



## It's Your Supply Chain: Know it, Know the Risks, Own it

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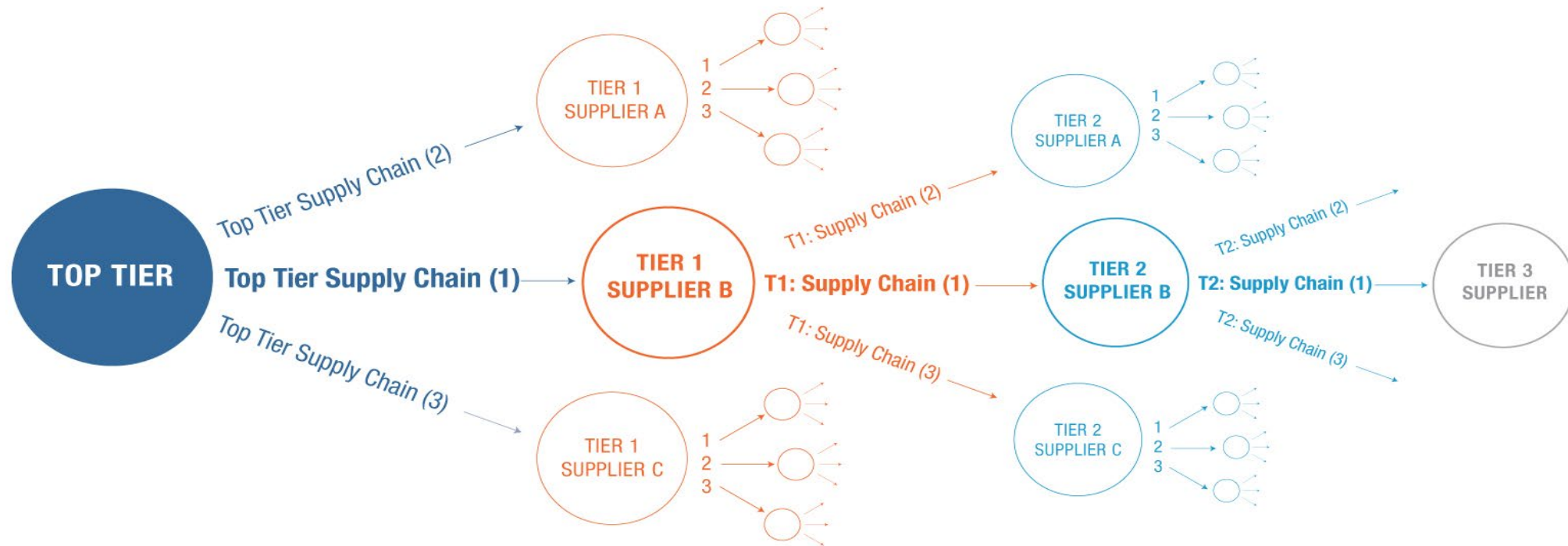
27 September 2023

# Agenda

- Supply Chain
  - what does that really mean?
  - Why do we care?
- It's really about the total system and total cost
- The risks – what are they?
- How do we mitigate our risks –
  - where do we concentrate our efforts?
  - What are some mitigation strategies and tools?
- Wrap Up

# Who's in the Room?

# Where are You in the Supply Chain



- How many “you are here” do you have?
- What are your direct connections? – Your Tier 1 Suppliers and Customers
- What is your Total Supply Chain? – Your customer's customers & your Tier 2 & 3

# Supply Chains Need Assistance in 12 Areas

## Critical

1. Increase Effectiveness of Information
2. Mitigate Global Risks
3. Optimize Supply Chain vs. Develop Individual Suppliers
4. Reduce / Manage Volatility

