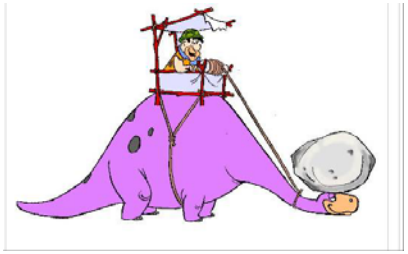
Six Sigma DMAIC Improvement Story

Green Belt **Project Objective:**

To Reduce the Length of Time to Launch Capital Project

Last Updated: 04.15.13

Team: *PWWM Capital d/b/a Slate Consulting*



Gaspar Miranda (Co-Team Leader) Anita Gibboney (Co-Team Leader)

Maria E. Johnson Michael Bauman Asok Ganguli

Sandra Melean Andrea Brown

Kathleen Woods-Richardson (Sponsor)

Active Strategy

Identify Project Charter

The team developed a team Project Charter.

Project Charter		
Business Case	*Project Name:*	Reduce Cycle time to launch PWWM Capital Projects
	Problem/Impact:	PWWM Capital Projects are important to be completed timely for continuation and improvement of services provided to county customers.
	Expected Benefits:	Improvement will result in reduced time to launch PWWM Capital Projects
Objectives	*Outcome Indicator(s)*	Q4- # of DaysCapital project Completed Late
	Proposed Target(s)	Target=TBD
	Time Frame:	Nov 2012 through March 2013
	Strategic Alignment:	Supports the County's Business Plan
Scope	*In Scope:*	PWWM Capital Projects
	Out-of-Scope:	Non-PWWM Capital projects
	Authorized by:	Kathleen Woods-Richardson
Team	*Sponsor:*	Kathleen Woods-Richardson
	Team Leader:	Gaspar Miranda and Anita Gibboney
	Team Members:	Maria E. Johnson, Mike Bauman, Asok Ganguli, Sandra Melean, Andrea Brown
	Process Owner(s):	Assistant Director
	Mgmt Review Team:	Antonio Cotarelo; Chris Rose; Kathleen Woods-Richardson
Schedule	*Completion Date:*	31-Mar-13
	Review Dates:	Monthly and Final Review in March 2013
	Key Milestone Dates:	See Action Plan

