



# **Communication, Selection, and Negotiation**

Module 5A Supplier Relations and Partnerships

# Motivation

*Why is this module important?*



- Most early stage hardware companies do not have the resources to support early production needs and, therefore, need to partner with manufacturing suppliers
- The supply chain is essential to any manufacturing endeavor, particularly for hardware based companies, and it includes many tradeoffs and potential pitfalls for a new company
- This module will provide entrepreneurs with a better understanding of supplier communication, selection, and negotiation to avoid pitfalls that can create irrevocable damage to your company

# Motivation

## *Common mistakes and misconceptions*

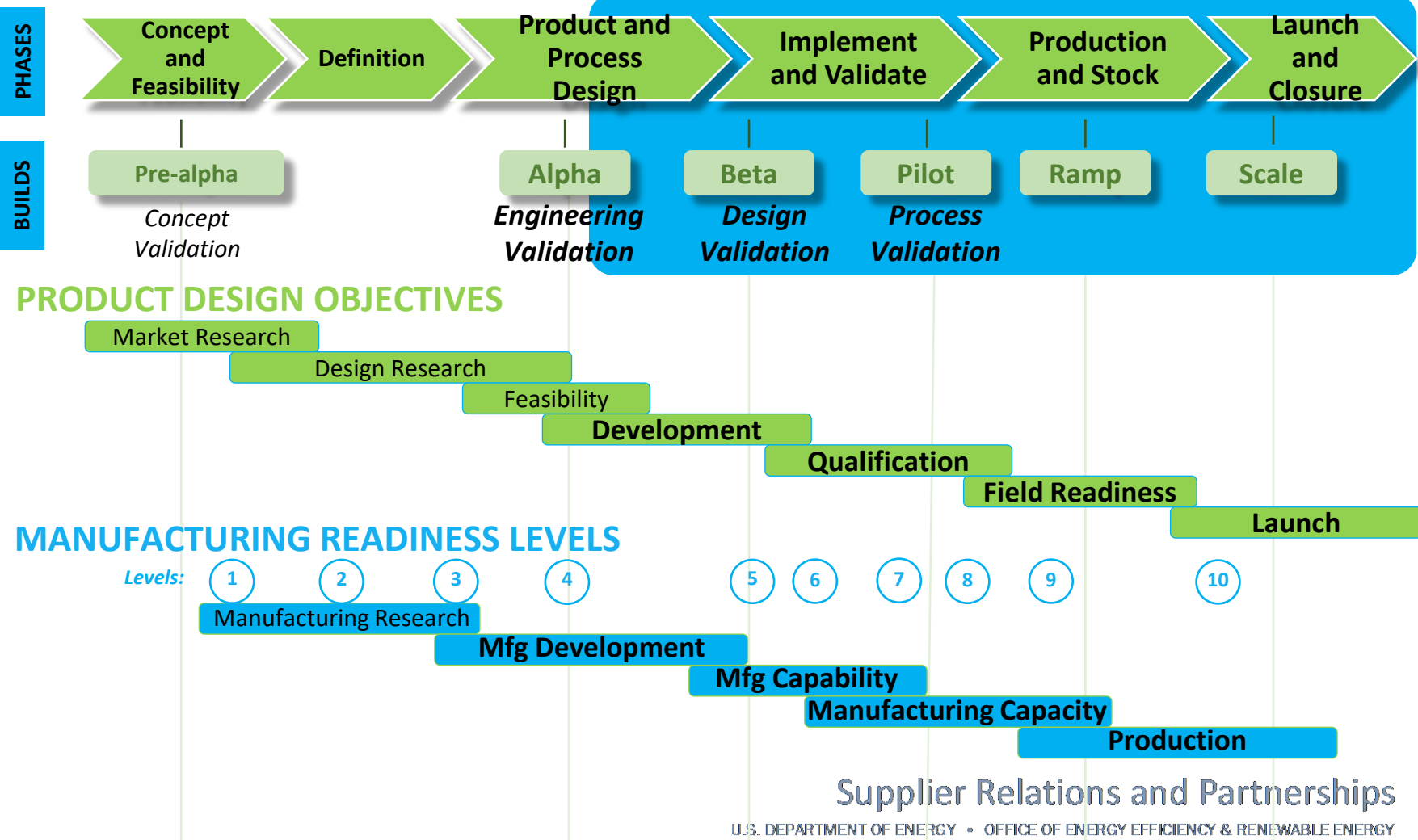


- ❑ Treating suppliers like they are servants
- ❑ Handling supplier relations like a task instead of a strategic plan
- ❑ Insufficient understanding of the how manufacturing suppliers operate
- ❑ Failure to engage suppliers in your business strategy and consider rewarding them in your commercial success

*“Are you trying to find a supplier or a strategic partner?”*

# Supplier Relations/Partnerships

*Where does this fit into the development cycle?*



# Manufacturing Readiness Levels

(MRL)



Material Solutions Analysis				Technology Development		Engineering and Manufacturing Development		Production and Deployment	Operations and Support
Basic Manufacturing Implications Identified	Manufacturing Concepts Identified	Manufacturing Proof of Concept Developed	Capability to Produce the Technology in a Laboratory Environment	Capability to Produce Prototype Components in a Production-Relevant Environment	Capability to Produce a Prototype System or Subsystem in a Production-Relevant Environment	Capability to Produce Systems, Subsystems or Components in a Production-Relevant Environment	Pilot Line Capability Demonstrated. Ready to Begin Low-Rate Production	Low Rate Production Demonstrated. Capability in Place to Begin Full Rate Production	Full Rate Production Demonstrated and Lean Production Practices in Place
1	2	3	4	5	6	7	8	9	10

This module's content is relevant at these MRLs



# Module Outline



- Learning objectives
- How to decide between make or buy
  - Key drivers
  - Manufacturing implications
- Supply chain partners
  - Communication, selection, negotiation
  - Assess supply chain risk
- Intellectual property

# Learning Objectives



- LO1. How to decide whether to make or buy a component (overlapping content with market feasibility module)
- LO2. How to choose and approach a supplier and/or contract manufacturer
- LO3. How to handle **intellectual property** (IP) with a potential partner
- LO4. How to negotiate a contract with a potential partner
- LO5. How to assess **supply chain** risk

# Make Versus Buy Decisions

## *Key questions*



- ☐ What process is used to decide which components to buy and which to manufacture in-house?
- ☐ When considering my bill of materials (BOM), what is captive in-house versus outsourced?
- ☐ What logistics are involved with the supply chain?
- ☐ How does the supply chain change with volume?
- ☐ How does a captive versus outsource strategy impact my fixed versus variable costs?
- ☐ What options do I have for key components?
- ☐ Purchase versus purchase & modify versus new design?



