

Determining Which Robotic Solutions Best Enable Your Business



POWERED BY **POSSIBILITIES.**

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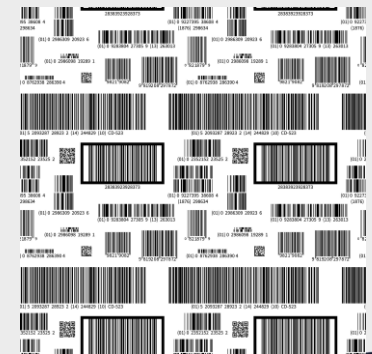
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Your Business Challenge

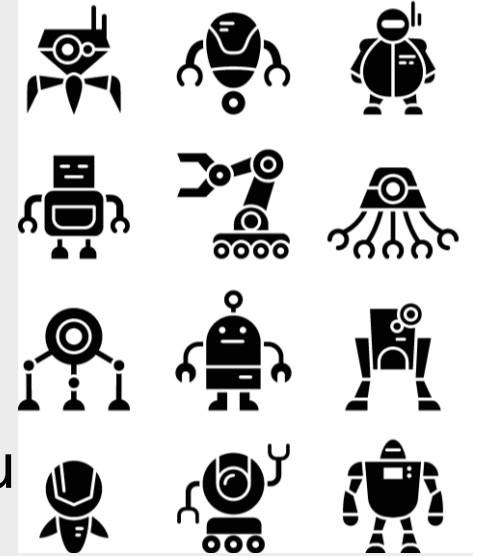
- Labor Shortage / Turnover
- Market Demand for Speed
- “3Ds” Dull, Dirty, and Dangerous Jobs
- Space Utilization
- Order Quality / Accuracy
- SKU Proliferation



POWERED BY POSSIBILITIES.

Your Business Fears

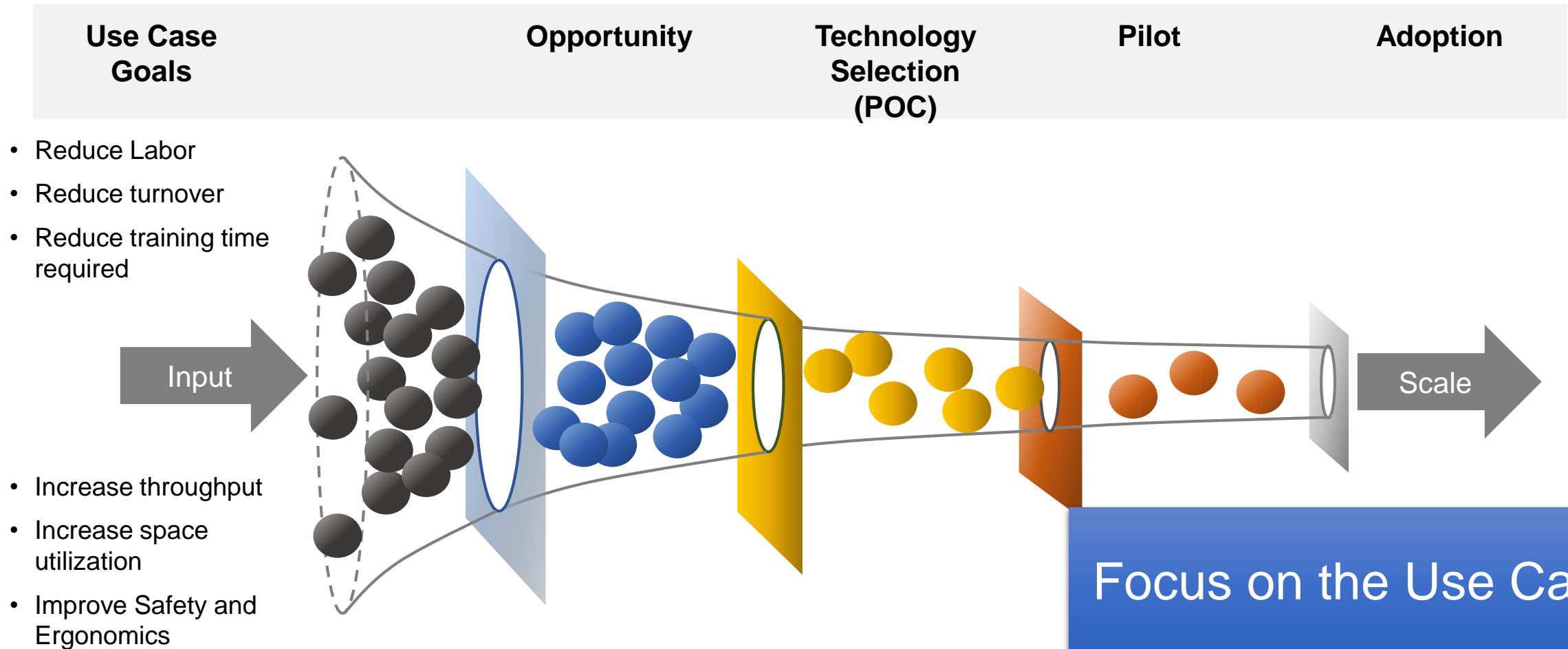
- Diversity of Technology
- Choosing the Wrong Tech
- Supplier Consolidation and Failure
- What is hype? What is real?
- Lack of Flexibility for Operations
- Ability to Maintain
- Single Point of Failure
- Proof of Concept (POC) Purgatory



