

## Six Sigma DMAIC Improvement Story

### *Green Belt* **Project Objective:**

### Reduce the Time to Deploy Miami-Dade Police Department Vehicles

Last Updated: 6-18-13

### Team: Two Bald Guys and the Fleet Team

Alex Alfonso (Co-Team Leader) Cara Tuzeo (Co-Team Leader) Gus Knoepffler Patrick Burke Felix Perez Bill Thommes Saima Plasencia Efren Lopez Rey Llerena (Subject Matter Expert) J.D. Patterson (Sponsor)



## Six Sigma Problem Solving Process

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

#### **DMAIC** Performance Improvement Process

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





## **Identify Project Charter**

#### The team developed a team Project Charter.

		Project Charter
	Project Name:	Current Vehicle process cannot support bulk purchase of vehicles 2.
Business Case	Problem/Impact:	MDPD Vehicles are vital in providing Police services to Miami-Dade citizens. Delayed Vehicle deployment creates increased maintenance, increased fuel consumption and overtime costs in ITD. Also, personnel downtime can result when vehicles are down without replacement.
	Expected Benefits:	Reduced time to deploy vehicles, more efficient process and better use of resources; determine funding need for more timely outputs
	Outcome Indicator(s)	Q2- Fiscal YTD % of MDPD Vehicles Deployed Timely (within 90 days from receipt from manufacturer)
Objectives	Proposed Target(s)	Target=70%
	Time Frame:	Feb 2013 thru Jun 2013
	Strategic Alignment:	Supports the County's Business Plan
	In Scope:	MDPD Vehicles
Scope	Out-of-Scope:	Other county Vehicles
	Authorized by:	J.D. Patterson
	Sponsor:	J. D. Patterson
	Team Leader:	Alex Alfonso, Cara Tuzeo
Team	Team Members:	Cara Tuzeo, Gus Knoepffler , Patrick Burke, Felix Perez, Bill Thommes, Saima Plasencia
	Process Owner(s):	Ana G., Felix Perez, Gus Knoepffler
	Mgmt Review Team:	Ray Scher; J.D. Patterson
	Completion Date:	30-Jun-13
Schedule	Review Dates:	Monthly and Final Review in June 2013
Conedule	Key Milestone Dates:	See Action Plan







# **Develop Project Timeline Plan**

The team developed a timeline plan to complete the Project.





## **Monitor Team Progress**

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

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		Objective: Demonstrate the importance of improve	ment needs in measurable terms.
	Stop 1	1. The stakeholders' need(s) were identified.	Team identified an indicator:
	Step I	2. The problem can be described as an "object" with a "defect" with unknown cause(s) that need to be identified.	
	Define	3. A line graph outcome indicator was constructed that appropriately measures the problem (or gap)	developed a Flowchart and a
		4. A schedule for completing the five DMAIC Story steps was developed.	Spreadsheet
F		Objective: Investigate the features of the indicator, stratify the	e problem and set a target for improvement.
	Step 2	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.	Histograms, Flowchart Stratification,
-	Moasuro	6. A target for improvement was established based on the stakeholders' need.	Paretos
3	Measure	7. The impact of the target on the indicator was determined.	
ר		8. A problem statement that describes the "remaining dataset" was developed.	
Γ		Objective: Analyze the stratified data to identit	fy and verify the root causes.
	01	9. Cause and effect analysis was taken to the root level.	Fishbone
	Step 3	10. Potential causes most likely to have the greatest impact on the problem were selected.	
	Analyze	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.	
		Objective: Develop and implement countermeasures to elimit	nate the verified root causes of the problem.
		13. Countermeasures were selected to address verified root causes.	Countermeasures Matrix: Barriers an
		14. The method for selecting the appropriate countermeasures was clear and considered effectiveness and feasibility.	Aids: Action Dlan
g	Ston 4	15. Barriers and aids were determined for countermeasures worth implementing.	Alus, Action Fian
-	Step 4	16. The action plan reflected accountability and schedule.	
		Objective: Confirm that the countermeasures taken impacted the root caus	es and the problem; and that the target has been me
<b>-</b>	improve	17. The effect of countermeasures on the root causes was demonstrated.	Before and After Line Graph
2		18. The effect of countermeasures on the problem (or indicator) was demonstrated.	
5		19. The improvement target was achieved and causes of significant variation were addressed.	Proposed Flowchart
		20. The effect of countermeasures on the indicator representing the stakeholders' need was demonstrated.	
		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	
	Step 5	22. Responsibility was assigned and periodic checks scheduled to ensure compliance with the	Process Control System;
5	etep e	revised process or standard.	
۲	Control	23. Specific areas for replication were identified.	
	Control	Objective: Evaluate the team's effectiveness	an a plan future activities.
		24. Any remaining problems (or gaps) were addressed.	Lessons Learn
		25. Lessons learned, P-D-C-A of the Story process, & team growth were assessed & documented.	





