Systematic Requirements Definition

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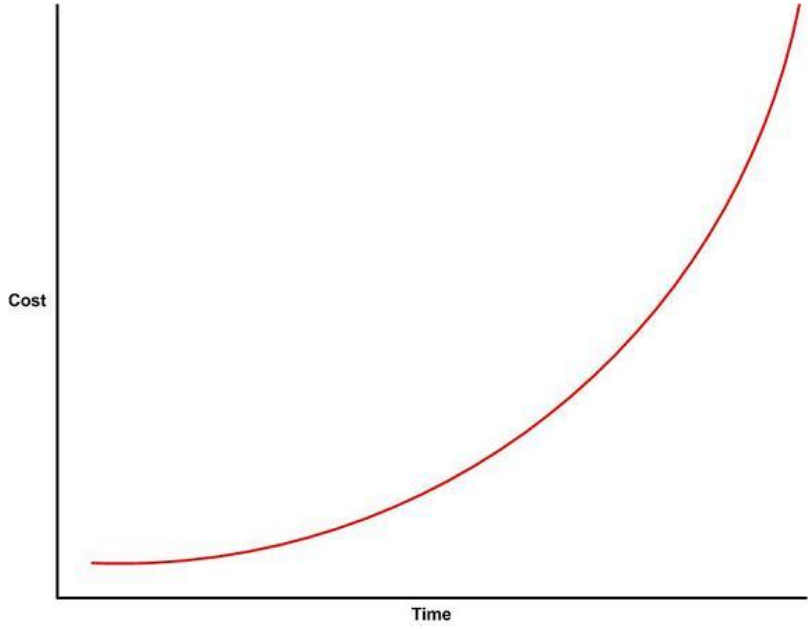
Agenda

- **Defining Requirements**
  - **Historical approach used**
  - **Use Systematic or Common Approach**
    - **Importance of understanding perspective**
    - **Standardize Work Breakdown Structure (WBS)**
    - **Include Department of Defense Architecture Framework (DoDAF) views**
    - **Applicable to any system**

Requirements Development

- Key to defining the fundamental architecture of any system
- Goals:
  - Save time
  - Save work effort
  - Save money
  - Reputation
  - Lower risk
  - Commonality
  - Mutual understanding
  - Develop system the stakeholders asked for



There's no point in being exact about something if you don't even know what you're talking about.

John von Neuman

Historical Approach & Issues

- Assign requirements into Work Breakdown Structures (WBS)
  - Takes time- consumes development time
  - Costly
  - Coordination
    - Gather all specialties for WBS in one place/one time
  - Ambiguous requirements
  - Customized - only one system, project or particular (company) use approach
  - Agile development cycle
  - Today's marketplace

Systematic Approach

- Incorporate Department of Defense Architecture Framework (DoDAF) views
- Structure applicable no matter what system project or company
- Distributes requirements into standardize WBS
  - Certain WBS always present no matter how simplistic the system
    - Requirement counts for each WBS based upon:
      - Program scope
      - Company procedures
      - Technology
      - Historical data
      - Customer policies
- Constant/common requirements across different system architectures

Understanding Perspectives

- **You are to develop a display for a recent acquisition to be placed in the permanent collection at your local museum**
- **How much information do you want?**
- **One view?**
- **Multiple views?**
- **When do you understand the essence of the challenge?**

Right side head/face view

Understanding Perspectives – con't

- **Location: Louvre Museum Paris, France**
- **Artist/Maker:** Unknown
- **Description English:** So-called "Venus de Milo" (Aphrodite from Melos). Parian marble, ca. 130-100 BC? Found in Melos in 1820.
- **Dimensions:** H. 2.02 m (6 ft. 7 ½ in.)
- **Credit:** Gift of the Marquis de Rivière to Louis XVIII of France, 1821
- **Accession number:** Ma 399 (LL 299)
- **Current Location:** *Temporary* - Department of Paintings, Sully, first floor, room 74
- **References:** Hamiaux, M., *Les Sculptures grecques*, II, Paris, 1998, no. 52, pp. 41-44

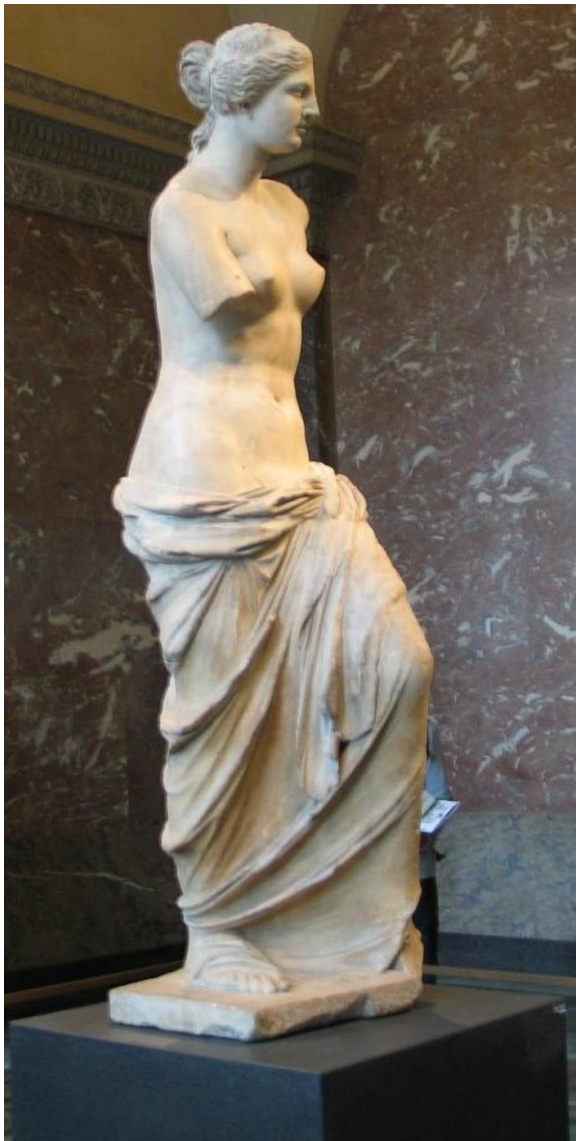
Venus De Milo – Right side full body view

