availability of resources, which initially limits the levels of performance that can be delivered in practice.

4. **The Principle of 'Attribute Balance'**
Once you have found a balance between performance and costs, management cannot cut the financial budget, people or time without negative consequences.

5. **The Principle of 'The Cost of Perfection'**
Perfect quality costs infinity.

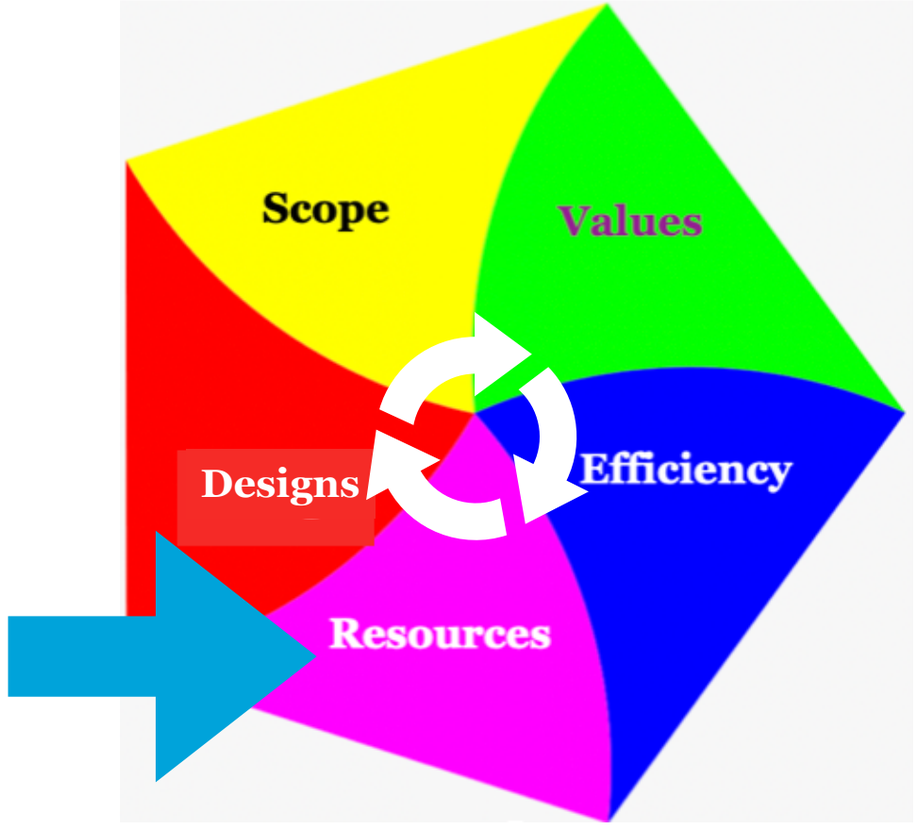
6. **The Principle of 'The Rolls Royce'**
Near-perfect performance levels, cost more than most people would pay.

7. **The Principle of 'Natural Ambition'**
The pressure on resources will always be at a 'level of discomfort', not to say downright intolerable – this is a natural management strategy, to find out how far they can push!

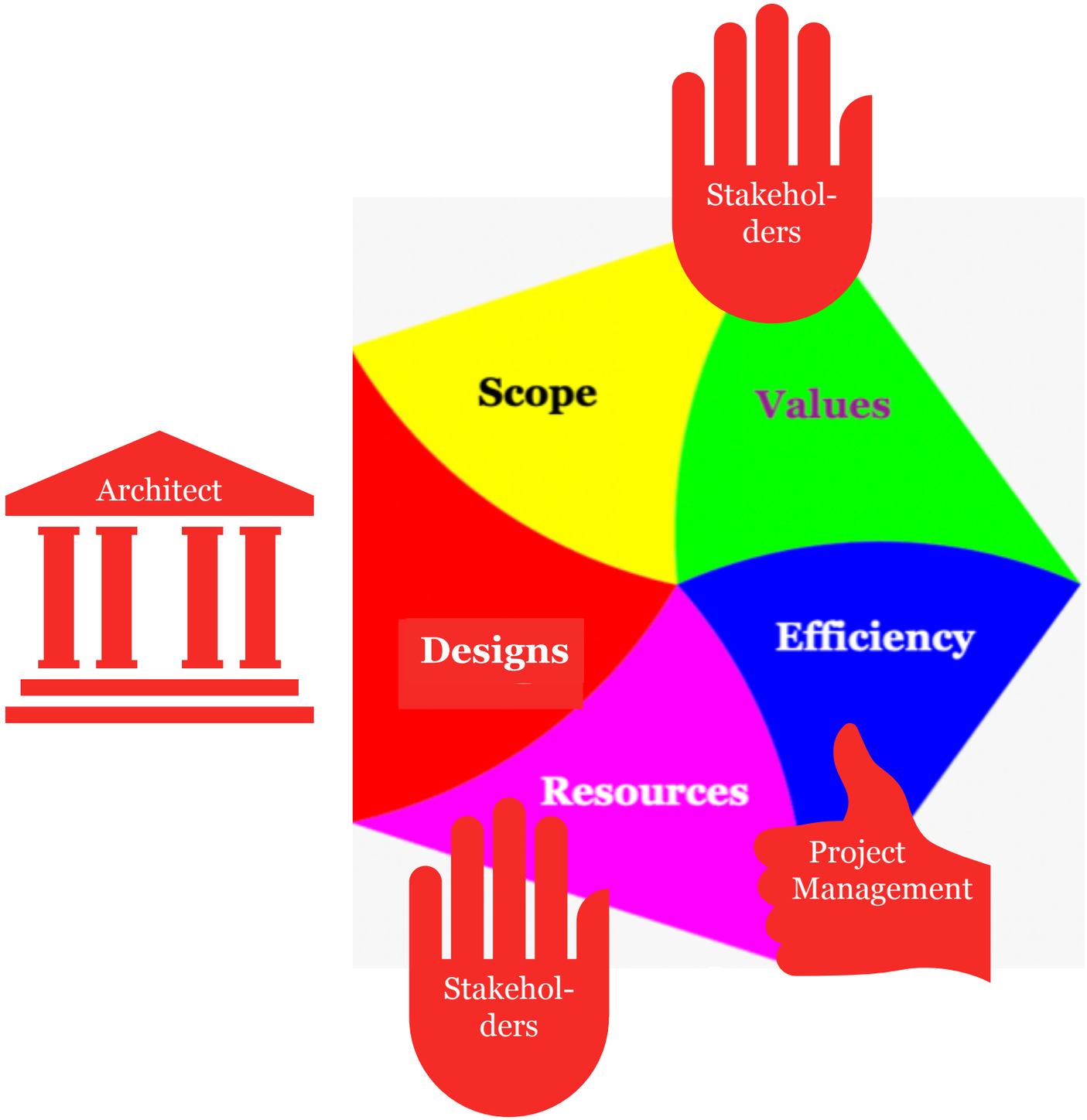
7. T**he Principle of 'The Traffic Bottleneck Illusion'**
Increasing your allocated resources will not relieve the pressure on you, but only raise that sponsor's expectations.
Removing one bottleneck serves mainly to discover others.

9. **The Principle of 'Really Useful Resource Management'**
The only practical way to control costs and performance in large complex dynamic systems [6] is by early, frequent realistic evolutionary feedback on costs, and consequent adaptation to realities.

10. **The Principle of 'Shifting Conflicts'**
Conflicts amongst budget targets, performance targets and design ideas are natural; there's no blame. You just keep resolving them: it's the name of the game.
Budget constraints will always exist and, will always be subject to change.



Edit of Principles Text 250822.1851 (3. + initially)



Stakeholders influence project requirements (but cannot dictate them)
Final requirements depend on other stakeholders requirements, design effectiveness, and resources actually available.

