TULIP

WEBINAR

A View Into Pharma 4.0

Modernizing Manufacturing in Regulated Industries to Support the Connected Worker

Presented by **Gilad Langer** Life Sciences Practice Lead, Tulip

PJ Geldenhuis Senior Process Engineer, Vertex Pharmaceuticals

Thank you for joining!

Use the Q&A button on the bottom of your screen to submit questions

Speakers

Gilad Langer
Life Sciences Practice Lead
Tulip Interfaces

PJ Geldenhuis
Senior Process Engineer
Vertex Pharmaceuticals

Webinar Objectives

1 **Human-centric Digital Manufacturing**

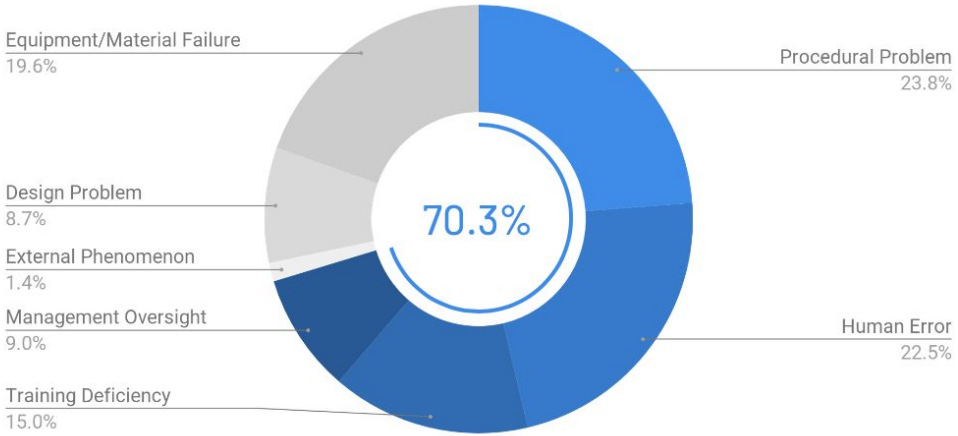
- Why people matter
- The augmented and connected worker
- What is digital manufacturing

2 **Digital pharma manufacturing in practice**

- Exemplifying digital manufacturing at Vertex
- Benefits of connecting & augmenting workers

Automation is not the solution

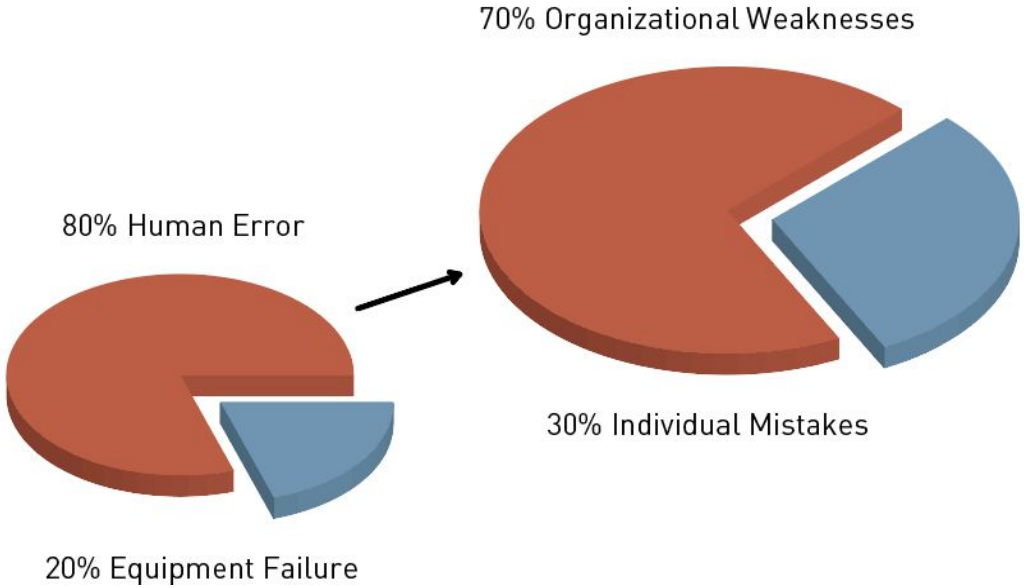
Manufacturers spending $2T/year on automation, but **it's not solving their biggest problems**



