UNIVERSITY OF ZAMBIA
School of Veterinary Medicine, Department of Disease Control

TEAM NAME: UNZA – VET DISEASE CONTROL

Improvement Focus:

Sample Management

Project: Improve Sample Management by Increasing Sample Traceability from 69% to 100% by July 2024.

About the University of Zambia & Alignment of Our Project

Mission Statement

Our Vision

A ***renowned university with a global appeal*** that is driven by pursuit of knowledge, research, innovation, and responsiveness to societal needs.

Our Mission

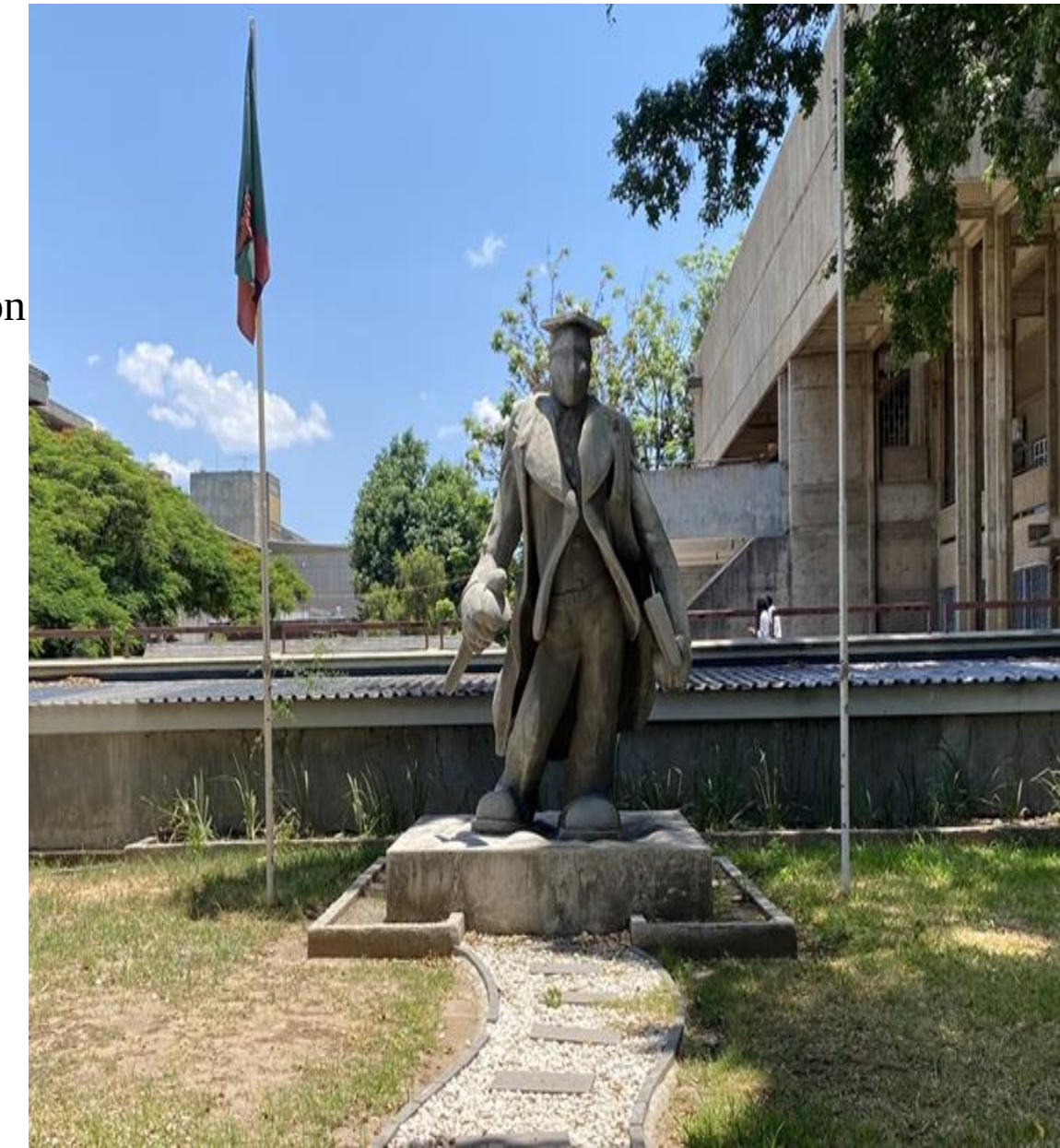
To provide quality and relevant higher education, research and innovation that shape the future of society.

Our Core Values:

- Academic Freedom
- Accountability
- Equity
- Excellence
- Green Environment
- Innovation
- Integrity

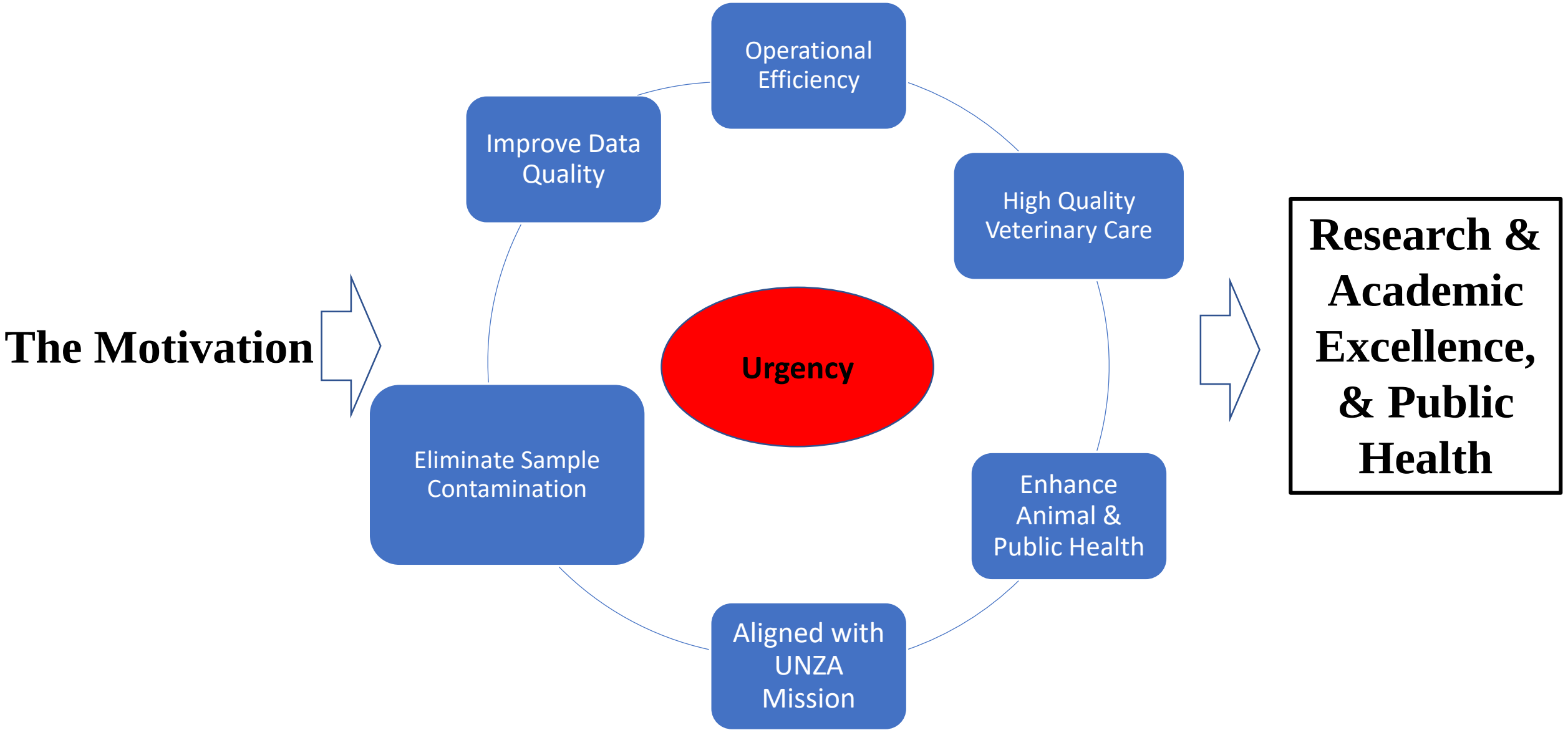
Our Management Philosophy

The university will embrace a ***participatory management style*** that will motivate employees, ***provide a work environment that is conducive to high productivity***, teamwork in which leadership is by example, provide effective communication and guidance, which will be accessible to all, and promote individual growth.



