MIAMI-DADE COUNTY

Six Sigma DMAIC Improvement Story

Green Belt **Project Objective:**

To Improve Efficiencies of Repair Operations

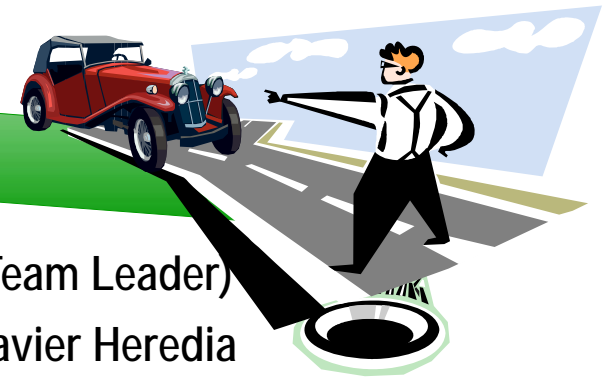*Last Updated: 2-24-13*

Team: *The "Roadsters"*

Manuel Garcia (Co-Team Leader)   Christina Cotter (Co-Team Leader)

Antonio Cotarelo   Christopher Rose   Javier Heredia

Stacy Santos   Nasif Alshaier

Kathleen Woods-Richardson (Sponsor)

Active Strategy

Lean Six Sigma Problem Solving Process

The team utilized the 5-Step DMAIC problem solving process.

DMAIC Performance Improvement Process

Process Step		Description of Team Activities
Number	**Name**	
1	DEFINE	• Select Problem • Identify Project Charter • Develop Project Timeline • Establish Method to Monitor Team Progress • Construct Process Flowchart • Develop Data Collection Plan • Display Indicator Performance "Gap"
2	MEASURE	• Stratify Problem (i.e."Gap") • Identify Problem Statement
3	ANALYZE	• Identify Potential Root Cause(s) • Verify Root Cause(s)
4	IMPROVE	• Identify and Select Improvement(s) • Identify Barriers and Aids • Develop and Implement Improvement Plan • Confirm Improvement Results
5	CONTROL	• Standardize Improvements within Operations • Implement Process Control System (PCS) • Document Lessons Learned • Identify Future Plans

Define > Measure > Analyze > Improve > Control

MIAMI-DADE COUNTY

Select Problem

Management reviewed many problems using a selection Matrix.

Project Selection Matrix					
				Selection Criteria	
Problem(s) (where cause is unknown and knowing cause is desired)	Customer (Internal or External)	A Impact on Customer (Accuracy/ Cost /Timeliness)	B Need to Improve (Performance Gap)	Estim. Month for Project Ready and Prep'd	C=A*B Overall
1 PWWM: Bulky Trash Collection Costs are too high	External	4	4	Oct '12	16.00
2 PWWM: Public Works' Road & Bridge operations needs to be more efficient/effective (e.g. generalist vs specialist teams)	External	3	4	Oct '12	12.00
3 PWWM: construction projects getting done quickly enough (especially length of time to launch project)	External/Internal	3	3	Oct '12	9.00
4 PWWM: Costs of Chemical Collection are too high	External	3	3	Oct '12	9.00
5 PWWM: Carryover is too high in Special Taxing Districts	External	3	3	Oct '12	9.00
6 Internal Services Department: Procurement process is too long/cumbersome	Internal	4	4	Oct - Nov '12	16.00
7 WASD: It takes too long for Dept to effectively answer/handle customer service calls	External	4	4	Nov '12	16.00
8 Transit: Cost of bus service has risen more dramatically than expected	External	4	4	Nov '12	16.00
9 Fleet Maintenance Costs are too high	Internal	tbd	tbd	Nov '12	TBD
10 PROS (Parks, Recreation, and Open Spaces): tbd	tbd	tbd	tbd	Nov - Dec '12	TBD
	Rating Scores:	5= Extreme 4= High	3= Moderate 2= Low 1=None		

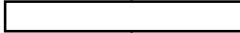The team was chartered by management to improve Road and Bridge operations.

MIAMI-DADE COUNTY
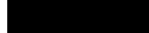
Develop Project Timeline Plan

The team developed a timeline plan to complete the Project.   4. ☑

Legend:

■	= Actual
☐	= Proposed

WHAT: Complete DMAIC Story Project by March 31, 2013

DMAIC Story Process Step	WHEN 2012					
	Oct	Nov	Dec	Jan	Feb	Mar
1. Define	☐ ■ Completed 11/11/12					
2. Measure	☐ ■ Completed 11/30/12					
3. Analyze			☐ ■ Completed 12/12/12			
4. Improve			☐ ■	1/30/13		
5. Control			■	☐		3/30/13

Define > Measure > Analyze > Improve > Control

4

Monitor Team Progress

The Team and Management used a Checklist to monitor team progress.