# Make Versus Buy Decisions

## *Contract manufacturing considerations*

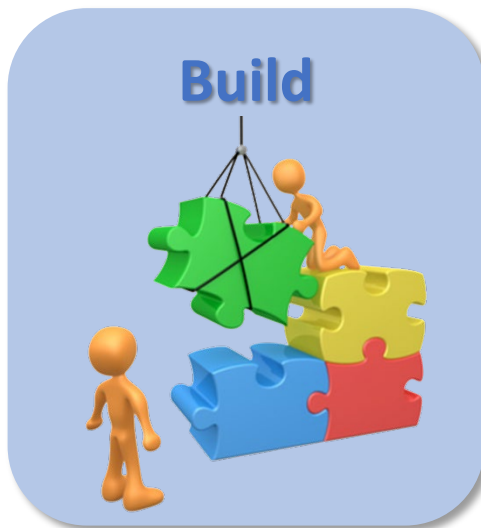


- What is my captive versus outsource strategy?
  - What are critical IP items that may need to stay in-house?
  - What core competencies are important for my company to retain?
  - How do I conduct a value chain analysis?
  - Who in the supply chain has the most to gain or lose from my product being successful?
- How do my supply chain partners change with volume?
- How do I ensure supply availability?
  - Supply chain risk assessment
- How do I protect my technology and future IP interests?

# Manufacturing Decisions

## *Captive versus outsource*

- **Captive (in-house) manufacturing:** Production processes that are conducted internally or in-house in the company's own operations
- **Outsource (contract) manufacturing:** Outsourcing involves contracting the production processes to another party



# Make Versus Buy Decisions

*Impact on your business model*



Captive Versus Outsource Model Options			
	Make	vs.	Buy
Facilities/Equipment	Buy/Build/Install	vs.	Contract manufacturing
Product	Manufacture	vs.	License
R&D	In-house	vs.	Outsourced design/engineering
Operations	Fixed (economies of scale)	vs.	Variable operational costs
Sales Channels	Direct sales	vs.	Distributors/ reps
Customer Relationships	Direct Customer Relations Management (CRM)	vs.	Distributors/ reps
Headcount	Salaried employees	vs.	Contract employees
IP	US/Global patent	vs.	Proprietary trade secrets

# Make Versus Buy Decisions

## *Risk trade-offs*



Develop for Others	Contract Mfg and Sell Through Others	Contract Mfg and Sell Direct	Mfg and Sell Through Others	Mfg and Sell Direct
Joint ventures, licensing	Mfg through partner, sell through reps or distribution	Mfg through partner, marketing and sales required	Mfg in-house, sell through reps or distribution	Complete mfg facility, marketing and sales required
Fixed investment risk LOW	MEDIUM	MEDIUM	HIGH	HIGH
ROI risk LOW	LOW	MEDIUM	HIGH	HIGH
Customer relationship risk LOW	MEDIUM	LOW	MEDIUM	LOW
Operational control risk LOW	MEDIUM	MEDIUM	LOW	LOW
Fundraising risk MEDIUM	LOW	MEDIUM	MEDIUM	HIGH

**Note:** As a company scales, they can reduce risk in key areas such as customer relationships, operations, and quality control

