

2023 NSRP All Panel Meeting



The Center for Naval Shipbuilding and Advanced Manufacturing presents the Navy ManTech Project

S2889 – Visual Search Engine

(A collaboration effort between ONR, NSAM, and Ingalls)

POP August 2020 – December 2022

Jamie Breakfield – Ingalls Shipbuilding

Scott Truitt – NSAM

DCN# 0543-215-23

For additional information contact: <https://nsam.ati.org/contact/>





Agenda

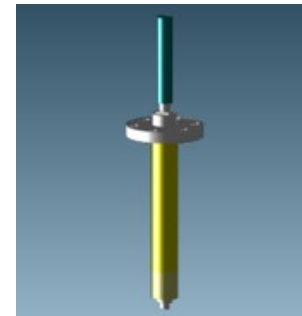
- Objectives
- Acknowledgements
- Background
- Benefits
- Technical Approach
- Results
- Project Status
- Issues





Objective

- **Ingalls wants to adapt and develop software that can index part data, not only at the meta data level but also, at the geometric level. Providing the user the ability to search by geometric features as well as identify duplicate, or closely matched, parts across multiple platforms. This will do the following:**
 - ↗ Reduce the amount of labor searching for parts
 - ↗ Reduce the amount of labor generating new part data
 - ↗ Reduce the amount of duplicated parts.





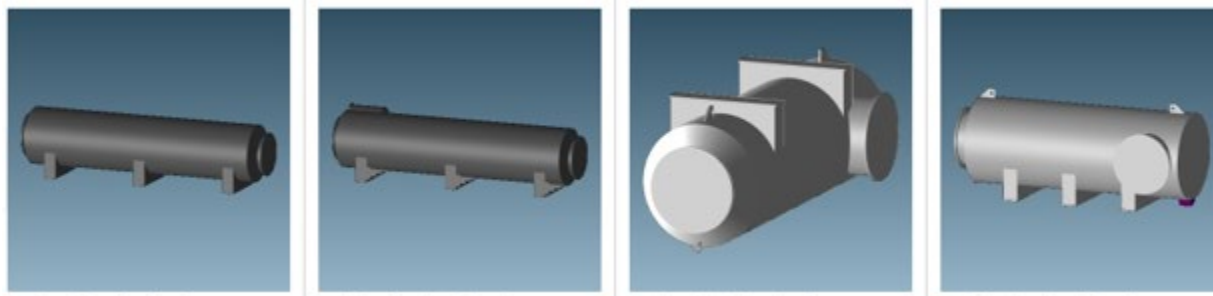
Acknowledgements

- **Project funding provided by the Office of Naval Research (ONR) Navy ManTech Program**
- **Navy ManTech program oversight provided by**
 - ↗ Paul Huang – ONR Program Officer
 - ↗ Scott Truitt– Center for Naval Shipbuilding and Advanced Manufacturing Project Manager
 - ↗ Dick Tiano – Project Technical Representative
- **Ingalls Shipbuilding**
 - ↗ Jamie Breakfield– Project Manager
 - ↗ Scott Robbins – Technical Lead
- **Imaginestics**
 - ↗ Matt Judge – Vice President
 - ↗ Rob Hill – Project Manager



Background

- Extensive research must be performed to identify and select required parts meeting ship design specifications
- New parts may be created when in fact similar parts have already been used in other areas of the ship, or on other vessels
- These parts may be duplicative in nature, represented by completely different data architectures, reside in disparate siloed data sources, and of varying formats





