Electronic Freight Management Case Studies

A Summary of Results

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7. Authors Diane Newton (SAIC), Jim Cassady (SAIC), Al Hovde (SAIC), Ron Schaefer (SAIC), Al Veile (SAIC), and Bob Fredman (Battelle)		8. Performing Organization Report No.	
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16. Abstract The Electronic Freight Management (EFM) initiative is a USDOT-sponsored project that applies Web technologies that improve data and message transmissions between supply chain partners. The EFM implementation case studies contained in this document examine the degree to which the EFM applications can improve the operational efficiency within intermodal supply chains. Each case study documents the cost-effectiveness, long-term viability, and sustainability of the EFM package, as it was modified and implemented within the supply chain. The case studies also detail the environment into which the EFM package was being deployed, capturing the implementation parameters that were put in place to operate the package successfully, and assess implementation benefits in terms of business process cost savings and return on investment to the participating organizations.			
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Executive Summary

The USDOT EFM Program

The Electronic Freight Management (EFM) initiative is a USDOT-sponsored project that applies Web technologies that improve data and message transmissions between supply chain partners. It promotes and evaluates innovative e-business concepts, enabling process coordination and information sharing for supply chain freight partners through public-private collaboration.[1] The USDOT EFM program began in 2004, when USDOT collaborated with leaders of freight industry groups to develop the EFM initiative, pilot it, test it, and measure the results.

The Columbus EFM deployment illustrated cost savings of nearly $6 per shipment.

The main partnership vehicle for EFM development was the Intermodal Freight Technology Working Group (IFTWG), operating as a committee within the Intermodal Association of North America (IANA). In 2007, USDOT conducted an EFM deployment test in Columbus, OH with partners from a Limited Brands air cargo supply chain originating in China. The EFM program uses XML messages written per the Universal Business Language (UBL) data standards. An independent evaluation of the Columbus test showed positive results for all supply chain partners involved, leading to the follow-up effort to implement several pilots of EFM around the United States to assess the flexibility of the EFM package, promote adoption and measure its benefits.2 These pilots were funded and kicked off in 2009.

The EFM Pilots

The EFM implementation case studies were intended to examine the degree to which the EFM applications can improve the operational efficiency within intermodal supply chains. Each case study documented the cost-effectiveness, long-term viability, and sustainability of the EFM package, as it was modified and implemented within the supply chain. Although contractor-led, the case study teams at Science Applications International Corporation (SAIC) and Battelle Memorial Institute (Battelle) worked closely with the private sector entities to promote the commercial adoption and use of self-supporting EFM-related systems and services.

Each case study documented the environment into which the EFM package was being deployed, captured the implementation parameters that were put into place to successfully operate the package, and assessed the benefits in terms of business process cost savings to assess the return on investment to the participating organizations.

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[1] Research and Innovative Technologies Administration, ITS JPO, "Electronic Freight Management" Web page. Available at: http://www.its.dot.gov/efm/index.htm

[2] Research and Innovative Technology Administration, ITS JPO, *Columbus Electronic Freight Management Evaluation Final Report*, (Washington, DC: June 2008). Available at: http://ntl.bts.gov/lib/31000/31500/31594/14442.htm

SAIC conducted six case studies and Battelle conducted two case studies. More information on the background for these case studies is found within the body of the report.

- SAIC:
  - Kansas City SmartPort – DEMDACO
  - Interdom Partners and Pride Logistics
  - Interdom Partners and Agmark Logistics
  - WorldWide Integrated Supply Chain Solution and Griffin Pipe Products Company
  - Express Systems Intermodal, Inc.
  - Fellowes (a simulation)
- Battelle:
  - "ACME", an alias for a global supplier to the consumer products, electronics, and energy manufacturing industries (a simulation) conducted through Freightgate
  - Carter Transportation LLC and Freightgate

The EFM Package

These EFM case study pilots support supply chain partner interaction between individual partner systems and between partners and the EFM package. For each case study, SAIC and Battelle worked with the various supply chain partners to implement the EFM package, which was initially developed by Battelle Memorial Institute. The EFM package consists of three documents sets, targeted for specific audiences, as well as several software component bundles (source code):

- The Adopter set is geared for a logistics person charged with evaluating the applicability of EFM package to their needs.
- The deployment documentation provides specifics as to the infrastructure on which the package is deployed.
- Finally, the developer documentation details the software architecture of the EFM package and how one tailors it for their specific adoption.[3]

In these case studies, SAIC and Battelle relied on the software component bundles. These bundles included the message sets, which were the basis for the Universal Business Language message schemas that were used for the case studies.

Modification of the EFM Package

During implementation of the EFM case studies performed by SAIC, the EFM package was modified to better suit the needs of the clients. In most cases it was necessary to extract data from plain text files or Microsoft Excel files instead of getting the data directly from a database. This required writing parsers for each file format encountered to populate the data structure being used by the web service.

The data structures used by the web services were also modified when necessary. Most of the data structures defined by the XML Schema Document (XSD) for the web services are very large allowing them to handle almost any kind of data. SAIC found these structures to be overly complex for our needs, so SAIC refined them, making them simpler but maintaining UBL

[3] Electronic Freight Management web site, administered by Battelle: http://www.efm.us.com/

compliance. This allowed for quicker development of applications that would consume the web service.

Another challenge encountered was building an application from the EFM package that would deploy to an IBM AS 400 using the built in application server. The bundled application is not fully compliant with the J2EE standards, so SAIC used a simplified version of the EFM package. This involved removing anything that wasn't necessary to transfer or receive data from the AS 400 server.

Quantitative Results

Per the FHWA Statement of Work, the ultimate goal of the EFM Implementation Case Studies was to demonstrate a positive return on investment (ROI) for the supply chain 'anchor' who assumed responsibility for implementing the EFM package within their infrastructure. Additionally, it was intended for the EFM package to be implemented in such a way that facilitated continued use of the technology after the pilot concluded, which was achieved in numerous instances.

- Table 1-1 summarizes the net present value (NPV), ROI, and total process improvement (in dollars). These terms are defined as follows:
- Total process improvement – annual savings to all supply chain partners
- Net present value - includes all cash flows including initial investment discounted using a minimum attractive rate of return of 10%.
- Benefit cost ratio - ratio of the benefits of a project, expressed in monetary terms, relative to its costs, also expressed in monetary terms (all benefits and costs expressed as discounted present values).
    - Projects with a benefit-cost ratio greater than 1 have greater benefits than costs (positive *net* benefits). The higher the ratio, the greater the benefits relative to the costs.

Table ES-1. EFM Case Study Quantitative Results

Case Study	Minimum Attractive Rate of Return	Useful Life	Net Present Value	Benefit Cost Ratio	Annual Total Process Improvement
SAIC					
WorldWide Integrated Supply Chain Solutions	10.00%	5 Years	$58,648.33	7.33	$17,916.00
Kansas City SmartPort - DEMDACO	10.00%	5 Years	$25,470.06	2.49	$11,216.00
Interdom Partners-Agmark	10.00%	5 Years	($1,151.63)	0.94	$4,800.00
Interdom Partners-Pride	10.00%	5 Years	$77,193.57	6.62	$23,990.00
Express Systems Intermodal	10.00%	5 Years	($579.56)	0.96	$3,830.00
Fellowes (Simulation)	10.00%	5 Years	$1,603,676.52	18.39	$276,000.00
Battelle					
Carter Transportation	10.00%	5 Years	$57,761	1.36	$24,710
ACME (Simulation)	10.00%	5 Years	$8,814,749	127.15	$2,619,293

Key Observations

Kansas City SmartPort – DEMDACO

The unique aspect of this case study was the use of the Kansas City Trade Data Exchange (TDE) to essentially act as the user interface for the EFM package. Providing such an interface meant that any employee can access purchase order and shipment status information. This allows for tracking of all inbound orders, and reduces the calls for status to the logistics supervisors. This case study was a limited deployment of the package and did not include all of DEMDACO's transportation providers (and therefore did not include all of their orders). Likewise, use of the package via the TDE was constrained to DEMDACO office staff. Had the pilot included all providers and been used by warehouse staff (in forecasting order receipt), the process cost savings would have been approximately $10,000 more than what was realized during the pilot.

Interdom Partners and Pride Logistics

Interdom's dray (truck) provider, Pride Logistics, was the prime recipient of both the qualitative and quantitative impacts of the EFM package. The EFM package automated *all* information exchanges between Interdom and Pride. The elimination of manual processes has several direct outcomes, including eliminating rekeying of data, improving data accuracy, simplifying their exchanges with their partners, improved efficiency, etc. Perhaps what is most important about the EFM implementation with Pride is that it is a long-term solution for them, the benefits will continue to accrue even though the case study is technically complete. It has changed the way Pride does business and the way they interact with their customer (Interdom). This is also an example of a case study where EFM continues to operate and provide benefits to Pride after the pilot ended. With an estimated annual growth in volumes of 20%, this will allow Pride to maximize their operations while maintaining their current staff size, at least for the next few years.

Interdom Partners and Agmark Logistics

The Interdom – Agmark case study was an example of a case study with less favorable quantitative results. This was primarily due to the high level of automated tools that the supply chain depended on, and continued to use in parallel with the EFM package. Agmark currently relies on a value-added network to support Electronic Data Interchange (EDI) transactions as well as a third party data provider to obtain rail status. Because the information exchanges were completely automated on Agmark's end, all quantitative benefits were realized by Interdom.

WorldWide and Griffin Pipe

The primary impacts of the EFM package for WorldWide's customer, Griffin Pipe Products, was having transportation status available to them "at their fingertips," allowing their customer service representatives to be more proactive in tracking shipments, perhaps noting exceptions before a customer is alerted. It also allows them to be more responsive and track more loads, not just those with issues and/or delays, providing increased visibility over all of their shipments. Unfortunately, the shipment volumes Griffin Pipe moved with WorldWide decreased during the economic downturn. However, Griffin Pipe estimated that if their volumes increase to levels seen before the crisis began, the labor and process savings from using EFM to track shipment status could be much higher than estimated for this pilot. Therefore, they remain interested in applying a tool like the EFM package to their business.

Express Systems Intermodal, Inc.

Express Systems Intermodal (ESI) recognized perhaps the most important qualitative benefit that EFM provides: a competitive advantage. ESI articulated that in an increasingly low-cost environment, technology tools like the mobile app developed as part of their EFM pilot give them an advantage in marketing to and securing new customers, as it offers an additional way to interact and complete transactions 'on-the-fly' and at all hours. Second, as with the Interdom-Pride case study, the EFM case study with Express provided an opportunity to automate the invoice transaction with one of their more manual dray carriers, Hammer Express. The savings for this automation was so great that ESI intends to continue their use of the EFM package and pursue adoption of the automated invoicing with their second (also manual) dray carrier to double their process savings in this area.

Fellowes

As the detail of the Fellowes Case Study provides, a case study was not completed with Fellowes, a manufacturer of business equipment. Once the project was kicked off, multiple changes in the environment caused the study team to abort the pilot implementation of the EFM package and complete a simulated calculation of benefits. These changes included loss of a project sponsor within the Fellowes organization, a freight forwarder contract change, and Fellowes' purchase of an off-the-shelf supply chain visibility tool. The goal in the simulation – and as reflected by the results – was to prove that the EFM package can act as a low-cost alternative to value-added networks and commercial off-the-shelf (COTS) solutions. In addition, a large company like Fellowes may benefit in that the benefits provided by the package could improve the less-automated operations and subsidiaries within their brands.

Carter Transportation

Prior to implementing the EFM package, there was no electronic messaging occurring between the adopting supply chain partners. Therefore, the pilot implementation offered an opportunity to become as efficient as possible in managing booking and operations translated directly to their capacity to service clients and build their network. The pilot implementation resulted in completely automating the booking transactions between the shipper, Carter and the carrier, dramatically reducing booking transaction time and cost. The EFM adoption has had a dramatic impact on administrative productivity and customer service for Carter. This demonstrates a key impact of the package, in that the EFM package is a relatively fast and easy solution to implement, yet the degree of business process integration frees up valuable time for small businesses whose Principal wears all the hats at various times. The Principal's time should be spent managing clients, service, cost and building the business. Automation of business processes allow for more focus to be placed in these areas. Electronic exchange of business information can also help to remove some of the verbal communication barriers that exist when English is a second language for some supply chain participants.

ACME

"ACME," an alias for a global supplier to the consumer products, electronics, and energy manufacturing industries that comprises multiple divisions and hundreds of vendors worldwide, was another case study that encountered many challenges. There were difficulties in the ability to quantitatively assess the potential benefits to the supply chain partners. Partner acceptance [of the EFM solution] was also a barrier to this success of this case study. That said, qualitatively, the EFM package could provide the ability for ACME's vendors to access routing information via the vendor portal, with a significant time and accuracy improvement over referencing paper copies. For ACME's forwarders, the EFM package could provide integration with their internal operating systems, eliminating duplicate data entry as well as the rework and potential routing errors that occur with data entry errors. In this adoption, ACME is aggressive in negotiating favorable rates for transportation services and has a very sophisticated supply chain for delivering high-value and time-sensitive products to their global customers. The cost of misroutes represents a small percentage of their total transportation spend, yet these hidden costs add up to significant and real dollars taken from their bottom line. This was the primary target of opportunity for the EFM package.

Chapter 1. DEMDACO – KANSAS CITY SMARTPORT – TRADE DATA EXCHANGE

1.1 Environment Summary

1.1.1 Operating Environment

DEMDACO is a Kansas City-based importer of gift and decorative items. Their supply chain is an ocean-rail oriented supply chain, with dray support at both origin and destination locations. The supply chain originates in China and ends in Kansas City, MO. Ocean carriers transport the containers into a U.S. West Coast port where they are transferred by rail for destination into Kansas City. DEMDACO operates their own warehouse in the Kansas City area, but works with a Hong-Kong based buying agent (D.D. Traders) to arrange the remainder of the transportation.

DEMDACO participated in a short-term case study of Electronic Freight Management (EFM) beginning in 2008, which resulted in a two-month deployment of EFM among DEMDACO and their partners in early 2009. A second case study with the DEMDACO-owned supply chain was undertaken primarily to demonstrate visibility of electronic data interchange (EDI) messages via the Kansas City Trade Data Exchange.

1.1.2 Key Participants

In addition to DEMDACO, the key participants in this case study included:

The Kansas City Trade Data Exchange (TDE) and the Trade Data Organization (TDO).

The central goal of the second DEMDACO pilot was to provide visibility to DEMDACO through the Kansas City TDE, with the TDE acting as the DEMDACO user interface. The TDE is public-private partnerships based largely in Kansas City, MO whose beneficiaries include importers and exporters, carriers, brokers, and government agencies, which may access the TDE as members or non-members. The TDE provides a community for these entities to share and communicate supply chain data.

The TDE is a member-run and a member-owned community that complements existing data risk management clearinghouse software enables multiple partners to track shipments for the logistics industry in a more visible way. Supply chain partners can all connect through the system. Customized system integration and a web-based user interface enables shipment data to be entered only once, thereby reducing the potential for mistakes and eliminating the need to contact multiple shippers or track shipments on multiple websites.

From a technological perspective, the Trade Data Organization (TDO) is the operator and administrator of the TDE, and they participated in the EFM Case Study as a subcontractor to SAIC. The TDO worked with DEMDACO and SAIC in performing the required modifications to the TDE, including implementing EFM web services and universal business language (UBL)

message schemas to exchange the pertinent information, and modifying their database to receive and store the required information for the pilot.

Transportation Partners

In addition to DEMDACO as the supply chain owner and the TDO as the operator of the TDE, the second EFM case study supply chain partner participants included:

- Mediterranean Shippers, MSC (ocean carrier)
- American President Lines, APL (ocean carrier)
- Kansas City SmartPort: a key facilitator between the DEMDACO supply chain and the SAIC team

The two ocean carriers supply status messages to DEMDACO for all legs of the shipment, from the time the container is loaded onto the vessel in Hong Kong through the rail transit of the container from the U.S. West Coast to Kansas City. IXT, the dray provider, delivers containers from the rail carriers' Kansas City intermodal facilities to its North Kansas City warehouse. The dray also picks up the empty containers from the warehouse and drops them at the ocean carriers' container yard. Both ocean carriers supplied status messages for the dray carrier.

In addition to the EFM web services and the TDE, the DEMDACO EFM case study also planned to use SAIC's Transportation Visibility Management Solution (TransVM). TransVM is an integrated toolset designed to manage shipment activity from order creation to final delivery in a true exception-based environment. While TransVM offers a wide suite of functionality, for purposes of this case study, it acted as the engine to collect, store and generate supply chain information such as status and estimated time of arrival (ETA) using web services and push this information back out to the TDE using EFM (UBL) message schemas for display to DEMDACO staff through the TDE.

1.1.3 Description of As-Is Technical Environment

As with many organizations, DEMDACO's receipt and use of shipment status was reliant on a variety of tools, many non-technical. To research a particular PO required numerous inquiries of DEMDACO's various partners via phone calls, e-mails, facsimiles, static reports and web-based inquiries. The basis for each inquiry was typically by container number because DEMDACO mostly ships full container loads. The DEMDACO PO number stored the PO number, and this number was used for the in-transit inquiries made by DEMDACO staff to the ocean carrier websites. Dray status, if needed, was sought and received by phone.

In deploying the EFM package, one piece of information DEMDACO hoped to gain was receipt of the container's expected arrival date into their Oracle ERP system, EBS. Currently, EBS uses static expected arrival date based on a fixed offset from the ship date of the container. Critical decisions about outbound order release are made by EBS using this 'expected' ship date. Therefore the expected time of arrival (ETA) is not an up-to-date, variable piece of data for DEMDACO to act on, and current practices would require manual updating of the expected arrival date, which is not practical. This presents a critical area of opportunity for the EFM package, because the package could provide DEMDACO with an automated update of expected time of arrival (ETA) based upon near real-time status from their carrier partners, thereby improving outbound order release decisions.

Table 1-1 provides a summary of the DEMDACO environment. It summarizes the supply chain environment prior to the implementation of the EFM web services. This table is meant to illustrate the areas of opportunity that the EFM services can improve.

Table 1-1. DEMDACO Environment Summary

DEMDACO EFM Case Study Environment Summary	
As-is Business Environment:	
Partner	**Summary of Case Study Participation**
DEMDACO	• Owns freight and manages contracts and relationships with other Supply chain partners. • Primary interaction with SAIC project team
Mediterranean Shipping Company (MSC)	• Transports freight as agreed with cargo owner • Data provider (ocean and rail status as ftp)
American President Lines (APL)	• Transports freight as agreed with cargo owner • Data provider (ocean, rail, customs, and dray status, as ftp)
Business Problem:	
Problem	**Projected Benefits**
Access to data currently not available or more difficult to acquire	• TransVM to send BOL status using UBL schema/web service to TDE: show PO-level data such as weight/quantity. • Replace use of carrier and freight forwarder tracking websites with TDE; enhance analysis of shipment data; allow more timely decision making.
Planning of unloading labor	• Generation of ETA using TransVM and provided to DEMDACO via the EFM package and TDE. • Improved labor utilization due to efficiency and completeness of status from transportation providers.
Lack of in-transit shipment (PO) visibility	• Improved shipment visibility through the TDE and integration of EFM web services (from TransVM) into the TDE and the DEMDACO Oracle operating system. • APL and MSC send status – including railroad data – to TransVM Web service pushes status data to TDE for display.
Lack of automation and efficiency	• DEMDACO to send and receive PO data using UBL schema for web service through TransVM to TDE. This gives DEMDACO visibility into the booking process to improve accuracy, timeliness and completeness of data. • TDE gives DEMDACO a single point of access for viewing shipments and PO detail. • Use of web services/automation of messaging reduces redundant data entry.
Supply Chain Technical Environment	

DEMDACO EFM Case Study Environment Summary	
Current IT Tools	• Oracle EBS Enterprise Resource Planning System (DEMDACO) • IBM Cognos reporting tool that supports ERP system (DEMDACO) • 1EDI Source (EDI Translator; DEMDACO) • Centric Product Lifecycle Management Tool (DEMDACO)
Current Messaging	• Fax • Email attachment: scanned document, Excel spreadsheet, EDI, flat file • Telephone • In-Person Meetings
Current Interchanges (targeted with the EFM package)	• (from-to) • Create and send PO (DEMDACO – origin office and vendor) • Booking receipt and confirmation; Means: email and/or telephone (Origin office/vendor - carrier) • Issue BOL; Means: scanned email attachment (ocean carrier – origin office) • Shipment transit status for ocean, rail and destination dray; Means: carrier website (ocean carrier – DEMDACO), freight forwarder website • Release freight; Means: fax, e-mail (ocean carrier - IXT)

1.2 Implementation Summary

1.2.1 Application of the EFM Package

Prior to creating the message schemas and implementing the web services which exchanged the supply chain information among partners, SAIC first documented the end-to-end supply chain process used by DEMDACO to determine where the EFM package could add value. This process is summarized below in Figure 1-1.

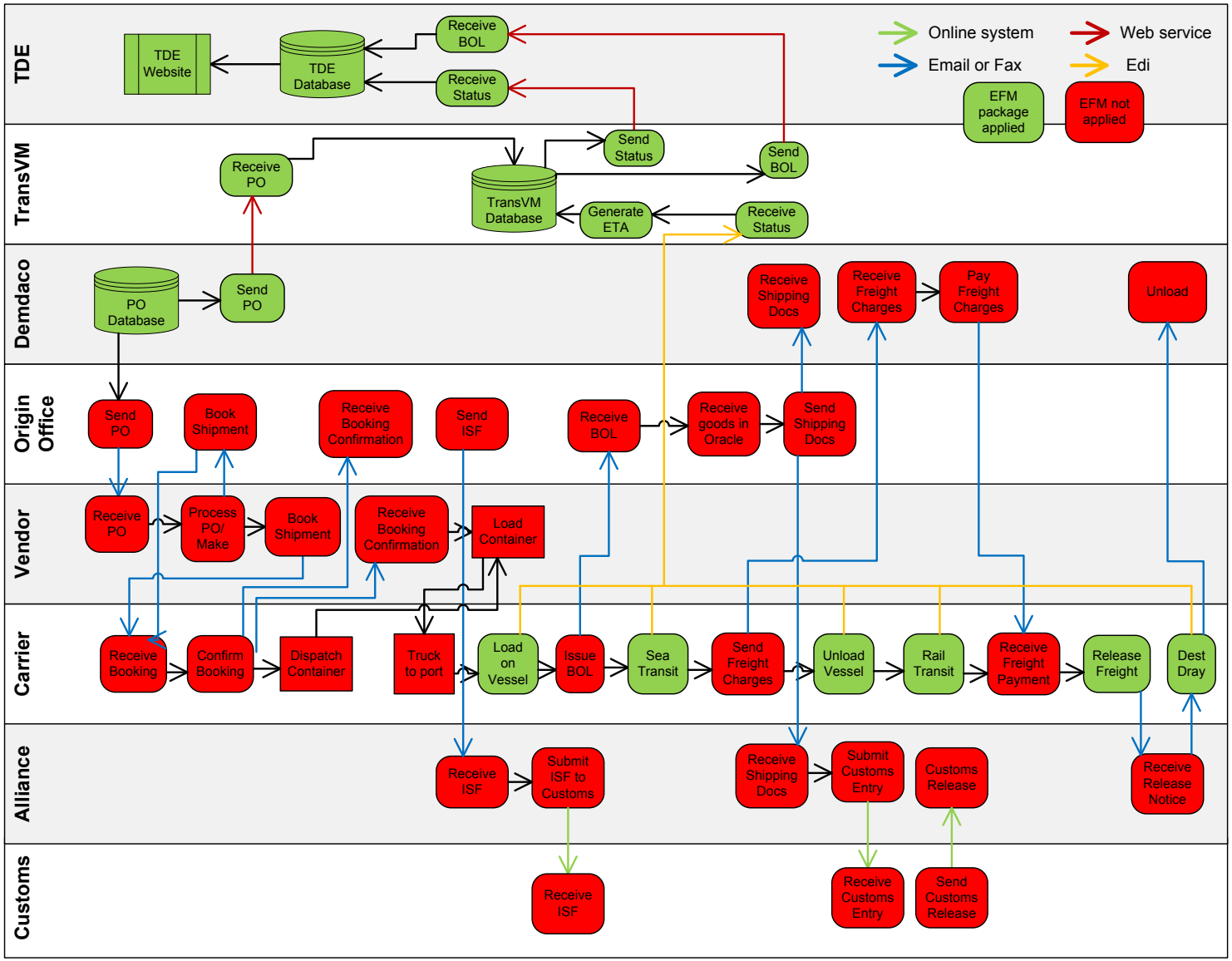

Figure 1-1. DEMDACO Supply Chain Map

1.2.2 Implementation Decision Process

Several issues were involved in the business rationale for making the decisions regarding final partner involvement and EFM package coding, testing and implementation.

1) **The most important factor affecting the final outcome and structure of the Kansas City SmartPort/TDE EFM case study was the integration of the TDE with the EFM package.** As such, major project resources were needed to modify the TDE so that it could receive shipment information via EFM web services and provide visibility to DEMDACO for this information. Since one of the main goals of the study was to provide DEMDACO with increased visibility of their shipment data and information within the TDE, the case study team had to prioritize the involvement of supply chain participants and the information they provided to ensure that the most important information was acquired by the EFM package and displayed in the TDE. This resulted in several participants, who were originally planned for participation, ultimately being excluded from the study, as summarized in Table 1-2.

Table 1-2. Participants Not Included in KCSP-TDE-DEMDACO Study

Partner	Role	Decision Points
Alliance	Freight forwarder and customs broker	• Alliance reports customs status to the ocean carrier. • Ocean carrier provided the customs status information to SAIC at the same time as they reported shipment status. • Visibility over customs status information was a low priority for DEMDACO, as clearing customs is not an issue for them. They do not experience delays while waiting for shipments to clear customs.
DD Traders	DEMDACO origin office in Hong Kong	• The primary role of the origin office is to exchange information with vendors and carriers in China and Hong Kong. • The exchanges between DEMDACO and their origin office were a low priority.
U.S. Customs and Border Protection	Import clearance	• CBP has their own electronic filing processes and has not participated in any of the EFM case studies or pilots to date.
Union Pacific and BNSF	Class I rail carriers	• The ocean carriers are responsible for booking transport from origin through delivery to DEMDACO's warehouse. As such, the ocean carriers have rail status and provided it to SAIC along with ocean status.
IXT	Dray carrier	• The dray status was not a high priority for DEMDACO, as the dray portion of the trip is a 10-mile trip from the rail terminal to the distribution center. • The ocean carrier, as the responsible party for the trip, also provided some dray status.

2) **Once the participants and transactions were identified, SAIC worked to ensure the technical environment supported EFM package implementation.** Pre-implementation efforts included addressing the business rationale issues and ensuring that changes to the technical environment, as a result of implementation, did not negatively affect DEMDACO's daily business operations.

3) A critical aspect of the implementation phase was to confirm that the data feeds from all of the partners were properly integrated. The technical team worked with the partners throughout the implementation phase of the project to integrate their data feeds with TDE through the EFM package:

    a) The ocean carriers provided data through channels they use to provide data to other customers. For example, although the EFM package encourages data transmission by web service and UBL message schema, this could require additional work by the data provider to implement. In the case of this case study, the ocean carriers preferred to keep data in existing formats (for example, Electronic Data Interchange, or EDI) and provide it to SAIC via ftp. This meant that it was primarily up to SAIC to adapt their data feeds for receipt and re-use by the EFM package. Adapting their data was relatively straight forward and did not affect the project schedule.

4) **Another critical aspect to this case study was the use of the EFM package to provide supply chain data from the participants to TransVM, ideally using web services**. SAIC's TransVM tool acted as the repository for the data collected and distributed by the EFM package. SAIC incorporated TransVM into this case study to test how a third party logistics system could interface with the EFM package. For this case study, TransVM translated the EDI status that was provided by the ocean carriers before pushing to the TDE. The code that performed this translation could be moved or used elsewhere to no detriment of the EFM package or the TDE. TransVM was involved in the following transactions:

    a) PO data from DEMDACO's EBS was sent to TransVM (this was accomplished using web services as designed by the EFM package).

    b) Transportation status (ocean, rail and dray) was sent from the ocean carriers to TransVM (this was accomplished via EDI or flat file to ftp).

5) **The development of the EFM web services and UBL message schemas was also a critical activity for SAIC and TDO, who was responsible for the needed modifications to the TDE.** Following the business rationale decisions regarding which partners would provide data, what data they would provide, and how it would be provided, this was a critical aspect of the implementation that included the development of EFM web service to send transportation status and BOL data from TransVM to the TDE.

6) **DEMDACO's vision of TDE included the use of the EFM package to support the provision of a dashboard of sorts of critical shipment data and information on a few TDE screens that otherwise was more difficult to ascertain from their EBS**. This included shipment weights and other data however because of the challenges DEMDACO had in working through these changes to TDE with TDO, the changes took much longer than anticipated. A major issue here was that SAIC's hands were tied because this was a decision between TDO, the TDE administrator and operator, and DEMDACO, a TDE member.