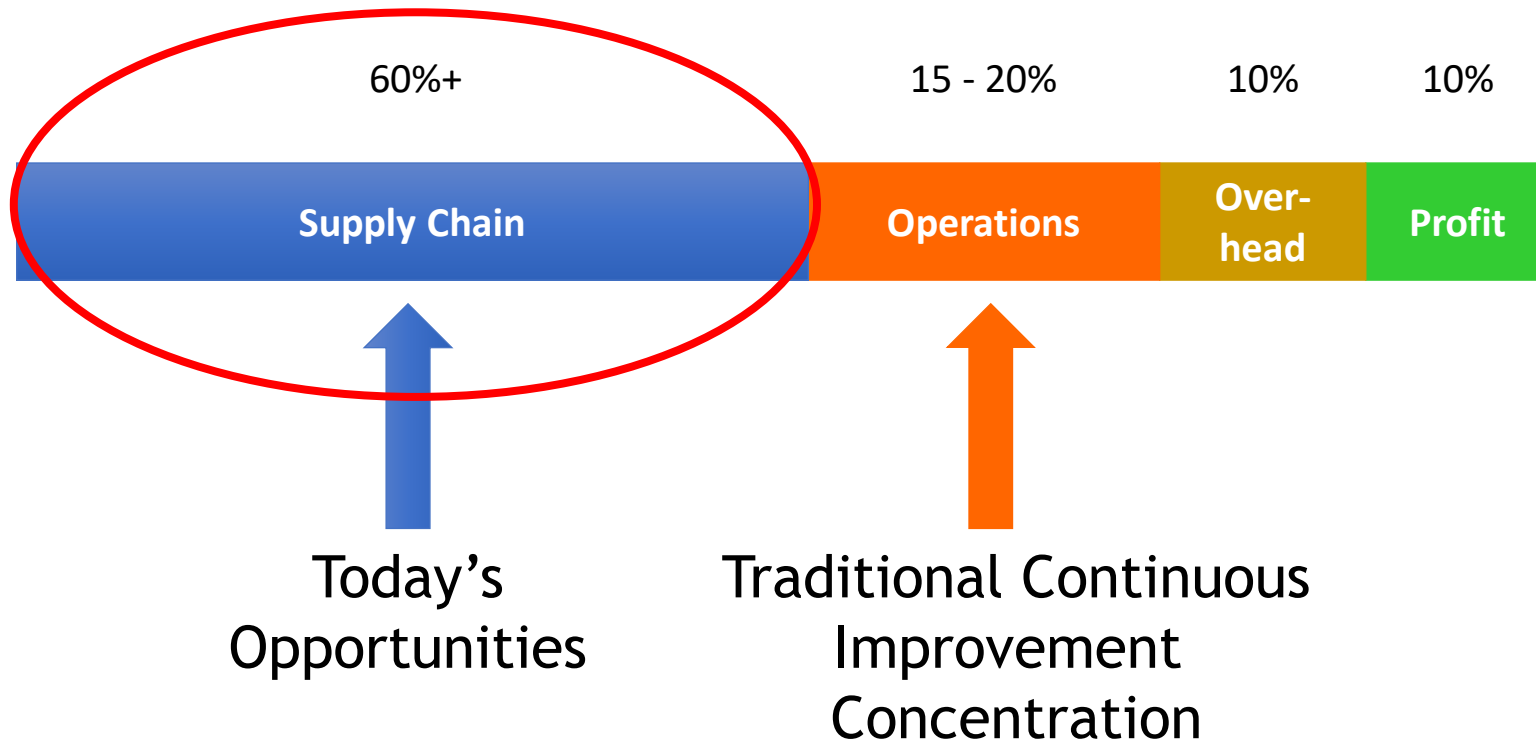
## Highly Important

1. Identify and address choke points in a sustainable manner
2. Document supply chain strategy
3. Align supply chain metrics with long-term business focus
4. Expand supplier capabilities for emergent needs in technology and ability
5. Make Better Total Cost Sourcing Decisions
6. Enhance value chain collaboration among suppliers, Top Tiers, and customers
7. Improve Top Tier-Supplier product development collaboration
8. Recognize the emerging needs for future capabilities



U.S. Supply Chain  
Competitiveness  
Study

# Why Optimize the Supply Chain?



# Supply Chain – What does that Really Mean?

NIST AMS 100-49  
October 2022

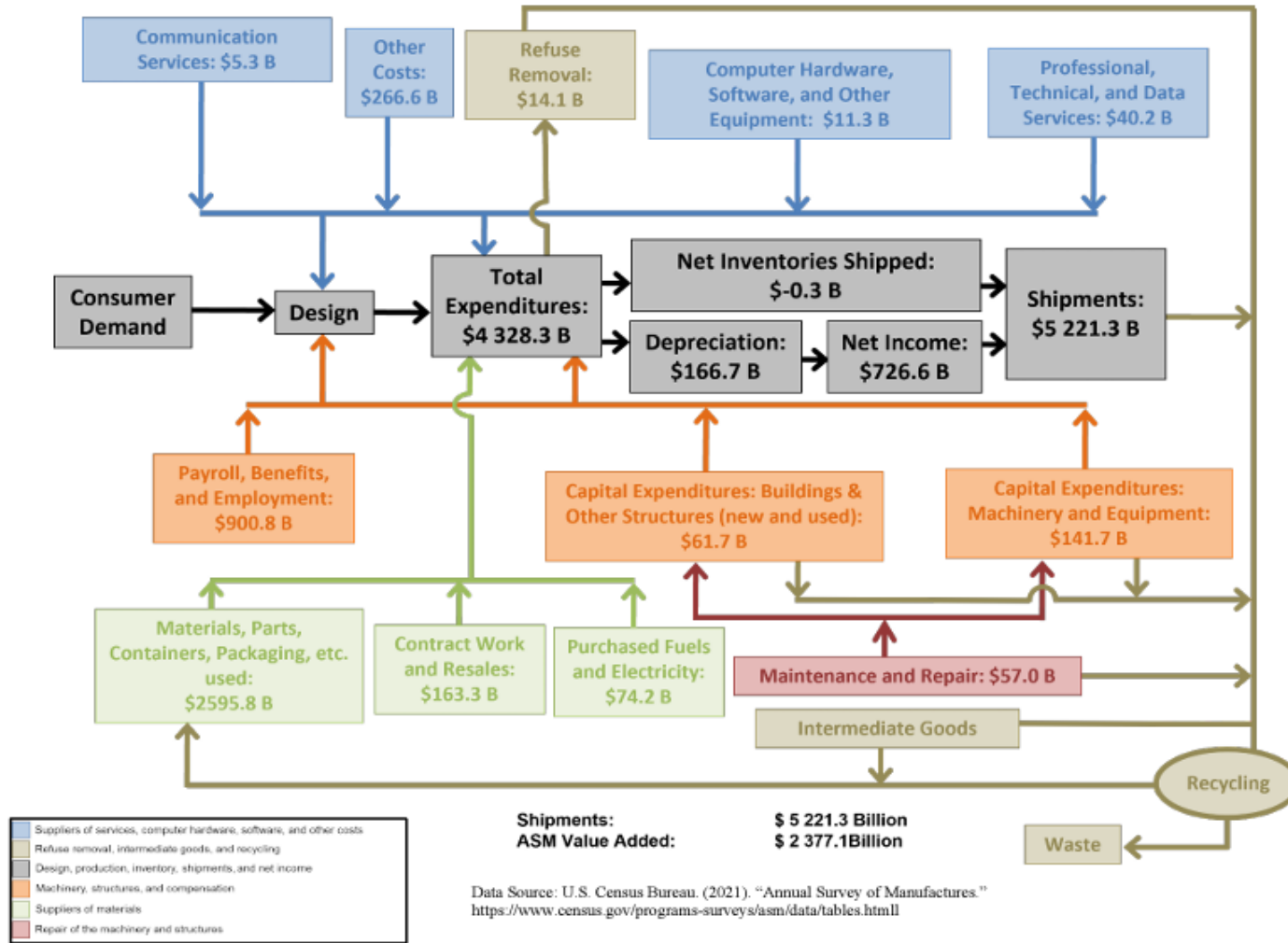
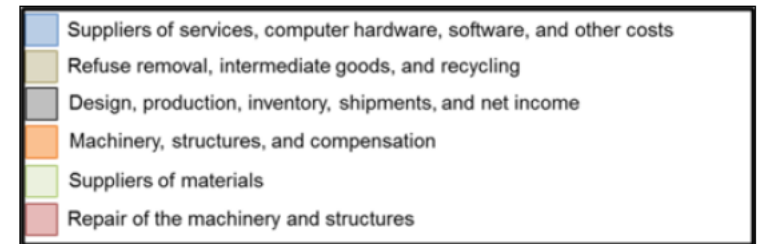


