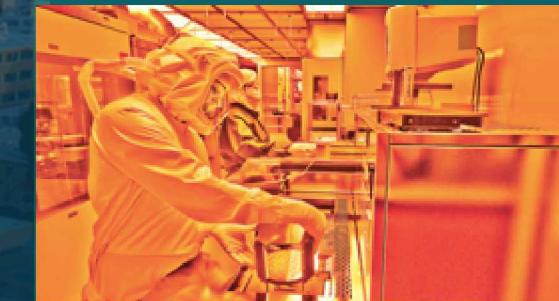


NW Engineering Process Modeling

SAND2020-2057PE



PRESENTED BY

Joshua Salinas, 2496

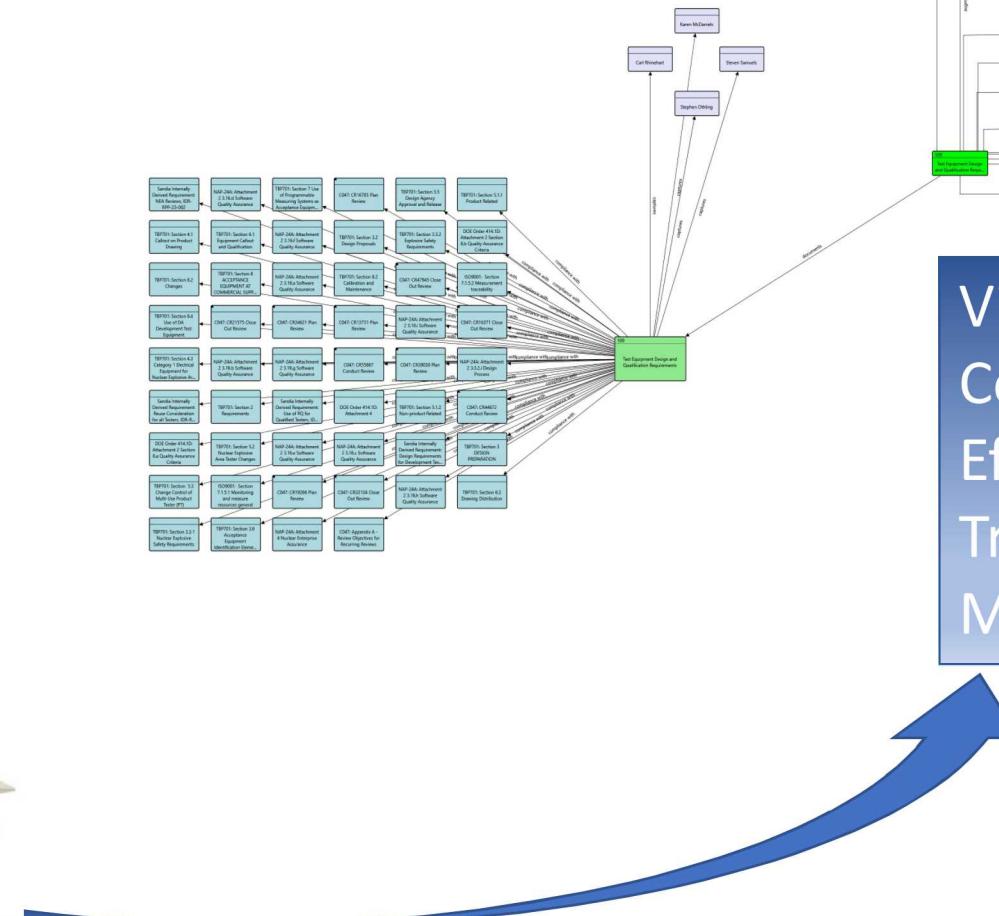


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NA0003525.