1.2.3 Implementation Parameters

1.2.3.1 *Business Rationale of Adopters/Potential Adopters*

The business rationale and goals of the KC SmartPort/DEMDACO/TDE EFM Case study were much more complex than the initial EFM pilot in 2008, as the demonstration of the integration of the EFM package with TDE was the major goal. Therefore, the cost-benefit component of the case study (performed using the Freight Technology Assessment Tool (FTAT) analysis outlined later in this study) demonstrates cost reductions driven specifically by the use of the TDE to host and display information to its participating supply chain partners. The basis for integrating the EFM package with TDE use assumes that the "as-is" business environment experiences inefficiencies in the exchange of data and information among supply chain partners due to duplication, delays and timeliness in communications. In theory, the TDE decreases the hidden costs associated with these communications by improving the visibility of logistics data, a benefit complementary to EFM, which applies web-based applications to improve data and message transmissions among partners.

1.2.3.2 *Performance Measures*

- DEMDACO does not hold their supply chain providers to formalized requirements, although there are understood expectations from certain providers: The customs broker should file the Customs entry in time to secure a Customs release prior to the container being grounded at the destination rail yard to avoid shipment delay.
- The dray carrier should pick up the container from the rail yard prior to the expiration of the free time to avoid demurrage charges.

These expectations were not impacted by the use of the EFM package or the TDE. As mentioned earlier, this case study was the second deployment of EFM within DEMDACO. The first pilot in 2008 sought and achieved benefits in the areas of:

- Reduction in outbound backorders.
- Increase in container utilization.
- Reduction in the cost of 10+2 filing.

Targeted improvements for the second DEMDACO EFM case study, featuring the TDE, were:

- Improved visibility of EDI messages through the TDE and integration of EFM web services (from TransVM) into the TDE and the DEMDACO EBS, specifically:
  - Visibility into the booking process
  - Improved accuracy, timeliness and completeness of data.
- A single point of access to DEMDACO for viewing shipments and PO detail.
- Reduction in redundant data entry (by DEMDACO).

  Improved efficiency in management labor utilization due to increased timeliness, accuracy and completeness of shipment status from transportation providers.

1.2.3.3 *Implementation Challenges*

Anticipated:

- EFM is not widely known, accepted or used in the freight industry

- There was no major player as an endorser of the technology ("anchor tenant") who could require participating partners to support EFM package implementation
- The project schedule allowed for a relatively short (90-day) operational test phase. Many expected operational changes could not be effectively demonstrated.
- Information Technology resources of DEMDACO were limited because of other operational commitments.
- Unknown ability of supply chain partners to provide the shipment event information needed for effective shipment visibility to DEMDACO. Contract renewal with ocean carriers occurred during the case study period that could have impacted case study cooperation.
- The transportation service providers did not intend to use the information supplied via the EFM package in their operations. Therefore, they did not seek to achieve any internal benefit.
- DEMDACO transportation service providers transmitted required data using their standard distribution methods – thereby not demonstrating the use of EFM web services and UBL message schemas.
- Without direct benefit, service providers did not have economic incentive to participate.

Unanticipated:

- No clear vision by TDO of how TDE would interface with the EFM package to provide DEMDACO with increased visibility of their shipments. There was great trepidation by TDO to make changes to TDE because they were concerned that the changes to accommodate DEMDACO may not bode well for TDE's membership as a whole. This caused significant delay in EFM package implementation as there was no plan or proactive effort on TDO's part to leverage the package to improve DEMDACO's standing as a member of the TDE. In addition the use of the TDE and the modifications that were required (using project resources) forced the project team to prioritize project achievements. As discussed, some participants were not included in the case study, and all of the information requested by DEMDACO could not be collected, calculated and provided via the EFM package, TransVM and the TDE.

Table 1-3 provides a summary of the DEMDACO implementation parameters.

Table 1-3. DEMDACO/KCSP/TDE Implementation Parameters Summary

Decision Process	• Reduction in effort and labor hours expended researching EDI and monitoring inbound shipments • Near real-time ETA information
Business Rationale	**Potential Benefits:** • Single source of EDI-based status information • Provision of a user interface for DEMDACO for visibility of EDI (the TDE) • Reduced cost of monitoring inbound shipments **EFM Implementation Goals:** • Improved visibility of EDI status message • Generation of and visibility over estimate time of arrival (ETA)

	through the TDE. • Reduced costs • More timely and accurate information for decision making
Potential Performance Measures	• Labor expended monitoring inbound shipments • Timeliness of EDI status information • Accuracy of ETA
Implementation Challenges	• Lack of a major player as an endorser of the technology ("anchor tenant") • The pilot demonstration was only 90 days duration and operational changes could not be effectively demonstrated • DEMDACO IT resources were limited because of other operational commitments • Unknown ability of supply chain partners to provide shipment event information as contract renewal with carriers occurred during case study • EFM not yet widely used • Participants who participate in the project without economic incentive because they are serving a customer may not have resources to devote • TDO had no clear vision of how TDE would interface with the EFM package to provide DEMDACO with increased shipment visibility

1.2.4 Implementation Cost Summary

The costs associated with implementing the EFM package for the KCSP/DEMDACO/TDE pilot reflect the costs to DEMDACO using a hosted technology outsourcer (SAIC), who provided the computing platform (TransVM), communications link (the EFM package) and necessary support and management personnel. In addition, this case study includes costs associated with the modification to the DEMDACO user interface (TDE) for this case study.

Table 1-4 contains the implementation and operations/maintenance cost summary for the KCSP/TDO/DEMDACO EFM Case Study. These were the costs that were factored into the benefit-cost assessment conducted using the Freight Technology Assessment Tool (FTAT). These costs are based on:

- The number of web services that were deployed within the IT infrastructure of each supply chain partner
- The number of hours spent by key IT staff at DEMDACO to refine and prepare the EFM package for implementation.
- The number of hours spent by SAIC and TDO staff providing technical guidance to DEMDACO

An estimate of the annual number of hours required to continue EFM operation - this includes the minimal maintenance costs of running support servers, but assumes no further modification to the TDE or EFM package to provide enhanced service to DEMDACO.

Table 1-4. DEMDACO Implementation, Operations and Maintenance Costs

Assumptions:

- Technical assessment of deployment environment takes on average 2 weeks (40 hours per week) = $2,240. This cost is factored into the cost per party as a flat rate expense.
- Each client/service takes on average 1 week to deploy = $1,120 per service/client
- Average hourly rate = $28/hour

Implementation

Party	EFM Clients	EFM Services	Cost per party
DEMDACO	1	0	$3,360
TransVM	2	2	$6,720
Carrier (Ocean)	0	0	$0
TDE		2	$4,480
Total Implementation Costs			**$14,560**

Operations and Maintenance

24 hours per year at $28/hour	**$672**

1.3 Impact Assessment

1.3.1 Business Process / Cost Improvement

The purpose of this section is to provide the data necessary to execute calculate the cost savings for DEMDACO as a result of using the EFM package. In addition, it provides the data necessary to conduct a benefit-cost assessment; specifically, to calculate the net present value, internal rate of return, payback period, and benefit/cost ratio.

Assumptions

The cost savings are calculated in terms of the business process that is affected. For the most part, DEMDACO's specific business processes are shown on Figure 1 earlier in the document; one notable exclusion is the outbound shipping process from DEMDACO's warehouse. This process, while not specifically impacted by this case study, was identified by DEMDACO as one that could be impacted if the EFM implementation were expanded.

For the impact assessment, the SAIC team calculated the as-is and to-be cost of each process. The as-is cost is the cost of executing the business process before implementation of the EFM package while the to-be cost is the cost after implementing EFM. In addition to this definition, there are several assumptions related to the cost-savings calculations:

- Some processes might be grouped together. For example, ocean, rail and dray status, while portrayed as individual processes on the supply chain diagram, are considered a single process – "transportation status" – for purposes of the impact assessment.

- Since the EFM package is largely about streamlining business processes through improved automation, many of the savings are accrued as a result of a process not taking as long; for any process especially tied to labor, the SAIC team assumed a current hourly wage of $15 per hour for DEMDACO staff in Kansas City, per DEMDACO guidance.

Business Processes and As-Is Costs

The business processes that were impacted or have the potential to be impacted by the deployment of the EFM Package include:

- Purchase Order (PO) generation
- PO shipment at origin
- Transportation Status – to include ocean, rail and dray status
- Order shipment from warehouse
    - Customer service on outbound shipments

Table 1-5 summarizes the steps and associated costs of each of these shipments:

Table 1-5. As-Is Process Description and Costs

Business Process	As-Is Steps	As-Is Cost
Purchase Order Generation	• PO generated within DEMDACO ERP system in Kansas City • Origin office accesses the PO electronically • Origin office sends the PO to vendor for processing, order placement, and shipment booking.	• On average, each PO requires 2 revisions • 1,000 POs annually, $3.75/PO • Total annual process cost = $3,750
Purchase Order Shipment	• Vendor books transportation with freight forwarder • Carrier receives booking from forwarder • Carrier confirms booking with vendor and origin • Carrier dispatches container to vendor for packing	• Total annual process cost = $3.5M • Total Transportation cost = $3.1M • Total dray, loading, unloading = $342,800 • Total annual cost (DEMDACO labor) = $57,200
Transportation Status	• DEMDACO staff attempts to research status before contacting logistics or receiving supervisor • Logistics supervisor and receiving supervisor actions (known container number): • Log on to carrier website • Enter container number to check status • If on inland (rail) leg, ocean carrier may	• Total annual requests for status (1-2 per week) = 104 • Average response time per request = 9 minutes • Total annual process cost = $234 NOTE: these are only

Business Process	As-Is Steps	As-Is Cost
	not update website regularly, which requires contacting dray carrier for latest rail status • Unknown container number unknown: • Log onto DEMDACO ERP system to identify container number associated with SKU or PO number • Determine appropriate container • Log on to carrier website with correct container number • If on inland (rail) leg, ocean carrier may not update website regularly, which requires contacting dray carrier for latest rail status	capturing the exception-based status requests. DEMDACO noted that the additional information offered by EFM allows for more staff to check status as needed on any container.
Order Shipment from Warehouse	• Container arrives at DEMDACO warehouse. • Labor called in after container arrival: o Container may sit up to 24 hours awaiting arrival of warehouse labor • Container may not contain full PO: o Split POs may arrive separately o With no visibility over arrival of remaining items on PO, warehouse labor will ship partial orders. o This results in additional shipments at additional expense (shipping and labor)	• Per package (labor only) = $2 • 3,000 packages per year • Total annual process cost = $6,000
Customer Service Management	For outbound shipments from the DEMDACO warehouse: • Customer service agent receives call • Agent researches question • Agent responds to customer with answer • Agent may schedule follow-up depending on the inquiry (however, most inquiries are status related).	• 2,771 calls over 3 month period • Average 4 minutes per call = 185 hours per quarter, • Total annual process cost: 739 hours per year at $15/hour = $11,084/year

1.3.2 **Benefits**

1.3.2.1 ***Quantitative***

- Reduced labor on order tracking (status) – time spent on researching and tracking containers:
  - An inquiry into the status of a shipment with exceptions takes an average time of 9 minutes for the logistics supervisor to research, ranging from 1 minute to 20 minutes

depending on the complexity of the inquiry, the number of systems to access and phone calls to make. EFM reduced the average response time to 1 minute for any type of inquiry regarding the 2 carriers participating in the test. This was approximately an 89% improvement.

- The logistics supervisor at DEMDACO receives on average 2 shipments per week to research; therefore the total annual savings, assuming a $15/hour labor rate, are fairly small - $208.

1.3.2.2 *Qualitative*

- The EFM package facilitated the collection of more information and consolidated it into a single user interface which allows for more timely access to a wide variety of information:
  - Purchase Order data more visible; data was accurate and timely
  - Status more visible, complete, accurate and timely
  - Visibility over purchase order data and updated estimated time of arrival (ETA) allows for improved scheduling of warehouse labor for processing outbound shipments.
  - The EFM package created a relationship between the PO number, the SKU number and the container number, a relationship that, before EFM, would require the logistics supervisor to access multiple systems/websites.
- The user interface – the trade data exchange – means that any employee can access purchase order and status information. This allows for tracking of all inbound orders, and reduces the calls for status to the logistics supervisors.
- Improved visibility over status means some exceptions are detected before the carrier becomes aware.
- Improved response time for the logistics supervisor when responding to inquiries about shipments with exceptions.

1.3.2.3 *Future Benefits*

- Data facilitated through EFM could be more valuable if all carriers participated and all orders included.
- Benefits of EFM would be greater if more staff at DEMDACO used the system, to include customer service agents, warehouse staff, and all employees within the transportation department:
  - Customer service savings estimates at a 10% reduction in calls at an annual savings of $1,100.
  - The provision of more information in one place would allow any employee to easily check status, improving order visibility and allowing order tracking for all orders, not just those with exceptions.
  - If all employees had access to EFM, there would be fewer requests for status to the Logistics Supervisor, resulting in labor savings on his part.
  - Since the volume of status requests vary, the savings could be significant during a week were there are 10 requests for status, and each request would take 15 minutes.
  - If warehouse staff had visibility, DEMDACO estimates that backorders could be reduced tremendously; management estimates an annual savings of $3,900 per year

from improved management of shipping and receiving in their warehouse. This was derived by DEMDACO staff, using the following assumptions:

- Better information would eliminate 2 instances annually of underestimating warehouse labor requirements and having labor work overtime to compensate.
- The duration of overtime for each instance was estimated at 4 hours (8 hours total annually).
- Average labor rate was multiplied by ½ to cover the extra cost of overtime versus straight time.
- One shift = 70 people.
- Total savings of 560 hours at $7/hour (1/2 labor rate) = $3,900.

- Additional benefits are possible with expanded deployment of EFM – notably, if the package were deployed to allow automatic updating of the PO with the ETA date. Constrained resources at DEMDACO prevented this from being implemented in this case study. Management estimated 3,000 extra shipments from origin annually due to partial shipments of POs and no visibility over when the remainder of the PO will be available to ship. At a cost of $2/shipment, DEMDACO could save $6,000 annually by reducing these extra, often unnecessary, shipments.
  - This functionality would also improve data accuracy throughout the shipment cycle. In some instances, the ship date is recorded incorrectly and once the error is caught, the original entry cannot be corrected in DEMDACO's system. If EFM could automatically update the PO within their ERP system, the ship date could easily be corrected and the change carried through the shipment's paperwork. Incorrect ship dates (that are not updated) are a frequent reason why some shipments are believed to be early or late when they are actually not.

Table 7 summarizes the realized and potential cost savings that DEMDACO found with respect to their use of the EFM package.

Table 1-6. Summary of Potential Cost Savings

Business Process	As-Is Cost	To-Be Costs	Potential Cost Savings
PO Generation	• Total annual process cost = $3,750	• Total annual process cost = $3,750	None = the use of the EFM package simplified the process for checking status by including PO data within the message. The process for creating and submitting a PO were unchanged, therefore no cost savings.
PO Shipment	• Total annual process cost = $57,200	• Total annual process cost = $51,200	• Annual savings of 10% ($6,000) • (Future)
Status	• Total annual process cost = $234	• Total annual process cost = $26	• Annual savings of 89% ($208)

Business Process	As-Is Cost	To-Be Costs	Potential Cost Savings
			• (Realized)
Outbound Order Shipment	Warehouse Management: • Total annual process cost = $6,000	• Total annual process cost = $2,100	• Annual savings of 65% ($3,900) • (Future)
	Customer Service: • Total annual process cost = $11,084/year	• Total annual process cost = $9,976	• Annual savings of 10% ($1,100) • (Realized)

1.3.3 FTAT Results

The USDOT's Freight Technology Assessment Tool was re-configured in 2011 and used to calculate the net present value, benefit-cost ration and total process improvement for each case study. The inputs for DEMDACO are summarized in Table 1-7 and the FTAT results are shown in Table 1-8.

Table 1-7. DEMDACO-Kansas City SmartPort FTAT Inputs

Input	Amount
Total As-Is Annual Process Cost	$78,268
Total To-Be Annual Process Cost (with EFM)	$67,025
Initial Investment	$14,560
Annual Operating and Maintenance	$672

Table 1-8. DEMDACO-TDE FTAT Results

Minimum Attractive Rate of Return	Useful Life	Net Present Value	Benefit Cost Ratio	Total Process Improvement
10.00%	5 Years	$25,470.06	2.49	$11,216.00

Chapter 2. EXPRESS SYSTEMS INTERMODAL INC. (ESI)

2.1 Environment Summary

2.1.1 Operating Environment

Express Systems Intermodal, Inc. (ESI) is a Chicago-based subsidiary of Orient Overseas Container Line (OOCL). Established in 1985, ESI's primary transportation services involve ramp to ramp movement of stack train and conventional railcars. ESI the United States (U.S.) domestic repositioning program for OOCL and other ocean lines as well. The primary goal in these programs is to provide empty equipment to fulfill domestic shipments. ESI's work also requires close collaboration with the rail lines, and as such, they maintain contracts with most of the Class I railroads; this also allows ESI to act as a full service transportation company through the provision of "ramp to ramp or door to door delivery services as required."[4]

As a transportation company, ESI also manages chassis pools and provides information technology services, over the road/dray transportation and in-bond service. Their diversity allows them to provide services to a variety of entities beyond steamship and rail lines, including intermodal carriers, freight forwarders, and non-vessel operating common carriers (NVOCC).

In the execution of the EFM case study with ESI, SAIC sought to demonstrate the application of the EFM package on a mobile device in addition to automating manual activities typically completed from a desktop. The mobile phone application offered ESI customers direct access to container tracking via their smart phones. This would have productivity advantages over the existing access methods by reducing the amount of time necessary to access the desired data, and increasing the availability of the information.

With respect to the automation of the invoicing process, the SAIC team sought to automate a previously manual exchange between ESI and one of their dray carriers.

2.1.2 Key Participants

The ESI case study was completed with the key participation of Flatirons Two, Inc., the vendor and administrator for the Logistics Order Tracking System (LOTS) software used by ESI. LOTS provides ESI with a system for managing the order and freight audit processes. LOTS provides ESI with rate management and inquiry capabilities, facilitates vendor quote processes, and handles order management including online management of orders to facilitate automation over the order process.

As a company, Fi2 also offers "technical solutions that maximize efficiency, reduce cost, and expedite all elements of the supply chain from point of origin to point of consumption."[5] From a technological perspective, Fi2 was a subcontractor to SAIC in this case study. Their main role was to act as a technology liaison between SAIC and ESI, facilitating the deployment of the EFM

[4] Express Systems Intermodal Home Page: http://www.esi-intermodal.com/ESI/jspGeneral/ jspAboutUs.jsp.
[5] Flatirons Two, Inc. Home Page: http://f-i-2.com/.

package with ESI's information technology (IT) system. For purposes of these two case studies, Fi2 implemented the EFM package within ESI's system and also led the development of the mobile phone application for the Android phone.

Although ESI did coordinate with a dray carrier to test the EFM deployment, this carrier was not a key participant in the case study. ESI was the primary case study participant from the perspective of implementing the package and participating in the pilot test. With respect to the container status application for the Android phone, one of ESI's customers, Domestic Container Transportation, assisted in testing. With respect to the automation of the invoice process, another partner of ESI's, Hammer Express Inc., a Chicago-based intermodal drayage carrier, supported the test. For this case study, the deployment of the EFM package did not require integration into Hammer's back office system due to time and resource constraints.

2.1.3 Description of As-Is Technical Environment

ESI's operations are conducted on an IBM AS/400 equipped with the LOTS software from Fi2. This program allows ESI to handle many tasks including billing instructions to the railroads, direct interface to the rail computer for tracing and invoicing. ESI is also electronic data interchange (EDI) enabled, allowing customers to EDI shipping instructions to ESI.

Currently, Express System Intermodal customers can retrieve tracking data for their shipments by calling an ESI customer service representative or by logging into the ESI website and requesting specific rail status information by container. This EFM case study sought to develop a smart phone application for the Droid operating system, and use EFM web services to allow ESI customers direct access to container tracking via a mobile phone. This would have productivity advantages over the existing access methods by reducing the amount of time necessary to access the desired data, and increasing the availability of the information. Also, an ESI representative's time would not be consumed with relaying tracking information that could be done directly by its customer. The container status process (specifically, container availability by city) could also be modified to utilize the smart phone / EFM web services technology. This would allow ESI's customers to review specific container availability when they are outside their office on sales calls to their clients in order to know if they can sell specific lanes and reserve available equipment.

With respect to dray moves, ESI uses dray carriers for rail pick-ups and arrivals and cross-town moves. The ESI – dray carrier relationship relies primarily on manual communications: phone, email and fax. Currently the pickup order, cross-town pre-note, and delivery pre-note are faxed from ESI to their dray carriers; it is assumed if ESI sends the fax, that the load will be accepted. With respect to this case study, one dray carrier (Hammer Express) sent their weekly invoices as an Excel attachment to an email from Hammer to ESI. This component of the case study was to automate the processing of this weekly invoice file within ESI's operations.

Table 2-1 provides a summary of the ESI environment. It also describes the supply chain environment prior to the implementation of the EFM web services and is meant to illustrate the areas of opportunity that the EFM services can improve.

Table 2-1. ESI Environment Summary

As-is Business Environment:	
Partner	**Summary of Case Study Participation**
Express System Intermodal, Inc.	• Provides logistics services • Website for customers that provides equipment booking and shipment status functions
Business Problem:	
Problem	**Projected Benefits**
Access to equipment availability information requires desktop access for ESI customers.	• Supplement use of ESI website for equipment availability information, allowing real-time, mobile access by ESI customers during sales calls.
Higher in-transit track & trace labor required	• More efficient labor utilization for ESI due to accuracy, completeness, and timeliness of shipment status. • Provision of track and trace information to mobile devices reduces customer reliance on ESI customer service representatives for this information.
Lack of automation and efficiency	• Currently, the processing of the dray invoices is manual within ESI, which depend on a person to match invoice numbers from an email attachment to information contained in ESI's LOTS system to complete processing and payment of the invoice.
Supply Chain Technical Environment	
Current IT Tools	• AS/400 Operating system, supported by Fi2 Logistics Order Tracking System (LOTS) (ESI)
Current Messaging	• EDI (VAN) • Fax • Email attachment: scanned document, Excel spreadsheet, EDI, flat file • Telephone • Customer website (www.esi-intermodal.com)
Current Interchanges (targeted with the EFM package)	• Container availability send/receive • Container status send/receive • Invoice send/receive, Hammer <-> ESI (the EFM package will use the UBL schema for invoice service; allows direct receipt by ESI)

2.2 Implementation Summary

2.2.1 Application of the EFM Package

Prior to creating the message schemas and implementing the web services which exchanged the supply chain information among partners, SAIC, Fi2 and ESI first documented the supply chain process used by ESI to determine where the EFM package could add value:

1) First, SAIC and Fi2 worked with ESI to identify their technical environment and to define the business problems that EFM implementation could address or provide opportunity for.
2) SAIC and Fi2 mapped and documented ESI's technical environment (all information technologies and communications that support order placement, fulfillment, and delivery, and the processes by which these communications are completed).
3) Once the supply chain process was laid out, SAIC and Fi2 identified which communication methods were the best candidates for replacement or supplementation by the EFM package.

One unique goal of the ESI EFM case study was to demonstrate the use of EFM web services to communicate supply chain data to a mobile device; this goal drove the decision to use the package to provide container availability and status to a mobile device. The decision to automate the invoicing process was driven strictly by the fact that it was the most manual process within ESI and their dray provider, Hammer, and therefore had the opportunity for improved efficiencies as a result of EFM package implementation.

The flow and processing of information was revised as a result of EFM package implementation. Below is a summary of data exchange that occurred through interaction with the EFM package.

Figure 2-1 and Figure 2-2 document the as-is processes for container status and dray moves and highlights in red where the EFM package was applied.

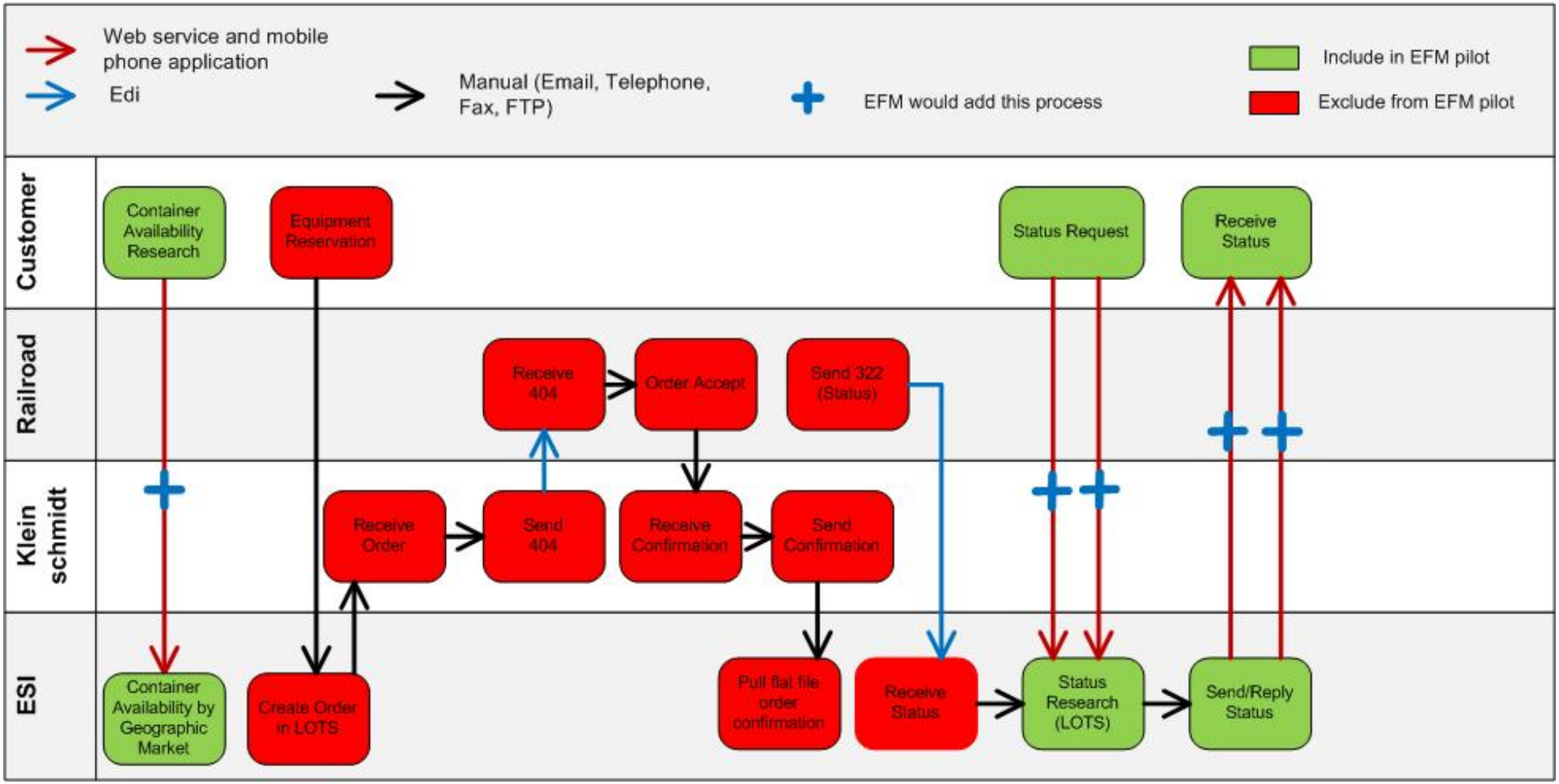

Figure 2-1. ESI Container Availability and Status Processes

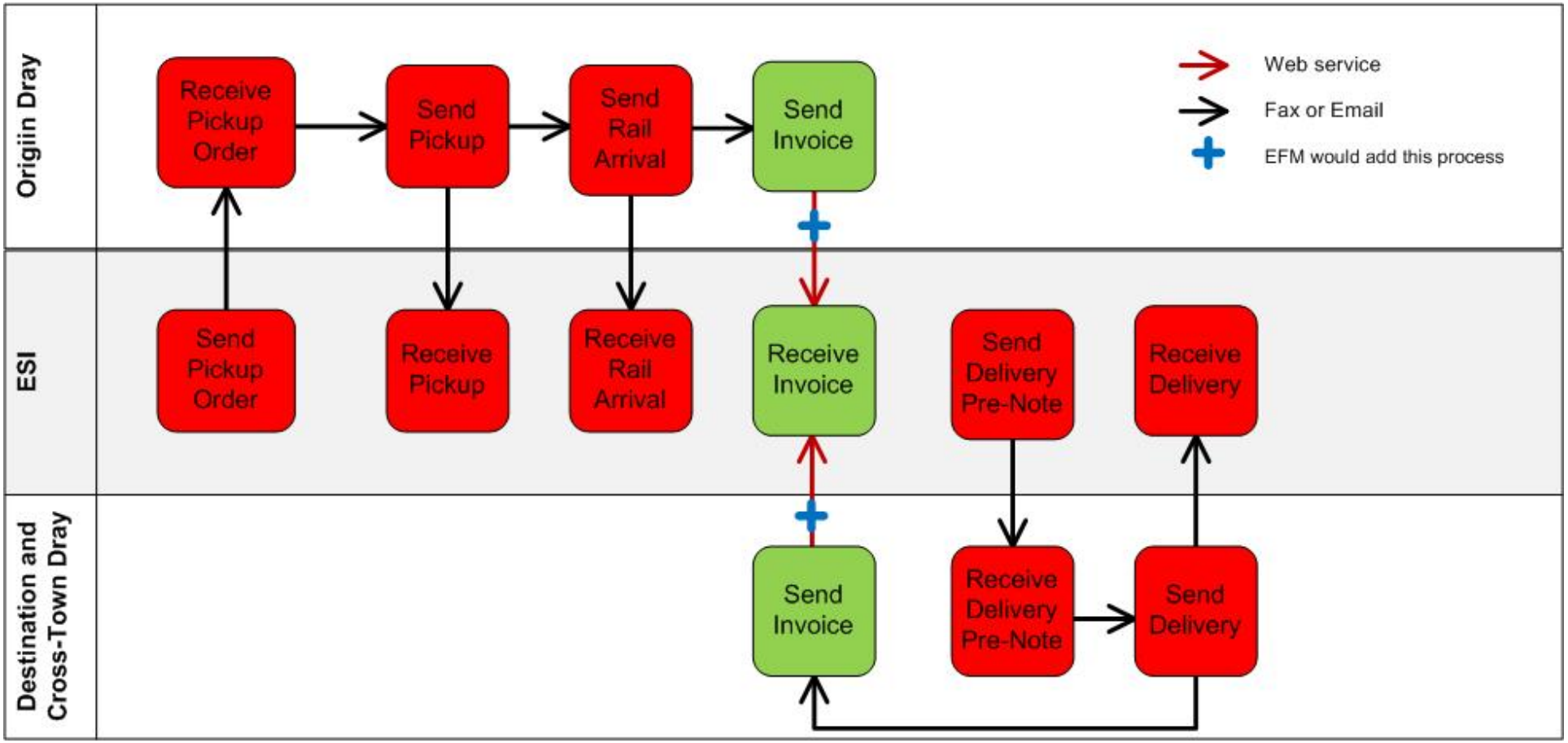

Figure 2-2. ESI Drayage Process

2.2.2 Implementation Decision Process

Several issues were involved in the business rationale for making the decisions regarding EFM package coding, testing and implementation.

