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LIVEWORX

A NEW ERA IN PRODUCT LIFECYCLE INNOVATION

SESSION ID: **AR1105C**

BRINGING INNOVATION TO PRODUCTION: MAXIMIZING SHOPFLOOR HUMAN PERFORMANCE

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15 to 18 May, 2023

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We use the power of leading-edge science to save and improve lives.



Merck & Co., Inc.
Rahway, New Jersey, US

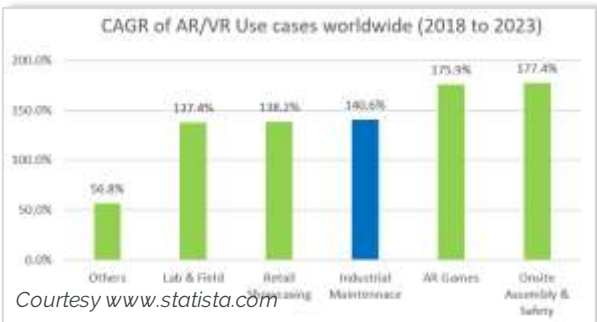
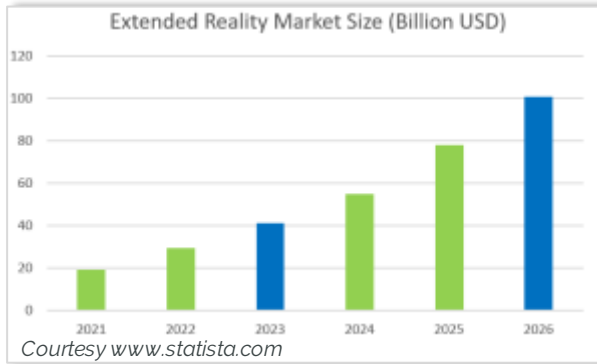


Approximately 69,000
Employees Worldwide.
(as of 12/31/2022)



Business: Prescription
Medicine, Vaccines, Biologic
Therapies, Animal Health
Products and Technology
Solutions

WHY ARE WE HERE?



To share our experience with...