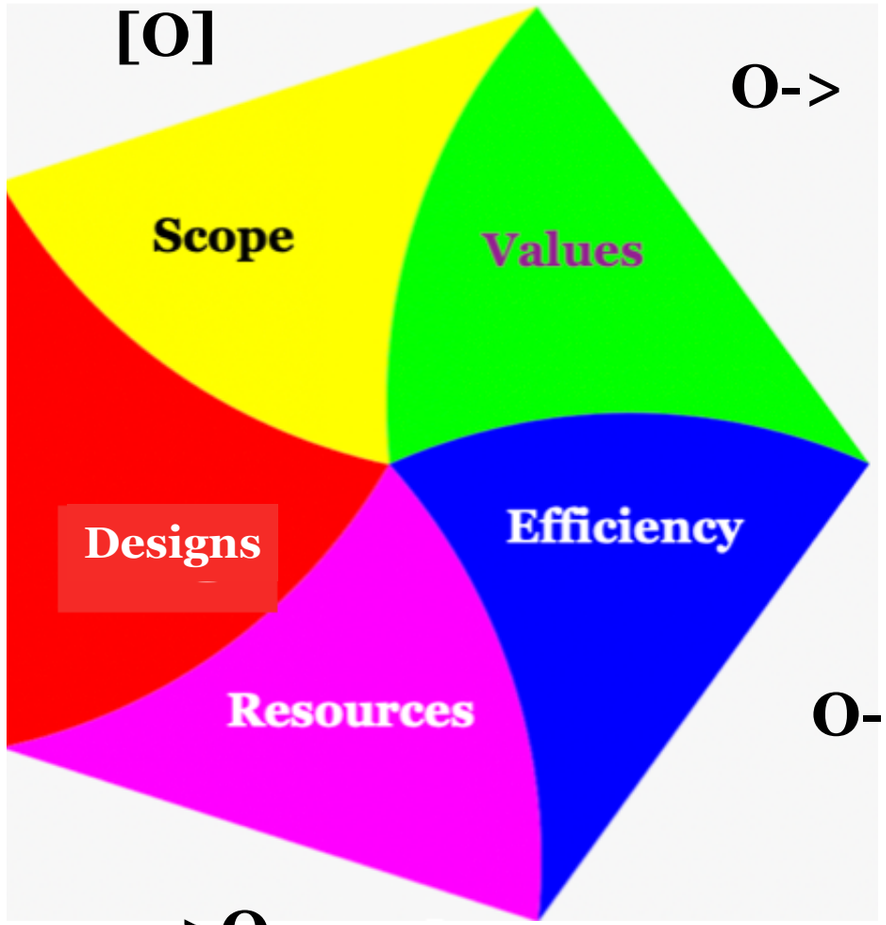
Stakeholders influence Resources available under defined conditions

Architects (designers, engineers, strategic planners) determine the degree of cost-effective designs that we can imagine and try out.

Here are some ‘Keyed Icons for the Concepts.
This is a simple way of pointing to the concepts in all languages

[O]

