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How Enterprises and Trading Partners Gain from Global Trade Management

A New Process Model for the China-to-US Trade Lane

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UNIVERSITY

By

Warren H. Hausman, Stanford University

Hau L. Lee, Stanford University

Graham R. F. Napier, TradeBeam, Inc.

Alex Thompson, TradeBeam, Inc.

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Executive Summary

After decades of domestically-focused economic activities, the world economy experienced the greatest expansion of global trade in history in the last two decades of the 20th century and the first decade of the 21st century. This expansion was spurred by the end of the cold war, the adoption of trade-friendly policies by countries across the world, and the emergence of low cost technologies and transportation options that enabled companies to transact over long distances. However, as companies have rushed to globalize to take advantage of new markets and the dramatic labor cost differences among countries, the level of sophistication of supply chain skills, processes and technologies has remained low, relative to equivalents for domestic supply chains within the industrialized economies.

In response to increasing levels of globalization and the relatively low efficiency of global trade operations, organizations have begun to address improvement in their global trade operations in a systematic manner. Global Trade Management (GTM) has evolved as a term to describe the processes to support cross border transactions.

To improve the level of understanding of GTM, and to help companies estimate and work to realize efficiency gains through skills, process and technology investments, we have developed a new, detailed process model for global trade, which we label the Stanford Trade Process Model, or STPM. The model contains sufficient detail on cross border trade processes to allow users to estimate the benefits of IT-Enabled GTM at the individual process step level for over 100 separate process steps. The analysis we have performed for this study focuses on the apparel industry in the China-US trade lane, so as to provide a real-world context. We have obtained estimates of both current process step times and reduced times due to IT-Enablement from knowledgeable sources from both the USA and China.

Since some process steps can be performed in parallel, we use Critical Path Analysis to determine the current and potential times to perform various important tasks in global trade. For exporters, key duration metrics are the Manufacture to Invoice Cycle and Days Sales Outstanding. Additional GTM IT-Enablement benefits for exporters include reductions in pipeline (in-transit) inventory, tax rebates, workload reduction, savings due to receivables financing programs, and reduced expediting expenses. For importers, our primary duration metric is the Order to Receipt Cycle. We also estimate importer savings from safety stock inventory reduction, receivables financing programs, reduced cargo insurance costs, reduced broker fees, workload automation, and benefits associated with improved goods classification and customs processing. In addition, we estimate select IT-Enabled benefits accruing to Supply Chain Intermediaries (such as brokers and freight forwarders) using our methodology.

Under reasonably conservative scenarios, excluding IT-Enablement implementation costs, we estimate key benefits of IT-Enabled GTM to be as follows:

- Dollar savings amounting to 1.7% in Annual Sales for Exporters
- Dollar savings amounting to 0.6% in Annual Sales for Importers
- Benefits amounting to a 28% increase in Annual Profit for Exporters (assuming profit = 6% of sales)
- Benefits amounting to a 10% increase in Annual Profit for Importers (assuming profit = 6% of sales)

The following table summarizes the major benefits of IT-Enablement, including a range of benefits based on conservative versus aggressive assumptions. In addition to increases in profitability for each party, there are also reductions in various cycle time metrics: the Manufacture to Invoice time is reduced by 9%, the Days Sales Outstanding is reduced by 28%-29%, and the Order to Receipt time, often called the lead time by the importer, is reduced by 35%.

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Summary of IT-Enablement Benefits

	Exporter	Importer
Manufacture to Invoice Cycle Reduction (Days & %)	4 Days 9%	N/A
Days Sales Outstanding Reduction (Days & %)	11 ~ 12 Days 28% ~ 29%	N/A
Order to Receipt Cycle Reduction (Days & %)	N/A	36 Days (35%)
Benefit as % of Sales (%)	1.7% ~ 2.4%	0.6% ~ 2.2%
Profit Increase (%)	28% ~ 40%	10% ~ 37%

We also obtained estimates of select benefits to Supply Chain Intermediaries on workload savings. These benefits amount to 3.1% of annual revenue from a representative client for Export Intermediaries such as forwarders, brokers and carriers and 5.5% of annual revenue for similar Import Intermediaries.[21]

It is possible to extrapolate the benefits derived above to total worldwide trade, with caveats which we discuss in the paper. World Merchandise Exports in 2007 totaled $13.6 Trillion. Similarly, Total World Merchandise Imports in 2007 were $14 Trillion. Extrapolation of our results suggests:[22]

- Annual Benefit to Exporters from $194 Billion to $263 Billion
- Annual Benefit to Importers from $52 Billion to $109 Billion

Our study demonstrates that there are significant opportunities for companies to benefit by improving their global trade processes, as well as looking at global trade in a strategic manner. Companies seeking to take full advantage of these gains can use the Stanford Trade Process Model as a framework, following traditional process improvement methodologies developed in the quality revolution:

- Perform Business Process Re-Engineering.
  - » Model 'As-Is' processes at a detailed level, with sequences, branches and dependencies, and identifying bottlenecks and inefficiencies.
  - » Design 'To-Be' processes, making certain to put in place processes supporting efficient collaboration with a network of globally distributed trading partners, conducive to cross-departmental, cross-functional, and cross-geographical operations, and responsive to dynamic global trade regulations.
- Perform Benchmarking, determining current and historical company and competitor operational and executive metrics, as well as targeting industry-leading metric goals.
- Identify skills, partners, processes, tools and technologies required to achieve target goals.

21 Our estimates for Supply Chain Intermediaries were limited to their direct involvement in transactions with importers and exporters, and to labor savings due to workload reduction through automation. It is expected that Supply Chain Intermediaries would gain additional benefits through IT-Enablement of their own internal, back office operations, which were not addressed in this study, as well as potential benefits beyond labor-related savings from GTM IT-Enablement, such as improved asset management.

22 All dollar values in this report are in US dollars.

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- Implement, measure and improve supply chain processes on a continuous basis, similar to the Six Sigma Process.

The goal of the STPM is to provide a framework that serves as a starting point, enabling companies to perform these steps in a structured manner, communicate internally and externally with all stakeholders, and measure and improve their operational performance over time.

Acknowledgments

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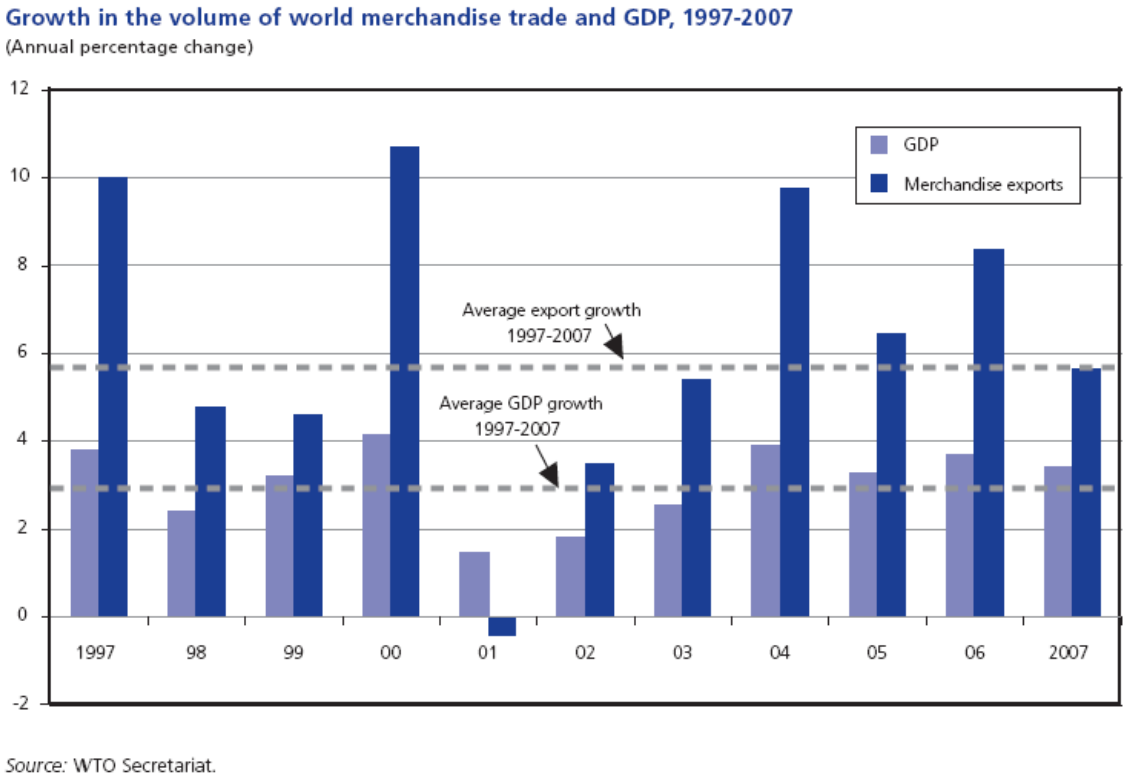
1. Introduction

Increasingly, the global supply chains of most companies span multiple countries or continents. The supply sources, subassembly sites, final assembly factories, distribution centers, and retail outlets or final customer sites are often globally distributed. As a result, the quantity of products crossing country borders is already high and increasing at a rapid pace. Indeed, in the last ten years, the growth of global trade has been double that of the growth of global GDP (see Figure 1).

Figure 1. Global Trade Growth



Source: WTO Secretariat.

Effective management of trade processes is critical to the efficiency of a global supply chain. Hausman et al.[21] have found that logistics friction could be a major determinant of the volume of trade between countries. Some of the friction relates to the lead times and costs involved in having goods cross borders. Improving cross border trade processes, therefore, could reduce logistics friction, encourage trade, improve supply chain performance, and in the long run, increase the competitiveness of countries.

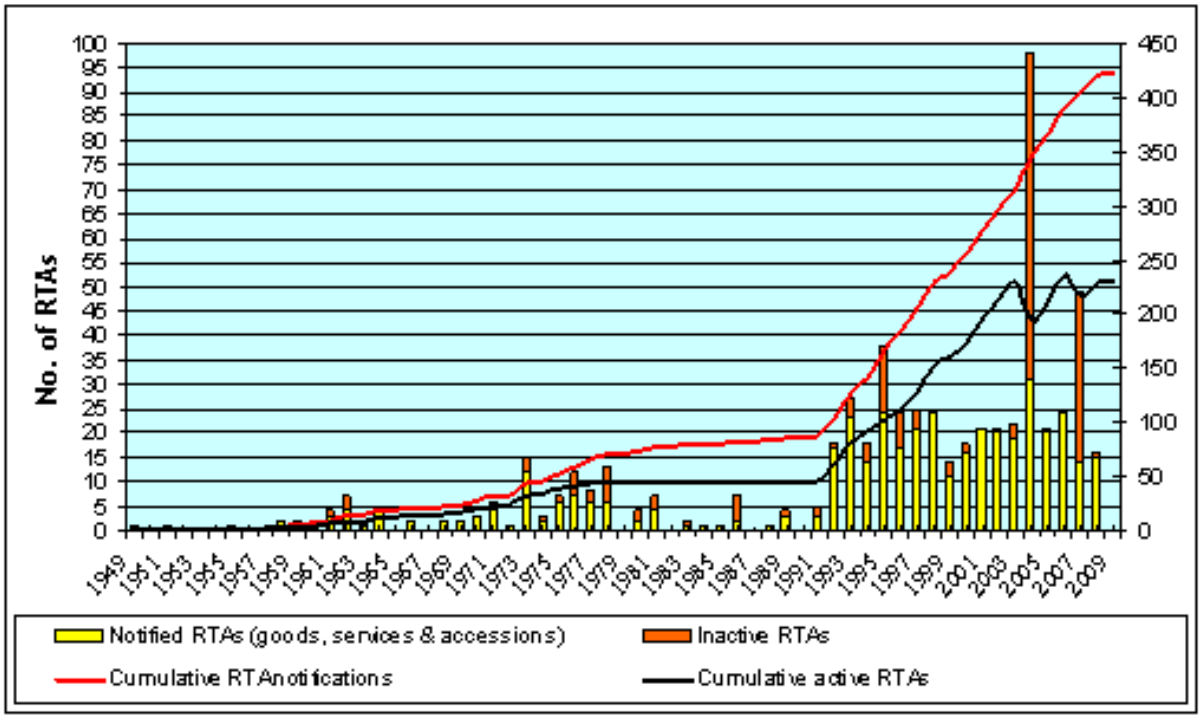
Adding to the complexity of the cross border trade processes is the increasing number of regional trade agreements (RTAs) that have been in force in global trade. Figure 2 shows the number of RTAs introduced and those currently in force over the last 60 years, which has occurred in spite of the fact that overall, average world tariff rates have decreased significantly during this time[3]. Compliance to these RTAs requires additional documentation, tracking and verification, all of which become part of cross border processes.

21 Hausman, W. H., Lee, H.L., and Subramanian, U., "Global Logistics Indicators, Supply Chain Metrics, and Bilateral Trade Patterns," World Bank Working Paper WPS3773, 2006

Figure 2. Increasing Regional Trade Agreements

"Evolution of Regional Trade Agreements in the world, 1948-2008"

The following Chart shows all RTAs notified to the GATT/WTO (1948-2009), including inactive RTAs, by year of entry into force.



Source: WTO, Facts and Figures, The Changing Landscape of Regional Trade Agreements: 2008 Update

It is important for supply chain managers to manage cross border trade processes well. It is not just for the sake of control of standard lead times and operational costs; mistakes in cross border processes could also result in significant penalties or fines, and added delays in the supply chain. Mismanaged cross border processes could also mean that a company might leave money on the table. For example, World Express estimates that 78% of earned duty drawbacks go unclaimed[22].

Understanding the true costs and operational performances in cross border trade processes is also critical for companies to design their global supply network. Decisions such as off-shoring, near-shoring, or on-shoring, or whether to use a particular outsourced partner in a particular geography, require a full analysis of total landed costs. Cross border costs and operational efficiencies form an important input to such analysis.

Although most supply chain managers recognize the importance of improving cross border trade processes, these processes are very complex and may not be well understood by general supply chain managers, due to the relative youth of the trend of globalization.

GTM Background and Definition

Global Trade Management (GTM) as a term came about in the late 1990s and early 2000s in response to rising levels of globalization, low levels of efficiency, responsiveness and transparency in global operations, and the lack of a

22 http://www.worldexpressonline.com/newsite/worldexpress/drawback.htm

systematic methodology for continuously improving global trade operations. While enterprises had witnessed great progress in automating business processes in the 1990s through the implementation of ERP systems and associated business process re-engineering associated with the Quality Revolution, these systems did not adequately address the challenges of global operations: they were domestic or regionally focused; they focused on automation within organizations, rather than collaboration with external partners; they focused on automation within single departments, such as Human Resources, Manufacturing, or Finance, rather than across departments; and they did not adequately take into account the greater complexities of global trade, such as dynamic government regulations, a higher number of trading partners, different and greater documentation requirements, different currencies, languages, and time zones, extended lead times and geographically dispersed supply and customer bases.

GTM is a relatively new term, with no universally accepted definition. For purposes of our report, we contribute a working definition as follows:

- GTM describes the processes required to support cross border transactions between importers, exporters, their trading partners and governments. GTM encompasses network planning, sourcing, order collaboration, compliance with government regulations, transportation, inventory, and warehousing management, as well as financial settlement.
- GTM is a way for companies to view their global supply chains in a holistic manner, extending from a domestic to a global dimension, extending across departments within organizations, and extending outside corporations to connect businesses with trading partners, governments and customers.
- GTM includes internationalized versions of many processes that are also conducted domestically, such as order management, together with processes that are unique to international trade, such as Letters of Credit and specialized security regulations.

The term GTM is often used to refer to software solutions for global trade, rather than processes. Our view is that GTM focuses on processes. GTM can be performed manually, or in a highly automated fashion, and with poor or efficient processes.

The detailed documentation of cross border trade processes provides a valuable framework which companies or countries can use to evaluate the potential value of investing in technologies to improve such processes, the value of streamlining processes through process re-design, and the value of simplifying processes through collaborative efforts among governments and trade partners. Hence, we think that there is a need to conduct deep-dive fundamental research on how the trade process works, and assess the value of improvements through new information technologies and supporting process improvements and skills upgrades. Our new report aims at contributing to the literature with the following objectives:

1. provide the most comprehensive description of cross border trade processes and sub-processes;
2. better estimate the lead times and costs of cross border trade processes in supply chain planning;
3. identify ways to streamline the processes;
4. quantify business values through investments in new technologies such as IT and continuous improvement; and,
5. understand how the financial flows work under cross border trades, and re-engineer such flows for improvements.

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Among supply chain management practitioners, SCOR[23] is the reference model that has been most widely used. The SCOR model describes the processes involved in supply chain management, including both planning and execution steps. The SCOR model contains both high level as well as operational level views that describe work processes. Here, we are most interested in the workflow processes involved in trade flows. Specific to global trade, the most detailed process model to date is the International Supply Chain Reference Model developed by the UN/CEFACT/TBG-International Trade Procedures and Business Process Analysis Groups[24].

