Six Sigma DMAIC Improvement Story
To Reduce the Time for Fleet Body Shop Repairs

The Body Builders
Miami-Dade County, Florida

Introduction

This project was completed and presented to the Internal Services' Department Management Team in December 2016.

In June 2017, members of this team, under the team name of The Body Builders, participated in the Florida Sterling Council's Team Showcase and received the award for Best Use of Tools.

In addition, this project was a recipient of a 2017 National Association of Counties (NACo) Achievement Award.

The team was comprised of the following members:

Luis Duarte

Jose Espinoza

Roy Ferreira

Amy Horton-Tavera

Rey Llerena

Pete Moolah

Mayra Morales

Nestor Suarez

Yoamel Zequeira

Alex Alfonso (Sponsor)

Jennifer Moon (Executive Sponsor)

Project Selection

Management reviewed perceived problems within ISD Fleet and evaluated the need for a project using a Project Selection Matrix

Problem(s) *(where cause is unknown and knowing cause is desired)*	Primary Customer (Internal or External)	Selection Criteria			
		Impact on Customer (Accuracy, Cost, & Timeliness)	Need to Improve (Performance Gap)	Supports Miami Dade Strategic Goal(s)? Yes or No	Overall Rating
It takes too long to dispose vehicles	Internal	3	5	Y	15
Body shop repairs take too long	Internal	5	5	Y	25
Revenue for disposed cars is too low	Internal	3	3	Y	9
Body shop repairs have too much rework	Internal	4	4	Y	16
		Rating Scores:	5= Extreme 4= High	3= Moderate 2= Low 1=None	

Body shop repairs taking too long, the highest rated problem, was selected.

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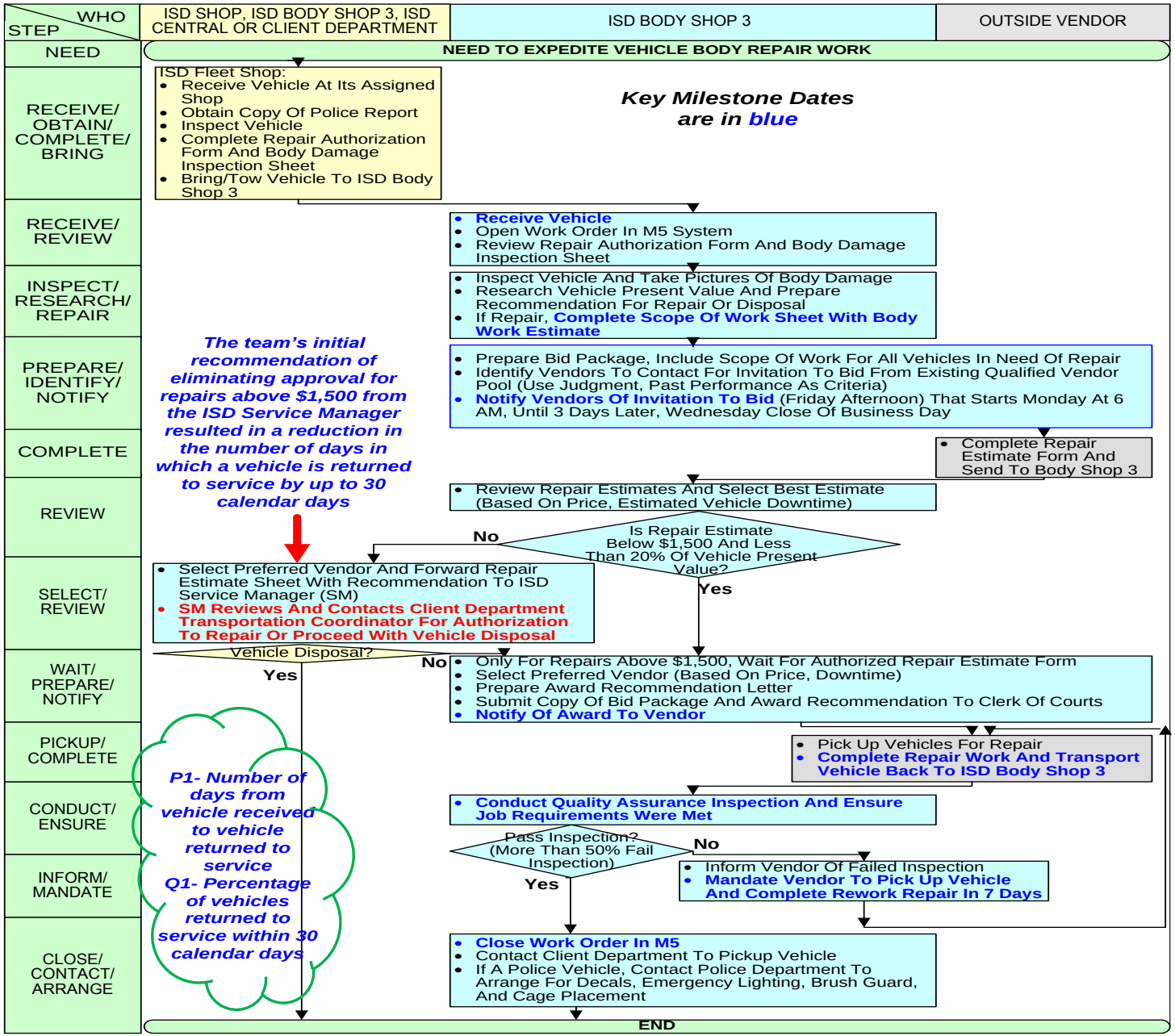
Project Charter

The team then developed a project charter:

Business Case	**Problem/Impact:**	Body repair work takes too long to complete. ISD outsources body repair work to vendors across the County. Currently, the end-to-end time of this process is excessive
	Expected Benefits:	Improved turnaround times will ensure that vehicles are returned to customer departments more quickly. It will reduce the amount of space ISD Fleet needs to set aside for vehicles in need of body work
Objectives	**Outcome Indicators:**	Q1: Percentage of vehicles returned to service within 30 calendar days (approximately 20 business days, from the date vehicle received by the ISD fleet shop) P1: Number of days from vehicle received to vehicle returned to service
	Proposed Target:	Q1 Target = 90% of vehicles returned within 30 calendar days P1 Target = 30 calendar days from vehicle received to vehicle returned to service
	Strategic Alignment:	Supports the County's Strategic Plan. General Government Objective 5-2: Provide well maintained, accessible facilities and assets
Scope	**In Scope:**	Light Fleet vehicles
	Out-of-Scope:	Heavy fleet vehicles, vehicles chosen for disposal (may be evaluated at a future date), and vehicles not managed by ISD Fleet
Method	**Project Methodology:**	DMAIC (Define-Measure-Analyze-Improve-Control); additionally, the project will include a benchmarking component.
Project Team	**Team Members:**	Amy Horton-Tavera, Luis Duarte, Jose Espinoza, Roy Ferreira, Rey Llerena, Pete Moolah, Mayra Morales, Nestor Suarez, and Yoamel Zequeira
	Process Owner:	Alex Alfonso
Schedule	**Completion and Review Dates:**	Completion date: September 2016. With final review in December 2016 and ongoing monthly monitoring.

Process Flowchart

Internal Services Department (ISD) Fleet Management Division – Auto Body Repair Process (Process Owner: Alex Alfonso)



Major Process Steps

1) Initial Review

2) Procurement

3) Repair

4) Quality Control

Identify Data Collection Needs

The team developed a data collection spreadsheet, each row is a Closed Work Order

DEMOGRAPHICS						
Vehicle #	Year	Make	Model	Current Mileage	Shop Name	Vendor
466A	2006	FORD	F150	125,760	SDGC	Advanced
3129A	2014	FORD	TAURUS	29,847	PDHQ	Horson

MILESTONES DATES															
Date Of Vehicle Accident	Date Vehicle Received At Shop	Date Scope Of Work Completed	Date Scope Of Work Sent Out For Bid	Date Bid Received	Date Bid Are Evaluated	Date Repair Estimate Form Is Completed	Date Repair Estimate Form Is Sent For Approval	Date Approval For Repair Is Received	Date Of Notice Of Award To Vendor	Date Vendor Picked Up Vehicle	Date Vendor Returned Vehicle	Date Of Quality Inspection	Date Vendor Notified Of Failed Inspection	Date Vendor Picked Up Vehicle For Rework	Date Vendor Returned Vehicle For Rework
8/26/2015	1/14/2016	2/1/2016	2/4/2016	2/8/2016	2/10/2016	2/1016	2/10/2016	2/12/2016	2/12/2016	2/12/2016	3/21/2016	3/22/2016	3/22/2016	3/23/2016	4/4/2016
1/21/2016	2/29/2016	3/7/2016	3/11/2016	3/13/2016	3/14/2016	3/15/2015	3/15/2016	4/22/2016	4/25/2016	4/25/2016	5/5/2016	5/6/2016	N/A	N/A	5/6/2016
N/A	4/7/2016	4/21/2016	4/25/2016											N/A	6/2/2016

DURATION				OUTCOMES	
Number Of Days From Unit Received To Scope Of Work Completed	Number Of Days From Scope Of Work Completed To Notice Of Award To Vendor	Number Of Days From Notice Of Award To Vendor To Vehicle Returned	Number Of Days From Vendor Orginal Vehicle Returned To Final Vehicle Returned (After Rework)	P1: Number Of Days From Unit Received To Vehicle Returned To Service	Q1: Percentage Of Vehicles Returned To Service Within 30 Calendar Days?
18	11	38	14	81	No
7	49	10	1	67	No
14	14	27	1	56	No