O->



O-> / ->O

->O

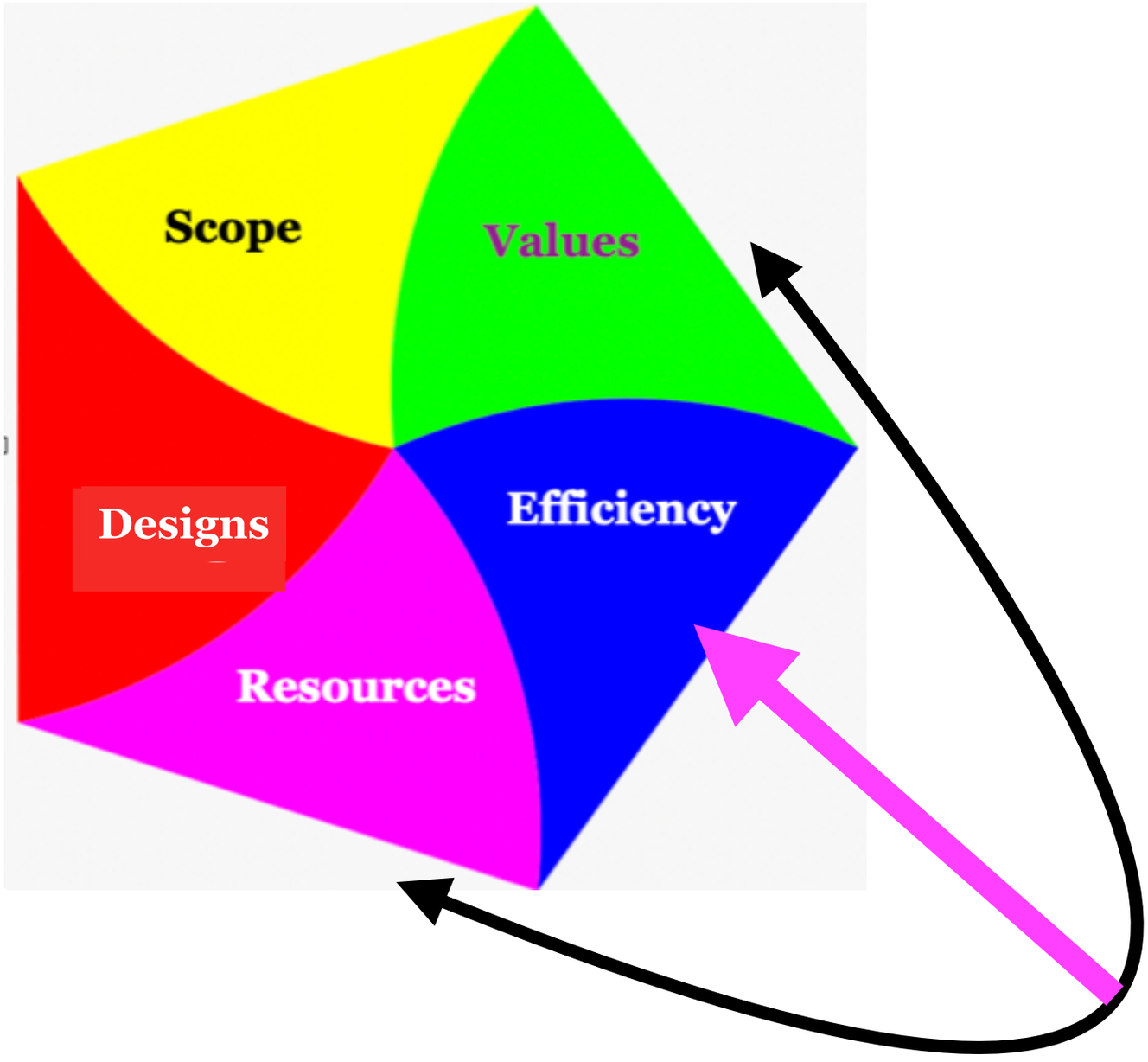
Design

Keyed Icons for the Quint concepts

O——[——D—]—>

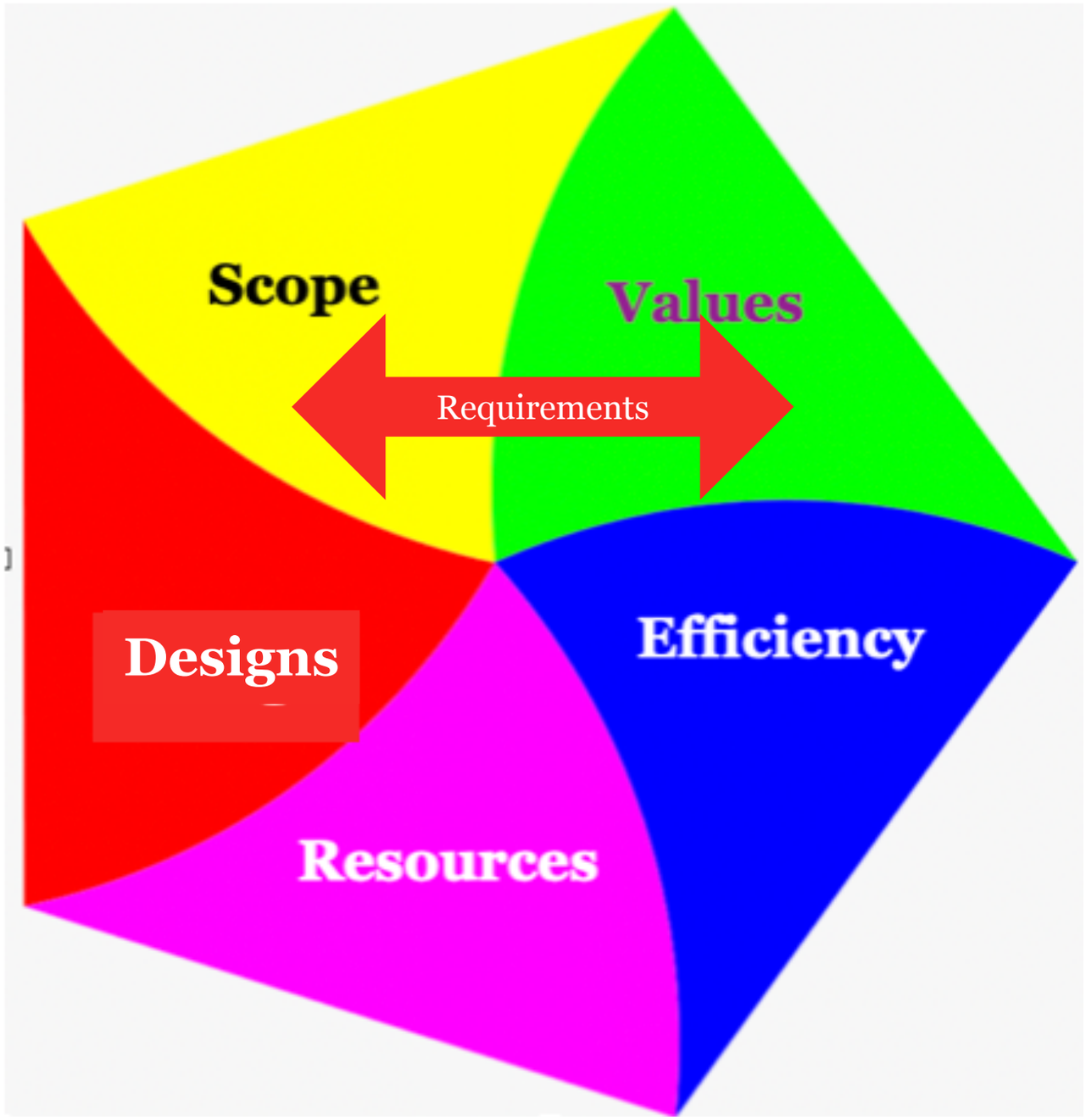
[Design ‘D’ Impact] on ValueScale ——>

Plicons: A Graphic Planning Language for Systems Engineering
(Plicons Paper)
http://www.gilb.com/DL37