## Hidden Costs of Late Vehicle Deployments

The team estimated annual costs of late vehicle deployments

Hidden Cost Type:	Annual Cost Per Unit	Cost per Business Day Per Unit	Cost for Per Vehicle for 90 Day Prep	Number of Car Historically Outfitted within 90 Days	90 Days Expense	Average Vehicle beyond 90 day	Average Completion of 121 days	Total Annual Expense
Vehicle Transfer Productivity Loss:	\$12,932	\$ 50	\$ 4,476	25	\$111,912	96	\$ 577,766	\$ 689,679
Additional Annual Unit Vehicle Maintenance:	\$ 1,985	\$8	\$ 687	25	\$ 17,179	96	\$ 88,688	\$ 105,867
Total Inefficiency:	\$14,917	\$57	\$ 5,164		\$129,091		\$ 666,454	\$ 795,546







## **Review Process Flow Chart**



COUNTY

## **Identify Data Collection Needs**

The team developed a data collection spreadsheet to collect indicator and demographic data...

#### Miami-Dade Police Department Vehicle Deployment Summary

BCB	CB DEMOGRAPHICS MILESTONE DATES																			
		VEHICL	E INFOR	MATION	-															
	В	С	D	E	F	G	Ν	0	Р	Q	S	т	U	V	W	х	Y	z	AA	AB
Line #	Vehicle Number	Vehicle Year	Vehicle Make	Vehicle Model	Deployment Type	Decals Needed?	1- Vehic Receiv Date	ile /ed Day	2- Vehic Accep Date	le ted Day	3- Transpo Program Date	nder med Day	4 Decals/ Install Date	Tag ed Day	5- Radio/E Install Date	quip led Day	6- Cage Install Date	e ed Day	7- Vehic Deploy Date	cle yed Day
				•		%Y		%Mo		%Mo		% Mo		% Mo		% Mo		% Mo		% Mo
						33.3		0.0		0.0		0.0		0.0		0.0		33.3		33.3
1	2661A	2012	Dodge	Charger	Uniform Patro	Υ	6/2/09	Tu	6/20/09	Sa	6/26/09	Fr	6/30/09	Tu	8/21/09	Fr	8/23/09	Su	9/1/09	Tu
2	2662A	2012	Ford	Crown V.	Unmarked	Ν	10/9/09	Fr	10/21/09	We	10/27/09	Tu	10/27/09	Tu	11/6/09	Fr	11/8/09	Su	11/9/09	Мо
3	2663A	2012	Dodge	Charger	K9 Vehicle	Ν	6/21/09	Su	6/26/09	Fr	7/10/09	Fr	8/11/09	Tu	8/20/09	Th	8/24/09	Мо	8/26/09	We

DURATION								COMES	
AC=	AD=	AE=	AF=	AG=	AH=	AI=	AO=	AP='Y' if	ВВ
P-N	S-P	U-S	W-U	Y-W	AA-Y	AA-N	AI-90	AI<=90	
Vehicle	Vehicle	Transpndr	Decals/Tag	Rdio/Eqp	Cage	Vehicle			
Received	Accepted	Progrmd	Installed	Installed	Installed	Received			
ТО	ТО	ТО	ТО	ТО	ТО	ТО	# of Day		
Vehicle	Transpndr	Decals/Tag	Radio/Eqp	Cage	Vehicle	Vehicle	Deployed	Deployed	
Accepted	Progrmd	Installed	Installed	Installed	Deployed	Deployed	Late	On-Time?	Comments
			Avg # of [	Days				%Y	
11.7	8.7	12.0	23.7	2.7	4.0	62.7	-27.3	66.7	
P1	P2	Р3	P4	Р5	P6	Q1	Q3	Q2	
18	6	4	52	2	9	91	1	N	
12	6	0	10	2	1	31	-59	Ý	
5	14	32	9	4	2	66	-24	Ý	
								イア	8

MIAMIDADE



## **Review Selected Indicator**

The team collected indicator data and reviewed performance trends: 3.

Q2- Fiscal YTD % of MDPD Vehicles Deployed (or Inventoried) Timely (within 90 Days) FY 2012-2013



# **Stratify the Problem**

The team stratified 121 MDPD Deployed Vehicles using a histogram and found...

#### MDPD Vehicles Deployed from 9/19/12 thru 1/22/13



The team looked closer at comparing the Late to the Timely Deployed Vehicles.





# **Stratify the Problem**

The team compared the LATE Vehicles to the TIMELY Vehicles and found...