DMAIC Story Checkpoints

PLAN/DO/CHECK/ACT	Step	Checkpoints	Tools
PLAN	**Step 1 Define**	**Objective: Demonstrate the importance of improvement needs in measurable terms.** 1. The stakeholders' need(s) were identified. 2. The problem can be described as an "object" with a "defect" with unknown cause(s) that need to be identified. 3. A line graph outcome indicator was constructed that appropriately measures the problem (or gap). 4. A schedule for completing the five DMAIC Story steps was developed.	▪Team identified an indicator; developed a Flowchart and a Spreadsheet
PLAN	**Step 2 Measure**	**Objective: Investigate the features of the indicator, stratify the problem and set a target for improvement.** 5. Data contained or directly linked to the indicator were stratified from various viewpoints (i.e., what, where, when and who) and a significant dataset was chosen. 6. A target for improvement was established based on the stakeholders' need. 7. The impact of the target on the indicator was determined. 8. A problem statement that describes the "remaining dataset" was developed.	▪Histograms, Paretos
PLAN	**Step 3 Analyze**	**Objective: Analyze the stratified data to identify and verify the root causes.** 9. Cause and effect analysis was taken to the root level. 10. Potential causes most likely to have the greatest impact on the problem were selected. 11. A relationship between the root causes and the problem was verified with data. 12. The impact of each root cause on the gap was determined.	▪Single Case Bore; Fishbone ; RC Verification Matrix
DO	**Step 4 Improve**	**Objective: Develop and implement countermeasures to eliminate the verified root causes of the problem.** 13. Countermeasures were selected to address verified root causes. 14. The method for selecting the appropriate countermeasures was clear and considered effectiveness and feasibility. 15. Barriers and aids were determined for countermeasures worth implementing. 16. The action plan reflected accountability and schedule.	▪Countermeasures Matrix; Barriers and Aids; Action Plan
CHECK		**Objective: Confirm that the countermeasures taken impacted the root causes and the problem; and that the target has been met.** 17. The effect of countermeasures on the root causes was demonstrated. 18. The effect of countermeasures on the problem (or indicator) was demonstrated. 19. The improvement target was achieved and causes of significant variation were addressed. 20. The effect of countermeasures on the indicator representing the stakeholders' need was demonstrated.	Line Graph
ACT	**Step 5 Control**	**Objective: Prevent the problem and its root causes from recurring. Maintain and share the gains.** 21. A method was established to document, permanently change, and communicate the revised process or standard. 22. Responsibility was assigned and periodic checks scheduled to ensure compliance with the revised process or standard. 23. Specific areas for replication were identified.	▪Process Flowchart; Process Control Chart
ACT		**Objective: Evaluate the team's effectiveness and plan future activities.** 24. Any remaining problems (or gaps) were addressed. 25. Lessons learned, P-D-C-A of the Story process, & team growth were assessed & documented.	Lessons Learned

Define > Measure > Analyze > Improve > Control

MIAMI-DADE COUNTY

Identify Project Charter

The team developed a team Project Charter.

Project Charter		
Business Case	*Project Name:*	To Improve Efficiencies of Repair Operations 2. ☑
	Problem/Impact:	Road and Bridge Repairs are ongoing and require significant resources to address. Backlog of service requests result in late completions. Citizen complaints and risk can result with delayed completion of repairs. 1. ☑
	Expected Benefits:	Reduced costs; Improved Efficiencies. Improved service repair time on repairs.
Objectives	*Outcome Indicator(s)*	Q1- % of Repair Service Requests Completed Late
	Proposed Target(s)	Target= 2 %
	Time Frame:	October 2012 thru March 2013
	Strategic Alignment:	Supports the County's Business Plan
Scope	*In Scope:*	Public infra-structure repairs…e.g. Road, Bridge and Canal Repairs
	Out-of-Scope:	Other types of repairs
	Authorized by:	Kathleen Woods-Richardson
Team	*Sponsor:*	Kathleen Woods-Richardson
	Team Leader:	Manuel Garcia, Christina Cotter
	Team Members:	Antonio Cotarelo, Chris Rose, Javier Heredia, Stacy Santos, Nasif Alshaier
	Process Owner(s):	Manuel Garcia
	Mgmt Review Team:	Ray Scher; Chris Rose; Kathleen Woods-Richardson
Schedule	*Completion Date:*	31-Mar-13
	Review Dates:	Monthly and Final Review in Mach 2013
	Key Milestone Dates:	See Action Plan

Review Process Flow Chart

The team constructed a Process flow chart describing the Process.

The team next looked closer how to capture indicator data.