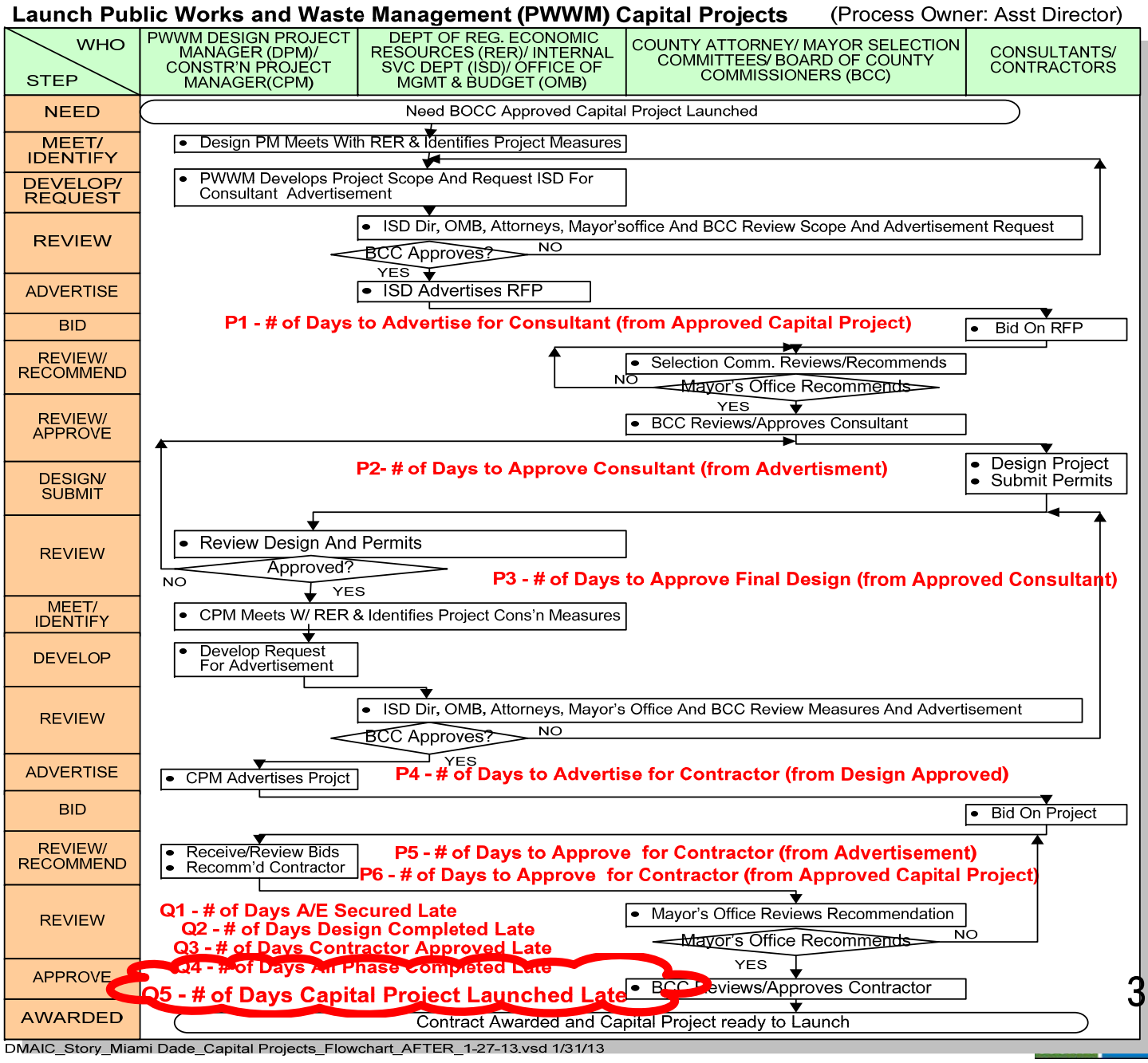
2. ☑

1. ☑

Review Process Flow Chart

The team constructed a Process flow chart describing the Process.

The team next looked closer how to capture indicator data.



Hidden Costs of Late Capital Projects

The team identified info on costs of late Capital Projects

Annual Cost

1. Construction delay cost (on an average $5 million contract with a year delay)

A one year (365 days) delay on a $5 million roadway construction project is estimated to cost the County 4.5% of the total estimated contract amount (5,000,000*.045)..... $225,000**

2. Managing Project Backlog

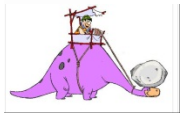
It is estimated that a Project Manager is projected to spend an additional 10% to 15% of his/her time doing project rework (average salary $85,000 * 15%)..... $12,750

3. Design rework

A modification in the project design of a typical roadway project, based on an average $400,000 design cost and an additional 10% per change order fee is estimated to cost the County..... $40,000

Hidden Costs = $277,750

**This information is based on the table of Construction Cost Inflation Factors published by the Florida Department of Transportation (FDOT) Office of Policy Planning.



Identify Data Collection Needs

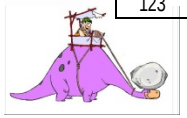
The team developed a data collection spreadsheet.

Miami-Dade Capital Project Status Summary

BCB	DEMOGRAPHICS													MILESTONE DATES												
	WHAT							WHERE			WHO															
	B	C	D	E	G	H	I	J	K	L	M	N	O	P	Q	R	S	U	V	W	X	Y	Z	AA	AB
Line #	Project #	Project Desc'ptn	Project Type	Right-of-Way Acquistion?	Total Cost ($)	Funding Source	Pubblic Involved?	Dist Cap Prjct Phys Loc'n	District Served	Muni-cipality	A/E PM	Design PM	Con-struction PM	1- A/E Selection Start Date	Day	2- A/E Selection End Date	Day	3- Design Start Date	Day	4 Design End Date	Day	5- Cntrctor Selection Start Date	Day	6- Cntrctor Selection End Date	Day
				%Y	Avg		%Y								% Mo		% Mo		% Mo		% Mo		% Mo		% Mo
				15.0	$5,576,426										20.0		15.0		40.0		25.0		5.0		15.0
1	6E+06	WIDEN N	Roadwa	N	$8,314,000						Leandro	Leandr	Frank Aira	1/28/03	Tu	12/14/03	Su	8/4/03	Mo	7/1/04	Th	12/6/06	We	6/4/07	Mo
2	6E+06	IMPROVE	Roadwa	N	$8,201,000						Leandro	Leandr	Frank Aira	9/29/03	Mo	11/4/04	Th	1/3/05	Mo	12/11/06	Mo	9/12/06	Tu	7/31/07	Tu
3	6E+06	WIDEN N	Roadwa	N	$6,194,000						Leandro	Leandr	Frank Aira	2/5/04	Th	6/7/04	Mo	7/22/04	Th	6/4/07	Mo	3/1/07	Th	1/10/08	Th

DURATION													OUTCOMES								
						TARGET DURATIONS															
AC= R-P	AD= U-R	AE= W-U	AF= Y-W	AG= AA-Y	AH= AA-P	AI	AJ	AK	AL	AM	AN= Today-AM Due	AO= Today-AL Due	AP= R-(P+AI)	AQ= W-(U+AJ)	AR= AA-(Y+AK)	AS= AP+ AQ+AR	AT= AA-(P+AL)	AU= 'Y' if AG<=AI	AV= 'Y' if AE <=AJ	AY= 'Y' if AG <=AK	BA= 'Y' if AU=AV= AY='Y'	BB
A/E Sel Start TO A/E Sel End	A/E Sel End TO Design Start	Design Start TO Design End	Design End TO Cntrtr Sel Start	Cntrtr Sel Start TO Cntrtr Sel End	A/E Sel Start TO Cntrtr Sel End	A/E Sel Start TO A/E Sel End	Design Start TO Design End	Cntrtr Sel Start TO Cntrtr Sel End	A/E Sel Start TO Cntrtr Sel End	Next Milestone Due	# of Days Until Mile-stone Due	# of Days Until Contractor Selection Due	Phase 1 # of Days A/E Selctn Late	Phase 2 # of Days Design Cmpld Late	Phase 3 # of Days Cntrctr Selctn Late	# of Days All Phases Late	# of Days Cap Prj Cmpltd Late	A/E Selctd On-Time?	Design Ended On-Time?	Cntrctr Selctd On-Time?	All Project Phases On-Time?	Comments
Avg # of Days						Avg # of Days					# Past Due	# Past Due	Average # of Days					%Yes				
245.8	51.1	795.1	67.3	319.3	1478.5	289.2	464.2	271.6	1025.0		0	0	-51.4	335.9	45.9	330.4	448.7	75.0	30.0	25.0	5.0	