Venus De Milo – Upper body – front view

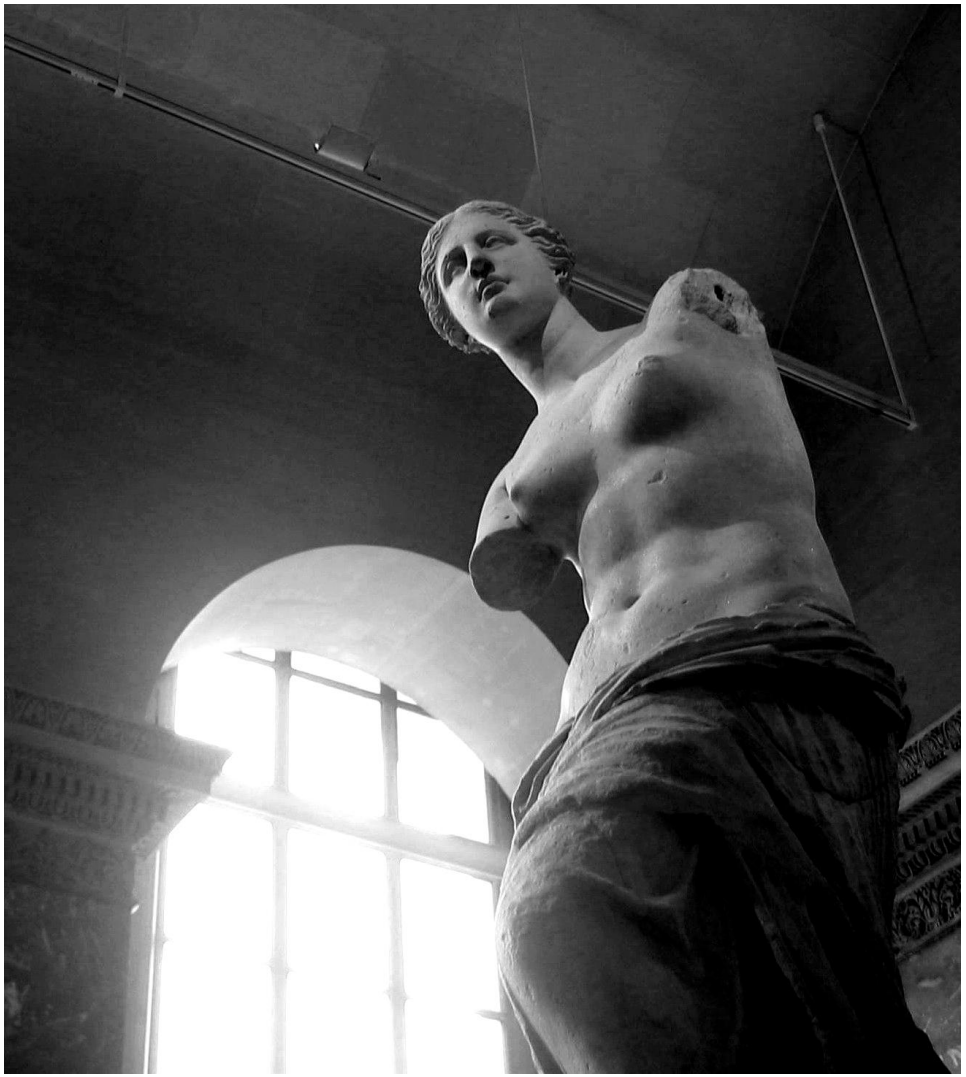
Venus De Milo – Left side full body view

