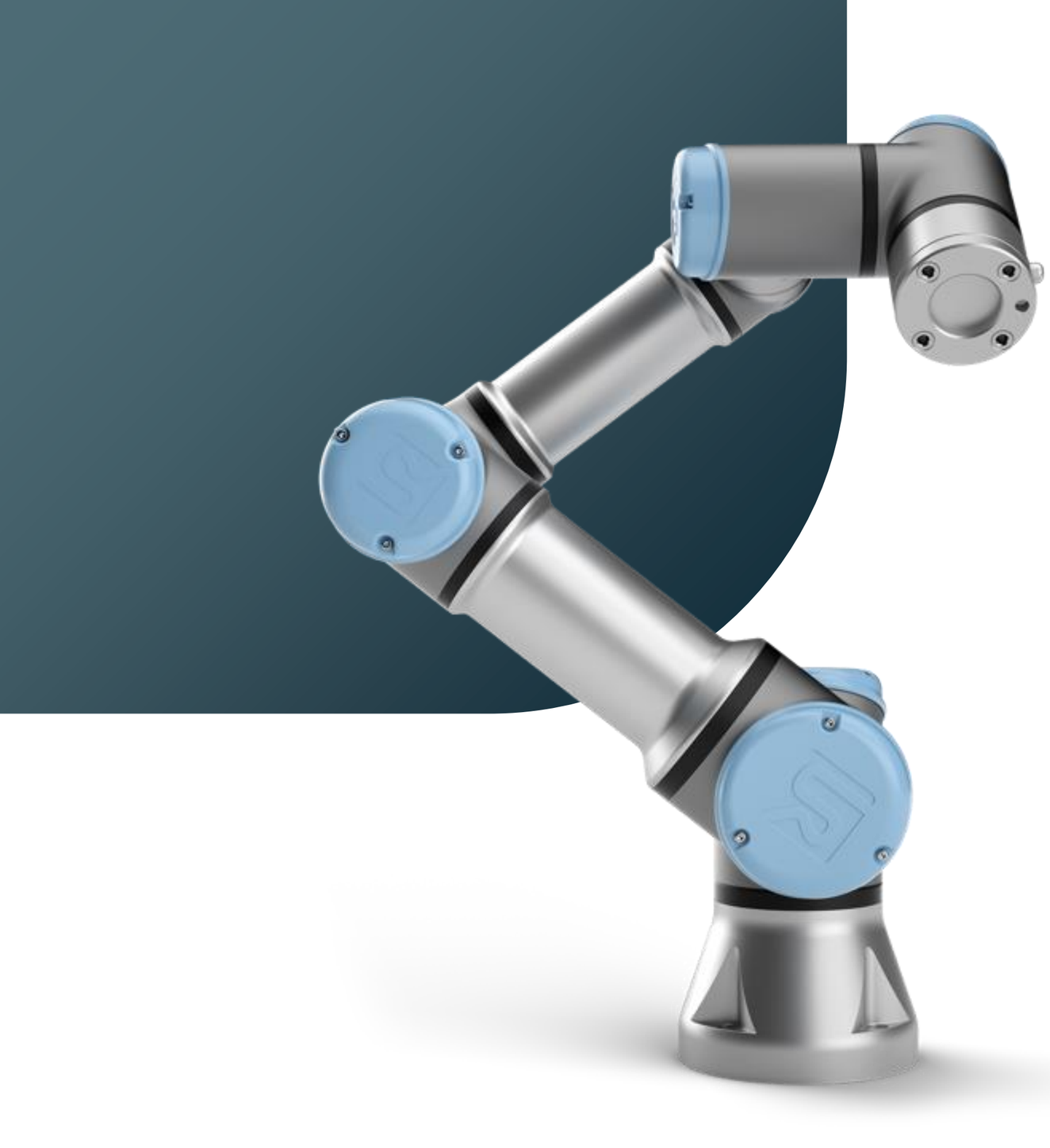

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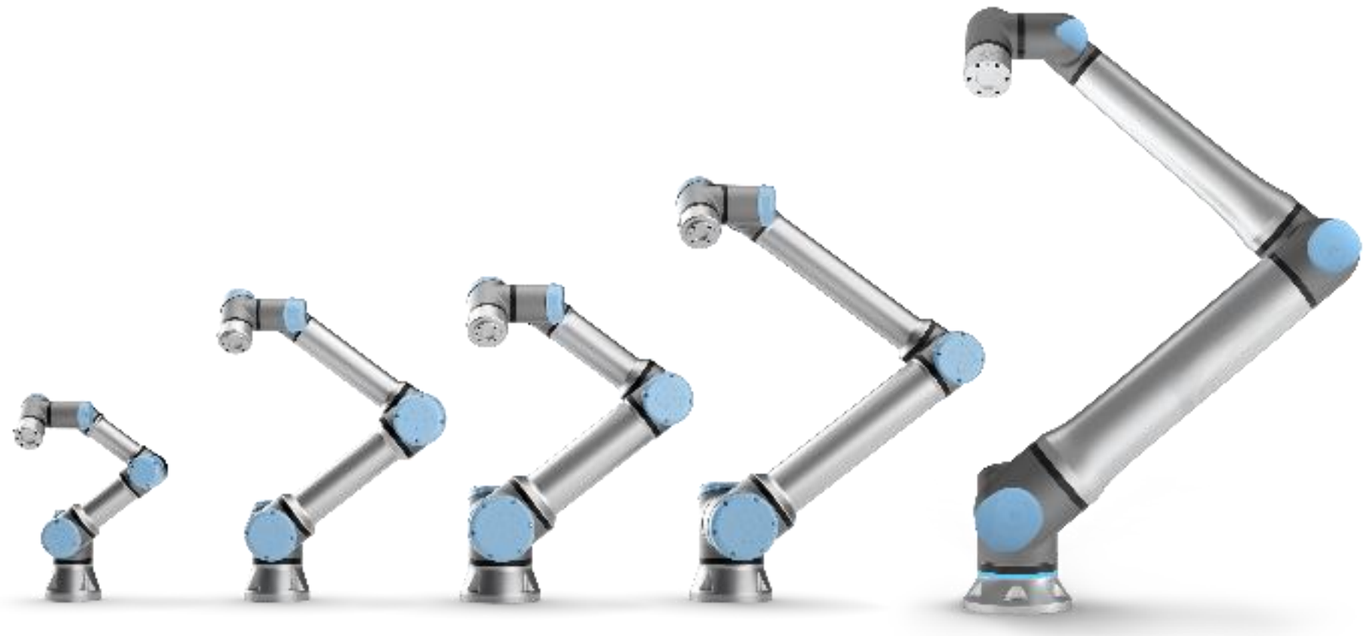
Automation Systems Integration: 4 Paths to Success

Joe Campbell

ASSEMBLY SHOW Learning Theater

10/2022



Joe Campbell

Universal Robots

Strategic Marketing

Applications Development

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Traditional Automation

Collaborative Automation

Cobot Basics

Collaborative & Safe – Capable to safely operate alongside humans in shared space.

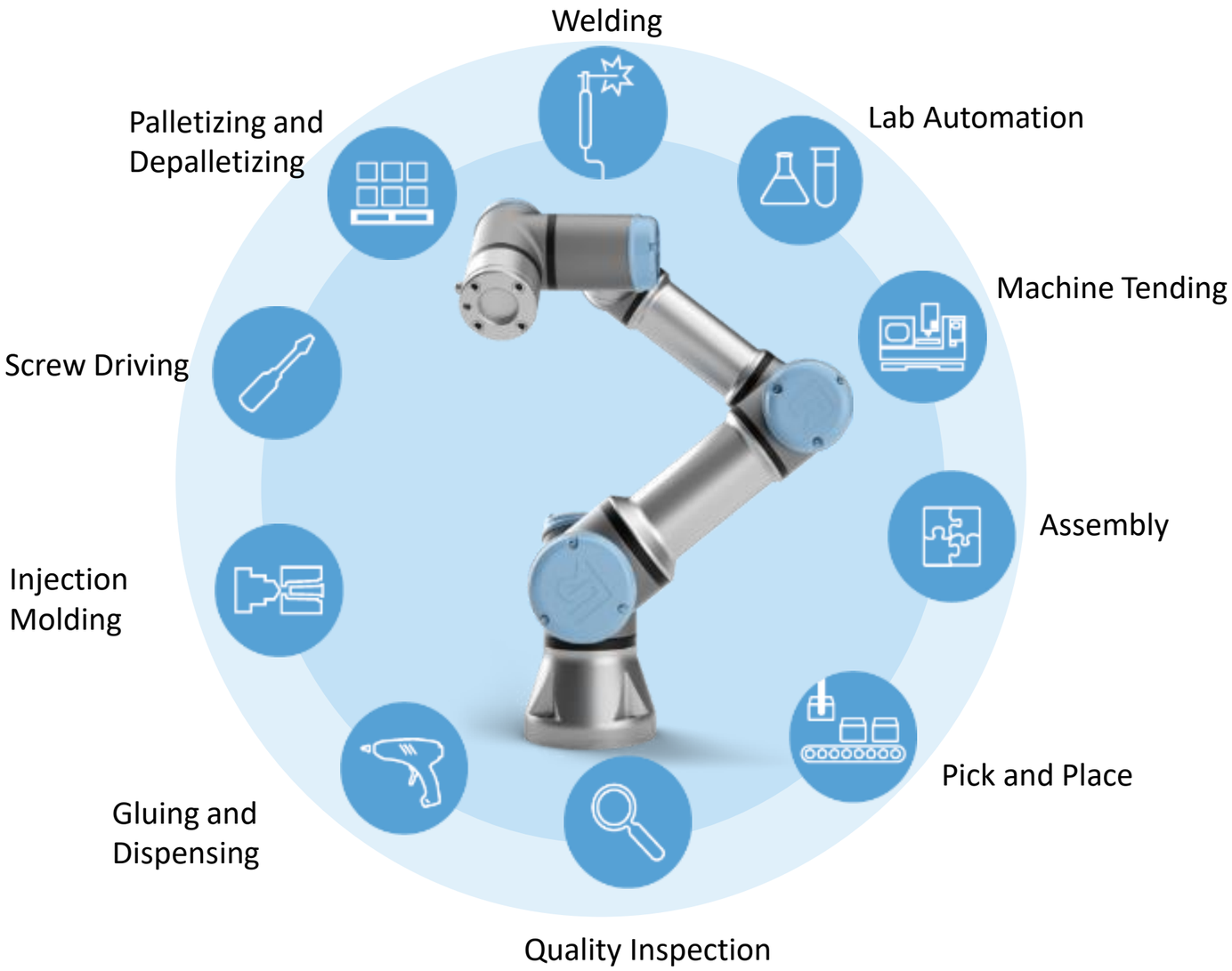
Easy to Program - No previous coding, robotics, automation experience required.

Fast Setup – 120v power, simple out-of-box experience.

Flexible & Versatile – Easy to redeploy into new applications or new production runs.

