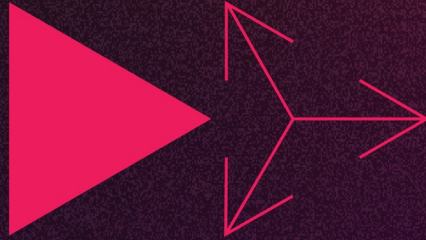


# INNOVATIVE MANUFACTURING ACCELERATED

Thursday, 9 June 2022  
8:00am-1:00pm  
UTS Tech Lab Sydney



Dr Shanti Krishnan  
Swinburne University  
of Technology



Dimi Marinakis  
Australian Red Cross  
Lifblood

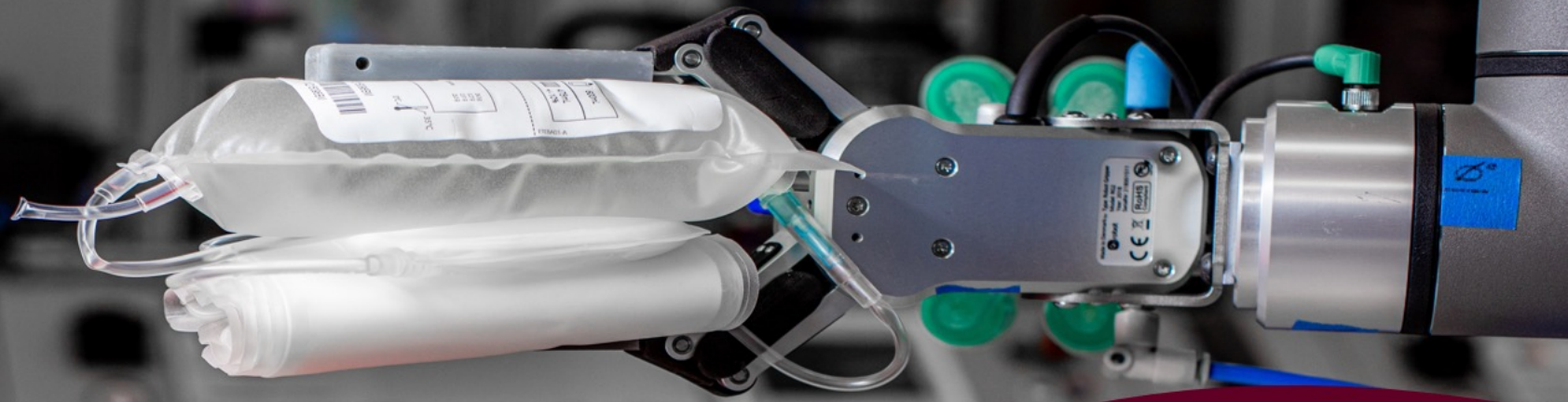
Project Insights

## Robots and automation handling of precious blood donation packs

IMCRC | we champion  
manufacturing  
innovation

  
Australian Government  
Department of Industry, Science,  
Energy and Resources  
**AusIndustry**  
Cooperative Research  
Centres Program





# Robotic automation handling precious blood pack donations

Dimi Marinakis,  
Manufacturing Program Manager



Australian Red Cross  
**Lifeblood**



## Blood



A new blood donor is needed  
**every 5 minutes.**



One blood donation is needed  
**every 24 seconds.**



Australia needs **around 31,000 donations** every week to meet demand.

