

Can Systems Engineering Enhance Policy Development?

HEATHER MASTAPETER
STEVEN H. DAM, PH.D., ESEP
SPEC INNOVATIONS
STEVEN.DAM@SPECINNOVATIONS.COM



Outline

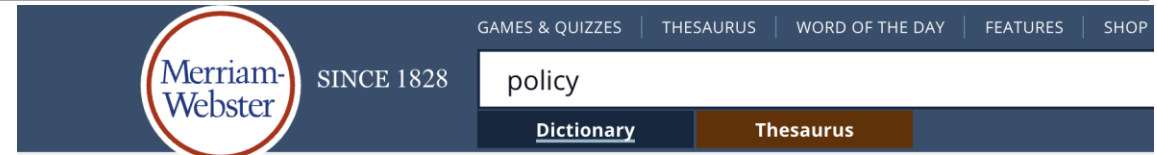
1. What Is a Policy?
2. How Can We Apply SE to Improve Policies?
3. How Can We Implement this Approach without Scaring Policy Makers?

1. WHAT IS A POLICY?



What's a Policy

- Lot's of definitions, but the “Merriam-Webster” shows the key elements
 - Definite course of action
 - High-level overall plan
- But what is it in Systems Engineering terms?



policy **noun (1), often attributive**

 Save Word

pol-i-cy | \ 'pä-lə-sē  \

plural **policies**

Definition of *policy* (Entry 1 of 2)

- 1
 - a** : prudence or wisdom in the management of affairs
 - b** : management or procedure based primarily on material interest
- 2
 - a** : a definite course or method of action selected from among alternatives and in light of given conditions to guide and determine present and future decisions
 - b** : a high-level overall plan embracing the general goals and acceptable procedures especially of a governmental body

<https://www.merriam-webster.com/dictionary/policy> accessed 10/10/2022

Policies in SE Terms

- Policies contain *requirements and constraints* for the organization
- Those requirements and constraints are *allocated or traced* to different parts of the organization
- Policies also frequently contain processes or procedures which are essentially implementation *scenarios*

Why not apply systems engineering techniques to analyze these policies to make sure they work prior to implementation?

