Build4 Scale
U.S. Department of Energy

Communication, Selection, and Negotiation

Module 5D Shipping, Packaging, and Customs Considerations

Motivation

Why is this module important?

Some research data to consider (Shockwatch Report, 2013):

- 43 percent of insurance claims made by shippers are due to mechanical damage of the products during shipping
- Another 15 percent are environment-related (water and humidity)
- Poorly conceived packaging can turn customers away from your product
- Inferior package design can cost you a lot in terms of shipping damage
- According to one study, the cost of goods damaged in-transit is more than USD $4 billion annually—you can minimize many of these costs by designing reliable and efficient packaging

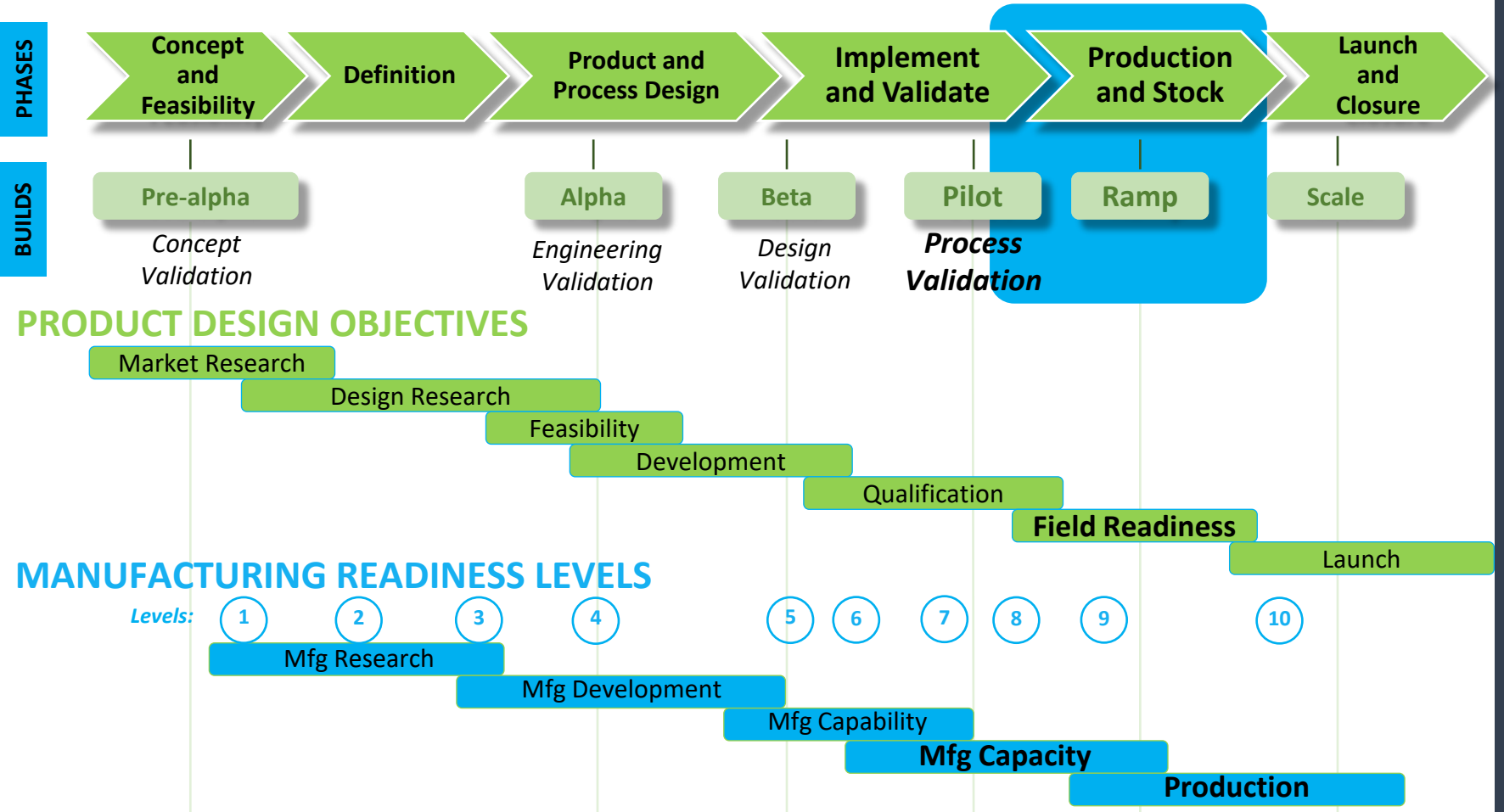
Motivation

Why is this module important? (cont.)

- Shipping and packaging is one of the largest cost factors in the total landed-costs equation
- Knowing the industry rules and best practices can provide the competitive edge you need to enter a new market!

Shipping, Packaging, Customs

Where does this fit into the development cycle?