P1	P2	P3	P4	P5	P6						P7	P8	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	
320	-132	332	888	180	1588	449	365	307	1121	**Cntr Selected**	NA	NA	-129	-33	-127	-289	467	Y	Y	Y	Y	
402	60	707	-90	322	1401	449	365	307	1121	**Cntr Selected**	NA	NA	-47	342	15	310	280	Y	N	N	N	
123	45	1047	-95	315	1435	60	365	307	732	**Cntr Selected**	NA	NA	63	682	8	753	703	N	N	N	N	



Define → Measure → Analyze → Improve → Control

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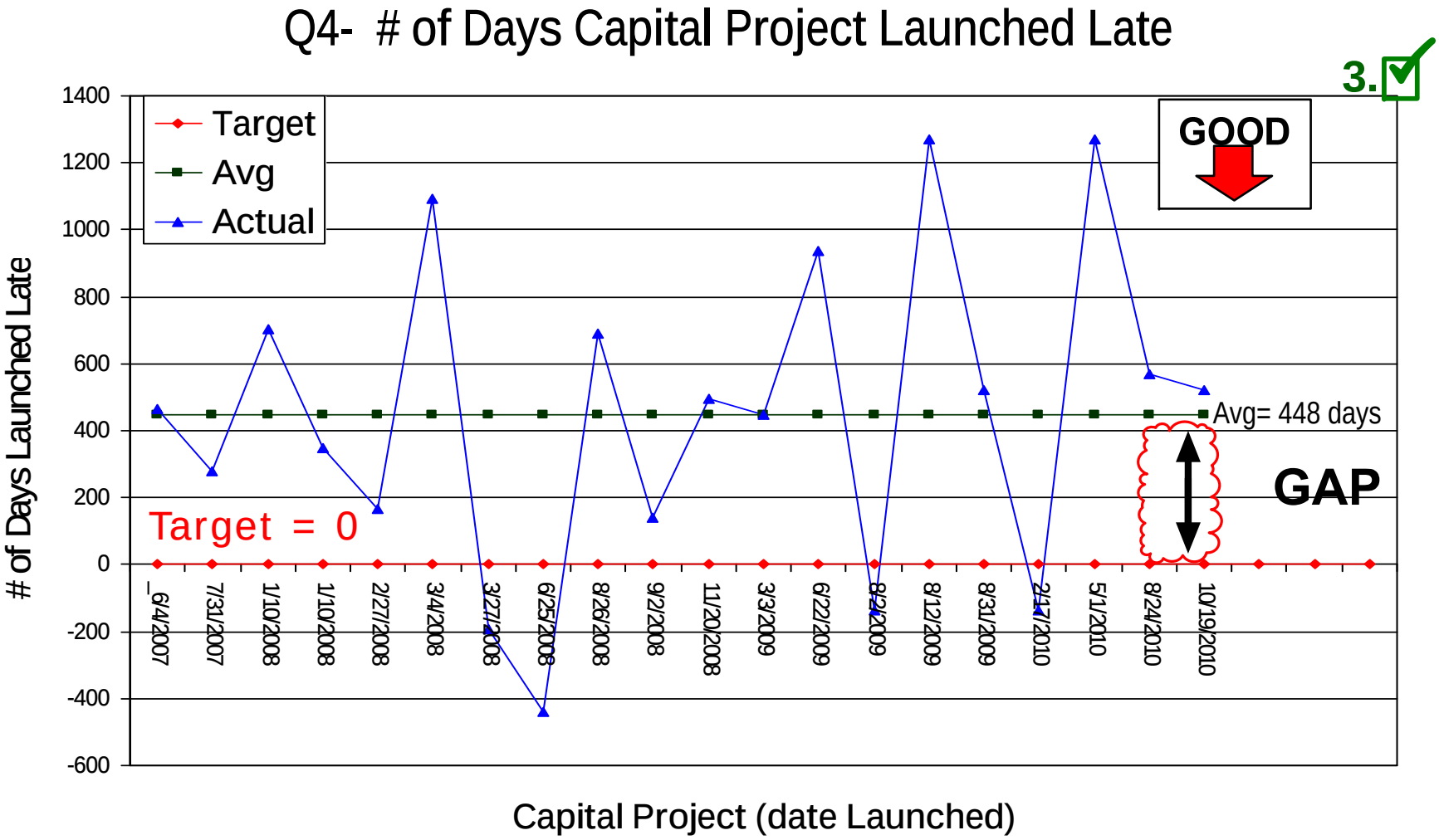
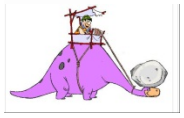
Review Selected Indicator

The team collected Q4 indicator data and reviewed performance trends:



The team next looked closer at the Gap.