2. HOW CAN WE APPLY SE TO IMPROVE POLICIES?

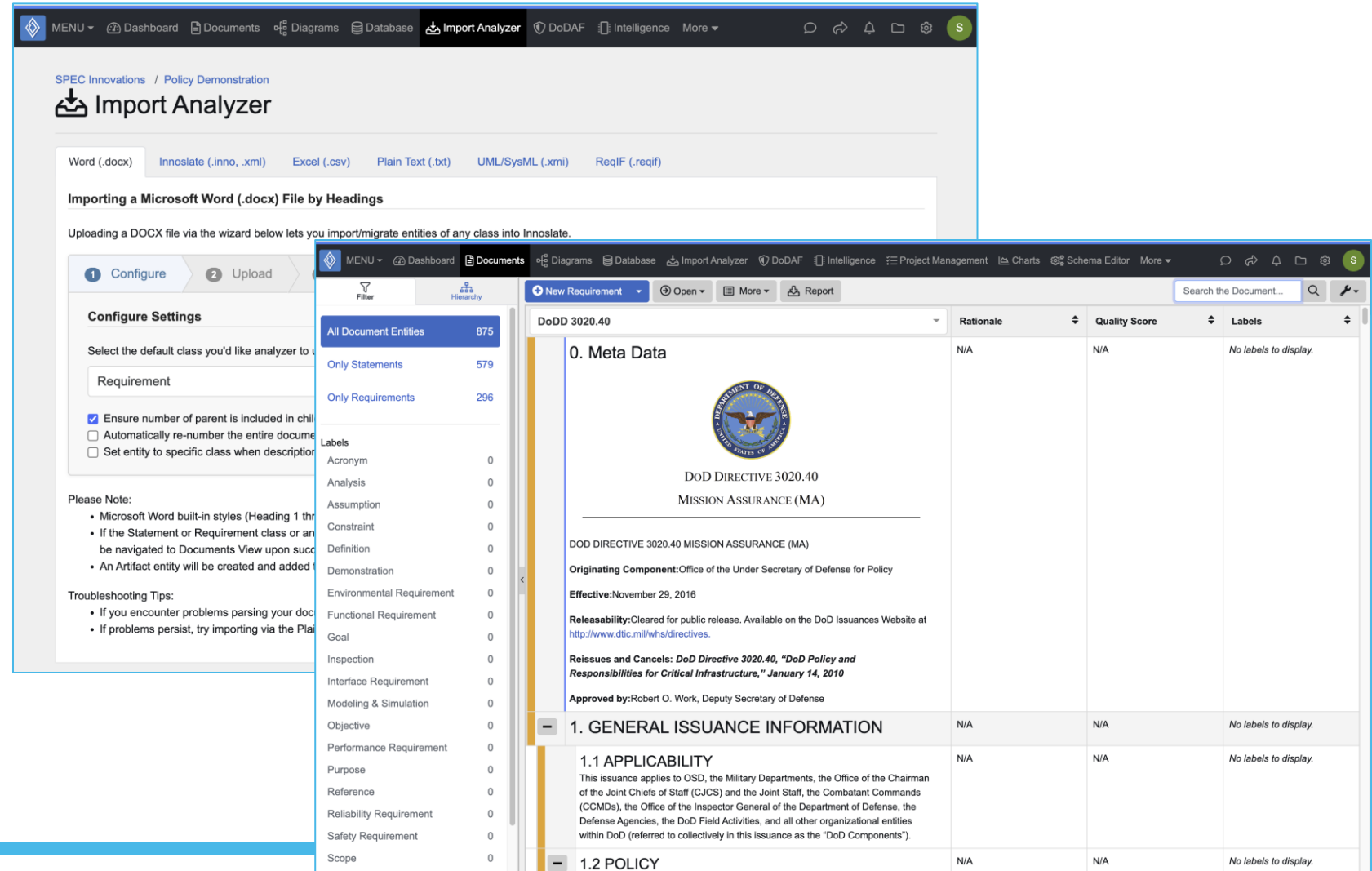


Apply Requirements Analysis

- Treat the policy draft(s) as a requirements document
- Analyze for quality (clarity, completeness, etc.)
- Enhance the text using these quality criteria
- Use a “document view” for presentation to stakeholders
- Capture comments in tool and produce “comment matrix”

RA: Treat the policy draft(s) as a requirements document

- Import documents into a requirements analysis tool
- Break paragraphs into individual requirements for analysis
- Note many statements may not be written like a requirements, but still are requirements



Import Analyzer

Word (.docx) Innoslate (.inno, .xml) Excel (.csv) Plain Text (.txt) UML/SysML (.xmi) ReqIF (.reqif)

Importing a Microsoft Word (.docx) File by Headings

Uploading a DOCX file via the wizard below lets you import/migrate entities of any class into Innoslate.

1 Configure 2 Upload

Configure Settings

Select the default class you'd like analyzer to use

Requirement

Ensure number of parent is included in child
 Automatically re-number the entire document
 Set entity to specific class when description

Please Note:

- Microsoft Word built-in styles (Heading 1 through 3)
- If the Statement or Requirement class or another class is selected, you will be navigated to Documents View upon success
- An Artifact entity will be created and added to the document

Troubleshooting Tips:

- If you encounter problems parsing your document, try importing via the Plain Text option
- If problems persist, try importing via the Plain Text option

Documents

All Document Entities 875
Only Statements 579
Only Requirements 296


Labels
Acronym 0
Analysis 0
Assumption 0
Constraint 0
Definition 0
Demonstration 0
Environmental Requirement 0
Functional Requirement 0
Goal 0
Inspection 0
Interface Requirement 0
Modeling & Simulation 0
Objective 0
Performance Requirement 0
Purpose 0
Reference 0
Reliability Requirement 0
Safety Requirement 0
Scope 0

DoDD 3020.40

Rationale Quality Score Labels

0. Meta Data

N/A N/A No labels to display.


DoD DIRECTIVE 3020.40
MISSION ASSURANCE (MA)

DOD DIRECTIVE 3020.40 MISSION ASSURANCE (MA)

Originating Component: Office of the Under Secretary of Defense for Policy

Effective: November 29, 2016

Releasability: Cleared for public release. Available on the DoD Issuances Website at <http://www.dtic.mil/whs/directives>.

Reissues and Cancels: DoD Directive 3020.40, "DoD Policy and Responsibilities for Critical Infrastructure," January 14, 2010

Approved by: Robert O. Work, Deputy Secretary of Defense

1. GENERAL ISSUANCE INFORMATION

N/A N/A No labels to display.

1.1 APPLICABILITY

N/A N/A No labels to display.