Repair County Roads, Bridges and Canals   (Process Owner: Manny Garcia)

STEP WHO	CUSTOMER	311 OPERATOR	RBC STAFF AND PWS	SUPERVISOR / FIELD CREWS
NEED	Need Repairs of Roads, Bridges or Canals			
OBSERVE/ IDENTIFY	• Observe County Roads And Bridges During Normal Work And Other Activities • Identify Needed Repairs And Report Via 311 Or Directly To RBC Staff			
GREET/ DISCUSS	Directly To RBC Staff? — NO / YES	• Greet Caller • Discuss Observed Repair Need(s) RBC Jurisdiction? — NO / YES		
REFER		• Refer Caller To Municipality/ Other Entity		
INTAKE/ GENERATE	Able To Schedule Crew Directly? — NO / YES	• Intake Service Request Information Into 311 • Generate Service Request	**P1 # of Days FROM Request Received by 311 TO Request Received by PWD**	
INTERFACE/ ASSIGN		• Interface With 311 Or PWS • Assign Supervisor		
SCHEDULES/ TRAVEL/ COMPLETE/ NOTIFY	**P2 - # of Days FROM Request Received By PWD TO Service Request Closed**			• Supv Schedules Crew • Crew Travels To Site • Completes Repairs • Turns In Paperwork • Supv Notifies RBC Staff
RECEIVE/ CLOSE/ NOTIFY	**Q1- % of Repair Service Requests Completed Late** **Q2- # of Days Repair Service Request Closed Late** **Q3- # of Days FROM Request Received by 311 (or PWD) TO Service Request Closed**		• Receive Repair Info From Supv • Close Out In 311 System • Notify Appropriate Parties As Needed	
COMPLETED	Service Rrequest completed			

7

DMAIC_Story_Miami_Dade_Roads-Bridges_Flowchart_11-2-12.vsd 11/10/12

Review Selected Indicator

The team collected Q1 indicator data and reviewed performance trends:

Q1- % of Repair Service Requests Completed Late
Fiscal 2011-2012

3. ☑

GOOD

3.3%

3.1%

4 Month Avg= 2.4%

GAP

Target = 2%

2.0%

1.2%

Percentage

- ◆— Target
- ■— Average
- ▲— Actual

Month

Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
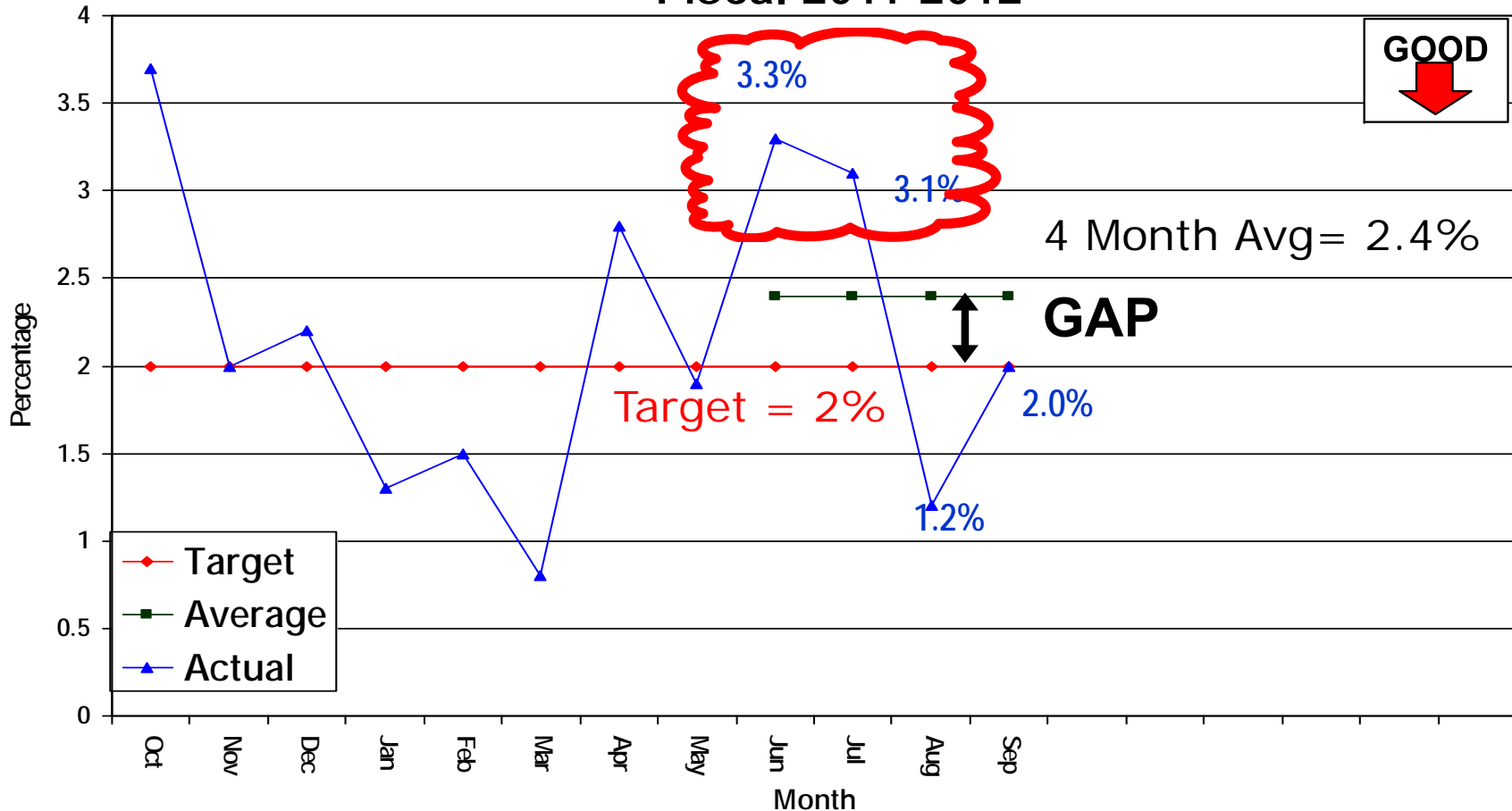
The team next looked closer at the June and July recent months.