Cost - 1/3 to 1/2 of traditional automation. Economically viable in high mix / low volume operations.

WHERE ARE THE COBOTS?



- Everywhere.
- All applications.
- All industries.

- What's Next?

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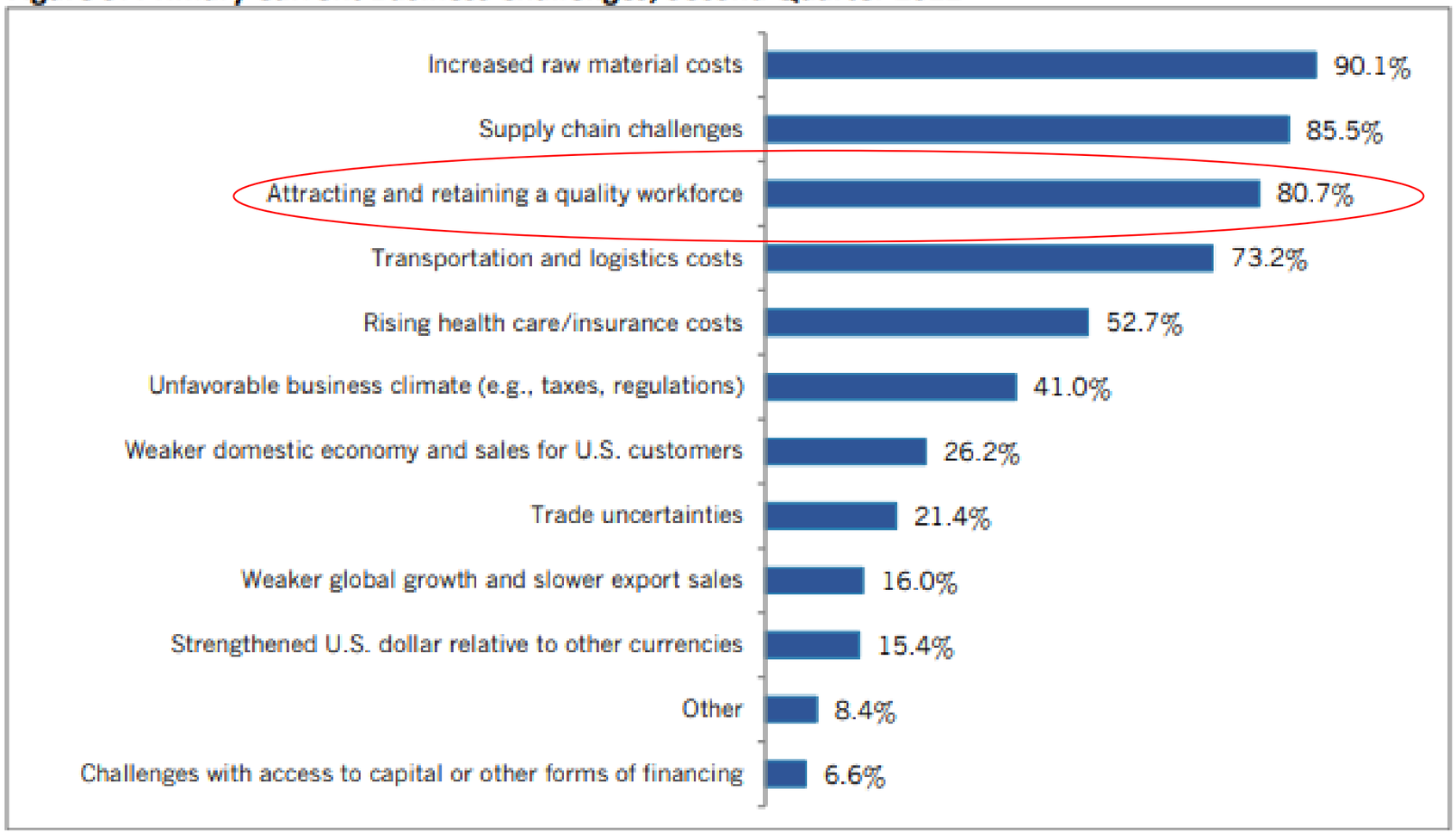
The Manufacturing Labor Shortage

Just Won't Go Away

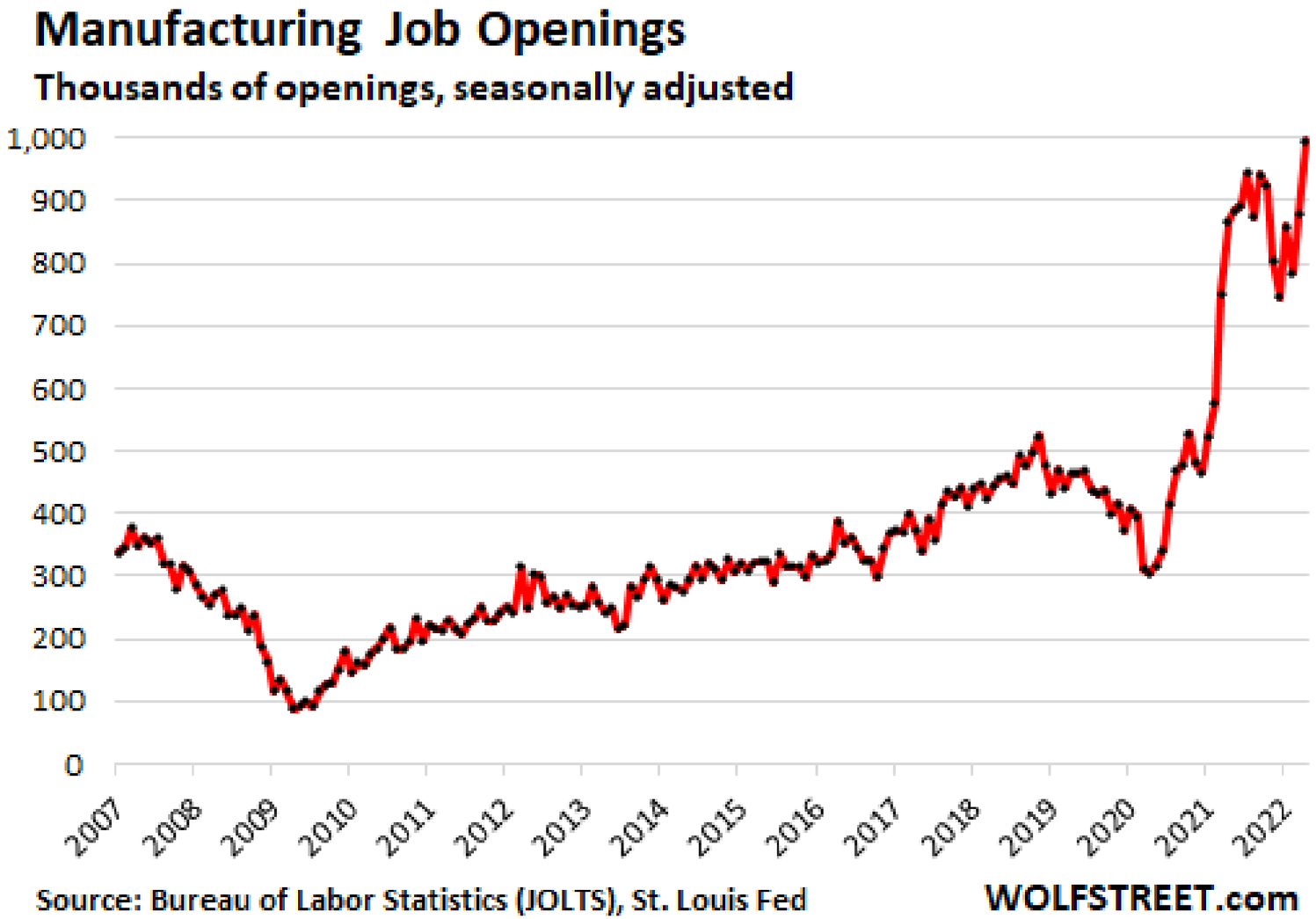
Figure 9: Primary Current Business Challenges, Second Quarter 2022



Note: Respondents were able to check more than one response; therefore, responses exceed 100%.

Source: National Association of Manufacturers Economic Report 6/10/22

JUNE 2022: 1,000,000 MANUFACTURING JOB OPENINGS



Bill Martin, MA Industries: *"I keep hearing about all the unemployed people, [but] I certainly can't find any of those folks."*

Source: BLS December 2022, NAM Economic Report 6/10/22

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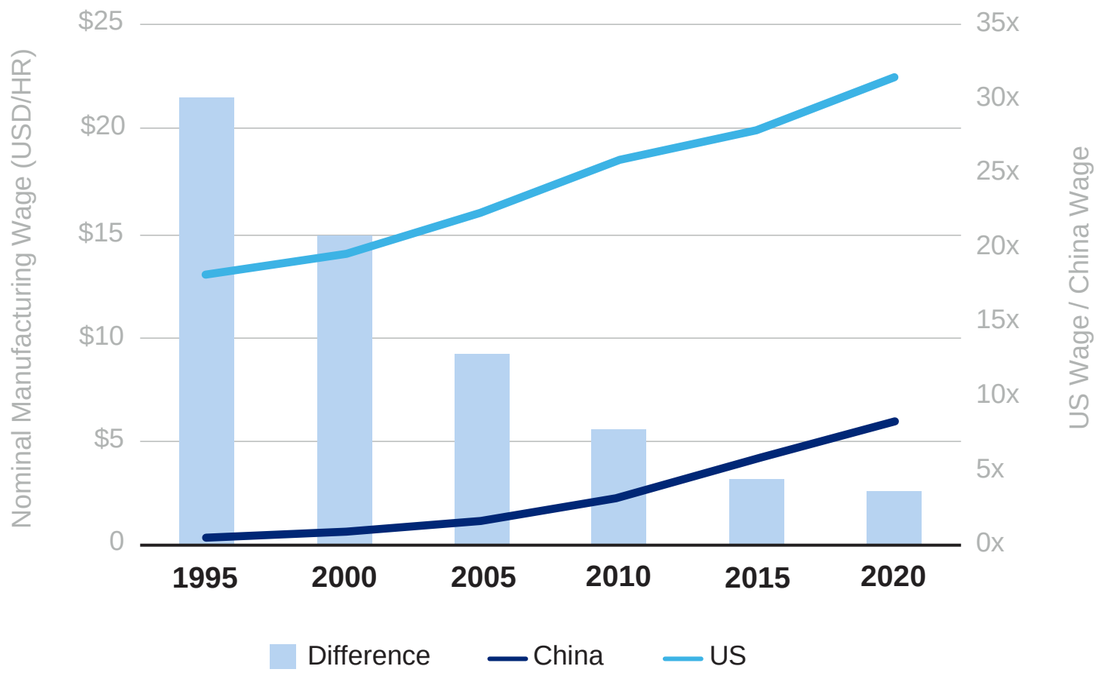
Reshoring driving growth in US manufacturing