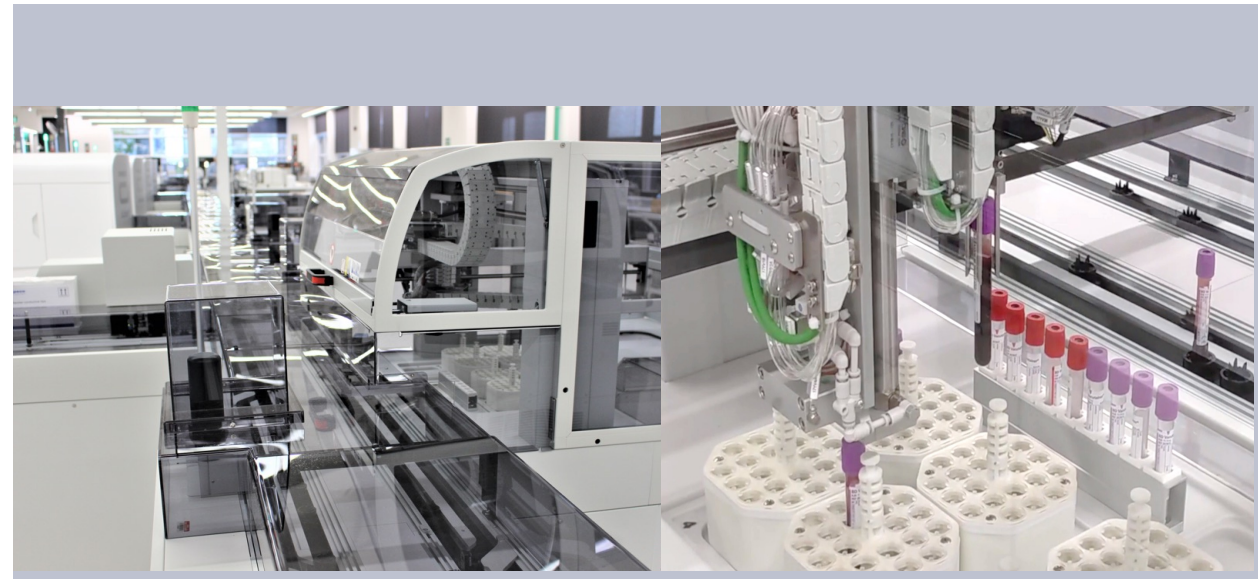
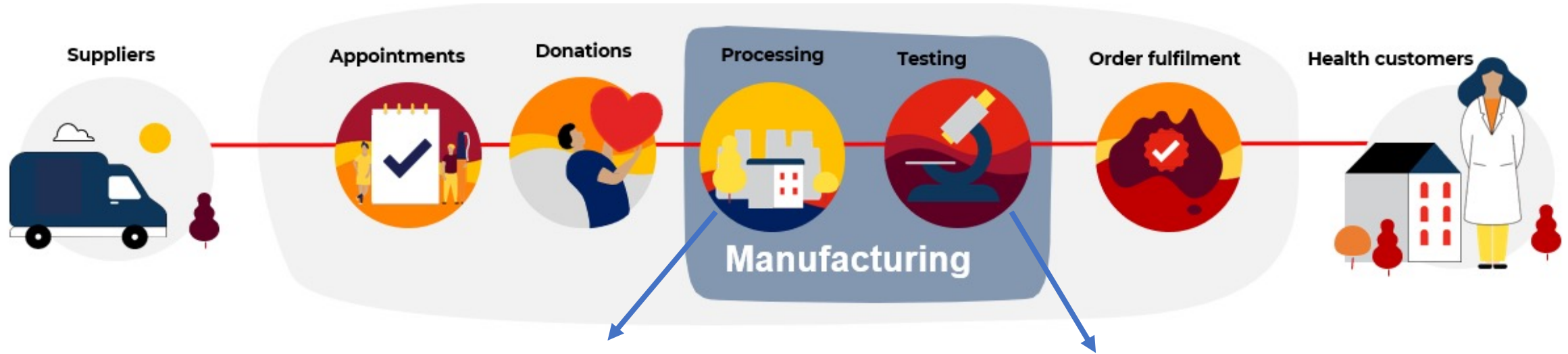


**Lifeblood needs more than 1.6 million donations every year** to meet the demand for blood and blood products.

*In 2019/20 donors gave 1,527,147 individual donations*

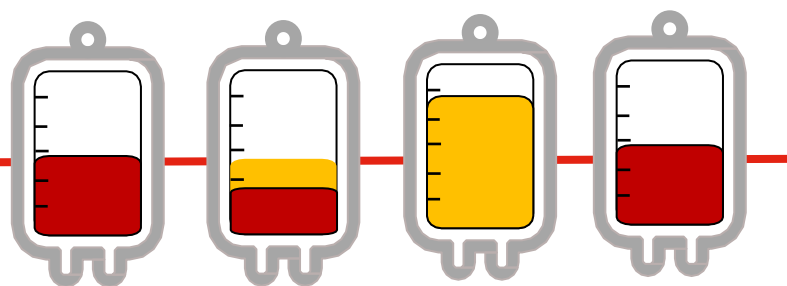


# Product Pathway





# Quality and Safety



## Innovation

- ✓ Enhance the Processing laboratory capability through innovative technology and processes
- ✓ Flexibility to allow for new processes

## Traceability & system control

- ✓ Ensure critical steps during product manufacturing are captured and recorded

## Improved workflow

- ✓ Reduction in manual handling of blood products
- ✓ Reduce unnecessary movement of product and reduce process steps