Our process model complements these workflow-based process models in the following ways:

1. Existing process models contain key steps involved in trade flows, but lack more detailed operational steps that would be helpful for analysis of process re-engineering or process improvements. For example, in the preparation of goods for export, the existing process models may specify steps such as technical assessment and registration of goods to declare for export. The STPM detailed steps involve classification of the goods, checking licenses, and screening partners, etc. For the analysis of process improvements, companies will benefit from this finer level of detail.
2. Existing process models do not show the linkages of information technologies and process performance.
3. Existing process models contain security measures prior to 2003, but do not reflect some of the latest changes in security measures (such as the "10+2" initiative for the USA).
4. Finally, the existing process models only focus on the information and physical flows; they do not adequately capture the financial flows involved in cross border trades.

To develop the most updated and comprehensive cross border process model, we have used the China to US trade lane for apparel goods for illustration purposes. We conducted extensive interviews and surveys of trade experts from companies that export and import apparel goods, as well as trade facilitators such as freight forwarding and logistics companies. Then, we used the same experts to assess the improved performances of the sub-steps in the trade processes through the use of new information technologies, from both the China and US side. We assume companies put in place appropriate partner, process and skills upgrades to support IT-Enabled GTM. From these task improvements, we then built analytical models to evaluate how such process improvements would lead to operational improvements, cost reductions and eventually business value for the trading partners. Hence, this is probably the most comprehensive and detailed analysis to date of the value of GTM technology in global trade. Although we used the China to US apparel trade as the illustrative example, our expanded process model and analytical model can be applied to other industries and other geographies.

For purposes of our report, we considered IT-Enabled GTM to be highly automated, with software systems connecting trading partners electronically in harmonized, readily accessible systems providing strong collaboration, messaging, document generation, data reconciliation, visibility, reporting, auditability and data quality management, versus GTM with low levels of automation, which is characterized by usage of faxes, email, spreadsheets and other tools that are not harmonized or centralized.

Additionally, for our report, our estimates of the benefits of GTM focused on those aspects of GTM that are specific to a global trade transaction, excluding planning, enablement, and functions such as inventory and warehouse man-

23 Supply=Chain Operations Reference Model, SCOR Overview, Version 9.0, Supply-Chain Council

24 "Reference Model for International Supply Chain with Special Reference to Trade Facilitation and Trade Security," UN/CEFACT/TBG-International Trade Procedures and Business Process Analysis Groups. September 2003.

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agement that occur before sourcing or after a transaction has been received at a warehouse or distribution center. We comment on these in sections 4.3 and 5.2, and note that estimating the benefits of IT-Enablement of these functions is worthy of further study, and will result in further benefits to enterprises and trading partners.

In the remainder of the report, Section 2 describes our new process model. The development of analytical models to assess the benefits of GTM technologies is described in Section 3. Section 4 shows how the process model and the benefits analysis works in the China-US apparel trade lane. Specifically, we show how data was collected and how the benefits of GTM were quantified. Section 5 discusses other uses of the process and benefits models related to government policy impact management, process enablement and supply chain network planning (also known as business value chain design). Section 6 concludes the report.

Additional details of the study are given in the Appendices. Appendix 1 describes how the apparel Quota system works between China and the US. Appendix 2 provides detailed description of the trade process steps for the China-US trade lane. Appendix 3 gives the analytical models used in calculating the benefits in Section 3 and 4. Appendix 4 provides detailed drivers for the benefits in cases when Letters of Credit are used as payment terms.

2. Stanford Trade Process Model (STPM)

In this section, we present the Stanford Trade Process Model (STPM) as a flowchart. The entire model is composed of four linked flowcharts: Pre-Export, Transport Arrangement & Export Declaration, Transport & Import Declaration, and Post-Import Customs Clearance & Payment. Their major contents are the following:

1. Pre-Export: steps that initiate the global trade process, including import screening, negotiation of price, contract and payment terms, creation of purchase/sales orders, and export screening.
2. Transport Arrangement & Export Declaration: steps preparing for exportation, including arrangement of transportation carriers, obtaining approval from inspection agencies, export declaration, and preparation and transmission of security filings to US Customs and Border Protection (CBP)
3. Transport & Import Declaration: steps include international ocean or air transport of the goods, generation and submission of import documents, and import customs clearance.
4. Post-Import Customs Clearance & Payment: the final steps of the global trade process, including inland delivery from the border to the importer's site, receipt of goods, review of landed cost, settling payment with the forwarder, broker and exporter, and filing for foreign exchange verification and tax refund if applicable.

When developing the STPM, we assume the Incoterms are FCA Factory (Free Carrier, Factory) and the transportation mode is ocean. Steps in green (rounded rectangles) are those involved when the trading partners use Letters of Credit (LC); steps in blue (with dashed-dotted borders) are optional steps that may or may not be executed during the process; and steps in pink (with dashed borders) are those involved when the trading partners engage in optional trade finance processes.

There were several significant challenges in building this process model. In order to identify all the steps, it was necessary to request information from a number of experts familiar with various portions of the international trade process and to iterate several times among them until agreement on the final set of steps was reached. Also, since some steps could be performed in parallel, it was necessary to request information about the required sequencing of the various steps. This required each step's immediate predecessor and immediate successor step(s) to be identified. Our experts included not only people familiar with the US side and the China side of China-US trade, it also included intermediaries such as Freight Forwarders, Brokers, Transportation Carriers, Logistics Services Providers, Financial Institutions, and IT Providers.

Figure 3: STPM Flowcharts: Pre-Export

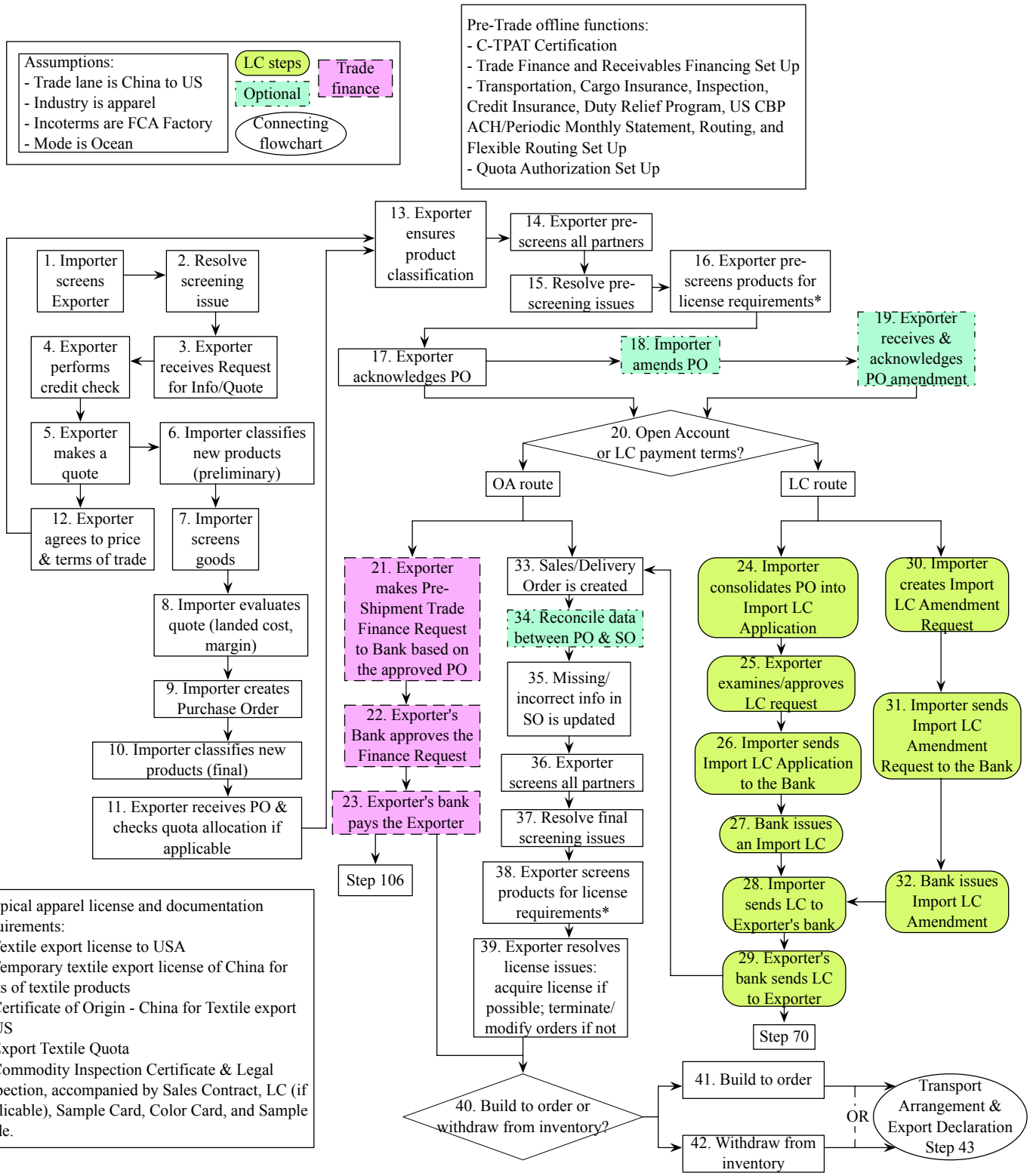


Figure 3: STPM Flowcharts: Transport Arrangement & Export Declaration

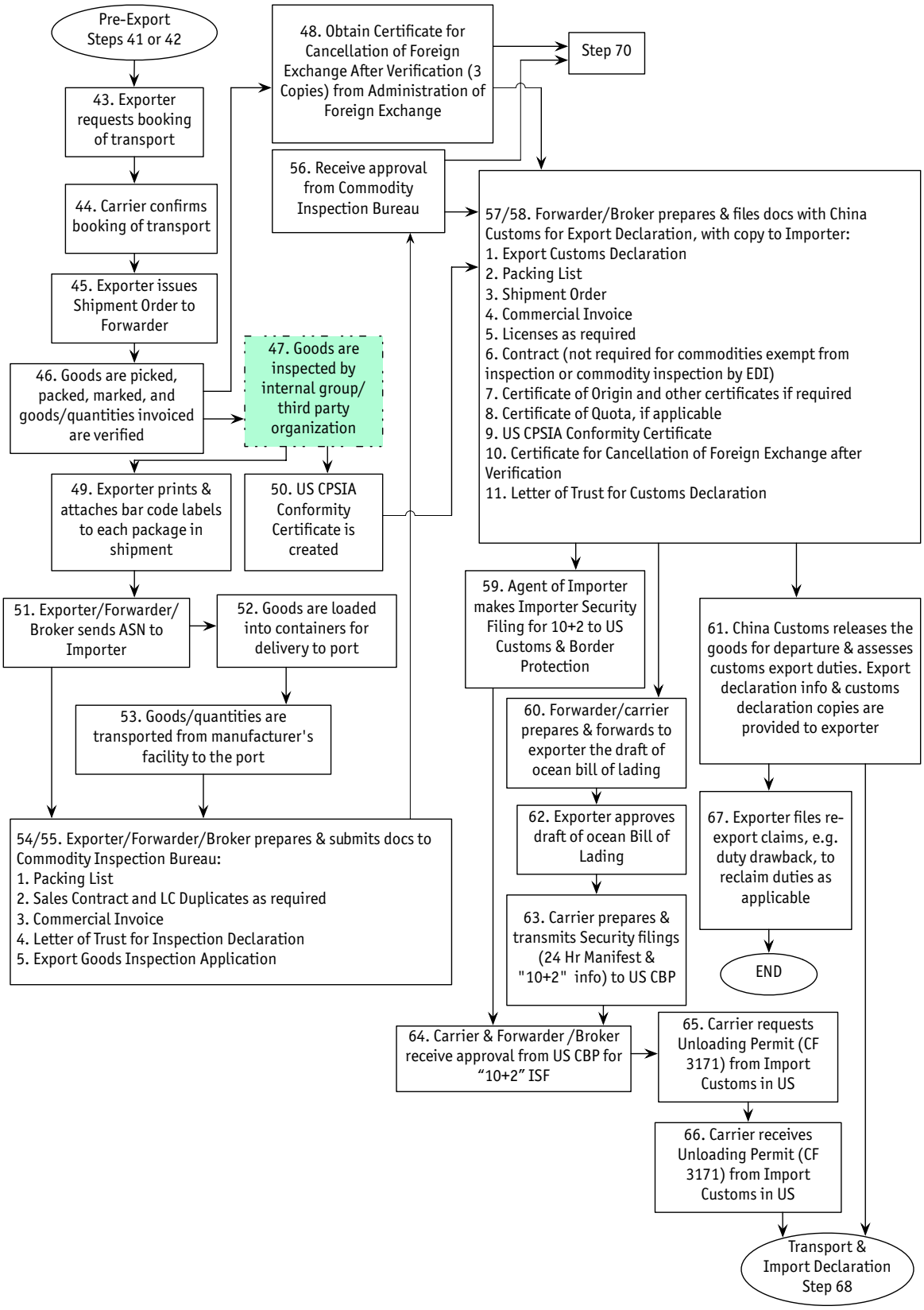


Figure 3: STPM Flowcharts: Transport and Import Declaration

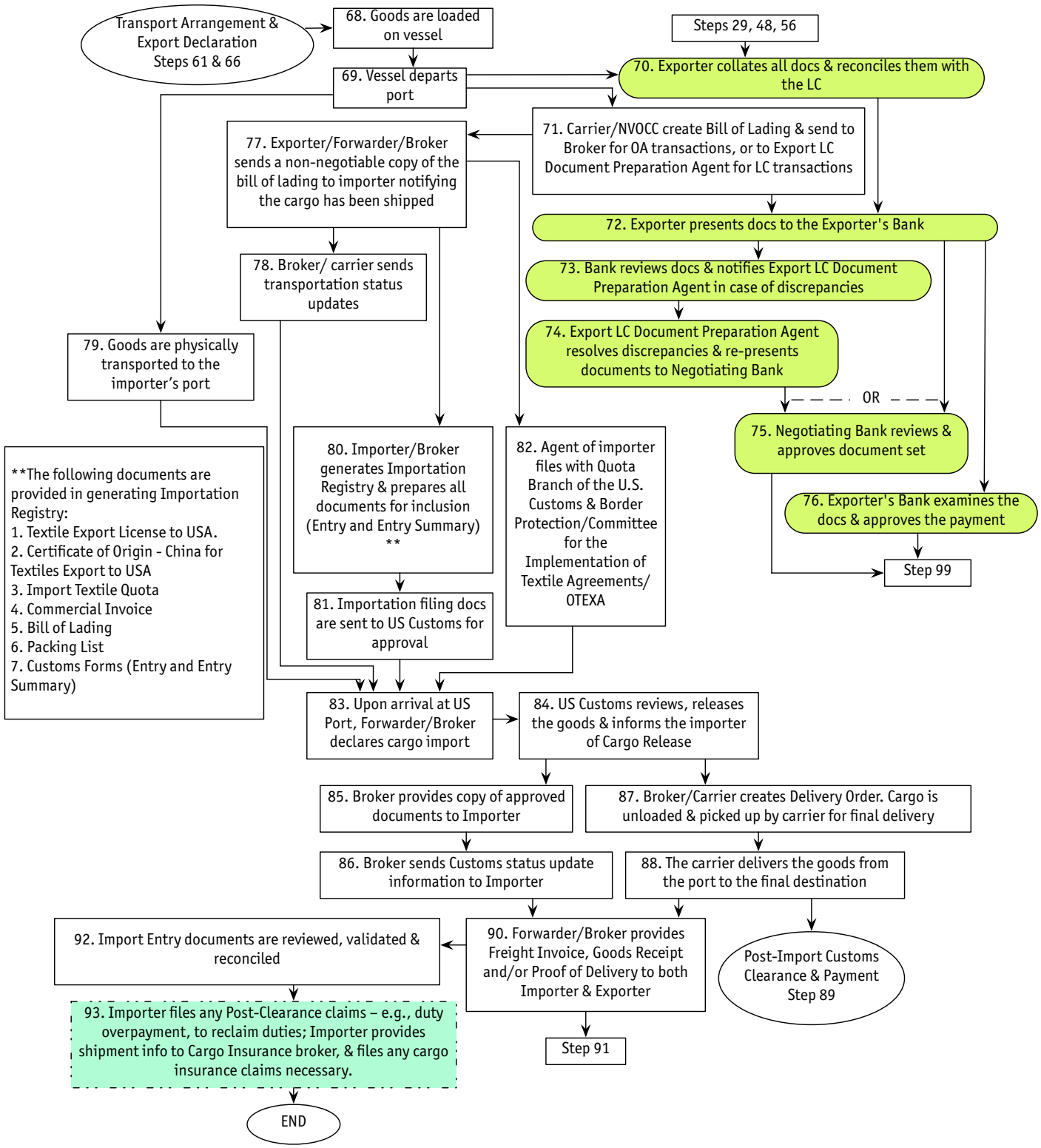
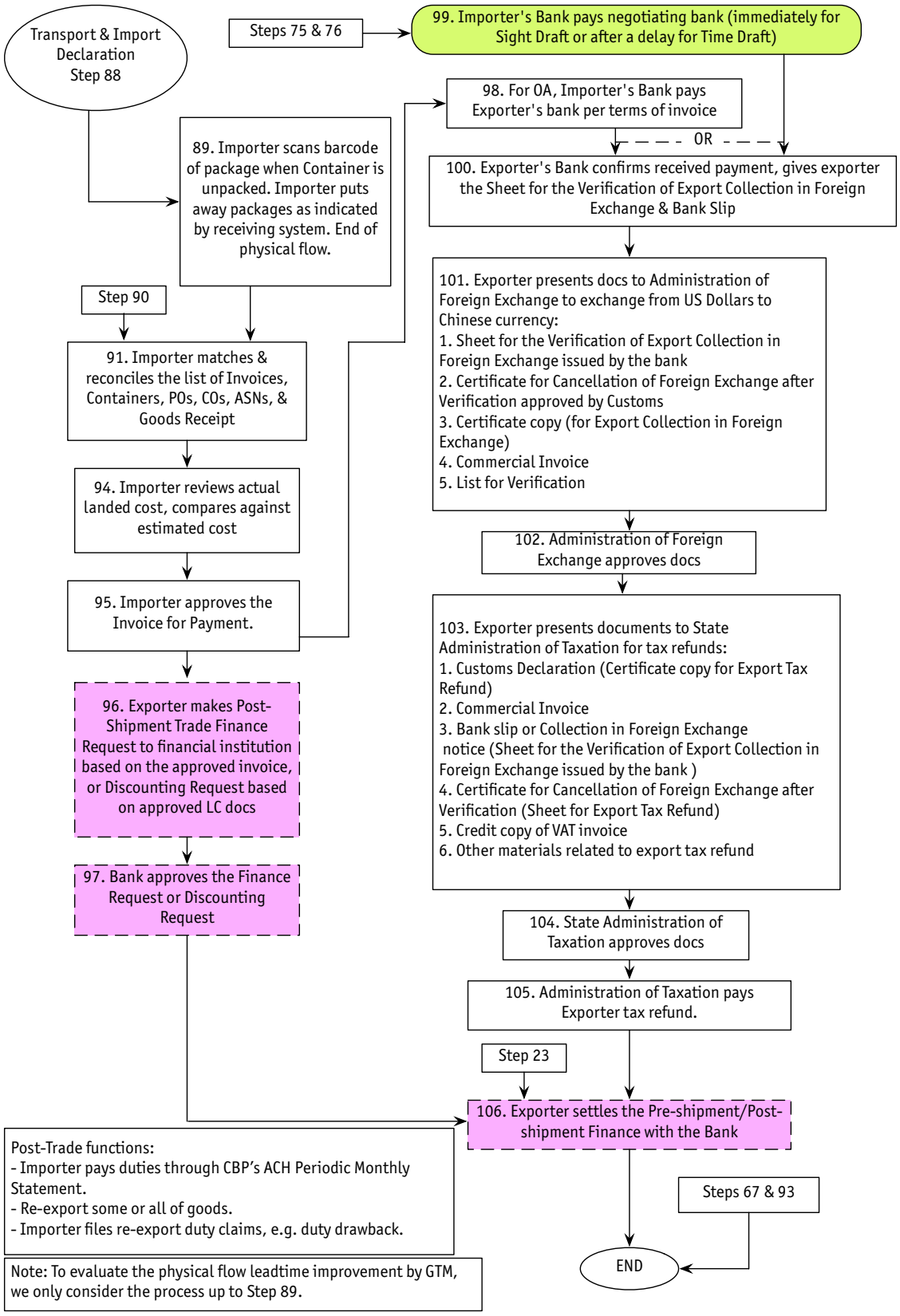