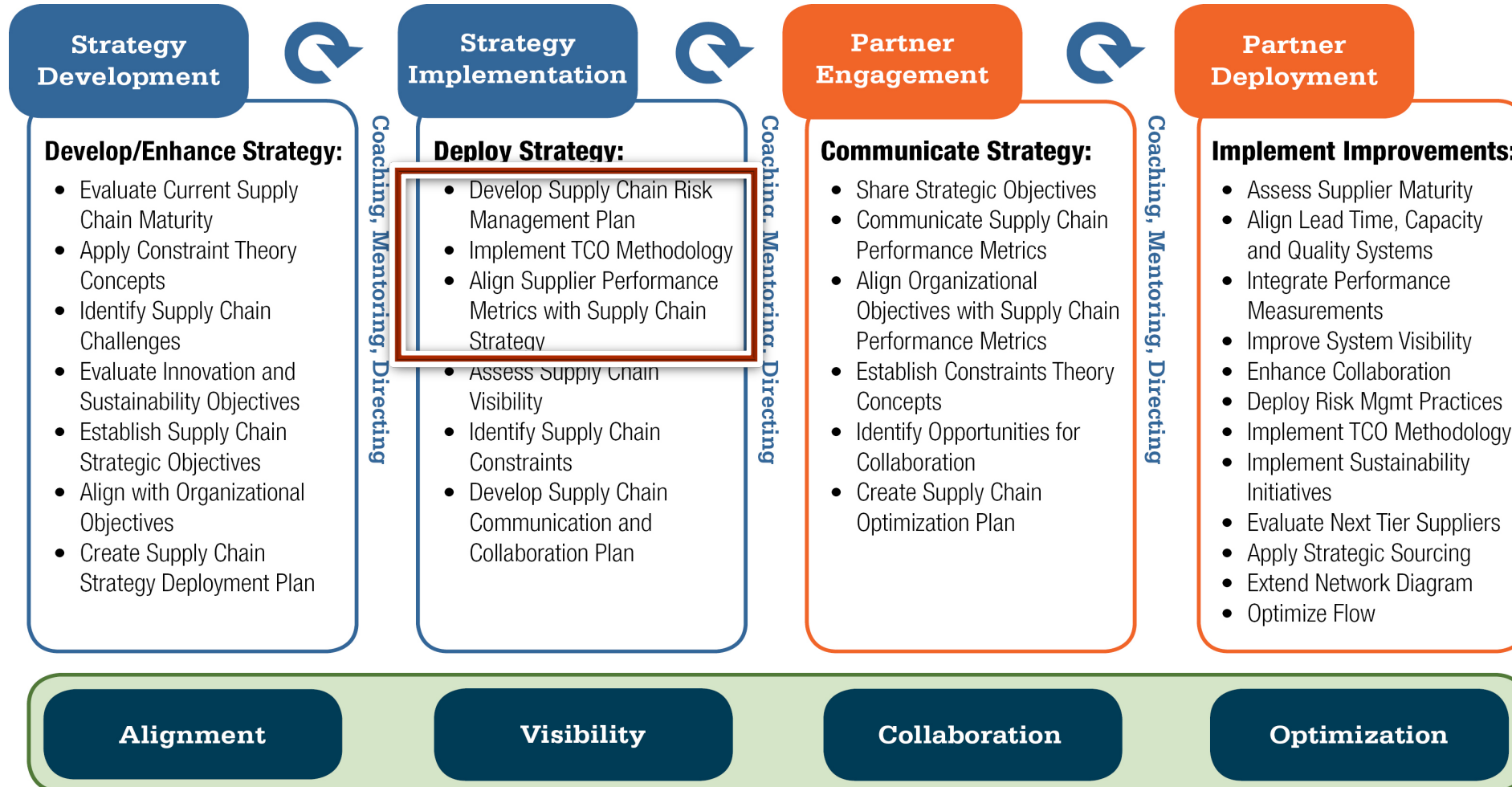
Figure 3.1: Manufacturing Supply Chain, 2020

- U.S. Direct and Indirect manufacturing value added (i.e., manufacturing and its domestic supply chain) was **\$4.278 trillion in 2019** (NIST AMS 100-49 ). (<https://doi.org/10.6028/NIST.AMS.100-49>)
- Manufacturing shipments were **\$5.221.3 trillion in 2020**, which can be broken into several supply chain costs (Figure 3.1)

NIST AMS 100-49 : Manufacturing Supply Chain, 2020(<https://doi.org/10.6028/NIST.AMS.100-49>)



