

NW Engineering Process Modeling

PRESENTED BY

Joshua Salinas, 2496

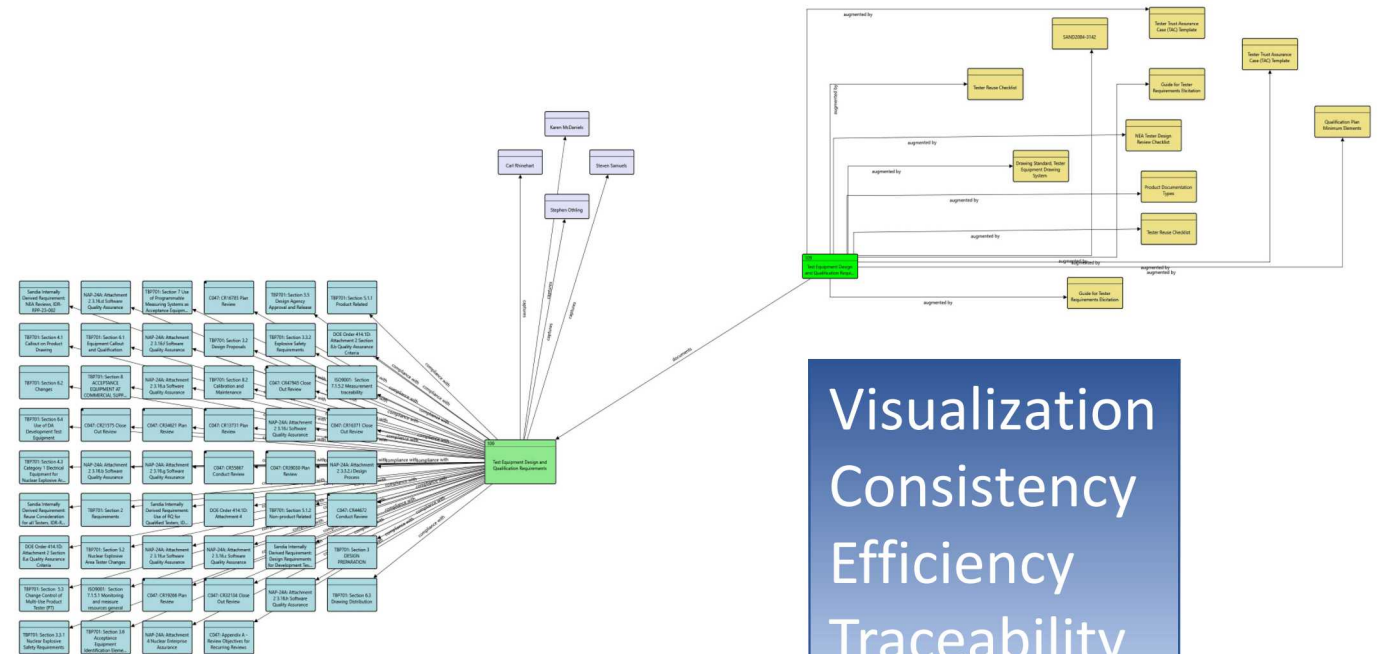


Sandia National Laboratories is a
multimission laboratory managed and
operated by National Technology &
Engineering Solutions of Sandia, LLC, a
wholly owned subsidiary of Honeywell
International Inc., for the U.S. Department
of Energy's National Nuclear Security
Administration under contract DE-
NA0003525.