Figure 3: STPM Flowcharts: Post-Import Customs Clearance and Payment



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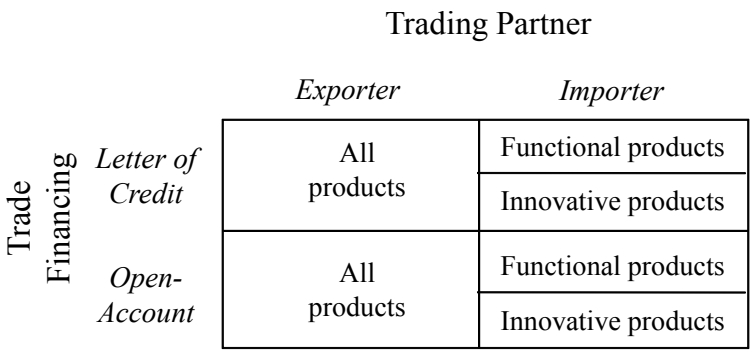
3. Modeling the Benefits of IT-Enabled GTM Technologies

In section 2, we have seen how complex and involved the total cross border trade process is. Each process step incurs time and cost. The possibility of waiting for critical information or people resources, insufficient documentation, mistakes in processes, the need to rework, and the varying complexity of requirements – all of these can result in variability in the time and cost of these process steps. Any delay in a process that is on the critical path of the overall trade process could result in the delay of the cross border trade. Moreover, the duration of some of the process steps also could induce other costs to the exporter and importer (e.g., inventory holding cost).

The use of IT-Enabled GTM technologies can potentially reduce the average elapsed time and the variability of some of the process steps. Such reduction is a result of a less error-prone process, ready availability of necessary information, elimination of the need for rework, faster processing time due to automation and digitization, and the corresponding potential shorter waiting time. Such improvements can have direct benefits in the form of lower costs – reduced direct costs due to less labor required and reduced penalties linked to errors. But they can also generate greater benefits in the form of improved business performance. For example, as the total trade process time improves, both importers and exporters can benefit from reduced inventory, faster response time, and greater flexibility. To assess the total benefits of IT-Enabled GTM improvements, we have created models to quantify these potential values.

There are multiple types of modeling scenarios that we need to capture in our analysis, and each scenario would require different ways to characterize the benefits and values of IT-Enabled GTM. First, the models for exporters and importers are clearly different. Second, the way trade finance is conducted could also affect the benefits (e.g., the inventory liability, the cash flows, loan payments and the opportunity costs of capital). We examined two typical types of trade financing: Letter of Credit (LC) and Open Account (OA). Third, there are different types of products which could have different order processes and inventory implications, ranging from products with short product life cycles and selling seasons, to products that are close to commodities with long product life cycles (so-called "evergreen" products). Fisher (1997)[21] broadly classified products into what he called "Innovative" and "Functional" products, corresponding to the short life cycle products and evergreens respectively. We modeled both types of products explicitly, and examined an importer who may have a combination of Innovative and Functional products in its portfolio. The following figure describes the multiple classes of models that we have developed to assess the values and benefits of IT-Enabled GTM.

Figure 4. Types of Models



Below, we describe how these models are developed.

21 Fisher, M., "What is the Right Supply Chain for Your Product" Harvard Business Review, March-April 1997, 105-116.

Exporter Model

For the exporter, we model the benefits of IT-Enabled GTM along multiple dimensions.

1. *Inventory holding cost.* An exporter builds inventory in its manufacturing process, ships the products from one country to another, holds inventory while the products are in transit, depending on invoice terms, and proceeds through customs and other border-crossing processes (at both the outgoing country border and the incoming country border), and distributes the product to the importer's destination. Any reduction in the total lead time would result in savings in non-capital inventory holding costs, such as warehousing, obsolescence, pilferage, damage, insurance, taxes, and other administrative costs.
2. *Financing cost*. There are three main categories of financing costs for exporters:
   (i) Manufacture-to-Invoice (M2I) Cycle. An exporter often needs to use bank loans to finance the manufacturing of the products, and so would incur loan costs in the manufacturing to invoice (M2I) cycle. Reduction of the M2I cycle clearly reduces loan costs.
   (ii) Days Sales Outstanding (DSO). Once an invoice is sent, until payment is collected from the customer, there are financial costs during this period of days sales outstanding. Here, reduction in time could result in lower loan costs incurred, as well as the ability of the exporter to use the proceeds from funds collected earlier, after paying off the outstanding loan, to earn income equal to the opportunity cost of capital for the exporter.
   (iii) Receivables Financing (also called Payables Discounting or Reverse Factoring). Finally, IT-Enabled GTM could enable the exporter to obtain receivable financing savings. Receivable Financing programs connect buyers, suppliers and financial institutions together in contractual relationships that enable suppliers to leverage the stronger credit ratings of buyers to obtain lower loan rates than they would obtain on their own, given their often smaller size and more limited credit market access. Here, with accurate monitoring, information availability, and contractual agreements established between importers, exporters and financial institutions, the exporter can obtain reduced loan interest rates, thereby lowering the overall costs for the supply chain. The reduced loan interest costs constitute the receivable financing savings, and such savings can be shared among the exporter, the importer, and the banks, or it can be shared in indirect ways, such as extending the payables terms for the buyer. Exporters also benefit by having greater certainty of cash flow, as well as mitigation of the risk of buyer default.
3. *Workload savings*. IT-Enabled GTM results in trade process steps that require fewer labor hours to complete, due to automation, ease of accessing the necessary information, fewer errors and rework, and reduced verification and validation work. We model such reduction by examining the reduced work involved, and translate it into the reduced number of Full-Time-Equivalents (FTEs). Naturally, the value of such reduction depends on the wage rate of the exporter's geography.
4. *Tax rebates*. Without IT-Enabled GTM, tax rebates are often left unclaimed, either because they are not tracked, or due to missing information. IT-Enabled GTM ensures that the full tax rebates are claimed in a timely manner.
5. *Cost of expediting.* Exporters sometimes have to expedite the shipment of their products if the lead times become too long to meet their promised commitments to customers. With IT-Enabled GTM, the probability of having to expedite is lower. The incremental cost due to expediting shipments constitutes the cost of expediting.

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6. *Fines*. IT-Enabled GTM could generate savings from reduction in fines such as demurrage, detention, and governmental fines for compliance or security-related issues, due to more accurate information and control[22].

Importer Model

1. *Procurement costs, lost sales and markdown revenue (for Innovative products)*. For Innovative products with short product life cycles (such as a season), an importer has to place an order with the exporter (build to order, or BTO) well in advance of the selling season, based on a newsvendor-like analysis of the forecasted demand distribution, the cost of overage (procurement cost less markdown price) and the cost of underage (selling price less procurement cost). With IT-Enabled GTM, the lead time is shorter, leading to a reduction of the standard deviation of the forecasted demand distribution. The lead time may depend on whether LC or OA is used by the exporter for trade financing. This lead time reduction could result in the importer's newsvendor order quantity being smaller than before, thereby reducing the procurement cost. Moreover, it also leads to reduced shortages, which translates into less lost sales revenue. But it could also lead to reduced excess inventory, which means that there would be fewer products with markdown prices on sale. These net benefits can all be captured using variations of the basic newsvendor model.
2. *Inventory costs (for Functional products)*. Functional products have long product life cycles, and so the importer would need to reorder from the exporter on a periodic basis to replenish its stock. The exporter in this case would build such products to stock, or BTS. Here, the importer would need to carry safety stock and cycle stock. With shortened lead time under IT-Enabled GTM, the safety stock required would be smaller, leading to savings in inventory costs. Note that, under LC and OA, the resulting lead times under GTM could be different. Hence, the inventory savings for LC and OA could be different.
3. *Inventory financing costs*. Just as in the case of the exporter, if the exporter and the importer can implement a receivables financing program using IT-Enabled GTM, then there would be some savings that would accrue to the importer.
4. *Logistics costs*. IE-Enabled GTM reduces the work involved in processing transactions, such as the automated collection, reconciliation and distribution of customs clearance data which enables importers to reduce the fees paid to brokers for handling shipments. In addition, with IT-Enabled GTM, cargo insurance premiums may be lowered in the long run due to improved information about the risk of shipments.
5. *Fines*. IT-Enabled GTM could generate savings from reduction in fines such as demurrage, detention, and governmental fines for security-related issues, due to more accurate information and control[23].
6. *Workload savings*. Similar to the case of the exporter, there will be savings to the importer due to the reduction in the amount of work required with IT-Enabled GTM. The savings, in the form of FTE reduction, could be different depending on LC versus OA.
7. *Customs classification accuracy*. In importing products, the importer has to classify the products correctly and pay the correct amount of customs duties. Without IT-Enabled GTM, errors in the

22 In our data analysis of Section 4, we were not able to estimate the savings from reductions in fines, as we do not have a reliable estimate of such costs. As a result, our estimated costs and savings in this category in Section 4 are conservative.

23 In our data analysis of Section 4, we were not able to estimate the savings from reductions in fines, as we do not have a reliable estimate of such costs. As a result, our estimated costs and savings in this category in Section 4 are conservative.

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classification could occur at a higher rate, which means that the importer could overpay duties; and at the same time, under occasional audits by the government, the importer may have to pay fines to the government for misclassifications that led to underpayment of duties. The increased accuracy of IT-Enabled GTM could reduce both the unnecessary overpayment and the fines due to underpayment.

The benefits models require significant data inputs. For example, task times for each of the sub-processes in the trade process with and without IT-Enabled GTM are required. These were obtained from our interviews and surveys with industry experts. We also need to know the actual labor hours required in each task (in addition to the total elapsed time), which is not readily available. However, with some reasonable assumptions, we were able to derive a lower bound of the savings in labor hours due to IT-Enabled GTM as a function of the reduction in elapsed times. There are many other data parameters required, such as the coefficient of variation of demand, reliability of compliance to duty payment, fines for non-compliance, physical inventory holding cost rate, bank loan interest rate, opportunity cost of capital, tax rebates rates, cargo insurance premium rates, gross margins of exporters and importers, markdown prices relative to original sales prices at the importers, the relative size of Functional and Innovative products at the importers, and the percentage split of OA versus LC in trade.

Most of these data can also be readily obtained from our expert inputs, but there are parameters in which the expert inputs or inputs from the published literature vary. One would have to perform sensitivity analysis around such data inputs. The critical ones for sensitivity analysis include:

- Percentage of trade conducted under OA versus LC
- Percentage of Innovative/Functional products at an importer
- Coefficient of variation of demand at the importer for both Innovative and Functional products
- Probability of stockout for Innovative products at the importer
- Reduction of standard deviation of demand for Innovative products as a function of lead time reduction.

In our models to assess the benefits of IT-Enabled GTM, we have assumed that the importer did not change its sourcing network. In the long run, however, the more accurate estimates of total landed costs, a deeper understanding of true duty rates, and the clear picture of how to leverage free trade zones as well as other regional trade agreements, can enable the importer to change its sourcing strategies. The new sourcing strategy can result in an optimized supply network, leading to even higher savings than we have modeled here. In our current models, we have not explicitly quantified the value of supply network optimization. We will discuss briefly what the potential of such benefits could be in a later section.

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4: Analysis Using the Process Model

4.1 Data Collection

Once the process model was finalized, we distributed it to experts from both the USA and China who were familiar with the China-US trade lane for the apparel sector. The USA experts included experts from TradeBeam Inc., Axxess International, select industry experts and also managers from major US retailers who import significant volumes of apparel from China. On the China side, we collected relevant data from employees of TradeBeam China and their extended network based in Beijing who were familiar with apparel exports from China to the US, as well as major apparel exporters.

We divided our 106 process steps into two categories: the steps that took place in China, and the steps that were related to or took place in the US. We then used the corresponding sources of experts from each side to calibrate our Process Steps Table (see Appendix 2). For each process step we asked experts to assess two things: (1) the current time to perform the step under normal conditions; and (2) the time to perform the step if the process was "IT-Enabled".

The STPM model was used to track various performance metrics for planning, control and benchmarking/assessment. For example, to monitor total lead time from ordering to receipt of goods, one would calculate how long it took to complete the relevant steps (i.e., steps 9 to 89).

Once data had been obtained on estimated elapsed times for each process step under both current and IT-Enabled scenarios, a Critical Path Analysis was performed to determine the reduced set of process steps that form the so-called Critical Path (and correspondingly, the set of process steps that were not on the critical path) for various important process durations such as the Manufacture to Invoice Cycle, Days Sales Outstanding, and the Order to Receipt Cycle. The Critical Path contains the subset of process steps that determine the total elapsed time to complete all steps. Reductions in activity times (by IT or other means) for the steps along the Critical Path will correspondingly result in reductions in total elapsed time for all steps, up to the point where some other non-critical path becomes critical. In this manner, we can accurately reflect the impact of reductions in time to perform process steps on the total time to accomplish all the steps for the stated global trade activity, even though in certain cases process steps can be done in parallel.

We also used Critical Path Analysis to estimate the benefits as described in Section 3. A detailed description of how the benefits of IT-Enablement can be obtained, based on the modeling framework in Section 3, is provided in Appendix 3.

We divided our results into those affecting the Exporter, those affecting the Importer, and those affecting Supply Chain Intermediaries such as brokers, freight forwarders, etc. We further partitioned our results into those situations where Open Account (OA) was used versus Letter of Credit (LC). We will present our main results using the Open Account assumption; the Letter of Credit results did not vary in any unexpected way and those results are contained in Appendix 4.

Before we present and discuss the results, it is important to note that at various stages in the data collection process we performed validity checks to ensure that data was grounded in real-world practices. We did this in three ways:

1. we asked multiple subject experts the same questions regarding process step data and compared their answers;

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2. we obtained some data from actual supply chains on various measures of interest (e.g. the actual shipping time from a China port to a US port); and
3. we used secondary data such as that referenced in published papers for some portions of the benefit computations described in Appendix 3.

4.2 Results

Parameter Default Values

As mentioned in section 3, we needed to perform sensitivity analysis for several model parameters because we obtained various inputs regarding the estimation of these parameters from different experts. In this section, we present the results of the benefits of IT-Enablement based on the default values of these parameters[21]. These default values were suggested by experts as the most reasonable (and usually conservative) estimates. They are as follows:

- Percentage of trade conducted under OA: 80%
- Percentage of Innovative products at an importer: 50%
- Coefficient of variation of demand for Innovative products: 1/3
- Coefficient of variation of weekly demand for Functional products: 0.75
- Probability of stockout for Innovative products: 25% (corresponding to a fill rate of 95%)
- Gross margin for Innovative products: 50%

Exporter Benefits

We assumed for illustration purposes that an exporter would export $100 Million worth of apparel annually from China to the US.