Business/Public Case & Benefits

❖The following rationale gave us the urgency to resolve this problem:



Theme Selection

❖Management directive, following observation of poor traceability of samples.

Problem Description

❖The UNZA, SOVM Department of disease Control had difficulties tracing and information retrievals vis-à-vis archived samples, and in some cases complete failure to retrieve some samples for references. Because of incomplete information on certain samples, they ended up being kept even indefinitely when in fact not necessary, thereby reducing storage space.

❖Combined storage of student samples, research and clinical (diagnostics) samples.

Impact of the problem on our customers/business or the employees?

❑Hazardous to freezer users (Long Exposure to Very Low Temp. ie. – 80^{O}

❑Possible contaminations

❑Undesirable health outcomes

- 80^{O} Temp
- Fridge

KPI Consideration

KPI	Definition	Research		clinical		student	
		Current	Target	Current	Target	Current	Target
PRIMARY KPI							
Traceability of achieved/stored samples	% of samples that can be traced in the laboratory	70%	100%	88%	100%	50%	100%
SECONDARY KPI							
1. Database Completeness	Number of samples on record whose information is complete.	40%	100%	100%	100%	34%	100%
2. Avg. Retrieval Time	Amount of Time Taken to Retrieve Samples from the refrigerator	3 hours	30sec	30min	30sec	5hrs	30sec

Overall Traceability of Archived Samples = $\frac{(70\% + 88\% + 50\%)}{3} = \mathbf{69\%}$

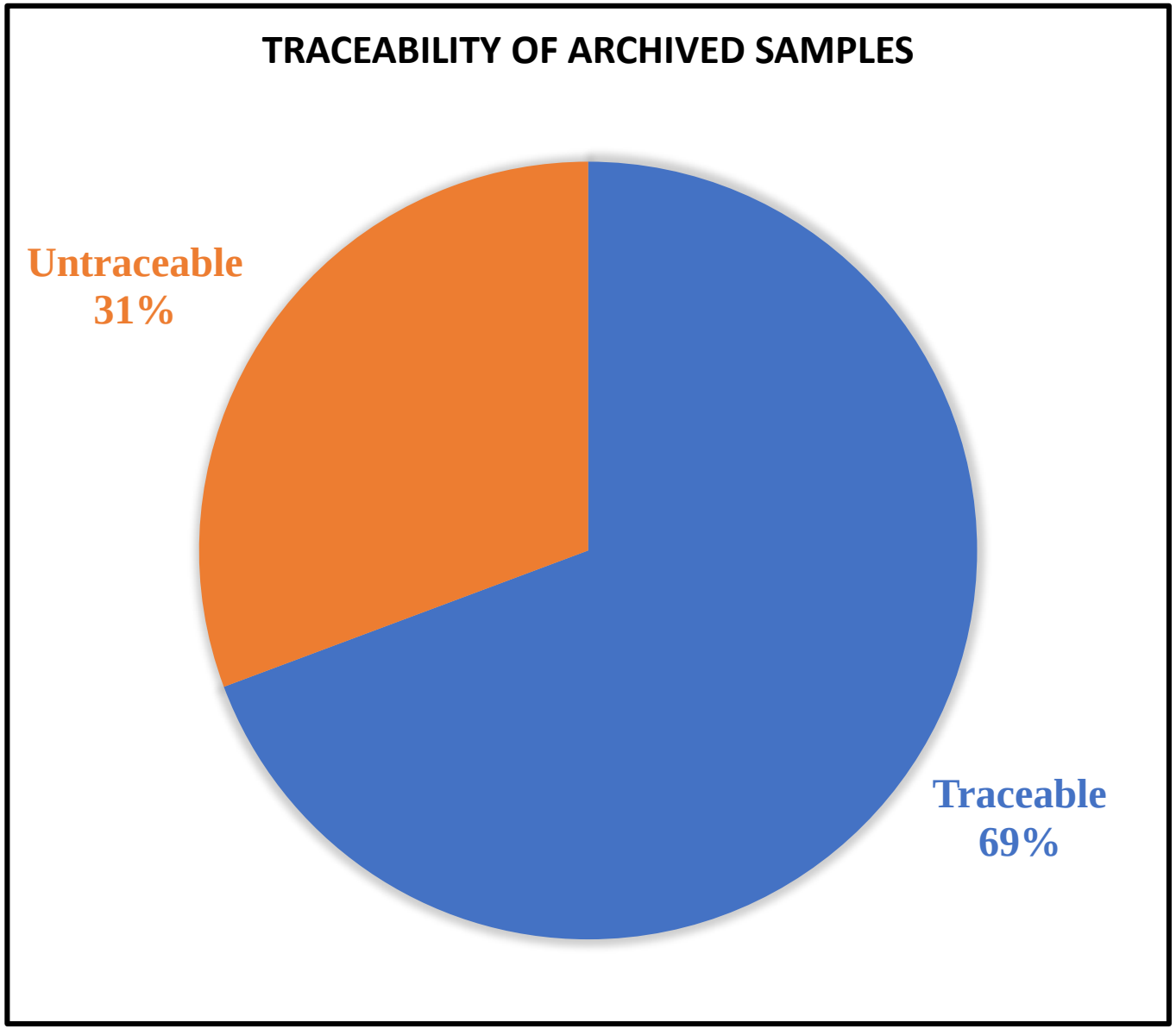
Not good for animal and public health institution

Overall Retrieval Time Of Archived Samples = $\frac{(180\text{min} + 30\text{min} + 300\text{min})}{3} = \mathbf{170\text{min}}$

170min = 2hrs 50min

Current Situation Analysis

N=60



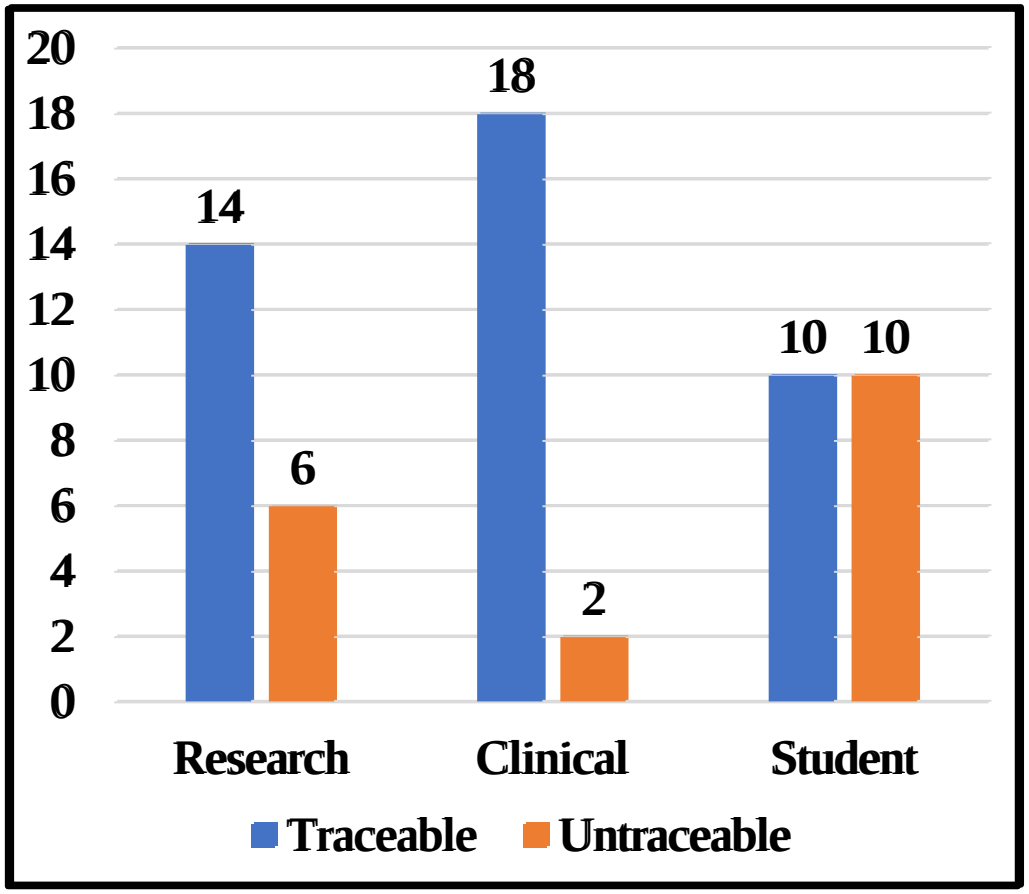
- A random trace of archived samples revealed that the majority of archived samples were traceable ie. 69%
- However, 69% traceability was too low for a public health institution like ours.