Traditional



Future



Visualization
Consistency
Efficiency
Traceability
Modularity

Ripple effect of interconnected artifacts

Programmatic Process



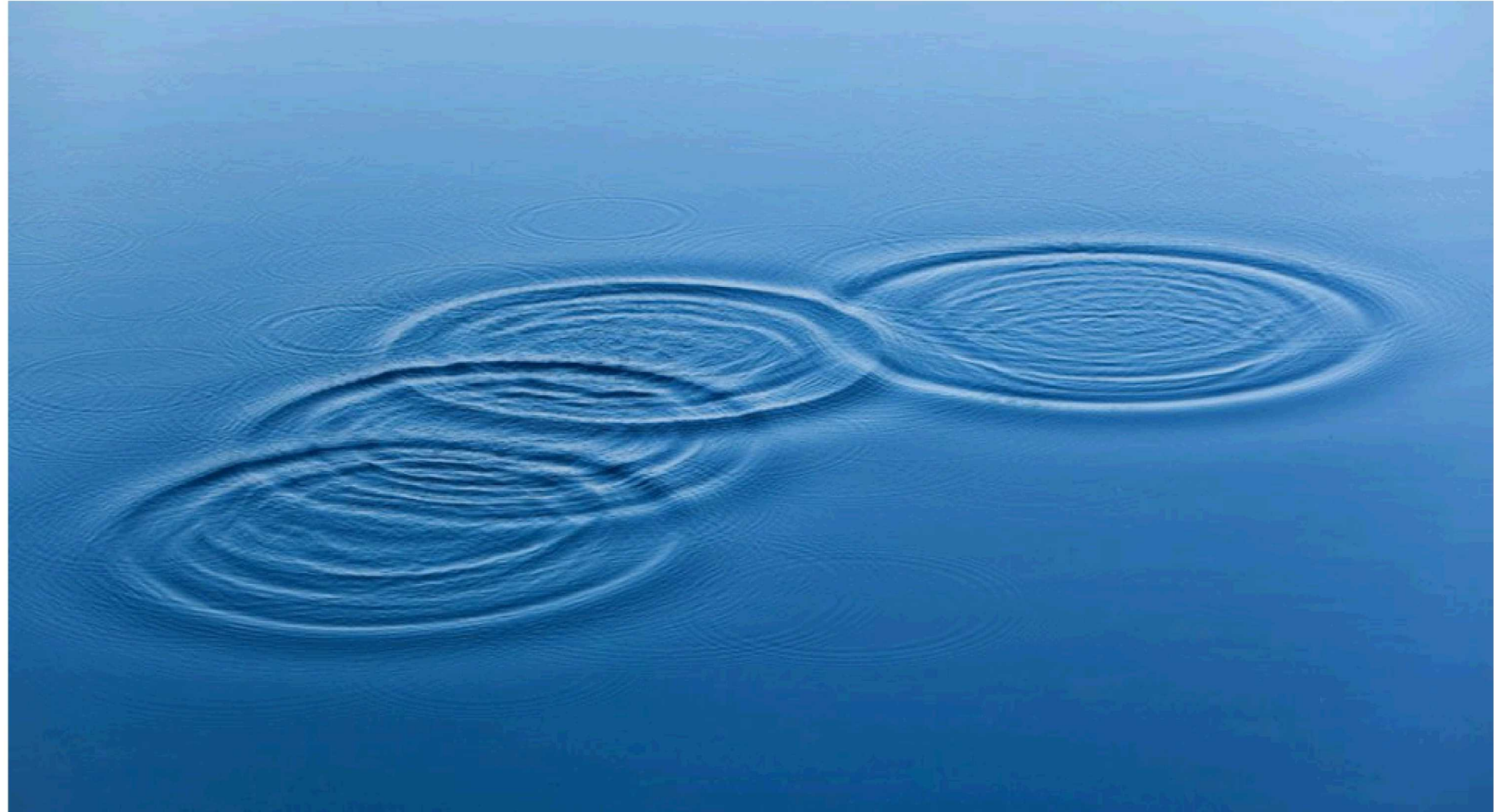
Requirements



Stakeholders



Schedules

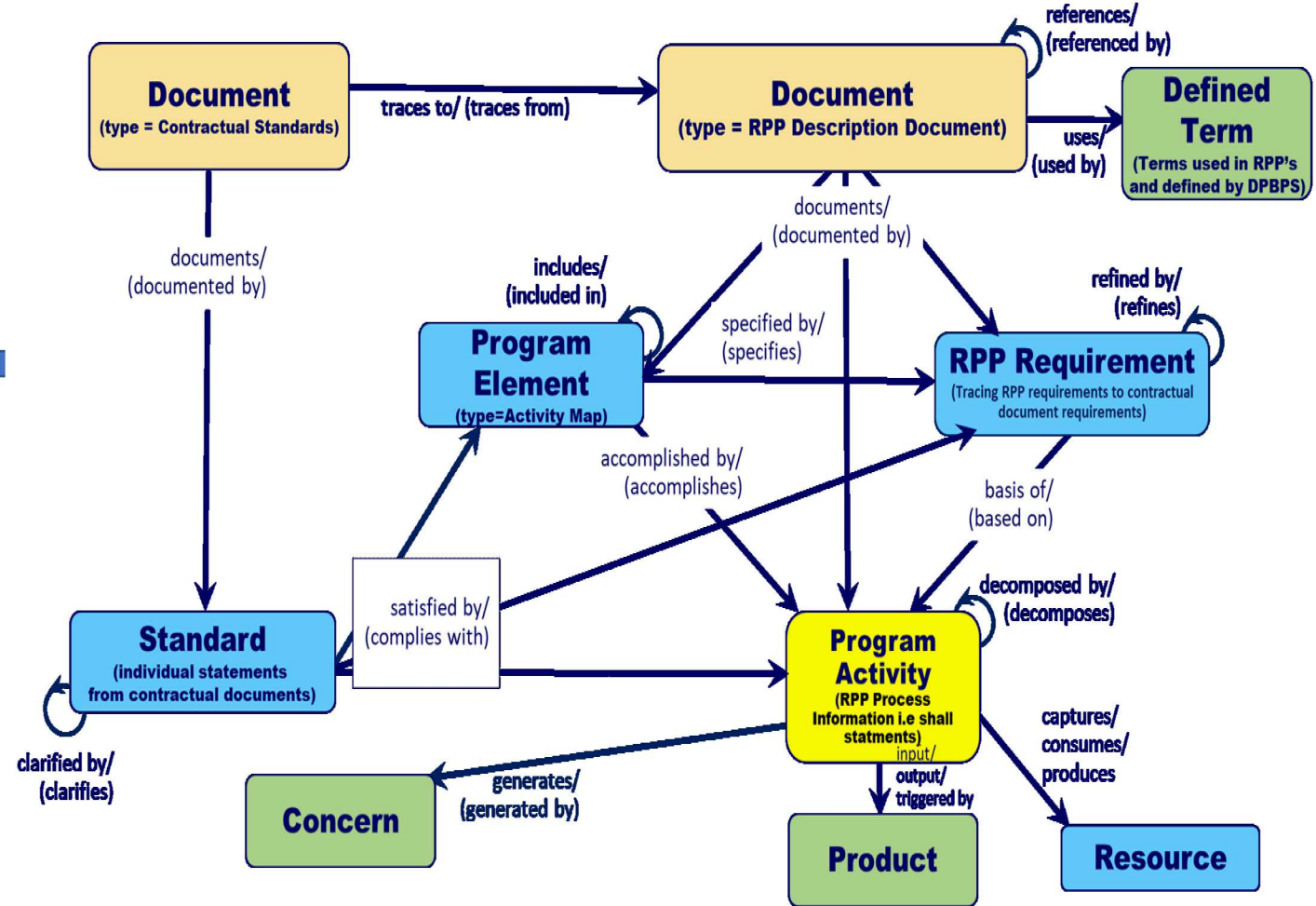
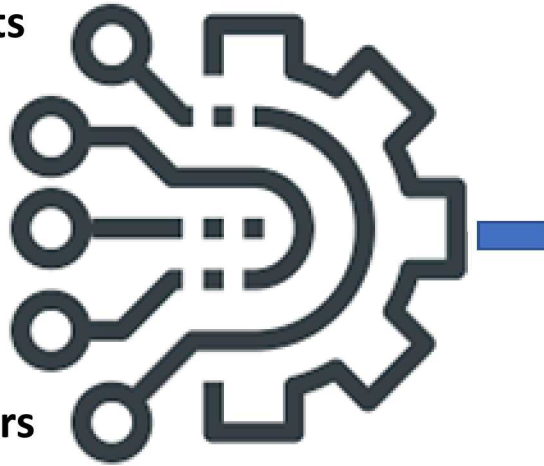