Define > Measure > Analyze > Improve > Control

MIAMI-DADE COUNTY

Hidden Costs of Late Repairs

The team identified info on costs of late repairs.

1. Handling Costs for Inquiries/Complaints asking about repairs

    a. (136 late repairs more than 13 days for Jun-Jul) X 6 X (50% probability
of call) X(.5 Staff Hrs per Call)X($26 per Staff Hr).. $5,304

2. Managing Service Repair Requests Backlog

    a. (136 late Repair Requests more than 13 days for Jun-Jul) X 6 X (.05
Staff Hrs per request) X($26 per staff hr)X(4 times).................................... $4,243

3. Claims through Internal Service Dept

    a. Settlement Costs for RBC (316 claims for FY 2011-12)...................... $836,160

    b. Processing Costs for RBC (25 Litigations for FY 2011-12)

      1. An equivalent county attorney (Salary + Fringe Benefits)……...........$200,00

      2. 3 equivalent claims Investigators (Salary+ Fringe Benefits)...............$90,635

      3. 2 equivalent claims Coordinators (Salary+ Fringe Benefits)...............$99,127

      4. .5 equivalent claims manager (Salary+ Fringe Benefits).....................$53,356

Annual Costs = $1,288,827

Define > Measure > Analyze > Improve > Control

MIAMI·DADE COUNTY

Identify Data Collection Needs

The team developed a data collection spreadsheet…

BCB	D E M O G R A P H I C S										
	WHAT					WHO			WHERE		
	B	C	D	E	F	G	I	J	K	L	M
Line #	Complaint Asgnmt #	Problem Description	Complaint Origin System	How Complaint Received	CSR Transferred? Y/N	Reporter Last Name	Rec'd By	Complaint Source	Complaint Address	Complaint Zone	Neat Zone #
					%Y						
					96.0						
1	A2011089249	Weed Control	PWS	N	N	Pw Neat C	SHERI	PUBLIC AT I	24500 SW 16	0	5
2	A2011089250	Weed Control	PWS	N	N	Pw Neat C	SHERI	PUBLIC AT I	SW 118TH A	0	5
3	A2011089251	Weed Control	PWS	N	N	Pw Neat C	SHERI	PUBLIC AT I	SW 122ND A	0	5

MILESTONES							DURATION			OUTCOMES		
N		O	P		Q	Z	AA	AB	AC= P-N	AD= AA-P	AI= AA-(N or P)	AO= Z-AB
1- Request Received by 311			2- Received By PWD			3- Request Closed		Complaint Due Date	Received by 311 TO Received by PWD	Received by PWD TO Rqst Closed	311 Rc'd/ PWD Rcd TO Rqst Closed	# of Days Repair Reques Closed Late
Date	Day		Date	Day		Date	Day					
	%Mo			%Mo			%Mo		Avg # of Days			
	3.4			9.5			11.6		0.0	37.2	37.3	20.4
									P1	P2	Q3	Q2
		29-Nov-11	Tu	20-Jul-12	Fr	30-Nov-11				234	234	233
		29-Nov-11	Tu	20-Jul-12	Fr	30-Nov-11				234	234	233
		29-Nov-11	Tu	20-Jul-12	Fr	30-Nov-11				234	234	233

Additional OUTCOMES columns (circled):

AP='Y' if Z-AB>0	BB
Repair Request Closed Late?	Comments
%Y	
100.00	
Q1	
Y	
Y	
Y	

Define > Measure > Analyze > Improve > Control

10

Stratify the Problem

The team stratified the June and July Late Repairs and found...