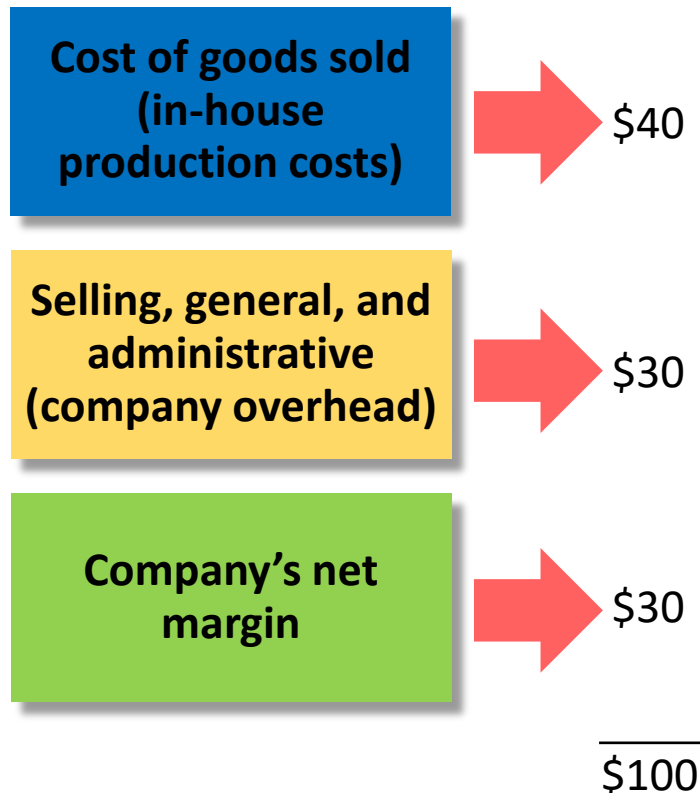
Supplier Relations and Partnerships

# Manufacturing Decisions

*Impacts on margins*

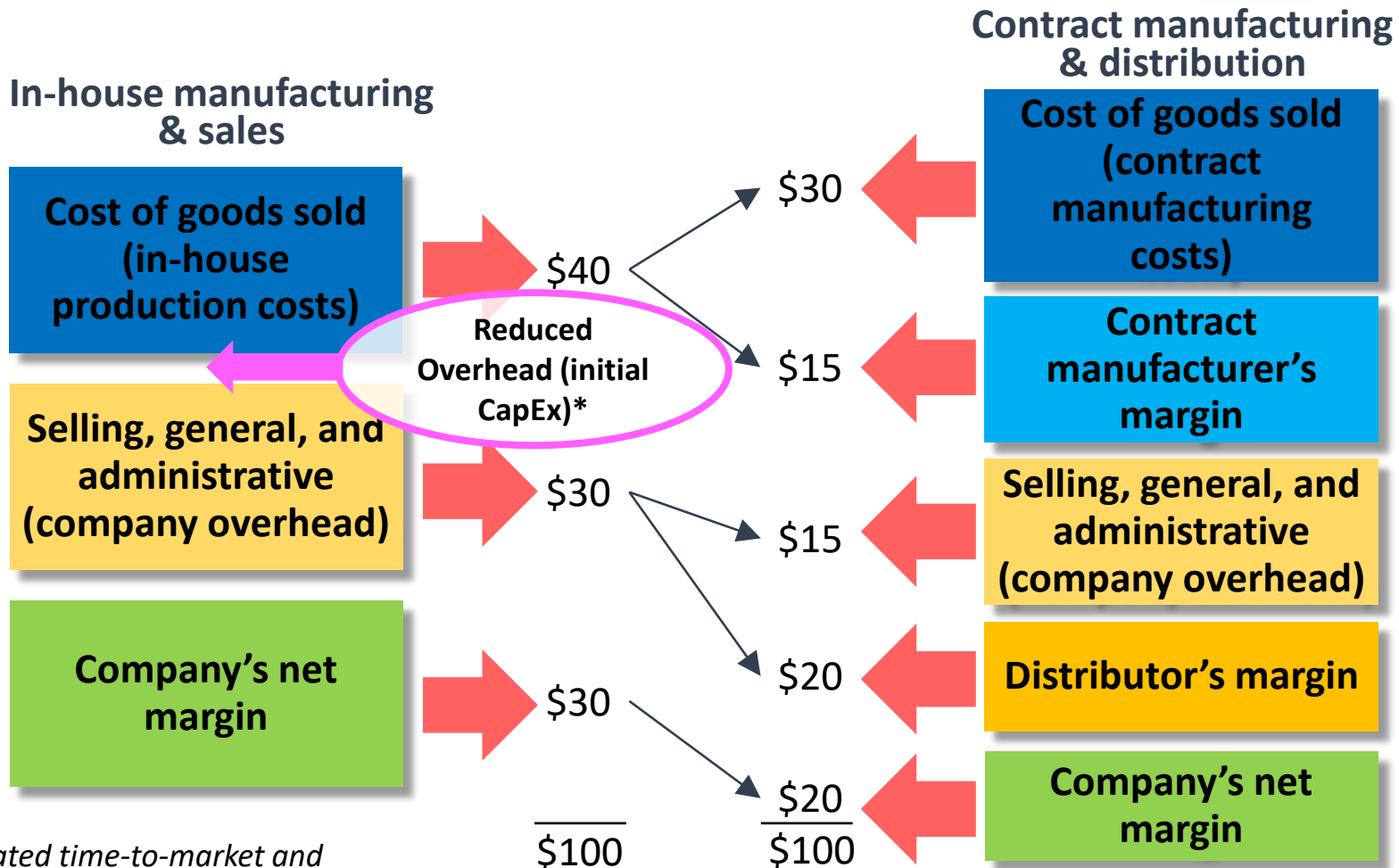


In-house manufacturing  
& sales



# Manufacturing Decisions

*Impacts on margins (cont.)*



*\*Related time-to-market and cash-flow considerations*

# Supply Chain Partners

*How do they change with volume?*



## Prototype suppliers:

- Specialize in 3D printing, one-off component samples, very responsive to variation in product and specialized requests

## Low-volume suppliers:

- Accustomed to volume runs up to hundreds of part runs per year, typically one or few operations, limited manufacturing process disciplines, low level of automation, often will work on a **purchase order (PO)** and a promise

# Supply Chain Partners

*How do they change with volume? (cont.)*



## Medium-volume suppliers:

- Accustomed to volume runs in hundreds or thousands of units per year, multiple operations, multiple manufacturing process disciplines, flexible cells to adhere to product variations, QS/ISO quality certifications, requires PO and some assurance of order commitments

## High-volume suppliers:

- Usually only pay attention to very high volume runs (thousands to millions per year), typically high levels of automation, sunken cost in capital equipment, global presence, multiple manufacturing process disciplines, equipment usually dedicated to individual high product manufacturing runs, QS/ISO quality certifications, require large order commitments



# Supplier Communication

## *Common mistakes and misconceptions*



- ❑ Failure to develop a supply chain strategy before reaching out to suppliers
- ❑ Treating suppliers like they are servants
- ❑ Not understanding how a supplier thinks nor their business model
- ❑ Not understanding your value proposition to a supplier
- ❑ Not being prepared for the likely questions a supplier will ask you
- ❑ Failing to set realistic expectations with a supplier about quality, reliability, timeline, and costs
- ❑ Neglecting internal processes needed to successfully interact with the supply chain

# Supplier Communication

## *Best practices*

- ❑ Develop a supply chain strategy that aligns with your company's growth plan
- ❑ Take the time to introduce your company, be honest about your stage of development and funding, and then explore their interest
- ❑ Develop a list of questions for the supplier in advance to quickly evaluate if they have the capabilities to support you
- ❑ Be prepared to engage with suppliers; come prepared with parts details (i.e., drawings and CAD files), supplier request for quotation (RFQ), timeline, target pricing, and terms
- ❑ Understand the control management between you and the supplier, as well as the closed-loop feedback process
- ❑ Let the supplier know you want true strategic partners, someone you can rely on and grow with

# Supplier Selection

## *Common mistakes and misconceptions*



- ❑ Always selecting the lowest bidder and overlooking quality
- ❑ Selecting a supplier that specializes in different volumes than your scaling needs
- ❑ Assuming that product quality is the supplier's responsibility rather than under your company's management control
- ❑ Selecting sole suppliers on critical or long lead time materials/components with no back-up

# Supplier Selection

## *Best practices*



- Think strategically when selecting a supplier
- Work out a value proposition to present to the supplier (e.g., opportunities for future growth and understanding fit in business plan)
- Decide on answers to likely supplier questions before making contact
- Develop a scoring matrix when evaluating suppliers
- Investigate the best resources to identify the most appropriate supply chain partner. There are many groups that are designed to help make your best choice (ex., economic development agencies)

# Supplier Selection

*Best practices (cont.)*



- ❑ Develop your most important criteria to use for evaluating suppliers
- ❑ Evaluate suppliers on many quality fronts, including: expertise, quality certifications, internal processes including **standard operating procedures** (SOP), part inspection, revision control, part numbers and traceability, on-time delivery, and re-work
- ❑ Evaluate suppliers based on familiarity with industry regulations/certifications/standards
- ❑ Audit the supplier's facility

# Supplier Selection

*Best practices (cont.)*



- ❑ Evaluate supplier's quote. How detailed is it? How progressive is it? Do they ask the right questions? Do they seem to understand the specifics of your product?
- ❑ Ensure that your volume is in alignment with the supplier's capacities and business model
- ❑ Ensure that you secure multiple sources for each material and component to avoid shortage of supply. If possible, let the supplier find and manage second and third sources
- ❑ Work out a value proposition to the supplier by creating opportunities to reward them for ensuring your commercial success

# Supplier Selection

*Remember*



*You are selecting the best strategic partners,  
not just the right suppliers!*

# Supplier Selection

## *Resources*



**Investigate the best resources to identify the most appropriate supply chain partner:**

- ☐ Consult economic development agencies
- ☐ Engage manufacturing extension partners (MEP)
- ☐ Partner with regional business incubators
- ☐ Consult local Chambers of Commerce
- ☐ Consult U.S. Department of Commerce