V/R = E

The Ratio of a set of Values / Set of Resources = Efficiency of the Designs

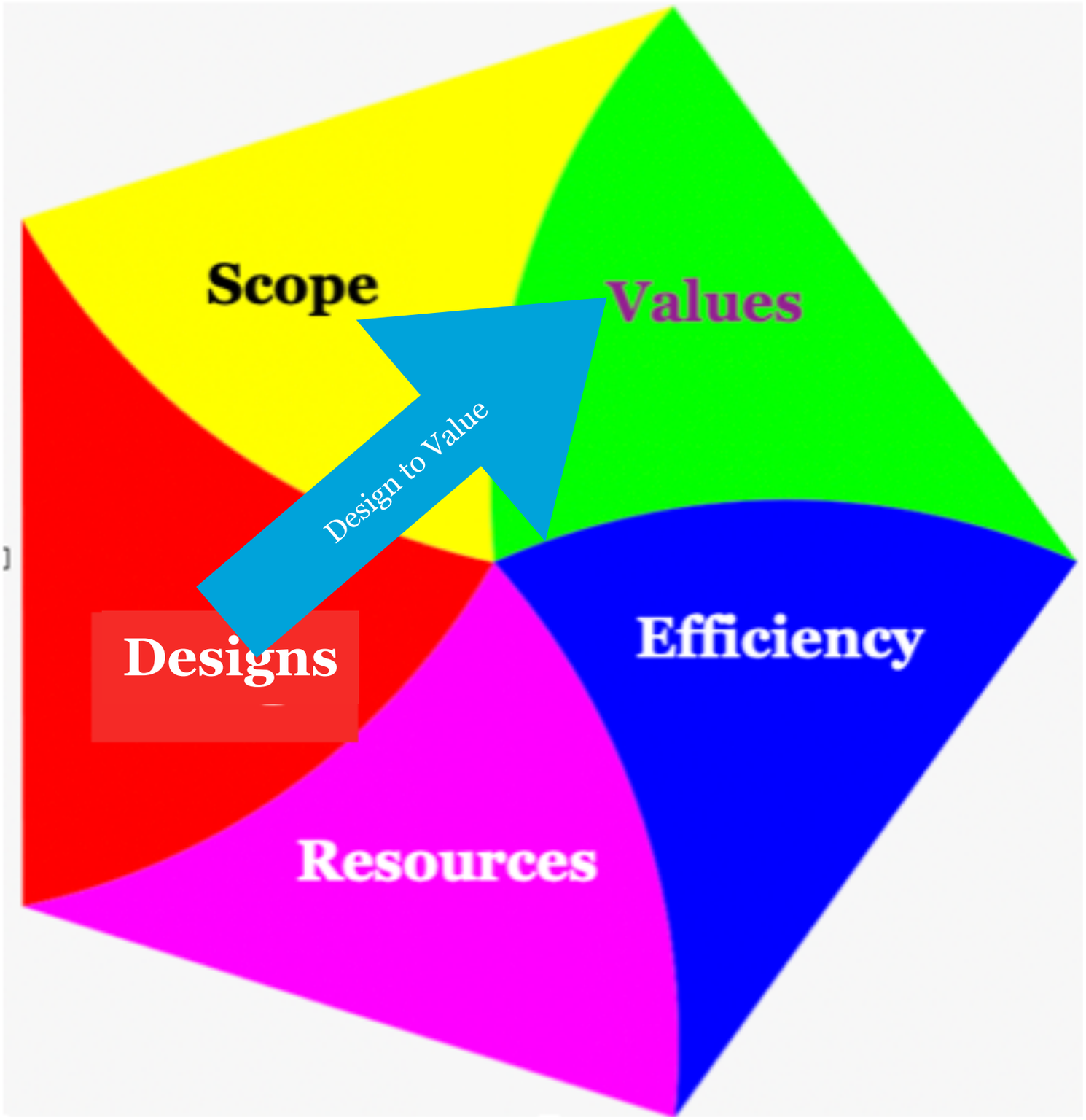


Improvement Projects or Processes

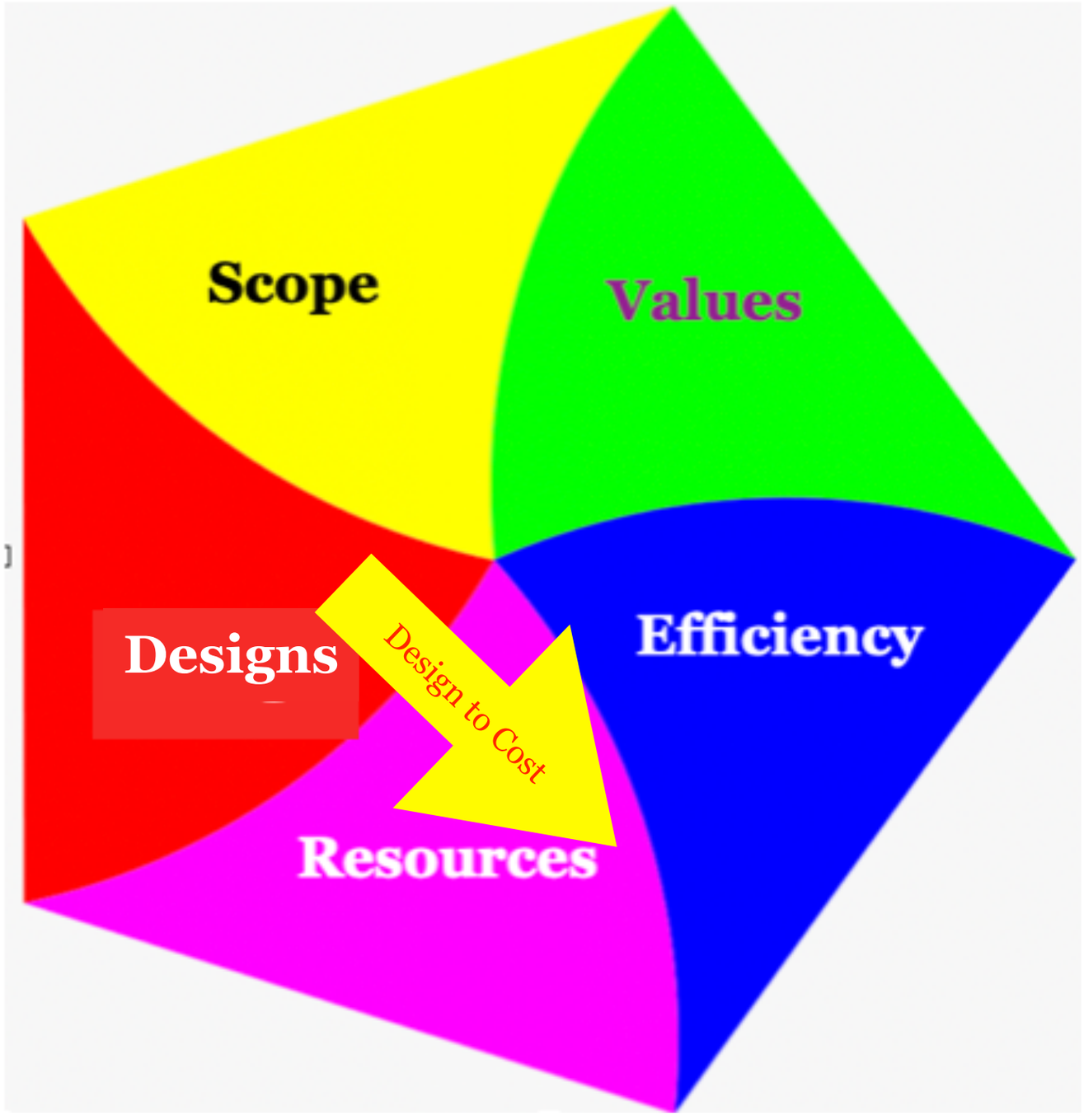
Are in the business of

Delivering increased future Values to stakeholders for a defined Scope.

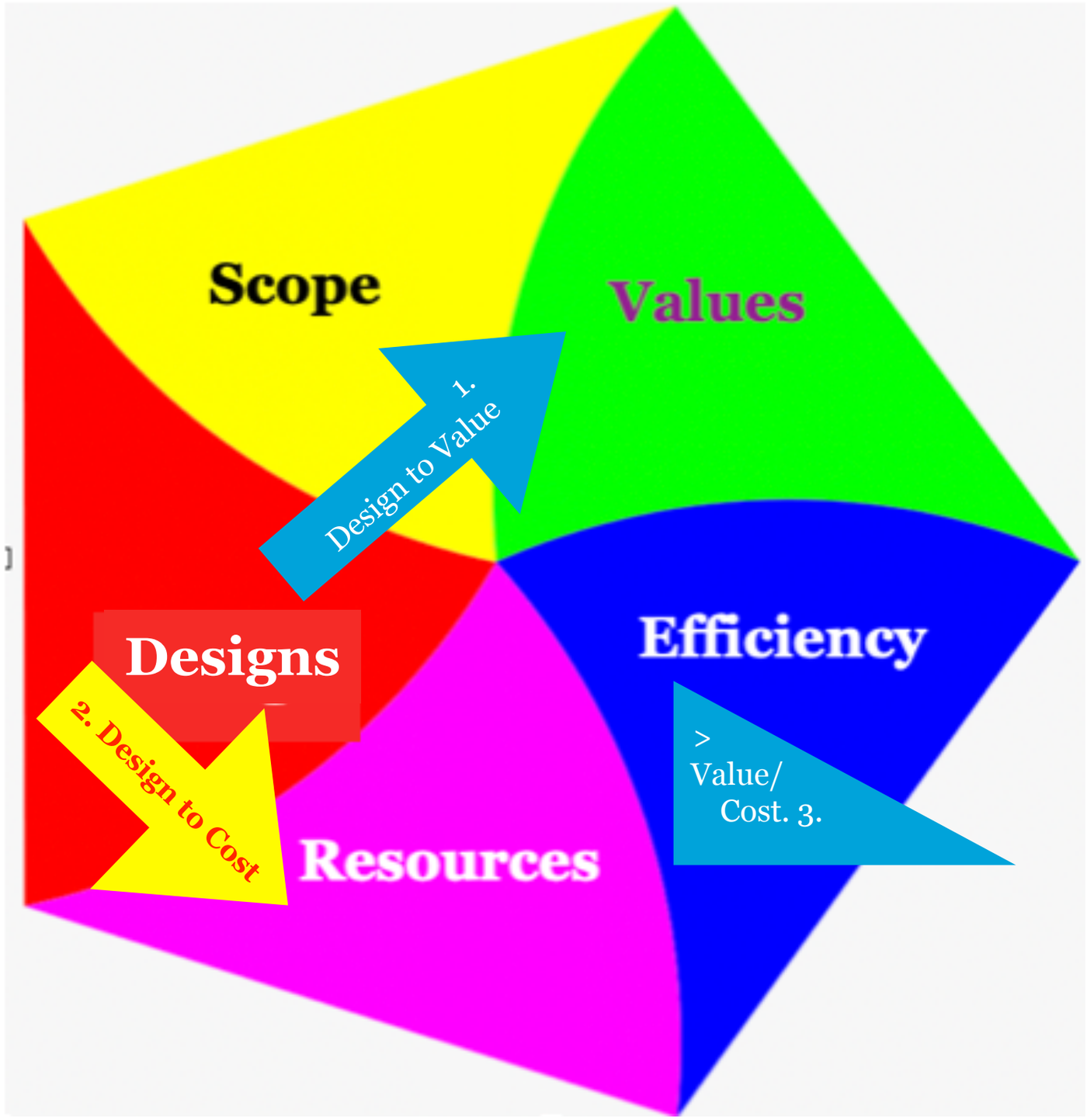
(Within Constraints, incl Resource Budgets)



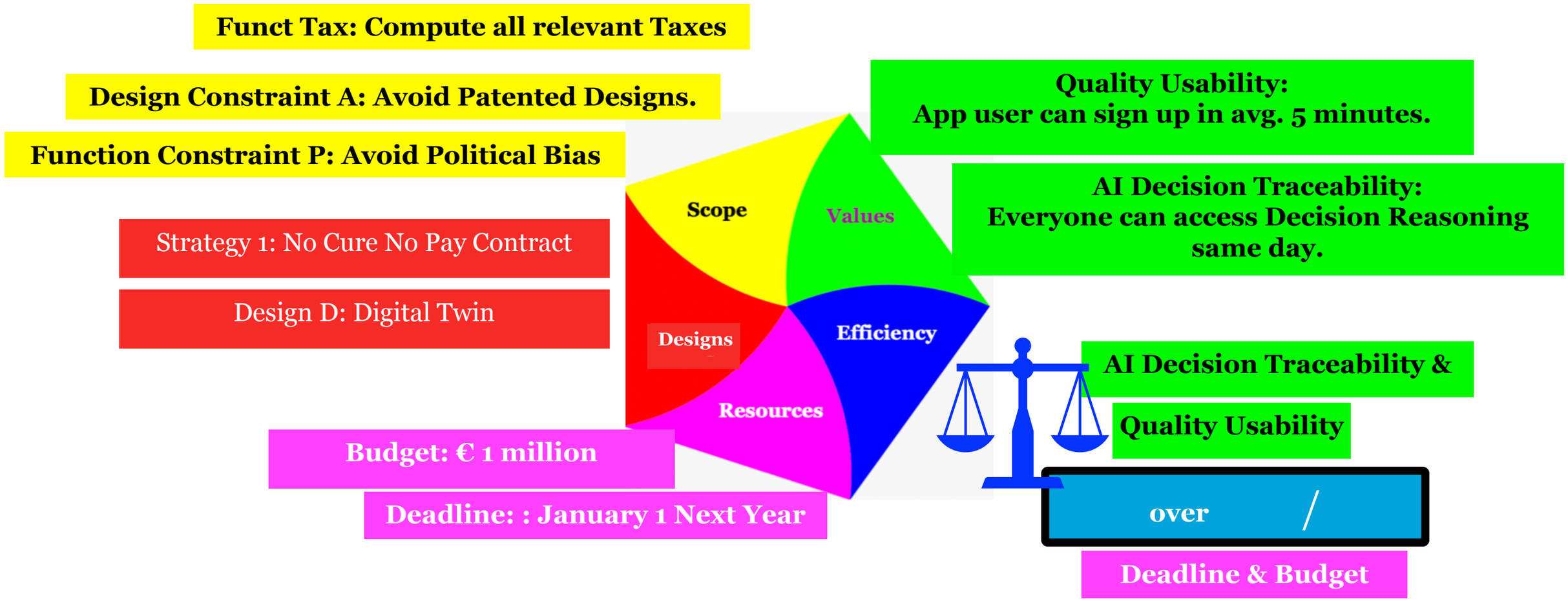
Designs can be imagined which will give more Value



Designs can be changed to meet Resource constraints (budgets, deadlines)



At any time, not least at (agile) Value delivery increment intervals,
we can (1.) improve Designs, to get better <u>Value</u> levels
and/or
(2.) improve Designs, to get lower <u>Resource</u> consumption
(for the delivery process and/or the system being improved).
This is what Musk does [MM]
Resulting in (3.) Improved Efficiency.