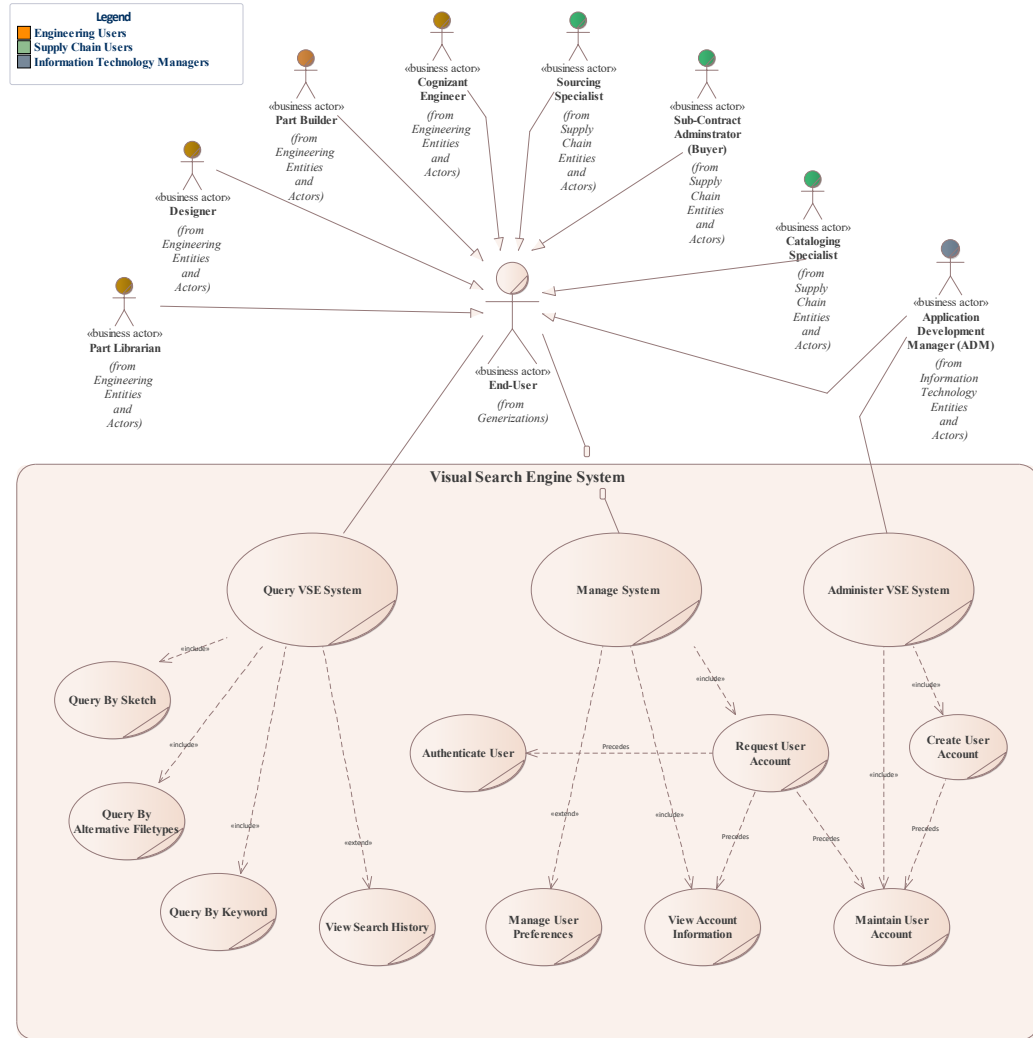
Benefits

- **By adapting and developing software that will generate a digital fingerprint of each part, Ingalls expects to be able to**
 - ↗ Reduce time associated with part lookup by 0.2 hr/part
 - ↗ Reduce time associated with duplicate part creation
 - ↗ Reduce the number of annually created duplicate parts
- **This technology can give visibility on parts used across different platforms where today, the data is disconnected.**