Shipping, Packaging, and Customs Considerations

Module Outline

- Learning objectives
- Preparing your products for shipping
- Introduction to packaging
- Packaging costs and design requirements
- Shipping documents
  - —Common shipping documents and regulatory requirements
  - —International shipment documentation
- Total landed cost (TLC)

Learning Objectives

- LO1. Identify necessary packaging-related and shipping-related regulatory requirements
- LO2. Understand packaging cost factors

What This Module Addresses

- How do you prepare your goods for shipping?
- What are important packaging considerations?
- How packaging can influence your product design and materials selection
- Cost of packaging and how a good packaging decision can reduce the shipping cost
- What documents do you need to prepare for overseas shipping and receiving
- Understanding the best practices in shipping
- Understanding the impact of packaging and shipping on total landed cost

Packaging/Shipping

Preparing products for shipment

- Pack in strong containers, adequately sealed, and filled whenever possible
- Regardless of size, make sure the weight is evenly distributed to provide proper bracing in the container
- Goods should be palletized and containerized whenever possible
- Consider packaging and unitizing alternatives
- Packages and packing filler should be made of moisture-resistant materials
- To avoid pilferage, avoid writing contents or brand names on packages; other safeguards include using straps, seals, and shrink wrapping
- Observe any product-specific hazardous materials packing requirements

Packaging/Shipping

Checklist

- ☐ Product safety
- ☐ Product specifications
- ☐ Quantity
- ☐ Compliance with customer and regulatory shipping requirements (regulatory documents and internal quality-inspection report)
- ☐ Packing customer compliant and secured?
- ☐ 100 percent inspection or sampling
- ☐ Sign-off by quality inspector

Packaging

Basics

- Packaging considerations include preparing goods for transport, distribution, storage, and retailing, as well as the ultimate function/end use of the goods
- Packaging includes both engineering (safety) and marketing (communication) functions

Tip: A great starting method to evaluate packaging needs is to evaluate the leading competitor and other like products. It is critical to only consider those produced by credible, ethical, reputable, well run, long standing companies. Leverage their investment in internal and external resources as well as practical experience that led to their current packaging and labeling format. Use this as a data source while remembering that ultimately you and only you are responsible for your products well being, customer compliance, legal status etc.

Packaging

Technical versus marketing

- Technical packaging professionals need to apply science and engineering skills, while marketing professionals provide insight on artistic and aesthetics for understanding of consumer motivation

Technical Functions	Marketing Functions
Contain	Communicate
Protect	Promote
Dispense	Display
Store	Sell
Measure	Motivate
Preserve	Inform

Packaging

Key functions

Contain:

- How the packaging containment function is selected depends on the form of the product (the product can range from all liquid, solid/liquid mixture, free-flowing, non-free-flowing powder, solid unit, discrete items, or multicomponent mix)
- The nature of the product is also important (it may be corrosive, corrodible, flammable, fragile, easily marked, under pressure, hygroscopic, irregular in shape, sticky, odorous, toxic, perishable, or aseptic)

Packaging

Key functions (cont.)

Protect/Preserve:

- "Protect" means preventing from any physical damage due to accident and other travel incidents
- "Preserve" usually refers to preventing biological and chemical change in food (or similar biological/chemical) products so the shelf-life of the products can be extended

Packaging

Key functions (cont.)

Transport:

- It underscores the safety of goods during transportation from the point of production to the point of final consumption
- One should consider various transport modes (truck, rail, aircraft, cargo ship, etc.), handling techniques, and storage conditions when selecting a package

Tip: Many transportation companies will assist you determining your packaging needs and even test for you. i.e., UPS:

https://www.ups.com/us/en/services/customized-solutions/optimization-logistics/package-engineering.page

https://compass.ups.com/ups-packaging-solutions-facility/

http://images.fedex.com/us/services/pdf/PKG_Testing_Under150Lbs.pdf

Packaging

Key functions (cont.)

Inform/Sell:

- It can be a good branding tool or medium to improve perceived product quality
- It deals with how a package communicates by its package material, shape and size, color, predominant typography, illustrations, recognizable symbols or icons, etc.
- Government regulations can dictate how a message can be presented on a package

Examples: how a product is named, quantity contained, and the address of the responsible organization

Packaging

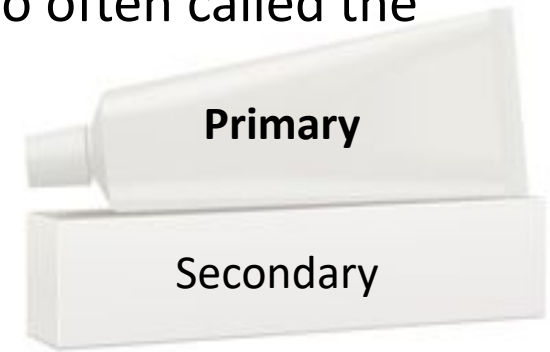
Examples - Levels of packaging

Plastic Bottles Individual Containers	Cardboard Boxes Plastic Trays	Pallets Roll cages

Packaging

Primary

- **Primary Package**: The package, which has enclosed the actual commodity, is called primary package. It refers to the product's immediate container. In some cases, the primary package is kept until the consumer is ready to use the product (i.e., plastic packet for socks); whereas in other cases, it is part of the product (i.e., a toothpaste tube, ketchup bottle, etc.) and is used throughout the life of the product.
- For Primary Packaging that is for organizing or protecting the product, such as a clear bag or film, it is also often called the "Inner Pack."
  - —A product with an inner pack then has Secondary Packaging.

