

Project Title

Microbiology Laboratory Automation

Project Lead and Members

Project Lead(s): Adj Asst Prof Partha Pratim De, Senior Consultant

Project Members:

- Wendy Lee Bee Leng, Principal Medical Technologist
- Lee Shin Jia, Medical Technologist
- Iris Lim Sing Pei, Senior Medical Technologist
- Lee Francisca Stephen, Senior Medical Technologist
- Long Jen Mee, Senior Medical Technologist
- Nur Ain Bte Lokman, Senior Medical Technologist
- Calvin Tham Wai Shen, Medical Technologist
- Esguerra Alec Nathan Nogrado, Medical Technologist
- Api Edilberto Medina, Junior Medical Technologist
- Sherman Lim Yi-Heng, Medical Technologist
- Shafiq Bin Shah Ni, Medical Technologist
- Kalaivani D/O Rethinasingham, Medical Technologist
- Muhamad Firdaus Bin Mohamed Aik, Medical Technologist
- Farah D/O Farook, Senior Executive Asst
- Janice Leong Wai Yeng, Principal Medical Technologist
- Joyce Yuen Suh Shin, Principal Medical Technologist
- Tham Mee Eng, Principal Medical Technologist
- Christine Chu Jia Huey, Senior Principal Medical Technologist
- Fok Kam Chuen, Senior Specialist
- Pooja Rao, Senior Resident Physician
- Jonathan Chia Wei Zhong, Consultant
- Yang Huina, Consultant
- Timothy Barkham, Senior Consultant

Organisation(s) Involved

Tan Tock Seng Hospital

Healthcare Family Group(s) Involved in this Project

Allied Health

Applicable Specialty or Discipline

Laboratory Medicine

Project Period

Start date: End 2019

Completed date: May 2022

Aim(s)

To improve the quality, consistency, productivity, and turnaround time within Microbiology Laboratory by leveraging automation, which mechanises conventional microbiology culture processes through the use of robotics

Background

See poster appended/ below

Methods

See poster appended/ below

Results

See poster appended/ below

Lessons Learnt

See poster appended/ below

Conclusion

Transformation of the Microbiology Laboratory with automation and software innovation has changed the culture of microbiology irrevocably for the better. The department has looked critically at processes and considered various strategies for maximising value to the patient and clinicians (both nurses and doctors). The resulting increased productivity has created better value for patients, the organisation and the healthcare system. Insights from our data and experience may be shared with the wider healthcare system to benefit other laboratories in the region.

Our medical technologists involved in the process have developed additional skill sets which have also benefitted the department, as in general there is more cohesiveness, communication and collaboration as a result.

The department has achieved increased throughput and quicker turnaround times for patients and clinicians for faster microbiology culture results in spite of the challenges posed by the pandemic over the last 2 years. Staff have benefited from being able to focus their skillset appropriately to more meaningful analytical and interpretive work.

Project Category

Care & Process Redesign

Productivity, Manpower saving

Keywords

Laboratory, Automation, Microbiology Culture Methods

Name and Email of Project Contact Person(s)

Name: Adj Asst. Prof Partha Pratim De

Email: partha_pratim_de@ttsh.com.sg

BACKGROUND

Rapid diagnosis of infection and multi-resistant organisms are essential to reduce morbidity and mortality. However, microbiology culture methods have remained relatively unchanged since the development of solid culture media by Robert Koch in 1881, and manual procedures for confirmation of infection is crucial for patient management. Traditional Microbiology processes and workflows require a major redesign to reduce waste, optimise efficiency and harness new technologies to transform the laboratory.

The Microbiology Laboratory Automation (MLA) system mechanises conventional procedures through the use of robotics and offers consistency in specimen processing, culture incubation and result interpretation. Through this transformation, greater value had been created for patients and clinicians with more rapid resulting, for the hospital as there is more judicious utilisation of limited isolation facilities with better and faster detection of multi-resistant organisms, as well as for our staff as there is enhanced ergonomics and robustness of laboratory safety.

THE TEAM

The MLA team comprised of Microbiology medical technologists, technical assistants, executive assistants, laboratory operations, Laboratory Information System staff, nurses, clinicians, EGIS, IHIS, and medical microbiologists.