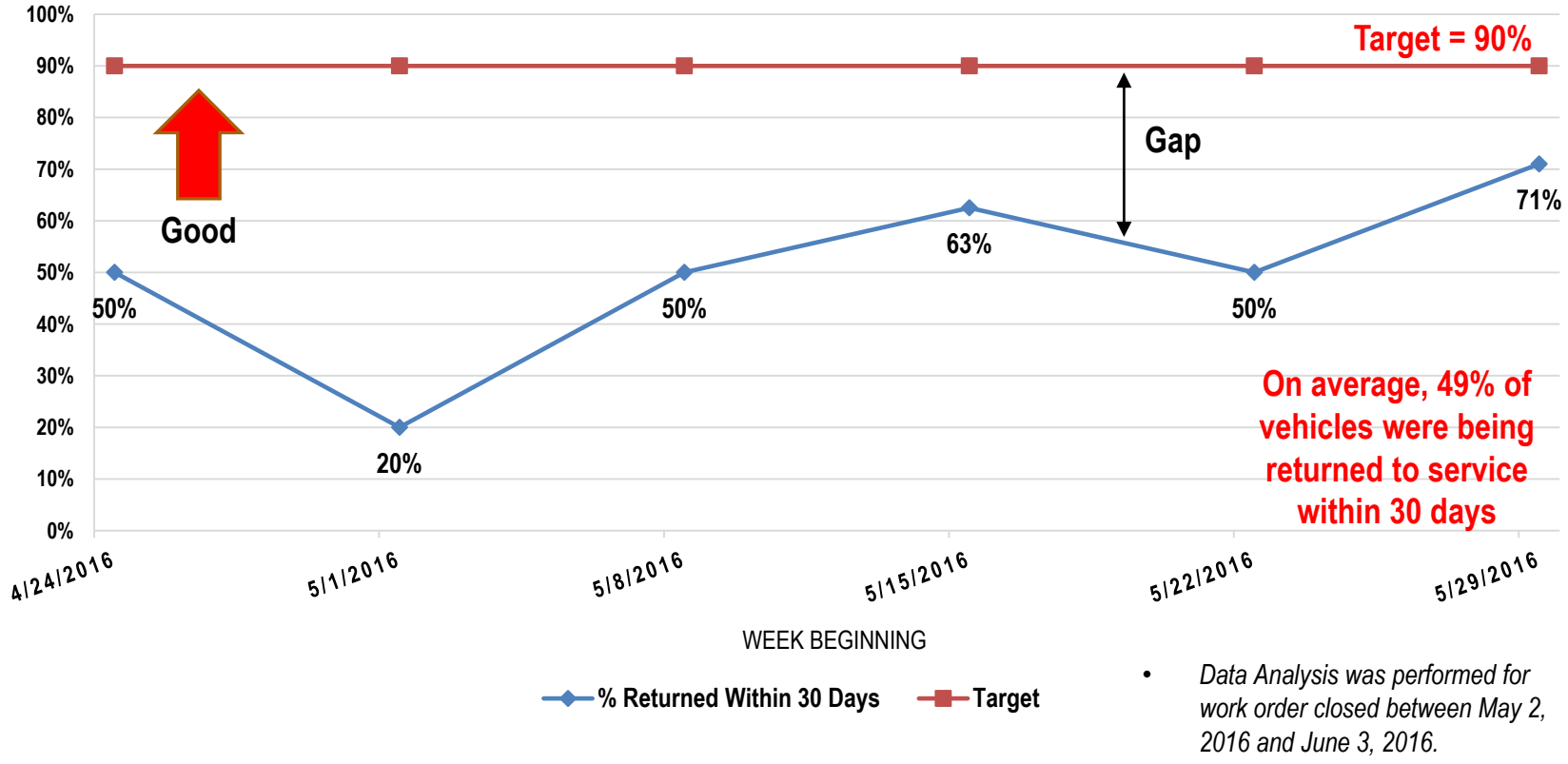
Next, the team reviewed outcome indicator data.

Review Performance Indicator

The team collected indicator data and reviewed the performance against the target:

Q1 - % of vehicles returned to service within 30 calendar days*

(vehicles are counted in the week in which the work order is closed)



- *Data Analysis was performed for work order closed between May 2, 2016 and June 3, 2016.*

Next, the team determined potential project savings.

Cost of Poor Quality

The team calculated the savings in officer time and reserve fleet size that Miami-Dade Police (ISD Fleet's largest customer) can achieve if the average body shop repair time is reduced from the average of 39 calendar days to the target 30 calendar days

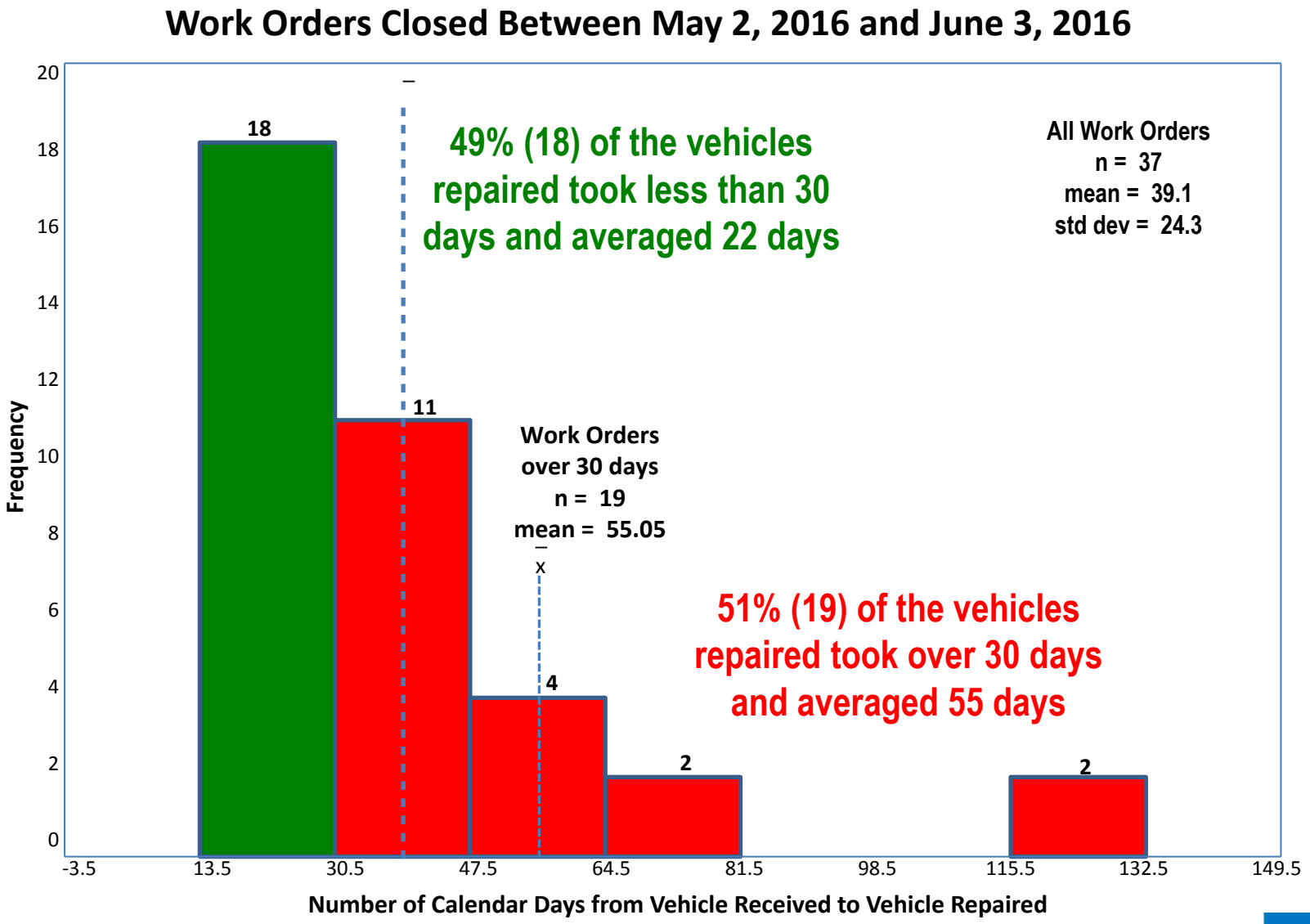
Estimated impact of body shop repair time on Miami-Dade Police Department			
	Previous performance level (39 days)	If performance target is achieved (30 days)	Annual Savings
Number of annual officer hours lost	11,666	9,166	2,500 officer hours
Number of annual pool vehicles required	42	32	10 pool vehicles