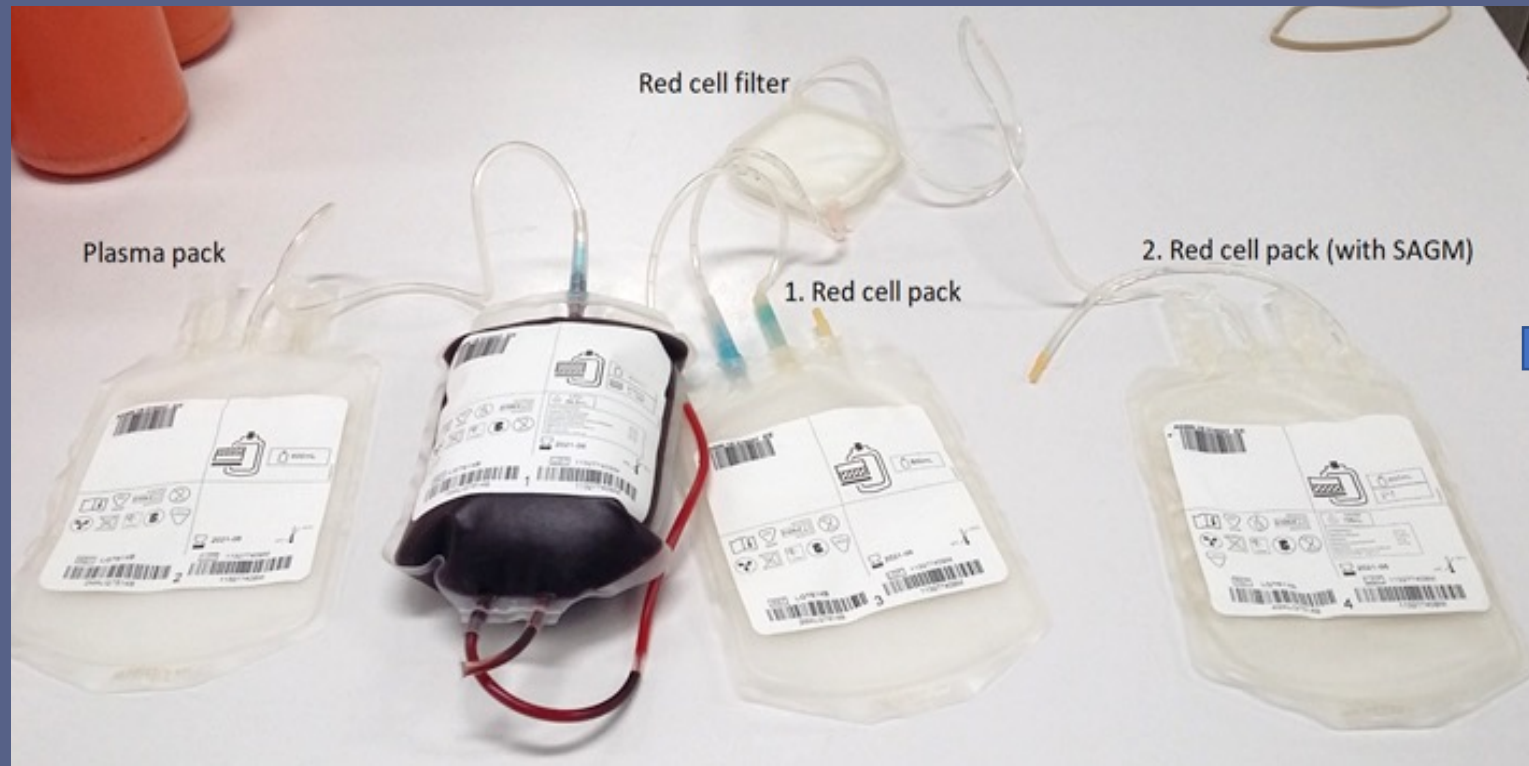
## Continued manufacturing of high quality products

- ✓ No adverse impacts to the product quality
- ✓ No adverse effect on regulatory compliance and the validated state



# Manual folding Process

1.



2.