#### **Deploy MDPD Vehicles**



The team looked closer at the 96 LATE Vehicles in the Program Transponder step.





# **Stratify the Problem**



The team stratified the 96 Late Deployed Vehicles using a histogram and found...





## Stratify the Problem (Continued)



**Problem Statement:** *"50* MDPD Uniform Patrol Vehicles deployed between 9/19/12 thru 1/22/13 were delivered late (>94 days from receipt) and took over 30 days to program the fuel transponder"





## **Identify Potential Root Causes**



The team completed Cause and Effect Analysis and found...



The team next looked to verify these (3) Potential Root Causes.







# Verify Root Causes

### The team collected data to verify the root causes and found.... 11.,12.

	<b>Root Cause Verification Matrix</b>						
P	Potential Root Cause	How Verified?	Root Cause or Symptom				
A	Transponder Program Step Design now Out- of-Date because subsequent work takes longer	Team Interviewed SMEs and verified that the transponder programming was being performed early in the process and that it was based on assumption that the subsequent Vehicle Preparation steps would take less than 60 daysnow subsequent steps take longer requiring re-programming of transponder.	( <sup>Root</sup> Cause				
В	Radio Shop and ISD Fleet Locations are too Far apart to allow for Installation coordination	Team Confirmed previous distance between ITD and Radio Shop was approximately 13 miles apart and vehicles cannot travel without License tags making handoffs time consuming and requiring additional staff transporting time	(Root Cause				
С	Priority for New Vehicle Transponder Programming is not well defined	Team confirmed that there was no written policy to prioritize new vehicle transponder work to other work including repairs on existing vehicles.	Root Cause				

...all three (3) were validated as root causes.





# Identify and Select Countermeasures

Γh	e team brainstor	rmed many countermeasu	ires and narrowed them down to these for	or ev	/alu	atio	n:
		Countermeas	ures Matrix				
				Legend:	5=Extremel 4=Very <b>Rat</b>	3=Mo ly 2=S 1=Li t <b>ings</b>	derately omewhat ttle or None
	Problem Statement	Verified Root Causes	Countermeasures	Effectiveness	Feasibility	Overall	Take Action? Ves/No
	"50 MDPD	A - Transponder Program Step Design now Out-of-	A1- Change Vehicle Status to prevent deactivation of Transponder	3	5	15	Ŷ
I	Uniform Patrol Vehicles deployed between 9/19/12	B - Radio Shop and ISD	A2/B1- Change Transponder installation and Programming to be performed later in Process	4	5	20	Y
	thru 1/22/13 were delivered late (>94 days from	Far apart to allow for Installation coordination	<b>B2-</b> Re-design Work Process to parallel ISD, Radio Shop and MDPD Vendor work	4	5	20	Y
( re c pi	receipt) and took over 30 days to program the fuel	C - Priority for New	<b>C1-</b> Develop Service Level Agreements for all Parties involved in Process	4	5	20	Y
	transponder"	Programming is not well defined	C2 - Fill Vacant Maintenance Repairman and fund another full time Maintenance Repairman	5	4	20	Ů

The team selected All five (5) countermeasures for implementation.





# **Identify and Select Countermeasures**

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



Countermeasure(s): Implement 4 Countermeasures to Speed of MDPD Vehicle Deployment

	Barriers	Aids					
Impact (H, M, L)	Forces against Implementation	Forces For Implementation					
H	1) Budget Constraints for Repairman (Supported by Aid:A,B,C,D,E)	A) Management very supportive of team's efforts in saving costs					
Η	2) Space Contraints (Supported by Aid:A,B,C,E)	B) Analyis that indicates benefits to Organization/Community					
Μ	3) Weather can delay work (Supported by Aid: B)	C) Employees/Union could Support faster deployment					
		D) Professional Image enhanced					
Μ	4) Security at Location (Supported by Aid: A,B,E)	E) Lower Vehicle operting and Maintenance costs					





## **Review Results**

The team collected indicator data and reviewed results of team's countermeasures

Q2- Fiscal YTD % of MDPD Vehicles Deployed (or Inventoried) Timely



# Other Efficiency Factors:

Marked Vehicle Lighting Revision:		
<ul> <li>Current Configuration (w/ 4 hrs ISD Labor):</li> </ul>	\$	827
<ul> <li>Revised Configuration (w/o 4 hrs Efficiency)</li> </ul>	\$	810
Efficiency Per Marked Vehicle:	-\$	17
FY 12/13 Marked Vehicles (Qty: 60):	-\$	1,020
Vehicle Get-Ready Relocation:		
<ul> <li>Transportation Efficiency:</li> </ul>	-\$	3,500
Reduction of Intake/Disposal:	-\$2	<u>79,000</u>
Total:	-\$2	82,500