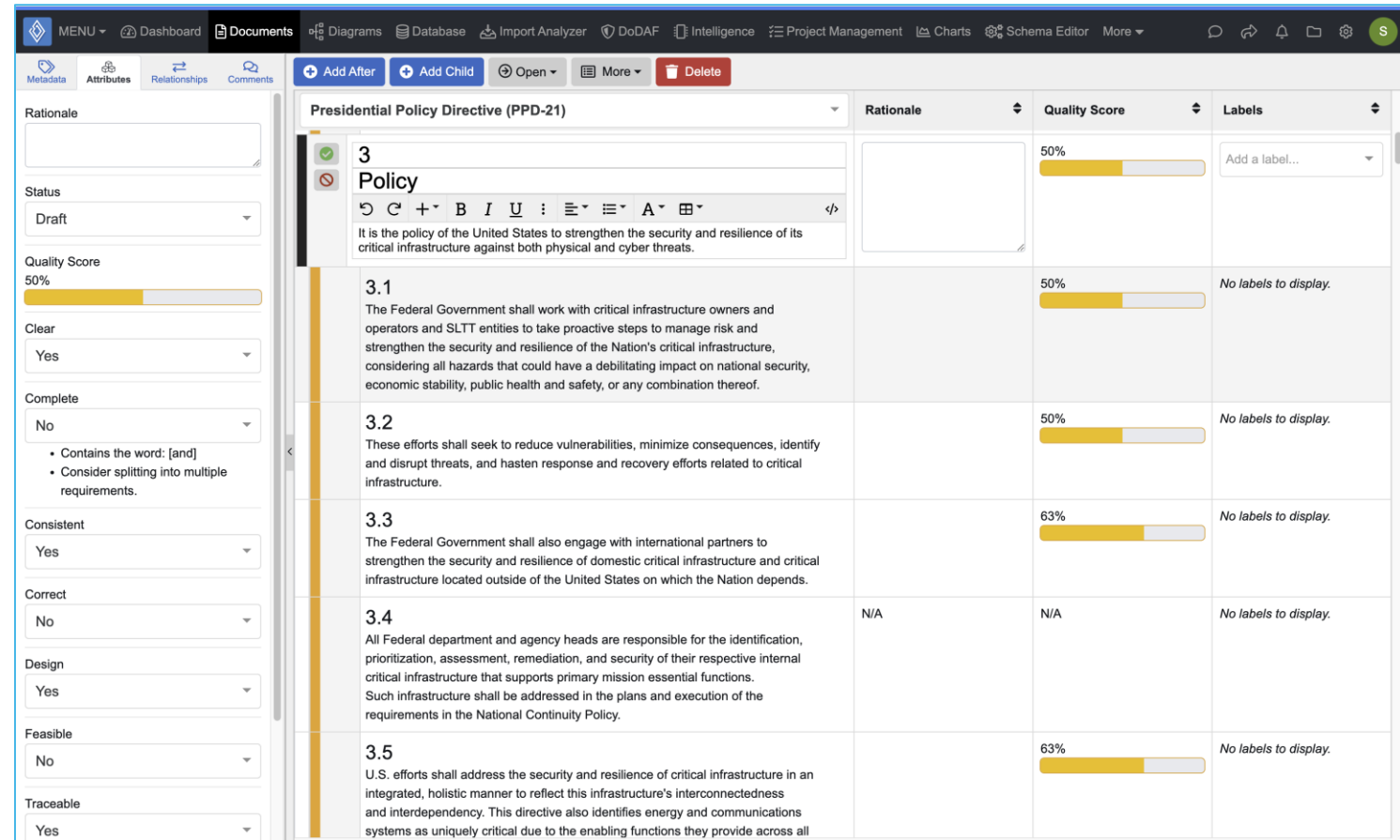
This issuance applies to OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff (CJCS) and the Joint Staff, the Combatant Commands (CCMDs), the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within DoD (referred to collectively in this issuance as the "DoD Components").

1.2 POLICY

N/A N/A No labels to display.

RA: Analyze for quality (clarity, completeness, etc.)

- A number of the standard quality factors apply directly to policies (clear, complete, consistent, and correct)
- Others may apply, depending on the specific policy (Design, Feasible, Traceable, Verifiable)



Rationale	Quality Score	Labels
<p>3</p> <p>Policy</p> <p>It is the policy of the United States to strengthen the security and resilience of its critical infrastructure against both physical and cyber threats.</p>	50%	Add a label...
<p>3.1</p> <p>The Federal Government shall work with critical infrastructure owners and operators and SLTT entities to take proactive steps to manage risk and strengthen the security and resilience of the Nation's critical infrastructure, considering all hazards that could have a debilitating impact on national security, economic stability, public health and safety, or any combination thereof.</p>	50%	No labels to display.
<p>3.2</p> <p>These efforts shall seek to reduce vulnerabilities, minimize consequences, identify and disrupt threats, and hasten response and recovery efforts related to critical infrastructure.</p>	50%	No labels to display.
<p>3.3</p> <p>The Federal Government shall also engage with international partners to strengthen the security and resilience of domestic critical infrastructure and critical infrastructure located outside of the United States on which the Nation depends.</p>	63%	No labels to display.
<p>3.4</p> <p>All Federal department and agency heads are responsible for the identification, prioritization, assessment, remediation, and security of their respective internal critical infrastructure that supports primary mission essential functions. Such infrastructure shall be addressed in the plans and execution of the requirements in the National Continuity Policy.</p>	N/A	No labels to display.
<p>3.5</p> <p>U.S. efforts shall address the security and resilience of critical infrastructure in an integrated, holistic manner to reflect this infrastructure's interconnectedness and interdependency. This directive also identifies energy and communications systems as uniquely critical due to the enabling functions they provide across all</p>	63%	No labels to display.

RA: Enhance the text using these quality criteria



- Enhance the grammar
- Simplify, where possible
- Break into separate requirements, if desirable

