A Case Study to Examine Technical Data Relationships to the System Model Concept

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Office of the Deputy Assistant Secretary of Defense for Systems Engineering

16th Annual NDIA Systems Engineering Conference

Arlington, VA | October 31, 2013

DASD, Systems Engineering Mission

Systems Engineering focuses on engineering excellence − the creative application of scientific principles:

- To design, develop, construct and operate complex systems
- To forecast their behavior under specific operating conditions
- To deliver their intended function while addressing economic efficiency, environmental stewardship and safety of life and property

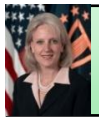
DASD(SE) Mission: Develop and grow the Systems Engineering capability of the Department of Defense – through engineering policy, continuous engagement with component Systems Engineering organizations and through substantive technical engagement throughout the acquisition life cycle with major and selected acquisition programs.

A Robust Systems Engineering Capability Across the Department Requires Attention to Policy, People and Practice

- ***US Department of Defense is the World's Largest Engineering Organization***
- ***Over 99,000 Uniformed and Civilian Engineers***
- ***Over 39,000 in the Engineering (ENG) Acquisition Workforce***

DASD, Systems Engineering

DASD, Systems Engineering
Stephen Welby
Principal Deputy Kristen Baldwin



Systems Analysis
Kristen Baldwin (Acting)

Addressing Emerging Challenges on the Frontiers of Systems Engineering

- Analysis of Complex Systems/Systems of Systems
- Program Protection/Acquisition Cyber Security
- University, FFRDC and Industry Engineering and Research
- Modeling and Simulation

Major Program Support
James Thompson

Supporting USD(AT&L) Decisions with Independent Engineering Expertise

- Engineering Assessment / Mentoring of Major Defense Programs
- Program Support Reviews
- OIPT / DAB / ITAB Support
- Systems Engineering Plans
- Systemic Root Cause Analysis

Mission Assurance
Vacant

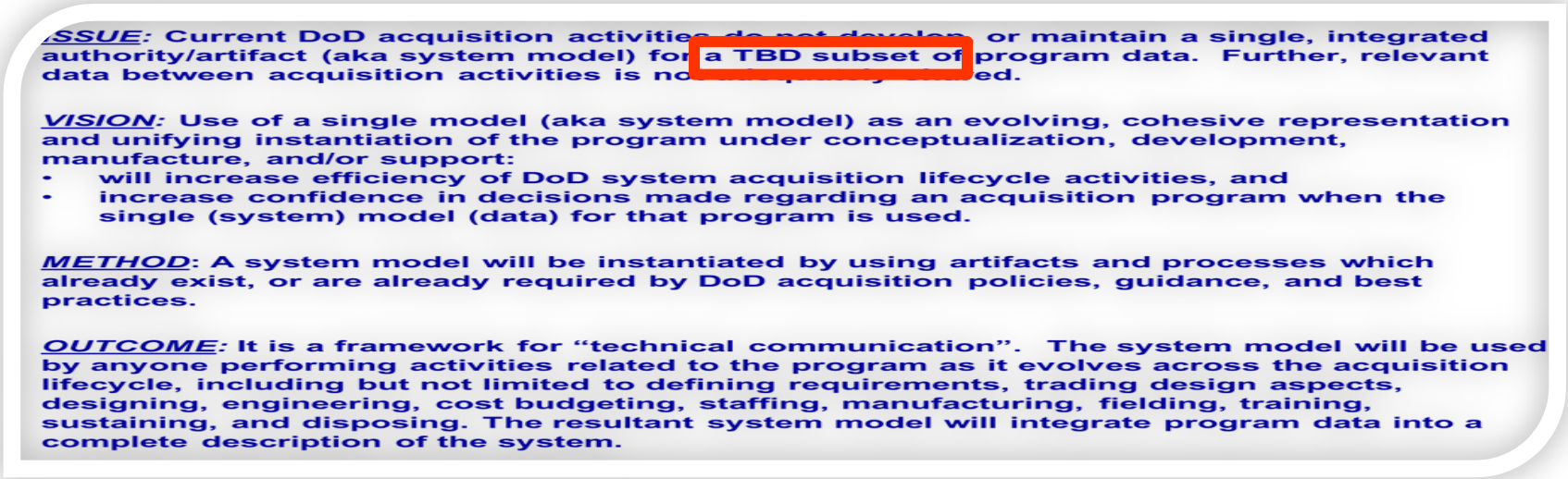
Leading Systems Engineering Practice in DoD and Industry