Technical Approach

Context Diagram of the Visual Search Engine System





Technical Approach

- The key objectives of Phase I were to

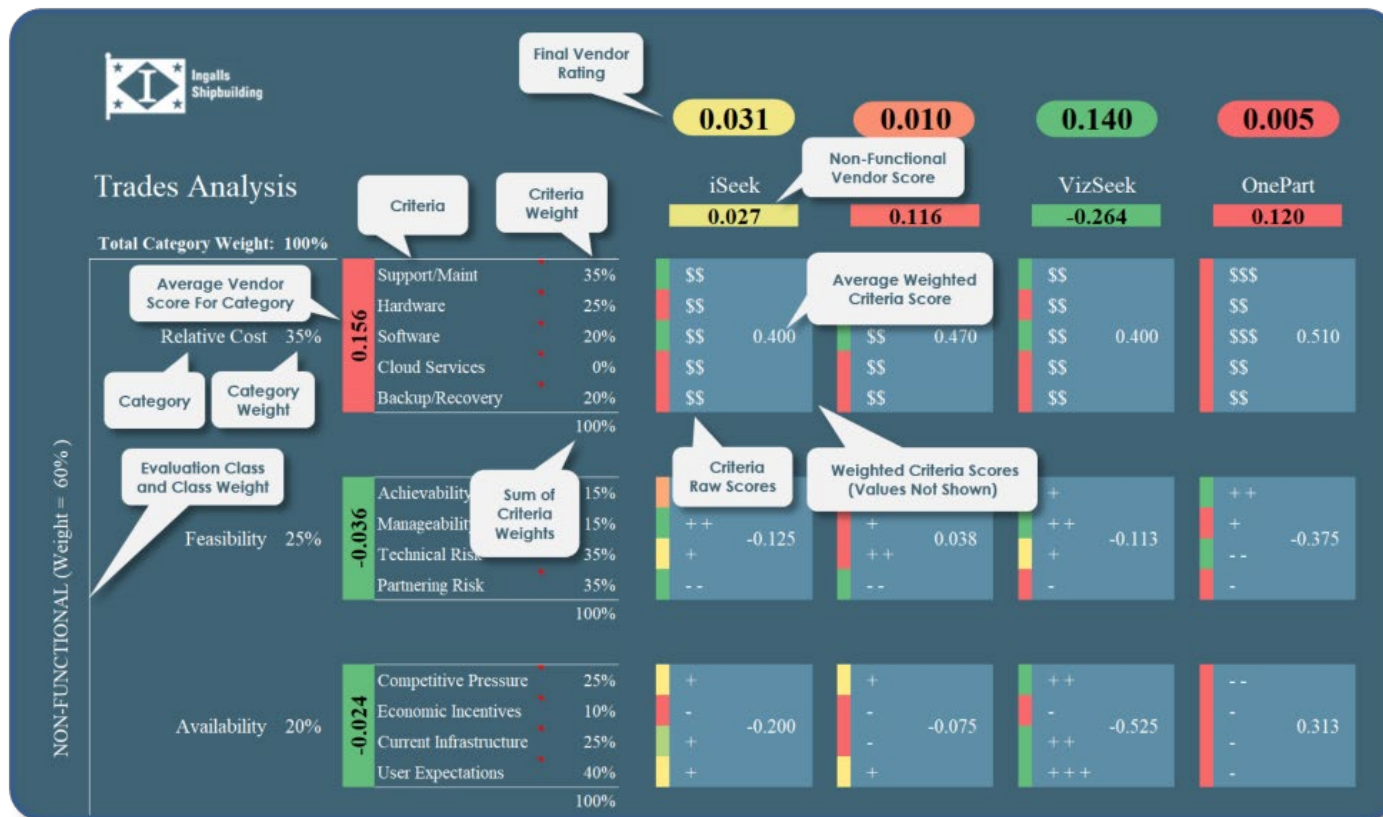
- Examine and document relevant current engineering parts search, supply chain, and logistics processes
- Document capability gaps; and perform a technology survey to identify candidate search technologies and vendors.
- A trade space analysis was conducted to establish a specific candidate technology for design and development in Phase II

		Phase I	Phase II	Phase III	Phase IV
ANNUAL REVENUE		\$777,000	\$6,184,000	\$1,555,000	\$36,529,000
NUMBER OF EMPLOYEES		4	32	8	189
ADM-0002	The System shall provide a capability for creating End-User Rights				
ADM-0003	The System shall provide a capability for creating End-User Roles				
ADM-0004	The System shall provide a capability for deleting End-User Rights				
ADM-0005	The System shall provide a capability for deleting End-User Roles				
ADM-0007	The System shall provide a capability for managing End-User Rights				
ADM-0008	The System shall provide a capability for managing End-User Roles				
CLOUD-0001	The VSE System shall be an on premise solution (must be resident on the Ingalls Network).				
CLOUD-0002	Any cloud services utilized by the VSE System shall be FedRAMP certified.				
EUSR-0001	The System shall provide an ability to search material catalogs and ShipConstructor® parts libraries using alternative filetypes as query parameters				
EUSR-0002	The System shall provide an ability to search material catalogs and ShipConstructor® parts libraries using PDF files (*.pdf) as query parameters				
EUSR-0003	The System shall provide an ability to search material catalogs and ShipConstructor® parts libraries using rich text format files (*.rtf) as query parameters				
EUSR-0004	The System shall provide an ability to search material catalogs and ShipConstructor® parts libraries using text files (*.txt) as query parameters				