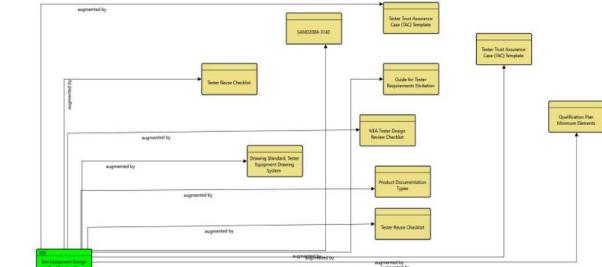
Traditional



Future



Visualization
Consistency
Efficiency
Traceability
Modularity



Ripple effect of interconnected artifacts

Programmatic Process



Requirements



Stakeholders



Schedules

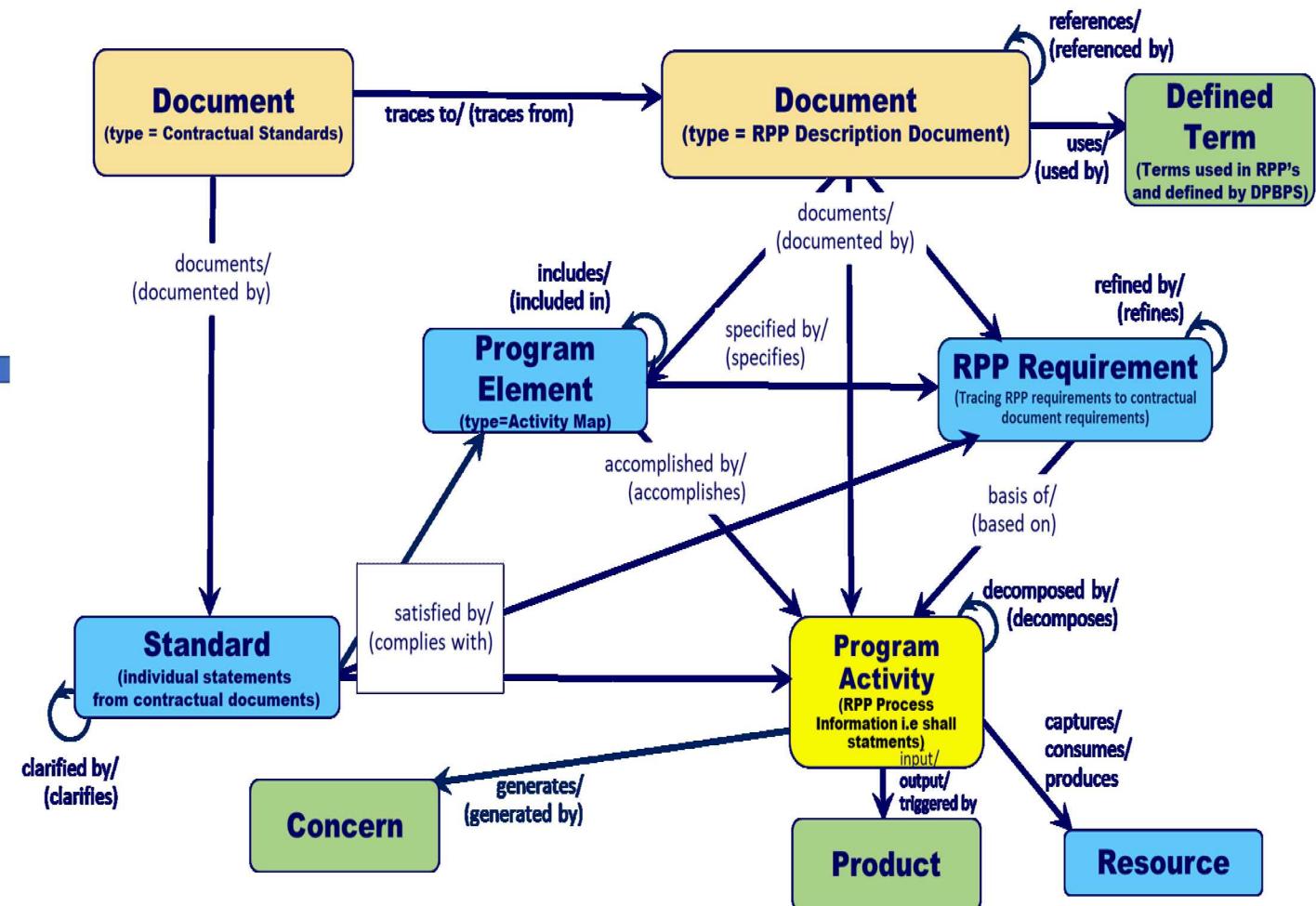
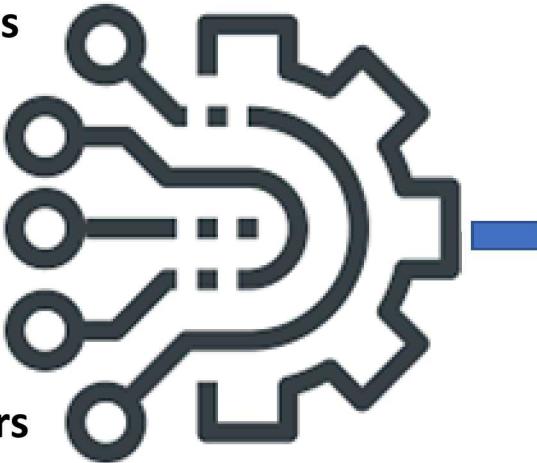


Sustainability



MBSE Approach

Subject Matter Experts
Requirements
Programmatic Processes
Document Artifacts
Stakeholders