# Supplier Selection

*Examples - Entrepreneur-to-manufacturer*



- ❑ Greentown Labs Manufacturing Initiative: CleanTech hardware incubator partnership with Massachusetts Manufacturing Extension Partnership (MassMEP) <http://www.greentownlabs.com/wp-content/uploads/2015/02/020515-Manufacturing-Initiative-PDF1.pdf>
- ❑ InnoState—Michigan entrepreneur-manufacturer match-making program organized by MEP Michigan Manufacturing Technology Center (MMTC) <http://innostatemi.com/>
- ❑ Pure Michigan Business Connect—Buyer-seller match-making events and portal <http://www.michiganbusiness.org/grow/pure-michigan-business-connect/>
- ❑ Vendop—Manufacturing vendor-matching portal <https://www.vendop.com/>
- ❑ NIST Manufacturing Extension Partnership (MEP) Network <https://www.nist.gov/mep>

# Supplier Selection

*Develop a scoring matrix for evaluation*



Supply chain attribute	Definition	Level-1 metric
Reliability	Supply chain performance: delivery with correct product, timing, location, condition, packaging, quantity, and documentation to the correct customer.	<ul style="list-style-type: none"><li>• Delivery performance</li><li>• Fill rates</li><li>• Perfect order fulfilment</li></ul>
Responsiveness	The time it takes a supply chain to provide products to the customer	<ul style="list-style-type: none"><li>• Order fulfilment lead times</li></ul>

# Supplier Selection

*Develop a scoring matrix for evaluation (cont.)*



Supply chain attribute	Definition	Level-1 metric
Flexibility	Supply chain agility in responding to marketplace changes to gain or maintain a competitive advantage	<ul style="list-style-type: none"><li>• Supply chain response time</li><li>• Production flexibility</li></ul>
Costs	The costs associated with operating a supply chain	<ul style="list-style-type: none"><li>• Cost of goods sold</li><li>• Total SC management costs</li><li>• Value-added productivity</li><li>• Warranty/returns processing</li><li>• Costs</li></ul>

# Supplier Selection

*Develop a scoring matrix for evaluation (cont.)*



Supply chain attribute	Definition	Level-1 metric
Asset management efficiency	The effectiveness of an organization to manage assets that support demand satisfaction. This includes management of all assets (ex., fixed and working capital)	<ul style="list-style-type: none"><li>• Cash-to-cash cycle time</li><li>• Inventory days of supply</li><li>• Asset turn</li></ul>

# Supplier Selection

*Exercise - Develop a supplier scoring matrix*

## Basic Supplier Evaluation Form

Review Date _____ Review By _____ Attendees, if Meeting Called _____ _____ _____						
Supplier _____ Supplier Location _____ Supplier Quality Contact _____ Contact Phone _____						
<b>Quality</b>	A. Quality System B. Concern for Quality C. Company History	Rating _____ _____ _____	Comments _____ _____ _____			
<b>Price</b>	A. Price - Quality B. Price - Negotiation/quote = Actual Price	_____ _____ _____	_____ _____ _____			
<b>Performance</b>	A. Technical Ability B. Capability C. Technical Assistance	_____ _____ _____	_____ _____ _____			
<table border="0" style="width: 100%;"> <tr> <td style="width: 30%;"><b>Rating system:</b></td> <td style="width: 20%;">           Very Good   5            Good         4            Average     3            Poor         2            Very Poor   1            Negative    0         </td> <td style="width: 50%; border: 1px solid black; padding: 5px;">           Supplier is rated as appropriate.            Only applicable blocks as determined by            the VP OP are rated.             Quality item A, Price item A and            Performance item B are requisite.         </td> </tr> </table>				<b>Rating system:</b>	Very Good   5 Good         4 Average     3 Poor         2 Very Poor   1 Negative    0	Supplier is rated as appropriate. Only applicable blocks as determined by the VP OP are rated.  Quality item A, Price item A and Performance item B are requisite.
<b>Rating system:</b>	Very Good   5 Good         4 Average     3 Poor         2 Very Poor   1 Negative    0	Supplier is rated as appropriate. Only applicable blocks as determined by the VP OP are rated.  Quality item A, Price item A and Performance item B are requisite.				
Take the total points from each rated block and divide by the total blocks rated for the supplier.  <div style="display: flex; justify-content: space-between;"> <span>Total Points from Blocks / Total Blocks Rated = _____</span> <span>Must be &gt; 2. If &lt; or = 2, supplier development must be considered.</span> </div>						



# Supplier Negotiation

## *Common mistakes and misconceptions*

- ❑ Incomplete understanding of supplier negotiation options
- ❑ Failure to develop a supplier negotiation strategy
- ❑ Limited knowledge of procurement terms
- ❑ Failure to estimate cost of current components
- ❑ Not accounting for ownership of tooling
- ❑ Assuming suppliers are going to pay for tooling to make your part
- ❑ Not having sufficient financial resources to initiate processes with suppliers and manufacturers
  - You need heavy project deposits to pay for raw materials and tooling to initiate the job
- ❑ Overlooking areas of mutual gain between you and the supplier



# Supplier Negotiation

## *Best practices*



- ❑ Develop a supplier negotiation strategy before quotes come in!
- ❑ Calculate the effects of alternative procurement terms (e.g., volume, delivery time, quality yields)
- ❑ Develop clear ownership of quality issues (e.g., product yield, failures), specifically manufacturing failure versus design failure responsibility
- ❑ Accurately estimate cost of each component to ensure that suppliers are not over-charging for their services

# Supplier Negotiation

## *Best practices (cont.)*



- Ensure ownership terms on tooling and manufacturing process innovation is covered (you, them, or shared)
- Develop supplier contracting documentation ahead of time (e.g., service agreement, purchase orders, payment terms and conditions)
- Explore areas of mutual gain
  - Can subcontractors provide services in the form of equity, debt, or supplier exclusivity?
  - Are there incentives I can offer for performance, quality, or delivery timing?
  - What are the must-haves in a supplier contract?
  - Consider revenue sharing and buyback contracts based on performance



# Supplier Negotiation

*Develop a scoring matrix for evaluation*



Supplier's Success Criteria	Total Cost Impact to Supply Manager (1 – 5 scale, 5 = high)	Perceived Value With Supplier (1 – 5 scale, 5 = high)	Net Concession Value (in rank order of impact)
Using supply manager's company name as a reference in advertising	1	5	4
Payment terms of Net 10	1	4.5	3.5
Initial payment received by end of quarter, ahead of product delivery	1.5	5	3.5
Weekly forecast updates provided to supplier to optimize inventory requirements	1.5	4	2.5
Limitation of liability capped to contract value for direct damages	4	5	1
Ownership of new IP developments	5	4	-1

