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Structured and Unstructured Data Sciences and Business Intelligence for Analyzing Requirements Post Mortem

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Monterey, California: Naval Postgraduate School

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Objectives

- Navy systems may have unexpected significant cost growth for many reasons.
- The objectives are to apply advanced analytics to understand the common elements, patterns, and deep causes of significant cost growth from historical data, which include structured and unstructured data such as Program Elements or Budget Exhibits (BEs, unstructured/structured mixed, unclassified), Initial Capability Documents (ICD, unstructured, classified), Key Performance Parameters (KPP, structured, classified), or Key-Systems Attributes (KSA, structured, classified) from Capability Development Documents (CDD, unstructured, classified).

Exhibit P-40, Budget Line Item Justification: PB 2024 Navy Date: April 2023

Appropriation / Budget Activity / Budget Sub Activity: 1611N: Shipbuilding and Conversion, Navy / BA 02: Other Warships / BSA 01: Other Warships

P-I Line Item Number / Title: 2122 / DDG-51

ID Code (A=Service Ready, B=Not Service Ready): A Program Elements for Code B Items: N/A Other Related Program Elements: N/A

Line Item MDAP/MAIS Code: N/A

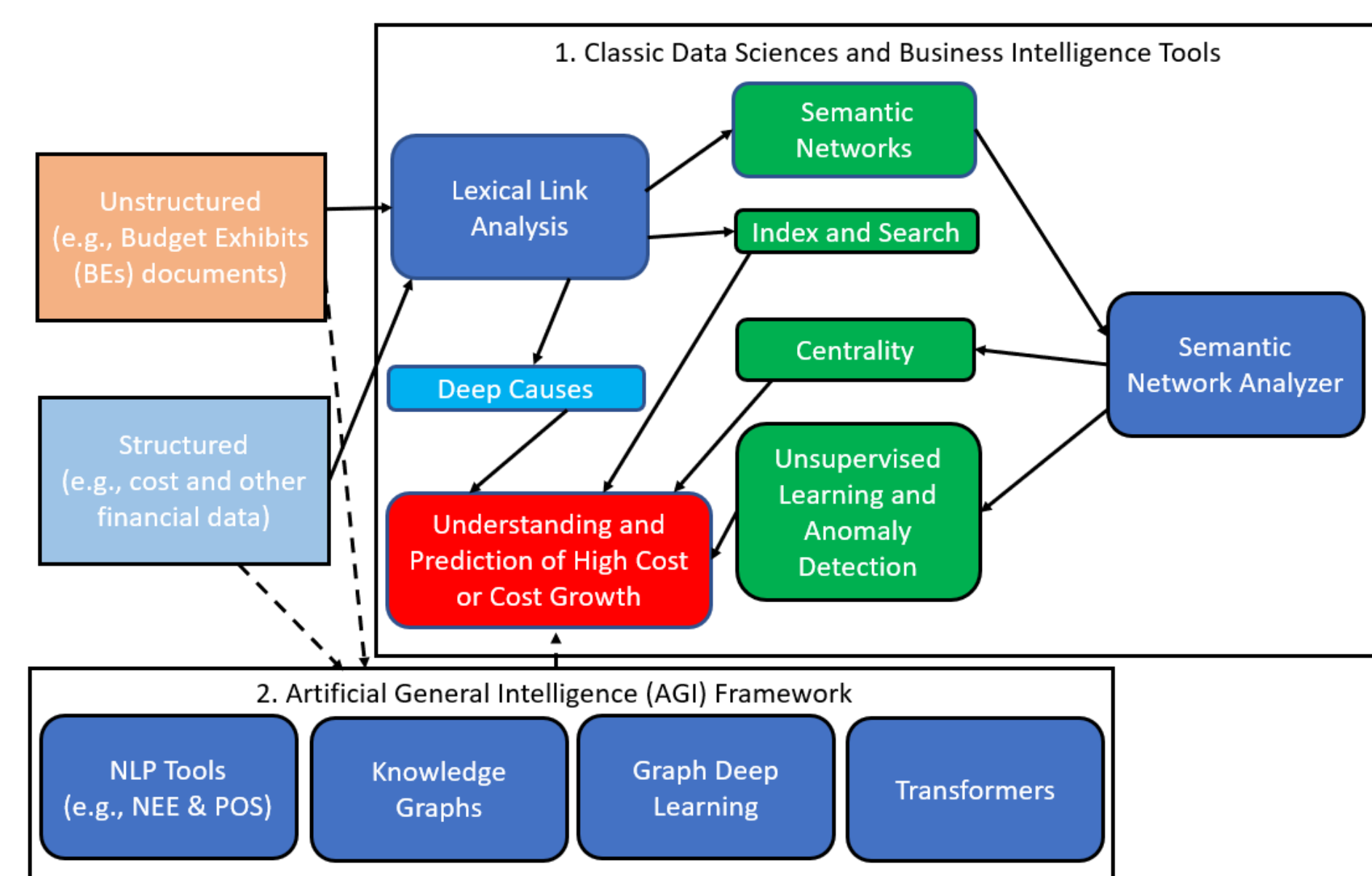
Resource Summary	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	To Complete	Total
Procurement Quantity (Units in Each)	87	2	2	2	-	2	2	2	1	1	2	101
Gross/Weapon System Cost (\$ in Millions)	99,459,611	3,930,919	4,417,537	4,364,003	0.000	4,364,003	4,328,523	4,447,255	2,714,061	2,259,750	4,927,728	130,849,387
Less PY Advance Procurement (\$ in Millions)	2,910,850	-	-	-	-	-	-	-	-	-	-	2,910,850
Less Cost To Complete (\$ in Millions)	2,203,070	-	-	-	-	-	-	-	-	-	-	2,203,070