Simplified specifications example of the Penta categories.

Scope draws the borders between things included in the system of consideration.

Values: the stakeholder value levels quantified.

Resources: time, effort, money, reputation, trust - limited resources needed to improve the system Values.

Designs: any implementable ideas, physical, logical, or conceptual, which can move our system towards stakeholder Value levels needs, and keep resources use down to acceptable levels.

Efficiency: a ratio of Values/Resources which keeps us mindful of the multiple life-cycle costs we incur by increasing values, or by not designing for low costs.

MANAGING the balance of these critical factors is a method for successful compromises

The Penta is an attempt to identify the key interrelating forces that interact with each other when solving a problem and how they relate to each other.

The issues of scope, values, efficiency, design, and resources, provide us with how to think about different approaches to solving problems.

These issues have four dimensions:

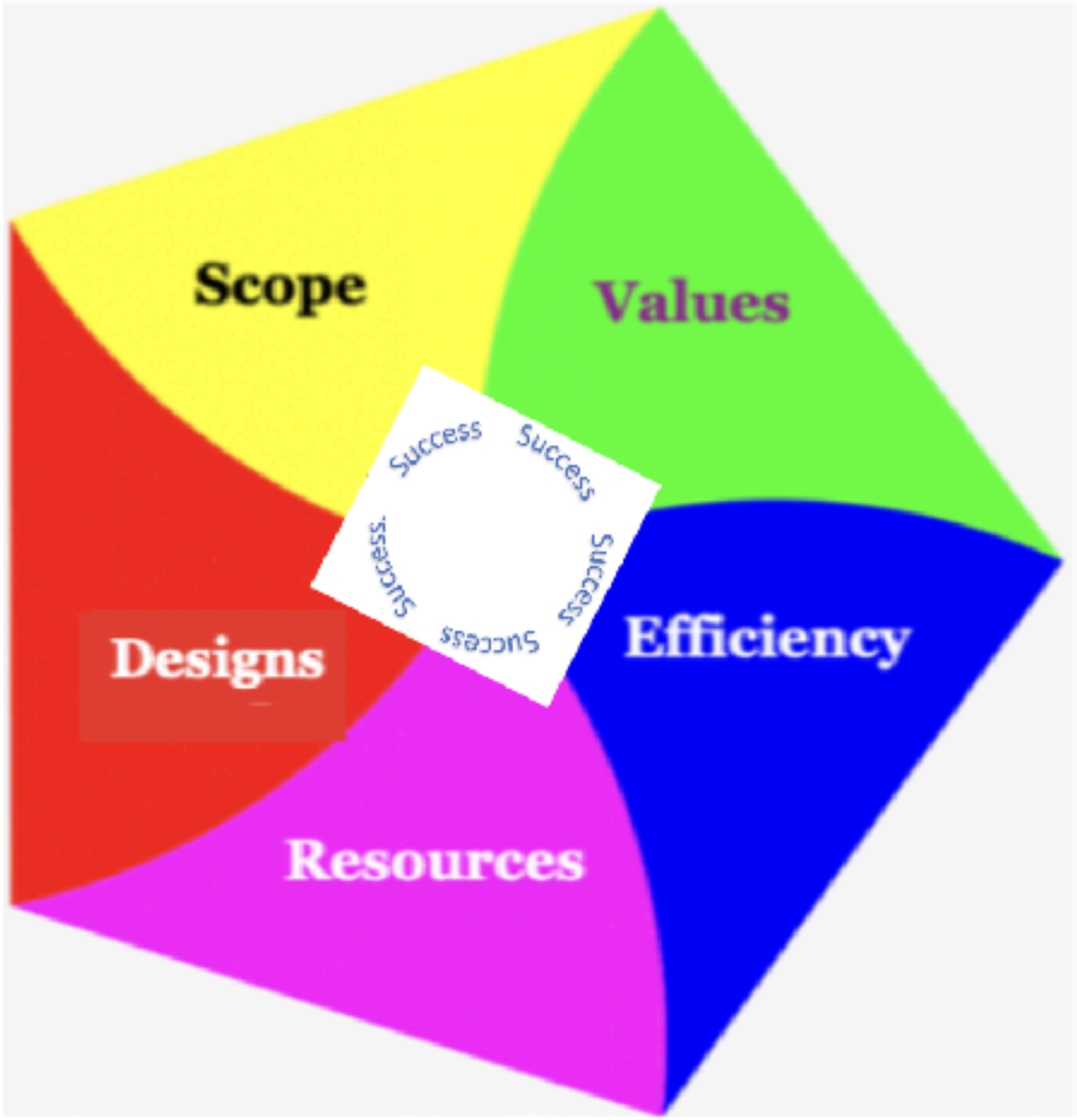
1. Initial constraints
2. Relationships between them
3. Side effects of these relationships
4. How they may change over time

The purpose of the Penta is to provide guidance on solving problems with different constraints.

The Iron Triangle was always a simplistic model ignoring the relationship between quality and speed.

Lean demonstrated that if one focuses on removing delays speed goes up while quality goes up. They are not in conflict with each other.

But to make this happen the concepts of the Penta must be considered.

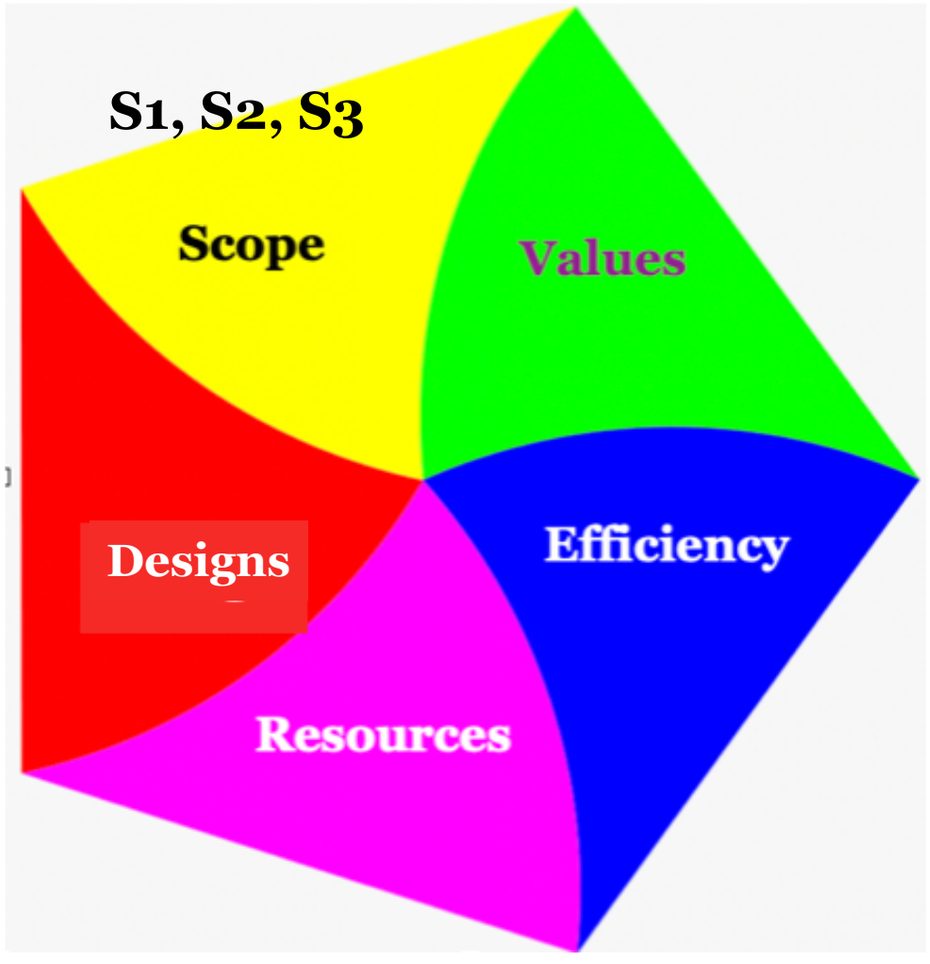


Success in Penta Suggested by Al Shalloway's daughter, Aliza Winship-Freyer, June 10 2023
Text 17 June 2023 by Al Shalloway

Tom Gilb, SUCCESS : Super Secrets & Strategies for Efficient Delivery in Projects, Programs, and Plans, Book Folder, tinyurl.com/SUCCESSGilb, October 2021. FREE, VIDEO 1 HOUR WESTFALL https://www.youtube.com/watch?v=8jnnBS-dNog, (7 SEPT 20).