Sustainability



MBSE Approach

Subject Matter Experts
Requirements
Programmatic Processes
Document Artifacts
Stakeholders



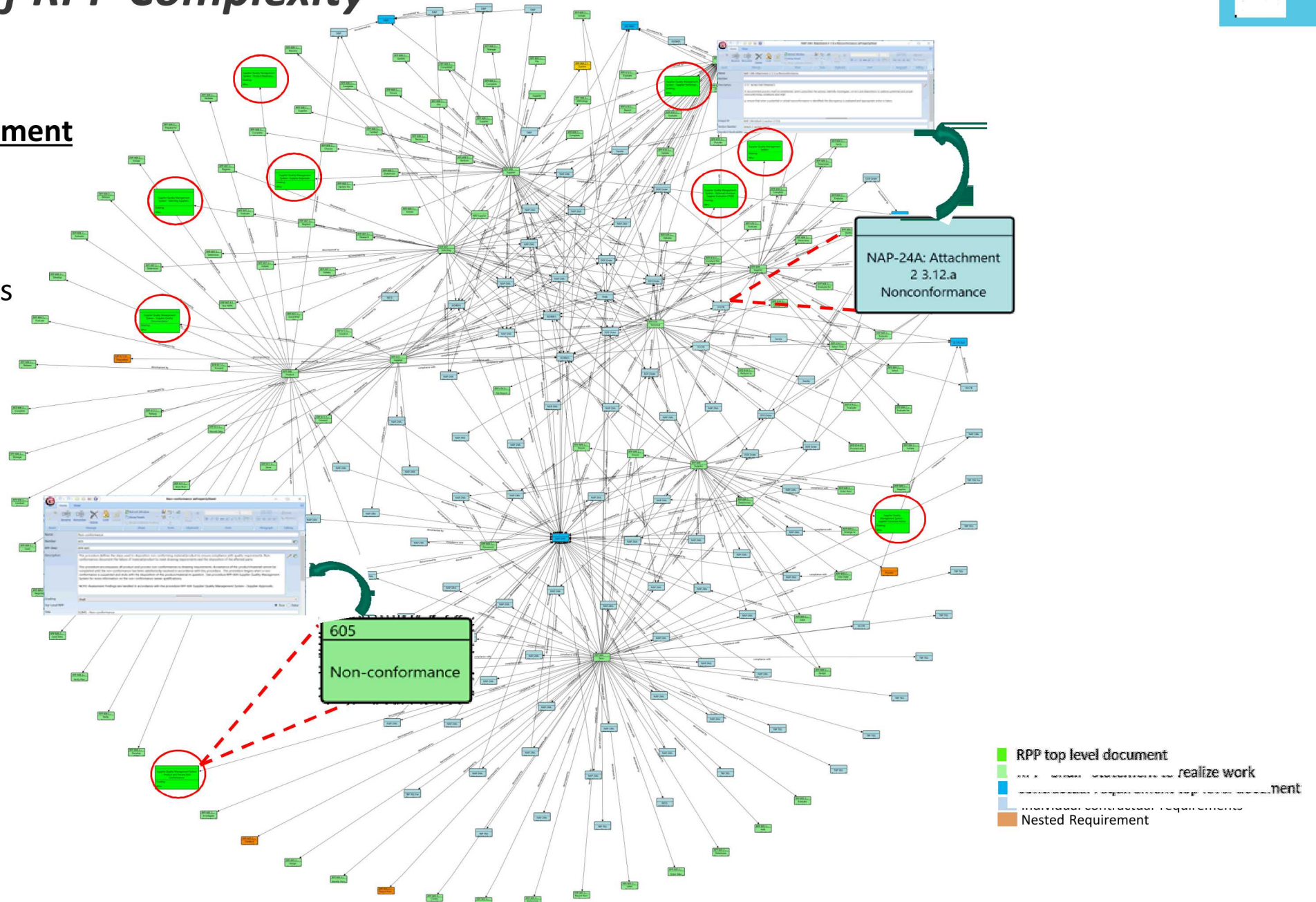
Schema for modeled information

Visualization of RPP Complexity

Supplier Quality Management System

Comprised of:

- 9 Procedures
- 8 contractual documents
- 180 requirements



Requirements Modeling

The screenshot displays the GENESYS Collaborative Edition software interface, which is used for Requirements Modeling. The interface is divided into several main sections:

- Project Explorer (Left):** A tree view showing the project structure. It includes folders for 'C Docs', 'R Docs', 'US Codes', and 'State'. The 'C Docs' folder is expanded, showing various documents like 'CFR Standards', 'DOE Order', 'DOE INA-STD', 'EP Docs', 'ISO 9001', 'NA SD 452.4', 'NAP 130.1', 'NAP 413.3', 'NAP 413.4', 'NAP 24A', 'NNSA SD 251.1A', 'NNSA SD 412.1', 'NNSA SD 452.3.2', 'Other Source', 'Pico Anderson', 'R Docs', 'Sandia Derived Requirement', 'T Docs', 'TBP', 'US Codes', 'State', 'TestActivity', 'TestConfiguration', 'TestItem', 'TestProcedure', 'Text', 'Transition', 'UML Association', 'UseCase', 'VerificationEvent', and 'VerificationRequirement'.
- Browser (Middle):** A list of requirements, including 'NAP 24A: Attachment 2.2.1.a Risk Management', 'NAP 24A: Attachment 2.2.1.b Risk Management', 'NAP 24A: Attachment 2.2.3.a Organization', 'NAP 24A: Attachment 2.2.3.b Organization', 'NAP 24A: Attachment 2.2.3.c Organization', 'NAP 24A: Attachment 2.2.4.1.a Productivity', 'NAP 24A: Attachment 2.2.4.1.b Productivity', 'NAP 24A: Attachment 2.2.4.a Early and Continuous Application of Quality Principles', 'NAP 24A: Attachment 2.2.4.b Early and Continuous Application of Quality Principles', 'NAP 24A: Attachment 2.2.4.c Early and Continuous Application of Quality Principles', 'NAP 24A: Attachment 2.2.5 Establishing and Validating Requirements', 'NAP 24A: Attachment 2.2.6.a Planning', 'NAP 24A: Attachment 2.2.6.b Planning', 'NAP 24A: Attachment 2.3.1 Control of Measuring and Test Equipment', 'NAP 24A: Attachment 2.3.1.1.a Continuous Improvement Process', 'NAP 24A: Attachment 2.3.1.1.b Continuous Improvement Process', 'NAP 24A: Attachment 2.3.1.1.c Continuous Improvement Process', 'NAP 24A: Attachment 2.3.1.1.d Continuous Improvement Process', 'NAP 24A: Attachment 2.3.1.2.a Prevention Versus Detection', 'NAP 24A: Attachment 2.3.1.2.b Prevention Versus Detection', 'NAP 24A: Attachment 2.3.1.3 Metrics', 'NAP 24A: Attachment 2.3.1.1 Government Furnished Material', 'NAP 24A: Attachment 2.3.11.2.a NNSA-Accepted Material', 'NAP 24A: Attachment 2.3.11.2.b NNSA-Accepted Material', 'NAP 24A: Attachment 2.3.11.2.c NNSA-Accepted Material', 'NAP 24A: Attachment 2.3.11.2.d NNSA-Accepted Material', 'NAP 24A: Attachment 2.3.11.2.e NNSA-Accepted Material', 'NAP 24A: Attachment 2.3.11.a Handling, Storage, Packaging and Distribution', 'NAP 24A: Attachment 