

Analytical Model: Evaluating Incoterm Conversion

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Summary: This capstone project investigates the various material buying arrangements that a buying entity will take on. The research will focus on a select group of products from a select group of suppliers. The suppliers selected will have different characteristics such as origin, volume, price, supplier relationship, etc. Total logistics costs and risk are included per incoterm option to give an overview to business managers on how to approach buying decisions. The result is a matrix of selected scenarios which will allow the buyer to understand the risk associated with each incoterm under a set of conditions and the expected cost difference.



Bio
Before coming to MIT, Mark worked in product distribution for several companies including U.S. Lumber, Weyerhaeuser, and Georgia-Pacific managing multiple departments including operations, transportation, procurement, and sales. He holds a BSci degree from the University of Tennessee / Knoxville.



Bio
Before coming to MIT, Pratik worked in various areas of supply chain at companies like Maersk, DPDHL and lately ABB. He advised leading companies on numerous topics ranging from growth strategy, supply chain management, operations restructuring to corporate restructuring. He holds an MSc from Cranfield and BEng degree from University of Rajasthan

KEY INSIGHTS

1. **Having an active inbound management operation is critical in taking advantage of an incoterm conversion strategy.**
2. **Increased inbound visibility helps production planning reduce the need for higher safety stocks.**
3. **Managed inbound allows for consolidation and backhaul possibilities that will lower overall logistics cost.**

spend and choice of shipper. This often results in poor shipment status visibility and less control of carrier selection for the buyer. Our research evaluated the impact of using E&F incoterms compared to C&D incoterms on the overall logistics cost and risk for the company. The visibility of the inbound freight is important because an accurate ETA assists production planning. Better production planning lowers capital tied up in safety stock inventory. Considering all these challenges, the company has requested an analytical model regarding the impact of incoterm choice regarding total logistics cost vs. risk. Some of the factors that we considered in the model are duties, taxes, material cost, supplier location, transport mode, lead time variability, inventory, and demand variability.

Introduction Incoterms are a set of commercial trade terms established by the International Chamber of Commerce. Incoterms provide a framework of who pays for what and where the responsibility of goods changes from seller to the buyer in the shipment process. For the purpose of this project we will classify incoterms into two groups. The first group will consist of E & F type incoterms where the buyer will arrange freight. The second group will consist of C & D type incoterms and is based on the seller paying for transportation. Current procurement strategy directs suppliers to buy mostly on C or D type incoterms. This strategy gives more control to the supplier on transport

Methodology We used a structured methodology (Figure 1) approach which the main stakeholders from the sponsoring company are familiar with.

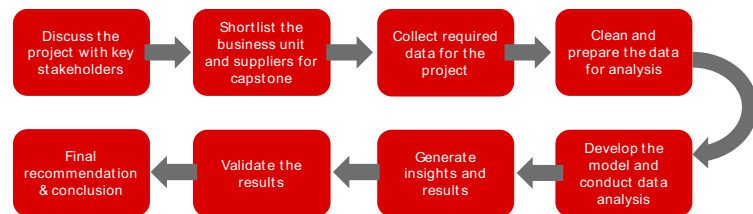


Figure 1: Project Methodology

Our project was discussed with the business operations leadership who value the importance of evaluating opportunities within inbound logistics management. Leadership is looking for a broad scope in terms of the number of sites, products, suppliers, and the expected output. The agreed upon goal was to develop a model that can evaluate the cost and impact of using various incoterms on different product categories. A preference matrix was developed to shortlist these products used for analysis. The following criteria was used in selecting the suppliers and products that would be analyzed for this research project.

- Are the suppliers willing to run a limited scope pilot to test the validity of the results?
- Can the company representatives invest time and effort during the 8-month project to help collect data, validate the data analysis assumptions, review the draft reports and help select scenarios for the pilot setup?
- Can the project be completed within the timeline required?
- Where are the suppliers based? Preference would be given to suppliers that are shipping products from multiple locations and using different modes of transport such as ocean, rail, and air. This would allow the analytical model to be tested for various scenarios.

Our model will focus on a selected set of 12 products as seen in Figure 2.

Product Code	Origin	Destination	Agreed Incoterm
PRO00000001	Hungary	China	CIP Beijing
PRO00000002	China	Switzerland	DAP
PRO00000003	China	China	DAP Beijing
PRO00000004	China	China	DAP Beijing
PRO00000005	China	China	DAP Beijing
PRO00000006	China	China	DAP Beijing
PRO00000007	China	China	DAP Beijing
PRO00000008	China	Finland	DAP
PRO00000009	China	India	FCA
PRO00000010	China	India	FCA
PRO00000011	Bulgaria	Finland	Multiple
PRO00000012	China	Switzerland	Multiple

Figure 2: Product Under Scope

We collected data for first quarter 2018 to calculate the total logistics costs. These costs included