AIM

To improve the quality, consistency, productivity, and turnaround time within Microbiology Laboratory by leveraging automation, which mechanises conventional microbiology culture processes through the use of robotics.

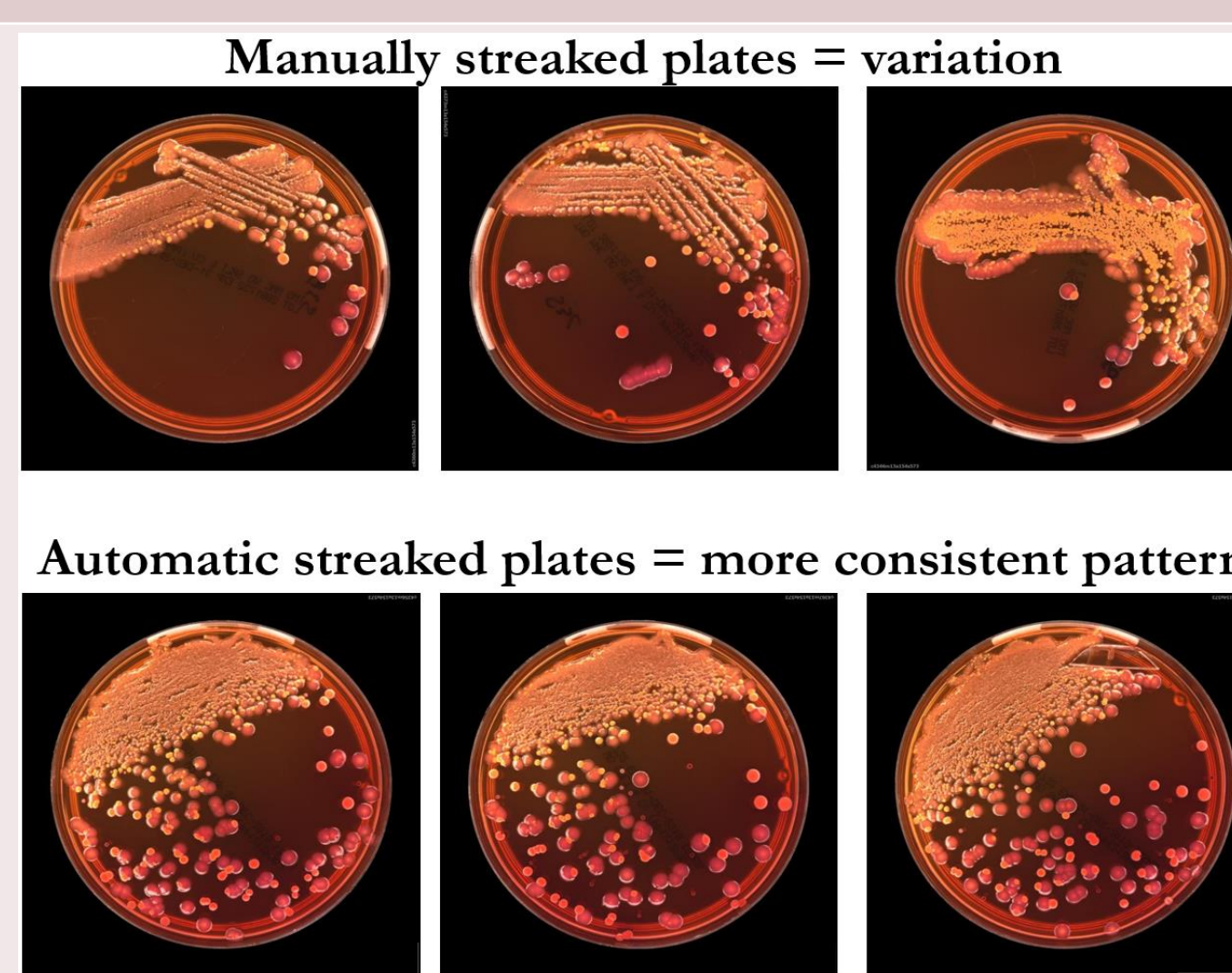
ANALYSIS

Traditional Microbiology Investigations

Highly Repetitive, Laborious & Time Consuming



Variable & Inconsistent Manual Processes



Occupational Hazards
(e.g. repetitive strain injury)