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# Other Efficiency Factors:

#### • Vehicle Attrition Savings: 157 Retired w/o replacement (5/13)

<ul> <li>EOY FY 12/13 Projection:</li> </ul>	-343 Vehicles retired
FY 12/13 Delivery:	182 Vehicles (New)
Net Remaining Loss:	-186 Veh w/o replace
Projected FY 13/14 Impact:	
<ul> <li>FY 12/13 Net Loss Carryover:</li> </ul>	-186 w/o replace
<ul> <li>FY 13/14 Projection:</li> </ul>	-411 Vehicles retired
FY 13/14 Projected Purchase:	210 Vehicles (New)
<ul> <li>Net Projected Loss of EOY FY 13/14:</li> </ul>	-387 Veh w/o replace
Projected Budget Vehicle Attrition Savings for FY 1	3/14:
Fuel Savings:	\$ 1.0 M
Maintenance Savings:	\$ 1.4 M
Total Savings:	\$ 2.4 M







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## **Standardize Countermeasures**





## **Standardize Countermeasures**







## Standardize Countermeasures

#### ... completed the Process Control System (PCS) Form.

	Process Control System								
Proce Depar	ess Name: Deploy Miami-Dae tment Vehicles	de Polic	ce	<b>Process Owner:</b> (Process Owners: Ana G., Felix Perez, Gus Knoepffler)					
Proce Depar	ess Customer: Miami-Dade tment	Police		Critical Customer Requirements: Provide Timely MDPD Vehicles with Requested Equipment					
Proce Vehicl	Process Purpose:     Equip and Delivery New     Current Sigma Level:     TBD       Vehicles to MDPD     Outcome Indicators:     01								
	Process and Quality Indicators			Checking / Indicate	or Monitorir	ng			
	Process Indicators	Control Limits	D	ata to Collect	Timeframe (Frequency)	Responsibility	Misc. • Actions Required		
	Quality Indicators	Specs/ Targets	What or Ind	is Checking Item icator Calculation	When to Collect Data?	Who will Check?	for Exceptions <ul> <li>Procedure</li> <li>References</li> </ul>		
P1	# of Days to Accept Vehicle (from Vehicle Received)	1 day	(Date Ve Date Vel	hicle Accepted)- hicle Received)	Monthly	ISD	ISD Spreadsheet; Contact vendor if problems		
P2	# Days to Place Equipment in Trunk (from Vehicle accepted)	TBD	(Date Eq Trunk)- E Accepted	uipment placed in Date Vehicle ป)	Monthly	ISD	ISD Spreadsheet; Contact MDPD if problems		
P3	# of Days to Install Equip/Decals (from Equip in Trunk)	TBD	(Date Eq Installed) Trunk))	uip/Decals - (Date Equip in	Monthly	ISD	ISD Spreadsheet; Contact Party delaying process		
P4	# of Days to Install Cage (from Equip/Decals Installed)	TBD	(Date Ca Vehicle E installed)	ge Installed)- (Date Equip/Decals	Monthly	ISD	ISD Spreadsheet;		
P5	# of Days to Deploy (or Inventory) MDPD Vehicle (from Cage Installed)	TBD	(Date Ve Delivered cage inst	hicle d/Inventoried)-(Date alled)	Monthly	ISD	ISD Spreadsheet;		
Q1	# of Days to Deploy (or Inventory) MDPD Vehicle (Vehicle received)	90 Days	(Date Ve Delivered Vehicle F	hicle d/Inventoried)-(Date Received)	Monthly	ISD	ISD Spreadsheet;		
Q2	Fiscal YTD % of MDPD Vehicles Deployed (or Inventoried) Timely (within 90 Days)	70%	100*(# of within 90 delivered	f Vehicles Delivered days)/(# of vehicles l)	Monthly	ISD	ISD Spreadsheet;		

Approved:

Date: \_\_\_\_\_ Rev #: \_\_\_\_ Rev Date: \_\_\_\_\_

#### The team looked ahead to the future.



Measure Analyze Improve Control Define





## **Identify Lessons Learned**

### Lessons Learned

- 1) Project allowed Business partners involved in the same process to communicate better and develop a better process to address common problems.
- 2) Data stratification was very important as it took the team to areas not initially thought to be part of the problem.
- **3) Creative Thinking techniques were more valuable** *in identifying more diverse countermeasures for the team to evaluate.*
- 4) Interviewing Subject Matter Experts after "Data Stratifications" proved very helpful in identifying countermeasures.
- 5) Flowchart Technique helped all team members see the process more clearly and was used to help identify communicate process improvements.

Next Steps

### 1) Monitor implementation of Countermeasures.