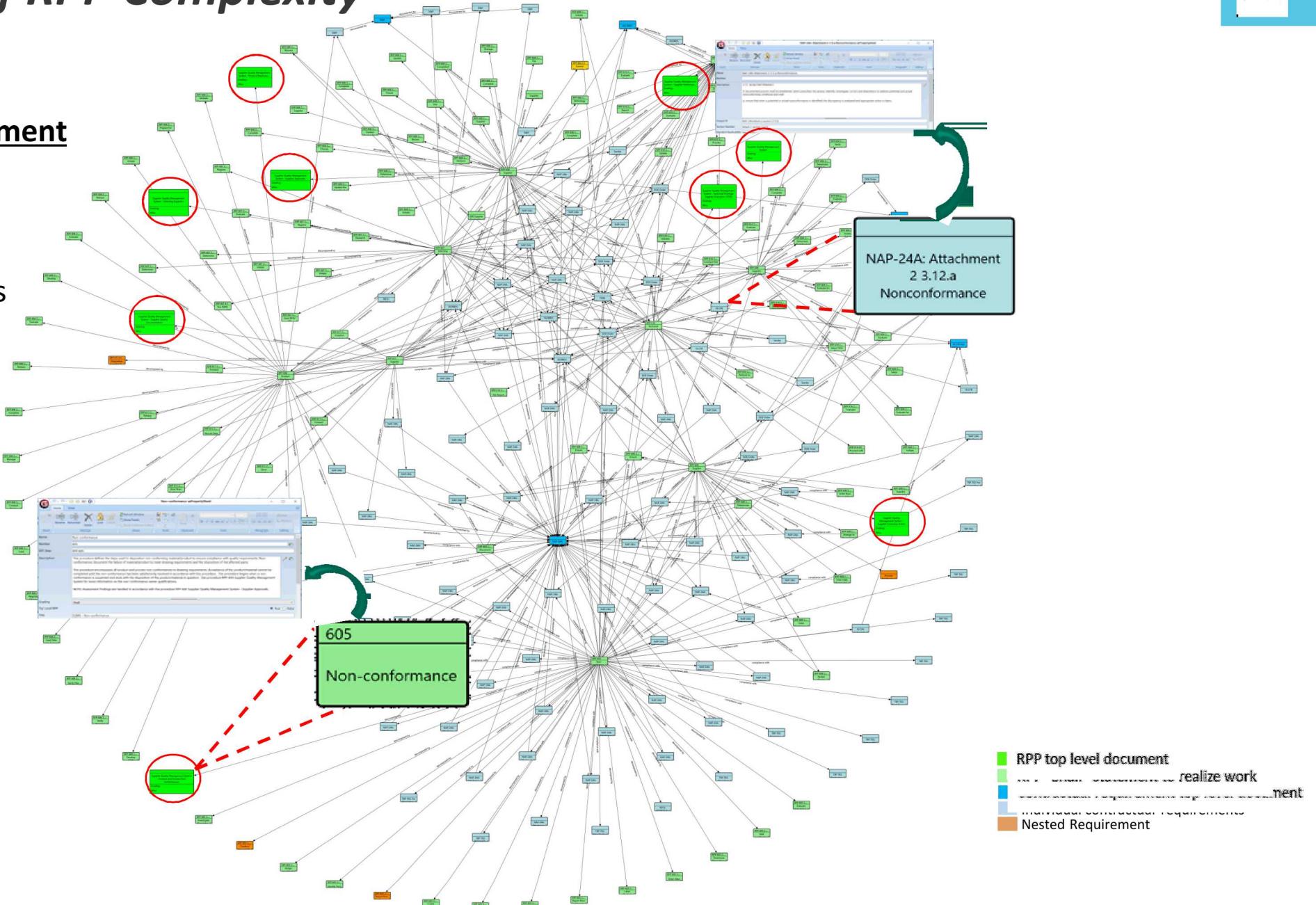
Schema for modeled information

Visualization of RPP Complexity

Supplier Quality Management System

Comprised of:

- 9 Procedures
- 8 contractual documents
- 180 requirements



Document Modeling

GENESYS Collaborative Edition

Project Explorer

Home Model Assistant Digital Engineering Integration Database Packages All Classes Category Change Request Package Component (5/5) Concern (12/12) ConstraintDefinition ConstraintTerm (601/601) Document (0/34) Appendices (136/136) IFRP Documents (8/8) C Document Standards (1/1) CFR Standards (1/1) D&B Manual (1/1) DOI Standards (1/1) ISO (1/1) NAP Standards (1/1) R Document Standards (17/17) RPP Document (130/143) Retired (13/13) Sandia Derived Requirement TBP (3/3) DomainSet (2/2) Event Exit (37/87) Externalfile (90/257) FullPort Function (9/9) Interface Item Link Mode Note Organization (1/1) Package (0/5) PortDefinition Product (36/159) ProgramActivity (1/2403) 001-99 Program Management (1/213) RPP 01 Project Management (37/37) RPP 02 Change Control for Project Management (3/3) RPP 06 Cost Management: Development Phase (5/5) RPP 07 Feasibility Study, Design Definition and Cost Study (11/11) RPP 09 Weapon Development Reports (24/24) RPP 10 Weapon Program Review Meetings (15/15) RPP 11 Weapon Project Reviews (13/13) RPP 12 Peer Reviews (74/74) RPP 16 Pilot Production Program Definition (8/8) RPP 18 Product Realization Report (5/5) RPP 21 Access to Weapon Display Area (8/8) RPP 22 Readiness Level (15/15) RPP 23 Nuclear Enterprise Assurance (24/24)

Properties Spider Hierarchy Requirements User Package Class Diagram Activity Sequence IDTD

General Physical Functional

Browser

Supplier Quality Management System asPropertySheet

Name: Supplier Quality Management System
Number: RPP-0004
Document Number: RPP-0004
Revision Number: D 6
Document Date: Thursday, December 14, 2012
Status: Released
Owner: Design Governance Board (DGB)
External File Path: RPP-004_Supplier Quality Management System
Type: RPP Document
Title: Supplier Quality Management System
Description:

Document Overview

This procedure defines the required approach for managing suppliers and their product for all production activities within the Nuclear Deterrence Program Management Office (NDPMO) that yield Mark Quality (MQ) product. This includes all MQ activities (both on-site production at Sandia National Laboratories (SNL) and off-site production managed by SNL) and may include Process Prove-In (PPI) and/or Quality Evaluation (QE) activities if intended to yield MQ product. All product realization activities that will yield Mark Quality (MQ) product require the use of Mark Quality input materials. Input materials consist of both direct material (stays with the final product) and indirect material (comes in contact with the product during fabrication, but does not stay with the final product). This includes all materials procured for on-site production activities and Government Furnished Materials (GFM) provided to external suppliers by SNL for off-site production activities. Mark Quality product includes War Reserve (WR) material, piece-parts, assemblies, and major components and WR-related tooling, handling equipment, and test equipment.