Attribute	Value	Supplier "A"	Supplier "B"	Supplier "C"
<b>Management System</b>				
Registered to ISO 9001	10	10	10	0
Registered to ISO 14001	5	5	0	0
Documented Internal Audits	5	3	3	2
Established Objectives and Improvements Programs	30	15	20	25
Cost Reduction Program	30	15	15	20
Preservation of Product	20	15	15	15
Stock Rotation for Shelf Life	15	15	11	0
Customer Notification of Changes to Product and Processes	30	25	15	5
<b>Total</b>	<b>145</b>	<b>103</b>	<b>89</b>	<b>67</b>
Attribute	Value	Supplier "A"	Supplier "B"	Supplier "C"
<b>Design</b>				
Use of Design Objectives	30	20	18	17
Use of Finite Element Analysis	20	18	12	16
3D Modeling and Rapid Prototypes	20	0	10	5
Failure Mode and Effects Analysis	10	7	10	5
Design Validation Test Plans	30	30	30	30
Design Validation/Qualification Test Reports	30	30	30	30
Test Lab (or supplier lab)	15	15	15	15
Product Specification vs. Test Reports	30	30	30	30
Design Reviews	30	25	15	10
<b>Total</b>	<b>215</b>	<b>173</b>	<b>170</b>	<b>158</b>
Attribute	Value	Supplier "A"	Supplier "B"	Supplier "C"
<b>Manufacturing</b>				
Tool Design Capabilities	20	15	5	0
Tool Construction Capabilities	15	10	0	5
Production Part Approval Process	20	15	15	10
Supplier Management	30	20	25	15
Evaluation of Raw Material	20	0	5	15
Evaluation of Supplier Components	25	25	25	25
Production Equipment Condition	30	5	25	25
Inspection and Test Data	25	25	20	15
Control of Nonconforming Product	20	15	20	10
Use of Lean Manufacturing & 5S	20	15	10	5
<b>Total</b>	<b>225</b>	<b>145</b>	<b>160</b>	<b>125</b>
<b>Grand Total</b>	<b>685</b>	<b>421</b>	<b>409</b>	<b>350</b>

**Note:** info enlarged on next three slides

Supplier Relations and Partnerships

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# Supplier Negotiation

*Develop a scoring matrix for evaluation (cont.)*



Supplier's Success Criteria	Total Cost Impact to Supply Manager (1 – 5 scale, 5 = high)	Perceived Value With Supplier (1 – 5 scale, 5 = high)	Net Concession Value (in rank order of impact)
Using supply manager's company name as a reference in advertising	1	5	4
Payment terms of Net 10	1	4.5	3.5
Initial payment received by end of quarter, ahead of product delivery	1.5	5	3.5

# Supplier Negotiation

*Develop a scoring matrix for evaluation (cont.)*

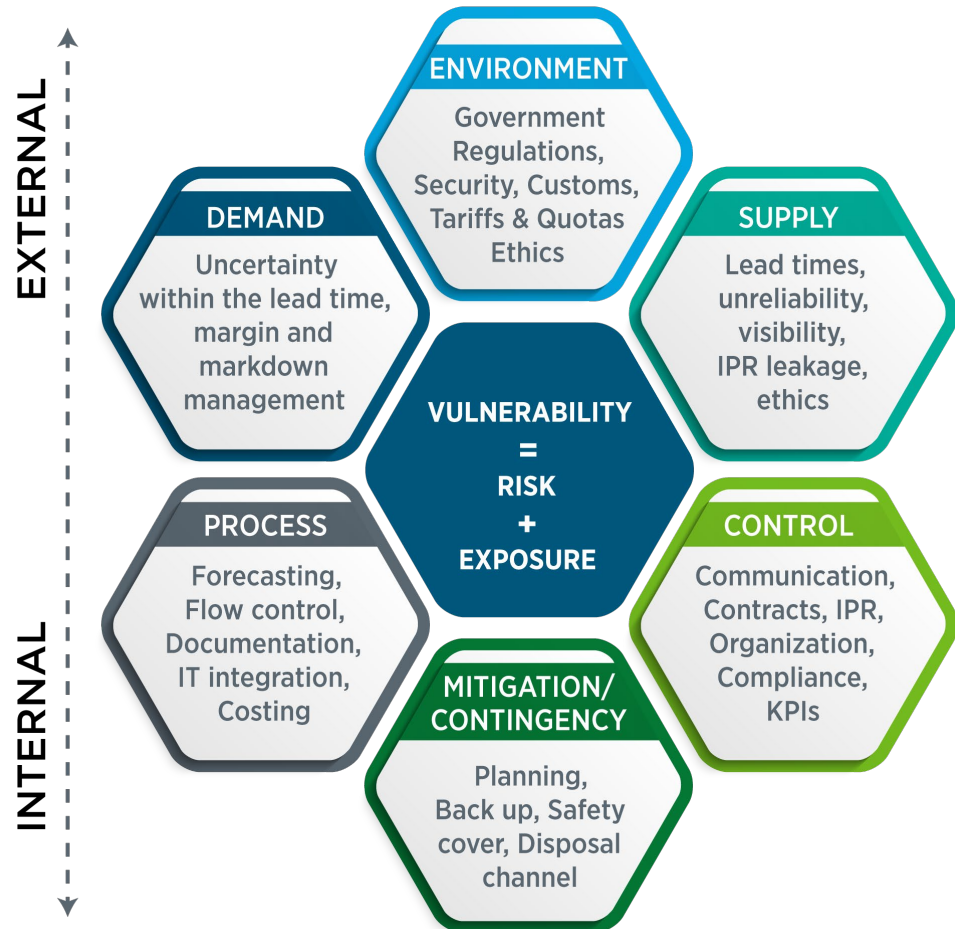


Attribute	Value	Supplier "A"	Supplier "B"	Supplier "C"
<b>Management System</b>				
Registered to ISO 9001	10	10	10	0
Registered to ISO 14001	5	5	0	0
Documented Internal Audits	5	3	3	2
Established Objectives and Improvements Programs	30	15	20	25
Cost Reduction Program	30	15	15	20
Preservation of Product	20	15	15	15
Stock Rotation for Shelf Life	15	15	11	0
Customer Notification of Changes to Product and Processes	30	25	15	5
<b>Total</b>	<b>145</b>	<b>103</b>	<b>89</b>	<b>67</b>

# Supply Chain Risk

## *Common mistakes and misconceptions*

- ❑ Ignoring global and regional supply chain capacity limitations
- ❑ Relying on one supplier; failing to line up multiple sources for components
- ❑ Custom product design limits the number of suppliers available
- ❑ Relying on one supplier or sole-source suppliers