Technical Approach

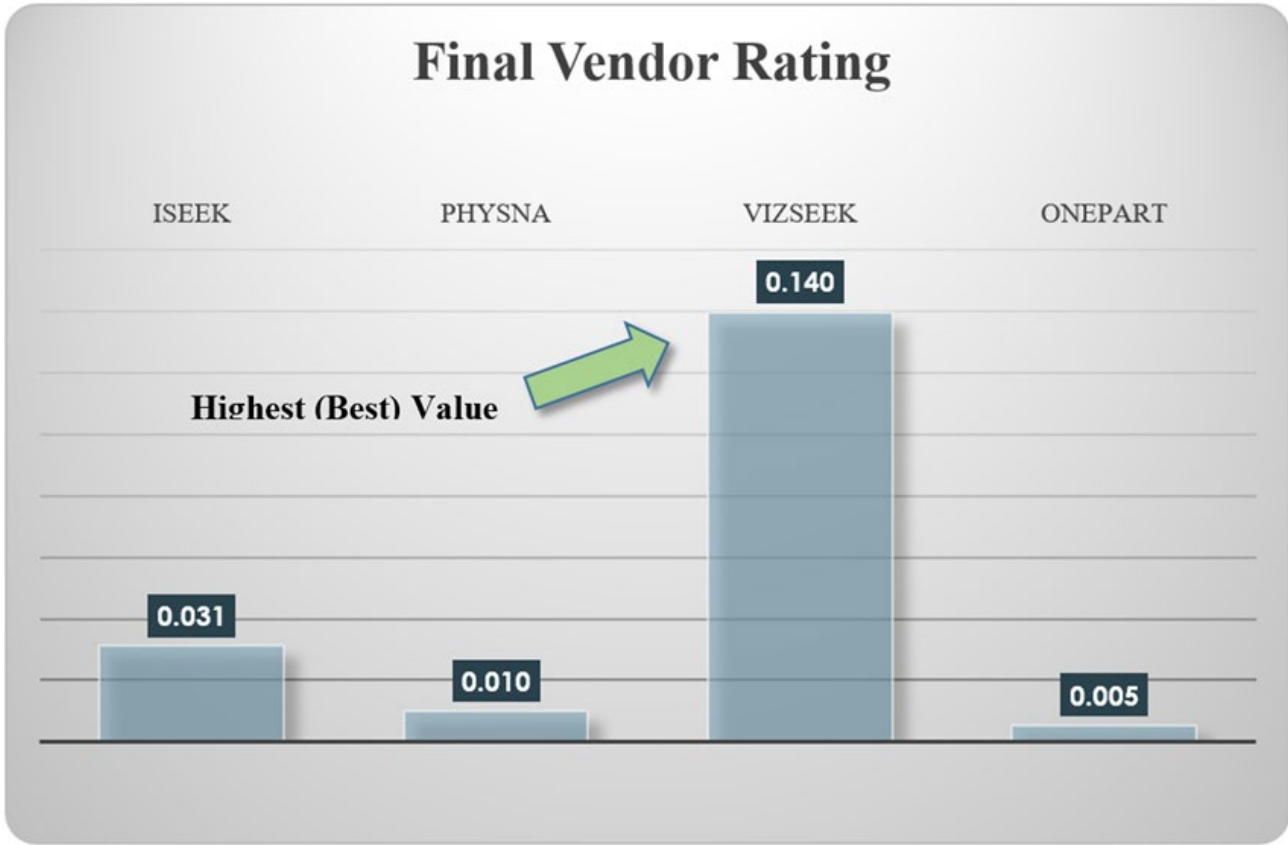
Non-functional Tradespace analysis





Technical Approach

Graphical representation of final vendor rating



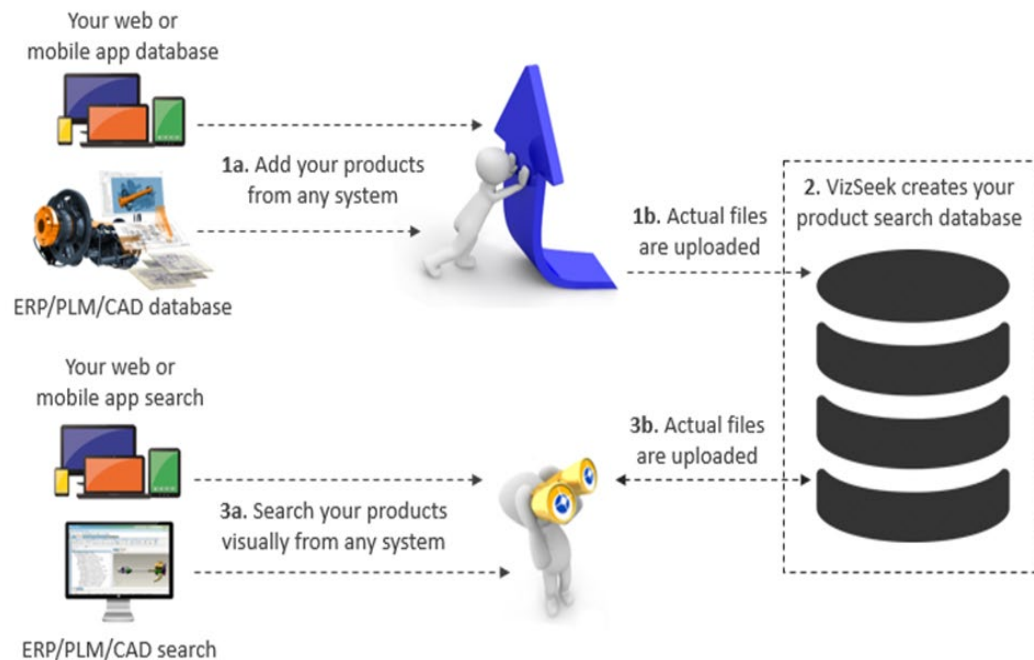


Technical Approach

- The key objectives of Phase II were to:

- Design and develop a prototype system using technologies identified in the Phase I
- Pilot the system to verify the system operates as expected under real-time operating conditions

Technology View