1. **The priority with respect to the ESI case study was developing a Smartphone application which would provide ESI's shipment status query and container availability status on a mobile device.** These functions currently exist on ESI's customer website, so the main technical work was using EFM web service code as a means to provide this data on a mobile device. Although the primary benefits were expected to be qualitative, the SAIC team felt this would be a unique implementation of the EFM package worth demonstrating.
2. **SAIC, Fi2 and ESI initially sought to use the EFM package to replace EDI transactions currently completed through Kleinschmidt, or perhaps did not exist at all.** Unfortunately, the team could not collectively identify any transactions which could be easily replaced with EFM web services. This caused the study team to instead seek to automate a previously manual process, ideally one that already had an UBL message schema within the package, easing implementation for all partners. Thankfully, the invoicing process between ESI and one of their dray carriers, Hammer, was primarily manual. Additionally, there was a large transactional volume, which provided an opportunity for significant quantitative benefits.
3. **Once the transactions were identified, SAIC worked to ensure the technical environment supported the EFM package implementation**. Pre-implementation efforts included addressing the business rationale issues and ensuring that changes to the technical environment, as a result of implementation, did not negatively affect ESI's daily business operations.
4. **The development of the EFM web services and UBL message schemas were also critical activities for SAIC and Fi2, who was responsible for the implementation of the EFM package within ESI's system**. SAIC and Fi2 sought to minimize the customization of the existing EFM web services, as discussed in bullet #2. Fi2 also interacted with ESI's customer (Domestic Container Transportation) on assessing the qualitative benefits of the Android application; they were also instrumental in coordinating with Hammer, the drayage provider who was involved in testing the invoice service. Fi2 led the development of the Android app, and also reviewed and revised the invoice service for implementation.
5. **The EFM package (web services and message schemas) was fully integrated into ESI's system,** meaning that the data was shared directly and automatically to and from their daily operating systems, eliminating the need for a 'shadow' database where test data is shared for exchange. Because the package is integrated into their operating systems, this also means that the EFM package can continue to operate after the pilot at no cost to SAIC and the operating and maintenance costs to ESI are minimal.

2.2.3 Implementation Parameters

2.2.3.1 *Business Rationale of Adopters/Potential Adopters*

The business rationale and goals of the ESI EFM case study were focused on two different areas. First, as a logistics provider, customer service is at the core of ESI's business model. As such, the opportunity to develop a mobile phone application to improve customer access to current

web-based tools like equipment/container availability and booking and equipment/container status was worthwhile to demonstrate. Second, while ESI is an intermodal provider and Hammer Express is just one of their transportation providers – in this case, a dray carrier, ESI saw potential productivity improvements that could be realized as a result of automating the process of previously manual communications. This is in line with some of the other EFM case studies executed by SAIC in that the use of the EFM package by ESI assumes that the "as-is" business environment experiences excess cost in the exchange of data and information due to additional labor required to conduct manual communications and to correct any errors that can be carried through the exchanges. These costs can be eliminated by using the package to allowing case study participants to interact both automatically and directly.

2.2.3.2 *Performance Measures*

As a logistics provider, ESI is responsible for providing equipment and arranging transportation; once booked with a provider, they do not control the movement or delivery of freight. However, their dray carriers do control a portion of the movement of a container through the supply chain. That said, there are no specific metrics that for ESI's dray carriers, with the exception of regular invoicing intervals – in the case of Hammer Express, it is weekly.

Targeted improvements for the ESI EFM case study were:

- Improved timeliness of all the dray invoice exchange.
- Reduced costs associated with conducting manual invoice exchange.
- Reduced costs associated with correcting incomplete or incorrect data.
- Use of web services/automation of messaging reduces redundancy of effort.
- Sustained use and possible expansion of the EFM package after the pilot test concludes.
- An additional *mobile* point of access for ESI's customers in viewing and booking available equipment and container status.

2.2.3.3 *Implementation Challenges*

Anticipated:

- EFM is not widely known, accepted or used in the freight industry.
- There was no major player as an endorser of the technology ("anchor tenant") who could require participating partners to support EFM package implementation.
- As the final case study to be executed by SAIC, the schedule and resources were extremely compressed. The project schedule allowed for just a 30-day operational test phase before assessing potential impacts. Second, financial resources were maximized, which resulted in the use of existing services that had been developed for other case studies to largely be re-used with minimal customization. Unfortunately, the overall case study schedule prevented full integration of the invoice service with Hammer's back office system, although the team was able to integrate the service within ESI's system, thereby still achieving significant benefits.

Unanticipated:

The smart phone application that was built for ESI's customers to track containers and provide availability information was completed for deployment on the Android phone. Unfortunately, the customers that were originally going to test the application backed out of the testing because they chose to purchase iPhones rather than Android based phones. When Fi2 and ESI approached

other ESI customers, it turned out that the majority of them used iPhones as their preferred smart phone. As such, the demonstration of the smart phone application was fairly limited and the benefits were assessed from a theoretical, and mostly qualitative, standpoint.

Table 2-2 provides a summary of the ESI implementation parameters.

Table 2-2. ESI Implementation Parameters Summary

Decision Process	• Reduce manual processing of and time to complete freight invoices • Increase accuracy, completeness and timeliness of data • Improve customer access to container availability and status
Business Rationale	**Potential Benefits:** • Increase customer satisfaction • Reduce cost of monitoring active loads in-transit **EFM Implementation Goals:** • Reduced costs • More accurate and timely transportation data and information for decision making
Potential Performance Measures	• Data processing costs • Labor on manual matching of invoices • Improved customer access to container data
Implementation Challenges	• Very tight timeline for testing (30 days versus 90 days on the other SAIC EFM case studies). • ESI customer decision to purchase iPhone as opposed to Android phone restricted the SAIC team's ability to test the Android application. • Resource and schedule constraints and Hammer Express' operational decision-making prevented full integration of the package within Hammer's back office system. • EFM not yet widely used.

2.2.4 Implementation Cost Summary

The costs associated with implementing the EFM package for the ESI pilot reflect the costs to ESI for implementing EFM web services within their server environment to exchange information for purposes of this pilot. The costs also include the labor associated with SAIC and Fi2 technical and management personnel, who developed the web services, message schemas, and provided technical assistance to ESI in order to deploy these services and troubleshoot issues identified during implementation, as well as time to test the mobile phone application with the selected ESI customer (Domestic Container Transportation).

Table 2-3 contains the implementation and operations/maintenance cost summary for the ESI EFM Case Study. These were the costs that were factored into the benefit-cost assessment conducted using the Freight Technology Assessment Tool (FTAT). These costs are based on:

- The number of web services that were deployed within the IT infrastructure of each supply chain partner

- The number of hours spent by key IT staff at ESI and Fi2 to refine and prepare the EFM package for implementation. Given the limited involvement of ESI's partners (Hammer Express and Domestic Container Transportation), the team assumed these entities had no cost.
- The number of hours spent by SAIC and Fi2 staff providing technical guidance to ESI
- An estimate of the annual number of hours required to continue EFM operation - this includes the minimal maintenance costs of running support servers, but assumes no further modification to the EFM package to provide enhanced service to ESI.
- Hardware costs were negligible because ESI deployed their web service on an existing server.

Table 2-3. ESI Implementation, Operations and Maintenance Costs

Assumptions:

- Technical assessment of deployment environment takes on average 2 weeks (40 hours per week) = $2,240. This cost is factored into the cost per party as a flat rate expense.
- Each client/service takes on average 1 week to deploy = $1,120 per service/client
- Average hourly rate = $28/hour

Implementation

Party	EFM Clients	EFM Services	Cost per party
ESI (mobile app)	3	1	$6,720
ESI (invoice)	3	1	$6,720
		Total Implementation Costs	**$13,440**

Operations and Maintenance

16 hours per year at $28/hour	**$448**

2.3 Impact Assessment

2.3.1 Business Process/Cost Improvement

The purpose of this section is to provide the data necessary to calculate the cost savings for ESI as a result of implementing the EFM package. In addition, it provides the data required for USDOT to run the Freight Technology Assessment Tool, which at the time of this report publication, was currently undergoing updating. This tool will be used to calculate the net present value, internal rate of return, payback period, and benefit/cost ratio.

Assumptions

The cost savings are calculated in terms of the business process that is affected. For the most part, ESI's specific business processes are shown in Figure 2 and Figure 3 earlier in the document. For the impact assessment, the SAIC team calculated the as-is and to-be cost of each

process. The as-is cost is the cost of executing the business process before implementation of the EFM package, while the to-be cost is the cost after implementing EFM.

With respect to the ESI case study, after careful evaluation of the deployed technology with the ESI point of contact, it became apparent that quantitative benefits assessment was only possible for the freight invoice process; the mobile phone application held mostly qualitative benefits such as competitive advantage improvements. Container Availability and Container Status are inquiries that a customer can currently make on the ESI customer website; this EFM case study made these inquiries available via an Android phone application.

Therefore, the as-is costs for these processes are from the perspective of the current website capability. With respect to container availability, the study team assumed that customers booking equipment online via the ESI website would be the most likely to use a mobile phone application to complete the same transaction. With respect to container status, the study team did not make the same assumption, as checking any type of status via a website on a phone is more labor intensive to complete on a phone as opposed to a website via a computer. The team therefore assumed that status inquiries ESI currently receives by telephone or email would be the appropriate area of opportunity for a mobile phone application, which would facilitate simplified access to status information. As such, the SAIC team did assume that some status inquiries that were previously handled by ESI via email or telephone could be eliminated as a result of the use of a mobile phone application and so a short discussion on the potential quantitative benefits is presented.

Lastly, with respect to the mobile phone, the test was extremely limited, with just one customer testing one phone for a short time period of a few weeks; this customer was also not a customer that typically books much equipment volume with ESI as compared to their average equipment-seeking customer (the customer, Domestic Container Transportation, typically books transportation services as opposed to equipment). As such, there was neither a sufficient test sample nor sufficient transactional volume from this single customer to provide much validity to the evaluation of the application. However, this section will also include statements of a qualitative nature from ESI with respect to the qualitative benefits of the application and potential future use.

Since the EFM package is largely about streamlining business processes through improved automation, many of the savings with respect to the freight invoice process are accrued as a result of a process not taking as long; for any process especially tied to labor, the SAIC team worked with ESI to document an average hourly wage, which is presented in footnotes.

Business Processes and As-Is Costs

The business processes that were impacted or have the potential to be impacted by the deployment of the EFM Package include:

- Container Availability
- Container Status
- Dray Invoice

Table 2-4 summarizes the associated costs of this process:

Table 2-4. As-Is Process Costs for ESI

Business Process	As-Is Cost
Container Availability	• Equipment bookings: o ~1,430 per month; 40 customers (36 equipment bookings per month per customer) o An average of 84% of bookings are completed online without ESI assistance • ESI's cost to complete online booking = $0 (no employee interface required) • Customer time to complete online booking = $0 (ESI estimated it would take a customer less than 1 minute to complete an online booking)
Container Status	• 3 inquiries per hour (phone and email) at an average of 1.5 minute per inquiry (36 minutes per day) • Customer service labor rate (average)= $27/hour • Annual cost (ESI) = $4,212* • Use of ESI website for status inquiries is not nearly as high as it is for equipment availability
Dray Invoice (Hammer Express only)	• Average invoices per week = 95 • Processing time: o 2 hours per week for A/P to review and match invoices against LOTS system (Accounts payable labor rate (average) = $22/hour) o 1 hour per week for operations/IT staff to respond to A/P questions regarding invoices that have missing data or errors (average labor rate = $27/hour) • Total annual cost = $3,692

* Assumes 8 hour work day, 52 weeks per year, 5 work days per week (260 work days per year)

2.3.2 Benefits

2.3.2.1 *Quantitative*

The realized quantitative savings came to ESI as a result of streamlining the process by which they view, match and approve invoices from their dray carrier. The benefits to the container status process are more theoretical in nature, but could be increased if more of ESI customers were interested in using the mobile phone application.

With respect to container availability, ESI did not anticipate any benefits within their organization, as the as-is cost to book equipment online was already negligible.

With respect to container status, ESI did estimate an approximate reduction of 5% in the number of inquiries they would have to respond to via telephone or email as a result of providing this status via a mobile phone application.

The deployment of the EFM package has significantly reduced the time it takes ESI to review and approve dray invoices from Hammer Express. Essentially, the use of the EFM package was able to demonstrate an auto-match of the invoice numbers from the weekly spreadsheet (from Hammer) to the data within ESI's LOTS system, completely eliminating the 2 hours of time previously spent doing this manually each week, and significantly reducing the 1 hour of time spent to coordinate between accounts payable and operational staff at ESI to resolve questions on invoices with missing or incorrect data. With the EFM package, these questions are directly provided to operational staff, who can provide the missing information to accounts payable before they realize they even need it.

Table 2-5 summarizes the savings to ESI as a result of implementing the EFM package.

Table 2-5. Potential Cost Savings

Business Process	As-Is Cost	To-Be Costs	Potential Cost Savings
Container Availability	ESI Total Annual Cost = $0	ESI Total Annual Cost = $0	ESI = $0
Container Status	ESI Total Annual Cost = $4,212	ESI Total Annual Cost = $4,000	ESI = $212 (5%)
Dray Invoice	ESI Total Annual Cost = $3,692	ESI Total Annual Cost = $74	ESI = $3,618 (98%)

2.3.2.2 *Qualitative*

Eliminated re-keying and manual matching of data that currently exists in ESI's operational system (LOTS) for invoices.

- Automatic matching of dray invoice data eliminates the need for phone calls and emails between Accounts Payable (A/P) staff and operational staff at ESI, who are located in different offices in different time zones. This can cause an interruption in the overall processing of invoices while waiting for a response to an email or voicemail with questions regarding an invoice.
  - The use of the EFM package allows invoices with missing or incorrect data to be transferred directly to operational staff for review and resolution. This allows operational staff to push the data required to resolve problematic invoices as opposed to waiting for a request from A/P.
- Both the container availability and container status Android application offer ESI a competitive advantage to securing new customers, as it offers an additional way to interact and complete transactions 'on-the-fly' and at all hours.
- Although the savings to ESI with respect to the container status application were small, eliminating some manual responses to status inquiries does free up some operational labor within ESI, which can be re-directed to other types of customer inquiries thereby improving the overall efficiency of these staff.
- For customers, the container status application may not save time or dollars, per se, but it would significantly improve the ease of use with regards to obtaining status. While status

is offered on ESI's website, requesting and checking this from a mobile device requires the navigation of several web screens which can be cumbersome when performed on a phone versus a computer. By comparison, mobile phone applications bring back data faster and presents in a size and format more appropriate when viewed on a smaller screen. Also, the availability of status from a phone application may allow them to track more shipments (or the same number of shipments more frequently) given a user-friendly application would provide quick and easy access to status information. Therefore, ESI customers could be more proactive in tracking shipments.

2.3.2.3 *Future Benefits*

- The EFM package created the infrastructure to reduce transactional costs with trading partners in the future – namely, the other cross-town dray provider that ESI also works with. This dray provider also has a manual process for submitting invoices (scanned documents as email attachments), but a similar volume to Hammer. Therefore, ESI's time savings with respect to the freight invoice service could double if the package were used for both dray providers. NOTE, ESI does intend to explore expanding the use of the invoice service to this second dray carrier.
- The EFM service for dray invoice was not integrated into Hammer's back office system; however, if it had been, there would have been additional quantitative benefits for Hammer staff. Likewise, if the invoice service is expanded to ESI's other cross-town dray provider and integrated into their back office system, the benefits would also increase. Integrating the invoice service into the dray carriers' system would also likely improve the speed with which they would receive payment.

  Many of ESI's customers are choosing the iPhone as their preferred smart phone. Modifying the status and availability application to accommodate this additional platform could allow for the evaluation of additional benefits and usability.

2.3.3 FTAT Results

The USDOT's Freight Technology Assessment Tool was re-configured in 2011 and was used to calculate the net present value, benefit-cost ration and total process improvement for each case study. The inputs for ESI are summarized in Table 2-6 and the FTAT results are shown in Table 2-7.

Table 2-6. ESI FTAT Inputs

Input	Amount
Total As-Is Annual Process Cost	$7,904
Total To-Be Annual Process Cost (with EFM)	$3,830
Initial Investment	$13,440
Annual Operating and Maintenance	$448

Table 2-7. ESI FTAT Results

Minimum Attractive Rate of Return	Useful Life	Net Present Value	Benefit Cost Ratio	Total Process Improvement
10.00%	5 Years	($579.56)	0.96	$3,830.00

Chapter 3. FELLOWES (SIMULATION)

3.1 Environment Summary

The intention of this case study was to implement the Electronic Freight Management (EFM) package into the back office system of Fellowes, a Chicago-based manufacturer of business equipment, and within the systems of several of their supply chain partners. The original case study kicked off in January 2010, but several factors were encountered that prevented a full-scale implementation of the package. As such, the SAIC team developed a revised approach to exploring the potential benefits to Fellowes of the EFM package; this approach is presented throughout this document and reflects the exploration of a full EFM implementation within Fellowes' and all supply chain partner systems.

The following bullets represent the main reasons for the revised approach in the execution of this case study:

- The main supporter and sponsor within the Fellowes organization for this case study left the company.
- During the environment assessment, Fellowes changed Freight Forwarders and the new forwarder saw EFM as eliminating services they want to provide.
- Fellowes purchased GT Nexus, a cloud-based collaboration platform, which provides visibility to their shipments along with EDI services.

3.1.1 Operating Environment

Fellowes is a Chicago-based manufacturer and marketer of business machines, records storage solutions, and technology accessories. For purposes of this simulation, their supply chain is an ocean-rail oriented supply chain, with dray support at both origin and destination locations. The supply chain originates in China and ends in Chicago, IL. Ocean carriers transport the containers into a U.S. West Coast port where they are transferred by rail for destination into Chicago.

The Fellowes supply chain consists of ocean container shipments from Hong Kong to a port on the west coast, rail to Chicago and dray to a facility in Chicago. This document describes the current technical environment used by Fellowes and their supply chain partners, and also the potential web services that need to be deployed at each supply chain participant in order to fully implement the EFM package for the supply chain. While the Fellowes used as a model supply chain is an ocean intermodal move between Hong Kong and Chicago the services should apply to any origin/destination and transportation mode.

3.1.2 Key Participants

This section describes the specific supply chain partners (participants) or in the case of a generic role, the participant types that are included in this simulation.

- Buyer (Fellowes): Fellowes is the buyer, or consignee. They would use the EFM package to request and receive consignment status from the supply chain participants. They will also use EFM web services to notify carriers when shipping containers are ready for pickup. Assuming that Fellowes also sells products, they are a supplier in many other supply chains that are not considered here. In that case, they would need the same services as a supplier. Exchanging product pricing information, purchase orders, and product payment information is part of the purchasing process and outside of freight transportation. Those processes are not included here.
- Suppliers: The suppliers are located in Hong Kong. They manufacture or distribute products to Fellowes following generation of a purchase order (PO). They would use the EFM package to book consignments, notify participants when a consignment is dispatched and receive notification of final receipt.
- Logistics Service Provider (LSP) – CEVA: CEVA Logistics (CEVA) is the freight forwarder Fellowes uses to arrange transportation from Hong Kong to the Chicago. They would use the EFM package to receive bookings from suppliers, book consignments with carriers, send information to the customs broker, and receive consignment status. CEVA also provides domestic logistics services for this supply chain. They would use EFM to exchange information with dray carriers and Fellowes and receive status from the transportation providers.
- Carriers: Consignments are shipped from Hong Kong to Chicago via ocean intermodal to the west coast of the U.S., rail from the port to Chicago and truck from the rail yard to Fellowes facility in Chicago. At this time, the ocean carriers used by Fellowes are American President Lines (APL) and Orient Overseas Container Line (OOCL). The rail carriers used by Fellowes are Burlington Northern-Santa Fe (BNSF) and Union Pacific (UP). They use a variety of truck carriers. Carriers will use EFM to receive and confirm booking requests, exchange status information, exchange customs information, and to be notified of an empty container.
- Customs broker – CEVA: CEVA also acts as the broker for CBP transactions. In that role, they receive shipping documents from forwarders and carriers, send those to CBP. Once they have filed the customs paperwork, they then receive customs status on the filings from CBP and send that to carriers, forwarders and Fellowes. In this role, the EFM package would be used to complete this exchange of information with CBP as well as to provide the customs status information to the other partners.

3.1.3 Description of As-Is Technical Environment

Fellowes' back office system was an enterprise resource planning (ERP) solution from Oracle). CEVA, the Freight Forwarder and Customs Broker, also offered several customer tools to Fellowes to track and monitor shipments. In addition to these tools offered to Fellowes by CEVA, Fellowes also uses a software/cloud solution called GT Nexus. GT Nexus provides a cloud-based collaboration platform that automates global supply chain processes. GT Nexus applications provide supplier management, transportation sourcing, transportation execution, supply chain visibility, and supply chain intelligence.

For purposes of this simulation, the technical environment at Fellowes varies depending on which partner they are communicating with:

- Suppliers: Fellowes works directly with product manufacturers to fulfill orders directly to Fellowes stock to sell domestically and produce for orders fulfilled at origin. Communication between Fellowes Inc. and the supplier is all over email, fax and phone.

The commercial invoice and packing list is provided by the supplier- usually an excel template that is printed by the supplier and provided to the forwarder. The forwarder creates the bill of lading (B/L) based off of date provided by the supplier during booking and container movement details. These are system generated by the forwarder.

- Forwarder: Fellowes does not communicate directly with their transportation providers or CBP, as CEVA handles these as their forwarder and customs broker. Fellowes Inc. and CEVA are connected vie EDI for purchase order management and email communication. Fellowes Inc. works with forwarders to manage direct carrier contracts as well as non-vessel operation (NVO) services to expedite freight to delivery or facilitate the local turn over for direct import customers. Fellowes typically only hears from 3PL if something goes wrong ('no news is good news'). CEVA tracks by container, Fellowes tracks by PO, so it is labor intensive when shipments require research (approximately 10% of shipments may require this additional work). Container status originates from the steamship line and is then passed to GT Nexus through CEVA).

To summarize, Fellowes supply chain transactions and the means by which they are currently completed are below:

- Consignment Booking - email
- Transportation Status – email and EDI
- Customs Clearance Status – email and EDI
- Send Invoice - email
- Delivery Notice - email

3.2 EFM Operational Simulation

3.2.1 Application of the EFM Package

In operational case studies, SAIC began the process of implementation by first documenting the end-to-end supply chain process used by Fellowes to determine where the EFM package could add value. The flow and processing of information could be altered as a result of EFM package implementation; in an ideal implementation, web services would be the mechanism by which all exchanges are completed.

Web Services

Any exchange using web services will always involve two participants. One of the participants will use the "client" component and the other will use the "service" component. Whichever participant initiates the exchange will do that by triggering the client. The client will format a message and invoke the service which has been deployed at the other participant. The service will send a response to the client.

In some cases the client will format what is basically a request for information and the service will return the information which could be a large message. This is the case for Request Status. The client will send a request that consists of a consignment ID and the service will return the current status. In other cases the client will format a large message that contains information they want to send to another party. The service will receive the information and return an acknowledgement. This is the case for Send Status. The client will format a status message and send it to the service. The service will receive and store the status and send a response to the client that acknowledges receipt of the message.

Data Exchanges

Below is a summary of data exchanges that could be targeted by interaction with the EFM package. Details regarding specific data that could be exchanged and a description of the web services that would be used to complete the process are contained in Appendix C.

- New Consignment: this is the process by which a supplier will create a new consignment, book the consignment, and communicate consignment information to other participants.
- Dispatch Consignment: the process that occurs when a consignment is ready to be shipped.
- Transportation Status: describes the updates that are provided to supply chain partners as the consignment is transported from origin to destination.
- Delivery Notice: the process that occurs when a consignment has reached final destination.
- Customs Clearance: the exchanges that take place between supply chain participants, the customs broker and CBP for shipments imported into the U.S. The customs agency exchange is assumed to occur through the Automated Customs Exchange (ACE) system and not EFM. It does not address any customs activity in the export country.

Figure 4 on the following page documents the supply chain process from purchase order (PO) generation through unloading of the container at Fellowes' facility in Chicago. Green boxes on this diagram indicate primary areas of opportunity for the EFM package.

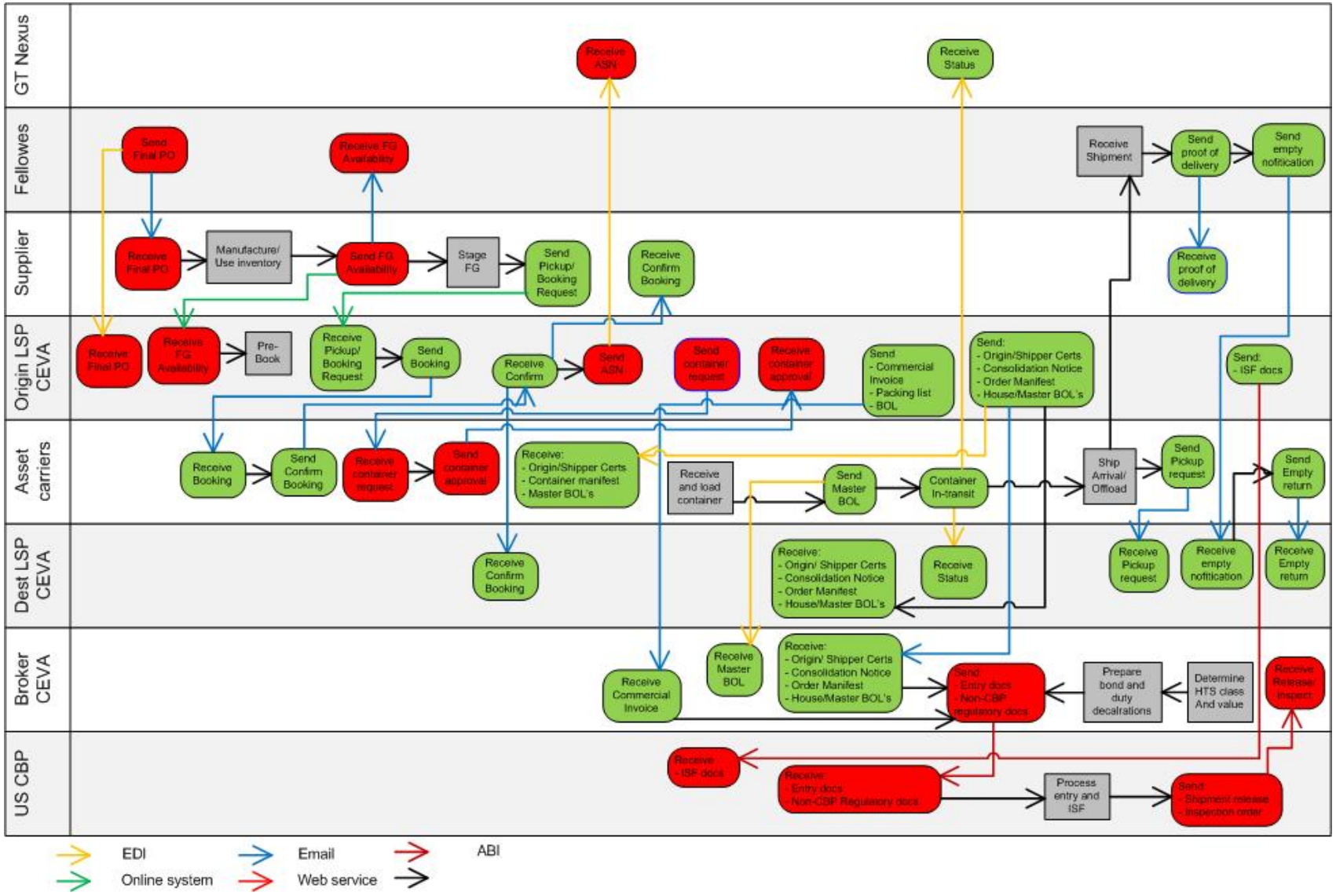

Figure 3-1. Fellowes Supply Chain

3.2.2 Theoretical Partner Interaction

This section describes the clients and services that each participant would need to deploy in an implementation of the EFM package. There are two aspects to every transaction in a web services architecture: one participant uses a "client" to invoke a "service" that is deployed at a different participant. Within EFM there are cases where the client is asking the service for information. In that case the service retrieves the information from a database and sends a response back to the requesting client. An example of this is a request for status. The client will send the consignment ID to the service. The service will look up status in the participant database and return a message that contains all of the status information. Also within EFM there are cases where the client sends information to a service. In that case the service stores the information in a database and returns an acknowledgement that it processed the information. An example of this is sending status. The client takes status information from a database, formats a status message and sends it to a service. The service saves the status information in that participant's database and returns an acknowledgement that it received the information.