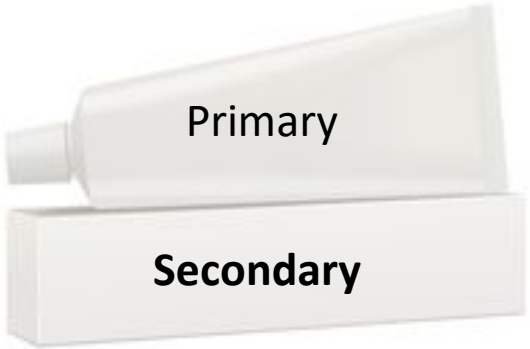


Source: http://www.qsstudy.com/business-studies/levels-of-packaging

Packaging

Secondary

- **Secondary Packaging**: The layer of cover added to the primary package for its protection is called secondary package. It refers to additional layers of protection that are kept until the product is ready for use, i.e., a tube of toothpaste usually comes in a card board box.
- When consumers start using the toothpaste , they will dispose off the box but retain the primary tube. Often called the “Outer Pack.”
- For retail products this is the packaging the product is seen in when sitting on the shelf.

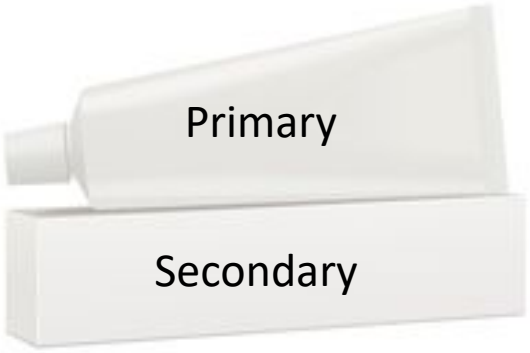


Source: http://www.qsstudy.com/business-studies/levels-of-packaging

Packaging

Transit/transportation

- **Transportation Packaging**: Transportation package is used to facilitate identification, transportation, handling, and storing of the products. It refers to further packaging components necessary for storage, identification, or transportation. For example a toothpaste manufacturer may send the goods to retailers in corrugated boxes containing 10, 20, or 100 units. Often called the “Master Carton or Pack.” It also includes things like “Gaylord”, wooden crates etc. that are needed for transport.



Transit

Source: http://www.qsstudy.com/business-studies/levels-of-packaging

Packaging

Efficiency through unitization and palletization

Unit loads:

- A unit load is a combination of products that are put together to improve transportation and materials handling function.
- Includes secondary items like cardboard boxes and plastic trays that are used to contain primary products, and tertiary items like pallets and roll cages, which are then used to unitize secondary items.
- According to a European consumer response report, “Unit loads represent a key cost driver since they impact on transport, storage, handling and packaging, estimated to account for 12–15 percent of retail sales price.”

Packaging

Efficiency through unitization and palletization

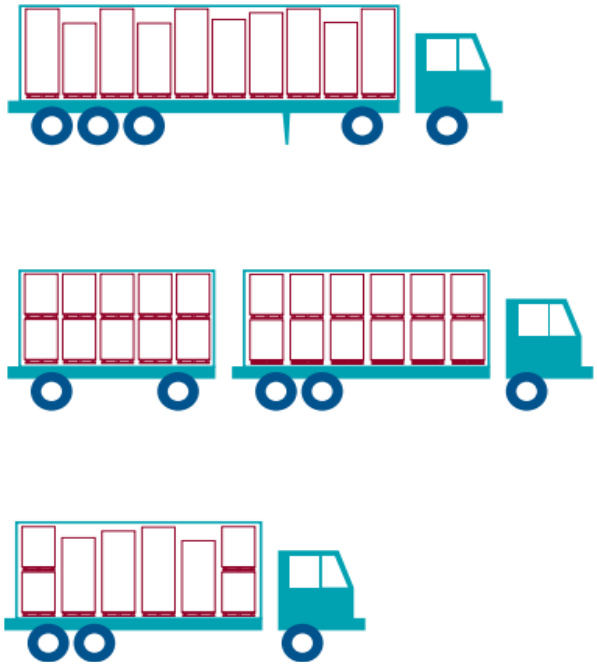
Palletization of loads:

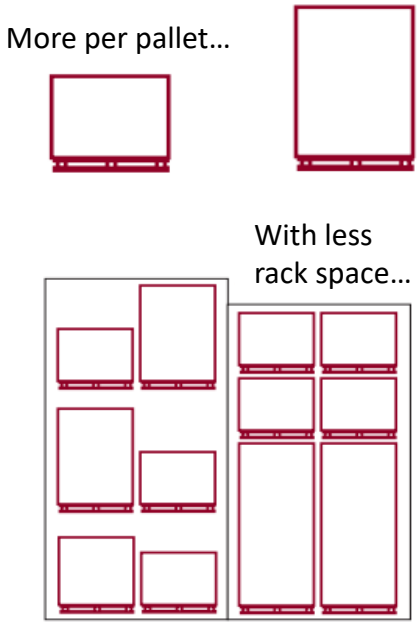
- Loads are most commonly unitized on pallets, which allows use of forklift truck or similar equipment for handling.
- Most pallets are made of hard wood—denser and stiffer woods are preferred for durability although they can be costlier than other woods. Plastic is becoming more popular as the food industry and other sterile or "particle" sensitive manufacturers are required to use plastic. Use of GPS & RFID devices and concern with recycling will also increased future use of plastic.
- There are many possible pallet sizes and designs; however, for the sake of standardized distribution, certain sizes and designs predominate

Packaging

Efficiency through space utilization

- The advantage of unit load is that it packs tightly into warehouse racks, intermodal containers, trucks, and boxcars; yet it can be easily broken apart at a distribution point, usually a distribution center.





Note: Figures show how products can be unitized to improve the utilization of space in a container. There are no one-to-one correspondence between trucks (on the left) and racks (on the right).

Source: A.T. Kearney, Efficient Unit Loads project

Packaging

Design requirements

Functional requirements:

- Consumer packaging (directed at a household) should provide safe containment for the product and sufficient information to user about how to use.
- Commercial packaging (directed at a commercial enterprise) should be attractive to the customers, provide a competitive advantage, and be easy to store and stock.

Packaging

Design requirements (cont.)

Distribution and safety:

- Product labeling
- The goal of the product labelling is to provide products details, directions of use, and other relevant information to the consumer
- Sales requirements
- Aesthetics, perceived quality of the product, and brief but adequate product information for customers

Packaging

Design requirements (cont.)

Unitization considerations:

- Rigid containers
- Flexible containers

Communication considerations:

- **Universal Product Code (UPC)**
- **Electronic Product Code (EPC)**
- **Radio-frequency identification (RFID)** technology

Materials-handling considerations:

- Pallets, fork-lift trucks, rider trucks, conveyers, etc.