Current Situation Analysis Ctd…

Results of Random sample of 60 (20 – Research, 20 – Clinical, 20 – Students):

Traceability of Samples

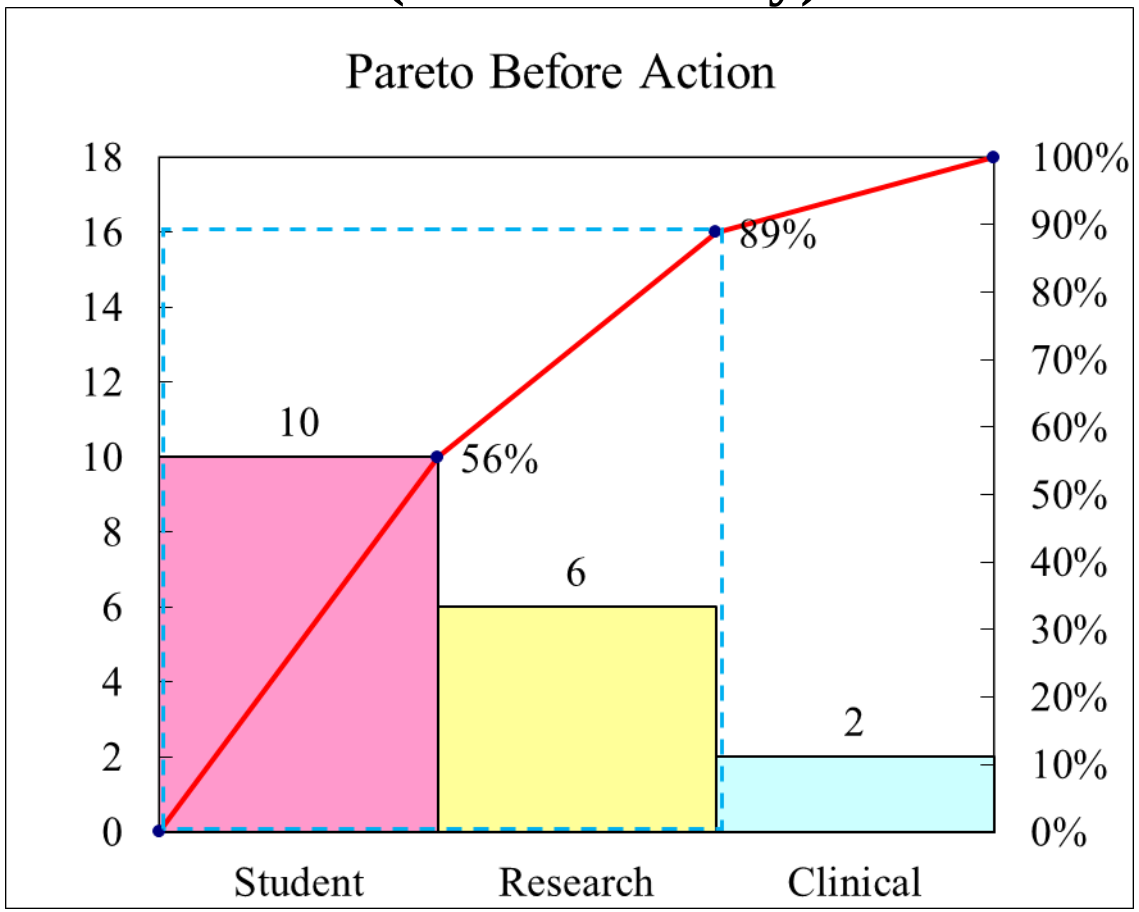
N=60



Total Traceable = 42 ⇨ 69% Trace

Total Untraceable = 18

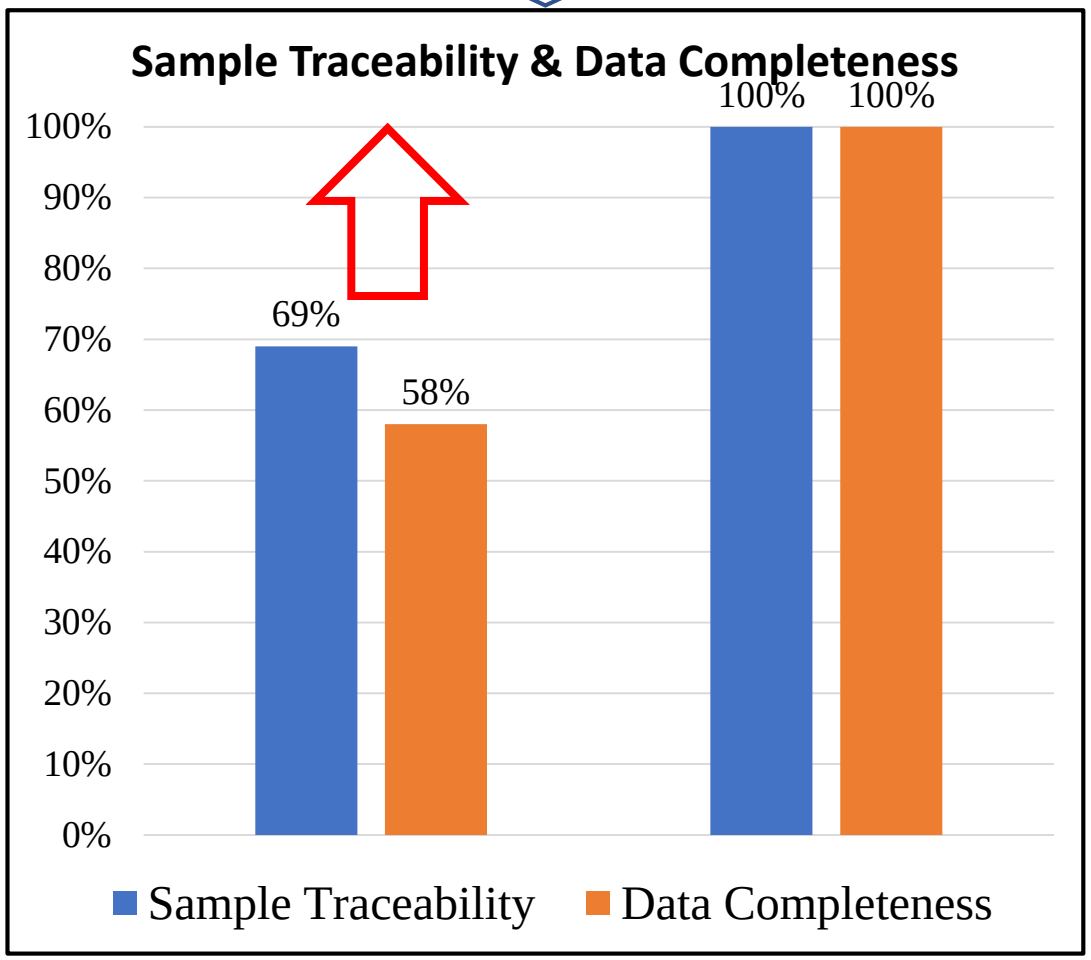
Pareto Analysis of our Problem (Untraceability)