Customer Service Requests Completed Late (after Due Date)
PWWM   June-July Completed CSRs

n = 328 (includes 7 CSRs over 100 days late)
mean = 20.4
std dev = 34.4

136 (41%) of the Late Repairs were Very Late (13 or more Days Late)
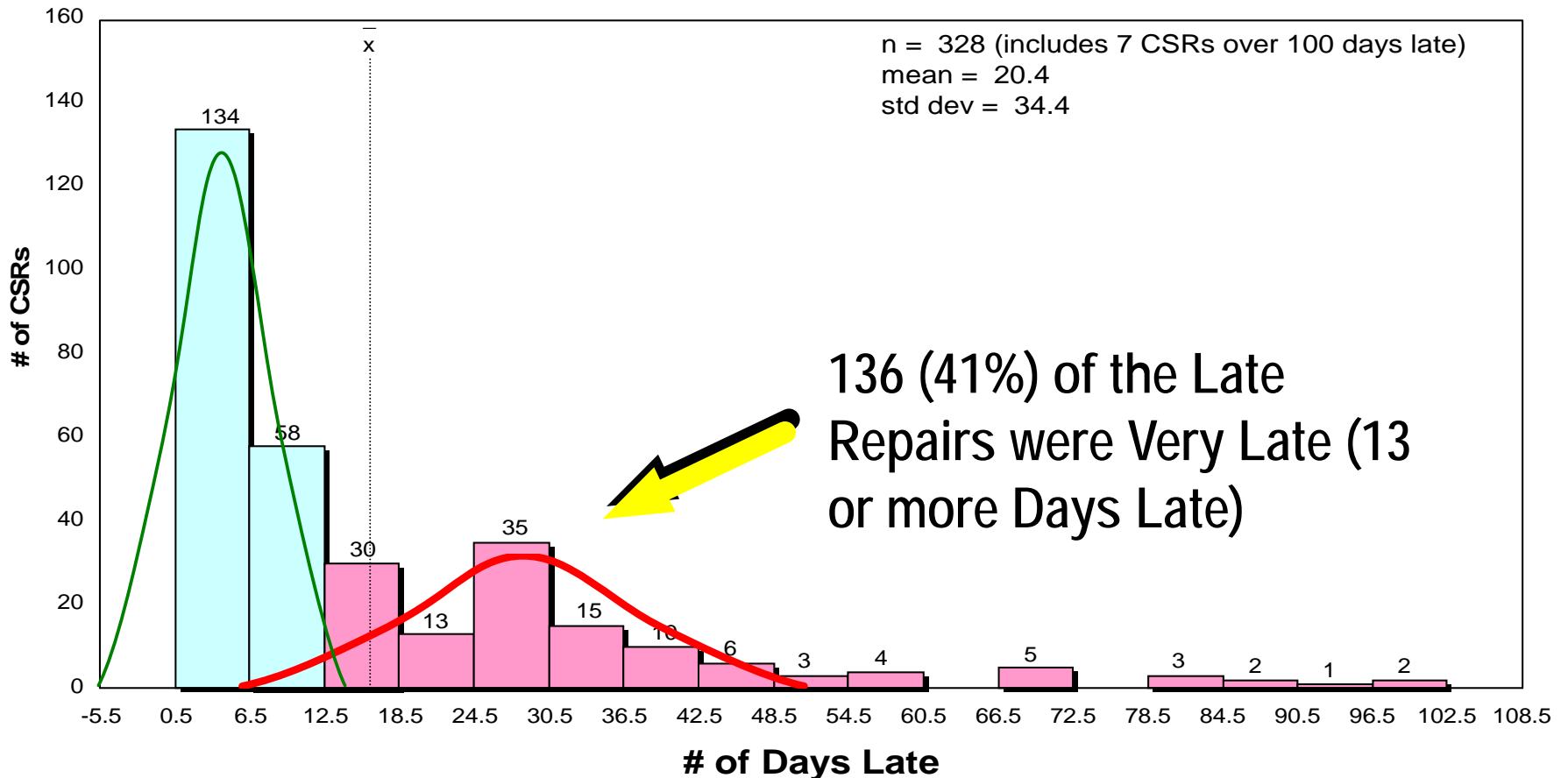
The team looked closer at these 136 Very Late Repairs.