Packaging Costs

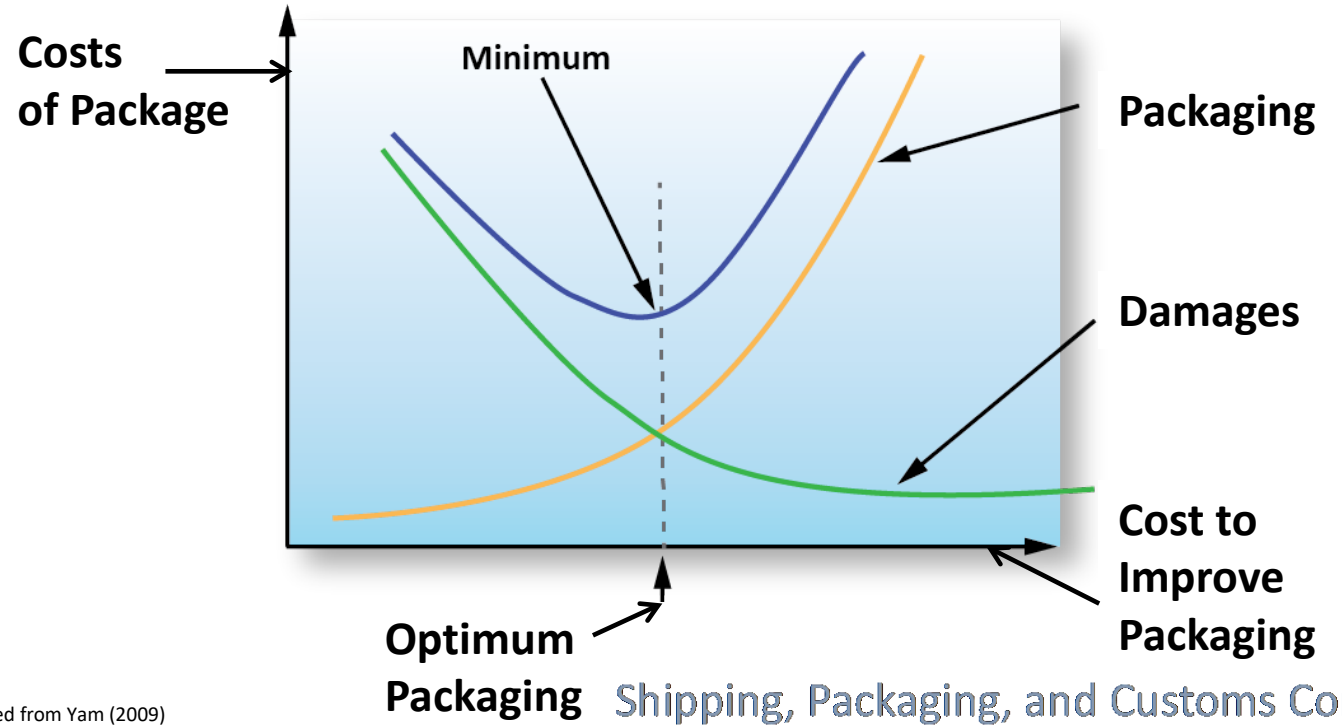
Contributing factors

- Customer requirements (product type and materials, functional requirements, sales requirements)
- Packaging materials cost
- Recyclability and reusability of packages
- Shipment quantity (i.e., enough for palletization?)
- Government regulations (i.e., safety and environmental considerations)

Packaging Costs

Tradeoffs

- Packaging cost can increase exponentially as we move from low to very low damage rate
- The point where the total cost (packaging cost + cost of damage) is minimum provides a desirable packaging design



Source: Adapted from Yam (2009)

Documentation/Requirements

Common shipping documents

Bill of lading (BOL):

- A required document to move a freight shipment
- Serves as a receipt of freight services, conveys the freight terms, and serves as a contract for carriage and a delivery receipt
- An official document that may be admissible in court of law and is issued by the shipping company

Freight bill:

- Similar to BOL except that it does not serve as a key piece of "evidence" in a dispute
- Can include additional charges, information, or stipulations that further clarify the information on the BOL

Documentation/Requirements

Common shipping documents (cont.)

Freight claims:

- A demand by a shipper or consignee upon a carrier (as for reimbursement of an overcharge, or for loss or damage to goods accepted for transportation).
- Freight claims occur for various reasons; some are real, some are contrived, some can be prevented, but they all can be controlled, understood, and kept to acceptable, understandable, and reconcilable levels.

Documentation/Requirements

Regulatory requirements

Occupational Safety and Health Administration (OSHA) requirements:

- Under the Occupational Safety and Health Act of 1970 (OSH Act), employers are responsible for providing a safe and healthful workplace.
- OSHA's mission is to ensure safe and healthful workplaces by setting and enforcing standards, and by providing training, outreach, education, and assistance.
- Employers must comply with all applicable OSHA standards
- Employers must also comply with the “General Duty Clause” of the OSH Act, which requires employers to keep their workplace free of serious recognized hazards.

Documentation/Requirements

Regulatory requirements (cont.)

E-Fulfillment/Third-Party Logistics/Pick-and-Pack:

- In broad terms, e-Fulfillment is an amalgamation of all the people, processes, and technology employed to deliver an online order to a customer.
- The key is to make all of these come together to create a positive customer experience before, during, and after a sale.
- It includes everything from the online checkout process, payment provider, and order management system; to the steps taken to pick, pack, and ship the order.
- At the end of 2014, U.S. e-trail sales surpassed $300 billion for the first time—This number is expected to keep growing as online shopping continues to increase.

Documentation/Requirements

Regulatory requirements (cont.)

Environmental concerns:

- The normal shipping hazards in the freight environment can vary by mode.
- Truckload, LTL, railcar, oceanic, and airfreight shipping environments typically include hazards that are unique to those modes, as well as their common hazards.
- Many of the more severe hazards are due to the number of separate handlings required and the mechanized material-handling equipment used.

Overseas Shipping

Considerations

Handling and determining method of shipping:

- Consult with a freight forwarder to determine the method of international shipping.
- Usually consists of large and bulky shipments, so it requires a long lead time and advance booking for a space on board a transport.
- The common practice is to have a multi-modal transit (more than one means of transportation such as truck, rail, barge, airplane, ship, etc.) operators take the full responsibility for the entire movement of goods from factory to your final (i.e., customer) destination.

Overseas Shipping

Considerations (cont.)

Factors to consider when determining international shipping methods:

- Cost of shipment
- Delivery schedule
- Accessibility to the shipped product by your foreign buyer
- Check Mandatory Screening of Cargo on Passenger Flights if shipped by a passenger aircraft

Overseas Shipping

Considerations (cont.)