Table 1 that follows contains our estimated benefits of IT-Enabled GTM for exporters. The table columns include the following:

- the specific metrics used;
- the value drivers for that metric;
- estimated times in business days under both "Non-IT-GTM" (meaning not IT-Enabled) and under "IT-GTM" (meaning IT-Enabled);
- the time difference in business days; and
- dollar values under either a conservative estimate of the values of IT-Enablement or an aggressive estimate of such value[22].

For example, an important benefit to exporters under IT-GTM is a reduction in pipeline inventory from 83 days under current procedures to 68 days under IT-GTM, or a reduction in pipeline inventory of 15 days' supply. Then multiplying a daily inventory holding cost (non-capital costs only; capital costs are charged separately) by the time difference of

21 Results of sensitivity analysis are available from the authors upon request.

22 Some examples of "aggressive" cases include: higher exporter borrowing rate at 15% (for a small and medium-sized exporter) instead of 9% (for an established, large exporter); exporter's tax rebate being increased by 15% with IT-GTM versus 10%; for the importer's cargo insurance savings, IT-GTM enables a reduction of $0.02 per $100 value of cargo import, versus zero; and a greater improvement of forecast standard deviation as a result of lead time reduction under IT-GTM.

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15 days produces an estimated saving of $367,200 to the exporter due to this reduction in pipeline inventory.

Benefits for exporters:

- Total Annual Benefits: $1.7 Million to $2.4 Million
- Benefits as a percentage of Annual Sales: 1.7% to 2.4%
- Benefits as a percentage of Profit: 28% to 40% increase in profit (assuming initial profit = 6% of sales)

Importer Benefits

For importers, we also assumed an importer imports $100 Million in apparel per year for illustration purpose; note this dollar figure represents purchased amount valued at cost and not at retail prices. Under standard markups, this amount of material imported would be associated with a significantly higher amount of retail sales (roughly $162 million in sales revenue, based on a weighted average of Innovative products with a gross margin of 50% and Functional products with a gross margin of 35%).

Table 2 below contains our estimated benefits of IT-Enabled GTM for importers. As in Table 1, the table columns include the following:

- the specific metrics used;
- the value drivers for that metric;
- estimated times in business days under both "non-IT-GTM" (meaning not IT-Enabled) and under IT-GTM (meaning IT-Enabled);
- the time difference in business days; and
- dollar values under either a conservative estimate of the values of IT-Enablement or an aggressive estimate of such value[23].

We have modeled separately the benefits of a reduced order-to-receipt cycle for importers under two different conditions: products that are Innovative and built-to-order (BTO), versus products that are Functional and built-to-stock (BTS). Our model allows for varying percentages of an importer's business to be Innovative vs. Functional. If 50% of the importer's business is with Innovative garments, then the annual benefits due to GTM-enablement under a conservative and an aggressive estimate are about $933,653 and $3,547,656, respectively. Converting to a percentage of retail sales, the benefits are 0.6% and 2.2% of retail sales, respectively. Again assuming typical profit margins are in the range of 6% for importers, the profit increase is 10% and 37%, respectively.

Benefits for Importers:

- Total Annual Benefits: $0.9 Million to $3.5 Million
- Benefits as a percentage of Annual Retail Sales: 0.6% to 2.2%
- Benefits as a percentage of Profit: 10% to 37% increase in profit (assuming initial profit = 6% of sales)

Intermediary Benefits

We have considered two types of benefits for the supply chain intermediaries: workload savings, and receivable financing savings for financial institutions. Table 3 gives details on the drivers of the benefits from IT-Enablement under Open Account for the Supply Chain Intermediaries.

23 See Footnote 11.

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Table 1. Benefits of IT-Enablement for Exporter under Open Account.

Exporter-OA Benefits							
Metrics	Value Driver	Non-IT GTM	IT-GTM	Diff.	Values (in US$)		Note
					Conservative	Aggressive	
Order to Receipt Cycle	Qualitative Competitive Differentiator	104	68	36			Qualitative benefit.
Pipeline inventory	Physical Inventory Holding Cost (daily) = Hi	83	68	15	$251,500	$251,500	Key components of non-capital inventory holding cost include: warehousing, obsolescence, pilferage, damage, insurance, taxes, administration and other. Assume: Hi = $16,767.
Order to Cash Cycle		101	71	32			See C2C Cycle.
Cash to Cash (C2C) Cycle		87	71	18			This is the sum of M2I and DSO
Manufacture to Invoice (M2I) Cycle	Inventory Value in Cost Dollars = Ci Loan Rate (annual) = g	45	41	4	$75,452	$125,753	Conservative Case: g = r1 = r2 = 9%, F = 50% Aggressive Case: g = 15%, r1 = 11%, r2 = 9%, F = 100% Assume: Ci = $76.5M; Si = $100M; 365 days per year; Pe = 25% Loan rates vary over time. While the above rates are high compared to actual rates at the time of publishing this report, the absolute numbers are not as important as the difference between rates (i.e., between g, r1 and r2).
Days Sales Outstanding (DSO)	Inventory Value in Sales Dollars (annual) = Si Loan Rate (annual) = g Investment Interest Rate (annual) = r	42	30	12	$295,890	$446,795	
Receivables Financing Savings	Inventory Value in Cost Dollars (annual) = Ci Basic Loan Rate (annual) = g; PO Triggered Loan Rate (annual) = r1; Invoice Approval Triggered Loan Rate (annual) = r2; Share for Exporter = Pe; Fraction of Goods for which Exporter obtains finance=F				$0	$180,247	

Exporter-OA Benefits (Continued)							
Metrics	**Value Driver**	**Non-IT-GTM**	**IT-GTM**	**Diff.**	**Values (in US$)**		**Note**
					Conservative	**Aggressive**	
Tax Rebate	Amount of Rebate = Ar	100%	115%	15%	$560,000	$840,000	Assume: Ar = 5.6%*$100M = $5.6M; Conservative case: GTM brings 10% increase; Aggressive case: GTM brings 15% increase.
Invoice Deductions	Amount of deductions correctly identified						Net cost to the supply chain is zero.
Duty Drawback	Amount of Drawback = Ad				$0	$0	No duties for importing raw materials if using "processing Quota".
Workload Savings	Annual Loaded Cost per FTE = Cf	48	9	1-9/48 = 81%	$425,250	$425,250	The reduction in process duration provides a lower bound to the actual workload saving. See Appendix 3. Assume: Cf = $25,000; Export FTE = 21.
Fines (Export Compliance)	Amount of Fines						Reliable data unavailable.
Expediting	Cost of Expediting	0.30%	0.18%	0.12%	$120,000	$120,000	Assume cost of expediting is 0.3% of total export value. Assume GTM results in a 40% reduction in cost of expediting.
Reliability	Qualitative Competitive Differentiator						Require more data for estimation.
				Subtotal	**$1,728,092**	**$2,389,545**	

Table 2. Benefits of IT-Enablement for Importer under Open Account.

Importer-OA Benefits							
Metrics	Value Driver	Non-IT-GTM	IT-GTM	Diff.	Values (in US$)		Note
					Conservative	Aggressive	
Order to Receipt Cycle (BTO)	Reduced procurement cost	104	68	36	$1,092,352	$7,282,348	**Assumptions:** - C = $100M import value generates $200M retail values. - Normal demand with coefficient of variation = 1/3; Pr (Stockout) = 0.25; - Demand standard deviation improvement by shortening O2R cycle = 6% in conservative case and 40% in aggressive case.
	Increased sales (reduced lost sales)	104	68	36	$483,117	$3,220,782	
	Reduced markdowns / disposals	104	68	36	- $889,274	-$5,928,493	
	Inventory Holding Cost = Hi				$102,955	$681,532	Weekly Hi = 17%/50
Order to Receipt Cycle (BTS)	Shorter lead time	104	68	36			See Safety Stock.
Safety Stock	Inventory Holding Cost = Hi;	104	68	36	$208,820	$208,820	Assume: Hi = 17%; Coefficient of Weekly Demand = 0.75.
Receivables Financing Savings	Same as the "Receivables Financing Savings" metric in Table 1; Share for Importer = Pi				$0	$360,493	Same as the "Receivables Financing Savings" metric in Table 1; Pi = 50%
Cargo Insurance Savings	Insurance Rate = I				$0	$20,000	Aggressive Case: lower cargo insurance rates; Importer pays the Cargo Insurance (FCA Factory INCOTERMS). I = $0.08 per $100 value; in the aggressive case, I = $0.06 per $100 value.
Invoice Deductions	Amount of deductions correctly identified						Net cost to the supply chain is zero.
Duty Drawback	Amount of drawback	100%	150%		$0	$0	Does not apply to apparel and other retail sales.

Importer-OA Benefits (Continued)							
Metrics	**Value Driver**	**Non-IT-GTM**	**IT-GTM**	**Diff.**	**Values (in US$)**		**Note**
					Conservative	**Aggressive**	
Expediting	Cost of expediting				$0	$0	Assume Exporter is responsible for all expediting costs.
Fines (Demurrage, Detention, Compliance, 10+2)	Amount of fines						
Reduced Trading Partner Fees (Lower broker fees)	Broker fee per shipment = Cb				$53,000	$53,000	Assume: Annual number of shipments = 1333; Cb = $100 without GTM and $60 with GTM.
Workload Savings	Annual loaded cost per FTE = Cf	9	1	1-1/9 = 89%	$320,400	$320,400	Assume: Cf = $90,000; Import FTE = 4.
Classification & Customs Processing	Accuracy of duties paid: Customs Audit Fines and Overpayment				$61,267	$61,267	**For customs audit fines:** Without GTM, an importer with an annual import size of $100M needs to pay an Importer Focused Assessment penalty of $0.07M every 4 years. With GTM, this penalty can be completely avoided. **For overpayment:** GTM can generate a reduction in overpayment of duties due to misclassification that is equal to 0.027% of sales.
Sourcing Efficiency	Accuracy of landed cost early in process						See Appendix 3.
				Subtotal	**$933,653**	**$3,547,656**	

Table 3. Benefits of IT-Enablement for Supply Chain Intermediaries under Open Account

Supply Chain Intermediaries-OA Benefits						
Metrics	**Value Driver**	**Non-IT-GTM**	**IT-GTM**	**Diff.**	**Values (in US$)**	**Note**
Workload Savings (Export Intermediaries)	Annual Loaded Cost per FTE = Cf	37	23	1-23/37 = 38%	3.04% of revenue ($152,000)	We use the same method as for Exporter/Importer to estimate workload savings for Export/Import Intermediaries. Assume: Cf for export FTE = $25,000; Cf for import FTE = $90,000; Export intermediary FTE = 16 (OA) and 17 (LC); Import intermediary FTE = 7 (both OA and LC); Revenue for a typical trading intermediary = $5M. Assume Export/Import Intermediary FTEs are proportional to the process duration compared to Export/Import FTEs. See Appendix 3.
Workload Savings (Import Intermediaries)	Annual Loaded Cost per FTE = Cf	16	9	1-9/16 = 44%	5.54% of revenue ($272,000)	
Receivables Financing Savings (Bank Intermediaries)	Same as the "Receivables Financing Savings" metric in Table 1; Share for Bank = Pb				$180,247	Same as the "Receivables Financing Savings" metric in Table 1; Pb = 25%
				Subtotal	**$604,247**	

Sensitivity Analysis

Figures 5 and 6 below show the sensitivity of the benefits to the exporter and the importer respectively (as a percentage of sales). We see in Figure 5 that the exporter benefits are somewhat sensitive to the percentage of aggressive vs. conservative estimates[24] and not at all sensitive to the % transactions using OA vs. LC. In Figure 6, however, the benefits to the importer are quite sensitive to assumed parameter values on the coefficient of variation of demand for Innovative products, the probability of stockout for Innovative products, the percentage of sales from Innovative products, the percentage of aggressive vs. conservative estimates used, and the gross margin for innovative products.

Figure 5. IT-Enabled GTM Benefits (As % of Sales) - Exporter

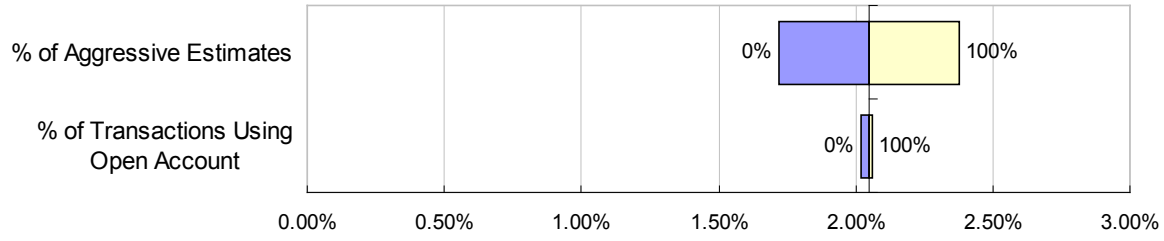
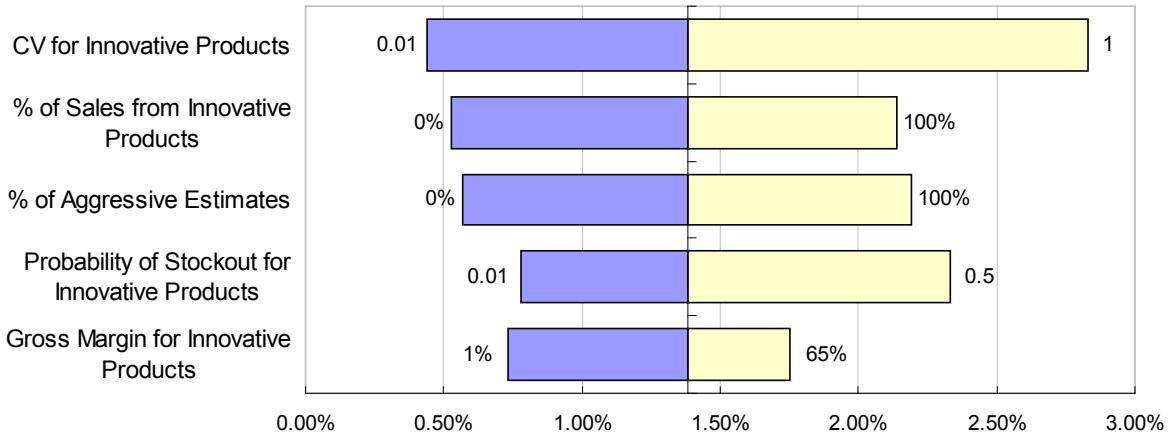


Figure 6. IT-Enabled GTM Benefits (As % of Sales) - Importer



4.3. Extrapolation of Results

In this report we have outlined the benefits that importers and exporters may gain by applying IT-Enabled GTM technologies to their cross border commercial transactions, using the specific case of an exporter shipping apparel products via ocean from China to an importer in the United States.

In order to estimate the opportunity for all importers and exporters worldwide, we must extrapolate from the specific case to global data. There are significant differences across industries and countries that we should keep in mind when making this extrapolation.

24 The percentage of aggressive estimates refers to the weight that we applied to the aggressive estimates of the values (one minus that percentage being the weight applied to the conservative estimates).

- Cross-industry differences:
  - » Industries are subject to different regulation, duties and taxes;
  - » There are variable levels of cross border trade across industries, and therefore more or less opportunity to benefit from IT-Enabled GTM;
  - » Products in different industries will be shipped via different modes of transit, and will therefore present different levels of benefit;
  - » Some industries may value quality, service or other product value factors to a greater extent than cost, so that savings areas such as safety stock reduction may be less of an opportunity.
- Geographical differences: Bilateral trade between different countries has different levels of regulation, duties, and other requirements. As a result, companies with different import and export trade lanes may experience significantly different results.

While there are differences across industries and countries, there are also many common challenges and opportunities that companies face with global trade:

- Many government regulations apply across industries with common standards for a given country or group of trading countries:
  - » Security programs such as the Customs-Trade Partnership Against Terrorism (C-TPAT) program in the US and similar programs elsewhere such as the Authorized Economic Operator (AEO) program in Europe;
  - » Customs regulations for import and export filings are common for all importers and exporters for a given country;
  - » Classification processes;
  - » Trade Finance processes such as Letter of Credit management.
- Opportunities to apply new technology and accompanying business process improvement are available to companies in all industries in all geographies, regardless of company size.

These common challenges and opportunities make the estimation of the global opportunity a worthwhile exercise in order to understand the general magnitude of the opportunity to be gained from IT-Enabled GTM.