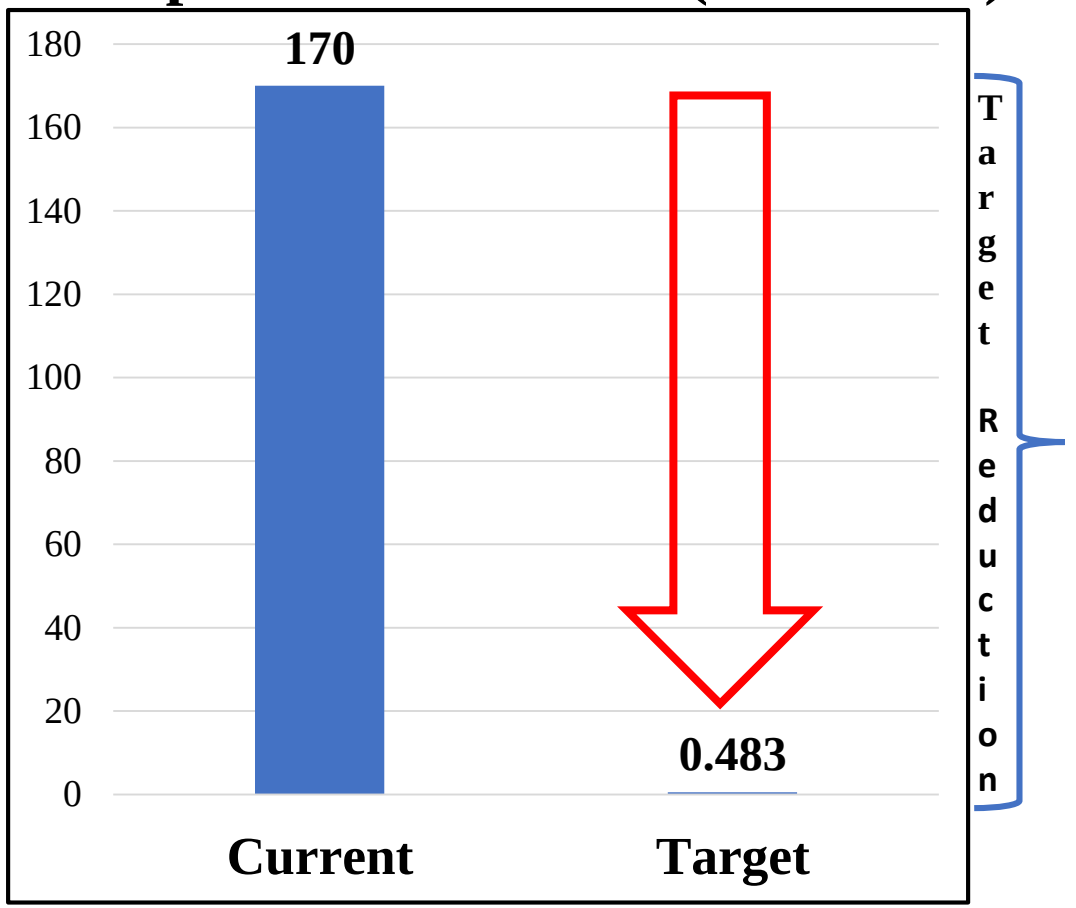
❖89% of untraceable samples were coming from 2 areas – Students and Researchers.

Target – Setting

KPI 1 & 2



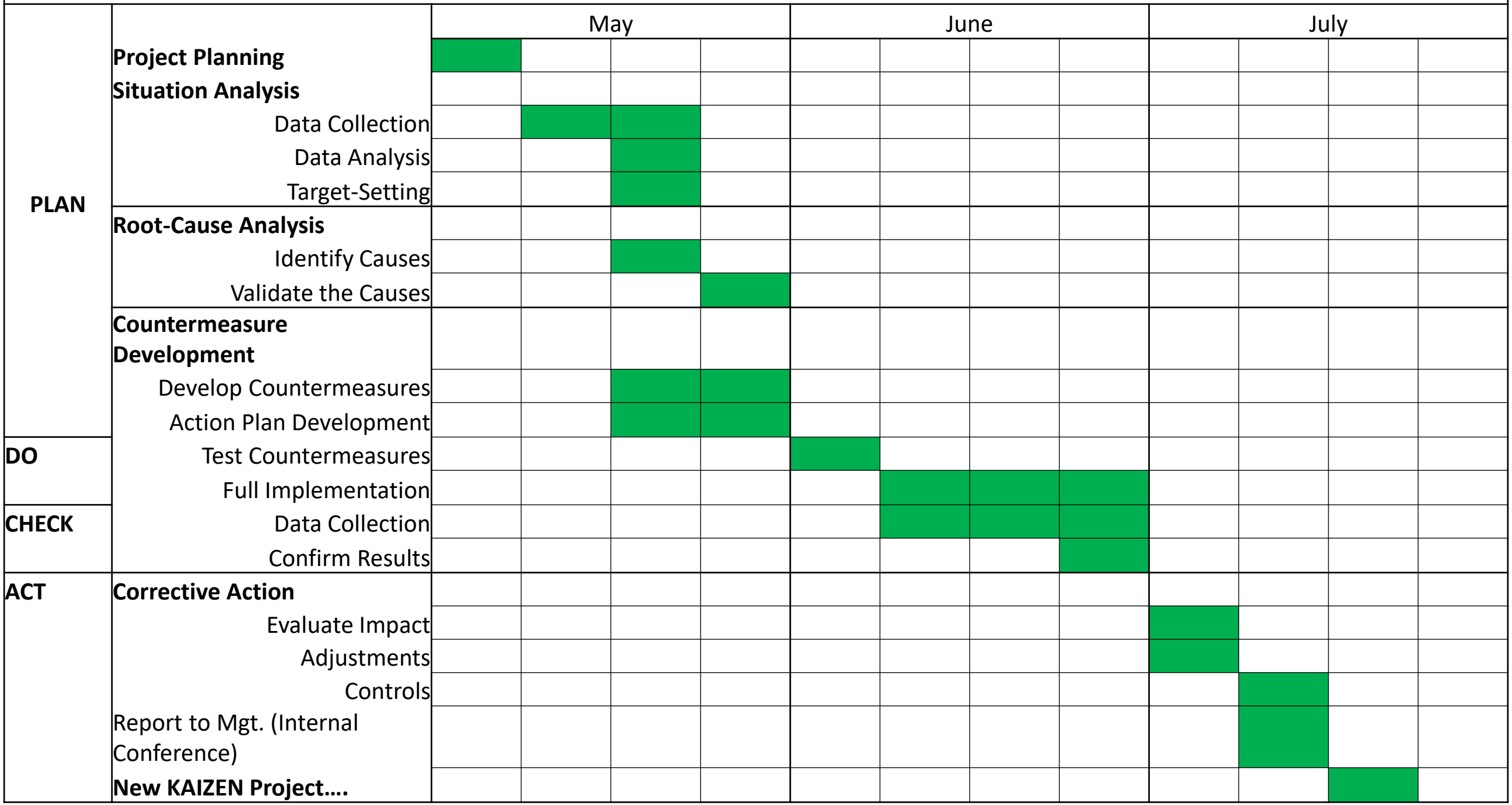
KPI 3



Targets:

1. 100% traceability of samples (69% - 100%).
2. Achieve 100% data completeness (58% - 100%)
3. Reduce Sample Retrieval Time from 170min - 0.483min (29 seconds)

OUR KAIZEN TIMELINE - SAMPLE MANAGEMENT - DISEASE CONTROL



Low Traceability of achieved samples at UNZA-Vet Disease Control laboratory

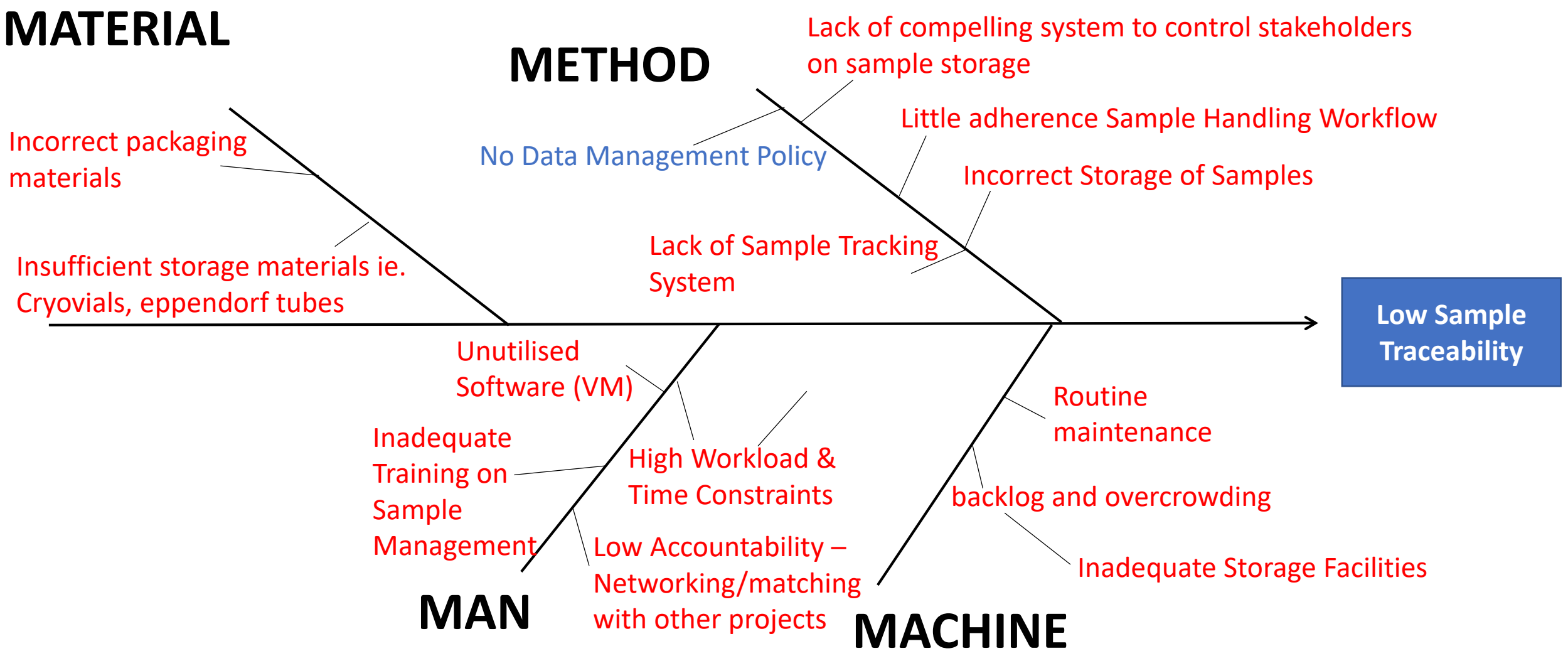


Figure: Ishikawa/Cause and Effect/Fishbone Diagram to Underline the Causes of the Problem