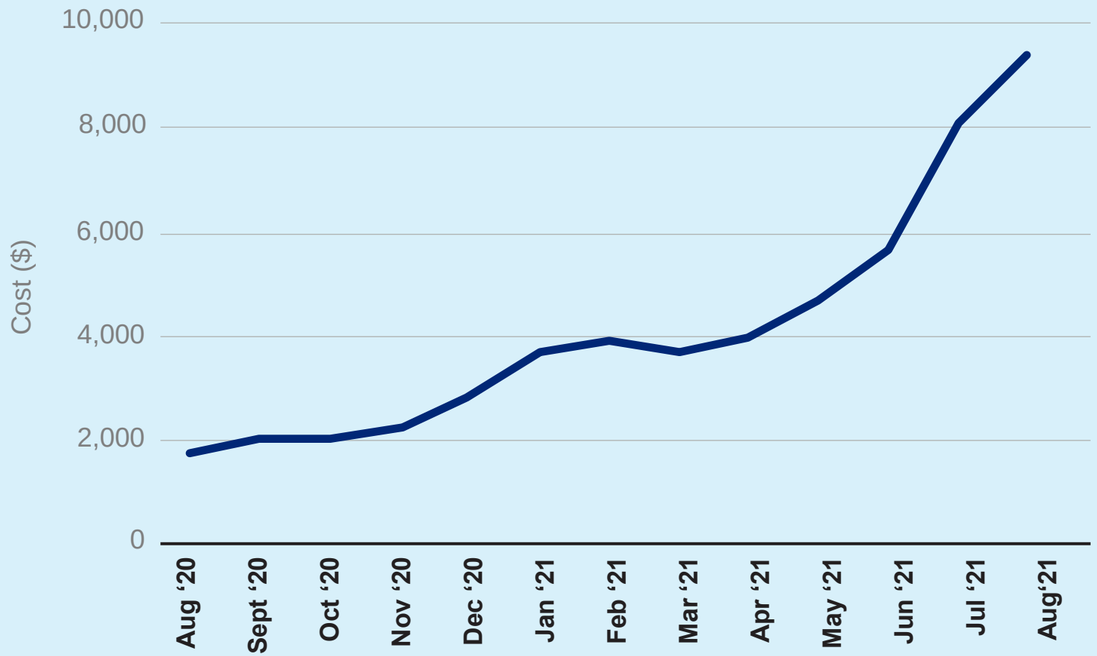
Wage differences decrease and shipping costs increase

Wage differences between China and US **decreased** from **30x in 1995** to **~3.5x in 2020**



Source: US Bureau of Labor Statistics Report
China: Trading Economics

Shipping cost from China to US **increased 5x from 2020 to 2021**



Source: Interact Analysis: MIO Report, Sept 2021

TERADYNE INDUSTRIAL AUTOMATION

Labor Summary Infographic

The New Face of DIY Robotics

Manufacturing & production, engineers & managers, machine operators, machine set up, MRO technicians, line operators, welders, maintenance.

-NOT-

Automation engineers, robot programmers, internal integrators, ”automation department”, teams of specialists (programmers, 3D CAD operators, simulation engineers, project managers, mechanical designers).

Cobots Are Reaching a New Class of Customers

- New to Automation
- No Robot Engineers
- Small and Medium Enterprises, aka SME’s.

In 2021, there were 292,825 factories in the US. Approximately 91% had less than 100 employees.

Source: U.S. Census Bureau, Bureau of Economic Analysis Report 2021

And Traditional Automation Customers

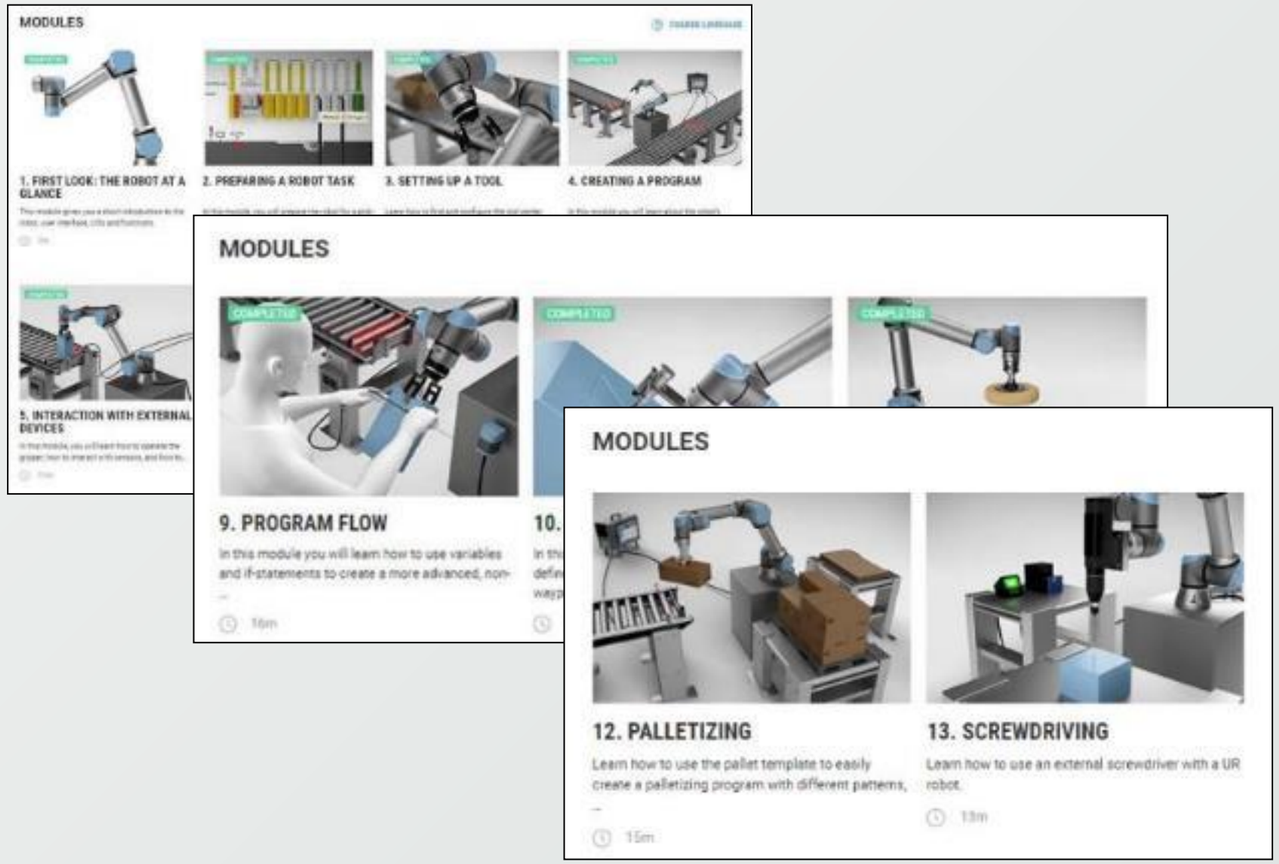
DIY Enablers

- UR Academy
- Application Builder
- UR+
- PolyScope

UR Academy

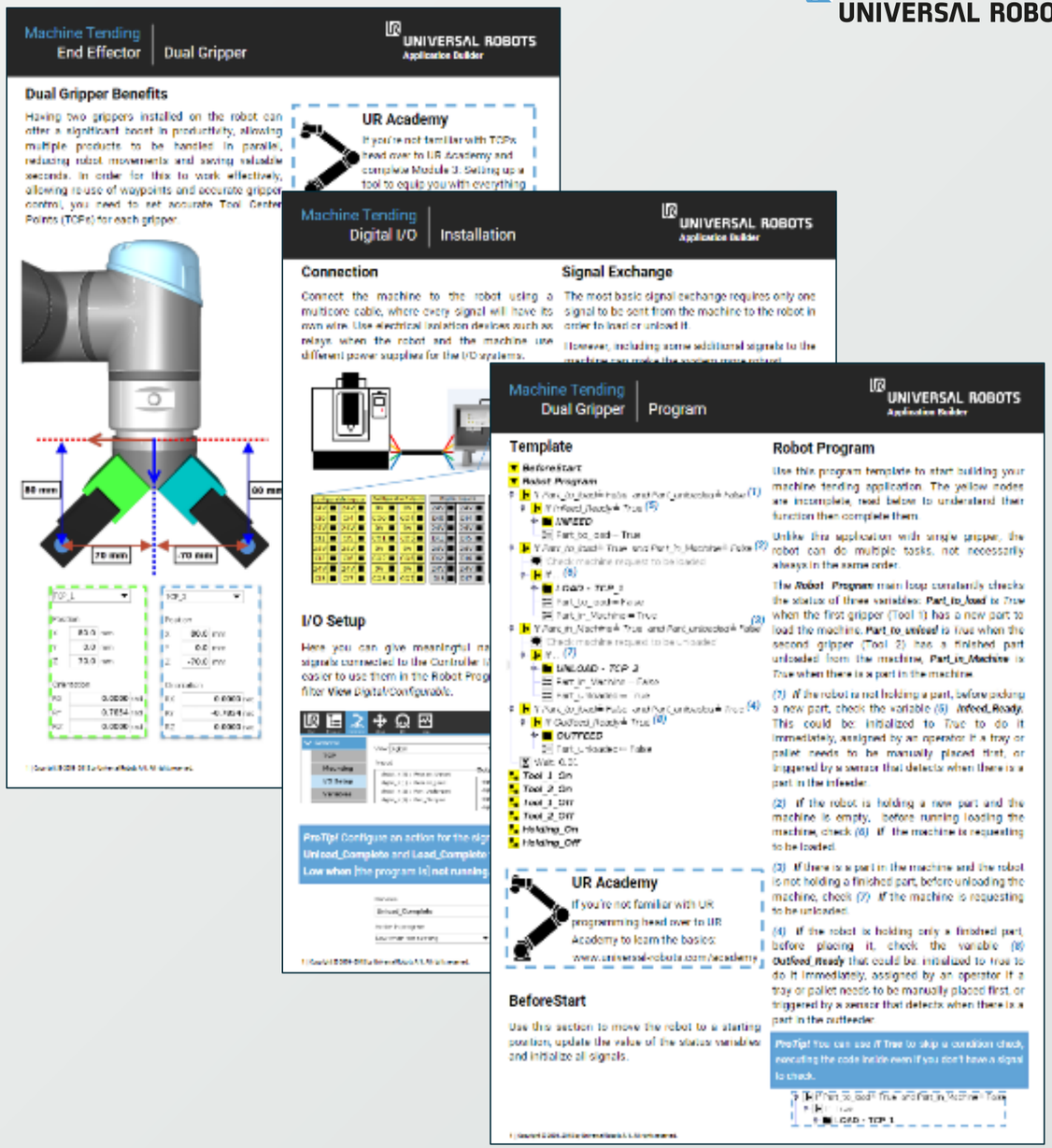
- Online training available at no charge, at https://www.universal-robots.com/academy/

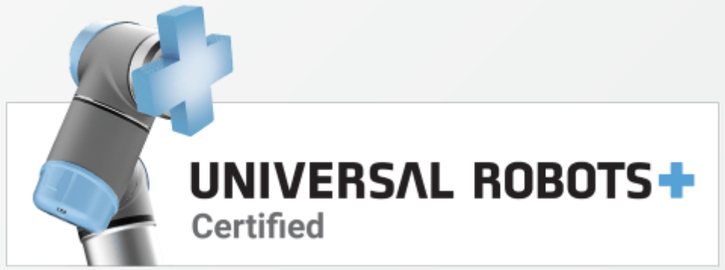
- 150,000+ users
- 130+ countries
- 16 languages
- 107 UR Authorized Training Centers



Application Builder

- Download your customized solution package.
- Program Templates
- How-To Cards





The App Store for UR Cobots

- **410 (and counting…)** components, peripherals, accessories, and application kits, engineered to work seamlessly with UR Cobots.
- Tested, validated and certified by UR.
- UR+ products reduce the time, cost and risk in any project.