Source: IHS Markit, DOE "Human Performance Improvement Handbook", Noria research

70-80% of factory failures are caused by **human-centric processes**

These “human problems” are symptoms of other failures



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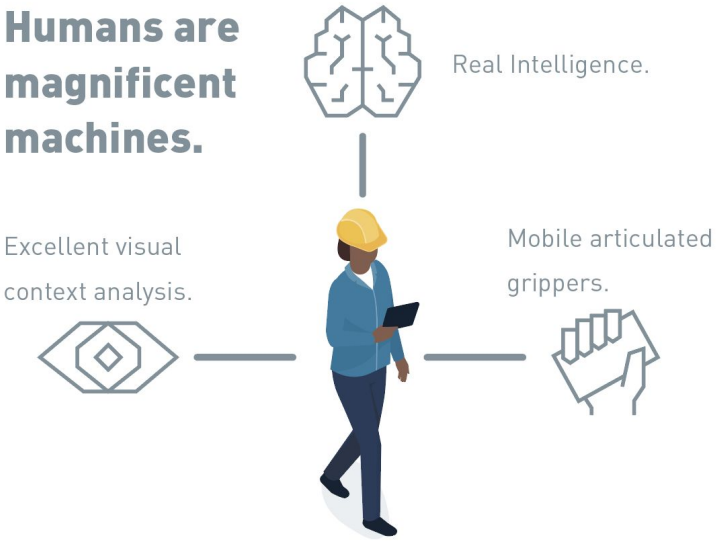
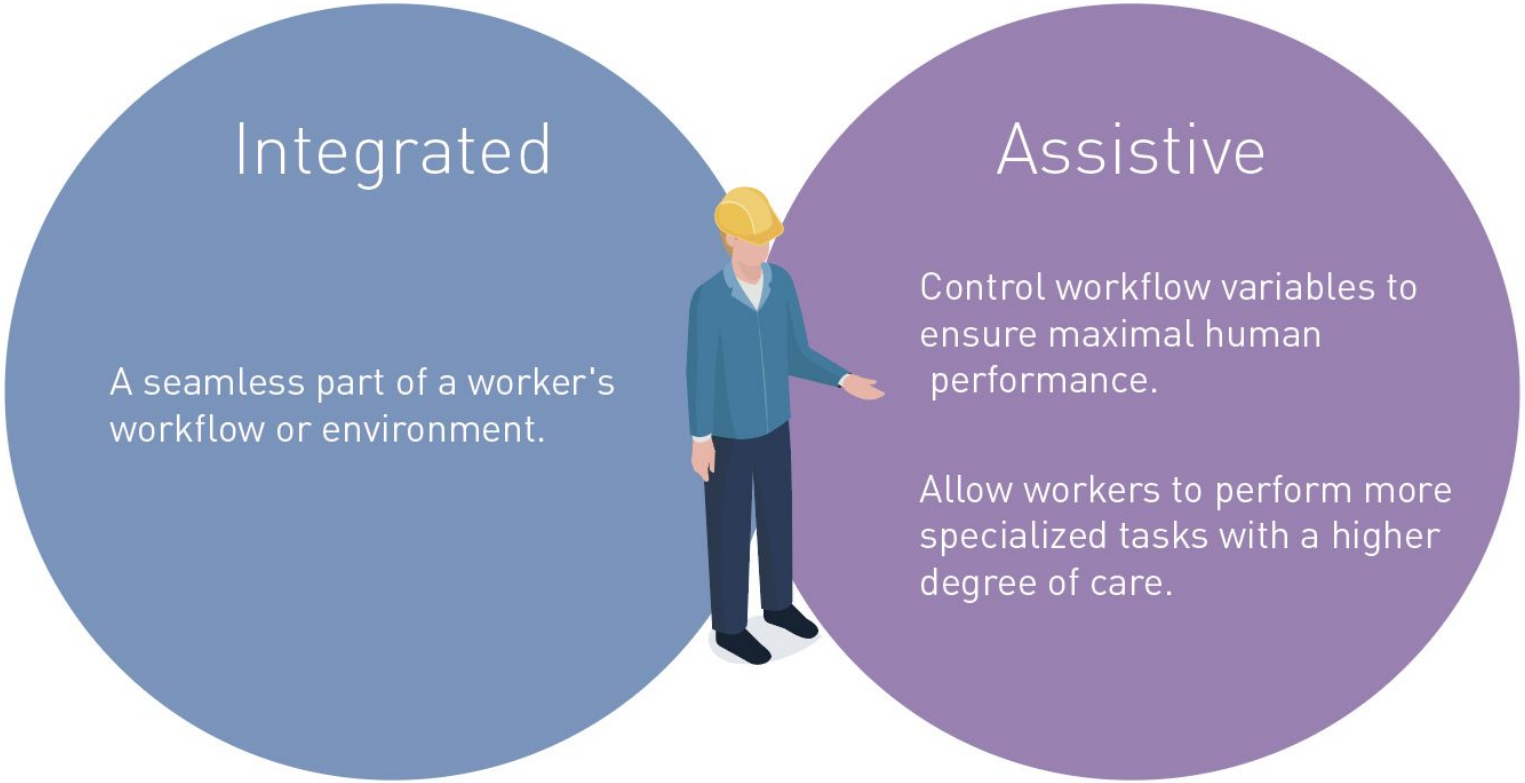
Augmentation scales human capabilities



+ Digital technologies supplement hard skills - physical skills.

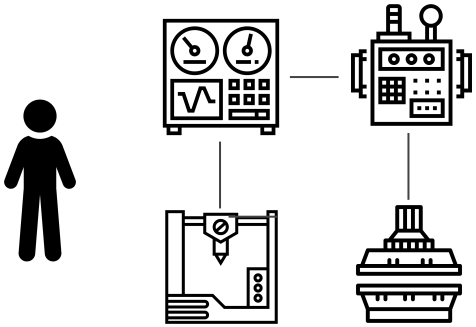
+ Digital technologies supplement uniquely human skills - people management, creativity, adaptability

What makes technology human centric?