# Supply Chain Optimization Roadmap

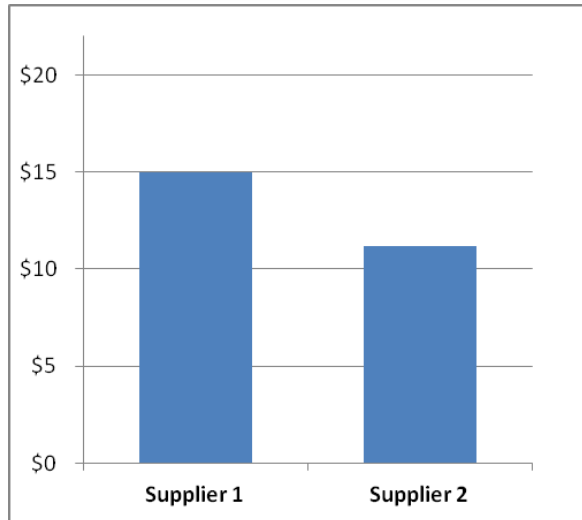




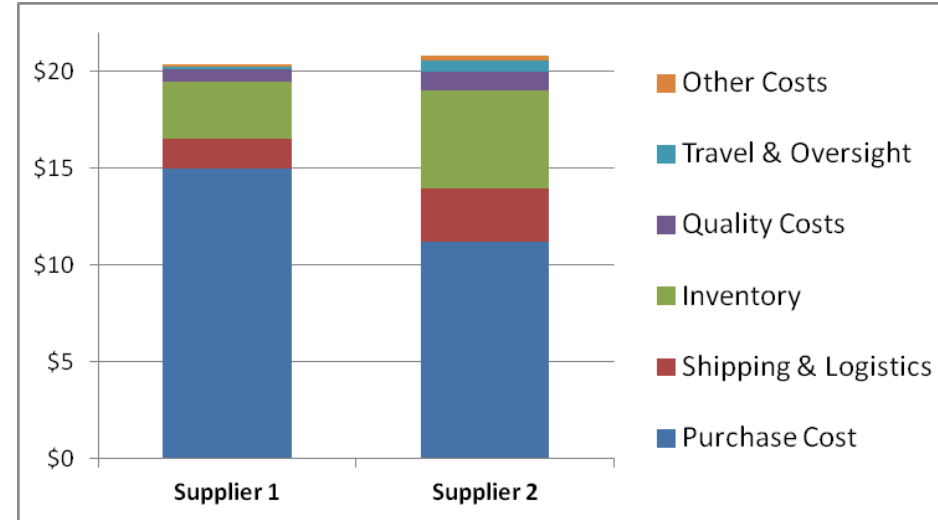
# Total Cost of Ownership of your Supply Chain

## “Traditional” vs. TCO Decision Making

Purchase Cost Only



Total Cost of Ownership



**TCO provides a more Complete & Competitive measurement of Direct *and* Indirect Acquisition Costs to aid in Strategic Sourcing Decisions**

# Why Implement a TCO Methodology?

## Visibility

### Strategy Implementation

Define Risk Management Plan  
Utilize Total Cost of Ownership  
Assess Visibility & Align Metrics

## Implement TCO Methodology

- **Benefits of Using Total Cost Methodology**
  - Provides knowledge of both visible and hidden costs
  - Understand the true cost of sourcing decisions
  - Make better strategic sourcing decisions
  - Understand post-award cost drivers (i.e.: quality, expediting, oversight)

## What is “Total Cost of Ownership” (TCO)?

The sum of all visible and hidden costs associated with the acquisition, transportation, storage, finance, transactions, and environmental impacts of every activity of the supply chain

# What Does TCO Look Like?

- We do not have time today to cover all these areas in detail.
- It is important to think about your supply chain at a system level.

Which areas are most important for your business?

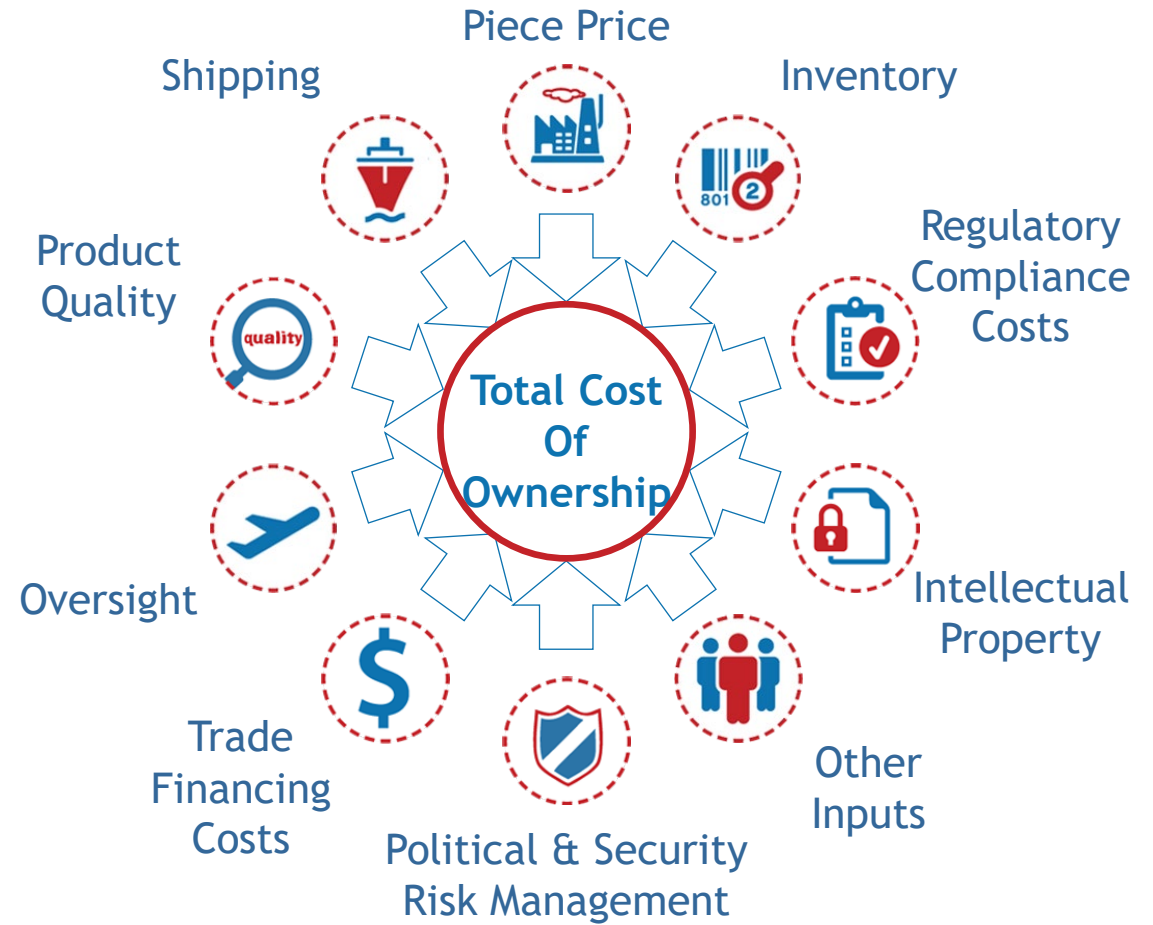
**Strategy Implementation**

**Deploy Strategy:**

- Develop Supply Chain Risk Management Plan
- Implement TCO Methodology
- Align Supplier Performance Metrics with Supply Chain Strategy
- Assess Supply Chain Visibility
- Identify Supply Chain Constraints
- Develop Supply Chain Communication and Collaboration Plan