2.3.11.b Handling, Storage, Packaging and Distribution', 'NAP 24A: Attachment 2.3.11.c Handling, Storage, Packaging and Distribution', 'NAP 24A: Attachment 2.3.12.1 Nonconforming Item Control', 'NAP 24A: Attachment 2.3.12.1.c Nonconforming Item Control', 'NAP 24A: Attachment 2.3.12.1.d Nonconforming Item Control', 'NAP 24A: Attachment 2.3.12.1.e Nonconforming Item Control', 'NAP 24A: Attachment 2.3.12.1.f Nonconforming Item Control', 'NAP 24A: Attachment 2.3.12.2.a Nonconforming Item Disposition', 'NAP 24A: Attachment 2.3.12.2.b Nonconforming Item Disposition', 'NAP 24A: Attachment 2.3.12.2.c Nonconforming Item Disposition', 'NAP 24A: Attachment 2.3.12.2.d Nonconforming Item Disposition', 'NAP 24A: Attachment 2.3.12.2.e Nonconforming Item Disposition', 'NAP 24A: Attachment 2.3.12.2.f Nonconforming Item Disposition', 'NAP 24A: Attachment 2.3.12.2.g Nonconforming Item Disposition', 'NAP 24A: Attachment 2.3.12.2.h Nonconforming Item Disposition', 'NAP 24A: Attachment 2.3.12.2.i Nonconforming Item Disposition', 'NAP 24A: Attachment 2.3.12.2.j Nonconforming Item Disposition', 'NAP 24A: Attachment 2.3.12.2.k Nonconforming Item Disposition', 'NAP 24A: Attachment 2.3.12.2.l Nonconforming Item Disposition', 'NAP 24A: Attachment 2.3.12.2.m Nonconforming Item Disposition', 'NAP 24A: Attachment 2.3.12.a Nonconformance', 'NAP 24A: Attachment 2.3.12.b Nonconformance', 'NAP 24A: Attachment 2.3.12.c Nonconformance', 'NAP 24A: Attachment 2.3.12.d Nonconformance', 'NAP 24A: Attachment 2.3.12.e Nonconformance', 'NAP 24A: Attachment 2.3.13.a Corrective Action', and 'NAP 24A: Attachment 2.3.13.b Corrective Action'.
- Property Sheet (Right):** A detailed view of the selected requirement, 'NAP 24A: Attachment 2.2.4.a Early and Continuous Application of Quality Principles'. It includes fields for 'Name', 'Number', 'Description', 'Unique ID', 'Section Number', 'Tags', 'Standard Applicability', and 'Standard Rationale'. The 'Description' field contains the text: 'NNSA contractors responsible for weapon and weapon-related product or process design shall a. have a documented process to ensure that operating, production, and quality requirements are incorporated in the design process as early as feasible;'. The 'Standard Applicability' field is set to 'Mandatory'.
- Relationships (Bottom Left):** A section showing the relationships between the selected requirement and other requirements. It includes a list of relationships, such as 'documented by', 'augmented by', 'categorized by', 'clarified by', 'documented by', 'has comments', 'impacted by', 'packaged by', 'refined by', 'refines', 'satisfied by', 'traced from', and 'traces to'.
- Targets & Attributes (Bottom Right):** A section showing the targets and attributes of the selected requirement. It includes a list of targets, such as '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', and 'traces to: R001: FR87842 Production Engineering Stage'.

