Panel Project Status Report

Project Final Report

Agreement No. 2010-618

Enterprise Resource Planning (ERP) Integration with CAD

Date: June 24, 2011

Brief Outline

This pilot project intends to map the existing business processes at a targeted shipyard (VT Halter Marine, Inc. (VTHM)) in efforts to identify common information with their Enterprise Resource Planning (ERP) system (MARS) and their 3D product modeling system of choice (ShipConstructor). Initially, the project will study instances where similar information exists within both MARS and ShipConstructor 2008 (SC2008). Once these instances are identified, an information alignment map will be developed in efforts to capture potential data exchange between the two software tools. Once the alignment map has been completed, material information will be targeted for potential data exchange. The project team will then assess the current business process in efforts to streamline a more lean business process that eliminate duplicate data entry task associated with the materials required by the ERP software.

VTHM and ShipConstructor USA, Inc. (SSIUSA) are the primary participants in this panel. Northrop Grumman Shipbuilding – Gulf Coast (now Huntington Ingalls Industries Newport News Shipyard) is a member of the steering committee and performs oversight functions only.

Objectives

The objectives of this project were to:

- Capture the current "As-Is" business process associated with the processing of manufacturing BOM's,
- Document potential material information data that could be shared between the two systems,
- Develop a "To-Be" business process that will streamline the data processing of manufacturing BOM's,
- Identify system integration paths (alignment map) for exchanging material data,
- Develop a pilot application to exchange material data between the 3D CAD system and an ERP system.

Capture current "As-Is" business process

Patrick Roberts (ShipConstructor Software USA) conducted on-site process mapping with VT Halter in order to capture the current "as-is" business model for processing manufacturing BOM's. This time spent with VT Halter allowed an IDEF0 functional map to be generated that detailed the types of data requirements in the business process for BOM data, when the data was required by different processes, and where that data was currently being generated or drawn from.

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The functional process map traces the data requirements to feed each of the identified business functions including what data is needed as input, what type of data is needed as a control, and any mechanism information needed to complete that function. The output (right side) of the IDEF0 function feeds further processes downstream. Figure 1: The IDEF0 Building Block shows the basic building block for generating an IDEF0 map.

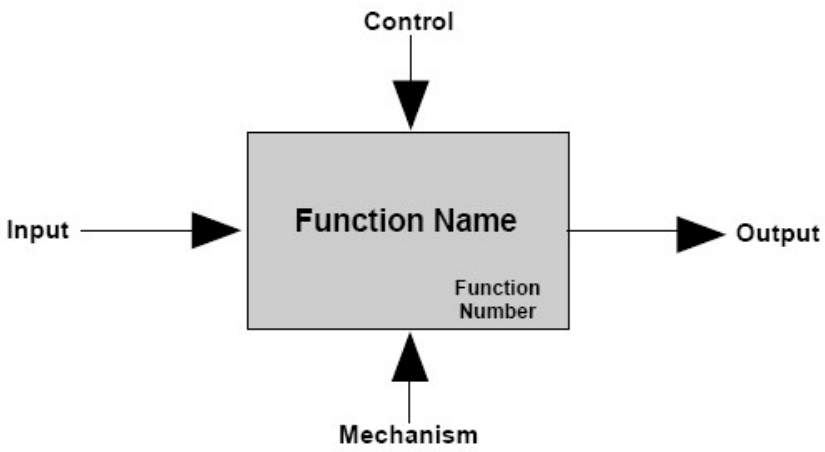

Figure 1: The IDEF0 Building Block

Application of this principal at VT Halter resulted in Figure 2: VTHM IDEF0 Map Example.