Venus De Milo – Right side upper body view

Venus De Milo – Right side full body view

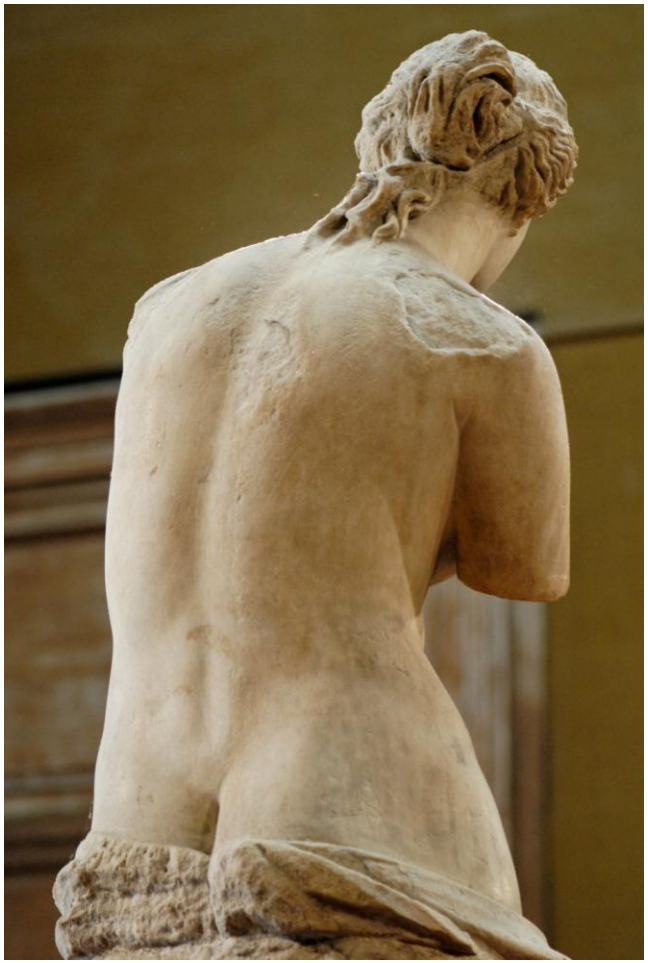


Venus De Milo – Left side upper body – looking up view



Venus De Milo – Front full body view

Venus De Milo – Rear upper body view



Understanding Perspective - Summary

- **Multiple views lead us to more complete understanding**
- **Differing perspectives reveal unforeseen information**
- **A more complete understanding typically leads to better, more appropriate solutions**
- **Now what?**
  - **A 3-D model, a visit to the current location**?

- Venus De Milo

Multiple Perspective views

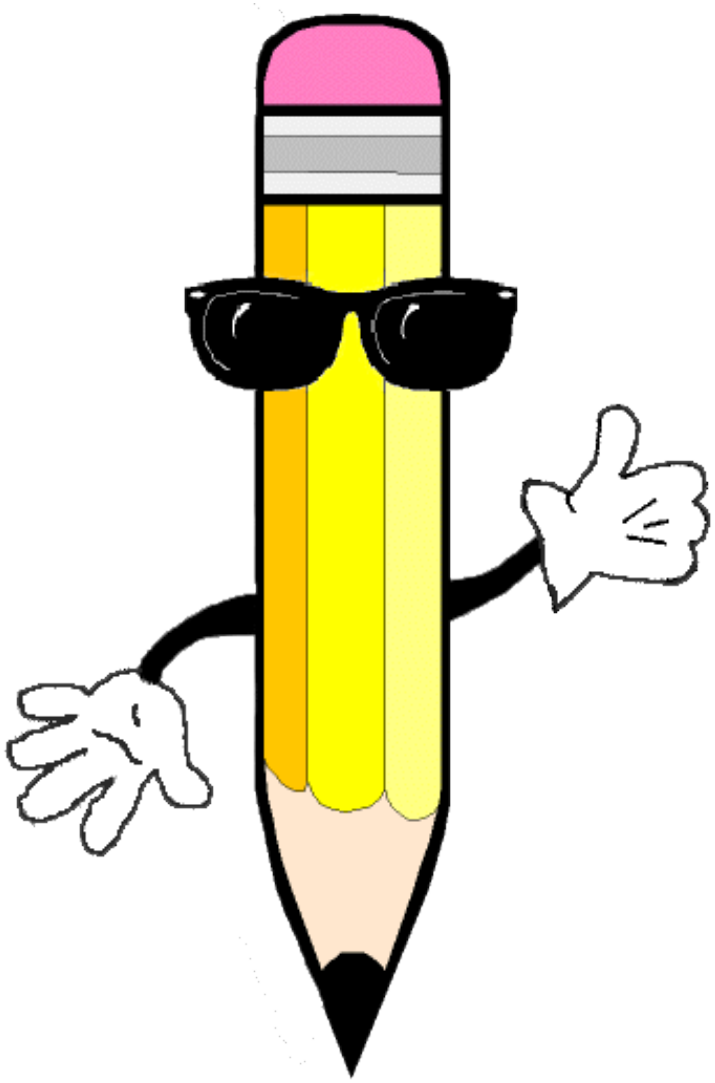
- **We discover there are certain tangible requirements, like size, safety, positioning, etc.**
- **We also begin to realize that the most important issue is the interaction of the public with the statue, and this is what should drive our design. It is about the photographs, the proximity, the notoriety of being with the statue that people want, and this is the essence of the problem.**

What is DoDAF?