Global Trade Opportunity

Based on our estimation from the STPM, the opportunity that importers and exporters might derive from IT-Enabled GTM is as follows:

Table 4: IT-Enabled GTM Benefit Summary

Category	Scope	Revenues (in $ Billions)	Savings from IT-Enabled GTM (in $ Billions)	
			Conservative	Aggressive
Exports	World Merchandise 2007	$13,570	$194	$263
Imports	World Merchandise 2007	$13,940	$52	$109
Combined	Total World Merchandise		$246	372

Sources: World Trade Report, 08, WTO, STPM Savings Estimates

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Note that some of the benefits noted earlier would not extrapolate to total worldwide trade; e.g., certain gains to one party may be at the expense of its "competitors", and thus extrapolation of those gains worldwide would not be appropriate. After removing the benefit metrics that were not appropriate for extrapolation, our revised estimates of benefits to exporters reduce to 1.43% and 1.94% (as a percentage of sales) under a conservative and an aggressive assumption, respectively. For importers, the revised estimates of benefits reduce to 0.37% and 0.78% under a conservative and an aggressive assumption, respectively.[25] These values were used to generate the results in Table 4.

Additional IT-Enabled GTM Benefits

For the STPM, we have focused our analysis on process steps that occur in the course of a typical transaction between an importer and exporter. Within the context of a transaction, there are some categories for which we have not estimated benefits in this study because we were not able to obtain reliable savings estimates, such as the amount of fines paid out in areas such as demurrage, detention, and government fines. The exclusion of these benefit estimates serves to make our analysis more conservative than it would otherwise be.

In addition to these exclusions due to unavailability of data, we have excluded other aspects of IT-Enabled GTM that partially or completely occur outside the context of a transaction, such as shifting the mix of suppliers so as to minimize duty costs. Based on estimates from outside sources, we list below these key additional benefits that might accrue to companies applying IT-Enabled GTM technologies and process improvement to their operations in Table 5.

The benefits in Table 5 were extrapolated from findings in "5 Ways to Increase the Business Value of Trade Compliance," Aberdeen, 2007. This study estimated benefits in five sample corporations in different industries through application of global trade management technologies and best practices. We have taken these results, determined an average across the five companies, and applied this to a sample $1 billion revenue company, and to World Merchandise Imports.

Table 5: Additional Importer IT-Enabled GTM Benefits

Category	Estimated Savings ($)	
	$1 Billion Company	World Merchandise Imports
Sourcing Mix Shift with New Suppliers[15]	$ 968,750	$13.5 Billion
Sourcing Mix Shift with Existing Suppliers[16]	$2,343,750	$32.7 Billion
Foreign Trade Zones[17]	$ 265,625	$3.7 Billion
Transportation Management Systems[18]	$2,695,000	$37.6 Billion
Total	$6,273,125	$87.4 Billion
Percentage of Top-line Revenue	0.63%	0.63%

For benefits that may be derived through application of Transportation Management Systems (TMS), we have taken estimates of freight costs and insurance as a percentage of revenue from UNCTAD, as well as TMS savings estimates from industry analysts such as AMR.

25 See footnote 11 for explanation of the conservative and aggressive assumptions.
15 Aberdeen, 2007, extrapolated.
16 Aberdeen, 2007, extrapolated.
17 Aberdeen, 2007, extrapolated.
18 AMR Research, 2007, and UNCTAD, 2001, extrapolated.

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The benefit categories noted above demonstrate significant savings opportunities worthy of further study. In some cases, as with duty relief programs such as Foreign Trade Zones or Bonded Warehouses, there may be significant upside for companies in industries where such solutions are applicable.

It should be noted that these additional IT-Enabled GTM benefits are potential opportunities with an upper bound limit within an industry or product area, in that they are more prone to being prevented from being implemented by other factors not having to do with cost, such as product type, product quality or customer service requirements. The benefits we have directly measured in the STPM model, on the other hand, may be more easily realizable across industries.

5. Other Uses of the Model

5.1. Government Policy Impact Management

Corporations must monitor government and multi-lateral organization policy changes on a continuous basis to determine if there are potential negative impacts or positive opportunities for their existing operations or planned projects. Government-level policy changes can cause changes to the business value chain at either the strategic or tactical level. A high-level policy change, for example, could provide new incentives causing a corporation to redesign its global multi-tiered network of manufacturing facilities; a tactical policy change may simply require a company to add a single step to its existing supply chain operations.

The STPM highlights "Government Policy Sensitive Steps" in the supply chain where government policy changes may have significant impact. By proactively monitoring and managing these policy-sensitive processes, companies can build resiliency into their business operations.

There are several key categories of governmental policy that corporations must take into account to optimize their business value chains (also known as supply chain network design.[21]

Tariff-based Trade Restriction and Promotion Programs

Import Tariffs. The most significant restrictions on global trade are import tariffs. Since the 1950s, tariff barriers have started to become less of an obstacle, on average, through the emergence of free trade agreements. This trend is evidenced by the fact that global average duty rates have decreased from almost 30% in 1983 to 9% by 2003[22]. While this trend has benefited global productivity on the whole, there are still many individual countries and industries with high tariff rates.

Due to the inability to finalize the WTO Doha Round of trade negotiations, and a consistent global movement to reduce trade barriers, there have been significant incentives for countries to conclude bilateral and multilateral Free Trade Agreements (as well as Economic Partnership Agreements, Investment Protection Agreements, Economic Cooperation Agreements, and other variations). As a result, there has been an explosion of agreements in the last 20 years as shown earlier in Figure 2. Currently, over 220 Free Trade Agreements are active, and another 100 are under negotiation or in earlier stages. All combined, there are over 700 initiatives concluded or underway.

Export Incentives. While imports are often taxed through tariffs, exports are generally left untaxed, except for taxing certain mineral, petroleum and agricultural products. Instead, exports are often promoted through subsidies. An example of export subsidies is China's policy of offering tax rebates on all imported material inputs into products that are ultimately exported.

The increased number of Free Trade Agreements (FTAs), export promotions and other arrangements presents opportunities to corporations to lower costs, but also presents the challenge of managing the increased complexity in a timely and efficient manner that delivers optimal value to the corporation.

Non-Tariff-based Restriction and Promotion Programs

FTAs themselves include many non-tariff barriers, such as environmental, quality or social regulations. In addition to

21 See "Renault's Logan Car: Managing Customs Duties for a Global Product," Stanford Graduate School of Business case GS-62, 4/29/08 by Hau L. Lee with Amanda Silverman.

22 The World Bank. World Development Indicators database, 2007.

FTAs, individual countries have many unilateral non-tariff barriers that corporations must take into account.

Regulatory Compliance. Compliance programs are a standard form of government regulation. Common categories of compliance include:

- Denied (or Restricted) Party Screening, a process which requires companies to check government lists of individuals and organizations with whom corporations are prevented from transacting;
- Licensing Management, a process which requires companies to identify government licensing requirements at the product level;
- Boycotts, which are designed to prevent companies from shipping to designated countries;
- Anti-Dumping and Countervailing Duty regulations, which are designed to compensate domestic industries against unfair competition through illegal pricing by levying duties on imports from countries or companies in violation of regulations.

Quotas. In the apparel industry, historically one of the most significant non-tariff restrictions has been the use of Quotas. Quotas restrict the quantity of products that can be imported into, or exported from a given country. Quotas were agreed per the Agreement on Textile and Clothing to be phased out over a ten year period from the date of the 1994 WTO Uruguay Round of trade negotiations, though relapses have occurred since the ten year period expired, such as renewed Quotas implemented between the US and China.

Duty Relief Programs. As duty payments can make up a significant cost of operations, companies stand to gain from deferring or avoiding duty payments altogether. Below is a listing of some key programs enabling companies to avoid or delay duty payments:

- Foreign Trade Zones (US), IMMEX - Maquiladoras (Mexico). These programs identify areas within a country where goods can be received and modified without payment of duties or going through customs entry procedures; if goods subsequently enter the country, they are subject to duty, but re-exported goods do not incur duties.
- Bonded Warehouses. These are areas where goods can be received without payment of duties. Goods must still be filed for customs entry. All developed economies have Bonded Warehouse programs.
- Duty Drawback (US), Australian Duty Reclaims, Canada Duty Recovery. Duty Recovery Programs enable companies to obtain rebates for duty paid on imported products that were used as material inputs into subsequently exported products. Unused Merchandise also applies for duty drawback.
- Inward Processing Relief/Outward Processing Relief. These programs enable companies to suspend or reclaim duty paid for non-EU inputs into products which are subsequently exported from the EU.

Security Programs. Post the 9/11 terrorist events in the US, governments have begun to implement measures to control and gain greater visibility into the flow of global trade in order to improve security.

The following are example programs that have been implemented, all of which impact corporations' global supply chain operations:

- Customs–Trade Partnership Against Terrorism (C-TPAT) (US), Authorized Economic Operator (Europe). Programs setting security standards for all participants in a company's supply chain, spanning across personnel, organizations, conveyances, containers, and processes. Companies that obtain certification from their governments receive benefits such as reduced cargo inspections and/or expedited customs processing.

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- Container Security Initiative/10+2 Importer Security Filing Initiative (US). The US programs similar programs planned in the EU and elsewhere require importers and logistics service providers to file documentation with the importing government prior to vessel departure from foreign ports.

Consumer Product Safety Programs. In response to product recalls and consumer concern about product safety, governments such as the US have implemented greater requirements for product quality testing and certification, as well as stricter regulations regarding allowable levels of harmful substances such as lead. Examples of such programs are the US Consumer Product Safety Improvement Act of 2008, which requires companies to test and provide certification documentation attesting to compliance with government safety standards.

5.2. Planning and Enablement Process Management

The STPM identifies the standard execution steps in global trade transactions, but there are also many activities that occur outside the context of transactions. These are activities that typically occur at regular intervals, and which enable and support downstream execution-level processes, such as the processing of multiple supply chain transactions over time.

Planning

Planning is the first step in all business processes, not only setting the foundation within sourcing, production and delivery processes, but also spanning across these processes to support the design and creation of a holistic business value chain. Globalization has made holistic business value chain design more complex. Companies that manage this complexity most effectively will be the most likely to succeed as globalization matures.

Following are key aspects of planning that will affect companies' global supply chains:

- Global Business Value Chain Design. With the proliferation of FTAs, there is a great variability of costs companies will incur based on where they choose to locate their manufacturing operations, where they perform assembly and sub-assembly, and from where they source their goods. As a result, companies stand to gain through Customs Engineering, the practice of modeling global manufacturing and sourcing operations to minimize duty and tax input costs. Other factors, such as labor rates, transportation rates and lead times, product quality, and country risk must also be considered to determine the optimal network of operations.
- Negotiation of Transportation and Warehousing Options. Transportation and Warehousing are key factors influencing the Global Business Value Chain. Companies must model their transportation and warehousing options based on market requirements. Options may be as simple as selecting modes of transportation and outsourced warehousing facilities, and as complicated as offering multiple consolidation or deconsolidation points, implementing foreign trade zones or bonded warehouses, offering flexible, modal diversion points, or offering multiple routing options.

Enablement

Enablement activities set up processes, tools, contracts or relationships that enable downstream execution processes. Key enablement activities include:

- Government Security Processes and Certifications (i.e., C-TPAT, AEO)
- Vendor Management Contracts, Processes and Relationships
- Trade Finance Contracts, Processes and Relationships

- Transportation Contracts, Processes and Relationships
- Foreign Trade Zone, Bonded Warehouse and other Duty Relief Program Contracts, Processes and Relationships
- Customs Brokerage and Forwarding Contracts, Processes and Relationships
- Quality Inspection Contracts, Processes and Relationship

Both Planning and Enablement are important global trade functions. IT-Enablement and optimization of these functions can deliver significant value. We have commented in section 4.3 on the potential opportunity that can be derived from IT-Enablement of some of these functions based on third party estimates. A deeper analysis of these functions is worthy of a follow on study.

6. Conclusion

While the level of global trade has reached historic proportions at the beginning of the 21st century, the maturity level of global trade processes and supporting skills, processes, and technologies is still relatively low compared with domestic equivalents. As a consequence, there are significant inefficiencies in the global supply chain.

In order to investigate the level of inefficiencies in global trade, and provide companies engaged in global trade with a framework for improving their global supply chains, we have developed a new, detailed process model for global trade management containing over 100 separate process steps. Our initial application is for apparel in the China-US trade lane. We have obtained estimates of both current process step times and reduced times due to IT-Enablement from knowledgeable sources both from the US and also several experts based in China.

Our process model was calibrated by trade experts from both the US and from China. Since some process steps could be performed in parallel, Critical Path Analysis was used to determine the current and potential times to perform various important tasks in global trade.

For exporters, key duration metrics are the Manufacture to Invoice Cycle and Days Sales Outstanding. For exporters key GTM IT-Enablement benefits also include reductions in pipeline (in-transit) inventory, tax rebates, workload reduction, savings due to receivables financing programs, and reduced expediting expenses.

For importers, our primary duration metric is the Order to Receipt Cycle. We also estimate importer savings from safety stock inventory reduction, receivables financing programs, reduced cargo insurance costs, reduced broker fees, workload automation, and benefits associated with improved goods classification and customs processing. In addition, we estimate IT-Enabled benefits accruing to Supply Chain Intermediaries (such as brokers and freight forwarders) using our methodology.

For an exporter, we estimate the annual benefits of IT-Enabled GTM to range from 1.7% to 2.4% of annual sales, depending on conservative or aggressive assumptions. For an importer, we estimate the annual benefits of IT-Enabled GTM to range from 0.6% to 2.2% of annual sales. Assuming net profit is approximately 6% of sales for both exporters and importers, these improvements range from a 28% to 40% increase in annual profit for exporters and a 10% to 37% increase in annual profit for importers. For both scenarios, we assumed a 50%/50% blend of Functional versus Innovative products; if one were to shift the blend to a higher percent of Innovative products, for which the margins are typically higher, the benefits would be even higher.

Although we focus specifically on the China – US trade lane and on apparel, the model is sufficiently general to be useful in many other global contexts.

As indicated above, companies stand to benefit significantly by improving their global trade processes, and by reviewing their entire business value chain from a strategic perspective with global trade in mind. Using the STPM as a framework specific to global trade, companies can follow traditional process improvement methodologies, including the following:

- Perform Business Process Re-Engineering.
- Model As-Is processes at a detailed level, with sequences, branches and dependencies, identifying bottlenecks and inefficiencies.

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- Design To-Be processes, making certain to put in place processes supporting efficient collaboration with a network of globally distributed trading partners, conducive to cross departmental, cross functional, and cross-geographical operations, and responsive to dynamic global trade regulations.
- Perform Benchmarking, determining current and historical company and competitor operational and executive metrics, as well as targeting industry-leading metric goals.
- Identify skills, partners, processes, tools and technologies required to achieve target goals.
- Implement, measure and improve supply chain processes on a continuous basis.

The goal of the STPM is to provide a framework that serves as a starting point, enabling companies to perform these steps in a structured manner, to communicate to relevant stakeholders, and to measure and improve their operational performance over time.

References

Bonini, C.P., Hausman, W.H., and Bierman, H. Jr., *Quantitative Analysis for Management,* McGraw-Hill, 9th ed., 1997.

Cooke, J.A., "Can a TMS System Really Save you Money," *DC Velocity*, March 2008, http://www.dcvelocity.com/articles/?article_id= 1763

Enslow, B., "5 Ways to Increase the Business Value of Trade Compliance," Aberdeen Group, 2007.

Erkip, N., Hausman, W.H., and Nahmias, D., "Optimal Centralized Ordering Policies in Multi-Echelon Inventory Systems with Correlated Demands," *Management Science, March* 1990.

Fiorentino, R.V., Verdeja, L., and Toqueboeuf, C., "The Changing Landscape of Regional Trade Agreements: 2006 Update", World Trade Organization Discussion Paper No. 12, 2006.

Fisher, M., K. Rajaram, A. Raman. Optimizing inventory replenishment of retail fashion products. *Manufacturing & Service Operations Management*. Summer 2001, 3 230-241.

Graham R.F. Napier, Alex Thompson and Anne van de Heetkamp, "Leveraging Origin Management to Benefit from Free Trade Agreements," TradeBeam working paper, June 2008.

Hammond, J.H., and Raman, A., "Sport Obermeyer, Ltd.", Harvard Business School Case 9-695-022, Revised August 15, 2006.

Hausman, W. H., Lee, H. L., and Subramanian, U., "Global Logistics Indicators, Supply Chain Metrics, and Bilateral Trade Patterns" (World Bank Working Paper WPS3773), 2006.

Lee, H.L. and A. Silverman, "Renault's Logan Car: Managing Customs Duties for a Global Product," Stanford Graduate School of Business case GS-62, 4/29/08.

Lee, H.L. and S. Whang, "Higher Supply Chain Security at Lower Cost: Lessons from Total Quality Management," *Int. J. of Production Research.* 96, 2005, 289-300.

Nahmias, S. *Production and Operations Analysis* (6th Edition). McGraw-Hill, New York, NY, 2009.

Supply-Chain Operations Reference-model, SCOR Overview, Version 9.0, Supply-Chain Council.

Timme, S., C. Timme. The real cost of holding inventory. *Supply Chain Management Review*, 2003.

UNCTAD, "Review of Maritime Transport," Geneva, 2001.

UN/CEFACT/TBG-International, "Reference Model of the International Supply Chain with special reference to Trade Facilitation and Trade Security," UN/CEFACT/TBG-International Trade Procedures and Business Process Analysis Groups, Nov 12, 2003.

World Trade Organization, "World Trade Report 2008: Trade in a Globalizing World" 2008.

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Appendix 1: Textile Quota

Following is background information relevant to the Quota Authorization Set Up Step that is part of the Order Enablement process:

For the apparel industry in the trade lane from China to the US, finding sufficient Quota approval is the responsibility of the Chinese apparel factory (the supplier).