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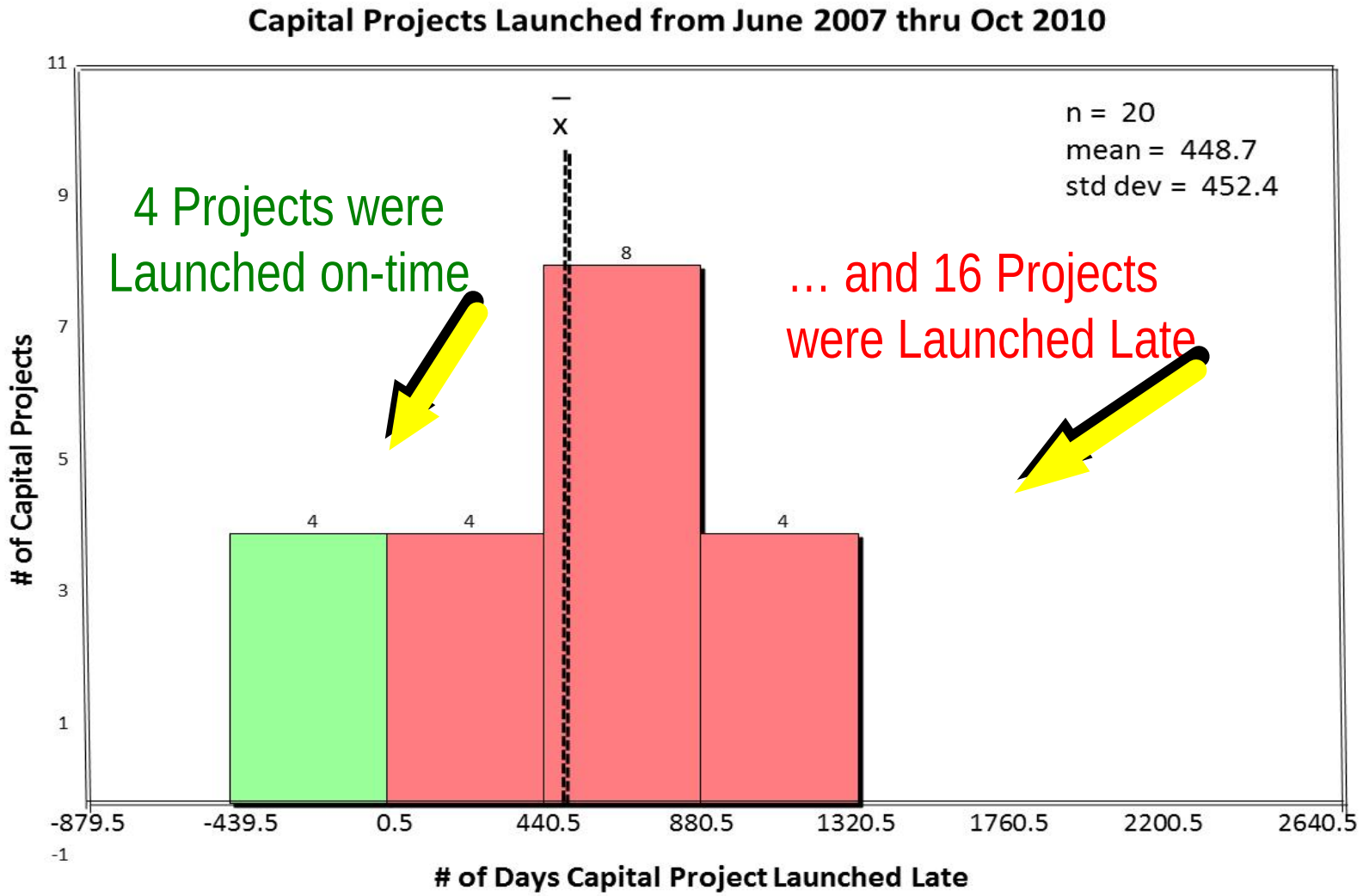
Stratify the Problem

The team stratified 20 Launched Capital Projects using a histogram and found…



The team looked closer at comparing the Late to the Timely launched Projects.