The bottom status bar shows the repository path 'Repository: AS35MCSNT.srm.sandia.gov', the project name 'Project: Requirements Traceability', the username 'Username: Administrator', and the authentication mode 'Authentication Mode: GENESYS'.

efficiency





Manage the model not the artifact!



Thank You!

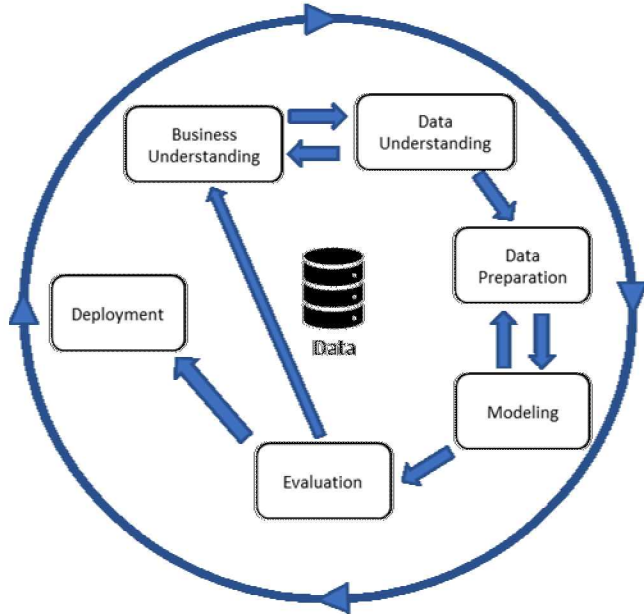
Topic Discussion (15mins)