# Project Objectives

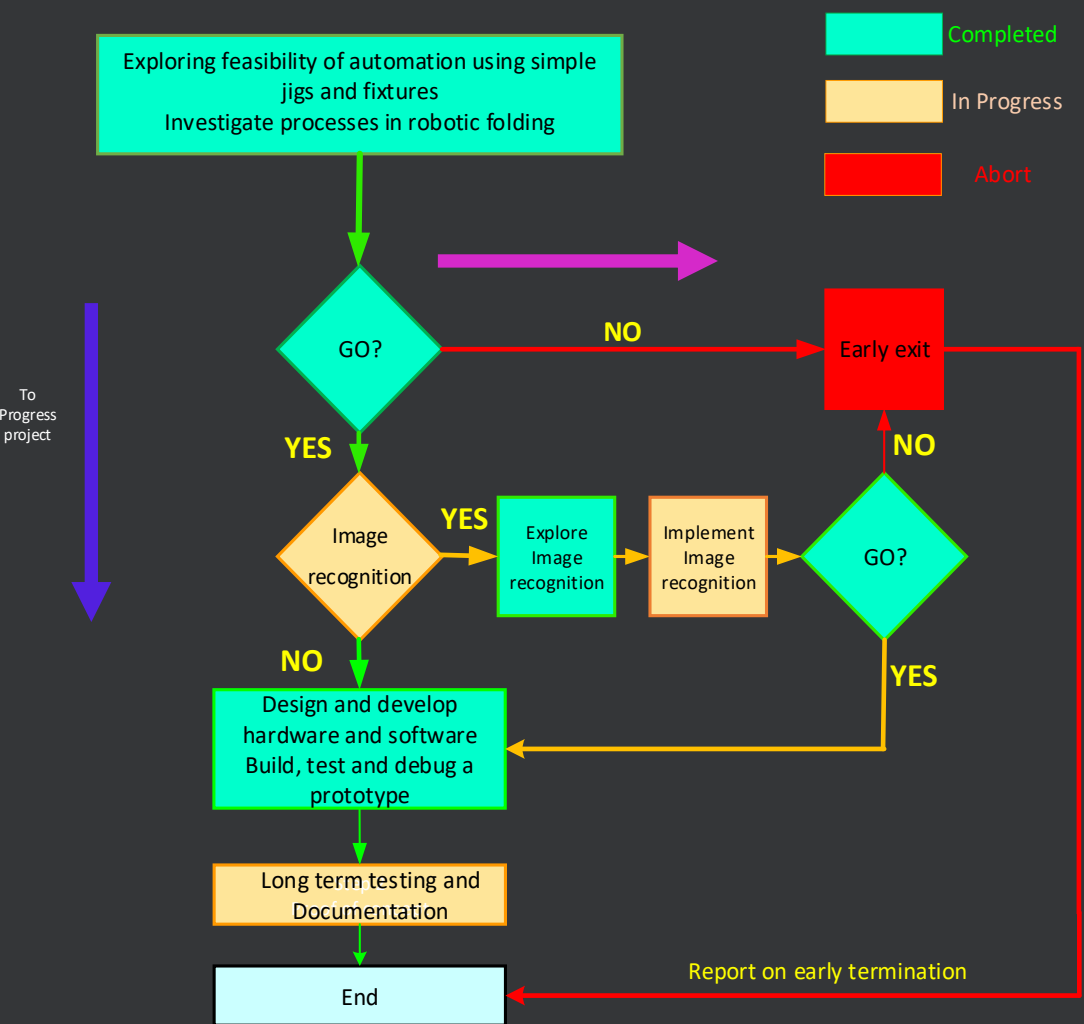
Automate the folding of whole blood packs into a configuration suitable for centrifugation to:

- Reduce the risk of repetitive strain injury (RSI)
- Introduce repeatable/specific folding technique to improve quality
- Traceability and label check to meet regulatory compliance
- Capture production data
- Production scaling and upskill of staff



**Lifeblood reached out to IMCRC and Swinburne University to undertake a proof of concept to determine the viability of automation for this activity.**

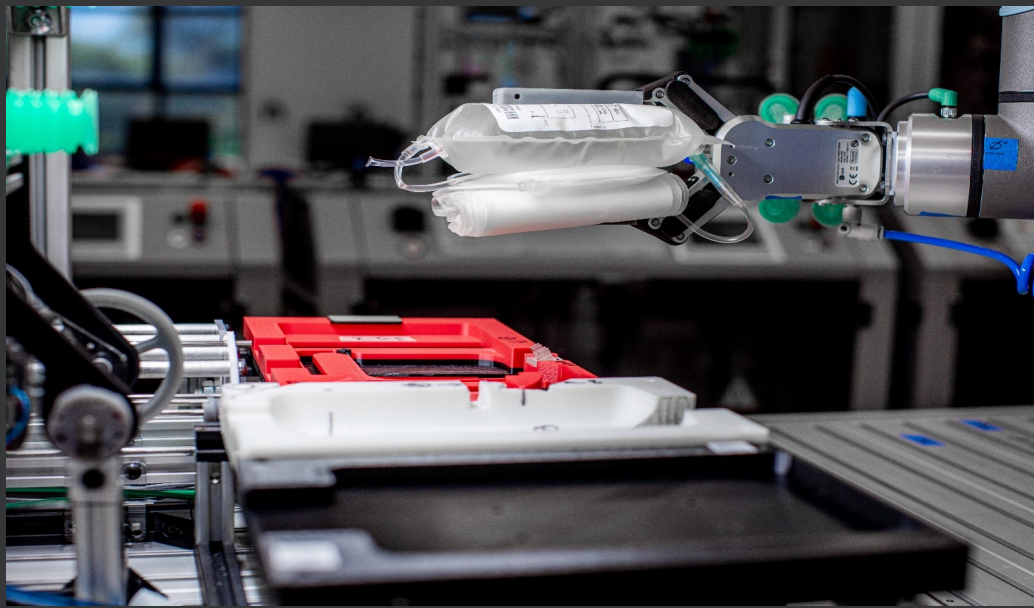
# Automated folding of blood bags for Lifeblood