**Visibility**

Coaching, Mentoring, Directing



# Calculating the TCO

TCO Calculator

### Total Cost of Ownership Calculator Main Menu

TCO Inputs | TCO Outputs | DataBase Editor | About |

**Data Input**

Product Info	Shipping Info	Inventory Info	Risk Mitigation Info
Demand Info	Vendor Lead Time	Expediting Info	Add'l/Misc Info
Vendor Info	Transportation Info	Oversight Info	PRINT Collection Sheet
			PRINT Entered Data

Save File to Disk | Exit Calculator

MEP Supply Chain Optimization

Transportation Information

	Supplier AA	Supplier BB	Supplier CC	Supplier DD
14 Name of Supplier	Supplier AA	Supplier BB	Supplier CC	Supplier DD
<b>Transportation Information</b>				
38 Time for Consolidation at Port of Departure (calendar days)	0	14	14	0
39 Number of Containers that Enter the United States Annually	132	80	60	50
40 Ocean Shipping Distance (nautical miles)	---	5,903	5,724	---
41 Transit Time, Port to Port (calendar days)	---	17	15	---
42 Ocean Freight Port of Discharge	---	Los Angeles, CA	Los Angeles, CA	---
43 Time for Consolidation at Port of Entry and Customs Clearance (calendar days)	0	14	14	0
44 Brokerage Fees, Per Order	\$0.00	\$13.00	\$1.00	\$0.00
45 Import Duty and Taxes, Per Order	\$0.00	\$500.00	\$600.00	\$0.00
46 Ground Distance in Miles from Seller (or Port of Entry) to Buyer	451	1,930	1,930	2,111
47 Intermodal: Percentage of US Ground Transport by Rail	0%	50%	95%	0%
48 Freight Costs from Seller or US Port to Buyer	\$123.45	\$234.56	\$147.25	\$159.35
49 Other Transportation Costs	\$234.56	\$345.56	\$471.85	\$753.24

Notes:

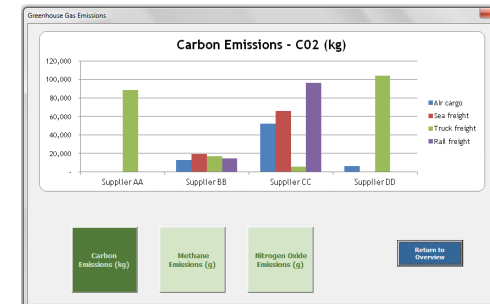
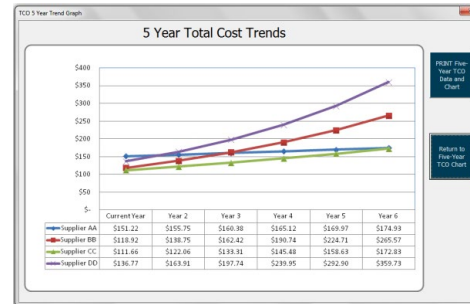
< Previous | Main Menu | Next >

Output - Overview

### TCO Output - Overview: PER UNIT Total Cost

	Supplier AA	Supplier BB	Supplier CC	Supplier DD
Quoted Cost	\$123.45	\$100.10	\$80.55	\$120.00
Packaging Cost	\$12.34	\$15.25	\$25.01	\$9.99
Transportation Costs	\$0.01	\$6.63	\$2.37	\$0.04
Quality Costs	\$2.72	\$2.88	\$3.69	\$4.55
Inventory Costs	\$6.00	\$8.85	\$6.61	\$5.90
Expediting Costs	\$3.37	\$1.77	\$2.49	\$6.38
Oversight Costs	\$0.04	\$6.10	\$6.20	\$6.35
Risk Management Costs	\$8.83	\$6.21	\$6.42	\$6.00
Miscellaneous Costs	\$6.00	\$6.00	\$6.00	\$6.00
<b>Total Cost, per unit</b>	<b>\$151.22</b>	<b>\$118.92</b>	<b>\$111.66</b>	<b>\$136.77</b>

TCO Composition Graphs | Return To Main Menu | Print TCO Output | Dynamics | Economics