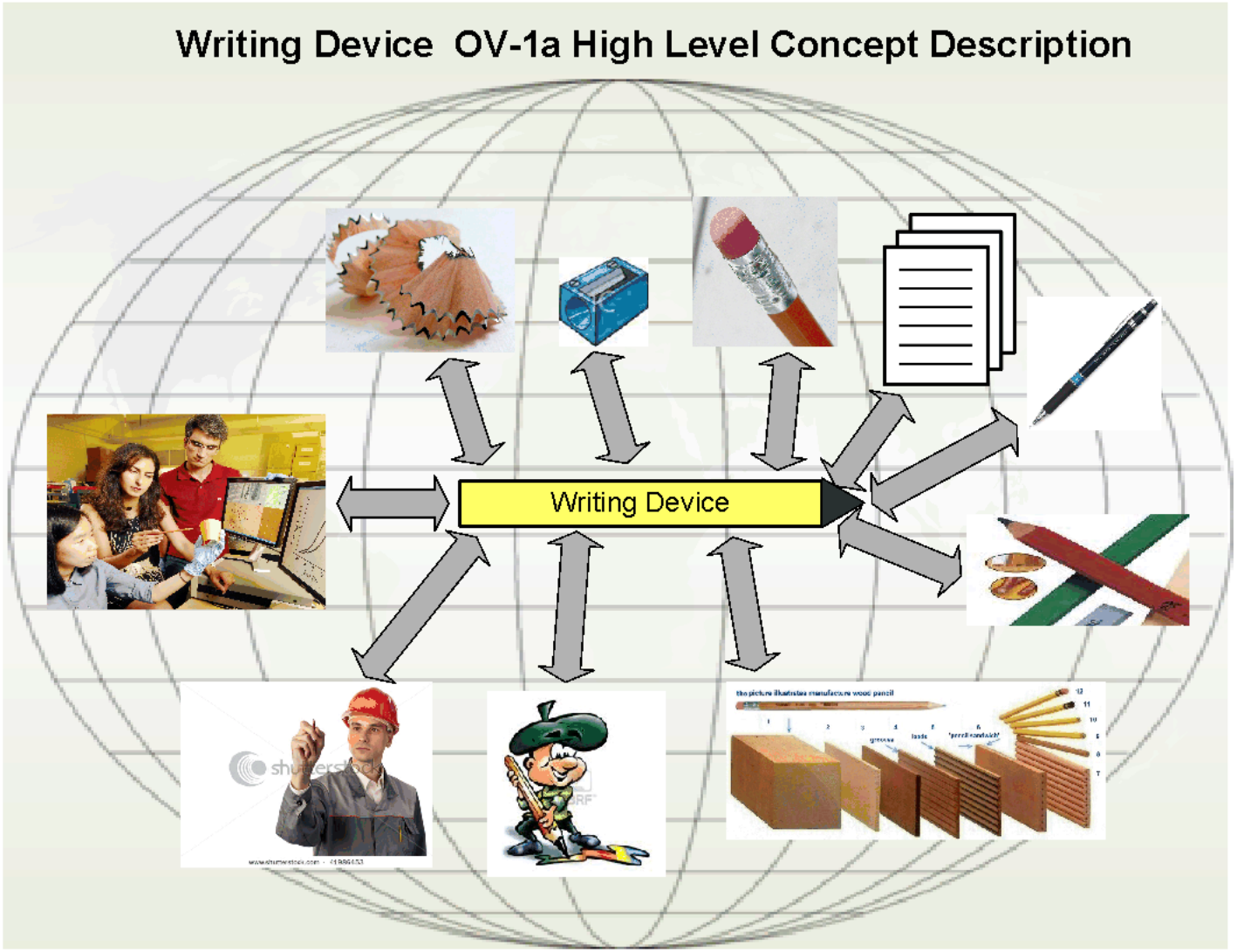
- Framework provides guidance for describing architectures for both war fighting operations and business operations and practices
- Defines three views of an architectural description:
  - Operational
  - Systems
  - Technical Standards
- Each view is composed of sets of architecture data elements that are depicted via graphic, tabular, or textual products

Source: DoD Architecture Framework Version 1.0 – Volume 1"Definiations and Guidelines, 30 August 2003, page ES-1