Scope Components

Scope consists of:



S1: **Functions**; what the system ‘does’

S2: **Explicit Binary Constraints**; what the system must do or must not do.

S3: Scalar Constraints; **Value or Resource limitations**. Too much or too little.

Value Components

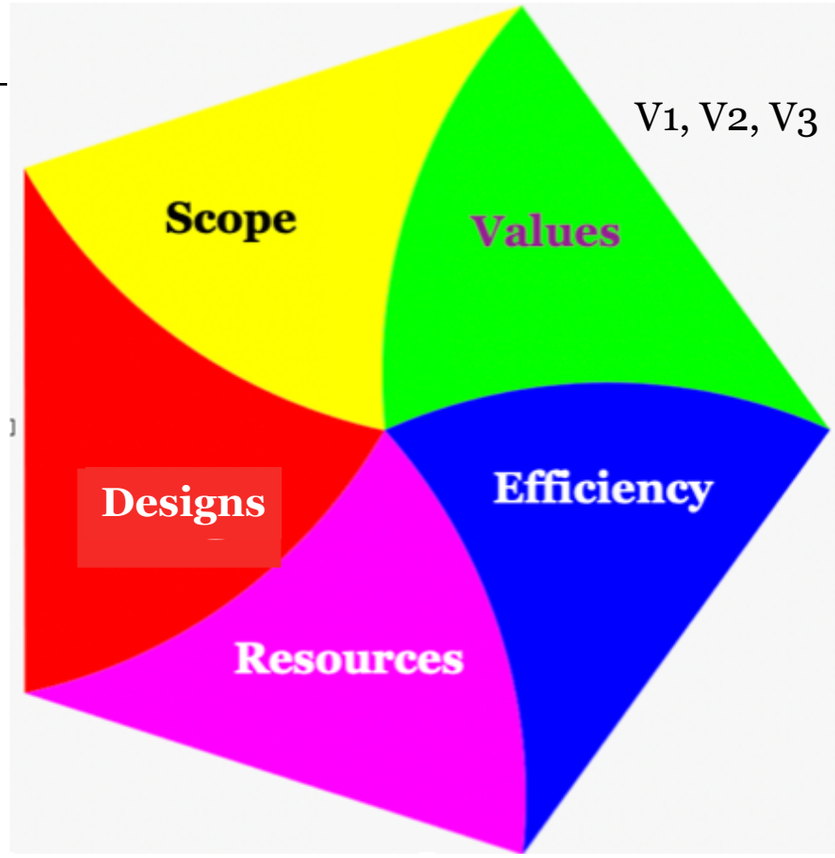
Values consist of:

V1: System **Qualities,** desired by stakeholders. The ‘how well’ the system performs.

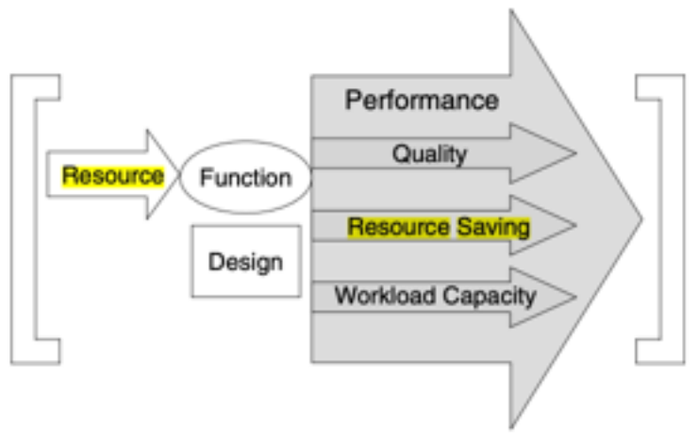
V2: System **Workload Capacity** attributes, desired by stakeholders. The ‘how much’ the system can do.

V3: **Resource Savings.** A stakeholder desire to reduce, or control, any type of resources in the system. Including people, effort, time, money, space.

Title



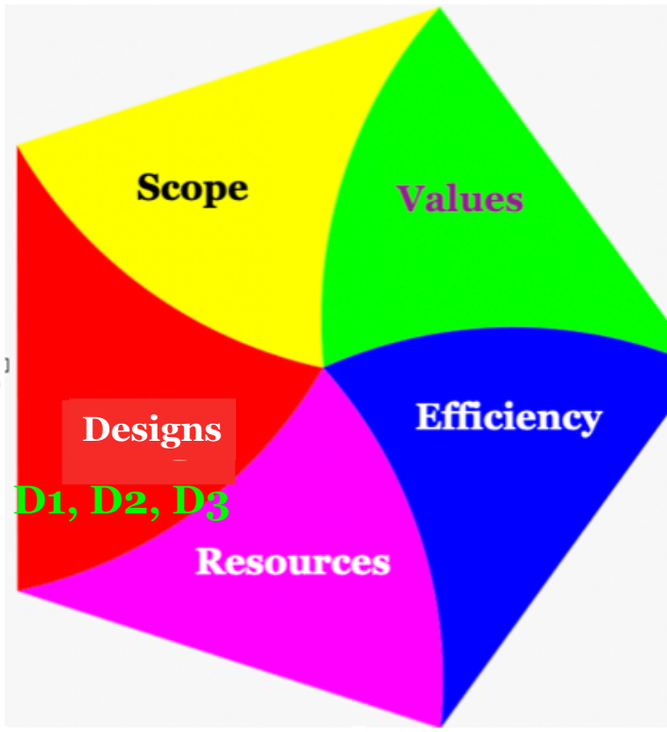
Caption



Source Competitive Engineering, Fig. G12.. This is for ‘performance attributes’, which is a synonym for ‘Values’ used by systems engineers. The [Square Brackets] are the Planguage icon for ‘Constraints’. (S2.)

Design Components

Title



D1: **Design**: Any specified, and potentially implemented, artefact; *physical, logical, or process*; which has the *purpose* or *intent* of improving the total system's Values and Resources.

Caption

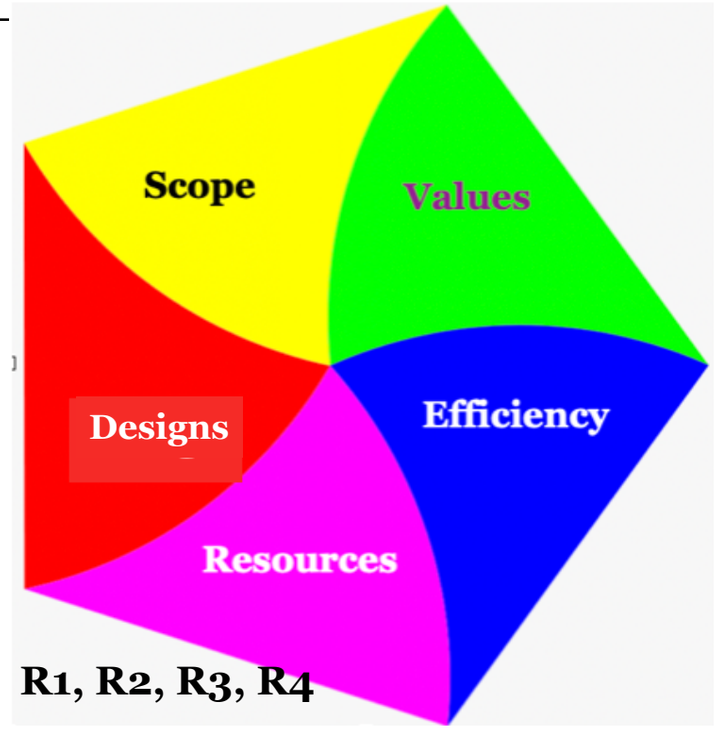
D2: **Strategies**: A **meta****-design idea which *dictates a number of more-specific designs*, within its scope. *Example: 'Buy Local', 'Contract for Value'.*