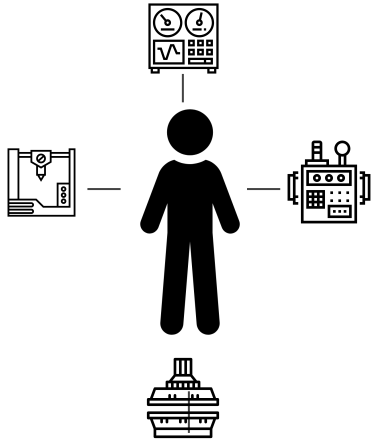


Digital manufacturing is human centric

3.0



Process Centric

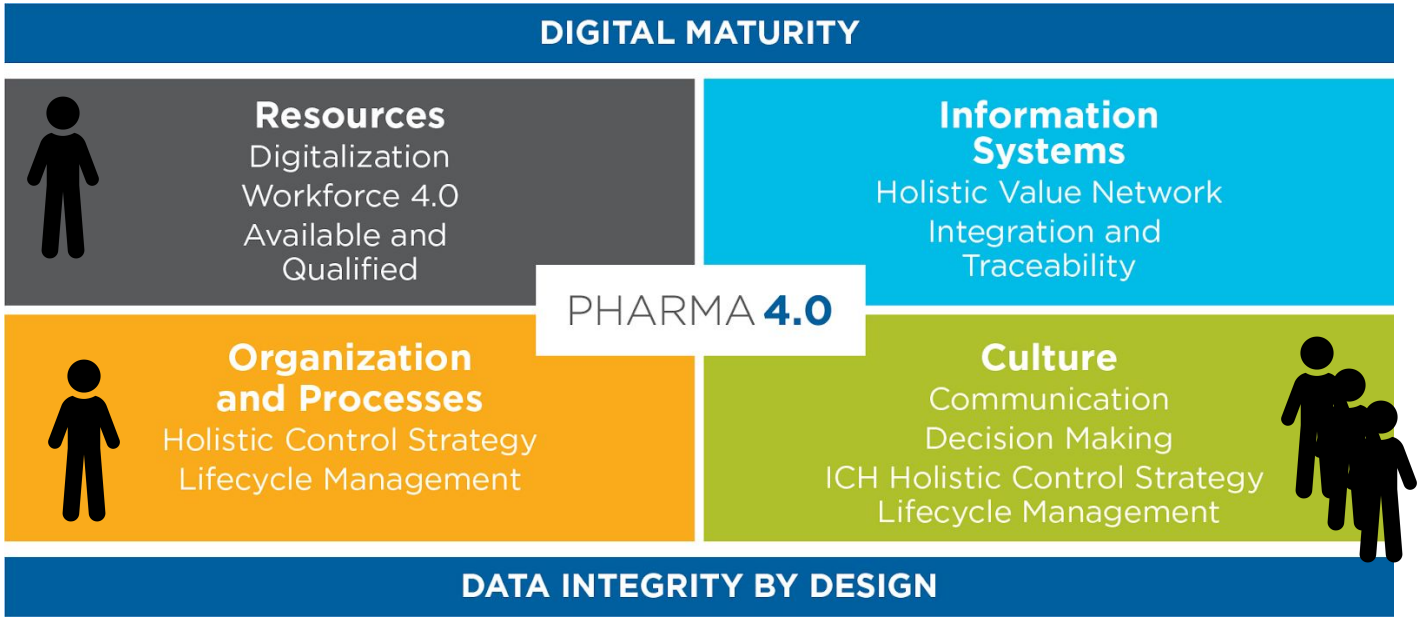


Human Centric

The Digital Divide

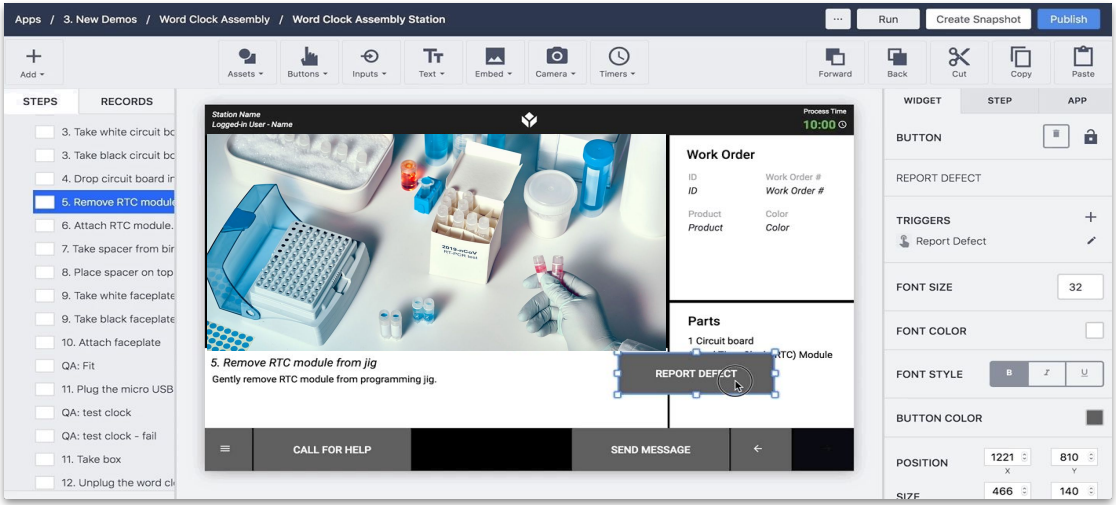
4.0

Pharma 4.0 is also very much “Human Centric”



Fundamentals of digital manufacturing

- Connected machines and devices
- Connected digital workflows
- Cloud computing



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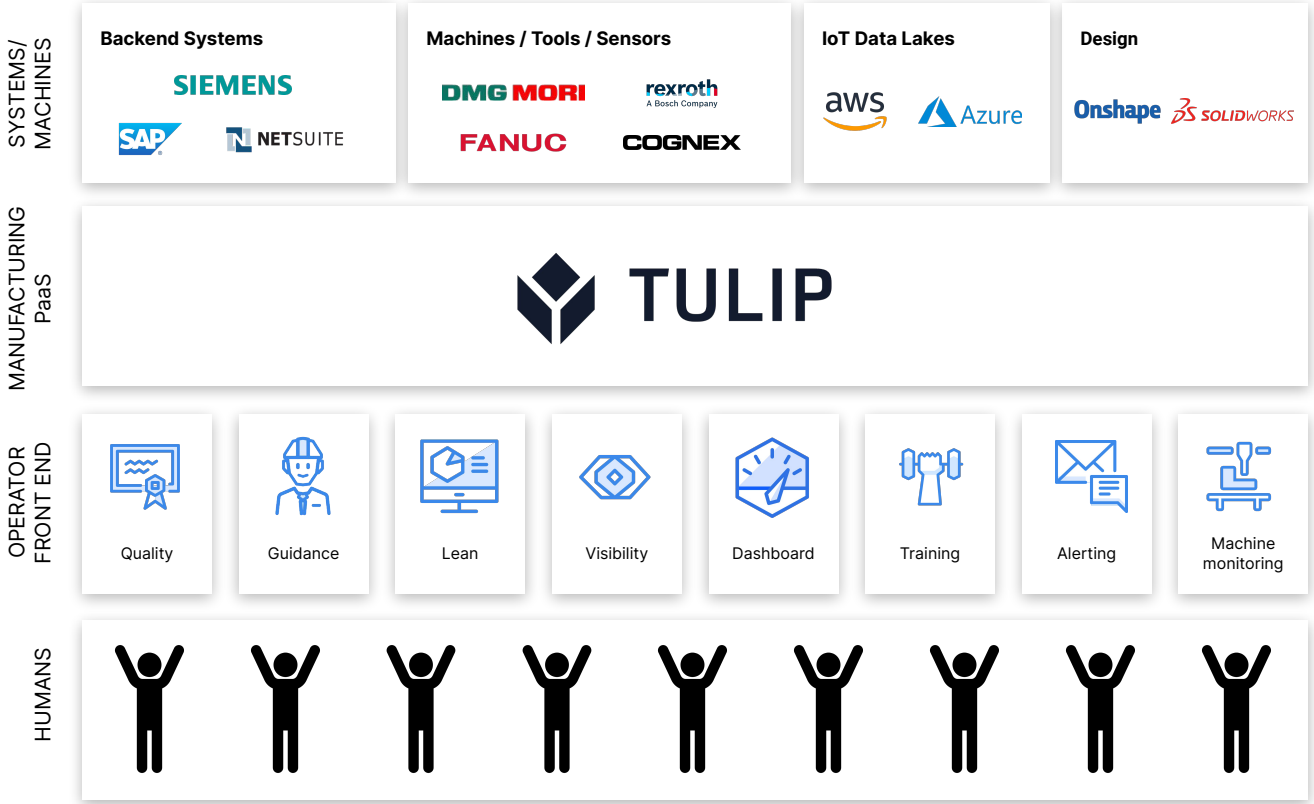
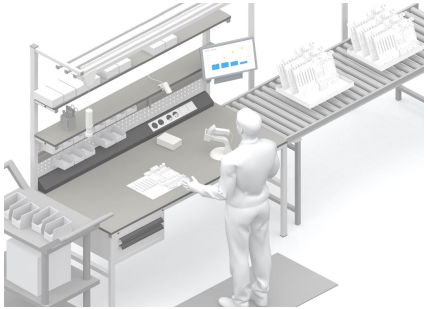
Humans are the **Foundation of the Factory Stack**