RA: Use a “document view” for presentation to stakeholders

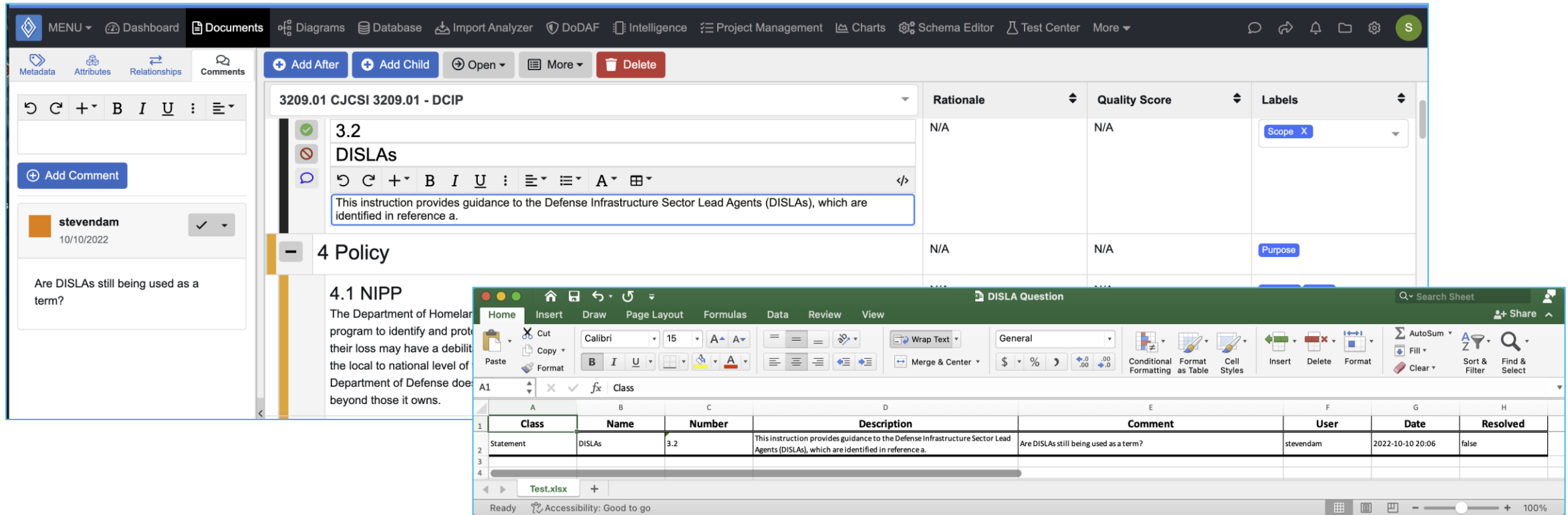


- Hide information that may confuse a reader/viewer
 - e.g., columns with quality score, labels, other attributes
- Readers can then view it as they would a document in MS Word, but any comments and other information would be accessible at the paragraph level
- Hyperlinks can be provided to guide them to other documents

A screenshot of a document viewer application. The interface includes a top navigation bar with options like 'MENU', 'Dashboard', 'Documents', 'Diagrams', 'Database', 'Import Analyzer', 'DoDAF', 'Intelligence', and 'More'. Below this is a secondary bar with 'New Requirement', 'Open', 'More', and 'Report' buttons, along with a search box labeled 'Search the Document...'. The main content area displays a document titled 'Presidential Policy Directive (PPD-21)'. The document is structured with a table of contents or index on the left, showing sections like '7.3 Evaluation of the Existing Public-Private Partnership Model' and '7.4 Identification of Baseline Data and Systems Requirements for the Federal Government to Enable Efficient Information Exchange'. The text of these sections is visible on the right, detailing requirements for the Secretary of Homeland Security.

RA: Capture comments in tool and produce “comment matrix”

- Use commenting features where available
- Special reports may be desired



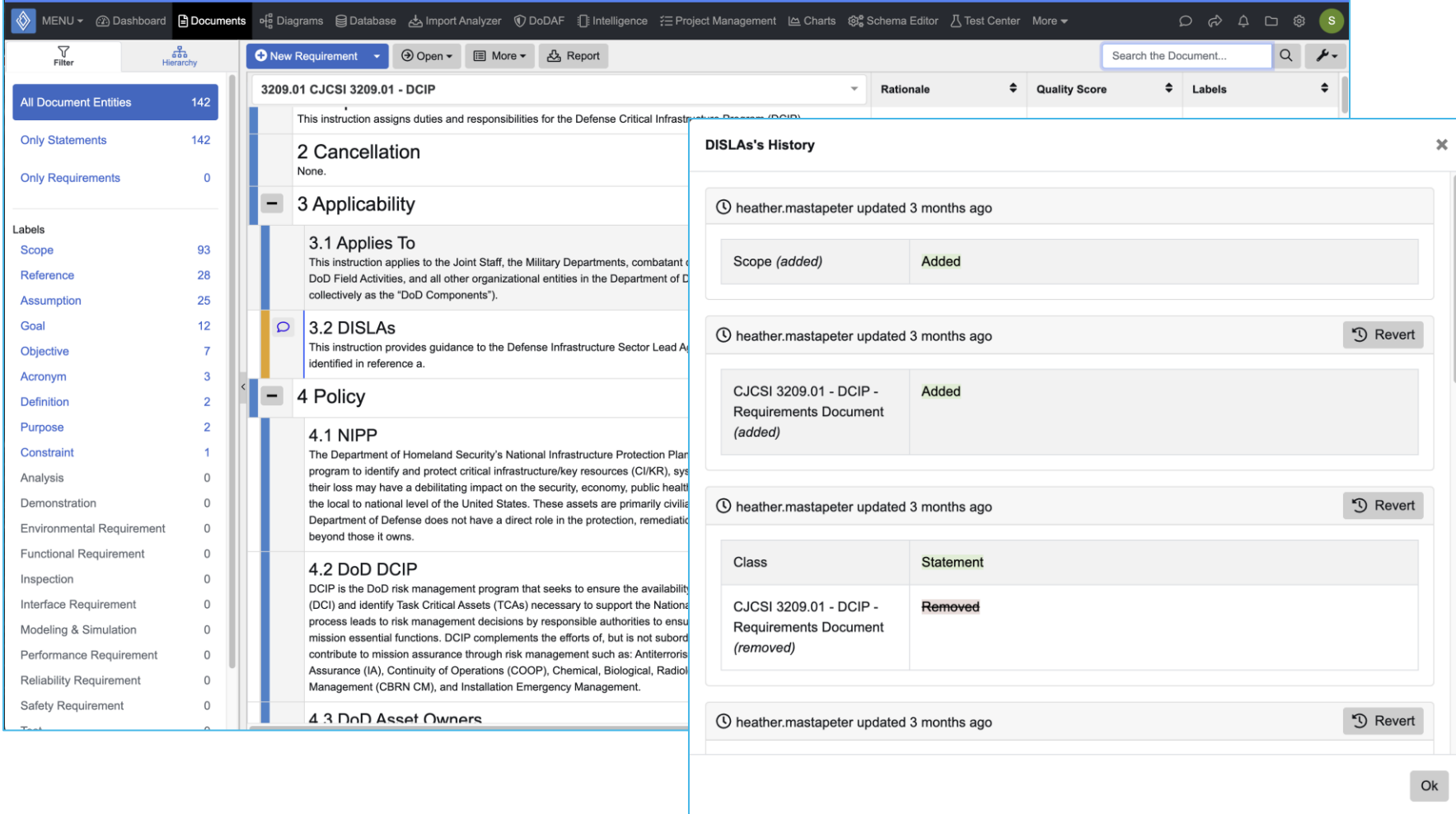
The screenshot displays a software interface for document management and commenting. The top navigation bar includes options like MENU, Dashboard, Documents, Diagrams, Database, Import Analyzer, DoDAF, Intelligence, Project Management, Charts, Schema Editor, and Test Center. The main workspace shows a document titled "3209.01 CJCSI 3209.01 - DCIP" with sections for "3.2 DISLAs" and "4 Policy". A comment by "stevendam" dated 10/10/2022 asks, "Are DISLAs still being used as a term?". The comment text is: "This instruction provides guidance to the Defense Infrastructure Sector Lead Agents (DISLAs), which are identified in reference a."