# Risk Mitigation

- Strictly Stage-gated approach
- Domain expert for in-situ validation of processes
- Iterative Design Thinking





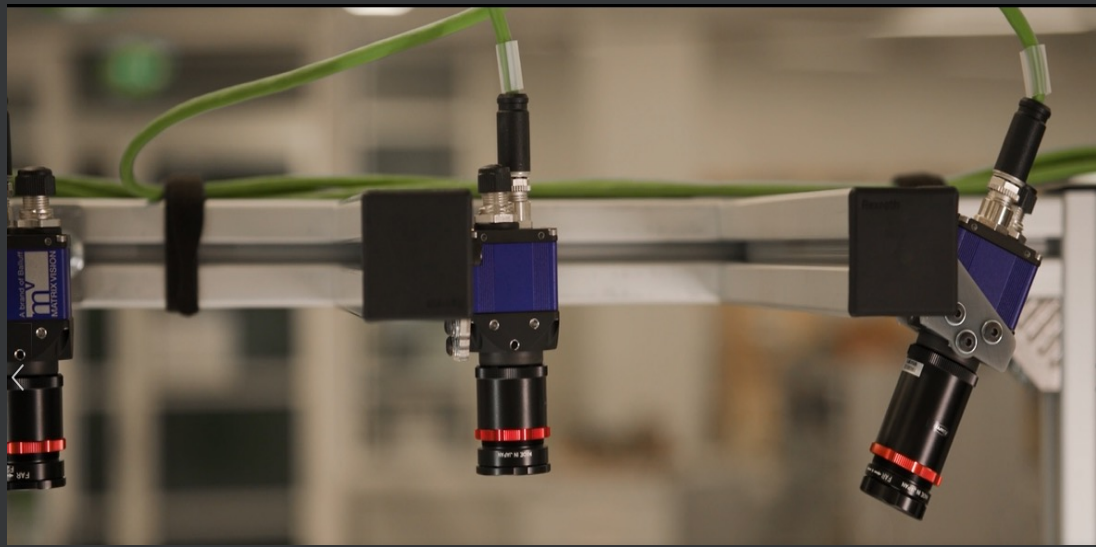
## Proposed Solution

1. Operator to place bags and pack in the purpose designed tray
2. Automation and Collaborative robots for prescriptive folding and assembly of blood bags and packs to meet centrifuge requirements

## Value added Inclusions

### Smart Vision system

1. Image recognition for quality inspection
2. Data recording for traceability
3. Anomaly detection in manually placed stickers/labels.