Textile Quota grants in china are allocated through both administrative channels and a bidding system. About 70% of the textile Quotas are distributed based on past performance and free Quota applications. At the beginning of every year, The Ministry of Commerce will publish the names of companies who received Quotas and the size of the Quota. This information can be found on websites such as www.mofcom.gov.cn, www.ec.com.cn. Quotas can be transferred or sold between Quota holders and companies who need Quotas. A factory that doesn't utilize a Quota of a certain category can exchange it for other categories with any other Quota holders. Quota brokers play the role of middleman. There are also some specialized websites (e.g. www.texquo.com) that provide both supply and demand information about Quotas. According to the data from Ministry of Commerce, only 20% of total 2008 Quotas were used within the first five months of 2008. Hence, finding enough Quotas has not been difficult in the recent past.

When placing an apparel order in china, the best guide is a factory's past performance because of the way the Chinese government distributes Quotas. Also, because US firms want to find qualified factories and avoid unpleasant surprises regarding Quotas, quality, and other factors, US firms usually use an agent (like Li & Fung) to select a Chinese factory, especially for medium to small size companies. Large companies tend to use their own staff based in Hong Kong or mainland China to accomplish this selection.

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Appendix 2: Detailed Description of Trade Process

Table A1 below, Process Steps, (China to US Trade lane), contains detailed information regarding the entire global trade process. There are four assumptions:

- The Trade Lane is China to US
- The industry is apparel
- Incoterms are FCA Factory
- Transportation mode is ocean

Table A1 below contains five columns:

- Step: This column shows the order of the steps in our Process Model (Section 2)
- Immediate predecessor: This column contains the previous step(s) that must be completed before the current step can begin
- Description: This column contains a detailed description of each step
- Process category: In this column, each step was classified under one of the following categories: Trade Compliance Enablement, Export Compliance Enablement, Export Compliance, Trade Finance, Order Management, Import Compliance, Classification, LC (Letter of Credit) Application, Export Compliance, Shipping, LC Document Preparation, Export Filling, Import Clearance, Tax Refund, Receiving, and Payment
- Actor: This column lists the responsible party for each step, which includes Importer, Exporter, Bank, Logistics Provider, Broker, Commodity Inspection Bureau, US Customs, China Customs, and Administration of Foreign Exchange

Color Legend for Table A1:

Description : Potentially IT-Enabled GTM processes

Process Category : LC-specific steps

Process Category : Trade Finance-specific, optional steps

Process Category : Optional steps

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Table A1: Process Steps (China to US Trade lane)

Step	Immediate Predecessor	Description	Process Category	Actor	Notes
		C-TPAT Certification and certification.	Compliance Enablement	Importer / Exporter	G
		Trade Finance and Receivables Financing set up.	Trade Finance Enablement	Importer / Exporter	
		Transportation, Cargo Insurance Procurement, Inspection, Credit Insurance, Duty Relief Program, US Customs ACH/Periodic Monthly Statement, Routing, and Flexible Routing Set Up.	Shipping Enablement	Importer / Exporter	
		Quota Authorization Set Up. Exporter bids for and obtains allocation of Quota for the year from Chinese Government, if applicable.	Order Enablement	Exporter	G
1		Importer screens exporter for denied party evaluation (i.e., list of Trans-shipments 592A), as well as C-TPAT or other vendor questionnaires.	Import Compliance	Importer	G
2	1	Importer resolves screening issues.	Import Compliance	Importer	
3	2	Exporter receives Request for Information or Request for Quote from Importer.	Order Mgt	Exporter	
4	3	Exporter performs credit check on importer.	Order Mgt	Exporter	
5	4	Exporter makes a quote to Importer.	Order Mgt	Exporter	
6	5	Importer performs preliminary classification of new products to be purchased.	Classification	Importer	
7	6	Importer screens goods to determine import control concerns (licenses, prohibitions, Quotas, anti-dumping), if any (depending on information supplied by the exporter).	Import Compliance	Importer	G
8	7	Importer evaluates Quote - Landed Cost, Margin, to confirm profitability.	Order Mgt	Importer	
9	8	Importer creates Purchase Order for the quoted goods to be purchased.	Order Mgt	Importer	
10	9	Importer performs final classification of new products to be purchased.	Order Mgt	Importer	
11	10	Exporter receives Purchase Order and checks Quota allocation if applicable to ensure ability to ship.	Order Mgt	Importer	
12	5	Exporter agrees to price and terms of sale.	Order Mgt	Exporter	
13	11,12	Exporter ensures products are classified for Export.	Order Mgt	Exporter	G

G=Government Policy Sensitive Step; L= Letter of Credit Path required; O=Optional Step; T=Trade finance Path Required

(Table continued on next page...)

Table A1 (continued)

Step	Immediate Predecessor	Description	Process Category	Actor	Notes
14	13	Exporter screens all partners related to the order: If a possible prohibited party is matched, system sends an email to internal logistics personnel for review. If the prohibited party is valid, logistics places a block on order; otherwise, order is released for shipment.	Export Compliance	Exporter	
15	14	Exporter resolves screening issue.	Export Compliance	Exporter	
16	15	Exporter pre-screens products for licenses requirements and any applicable embargoes/ prohibitions. Typical apparel requirements: 1. Textile Export License to US 2, Temporary Textiles Export License of PRC for parts of textile products 3. Certificate of Origin - China for Textiles export to US 4. Export Textile Quota 5, Commodity Inspection Certificate and Legal Inspection, accompanied by Sales Contract, LC (if appropriate), Sample Card, Color Card, and Sample Code as required	Export Compliance	Exporter	G
17	16	Exporter acknowledges Purchase Order	Order Mgt	Exporter	
18	17	Importer changes/amends the Purchase Order for the quoted goods to be purchased.	Order Mgt	Importer	O
19	18	Exporter receives and acknowledges Purchase Order changes/amendments.	Order Mgt	Exporter	O
20	17,19	Exporter and Importer determine if the transaction is Open Account or LC payment terms.	Order Mgt	Importer / Exporter	
21	20	If the payment terms are Open Account, Exporter makes Pre-Shipment Trade Finance Request to Bank based on the approved Purchase Order.	Trade Finance	Exporter	T
22	21	Exporter's Bank approves the Finance Request.	Trade Finance	Bank	T
23	22	Exporter's bank pays the exporter.	Trade Finance	Bank	T
24	20	If the Payment Terms are LC, Importer consolidates the Purchase Orders into an Import LC Application.	LC Mgt	Importer	L
25	24	Exporter examines / approves LC Application.	LC Mgt	Exporter	L
26	25	Importer sends an Import LC Application to the Bank.	LC Mgt	Importer	L

G=Government Policy Sensitive Step; L= Letter of Credit Path required; O=Optional Step; T=Trade finance Path Required

(Table continued on next page...)

Table A1 (continued)

Step	Immediate Predecessor	Description	Process Category	Actor	Notes
27	26	Bank issues an Import LC.	LC Mgt	Issuing Bank	L
28	27,32	Importer sends LC to Exporter's bank.	LC Mgt	Importer	L
29	28	Exporter's bank sends LC to Exporter.	LC Mgt	Advising Bank	L
30	19,20	If the Payment Terms are LC, Importer creates an Import LC Amendment Request.	LC Mgt	Importer	L
31	30	Importer sends an Import LC Amendment Request to the Bank.	LC Mgt	Importer	L
32	31	Bank issues an Import LC Amendment.	LC Mgt	Issuing Bank	L
33	20,29	Sales / Delivery Order is created.	Order Mgt	Exporter	
34	33	Data reconciliation occurs between Purchase Order and Sales Order.	Order Mgt	Exporter	O
35	34	Missing/incorrect information in the Sales Order is updated.	Order Mgt	Exporter	
36	35	Exporter screens all partners related to the order: If a possible prohibited party is matched, system sends an email to internal logistics personnel for review. If the prohibited party is valid, logistics places a block on order; otherwise, order is released for shipment.	Export Compliance	Exporter	G
37	36	Exporter resolves screening issue.	Export Compliance	Exporter	G
38	37	Exporter screens products for licenses requirements and any applicable embargoes/ prohibitions. Typical apparel requirements: 1. Textile Export License to US 2, Temporary Textiles Export License of PRC for parts of textile products 3. Certificate of Origin - China for Textile export to US 4. Export Textile Quota 5, Commodity Inspection Certificate and Legal Inspection, accompanied by Sales Contract, LC (if appropriate), Sample Card, Color Card, and Sample Code as required	Export Compliance	Exporter	
39	38	If license is required, exporter resolves license issues: - acquires any new licenses, and license is applied to the shipment. - or, terminates or modifies order if licenses cannot be acquired for some or all of products	Export Compliance	Exporter	G

G=Government Policy Sensitive Step; L= Letter of Credit Path required; O=Optional Step; T=Trade finance Path Required

(Table continued on next page...)

Table A1 (continued)

Step	Immediate Predecessor	Description	Process Category	Actor	Notes
40	23,39	Determine if 'Build to Order' or 'Withdraw from Inventory'	Export Compliance	Exporter	
41	40	Build to order	Export Compliance	Exporter	
42	40	Withdraw from inventory	Export Compliance	Exporter	
43	41 or 42	Booking of transport is requested.	Shipping	Exporter	
44	43	Booking of transport is confirmed.	Shipping	Logistics Provider	
45	44	Exporter issues shipping instructions to forwarder in form of Shipment Order.	Shipping	Exporter	
46	45	Goods are picked, packed and marked, and goods/quantities invoiced are verified.	Shipping	Exporter	
47	46	Goods are inspected by internal group or third party organization.	Shipping	Inspection Organization	G,O
48	47	Obtain Certificate for Cancellation of Foreign Exchange After Verification (3 Copies) from Administration of Foreign Exchange.	Export Compliance	Exporter	G
49	47	Exporter prints out bar code labels and attaches them to each package in shipment.	Shipping	Exporter	
50	47	US CPSIA Conformity Certificate created.	Shipping	Inspection Organization	G
51	49	Exporter or Forwarder/Broker sends ASN to Importer.	Shipping	Exporter, Broker	
52	51	Goods are loaded into containers for delivery to port.	Shipping	Logistics Provider	
53	52	Goods/quantities transported from manufacturer's facility to the port.	Shipping	Logistics Provider	
54	51,53	Exporter or Forwarder/Broker prepares and submits documents to Commodity Inspection Bureau: - Packing List - Sales Contract and LC Duplicates as required - Commercial Invoice	Shipping	Exporter/Logistics Provider	G

G=Government Policy Sensitive Step; L= Letter of Credit Path required; O=Optional Step; T=Trade finance Path Required

(Table continued on next page...)

Table A1 (continued)

Step	Immediate Predecessor	Description	Process Category	Actor	Notes
55	51,53	Exporter or Forwarder/Broker prepares and submits documents to Commodity Inspection Bureau: - Letter of Trust for Inspection Declaration - Export Goods Inspection Application	Shipping	Exporter/Logistics Provider	G
56	54,55	Receive approval from Commodity inspection Bureau.	Export Compliance	Commodity Inspection Bureau	G
57	48,50,56	Forwarder / Broker prepares and files documents with China Customs for Export Declaration, with copy to Importer: 1. Export Customs Declaration 2. Packing List 3. Shipment Order 4. Commercial Invoice 5. Licenses as required 6. Contract (not required for commodities exempt from inspection or commodity inspection by EDI) 7. Certificate of Origin and other certificates if required 8. Certificate of Quota, if applicable 9. US CPSIA Conformity Certificate	Export Filing	Logistics Provider	G
58	48,50,56	Forwarder / Broker prepares and files documents to China Customs for Export Declaration: 1. Certificate for Cancellation of Foreign Exchange after Verification 2. Letter of Trust for Customs Declaration	Export Filing	Logistics Provider	G
59	57,58	Agent of Importer such as Forwarder/Broker makes Importer Security Filing for "10+2" to CBP.	Import Clearance	Logistics Provider	G
60	57,58	Forwarder or Carrier prepares draft of ocean Bill of Lading, and forwards to Exporter for approval.	Shipping	Logistics Provider	
61	57,58	China Customs releases the goods for departure and assesses Customs export duties. Export Declaration information such as number and date, and Customs Declaration copies provided to Exporter.	Export Filing	China Customs	G
62	60	Exporter approves draft of ocean Bill of Lading.	Shipping	Logistics Provider	

G=Government Policy Sensitive Step; L= Letter of Credit Path required; O=Optional Step; T=Trade finance Path Required

(Table continued on next page...)

Table A1 (continued)

Step	Immediate Predecessor	Description	Process Category	Actor	Notes
63	62	Carrier prepares and transmits Security filings (24 Hour Manifest (Cargo manifest, CF 1302), and related "10+2" info) to US Customs and Border Protection.	Shipping	Logistics Provider	G
64	59,63	Carrier and Forwarder/ Broker receive approval from US CBP for "10+2" Importer Security Filing.	Import Clearance	Logistics Provider	G
65	64	Carrier requests Unloading Permit (CF 3171) from Import Customs in US.	Import Clearance	Logistics Provider	G
66	65	Carrier receives Unloading Permit (CF 3171) from Import Customs in US	Import Clearance	US Customs	G
67	61	Exporter files re-export claims as applicable. For example, duty drawback, to reclaim duties.	Duty Relief	Exporter	
68	61,66	Goods loaded on vessel.	Shipping	Logistics Provider	
69	68	Vessel sails.	Shipping	Logistics Provider	
70	29,48,56,69	In case of LC, Exporter collates all the documents and reconciles them with the LC.	LC Document Prep	Exporter	L
71	69	Carrier or Non-Vessel Operating Common Carrier (NVOCC) create Bill of Lading and couriers or electronically transmits to Broker for Open Account transactions or to Export LC Document Preparation Agent for LC transactions.	Import Clearance	Logistics Provider	
72	70,71	In case of LC, Exporter presents documents to the Exporter's Bank.	LC Document Prep	Exporter	L
73	72	Bank reviews documents, and notifies Export LC Document Preparation Agent if there are any discrepancies.	LC Document Prep	Bank	L
74	73	Export LC Document Preparation Agent resolves discrepancies and re-presents documents to Negotiating Bank.	LC Document Prep	Logistics Provider	L
75	72 or 74	Negotiating Bank reviews and approves document set (for LC transactions).	Payment	Bank	L
76	72	In case of LC, Exporter's Bank examines the documents and approves the payment.	LC Document Prep	Advising Bank	L
77	71	Exporter or Forwarder/Broker sends a non-negotiable copy of the Bill of Lading to the Importer notifying that the cargo has been shipped.	Shipping	Logistics Provider	

G=Government Policy Sensitive Step; L= Letter of Credit Path required; O=Optional Step; T=Trade finance Path Required

(Table continued on next page...)

Table A1 (continued)

Step	Immediate Predecessor	Description	Process Category	Actor	Notes
77	71	Exporter or Forwarder/Broker sends a non-negotiable copy of the Bill of Lading to the Importer notifying that the cargo has been shipped.	Shipping	Logistics Provider	
78	77	Broker or Carrier sends transportation status updates.	Shipping	Logistics Provider	
79	69	Goods are physically transported to the importer's port.	Shipping	Logistics Provider	
80	77	Importer/Broker generates Importation Registry & prepares all documents for inclusion (Entry and Entry Summary) The following documents are typically provided: 1. Textile Export License to USA. 2. Certificate of Origin - China for Textiles Export to USA 3. Import Textile Quota 4. Commercial Invoice 5. Bill of Lading 6. Packing List 7. Customs Forms (Entry and Entry Summary)	Import Clearance	Logistics Provider	G
81	80	Importation filing documents are sent to US Customs for approval.	Import Clearance	Logistics Provider	G
82	77	Agent of Importer such as forwarder files with Quota Branch of the US Customs and Border Protection or Committee for the Implementation of Textile Agreements or OTEXA.	Import Clearance	Logistics Provider	G
83	78,79,81,82	Upon arrival at US Port, the Forwarder /Broker declares cargo import.	Import Clearance	Logistics Provider	G
84	83	US Customs reviews, releases the goods and informs the Importer of cargo release.	Import Clearance	US Customs	G
85	84	Broker provides copy of approved documents to importer.	Import Clearance	Logistics Provider	G
86	85	Broker sends Customs status update information to Importer.	Receiving	Logistics Provider	G
87	84	Broker/Carrier creates Delivery Order. Cargo is unloaded and picked up by Carrier for final delivery.	Import Clearance	Logistics Provider	

G=Government Policy Sensitive Step; L= Letter of Credit Path required; O=Optional Step; T=Trade finance Path Required

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Table A1 (continued)

Step	Immediate Predecessor	Description	Process Category	Actor	Notes
88	87	Carrier delivers the goods from the port to the final destination.	Receiving	Logistics Provider	
89	88	Importer confirms delivery through receiving process. End of physical flow.	Receiving	Importer	
90	86,88	Forwarder / Broker provide Freight Invoice, Goods Receipt and / or Proof of Delivery.	Receiving	Logistics Provider	
91	89 and 90	Importer matches and reconciles the list of Invoices, Containers, POs, COs, ASNs, and Goods Receipt.	Receiving	Importer	
92	90	Import Entry documents (Customs Entry and Final Statement) are reviewed, validated and reconciled.	Receiving	Importer	
93	92	Importer files any Post-Clearance claims - For example, Duty Drawback, or duty overpayment, to reclaim duties. Importer provides shipment information to Cargo Insurance broker, and files any cargo insurance claims necessary	Receiving	Importer	G,O
94	91	Importer reviews actual landed cost, compares against estimated cost.	Receiving	Importer	
95	94	Importer approves the Invoice for payment (for non-LC transactions).	Payment	Importer	
96	95	Exporter makes Post-Shipment Trade Finance Request to financial institution based on the approved Invoice, or Discounting Request based on approved LC documents.	Trade Finance	Exporter	T
97	96	Bank approves the Finance Request or Discounting Request.	Trade Finance	Bank	T
98	95	For Open Account, Importer's Bank pays Exporter's bank per terms of invoice.	Payment	Bank	
99	75,76	For LCs, Importer's Bank pays Negotiating Bank (immediately for Sight Draft or after a delay For Time Draft)	Payment	Bank	L
100	98 or 99	Exporter's Bank confirms received payment of US dollars and exchanges into Chinese Currency. Bank gives exporter the Sheet for the Verification of Export Collection in Foreign Exchange and Bank Slip	Payment	Bank	G

G=Government Policy Sensitive Step; L= Letter of Credit Path required; O=Optional Step; T=Trade finance Path Required

(Table continued on next page...)