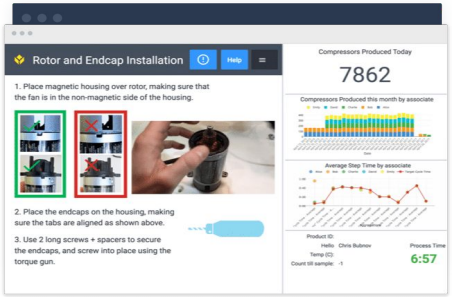


Tulip is used to augment & optimize human centric processes

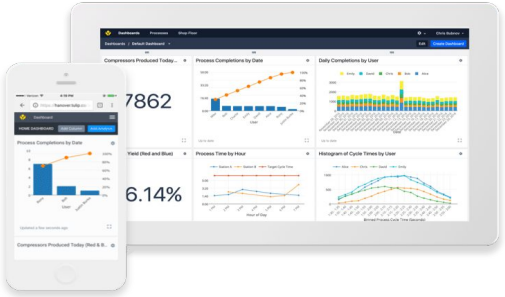
SHOP-FLOOR PROCESS



CLOUD MANUFACTURING APP



REAL-TIME PRODUCTION DATA

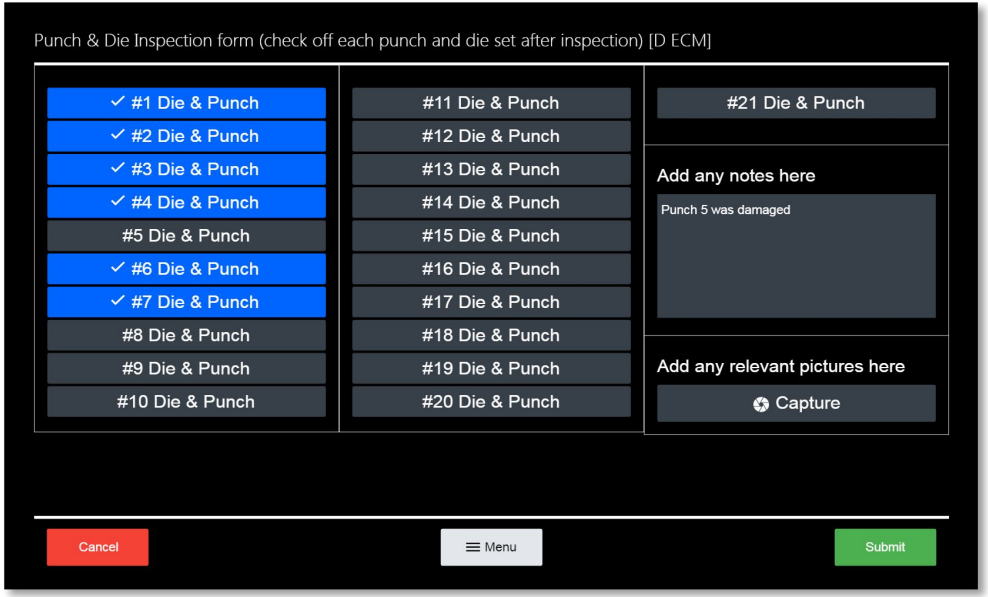


PROCESS OPTIMIZATION

- ✓ **SAAS DELIVERY**
- ✓ **SELF-SERVICE**
- ✓ **RAPID TIME TO VALUE**

Some Additional Features

- Digital checklists
- Digital forms for capturing notes and other use inputs
- Capture pictures for quality checks
- Implement required fields to ensure completion



A view into

TULIP VERTEX

➔ Complex System:

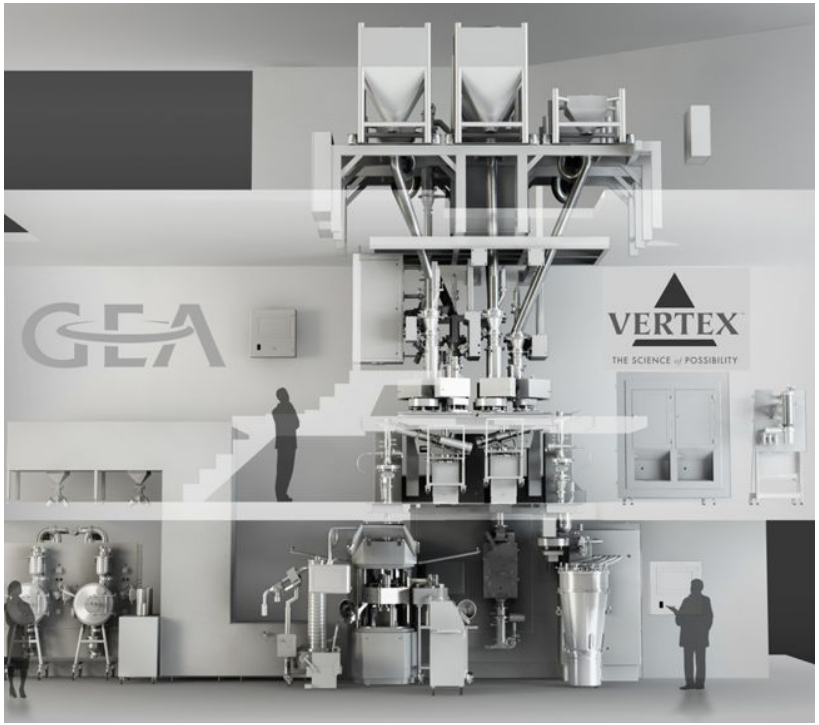
- Continuous oral solid dosage line with 3 configuration (WG/DG/DC)
- Over 2500 parts
- 10 day turnaround time (disassembly, cleaning, reassembly)
- Over 30 Standard Operating Procedures (SOPs) and Work Instructions (WI's) (up to 86 pages long)

➔ Infrequent Turnarounds:

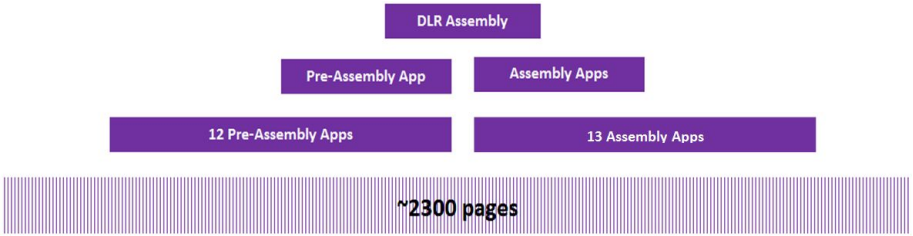
- 5 to 10 turnarounds per year depending on the production schedule

➔ Employee Flux:

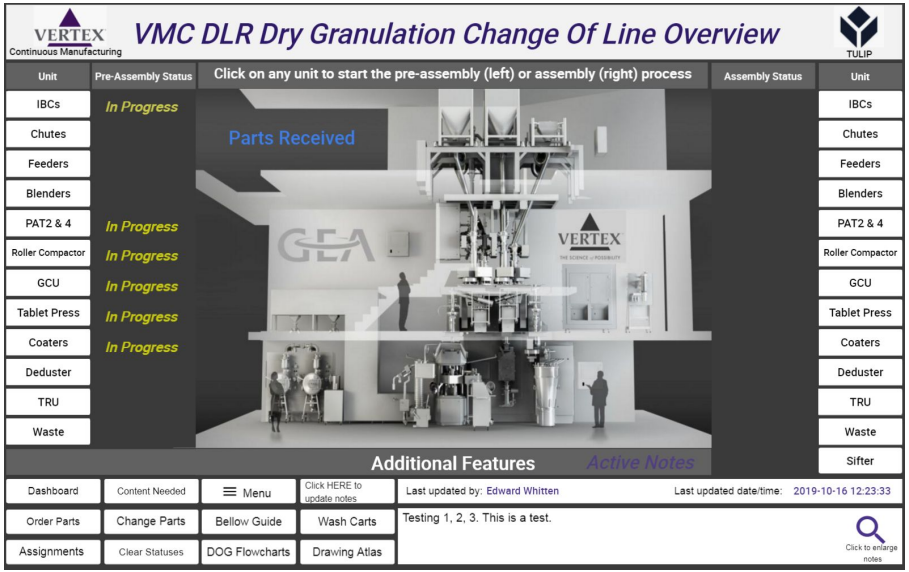
- Challenge training new employees on system assembly
- Need to capture all knowledge and best known methods
- Effective and efficient training process is needed