The savings in officer time is equivalent to 1.2 FTE's, or approximately one additional police officer in the community. The value of this police officer time saved is over $160,000.

Next, the team stratified Q1 indicator data.

Stratify the Problem

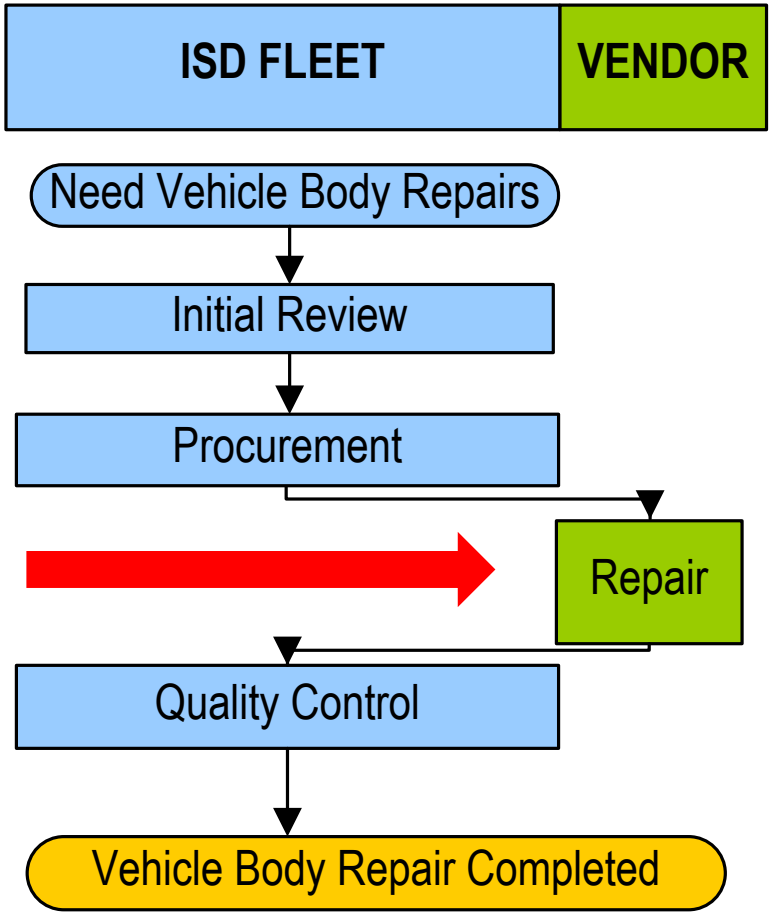
The team stratified the vehicles repaired using a histogram and found:



Stratify the Problem

The team used the flowchart to compare the 19 late vehicles to those repaired on time and found:

Late Vehicle repairs	On Time Vehicle Repairs	Difference
Days at each phase		
8	3	5
14	10	4
28	8	20
5	1	4
Total Days		
55	22	33



The 19 late vehicles averaged 28 calendar days in the repair phase, 20 calendar days longer than the on time vehicles. This led to the problem statement.

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Problem Statement

“19 late vehicles took an average of 28 calendar days for the vendor to repair and return them to ISD”