Table A1 (continued)

Step	Immediate Predecessor	Description	Process Category	Actor	Notes
101	100	Exporter presents docs to Administration of Foreign Exchange to exchange from US Dollars to Chinese currency: 1. Sheet for the Verification of Export Collection in Foreign Exchange issued by the bank 2. Certificate for Cancellation of Foreign Exchange after Verification approved by Customs 3. Certificate copy (for Export Collection in Foreign Exchange) 4. Commercial Invoice 5. List for Verification	Payment	Exporter	
102	101	Administration of Foreign Exchange approves documents.	Payment	Administration of Foreign Exchange	
103	102	Exporter presents documents to State Administration of Taxation for tax refunds: 1. Customs Declaration (Certificate copy for Export Tax Refund) 2. Commercial Invoice 3. Bank slip or Collection in Foreign Exchange notice (Sheet for the Verification of Export Collection in Foreign Exchange issued by the bank) 4. Certificate for Cancellation of Foreign Exchange after Verification (Sheet for Export Tax Refund) 5. Credit copy of VAT invoice 6. Other materials related to export tax refund	Duty and Tax Relief	Exporter	G
104	103	State Administration of Taxation approves documents.	Duty and Tax Relief	Administration of Foreign Exchange	
105	104	Administration of Taxation pays Exporter tax refund.	Duty and Tax Relief	Administration of Taxation	G
106	23,105	In case of Financing, Exporter settles the Pre-shipment/Post-shipment Finance with the Bank.	Trade Finance	Exporter	O,T
		Importer pays duties through CBP's ACH Periodic Monthly Statement.	Payment	Importer	
		Re-export some or all of goods.	Duty and Tax Relief	Importer	
		Importer files re-export duty claims, e.g. duty drawback.	Duty and Tax Relief	Importer	

G=Government Policy Sensitive Step; L= Letter of Credit Path required; O=Optional Step; T=Trade finance Path Required

Appendix 3: Detailed Benefits Modeling

1. Exporter

Basic assumptions:

Annual flow = US$100M (this is annual revenue for the Exporter)

Gross margin = 23.5% (based on estimates from a major apparel exporter)

Annual loaded cost per Export FTE (Full-time Equivalent worker) = US$25,000

Days per year = 365

Pipeline inventory (non-capital inventory holding cost)

We assume 76.5% of revenue is cost of goods sold (COGS) for the exporter. With $100M export sales flow, the daily inventory value in exporter cost dollars is $76.5M/365 = $209,600. If we use an 8% (average of 6% and 10%) of total inventory value as the non-capital holding cost[21], then the daily non-capital inventory cost is $209,600(.08) = $16,767. So, with a reduction of 15 days in pipeline inventory, the reduction in non-capital inventory holding cost = (15)$16,767 = $251,500 (for both OA and LC).

Cash-To-Cash (C2C) Cycle

The C2C cycle will be divided into two parts: the Manufacture-To-Invoice (M2I) Cycle and the Days Sales Outstanding (DSO) Cycle.

Manufacture-To-Invoice (M2I) Cycle

We assume that the exporter is smart enough to reschedule their ordering cycle when they take into account the shorter leadtime enabled by IT-GTM. Namely, holding the shipping date fixed, an exporter with a shorter M2I cycle will delay the initiation of production (considering build-to-order products), and hence delay the starting point of the loan from the bank. Therefore, reduction in the length of the M2I cycle reduces the amount of loan an exporter needs to pay the bank.

For small- and medium-size exporters, assume the annual loan rate is g, the annual inventory cost is $76.5M. Then the value of shortening the M2I cycle due to IT-GTM is equal to g($76.5M)(Time difference in M2I cycle)/365. For large-size exporters, because of their large size and strong credit rating, they generally have a much lower loan rate. Assume the loan rate for a large-size exporter is r, then the value of shortening the M2I cycle due to IT-GTM is equal to r($76.5M)(Time difference in M2I cycle)/365.[22]

Days Sales Outstanding (DSO)

For small- and medium-size exporters, shortening DSO not only makes them pay lower interest payments to the bank, but also enables them to invest the resulting profit earlier. Assume the annual COGS for the exporter is $76.5M and the annual revenue is $100M. Then the value of reducing DSO due to GTM is equal to r($100M – $76.5M)(DSO difference)/365 + g($76.5M)(DSO difference)/365.

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21 Estimate based on Timme, S., C. Timme. 2003. The real cost of holding inventory. *Supply Chain Management Review*.

22 Another interpretation of a lower loan rate for large-size exporters is that they do not need to borrow money from the bank for production and use internal funds instead. Then shortening the M2I cycle results in the reduction of opportunity costs associated with inventory. Here, r is assumed to be the annual investment interest rate.

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For large size exporters, shortening DSO not only reduces the opportunity cost associated with inventory, but also enables them to invest the resulting profit earlier. Therefore, the value of reducing DSO due to IT-GTM is equal to r($100M – $76.5M)(DSO difference)/365 + r($76.5M)(DSO difference)/365 = r($100M)(DSO difference)/365.

It is assumed that a large exporter will have $g = r$ because of their large size and strong credit rating.

Receivables Financing Savings

Due in part to the increased visibility brought about by employing I-Enabled GTM, a new financing initiative has emerged which is called "Receivables Financing," which is also known as "Payables Discounting," "Reverse Factoring," and other names, depending on the region, the terms of recourse and other variations of the program. The common feature of all such programs is the concept of leveraging the relatively stronger credit rating of larger and stronger buyers in order to obtain lower trade finance rates for suppliers. These initiatives are relevant for importers who have small- and medium-size exporters who need to borrow money from a bank to build inventory. (Larger exporters may have a need to finance inventory, but their credit rating is often as strong or stronger than their importer customer's credit rating, so they do not benefit from leveraging the importer's balance sheet.)

Following is an example of how such programs work:

Once the importer has confirmed a Purchase Order, or crossed some other significant transactional milestone, the exporter can go to the bank and request a loan at a rate lower than what they might obtain from their local banks on their own, for part or all of the transaction cost, based on their relationship with the buyer. All data relevant to the transaction is visible through the IT-Enabled GTM system to the relevant supply chain partners.

Later in the transaction lifecycle, as other milestones occur, such as the importer approving Invoices related to the Purchase Order, the exporter can obtain even lower loan rates, based on the lower risk profile of the transaction, again with all transactional information visible to the bank. Such a financing initiative reduces the amount of loan cost that an exporter has to pay to the bank, but since it requires collaboration among the exporter, the importer and the banks, the benefit is usually shared among all these parties. In this study, we will assume that the fractions of the receivables financing savings obtained by the exporter, the importer and the bank are P_e, P_i and P_b, respectively, with $P_e + P_i + P_b = 1$. As default values, $P_e = 0.25$, $P_i = 0.5$, and $P_b = 0.25$. Assume the loan rate after the first reduction is r_1 and the loan rate after the second reduction is r_2. Also assume that the fraction of goods that are included in the receivables financing program is F. Then the exporter's share of the receivables financing savings due to IT-GTM is equal to $[(g - r_1)$(Length of M2I cycle under IT-GTM) + $(g - r_2)$(DSO under IT-GTM)]($76.5M)($F$)($P_e$)/365.

Tax Rebate

Based on TradeBeam-China estimates, the annual amount of tax rebate for an exporter is about 5.6% of its export value. Given the $100M annual export flow and an estimated 25% increase in tax rebate due to IT-GTM, the increased amount of tax rebate is equal to (5.6%)($100M)(25%) = $1.4M.

Workload Savings

We use the following lower bound argument for assessing workload savings. Assume the non-IT-GTM process duration is: $t_1 = s + w$, where s is the actual working time, and w is the waiting time. Assume that workload saving (%) and the wait-time saving (%) brought by IT-GTM is $1–p$ and $1–q$, respectively; then the GTM process duration is: $t_2 = ps + qw$. Also assume for now that $q \geq p$. We see that $t_2/t_1 = (ps + qw)/(s + w) \geq p(s + w)/(s + w) = p$, hence $1–p \geq 1 – t_2/t_1$. Therefore, the duration reduction provides a lower bound on the workload savings, as long as the assumption $q \geq p$ holds.

Based on our discussion with a major apparel exporter with 200 employees in order processing, 75% of them are

devoted to export-related tasks (a conservative assumption). The annual revenue with these 200 employees is $713M. So, for an annual revenue of $100M, the Export FTE = (100/713)(200)(0.75) = 21. Assume that the annual loaded cost per exporter FTE is US$25,000, and we also know the duration reduction for the exporter is 78%. So the lower bound argument for workload savings based on duration reduction suggests that the annual workload saving is at least (21)(0.78)($25,000) = US$409,500 (for both OA and LC).

Expediting

Assume the cost of expediting is 0.3% of export value, and the percentage reduction with GTM is 40% (both estimates are from experts). So the reduction in annual expediting cost = (0.003)(0.40)($100M) = $120,000 (for both OA and LC).

2. Importer

Basic assumptions:

Annual flow = US$100M (this is the annual cost for the Importer)

Annual loaded cost per Import FTE = US$90,000

Days per year = 365

Weeks per year = 52 (i.e., 7 days per week)

Innovative BTO Items

Order-To-Receipt (O2R) Cycle

We sample the gross margins for importers whose business deals mainly with short cycle products[23] – Gap (37%), American Eagle Outfitters (39%), H&M (62%), Abercrombie & Fitch (67%), J. Crew (45%). Therefore, we assume the gross margin for Innovative items is 50% (i.e., the average of the above samples). Then the annual retail value associated with importing $100 Million in cost dollars is $100M/(1–0.5) = $200M.

We assume the importer uses the newsvendor[24] solution to determine purchasing quantities. Assume without IT-GTM that uncertain demand is normally distributed with mean μ and standard deviation σ_1. We use the critical fractile of 0.75 as in the Sport Obermeyer[25] Case; then the service level coefficient $z = 0.67$, and the importer needs to buy $Q_1 = \mu + z\sigma_1 = \mu(1+0.67*CV)$, where $CV = \sigma_1/\mu$ is the coefficient of variation of the forecasted demand and we take $CV = 1/3$ as the default value from the Sport Obermeyer Case (we will set CV as a variable parameter). Note that Q_1 is measured in sales dollars, not cost dollars, since μ and σ_1 are also measured in sales dollars. Since we assume the annual import value of $100M generates a retail value of $200M, and if we normalize the unit price to be $1, then we have Q_1 = $200M and μ = $200M/(1+0.67/3) = $163M. The expected sales[26] with Q_1 is $E(D) - E(D-Q_1)^+ = \mu - \sigma_1 L(0.67)$ = $155M; the expected excess inventory with Q_1 is $E(Q_1-D)^+ = E(D-Q_1)^+ + Q_1 - E(D) = \sigma_1[L(0.67) + 0.67]$ = $45M; if we assume the ratio between the markdown price and the full price is R, then the expected markdown revenue is equal to $R\sigma_1[L(0.67) + 0.67] = R($45M). The value of R is determined in the following way. Since the unit price is normalized to $1, and assume the gross margin is GM, then the normalized unit cost is $1 – GM. Since the underage cost is $1 – ($1

23 Our study is mainly focused on retailer-type importers, rather than brand owners such as Nike.

24 See Nahmias, S., Production & Operations Analysis, 6th ed., McGraw-Hill, 2009, p. 257.

25 Sport Obermeyer, Ltd., Harvard Business School Case 9-695-022 by Janice H. Hammond and Ananth Raman, Revised August 15, 2006.

26 The L( ) function is the standardized loss function; see Nahmias, op. cit., p. 270.

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– GM) = GM, and the overage cost is ($1 – GM) – R, then from the formula: 1 – Pr(Stockout) = (underage cost)/(underage cost + overage cost), we have $R = 1 - GM/[1 - \Pr(\text{Stockout})]$. We estimate the default value of R from the Sport Obermeyer Case previously referenced. Since the default GM is 50% and the default Pr(Stockout) is 0.25, we have the default value $R = 1/3$. Hence, the default expected markdown revenue is equal to $15M.

Now with IT-GTM providing a shorter lead time (O2R time), we have a better forecast about demand; i.e., we have a lower standard deviation σ_2 (assuming the same mean μ). Then the importer needs to buy $Q_2 = \mu + 0.67\sigma_2$; the expected sales with Q_2 is $\mu - \sigma_2 L(0.67)$; and the expected markdown revenue with Q_2 is $R\sigma_2[L(0.67) + 0.67]$. As a default, we assume that the forecast standard deviation improvement is 20% for both OA and LC; i.e., $\sigma_2 = 0.8\sigma_1$. Therefore, the procurement quantity under IT-GTM is Q_2 = $192M, this corresponds to procurement in cost dollars of $96M; the expected sales with Q_2 is equal to $157M; the expected markdown revenue with Q_2 is equal to $12M.

So the default benefit of shortening the O2R cycle by IT-GTM consists of three parts (the same for both OA and LC):

1. Reduced procurement cost by importing Q_2 instead of Q_1: the value is equal to ($100M)$(1 - Q_2/Q_1)$ = ($100M)$(\sigma_1-\sigma_2)z/(\mu + z\sigma_1)$ = ($100M)$(1 - \sigma_2/\sigma_1)z/(1/CV + z)$ = ($100M)(20%)(0.67)/(3+0.67) = $4M.
2. Increased sales (reduced lost sales) with inventory Q_2 instead of Q_1: the value is equal to $(\sigma_1-\sigma_2)\, L(z) = \mu CV(1 - \sigma_2/\sigma_1)\, L(z)$ = ($163M)((1/3)(20%)L(0.67) = $2M.
3. Reduced markdown revenue with inventory Q_2 instead of Q_1: the value is equal to $R(\sigma_1-\sigma_2)\,[L(z)+z] = R\sigma_1(1-\sigma_2/\sigma_1)[L(z)+z] = R\mu CV(1-\sigma_2/\sigma_1)[L(z)+z]$ = (1/3)($163M)(1/3)(20%)(0.15+0.67) = $3M.

To sum up, the total default benefit of shortening the O2R cycle with IT-GTM is equal to $4M+$2M–$3M = $3M. If we assume the fraction of the importer's business due to Innovative items is p, then the benefit is equal to $p$$3M for both OA and LC.

Lastly, we estimate the lower and upper bounds for forecast standard deviation improvement. The lower bound is estimated based on some confidential company forecasts and forecast revisions for a Functional product (not an Innovative product). Shortening the O2R cycle from 104 days to 68 days (OA) or 75 days (LC) generates a reduction of 6% (OA) and 4% (LC) in the standard deviation of the forecasted demand; i.e., $1 - \sigma_2/\sigma_1$ = 6% (OA) and 4% (LC). These values are assumed to be lower bounds for forecast standard deviation improvement because the demand for Functional products is much less volatile than that of Innovative products. Next, we estimate the upper bounds for forecast standard deviation improvement based on Fisher, Rajaram and Raman (2001). They demonstrate that a reduction of lead time from 104 days to 68 days (OA) (or 75 days for LC) generates a reduction in expected replenishment cost that is equal to 9% of expected sales (their expected replenishment cost is defined as the sum of underage and overage costs). However, this figure seems unrealistically high and hence we arbitrarily adjusted it downward to 3% of expected sales. Since the expected sales is equal to $\mu - \sigma_1 L(0.67)$ = $163M – ($163M/3)L(0.67) = $155M, and the total benefit of leadtime reduction is equal to ($100M)$(1 - \sigma_2/\sigma_1)z/(1/CV + z) + \mu CV(1 - \sigma_2/\sigma_1)L(z) - R\mu CV(1 - \sigma_2/\sigma_1)[L(z)+z]$, let this value to be equal to (0.03)(155M); this generates an upper bound for $1 - \sigma_2/\sigma_1$ of 40%. Therefore we assume the upper bound for forecast standard deviation improvement due to shortening the O2R cycle is equal to 40%, which generates a benefit of $4.65M for both OA and LC.

Inventory holding cost

In this section, we compute the inventory holding cost for Innovative items. We assume that there are two selling seasons and hence the importer makes two orders each year; and also assume that the inventory holding cost is computed weekly. Note that here we measure the demand in cost dollars. We know the default annual mean demand is μ = (100M)/(1+0.67/3) = 81.7M, so the default mean demand for each season is m = 40.9M; also denote the standard deviations of weekly demand without and with IT-GTM as s_1 and s_2 respectively.