There is no Silver Bullet!



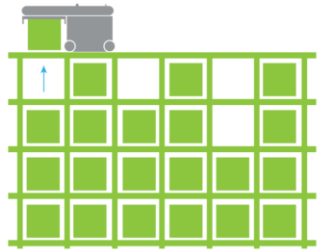
“Use Case” Funnel to Select Robotics



Robotics Solutions for Distribution Centers



Autonomous Mobile Robots (AMR)



Automatic Storage and Retrieval Systems (ASRS)



Robotic Piece Picking

AMR / AGV Overview

AMR:

- Navigate Uncontrolled Space
- No Physical Intervention



AGV:

- Uses Fixed or Defined Paths
- Often Requires Physical Intervention



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4 Primary AMR Types

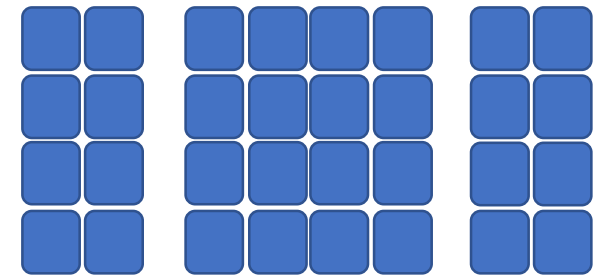
- Picking – Goods to Person or Person to Goods
- Freight – Point to Point Order Consolidation or Inventory Moves
- Flexible Sortation – Order Fulfillment, Returns, Kitting
- UAV (Drones) – Inventory or Equipment Management; Small Item High Speed Delivery

AMR Benefits

- Business Adaptability
- Operational Costs
- System Scalability
- System Portability
- Improved Speed and Accuracy
- Implementation Speed
- Potential RAAS (Robotics as a Service) Strategies

AMR Goods to Person

- Mobile Inventory Delivered to Picker
- Unified Inventory
 - Dynamic slotting
 - Can be configured as Multi-Deep
 - Does not Utilize Vertical Cube
- Labor Costs
 - Decrease 50%-75%
 - Improve Efficiency by 4 - 6x
 - Reduce injuries
- ROI is 1.5 - 3 year payback
- Deployment: 4 – 8 mos.
- Greater Flexibility (Open Space / Portable)



Mobile Storage Units
(plan view)

AMR Person to Goods

- Picker walking to slotted inventory
- Miles per day
- Traditional Inventory Storage w/Racking
 - No Dynamic Slotting
- Labor Costs
 - Decrease is minimal
 - Improve Efficiency by 2 – 2.5X
- ROI is 8 month - 1.5 year payback
 - Lower Long-Term Potential
- Deployment within 3 - 8 mos.
- Easier Implementation since Traditional Space Exists with Racks and Zones



AMR for Freight (Point to Point)

- Primary uses include Inventory Movement
 - Returns
 - Dock to storage
 - Order consolidation
 - Consolidation to Dock
 - Storage to Replenishment Station
- Labor Costs
 - Decrease Labor 40 – 50%
 - Improve Efficiency by 2 – 4X
- ROI is 8 months - 1.5 year payback
- Deployment within 3 - 8 months
- Flexible with Operational Requirements (order consolidation, pack-out, etc.)
- Scalable to Meet Throughput