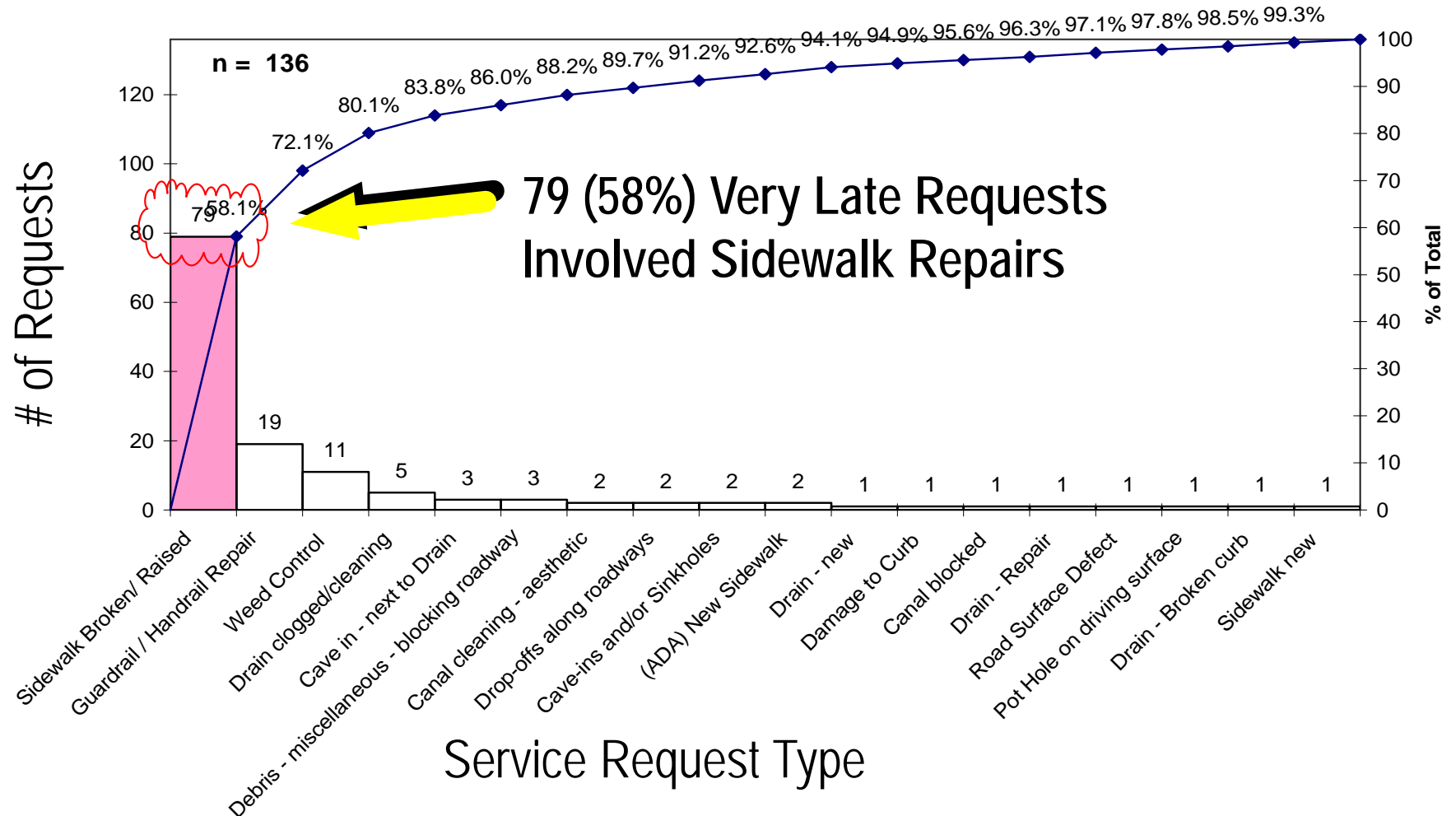Define > Measure > Analyze > Improve > Control

Stratify the Problem

The team stratified the 136 Very Late Repairs many ways and found...

Customer Service Requests Completed Very Late (13 or more days after Due Date)
PWWM   June-July Completed CSRs

79 (58%) Very Late Requests
Involved Sidewalk Repairs

The team looked closer at these 79 Sidewalk Repairs.

Define | Measure | Analyze | Improve | Control

12

Stratify the Problem

The team stratified the 79 Very Late Sidewalk Repairs many ways and found...