- Systems Engineering Policy & Guidance
- Development Planning/Early SE
- Specialty Engineering (System Safety, Reliability and Maintainability Engineering, Quality, Manufacturing, Producibility, Human Systems Integration)
- Counterfeit Prevention
- Technical Workforce Development
- Standardization

Providing technical support and systems engineering leadership and oversight to USD(AT&L) in support of planned and ongoing acquisition programs

Purpose

- **The system model will integrate (a TBD subset of) program data into a complete description of the system.**



ISSUE: Current DoD acquisition activities do not develop or maintain a single, integrated authority/artifact (aka system model) for a TBD subset of program data. Further, relevant data between acquisition activities is not [illegible] ed.

VISION: Use of a single model (aka system model) as an evolving, cohesive representation and unifying instantiation of the program under conceptualization, development, manufacture, and/or support:

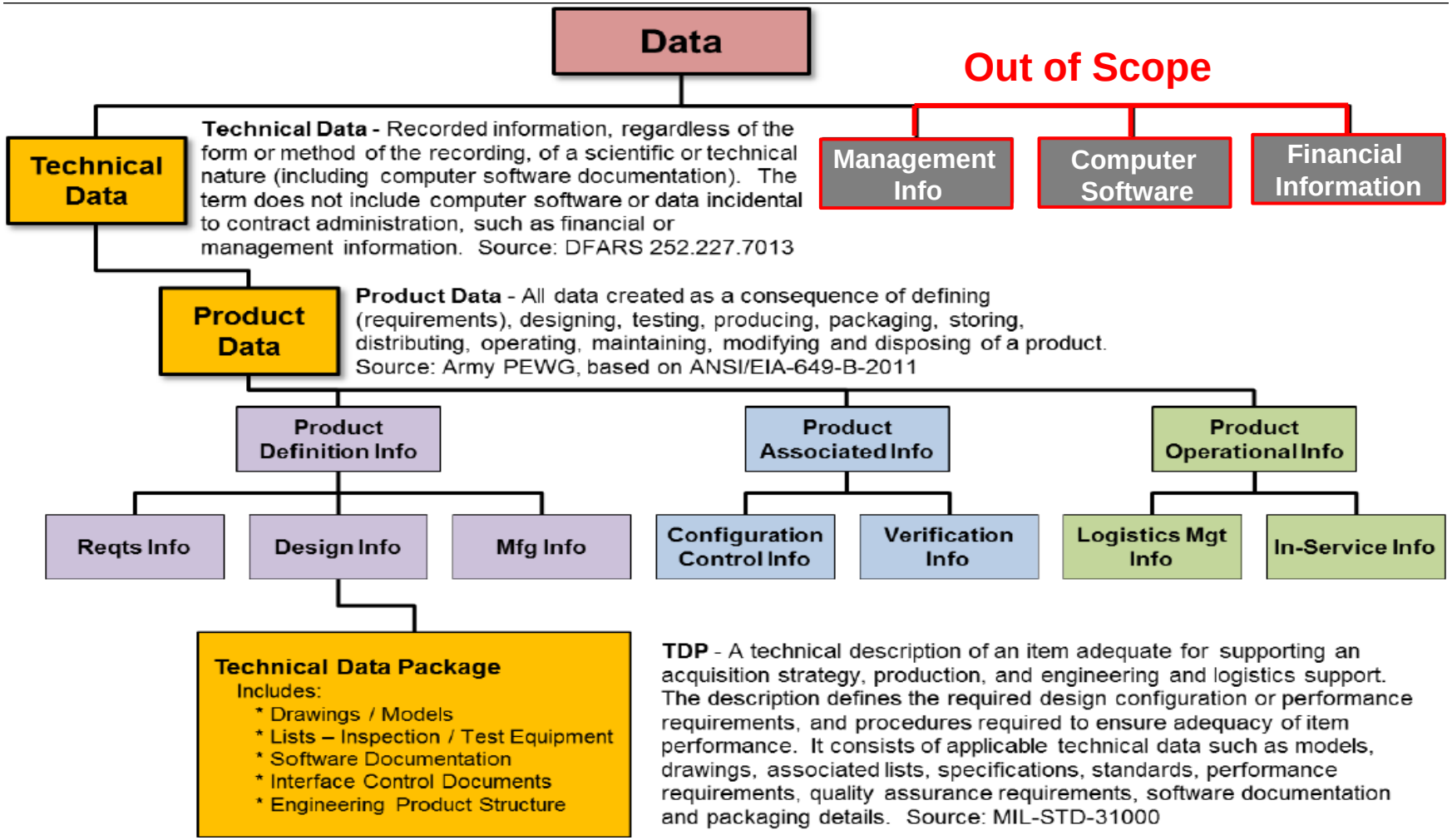
- will increase efficiency of DoD system acquisition lifecycle activities, and
- increase confidence in decisions made regarding an acquisition program when the single (system) model (data) for that program is used.