Technical Approach



Duplicate Files search

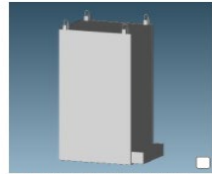
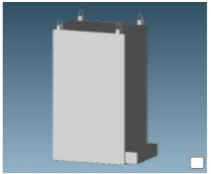
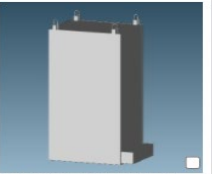
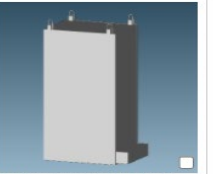
> Ingalls

Duplicate Files

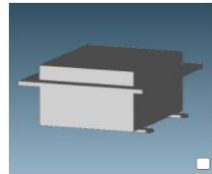
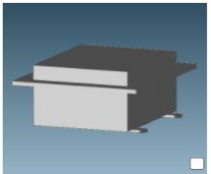
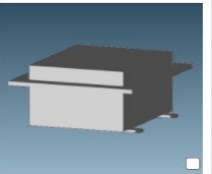
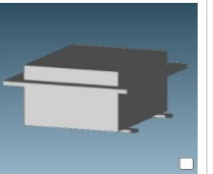
8971 files in 3217 groups.
Note: Use the checkboxes to select any two files to compare.