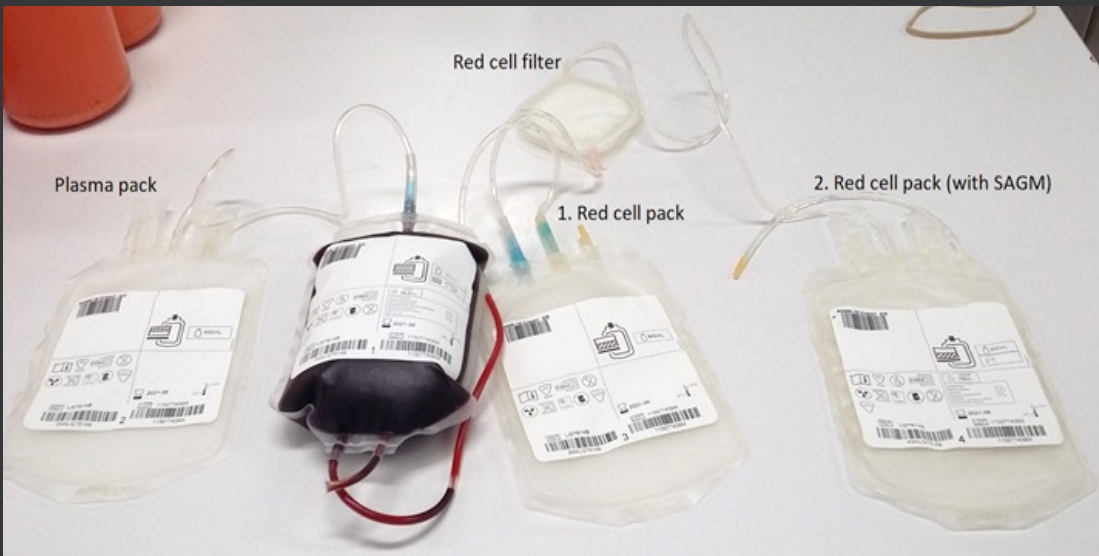


## Unique Challenges

### 1. Robots to

- Manipulate soft, deformable objects
- Handle Blood packs of different volumes
- Blood Bags of different sizes

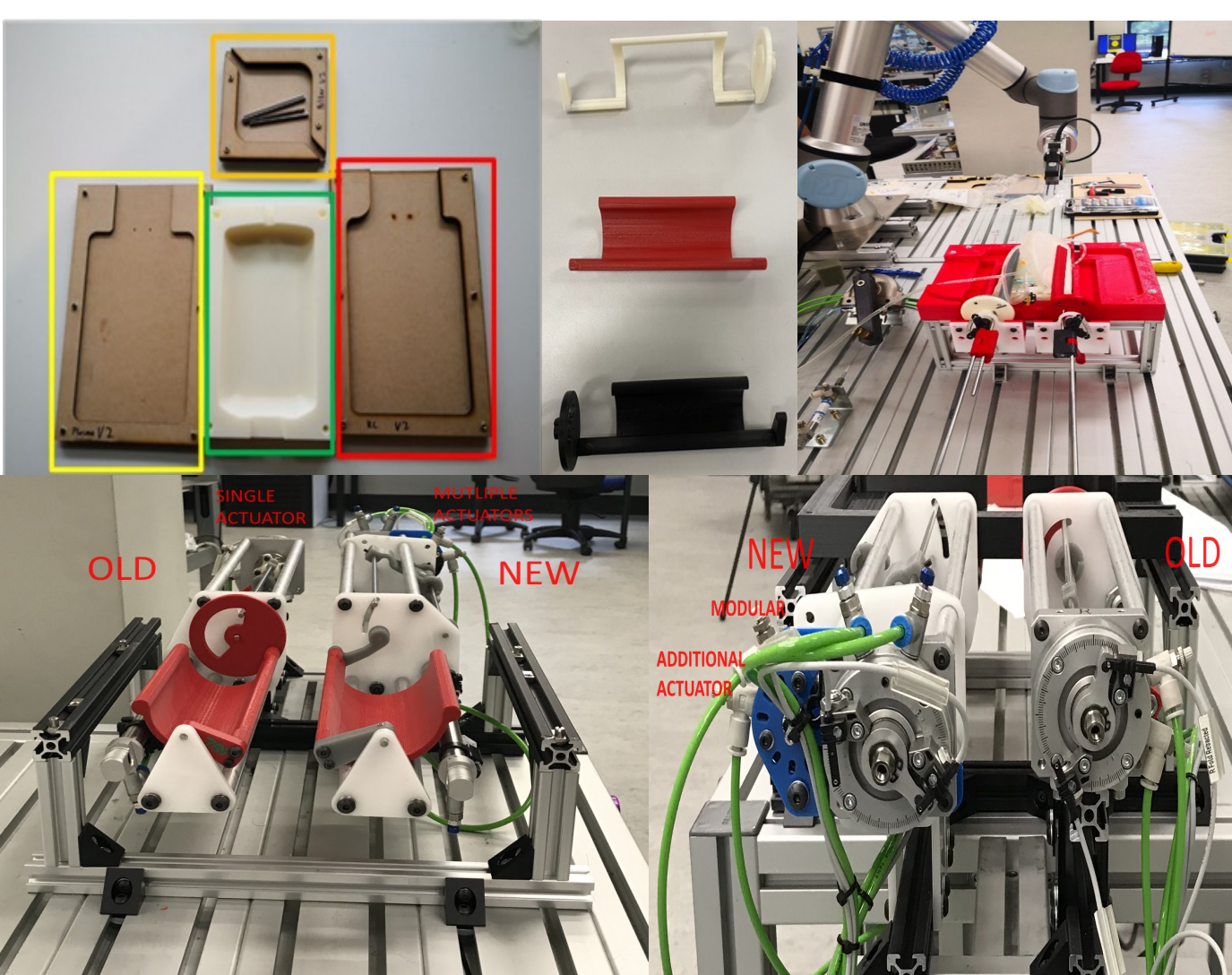
### 2. Read manually placed stickers in different orientations