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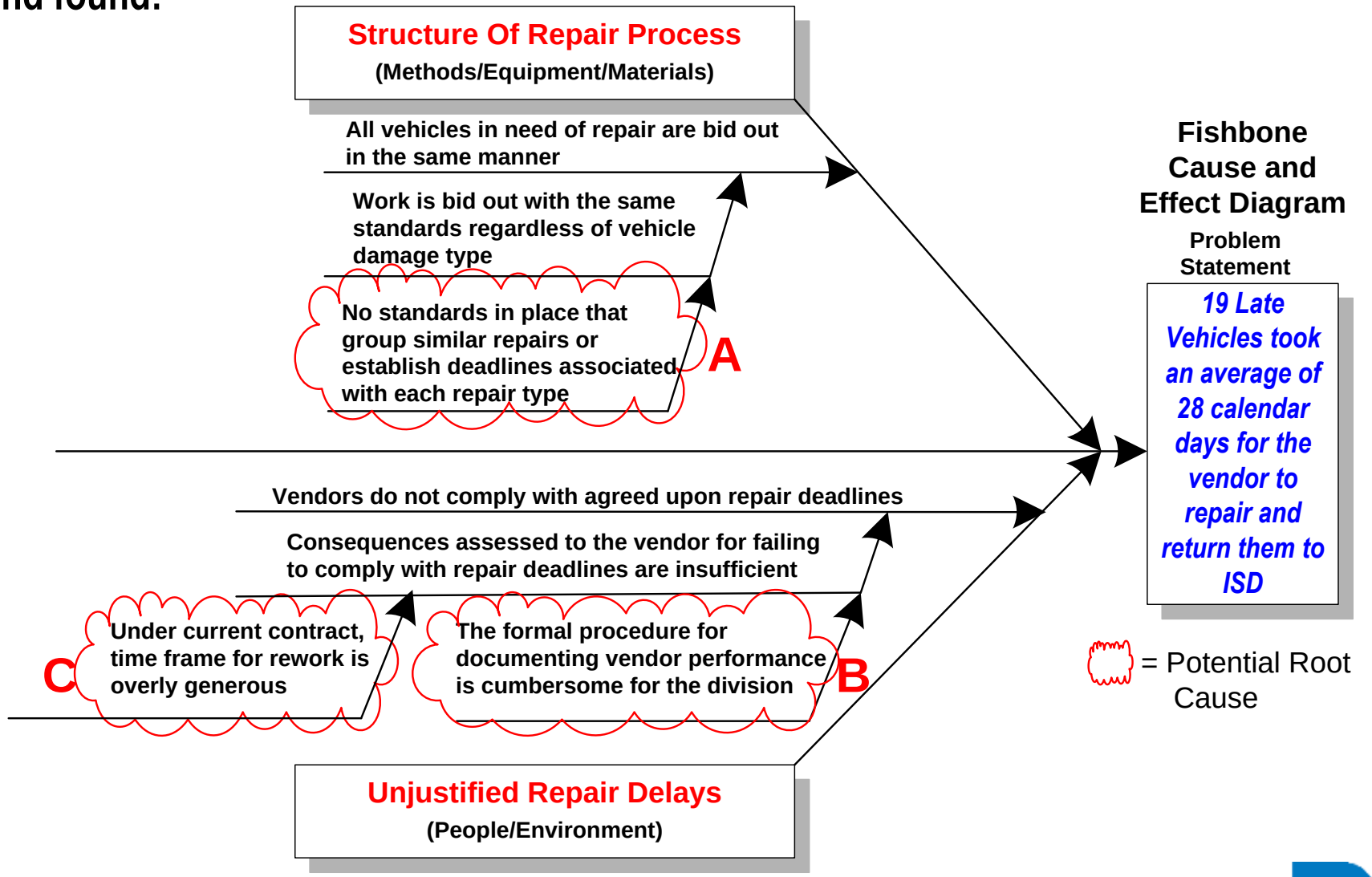
Identify Potential Root Causes

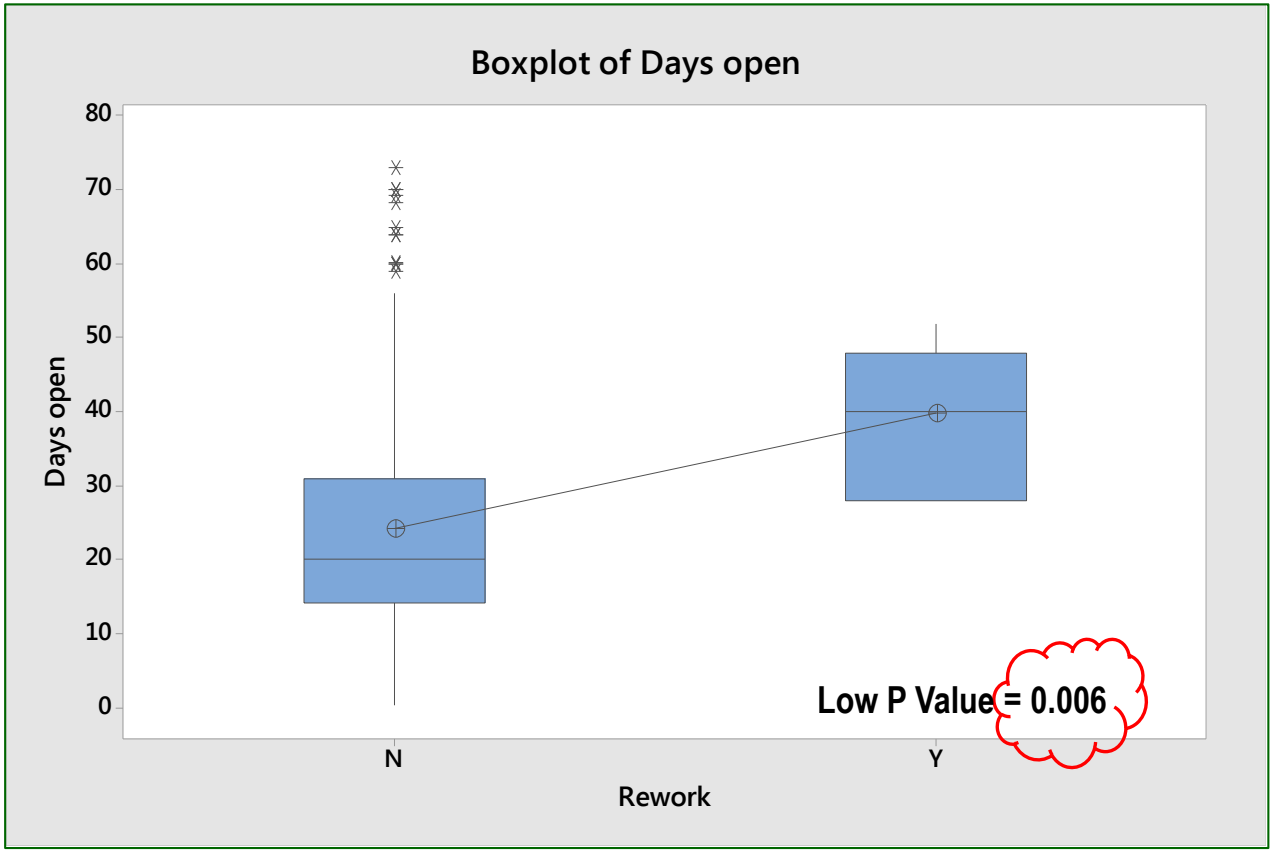
Next, the team utilized Cause and Effects Analysis to identify potential root causes and found:



The team also looked to verify these root causes.