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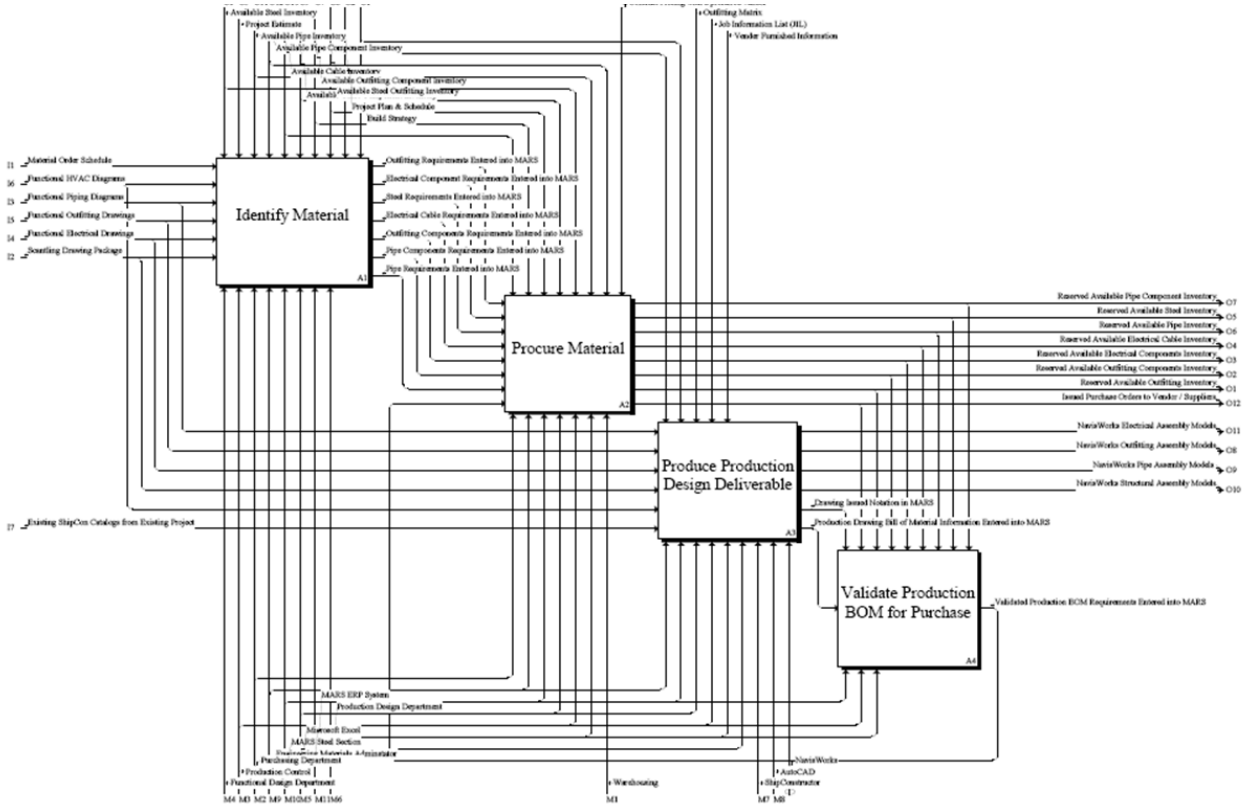

Figure 2: VTHM IDEF0 Map Example

Document potential material information data

This completed IDEF0 map for VTHM demonstrates all of the data requirements for materials in a production sequence under consideration and is the primary basis for identification of the proper data attributes. The data requirements at various stages in the IDEF0 map guide the project team in understanding what data is needed and at what stage in the process flow it is required to feed further functions. The data pertaining to material was the primary focus of this project, and particular attention was paid to the material data flow throughout the IDEF0 map.

Material information generated in one portion of the business process is identified for where it feeds further processes and is a means for determining what current process is used for transferring that data to the other functions. In cases outside of the design software environment the data had been manually transferred to other business processes for further manipulation.

Develop a "To-Be" business process

The "To-Be" definition in this case was to automate in some fashion the sharing of material data from the design system environment (ShipConstructor) into the Enterprise Resource Planning system (ERP) in an automated fashion that would require a minimum of human interaction with the actual data. This was to prevent any possibly errors that would creep into the data during the manual data translation to the ERP, and to speed the process up to save time.

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Identify system integration paths for exchanging material data

The IDEF0 mapping was investigated where the traces of material information identified in the previous objective was carefully followed throughout the business process. Identification was made of what the type of data was and where it was generated (either manually through software or through a different process). System integration paths were identified that would coincide with data that was being generated inside the design software ShipConstructor but would be required in an ERP system for further use (either as a control or input).

The identification of the material data of interest in the processes for VTHM was then compared against the managed data that was available in the ShipConstructor software. These data elements would be the primary focus of automation for exporting from ShipConstructor and importing into MARS.