Other important considerations for international shipping:

- Packaging and labeling
- Cargo insurance
- When shipping agricultural products, check the U.S. government regulation at Ship Your Agricultural Products

Preparing Products For Export

Considerations

Need to comply with both U.S. and foreign government regulations

Product classification:

- Finding the Harmonized System (HS) code is the starting point to classifying a product and preparing it for export.
- The international HS is administrated by the World Customs Organization, and serves as the foundation for the import and export classification systems used in the United States.
- The U.S. import classification system, the Harmonized Tariff Schedule (HTS) administered by the U.S. International Trade Administration Commission (USITC), and the U.S. export classification system, the Schedule B administered by the U.S. Census Bureau, Foreign Trade Division, both rely on the international HS codes for their 4-digit and 6-digit headings and subheadings.

Preparing Products For Export

Considerations (cont.)

Rules of origin (ROO):

- To take advantage of the reduced-duty benefits under a free trade agreement (FTA), an exported product must originate from an FTA party, or must contain a specified percentage of U.S. inputs and components.
- Each FTA has its own ROOs that describe how exported goods shipped to a country or a region may qualify for duty-free or reduced-duty benefits.
- Because the ROOs are FTA-specific and product-specific, they need to be followed carefully.

Foreign Standards and Certificates:

- Research US Trade Partner Countries to understand the trade benefits due to free trade and other agreements (export.gov)

Importing Into The United States

Best practices

- Review import rejection laws and trade barriers
- Build relationships and network on the ground in the export country
- Hire a customs broker
- Check license or permit requirements for importing certain goods
- Get assistance and training
- More information on this subject can be found at https://www.sba.gov/blogs/importing-goods-us-introductory-guide-small-business-owners

Note: *Customs brokers are private individuals, partnerships, associations or corporations licensed, regulated and empowered by U.S. Customs and Border Protection (CBP) to assist importers and exporters in meeting Federal requirements governing imports and exports.*

U.S. Customs

Import Industry Guide

A comprehensive report that provides information on the following:

- Packaging requirements
- Customs documents
- Internet purchases
- Intellectual property rights
- Toxic Substance Control Act (TSCA)
- International trade agreements
- A detailed report can be found at: http://www.dhl-usa.com/content/dam/downloads/us/express/local_other/dhl_us_customs_import_guide.pdf

Documentation/Requirements

International transport documentation

Exporting documents:

- BOL, dock receipt, delivery instructions, export declaration, letter of credit, consular invoice, commercial invoice, insurance certificate, and transmittal letter

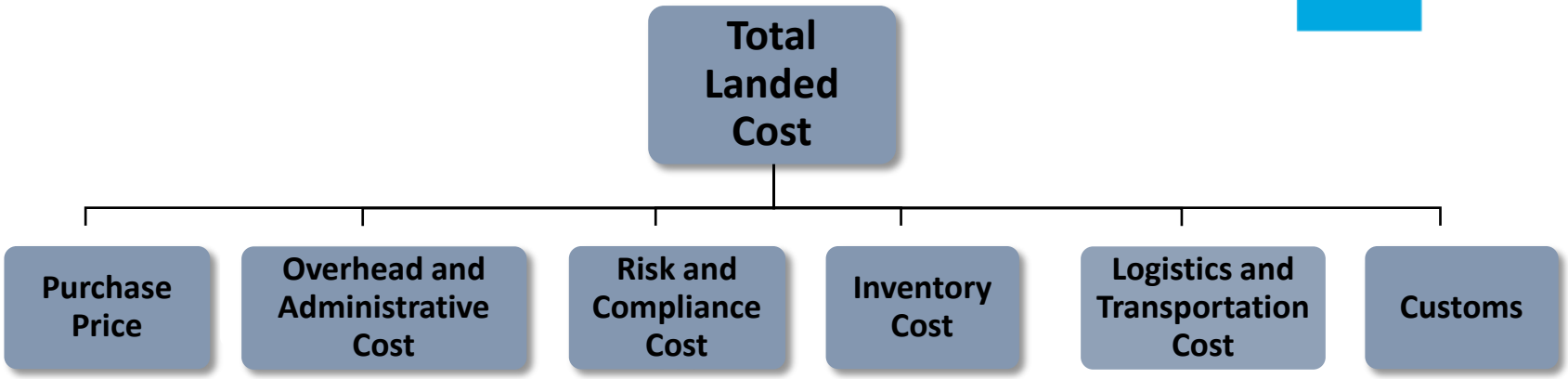
Importing documents:

- Arrival notice, customs entries, carrier's certificate and release order, delivery order, freight release, and special customs invoice (if applicable)

Note: For definitions and explanations of these documents, visit www.export.gov

Total Landed Cost

What it is and how to use it



- TLC is the sum of all costs associated with making and delivering products to the point where they produce revenue
- Allows business models to optimize the supply chain
- Identifies hidden costs in the supply chain
- Reduces working capital, thereby improving cash flow

Packaging and shipping costs are huge drivers of your logistics and transportation cost

TLC Drivers

Purchase price

The base price of sourcing the associated goods and/or materials —it includes the following:

- The price of goods paid to the seller
- Banking fees if and where applicable
- Currency exchange rates
  - —Choosing which currency to use for purchasing is very important
  - —Currencies with low volatility lead to reduction of risk and handling

TLC Drivers

Overhead/administrative costs

Includes cost terms that cannot be attributed directly to a product:

- It depends upon the hierarchy/levels present in an organization particularly when it comes to purchasing decision approval process (usually, the greater the hierarchy, the higher the cost and inefficiency)
- Banking fees if and where applicable
- Cost of material handling, manufacturing overhead costs, and oversight costs

TLC Drivers

Transportation/logistics costs

Includes the line-haul cost, domestic/international shipping alongside packaging and insurance costs—it depends on the following factors:

- The geographical distance traversed to deliver the product to the customer
- The total travel time (base trip time + refuelling time + loading time + border crossing time [for land shipping])
- Incoterm to be used, detailing the rules and regulations regarding goods transportation
  - —Type of packaging being used; taking care to ensure that risk of product damage is minimum
  - —Labor and fuel cost, and expedited shipping cost (if applicable)
  - —International trade agreements

Examples: http://www.dovelogistics.com/inco-terms-2016/

TLC Drivers

Customs

Includes the customs inspection, taxes, broker fees, and the merchandise processing fee (MPF)—the important factors to consider are:

- Applicable duties and taxes, with the objective of minimizing the tax burden
- Location of offshore production facility (if applicable)
- The country to which the product is shipped, since the customs and taxes vary vastly amongst different countries

TLC Drivers

Inventory cost

It consists of the value of the safety/cycle stock, the value of the inventory-in-transit, etc:

- **Safety stock**: the minimum inventory level to prevent stock-outs (associated with lead-time variability and demand)
- **Cycle stock**: the minimum inventory required to meet customer demands between inventory replenishment runs
- **Cost of inventory**: it depends on the company's business policy and production locations

TLC Drivers

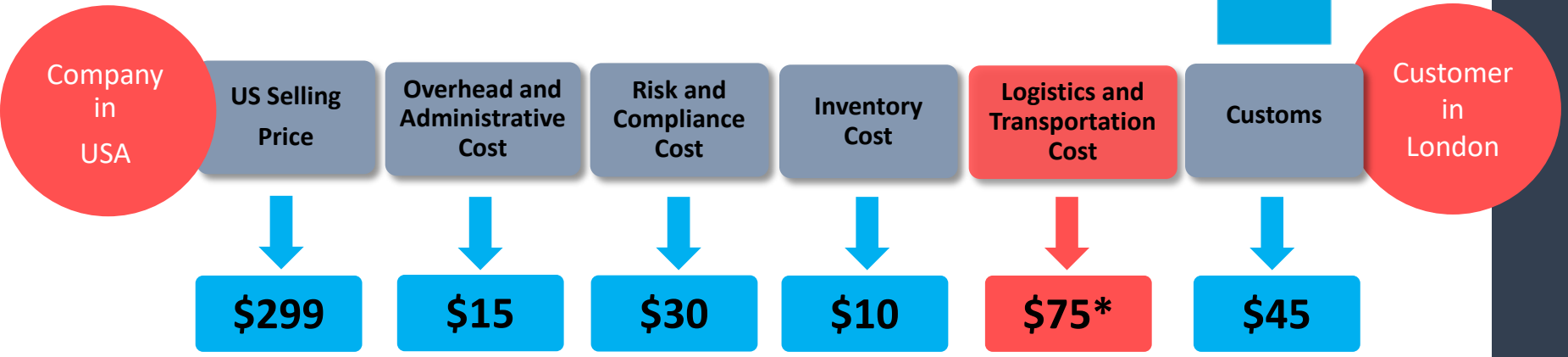
Risk/compliance cost

It is the cost of complying with regulations and trade policies and the cost of potential risks—including:

- Updating with respect to changes in government rules and guidelines
  - —Non-adherence could result in the disruption of the entire product supply chain
- Possibility of damaging the brand name
  - —This can occur by not meeting safety and/or health standards or causing damage to the environment
- Possibility of product recall due to defects
  - —This can lead to the occurrence of a reverse supply chain

TLC Calculation

Example



- This is a breakdown of the cost incurred for delivering an electronic product shipment from the manufacturer in the US to the customer in London

  TLC = $299 + $15 + $30 + $10 + $75 + $45 = $475

  Contribution (%) of shipping and packaging cost on:

  TLC = $75/$475 = **15.8%**

  Note: *Includes Packaging Cost + Inland Freight + Air/Sea Freight

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List of Acronyms

- 3PL – Third Party Logistics
- LTL – Less Than Load
- HS – Harmonized System
- HTS – Harmonized Tariff Schedule
- USITC – U.S. International Trade Administration Commission
- FTA – Free Trade Agreement
- ROO – Rules Of Origin

List of Acronyms

(cont.)