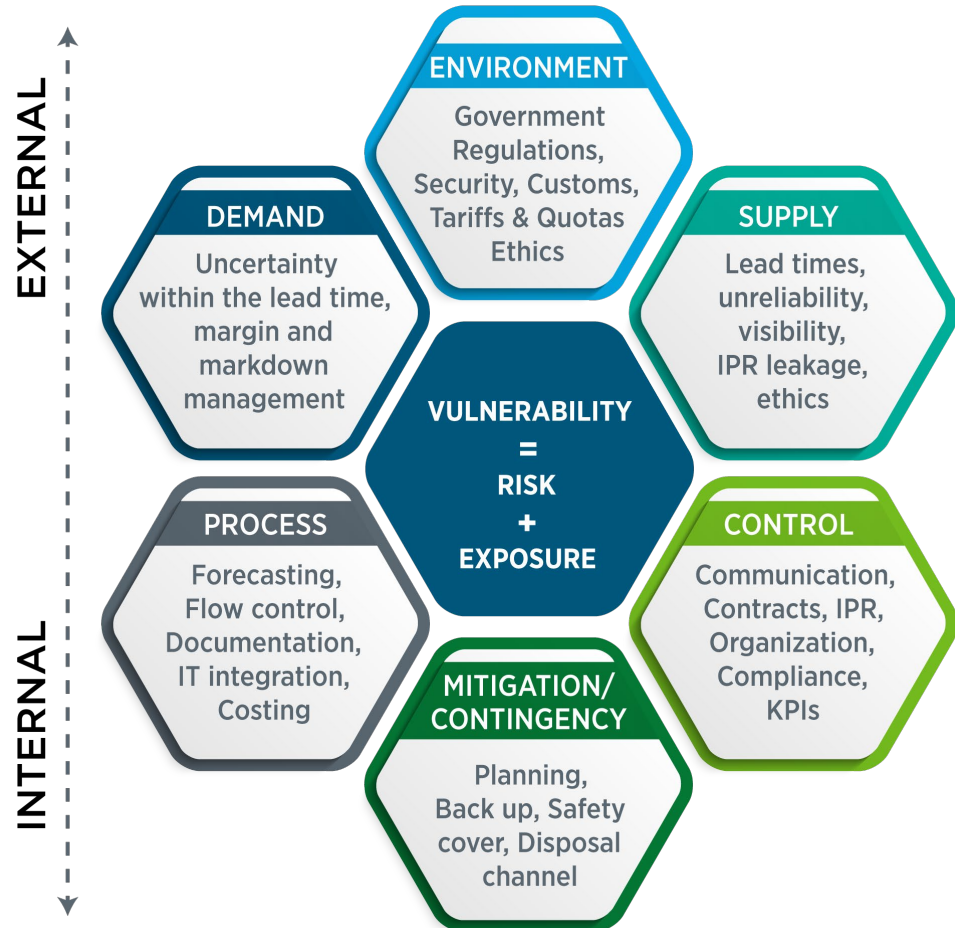


# Supply Chain Risk

## *Common mistakes and misconceptions (cont.)*

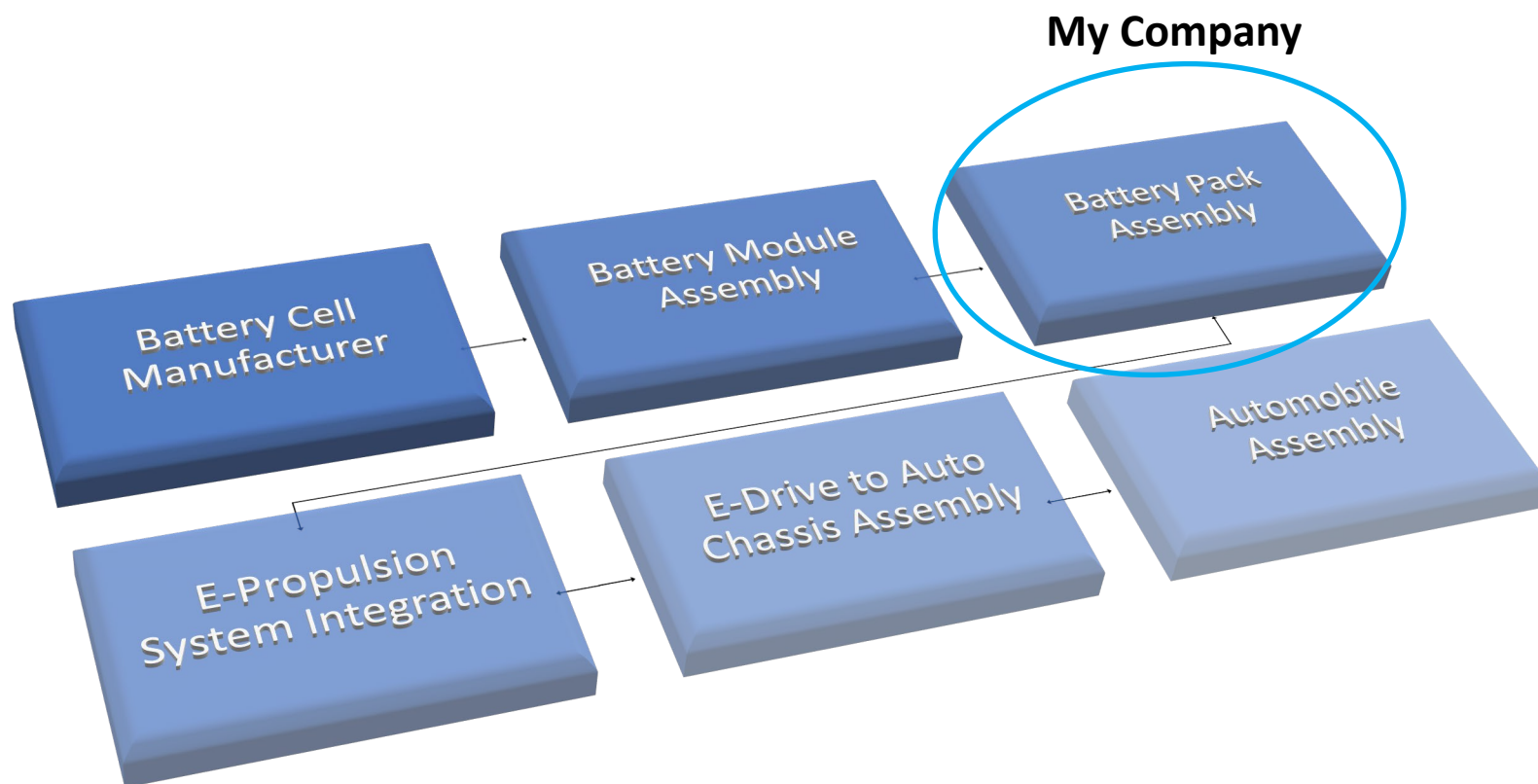
- ❑ Allowing suppliers to control tooling and components drawings
- ❑ Poor supplier documentation and parts tracing
- ❑ Always selecting the low-cost supplier without carefully evaluating quality
- ❑ Trying to bleed your suppliers of margin