### 3. Ability to constrain the connecting tubes



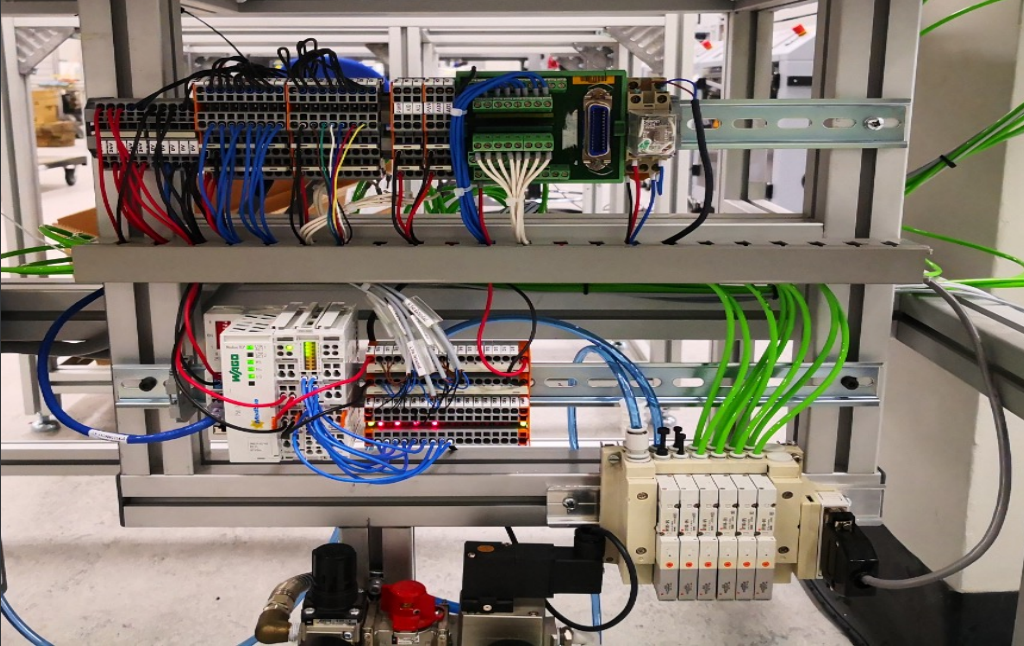
# Iterative Design Approach



- To assist reliable and repeatable robotic folding
- Jigs and Fixtures
- Automation
- Vision system to ensure proper placement

## Customised Solution

- Custom end-effectors for robots
- Purpose built holding Tray
- PLC control & Robot programming for reliable operation






Space 9000 - bar code reader2

Run Stop Load

Gar Image Output Image

14.70 ms  
1.25 ms  
08.09 ms  
03.70 ms  
0.71 ms  
12.08 ms  
2.51 ms  
05.43 ms  
10.53 ms  
10.33 ms  
10.20 ms  
0.70 ms  
10.21 ms  
07.84 ms  
10.44 ms  
18.51 ms  
1.87 ms  
02.95 ms  
00.48 ms  
09.98 ms



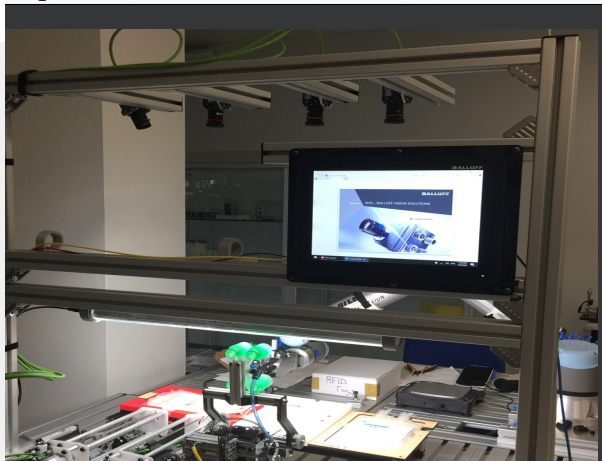
Results - bar code reader2

Tool	Name	Value
Find object	Object_1.Degree of match [%]	94
Find object	Object_1.Position in X direction [px]	1727.38
Find object	Object_1.Position in Y direction [px]	838.737
Find object	Object_1.Displacement in X direction [px]	-9.123
Find object	Object_1.Displacement in Y direction [px]	-53.261
	Code_1.Included text	=A53002003653300