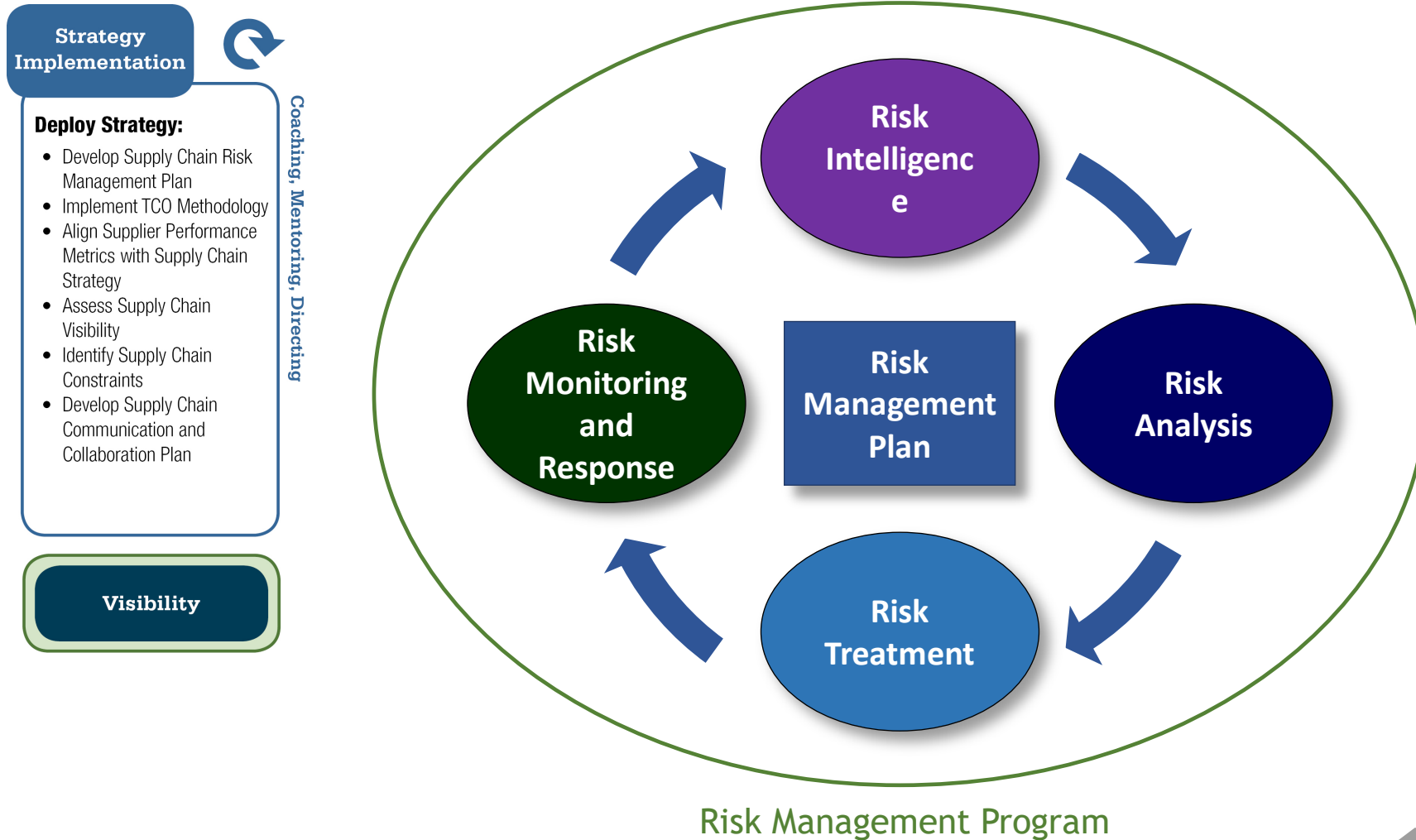
Example Screen Shots

## Focusing on Risk Management

- Risk Management is a component of the Total Cost of Ownership
- The Risk Mitigation cost for each supply source needs to be added to the Total Cost of Ownership
- The cost of risk is often overlooked yet, **every area contains risk**



# Supply Chain Risk Management Program



# The Risk Scoring Processes



Risk  
Analysis

For every vetted risk event, on a scale of 1 to 10:

1. What is the **Severity** of the effect on the supply chain of the event occurring?
2. What is the **Probability** of the event?
3. Can the event be anticipated by the detection of a **Trigger**?

# Example Risk Register Tools

### Risk Trigger

Enter Data in Orange Cells

Risk Category	Risk Description	"IF - THEN" Risk Statement	Trigger
1 Logistics	Glass panel cost includes component for delivery and is sensitive to increases in fuel cost	If fuel prices increase 5% or more then supplier will raise cost of panels to compensate	Fuel prices increase 5% over contract base
2 Supplier Performance	There has been a problem with photovoltaic cells shortly after installation	If cells fail early, warrantee replacement costs will lower profit margin and erode customer confidence	Failure rate exceeds 1%
3 Labor	Glass panel supplier is currently in contract negotiations with labor	If glass panel supplier goes on strike it could result in inventory shortages and inability to fill	Labor negotiations exceed 3 weeks

### Value at Risk

Enter Data in Orange Cells

Risk Category	Risk Description	"IF - THEN" Risk Statement	Probability %	Estimated Annual Impact	VaR
1 Logistics	Glass panel cost includes component for delivery and is sensitive to increases in fuel cost	If fuel prices increase 5% or more then supplier will raise cost of panels to compensate	90%	\$25,000	\$22,500
2 Supplier Performance	There has been a problem with photovoltaic cells shortly after installation	If cells fail early, warrantee replacement costs will lower profit margin and erode customer confidence	30%	\$315,000	\$94,500
3 Labor	Glass panel supplier is currently in contract negotiations with labor union	If glass panel supplier goes on strike it could result in inventory shortages and inability to fill orders	20%	\$150,000	\$30,000
4 Capacity	Manual lamination process is time consuming and is limited by line capacity	If capacity is lacking then the increase in the manual lamination process will cause late orders	80%	\$125,000	\$100,000
5 Legal	Installers could potentially cause roof leaks resulting in litigation for damage and inventory loss at customer location	If installer errors result in leaks in customer's roof, leaks could damage inventory at customer facility	50%	\$100,000	\$50,000

### Risk Impact Analysis

Enter values to distinguish between high, med, and low risk order numbers

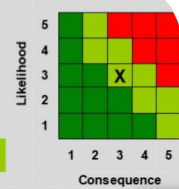
Risk Category	Risk Description	"IF - THEN" Risk Statement	Probability	Detectability	Severity	Risk Impact Number	Probability %
1 Logistics	Glass panel cost includes component for delivery and is sensitive to increases in fuel cost	If fuel prices increase 5% or more then supplier will raise cost of panels to compensate	9	4	6	216	90%
2 Supplier Performance	There has been a problem with photovoltaic cells shortly after installation	If cells fail early, warrantee replacement costs will lower profit margin and erode customer confidence	3	5	8	120	30%
3 Labor	Glass panel supplier is currently in contract negotiations with labor union	If glass panel supplier goes on strike it could result in inventory shortages and inability to fill orders	2	4	4	32	20%
4 Capacity	Manual lamination process is time consuming and is limited by line capacity	If capacity is lacking then the increase in the manual lamination process will cause late orders	8	4	5	160	80%
5 Legal	Installers could potentially cause roof leaks resulting in litigation for damage and inventory loss at customer location	If installer errors result in leaks in customer's roof, leaks could damage inventory at customer facility	5	6	8	240	50%

Item No.: Technical Data 1  
 Risk Identifier: Person's name  
 Company: Yours  
 Title: Short Descriptive Title Formed metal acceptance Criteria  
 Description: Processing provides guidance for measuring gap at edge only  
 Basic Cause/Risk: Metal may be within tolerance at edges, but not in center area  
 Impact: 1) Part may not fit at next level of assembly. 2) vibration interference. 3) weather intrusion in field. 1) may require additional operation assy time. 2) & 3) may be warranty or product quality issues.  
 Mitigation: Agree to a plan for checking the fit-up of the metal across the entire tool prior to beginning forming trials.  
 Closeout: Process acceptance.

