

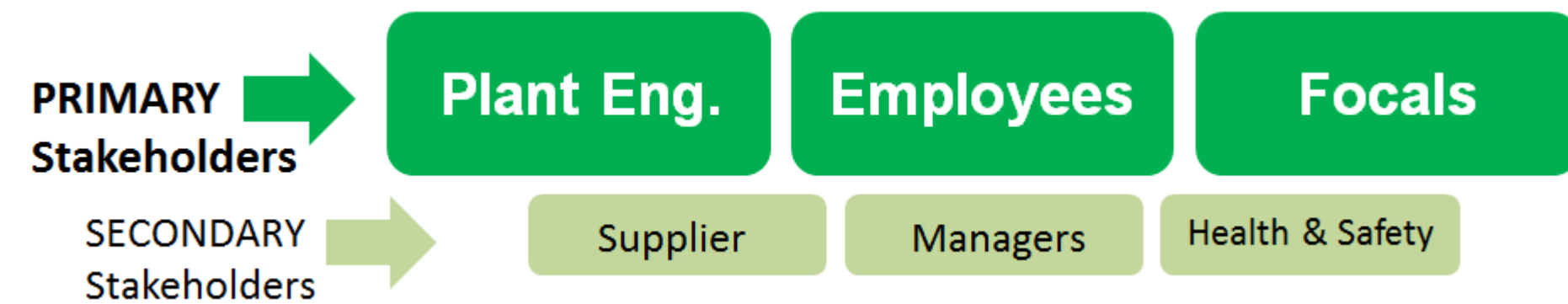
Professor Villiam Makis
Project Supervisor

Hadid Huque, Gordon Taylor Walker

Plant Engineering Dept.
Project Client

Introduction

Client: Plant Engineering at Bombardier Aerospace
Problem: Expensive and inefficient employee linen program
Facts: ~13,500 uniforms among ~1,700 employees,
Weekly cycle turnovers by 3rd party supplier



Objectives

- Reduce the program cost
How? → Improve the current processes
→ Increase the linen quality
→ Boost employee morale
- Endorse a PPE recommendation

Analysis

- Application of **workflow modeling** and **lean analysis** to identify sources of waste and inefficiency
- Linen system is divided into the Ordering, Billing and Distribution processes

Finding the Lean sources of waste:

- Where; T-Transportation, I-Inventory, M-Motion, W-Wait, Op-Overprocessing, Od-Overproduction, D-Defect