Overlaid on the bottom right is a spreadsheet titled "DISLA Question" with the following data:

Class	Name	Number	Description	Comment	User	Date	Resolved
Statement	DISLAs	3.2	This instruction provides guidance to the Defense Infrastructure Sector Lead Agents (DISLAs), which are identified in reference a.	Are DISLAs still being used as a term?	stevendam	2022-10-10 20:06	false

Configuration Manage Policy Documents

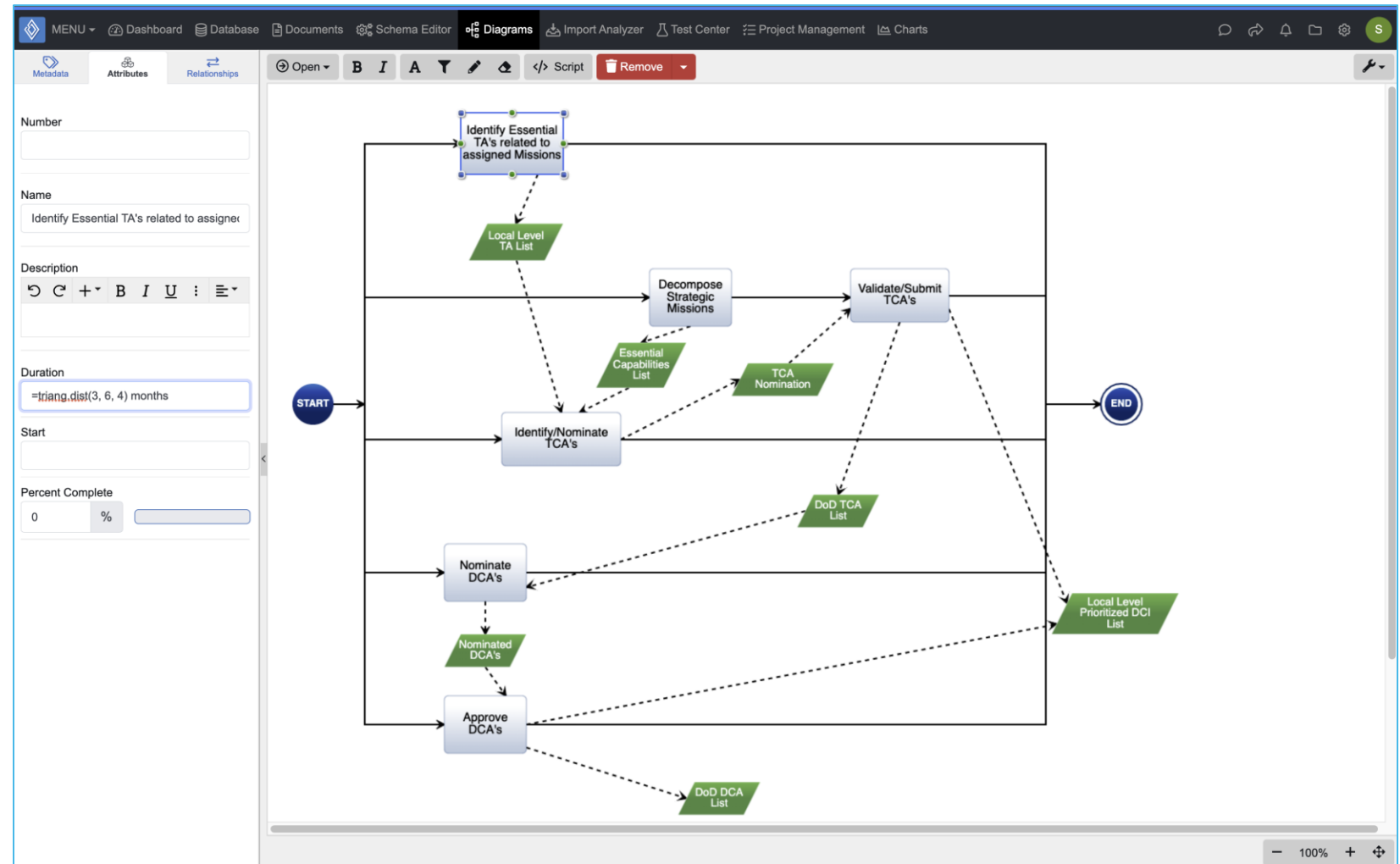
- Baseline
- Track change history
- Branch/fork for excursions
- Store files in database