[Download CSV](#)

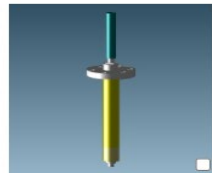
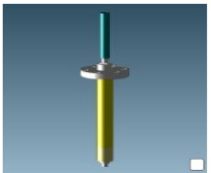
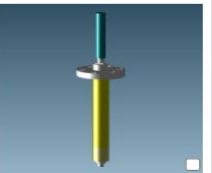
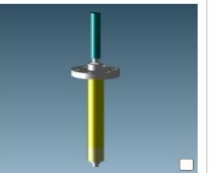
GroupId: 45a2a408-a59d-4751-b243-cb057209b0d8 (4 files)

 PROCESSOR_G13A-123-347000_...791e.dwg	 PROCESSOR_G13A-123-348000_...b7b1.dwg	 RECEIVER_G13A-123-333000_0...446c.dwg	 PROCESSOR_G13A-123-349000_...d819.dwg
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GroupId: 48b5ffe3-e67c-4c43-8fad-461a90ff3e83 (4 files)

 BOX_6099-DA0-770189_00-f556...87.dwg	 BOX_6099-DA0-770188_00-14b...9ade.dwg	 BOX_6099-DA0-770205_00-ab87...ba.dwg	 BOX_6099-DA0-770187_00-e9fa...d7.dwg
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GroupId: 4d9d8f68-e03c-41d5-a850-c558ca31d947 (4 files)

 5930-DA0-660636-1e782f63-24...3...7.dwg	 5930-DA0-660658-f34e5f1d-41...d...7.dwg	 5930-DA0-660658-f34e5f1d-41...d...7.dwg	 5930-DA0-660636-1e782f63-24...3...7.dwg
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Technical Approach

Example of “Find Similar” search result

The screenshot displays the VizSeek web interface. At the top left, the VizSeek logo and 'Ingalls' are visible. On the right, there are links for 'Browse files', 'Add files', a language dropdown set to 'English (US)', and a user profile icon. The main content area shows search results for a 3D model. On the left sidebar, under 'Refine results:', there are 'Apply Filters' and 'Clear Filters' buttons. Below that, the 'Visual input' section shows the file name 'SPK_ARSRG_SILCR_PRELIM II-184ec971-6c df-41bd-8695-c8981469d052.dwg' with a checked checkbox. A large image of the 3D model is shown below. At the bottom of the sidebar, there is a 'Text' search box with the placeholder 'Search with text'. The main results area shows '1 - 20 of 20 results' and a search time of '0.294 seconds'. There is a checkbox for 'Select all models' and a question 'Any usable results?' with 'Yes' and 'No' radio buttons, and a 'Give detailed feedback' link. Four 3D model thumbnails are displayed in a row, each with a set of navigation icons (pan, rotate, zoom, etc.) below it.



Technical Approach

Example of clusters showing parts that are groups together based on geometry

Duplicate Files
4174 files in 1305 groups.
Note: Use the checkboxes to select any two files to compare.

[Download CSV](#)

GroupId: 2aef1b8d-cf5c-41a8-9956-a14bd397bec (3 files)

FALSE_DECK_DESC-CH4F113041 c4e9b.dwg	NONPREF_FALSE_DECK_DESC-CH... 1c18a.dwg	FALSE_DECK_DESC-CH3F113040 5e2b.dwg

GroupId: 2d0e1d44-42c6-424b-9974-479d86efdde (3 files)

REFER_PEN_ETR-OR04104-002_... 3b27.dwg	RMCP_ETR-OR04109-002_00-1f a994.dwg	RMCP_ETR-OR04104-002_00-1f b747.dwg

GroupId: 2d3e9e4-52e2-4db6-b9f8-d394e793f5cc (3 files)

2326e72a-f669-4543-b4d1-ef3...dc c.dwg	f80e73fc-f079-4818-83bd-ef3...a8c d.dwg	34d4a8ab-fc94-412b-b0b6-ef3...bb c.dwg

Duplicate Files
4174 files in 1305 groups.
Note: Use the checkboxes to select any two files to compare.