METHOD: A system model will be instantiated by using artifacts and processes which already exist, or are already required by DoD acquisition policies, guidance, and best practices.

OUTCOME: It is a framework for "technical communication". The system model will be used by anyone performing activities related to the program as it evolves across the acquisition lifecycle, including but not limited to defining requirements, trading design aspects, designing, engineering, cost budgeting, staffing, manufacturing, fielding, training, sustaining, and disposing. The resultant system model will integrate program data into a complete description of the system.

- **Case Study Purpose**
  - Examine the technical data acquired by three major programs
  - Examine the challenges associated with integrating technical data to support the system model concept

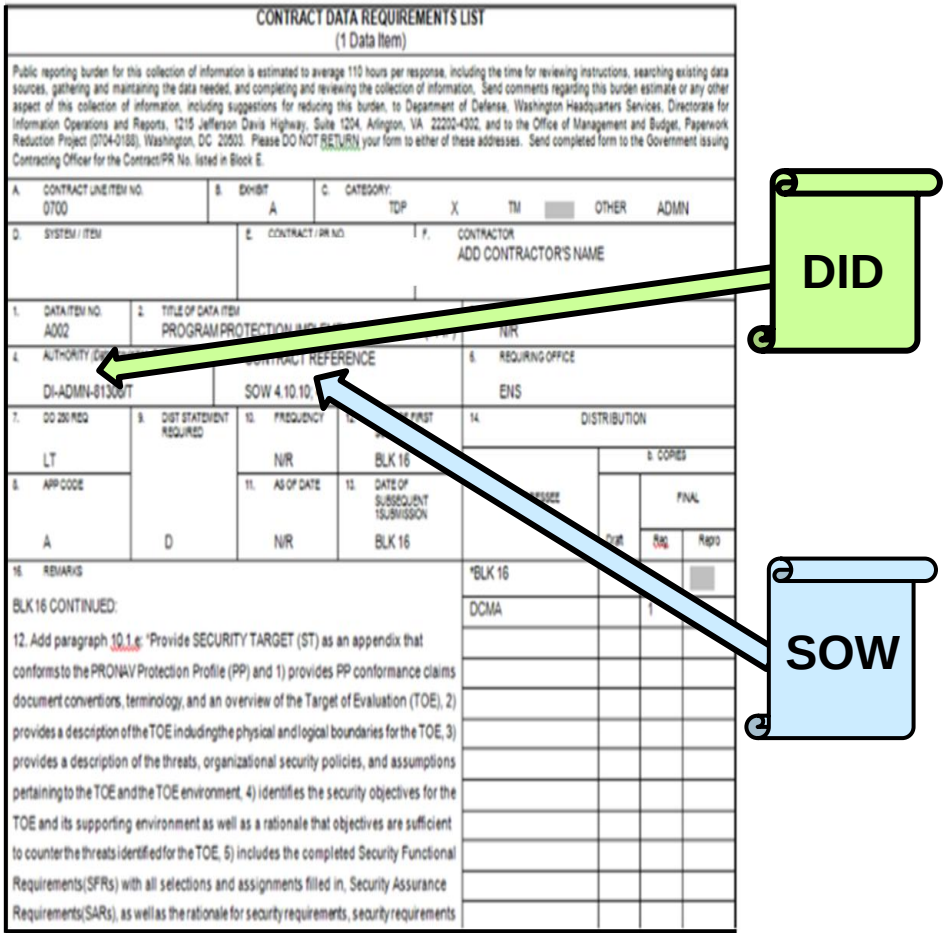
Technical Data



Source: DAG Chapter 4

Defining Data Requirements

Sample CDRL



- **Statement of Work (SOW)**
  - Defines work to be performed
- **Contract Data Requirements List (CDRL) (DD Form 1423)**
  - Standard format for defining data requirements
  - Attachment to the contract
- **OMB Approved Document**
  - Data Item Description Document (DID)
  - Each CDRL must reference a DID