1. Value-first AR adoption
2. Focus on KPIs
3. Building Enterprise Value

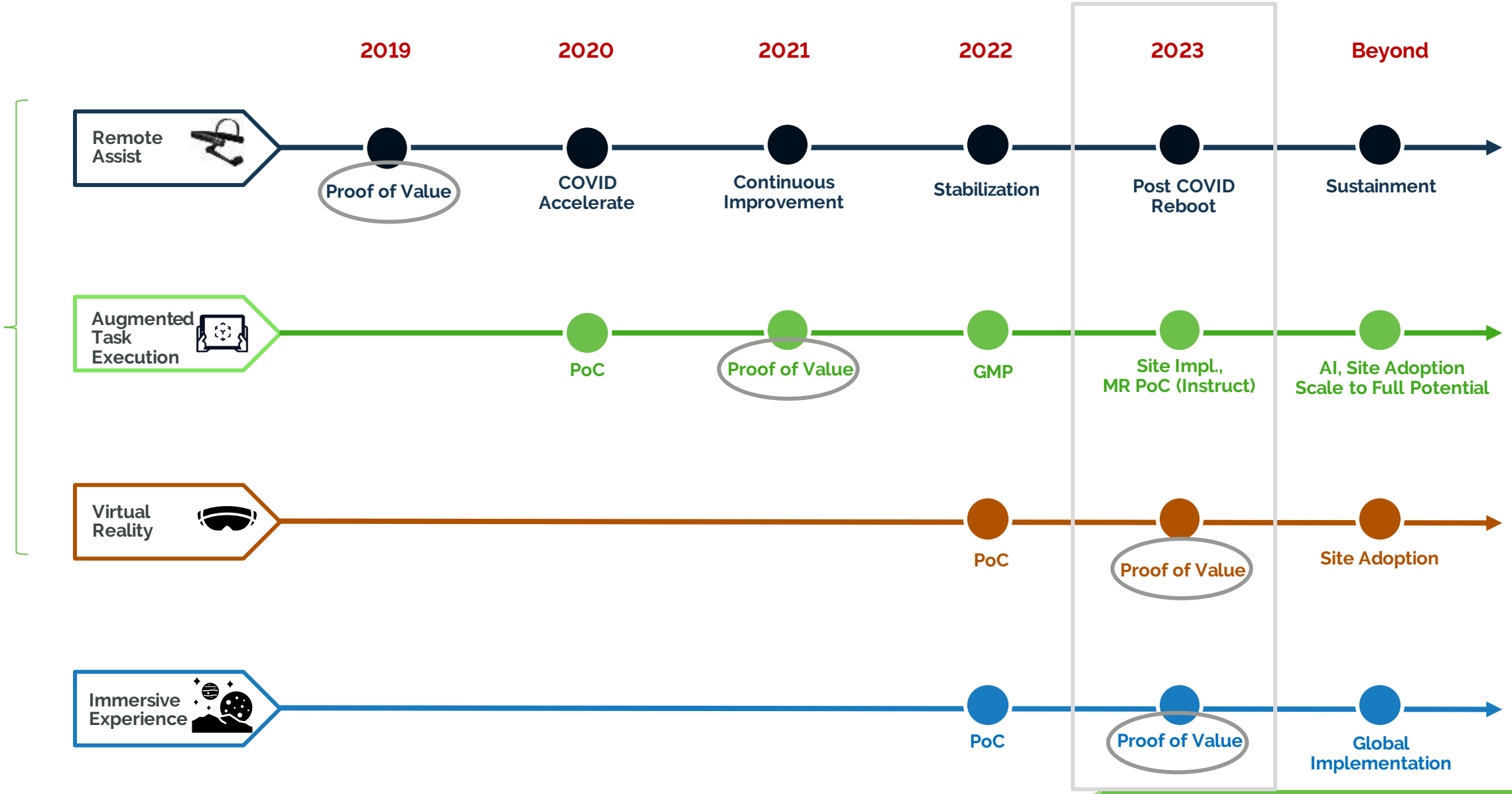


MERCK XR PROGRAM OVERVIEW

A value first approach...

XR PROGRAM KEY TO SUCCESS: DEMONSTRATE VALUE FIRST APPROACH

Foundational
Capabilities



AUGMENTED TASK TRAINING & EXECUTION

Platform	Devices	Use Cases	Adoption	KPIs
<ul style="list-style-type: none"> • Vuforia Expert Capture • GMP Qualified • Steady State Release Management • Reference Architecture 	<ul style="list-style-type: none"> • iPads (60%) • HoloLens (20%) • Laptops (10%_) • Others (10%) 	<ul style="list-style-type: none"> • Human Health <ul style="list-style-type: none"> • Operations (70%) • Maintenance (10%) • Labs (10%_) • Others (10%) • Animal Health <ul style="list-style-type: none"> • Labs (90%_) • Others (10%) • Research <ul style="list-style-type: none"> • Labs (100%_) 	<ul style="list-style-type: none"> • 150+ Modules • 10+ Manufacturing Sites • Learning & Development • Knowledge Management • Merck Production Systems • Quality 	<ul style="list-style-type: none"> • Speed to Competency • Right First Time • Productivity

Success Factors:

- **Strategy** : Bottom-Up approach leading to demand originating at Site
- **Platform** : GMP Compliance
- **Technology** : Short learning curve
- **Adoption** : Effective Change Management



VALUE FOCUS

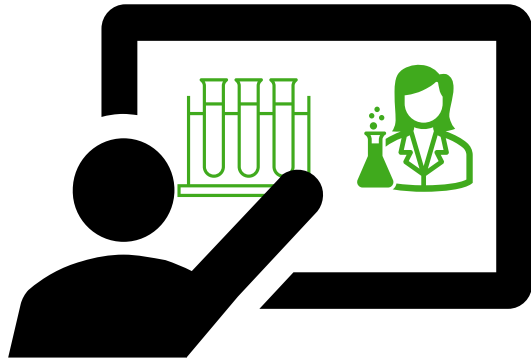
Top 3 KPIs

- 1. Speed to Competency*
- 2. Right First Time*
- 3. Productivity*

INCREASE SPEED TO COMPETENCY

Outcome noted in 100% of Use Cases

TRAINER



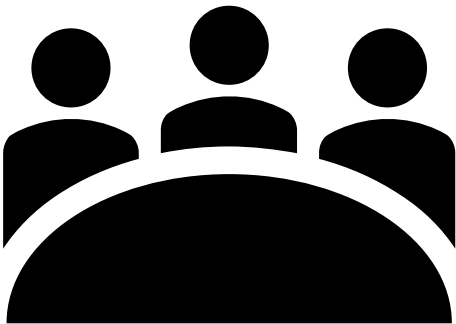
Primary Outcomes:

- **60%** reduction in Training Asset Development Effort
- **40%** reduction in Training Cycle Time

Secondary Outcomes:

- **Enables** best-practice sustainment through repeat, self-help training

TRAINEE



Primary Outcomes:

- **40%** reduction in time in skill qualification Cycle Time
- **80%** reduction in the need for SME Intervention

Secondary Outcomes:

- **Enhances** employee engagement

IMPROVE RIGHT FIRST TIME

Outcome noted in 60% of Use Cases



Primary Outcomes:

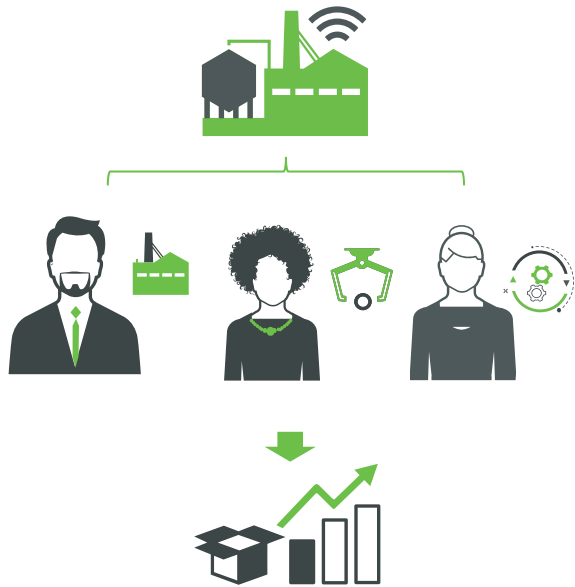
- **80%+** reduction in Human Performance related Quality Notifications
- **75%** reduction in consumables and material discards

Secondary Outcomes:

- **Reduces** number of QNs needing investigations
- **Increases** throughput
- **Reduces** number of batch lost
- **Reduces** Cost of Goods Manufactured

PRODUCTIVITY

Outcome noted in 40% of Use Cases



Primary Outcomes:

- **70%** SME time dedicated to training redirected to productive use.
- **2 weeks** of productive time saved per Training Cycle.

Secondary Outcomes:

- **Reduces** mean time to repair, where applicable
- **Reduces** unplanned slow-down of operations
- **Reduces** process variations
- **Mitigates** risk induced by SME attrition in a tight labor conditions.



BUILDING ENTERPRISE VALUE

- Business Case Development
- Implementation
- Outcomes

BUSINESS CASE DEVELOPMENT

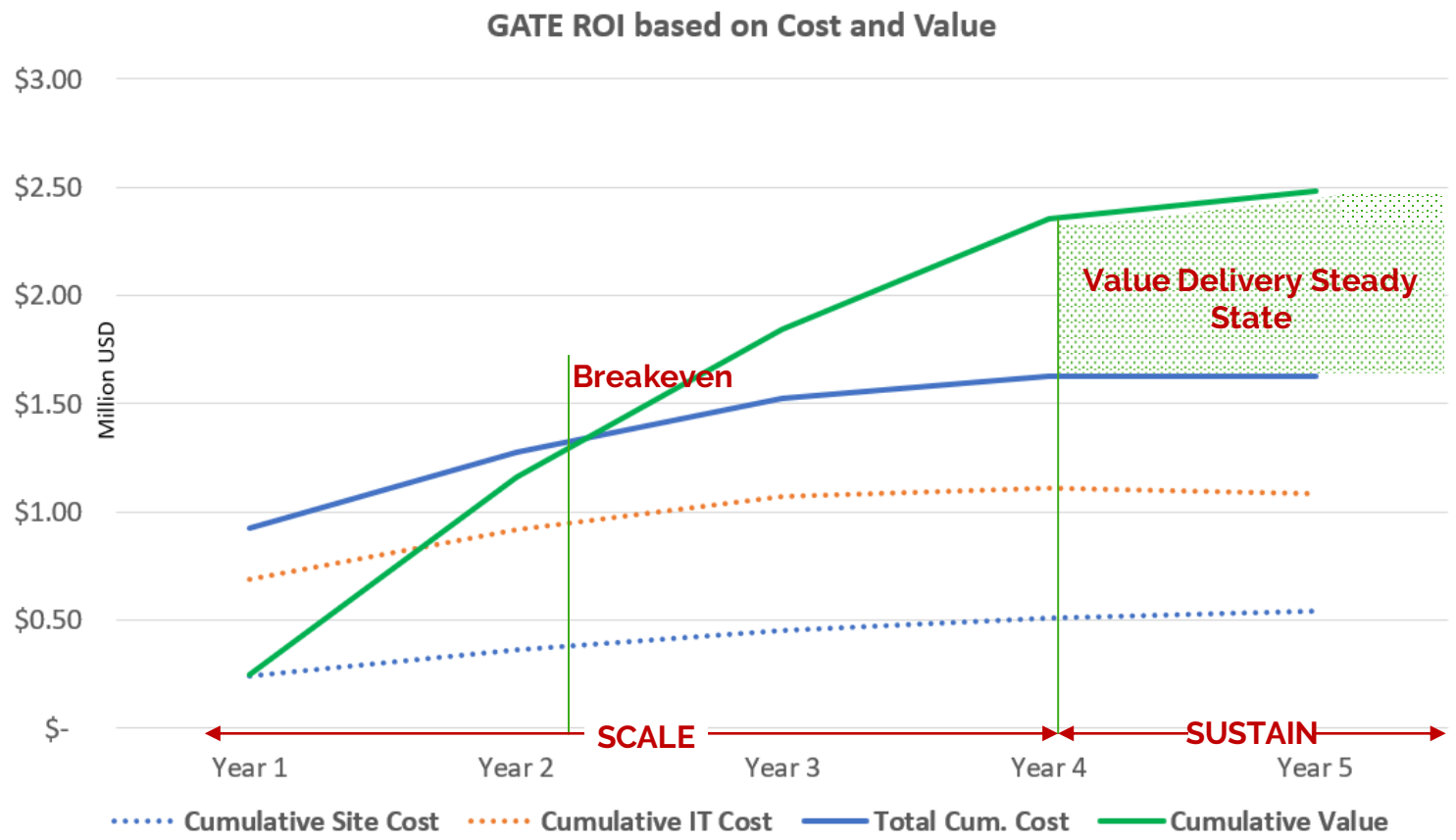
Key tenets that drive alignment and buy-in