[Download CSV](#)

GroupId: a13d6887-99dd-447b-8631-68b32c60f03d (3 files)

TRAPEZE_DESC-CHAR115061-0f c8b5.dwg	TRAPEZE_DESC-CHSR115061-13 1478.dwg	TRAPEZE_DESC-CH3R115061-f1 f09.dwg

GroupId: a5fe2a0d-3ac7-4f47-bad8-f3aefc5d3ae (3 files)

TRAPEZE_DESC-CH3R111121-28 aa08.dwg	TRAPEZE_DESC-CH4R111121-6d daca.dwg	TRAPEZE_DESC-CHSR111121-43 baec.dwg

GroupId: a6034f7b-1196-42cd-9f09-b6cb4a31d2a6 (3 files)

TRAPEZE_DESC-CHAR111053-1d c9ab.dwg	TRAPEZE_DESC-CH3R111053-15 05a7.dwg	TRAPEZE_DESC-CHSR111053-51 50b7.dwg

Duplicate Files
4174 files in 1305 groups.
Note: Use the checkboxes to select any two files to compare.

[Download CSV](#)

GroupId: 93907267-4cb4-42b6-8ef8-7c29a78ca74a (3 files)

863ad66e-a19f-451a-ade4-ef2...ca c8.dwg	19a79e02-1adc-4794-a869-ef2...6 c9.dwg	9a7c8596-d4e4-4730-885d-ef2...fd d0.dwg

GroupId: 95cfs1ba-ff63-4f31-af66-00b69ce89b43 (3 files)

TRAPEZE_DESC-CHAR115093-a8 db6a.dwg	TRAPEZE_DESC-CHSR115093-e3 dbff.dwg	TRAPEZE_DESC-CH3R115093-d6 ef0.dwg

GroupId: 96b6f1a9-74c3-4528-bd92-d993d95a253 (3 files)

TRAPEZE_DESC-CHAR119061-b2 eecc.dwg	TRAPEZE_DESC-CHSR119061-ef dff4.dwg	TRAPEZE_DESC-CH3R119061-20 fbaa.dwg





Results

- **Initial savings projections were met**

- ↗ Reduce time associated with part lookup by 0.2 hr/part
- ↗ Reduce time associated with duplicate part creation
- ↗ Reduce the number of annually created duplicate parts

- **ROI increased based on actual project cost**

- ↗ DDG ROI – 1.63
- ↗ Combined platform ROI – 5.1

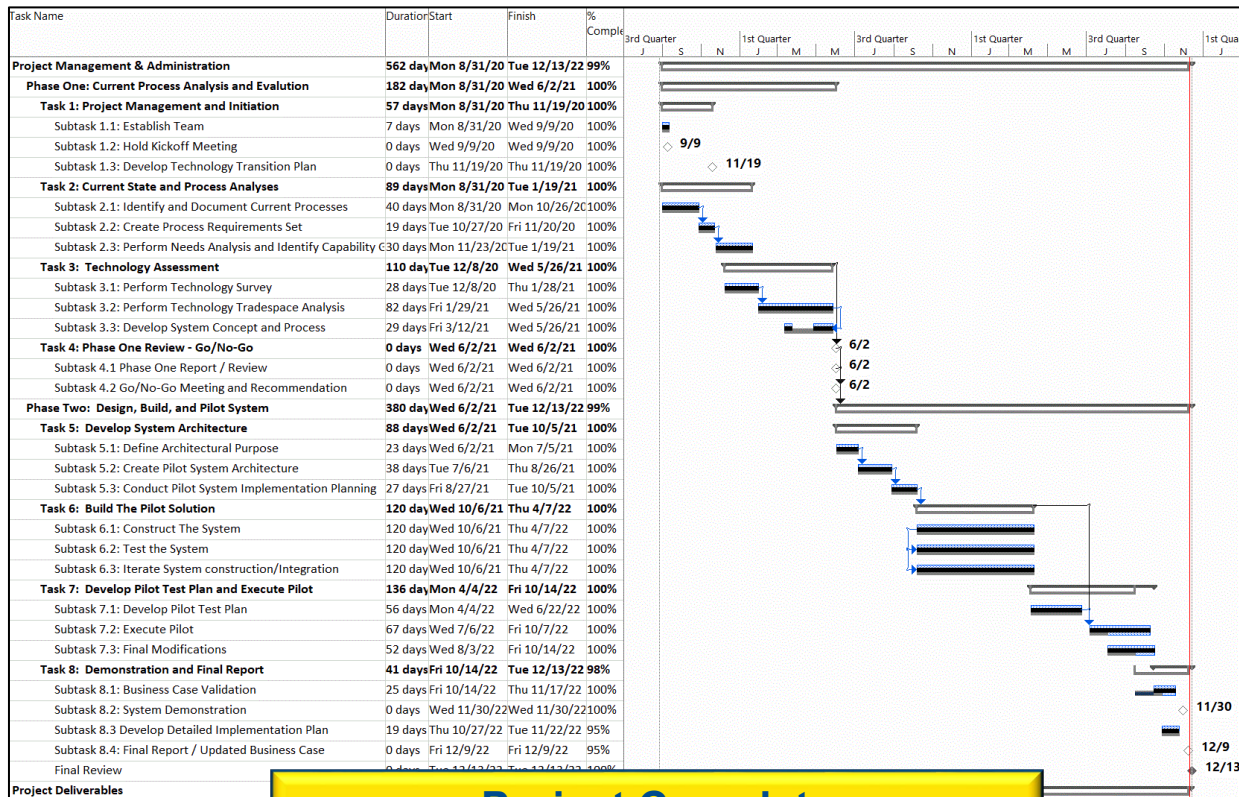
- **Potential Partnership between Imaginestics and ShipConstructor**