Data that was generated in ShipConstructor could then be considered for automation into the ERP system MARS according to when in the process it is required. The normal workflow required that material data be entered into the ERP system when it coincides to Bill of Material (BOM) data located on a production output drawing that is delivered for construction to the production yard. This means that the data in a ShipConstructor production drawing will be required by the VTHM processes to be transferred into the MARS ERP system to coincide with the creation/issue of the production output drawing.

Develop a pilot application

The pilot application was constructed based on the results of the previous objectives. Focus was made on the ability to export the requisite material data from a ShipConstructor production output drawing that included all of the material and information located on a BOM for that drawing. ShipConstructor developed the application as a dynamic link library (DLL) for ShipConstructor that would expose a new command to export all of the required data to a neutral file format temporarily. Figure 3: ShipConstructor ERP Export shows the exporter DLL being invoked to write out an XML output file containing all of the required material data from a ShipConstructor assembly level.

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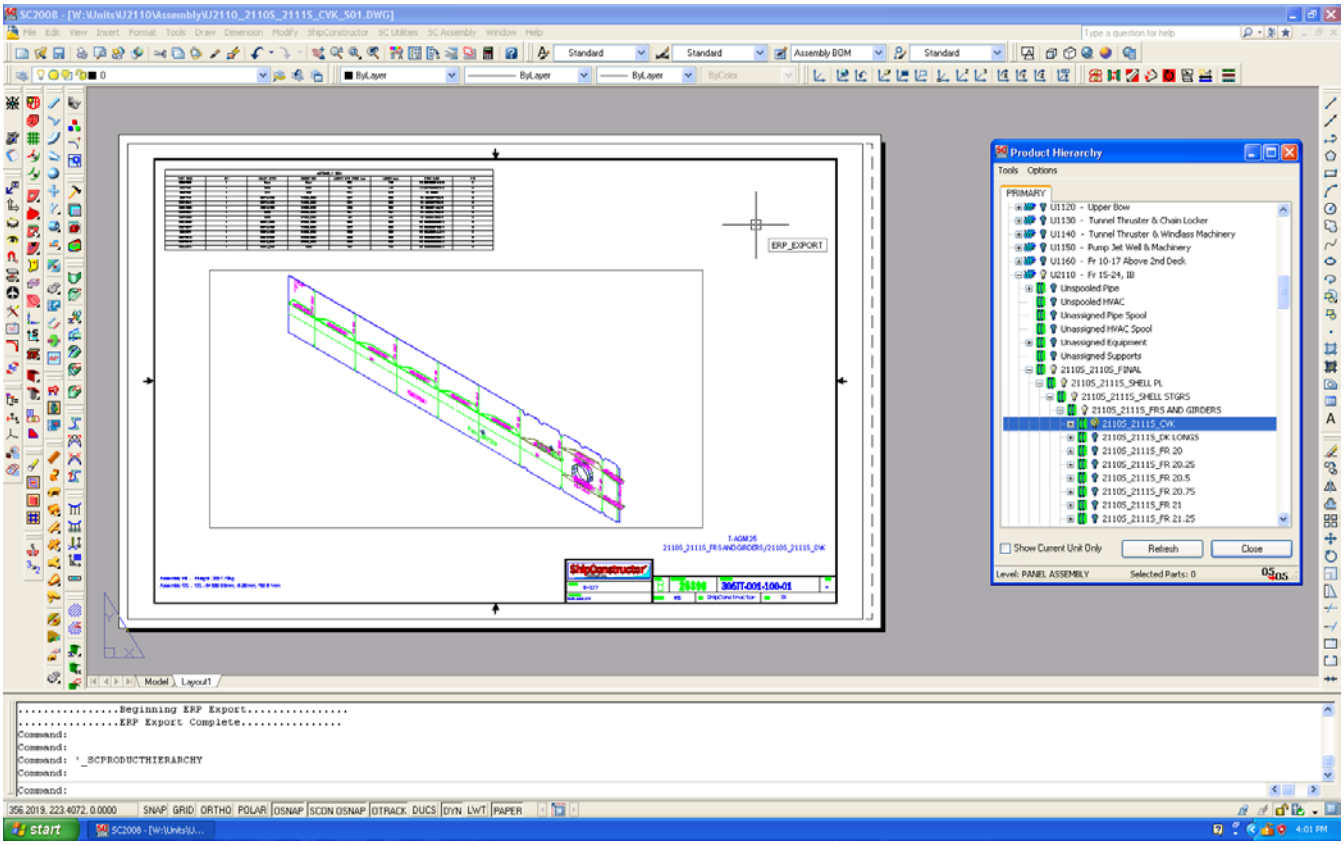