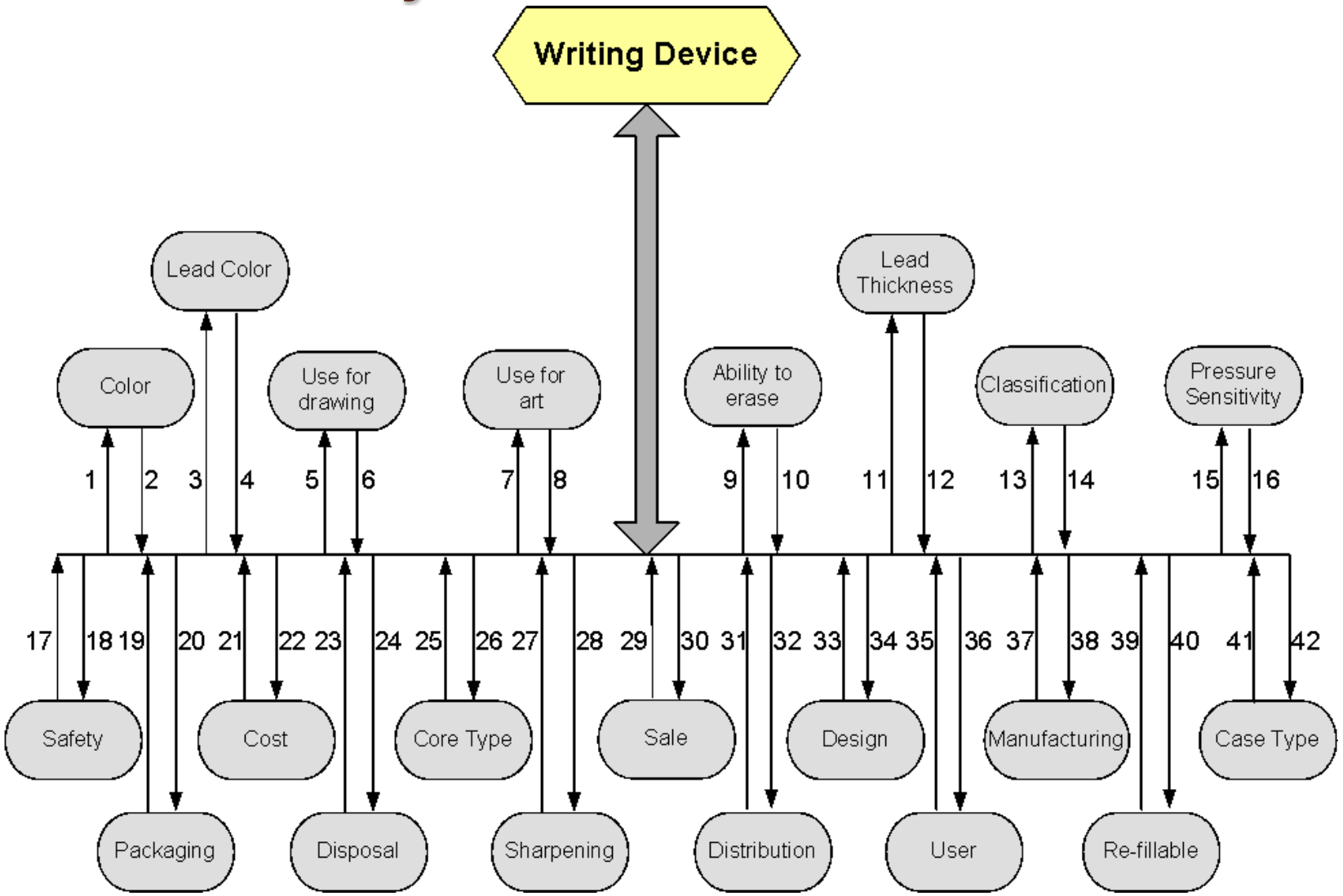
Example – The Writing Device



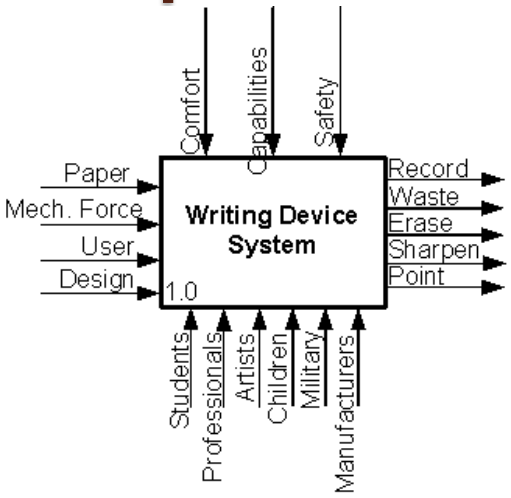
DoDAF OV-1- High Level Operational Concept