Ratings:  
 Likelihood 3  
 Consequence 3  
 Risk Level Mod  
 Risk Type: S,C

Potential Cost  
 Potential \$ for Mitigation  
 Risk \$ added to

Created: 18-  
 Last update: 18-  
 Last review: dat  
 Status: op



Unmitigated Risk Count

	Unmitigated	Mitigated
Low	8	18
Mod	8	25
High	40	13
Total	56	56

Mitigated Risk Count

Unmitigated Risk Count Mod/High Risks

Mitigated Risk Count Mod/High Risks

Risk Mitigation Plan Status

	Unmitigated	Mitigated
Cost	20	14
Schedule	9	7
Technical	16	15
Program	3	2
Total	48	38

Status: This risk count includes moderate (yellow) and high (red) risks only.

	Unmitigated	Mitigated
Open	1	
Pending	30	
Closed	25	
Total	56	

### Risk Response Register

Enter values to distinguish between high, med, and low risk

Enter Data in Orange Cells

Risk Category	Risk Description	"IF - THEN" Risk Statement	Risk Impact Number	Risk Mitigation Strategy	Trigger	Trigger Activated Y/N	Fall Back Mitigation Strategy	Risk Owner Contact Info	Trigger Activated Date	Due Date	Notes
1 Logistics	Glass panel cost includes component for delivery and is sensitive to increases in fuel cost	If fuel prices increase 5% or more then supplier will raise cost of panels to compensate	216	Negotiate long-term contract with logistics suppliers	Fuel prices increase 5% over contract base	Y	Identify alternative suppliers	Emily Pearson (515) 755-0107	5/1/14	5/30/14	Contract discussions are underway with 3 logistics providers.
2 Supplier Performance	There has been a problem with photovoltaic cells shortly after installation	If cells fail early, warrantee replacement costs will lower profit margin and erode customer confidence	120	Implement new advanced technology cell test	Failure rate exceeds 1%	N	Identify alternative suppliers	Bob Davis (515) 755-0110			Continue monitoring
3 Labor	Glass panel supplier is currently in contract negotiations with labor union	If glass panel supplier goes on strike it could result in inventory shortages and inability to fill orders	32	Reserve additional capacity at alternate glass panel supplier	Labor negotiations exceed 3 weeks	N	Identify alternative suppliers	Jill Giesman (515) 755-0100			Continue monitoring
4 Capacity	Manual lamination process is time consuming and is limited by line capacity	If capacity is lacking then the increase in the manual lamination process will cause late orders	160	Implement second lamination cell to handle increases in customer demand	Order volume increases more than 20%	N	Implement automated production line	Emily Pearson (515) 755-0107			Continue monitoring
5 Legal	Installers could potentially cause roof leaks resulting in litigation for damage and inventory loss at customer location	If installer errors result in leaks in customer's roof, leaks could damage inventory at customer facility	240	Redesign installation kit and develop installer qualification program	Report of roof damage	N	Develop installation kit with non-penetrating attachment	Ron Jones (515) 755-0102			Continue monitoring



# Putting a Value to the Risk

Value at Risk						
Enter the estimated annual impact if this risk manifests itself						
Risk Category		Risk Description	"IF - THEN" Risk Statement	Probability (0-1)	Estimated Annual Impact	VaR
1	Logistics	Inbound and outbound freight costs are sensitive to increases in fuel prices	IF fuel prices increase THEN profit margins can be significantly eroded	0.4	\$100,000	\$40,000
2	Labor	Eastern Star shipments travel through 2 ports, each of which has undergone strikes in the last 10 years	IF there is a port strike, Eastern Star cells delivery will be disrupted	0.01	\$400,000	\$4,000
3	Labor	Glass panel supplier is currently in contract negotiations with labor union	IF glass panel supplier goes on strike THEN it could result in inventory shortages and inability to fill orders	0.2	\$800,000	\$160,000
4	Capacity	The supply chain may be agile enough to effectively react to changes in demand, both up or down.	IF demand changes THEN SSC may not have enough materials (or too many if demand drops) to respond	0.1	\$500,000	\$50,000
5	Business Continuity	SSC's location on the north Florida Atlantic coast makes it susceptible to disruptions and damage due to Atlantic hurricanes	IF a hurricane hits the SSC area THEN disruptions and possible damage will effect operations	0.019	\$5,000,000	\$95,000

- How do you consider this in the price of a product?
- How do you consider this in supply chain decisions?
- Do not discount the non-quantified risks such as preferred customers you have & potential lost business (which may or may not be quantified)
- This is part of the TOTAL COST OF OWNERSHIP

# Risk Mitigation Strategies

- Remove the risk source
- Change the probability of occurrence
- Change the severity
- Share or transfer the risk with another party or parties
- Avoid the risk by deciding not to start or continue with the activity that gives rise to the risk

Additionally, the risk may be Accepted, by informed decision; or increased to pursue an opportunity

**Are cost constraints causing a risk to be accepted with the Hope it won't happen?  
Do this with your Eyes Wide Open!!**

# Risk Monitoring Example – Supplier Performance

- Ensure supplier **audits** and **scorecards** include strategic supply chain risk metrics in addition to operational metrics
- Evaluate supplier capacity against projected 12-month demand
- Maintain an alert system for part change notifications
- Strive for an environment of supplier collaboration and information sharing
- Have a Supplier Evaluation and Supplier Performance Program