Back-up Slides

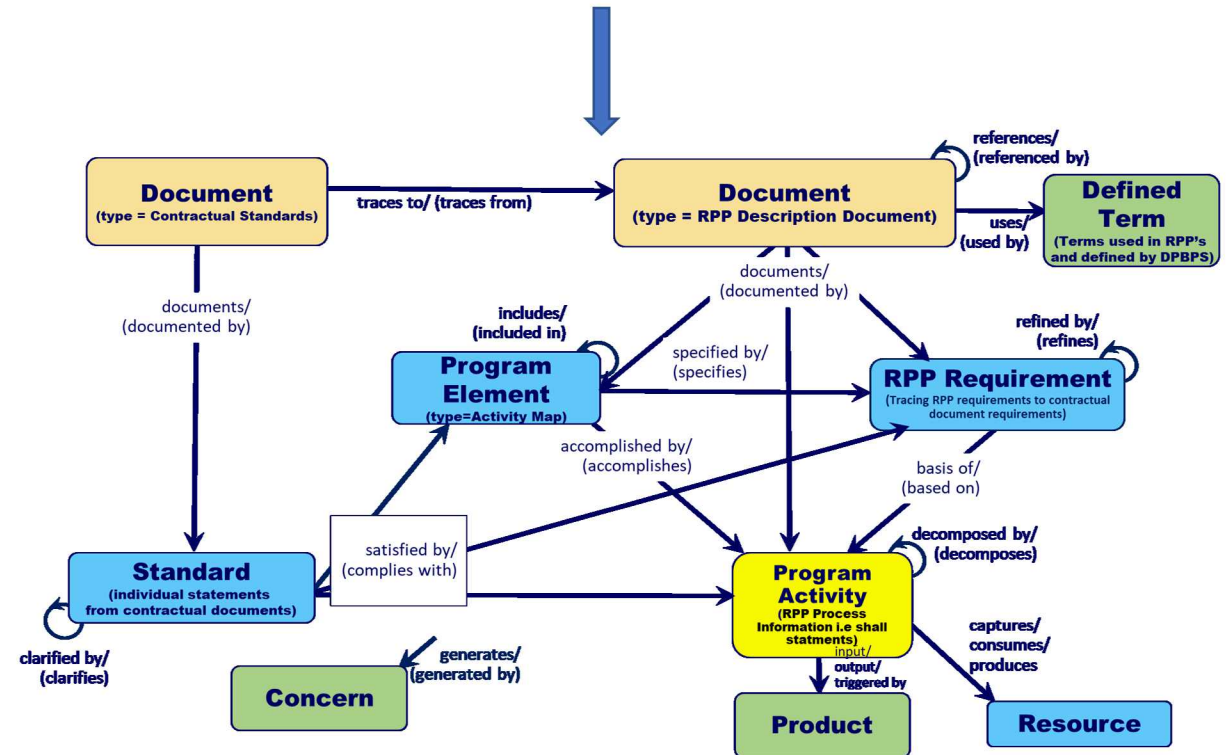
NW Engineering Process Modeling

MBSE Project Approach

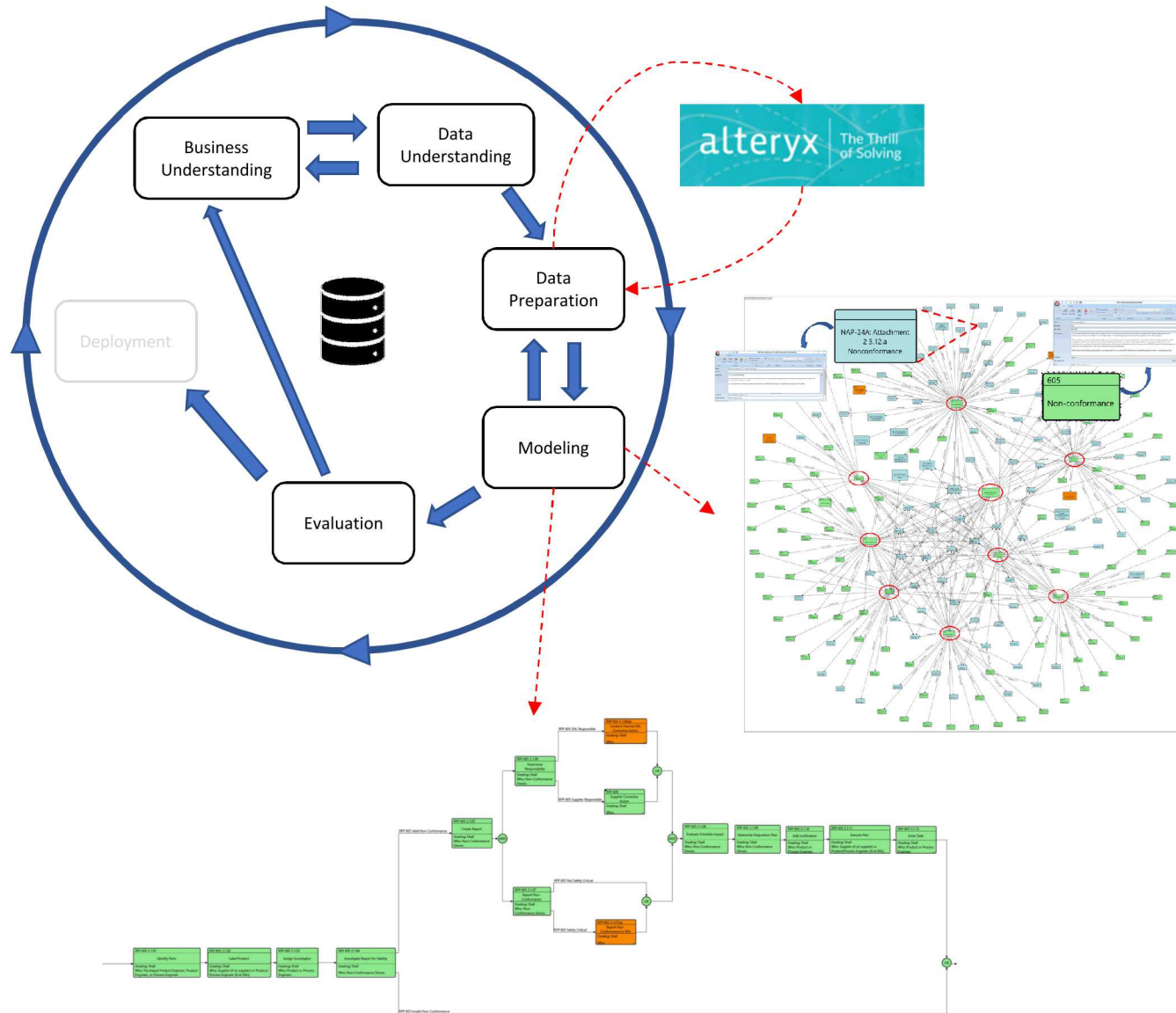


Cross Industry Standard Process for Data Mining (CRISP-DM):
a methodology that provides a structured approach to data mining.