Overview of Case Study Programs

- **Three programs pre-Milestone C**

Navy Electronic Warfare System

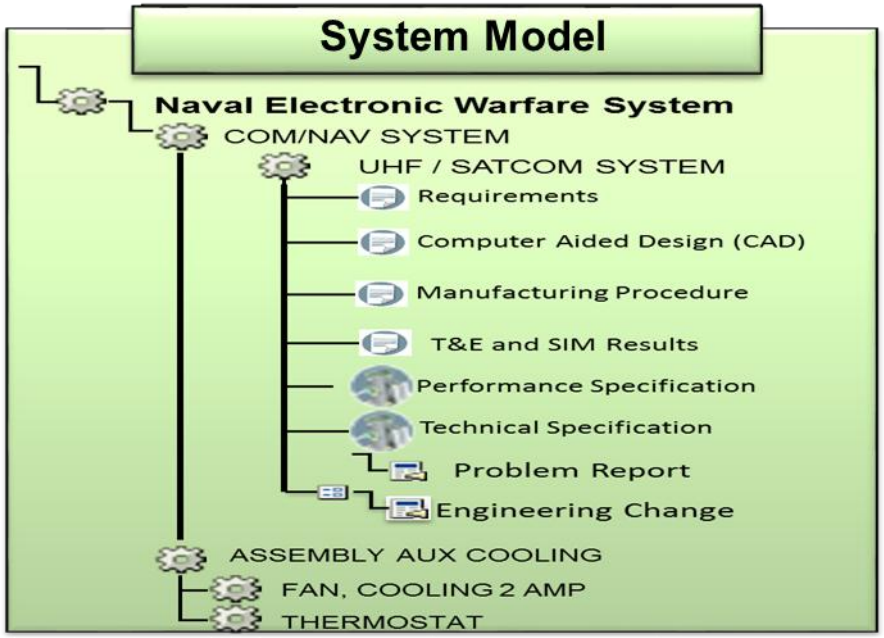
Army Surveillance and Reconnaissance System

Marine Corps Vehicle Missile System

- **These programs were selected based on**
  - Availability of and access to technical data
  - Collaboration to manage program technical data and use in developing a system model
    - Communications- Electronic Command Logistics and Readiness Center (CECOM LRC)
    - Naval Surface Warfare Center Port Hueneme Division (NSWC PHD)

Case Study Overview

- **DASD(SE) collaboration with**
  - CECOM LRC
  - NSWC PHD
- **Integrated, managed, and assimilated technical data into a system model for specific SE activities**