The matrix in Table 3-1 summarizes the services and clients for all of Fellowes' potential supply chain partners.

Table 3-1. Summary of Simulated Web Services and Clients

Partner	Services That Consume Information	Services that Return Information	Clients that Send Information	Clients that Request Information
Fellowes	• Confirm Booking (origin LSP) • Dispatch Notify (supplier) • Send Status (all except supplier)		• Register consignment (all except supplier) • Receipt notify (supplier) • Empty notify (destination LSP)	• Request status (all except supplier)
Supplier	• Confirm Booking (origin LSP) • Receipt Notify (Fellowes) • Send Status (all except Fellowes)		• Book consignment (origin LSP) • Receipt pick-up (carrier) • Dispatch notify (Fellowes) • Register consignment (all except Fellowes)	• Request status (all except Fellowes)
Origin LSP	• Book consignment (supplier) • Confirm booking (carrier) • Dispatch notify (supplier) • Customs release (broker) • Register consignment (Fellowes, supplier) • Send status (carrier, broker, destination LSP)	• Request status (Fellowes, supplier, destination LSP)	• Book consignment (carrier) • Confirm booking (destination LSP, supplier, Fellowes) • Customs documents (broker) • Register consignment (carrier, destination LSP, broker)	• Request status (carrier, destination LSP, broker)
Carrier	• Book consignment (origin LSP) • Customs documents (origin LSP) • Empty notification (destination LSP) • Customs release (broker) • Register consignment (both LSPs, Fellowes, supplier)	• Request status (Fellowes, supplier, both LSPs)	• Confirm booking (origin LSP) • Customs documents (broker) • Send status (Fellowes, supplier, both LSPs)	
Destination LSP	• Confirm booking (origin LSP) • Empty notification (Fellowes)	• Request status (Fellowes, supplier, origin	• Empty notify (carrier) • Register consignment (carrier, origin LSP, broker)	• Request status (carrier, origin LSP, broker)

Partner	Services That Consume Information	Services that Return Information	Clients that Send Information	Clients that Request Information
	• Customs release (broker) • Register consignment (Fellowes, supplier) • Send status (origin LSP, carrier, broker)	LSP, broker)		
Broker	• Confirm booking (origin LSP) • Customs documents (both LSPs) • Register consignment (Fellowes, supplier, both LSPs) • Send status (both LSPs, carrier)	• Request status (Fellowes, destination LSP)	• Customs release (destination LSP) • Register consignment (both LSPs, carrier) • Send status (Fellowes, destination LSP)	• Request status (carrier, both LSPs)

3.2.3 Simulation Parameters

3.2.3.1 *Business Rationale*

Prior to the factors that led to the transition of this case study from pilot test to simulation, the SAIC project team noted the following reasons for Fellowes initial interest in the EFM package:

Since the bulk of shipment tracking within the Fellowes organization was by exception, they were looking for a solution which would identify shipments at risk for exception before the exception occurred. Ideally, the EFM package would allow the logistics staff at Fellowes to identify shipments and shipment legs requiring extra attention to ensure smooth transport while identifying areas of preventable delay and minimizing it. In addition, the Fellowes staff saw potential benefits in using the EFM package as a way to track and log root causes of delay so that from a historical perspective, staff could learn about these issues and how to prevent them in the future. In addition, Fellowes also saw the EFM package as a means to improve the less-automated operations within their brands.

Overall, Fellowes also thought a pilot test of the EFM package may demonstrate a low-cost alternative to value-added networks and commercial off-the-shelf (COTS) solutions offered by secondary logistics providers. Their initial intent in committing to the EFM case study, however, was not to replace their existing products, providers or services.

3.2.3.2 *Potential Performance Measures*

Although Fellowes does not have specific performance measures for their partners beyond delivery metrics: a shipment is considered late if it is not delivered between 6 days before ETA and the day of the ETA. The use of a visibility tool such as the EFM package would not impact this type of delivery metric. However, improved visibility and automation has the potential to seek the following types of benefits:

- Improved automation of the communication between Fellowes and their overseas suppliers (reducing redundant data entry and improving data accuracy)
- Reduction in outbound backorders.

A single point of access to Fellowes for viewing shipments and PO detail, which could reduce the cost and resources associated with supporting current software tools.

- Improved efficiency in management labor utilization due to increased timeliness, accuracy and completeness of shipment status from transportation providers.

3.2.3.3 *Case Study Challenges*

The intention of this case study was to implement EFM service into Fellowes' back office system and within the systems of several of their supply chain partners. There was particular interest in using EFM web services to exchange information between the customs broker and U.S. Customs and Border Patrol (CBP) to improve the efficiency of the filing and approval process. During the course of the pilot several changes occurred to the environment.

- CBP did not have any interest in changing course from their existing electronic processes. This was in part due to the current security risks for the U.S. and concern about making any changes to the existing processes.
- The main supporter and sponsor within the Fellowes organization for this case study left the company.

- During the environment assessment, Fellowes changed Freight Forwarders and the new forwarder saw EFM as eliminating services they want to provide.
- Fellowes purchased GT Nexus, a cloud-based collaboration platform, which provides visibility to their shipments along with EDI services.

Because of these changes, the new logistics manager at Fellowes did not want to continue the case study; however, the SAIC team had spent a lot of resources during the environment assessment and making plans toward implementation of the case study. Therefore, there were not adequate resources to pursue a replacement case study from inception through pilot test. Since the supply chain map for Fellowes that was developed by the SAIC team was a good representation of international intermodal freight regardless of mode choice, the project sponsor at the U.S. Department of Transportation (USDOT) suggested we simulate the potential benefits of EFM.

This approach enabled us to explore a full EFM implementation on all supply chain partners. The other case studies were limited to one or two services for two participants.

EFM Governance and Orchestration

In the course SAIC's development of this simulation and our work on other EFM case studies, several issues arose that need to be addressed through governance and/or orchestration. The controlled nature of our involvement in the case studies did not require this level of orchestration. There is also a separate project dealing with EFM governance. However, the SAIC team did log these issues and open items; these are noted below as things to be considered if EFM would be made commercially available or deployed on a large scale:

- Participant Identifier (ID): Participants will need a universally unique ID. This is particularly important when a logistics services provider communicates to all parties the list of participants for a specific consignment. This will be used to register for status, query for status, and for security. The participant ID's need to be universally recognized and unique.
- Consignment ID: It is assumed that the manufacturer or supplier will generate a unique consignment ID. Since they are the party that needs the ID and they are the party that is generating it there is no need for a "Consignment ID" service.
- Web Service URL: Whenever a participant needs to invoke a web service they will need to know the URL for that service. There are two methods that can be used:
    - Participants can maintain a database that contains participant ID, services they support, and the URL for each specific service.
    - The services and URL's could be administered in a central registry in such a way that given a participant ID and service ID the URL can be looked up each time a service needs to be invoked.
- Status – Push, pull, or both: There are two methods that can be used to handle consignment status messages:
    - Automatically publish to anyone registered - Anyone who wants to receive status for a specific consignment can register with each participant for that consignment. Whenever a status occurs the party will send status to all registered participants.
    - Respond to a request - A party can request either current or all status for a specific consignment. The requested party will respond with the status.

- Customs participation: While the EFM package could be used to electronically exchange information between CBP and customs brokers, CBP has already developed their own tools to complete this exchange. Therefore, it seems unlikely that CBP would be receptive to a pilot test of the EFM package given their existing investment in similar technology.

3.2.4 Estimated Implementation Costs

The implementation costs reflect the total estimated cost to implement across all supply chain participants. These costs are only for EFM integration. They assume that all participants have applications and databases in place that can be integrated with EFM. The following additional assumptions are included in the cost estimates:

- Each service or client will take 4 weeks to implement
  - Adding database connectivity into the client/service template
  - Testing the client/service
  - Deploying the client/service
  - Registering the service
- The cost per hour to implement is $40
- The cost per service or client to implement is $6,400 (4 weeks at 40 hours per week at $40 per hour)

Table 3-2 shows the costs to each party to implement EFM. Some participants will be part of many supply chains. Once they have implemented the services for one supply chain they will be able to use those for any other supply chain at no additional costs. The total costs are pro-rated based on the estimated number of supply chains for each type of participant. For example a carrier must implement a total of 9 services and clients at a cost of 9 x $6,400 for a total of $57,600 per carrier. However, a single carrier is involved in 1000 total supply chains. Once they have implemented all supply chains will benefit from that implementation. The cost that is apportioned to Fellowes is $57,600 / 1000 or $57.60 per carrier. Fellowes uses 10 carriers, so the total cost for carriers in the Fellowes supply is $57.60 x 10 or $576. The calculation is similar for each type of participant.

Table 3-2. EFM Implementation Costs

Party	EFM Clients	EFM Services	Cost per party	Total Supply Chains for each party	Portion for Fellowes per party	Number Parties in Fellowes chain	Total Cost Fellowes Supply Chain
Fellowes	4	3	$44,800	1	$44,800	1	$44,800
Suppliers	5	3	$51,200	100	$512	100	$51,200
Logistics services provider	8	9	$108,800	50	$2,176	2	$4,352
Carrier	3	7	$64,000	1000	$64	20	$1,280

Table 3-3 shows the annual operating and maintenance costs for each type of participant. The costs are apportioned to Fellowes in the same manner as the implementation costs. The total annual operating and maintenance costs for the Fellowes supply chain for all participants are $8,120.

Table 3-3. EFM Annual Operating and Maintenance Costs

Party	Annual operating and maintenance	Total Supply Chains for each party	Portion for Fellowes per party	Number Parties in Fellowes chain	Total Cost Fellowes Supply Chain
Fellowes	$4,160	1	$4,160	1	$4,160
Supplier	$4,160	100	$42	100	$4,160
Logistics services provider	$4,160	50	$83	2	$166
Carrier	$4,160	1000	$4	20	$83

3.3 Impact Estimate

The purpose of this section is to provide the data necessary to estimate the cost savings for Fellowes and their partners as a result of using the EFM package. Given that this case study was a simulation, there was no real-world data to assess process cost savings. Therefore, the potential impacts of EFM were assessed from the perspective of the savings offered by using EFM as an alternate to other technologies. Like the other case studies, however, the simulation does include a benefit-cost assessment using FTAT; specifically, to calculate the net present value, internal rate of return, payback period, and benefit/cost ratio.

3.3.1 Cost Comparison

Assumptions

In terms of assessing the potential benefits of EFM, the SAIC team took the approach of comparing EFM to the other means of completing supply chain transactions in terms of implementation, operations and maintenance costs. Therefore, the benefits of EFM are articulated in terms of avoiding the expense of completing the transactions via the alternative means – manually or automated (electronic data exchange (EDI) through a value-added network (VAN)).

Cost Comparison

Costs have been estimated for three categories of expenses. Implementation costs are associated with initial development of applications that extract data from a database, exchange it with another participant, and update their database. This will require technical expertise. Operational costs are those associated with monitoring and maintaining the applications. This also requires technical expertise and transaction costs are associated with each individual exchange of information. This could be the time it takes to manually fax or Email information, plus input into a database. This could also involve fees paid to a VAN. Costs are estimated for four scenarios:

- EFM – All participants deploy a full set of EFM web services and clients and integrate then with their internal applications. In this scenario there will be no transaction costs. There will be a higher implementation cost and operating cost.
- Manual – All participants exchange information via Email or Fax. Information is manually keyed into internal applications. In this scenario the transaction costs are high, but there is no implementation or operating costs.
- VAN – All participants automatically send information to a VAN who reformats and passes it to the recipient. Implementation and operating costs are low, transaction costs are based on VAN fees.
- EDI – All participants format information into standard EDI format and send it electronically directly to the other participants without passing through a VAN. The implementation and operating costs are higher than a VAN, but without any transaction costs.

Table 3-4. Estimated costs

	Implementation	Operate	Transaction
EFM	$101,632	$8,570	$0
VAN	$25,408	$2,142	$156,000
Manual	$0	$0	$420,000
Hybrid	$9,408	$1,102	$276,000
EDI	$76,224	$4,285	$0

3.3.2 FTAT Results

The USDOT's Freight Technology Assessment Tool was re-configured in 2011 and was used to calculate the net present value, benefit-cost ration and total process improvement for each case study. The inputs for Fellowes are summarized in Table 3-5 and the FTAT results are shown in Table 3-6.

Table 3-5. Fellowes FTAT Inputs

Input	Amount
Total As-Is Annual Process Cost	$276,000
Total To-Be Annual Process Cost (with EFM) – *no transaction costs*	$0
Initial Investment	$22,400
Annual Operating	$0.50/transaction
Annual Maintenance	$6,000

Table 3-6. Fellowes FTAT Results

Minimum Attractive Rate of Return	Useful Life	Net Present Value	Benefit Cost Ratio	Total Process Improvement
10.00%	5 Years	$1,603,676	18.39	$276,000

Chapter 4. INTERDOM PARTNERS

4.1 Environment Summary

4.1.1 Operating Environment

Interdom Partners is a Palos Heights, Illinois based intermodal marketing company (IMC), and the main sponsor of two EFM case studies. Interdom Partners is not a supply chain owner in that they do not ship goods internationally or domestically; rather, their business involves arranging rail and dray service for both international and domestic shippers and other intermodal companies. Interdom Partners (Interdom or IP) got their start by arranging double stack rail service for steamship lines moving containers east from west coast ports. Interdom's current customers include steamship lines, non-vessel operating common carriers, freight forwarders and customs brokers, and supply chain owners/importers. As an intermodal provider, Interdom has contacts with numerous Class I railroads and trucking companies in addition to their wide customer base.

Interdom Partners anchored two separate deployments of the EFM package. The first case study had the goal of automating the communications between Interdom and one of their primary dray carriers in the Chicago area, Pride Logistics LLC (Pride). This case study focused solely on creating automated electronic data exchanges between IP and Pride, where only manual processes previously existed.

The second case study sponsored by IP focused on streamlining the order process between Interdom and one of their customers, Agmark Foods/Agmark Intermodal, another IMC. This case study also sought to provide rail status to Agmark directly, eliminating their reliance on receiving IP-related rail shipment data from Steelroads, a rail data provider.

4.1.1.1 *Pride Logistics LLC (Pride) Case Study*

Interdom is the parent company of Pride, an intermodal trucking and drayage company also located in the greater Chicago area. Pride provides service to and from all of the Class I rail ramps in Chicago, as well as a larger five-state regional area. Pride consists of owner-operators and specializes in the intermodal market. They maintain active interchange agreements with the major railroads, steamship lines and equipment providers, and utilize owner-operators to execute their moves.

Pride's current communications with Interdom are completely manual. To initiate a shipment, Interdom orders trucking service from Pride. Once a shipment is in transit, Pride sends status information to Interdom. At the end of the shipment cycle, the trucking company sends an invoice to Interdom. Today, these processes take place via fax, email and phone.

4.1.1.2 *Agmark Foods, Inc./Agmark Intermodal (Agmark)*

Agmark is also an IMC, specializing in the movement of intermodal tanks, based in Nashville, TN. Agmark primarily arranges transportation for liquid, bulk food and agricultural products in intermodal tanks they developed via truck, rail and ocean. Agmark's tanks include sanitary-grade and super-insulated models, allowing for the shipment of bulk, raw food products such as milk.

Interdom primarily arranges for the rail and truck transportation of Agmark containers. As an IMC, Agmark utilizes Kleinschmidt, a freight data/e-Commerce provider, to act as their Value-Added Network (VAN). In this role, Agmark orders are placed and transmitted to Interdom through Kleinschmidt. In addition to creating orders, Kleinschmidt also generates and transmits Electronic Data Interchange (EDI) 404 (bill of lading) and 322 (status) messages.

4.1.2 Key Participants

In addition to DEMDACO, the key participants in this case study included:

Flatirons Two, Inc. (Fi2)

Similar to the ESI case study, Flatirons Two, Inc. was also a critical stakeholder in both Interdom case studies. As with ESI, Interdom uses Fi2's Logistics Order Tracking System (LOTS). LOTS provides Interdom with a system for managing the order and freight audit processes, and also provides Interdom with rate management and inquiry capabilities, vendor quote processes, and order management including online management of orders to facilitate automation over the order process.

From a technological perspective, Fi2 was a subcontractor to SAIC on both Interdom case studies. Their main role was to act as a technology liaison between SAIC and Interdom, facilitating the deployment of the EFM package with Interdom's information technology (IT) system. For purposes of these two case studies, Fi2 implemented the EFM package within Interdom's system to support both case studies, and also facilitated the deployment of certain aspects of the package within Pride for that particular case study. The deployment of the package for the Pride study created an interface between Pride and Interdom's LOTS system. Fi2 worked with Pride Trucking's private IT consultant on the deployment of the EFM package within their Microsoft Access system.

Third Parties, Data Providers and Transportation Partners

In addition to Interdom as the case study owner, their key partners, Agmark and Pride, and Fi2, the deployment of the EFM package within Interdom included the following partners:

- Kleinschmidt, an e-Commerce provider and Interdom's Value-Added Network (VAN)
- Steelroads, a third party rail data provider that collects and consolidates railroad information
- Burlington Northern – Santa Fe (BNSF), a Class I railroad

Kleinschmidt, as Interdom's VAN, acted as the primary interface between Interdom and Agmark and between Interdom and BNSF. Kleinschmidt facilitates the placement of a transportation order with Interdom, and once booked, they also supply EDI 404 (bill of lading) and 322 (status) for the rail portion of the trip. For the Agmark containers that were a part of this EFM case study, BNSF was the rail carrier that was used; they provide their status to Steelroads and Interdom, although the VAN acted as the intermediary for the transmission of this information between BNSF and Interdom. Steelroads receives rail status from the railroads and also generates and sends car location messages (CLMs).

NOTE: Kleinschmidt, Steelroads and BNSF were only involved in the Interdom-Agmark case study. The Interdom-Pride case study involved Interdom, Pride and Fi2.

4.1.3 Description of As-Is Technical Environment

4.1.3.1 *Interdom-Pride*

Not a stand-alone supply chain, Interdom-Pride is instead a customer-provider relationship where Interdom places orders for dray and regional truck moves with Pride Trucking. The Interdom – Pride relationship relies entirely on manual communications: phone, email and fax. Pride moves both inbound containers from the intermodal rail terminal to destination and outbound containers from their origin to the intermodal rail terminal for shipment. For outbound containers, Interdom places orders with Pride to move containers from origin to an intermodal rail terminal; typically the order is placed via [phone/fax/email or all of the above]. Once received, Pride enters this information into their operating system, a home-grown Microsoft Access database program. Pride notifies Interdom of rail arrival (i.e., container departure) and provides an invoice for payment.

For inbound containers, Interdom sends a "pre-note" with container arrival time to the rail facility to Pride, typically via email. For inbound container orders, Pride must accept or reject each order received from Interdom; again, this is a manual process, typically provided by phone, fax or email. If the move is accepted, Pride provides delivery notice along with an invoice for payment back to Interdom. Regardless of the type of move, Pride provides in-transit status to Interdom over the phone.

In deploying the EFM package in the Interdom-Pride communications process, the main goal was to automate all of the above manual communications using web services and UBL message schemas.

Table 4-1 provides a summary of the Interdom-Pride environment. It also describes the supply chain environment prior to the implementation of the EFM web services. This table is meant to illustrate the areas of opportunity that the EFM services can improve.

Table 4-1. Interdom-Pride Environment Summary

Interdom-Pride EFM Case Study Environment Summary	
As-is Business Environment:	
Partner	**Summary of Case Study Participation**
Interdom	• Arranges transportation and manages contracts, communications and relationships between shippers, carriers, and third party providers. • Primary interaction with SAIC project team
Pride Trucking LLC	• Transports freight as agreed to with Interdom • Data provider (manual data provided via phone, fax and email)
Business Problem:	
Problem	**Projected Benefits**
Manual data is less accurate, timely and complete	• The EFM package automates the transmission of orders, order acceptance and pre-note transmission, reducing the points of manual data entry time spent waiting to transmit data by phone, fax or email. This automation also improves accuracy and timeliness.

Interdom-Pride EFM Case Study Environment Summary	
Lack of automation and efficiency	• Currently, the transmission of the order, pre-note, shipment tracking, order acceptance, pick-up/delivery notification and invoices are all manual processes which depend on a person to generate the data and manually transmit it to the partner.
Supply Chain Technical Environment:	
Current IT Tools	• AS 400 Operating system, supported by FI2 Logistics Order Tracking System (LOTS) (Interdom) • 'Home grown' Microsoft Access database system run on a Windows PC (Pride)
Current Messaging	• Fax • Email attachment: scanned document, Excel spreadsheet • Telephone
Current Interchanges (targeted with the EFM package)	(from-to) • Send/receive order, Interdom <-> Pride (the EFM package will use UBL message schema for book consignment service, which allows direct receipt by Pride). • Send/receive pickup, Pride – Interdom (the EFM package will use the UBL message schema for status services, which allows direct receipt by Interdom of the pickup/delivery information). • Send/receive rail arrival, Pride – Interdom (the EFM package will use the UBL message schema for status service; allows direct receipt by Interdom). • Send/receive pre-note, Interdom <-> Pride (the EFM package will use the UBL schema for book consignment service; allows direct receipt by Pride). • Order delivery send/receive, Pride <-> Interdom (the EFM package will use the UBL schema for status service; allows direct receipt by Interdom) • Invoice send/receive, Pride <-> Interdom (the EFM package will use the UBL schema for invoice service; allows direct receipt by Interdom)

4.1.3.2 *Interdom-Agmark*

The Interdom-Agmark supply chain currently relies primarily on EDI communications. As discussed briefly, Agmark sends orders to Interdom through Kleinschmidt in the form of an EDI message. Once received, Interdom supplements the order information and then sends the order as an EDI transmission (EDI 422, bill of lading) through Kleinschmidt to BNSF. As the container moves, BNSF sends status information to Steelroads and Interdom as EDI (EDI 322, status). The transmission of the EDI 322 from BNSF to Interdom is again executed through Kleinschmidt. Steelroads passes status information as an EDI feed to Agmark.

In deploying the EFM package in the Interdom-Agmark supply chain, the main goal was to demonstrate that the reliance on the VAN could be reduced or eliminated. Both Agmark and Interdom utilize existing transportation systems that provide a fair amount of supply chain

visibility; in this case, the information exchanges were already quite automated, but the area of opportunity focused on eliminating the need and cost associated with utilizing third party providers. The critical areas of opportunity for the Interdom-Agmark EFM case study included:

- The EFM package will enable Agmark to send orders directly to Interdom.
- Replacement of the rail status process by a direct feed from the railroad to Interdom using traditional EDI techniques.
- Interdom's use of EFM web services to forward status to Agmark, eliminating their need to receive status from Steelroads

Table 4-2 provides a summary of the Interdom-Agmark environment. It also describes the supply chain environment prior to the implementation of the EFM web services. This table is meant to illustrate the areas of opportunity that the EFM services can improve.

Table 4-2. Interdom-Agmark Environment Summary

Interdom-Agmark EFM Case Study Environment Summary	
As-is Business Environment:	
Partner	**Summary of Case Study Participation**
Interdom	• Arranges transportation and manages contracts, communications and relationships between shippers, carriers, and third party providers. • Primary interaction with SAIC project team
Agmark	• Arranges freight transportation as agreed to with cargo owner • Data provider (EDI 404 file on a server for access by the web service client)
BNSF	• Transports freight as agreed to with cargo owner • Data provider (status as EDI to Interdom using EFM web services)
Kleinschmidt	• Kleinschmidt was not required to engage in the case study as a data provider. They continued to receive the order from Interdom as before, although the case study eliminated their role as a third party between Agmark and Interdom in the order placement process.
Steelroads	• Steelroads was not required to engage in the case study as a data provider. The EFM case study eliminated the need for Steelroads to send CLM (status) to Agmark.
Business Problem:	
Problem	**Projected Benefits**
Transfer of data requires use of third party (VAN), with associated costs.	• Order placement from Agmark directly to Interdom using Universal Business Language (UBL) schema/web service. • Eliminates the need (cost) of a VAN to receive, process and transfer this information from Agmark to Interdom. • Also eliminates the use of the VAN for status transmissions from BNSF to Interdom; EFM facilitates direct communication using EFM web services, while preserving the use of traditional EDI.

Interdom-Agmark EFM Case Study Environment Summary	
Streamlined communications among core supply chain members	• Use of the EFM package facilitated direct communication of in-transit status from Interdom to Agmark using web services and UBL message schema. Theoretically, if used by Agmark for all of their intermodal providers, they could reduce or eliminate the need for a third party data provider (Steelroads), thereby saving money. For this case study, however, the cost savings would be relatively small given Interdom is just one company that Agmark works with in the tracking of their shipments.
Supply Chain Technical Environment:	
Current IT Tools	• AS 400 Operating system, supported by Fi2 Logistics Order Tracking System (LOTS) (Interdom) • In-house management system for order generation/management. This system creates an order in EDI for transmission/translation to Interdom by Kleinschmidt (Agmark)
Current Messaging	• EDI (VAN) • Fax • Email attachment: scanned document, Excel spreadsheet, EDI, flat file • Telephone • Customer website (www.interdompartners.com)
Current Interchanges (targeted with the EFM package)	• (from-to) • Create and send order (Agmark – ~~Kleinschmidt~~ - Interdom) • Rail transit status to Interdom; Means: Kleinschmidt (BNSF – ~~Kleinschmidt~~ - Interdom), freight forwarder website • Rail transit status to Agmark; Means: Steelroads (BNSF – ~~Steelroads~~ – Agmark) • Rail transit status from Interdom to Agmark (new exchange created by the EFM package). NOTE: strikethrough indicates the elimination of one leg of communication as a result of the direct connection provided by the EFM package.

4.2 Implementation Summary – Interdom-Pride

4.2.1 Application of EFM Package

Prior to creating the message schemas and implementing the web services which exchanged the supply chain information among partners, SAIC, Fi2, and Interdom documented the supply chain process used by Interdom and Pride to determine where the EFM package could add value:

1. First, SAIC and Fi2 worked with Interdom to lay out the process for their order placement, Pride's order fulfillment, status and invoicing.
2. SAIC and Fi2 mapped and documented Interdom's and Pride's technical environment (all information technologies and communications that support order placement, status

communication, and invoicing, and the process by which these communications are completed).

3. Once the supply chain process was laid out, SAIC and Fi2 worked with Interdom and Pride to identify which communications were the best candidates for automating using the EFM package. Since all of the Interdom-Pride communications were conducted via manual means, the goal in deploying the EFM Package was to automate order placement, status and invoicing.
    a. Although order placement was included in the Interdom-Pride case study, Pride's order acceptance or rejection was not; the reason for excluding this transaction is because Pride does not maintain any data within their Access database system with respect to this event. For the transaction to be included in the case study (thereby automated) would have required a screen for the manager to accept or reject the order and location for the data within the Pride database.

Ultimately, the use of the EFM package resulted in the complete automation in the flow and processing of information; specifically, this case study sought to demonstrate that Interdom and Pride could use the EFM package to exchange information directly, eliminating the reliance on manual communications and improving the speed and accuracy with which they communicate. Figure 5 below documents the supply chain process from order placement through delivery. Note, all exchanges were between Interdom and Pride only; red indicates where the EFM package was applied.