- NW Engineering Process Modeling
- Requirements Traceability
- Text Analytics



NW Engineering Process Modeling



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

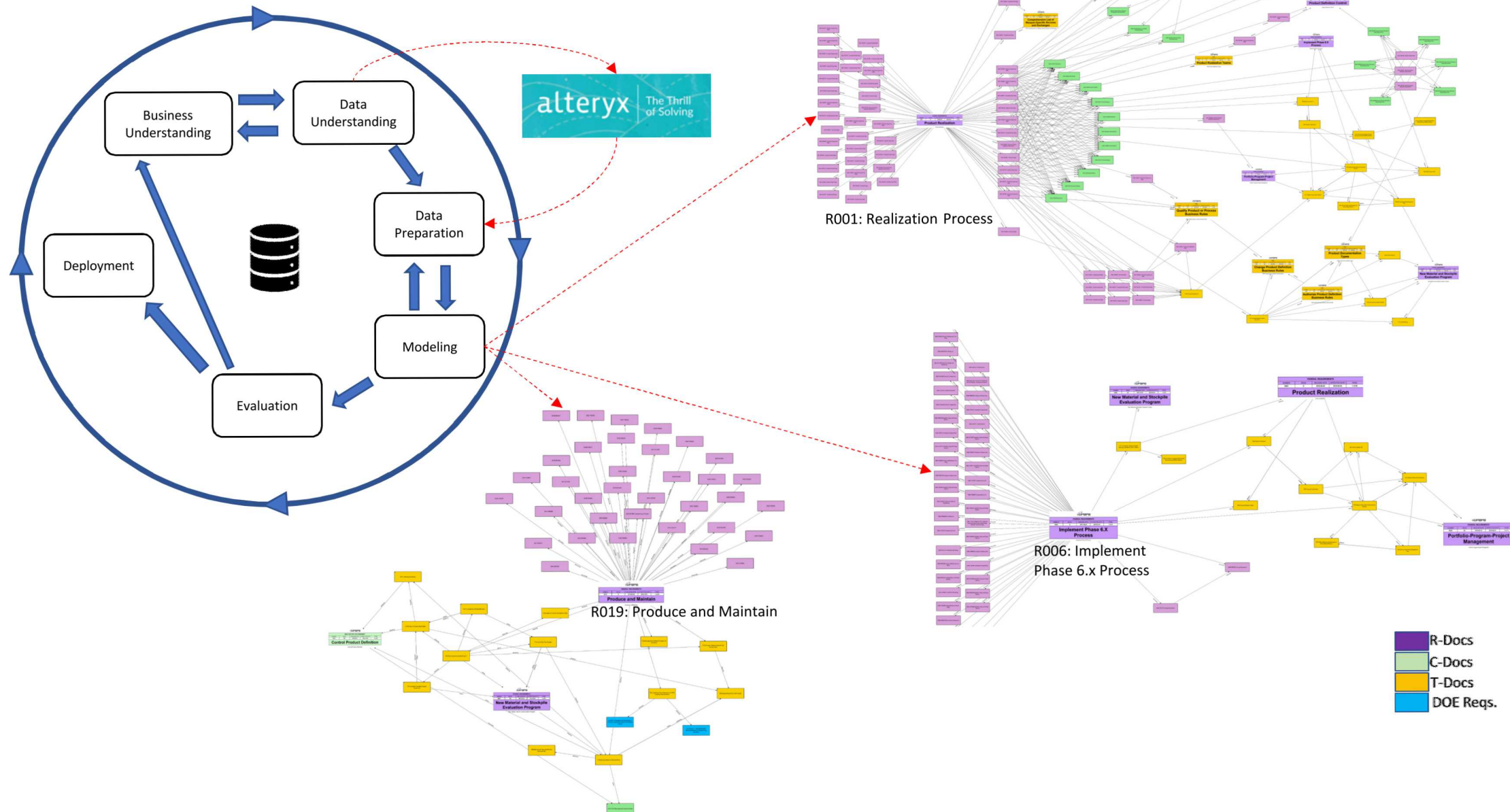
Road Blocks:

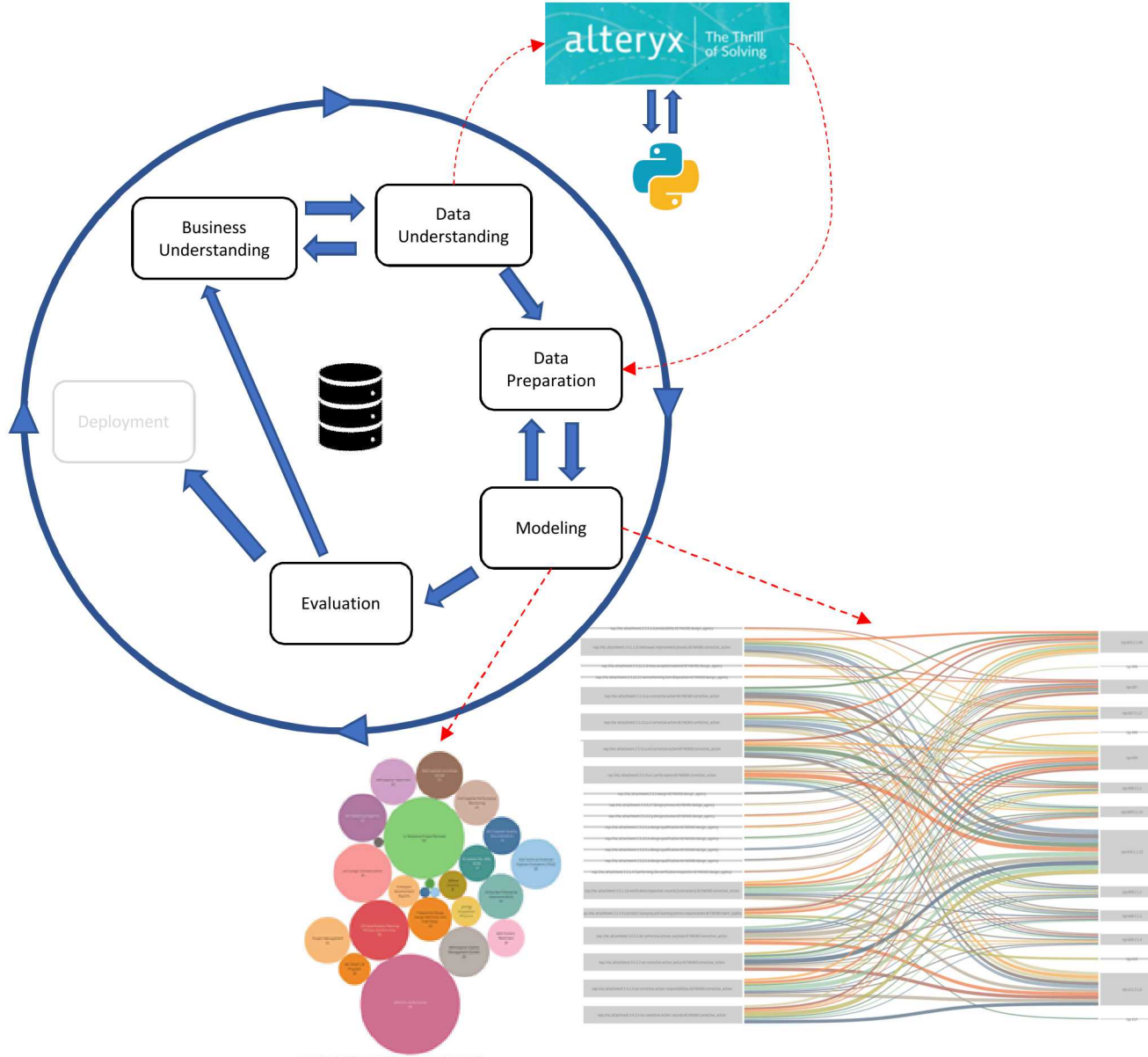
- Document “Shall” statements do not translate to Functional Flow Diagrams because they are not written in a requirement format
- Resistance to evolve/modernize programmatic documents from a document centric to a model based approach

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





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:

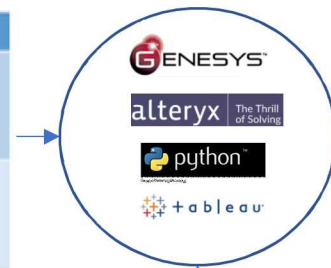
- Resistance to learn or be informed about technologies that can improve our current state

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 the 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.