Root Cause Verification

The team verified potential root cause B *"The formal procedure for documenting vendor performance is cumbersome for the division"* and potential root cause C *"Under current contract, time frame for rework is overly generous"* by examining the relationship between rework and the overall repair time:



ANOVA analysis showed that, on average, vehicles requiring rework take longer to repair.

Identify and Select Countermeasures

The team developed countermeasures, evaluated them based on effectiveness and feasibility, and selected countermeasures for implementation

Countermeasure Matrix Fleet Body Shop Repairs	Ratings Legend: 5 = Extremely 3 = Average 1 = Poor			
Problem Statement: 19 late vehicles took an average of 28 days for the vendor to repair and return them to ISD	Effectiveness - E	Feasibility - F	Overall - O	Take Action? - TA Yes/No
Verified Root Cause - A No standards in place that group similar repairs or establish deadlines associated with each repair type				
Countermeasure A-1: Break body work repairs into three different categories and create standards for each repair type. Vendors will be expected to comply with each standard	5	5	25	Y
Dents and scratches -- 7 calendar day target	5	5	25	Y
Accidents and non-reported body damage -- 20 to 25 calendar day target	5	5	25	Y
Total loss and retirement -- 5 calendar day target (from the time a vehicle is received until it is declared a total loss)	5	5	25	Y
Countermeasure A-2: Change the layout of the facility to group vehicles into the three different categories by repair type	4	5	20	Y
Verified Root Cause - B The formal procedure for documenting vendor performance is cumbersome for the division	E	F	O	TA
Countermeasure B-1: Continue to work with ISD Procurement to expedite submittal and processing of non-performance actions (under current contract)	5	3	15	Y
Countermeasure B-2: Review existing vendor award process for "Responsibility Determination" in accordance with ISD Procurement Best Practices	5	3	15	Y
Countermeasure B-3: Work with ISD Procurement to establish a new or modify existing vendor pool that incorporates stronger incentives for timely and high quality repairs	5	4	20	Y
Countermeasure B-4: Incorporate an internal rating scale system for tracking vendor performance into the new or existing vendor pool	5	4	20	Y
Verified Root Cause - C Under current contract, time frame for rework is overly generous	E	F	O	TA
Countermeasure C-1: In the new or existing vendor pool (See ***Countermeasure B-3***), reduce the number of days allowed for rework	5	4	20	Y
Additional Recommendation - D	E	F	O	TA
Countermeasure D-1: Require higher level qualifications in the new or existing vendor pool (See ***Countermeasure B-3***), for severe body damage repairs in accordance with Industry Best Practices and Standards	5	4	20	Y
Benchmarking survey was used as a reference to develop vendor targets				

Countermeasures included:

- Breaking up body work into three different categories and creating standards for each repair type.

- Changing the layout of the facility to group vehicles into the three different categories of repair type.

- Working with ISD Procurement to establish a new vendor pool (contract) that incorporates stronger incentives for timely and high quality repairs.

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Additional Process Failures and Causes

The team also used a risk analysis technique known as Failure Mode and Effects Analysis (FMEA) to identify potential causes affecting the overall process

Failure Mode and Effects Analysis - FMEA								
Process:	**ISD Fleet Body Shop Repairs**							
Process Steps	**Failure Mode**	**Failure Effects**	**SEV**	**Causes**	**OCC**	**Controls**	**DET**	**RPN**
Initial Review: Vehicle received to scope of work completed	Accident reports do not match vehicle damage	Vehicles sit at ISD Fleet lot waiting for appropriate paperwork from the user department	7	**Lack of supervision by the user departments**	7	No compliance with body shop documentation procedure	9	441
	Incomplete documentation to adhere to County policy	ISD Fleet will not proceed with repair process without documentation detailing each body damage	7		8	No enforcement of documentation policy	10	560
	Existing staff at the Body shop was not assisting with the preparation of the scope of work	Vehicles sit at the ISD Fleet lot for a longer period of time	8	**Insufficient training**	8	No formal training in place	9	576
	Repair estimates above $1,500 can't be approved in the absence of the Facility Supervisor	Vehicles sit at the ISD Fleet shop pending approval	9	**No personnel in the shop to approve repair(s)**	9	No replacement procedure/policy in place	9	729
Procurement: Notice of award to vendor to vehicle returned	Facility Supervisor spending authority is too low (repair approval threshold)	Vehicles sit at ISD Fleet lot waiting for approval from the user departments' Transportation Coordinator	8	**Spending authority hasn't increased parallel with market prices for body shop repairs**	9	Policy that dictates spending authority is out of date	10	720
	Service Manager reviews estimates prior to Facility Supervisor contacting the user departments' Transportation Coordinator	Vehicles sit at ISD Fleet lot waiting for approval from the ISD Service Manager	8		9	Policy that requires Service Manager to review estimates prior to contacting departments' Transportation Coordinator is out of date	10	720
Legend: **SEV** = Severity, **OCC** = Occurrence, **DET** = Detection, **RPN** = Risk Priority Number						**Total Risk Priority Number =**		1280

Next, the team developed countermeasures to address the causes of the failures.