The screenshot displays the SPEC INNOVATIONS software interface. The main window shows a document configuration tree for '3209.01 CJCSI 3209.01 - DCIP'. The tree includes sections for '2 Cancellation', '3 Applicability', '3.1 Applies To', '3.2 DISLAs', '4 Policy', '4.1 NIPP', '4.2 DoD DCIP', and '4.3 DoD Asset Owners'. A 'DISLAs's History' window is open, showing a list of changes with columns for 'Class' and 'Statement'. The history includes entries for 'Scope (added)' and 'CJCSI 3209.01 - DCIP - Requirements Document (added)', both marked as 'Added', and an entry for 'CJCSI 3209.01 - DCIP - Requirements Document (removed)', marked as 'Removed'. Each entry is dated '3 months ago' and includes a 'Revert' button. The interface also features a top navigation bar with options like 'New Requirement', 'Open', 'More', and 'Report', and a left sidebar with a 'Filter' and 'Hierarchy' section.

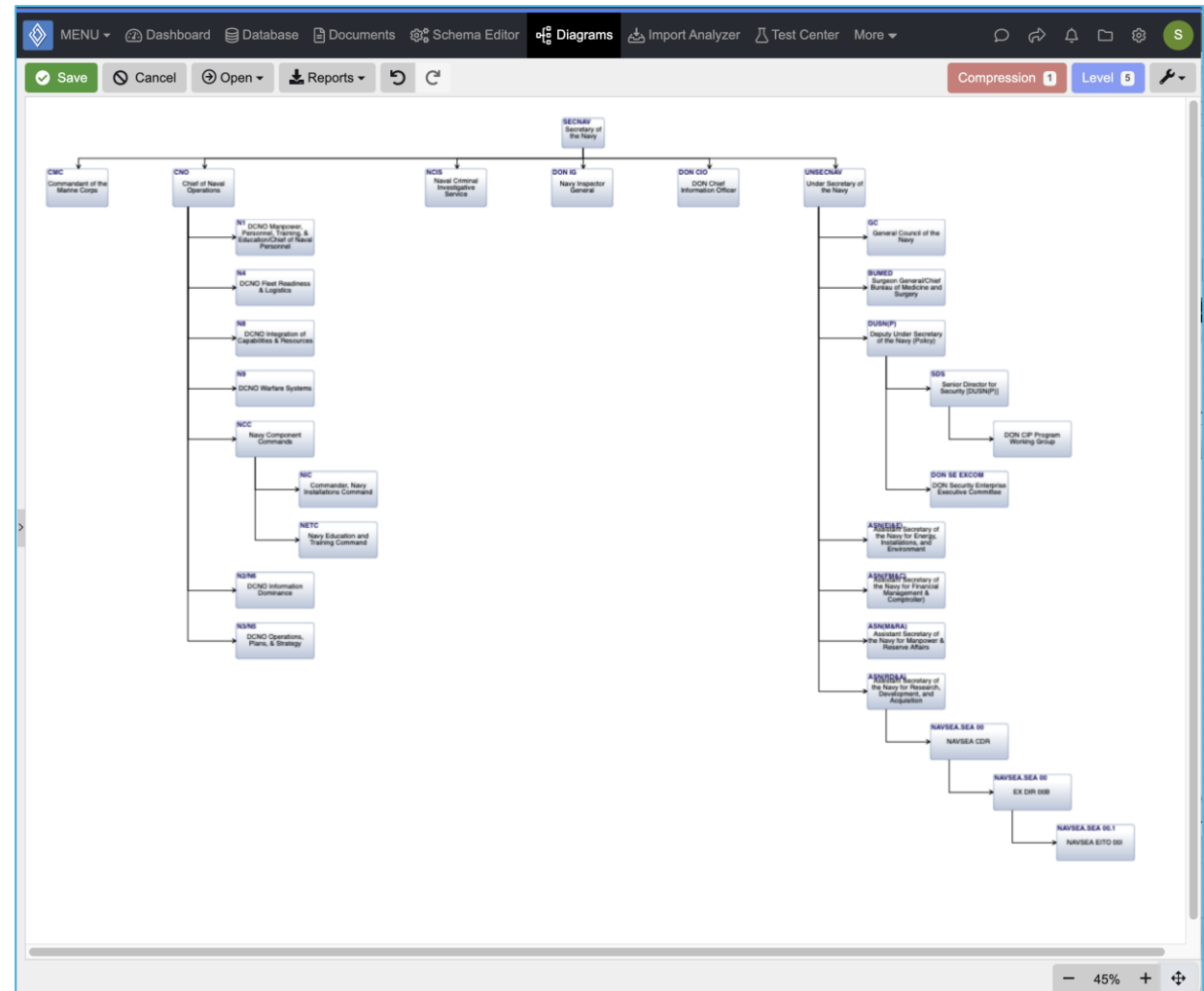
Model Processes and Procedures

- Review policies for processes and procedures
- Create a functional model
- Trace back to requirements
- Enter time distributions
- Associate costs
- Allocate to performing elements