Countermeasure Development

1. Develop and Implement Standard Operating Procedures (SOPs) for sample management.
2. Provide training and regular awareness sessions for staff on sample handling and traceability importance.
3. Expand storage facilities to accommodate increasing sample volume.
4. Strengthen Bio Security – Introduce Lock-and-key.
5. Implement Sample Tracking System for efficient sample retrieval and status monitoring.
6. Reduce Volume of Sample Archived (Effective utilisation of cryovials in storage).
7. Update & streamline the data management policies to ensure proper recording, storage, and retrieval of sample information.

Physical record in lab

1. Improve Sample Storage Methods – Procure Appropriate Storage Vessels.
2. Strengthen Pre-Storage Data Capture

IDEA MAPPING
(Our Countermeasures)

Effectiveness Very effective = 5 Effective = 3 Less effective = 1	**Easiness** Very easy = 5 Easy = 3 Less easy = 1	**Cost** Less cost = 5 Some cost = 3 Much cost = 1	**Total Points** **Effectiveness** **Easiness** **Cost**

Improved Sample Traceability

Sample Tracking System	Stock take	5	5	5	125
	Design data parameters	5	5	5	125
	Excel Programming for Visualisation	5	4	5	100
Strengthen Data Capture Efficiency	Streamline Existing Policies	5	5	5	125
	Capture Before Admission	5	4	4	80
	Update/Develop SOPs	5	5	5	125
Strengthen Bio Security for Archived Samples/Facilities	Identify Sample Storage Facilities	5	5	5	125
	Allocate PIC/Custodian	5	5	5	125
	Install Locking system for all Storage Facilities	5	5	5	125
Expand Storage facilities for samples	Specs Development	5	5	5	125
	Request JICA Support	5	5	3	75
	Purchase & Install	5	5	3	75

IDEA MAPPING
(Our Countermeasures)

Effectiveness	**Easiness**	**Cost**	**Total Points**
Very effective = 5 Effective = 3 Less effective = 1	Very easy = 5 Easy = 3 Less easy = 1	Less cost = 5 Some cost = 3 Much cost = 1	**Effectiveness** **Easiness** **Cost**

Improved Sample Traceability

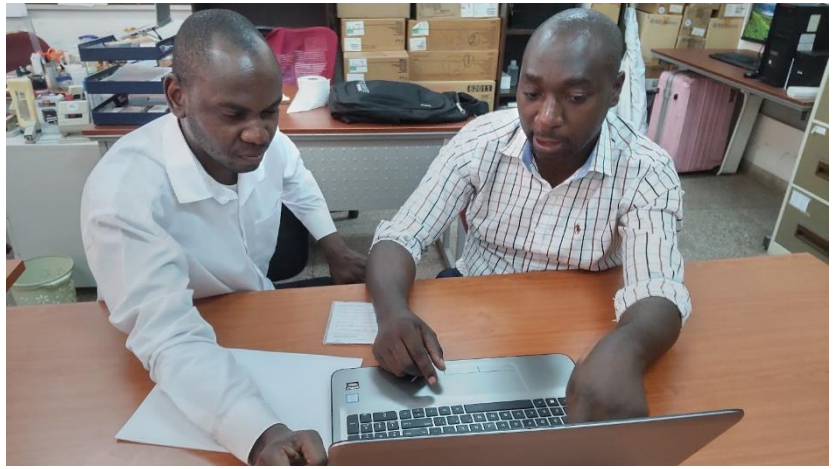
Size Reduction of Samples

	Effectiveness	Easiness	Cost	Total Points
Procure Cryovials	5	4	3	60
Reduce Large Samples to 25mg (in Cryovials)	5	5	5	125
Store in Cryovials/Archive in refrigerator	5	5	5	125

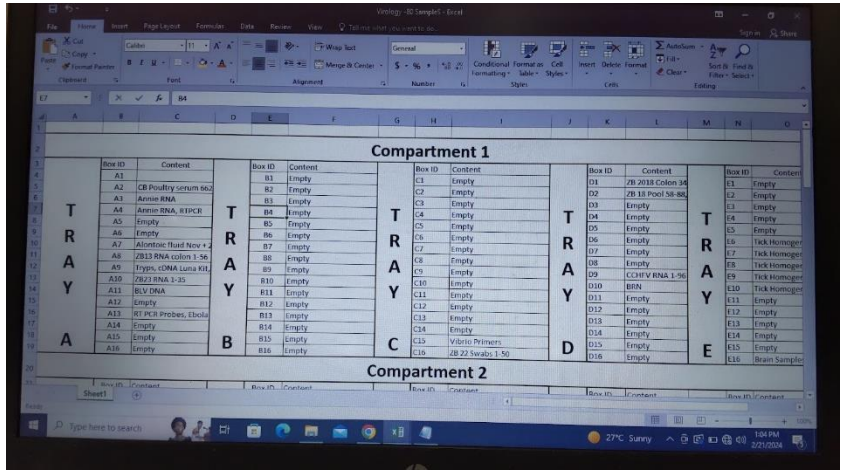
Action Plan (5W1H)

SN	WHAT	WHY	WHO	WHEN	WHERE	HOW
1	Stock Taking	Identify available resources and equipment	Mr. A. Mukubesa/ Prof. N. Saasa/Dr Ndebe	22-03-2024	UNZA-VET DC	Brainstorming
2	Agree on Data Parameters	Standardize data collection for traceability	Prof. N. Saasa/ Mr. P. Katemangwe/ Mr. A. Mukubesa	20-06-2024	UNZA-VET DC	Review & Editing
3	Excel Programming for Visualization	Develop visual tools for tracking sample data	Mr. A. Mukubesa/ Mr. P. Katemangwe/ Prof. N. Saasa	30-06-2024	UNZA-VET DC	Consultations & Assignments
4	Introduce Lock & Key System	Enhance security of sample storage	Prof. N. Saasa/ JICA/Dr Ndebe	30-06-2024	UNZA-VET DC	Develop proposal for donor support
5	Develop Sample Management SOP	Standardize processes for sample handling	Prof. N. Saasa/ Mr. A. Mukubesa	02-09-2024	UNZA-VET DC	Documentation and internal review
6	Develop Orientation Schedule on Sample Management	Train staff on the new system	Prof. N. Saasa/ Mr. A. Mukubesa	20-07-2024	UNZA-VET DC	Schedule and disseminate guidelines
7	Orientation on New System of Sample Management	Familiarize team with the implemented system	Prof. N. Saasa/ Mr. A. Mukubesa	30-07-2024	UNZA-VET DC	Meeting with practical demonstrations
8	Procure Proper Storage Vessels	Improve storage conditions for traceability	Mr. P. Katemangwe/ Dr Ndebe	20-08-2024	UNZA-VET DC	Identify needs and engage suppliers
9	5S Implementation	Organize and standardize laboratory operations	Prof. N. Saasa/ Mr. A. Mukubesa	25-08-2024	UNZA-VET DC	Implement sorting, set in order, shine, standardize, sustain
10	Procure Cryovials	Ensure proper preservation of samples	Mr. P. Katemangwe/ Prof. N. Saasa/Dr Ndebe	30-08-2024	UNZA-VET DC	Purchase from approved vendors
11	Reduce Large Samples to 25 mg	Optimize sample storage space and efficiency	Mr. A. Mukubesa/ Laboratory Technicians	30-08-2024	UNZA-VET DC	Use precise equipment and document sample reduction