Applicability

Suppliers are essential partners in manufacturing product for the NDPMO. This procedure not only defines the Supplier Quality Management System (SQMS), but also invokes a set of procedures to enhance the ability of both internal capabilities and external suppliers to consistently yield acceptable products.

The NDPMO does not require the use of the SQMS set of procedures for product realization activities that will yield non-Mark Quality (non-MQ) product. However, the use of the SQMS set of procedures is still highly recommended for these activities, which may include development, PPI, and/or QE phases. Incorporating SQMS philosophies during development activities while engaging the prospective supplier base often results in various product realization benefits (i.e., producibility, progress up product learning curve, supplier

This procedure applies to the following:

- Product Realization Team (PRT) Lead, Production Governance Board (PGB), all SQMS users
- All product realization activities that will yield MQ product, including QE product realization activities, should be used for development and PPI product realization activities.
- All products where SNL is the designated production agency (PA). For activities where SNL is not the designated PA, refer to local site procurement procedures.
- These procedures apply for all WR material, piece-parts, assemblies, and major components and WR-related tooling, handling equipment, and test equipment produced or procured by SNL.

Relationships

(all relationships) augmented by augments categorized by documents generates has comments impacted by owned by packaged by referenced by references refined by refines reports on revised by signed by supplied by traced from

Properties Spider Hierarchy Requirements

Targets & Attributes

- augmented by Procurement Policy
- augmented by Supply Chain Risk Management: Quality Level Program
- augments Control of Material in Production Stores
- augments Supplier Quality Management System - Supplier Approvals
- documents RPP-004_Supplier Quality Management System
- referenced by Nuclear Enterprise Assurance
- referenced by Qualification Planning Process and Activities
- referenced by Supplier Quality Management System - Product and Process Non-Conformances
- referenced by Supplier Quality Management System - Product Readiness and Acceptance Preparation
- referenced by Supplier Quality Management System - Selecting Suppliers
- referenced by Supplier Quality Management System - Supplier Corrective Action
- referenced by Supplier Quality Management System - Supplier Performance Monitoring
- referenced by Product Acceptance Process and Activities Overview
- referenced by Supplier Quality Management System - Product Readiness and Acceptance Preparation
- referenced by Supplier Quality Management System - Selecting Suppliers
- referenced by Supplier Quality Management System - Supplier Approvals
- referenced by Supplier Quality Management System - Supplier Corrective Action

Sort: RPP Step Order

Repository: AS35MCSNT.snm.sandia.gov | Project: Digital Engineering Integration | Username: Administrator | Authentication Mode: GENESYS

Requirements Modeling

GENESYS Collaborative Edition

Project Explorer

Properties Spider Hierarchy Requirements User Case Class Diagram Entity Activity Sequence IDEF1X

General Physical Functional

NAP-24A: Attachment 2 2.4.a Early and Continuous Application of Quality Principles as PropertySheet

Attributes **Properties** **Parameters** **Diagnostics**

Relationships

- all relationships
- augmented by
- categorized by
- clarified by
- clarifies
- documented by
- has comments
- impacted by
- packaged by
- refined by
- refines
- satisfied by
- traced from
- traces to

Targets & Attributes

- documented by **Weapon Quality Policy**
 - satisfied by RPP 103 Qualification Planning Process and Activities [Digital Engineering Integration]
 - traces to R001:FR11562 Feasibility Study Stage
 - traces to R001:FR31422 Conceptual Design Stage
 - traces to R001:FR66761 Conceptual Design Stage
 - traces to R001:FR72352 Conceptual Design Stage
 - traces to R001:FR74391 Feasibility Study Stage
 - traces to R001:FR78574 Baseline Design Stage
 - traces to R001:FR85817 Baseline Design Stage
 - traces to R001:FR87842 Production Engineering Stage

Filter: All Entities Sort: Numeric

Properties Spider Hierarchy

Repository: AS3MCSNT.srm.sandalog Project: Requirements Traceability Username: Administrator Authentication Mode: GENESYS

efficiency





Manage the model not the artifact!



Thank You!

Topic Discussion (15mins)