First we derive general formulas for the mean and standard deviation of weekly demand, as well as the default values. We assume that the weekly mean demand is decreasing linearly during a single season and there are 25 weeks in each season. Suppose the last-week demand is x, so the week-i demand is $(26-i)x$. We have $(1+2+\ldots+25)x = m$, i.e., $x = 2m/(25\cdot26) = 0.13M$. Also suppose that the weekly $CV = k$ and it remains constant throughout the season, so the week-i variance is $[(26-i)xk]^2$. Assuming independent[27] normal demand for each week, since the CV for a season before shortening the O2R cycle is 1/3, we have $\left(\sqrt{1+4+\ldots+25^2}\right)xk = mCV = s_1$; i.e., $k = s_1/\left[\left(\sqrt{5525}\right)x\right] = 1.4$. To summarize, the week-i mean demand is $(26-i)2m/(25\cdot26) = (26-i)m/(25\cdot13)$, and the week-$i$ demand standard deviation before shortening the O2R cycle is $(26-i)s_1/\sqrt{5525}$.

Next we derive the general formula for the expected inventory holding cost with an inventory of Q at the beginning of the season. Note that the expected inventory holding cost at the end of week n is equal to $(H_i/50)E[Q - D(n)]^+$, where $H_i = 17\%$ as assumed in the next section (and assume 50 weeks per year), Q is the inventory at the beginning of the season, and $D(n)$ is the cumulative demand from week 1 to week n. Therefore, $D(n)$ has mean $\sum_{i=1}^{n}(26-i)\, m/(25\cdot13)$ (denoted as M_n), and standard deviation $\sqrt{\sum_{i=1}^{n}(26-i)^2}\; s_1/\sqrt{5525}$ (denoted as S_n). Then, the expected inventory holding cost at the end of week n is $(H_i/50)E[Q - D(n)]^+ = (H_i/50)(Q-M_n)F[(Q-M_n)/S_n] + S_n f[(Q-M_n)/S_n]\}$, where $F(.)$ and $f(.)$ is the c.d.f. and p.d.f. for the standard normal random variable. respectively. So the total annual expected inventory cost is equal to $\text{Inv(Innovative)} = 2(H_i/50)\sum_{n=1}^{25}(Q-M_n)F[(Q-M_n)/S_n] + S_n f[(Q-M_n)/S_n]\}$.

Finally, with IT-GTM, we have a shorter O2R cycle, so the standard deviation for each season is reduced to s_2 and the ordering quantity is changed to $Q_2 = m + zs_2$. So the benefit of GTM for the Innovative items in the inventory cost part is equal to the difference in the inventory cost function Inv(Innovative) with (Q_1, s_1) changed to (Q_2, s_2).

Functional BTS Items

Safety Stock

We first illustrate the general method of computing safety stock for a company facing stochastic demand. Assume weekly customer demand follows a Normal distribution with mean μ and standard deviation σ. Then the standard deviation of leadtime demand is equal to $\sigma\sqrt{\text{lead-time}}$. Also assume that the required fill rate is β, then the service coefficient determining safety stock is $z = L^{-1}[(1-\beta)\mu/\sigma]$, where L is the partial expectation of the standard normal random variable. Finally, the safety stock is equal to $z\sigma\sqrt{\text{lead-time}}$. Hence, the reduction in safety stock by GTM is

27 Weekly demands for Innovative items are likely to be positively correlated rather than independent random variables. It can be shown that the assumption of independence made here produces a lower bound on the variability of demand over the season; see "Optimal Centralized Ordering Policies in Multi-Echelon Inventory Systems with Correlated Demands" (Erkip, Hausman and Nahmias), *Management Science, March* 1990.

equal to $z\sigma[\sqrt{\text{non-GTM lead-time}} - \sqrt{\text{GTM lead-time}}]$. This value multiplied by the inventory holding cost rate gives the reduction of safety stock in cost dollars.

Since the annual inflow for the importer is $100M, the weekly inflow is $100M/50 = $2M. Assume the weekly coefficient of variation is 0.75 and the targeted fill-rate is 95%, then the service coefficient for determining safety stock is $z = L^{-1}[(1-\beta)\mu/\sigma] = L\text{-}1[0.067] = 1.11$. The inventory holding cost Hi is the sum of non-capital inventory holding cost (8% as assumed in the exporter side) and the opportunity cost (i.e., the interest rate r = 9%), i.e., Hi = 8% + 9% = 17%. So the savings in safety stock = $H_i z\sigma[\sqrt{\text{non-GTM lead-time}} - \sqrt{\text{GTM lead-time}}] = (0.17)(1.11)[\sqrt{104/7} - \sqrt{68/7}]($2M)(0.75) = $208,820 (OA) and $(0.17)(1.11)[\sqrt{104/7} - \sqrt{75/7}]($2M)(0.75) = $164,520 (LC).

If we assume the fraction of the importer's business due to Innovative items is p, then the savings in safety stock for the Functional items is equal to (1-p)($208,820) for OA and (1–p)($164,520) for LC. This is also the benefit of shortening the Order-To-Receipt cycle for the Functional items.

In order to reflect the benefit of IT-GTM as a percentage of expected sales, we also sample the gross margins for basic, Functional items from the following retailers: Ross Stores (24%), JC Penney (37%), Men's Wearhouse (43%). Therefore, we assume the gross margin for Functional items is equal to 35% (the average of the above samples).

Receivables Financing Savings

For details see the corresponding section under "Exporter". As described there, we assume that the importer gets a fraction Pi of the total benefit. Then the importer's share of the receivables financing saving due to IT-GTM is equal to [(g – r1)(Length of M2I cycle under IT-GTM) + (g – r2)(DSO under IT-GTM)]($76.5M)(F)(Pi)/365.

Cargo insurance Savings

We assume FCA Factory INCOTERMS, and so the importer pays the cargo insurance. We assume the regular insurance rate is $0.08 per $100 value of cargo, and in the aggressive case IT-GTM can bring a $0.02 reduction per $100 value of cargo. So the total savings by IT-GTM in the aggressive case is equal to ($0.02)($100M)/$100 = $0.02M. (We assume there is no saving in the conservative GTM case.)

Reduced Trading Partner Fees

Based on interviews with industry experts, we assume the regular broker fee is $100 per shipment, and the value of each shipment is $75,000. We also assume that IT-GTM can bring a reduction of $40 in broker fee for each shipment, so the total reduction in trading partner fees by IT-GTM is equal to ($40)($100M)/$75,000 = $53,000.

Workload Savings

We estimate the Import FTE from the Export FTE by the assumption that their ratio is equal to the ratio between the duration times of importer steps and exporter steps. Note that we use the exporter step duration under BTS as the reference point for the Export FTE. This is because in the BTO process, there is a 40-day production lead time and the FTE corresponding to this lead time should not be linked to the Export FTE, since we assume the Export FTE is only the FTE related to tasks specific for exportation. We know that the duration time for importer steps is 9 days and 11 days for OA and LC, respectively; the duration time for exporter steps is 50 days (for both OA and LC); and the Export FTE is 21. So, we have the Import FTE is (21)9/50 = 4 for OA and (21)11/50 = 5 for LC. Since the annual loaded cost per Import FTE is $90,000, and the duration reduction by GTM is 89% and 73% for OA and LC, respectively, we have the workload savings to be ≥ 4(0.889)$90,000 = $320,400 for OA and 5(0.73)$90,000 = $328,500 for LC.

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Classification and Customs Processing

This metric includes two types of savings in duties paid: (1) reducing customs audit fines; (2) reducing overpayment due to misclassification of products. For (1), based on our discussion with a major apparel importer, currently there is an Importer Focused Assessment penalty of $0.5M every 4 years. Since the import size of this importer is about $700M, we assume that for a $100M import size, the annual penalty is ($0.5M/4)$100M/$700M = $285,000. Also, we assume that the importer can avoid this penalty by using IT-GTM, so the reduction in customs audit fines by IT-GTM is equal to $285,000. For (2), based on our discussion with a third-party expert, we assume that IT-GTM can reduce overpayment due to mis-classification by an amount that is equal to 0.027% of sales. We will compute the importer's sales as the weighted sum of sales from Functional and Innovative items.

Supply Chain Intermediaries

Workload savings for Export Intermediaries

We use the proportion in process duration to estimate Export/Import Intermediary FTEs based on Export/Import FTEs. We have 21 Export FTEs corresponding to 50 days of duration for Exporter (both OA and LC), then for Export Intermediaries, we have 21·37/50 = 16 FTEs (for OA) and 21·41/50 = 17 FTEs (for LC). Assume the annual loaded cost per Export Intermediary FTE is $25,000, then the duration reduction of 38% (OA) and 39% (LC) for Export Intermediary steps leads to workload savings that are at least 16(0.38)$25,000 = $152,000 (OA) and 17(0.39)$25,000 = $165,700 (LC), using the same lower bound argument as for Exporter.

Workload savings for Import Intermediaries

We use the same method as we compute the workload savings for export intermediaries, so the import intermediary FTE is equal to 6 (for both OA and LC); and the workload savings are at least 6(0.47)$90,000 = $253,800 (both OA and LC).

Receivables Financing Savings

For details see the corresponding section under "Exporter". As described there, we assume that the bank intermediary gets a fraction P_b of the total benefit. Then the bank's share of the receivables financing savings due to IT-GTM is equal to $[(g - r_1)(\text{Length of M2I cycle under IT-GTM}) + (g - r_2)(\text{DSO under IT-GTM})]($76.5M)(F)(P_b)/365$.

Appendix 4: Benefits of IT-Enablement under Letter of Credit

Table A2: Exporter-LC Benefits

Metrics	Value Driver	Non IT-GTM	IT-GTM	Diff.	Values (in US$)		Note
					Conservative	Aggressive	
Order to Receipt Cycle	Qualitative Competitive Differentiator	104	75	29			Qualitative benefit
Pipeline inventory	Physical Inventory Holding Cost (daily) = Hi	83	68	15	$251,500	$251,500	Key components of non-capital inventory holding cost include: warehousing, obsolescence, pilferage, damage, insurance, taxes, administration and other. Assume: Hi = $16,767.
Order to Cash Cycle		98	69	29			Not dollarized, See C2C Cycle.
Cash to Cash Cycle		84	69	15			This is sum of M2I and DSO
Manufacture to Invoice Cycle	Inventory Value in Cost Dollars (annual) = Ci; Loan Rate (annual) = g	45	41	4	$75,452	$125,753	Conservative Case: g = r1 = r2 = 9%, F = 50% Aggressive Case: g = 15%, r1 = 11%, r2 = 9%, F = 100% Assume: Ci = $76.5M; Si = $100M; 365 days per year; Pe = 25%
Days Sales Outstanding	Inventory Value in Sales Dollars (annual) = Si; Loan Rate (annual) = g; Investment Interest Rate (annual) = r	39	28	11	$271,233	$409,562	
Receivables Financing Savings	Inventory Value in Cost Dollars (annual) = Ci Basic Loan Rate (annual) = g; PO Triggered Loan Rate (annual) = r1; Invoice Approval Triggered Loan Rate (annual) = r2; Share for Exporter = Pe; Fraction of Goods for which Exporter obtains finance=F	3	1	2	$0	$173,959	Loan rates vary over time. While the above rates are high compared to actual rates at the time of publishing this report, the absolute numbers are not as important as the difference between rates (i.e., between g, r1 and r2).

Exporter-LC Benefits (Continued)							
Metrics	**Value Driver**	**Non-IT-GTM**	**IT-GTM**	**Diff.**	**Values (in US$)**		**Note**
					Conservative	**Aggressive**	
Tax Rebate	Amount of Rebate = Ar	100%	115%	15%	$560,000	$840,000	Assume: Ar = 5.6%*$100M = $5.6M; Conservative case: GTM brings 10% increase; Aggressive case: GTM brings 15% increase.
Invoice Deductions	Amount of deductions correctly identified						Net cost to the supply chain is zero.
Duty Drawback	Amount of Drawback = Ad				$0	$0	No duties for importing raw materials if using "processing Quota".
Workload Savings	Annual Loaded Cost per FTE = Cf	50	10	1-10/50 = 80%	$420,000	$420,000	The reduction in process duration provides a lower bound to the actual workload saving. See Appendix 3. Assume: Cf = $25,000; Export FTE = 21.
Fines (Export Compliance)	Amount of Fines						Dollarizable but requires more data.
Expediting	Cost of Expediting	0.30%	0.18%	0.12%	$120,000	$120,000	Assume cost of expediting is 0.3% of total export value. Assume GTM results in a 40% reduction in cost of expediting.
Reliability	Qualitative Competitive Differentiator						Require more data for estimation.
				Subtotal	**$1,698,185**	**$2,340,774**	

Table A3: Importer-LC Benefits

Metrics	Value Driver	Non-IT-GTM	IT-GTM	Diff.	Values (in US$)		Note
					Conservative	Aggressive	
Order to Receipt Cycle (BTO)	Reduced procurement cost	104	68	36	$1,092,352	$7,282,348	**Assumptions:** - C = $100M import value generates $200M retail values. - Normal demand with mean μ, standard deviation σ. - Defaults: CV = σ1/μ = 1/3; Pr (Stockout) = 0.25; z = 0.67, L(z) = 0.15; R = 1/3. - Demand standard deviation improvement by shortening O2R cycle = 6% in conservative case and 40% in aggressive case.
	Increased sales (reduced lost sales)	104	68	36	$483,117	$3,220,782	
	Reduced markdowns / disposals	104	68	36	- $889,274	- $5,928,493	
	Inventory Cost				$102,955	$681,532	Weekly Hi = 17%/50.
Order to Receipt Cycle (BTS)	Shorter lead time	104	75	29			See Safety Stock.
Safety Stock	Inventory Holding Cost = Hi; Service Level Coefficient = z; Mean / Standard Deviation of Demand = μ / σ	104	75	29	$164,520	$164,520	Assume: Hi = 17%; μ = $2M; σ/μ = 0.75; z = 1.11.
Receivables Financing Savings	Same as the "Receivables Financing Savings" metric in Table A2; Share for Importer = Pi				$0	$347,918	Same as the "Receivables Financing Savings" metric in Table A2; Pi = 50%
Cargo Insurance Savings	Insurance Rate = I				$0	$20,000	Conservative Case: Quantity * rate, no change. Aggressive Case: lower cargo insurance rates via improved information. Assumes Importer pays the Cargo Insurance (FCA Factory INCOTERMS). Assume: I = $0.08 per $100 value; in the aggressive case, I = $0.06 per $100 value.

Importer-LC Benefits (Continued)							
Metrics	**Value Driver**	**Non-IT-GTM**	**IT-GTM**	**Diff.**	**Values (in US$)**		**Note**
					Conservative	**Aggressive**	
Invoice Deductions	Amount of deductions correctly identified						Net cost to the supply chain is zero.
Duty Drawback	Amount of drawback				$0	$0	Does not apply to apparel and other retail sales; does apply to intermediate goods manufacturers.
Expediting	Cost of expediting				$0	$0	Assume Exporter is responsible for all expediting costs.
Fines (Demurrage, Detention, Compliance, 10+2)	Amount of fines						
Reduced Trading Partner Fees (Lower broker fees)	Broker fee per shipment = Cb				$53,000	$53,000	Assume: Annual number of shipments = 1333; Cb = $100 without GTM and $60 with GTM.
Workload Savings	Annual loaded cost per FTE = Cf	11	3	1-3/11 = 73%	$328,500	$328,500	Assume: Cf = $90,000; Import FTE = 5.
Classification & Customs Processing	Accuracy of duties paid: Customs Audit Fines and Overpayment				$61,267	$61,267	**For customs audit fines:** Without GTM, an importer with an annual import size of $100M needs to pay an Importer Focused Assessment penalty of $0.07M every 4 years. With GTM, this penalty can be completely avoided. **For overpayment:** GTM can generate a reduction in overpayment of duties due to misclassification that is equal to 0.027% of sales.
Sourcing Efficiency	Accuracy of landed cost early in process						See Appendix 3.
				Subtotal	**$919,603**	**$3,521,030**	

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Table A4: Supply Chain Intermediaries-LC Benefits

Metrics	Value Driver	Non GTM	GTM	Diff.	Values (in US$)	Note
Workload Savings (Export Intermediaries)	Annual Loaded Cost per FTE = Cf	41	25	1-25/41 = 39%	3.32% of revenue ($165,750)	We use the same method as for Exporter/Importer to estimate workload savings for Export/Import Intermediaries. Assume: Cf for export FTE = $25,000; Cf for import FTE = $90,000; Export intermediary FTE = 16 (OA) and 17 (LC); Import intermediary FTE = 7 (both OA and LC); Annual revenue for a typical trading intermediary = $5M Assume Export/Import Intermediary FTEs are proportional to the process duration compared to Export/Import FTEs. See Appendix 3.
Workload Savings (Import Intermediaries)	Annual Loaded Cost per FTE = Cf	16	9	1-9/16 = 44%	5.54% of revenue ($277,200)	
Receivables Financing Savings (Bank Intermediaries)	Same as the "Receivables Financing Savings" metric in Table A2; Share for Bank = Pb				$173,959	Same as the "Receivables Financing Savings" metric in Table A2; Pb = 25%
				Subtotal	**$616,909**	