TULIP VERTEX



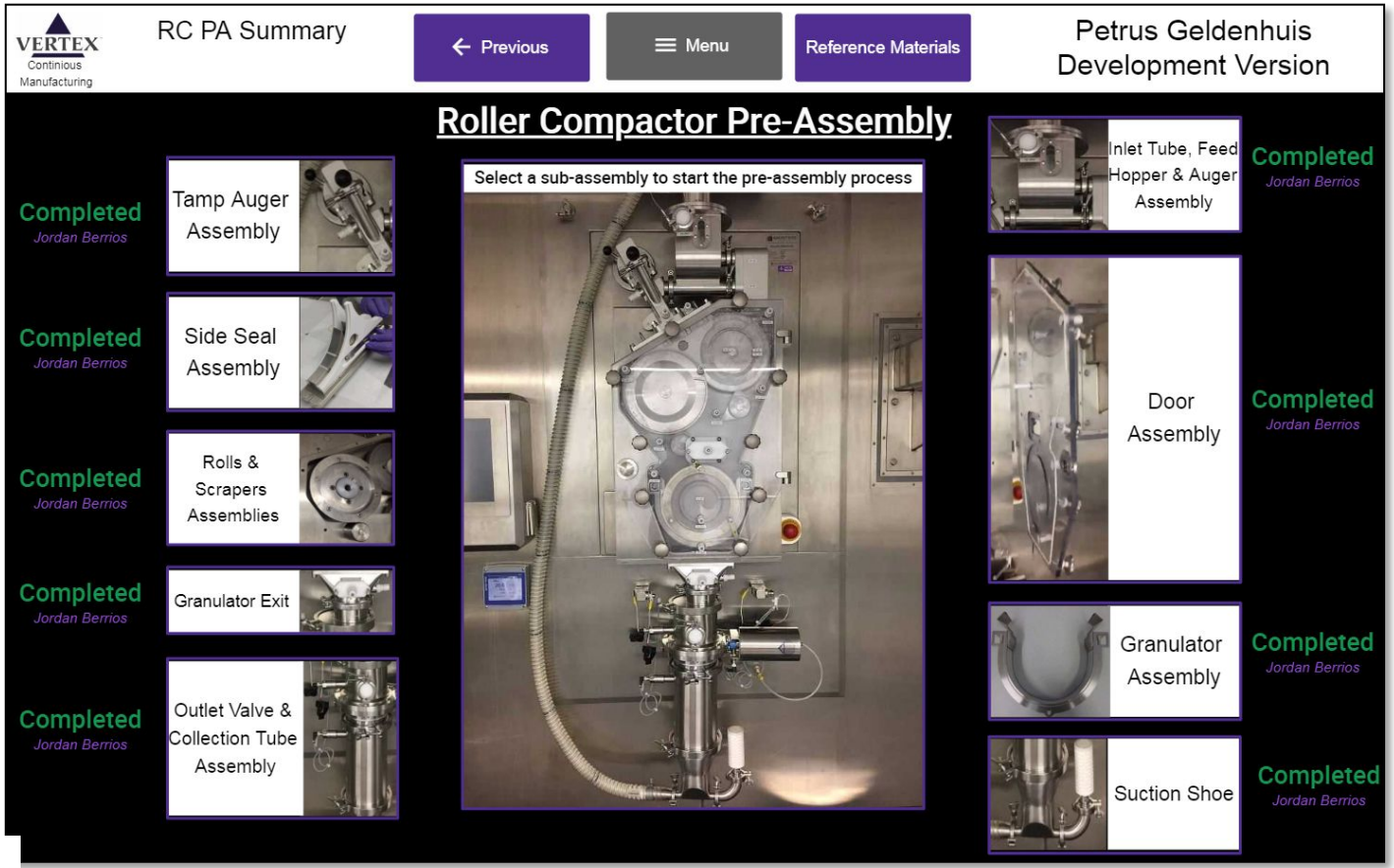
Tulip Job Aid Applications



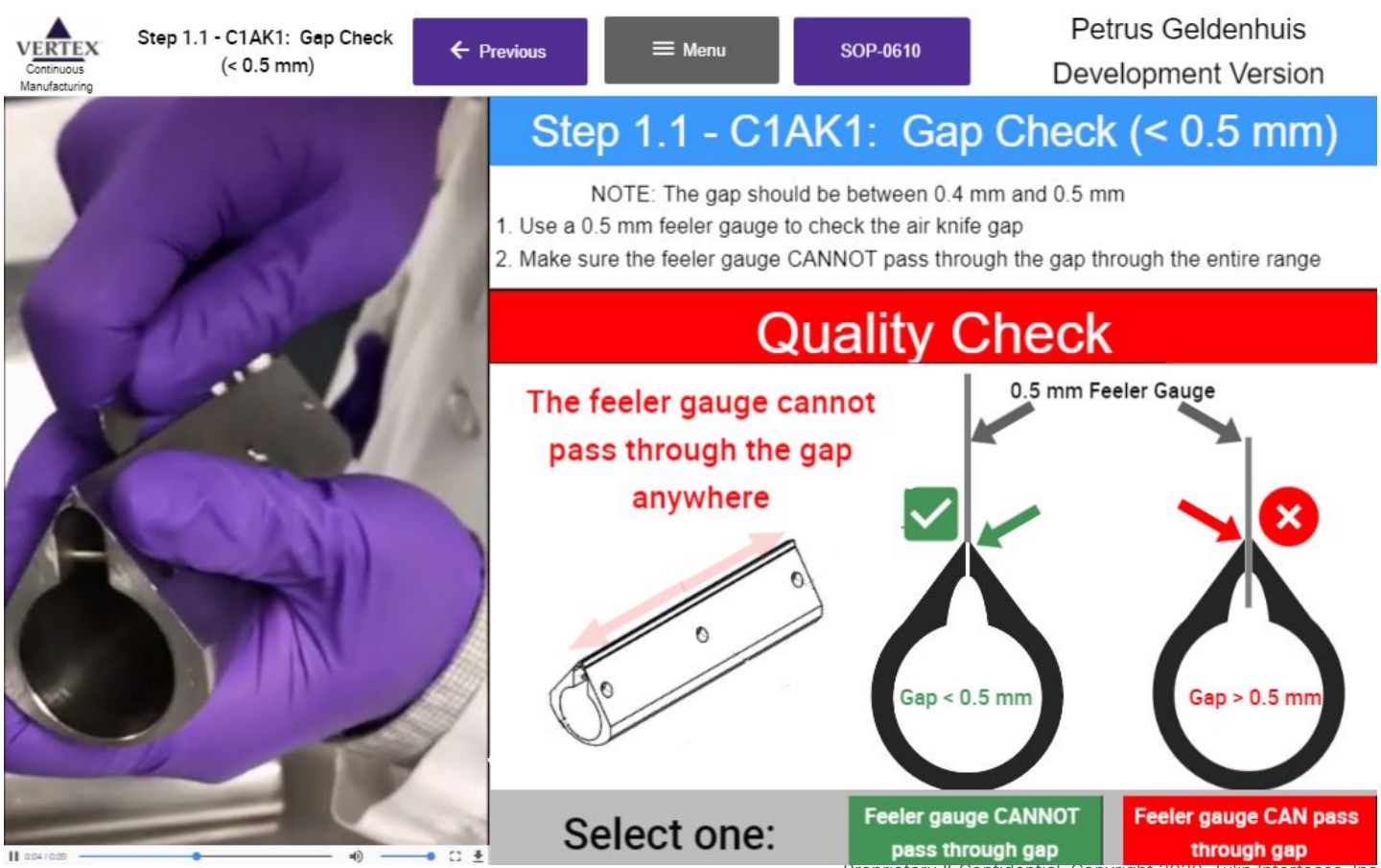
- High level overview of process with ability to drill down
- Detailed assembly instructions with videos/pictures
- Assembly order logic in place
- View assembly status from anywhere
- Tracked assembly data used for continuous improvement
- Link to any other system with an API endpoint
- Improve training based on usage