- **Quantified Problem Statement**
 - For instance, include deviation stats, cost of investigations etc.
- **Value centric assessment of Opportunities**
 - Map to KPIs and compute \$ value.
- **Cost Estimates**
 - Include FTE, Device, License cost
 - IT and Business costs
 - Cost for implementation and sustainment phases
- **Document ROI**
 - Summarize Business Case paraphrasing salient points in Business terms.

BUSINESS CASE DEVELOPMENT

Sample ROI (all numbers in this slide are fictional and for representation only)

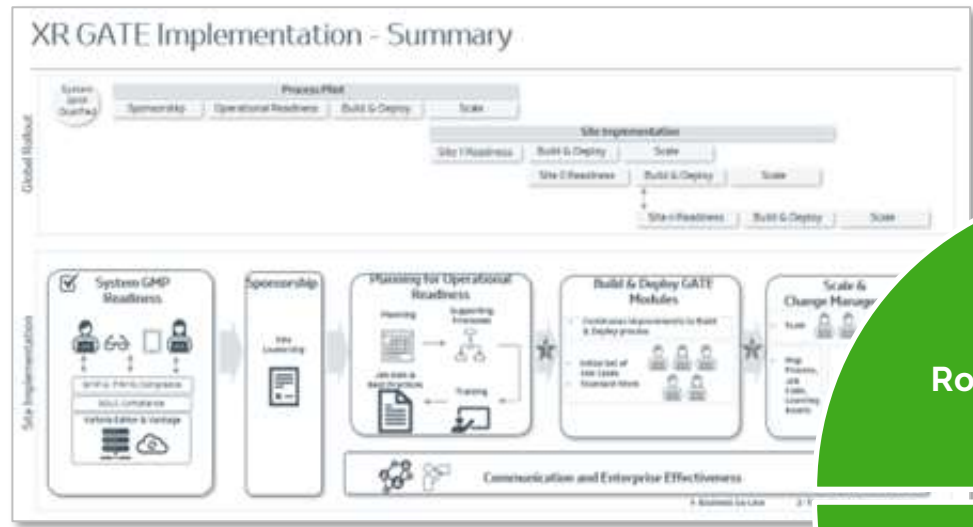


Value Highlights

- "X" batch(es) - minimum number of batches saved annually.
- "N" weeks of training saved per resource per cycle.
- %% ~ SME hours redirected towards productive use.
- \$\$ ~ potential for material and consumable discard reduction.

IMPLEMENTATION

Resources required to Implement AR



Planning for Operational Readiness Site Planning

Objective: Assess implementation needs related to functional alignment, resource bandwidth, procedures for maintenance, training, services.