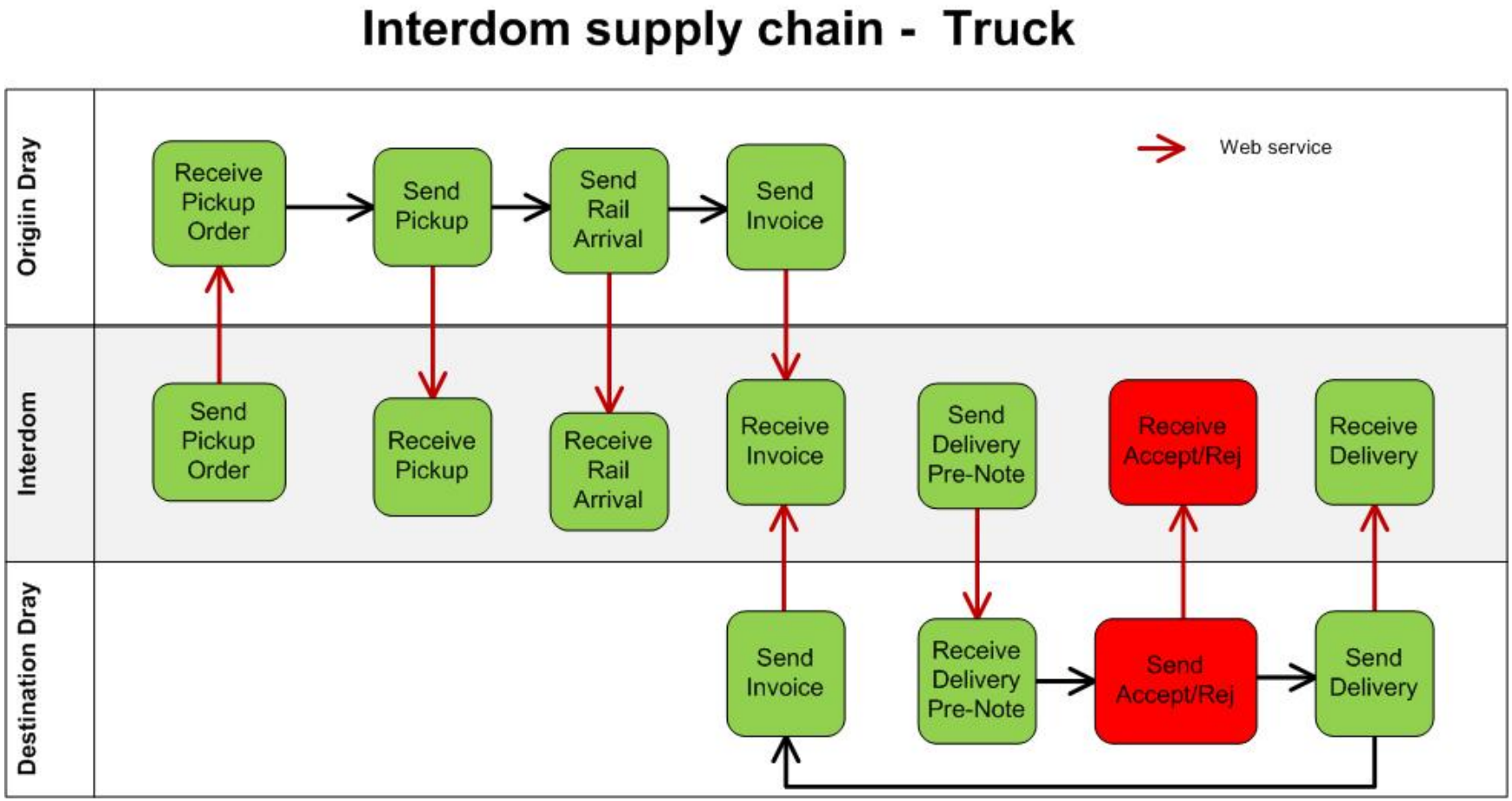

Figure 4-1. Interdom-Pride Supply Chain Map

4.2.2 Implementation Decision Process

Several issues were involved in the business rationale for making the decisions regarding final partner involvement and EFM package coding, testing and implementation.

1) **The main goal of the Interdom-Pride EFM case study was to automate the all communications connectivity between Interdom and Pride.** Theoretically, this increases the speed and accuracy of the transactions. Keeping this goal in mind, the case study team had to prioritize the selection of the Interdom transportation provider to include and the information they provided to ensure that manual transactions were targeted for replacement by the EFM package.

2) **Initially, the SAIC team envisioned this case study including several of Interdom's dray carriers;** ultimately only Pride Trucking participated. During the environment assessment, the team planned to include a total of 3 dray carriers, including Pride. The other two companies were based in California, and also operated under the Interdom umbrella. During the environment assessment, however, the team determined that these companies had very little in the way of IT systems, lacking even a home grown operating system for tracking orders or status. Thus, team resources would have been strained to install the package into a rather low-tech environment. Second, the other two dray carriers were also concerned about the impact of EFM on current operations, again because of their low tech IT. The ultimate decision to include only Pride happened rather late in the environment assessment because it took several discussions to determine that the impact would be relatively low because the other two carriers had a low volume of moves for Interdom.

3) **Once the participants and transactions were identified, SAIC worked to ensure the technical environment supported EFM package implementation**. Pre-implementation efforts included addressing the business rationale issues and ensuring that changes to the technical environment, as a result of implementation, did not negatively affect Interdom's or Pride's daily business operations.

4) **A critical aspect of the implementation phase was to confirm that the data feeds from the participants were properly integrated**. The technical team worked with the partners throughout the implementation phase of the project to integrate their data feeds through the EFM package:

5) **The development of the EFM web services and UBL message schemas were also critical activities for SAIC and Fi2, who was responsible for the implementation of the EFM package within Interdom's system**. Fi2 also consulted with Pride on the implementation of the web services within their Microsoft Access database, which acts as their transportation management tool. Following the business rationale decisions regarding which partners would provide data, what data they would provide, and how it would be provided, this was a critical aspect of the implementation that included the development of EFM web service to exchange transportation status, order data (BOL) and freight invoice between Interdom and Pride.

6) **Perhaps most importantly, the EFM package (web services and message schemas) were fully integrated into Interdom's and Pride's system**, meaning that the data was shared directly and automatically to and from their daily operating systems, eliminating the need for a 'shadow' database where test data is shared for exchange. Because the package is integrated into their operating systems, this also means that the EFM package can continue to operate after the pilot at no cost to SAIC and the operating and

maintenance costs to Interdom and Pride are minimal. They would have the cost to monitor the process and fix any problems, which the team estimates would be no more than 24 hours annually.

4.2.3 Implementation Parameters

4.2.3.1 *Business Rationale of Adopters/Potential Adopters*

The business rationale and goals of the Interdom-Pride EFM case study were different than a traditional supply chain owner's might be, as Interdom is an intermodal provider and Pride is one of their transportation providers – in this case, a dray carrier. Respectively, both Interdom and Pride are customer service oriented, and in the scope of this case study, Interdom is Pride's customer. To that end, improving the speed and accuracy of their communications can improve the productivity and save costs for both organizations.

The business rationale and goals of this study focused on the cost savings gained through automating the information exchanges between Interdom and Pride. Therefore, the cost-benefit component of the case study (performed using the Freight Technology Assessment Tool (FTAT) analysis outlined later in this study) demonstrates cost reductions driven specifically by the use of the EFM package to collect and exchange information between Pride Trucking and their customer, Interdom. The use of the EFM package by Interdom and Pride assumes that the "as-is" business environment experiences excess cost in the exchange of data and information due to additional labor required to conduct manual communications and to correct any errors that can be carried through the exchanges. These costs can be eliminated by using the package to allowing case study participants to interact both automatically and directly.

4.2.3.2 *Performance Measures*

As a third party logistics provider (3PL), Interdom is responsible for arranging transportation; once booked with a provider, they do not control the movement or delivery of freight. However, Pride, as a dray carrier, does control a portion of the movement of a container through the supply chain. That said, there are no specific metrics that Interdom holds Pride to in these dray movements. Even though transportation is executed by Pride, the only expectation that the freight will move as soon as possible, be accounted for throughout transit, and be delivered to the correct location.

Targeted improvements for the Interdom-Pride EFM case study were all related to automating previously manual exchanges. In addition, this case study also allowed for direct exchanges between Interdom and Pride. The resulting benefits – for both Interdom and Pride - include:

- Improved accuracy of data exchanges – including more complete information with respect to status, order, and invoices.
- Improved timeliness of all data exchanges.
- Reduced costs associated with conducting entirely manual exchanges.
- Reduced costs associated with correcting incomplete or incorrect data.
- Use of web services/automation of messaging reduces redundancy of effort.
- Sustained use of the EFM package after the pilot test concludes.

4.2.3.3 *Implementation Challenges*

Anticipated:

- EFM is not widely known, accepted or used in the freight industry.
- The project schedule allowed for a relatively short (90-day) operational test phase. However, in the case of the Interdom-Pride case study, the package will continue to operate at the end of the test phase, initially at no cost to SAIC or any of the participants. This may allow for the evaluation of additional benefits.

Unanticipated:

In the case of the Interdom-Pride case study, unanticipated technical challenges caused the greatest delay. There were a few separate technical issues that arose with the implementation of the EFM package within both Interdom and Pride's system:

- Once Fi2 began the EFM implementation for Interdom, they recognized that Interdom's server could not run the required version of Java. This caused significant delay in EFM package implementation because initially, Fi2 worked to troubleshoot this issue by modifying the EFM package to run the previous version of Java. This resulted in decreased functionality; SAIC and Fi2 then had to come up with a backup plan, which in this case consisted of modifying a local Interdom PC to act as the server for the case study so that it was running the appropriate database tools and versions.
    - In addition, Interdom had limited IT resources to support the troubleshooting activities. The issue related to the version of Java running at Interdom required consultation with IBM regarding how to run the services on their server. The advice provided by IBM was to make some operating upgrades, at unplanned expense. This also contributed to the end decision to use a PC and install the services on the PC rather than use the same server that the rest of their systems run on. While the team ultimately overcame this issue, this caused an approximate 8 week delay while the issue was identified, workarounds tested, and a final solution implemented.
- With respect to Pride, the interaction with their Microsoft Access database was occasionally complicated; used by Pride for their transportation management. Initially, the SAIC team had difficulty accessing it. Second, once access was gained to the system, it was sporadic and most reliable on the weekends and in the evenings. Fi2 changed remote access of the Pride Server to more reliable and efficient software and the team worked around the access issues.

Table 4-3 provides a summary of the Interdom-Pride implementation parameters.

Table 4-3. Interdom-Pride Implementation Parameters Summary

Decision Process	• Facilitate direct connectivity between Interdom and Pride • Reduce reliance on manual communications • Increase accuracy, completeness and timeliness of data
Business Rationale	**Potential Benefits:** • Improved data accuracy/completeness • Improved data timeliness • Reduced costs associated with executing and correcting manual communications **EFM Implementation Goals:**

	• Direct partner connectivity • Reduced costs • More accurate, complete and timely transportation data and information for decision-making
Potential Performance Measures	• Labor expended on manual communications
Implementation Challenges	• The pilot demonstration was only 90 days duration • Technical compatibility between Interdom servers and EFM package requirements • Access issues with Pride's legacy system • EFM not yet widely used

4.1.2 Implementation Cost Summary

The costs associated with implementing the EFM package for the Interdom - Pride pilot reflect the costs to both entities for implementing EFM web services within their server environments to exchange information for purposes of this pilot. The costs also include the labor associated with SAIC and Fi2 technical and management personnel, who developed the web services, message schemas, and provided technical assistance to Interdom and Pride in order to deploy these services and troubleshoot issues identified during implementation.

Table 4-4 contains the implementation and operations/maintenance cost summary for the Interdom – Pride EFM Case Study. These were the costs that were factored into the benefit-cost assessment conducted using the Freight Technology Assessment Tool (FTAT). These costs are based on:

- The number of web services that were deployed within the IT infrastructure of each supply chain partner
- The number of hours spent by key IT staff at Interdom, Pride and Fi2 to refine and prepare the EFM package for implementation.
- The number of hours spent by SAIC and Fi2 staff providing technical guidance to Interdom and Pride
- An estimate of the annual number of hours required to continue EFM operation - this includes the minimal maintenance costs of running support servers, but assumes no further modification to the EFM package to provide enhanced service to Interdom and Pride.

Table 4-4. Interdom – Pride Implementation, Operations and Maintenance Costs

Assumptions:

- Technical assessment of deployment environment takes on average 2 weeks (40 hours per week) = $2,240. This cost is factored into the cost per party as a flat rate expense.
- Each client/service takes on average 1 week to deploy = $1,120 per service/client
- Average hourly rate = $28/hour

Implementation			
Party	**EFM Clients**	**EFM Services**	**Cost per party**
Interdom	1	2	$5,600
Pride	2	1	$5,600
		Total Implementation Costs	**$11,200**
Operations and Maintenance			
24 hours per year at $28/hour			**$672**

4.3 Implementation Summary – Interdom-Agmark

4.3.1 Application of the EFM Package

Prior to creating the message schemas and implementing the web services which exchanged the supply chain information among partners, SAIC, Fi2, and Interdom documented the supply chain process used by Interdom and Agmark to determine where the EFM package could add value:

1) First, SAIC and Fi2 worked with Interdom to lay out the process for Agmark's order placement and Interdom's order fulfillment.
2) SAIC and Fi2 mapped and documented Interdom's technical environment (all information technologies and communications that support order placement and fulfillment, and the process by which these communications are completed).
3) Once the supply chain process was laid out, SAIC and Fi2 worked with Interdom and Agmark to identify which communications were the best candidates for replacing with the EFM package. These decisions were based on several factors:
   a) Agmark's willingness and ability to provide data, considering:
      i) Type of data to exchange: order, CLM, EDI 322s and 404s, or transportation status. Ultimately, order and status (replacing the need for Interdom to receive the EDI 322) were the data exchanged using the EFM package. These were the highest priority data types for Interdom and Agmark, and also the most feasible to replace with EFM with the least disruption to Interdom and Agmark's other partners.
      ii) How the data should be exchanged between Interdom and Agmark,
      iii) Source of data: for example, status is available from BNSF, Steelroads or Kleinschmidt.

Ultimately, the use of the EFM package resulted in the revised flow and processing of information; specifically, this case study sought to demonstrate that Interdom and Agmark could exchange information directly, eliminating the need and cost associated with using a VAN to facilitate these transactions. Figure 6 below documents the supply chain process from order placement through shipment transit. Red indicates where the EFM package was applied.

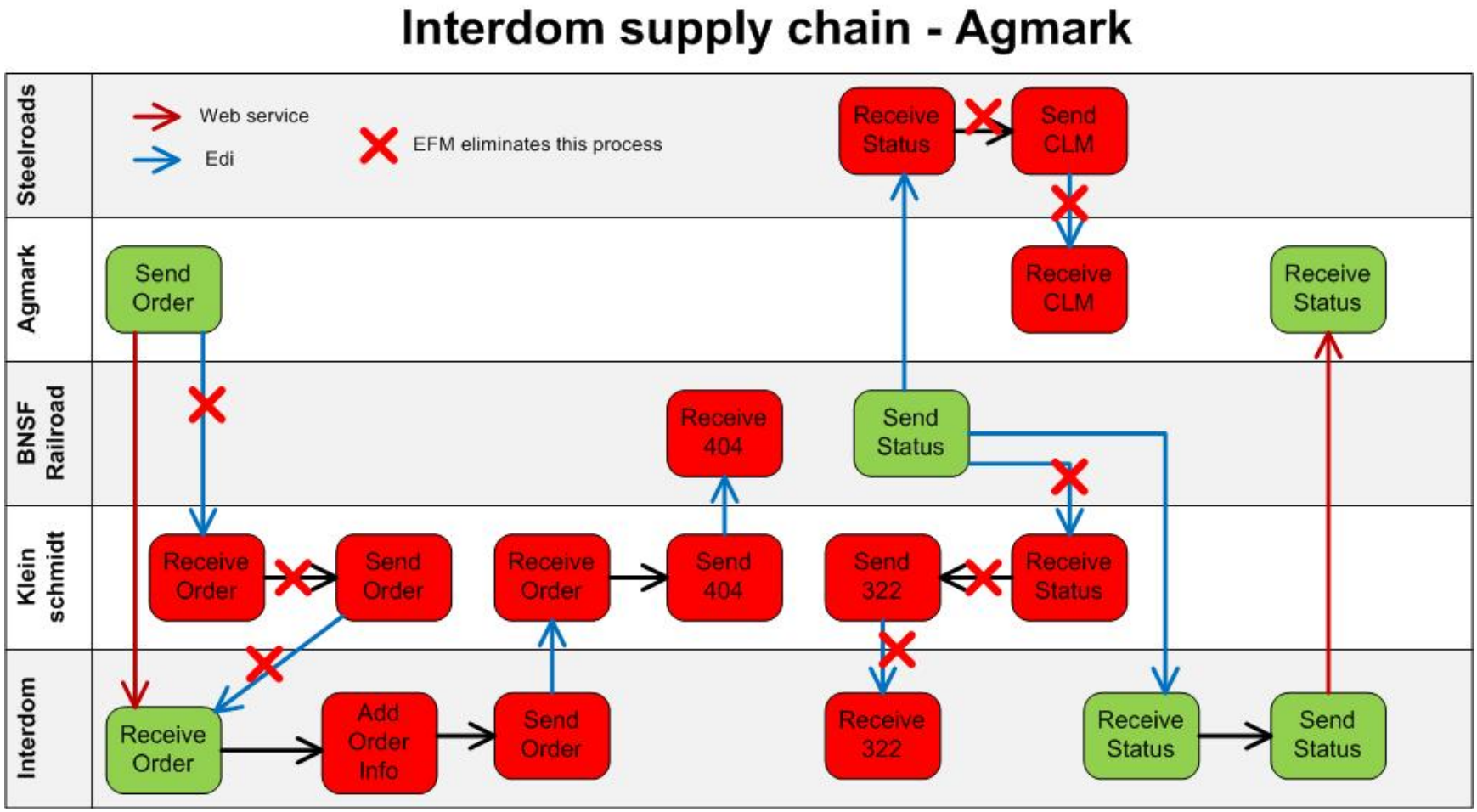

Figure 4-2. Interdom-Agmark Supply Chain Map

4.3.2 Implementation Decision Process

Several issues were involved in the business rationale for making the decisions regarding final partner involvement and EFM package coding, testing and implementation.

1) **The main goal of the Interdom-Agmark EFM case study was to demonstrate direct connectivity between Interdom and their customers** (in this case, Agmark Intermodal) **eliminating the need and cost of using a VAN such as Kleinschmidt and a reduced reliance on 3rd party data providers such as Steelroads**. Keeping this goal in mind, the case study team had to prioritize the selection of the Interdom partner to include and the information they provided to ensure that the most important information was acquired and exchanged by the EFM package. Obviously, information exchanges currently conducted via the VAN and 3rd party provider were targeted and evaluated for inclusion in the case study.

2) **Once the participants and transactions were identified, SAIC worked to ensure the technical environment supported EFM package implementation**. Pre-implementation efforts included addressing the business rationale issues and ensuring that changes to the technical environment, as a result of implementation, did not negatively affect Interdom's daily business operations.

3) **A critical aspect of the implementation phase was to confirm that the data feeds from the participants were properly integrated**. The technical team worked with the partners throughout the implementation phase of the project to integrate their data feeds through the EFM package:

    a. In the case of BNSF, they provided data through channels they use to provide data to other customers. For example, although the EFM package encourages data transmission by web service and UBL message schema, this could require additional work by the data provider to implement. BNSF preferred to keep data in existing formats (namely, Electronic Data Interchange, or EDI) and provide it to Fi2 via ftp. This meant that it was primarily up to Fi2 to adapt their data feeds for receipt and re-use by the EFM package. Adapting their data was relatively straight forward and did not affect the project schedule.

4) **The development of the EFM web services and UBL message schemas were also critical activities for SAIC and Fi2, who was responsible for the implementation of the EFM package within Interdom's system.** Following the business rationale decisions regarding which partners would provide data, what data they would provide, and how it would be provided, this was a critical aspect of the implementation that included the development of EFM web service to exchange transportation status and order data (BOL) between Interdom and Agmark.

5) **As with Pride, the SAIC team sought to were fully integrated into both Interdom's and Agmark's system, but ultimately, the EFM package was only integrated into Interdom's system and not Agmark's**. Essentially, had the package been integrated into Agmark's system, they could have eliminated the use of Kleinschmidt to process Interdom's order. Since they did not, the EFM package ran in parallel to the processing the Kleinschmidt provides as opposed to replacing it. Kleinschmidt is still essentially the system used by Agmark in their order execution although it could be replaced if Agmark chose to integrate the services into their back-end system.

4.3.3 Implementation Parameters

4.3.3.1 *Business Rationale of Adopters/Potential Adopters*

The business rationale and goals of the Interdom-Agmark EFM case study were different than a traditional supply chain owner's might be, as Interdom is an intermodal provider, and as such, customer service is at the core of their business model. This is not to say that they do not partner with associates in specialized fields including freight carriers, freight-forwarders, and US Customs clearance and process brokers, however not in the sense as an anchor tenant like a supply chain owner might be.

The business rationale and goals of this study focused on the cost savings available to both Interdom and Agmark by directly connecting them with each other and BNSF, and eliminating the need for 3rd party data providers. Therefore, the cost-benefit component of the case study (performed using the Freight Technology Assessment Tool (FTAT) analysis outlined later in this study) demonstrates cost reductions driven specifically by the use of the EFM package to collect and exchange information between Interdom and their customer, Agmark Intermodal. The use of the EFM package by Interdom and Agmark assumes that the "as-is" business environment experiences excess cost in the exchange of data and information due to the use of a value-added network and 3rd party data provider and that these costs can be eliminated by using the package to allowing case study participants to interact directly.

4.3.3.2 *Performance Measures*

As a third party logistics provider (3PL), Interdom is responsible for arranging transportation; once booked with a provider, they do not control the movement or delivery of freight. The most important metric between Interdom and their customers is the rate that they charge. That said, even though transportation is executed by external providers, there is an expectation that the freight will move as soon as possible, be accounted for throughout transit, and be delivered to the correct location. Therefore, delivery or shipment errors can ultimately be very costly to Interdom, but there are no formal metrics measuring their performance in these areas.

Targeted improvements for the Interdom-Agmark EFM case study were:

- Reduction in cost associated with utilization of a VAN to transfer order information between Interdom and Agmark.
- Reduction in costs associated with Agmark receiving rail status via a 3rd party data provider.
- Reduction in costs associated with the VAN facilitating the collection and transfer of EDI 322 (status) from the railroad to Interdom.

4.3.3.3 *Implementation Challenges*

When compared to the other EFM case studies pursued by SAIC, the Interdom-Agmark case study experienced very few unanticipated challenges. Since the Interdom-Pride EFM implementation was completed prior to Agmark, the lessons learned and technical workarounds gained from the Interdom-Pride implementation challenges greatly reduced the challenges faced here. The Interdom-Agmark implementation required very little modification from what was deployed with Interdom and Pride.

Anticipated:

- EFM is not widely known, accepted or used in the freight industry.

- As a 3PL, Interdom had to solicit a customer to participate in the case study. As such, they could not necessarily be the main endorser of the technology ("anchor tenant") who could require their customers to support EFM package implementation.
- The project schedule allowed for a relatively short (90-day) operational test phase. Many expected operational changes could not be effectively demonstrated.
- The transportation service providers – in this case, BNSF railroad - did not intend to use the information supplied via the EFM package in their operations. Therefore, they did not seek to achieve any internal benefit.
- BNSF transmitted required data using their standard distribution methods – thereby not demonstrating the use of EFM web services and UBL message schemas.
- Without direct benefit, service providers did not have economic incentive to participate.

Unanticipated:

- Pursuing a case study with a 3rd party provider such as Interdom required that one of their customers also come on board. In this case, SAIC, Fi2 and Interdom quickly identified Agmark, who agreed to participate. However, **once Agmark was brought on board, there were some indications that competing priorities would affect their ability to implement the required EFM web services within the scheduled timeframe.**

Once the package was ready to be deployed, there was some reluctance on Agmark's part to deploy the EFM web services on their system. Ultimately, SAIC ran the actual web services to access Agmark's data. Agmark did make their data available, although achieving this compromise was more time consuming than anticipated.

Table 4-5 provides a summary of the Interdom-Agmark implementation parameters.

Table 4-5. Interdom-Agmark Implementation Parameters Summary

Decision Process	• Reduce Agmark's dependency on 3rd party data provider (Steelroads) for rail status information. • Reduced involvement of the VAN (Kleinschmidt) to act as a facilitator for order transfer between Agmark and Interdom. • Reduce Interdom's dependency on the VAN for rail status information. • Facilitate direct connectivity between Interdom-Agmark and Interdom and BNSF.
Business Rationale	**Potential Benefits:** • Reduced costs associated with use of 3rd party data provider (Agmark) • Reduced functionality/cost associated with use of a VAN (Interdom) **EFM Implementation Goals:** • Direct supply chain partner connectivity • Reduced costs
Potential Performance Measures	• 3rd party data costs

	• VAN costs
Implementation Challenges	• Lack of a major player as an endorser of the technology ("anchor tenant") • The pilot demonstration was only 90 days duration and operational changes could not be effectively demonstrated • EFM not yet widely used • Participants who participate in the project without economic incentive because they are serving a customer may not have resources to devote

4.1.3 Implementation Costs

The costs associated with implementing the EFM package for the Interdom - Agmark pilot reflect the costs to Interdom for implementing EFM web services within their server environment to exchange information for purposes of this pilot. The costs also include the labor associated with SAIC and Fi2 technical and management personnel, who developed the web services, message schemas, and provided technical assistance to Interdom in order to deploy these services and troubleshoot issues identified during implementation.

Table 28 contains the implementation and operations/maintenance cost summary for the Interdom – Agmark EFM Case Study. These were the costs that were factored into the benefit-cost assessment conducted using the Freight Technology Assessment Tool (FTAT). These costs are based on:

- The number of web services that were deployed within the IT infrastructure of each supply chain partner
- The number of hours spent by key IT staff at Interdom, Agmark and Fi2 to refine and prepare the EFM package for implementation.
- The number of hours spent by SAIC and Fi2 staff providing technical guidance to Interdom and Agmark
- An estimate of the annual number of hours required to continue EFM operation - this includes the minimal maintenance costs of running support servers, but assumes no further modification to the EFM package to provide enhanced service to Interdom and Pride.

Table 4-6. Interdom – Agmark Implementation, Operations and Maintenance Costs

Assumptions:

- Technical assessment of deployment environment takes on average 2 weeks (40 hours per week) = $2,240. This cost is factored into the cost per party as a flat rate expense.
- Each client/service takes on average 1 week to deploy = $1,120 per service/client
- Average hourly rate = $28/hour

Implementation

Party	EFM Clients	EFM Services	Cost per party
Interdom	3	1	$6,720
Agmark	1	2	$5,600
Carrier (Rail)	2	0	$4,480
		Total Implementation Costs	**$16,800**
Operations and Maintenance			
24 hours per year at $28/hour			**$672**

4.4 Impact Assessment – Interdom-Pride

4.1.4 Business Process / Cost Improvement

The purpose of this section is to provide the data necessary to execute calculate the cost savings for Interdom and Pride Trucking as a result of using the EFM package. In addition, it provides the data necessary to conduct a benefit-cost assessment; specifically, to calculate the net present value, internal rate of return, payback period, and benefit/cost ratio.

Assumptions

The cost savings are calculated in terms of the business process that is affected. For the most part, Pride's specific business processes are shown on Figure 5 earlier in the document.

For the impact assessment, the SAIC team calculated the as-is and to-be cost of each process. The as-is cost is the cost of executing the business process before implementation of the EFM package while the to-be cost is the cost after implementing EFM. In addition to this definition, since the EFM package is largely about streamlining business processes through improved automation, many of the savings are accrued as a result of a process not taking as long. For Interdom, we assumed an hourly wage of $15/hour while for Pride we assumed an hourly wage of $20/hour (both estimated per company guidance).

Business Processes and As-Is Costs

The business processes that were impacted by the deployment of the EFM Package include:

- Dray order
- Dray Pre-Note
- Dray Status
- Invoice

Table 4-7 summarizes the steps and associated costs of each of these shipments:

Table 4-7. As-Is Process Costs

Business Process	As-Is Cost (Interdom)	As-Is Cost (Pride)
Order	• Annual orders = 2,500; 200 hours per year • Total annual cost = $3,000	• Annual orders = 2,500; 200 hours per year • Total annual cost = $4,000
Pre-Note	• Annual pre-note = 2,500; 200 hours per year • Total annual cost = $3,000	• Annual pre-note = 2,500; 200 hours per year • Total annual cost = $4,000
Status	• Annual dray status inquiries = 16,000 • Average 6 hours per week at $15/hour • Total annual cost = $4,680 ($0.30 per inquiry)	• Annual dray status inquiries = 16,000 • Average 6 hours per week at $20/hour • Total annual cost = $6,240 ($0.39/inquiry)
Invoice	• Annual invoices = 7,500; 500 hours per year • Total annual cost = $7,500	• Annual invoices = 7,500; 500 hours per year • Total annual cost = $10,000

4.1.5 Benefits

4.1.5.1 Quantitative

The deployment of the EFM package has completely automated all information exchanges between Interdom Partners and Pride Logistics. The benefits overall varied slightly among Interdom and Pride, with Interdom estimating slightly higher savings. This is likely due to the additional automation provided by their current information technology tools that operated in collaboration with EFM, whereas Pride continued some existing manual processes, mainly the receipt of rail arrival from the railroads, using their current back office system. Table 4-8 summarizes the savings to Interdom and Pride as a result of implementing the EFM package.