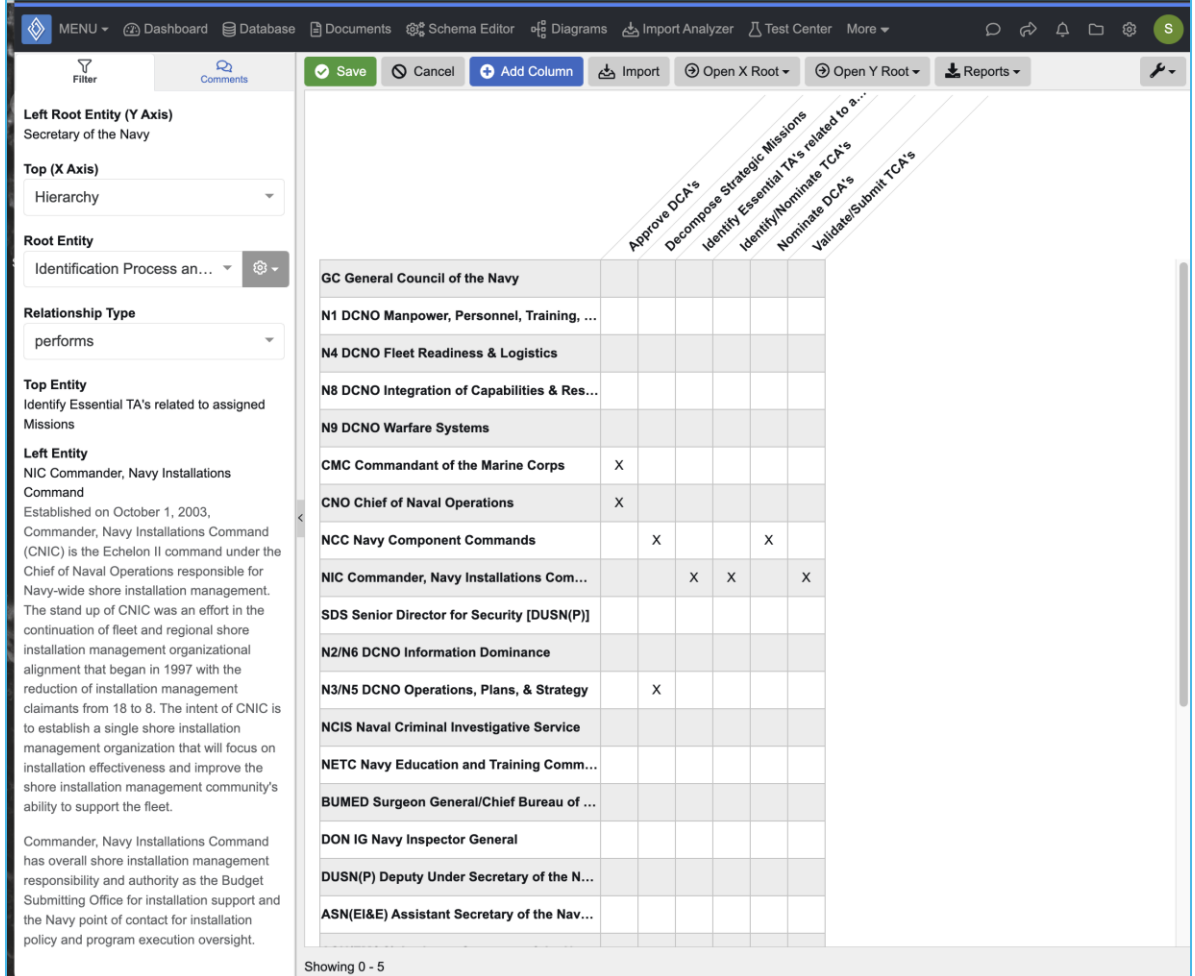
Capture Organization Information in Database