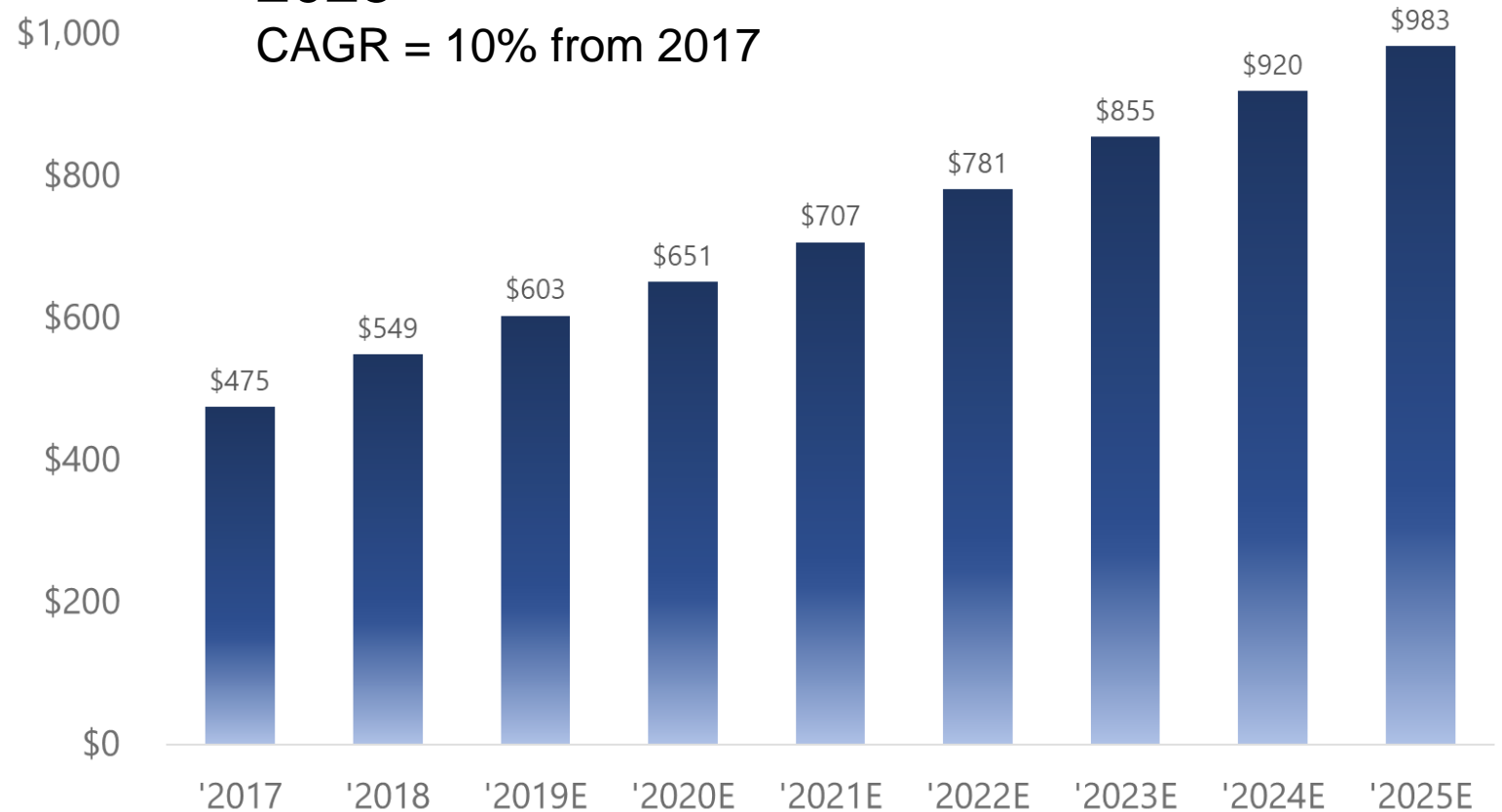


ASRS Overview

- Places and retrieves loads
- Can handle case, bins of eaches, or pallets
- Defined / Flexible Storage Locations