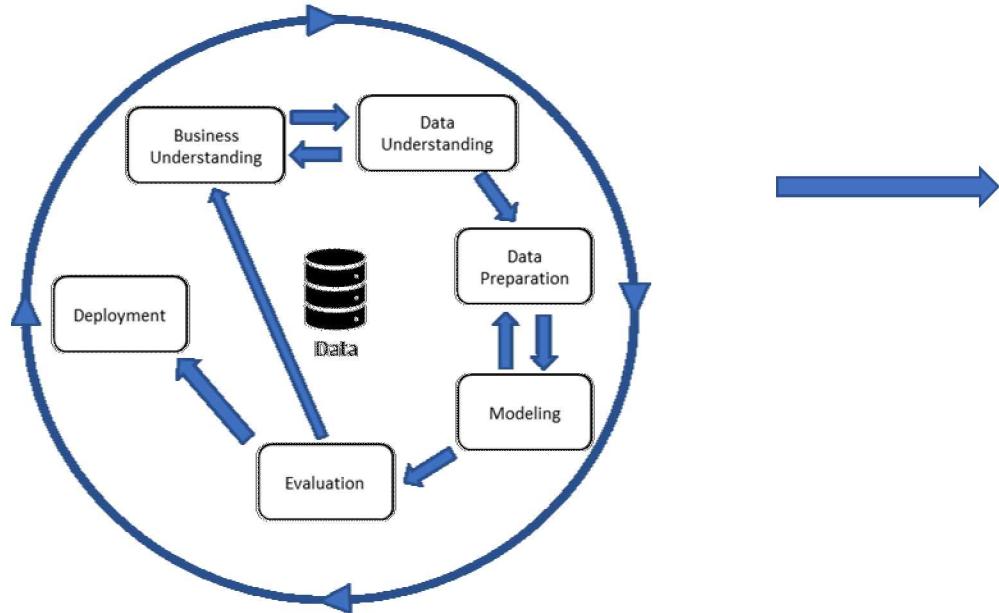


Back-up Slides

NW Engineering Process Modeling

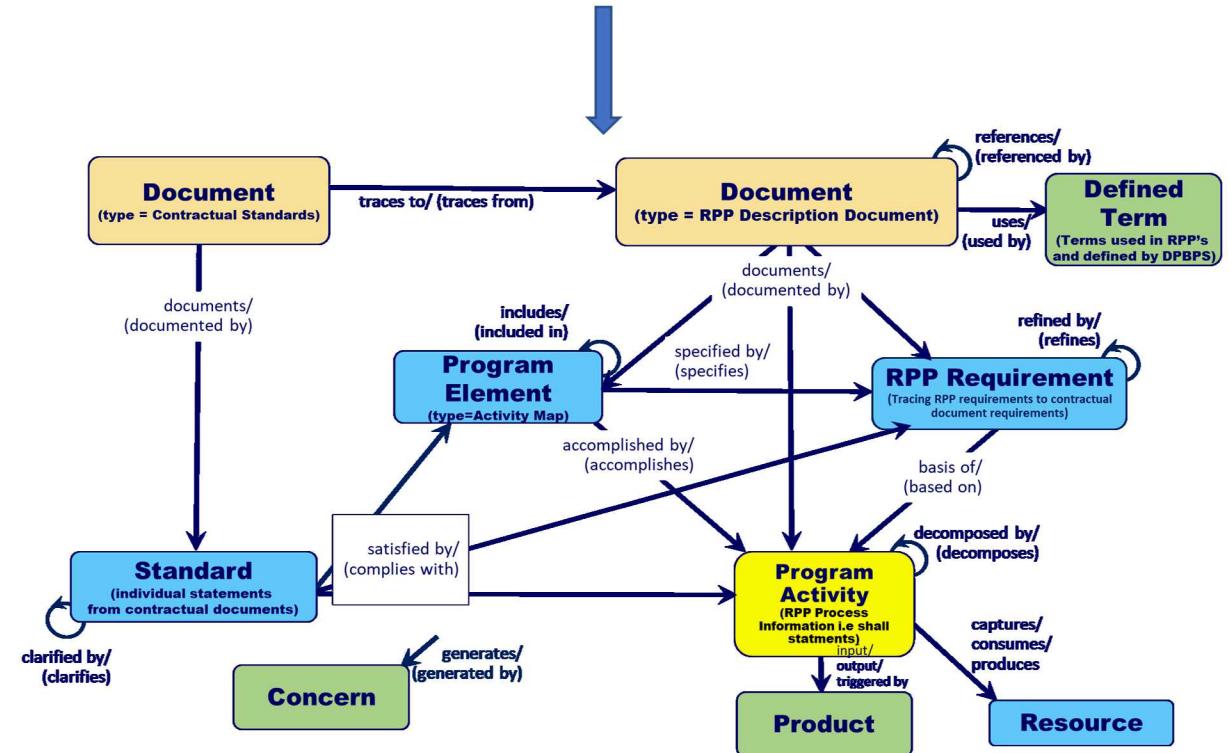
14

MBSE Project Approach



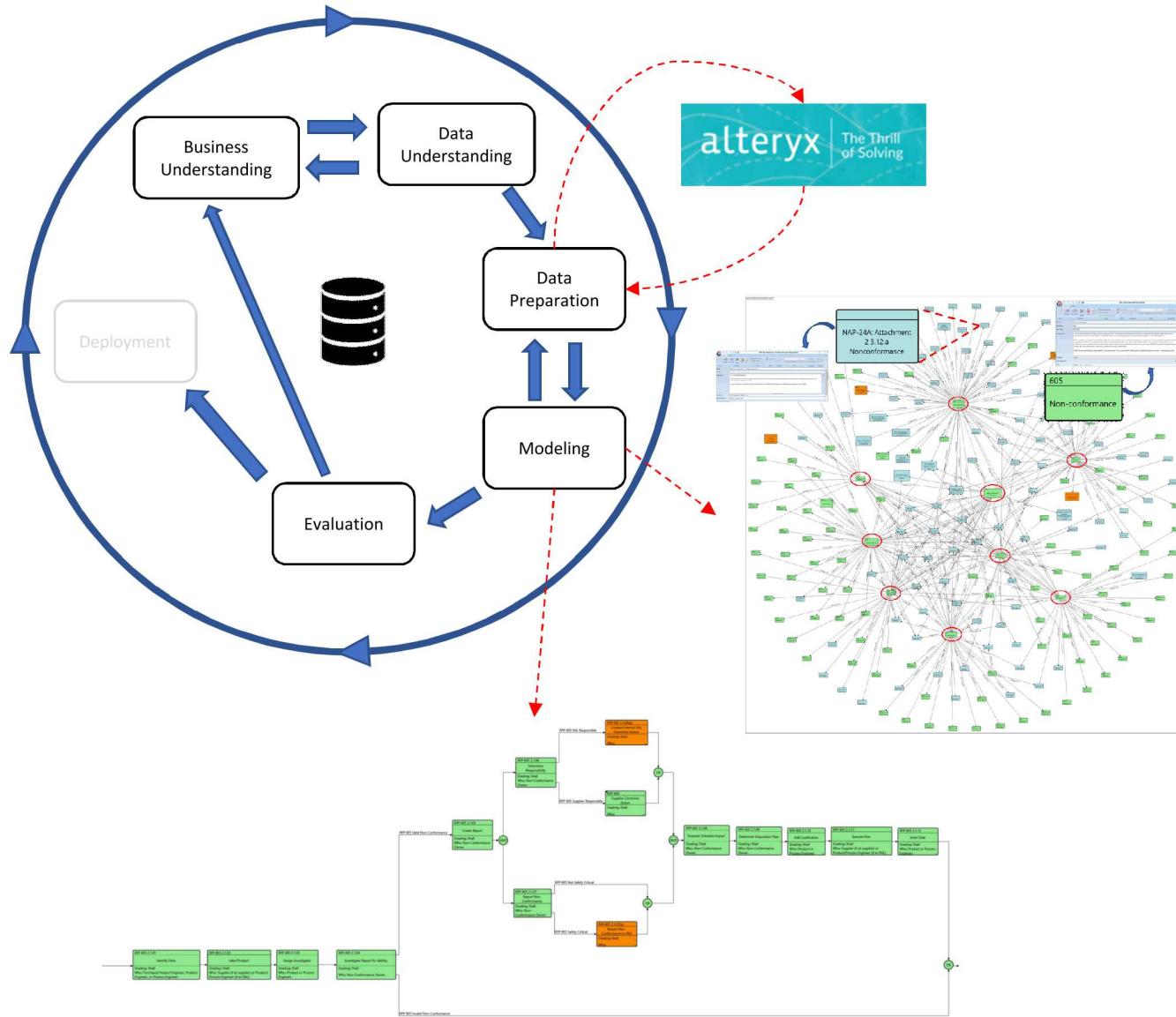
Cross Industry Standard Process for Data Mining (CRISP-DM):
a methodology that provides a structured approach to data mining.

- NW Engineering Process Modeling
- Requirements Traceability
- Text Analytics



NW Engineering Process Modeling

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The project focuses on RPSS process improvement cornerstones:

- Understanding and improving the current system
- Visualizing interactions and system complexity
- Identifying process areas of redundancy and/or gaps
- Building efficiencies in how documents are managed

What Worked:

- Creating a foundation for the future
 - Understanding cause and effect of cycle time reduction efforts
 - Understanding, quantifying, and communicating risk
 - Building efficiency into the SNL site impact analysis process
 - Visual, modular, and model-based engagement with PRTs, improving the end user experience
- Document modularity to enable flexibility in content delivery.
- MBSE Digital Twin, mirroring the functionality of the current document relational database

Road Blocks:

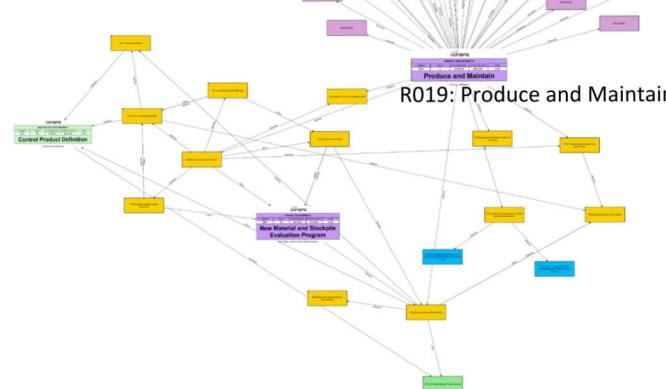
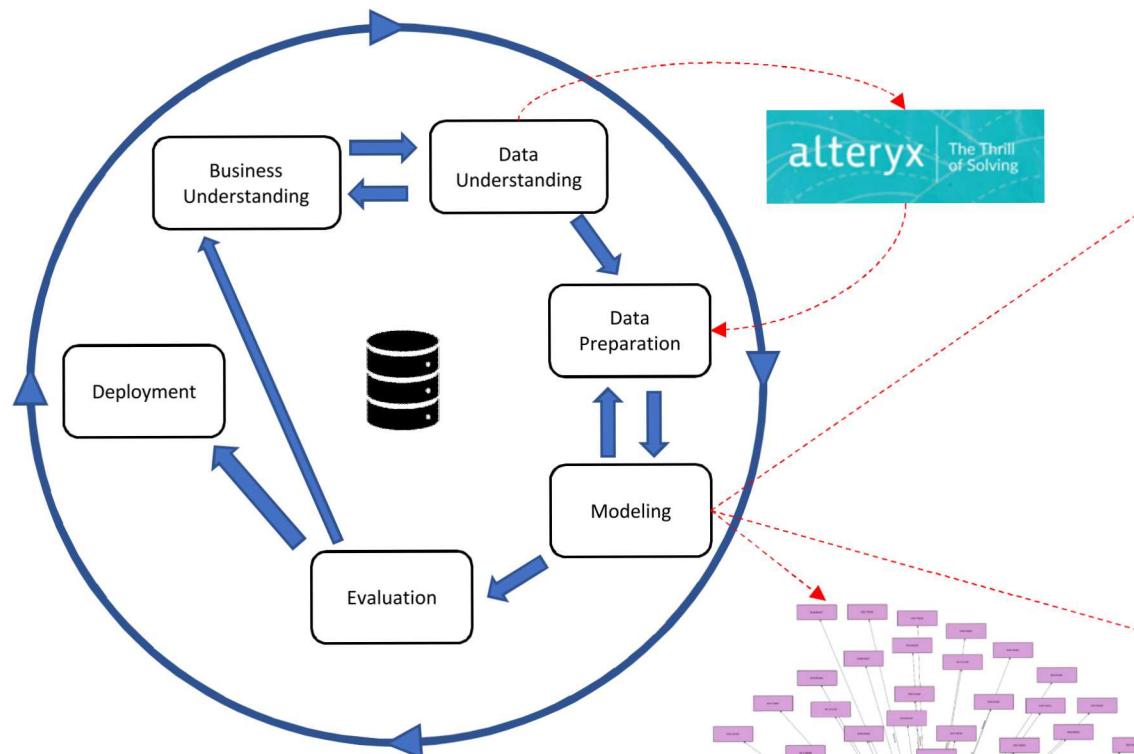
- Document "Shall" statements do not translate to Functional Flow Diagrams because they are not written in a requirement format
- Resistance to evolve/modernize programmatic documents from a document centric to a model based approach

Improvement Opportunity:

- Rewrite document "shall" statements to conform to a requirement standard (e.g. ANSI/IEEE Guide to Software Requirements STD 830)
- Leadership MBSE support

Requirement Traceability

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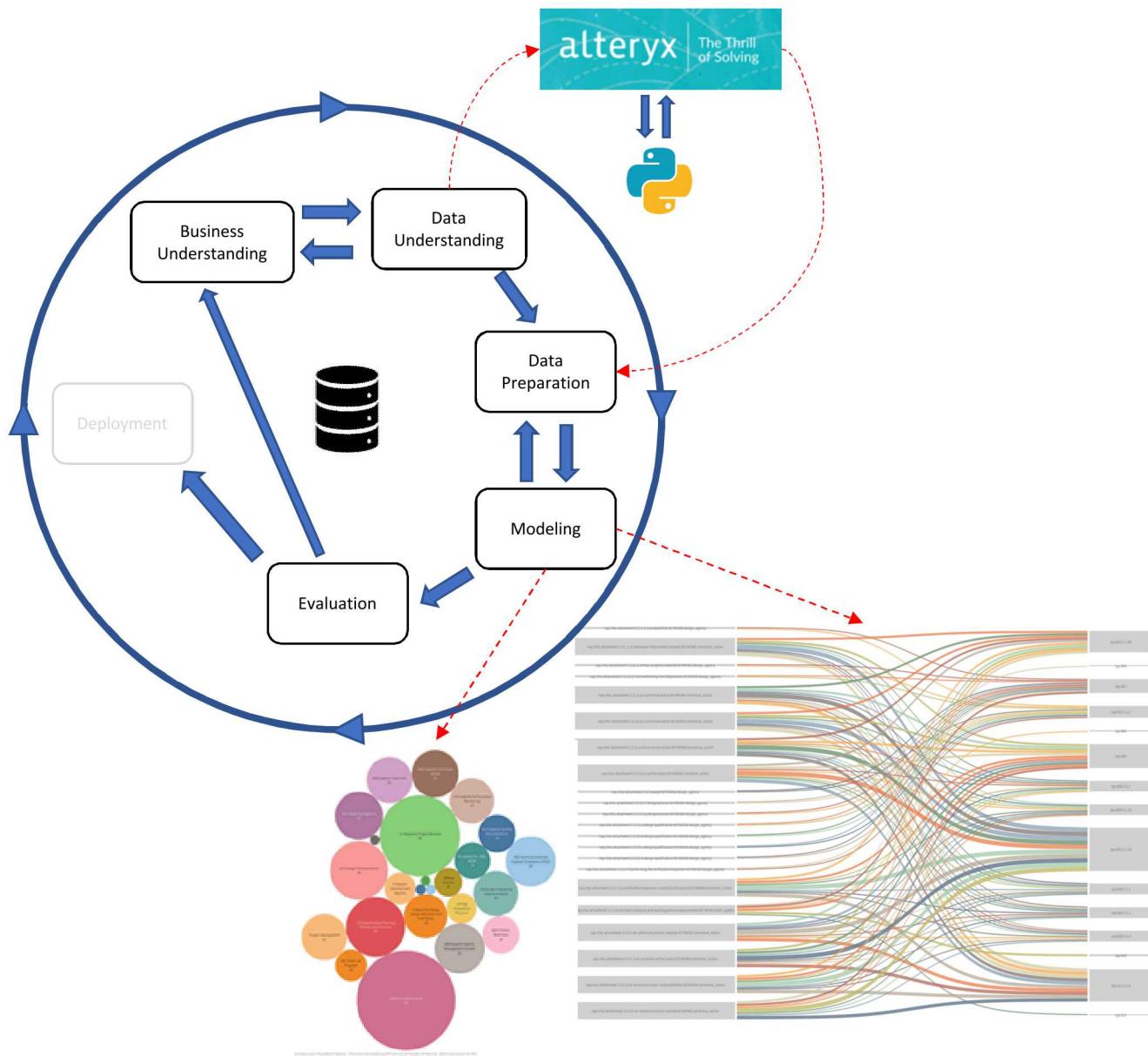