- ↗ ShipConstructor is evaluating the benefits of integrating this technology.



Project Status

- The project is complete, as of 12/23/22, with all deliverables and milestones met.



Project Complete



Project Status / Issues

● Issues

- Supply chain issues affected the timeline for server hardware delivery
- Team worked alternative solutions to move forward until hardware could be received and installed
- A No-Cost Extension was processed to allow for late delivery/set-up of server hardware
- Project team encountered issues with setup and configuration of the VizSeek software
 - Network security configuration issues and local security policy issues
- Team was able to overcome all configuration issues



Questions?





Content-Based search analyses capability for technical data

Project Number: S2889

Title: Visual Search Engine

Performing Activity: Naval Shipbuilding and Advanced Manufacturing Center (NSAM)

Objectives: Reduce the time it takes engineers to research, identify and select parts and to reduce the number of parts that are duplicated each year, thereby reducing the engineering, supply chain, and associated labor with respect to new part creation.

Start / End Dates: Aug 2020 – Dec 2022

Project Cost:

ManTech Investment: \$1.2M

Weapon System: DDG-51

Performing Entities:

- Navy ManTech – Program Oversight
- NSAM – Project Management / Technical Oversight
- PMS 400D – Project Oversight
- Ingalls – Project Lead / Facility Support

Technical Achievements:

Jun	21	Phase I complete; "Go" for Phase II
Jul	21	Architecture Vision Document
Aug	21	Pilot System Architecture
Oct	21	Initial Pilot Implementation Plan
Apr	22	Iterative Test Results Summary
Jun	22	Pilot Test Plan
Sep	22	Pilot Test Results
Nov	22	System Demonstration
Dec	22	Final Report/Review

Implementation:

System: DDG-51

Site: Ingalls

Schedule: Q4 FY23

Status: Implementation anticipated 1Q FY24 Cost

Payoff:

Schedule	<div style="width: 100%; height: 15px; background-color: #00FF00;"></div>
Technical	<div style="width: 100%; height: 15px; background-color: #00FF00;"></div>
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Total 5-year Savings - \$7.6M (4.37 ROI)
 DDG 5-year Savings - \$3.3M (1.36 ROI)

Project Team



Paul Huang – ManTech Program Officer

Bobby Mashburn – Deputy Director
George Caramico – Technical Director
Scott Truitt – Project Manager
Dick Tiano – Project Technical Representative



David Clark PMS 400D



ManTech Program Manager – Ambre Cauley
ManTech Project Manager – Jamie Breakfield
R&D – Scott Robbins
Engineering – Virgel Smith
IT Team – Terry Walley
IT Team – John Pickard



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