Pre-Req/Task	Owner
1. Site LT and DTC Approval, A3	Site Lead
1. Engage with Site/OT, Quality, L&D, Ops and align GATE implementation at Site	Site Lead
2. Identify Site Resource Bandwidth required to support Roll-out/Deployment of GATE Modules at Site	Site Lead
3. Prepare Site approach to include GATE Modules in the Site-based Learning Plans	Site Lead
4. Prepare process to review and approve OMP GATE Modules	Site Lead
5. Review Implementation approach, Need for HR Services support	Site Lead, HRDL
6. Review and assign Deployment Lead (PROL)	HR Dept
7. Review Decides on-site	HRDL
8. Deployer GATE Capacity Training Plans are required for Site	HRDL
9. Identify HR resources that would support implementation	HRDL
10. Develop Communication Plan	HR Dept Lead
11. Identify Demand required for Site Implementation	HRDL
12. Review Site-based HR Structures based on HR KPI of GATE Learning Learning	Site Lead

Potential Risk	Risk	Impact	Suggested Mitigation
1. Additional time required for Site alignment between functional teams, could delay the start of Site Implementation	Med	High	Site Leads to meet out to Site Operations in case such delays are anticipated

Deliverables	Owner
1. Site Method for review and approval of OMP Modules	Site Lead
2. Detailed Assessment for Devices & Licenses	HRDL
3. Updated Site Specific Training Plans	HRDL, Site Lead
4. Updated Site Specific Communication Plans	HRDL
5. Site Out-look plan	Site Lead, HRDL

A detailed table showing resource requirements across various categories like Sponsorship, Operational Readiness, Build & Deploy, and Scale & Steady State. It includes columns for role, FTE, and other metrics.

Capacity Assessment

	Sponsorship	Operational Readiness	Build & Deploy	Scale & Steady State	BW Req. per Role (initial)	BW Req. per Role (recurring)
Phase 1	0.25 FTE (phase)	0.5 FTE (phase)	0.25 FTE (phase)	0.1 FTE (recurring)	0.25 FTE	0.1 FTE
Phase 2	0.1 FTE	0.5 FTE	0.5 FTE	0.25 FTE	0.3 FTE	0.25 FTE
Role 3	NA	0.1 FTE (Training)	0.25 FTE /Module	0.25 FTE /Module	0.3 FTE	0.25 FTE /module
Role 4	NA	0.1 FTE (Training)	0.1 FTE /Module	0.1 FTE	0.2 FTE	0.1 FTE /module
Role 5	NA	0.1 FTE (Training)	0.1 FTE /Module	0.1 FTE	0.2 FTE	0.1 FTE /module
Role 6	NA	0.5 FTE	0.1 FTE	0.25 FTE	0.1 FTE	0.25 FTE /module
Role 7	NA	0.1 FTE	0.1 FTE	0.1 FTE	0.6 FTE	0.1 FTE
BW Req. per phase	-0.5 FTE	-2 FTE	-1.5 FTE/Module	-1.25 FTE/Module		

OUTCOMES

	<p>USE CASE</p> <h2>Knowledge Retention</h2>	<p>DEMAND</p> <p>Quick turnaround of comprehensive, SME knowledge capture.</p>	<p>OUTCOME</p> <p>Accelerate operational readiness in new Facility setups. Deliver 60% reduction in deviations.</p>	<p>VALUE DEMONSTRATED</p> <ul style="list-style-type: none"> ✓ Speed To Competency ✓ Right First Time
	<p>USE CASE</p> <h2>Bioprocessing; Filtration</h2>	<p>DEMAND</p> <p>Accelerate new hire on-boarding to mitigate effects of resource rotation and optimizing SME workload</p>	<p>OUTCOME</p> <p>Onboarding time reduced by 40%+. Enhanced HuP* resulted in higher throughput, reduced rework and discard savings</p>	<p>VALUE DEMONSTRATED</p> <ul style="list-style-type: none"> ✓ Speed To Competency ✓ Right First Time ✓ Productivity
	<p>USE CASE</p> <h2>Operational Efficiency</h2>	<p>DEMAND</p> <p>Training operators to quickly get Automated Guided Vehicle back on track..</p>	<p>OUTCOME</p> <p>Mean time to repair reduced by 80%+</p>	<p>VALUE DEMONSTRATED</p> <ul style="list-style-type: none"> ✓ Speed To Competency ✓ Productivity

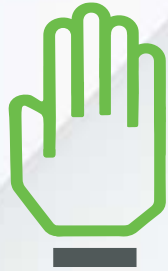
Filtration Image courtesy: TangenX SIUS Gamma
 (*) Human Performance

SEE VUFORIA IN ACTION AT PTC DEMO BOOTH

Watson Marlow Flexicon FPC50 Filling, Stoppering & Capping System

- Small batch filling system setup using Vuforia AR instructions





QUESTIONS?

Thank you! You can find me at:



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