Implementation

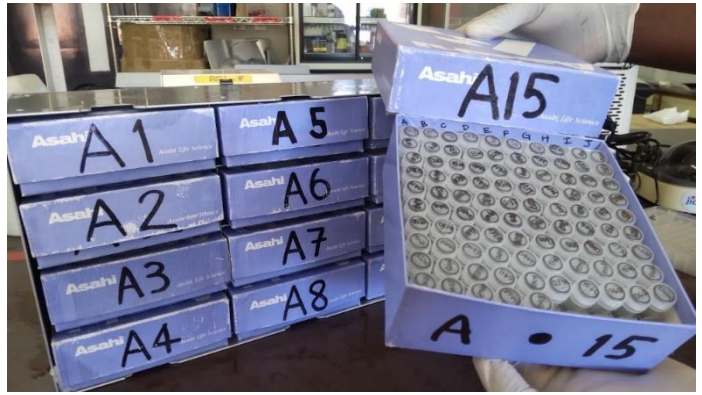


Developing Excel: Sample Tracking System



Excel: Sample Tracking System

5S hands-on & Waste Elimination in the Storage Facilities



Reducing large samples to small volume and storing in cryovials

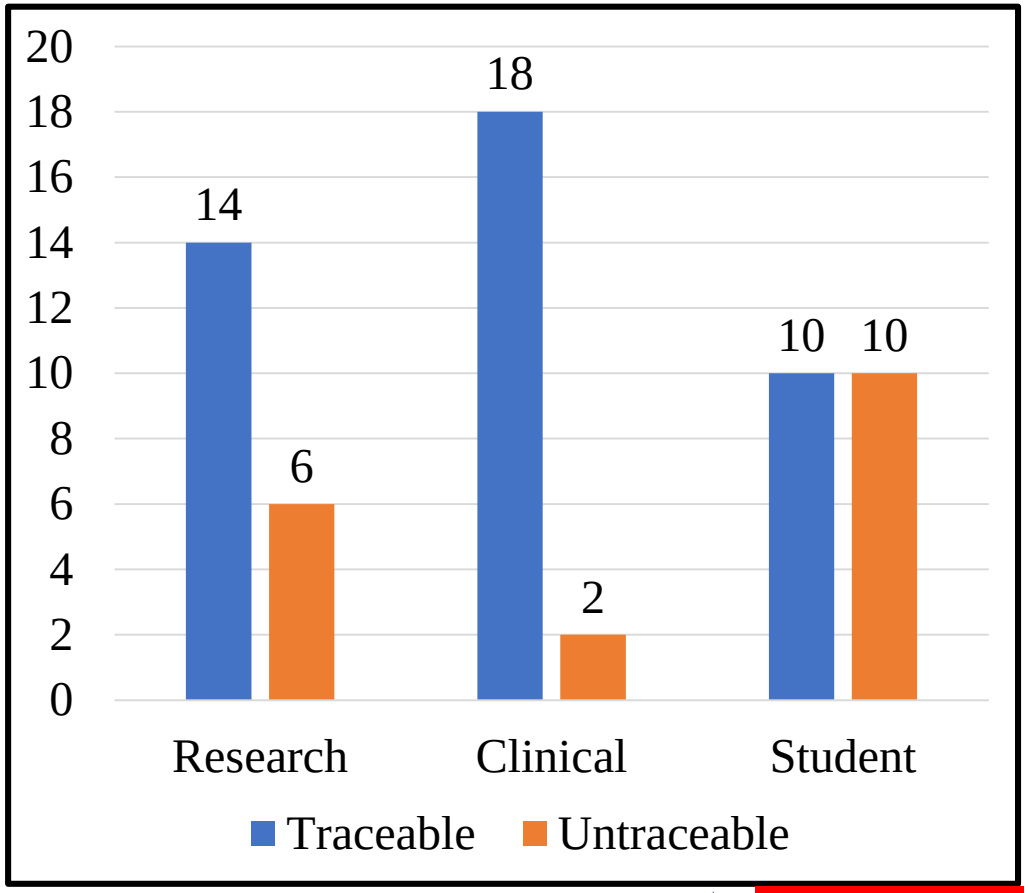
Bio-Security Strengthened – Lock & Key

Confirmation of Results

(i) Primary KPI: Traceability of Archived Samples

N=60

Before KAIZEN

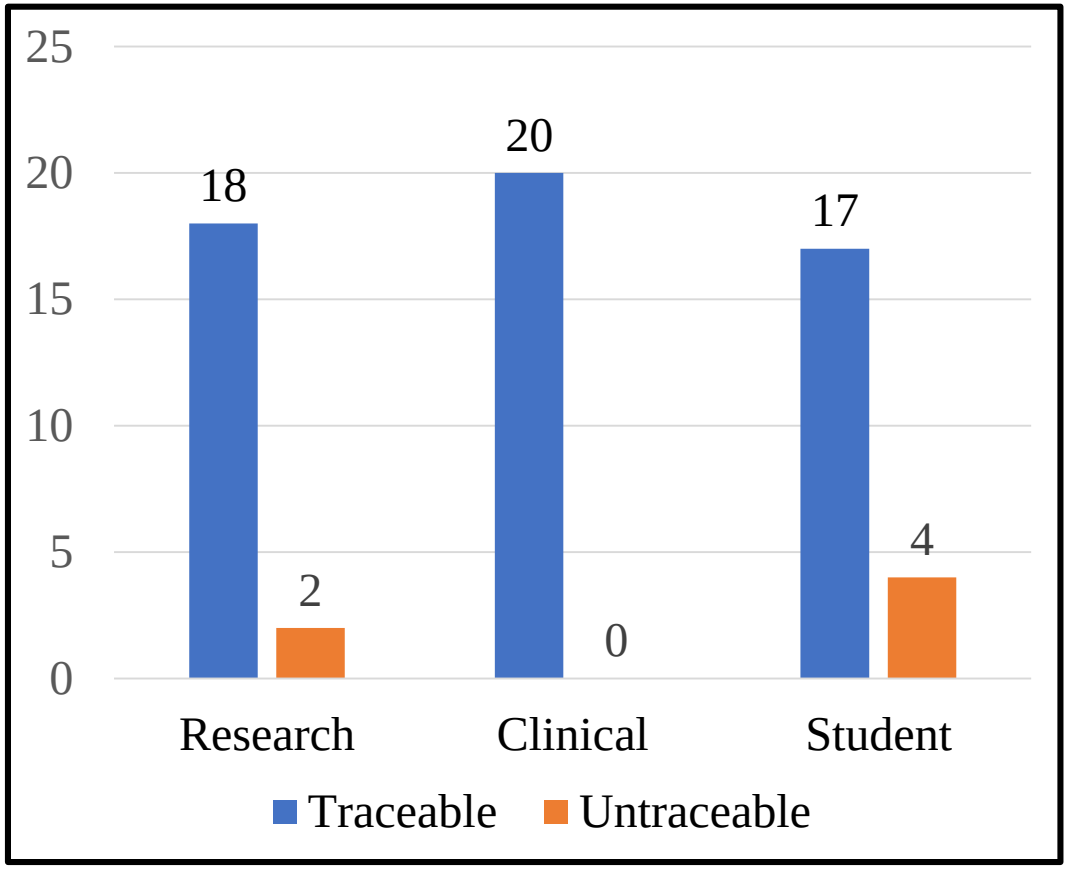


Total Traceable = 42 ⇨ 69% Trace

Total Untraceable = 18

Vs

After KAIZEN



Total Traceable = 55 ⇨ **91.7% Trace**

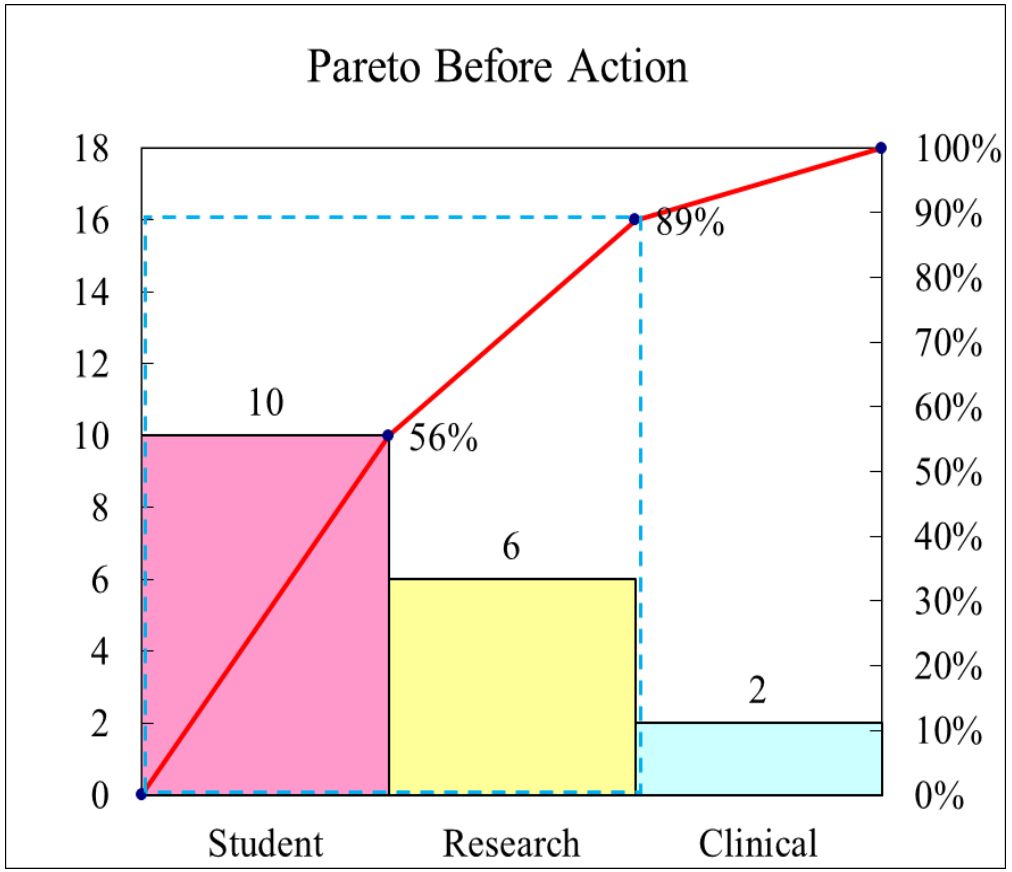
Total Untraceable = 05

Traceability = $\frac{\text{Traceable Samples}}{\text{Total Samples}}$ X 100%

Confirmation of Results Ctd…