Less Subsequent Year Fall Funding (\$ in Millions)	433,000	-	-	-	-	-	-	-	-	-	-	433,000
Less Hurricane (\$ in Millions)	227,100	-	-	-	-	-	-	-	-	-	-	227,100
Less EOQ (\$ in Millions)	1,621,241	254,932	41,000	233,588	-	233,588	232,995	232,990	193,786	-	-	2,810,532
Less Escalation (\$ in Millions)	48,200	-	-	-	-	-	-	-	-	-	-	48,200
Less Transfer (\$ in Millions)	218,500	-	-	-	-	-	-	-	-	-	-	218,500
Net Procurement (P-1) (\$ in Millions)	91,797,650	3,675,987	4,376,537	4,130,415	0.000	4,130,415	4,095,528	4,214,265	2,520,275	2,259,750	4,927,728	121,998,135
Plus Subsequent Year Fall Funding (\$ in Millions)	433,000	-	-	-	-	-	-	-	-	-	-	433,000
Fall Funding TOA (\$ in Millions)	92,230,650	3,675,987	4,376,537	4,130,415	-	4,130,415	4,095,528	4,214,265	2,520,275	2,259,750	4,927,728	122,431,135
Plus CY Advance Procurement (\$ in Millions)	3,332,434	-	-	-	-	-	-	-	-	-	-	3,332,434
Plus Cost To Complete (\$ in Millions)	1,149,086	45,753	228,577	225,917	-	225,917	114,695	149,446	130,912	158,684	-	2,203,070
Plus EOQ (\$ in Millions)	1,454,589	120,000	618,352	196,007	-	196,007	-	-	-	-	-	2,388,948
Plus Escalation (\$ in Millions)	48,200	-	-	-	-	-	-	-	-	-	-	48,200
Plus Transfer (\$ in Millions)	218,500	-	-	-	-	-	-	-	-	-	-	218,500
Plus Hurricane (\$ in Millions)	227,100	-	-	-	-	-	-	-	-	-	-	227,100
Total Obligation Authority (\$ in Millions)	98,640,559	3,841,740	5,223,466	4,552,339	0.000	4,552,339	4,210,223	4,363,711	2,651,187	2,418,434	4,927,728	130,849,387

An Example of BE Data

Results

- Showed the feasibility to apply the classic data sciences and business intelligence tools and artificial general intelligence (AGI) framework to address the common elements and deep causes of Navy programs and systems that create excessive cost growth.
- Demonstrated the potential to enable a knowledge system of unstructured and structured data that can effectively learn from historical data and environment and make discovery and prediction.