Table 4-8. To-Be Process Costs and Potential Cost Savings

Business Process	As-Is Cost	To-Be Costs	Potential Cost Savings
Order	• Interdom Annual Cost = $3,000 • Pride Annual Cost = $4,000	• Interdom Annual Cost = $300 • Pride Annual Cost = $1,500	• Interdom = $2,700 (90%) • Pride = $2,500 (63%)
Pre-Note	• Interdom Annual Cost = $3,000 • Pride Annual Cost = $4,000	• Interdom Annual Cost = $300 • Pride Annual Cost = $1,500	• Interdom = $2,700 (90%) • Pride = $2,500 (63%)

Business Process	As-Is Cost	To-Be Costs	Potential Cost Savings
Status	• Interdom Annual Cost = $4,680 • Pride Annual Cost = $6,240	• Interdom Annual Cost = $2,340 • Pride Annual Cost = $3,740	• Interdom = $2,500 (53%) • Pride = $2,500 (40%)
Invoice	• Interdom Annual Cost = $7,500 • Pride Annual Cost = $10,000	• Interdom Annual Cost = $750 • Pride Annual Cost = $8,000	• Interdom = $6,750 (90%) • Pride = $2,000 (20%) •

4.1.5.2 Qualitative

With regards to the automation of Pride's business processes, the EFM package is 100% responsible for doing so. What is most important about the EFM implementation with Pride is that it is a long-term solution for them, and the benefits (savings) will continue to accrue even though the pilot is complete. It has changed the way they do business and the way they interact with their customer (Interdom). Specific qualitative benefits include:

- Eliminated re-keying of data that currently exists in Interdom's operational system (LOTS) for orders, pre-notes, and invoices.
- Elimination of manual data entry improved data accuracy.
- The automation of Pride's processes will enable them to handle more volume and hence, more transactions, with the same number of staff. Pride is a relatively small operation, with just 3 staff currently supporting their transaction/documentation processes. With an estimated annual growth in volumes of 20%, this will allow Pride to maximize their operations while maintaining their current staff size, at least for the next few years.
- While Interdom is Pride's primary customer, the use of EFM does provide Pride with a competitive advantage over less-automated dray carriers given the increasing industry trend toward automation. In addition, it eases the overall burden of communicating with and completing transactions for Interdom.

4.1.5.3 Future Benefits

- The EFM package created the infrastructure to reduce transactional costs with trading partners in the future. The EFM package continues to operate and provide process savings to Interdom and Pride at relatively no cost.
- The operational point of contact at Pride also estimated that the benefits have the potential to continue to improve the efficiency of their operations. The use of the EFM package improved their transactional efficiency by 46% on average across the 4 processes, which could increase if additional volumes could be processed by the same number of staff.
- Pride articulated that they would continue to use the EFM package even if additional expense were required on their part given the benefits achieved during the pilot. Pride also articulated additional functionality that could create additional benefits. For example,

Pride currently receives notice of rail arrival as a fax notification which must be re-keyed into their system. Automating this exchange would offer additional efficiency benefits.

4.1.6 FTAT Results

The USDOT's Freight Technology Assessment Tool was re-configured in 2011 and was used to calculate the net present value, benefit-cost ration and total process improvement for each case study. The inputs for Interdom-Pride are summarized in Table 4-9 and the FTAT results are shown in Table 4-10.

Table 4-9. Interdom - Pride FTAT Inputs

Input	Amount
Total As-Is Annual Process Cost	$42,420
Total To-Be Annual Process Cost (with EFM)	$18,430
Initial Investment	$11,200
Annual Operating and Maintenance	$672

Table 4-10. Interdom - Pride FTAT Results

Minimum Attractive Rate of Return	Useful Life	Net Present Value	Benefit Cost Ratio	Total Process Improvement
10.00%	5 Years	$77,194	6.62	$23,990

4.5 Impact Assessment – Interdom-Agmark

4.5.1 Business Process / Cost Improvement

The purpose of this section is to provide the data necessary to execute calculate the cost savings for Interdom and Agmark as a result of using the EFM package. In addition, it provides the data necessary to conduct a benefit-cost assessment; specifically, to calculate the net present value, internal rate of return, payback period, and benefit/cost ratio.

Assumptions

The cost savings are calculated in terms of the business process that is affected. For the most part, the specific business processes between Interdom and Agmark are shown on Figure 6 earlier in the document.

For the impact assessment, the SAIC team calculated the as-is and to-be cost of each process. The as-is cost is the cost of executing the business process before implementation of the EFM

package while the to-be cost is the cost after implementing EFM. In addition to this definition, since the EFM package is largely about streamlining business processes through improved automation, many of the savings are accrued as a result of a process not taking as long; for any process especially tied to labor, the SAIC team assumed a current hourly wage of $15 per hour for Interdom staff, per company guidance.

Business Processes and As-Is Costs

The business processes that were impacted by the deployment of the EFM Package include:

- Transportation Order - Mostly automated (minimal cost) for Agmark due to use of internal TMS and EDI through Kleinschmidt
- Transportation Status - Mostly automated (minimal cost) for Agmark due to Steelroads sponsorship by rail partners

Table 4-11 summarizes the steps and associated costs of each of these shipments:

Table 4-11. As-Is Process Costs

Business Process	As-Is Cost (Interdom)	As-Is Cost (Agmark)
Order	• Annual orders = 3,000; 240 hours • Total annual cost = $3,600	• Annual orders = 3,000; Cost per order $0.20 • Total annual cost = $600
Status	• Annual status inquiries = 50,000 • 4 hours per week at $15/hour • Total annual cost = $3,120	• Annual status inquiries = 50,000; cost per status ($0.01) • Total annual cost = $500

4.5.2 Benefits

4.5.2.1 *Quantitative*

Much of Agmark's current operation is already highly automated for both the order and status process. For the order, Agmark utilizes an EDI interchange via Kleinschmidt; as a result of their relationship with Interdom and the volume of their business, the relative cost of using this service is low. Prior to using EFM, the order process was completely automated on Agmark's side of the transaction. As such, Agmark did not want to explore an alternative to this existing internal process; therefore, during the EFM pilot, Agmark continued to directly feed their EDI 404 (rail billing) to Interdom through Kleinschmidt.

Similarly, the provision of rail status from Steelroads is also low cost due to the sponsorship of Agmark by Class I carriers CSX and BNSF. Agmark's transportation management system automatically receives car location messages providing rail status. Again, Agmark did not want to change their existing internal processes for acquiring tracking records. Contributing to the difficulty in using only EFM for the status process was the fact that Agmark's system receives car location messages for all of their rail moves, not just the loads that are being moved by Interdom.

Therefore, with respect to the benefits assessment for the Interdom-Agmark case study, while Interdom did articulate quantitative benefits, Agmark did not attribute any quantitative benefit as a result of the use of EFM although they did articulate potential future benefits.

Table 4-12 summarizes the savings to Interdom as a result of implementing the EFM package.

Table 4-12. To-Be Process Costs and Potential Cost Savings

Business Process	As-Is Cost	To-Be Costs	Potential Cost Savings
Order	• Interdom Annual Cost = $3,600 • Agmark Annual Cost = $600	• Interdom Annual Cost = $360 • Agmark Annual Cost = $600	• Interdom = $3,240 (90%) • Agmark = $0
Status	• Interdom Annual Cost = $3,120 • Agmark Annual Cost = $500	• Interdom Annual Cost = $1,560 • Agmark Annual Cost = $500	• Interdom = $1,560 (50%) • Agmark = $0

4.5.2.2 *Future Benefits*

- Exclusive use of the EFM package could result in a cost advantage to bypass the use of the existing VAN and for Interdom's customers to have the ability to send rail billing data directly to them.
- Agmark's ocean freight business is not as automated as their domestic rail shipments. Status data for ocean shipments is not timely or accurate in comparison; this is an area of opportunity for Agmark to receive better information from their partners. Agmark ships approximately 4,000 loads per year via ocean.
- In the area of rail shipments, Agmark also does some business with a Mexican railroad, Ferromax. While their data is transferred to Railinc, the accuracy of the data could be improved. Agmark identified this data and data source as a potential future area that could be improved using a tool such as the EFM package.

4.5.3 FTAT Results

The USDOT's Freight Technology Assessment Tool was re-configured in 2011 and was used to calculate the net present value, benefit-cost ration and total process improvement for each case study. The inputs for Interdom-Agmark are summarized in Table 35 and the FTAT results are shown in Table 4-14.

Table 4-13. Interdom - Agmark FTAT Inputs

Input	Amount
Total As-Is Annual Process Cost	$7,820
Total To-Be Annual Process Cost (with EFM)	$3,020
Initial Investment	$16,800
Annual Operating and Maintenance	$672

Table 4-14. Interdom - Agmark FTAT Results

Minimum Attractive Rate of Return	Useful Life	Net Present Value	Benefit Cost Ratio	Total Process Improvement
10.00%	5 Years	($1,151.63)	0.94	$4,800

Chapter 5. WORLDWIDE ISCS

5.1 Environment Summary

5.1.1 Operating Environment

WorldWide ISCS (WorldWide) is a Des Moines-based logistics provider that designs freight transport systems and manages truck and multimodal traffic for manufacturers and distributors through use of integrated supply chain solutions. Unlike conventional brokers, WorldWide does not auction freight to low-bid carriers. Instead, they match loads and lanes with the most capable and reliable carriers. Large fleets with extensive geographic coverage and smaller core fleets give WorldWide the ability to match ship-from points with delivery destinations. Filling empty lanes with backhauls creates efficiencies for multiple shippers.

WorldWide also operates warehouse facilities at the Port of Savannah for the receipt and embarkation of ocean freight with related services including inbound break-bulk capacity, outbound container filling, and cross-docking for long-haul truck transport of intermodal transfer to air and rail carriers. WorldWide does not operate established supply chains in the traditional sense, rather they perform load management and have partnered with associates in specialized fields including freight carriers, freight-forwarders, and US Customs clearance and process brokers.

WorldWide manages a data repository (DR) hosted in an external network operations center. The DR synchronizes data and information across all WorldWide systems used under the WorldNet banner (imaging, transportation management, warehouse management, and financial). Shipment data and information regarding a customer or carrier can be presented back to them through a WorldWide's WorldNet portal. Currently, data exchange occurs between TransVM and the DR using SQL Server Integration Services (SSIS) over open database connectivity (ODBC) twice an hour at :15 and :45. This process is inefficient in that WorldWide must make the SSIS calls for all "active" loads to find changes and then bring that information back to the DR, delete the record, and insert a new one.

WorldWide desires to endear their trading partners by offering a single point of information (WorldNet) regardless of which service they are using from WorldWide. The ability for WorldWide to have application programming interfaces (APIs) and web services in place to better synchronize the DR and to replace the existing TransVM shipper and carrier web screens would go a long way in endearing the trading partners. A shipper, carrier, broker or other trading partner of WorldWide would be able to access WorldNet, enter orders, select load tenders, enter costs, view current load statuses, etc., without having to go to more than one location.

The current and desired process for WorldWide customers to access data and information is shown in Figure 5-1.

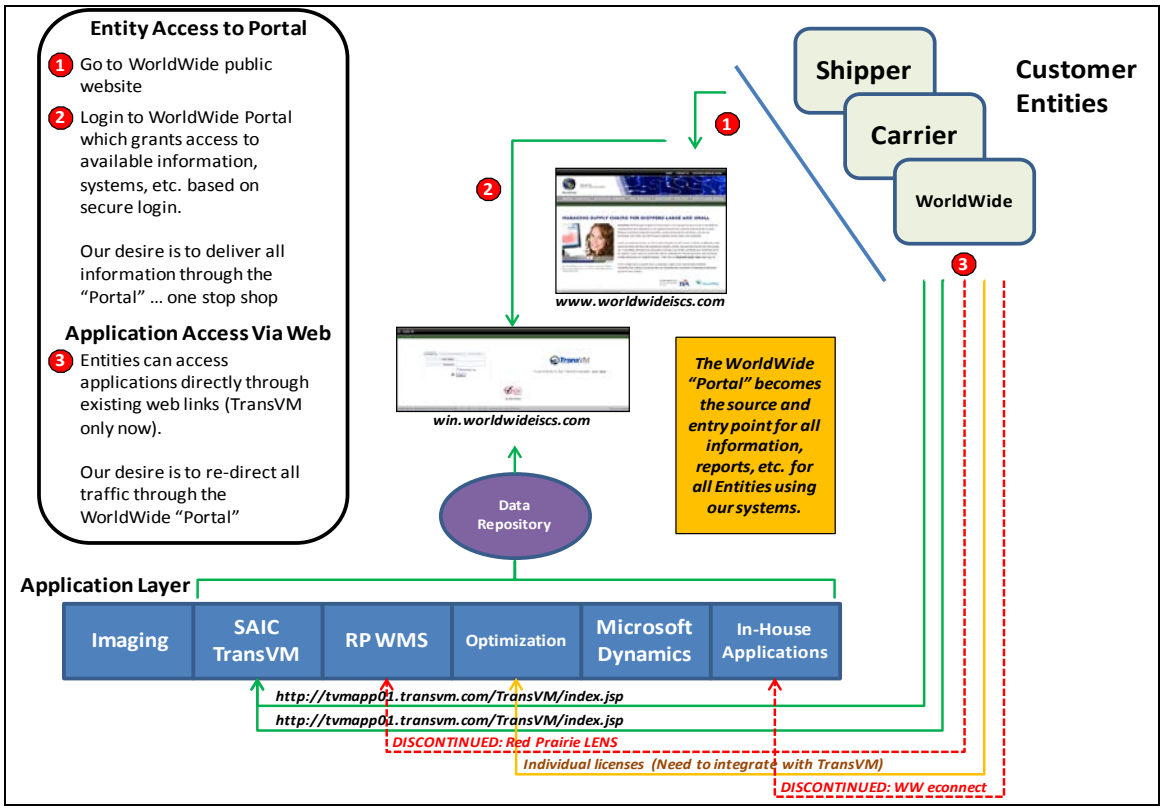

Figure 5-1. Current / Desired WorldWide Data Exchange Processes

Based on WorldWide's vision for its WorldNet portal becoming the single point of access for all supply chain partner data and information, this case study began as an opportunity to see how the EFM package could support WorldWide's vision for the WorldNet portal.

5.1.2 Key Participants

In addition to WorldWide as the logistics provider, the case study involved:

- Griffin Pipe Products Co. (a WorldWide customer); Griffin Pipe Products Co. is a leading manufacturer of water transmission products (piping, fittings) for North American distributors, contractors and municipalities. They are the shipper and customer to WorldWide.
- Note, additional customers can be added at any time without making any changes to the EFM implementation. In order to do this, WorldWide just needs to open the status link on their WorldNet website to the customer – in fact, since the conclusion of the WorldWide – Griffin Pipe Pilot, additional customers have begun using the services provided by the EFM package.
- As with the DEMDACO case study, the WorldWide EFM case study also planned to use SAIC's Transportation Visibility Management Solution (TransVM). TransVM is already part of WorldWide's transportation management system (TMS) application layer. TransVM is an integrated toolset designed to manage shipment activity from order creation to final delivery in a true exception-based environment. While TransVM offers a wide suite of functionality, for purposes of this case study, it acted as the engine to

collect, store and generate transport status using web services and push this information back out to WorldNet using EFM universal business language (UBL) compatible message schemas and extensible markup language (XML) data sets for display to Griffin Pipe through their access to a WorldNet web page.

5.1.3 Description of As-Is Technical Environment

Before implementation of the EFM environment, WorldWide had a rather sophisticated transportation management solution consisting of systems for imaging, transportation management, warehouse management, and finance. However WorldWide relied on DR data calls through an integrated server service twice hourly to ascertain information on active loads (shipments) for their customers. Even with WorldWide's current level of sophistication, the process of track & trace was considered by WorldWide to be inefficient in that the changes or updates resulting from the data calls on active loads required WorldWide to transfer that updated record back into the DR by deleting the existing record and inserting the updated record. This resulted in WorldWide customers choosing to log into TransVM.com, besttrans.com, and other websites in addition to WorldNet to obtain timely and accurate data. Using this process prevents WorldWide from providing timely and accurate track & trace data and other information to trading partners without the partners having to log into another system in addition to WorldNet. Requiring a trading partner, specifically the carriers, to access more than a single point makes them less likely to obtain the latest information and operate under less visibility of the supply chain. In the as-is technical environment, carriers are being required to access other sites to post loads, take loads, and bid loads, making it more difficult for them to capture freight and move it quickly and at the best cost.

Table 5-1 provides a summary of the WorldWide environment. It also describes the supply chain environment prior to the implementation of the EFM web services and is meant to illustrate the areas of opportunity that the EFM services can improve.

Table 5-1. WorldWide Environment Summary

WorldWide EFM Case Study Environment Summary	
As-is Business Environment:	
Partner	**Summary of Case Study Participation**
WorldWide ISCS	• Provides logistics services • Website for customers that provides shipping information
Griffin Pipe Products Co.	• Ships freight • Needs to know up-to-date shipment status • Will use WorldNet website to view status data and information acquired in real-time via EFM web service from TransVM
TransVM	• Carrier rating • Shipment status • Interfaces with WorldWide applications
Business Problem:	
Problem	**Projected Benefits**

WorldWide EFM Case Study Environment Summary	
Access to in-transit shipment data more cumbersome to acquire	• TransVM to receive shipment status request from WorldNet • TransVM to send shipment status using UBL compatible schema/web service to WorldNet • Replace use of carrier and freight forwarder tracking websites with WorldNet; enhance analysis of shipment data and allow more timely decision making.
Higher in-transit track & trace labor required	• More efficient labor utilization for WorldWide due to accuracy, completeness, and timeliness of shipment status.
Lack of timely in-transit shipment visibility	• Improved shipment visibility through WorldNet and integration of EFM web service (from TransVM) into WorldNet. • Upon request, TransVM web service pushes shipment status data to WorldNet for display on a web page.
Lack of efficiency	• TransVM to receive shipment status request from WorldNet and sends shipment status to WorldNet using UBL compatible message schema/web service. This gives Griffin Pipe increased asset visibility and enhances service to allow more timely, accurate and complete decision making. • WorldNet gives Griffin Pipe a single point of access for viewing up-to-date shipment status and details. • Use of web services/automation of messaging reduces redundant effort.
Supply Chain Technical Environment	
Current IT Tools	• TransVM transportation management system (WorldWide) • Red Prairie warehouse management system (WorldWide) • Microsoft Dynamics customer relationship management system (WorldWide) • In-house applications including document imaging and storage (WorldWide) • Network Operations Center (WorldWide) • Data repository (WorldWide)
Current Messaging	• Fax • EDI • Flat file • Email • Telephone • Web screens
Current Interchanges (targeted with the EFM package)	• Request Status

5.2 Implementation Summary

5.2.1 Application of EFM Package

Prior to creating the message schemas and implementing the web service, SAIC first documented the end-to-end supply chain process used by WorldWide to determine where the EFM package could add value:

1) First, the SAIC team worked with WorldWide to identify their technical environment and to define the business problems that EFM implementation could address or provide opportunity for.
2) SAIC and WorldWide mapped and documented WorldWide's technical environment (all information technologies and communications that support order placement, fulfillment, and delivery, and the processes by which these communications are completed).
3) Once the supply chain process was laid out, SAIC worked with WorldWide to identify which communication methods were the best candidates for replacement or supplementation by the EFM package. These decisions were based on several factors:
    a) The most important factor was WorldWide's strategic vision for the WorldNet portal. With respect to this vision, the study team had to make several decisions, including:
        i) Type of data to be exchanged: purchase order, dispatch notification, transport booking, bill of lading, consignment status, carrier rating, etc. Ultimately, consignment status was the data exchanged using the EFM package, as the related data elements were the highest priority data types.
        ii) How the data should be exchanged: between TransVM and WorldNet based on WorldWide's technical environment and business processes.
4) Data to be displayed and web screen format on WorldNet for Griffin Pipe use.
5) Data to be provided by the EFM package: there was some proprietary discussion on how the customer would identify their load, so primary load number and alternate load identification data elements were ultimately included as part of the EFM package.

The flow and processing of information was revised as a result of EFM package implementation. Figure 5-2 documents the supply chain process from purchase order generation through load delivery; red indicates where the EFM package was applied.

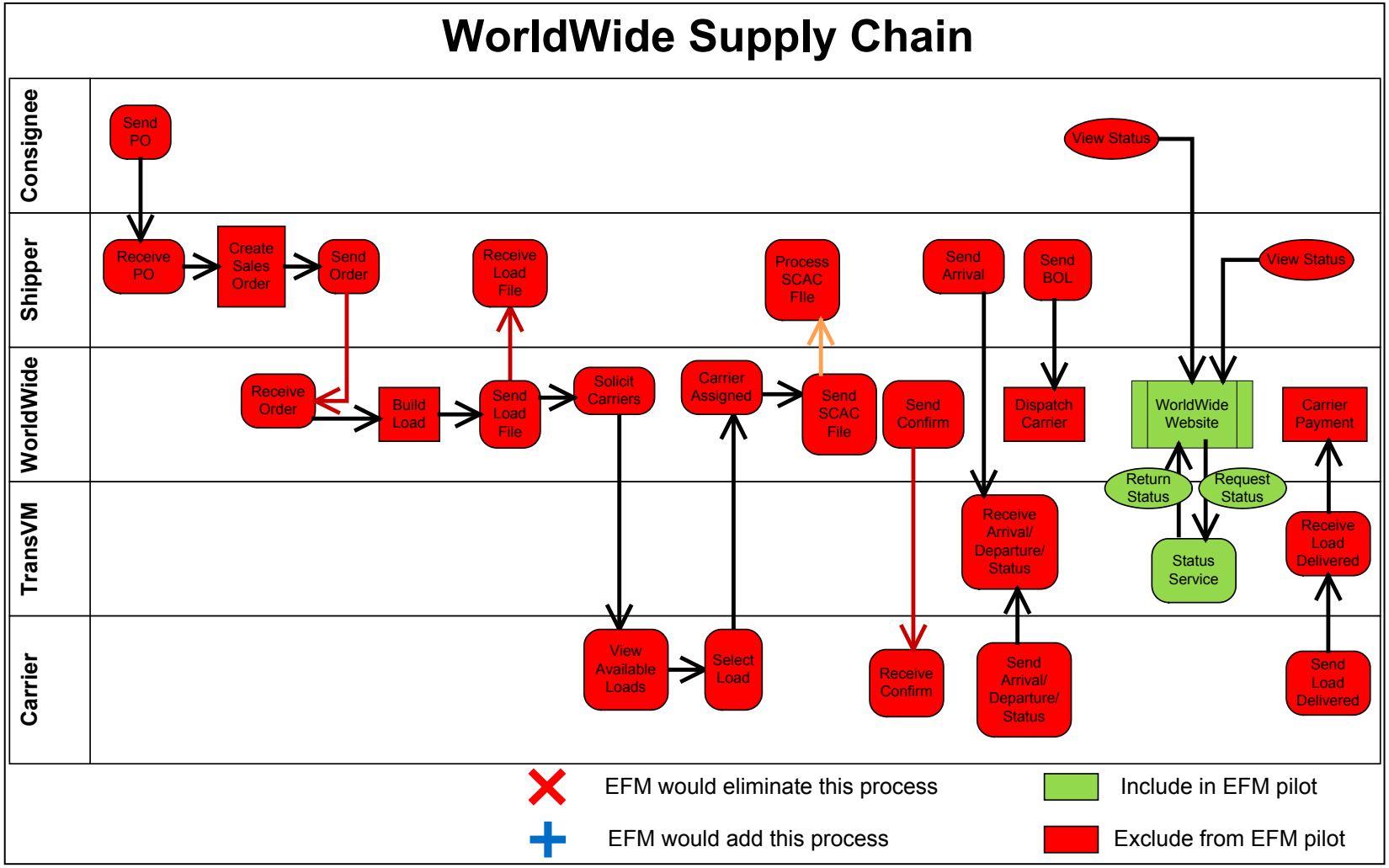

Figure 5-2. WorldWide Supply Chain Map

5.2.2 Implementation Decision Process

Several issues were involved in the business rationale for making the decisions regarding EFM package coding, testing and implementation.

1) **The most important factor affecting the final outcome and structure of the WorldWide EFM case study was the integration of TransVM and WorldNet through the EFM packag**e. As such, project resources were needed to modify WorldNet so that it could receive shipment status from TransVM via EFM web services and provide shipment visibility to Griffin Pipe. Since the main goal of the study was to provide Griffin Pipe with enhanced service through increased visibility of their shipment data and information within WorldNet, the case study team worked with WorldWide to ensure that the most important and relevant data was acquired by the EFM package and displayed in WorldNet.
2) **Once the transaction was identified, SAIC attempted to work with WorldWide to ensure the technical environment supported EFM package implementation**. Pre-implementation efforts included addressing the business rationale issues and ensuring that changes to the technical environment, as a result of implementation, did not negatively affect WorldWide's daily business operations.
3) **A critical aspect to this case study was the use of the EFM package to provide supply chain data from TransVM using web services**. SAIC's TransVM tool, which was already a part of WorldWide's transportation management solution, acted as the repository for the data collected and distributed by the EFM package. SAIC incorporated TransVM into this case study to test how a third party logistics provider could interface with the EFM package. For this case study, TransVM translated the status that was provided by carriers before pushing to WorldNet. The code that performed this translation could be moved or used elsewhere to no detriment of the EFM package or WorldNet. TransVM was involved in the following transactions:
    a) Received request for shipment status data from WorldNet (this was accomplished using web services as designed by the EFM package).
    b) Returned shipment status from carriers to WorldNet (this was accomplished using web services as designed by the EFM package).
4) **The development of the EFM web service and UBL compatible message schemas were also a critical activity for SAIC and WorldWide including needed modifications to WorldNet.** Following the business rationale decisions regarding what data would be provided to Griffin Pipe and how it would be provided, the development of the web service and coding of the data sets were the most important aspects of the implementation to send transport status from TransVM to WorldNet.
5) **WorldWide's vision of WorldNet included the use of the EFM package to support the provision of shipment status on a web page that otherwise was more difficult to ascertain from multiple websites**. This included working through the issues associated with how customers would enter load identification search criteria and how the web service would be developed to support the search. The process took much longer than anticipated, as this study was just not a high priority for WorldWide because of other commitments. Ultimately, both a load number and alternate load identification were included in the web service.

5.2.2.1 *Business Rationale of Adopters/Potential Adopters*

The business rationale and goals of the WorldWide EFM case study were different than a traditional supply chain owner's might be, as WorldWide is a logistics provider, and as such, customer service is at the core of their business model. This is not to say that they do not partner with associates in specialized fields including freight carriers, freight-forwarders, and US Customs clearance and process brokers, however not in the sense as an anchor tenant like a supply chain owner might be.

WorldWide's business model supported their desire to leverage the EFM package as part of a larger strategy to improve customer service through its integration with TransVM and their WorldNet website. Therefore, the case study impact assessment demonstrates cost reductions driven specifically by the use of WorldNet to host and display information to Griffin Pipe via their online release tool. The basis for integrating the EFM package with WorldNet assumes that the "as-is" business environment experiences inefficiencies in the exchange of data and information with customers due to duplication, delays and timeliness in communications. In theory, WorldNet decreases the hidden costs associated with these communications by improving the visibility of logistics data, a benefit complementary to EFM, which applies web-based applications to improve data and message transmissions among partners.

5.2.2.2 *Performance Measures*

Targeted improvements for the WorldWide EFM case study, featuring WorldNet, were:

- More efficient labor utilization for WorldWide due to accuracy, completeness and timeliness of data and information.
- Improved shipment visibility through WorldNet and integration of EFM web service (from TransVM) into WorldNet, specifically the visibility into active load shipment status.
- Cost reductions associated with more accurate shipment delivery dates
- A single point of access for Griffin Pipe in viewing shipment status and details.
- Use of web services/automation of messaging reduces redundancy of effort (by WorldWide).

5.2.2.3 *Implementation Challenges*

Anticipated:

- EFM is not widely known, accepted or used in the freight industry.
- The current economic climate forced this case study far down the list of priorities for WorldWide.
- There was no major player as an endorser of the technology ("anchor tenant") who could require participating partners to support EFM package implementation.
- The project schedule allowed for a relatively short (90-day) operational test phase; expected operational changes could not be effectively demonstrated.
- Information Technology resources of WorldWide were extremely limited because of other operational commitments.
- WorldWide transportation service providers transmitted required data using their standard distribution methods – thereby not demonstrating the use of EFM web services and UBL compatible message schemas.

Unanticipated:

- **The project lost its champion at WorldWide when he left the company unexpectedly before EFM implementation.** The executive at WorldWide who supported the case study and developed the vision which incorporated EFM into the company's business strategy left the company unexpectedly, leaving the case study in a state of limbo for quite a period. The company's leadership had to be re-engaged on more than one occasion by the SAIC program manager to keep the study moving forward. As a result, there were significant delays in the schedule (see Figure 3).
- **The case study's lack of priority at WorldWide resulted in spotty participation and lack of direction as to which EFM services would be implemented and which partners would participate.** It was difficult to get WorldWide's attention on a consistent basis and their lack of engagement stalled study team progress. Although there was discussion and planning for EFM implementation, there was often very little follow through. Ultimately, only one EFM component (Transit Status) was implemented.

Table 38 provides a summary of the WorldWide implementation parameters.