- Create hierarchy
- Allocate actions and requirements as appropriate



Allocate Tasks to Organizational Elements

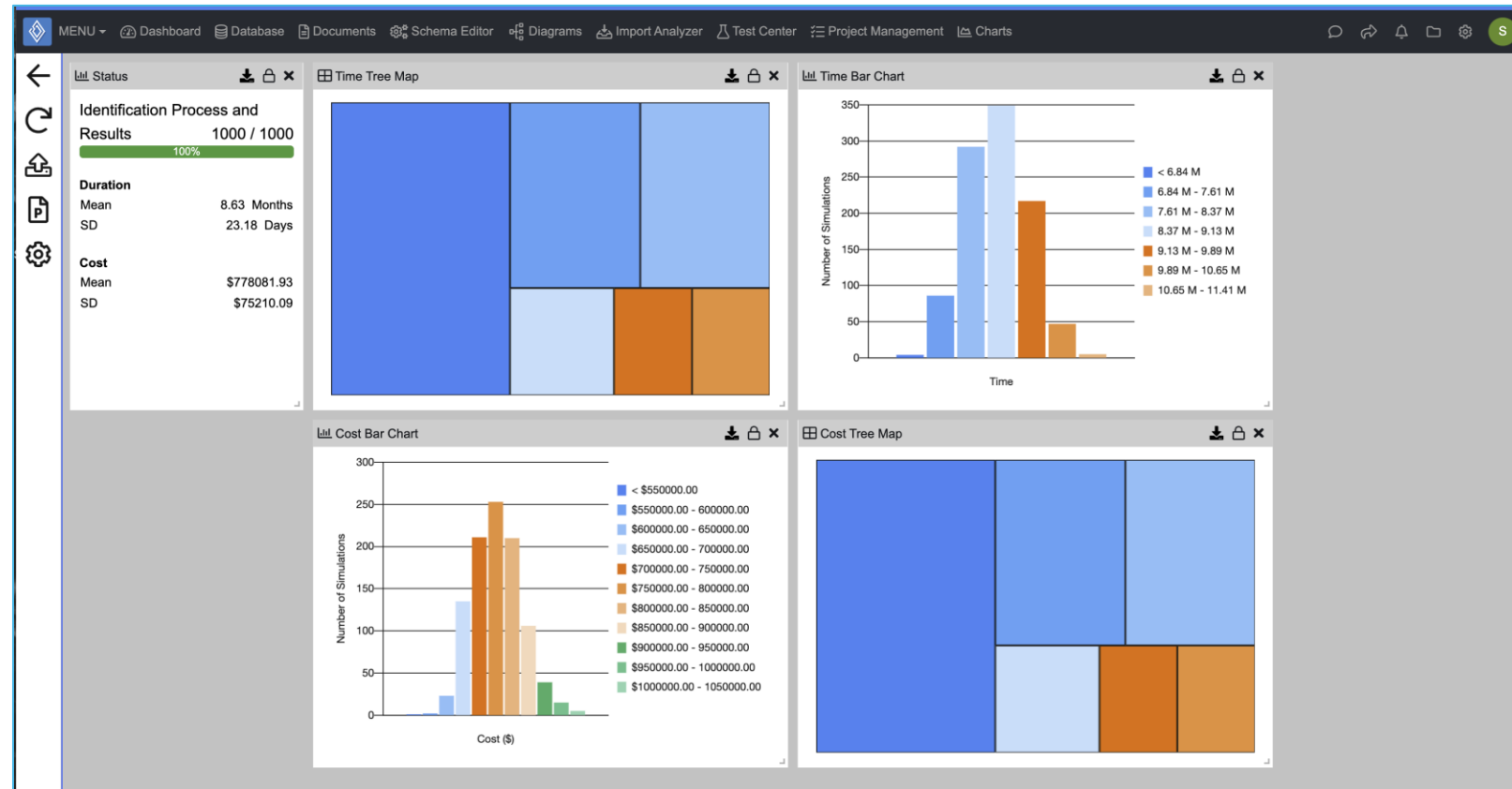
- Create relationships between tasks and organizations, according to policies
- Use this information to determine if the correct organizations are being correctly tasked
- Suggest changes, as appropriate, and/or identify risks to the organization and mitigation strategies



	Approve DCA's	Decompose Strategic Missions	Identify Essential TA's related to a...	Nominate DCA's	Validate/Submit TCA's
GC General Council of the Navy					
N1 DCNO Manpower, Personnel, Training, ...					
N4 DCNO Fleet Readiness & Logistics					
N8 DCNO Integration of Capabilities & Res...					
N9 DCNO Warfare Systems					
CMC Commandant of the Marine Corps	X				
CNO Chief of Naval Operations	X				
NCC Navy Component Commands		X		X	
NIC Commander, Navy Installations Com...			X	X	X
SDS Senior Director for Security [DUSN(P)]					
N2/N6 DCNO Information Dominance					
N3/N5 DCNO Operations, Plans, & Strategy		X			
NCIS Naval Criminal Investigative Service					
NETC Navy Education and Training Comm...					
BUMED Surgeon General/Chief Bureau of ...					
DON IG Navy Inspector General					
DUSN(P) Deputy Under Secretary of the N...					
ASN(EI&E) Assistant Secretary of the Nav...					

Verify Processes Work through Simulation

- Uses timing and cost information for each step
- Distributions in time and cost provide a more realistic range of the process
- These distributions also provide a measure of cost and schedule risk



3. HOW CAN WE IMPLEMENT THIS APPROACH WITHOUT SCARING POLICY MAKERS?



Implementation Strategy

- Don't tell them you are doing systems engineering
 - Most people think systems engineering only applies to hardware and software
- Perform the analysis, but only show results in a form that they will easily accept
 - No UML, SysML, IDEF0, etc. drawings
 - Simple summaries of changes (i.e., document markups and text summaries)
 - No engineering jargon!
- Wait for them to ask how you got the results
 - Then just show them the bare minimum of SE information
 - Once they buy into these, you can start show them more

Summary

- Systems engineering can dramatically improve policy development and implementation
- You must work fast in doing your analysis – use multi-purpose tools with analytics to speed up your analysis and delivery
- Only show results, not how you got there ... until necessary