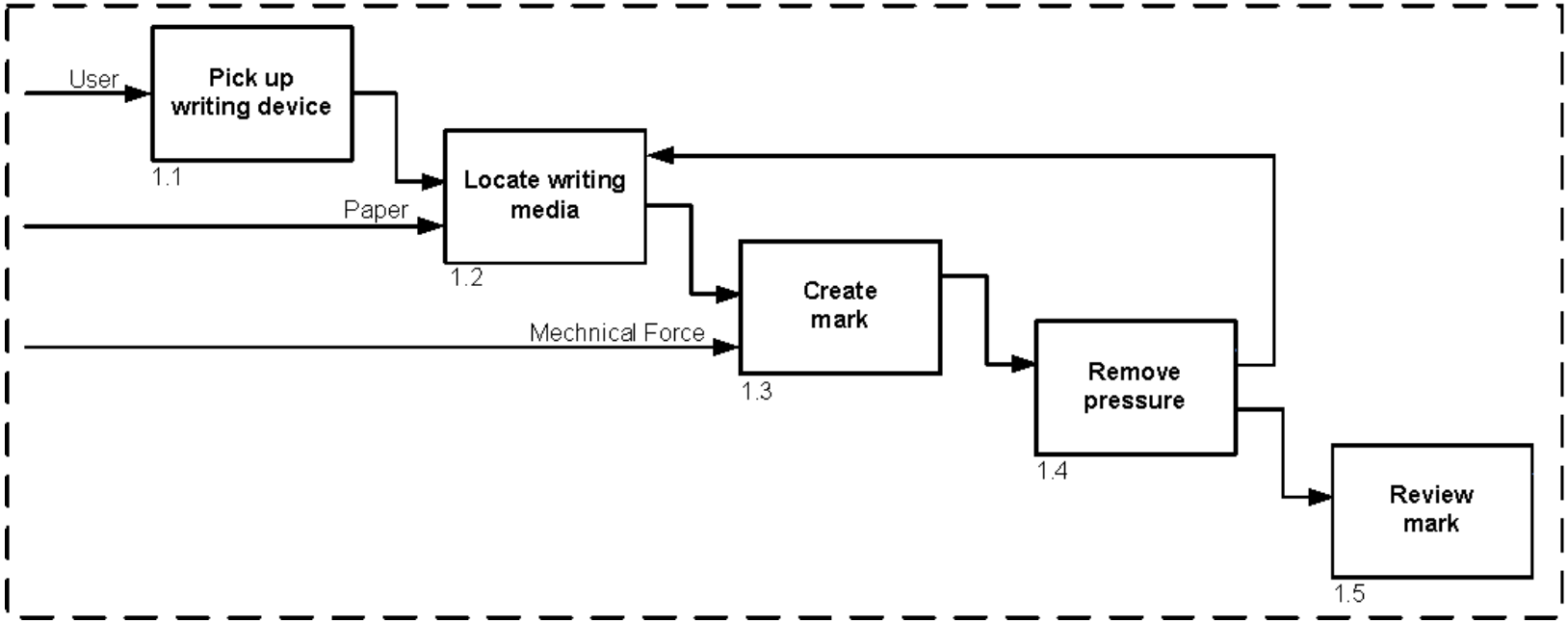


DoDAF OV-2 – Operational Node Connectivity

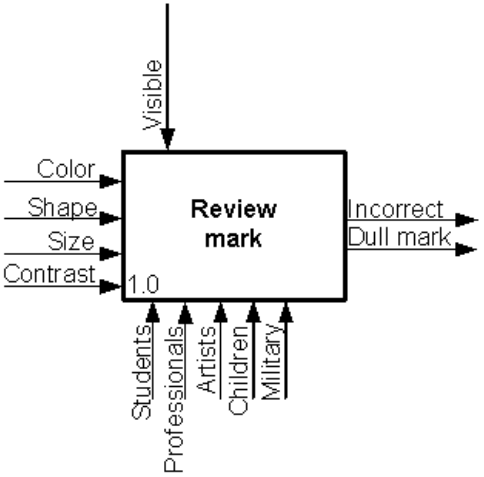


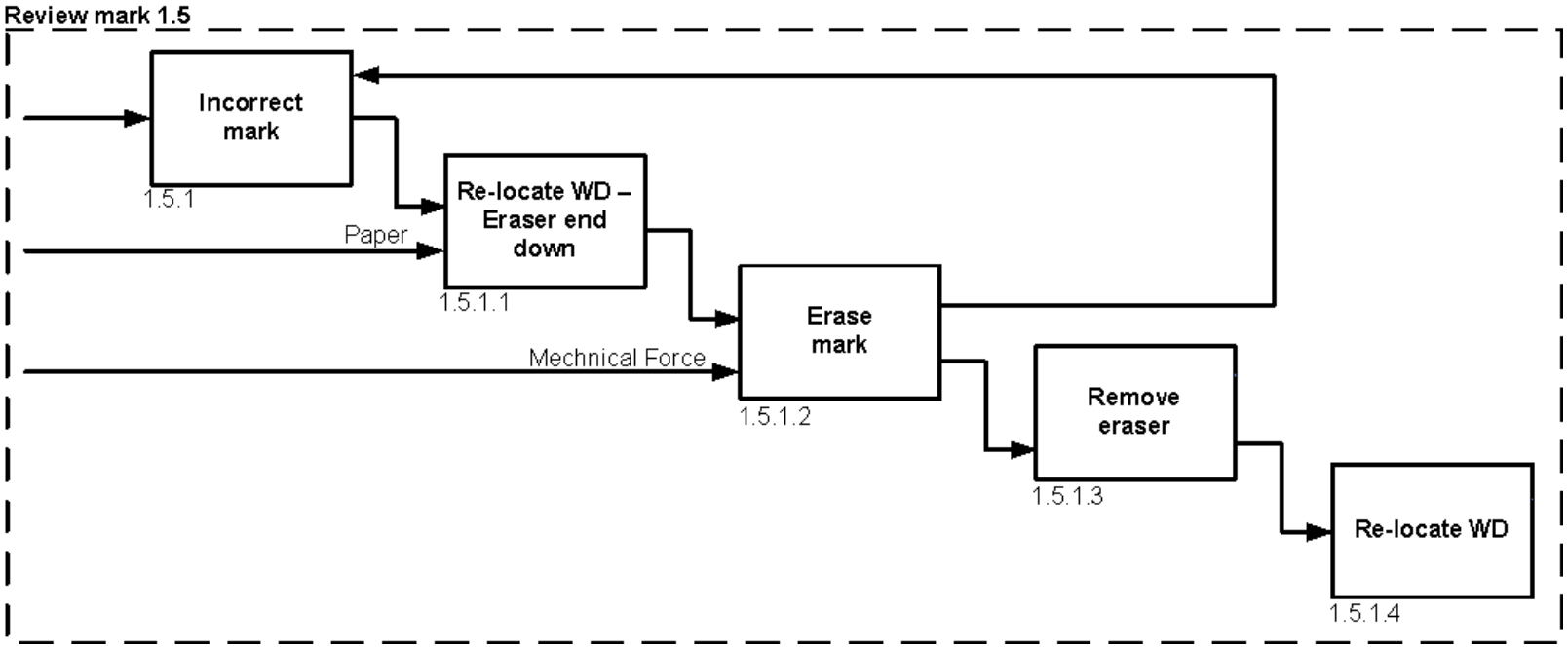
DoDAF OV-5 – Operational Activity Model



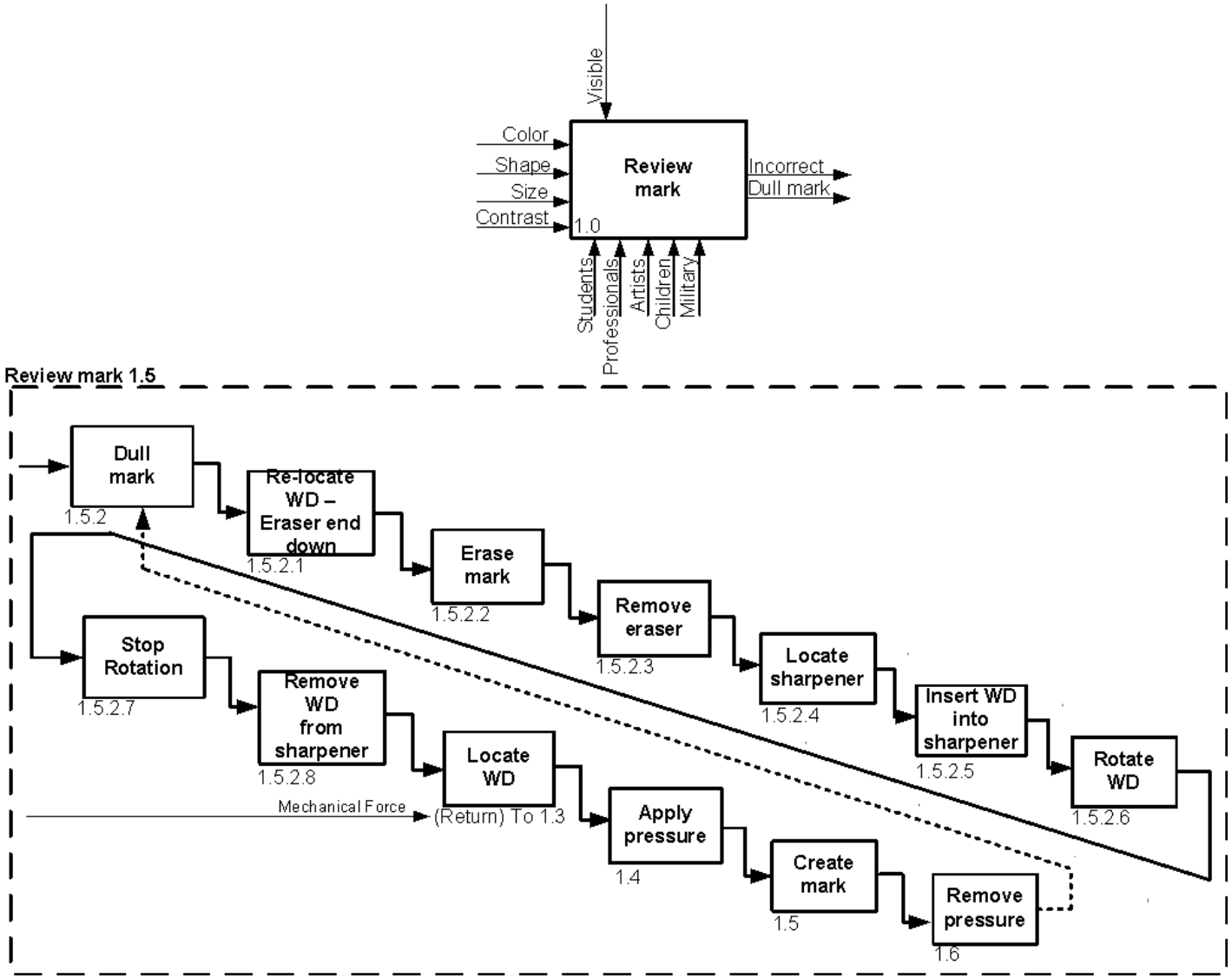


DoDAF OV-5a – Subset – Operational Activity





DoDAF OV-5b – Subset – Operational Activity



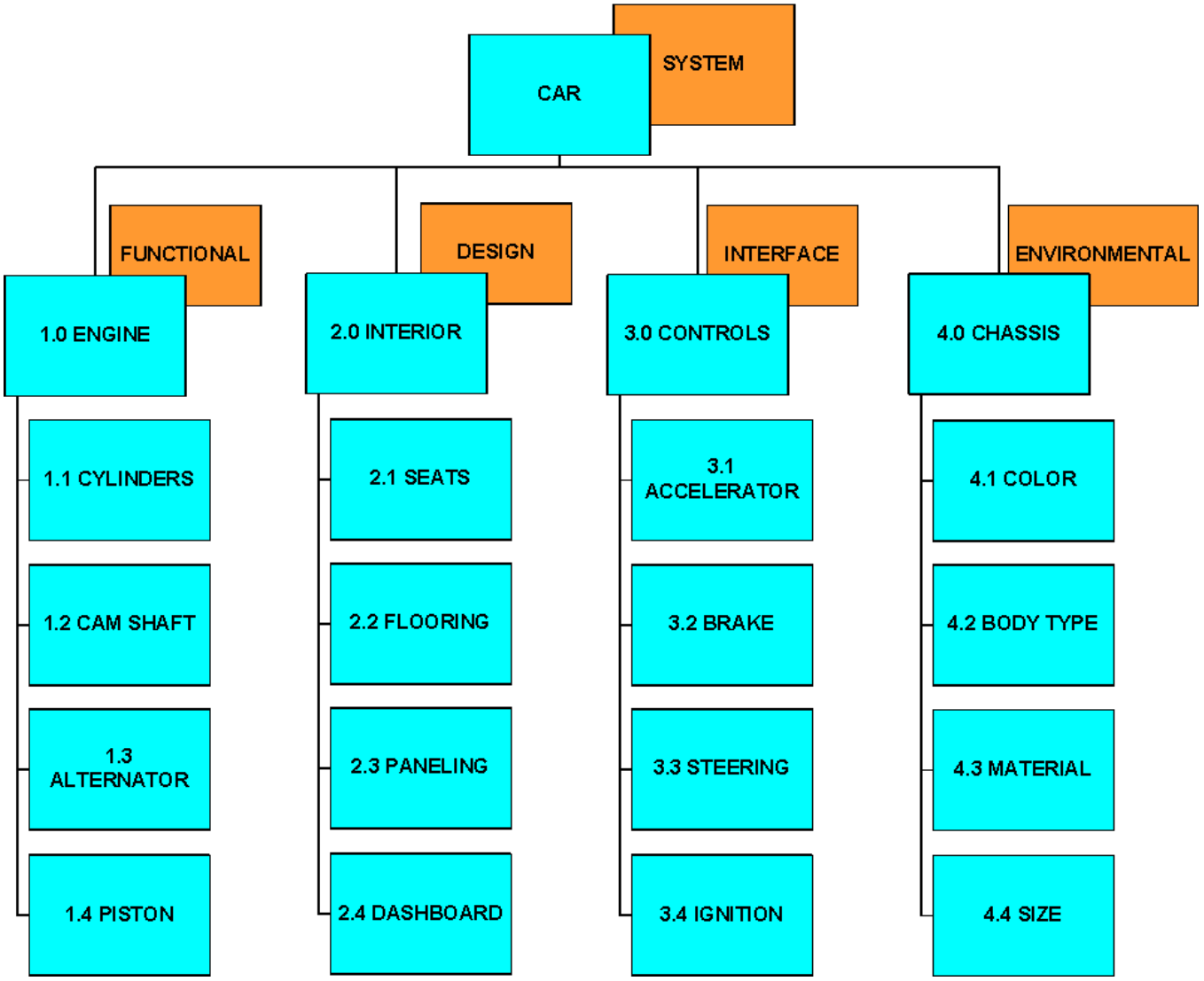
WBS Alignment

- **Generic WBS has most or all nine requirements major areas, each with sub-elements**
- **Start with a WBS from your organization, organize it into historical (major) areas used in the past**
  - **Leverage from WBS breakdown**
  - **For each area, assure at least three requirements exist**
  - **Look for commonality – Synonyms**
  - **Some areas may be shorter or larger – dependent upon business model or technology – i.e, pacemaker manufacturer**

Requirements major areas

- **Functional - What does the product or service need to do?**
- **Technical - Conformance to standards**
- **Usability - Describes how the functional requirement should be executed**