Table 5-2. WorldWide Implementation Parameters Summary

Decision Process	• Remove Griffin Pipe's need to visit multiple sites to obtain active load shipment data • Increase accuracy, completeness and timeliness of data • Decreased outbound shipping costs (and better customer service) due to more accurate delivery date information
Business Rationale	**Potential Benefits:** • Increase customer satisfaction • Reduce cost of monitoring active loads in-transit • Reduce shipment delays **EFM Implementation Goals:** • Improved shipment visibility • Reduced costs • More accurate, complete and timely transportation data and information for decision making
Potential Performance Measures	• Delay fees to carriers • Outbound shipping costs • Labor expended monitoring active loads
Implementation Challenges	• Loss of the case study champion at WorldWide when he left the company prior to EFM implementation • Economic climate forced case study far down the list of priorities for WorldWide • Lack of a major player as an endorser of the technology ("anchor tenant") • The pilot demonstration was only 90 days duration and operational changes could not be effectively demonstrated • WorldWide IT resources were extremely limited because of other operational commitments • EFM not yet widely used

5.2.3 Implementation Costs

The costs associated with implementing the EFM package for the WorldWide pilot reflect the costs to WorldWide for implementing EFM web services within their server environment to exchange information for purposes of this pilot. The costs also include the labor associated with SAIC technical and management personnel, who developed the web services, message schemas, and provided technical assistance to WorldWide in order to deploy these services and troubleshoot issues identified during implementation.

Table 5-3 contains the implementation and operations/maintenance cost summary for the WorldWide EFM Case Study. The costs associated with implementing the EFM package for the WorldWide pilot reflect the costs to WorldWide using a hosted technology outsourcer (SAIC), who provided the computing platform (TransVM), communications link (the EFM package) and necessary support and management personnel. In addition, this case study includes costs associated with the modification to the WorldWide user interface (WorldNet) for this case study. These were the costs that were factored into the benefit-cost assessment conducted using the Freight Technology Assessment Tool (FTAT). These costs are based on:

- The number of web services that were deployed within the IT infrastructure of each supply chain partner – note in the case of WorldWide, as a user of TransVM, the services were deployed there. It can be assumed though, that those costs were assumed by WorldWide as part of the TransVM operations and maintenance contract.
- The number of hours spent by key IT staff at SAIC to refine and prepare the EFM package for implementation.
- The number of hours spent by SAIC and Fi2 staff providing technical guidance to WorldWide and Griffin Pipe
- An estimate of the annual number of hours required to continue EFM operation - this includes the minimal maintenance costs of running support servers, but assumes no further modification to the EFM package to provide enhanced service to WorldWide or their customers.

Table 5-3. WorldWide Implementation, Operations and Maintenance Costs

Assumptions:

- Technical assessment of deployment environment takes on average 2 weeks (40 hours per week) = $2,240. This cost is factored into the cost per party as a flat rate expense.
- Each client/service takes on average 1 week to deploy = $1,120 per service/client
- Average hourly rate = $28/hour

Implementation			
Party	**EFM Clients**	**EFM Services**	**Cost per party**
WorldWide	0		$0
TransVM		1	$3,360
Griffin Pipe	1	0	$3,360
		Total Implementation Costs	**$6,720**
Operations and Maintenance			
24 hours per year at $28/hour			**$672**

5.3 Impact Assessment

5.3.1 Business Process / Cost Improvement

The purpose of this section is to provide the data necessary to calculate the cost savings for WorldWide and Griffin Pipe as a result of implementing the EFM package. In addition, it provides the data required for USDOT to run the Freight Technology Assessment Tool, which at the time of this report publication, was currently undergoing updating. This tool will be used to calculate the net present value, internal rate of return, payback period, and benefit/cost ratio.

Assumptions

The cost savings are calculated in terms of the business process that is affected. For the most part, Griffin Pipe's specific business processes are shown in Figure 1 earlier in the document. For the impact assessment, the SAIC team calculated the as-is and to-be cost of each process. The as-is cost is the cost of executing the business process before implementation of the EFM package, while the to-be cost is the cost after implementing EFM. Since the EFM package is largely about streamlining business processes through improved automation, many of the savings are accrued as a result of a process not taking as long; for any process especially tied to labor, the SAIC team assumed a current hourly wage of $25 per hour for WorldWide and Griffin Pipe, per company guidance.

Business Processes and As-Is Costs

The business processes that were impacted or have the potential to be impacted by the deployment of the EFM Package include:

- Transportation Status

Table 5-4 summarizes the associated costs of this process:

Table 5-4. WorldWide As-Is Process Costs

Business Process	As-Is Cost
Transportation Status	• Annual load volume from Griffin pipe: o 16,300 loads (2010) o 2011 volumes: 6,350 (January-June) • Pilot volumes (3 months): 3,175 • Annual status requests (exception based tracking; tracking required for 5% of loads on average): o 2010: 815 o 2011 (6 months): 318 o Pilot (3 months): 159 • Cost per status request (Griffin Pipe) o Average of 45 minutes per status request (calls to both WorldWide and their customers); average $25/hour wage for customer sales representative o $18.75/request at Griffin Pipe • WorldWide: o Average 15 calls per week at 20 minutes per call; average

Business Process	As-Is Cost
	$25/hour wage per representative o $125/week; $6,500 annually • Griffin Pipe Total Annual Cost: o 2010: $15,281 o 2011 (6 months): $5,962 o Pilot (3 months): $2,981 • WorldWide Total Annual Cost: o 2010: $6,500 o 2011 (6 months): $3,250 o Pilot (3 months): $1,625

5.3.2 Benefits

5.3.2.1 *Quantitative*

The deployment of the EFM package has allowed Griffin Pipe easier access to status information, reducing the number of customer service inquiries that WorldWide responds to. WorldWide estimates 10 fewer phone calls per week from Griffin Pipe, whereas Griffin Pipe estimates that the ability for them to research status on their own saves approximately 40 minutes per status request – the use of EFM allows them to research status within an average of 5 minutes.

- At an average of 20 minutes per request, this equates to a savings of $83/week for a total savings of $1,000 for the 12 week (3 months) pilot period. This equates to an estimated annual savings of $4,316.
- For Griffin Pipe, they estimated that the use of the EFM package provides status much faster than contacting WorldWide and researching it on their own. The per-request cost can be reduced from $18.75 to just over $2.00. This equates to a total savings of $2,950 for the 12 week (3 months) pilot period and an estimated annual savings of $13,583.

Table 5-5 summarizes the savings to WorldWide and Griffin Pipe as a result of implementing the EFM package.

Table 5-5. Potential Cost Savings

Business Process	As-Is Cost	To-Be Costs	Potential Cost Savings
Transportation Status	• Griffin Pipe Total Annual Cost: o 2010: $15,281 o 2011 (6 months): $5,962 o Pilot (3 months): $2,981 • WorldWide Total Annual Cost: o 2010: $6,500	• Griffin Pipe Total Annual Cost: o 2010: $1,698 o 2011 (6 months): $662 o Pilot (3 months): $13 • WorldWide Total Annual Cost: o 2010: $2,167 o 2011 (6 months):	• Griffin Pipe Total Annual Cost: o 2010: $13,583 o 2011 (6 months): $5,300 o Pilot (3 months): $13 • WorldWide Total Annual Cost: o 2010: $2,167 o 2011 (6 months):

Business Process	As-Is Cost	To-Be Costs	Potential Cost Savings
	o 2011 (6 months): $3,250 o Pilot (3 months): $1,625	$1,083 o Pilot (3 months): $542	$1,083 o Pilot (3 months): $542

5.3.2.2 *Qualitative*

WorldWide was pleased with the additional functionality that the EFM package offered them and their customers. In fact, since the pilot of the EFM package concluded, WorldWide continues to use the services installed as part of the package. WorldWide has also provided this functionality to additional customers at no additional expense. Therefore, the quantitative benefits continue to accrue.

Griffin Pipe did not indicate that the status content provided via the EFM package was more accurate than what they would receive from WorldWide via their status phone calls. However, as other pilot test participants indicated, Griffin Pipe noted that having status available to them "at their fingertips" allows their customer service representatives to be more proactive in tracking shipments, perhaps noting exceptions before a customer is alerted. It also allows them to be more responsive and track more loads, not just those with issues and/or delays, providing increased visibility over all of their shipments.

5.3.2.3 *Future Benefits*

WorldWide sees future benefit in using the EFM package to automate the order process; they currently use file transfer protocol (ftp), which is time consuming when taking on a new customer. There could be significant time savings in getting new customers up and running in terms of placing orders.

WorldWide would also like to explore the use of the package to facilitate automatic updating of their carrier profile. Currently, WorldWide must perform nightly uploads of the profiles to ensure they stay current. Using the EFM package would eliminate the need for nightly uploads, as the services could automatically update just the fields that had changed.

Griffin Pipe's business is largely tied to the homebuilding business. Since the market downturn began in 2007, Griffin Pipe estimates their shipment volumes with WorldWide have decreased by about 75% - from approximately 200 loads daily at their peak to an average of 45 loads per day in 2010. They estimate that if their volumes increase to levels seen before the economic crisis began the labor savings from using EFM to track shipment status could be much higher than estimated for this pilot. Therefore, they remain interested in applying a tool like the EFM package to their business. Currently, it holds the most value for them as a means to track shipment status, as many of their other processes such as billing are already automated.

5.3.3 FTAT Results

The USDOT's Freight Technology Assessment Tool was re-configured in 2011 and was used to calculate the net present value, benefit-cost ration and total process improvement for each case study. The inputs for WorldWide are summarized in Table 5-6 and the FTAT results are shown in Table 5-7.

Table 5-6. WorldWide FTAT Inputs

Input	Amount
Total As-Is Annual Process Cost	$21,781
Total To-Be Annual Process Cost (with EFM)	$3,865
Initial Investment	$6,720
Annual Operating and Maintenance	$672

Table 5-7. WorldWide FTAT Results

Minimum Attractive Rate of Return	Useful Life	Net Present Value	Benefit Cost Ratio	Total Process Improvement
10.00%	5 Years	$58,548	7.33	$17,916

Chapter 6. CARTER TRANSPORTATION (BATTELLE)

6.1 Environment Summary

6.1.1 Operating Environment

Transportation booking is a prime example of business collaboration and synchronization extended beyond the walls of one entity through their supply chain network. Shippers offer loads for which carriers must match available assets. Automated booking and acceptance reduces administrative time by eliminating the need for transportation clerks to make inquiries into carrier capacity from multiple sources. This collaboration allows carriers to efficiently accept loads and include them seamlessly into their operational plans and equipment /driver scheduling. Automated transportation booking is widely adopted and has delivered significant savings to the bottom lines of both shippers and carriers.

Carter Transportation is the primary beneficiary of the EFM-supported tools; they are a small start-up transportation brokerage operation in the greater Los Angeles, California area. Freightgate, who is the adopting partner, is a leading information service provider (ISP) in the freight logistics community. Carter had been using other Freightgate business applications and was an excellent candidate for the adoption and case study. Their booking process was manually intensive, repetitive, and detracted from the owner's time and ability to grow the business. Greg Carter, the owner, handled sales as well as booking. Therefore, becoming as efficient as possible in managing booking and operations translated directly to their capacity to service clients and build their network. With the Electronic Freight Management EFM adoption, the booking transactions between the shipper, Carter and the carrier are now highly automated, dramatically reducing booking transaction time and cost.

6.1.2 Key Participants

Other partners in the adoption include:

- Freightgate is the adopting partner and a leading information service provider (ISP) in the freight logistics community. Freightgate provides hosted logistics management solutions to Carter and uses EFM to expand the capabilities of their PLTX® suite of tools to include UBL-based web service communication with their customers and their respective data provider(s).
- Best Slip Covers is a shipper that contracts with Carter Transportation for the movement of goods for national distribution to their customers.
- Motor Carriers engaged in the movement of goods for Carter Transportation are not identified for the purposes of this case study.

6.1.3 Description of As-Is Technical Environment

Prior to the adoption, there was no electronic messaging occurring between the adoption supply chain partners. Where available, Freightgate uses SOAP 1.1 web services and XML, but also supports EDI, ASCII and other formats. Freightgate provides hosted logistics management solutions to Carter Transportation and uses EFM to expand the capabilities of their existing offerings to include UBL-based web service communication with their customers and their respective data provider(s). Their PLTX® suite of logistics lifecycle management solutions includes I-Trek!®, their shipment visibility and control tool, as well as tools to support procurement, payments, compliance, and execution.

All interchanges between Carter, Best and the carriers occurred via phone and email. Carter utilized Freightgate's I-Trek!® to manage their operations internally. In communicating shipment status to Best, Carter referenced the information in I-Trek!® and communicated via phone or email. A Carter bill of lading (BOL) was prepared by Best. BOL information was manually entered into the respective systems of Carter and the carriers. Other shipping documents were prepared by Best and accompanied the shipment. Freight bills were manually prepared by the carriers and presented to Carter and by Carter to Best.

Table 6-1 summarizes the deployment environment for the Carter case study.

Table 6-1. Carter Environment Summary

Carter EFM Case Study Environment Summary	
As-is Business Environment:	
Partner	**Summary of Case Study Participation**
Carter	Supply chain "owner" Transportation broker Lead recipient of potential benefits
Freightgate	Adopting partner Information service provider [to Carter].
Customer (Best Slip Covers)	Ship goods with Carter
Carriers	Not specified for this case study (did not deploy any services)
Business Problem:	
Problem	**Projected Benefits**
Lack of in-transit shipment visibility	• EFM connects Carter's network – shippers and carriers – with automated booking and shipment tracking capabilities. • Reduces time engaging in booking and shipment tracking. • Automation of the information exchange also eliminates language-based communication errors that arose in verbal communications. These miscommunications would often result in clarifications to the instructions given downstream.
Lack of efficiency, especially within booking process.	
Supply Chain Technical Environment	

Carter EFM Case Study Environment Summary	
Current IT Tools	Freightgate is a user of open source tools and an adopter of technologies. Currently, the IT tools in use include: LAMP/plus: Linux, Apache, MySQL, Perl, Java, Tomcat, Glassfish, OpenESB and custom JBI components. In addition Freightgate has developed and deployed a scalable yet light weight service bus (aka LightRail™) which has reduced overhead and bugs associated with OpenESB.
Current Messaging	Where available, Freightgate uses SOAP 1.1 web services and XML, but also supports EDI, ASCII and other formats
Current Interchanges (targeted with the EFM package)	• Tender (notify) booking request (shipper) • Accept booking request (Carter) • Forward (notify) booking request to carrier (Carter) • Accept booking request (carrier to Carter) • Confirm booking request (Carter to shipper) • Generate Bill of Lading (shipper) • Enter BOL (Carter)

6.2 Implementation Summary

6.2.1 Application of EFM Package

Prior to adoption, Best Slip Covers would tender shipments to Carter Transportation and other carriers/brokers in their network at the time shipments were ready. Carter would receive the shipment tender and then contact and negotiate with their carriers to provide the actual transportation. Once confirmed, the carrier would contact Best directly to coordinate the pickup. The carrier would assign a driver and equipment to pickup, transport and deliver the shipment. Shipment status updates were provided to the shipper and consignee, as needed.

Shipment information was taken over the phone or via email and would be communicated again to the carrier. All downstream processes, generation of bills of lading and freight bills, and communication of shipment status were manual, as well. Repetitive calls and emails were often needed to clarify and convey information.

Partner sophistication precluded the use of external web services to facilitate partner-to-partner transactions, however the messages exchanged are UBL compliant, and the notion of web services was used internally with the ability to deploy as a public-facing interface where the appropriate mix of partner acceptance to exist.

Figure 9 and Figure 10 summarize the current supply chain exchanges and the revised flow of information, as impacted by the pilot of the EFM package.

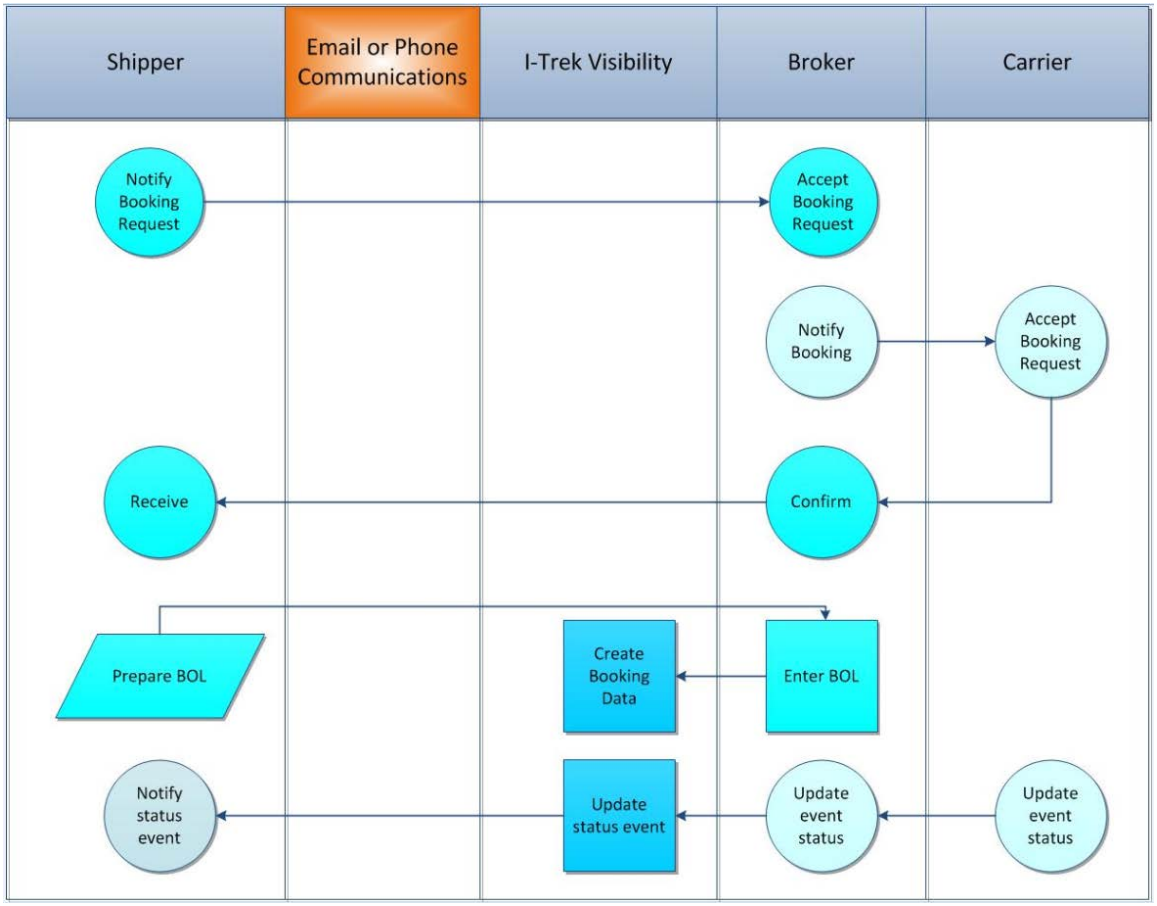

Figure 6-1. Carter's As-Is Supply Chain Processes

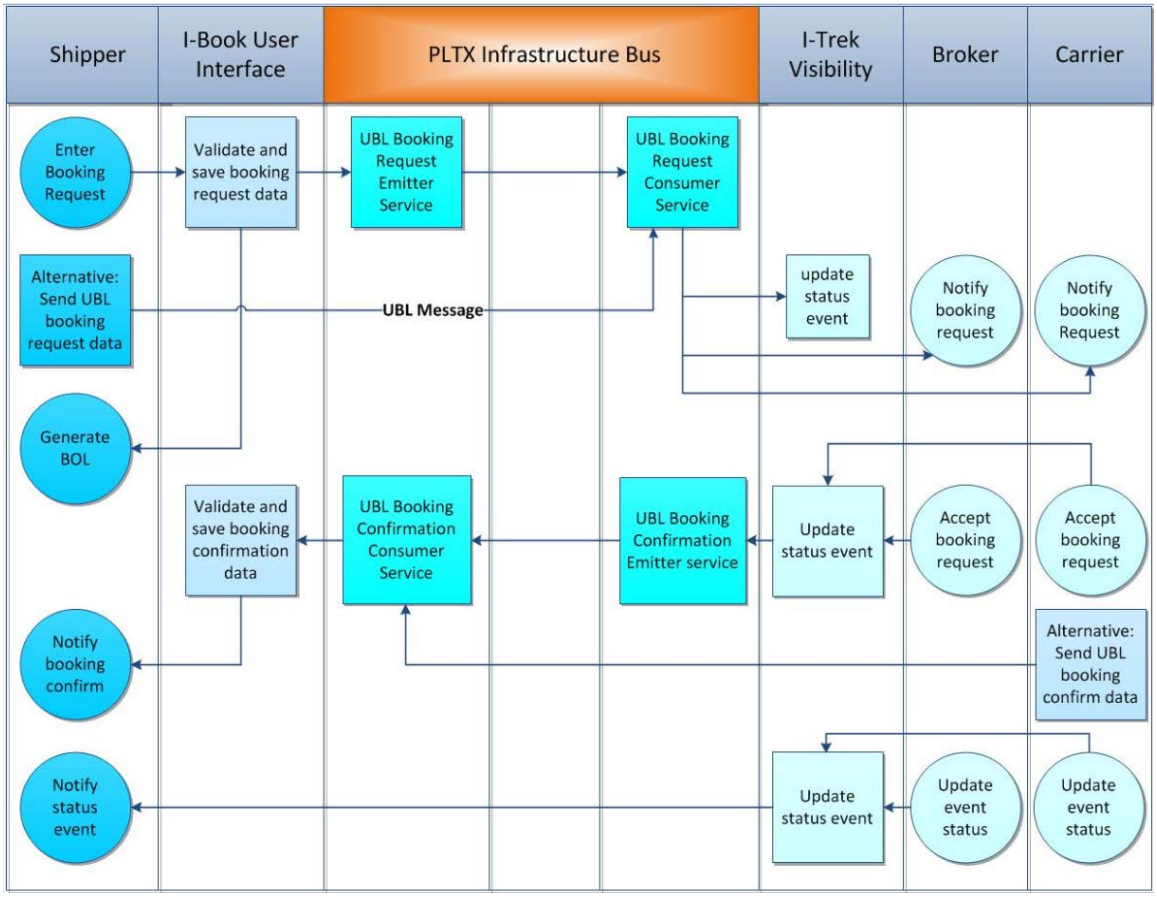

Figure 6-2. Carter's To-Be Supply Chain Processes (with EFM)

6.2.2 Implementation Decision Process

Carter was looking for a solution to integrate their supply chain and streamline critical business processes. Freightgate, a provider of supply chain collaboration software was involved in an earlier implementation of EFM (DEMDACO, 2009) and was impressed with many of the EFM attributes. Freightgate felt EFM, with its web services and UBL 2.0 message schema, ease, risk and cost of implementation and maintenance was strong strategic solution for Carter's needs. Freightgate had interest, as well, in adding EFM capabilities to its suite of logistics solutions. The support of Federal funding for the adoption was a critical factor given Carter being very much still a start-up with limited funding for its IT solution.

The following issues were involved in Freightgate and Carter's decision process:

1. EFM suitability in meeting Carter's supply chain informational and operational needs
2. Ease, risk and cost of implementation and ongoing maintenance and support
3. Funding availability to implement the EFM solution
4. Government funding reporting requirements, including release of business-sensitive information

6.2.3 Implementation Decision Process

6.2.3.1 *Business Rationale of Adopters/Potential Adopters*

EFM was envisioned to streamline the business processes, enable Carter to provide integrated information capabilities on par with much larger competitors and focus on sales and service. Not only was Carter a start-up firm and needed to grow their business, but they came in at a time when the recession was making it very hard for even established competitors to stay in business.

Carter expected to realize a significant improvement in administrative productivity through the automation of the booking process. In the pre go-live period, Carter averaged just over 1 hour per shipment in booking-related communication with the shipper and carrier. Carter also expected the EFM package to make them more competitive and to devote more time to sales and service because the transactions could be completed with greatly reduced manual intervention, reduced verbal communication errors, as well as rekeying errors.

6.2.3.2 *Performance Measures*

Targeted improvements for the Carter case study included:

- Reduction in Transportation Booking administrative time and cost
- Reduction in total cycle time for completion of Transportation Booking

An assessment of the level of improvement in these measures was conducted by Battelle as part of the self-evaluation for this case study and is presented in the Impact Assessment for the case study (the following section of this report).

6.2.3.3 *Implementation Challenges*

Identification of the proper UBL message set and then working within it to incorporate unspecified data elements was a challenge, but overcome by searching for early adopter/designer comments on forums and falling back to traditional EDI customization practices, which UBL was suppose to alleviate. The limited adoption rate of the UBL message made this a challenge to verify that the implementation was compliant to the Universal Business Language policies and procedures. Since the implemented solution was both the generator and consumer of the UBL messages in this case study, potential conflicts with other adopters was significantly reduced. This has proven to be a more significant challenge in other UBL message implementations the deployment team has completed with multiple partners who struggled with this unfamiliar message set, even though familiar with XML.

The logistics and availability of business activity data to capture the change from the “As Is” to the “To Be” states. The research team relied heavily on the expert opinion of Greg Carter. An activity process chart (table 2) was constructed to aid in the validation.

The ebbs and flows of the business activity. Carter Transportation business volumes were volatile. In the mid-June – mid-August timeframe, Carter Transportation moved only 40 shipments for Best. In the mid-August – mid-October time frame, Carter moved twice as many shipments.

Initial concerns over the technical capabilities of the adoption partners were mitigated by the Freightgate PLTX® capabilities as a hosted solution, which meant Best and the carriers had no actual implementation. They needed only web connectivity to the Carter portal residing at Freightgate.

Table 6-2 provides a summary of the Carter implementation parameters.

Table 6-2. Carter Implementation Parameters Summary

Decision Process	• EFM suitability in meeting Carter's supply chain informational and operational needs • Ease, risk and cost of implementation and ongoing maintenance and support • Funding availability to implement the EFM solution • Government funding reporting requirements, including release of business-sensitive information
Business Rationale	**Potential Benefits:** ♦ Improved efficiency of booking process Improved efficiency of shipment tracking process
Potential Performance Measures	♦ Reduction in Transportation Booking administrative time and cost ♦ Reduction in total cycle time for completion of Transportation Booking
Implementation Challenges	Incorporating unspecified data elements into UBL message schemas Collecting the as-is and to-be cost information Volatile volumes of business activity Concerns regarding the technical capabilities among adoption partners

6.2.4 Implementation Costs

The EFM system was implemented in a cloud computing environment hosted by Freightgate. The cost for startup of the Carter EFM was $39,500 and included user training, system setup, configuration and message integration. With regards to operations and maintenance, Freightgate offers various pricing strategies to clients, which covers their operating and maintenance costs. For purposes of calculating the operational and maintenance costs of the deployment, a simplified Freightgate rate structure was used to protect business-sensitive information. The lowest available shipment volume level was used in determining Freightgate's charges (based upon a multi-tenant environment). The rate of $2.68 per shipment is used for the calculation

Table 6-3 summarizes the implementation, operations and maintenance costs for the Carter pilot.

Table 6-3. Carter Implementation, Operations and Maintenance Costs

Implementation			
Party			**Cost per party**
User Training			$3,500
System Setup			$20,000
Configuration			$10,000
Message Integration			$6,000
		Total Implementation Costs	**$39,500**
Operations and Maintenance			
Shipments	**Monthly**	**Charge**	**With Startup**
300	525	$1.75	$2.676
1,000	700	$0.70	$0.978
2,500	1,075	$0.43	$0.541
5,000	1,700	$0.34	$0.396
10,000	2,950	$0.295	$0.323

6.3 Impact Assessment

The purpose of this section is to provide the data necessary to calculate the cost savings for Carter as a result of implementing the EFM package. In addition, it provides the data required for USDOT to run the Freight Technology Assessment Tool, which at the time of this report publication, was currently undergoing updating. This tool will be used to calculate the net present value, internal rate of return, payback period, and benefit/cost ratio.

6.3.1 Business Process / Cost Improvement

The business processes targeted for improvement with the EFM package included:

- Tender (notify) booking request (shipper)
- Accept booking request (Carter)
- Forward (notify) booking request to carrier (Carter)
- Accept booking request (carrier to Carter)
- Confirm booking request (Carter to shipper)
- Generate Bill of Lading (shipper)
- Enter BOL (Carter)

Table 6-4 summarizes the as-is costs associated with the booking process.

Table 6-4. Carter Baseline Costs for the Booking Process

element	Phase Baseline	no. shipments_57_		
	Partner	Carter	Shipper (est)	Carrier (est)
Activity	No. phone calls per ship booking	19.7	5.5	14.2
	No. emails per ship booking	3.7	1.2	2.5
	No. data entry per ship booking			
Time	Total min per booking, phone call	59	16	43
	Total min per booking, email	15	1	3
	Total min per booking, data entry			
	Total min per booking, additional misc	22	5	14
Cost	phone cost/minute	.10	.02	.02
	data cost/minute			
	Labor cost/minute	.507	.276	.276
	i-Trek cost per _____			
	Cost per transaction	$54.57	$ 6.12	$ 20.19
	Estimated total transaction cost			$ 80.88

6.3.2 **Benefits**

6.3.2.1 ***Quantitative***

During development, Freightgate implemented the track and trace component of the I-Trek! software environment for Carter. This capability provided increased efficiencies for both Carter and Best in tracking and reporting shipment status by reducing the amount of phone calls and emails needed to provide the status. As this was part of a phased roll-out, it was still necessary for Carter to update this information based on current manual processes with carriers, but a reduction in communications (in terms of number of emails and phone calls) between Carter and Best was realized. As it did not provide any benefit to the booking process, performance metrics are not reported as part of this case study.