Client X Supply Chain Risk Assessment						Supplier Evaluation	
Risk Scorecard of Tier 1 Suppliers						the ranges are not static, but based on company's input, and columns are weighted based on client's needs.	
Supplier Name	Distance From You	Supplier Reliability	Suppliers of Importance	Number of Unique Parts	Spent Amount	Will Production Stop	Score
Πλαστυχτ Πολυζωνε	3	3	3	3	3	3	3.00
Ρεγλινα Ριδουτορι Σφλ	3	3	3	3	3	3	3.00
Ευπαριτο Γεαρβο Χομπανω	2	3	3	3	3	3	2.90
Δυναμιτ Φλιτο Χομπονετο	2	3	3	2	3	3	2.85
Χροσο Μανουφακτυρινη Ινχ.	1	3	3	3	3	3	2.80
ΝΤΙ, ΑΤΔ.	1	3	3	3	3	3	2.80
Ενεχα Φουνορω	1	3	3	3	3	3	2.80
Ετοιε Χιτω Φουνορω Χο.	1	3	3	3	3	3	2.80
Γεασλερ Ενηνερινη Ινχ.	1	3	3	3	3	3	2.80
Προσπερτ Φουνορω Ινχ.	1	3	3	2	3	3	2.75
Οστροκη Χοι, Σπρινη Χο.	1	3	3	2	2	3	2.70
ΡΠΣ Ενηνερινη	2	2	3	3	3	3	2.65
Ωαλπερχηριδ Ινχ.	2	3	3	3	3	3	2.65
Απερω Ωετη-Τρονιε	1	2	3	3	3	3	2.55
Μαρινη Σπροχκετ & Γεαρ	1	2	3	3	3	3	2.55
Μοπερο, Ινχ.	1	3	2	3	3	3	2.55
Ποσερ Συστεμα ΛΑΧ	1	2	3	3	3	3	2.55
Τερογ Μανουφακτυρινη Χο	1	3	2	3	3	3	2.55
Τοσορο Απορο Μοπερο Οπ	2	2	3	3	3	3	2.55

# Back to the System Level

NIST AMS 100-49  
October 2022

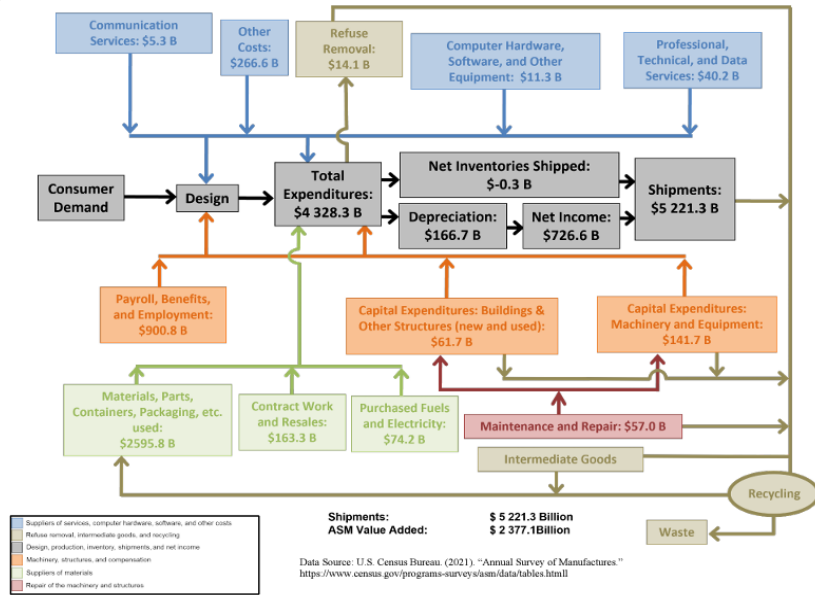
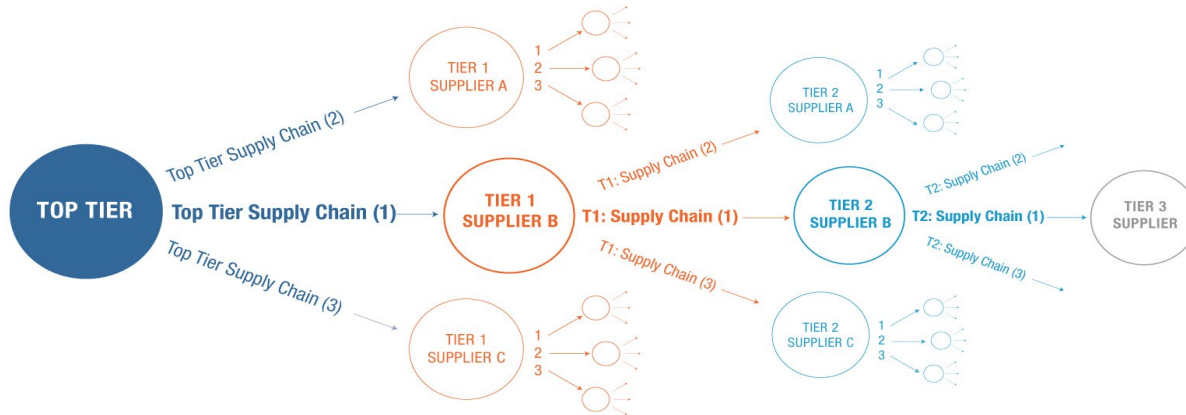
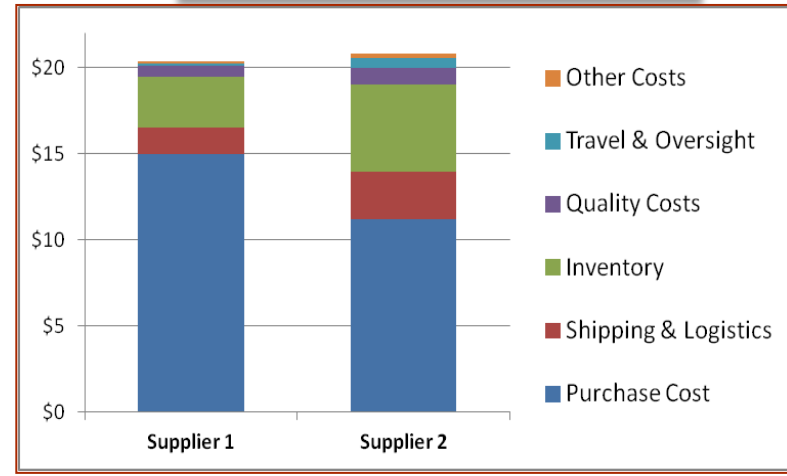


Figure 3.1: Manufacturing Supply Chain, 2020



## Total Cost of Ownership



- It is a complex system!
- It is a living / changing system!
- Approach it in Chunks and Bites
  - Develop a strategy and plan
  - Implement the plan
  - Monitor & measure successes
  - Collaborate with your partners

Thank you!



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