INTERVENTION AND IMPLEMENTATION

Installation of
MLA System

Lab User
Training

Eswab
Implementation

IT Connectivity
& Cybersecurity

Process
Redesign

Evaluation &
'Live' Testing

MRSA & VRE
Screen Go 'Live'

Process
Review

Urine Culture
Go 'Live'

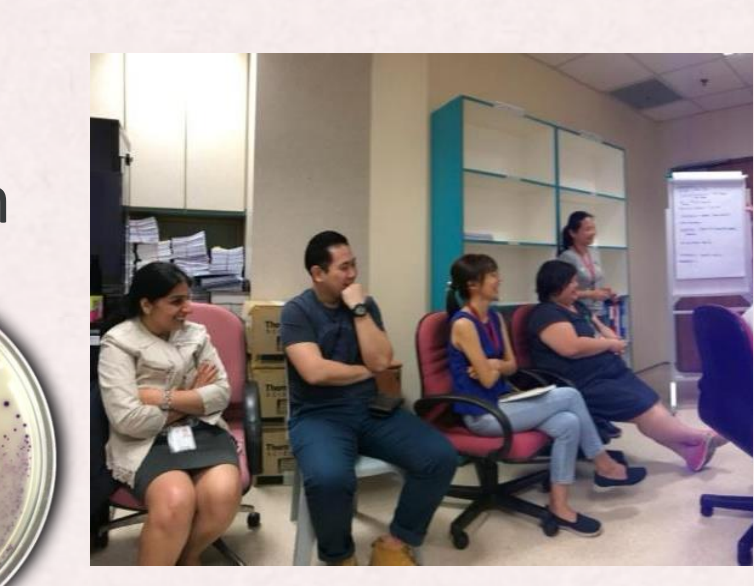
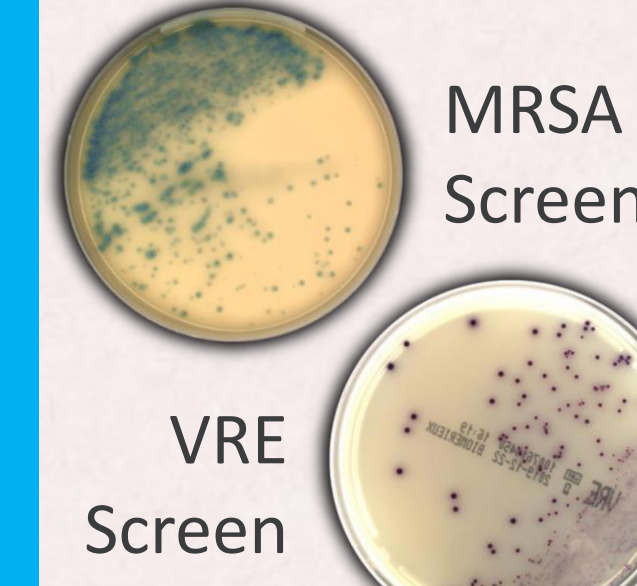
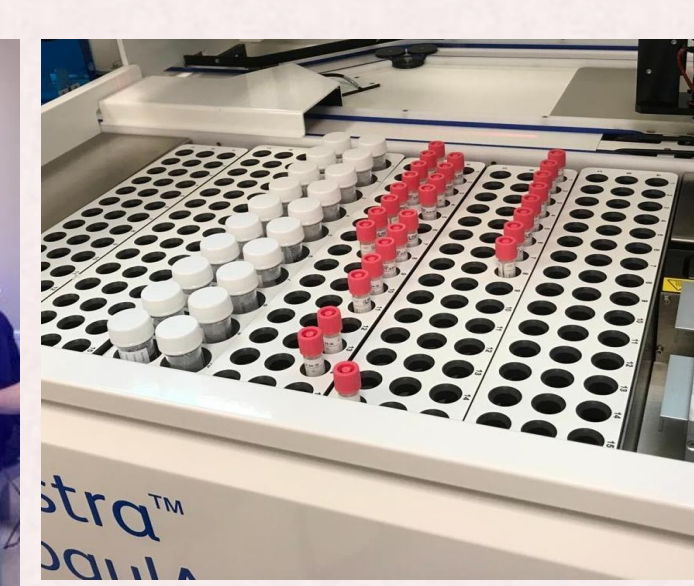