(i) Primary KPI: Traceability of Archived Samples – Pareto Analysis

Before KAIZEN

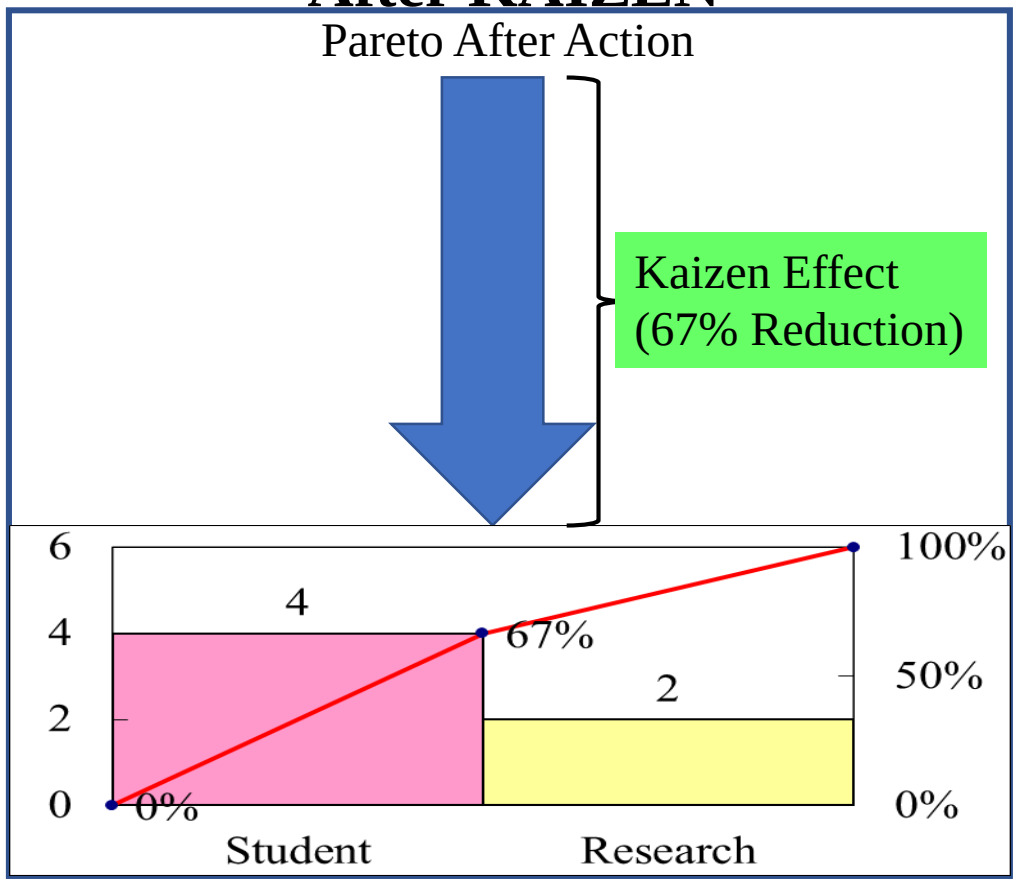


❖ Total Untraceable = 18

❖ 89% of untraceable samples were coming from 2 areas – Students and Researchers.

Vs

After KAIZEN



❑ Total Untraceable = 06

❑ We witnessed a significant reduction in our problem.

Improvement = $\frac{\text{Before} - \text{After}}{\text{Before}}$ X 100% = $\frac{18 - 6}{18}$ X 100% = **67%**

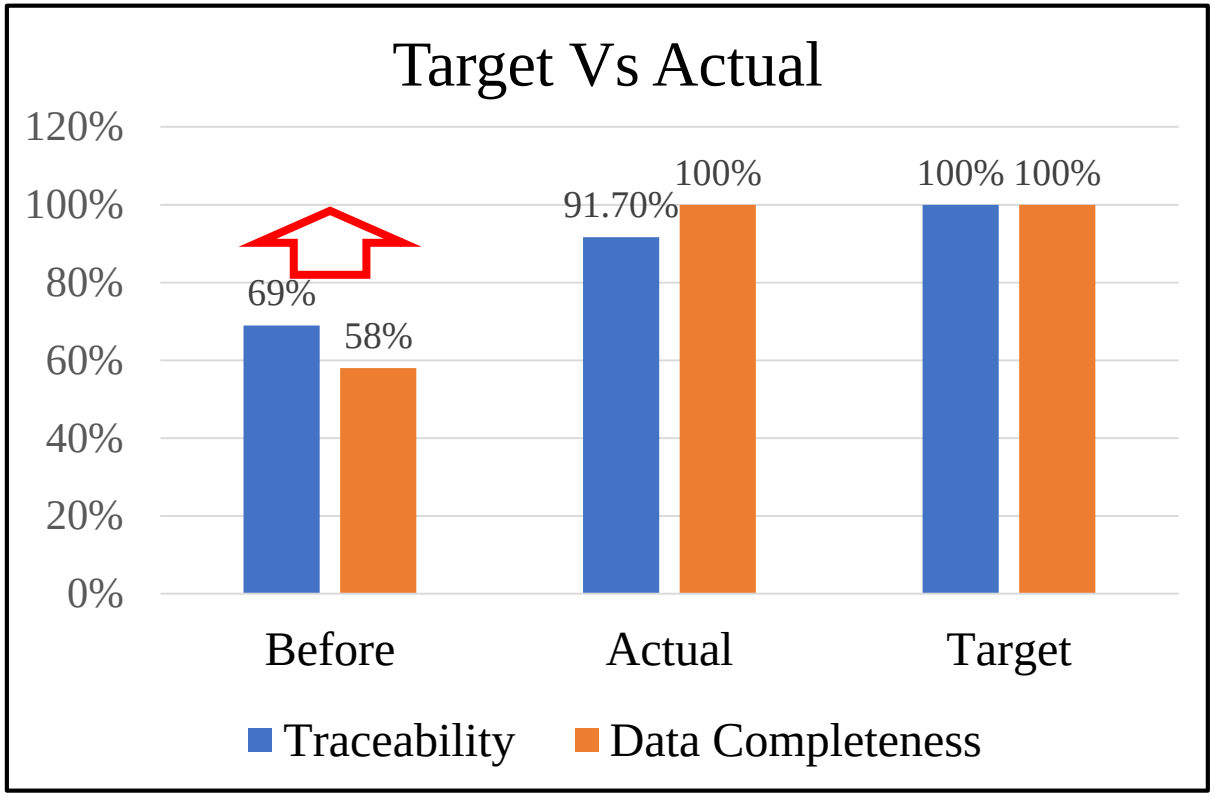
Target Achievement Ratio –Traceability

- Initially, Team planned to eliminate the problem of untraceable archived samples ie. from 18 cases to 0 (=Reduction by 18).
- Team failed to achieve its initial target of eliminating the cases to 0 ie. after kaizen, team recorded a total of 6 cases.