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Additional Countermeasures from FMEA

In addition, the team developed recommended actions to address the additional process failures identified in the FMEA:

Failure Mode and Effects Analysis - FMEA						
Process:	**ISD Fleet Body Shop Repairs**					
Process Steps	**Action Recommended**	**Action Taken?**	**After Action Taken**			
			SEV	**OCC**	**DET**	**RPN**
Initial Review: Vehicle received to scope of work completed	Countermeasure E-1: Have ISD Fleet Management inform user departments on existing documentation that is required at the time a vehicle is delivered	Yes	2	3	3	18
	Countermeasure E-2: Require supervisors, or their employees who submit vehicles for repair, to submit all required documentation at the time a vehicle is delivered to ISD Fleet Shop	Yes	2	4	1	8
	Countermeasure E-3: Continue training everyone in the Body Shop operation to write scopes of work	Yes	1	2	1	2
	Countermeasure E-4: Assign Lead Worker with delegation of authority to review and approve repair work	Yes	1	1	1	1
Procurement: Notice of award to vendor to vehicle returned	Countermeasure E-5: Increase Shop Supervisor spending authority to $5,000 or 50% of the estimated value of the vehicle, whichever is higher	Yes	2	4	1	8
	Countermeasure E-6: Eliminate the Service Manager from the approval step. Service Manager will only get involved when there is a disagreement with the departments' Transportation Coordinator	Yes	2	4	1	8
Legend: **SEV** = Severity, **OCC** = Occurrence, **DET** = Detection, **RPN** = Risk Priority Number			**"After" Risk Priority Number =**			16

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Identify Barriers and Aids

The team performed a Barriers and Aids analysis on the selected countermeasures:

Implement 14 countermeasures to improve the number of days for the vendor to repair a vehicle and return it to ISD Fleet			
Barriers		**Aids**	
Impact (High, Medium, or Low)	**Forces Against Implementation**	**Forces For Implementation**	
Medium	Limited Manpower *(Supported by Aid: A)*	A	ISD Management is encouraging crosstraining and the idea of assigning a Lead Worker to assist the facility supervisor
Medium	Process for documenting vendor non performance actions can be cumbersome *(Supported by Aid: B and D)*	B	ISD Management is very supportive of processing vendor non-performance actions
High	Possible resistance from Departments on required paperwork and increased repair threshold *(Supported by Aid: C)*	C	Departments welcome the idea of expediting vehicle repairs
High	Possible pushback from existing vendors *(Supported by Aids: B, C and D)*	D	Strong partnership between ISD Fleet and ISD Procurement

Next, the team sought to incorporate this analysis into the team's Action Plan.

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Develop an Action Plan

The team identified the responsible people and implementation dates for the selected countermeasures:

Fleet Body Shop Repairs Action Plan	Take Action? Yes or No	Responsible Person(s)	Implementation Date
Countermeasure A-1: Break body work repairs into three different categories and create standards for each repair type. Vendors will be expected to comply with each standard (Dents and Scratches, Accidents, and Total Loss)	Y	Luis Duarte	Complete October 2016
Countermeasure A-2: Change the layout of the facility to group vehicles into the three different categories by repair type	Y		
Countermeasure B-1: Continue to work with ISD Procurement to expedite submittal and processing of non-performance actions (under current contract)	Y	ISD Fleet ISD Procurement	Ongoing
Countermeasure B-2: Review existing vendor award process for "Responsibility Determination" in accordance with ISD Procurement Best Practices	Y		
Countermeasure B-3: Work with ISD Procurement to establish a new or modify existing vendor pool that incorporates stronger incentives for timely and high quality repairs	Y		October 2018
Countermeasure B-4: Incorporate an internal rating scale system for tracking vendor performance into the new or existing vendor pool	Y		
Countermeasure C-1: In the new or existing vendor pool (*See Countermeasure B-3*), reduce the number of days allowed for rework	Y		
Countermeasure D-1: Require higher level qualifications in the new or existing vendor pool (*See Countermeasure B-3*), for severe body damage repairs in accordance with Industry Best Practices and Standards	Y		
Countermeasure E-1: Have ISD Fleet Management inform user departments on existing documentation that is required at the time a vehicle is delivered	Y	Alex Alfonso Nestor Suarez	Ongoing
Countermeasure E-2: Require supervisors, or their employees who submit vehicles for repair, to submit all required documentation at the time a vehicle is delivered to ISD Fleet Shop	Y		
Countermeasure E-3: Continue training everyone in the Body Shop operation to write scopes of work	Y	Luis Duarte	
Countermeasure E-4: Assign Lead Worker(s) with delegation of authority to review and approve repair work	Y	Nestor Suarez	Complete
Countermeasure E-5: Increase Shop Supervisor spending authority to $5,000 or 50% of the estimated value of the vehicle, whichever is higher	Y	Alex Alfonso Nestor Suarez	Ongoing
Countermeasure E-6: Eliminate the Service Manager from the approval step. Service Manager will only get involved when there is a disagreement with the departments' Transportation Coordinator	Y	Nestor Suarez Luis Duarte	Pilot in Progress

Ongoing Review of Selected Indicators

The team developed a Process Control System to monitor the process moving forward:

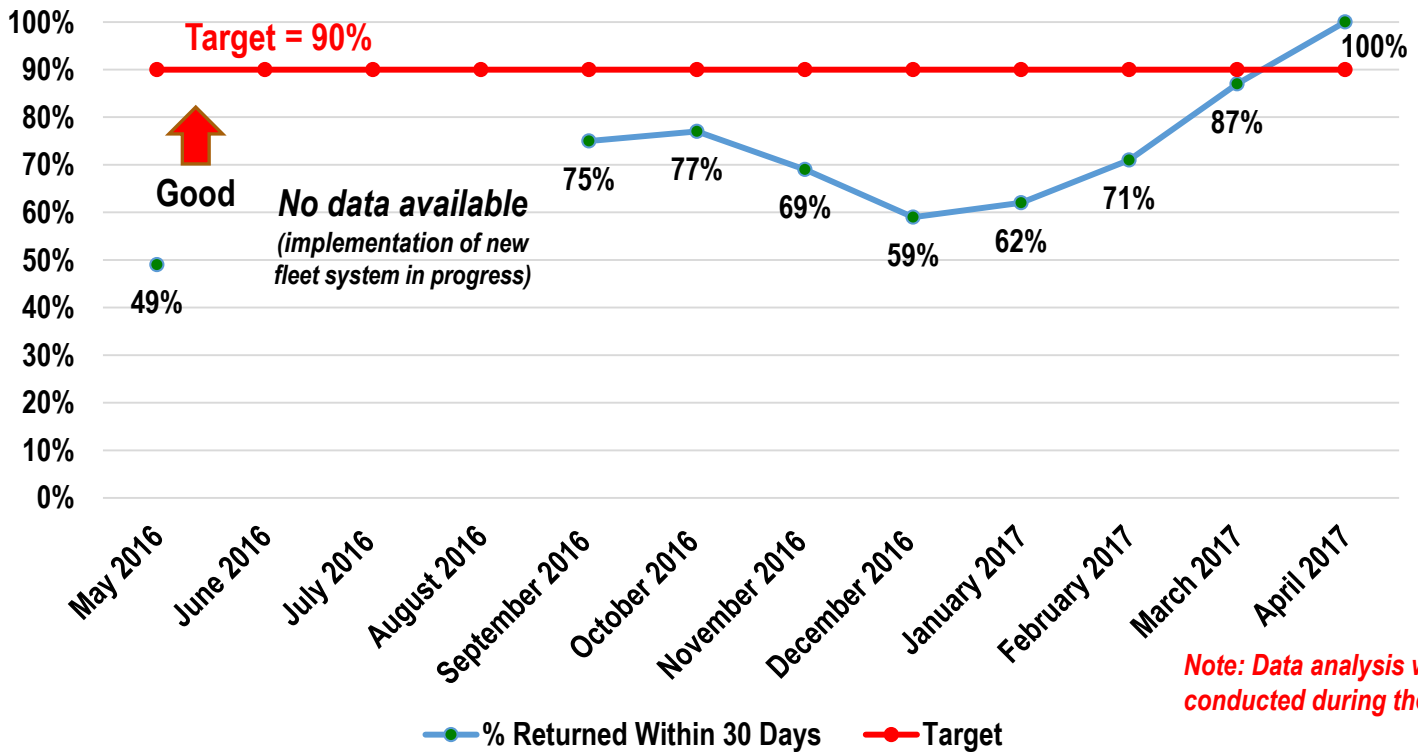
Process Control System					
Process Name: ISD Auto Body Repair Process			**Process Owner:** Alex Alfonso		
Process Customer: County Departments			**Critical Customer Requirements:** Timely repair of light fleet vehicles in need of body work		
Process Purpose: Conduct auto body repairs			**Outcome Indicators:** Q1, P1, P2, P3, and P4		
Indicators			**Checking and Indicator Monitoring**		
Process and Quality Indicators		**Target(s)**	**Data to Collect (Checking Item or Indicator Calculation)**	**Timeframe (Frequency)**	**Responsibility (Data Collection)**
Q1	% of vehicles returned to service within 30 calendar days	**90%**	(# of vehicles returned to service within 30 calendar days) / (total # of vehicles returned to service)	**Tracked Monthly**	**Luis Duarte**
P1	# of days from vehicle received to vehicle return to service	**30 calendar days**	(date vehicle returned to service) - (date vehicle received by ISD Fleet Shop)		
P2	Dents and scratches: # of days for vendor to repair vehicle	**7 calendar days**	(date vehicle returned by vendor) - (date vehicle picked up by vendor)		
P3	Accidents and non-reported body damage: # of days for vendor to repair vehicle	**20 to 25 calendar days**	(date vehicle returned by vendor) - (date vehicle picked up by vendor)		
P4	Total loss and retirement: # of days for vendor to evaluate vehicle	**5 calendar days**	(date vehicle returned by vendor) - (date vehicle picked up by vendor)		

Project Results

The team has been collecting indicator data to review the results of the countermeasures:

Q1 - % of vehicles returned to service within 30 calendar days*

(vehicles are counted in the week in which the work order is closed)



Note: Data analysis was not conducted during the project

We will continue to monitor the countermeasures and results. The goal is to achieve and maintain the 90% target no later than October 2018 or upon implementation of all countermeasures.

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Lessons Learned

- A process flowchart can help you identify “quick wins”.
- Do not let poor quality or availability of data deter the team’s progress.
- Comparing late and on time output cycle times for each major process phase can help stratify data.
- Risk analysis (FMEA) was a useful tool to develop additional recommendations for process steps not included in the problem statement.
- Benchmarking was helpful when formulating vendor targets and vehicle repair thresholds.
- Working together with the different stakeholders fostered creativity and ensured team buy-in for the recommendations.
- Although internal support operations are often invisible to residents, they have a direct role on the quality of public services (such as police) provided to the community.
- ISD Fleet staff have increased their understanding of the ways data can be used to improve performance, and have expressed interest in pursuing Lean Six Sigma Green Belt certifications.

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Thank you!