Collaboration with

- MMD
- Nursing
- Infection Control
- Clinicians

Collaboration with

- DLM
- BD
- LIS
- EGIS
- IHIS



End 2019

Nov 2020

Dec 2020

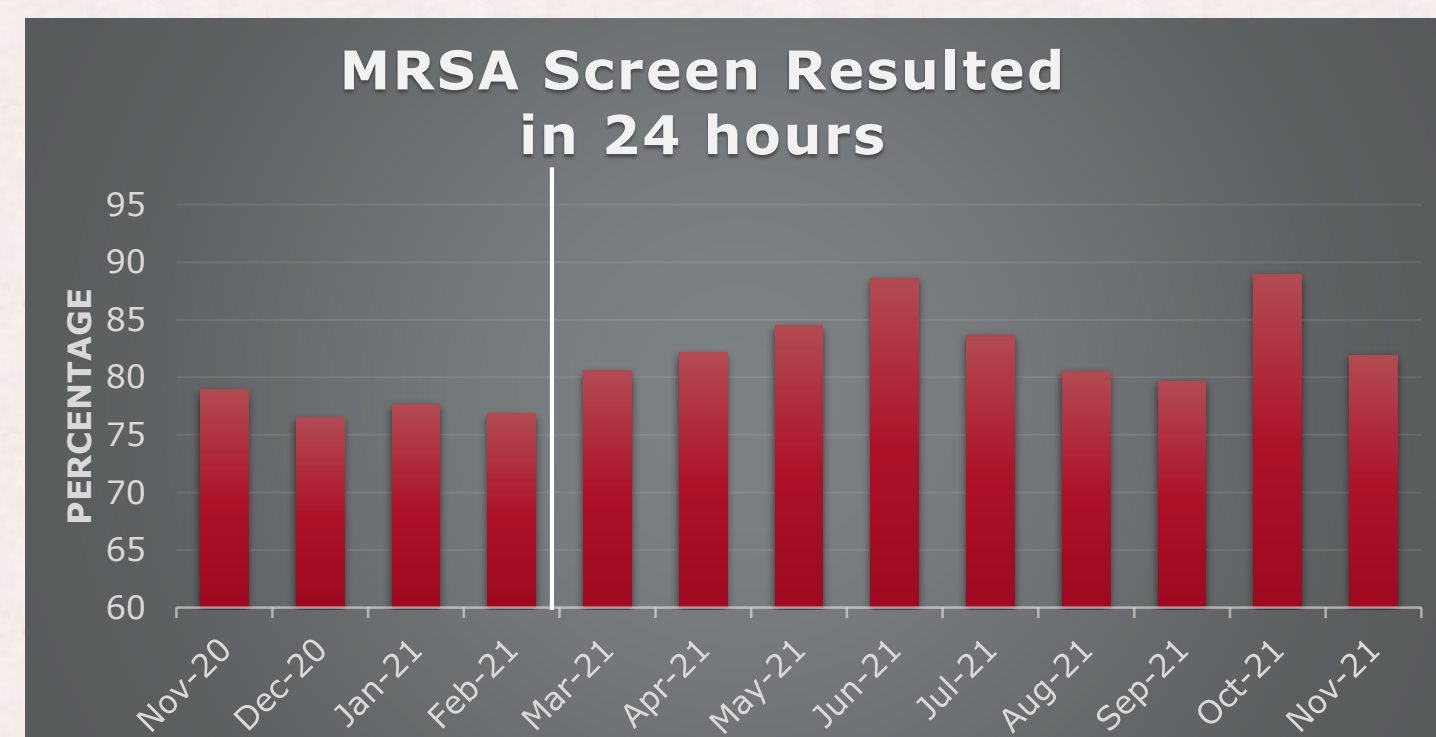
Feb 2021

May 2022

RESULTS

MRSA Screen

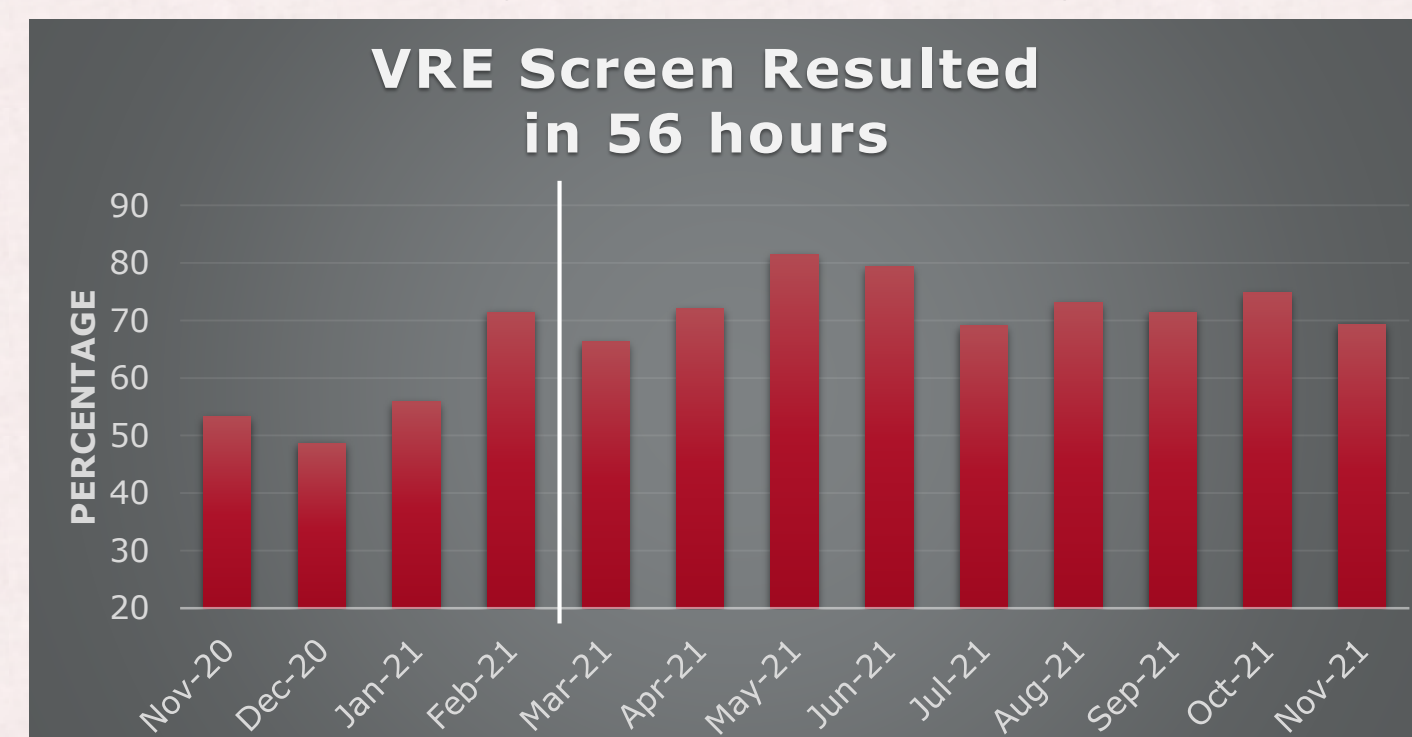
- ↑ 20% increase in workload
- ↑ 5.7% more samples resulted within 24 hours (77.7% vs.. 83.4%)



↑ Improved Laboratory Productivity Index from 94.7 to 108.7

VRE Screen

- ↑ 3.5% increase in workload
- ↑ 20% more samples resulted within 56 hours (52.6% vs.. 73.0%)