Figure 3: ShipConstructor ERP Export

ShipConstructor then created an application that would input this neutral XML file (see Figure 4: XML Sample Output), parse the data, and present it to the end user for verification (Figure 5: MARS Import of XML Data). At this time any extraneous data not created and managed by ShipConstructor, but still required by the MARS ERP system, could be manually filled out and modified. This application would then allow the user to push the parsed data out into a temporary SQL table in MARS that would then utilize the business logic in the ERP to push the data forward internally in the software to the required locations and for the intended uses.

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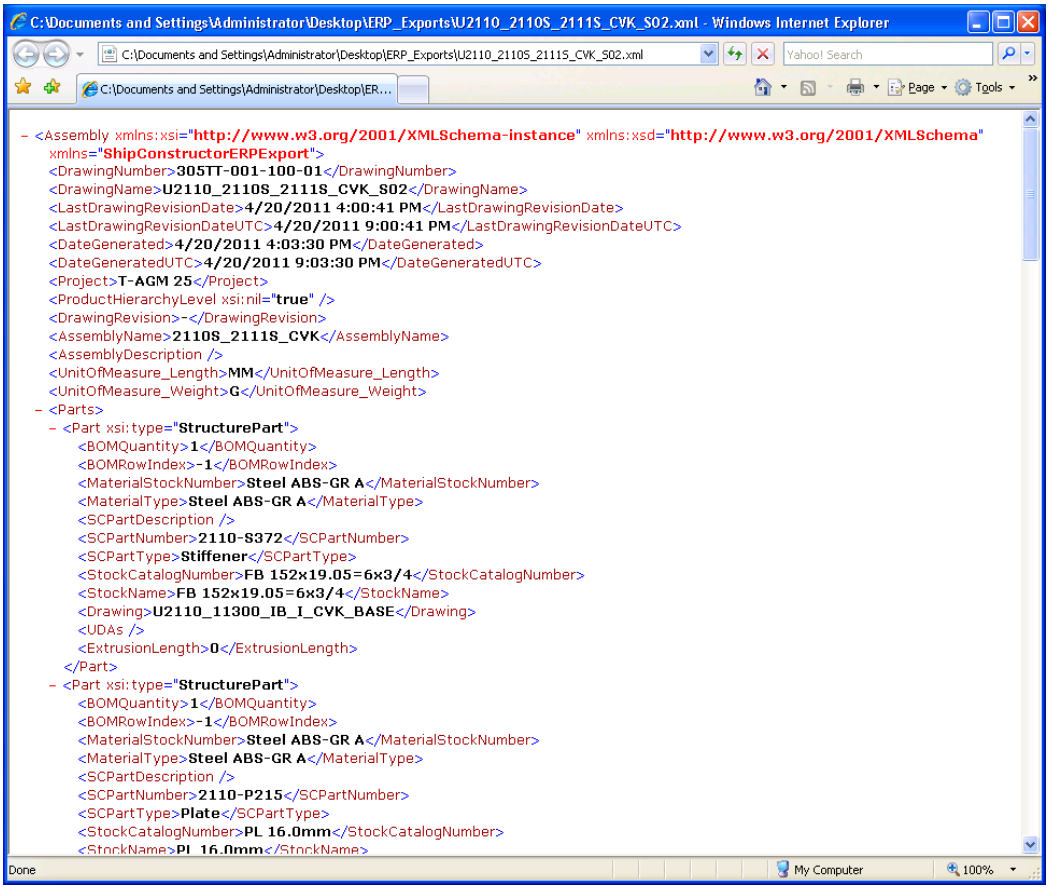