Customer Service Requests for Sidewalk Repairs Completed Very Late (13 or more days after Due Date) PWWM   June-July Completed CSRs
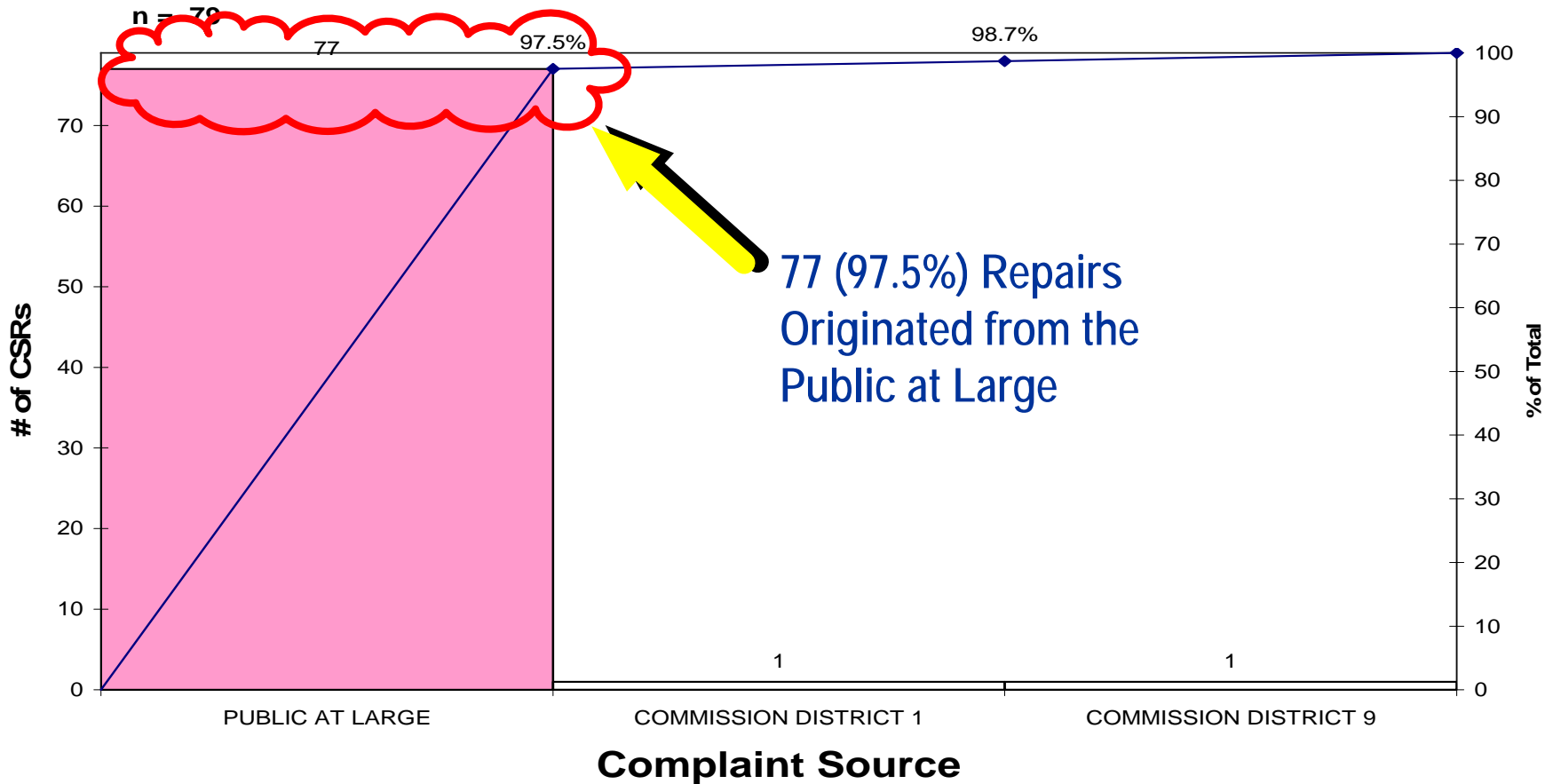
77 (97.5%) Repairs Originated from the Public at Large

Problem Statement: *"77 Customer Service Requests from the Public at Large for Sidewalk Repairs were Completed Very Late (13 or more days after the Due Date) in June and July 2012"*

Define Measure Analyze Improve Control

13

The team sampled 23 of the 77 Late Sidewalk Repairs and reviewed Request documentation before conducting Single Case Bore Analysis.

Single Case Bore Analysis

Problem Statement: *"77 Customer Service Requests from the Public at Large for Sidewalk Repairs were Completed Very Late (13 or more days after the Due Date) in June and July 2012"*

Reasons or Factors (That possibly contributed to Very Late Repair of Sidewalk)	Random Sample of 23 of the 77 Sidewalk Repairs																							Total	Percentage
	2012019048	2012035531	2012034629	2012034798	2012033483	2012031877	2012019054	2012024210	2012025323	2012030772	2012029929	2012019051	2012023929	2012026364	2012030058	2012026775	2012030455	2012029352	2012028654	2012028657	2012028660	2012028661	2012028207		
Requires both grinding and asphalt patch (two crews)	X	X	X	X		X	X		X			X				X	X	X	X	X	X	X	X	16	70%
Office closure issue		X			X			X		X	X					X					X			7	30%
One very large project (took a long time to complete)						X					X	X	X	X										6	26%
Tree Roots							X					X					X	X						4	17%
Utility Verification	X				X			X																3	13%
Internal coordination required				X		X								X										3	13%
Requires ADA verfication of proximity				X																				1	4%
Pending permanent sidewalk repair (takes time to make this determination)					X																			1	4%
Municipal coordination required				X																				1	4%

The team next looked closer at these 3 factors.