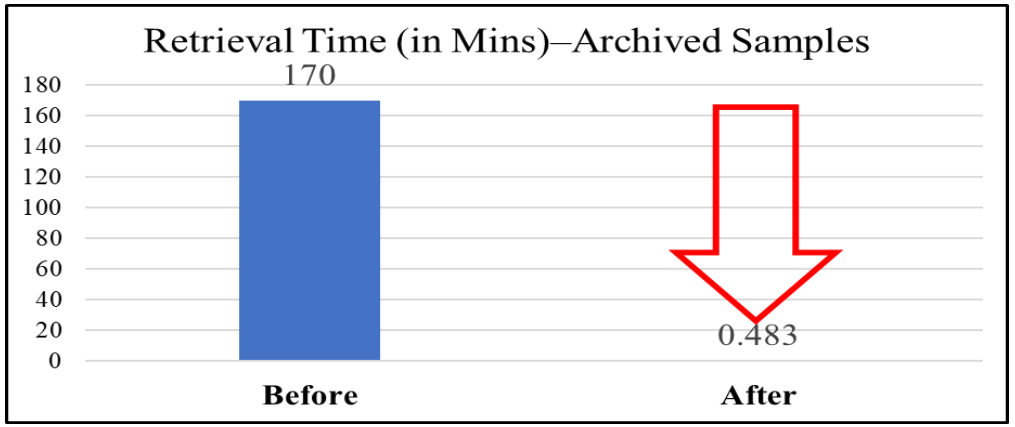
$$\text{Target Achievement} = \frac{\text{Actual}}{\text{Target}} \times 100\%$$

$$= \frac{18 - 6}{18 - 0} \times 100\%$$

$$= \mathbf{66\%}$$



- **Team Achived 66% of the Target it had initially set.**



Sample Retrieval Time
(for Archived Samples) Improved
from 170 Work Minutes to 29 Seconds

Outcomes

The positive outcome of the project have has set the laboratory for more Quality management system which is essential for any reference laboratory and accreditation by international bodies and as well as for enhanced collaborations with other research centers.

Virology Laboratory (Before) (After)

5S –Stored samples in Public Health Laboratory

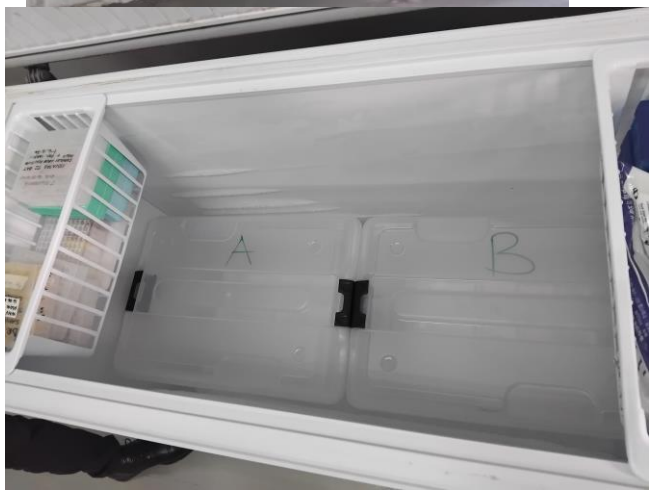
Before Kaizen

After Kaizen

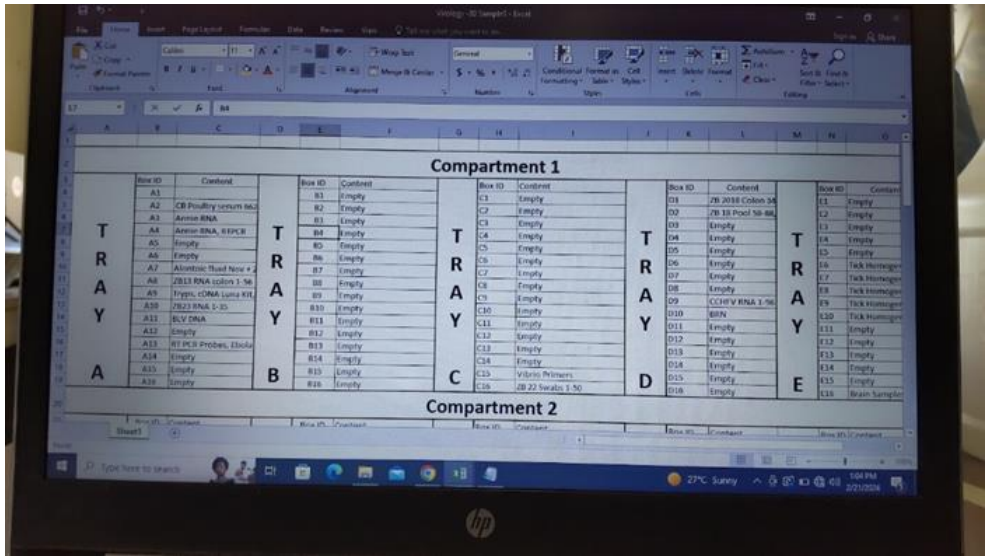
Before Kaizen

After Kaizen

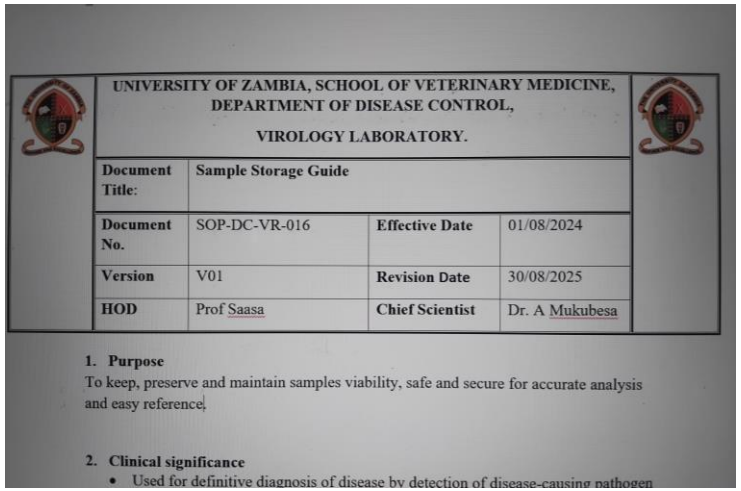
Standardisation



Freezers well arranged and labelled



Information on Excel sheet



UNIVERSITY OF ZAMBIA, SCHOOL OF VETERINARY MEDICINE,
DEPARTMENT OF DISEASE CONTROL,
VIROLOGY LABORATORY.

Document Title:	**Sample Storage Guide**		
Document No.	SOP-DC-VR-016	**Effective Date**	01/08/2024
Version	V01	**Revision Date**	30/08/2025
HOD	Prof Saasa	**Chief Scientist**	Dr. A Mukubesa

1. Purpose

To keep, preserve and maintain samples viability, safe and secure for accurate analysis and easy reference.

2. Clinical significance

- Used for definitive diagnosis of disease by detection of disease-causing pathogen

SOP on Sample Management

1. Samples identified
2. Stored according to plan
3. Easily retrievable
4. Safe and secure

Conclusion

- Our target was to increase sample traceability to 100%
- However, we only achieved 91.7% sample traceability.
- Some samples lack primary information because students/researchers were not available to provide information

- ***Contributing Factors to Non-Achievement of the Target***:

(i) Samples can only be disposed with approval from owners due to high cost of collection as well as being used as reference point.

(ii) No backup freezers to package samples as the identification process was taking place. Cold chain needed to be maintained even during the entire process to avoid compromising the integrity of the samples.

Tangible Benefits

Monetising the Gain in Retrieval Time or Cost Recovery

**From 170min to 0.483min (29 seconds) ⇨ 169.527Min

169.527/60 = 2.83 Hours

Laboratory Staff Avg. Salary Per Work Day = (ZMW12,000 **X** 5 staff)/22 Work days Per Month = **ZMW2,727.27**

1 Manhour = ZMW2,727.27/8 Work Hrs = **ZMW340.9**

Our Gain Per Day= 2.83Hrs **X** ZMW340.9 = ZMW 964.747

Gain (June – Dec) = ZMW964.747 **X** 22 Days **X** 7 Months

=ZMW148,571.038

Therefore, Cost Recovery (Jun – Dec)

=ZMW148,571.038

Intangible Benefits

- ❑ Improved Team Work
- ❑ Improved Problem-solving skills
- ❑ Conducive & Vitalised work environment
- ❑ Enhanced Safety

Acknowledgements

- University of Zambia Management
- The Dean – School of Veterinary
- JICA Coordinator
- SATREPS Project
- Kaizen Institute of Zambia Limited (KiZ) Consultant
- Team Members

The End