Figure 4: XML Sample Output

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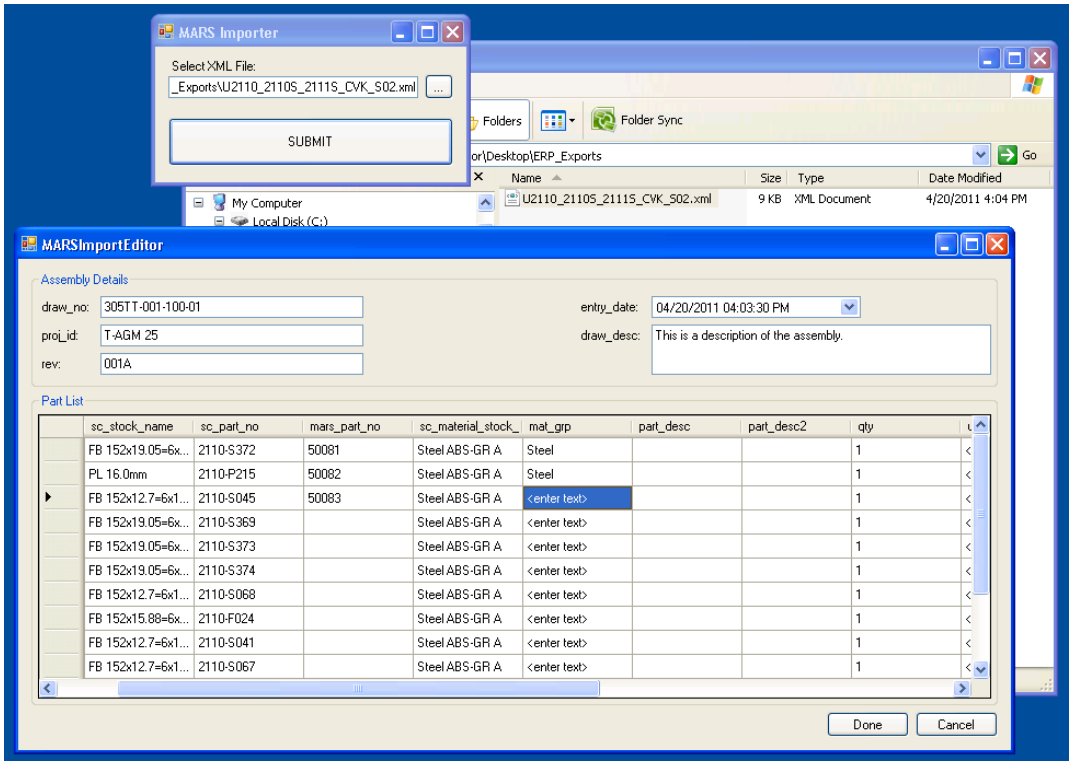

Figure 5: MARS Import of XML Data

Figure 6: Material Data Imported Into MARS shows the material data from the test project successfully imported into the MARS database into a temporary table. MARS contains the business logic required from that point to push the data into the appropriate locations internally within its own database tables for further use.

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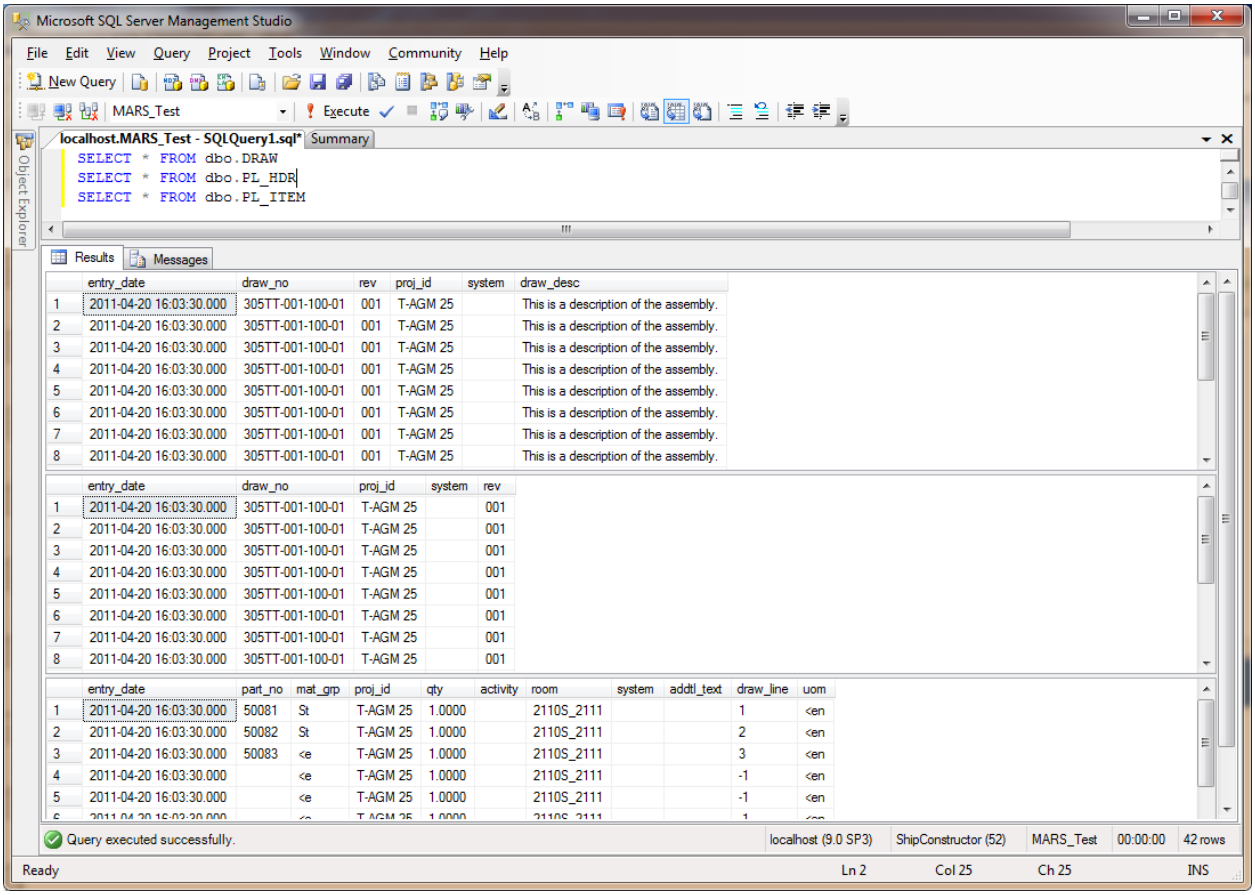