Define > Measure > Analyze > Improve > Control

14

Develop and Implement Action Plan

The team implemented an Action Plan for the team's Countermeasures.

16. ☑

·WHAT·:· **Implement Countermeasures to Reduce Service Request Late Completions**

		·WHEN								
		·2012	·2013							
·HOW	**·WHO**	·Dec	·Jan	·Feb	·Mar	·Apr	·May	·Jun	·Jul	·Aug
·1. ·Develop Countermeasures:										
·A1- · Create PWWM Asphalt Plant	·Chris	▭ ■	·1/15/13							
·A2- · Secure second Supplier	·Chris	▭ ■	·1/15/13							
·A4- · Ask Provider to add more days of ·Patch Supplies	·Chris	▭ ■	·1/15/13							
·A5- · Develop SOP for Scheduling Asphalt Crews	·Javier/ ·Christina/ ·Stacy	▭ ■	·1/15/13							
·A6- · Re-train staff in Priority of finishing Asphalt ·Patches when possible	·Javier/ ·Christina/ ·Stacy	▭ ■	·1/15/13							
·B1- · Create new task code for large projects and ·SOP for use of new task code	·Nasif	▭ ■	·1/15/13							
·C1-·Develop Procedure to separate out sidewalk ·repairs in phases	·Manuel	▭ ■	·1/15/13							
·C2- · Add two men crews	·Chris	▭ ■	·1/15/13							
·2. ·Secure Management Approval of ·Countermeasures ·(share benefits and cost savings)	·Team		▭	·3/1/13						
·3. ·Communicate/Train PWWM Staff in ·Countermeasures and related ·policies/procedures ·(share benefits and cost savings)	·Team		▭		·3/15/13					
·4. ·Implement Countermeasures and Pilot ·Countermeasures	·Manuel ·Garcia/ ·Team			▭		·4/15/13				
·5. ·Review Pilot and determine Benefits and ·adjust as necessary and present results to ·management	·Team/ ·Manuel ·Garcia					▭	·4/30/13			
·6. ·Establish On-going responsibilities and ·standardize countermeasures into operations	·Manuel ·Garcia						▭			▭
						·On·going				

Define > Measure > Analyze > **Improve** > Control

15

Implement Process Control System

The team developed a Process Control System to better monitor the process on-going.

Process Control System						
Process Name: Repair County Roads and Bridges			**Process Owner:** Manuel Garcia			
Process Customer: Public at Large			**Critical Customer Requirements:** Respond Timely and Satisfactorily to Service Requests			
Process Purpose To respond to (and complete) service requests			**Current Sigma Level** 98% (approx 2.9 sigma)			
			Outcome Indicators Q1, Q2, Q3			

Process and Quality Indicators		Control Limits	Checking / Indicator Monitoring	Timeframe (Frequency)	Responsibility	Contingency Plans / Misc. Actions Required for Exceptions / Procedure References
Process Indicators And Quality Indicators		Specs/ Targets	Data to Collect — What is Checking Item or Indicator Calculation	When to Collect Data?	Who will Check?	
P1	# of Days FROM Request Received by 311 TO Request Received by PWD	2 days	(date Request recd by PWD) - Date Request Recd by 311)	Monthly	Manuel Garcia	311/PWD system
P2	# of Days FROM Request Received By PWD TO Service Request Closed	15 Days	(Date Request completed) (Date Request recd by PWD)	Monthly	Manuel Garcia	311 system **Escalate to Supv if Overdue**
Q1	% of Repair Service Requests Completed Late	75%	100*(# Completed Late)/(# completed)	Monthly	Manuel Garcia	311 system **Overdue Rpt**
Q2	# of Days Repair Service Request Closed Late	0	9 [(Date Completed) (Date Recd by 311)]	Monthly	Manuel Garcia	311 system **Overdue R pt**
Q3	# of Days FROM Request Received by 311 (or PWD) TO Service Request Closed	120 days	(Date Request Completed) - (Date Request Rcd by 311)	Monthly	Manuel Garcia	311/PWD system **Overdue R pt**

Approved: _____ Date: _____ Rev #: _____ Rev Date: _____

The team looked ahead to the future.

Define > Measure > Analyze > Improve > Control

MIAMI-DADE COUNTY

Identify Lessons Learned

Lessons Learned

1) **Accurate and appropriate data is very important in analysis.** Care should be taken to identify appropriate data collected in order to solve the problem.

2) **There are many approaches to analyze problems**, each requiring the use of appropriate tools to separate the pertinent data needed to help identify Root Causes.

3) **Learned how to interpret various graphs** in order to better understand what is happening with the process and outputs.

4) **All Root Causes come from either Standards that Fail or People that Fail the Standards"**

Next Steps

1) Continue to monitor the countermeasures and performance results.

Define > Measure > Analyze > Improve > Control

MIAMI-DADE COUNTY