*If they fail, you fail!*



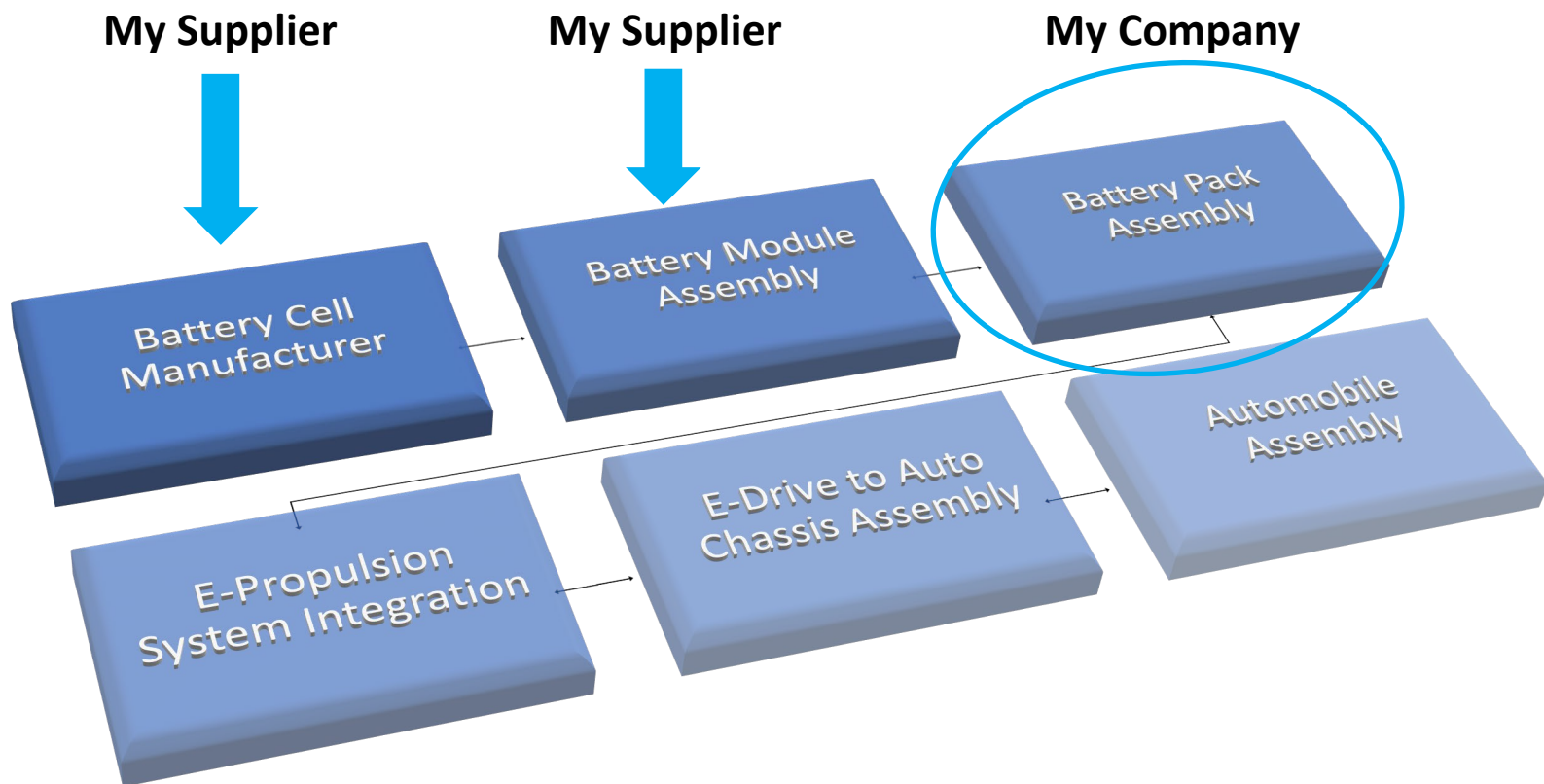
# Supply Chain Risk

*Understand your position in the supply chain*



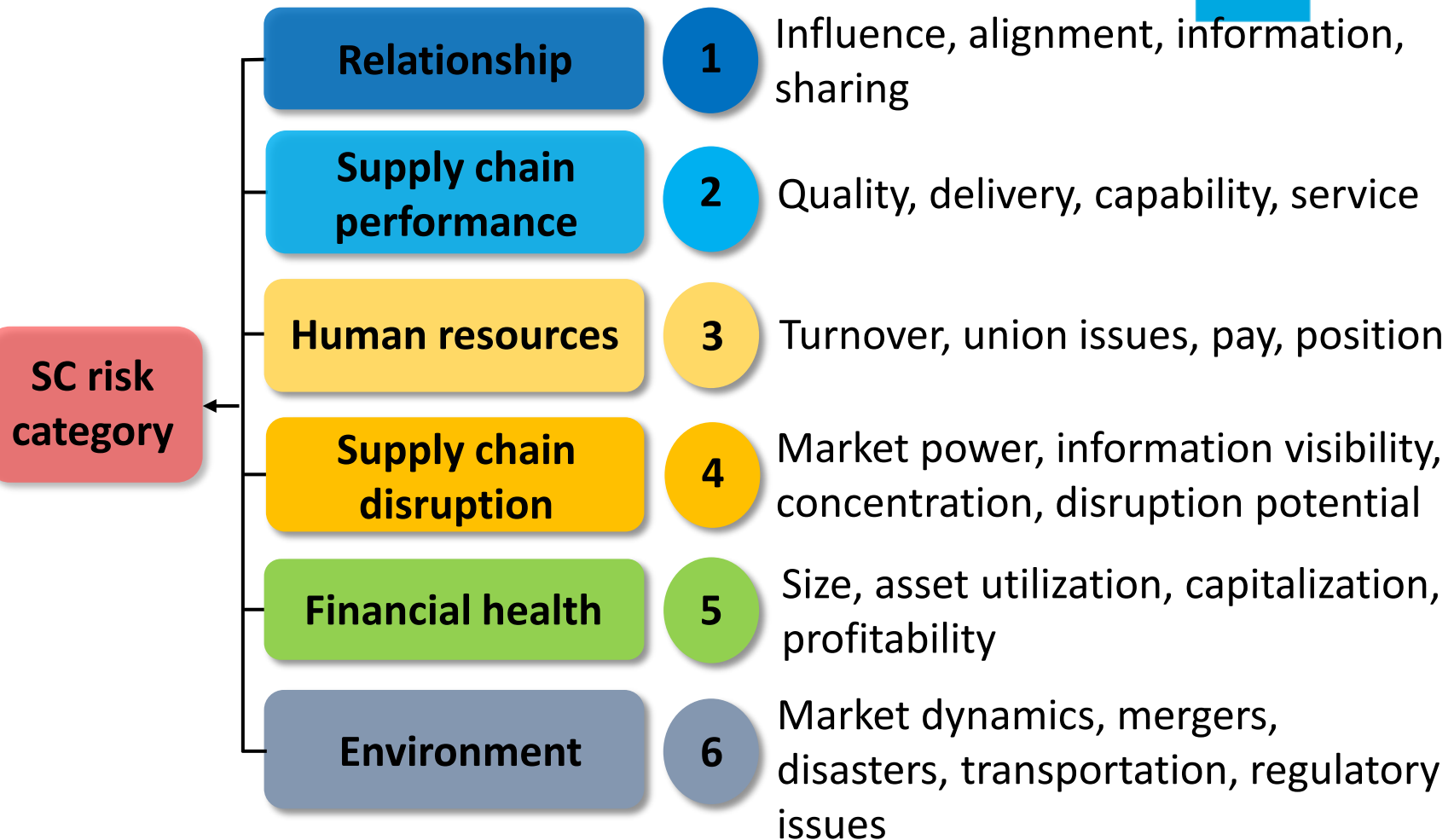
# Supply Chain Risk

*Understand your risk in the supply chain*



# Supply Chain Risk Assessment

*Example – Risk categories*



Supplier Relations and Partnerships



# Supply Chain Risk Assessment

## Example



Risk Description (event/scenario)	Risk Type	Internal/External	Risk Information Variables	Inherent Risk Analysis & Evaluation		Existing Controls, Treatment Plans
				Impact Risk Category (people, assets, revenue, production loss, environment, reputation, compliance)	Likelihood	Existing Control Description
Product Failure - Technical	Operational	Internal	Defect Percentage Identified	Critical	Not likely (<10%)	Quality Control and Assurance Process
Significant breakdowns of plant & machinery	Operational	Internal	Reported Breakdowns	Critical	Not likely (<10%)	Preventive Maintenance Process
Inadequate future capacity creation	Strategic	Internal	Demand vs. Supply Gap	High	Not likely (<10%)	Appropriate planning/forecast
Delayed availability or unavailability of supplies	Operational	Internal and external	Reported Unavailabilities	Critical	Not likely (<10%)	Project Planning and Management

## Exercise

[illegible]

# Intellectual Property Protection

*Common mistakes and misconceptions*



## How do I ensure my technology is protected?

- ☐ Not signing non-disclosure agreements (NDA) with suppliers
- ☐ Not disclosing existing patents
- ☐ Failure to recognize that unique unprotected technology is already embedded in your existing design and manufacturing processes

# Intellectual Property Protection

## *Common mistakes and misconceptions (cont.)*



- ❑ Underestimating the value of the manufacturing process as a unique technology that needs to be protected
- ❑ Underestimating the value of “know-how” in the manufacturing process that, if not shared by the supplier, could jeopardize your company’s future product improvements
- ❑ Allowing your supplier to own critical manufacturing process IP or know-how of your product that prohibits your company from upgrading future product versions or scaling your process without their blessing and commitment

# Intellectual Property Protection

## *Best practices*



- ☐ Secure NDAs with suppliers
- ☐ Fence-in your IP by adding all unique manufacturing and assembly process concepts
- ☐ File for all potential patents before providing a supplier with the product data/files

# Intellectual Property Protection

*Best practices (cont.)*



- Include wording in contracts with suppliers that all unique design, tooling, and manufacturing processes developed during the course of development and supply will be your property
- When a supplier brings a unique process that supports your product, consider sharing IP or a joint development agreement (JDA)
- If a supplier is offering the only option for a unique material, component, or manufacturing process that is core to your IP, consider providing equity in your company in exchange for exclusive supply as a way to make the supplier equally vested in the commercial success of your company

# Resources



- ❑ MForesight Report: Manufacturing 101 An Education and Training Curriculum for Hardware Entrepreneurs:  
<http://www.mforesight.org/>
- ❑ Outsourcing, Wikipedia:  
<https://en.wikipedia.org/wiki/Outsourcing>
- ❑ I-Corps @ NIH – Pivoting the Curriculum, Steve Blank (blogsite), 2014: <https://steveblank.com/2014/06/26/i-corps-nih-pivoting-the-curriculum/>
- ❑ NextEnergy and University of Michigan Center for Entrepreneurship I-Corps Energy and Transportation:  
<https://nextenergy.org/icorps/>

# List Of Terms

*In glossary*