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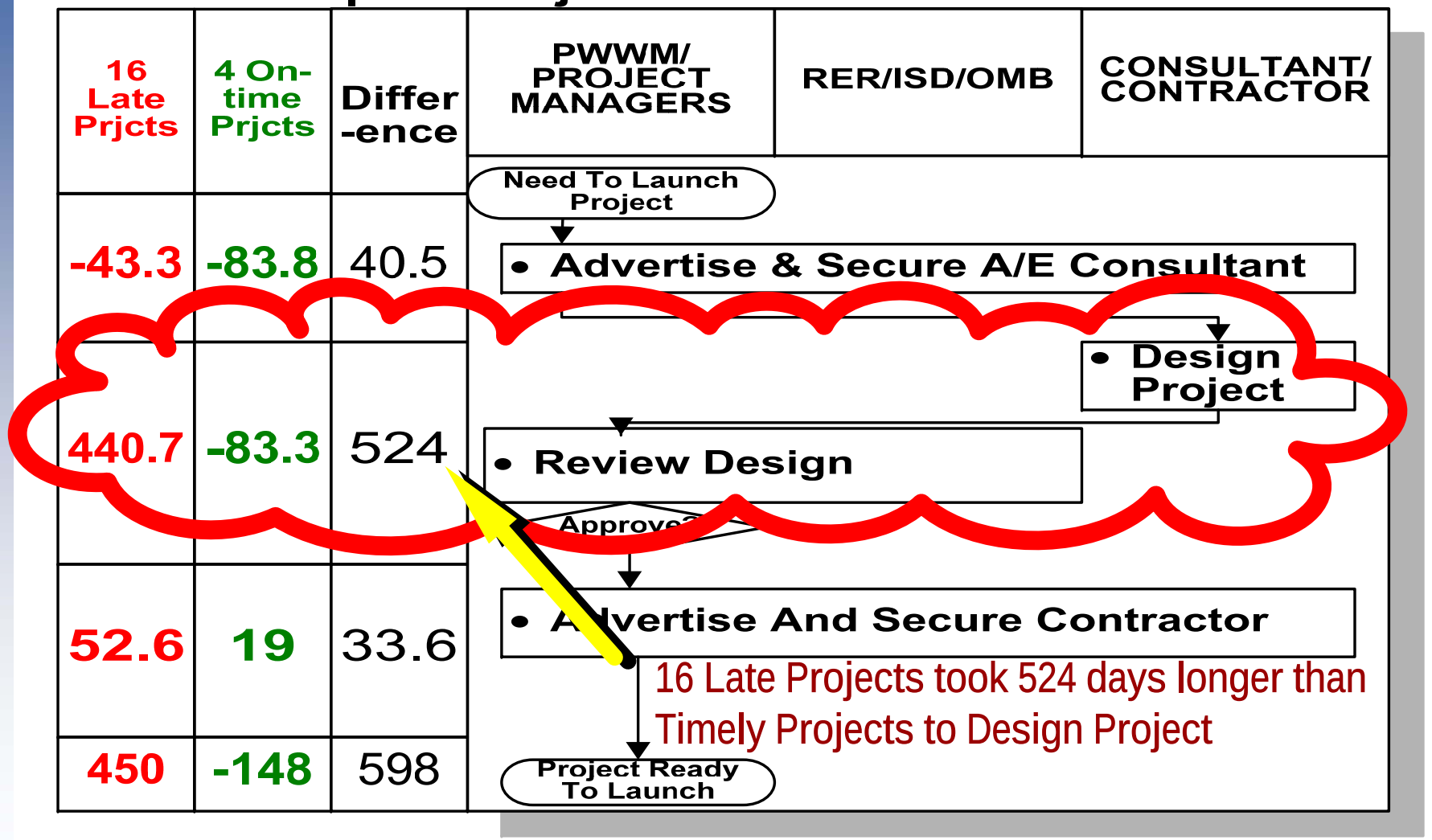
Stratify the Problem

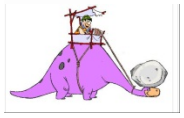
The team compared the LATE Projects to the TIMELY Projects and found…

Launch Capital Projects

16 Late Prjcts	4 On-time Prjcts	Differ-ence
-43.3	-83.8	40.5
440.7	-83.3	524
52.6	19	33.6
450	-148	598



The team looked more closely at the 16 LATE Projects for the Design Step.



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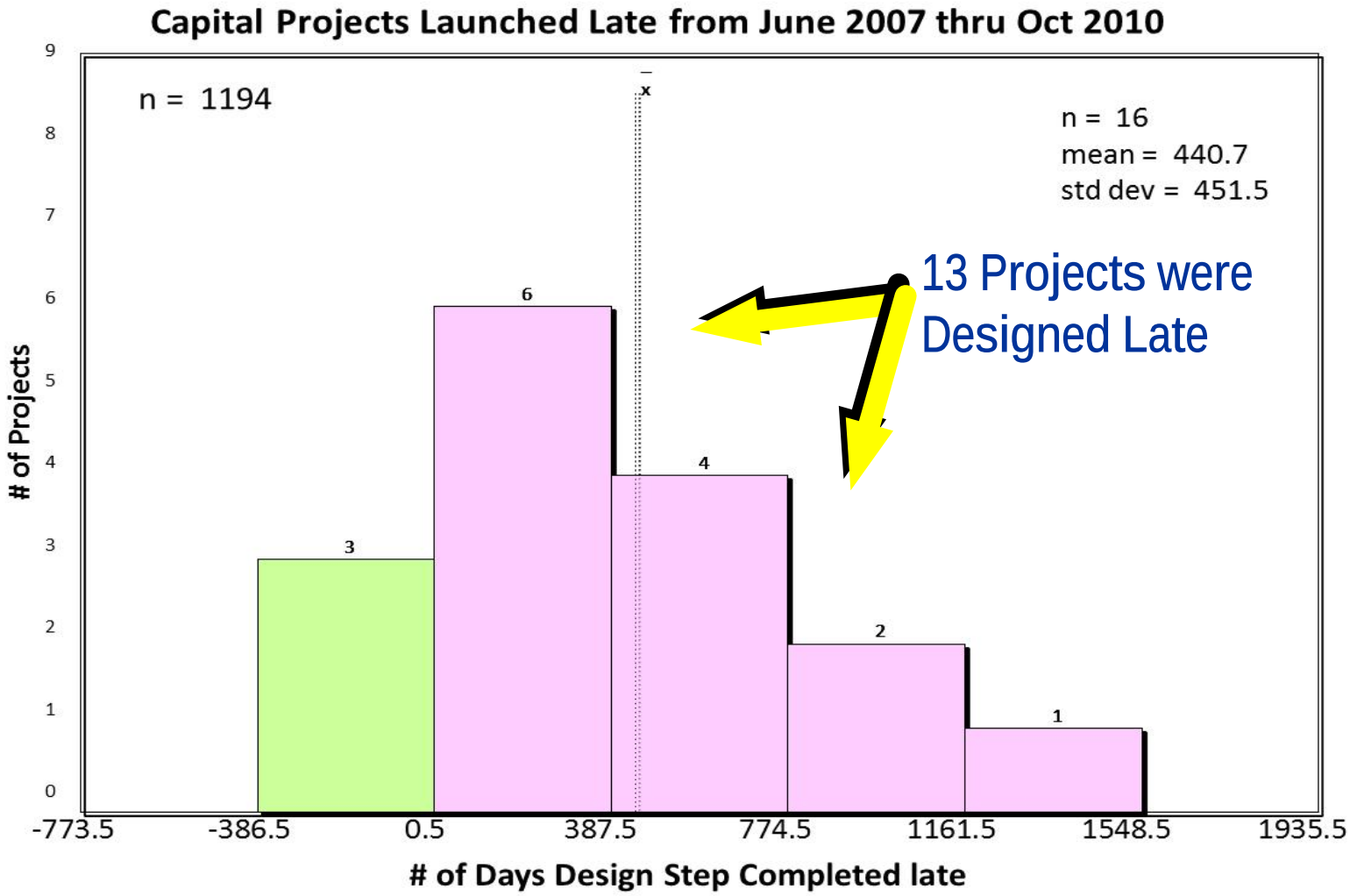
Stratify the Problem