- https://www.universal-robots.com/plus/

Rapid Deployment Robotics

4 weeks from purchase order to production?

How is that possible?

Robot lead times → Often in stock at local distributor

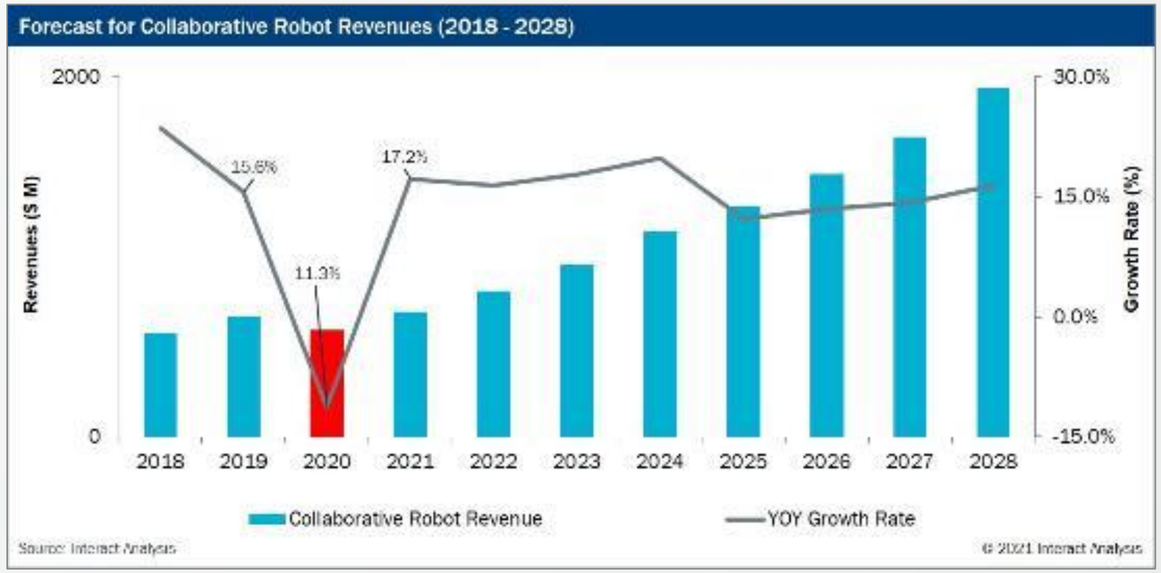
Reduced engineering → UR+, Application Builder

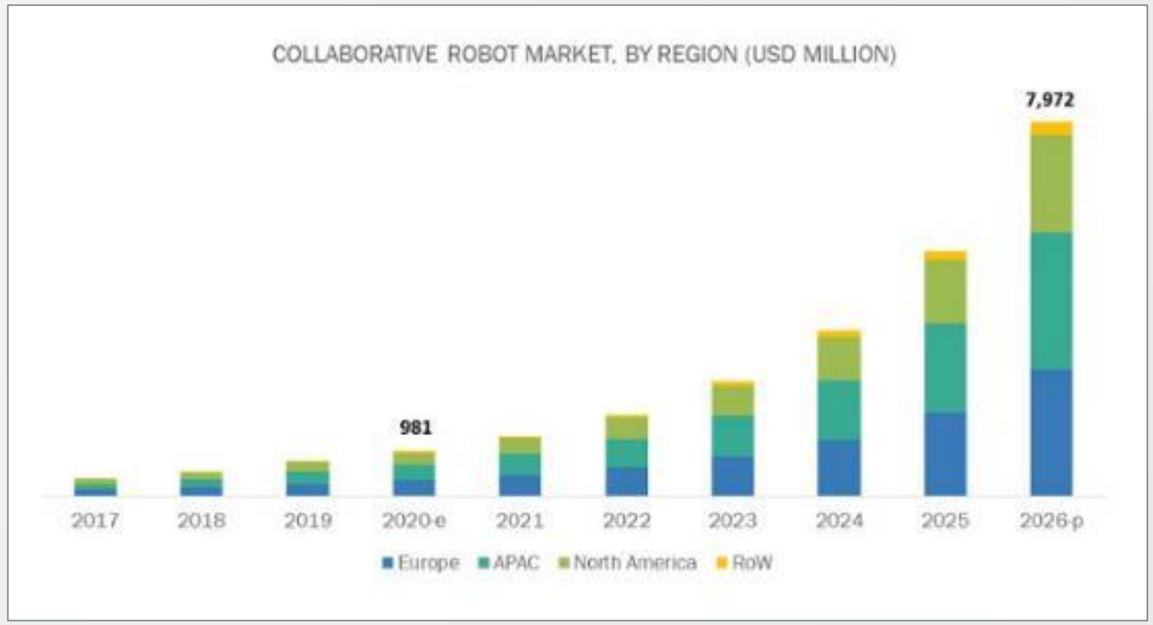
Reduced programming → Application Builder, Wizards, PolyScope