North American Market Forecast through 2025

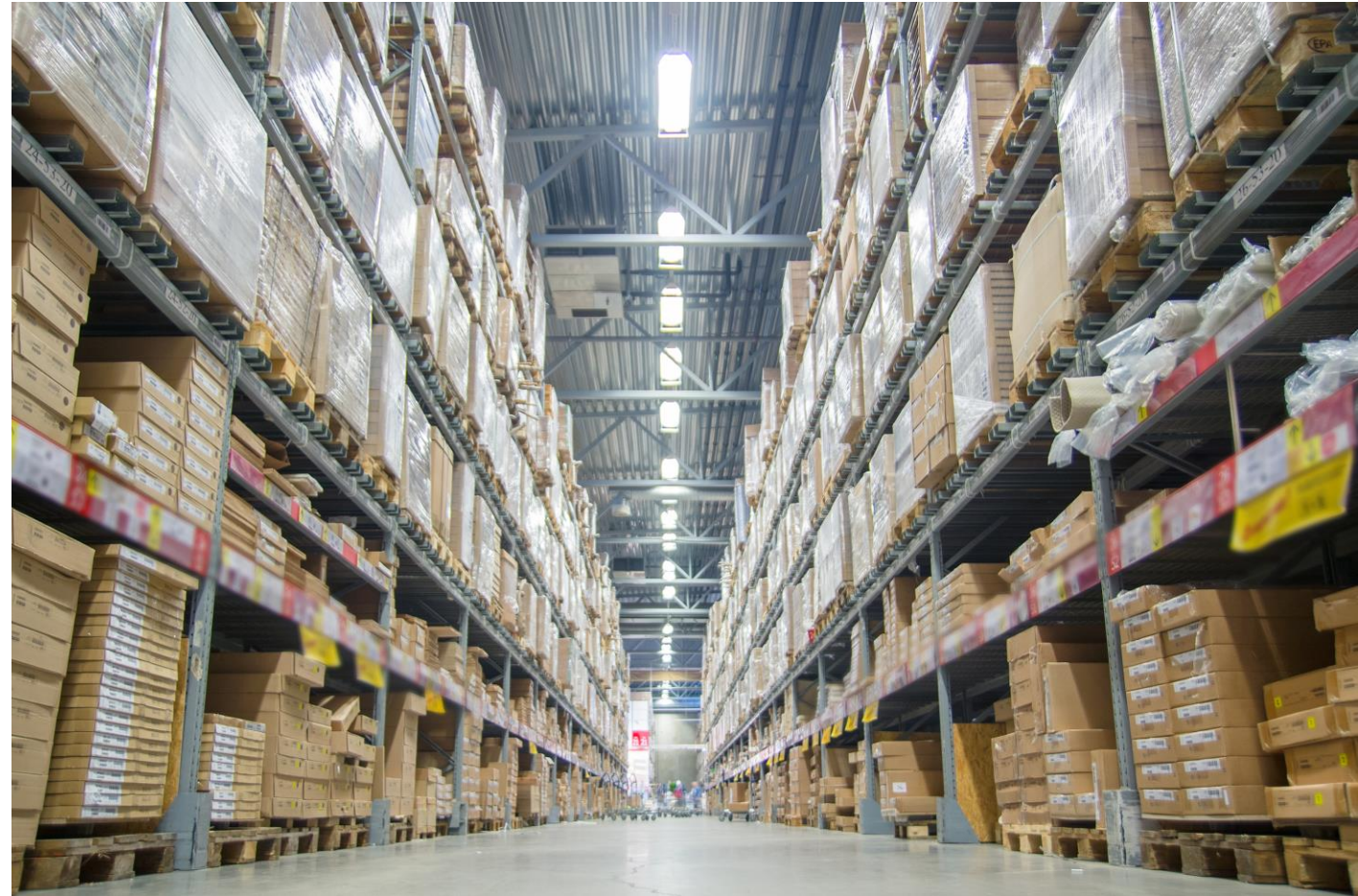
CAGR = 10% from 2017



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AS/RS Benefits

- High Volume Throughput
- High Storage Density
- Reduces Replenishment Labor and Transportation
- Increases Picking Accuracy
- Reduces Product Damage / Increases Security