Due to subsequent carrier integration, the Go-Live became multi-phased. In the first Go-Live phase, Freightgate implemented the Online Booking component of the I-Trek! Software environment for Carter. In the second phase of the process automation and improvement activities, a phase not originally planned for in the case study, select partner transportation companies were provided direct access to the Freightgate portal and as such, were able to directly manage and react to booking requests.

The quantitative process improvement for each phase is presented in Table 6-5 and Table 6-6.

Table 6-5. Carter Go-Live Phase 1 Booking Process Savings

element	Phase Go Live 1	no. shipments_40_		
	Partner	Carter	Shipper (est)	Carrier (est)
Activity	No. phone calls per ship booking	13.6	2.8	10.8
	No. emails per ship booking	2.4	1.2	1.2
	No. data entry per ship booking	1	1	
Time	Total min per booking phone call	42	8	32
	Total min per booking email	10	4	4
	Total min per booking data entry	2	2	
	Total min per booking additional misc	4	7	4
Cost	phone cost/minute	.10	.02	.02
	data cost/minute			
	Labor cost/minute	.507	.276	.276
	i-Trek cost per Shipment	2.68		
	Cost per transaction	$ 36.16	$ 6.11	$ 11.68
	Total transaction cost			$ 53.95
	Savings per Shipment			$ 26.93

Table 6-6. Carter Go-Live Phase 2 Booking Process Savings

element	Phase Go Live 2	no. shipments_80_		
	Partner	Carter	Shipper (est)	Carrier (est)
Activity	No. phone calls per ship booking	3.6	1.8	1.8
	No. emails per ship booking	.2	.2	.2
	No. data entry per ship booking		1	1
Time	Total min per booking phone call	6	3	3
	Total min per booking email	1	.2	.2
	Total min per booking data entry		2	2
	Total min per booking additional misc	2	4	2
Cost	phone cost/minute	.10	.02	.02
	data cost/minute			
	Labor cost/minute	.507	.276	.276
	i-Trek cost per __shipment__	2.68		
	Cost per transaction	$ 7.83	$ 2.48	$ 1.93
	Total transaction cost			$ 12.24
	Savings per shipment			$ 68.64

6.3.2.2 *Qualitative*

In the first Go-Live phase, Freightgate implemented the Online Booking component of the I-Trek! Software environment for Carter. This capability further increased efficiencies for both Carter and Best. It reduced the amount of phone calls and emails that Carter Transportation had previously generated in order to confirm daily pickup requests with Best and provided an email notification that Carter could forward to Carter's carrier handling the pickup. Best booked the shipment online which automatically confirmed the booking via EFM. Carter received immediate notification of the confirmation and then contacted the carrier to handle the request. Best also received the Bill of Lading as a .pdf, which was used to tender the shipment to the carrier. The solution was rolled out in June 2010, and comprised what was the original end-goal for the case study, a complete, automated booking interface between Carter and the shipper.

In the second phase of the process automation and improvement activities, Freightgate updated the Online Booking component of the I-Trek! Software environment for Carter's carrier access. This capability further increased efficiencies for both Carter and their carriers handling the pickup. It reduced the amount of phone calls and emails that Carter Transportation had previously forwarded and responded to in order to confirm daily pickup requests with both the shipper and carrier. When Best booked the shipment online, Carter and the carrier both received immediate notification of the confirmation, reducing the manual forwarding and confirming of booking requests between Carter, the shipper and the carrier.

6.3.3 FTAT Results

The USDOT's Freight Technology Assessment Tool was re-configured in 2011 and was used to calculate the net present value, benefit-cost ration and total process improvement for each case study. The inputs for Carter are summarized in Table 6-7 and the FTAT results are shown in Table 6-8.

Table 6-7. Carter FTAT Inputs

Input	Amount
Annual Process Cost Savings	$24,710
Initial Investment	$39,500
Annual Operating and Maintenance (per shipment)	$0.30 - $1.75

Table 6-8. Carter FTAT Results

Minimum Attractive Rate of Return	Useful Life	Net Present Value	Benefit Cost Ratio	Total Process Improvement
10.00%	5 Years	$57,761	1.36	$24,710/yr

Chapter 7. "ACME" (BATTELLE)

7.1 Environment Summary

7.1.1 Operating Environment

This case study of an Electronic Freight Management (EFM) adoption demonstrates potential benefits of enhanced visibility across supply chain partners to improve and streamline the forwarder assignment process and vendor compliance to reduce transportation expense. As with the Fellowes Case Study, results were calculated as though the EFM package was applied across the supply chain to all transactions.

The adopting partner is referred to here under the alias of "ACME" in response to a request for business confidentiality. They are a global supplier to the consumer products, electronics, and energy manufacturing industries that comprises multiple divisions and hundreds of vendors worldwide. ACME has experienced unapproved transportation expenditures as a result of routing guide violations: vendors will tender shipments designated to ship via ocean to instead ship via air, without receiving proper authorization from ACME. The solution is to improve visibility and communication between the parties and tighten the process for request/confirmation of a mode-change through a Priority Freight Authorization (PFA). An EFM-compliant, forwarder instruction message incorporates a portal application to communicate between the vendor and ACME using Universal Business Language (UBL)-compliant transactions to share those instructions (along with the authorization number) with the assigned forwarder.

In the case study pilot, ACME has experienced a significant reduction in "misroutes" (unapproved diversions from ocean to air) with the EFM solution. "As-Is" (pre-implementation) statistics showed a 16.8% misroute rate, and the "To-Be" (post-implementation) statistics showed a 0.0% misroute rate amongst the shipments in the pilot. With an average cost differential of $4.66/kg, and even a modest reduction in misroutes, ACME may potentially realize a net savings of $12.8 million over five years. Rather than assuming the continuation of the 0.0% rate, the estimation of improvement is very conservative. This is due to a number of operational and other business factors beyond the department's span of control. Furthermore, it is expected that most mode diversions classified as "misroutes" today would receive a PFA and yet still incur the additional cost of converting from ocean to air.

7.1.2 Key Participants

This adoption was performed with Freightgate, an information service provider (ISP) to the logistics industry. Freightgate provides hosted logistics management solutions and has included EFM-compliant, UBL-based web service communications among their PLTX® suite of tools.

Acme's forwarders and vendors are not identified for the purposes of this case study.

7.1.3 Description of As-Is Technical Environment

ACME has hundreds of vendors worldwide, supplying either raw materials or components to the many ACME divisions. The vendors are not identified for the purposes of this case study.

Vendors ship either directly to ACME facilities or directly to customers. Vendors, as well as the ACME locations and end customer shipping locations, are worldwide.

The shipment of goods is facilitated through the global logistics network that is comprised of integrators, forwarders, and ocean, air, and motor carriers in addition to other service providers essential to international shipping. This adoption case study, however, is applicable only to ACME's forwarder international shipment network. The network of seven freight forwarders accounts for 33 percent of total shipment volume.

ACME utilizes a third party freight audit and payment service (FAPS) to handle transportation carrier settlement due to the large volume and complexity of worldwide shipments and rate structures.

Vendors are charged with following the routing guidelines in forwarder selection and in providing necessary documentation and notification to enable timely and compliant shipment and delivery. Communication between forwarders and ACME has been accomplished through a combination of phone, fax, and email prior to the implementation of the vendor portal. Requests for PFA have also been made through fax and email.

Upon receipt of the shipment, the forwarder is responsible for entering shipment information into their internal system to produce a Bill of Lading (BOL). The BOL is used to tender the shipment to the carrier selected by the forwarder. The forwarder submits invoices to the FAPS for payment processing.

The FAPS is responsible for audit and payment of ACME freight bills.

Table 7-1 summarizes the deployment environment for the ACME case study.

Table 7-1. "ACME" Environment Summary

"ACME" EFM Case Study Environment Summary	
As-is Business Environment:	
Partner	**Summary of Case Study Participation**
"Acme"	Supply chain "owner" Global supplier of goods
Freightgate	Adopting partner Information service provider
Forwarders	Not specified for this case study (did not deploy any services)
Vendors	
Business Problem:	
Problem	**Projected Benefits**
Manual communication among supply chain partners	• Vendor portal provides access to routing guide information, request PFA authorization (if needed), and enter shipment information to generate a booking request.

"ACME" EFM Case Study Environment Summary	
Manual and repeated data entry	• Forwarder selection and notification process more efficient than it had been prior to implementation. • UBL messaging facilitates message exchanges with the forwarders for booking requests and confirmations. • Automatic population of forwarder internal systems, generates additional efficiencies, and greatly improves data accuracy.
Supply Chain Technical Environment	
Current IT Tools	Freightgate is a user of open source tools and an adopter of technologies. Currently, the IT tools in use include: LAMP/plus: Linux, Apache, MySQL, Perl, Java, Tomcat, Glassfish, OpenESB and custom JBI components. In addition Freightgate has developed and deployed a scalable yet light weight service bus (aka LightRail™) which has reduced overhead and bugs associated with OpenESB.
Current Messaging	• Minimal electronic messaging occurs between the adoption supply chain partners. • Some forwarders use EDI to convey data. Otherwise, messaging is facilitated only through traditional phone, facsimile, or e-mail exchanges between partners Freightgate, as part of their standard SaaS offering, uses SOAP 1.1 web services and XML, but also supports traditional EDI, ASCII, and other formats.
Current Interchanges (targeted with the EFM package)	• Distribute Routing Guide (consignee) • Order Products (deliver to) • Select Carrier and Service Level (shipper) • Request PFA (shipper) • Issue PFA (consignee) • Tender (notify) booking request (shipper) • Accept booking request (forwarder) • Forward (notify) booking request to carrier (forwarder) – not shown • Accept booking request (carrier) – not shown • Confirm booking request (forwarder) • Generate Bill of Lading (forwarder) • Tender shipment on forwarder BOL (shipper) • Send Invoice for Payment (forwarder) • Process Payment (freight audit and payment service) • Receive Payment (forwarder)

7.2 Implementation Summary

7.2.1 Application of EFM Package

The As-Is and To-Be business process maps are provided in Figure 7-1 and Figure 7-2.

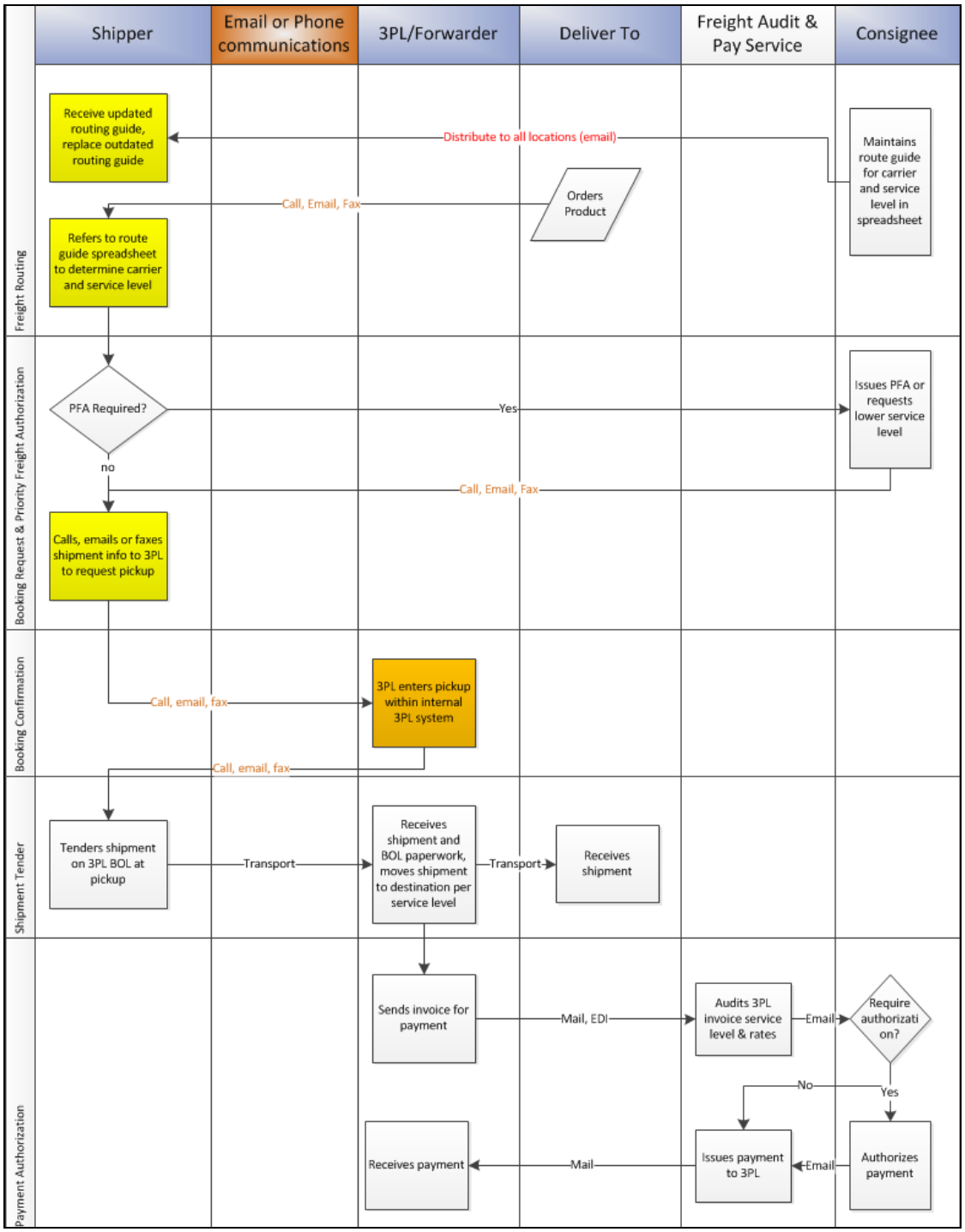

Figure 7-1. ACME As-Is Supply Chain Processes

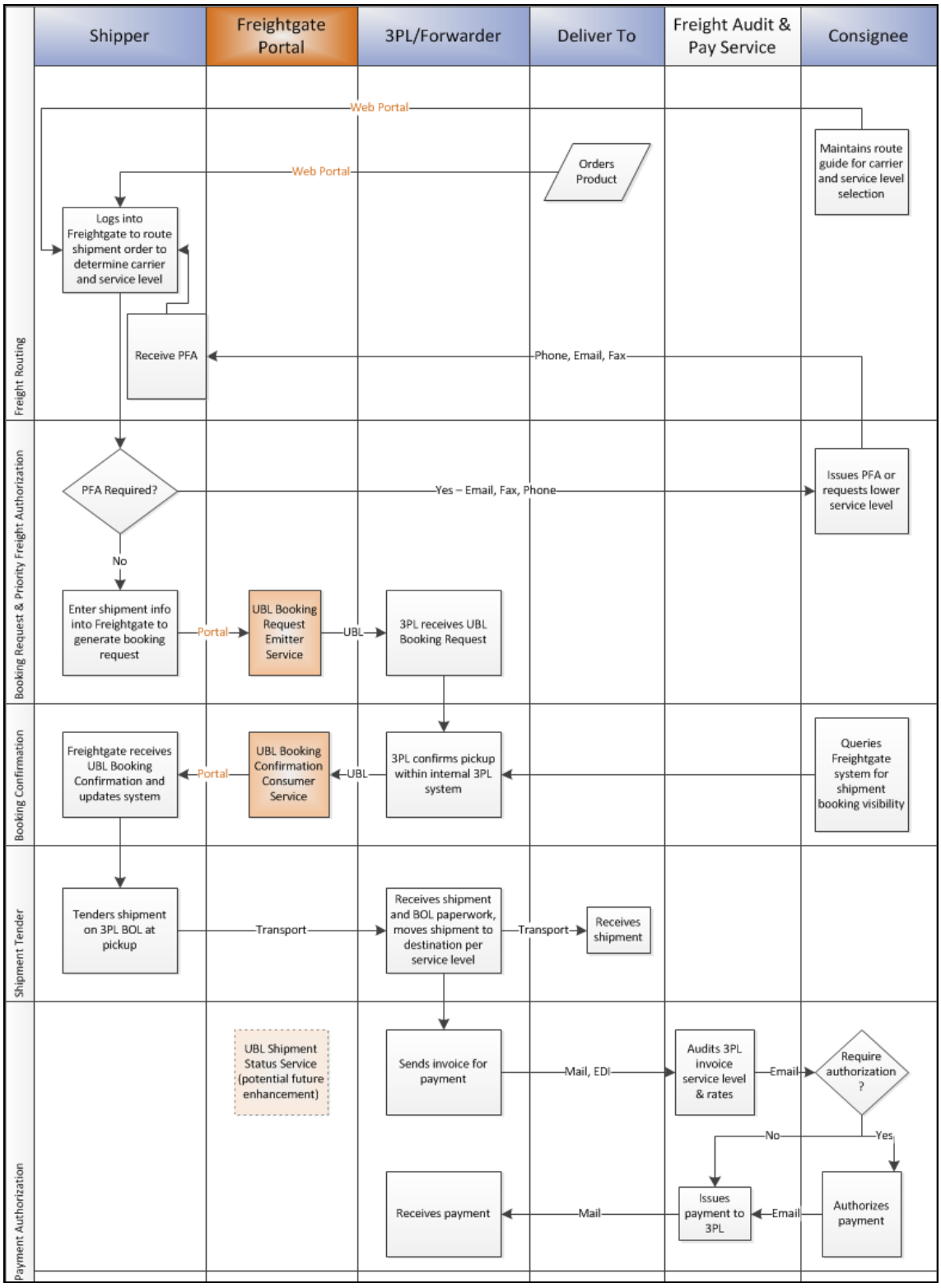

Figure 7-2. ACME To-Be Supply Chain Processes (with EFM)

The spreadsheet-based routing guide is provided to Shippers (vendors) by the Consignee (ACME). Normal operations begin with the Order Product step. When an order is ready to be

shipped, the Shipper consults the routing guide to determine the carrier and service level. If a Priority Freight Authorization (PFA) is necessary, the Shipper also makes this request to the Consignee. A booking request is then made by the Shipper to the forwarder via phone calls, fax or email. The forwarder records the booking request into its internal system and selects a carrier (not shown). The shipment is then tendered on the forwarder BOL and transported to the Deliver To via the specified service level. Upon completion of the shipment, the forwarder submits the invoice to the freight audit and payment service for payment. This service audits the invoice on behalf of ACME and issues payment to the forwarder.

The implementation of EFM and the associated Software as a Service (SaaS) portal provided by Freightgate (I-Trek) touches many of these process areas. As shown in Figure 4, the first change is the automation of route guidance procedures. This affects 'as-is' processes 1 and 3. The Shipper now logs into the Freightgate portal system to determine the appropriate carrier and service levels for a given shipment weight and origin/destination. Route guidance is maintained by the Consignee and updates are reflected on the portal. By automating this selection process, the number of mis-routes is greatly reduced. Additionally, and while not presently automated, it also serves to facilitate a higher compliance in PFA requests and approvals.

The portal also provides a method to streamline the booking process between the Shipper and the forwarders. This consists of the steps 6 through 11 as depicted in the 'as-is' of Figure 3. As shown in Figure 4, UBL messages consistent with the EFM architecture are now implemented between the shipper (via the I-Trek portal) and with the forwarders internal logistics management tools. These Request and Confirmation messages both leverage the UBL v2.0 Forwarding Instruction message. Freightgate has integrated this message exchange directly with all seven (7) of ACME's current forwarder providers. This improvement has multiple positive outcomes including the reduction in calls, emails or faxes between the shipper and forwarder and the elimination of the need to re-key the data into the forwarder system, resulting in less errors in the data, and more timely information being available to the forwarder.

Shipment booking visibility, a new feature not previously available to the Consignee is now also afforded by the use of the UBL data exchange and the I-Trek portal.

7.2.2 Implementation Decision Process

ACME has experienced significant transportation expenditures as a result of routing guide violations. ACME's primary driver is a system that improves vendor communication and compliance by conveying routing guide information; facilitates request/confirmation of PFAs; streamlines information exchange; eliminates data entry redundancy and errors through electronic data sharing; and ensures continuity of shipment information and the PFA through the freight payment and audit process.

The cost of misroutes is deemed of sufficient magnitude by the Finance organization to warrant the decision to implement the system. ACME's decision process to implement the application entails the involvement and consideration of the objectives of various stakeholders including Sourcing, Logistics, and Finance. Vendor compliance from the aspect of expedited shipment authorization has rested mainly with the Finance organization.

Freightgate has been instrumental in developing client solutions using UBL-compliant web services and promoting the advantages of implementing these versions over traditional EDI.

7.2.3 Implementation Costs

7.2.3.1 *Business Rationale of Adopters/Potential Adopters*

The adopter understood that improving vendor compliance would primarily reduce transportation expenditures. The improved data sharing would also mitigate the issues identified above. They worked with Freightgate to roll out the portal and EFM messages to these parties in the pilot.

Cost reduction is ACME's primary goal in implementing the EFM application. As stated earlier, compliance with the routing guide and practice of obtaining the PFA for mode diversions was expected to – and has shown to – reduce transportation expense significantly.

7.2.3.2 *Performance Measures*

Targeted improvements for the ACME case study included:

- Percent of non-conforming misrouted shipments (ACME) and related cost
- Transportation cost avoidance (ACME)
- Time savings in shipment processing, data error reduction, and communication (vendor) – qualitative indicators only
- Time savings in shipment processing, data error reduction, and communication (forwarder) – qualitative indicators only

An assessment of the level of improvement in these measures was conducted by Battelle as part of the self-evaluation for this case study and is presented in the Impact Assessment for the case study (the following section of this report).

7.2.3.3 *Implementation Challenges*

Identification of the proper UBL message set and then working within it to incorporate unspecified data elements was a challenge, but overcome by searching for early adopter/designer comments on forums and falling back to traditional EDI customization practices, which UBL was suppose to alleviate. The limited adoption rate of the UBL message made this a challenge to verify that the implementation was compliant to the Universal Business Language policies and procedures. The two primary issues related to UBL was the absence of a 3rd Party Bill-To person, and had to find a way to fit internal and partner reference numbers into the current structure of UBL.

Transition from EDI to XML implementation approach was also a challenge with many of the partners. Use of EDI-familiar techniques to map data or use of XML Document Type Definition (DTD's), as opposed to current XSD (XML Schema Document) approach limited some of the adoption benefits that may be realized in today's computer programming environment. The deployment team has seen this as a challenge not only in this adoption, but also with past implementation partners. Some partners, even though familiar with XML, struggle with this unfamiliar message set.

Partner acceptance, as documented above, has been an issue for ACME. They have an extensive supply chain and multiple internal stakeholders that must coordinate and align their objectives. Different organizations own the relationships for vendors and forwarders, as well as the processes that link with the EFM solution.

Detailed shipment data was developed by mapping the sample forwarder and FAPS data files. Freightgate does not capture, nor did ACME provide detailed shipment data for all forwarder shipments. The sample forwarder handles represents approximately 40% of all forwarder shipments during the evaluation period.

Table 7-2 provides a summary of the ACME implementation parameters.

Table 7-2. ACME Implementation Parameters Summary

Decision Process	• High number of routing guide violations • Need for streamlined information exchanges • Eliminating redundant data entry/usage
Business Rationale	**Potential Benefits:** Improved vendor compliance Cost reduction
Potential Performance Measures	• Percent of non-conforming misrouted shipments (ACME) and related cost • Transportation cost avoidance (ACME) • Time savings in shipment processing, data error reduction, and communication (vendor) • Time savings in shipment processing, data error reduction, and communication (forwarder)
Implementation Challenges	Incorporating unspecified data elements into UBL message schemas Transition from EDI to XML implementation approach Partner acceptance Supporting data to conduct evaluation

7.2.4 Implementation Costs

The EFM system was implemented in a cloud computing environment hosted by Freightgate. The cost for startup of the Carter EFM was $61,000 and included user training ("train the trainer"), system setup, configuration, and message integration.

Freightgate offers various pricing strategies to clients, which covers their operating and maintenance costs. Based on the current volume of shipments that Freightgate processes for ACME, the monthly recurring fee is $3,000. This rate is based on a pricing structure that provides for a monthly volume of 30,000 transactions or less. Maintenance costs are included in the operational expenses.

Table 7-3 summarizes the implementation, operations and maintenance costs for the ACME pilot.

Table 7-3. ACME Implementation, Operations and Maintenance Costs

Implementation	
Party	**Cost per party**
Training, setup and configuration	$40,000
Message Integration @ $3,000 per service provider x 7 providers	$21,000
Total Implementation Costs	**$61,000**
Operations and Maintenance	
Annual	$42,000

7.3 Impact Assessment

The purpose of this section is to provide the data necessary to calculate the potential cost savings for ACME as a result of implementing the EFM package. In addition, it provides the data required for USDOT to run the Freight Technology Assessment Tool, which at the time of this report publication, was currently undergoing updating. This tool will be used to calculate the net present value, internal rate of return, payback period, and benefit/cost ratio.

7.3.1 Business Process / Cost Improvement

The business processes targeted for improvement with the EFM package included:

- Distribute Routing Guide (consignee)
- Order Products (deliver to)
- Select Carrier and Service Level (shipper)
- Request PFA (shipper)
- Issue PFA (consignee)
- Tender (notify) booking request (shipper)
- Accept booking request (forwarder)
- Forward (notify) booking request to carrier (forwarder) – not shown
- Accept booking request (carrier) – not shown
- Confirm booking request (forwarder)
- Generate Bill of Lading (forwarder)
- Tender shipment on forwarder BOL (shipper)
- Send Invoice for Payment (forwarder)
- Process Payment (freight audit and payment service)
- Receive Payment (forwarder)

As with the Fellowes' simulation, Battelle was unable to collect baseline data regarding the current, as-is costs associated with each of these processes due to the lack of participation on the part of the forwarders and vendors.

7.3.2 Benefits

7.3.2.1 *Quantitative*

ACME shipment information was provided for 3-month periods both before and after adoption. Detailed route, weight, and volume information was collected for one of ACME's largest forwarders, but was not available for other carriers and forwarders. The forwarder accounts for approximately 40% of all forwarder shipments. Shipment cost information was captured from the 3rd party FAPS and merged with the sample forwarder's shipment data, resulting in 7784 records. The data was cleansed (such as excluding certain exceptional charges) to determine the average cost for air and ocean shipments. From this data, the team is able to approximate the differential in cost between air and ocean.

The compliance of certain vendors and forwarders with the EFM application is used as an indicator of PFA and routing compliance. Other forwarders and vendors have not been compliant in using the system, an issue ACME continues to address and improve upon. Compliance measures are captured from this pilot population.

Battelle did not have access to all vendor and forwarder representatives to properly quantify the impact of the administrative process improvement. However, past EFM adoptions have shown these savings to be significant. By comparison, the Columbus EFM (CEFM) case study identified $5.69 combined per shipment savings by parties other than the shipper.[6] The Carter EFM case study identified a best-case $26.31 combined per shipment savings for the shipper and carrier.[7] While these business environments vary, both are representative of savings brought by EFM adoption through reduction in duplicate data entry, data entry errors, and inefficient communication.

With regard to misroutes, "as-is" (pre-implementation) statistics showed a 16.8% misroute rate, while the "To-Be" (post-implementation) statistics showed a 0.0% misroute rate amongst the shipments in the pilot. With an average cost differential of $4.66/kg, and even a modest reduction in misroutes, ACME may potentially realize a net savings of $12.8 million over five years. This estimation on improvement is very conservative due to a number of operational and other business factors beyond the department's span of control. Furthermore, it is expected that most mode diversions classified as "misroutes" today would receive a PFA and yet still incur the additional cost of converting from ocean to air.

Finally, as a result of a very high number of shipments through their global forwarder network (an average of 7,813 shipments per month), the EFM package offers a high value in potential savings. In a projected phased implementation of the system across ACME's supply chain, savings could exceed $4.6 million per year.

7.3.2.2 *Qualitative*

The pilot indicated that supply chain partners received benefits through streamlined business processes, although the research team was not provided with sufficient data to quantify. These include:

- For vendors: ability to access routing information via the vendor portal, with a significant time and accuracy improvement over referencing paper copies.
- For forwarders: integration with their internal operating systems, eliminating duplicate data entry as well as the rework and potential routing errors that occur with data entry errors.

7.3.3 FTAT Results

The USDOT's Freight Technology Assessment Tool was re-configured in 2011 and was used to calculate the net present value, benefit-cost ration and total process improvement for each case study. The inputs for the ACME simulation are summarized in Table 7-4 and the FTAT results are shown in Table 7-4.

[6] Columbus Electronic Freight Management Evaluation Final Report, SAIC, May, 2008.
[7] Carter Transportation Booking EFM Adoption Case Study, Battelle Memorial Institute, June, 2011.

Table 7-4. ACME FTAT Inputs

Input	Amount
Annual Process Cost Savings	$2,619,293
Initial Investment	$61,000
Annual Operating and Maintenance	$42,000

Table 7-5. ACME FTAT Results

Minimum Attractive Rate of Return	Useful Life	Net Present Value	Benefit Cost Ratio	Total Process Improvement
10.00%	5 Years	$8,814,749	127.15	$2,619,293/yr (avg) $13,096,465 total

U.S. Department of Transportation
ITS Joint Program Office-HOIT
1200 New Jersey Avenue, SE
Washington, DC 20590

Toll-Free “Help Line” 866-367-7487
www.its.dot.gov

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