TULIP VERTEX

Assembly Application Example – Roller Compactor



Step Details – Coater Air Knife Gap Check



Step Details – **Coater Bioprene Tube Install**

VERTEX Continuous Manufacturing

Step 1 - Suspension Recirculation Pump

Previous | Menu | Reference Material

Petrus Geldenhuis
Development Version

Step 1 - Suspension Recirculation Pump Bioprene Tube Install

1. Open the suspension recirculation pump (SC6790)
2. Attach the left side of the bioprene tube to the stationary clamp
3. Seat the bioprene tube over the pump rolls
4. Cut the bioprene tube to the appropriate length

Parts

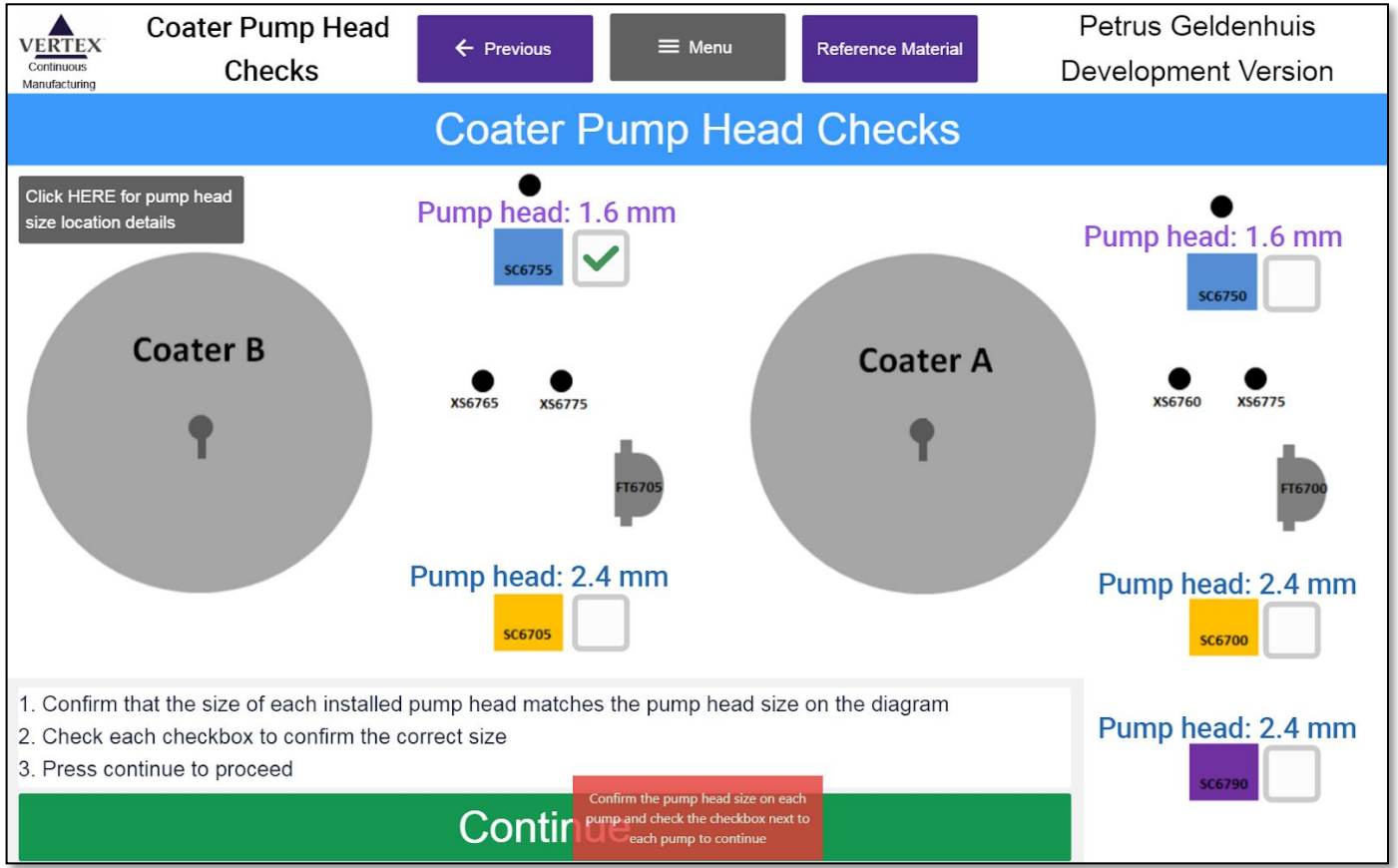
Biopren Tube (#24) 6.4 mm Bore
2.4 mm Wall 15 m

Quality Check

Ensure the bioprene tubing is properly seated on the rolls

Completed

Step Details – **Coater Pump Head Checks**



Some Additional Features Continued

Part (Click to enlarge)	Part # & Description	Update Quantity	Selected Quantity	Order Status	Last Ordered Quantity	Last Updated By	Reason For Order
	Seal Silicone DN150 Part # L60320226000001 BOS # XXXXXXX	Add Remove	2		1		Missing / Damaged / Single Use → Missing
	Seal NW150 Part # 526150000 BOS # XXXXXXX	Add Remove	1		1		Missing / Damaged / Single Use → Damaged
	DN200 MEI Butterfly Valve Seal Part # AF194555 BOS # XXXXXXX	Add Remove	1		1		Missing / Damaged / Single Use → Damaged
	Bellow DN150 Part # 8000454855 BOS # XXXXXXX	Add Remove	1		1		Missing / Damaged / Single Use → Single Use
	6" Silicone Tri-Clover Seal Part # 4523060000 BOS # XXXXXXX	Add Remove	1		1		Missing / Damaged / Single Use → Single Use

← Previous	Click HERE to process order	Quantity Ordered	Ordered By	Delivered By	Click When Delivered	Click When Received	Add'l/Edit Notes