Vision system interface

File Edit

message ID=0020 (Container)  
Data Field length=51 Bytes  
In: position (program No.) id=64  
Text- Discard Component : en  
Hue =20 degrees  
Bar code header -01 65 bar code -A53002003653300  
Displayment X = 9 px  
Displayment Y = -53 px  
Rotation =5 degrees



## Traceability and anomaly detection

- Smart Vision System
- Traceability through bar-code recording
- Image recognition of the manually placed stickers
- Anomaly detection
- Quality check of layout configuration of the packs and bags

# Representative Operation of Folding Cobot Work-Cell

imcrg | we champion  
manufacturing  
innovation

  
Australian Red Cross  
**Lifeblood®**



## Next steps

01

Domain expert  
training and  
documentation  
development

02

Relocation of the  
automation to  
Lifeblood's  
Innovative  
Development  
Centre

03

Further testing and  
speed to test  
robustness  
Staff engagement

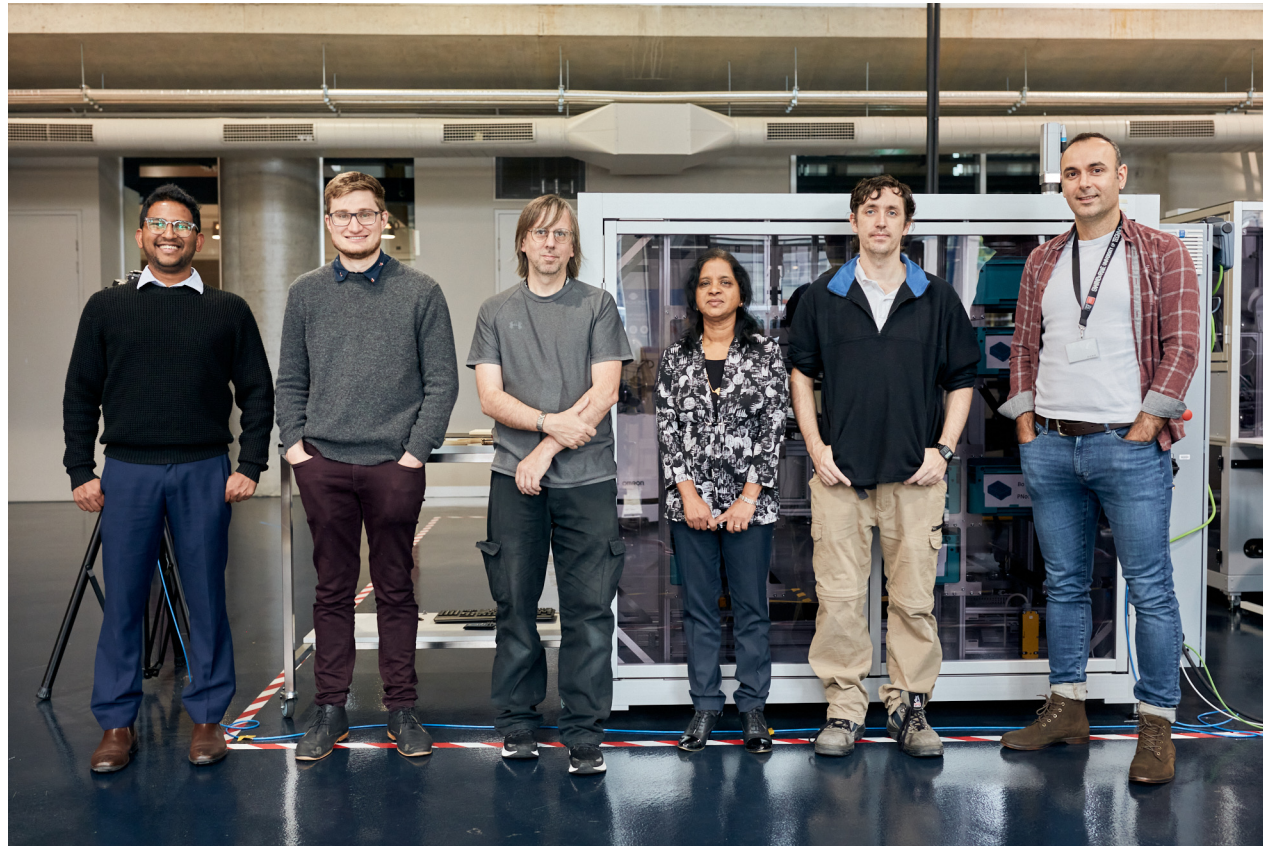
04

Proposal to identify  
commercial partner  
for pre prototype  
design/build

05

Develop  
commercialisation  
options

# Thank you





Australian governments fund the Australian Red Cross Lifeblood for the provision of blood, blood products and services to the Australian community.