Ordering

4 Problems found

Lean:	T	I	M	W	Op	Od	D
Waste		X		X	X	X	

Primary Problem → Inventory Waste

Billing

7 Problems found

Lean:	T	I	M	W	Op	Od	D
Waste		X		X	XXX	X	X

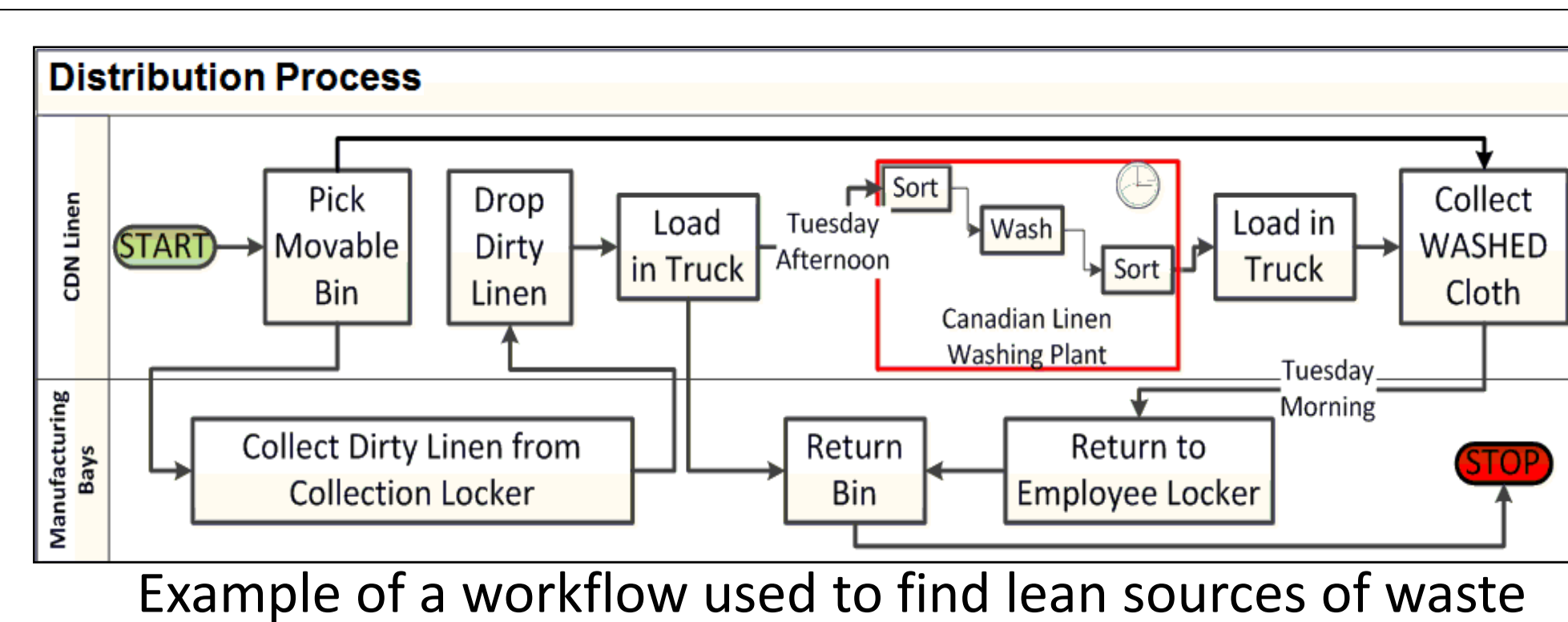
Primary Problem → Overprocessing Waste

Distribution

5 Problems found

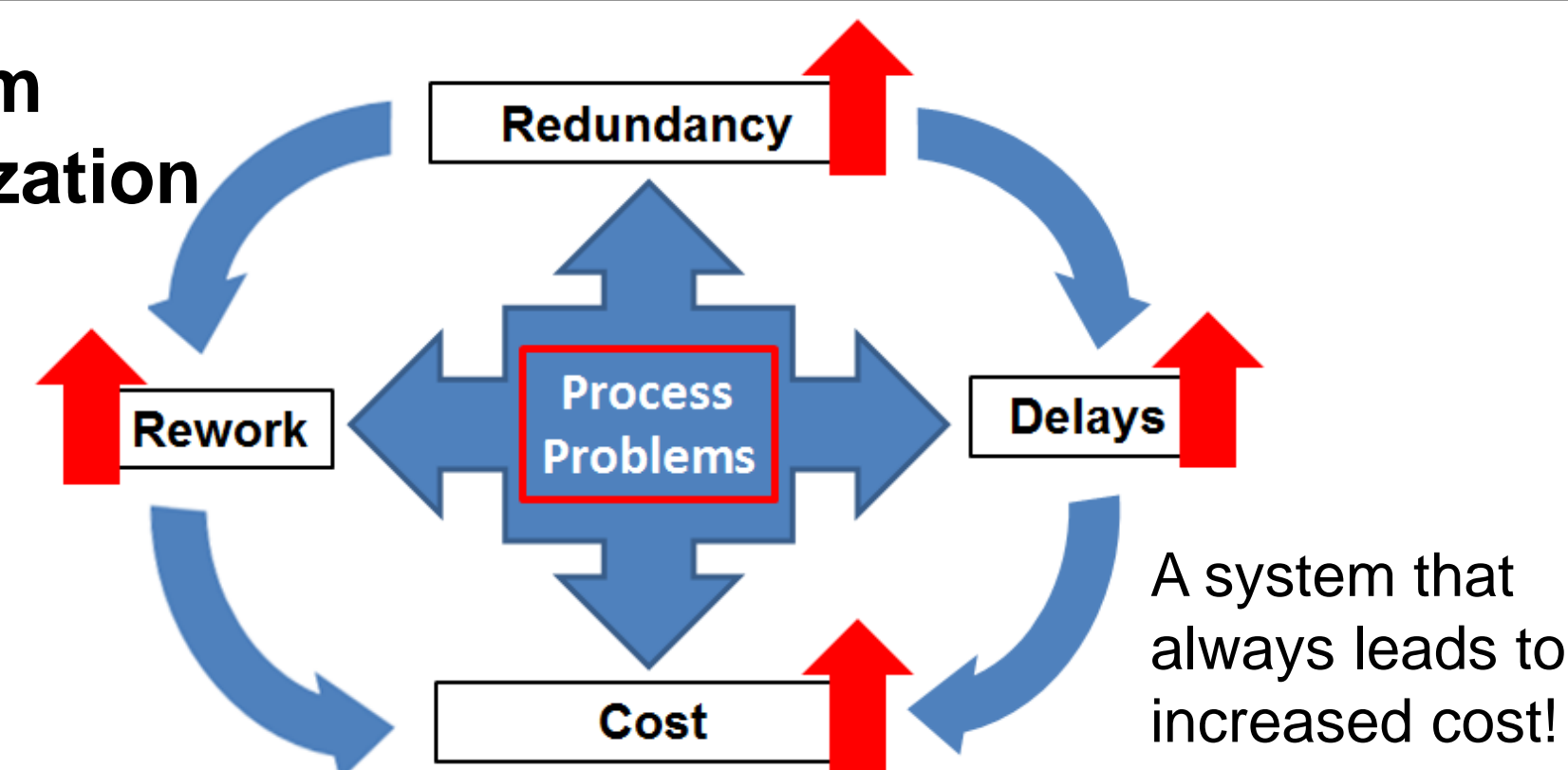
Lean:	T	I	M	W	Op	Od	D
Waste	X	X	X				XX

Primary Problem → Transportation & Defect Waste



Example of a workflow used to find lean sources of waste

Problem Visualization



Alternative Brainstorming and Evaluation



Objectives	Objectives			Constraints			Σ
	Process Improvement	Improve Quality	Cost Reduction	Specialty Garments	Floor Space	Implementation	
1	4	2	3	4	4	5	27
2	3	5	1	5	2	1	19
3	2	2	2	3	5	1	16
4	5	5	5	4	2	5	31
5	2	1	2	2	4	3	16

Alternatives 1 and 4 are ideal.

Recommendation

- Purchase, new, high-quality uniforms for employees with washing at home



Old Uniform
- 65% Polyester
- 35% Cotton
- Lacks comfort
- Poor drying
- Not colour coded

Vs.

New Uniform
- 0% Polyester
- 100% Cotton Twill
- Nanotex Fibre
- Fast drying fabric
- Colour coded



Outcome

- Leads to *reduction* and *elimination* of waste found with the current processes
- Retain supplier* at a reduced cost for specialty linens
- Establishment of *incentives* and *gamification* to encourage PPE use among employees
- Colour-coding* of PPE based on job classification for easy identification, using Velcro markers
- Increased Employee safety* and morale
- Substantial* reduction in program cost

Future Work

- Sensitivity analysis to determine uncertainty in the cost analysis inputs
- Detailed preview of the estimated payback period
- Establishment of reordering and repair processes for employees
- Central database with employee sizes and distributions

Conclusions

- Application of workflow modeling and lean analysis to deliver a **cost reduction**, improved linen quality and increased program usage.
- Reduction of various sources of waste
→ Defects, Transportation, Over Processing