- Parts ordering function
- Show status of parts
- Ordered, in process, delivered, received
- Log reason for ordering
- Log reason with a single button
- Capture pictures of damaged parts
- Analyze data for continuous improvement
- Email and text notifications
- Assignment tool
- Assign assembly tasks to different personal

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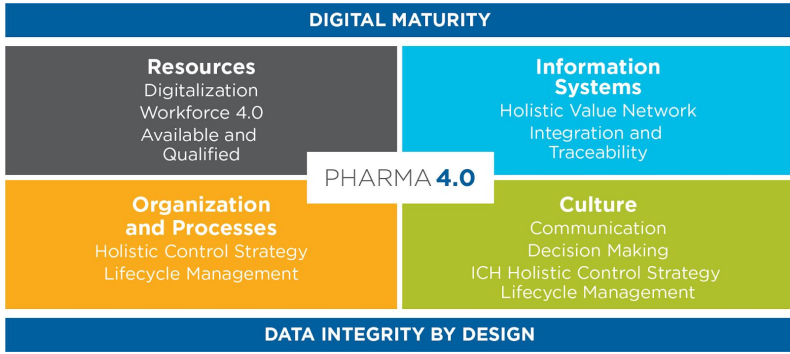
Benefits of connecting & augmenting workers

Manufacturing benefits

- ↓ Fewer Errors
- ↑ Higher Quality
- ↑ Higher Throughput
- ↑ Faster Changeovers
- ↓ Less Downtime

Human benefits

- ↑ Better Attention
- ↑ More Comfortable Conditions
- ↑ More Innovative Thinking
- ↑ Long Term Worker Well-Being



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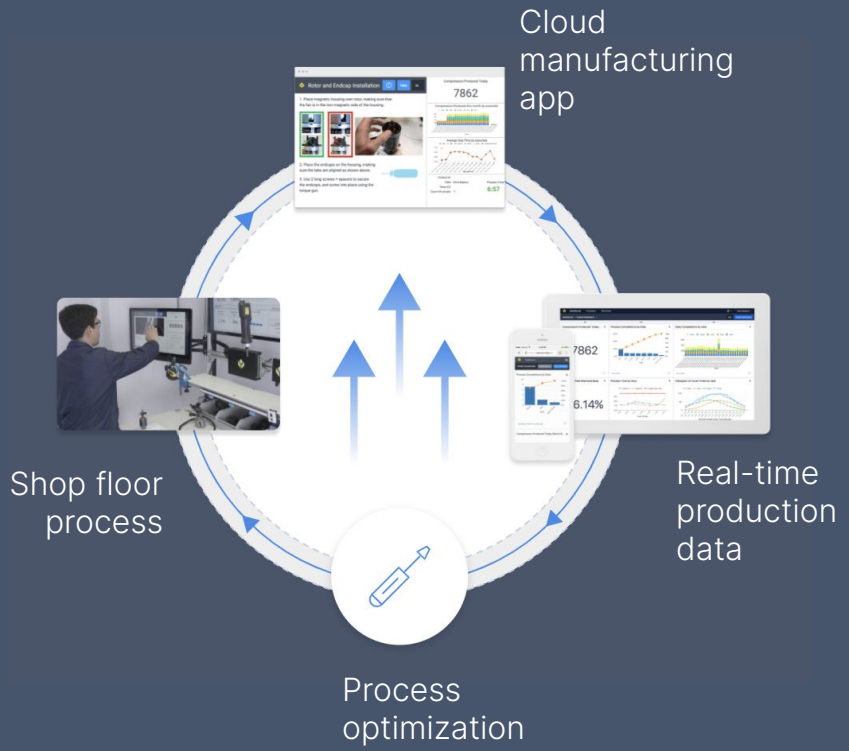
In an agile system flexibility reigns

Moving fast means:

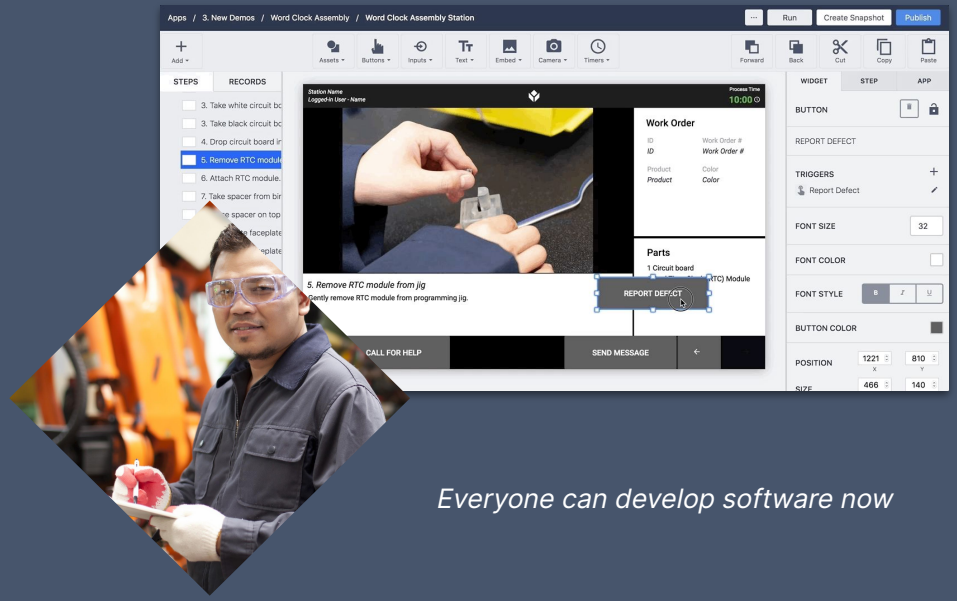
- Software development cycle is hours, not weeks
- Process visibility in the moment, not in retrospect
- Information when you need it
- Empowered front-line workforce



Democratize the shop floor

Give the frontline workforce control over their processes:

- Build apps without writing code
- Empower manufacturing experts to improve processes
- Speed development cycles
- Improve collaboration and decision making with better data



Everyone can develop software now

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Thank you for joining!

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