R001: Realization Process

R006: Implement Phase 6.x Process

R-Docs
C-Docs
T-Docs
DOE Reqs.

Text Analytics



Project focuses on the quality of data traceability

What Worked:

- Maintainability
 - By providing a means to keep data sources (PNPI/GENESYS/DPBPS) synchronized
 - Identify impacts of contractual requirements changes
 - Maintainable
 - Verifiable
- Data parsing of RPP's to provide meaningful insights (e.g.: topic, identify redundancies)
- Automated source document comparisons
 - Completeness and correctness
- Reduction in time required to perform a requirements impact analysis
- Identify quantitative vs qualitative measures
 - Implicit to explicit
 - Occurrence of specific terms and phrases

Road Blocks:

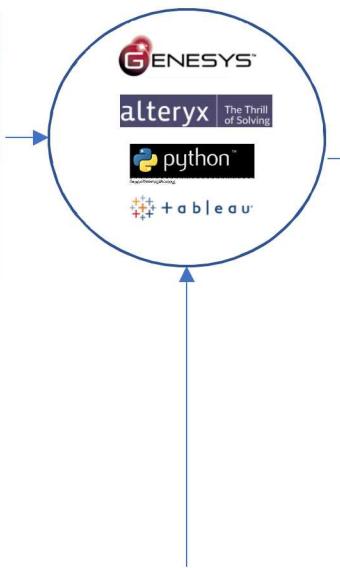
- Resistance to learn or be informed about technologies that can improve our current state

Improvement Opportunities:

- Leadership support to enable text analytics capabilities to leverage technology for better decision making and data processing in a cost effective way.

Process Modeling Software Eco-System

	Structured Data	Unstructured Data
Characteristics	<ul style="list-style-type: none"> Pre-defined data models Usually text only Easy to search 	<ul style="list-style-type: none"> No pre-defined data model May be text, images, sound, video or other formats Difficult to search
Resides in	<ul style="list-style-type: none"> Relational databases Data warehouses 	<ul style="list-style-type: none"> Applications NoSQL databases Data warehouses Data lakes



'What if' scenarios based on user requests

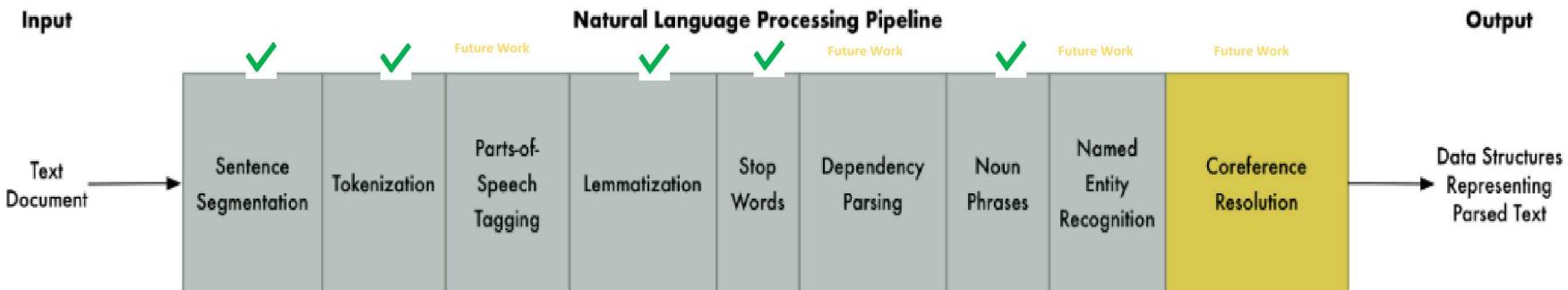
- Why?: To keep the system relevant to the way TA's perform work.
- How?: By implementing a software eco-system that enables rapid application development, testing, and deployment

Track changes between data sources

- Why?: Changes are inevitable; Access to accurate and timely information
- How?: Implementing processes to identify differences between data sources and data-syncs.

Automatically combine data into comprehensible reports for TA's

- Why?: Improve efficiency, accuracy, repeatability
- How?: Through the use of tools and processes to combine information in lieu of the existing manual process.



What is:

Alteryx? An analytical tool that enables data blending, discovery, preparation, and analysis of structured and unstructured data.

Tableau? Visual data representation for interactive data exploration

GENESYS? A tool that enables MBSE functionality through integrated system models that capture the critical interrelationships within the system and across the system design process.

Text analytics? Text analytics is the process of converting unstructured text data into meaningful data for analysis for business intelligence, exploratory data analysis, research, and investigation to support fact based decision making.