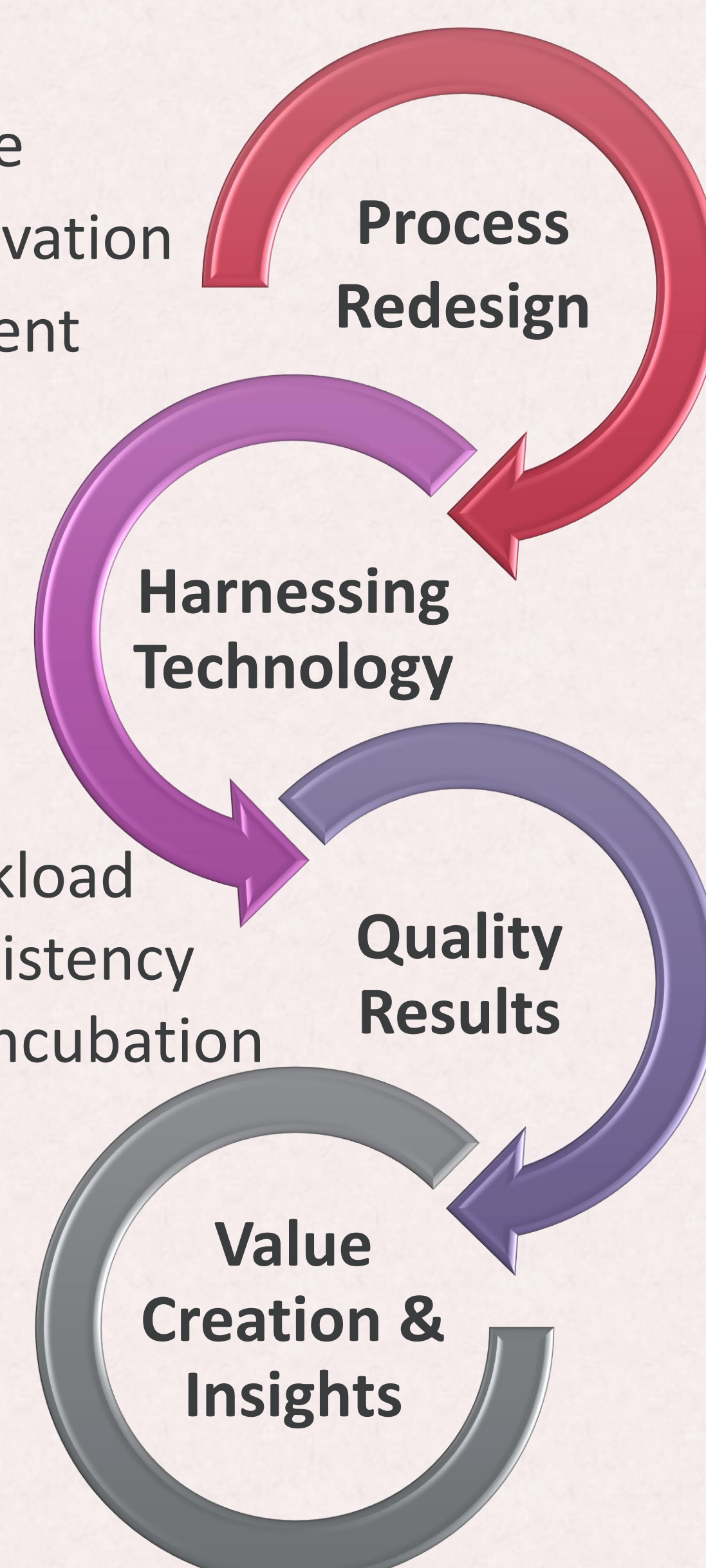


TRANSFORMATION IMPACT

- Reducing waste
- Workflow innovation
- Staff engagement

- Faster sample throughput
- Increased workload
- Improved consistency
- Standardised incubation

- Patients & clinicians: Faster results
- Hospital: Judicious use of isolation facilities
- Cluster: Capacity building
- Staff: Better ergonomics & staff engagement



LESSONS LEARNT

The value of consistent, regular communication and engagement was crucial for the project.

Increased engagement with innovation and collaboration within the department have other intangible benefits such as improved team dynamics, upskilling of laboratory staff and synergies with other departments.

Overall, this worthwhile and enriching journey together has resulted in a stronger, more cohesive Microbiology team and made a positive impact on the quality and robustness of our clinical results, which adds value to patients, clinicians and the organisation.