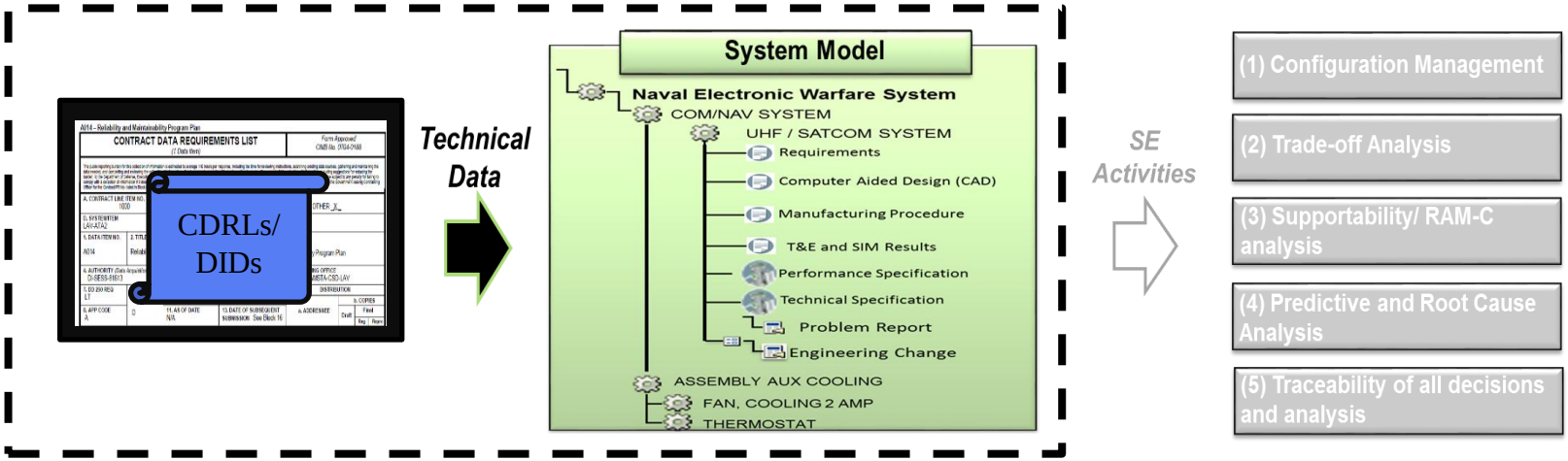


SE Activities

- **(1) Configuration Management**
- **(2) Trade-off Analysis**
- **(3) Supportability/ RAM-C analysis**
- **(4) Predictive and Root Cause Analysis**
- **(5) Traceability of all decisions and analysis**

Case Study Approach

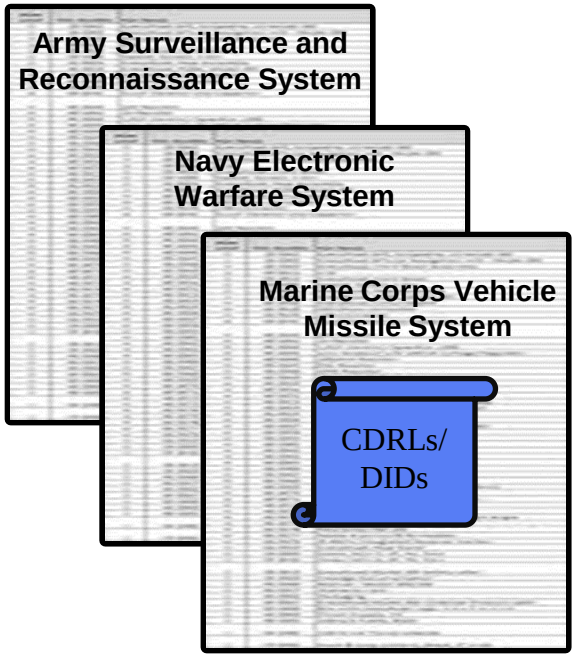
- **Leveraged the system model effort to understand technical data relationships to the system model concept**



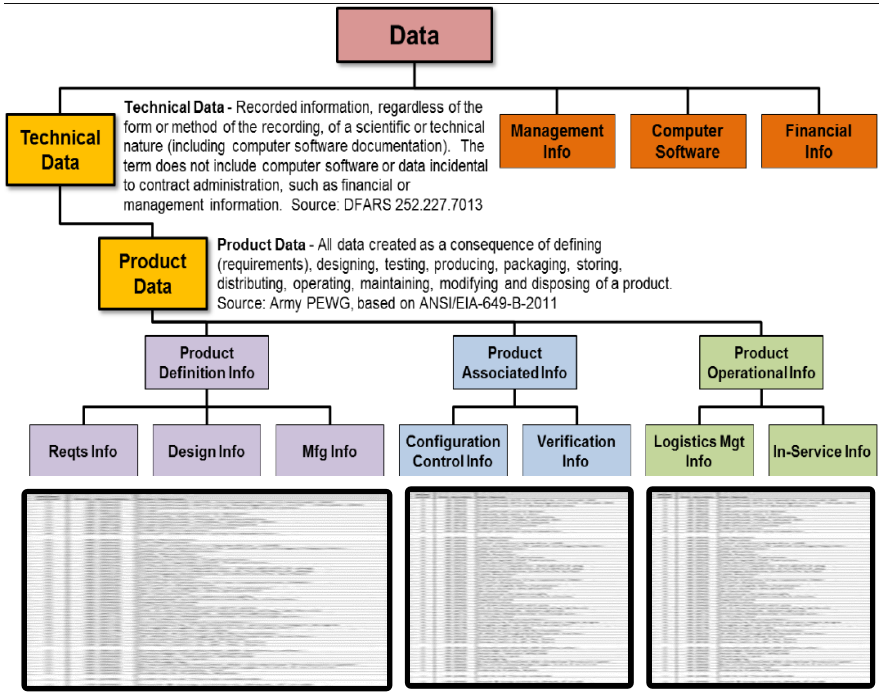
- **Case Study Approach**
  - Identified minimum data requirements to enable system model concept
  - Baselined data procured via contracts
  - Reconciled and integrated data from CDRLs and DIDs
  - Utilized integrated COTS product lifecycle management technology
  - Examined challenges