- Purchasing
- Ordering
- Inventory

- Duties
- Taxes
- Transportation

During the data collection it was observed that costs such as the warehouse handling for inbound shipments are miniscule compared to the transport and inventory costs; hence it was decided not to

include them in the final data model. The model then calculated the total logistics costs per shipment under common incoterms and the quantitative level of risk associated with each option. Some of the main challenges while collecting and analyzing the data were

- No central system existed where the data could be extracted at once. Purchase order information was pulled from SAP, but shipment data was collected from multiple sources including TMS and Excel. Warehouse and handling costs were calculated based on primary interviews and limited warehousing data.
- Diverse set of values for data points such as the cost of working capital used to range from 5% to 17%
- Lack of common consistent indicator to match purchase order information with actual shipment/transport information.
- Limited and largely inaccurate information was available on actual pickup and delivery dates for shipments.

The risks were calculated using qualitative input via primary interviews with production planners, supply chain managers, and buyers. A rating of 1 to 5 was generated based on the responses with 5 being the highest. The parameters used in calculating risk were:

- Product country of origin
- Product supplier past performance
- Product cost
- Strategic product or commodity product

Results A decision matrix (Figure 3) was developed to help choose the best incoterm for a product category. Having an active inbound operations management is critical in order to take full advantage of converting incoterms from C&D terms to E&F terms. A full in-house management setup requires a

company to have a structured inbound team or contract with an external service provider to manage the inbound shipments.

may cause the need for more expensive air freight solutions)

- Suppliers may not inform the buyer about shipment changes and details

Purchase Price	Volume	Nature of Product	Origin	Destination	Inbound Operations Actively Managed	Proposed Incoterm
0-50 USD	0-10000	Commodity	Asia	Europe	Yes	CPT/ DAP/ DDP
0-50 USD	10000-100000	Commodity	Asia	Europe	Yes	FCA/ FOB
0-50 USD	100000+	Commodity	Asia	Europe	Yes	FCA
0-50 USD	0-10000	Commodity	Asia	Europe	No	DAP/ DDP
0-50 USD	10000-100000	Commodity	Asia	Europe	No	FCA/ FOB
0-50 USD	100000+	Commodity	Asia	Europe	No	FCA
50-200 USD	0-10000	Strategic	Asia	Europe	Yes	FCA
50-200 USD	10000-100000	Strategic	Asia	Europe	Yes	FCA
50-200 USD	100000+	Strategic	Asia	Europe	No	FCA

Figure 3: Incoterm Selection Matrix

The key benefits to having visibility and control of inbound shipments to production sites are

- Better production planning thus reducing the need for higher safety stocks
- Consolidation options on inbound shipments from multiple suppliers coming from the same country/region
- Increased carrier performance management with data
- Backhaul potentials instead of one direction flows

The key challenges to this setup include

- Additional investment required for people and systems
- Some may consider inbound not as important as outbound logistics
- Increased risk / liability for company
- Benefits sometimes take longer to show up
- Suppliers may not be open to sharing data via interfaces

One possible alternative to establishing an in-house inbound management setup is to work with a third party (3PL) or fourth party (4PL) logistics service provider and allow them to manage the inbound operational activities. These responsibilities could include

- Checking with suppliers to check if goods are ready to be picked up
- Consolidate goods from the supplier to same end destinations
- Conducting compliance checks on the customs declarations and material codes

Despite having several advantages such as lower cost of implementation and ease of rolling out service, 3PL/4PL does have several inherent disadvantages including

- Limited control on what services the suppliers can use with the carrier (delays

E&F Type incoterms allow a company to enjoy increased visibility when the product is under the buyer's control. Consolidated purchase volume is a possibility with E&F terms. A final possible benefit could be delayed shipment invoicing as the shipper can only bill for shipment when it is delivered compared to when it ships. Based on the analysis, we have decided to not consider E terms as it includes the additional risk of goods getting loaded at the supplier site. Most of the goods with our sponsoring company are larger in size and require special loading equipment. A supply manager would not consider this as a value adding activity.

Results from the research identify the company incurring higher costs but gaining additional control of the inbound. This trade off is a relevant topic for companies that buy internationally and have high levels of working capital.

Conclusion This research recommends evaluating incoterms when purchasing to achieve the lowest total cost for the company. The purchasing decision also needs to evaluate the optimal visibility of arrival and understand the risk associated with each incoterm. This scenario is best achieved with in house management of inbound logistics in most cases. The next best option would be to use third-party providers which manage the inbound on the company's behalf using agreed on performance metrics. Future research options could attempt to verify the cost savings vs. the implicit risks associated. Another research option could be to compare the benefits and risks involved with managing inbound internally vs outsourcing to a third party. Finally, there could be additional research regarding the implementation of this inbound management strategy, these best practices could then be applied to other industries that utilize international sourcing