ASRS Types

- Unit-load



- Horizontal carousels



- Mini-load

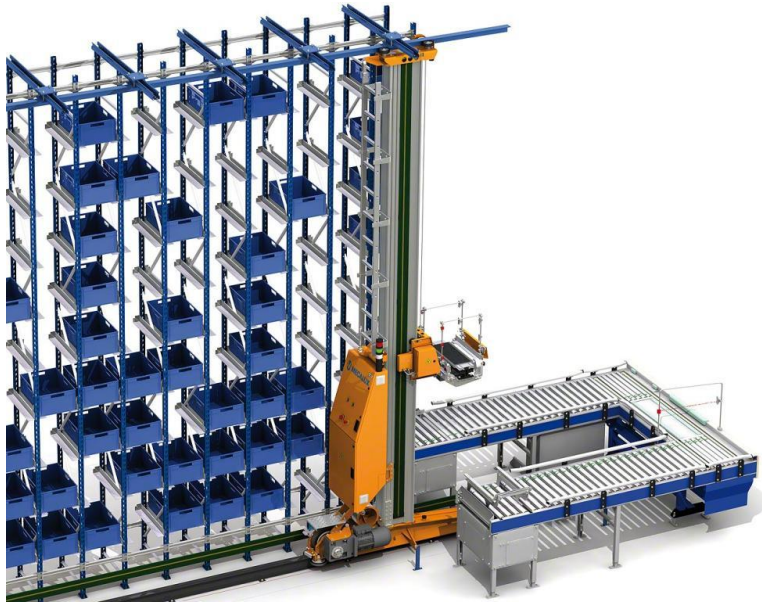
- Vertical carousels

- Vertical lift modules (VLMs)



ASRS Types

- Shuttles



- Cube-based Storage



ASRS Comparison – Operation Factors

Factor	Cube-Based	Shuttles
Initial Capital Investment	Lower	Higher
Uptime Risk	No single point of failure	Single points of failure that prevents access from aisles of SKUs
Net Unit Payload (lbs)	66	110
Throughput	13,500 bins per hour	500 in/out per Aisle
Storage Type	Bin Only	Bin and Carton



ASRS Comparison – Facility Factors

Factor	Cube-Based	Shuttles
Cubic Density	Best	Better
Expandability	Modular	Add other aisle
Additional Conveyor	Optional	Mandatory
Roof Clear	Shorter (< 30')	Taller (> 30')
System Shape	Any Shape (Square is optimal)	Rectangle only
Building Type	Greenfield / Brownfield	Greenfield / Brownfield
Temperature	Ambient / Cooler	Ambient / Cooler / Freezer

ASRS Application – Key Advantages

Shuttles

- High bay utilization
- Freezer capable
- Cartons capable

Different Ends of the Spectrum

Traditional high-volume warehousing



What is
your use
case?

Cube-based storage

- Brownfield flexibility (including non-traditional facilities)
- Easy to Expand
- Lower clearance utilization
- Additional conveyor is optional

Agile micro - fulfillment



Order Picking Technologies



- Robot Piece Picking
- Voice Picking
- Vision Picking



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Robotic Piece Picking – Key Drivers

- Labor Shortage
- Security
- SKU Proliferation
- Picking Quality
- Throughput Efficiency

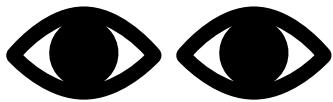


Robotic Picking Systems – 3 Key Attributes

- Strength of AI (picking algorithms)



- Vision System



- Robot Gripper / Payload



Robotic Piece Picking – Current Applications

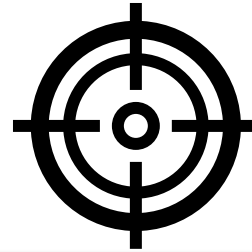
- Put to Put Wall
- Sortation Picking
- Kitting
- Put to Auto-Bagger



Start learning today!

Enable Your Business with Robotic Solutions

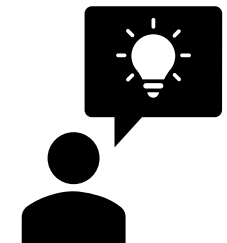
There is no Silver Bullet!



Focus on the Use Case!



Start learning today!



POWERED BY POSSIBILITIES.

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