5.

The team stratified the 16 Late Launched Projects for the Design Step and found…



The team looked closer at these 13 late designed Projects.

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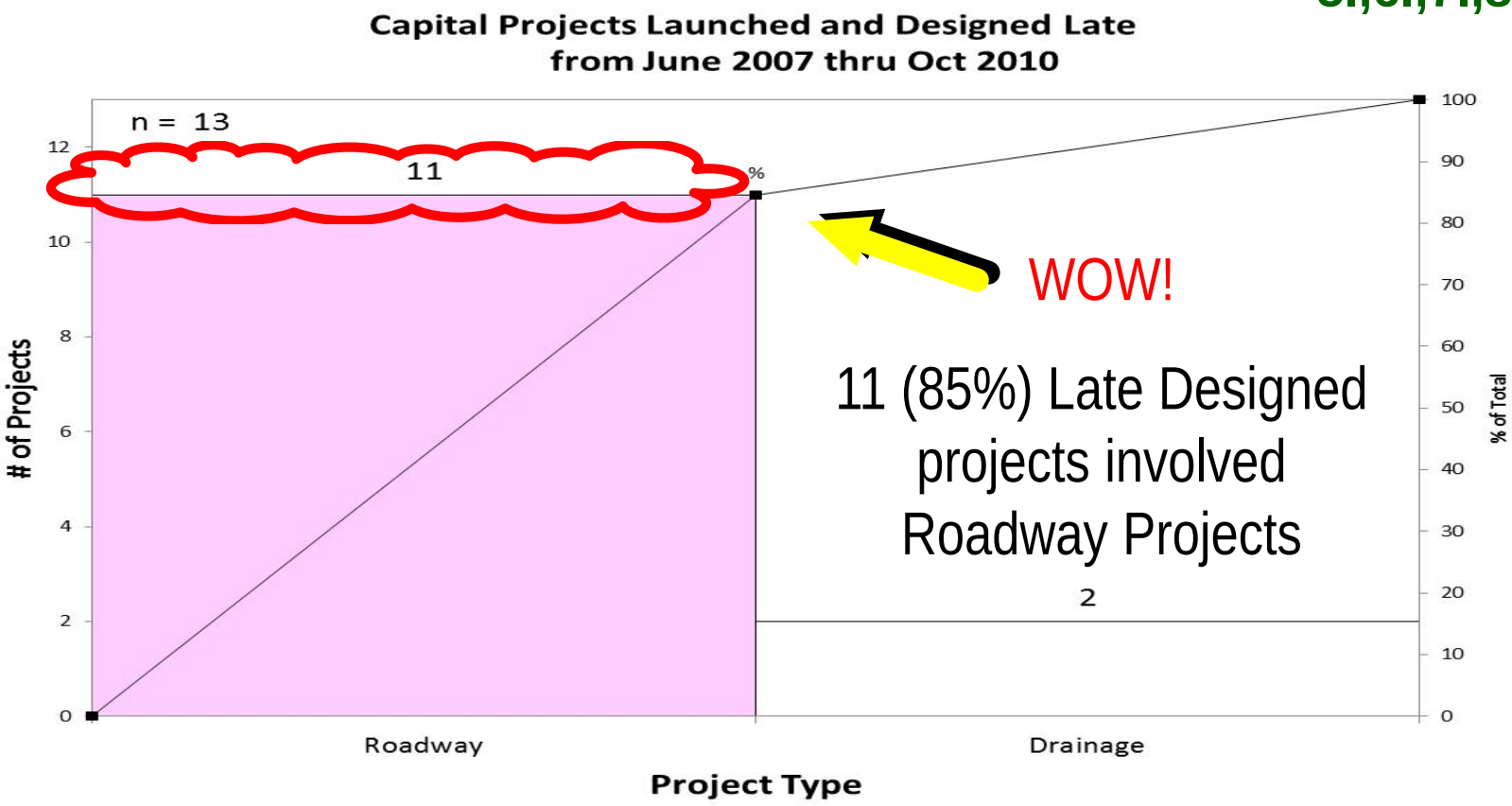
Stratify the Problem (Continued)