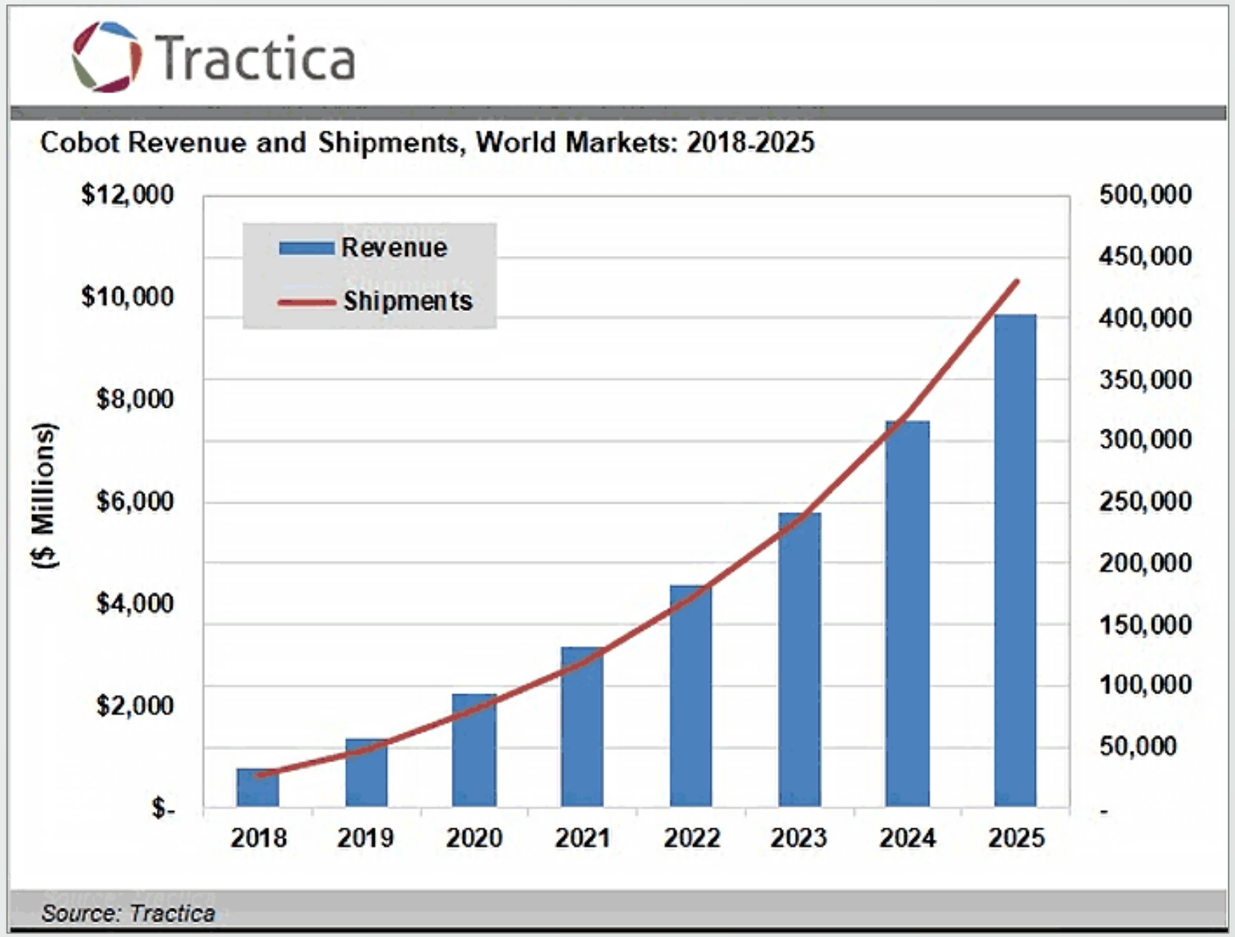
Reduced training → UR Academy

Reduced site work → 110 V power, no guarding, UR+ mounting systems

Cobots = Explosive Growth





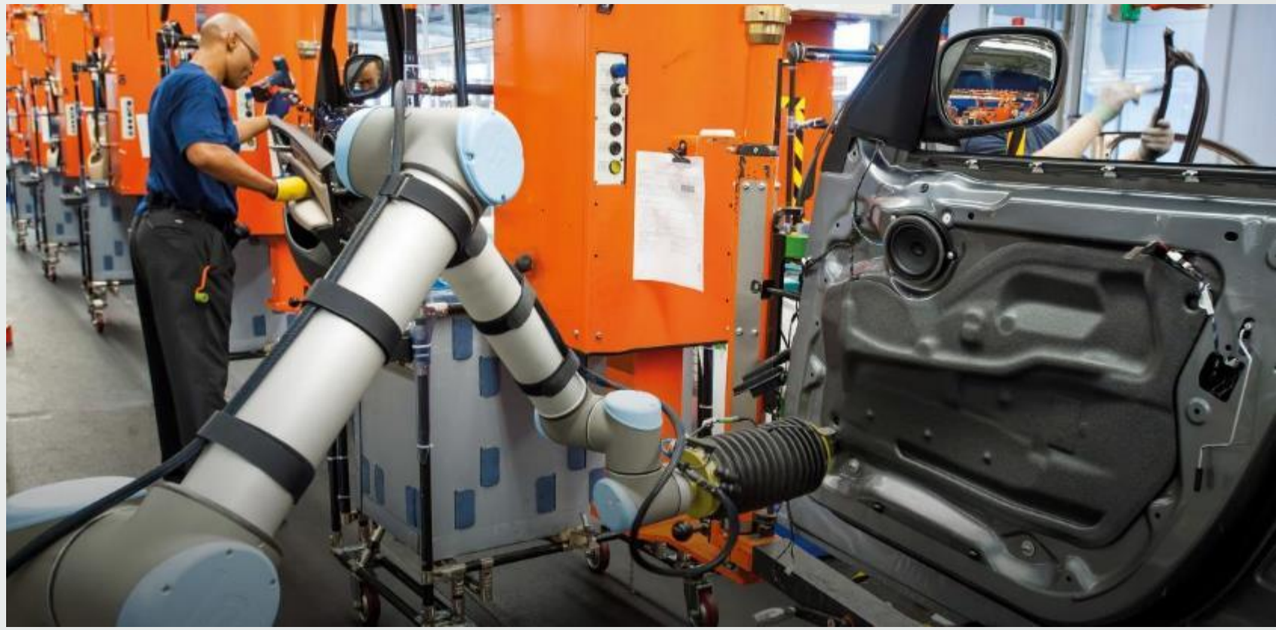


Source: Tractica, Markets & Markets, Interact Analysis

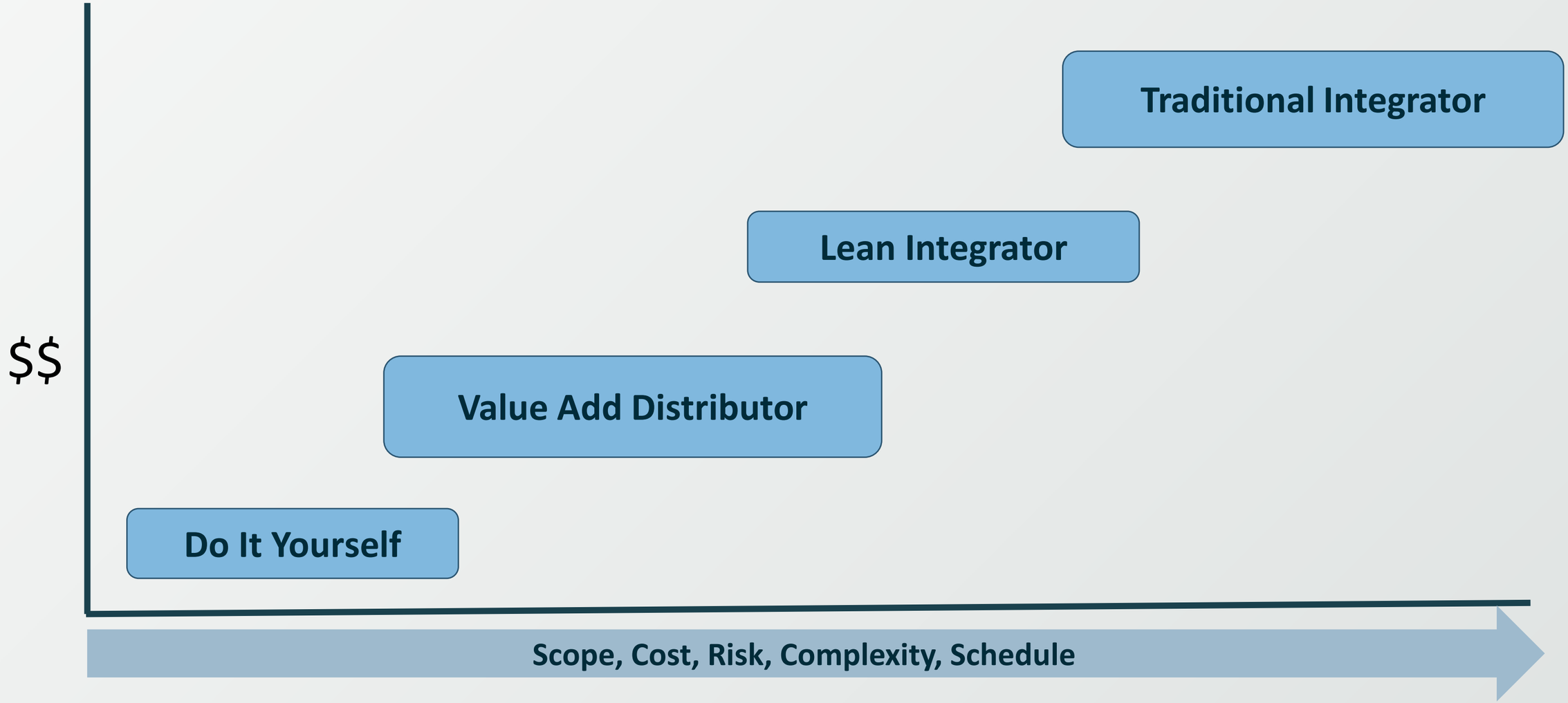
Key Takeaways?

DIY is now a viable alternative! But…

- DIY is <u>not</u> appropriate for every company, every project.
- Not all integrators are created equal!

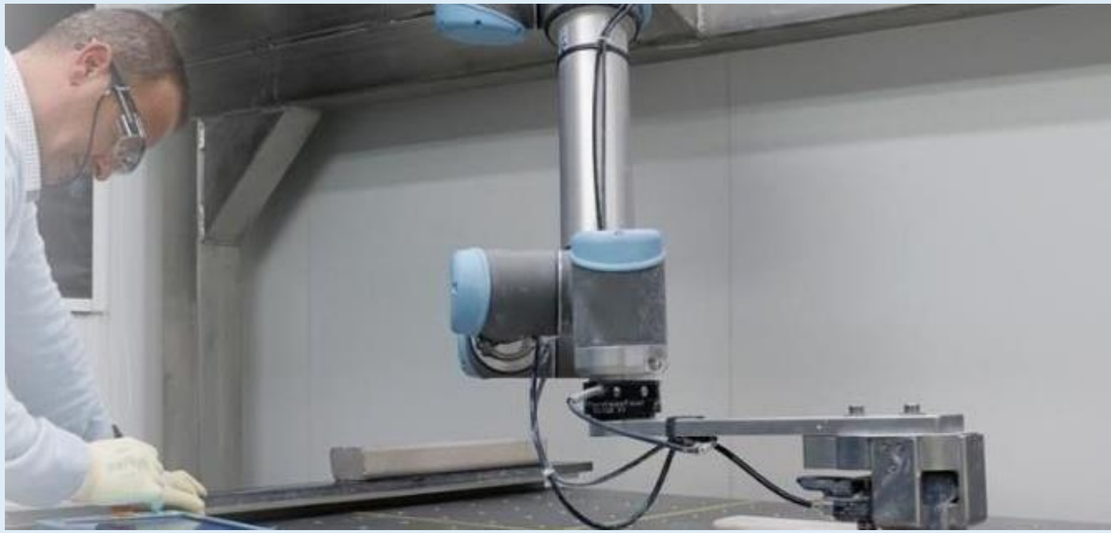


Major Categories Of Integration



Value Add Distributors

- Engineering to facilitate sales. Recommend configurations, peripherals, options
- Sales Engineer or Application Engineer is face to customer.
- Typically offers factory certified training, as well as remote and on-site support.
- Do not sell to performance specs.



Lean Integrators

Small project teams. Cross disciplines. Owner is often the project manager.

- Nimble processes focused on time. Lead time in weeks, not months.
- Constrained growth – big ≠ good!
- Small footprint, low overhead.
- Buy versus Build = Buy.

Application & Industry focus: “This is what we do.”

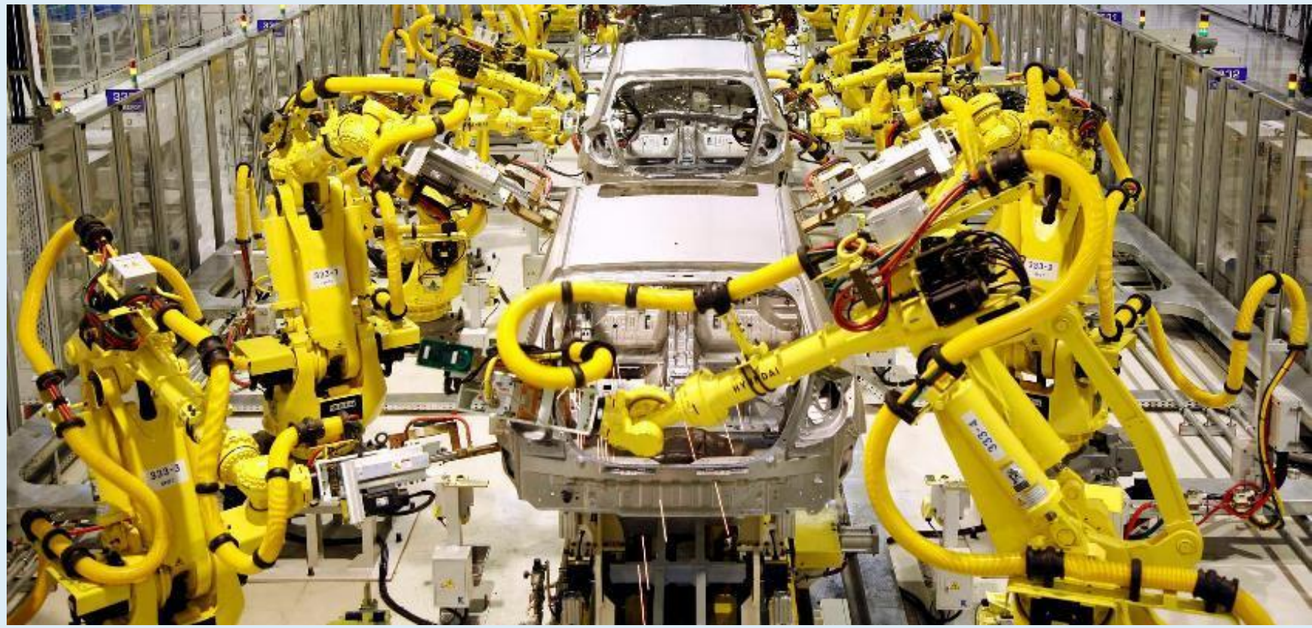
Traditional Integrators

Bigger is better. Big teams, big floorspace, big overhead. Big projects!