- MRL – Manufacturing Readiness Level
- TLC – Total Landed Cost
- UPC – Universal Product Code
- EPC – Electronic Product Code
- RFID – Radio Frequency Identification
- BOL – Bill of Lading
- OSHA – Occupational Safety and Health Act

List Of Terms

In glossary

- **Unit Load** combines individual items or items in shipping containers into single "units" that can be moved easily with a pallet jack or forklift truck.
- **Process Validation** is the analysis of data gathered throughout the design and manufacturing of a product in order to confirm that the process can reliably output products of a determined standard.
- **Manufacturing Capacity** is the volume of products or services that can be produced by an enterprise using current resources. Three commonly used definitions of capacity are as follows: design capacity, effective capacity & actual output. (Repeat from 2B)
- **Production** is the processes and methods used to transform tangible inputs (raw materials, semi-finished goods, subassemblies) and intangible inputs (ideas, information, knowledge) into goods or services.
- **Primary Package** is the first-level product packaging such as the bottle, can, jar, tube, etc., that contains the item sold. It is the last packaging thrown by the consumer.
- **Secondary Package** encloses the primary packaging, such as toothpaste tube in its box.
- **Transportation Packaging** is designed to protect goods that are in transit, especially products that are shipped by truck or train. However, the supply chain often includes other modes of transportation as well. Therefore, transport packaging needs to be designed for both the local conditions and the export conditions if the goods are sent from one country to another.
- **Unit Load** combines individual items or items in shipping containers into single "units" that can be moved easily with a pallet jack or forklift truck.
- **Palletization of Loads** is a method of storing and transporting goods stacked on a pallet, and shipped as a unit load. It permits standardized ways of handling loads with common mechanical equipment such as fork-lift trucks.
- **Universal Product Code UPC)** is a barcode symbology that is widely used in the United States, Canada, United Kingdom, Australia, New Zealand, in Europe and other countries for tracking trade items in stores. UPC (technically refers to UPC-A) consists of 12 numeric digits, that are uniquely assigned to each trade item.

List Of Terms

In glossary (cont.)

- **Electronic Product Code (EPC)** is designed as a universal identifier that provides a unique identity for every physical object anywhere in the world, for all time.
- **Radio-Frequency Identification (RFID) Technology** uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information.
- **Bill of Lading** is a document issued by a carrier (or his agent) to acknowledge receipt of cargo for shipment.
- **Freight Bill** is a carrier's invoice for freight charges applicable to a shipment. Also called freight invoice.
- **Freight Claims** is a legal demand by a shipper or consignee to a carrier for financial reimbursement for a loss or damage of a shipment.
- **Occupational Safety and Health Administration (OSHA)** is an agency of the United States Department of Labor. OSHA's mission is to "assure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance"
- **E-Fulfillment** is an amalgamation of all the people, processes, and technology employed to deliver an online order to a customer.
- **Third Party Logistics** is a company's use of third-party businesses to outsource elements of the company's distribution and fulfillment services.
- **Pick-and-Pack** is a part of a complete supply chain management process that is commonly used in the retail distribution of goods. It entails processing small to large quantities of product, often truck or train loads and disassembling them, picking the relevant product for each destination and re-packaging with shipping label affixed and invoice included.
- **Rules of Origin (ROO)** are used to determine the country of origin of a product for purposes of international trade

List Of Terms

In glossary (cont.)

- **Foreign Standards and Certificates** are required fro many products that are sold in multiple countries. This may include performance tests and quality assurance tests, to meet qualification criteria stipulated in contracts, regulations, or specifications (typically called "certification schemes" in the product certification industry).
- Most product certification bodies (or product certifiers) are accredited to ISO/IEC Guide 65:1996, an international standard for ensuring competence in those organizations performing product certifications. The organizations that perform this accreditation are called Accreditation Bodies, and they themselves are assessed by international peers against the ISO 17011 standard. Accreditation bodies that participate in the International Accreditation Forum (IAF) Multilateral Agreement (MLA) also ensure that these accredited Product Certifiers meet additional requirements set forth in "IAF GD5:2006 - IAF Guidance on the Application of ISO/IEC Guide 65:1996".
- **Less Than Load (LTL)** is the transportation of relatively small freight in a truck with products from other companies.
- **Harmonized System (HS)** is an internationally standardized system of names and numbers to classify traded products.
- **Harmonized Tariff Schedule (HTS)** is the primary resource for determining tariff (customs duties) classifications for goods imported into the United States.
- **U.S. International Trade Administration Commission (USITC)** is an independent, bipartisan, quasi-judicial, federal agency of the United States that provides trade expertise to both the legislative and executive branches.
- **Free Trade Agreement** free-trade area is the region encompassing a tradebloc whose member countries have signed a free-trade agreement (FTA). Such agreements involve cooperation between at least two countries to reduce trade barriers – import quotas and tariffs – and to increase trade of goods and services with each other.