Programs CDRLs/Technical Data

Captured CDRL technical data for each program



Mapped CDRL technical data to Data Taxonomy



Identified technical data acquired by the programs

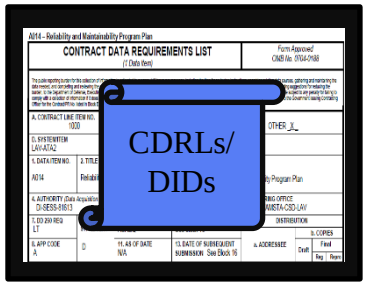
Need to further define what data are needed at what phase to support what analysis/activity.

Overarching Findings

- Incomplete understanding of the data's intended use
- Lacked data validation and use of data to perform analysis
- The information within the technical data deliverables were not integrated
- Inconsistencies found in the data because information is maintained in different systems and managed by different teams
- Decisions and tradeoffs were not traceable to the technical data
- Information was not timely—decisions were already made

Conclusion

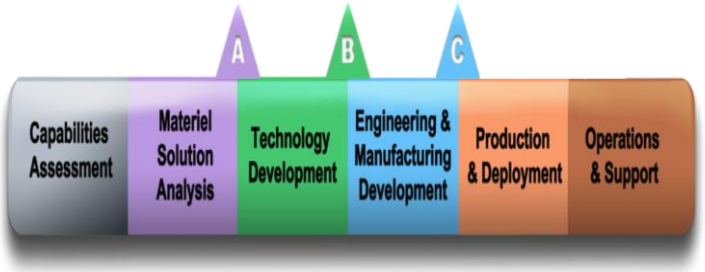
- **Gov't did have access to needed data**
- **Challenges primarily in integrating and using the data in a timely fashion to support decisions**
- **Required an integrated technology environment**
- **Future Work**
  - Expand scope to define what technical data are needed throughout the lifecycle
  - Further refine the system model definition
  - Identify a pilot program to test the "system model"



Technical Data

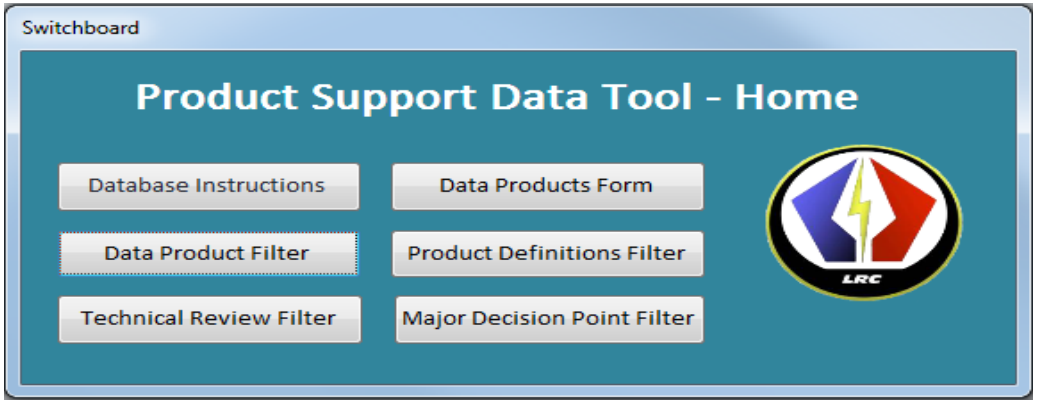
System Model Definition

SE Activities



Product Data Interactive Tool

- **The Product Data Interactive Tool was developed by CECOM LRC to help programs determine technical data needs**
- **Functional capabilities in work**
  - **User friendly Microsoft Access Application**
  - **Identifies technical data and data rights of DIDs**
  - **Identifies data needed to support milestone requirements, technical reviews, and key events**



References

- Defense Acquisition Guidebook
- DoD 5010.12-M, "Procedures for the Acquisition and Management of Technical Data”
- DoDI 5000.02, "Operation of the Defense Acquisition System”
- Technical Data Rights Strategy (2012 Army Guide)
- Technology Development Strategy/Acquisition Strategy
- Lifecycle Sustainment Plan
- Intellectual Property Strategy

For Additional Information

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Product Data Tool

Case Study Programs

Technical Data Rights

System Model

Systems Engineering: Critical to Defense Acquisition










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