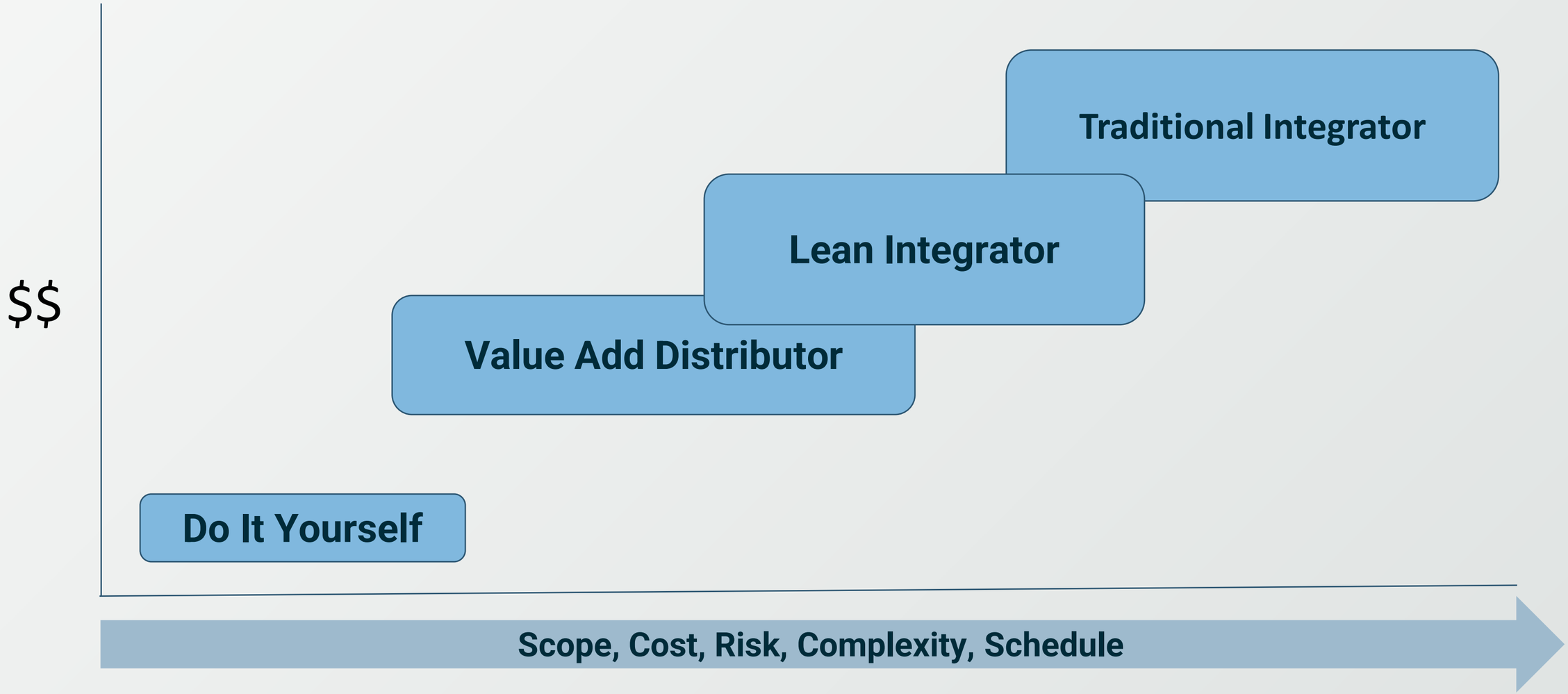
Multiple departments:

- Sales, Proposal Engineering
- Mechanical, Controls, Simulation
- Project Management, Supply Chain
- Production, Quality

- ISO processes built around large-scale project execution. Lead times in months.
- Buy versus Build = Build
- “We can do that!”



The Reality: “Some” Overlap



DECISION TIME!

Time to decide what approach is best for your company, your team and your project.

Choosing the integration model is a business decision, driven by 4 key factors:

- **Project Urgency**
- **In-house Resources**
- **Project Scope**
- **Project Risk**

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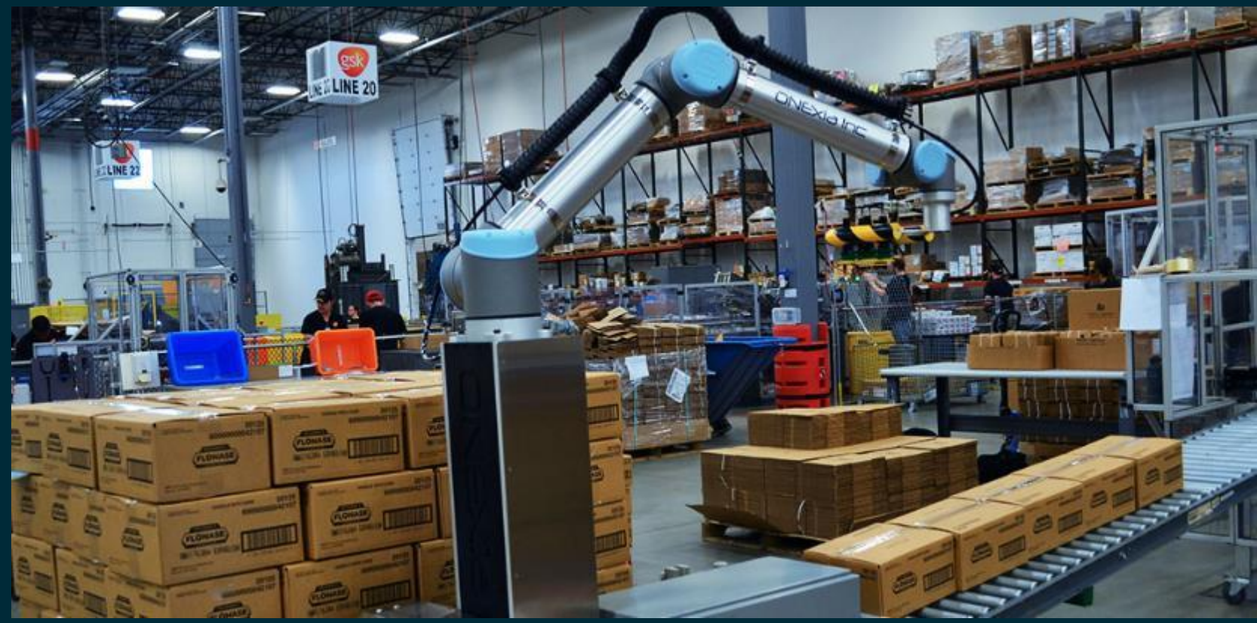
PROJECT URGENCY

What is the primary problem the project is solving? What is the primary benefit to be achieved?

- Labor Shortage / Savings
- Machine Utilization
- Customer Order / Future Capacity
- Customer Account Control
- Safety
- R&D
- Project timeline / schedule



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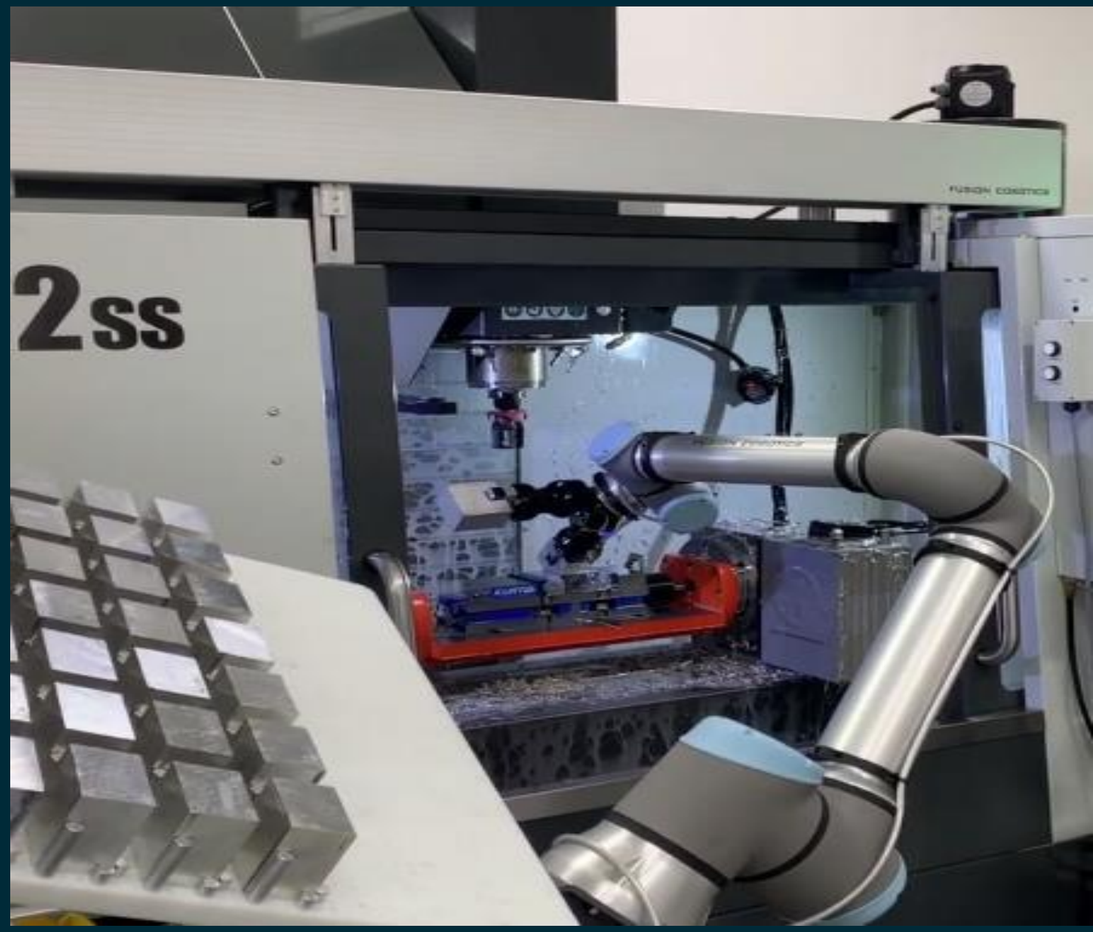
IN-HOUSE RESOURCES

What resources are can be assigned to this project?

- Availability – Full time, part time, hours per week
- Other assignments (“Day Job”)
- Automation experience
- Specialized training, such as safety protocols and Risk Assessments
- Project management skills



PROJECT SCOPE

Define the project scope, including application challenges:

- Single cell or multiples
- Additional process equipment
- PLC or HMI interface
- Complex sensors required
- Interface with enterprise ERP system
- Simulation / project assessment:
    - Requires >70% of rated payload.
    - Requires >70% of max work envelope.
    - Requires >70% of stated repeatability.

PROJECT RISK

Define major project risks:

- Impact of missing installation and startup schedules
- Impact of missing throughput / production rate goals
- Impact of missing quality objectives or goals
- Impact of overspending budget

UR Application Evaluation Tool

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- Captures and quantifies application risk in 6 key areas:
  - Experience with Robots
  - Environmental
  - Robot Capabilities, Performance
  - Tooling & Fixturing
  - Programming
  - Operator Interactions
- *Email JOCA@universal-robots.com for a copy.*

UNIVERSAL ROBOTS — Process: Palletizing

Application Evaluation Tool

Sheet created by Universal Robots USA

Instructions

Use columns G and K to type your responses. Evaluate the process you're considering automating. For each line of this form, assign a risk / complexity score from 0 to 5 as it relates to your project (0 = n/a, 5 = high risk to your project's success).
Add notes next to each line on strategies to mitigate and remove risks from your project. Consult your total score below to prioritize deployment strategies and winning projects.