Methods



Classic Data Sciences, Business Intelligence and AGI Applied

Discovery Process

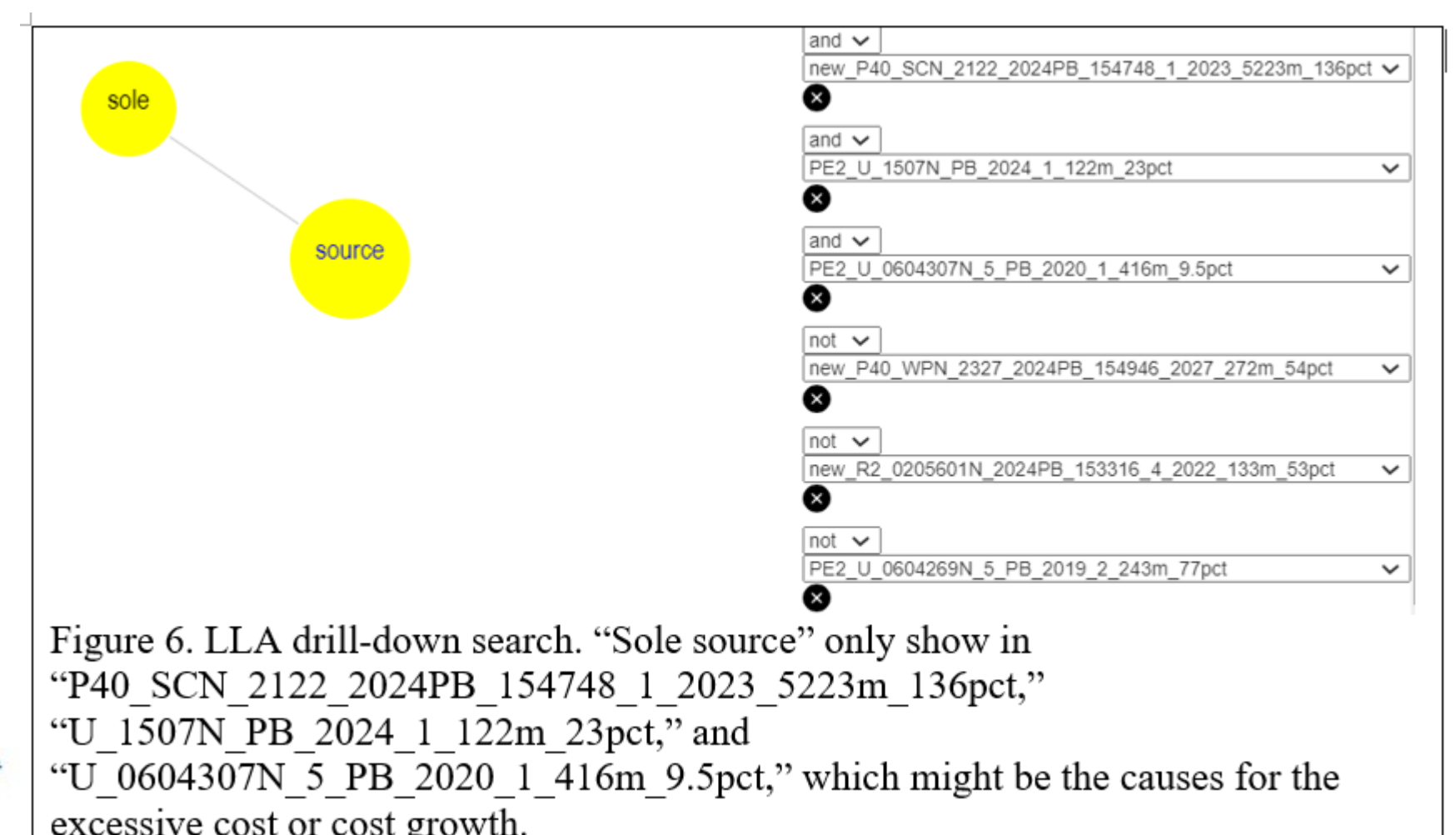
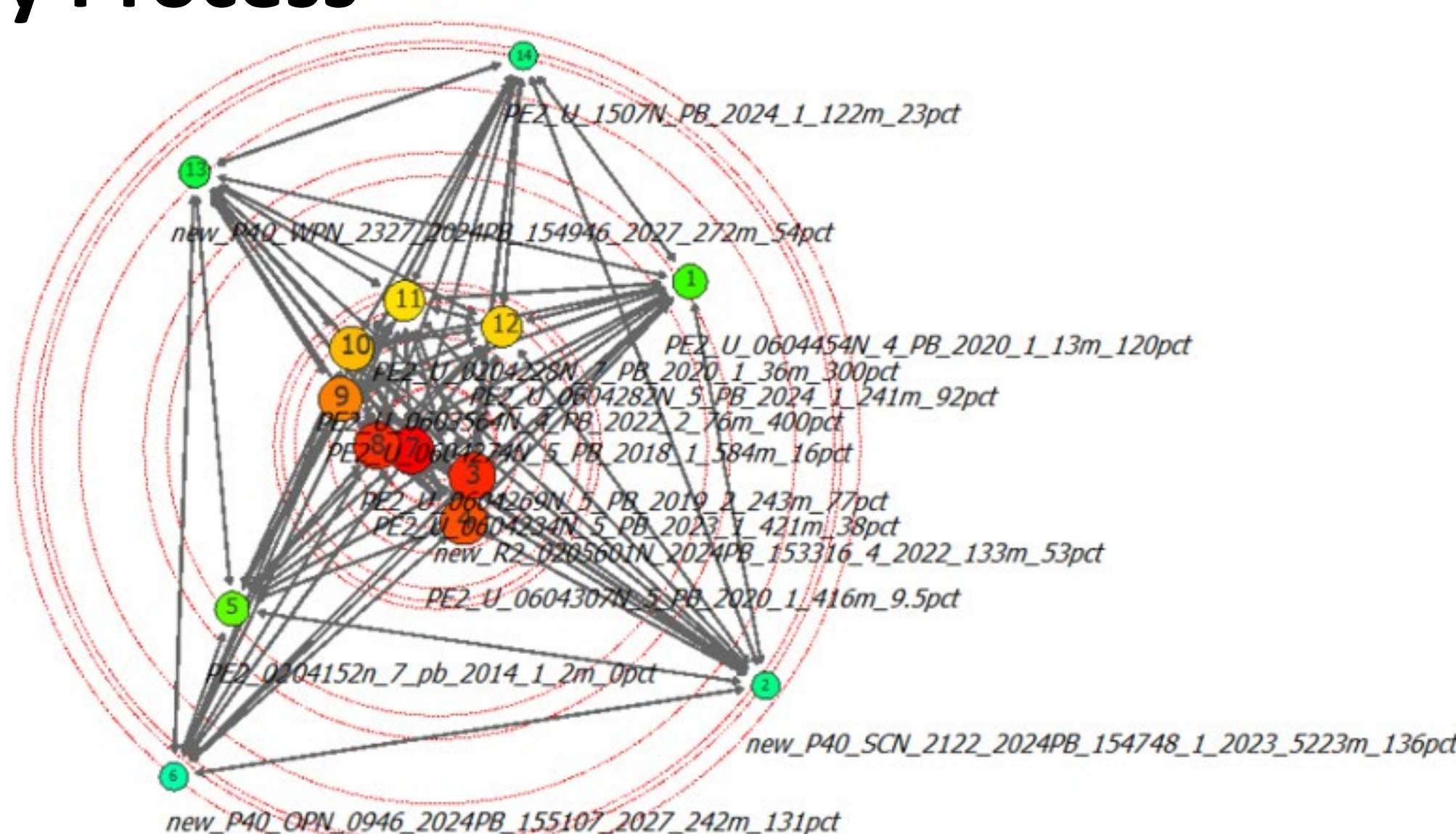


Figure 6. LLA drill-down search. "Sole source" only show in "P40_SCN_2122_2024PB_154748_1_2023_5223m_136pct," "U_1507N_PB_2024_1_122m_23pct," and "U_0604307N_5_PB_2020_1_416m_9.5pct," which might be the causes for the excessive cost or cost growth.

Lexical link analysis (LLA) reveals the relations of PEs and detects anomalies, i.e., PE 1,14,13,6, and 2

Recommendations

- Apply and scale up the combined analytic tools to predict the risk (likelihood and magnitude) of cost growth for future Navy Systems.
- Enable the OPNAV's Program Budget Information System (PBIS) to become a knowledge system that can effectively learn from human, data, and its surrounding environment to make good decisions for the future Program Objectives Memorandum (POM).



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 Thesis: none