D3: **Architecture:** designs of structure and interconnection of the system. *Example: Maximum Team Size 10. SOLID Internet Architecture.*

**** META: denoting something of a higher or second-order kind: *metalanguage* | *metonym*.**

The examples give, hint at a third level Penta model R1.1, R1.2, etc)

Resources Components

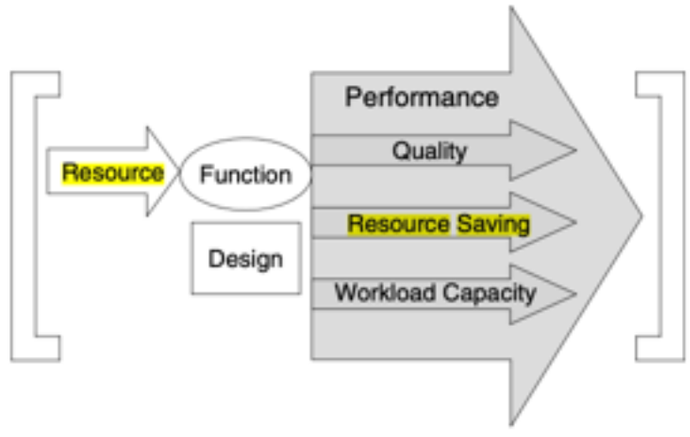


Resources are various limited fuels to create and maintain a system.

R1: **Financial** Resources. Capital Expenditure, Operating Expenditure, De-commissioning Expenditure

R2. **Human** Resources: Manual labour, Intellectual Labour, Training work.

R3: **Time** Resources: *calendar time* to complete, *cycle time* for a process.

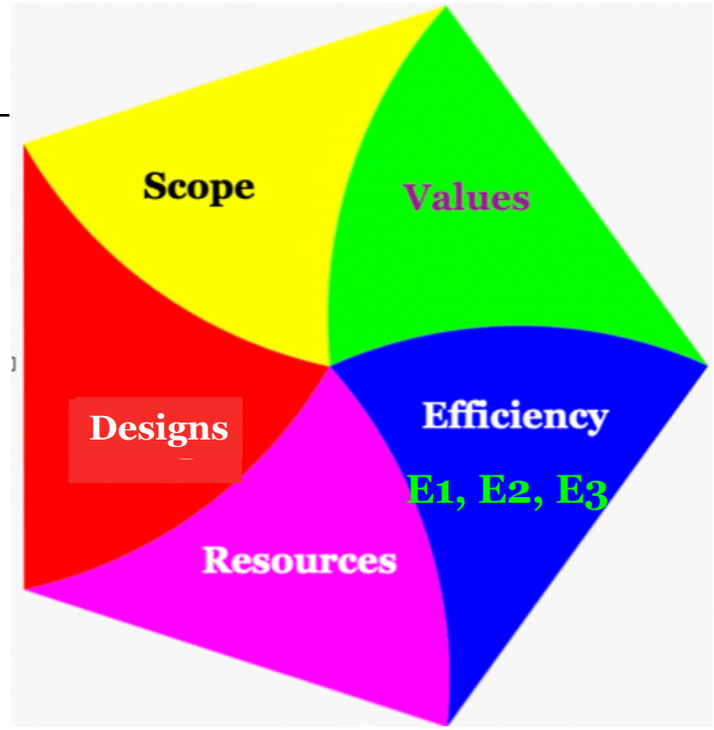


Source: 'Competitive Engineering', Fig. G12.. Notice the 'Resources' feeling the Function/Design/Values

R4: **Other Resources**, l*ike space, sustainability, trust, credibility, loyalty*.

Efficiency Components

Title



Caption

E1: **Generic Defined Efficiency**. Any selected critical set of Stakeholder Values divided by any selected, useful, or available, critical set of budgeted constrained resources. {V1, V2, Vn}/{R1, R2, Rn}.

E2: **Profitability**: any defined notions of profitability. Example before taxes, long-term average.

E3: **Value for Money**: useful for government-like institutions, charities, ideal organizations. ‘Citizen/Stakeholder Values’ for 'financial expenditure’, like taxes, donations. For system lifecycle or selected stages or aspects.

Acknowledgements: Per 25 August 2022

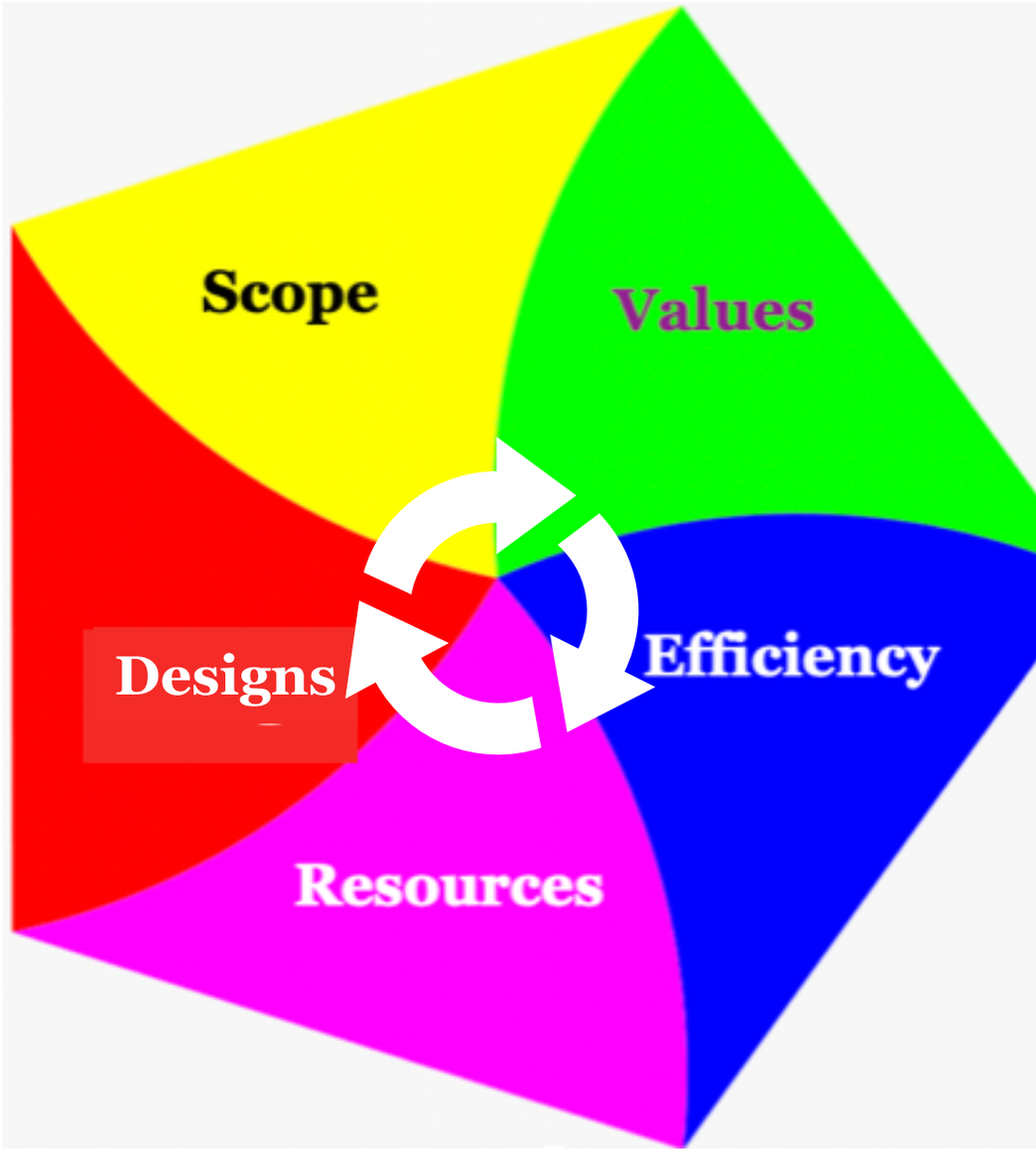
Al Shalloway and Tom Gilb have spent considerable time discussing methods, and discussing our unhappiness with many popular methods.