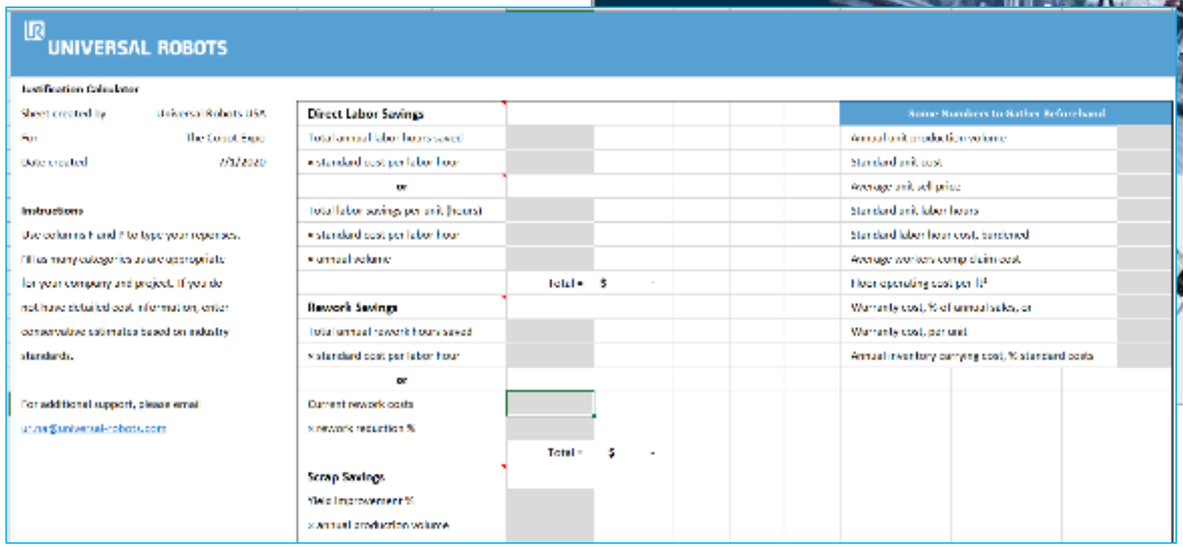
For additional support, please email ur.na@universal-robots.com

			Notes to reduce risk & complexity
Robotics Experience		**6**	
First robot installation at facility	3		
Operators inexperienced with robots	1		
No established manual process	2		
Environmental Cleanliness		**1**	
Extreme heat or cold	0		
Water or moisture	0		
Corrosive liquids	0		
Dust and particles	1		
Robot Arm Capabilities		**17**	
Precision (% of repeatability)	1		
Cycletime (% of top speed)	3		
Payload (% of maximum payload)	4		Consider next generation, high-performance UR20 cobot
Reach (% of work envelope)	4		UR20 should reduce risk
Mounting complexity	5		
Workpieces & Tooling		**16**	
Using in-house tooling	0		
Variety of part numbers	1		
Gripper complexity	2		
Multiple EOATs	3		
External axes: tracks, lifts, etc	5		
Tool changer	5		
Programming Considerations		**15**	
Number of steps in process	0		
Interfacing with external devices	1		
Part presentation	2		
Machine vision	4		
Controlling with PLC	3		
Using force mode	5		
Custom operator interface	0		
Frequency of Operator Interaction		**25**	
Cycle time depends on operator	5		
Reloading parts	5		
Running new programs	5		
Changing tools	5		
Moving the cobot	5		

Risk & Complexity Score = 80 / 150

UR JUSTIFICATION WORKSHEET

- 10 categories of top line and bottom line improvement:
  - Labor, quality, capacity, customer satisfaction, floor space, insurance, etc
- Multiple methods to measure.
- Recommendations on where to find the needed information in every company.
- *Email joca@universal-robots.com for a copy.*



CARRIERE INDUSTRIAL SUPPLY (CIS)

- *Complex DIY Project*
- Manufacturer of heavy earth-moving equipment for harsh mining environments, based in Sudbury, ON.
- 80% of production time plasma-cutting parts for large truck bodies spent cleaning up jagged edges from manual cuts.
- In manual MIG welding, large welded ribs raised critical ergonomic challenges for hard-to-staff welders.
- Due to the very large work pieces, CIS needed an automation solution they could bring to the work piece – not the other way around.

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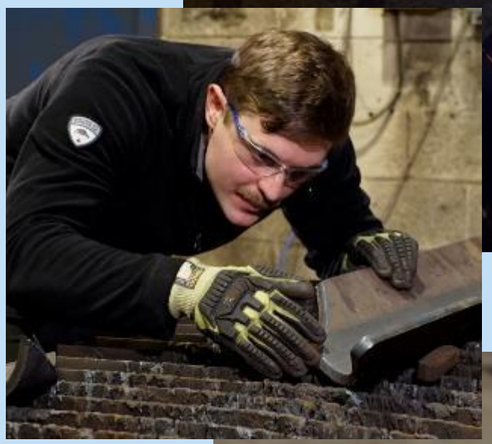
Carriere Industrial Supply: The Solution

- Deployed UR10e cobots to handle plasma-cutting and MIG welding tasks
- Cleanup after plasma-cutting (grinding jagged edges) now completely eliminated, saving 80% of production time, reducing work on each truck body from 50 to 12 hours.
- MIG welding the large work pieces is now automated by adding the UR10e cobot on a vertical 7th axis placed on a mobile skid.
- Both applications developed in-house.



ANDREW PEARCE BOWLS

- Artisan woodworker, manufacturing bowls and cutting boards, based in Hartland, VT.
- Could not keep up with demand due to labor shortages.
- Choke point in production was finish sanding, a particularly difficult DDD position to staff.
- With no robotics experience, high mix/low volume production, and a pride in hand-made products, Andrew Pearce Bowls had initial reservations about automation.

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Andrew Pearce Bowls: The Solution

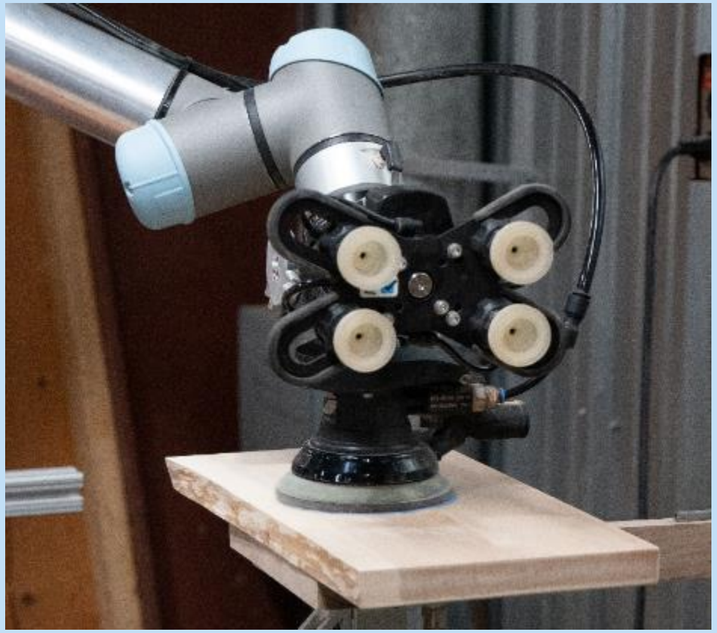
- ***Value Added Distributor Project***

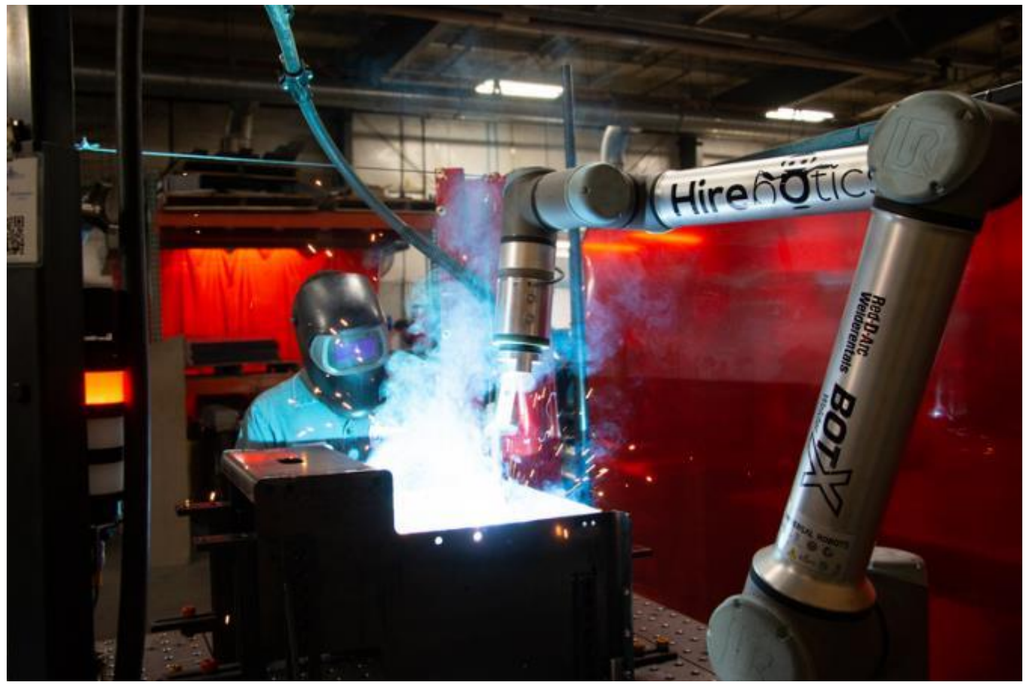
- Finish sanding of cutting boards is now performed by a UR5e finishing cell. The cobot handles the entire process: material handling to load blanks, flipping to allow sanding on top and bottom, and changing sandpaper on the orbital sander.

- Automating finish sanding with UR cut down sanding time by 20%, delivering an overall 40-41% increase in throughput.

- The UR5e, named “Sandrew” delivers a smoother finish and boosted worker morale.

- ROI < 2 months.





PMI: THE PROBLEM

- Metal fabricator that produces stamped and welded metal parts, based in Bloomer, Wisconsin
- 120 employees. Faced a tight labor market for skilled welders
- Needed a solution to handle small batch runs – high mix / low volume
- Wanted to increase productivity and profitability while improving working environment for employees.