The team stratified the 133 Invoices Paid Late many ways and found…

5.,6.,7.,8. ☑



Problem Statement: *"11 Late Launched Roadway Projects (launched 6/2007 thru 10/2010) were all late in Design step and took on average 524 days longer in the Design Step over Timely Launched Projects"*

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Identify Potential Root Causes

9.

The team reviewed Project records and interviewed involved staff before completing Single Case Bore Analysis.

Single Case Bore Analysis

Problem Statement: ""*11 Late Launched Roadway Projects (launched 6/2007 thru 10/2010) were all late in Design step and took on average 524 days longer in the Design Step over Timely Launched Projects*"

Reasons or Factors *(That possibly contributed to Late Design Step)*	**Project Numbers** 1) 601617	2) 602844	3) 607979	4) 603051	5) 603824	6) 603973	7) 609479	8) 601032	9) 603190	10) 603232	11) 607000	Total	Percentage
1) Right-of-Way Acquisition		X				X						2	18%
2) Permitting			X					X				2	18%
3) Changes Due to Public/Municipality Input	X	X	X	X	X	X	X	X	X	X	X	11	100%
4) Coordination with other County Dept/Agencies		X	X		X	X		X			X	6	55%

A

B

The team next looked closer at these two (2) factors.

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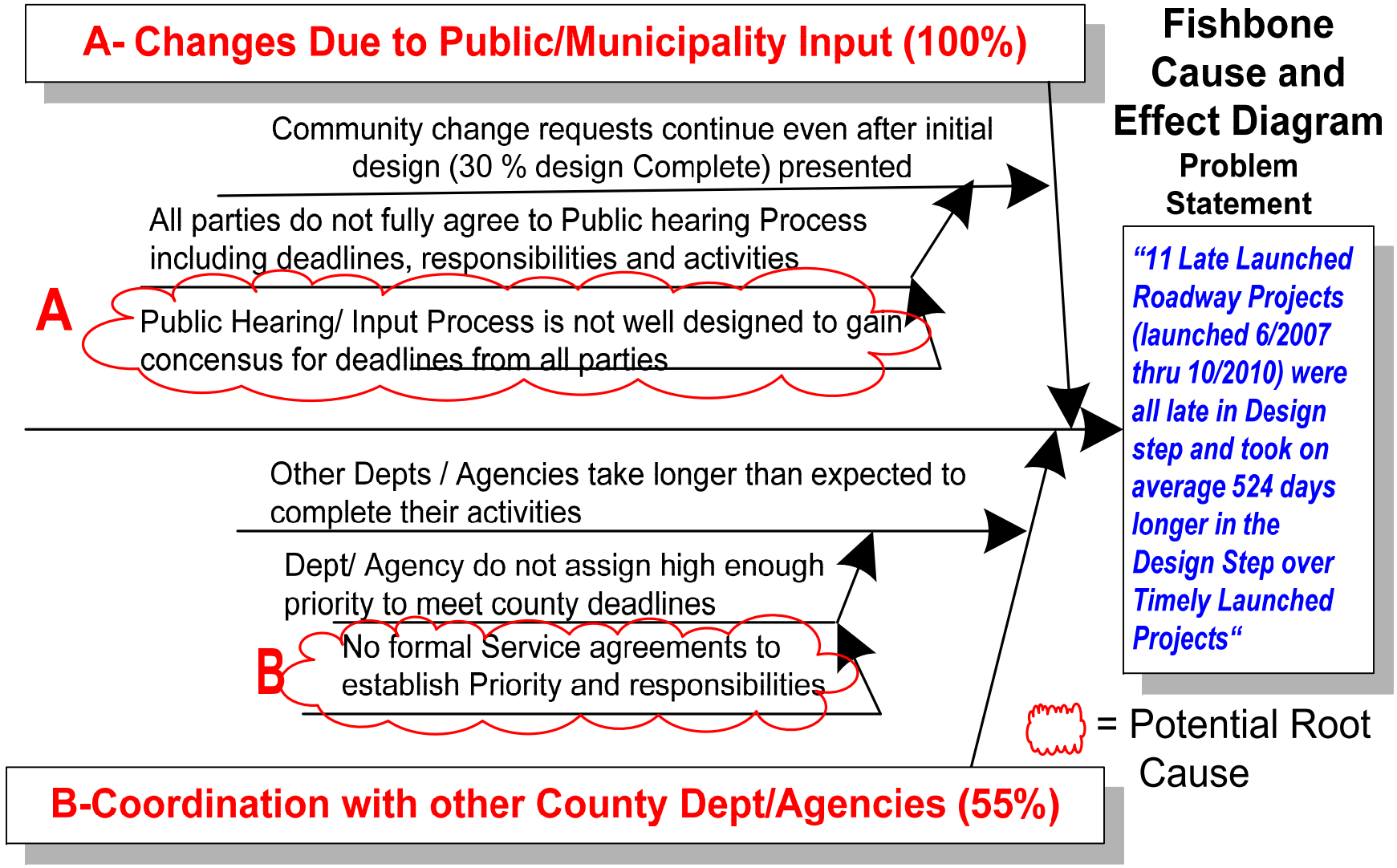
Identify Potential Root Causes

9.,10.