Figure 6: Material Data Imported Into MARS

Technical Status

The following Technical activities were created or performed during this project.

- A project kick-off meeting was held on June 9, 2010 at the ShipConstructor USA facility in Mobile, Alabama..
- The deliverable a (Kick-Off Meeting Minutes and its presentation material) was submitted on June 23, 2010.
- The deliverable b (Material Identification and Procurement As-Is Process Model) was submitted on July 22, 2010.
- The deliverable c (Quarterly Report #1) was submitted on July 1, 2010.
- VTHM and SSIUSA held several meeting to capture the Material Identification and Procurement To-Be Process Model. Several improvements were identified to the material process. The process model is being updated.
- During the meetings at VTHM to capture the to-be material process several other changes were identified that were not directly related to the material process.
- The deliverable d (Material Identification and Procurement To-Be Process Model) was submitted on September 22, 2010.

VT Halter TO-BE ERP Process Model Rev1a

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- Project status was presented by SSIUSA at the NSRP BPT Panel meeting scheduled on September 30, 2010, at General Dynamics Maritime Plaza in Washington DC.

- The deliverable e (Quarterly Report #2) was submitted on September 30, 2010.
- The deliverable f (Map of Material Data Exchange for Pilot System) was submitted on December 2, 2010.

- Project status was presented by SSIUSA at the NSRP BPT Panel meeting scheduled on December 9, 2010, at the Marriott Hotel in New Orleans, LA.

- The deliverable h (Quarterly Report #3) was submitted on December 29, 2011.
- The deliverable g (Pilot System Integration Plan) was submitted on January 20, 2011.
- The deliverable i (Pilot System Data Exchange) was submitted on June 23, 2011.

Scheduling Issues

SSIUSA's integration developer assigned to this project had left the company to pursue other interest in mid November 2010. SSIUSA was in the process of reorganizing and reprioritizing project tasking in efforts towards completing this project scope. This has caused a delay in submitting Pilot Exchange Integration Plan (deliverable g).

SSIUSA corporate demands and a family leave by the lead programmer necessitated a project extension which delayed the submitting of deliverable i (Pilot System Data Exchange) and this deliverable j (Project Final Report).

Results

The final results for this project are positive. The intended objectives were all completed with minimal problems or interruptions.

Output was generated from ShipConstructor and automatically imported into a MARS table successfully.

Conclusion

Overall the project was successful. Upon examination of the work involved it immediately becomes apparent that a proper IDEF0 map of the business processes and the data requirements is a crucial element in achieving a successful project. The IDEF0 process map clearly identifies the required data elements as well as the critical path for them to be utilized in the enterprise.

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