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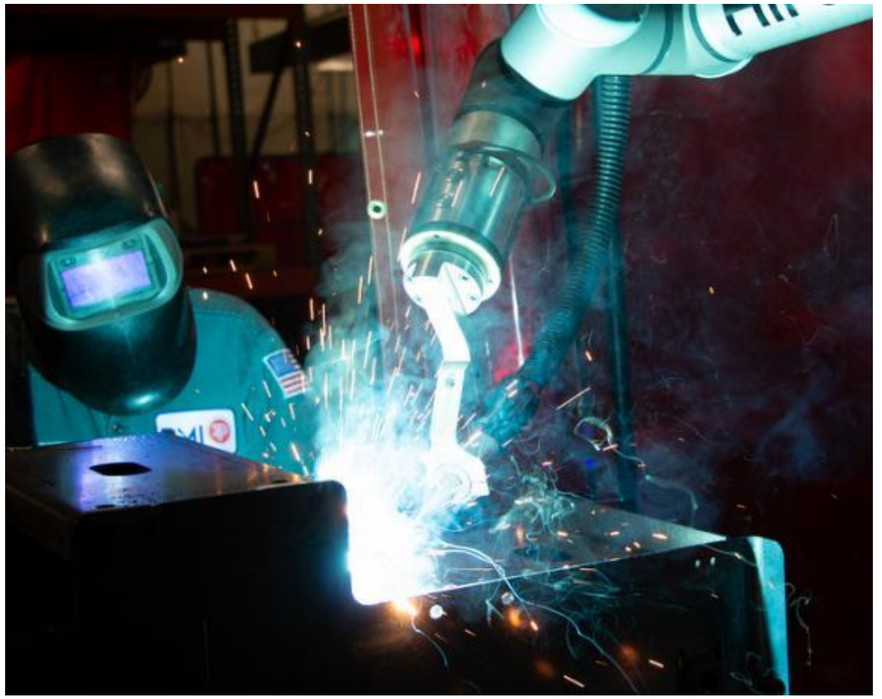
PMI: THE SOLUTION

- ***Lean Integrator / OEM Project***
- Deployed the BotX Welder from Hirebotics for welding applications
- Ability to quote and perform welding jobs without adding existing staff in the tight labor market
- Existing staff reallocated to larger, more profitable welds
- High mix/low volume welding now automated without developing time-consuming, expensive fixturing



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PSA GROUP: THE PROBLEM

- Plant of the Future project, with multiple objectives:
- Reduce vehicle costs to maintain competitiveness.
- Improve overall geometric dimensional tolerancing (GDT).
- Improve working conditions, protect operators from ergonomic and repetitive stress injuries.

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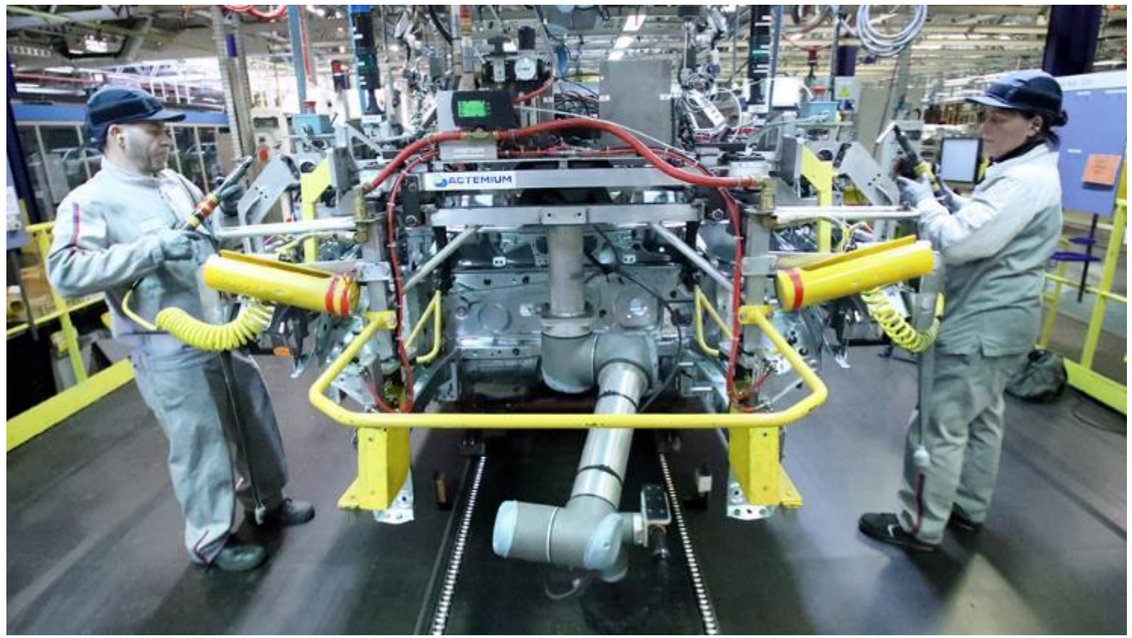

PSA GROUP: THE SOLUTION

- *Traditional Integrator Project*
- UR-10e is invert mounted on a free-standing fixture secured to a lift assist.
- Operators lower the fixture onto the chassis on the moving assembly line.
- Operators are driving screws and nuts in the more accessible locations.
- The UR-10e drives screws in the less accessible locations in the wheel wells and lower chassis.

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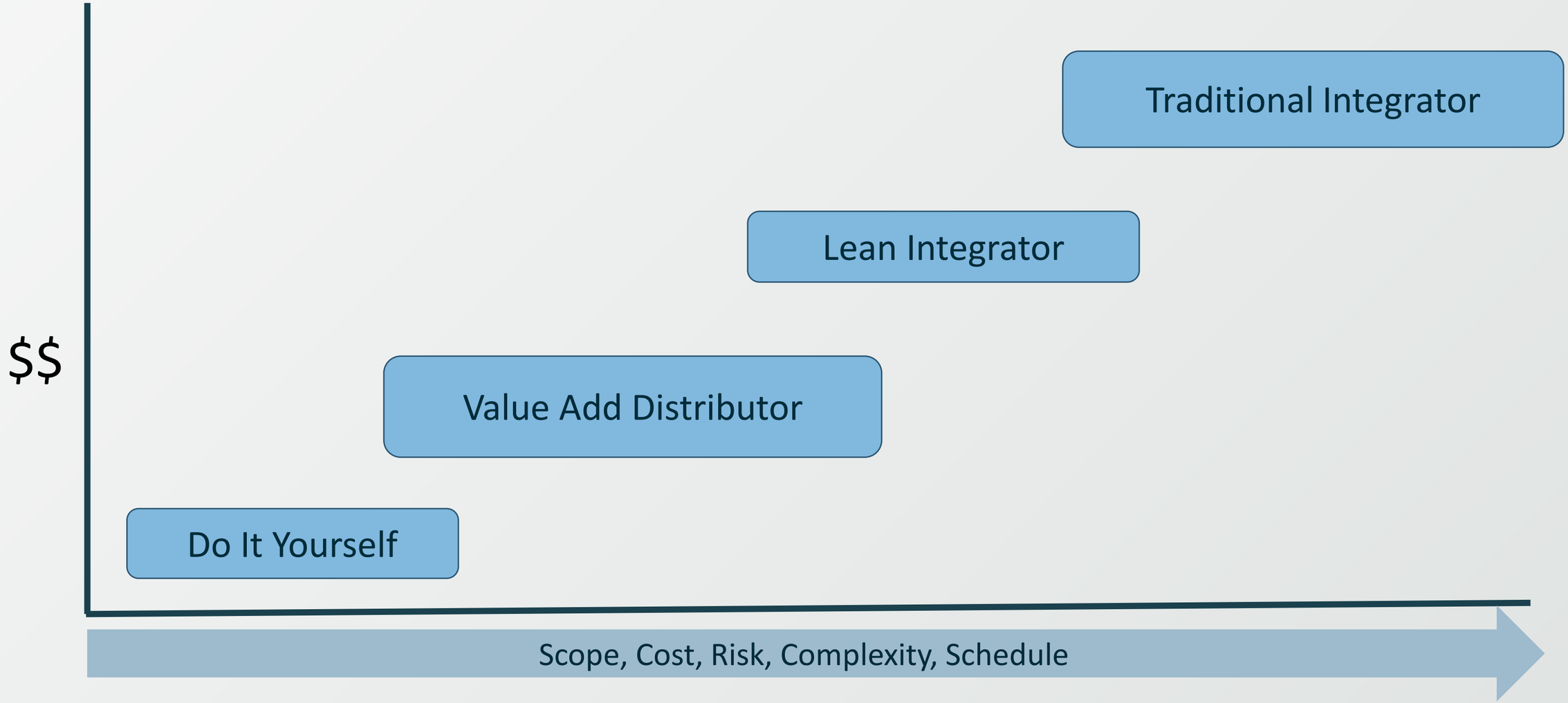
PTI ENGINEERED PLASTICS: THE PROBLEM

- Michigan based contract molder and manufacturer of plastic components and assemblies struggling with manufacturing labor issues.
- Serves the medical, automotive, defense/aerospace, and commercial/consumer products industries
- Low to mid volume/high mix, for simple to complex projects, from prototype to full production.
- Wide range of legacy molding machines, different sizes and different manufacturers.

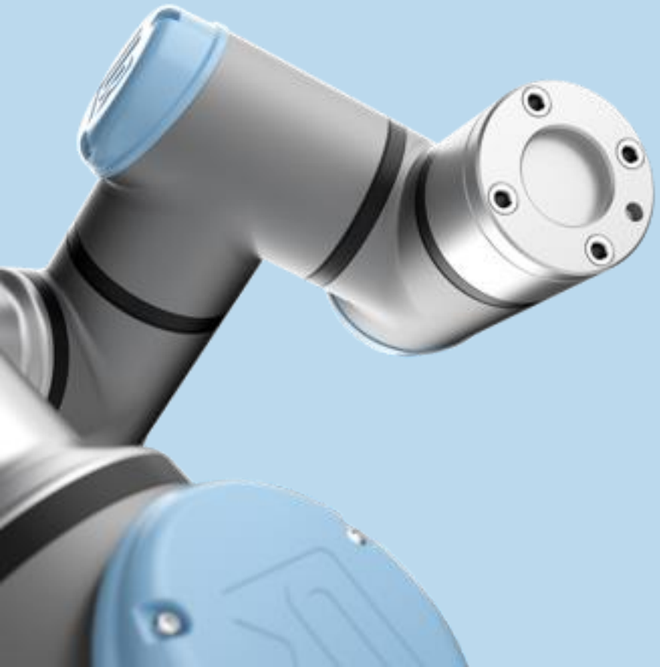
PTI ENGINEERED PLASTICS: THE SOLUTION

- ***Value Added Distributor / DIY Project***
- First system relied heavily on local distributor for support.
- “Cobot as a Tool” concept, mounted to mobile cart.
- Lift kit allowed height adjustment for variety of molding machines.
- Heavy use of UR+ components, configured and provided by distributor:
  - Flexxbotics – Flexx Reference, MurrSystems Cable Management, Ewellix – Liftkit, Vention – framing, UR – IMMI, Robotiq – Insight Software, EMI – Cobot Ready Conveyor
- Next 8 systems were built and integrated as DIY projects.

Major Categories Of Integrators



Thank you



Joe Campbell
joca@universal-robots.com
+734.417.7083