We suddenly (when discussing Iron Triangles) came up with a 5-legged beast, and felt that we had made an interesting step forward, in having a fairly simple way to present engineering ideas and systems ideas, more suitable for the [6] and difficult systems many of us need to deal with.

This paper was drafted by Tom, and edited by Al, who also suggested several major additions. Kai Gilb straightened Tom out on some conceptual ignorance I have, especially about the nature of Values.

We have made the paper public, and are hoping to add some notes on contributions, here, as time goes on.

Thanks to initial 25th Aug. 2022 feedback from good friends on Linkedin we managed to confuse, with the term (Means), instead of Design. The term ‘Design’ which is much clearer on first reading, then the highly ambiguous ‘Means’ is changed throughout. ***My*** rule is that the terms are to be understood as defined here, and in Planguage Glossary [CE] but that does not stop good people, from reading terms, before they see the definitions, and people do initially insist on their own personal (mis-)interpretations, notwithstanding my own preferences.



Page 1 Author References

[**CE**] Tom Gilb, **Competitive Engineering: A Handbook For Systems Engineering, Requirements Engineering, and Software Engineering Using Planguage** (paper or digital 2005). The definition of the Planguage, https://www.gilb.com/p/competitive-engineering (**free** pdf), and paper via Amazon (Kindle and paper), https://www.amazon.com/dp/0750665076/ref=rdr_ext_sb_ti_sims_2

[DE] Tom Gilb, **Decision-eering**. https://tinyurl.com/Decision-eering, booklet, pdf, 2022

[SEA] Gilb, Tom, **Systems Enterprise Architecture** (SEA) book, https://leanpub.com/SysEntArchBook, 2020, $4.99 to $9.99 +VAT EU, USE THIS PAID EDITION IF YOU REFERENCE IT IN PUBLIC, Systems Enterprise Architecture (SEA) BOOK, Free Download, https://tinyurl.com/SysEntArchBook (2020). See Chapter 5. Architecture Prioritization, and Chapter 7 . Architecture Risk Management

[QU] **QUANTeer: The Art of quantifying your value ideas.**, https://tinyurl.com/Quanteer, (**free** copy) or LEANPUB.COM/Quanteer, Paid $5-$10 and free sample.

[SU] Tom Gilb, **SUCCESS : Super Secrets & Strategies for Efficient Delivery in Projects, Programs, and Plans**, Book Folder, tinyurl.com/SUCCESSGilb. , Free copy), October 2021., Success Engineering Leadership University Lecture:, https://www.youtube.com/watch?v=YQ6rRMLoe_s, 3Hours video. See also **slides** , https://www.dropbox.com/sh/re0a3qlip9dncga/AACHHu5Qu6hZyQKKz1iyMG56a?dl=0

[MM] Free Book Link to **Musk's Methods**., https://tinyurl.com/MusksMethods

[DtC] **Estimation: A Paradigm Shift Toward Dynamic Design-to Cost and Radical Management,** Volume 13 Issue 2 of SQP journal - the March 2011 version., http://www.gilb.com/DL460, **Estimation – a Waste of Time? (and some alternatives that actually work !),** http://www.gilb.com/DL470, Slides: For BCS SPA, London, June 1 2011

[SE] **Stakeholder Engineering**., leanpub.com/StakeholderEngineering, Released 27 July 2021, Leanpub, 177 pages., https://tinyurl.com/StakeholderBook, July 5 to 18 2021, Version 1.2 Complete Draft, **Free** Download

Page 2 Author References

[AG] **How Well Does the Agile Manifesto Align with Principles that Lead to Success in Product Development?'**, https://www.ppi-int.com/wp-content/uploads/2021/01/SyEN-062.pdf, PAPER

[AE] **Agile Engineering** (Slides, Video), http://concepts.gilb.com/dl986, 120821, https://www.linkedin.com/video/live/urn:li:ugcPost:6830473178213572609/, 12Aug2021 1 hour, https://tinyurl.com/AgileEngineering, (folder with 2021 and 2022 bigger version, SLIDES).

[SM] Source: T. Gilb, **Software Metrics,** October 1976, (Winthrop, 1977).

'Evolution is a designed characteristic of a system development which involves gradual stepwise change.' (p. 214)

On step results measurement and retreat possibility

'A complex system will be most successful if it is **implemented in small steps** and if **each step has a clear measure of successful achievement** as well as a "retreat" possibility to a previous successful step upon failure.' (p. 214)

On minimizing failure risk, using feedback, correcting design errors

'The advantage is that **you cannot have large failures.**

You have the opportunity of receiving some **feedback from the real world before throwing in all resources** intended for a system, and you can **correct possible design errors before they become costly live systems.**' (p. 214)

On total project time

'The disadvantage is that you may sometimes have to wait longer before the whole system is functioning. This is offset by the fact that **some results are produced much earlier than they would be** if you had to wait for total system completion.

It is also important to distinguish between a date for total system operation and a date for total "successful" system operation.' (p. 215)

On the general applicability

'Many people claim that their system cannot be put into operation gradually. It is all or nothing. This may conceivably be true in a few cases . . . I think we shall find that **virtually all systems can be fruitfully put-in in more than one step**, even though some must inevitably take larger steps than others.' (p. 215)

A measure of degree of evolution

'A metric for evolution is degree of change to system "S" during any time interval "t".' (p. 214)

On risk and predicting requirements

'Risk estimates plus/minus worst case are key to selection of step size', and 'Saving of analysis of future real world'. (p. 217)

The first remark is recognition that **step sizing is determined by the need to control risk of failure.** It is not small steps in themselves which are important. A large step may be taken if the risk is under control; for example by using contract guarantees or known technology. The second remark is recognition that the **evolutionary method avoids the need to predict requirements and environments in the future; it allows us to wait until the future has arrived, to see the current requirements and the current environment.**

[IN] Innovation References

[IC] 'INNOVATIVE CREATIVITY' 124 pages €14, (BOOK),

https://www.gilb.com/store/QMMQhn2g

Innovative Creativity (BOOK)

https://www.gilb.com/offers/FnExtaw9/checkout, FREE GIFT REVIEW COPY FOR YOU ALONE. NO COUPON CODE REQUIRED.

[CRA Talk] **Creativity Requires Agility**

http://concepts.gilb.com/dl949, 20 min. Keynote at Sector 3.0 WarsawMay 22 2019

[IC Talk] **Innovative Creativity: How to deliver measurable values fast.,** 66 Slide Talk to Startups and Angel Investors on 5April 2019 at Bærum International Hub, Norway.Contains case studies, and analysis of Design Sprint methods (2 slides), http://concepts.gilb.com/dl939

[RM] **Risk Management: A practical toolkit for identifying, analyzing and coping with project risks.,** http://www.gilb.com/dl20

https://www.researchgate.net/publication/285403170_182_Managing_Project_Risks_in_Requirements_Design_and_Development_using_Planguage

[RMVP] **Risk Management Chapter 7 in** VP Value Planning Book., https://tinyurl.com/RiskMgtVP

Other References

[1] **Iron Triangle PMI**, https://www.villanovau.com/resources/project-management/iron-triangle-project-management/

[2] https://en.wikipedia.org/wiki/Project_management_triangle

[3] https://www.pmi.org/learning/library/beyond-iron-triangle-year-zero-6381

This is useful for the Process components of project management.

[4] **IBM Cleanroom**, MIlls and Quinnan Slides, http://concepts.gilb.com/dl896

[5] **Evolution of the PDSA Cycle, By Ron Moen and Cliff Norman, API**:,

http://www.cologic.nu/files/evolution_of_the_pdsa_cycle.pdf

[6] Pieces of the Action by Vannevar Bush and Ben Reinhardt | Jun 28, 2022. A wonderful wise practitioners view of building computers and atomic bombs, and organisational strategies for the top brass.

[7] Tom Gilb, **'The Penta Insight Model** Based on Planguage', https://www.dropbox.com/sh/u6nvyx1nbzruh6j/AADfr--cxOv6CkkVNyMMk9kVa?dl=0, Created 111222, a 'paper' in PPTX format., Inspired by reading of Gary Klein's book, Seeing What Others Don't: The Remarkable Ways We Gain Insights' John Murray Press. Kindle Edition. 2014, 284 pages, https://www.gary-klein.com/publications