- ❑ [Manufacturing Readiness Level \(MRL\)](#) is a measure developed by the Department of Defense (DOD) to assess the maturity of manufacturing readiness, similar to how technology readiness levels
- ❑ [Supply Chain](#) is a system of organizations, people, activities, information, and resources involved in moving a product or service from supplier to customer.
- ❑ [Engineering Validation](#) measures and analyzes the process, audits and calibrates equipment and creates a document trail that shows the process leads to a consistent result to ensure the highest quality products are produced. (Repeat from 2C)
- ❑ [Design Validation](#) is testing aimed at ensuring that a product or system fulfills the defined user needs and specified requirements, under specified operating conditions.
- ❑ [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.
- ❑ [Development](#) is the systematic use of scientific and technical knowledge to meet specific objectives or requirements.
- ❑ [Qualification](#) is the capacity, knowledge, or skill that matches or suits an occasion, or makes someone eligible for a duty, office, position, privilege, or status.
- ❑ [Field Readiness](#) is critical process during product development when a company determines their product's readiness for release. This process takes place after [learning market's problems](#), building a solution and preliminary [testing is successfully complete](#) and release is anticipated. (Repeat from 2B)
- ❑ [Launch](#) is the stage of development when all testing is so the company can vet the reception of the product before a full go-to-market investment is made. Market entry/commercialization is the stage in which the product is introduced to the target market
- ❑ [Manufacturing Development](#) or Engineering & Manufacturing and Development (EMD) phase is where a system is developed and designed before going into production. (Repeat from 2B)



# List Of Terms

*In glossary (cont.)*



- ❑ **Manufacturing Capability process** is a unique combination of tools, materials, methods, and people engaged in producing a measurable output; for example a manufacturing line for machine parts. All processes have inherent **statistical variability** which can be evaluated by statistical methods. (Repeat from 2B)
- ❑ **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.
- ❑ **Intellectual Property (IP)** refers to creations of the intellect for which a monopoly is assigned to designated owners by law. Intellectual property rights (IPRs) are the rights granted to the creators of IP, and include trademarks, copyright, patents, industrial design rights, and in some jurisdictions trade secrets
- ❑ **Captive (in-house) Manufacturing** refers to conducting an activity or operation within a company, instead of relying on outsourcing.
- ❑ **Outsource (contract) Manufacturing** or contract manufacturer ("CM") is a manufacturer that contracts with a firm for components or products. It is a form of outsourcing. A contract manufacturer performing packaging operations is called copacker or a contract packager.
- ❑ **Purchase Order (PO)** is a commercial document and first official offer issued by a buyer to a seller, indicating types, quantities, and agreed prices for products or services.
- ❑ **Standard Operating Procedures (SOP)** is a set of step-by-step instructions compiled by an organization to help workers carry out complex routine operations.
- ❑ **Manufacturing Extension Partnerships (MEP)** is a public-private partnership with Centers in all 50 states and Puerto Rico dedicated to serving small and medium-sized manufacturers assisting in efficiency and growth efforts and focused on operational excellence, workforce training and innovation.