- **Operational – How does it work?**
- **Environmental -Describe the environment**
- **Security - Confidentiality (e.g. encryption, authorization, authentication; privacy policies, etc.), Accessibility**
- **Physical characteristics – What is the look / feel**
- **Support - Maintainability, Logistics, Service level**
- **Training – How to prepare the users**

Example WBS


CAR
SYSTEM
FUNCTIONAL
DESIGN
INTERFACE
ENVIRONMENTAL
1.0 ENGINE
2.0 INTERIOR
3.0 CONTROLS
4.0 CHASSIS
1.1 CYLINDERS
1.2 CAM SHAFT
1.3 ALTERNATOR
1.4 PISTON
2.1 SEATS
2.2 FLOORING
2.3 PANELING
2.4 DASHBOARD
3.1 ACCELERATOR
3.2 BRAKE
3.3 STEERING
3.4 IGNITION
4.1 COLOR
4.2 BODY TYPE
4.3 MATERIAL
4.4 SIZE

Consolidation

- Align your requirements to the WBS
- Align your requirements to the major requirement areas
- Make sure your distribution of requirements in both cases fits with your organizational expectations
  - For example, at least three requirements in each major WBS area
- A total number of requirements that is in line with past development efforts

Conclusions

- **This methodology will produce a more robust requirements set**
  - **You are better off having a good distribution of requirements than you are having a large number of requirements**
    - **Requirements cost money**
      - **Cost to fulfill, verification/validation, track and manage**
      - **Quality not quantity**
  - **You can weed-out superfluous requirements in this manner to reduce costs**
- **Goal is to get to the *right* number of requirements**
  - **Based upon customer, program/company history, project itself, technology/industry, project scope**

Summary

- Compile ‘Standard’ WBS template based upon historical data/records
- Supplement WBS with DoDAF views
  - Breakdown/add views based upon complexity of system
- Benefits internal and external customers
  - Exhibits understanding
  - Generates dialogue verses debate
  - Reduces requirement/scope growth timeframe
  - Reduces re-work
  - Reduces overall project development timeframes & costs

Questions ?

References

- **Department of Defense Architecture Framework**

  http://en.wikipedia.org/wiki/DoDAF