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



The team next looked to verify these two (2) Potential Root Causes.

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Verify Root Causes

The team collected data to verify the root causes and found…. **11.,12.** ☑

Root Cause Verification Matrix

	Potential Root Cause	How Verified?	Root Cause or Symptom
A	Public Hearing/ Input Process is not well designed to gain concensus for deadlines from all parties	Team reviewed the Procedures for Public hearings	Root Cause
B	No formal Service agreements to establish Priority and responsibilities	Team reviewed the Procedures for Public hearings	Root Cause

…both potential root causes were validated as a root causes.

Identify and Select Countermeasures

13.,14.

The team brainstormed many countermeasures and narrowed them down to these for evaluation:

Countermeasures Matrix

Problem Statement	Verified Root Causes	Countermeasures	Effectiveness	Feasibility	Overall	Take Action? Yes/No
		Legend: 5=Extremely 4=Very 3=Moderately 2=Somew hat 1=Little or None	Ratings			
"11 Late Launched Roadway Projects (launched 6/2007 thru 10/2010) were all late in Design step and took on average 524 days longer in the Design Step over Timely Launched Projects"	A - Public Hearing/ Input Process is not well designed to gain concensus for deadlines from all parties	A1- Advertise Project on County Website	2.5	5	12.5	Y
		A2- hold Public hearing sooner	5	5	25	Y
		A3- Set Standards for what "Can" and "Can't be Changed"	5	4	20	Y
		A4- Provide Alternate Design Options to Public	4	3	12	Y
		A5- Provide Earlier notification and Concensus on Process and Deadlines from Elected Officials/Public	5	3	15	Y
		A6- Establish upfront "Core Group" from Community to review Design(s) /Options	5	5	25	Y
		A7- Select Appropriate & knowledgeable presenter	5	5	25	Y
	B - No formal Service agreements to establish Priority and responsibilities	B1- Develop Inter / IntraService Agreement and protocol for securing agreement	4	5	20	Y
		B2- Develop Team (with responsibilities and is part of performance evaluation) with Points of Contact for key depts involved in Capital Project	4	4.5	18	Y

The team selected 9 countermeasures for implementation.

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Identify Barriers and Aids

15.

The team performed Barriers and Aids analysis on the selected Countermeasures.

Countermeasure(s): Implement 9 Countermeasues to Improve Timeliness of Capital Projects

Barriers		Aids	
Impact (H, M, L)	Forces against Implementation		Forces For Implementation
H	1) Laws may restrict or prevent countermeasures *(Supported by Aid: C,E)*	A)	County has an existing Website
H	2) Politicians/Agencies may push back on changes *(Supported by Aid: A,B,C,D, E)*	B)	Everyone wants Project Benefits
M	3) Public may push back on Changes *(Supported by Aid: A,B,C,D)*	C)	Mayor and many elected Officials are very supportive of Projects
		D)	Beneficial Impact on Cost and Time Savings
H	4) Changes could cost more (Supported by Aid:A, B,C,D, E)	E)	Management very supportive of team's efforts in saving costs

The team next sought to incorporate this analysis into the team's Action Plan.

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Develop and Implement Action Plan

Legend:
= Actual
= Proposed

The team implemented an Action Plan for the team's Countermeasures. 16.

WHAT: Implement 9 Countermeasures to Improve Timeliness of Capital Projects

	HOW	WHO	WHEN (2013)
1.	**Develop Countermeasures:**		
	A1- Advertise Project on County Website	Andrea/Anita	02/28/13
	A2- hold Public hearing sooner	Gaspar/Maria/ Mike	2/28/13
	A3- Set Standards for what "Can" and "Can't be Changed"	Gaspar/Maria/ Mike	2/28/13
	A4- Provide Alternate Design Options to Public	Gaspar/Maria/ Mike	2/28/13
	A5- Provide Earlier notification and Concensus on Process and Deadlines from Elected Officials/Public	Gaspar/Maria/ Mike	2/28/13
	A6- Establish upfront "Core Group" from Community to review Design(s) /Options	Gaspar/Maria/ Mike	2/28/13
	A7- Select Appropriate & knowledgeable presenter	Gaspar/Maria/ Mike	2/28/13
	B1- Develop Inter / IntraService Agreement and protocol for securing agreement	Gaspar/ Anita	2/28/13
	B2- Develop Team (with responsibilities and is part of performance evaluation) with Points of Contact for key depts involved in Capital Project	Gaspar/ Anita	2/18/13
2.	**Secure Management Approval of Countermeasures (share benefits and Time savings)**	Team	3/15/13
3.	**Communicate/Train Staff in Countermeasures and related policies/procedures** (share Improved Service & Time savings)	Team	4/30/13
4.	**Implement Countermeasures**	Team	6/30/13
5.	**Establish On-going responsibilities and standardize countermeasures into operations**	Team	On-going

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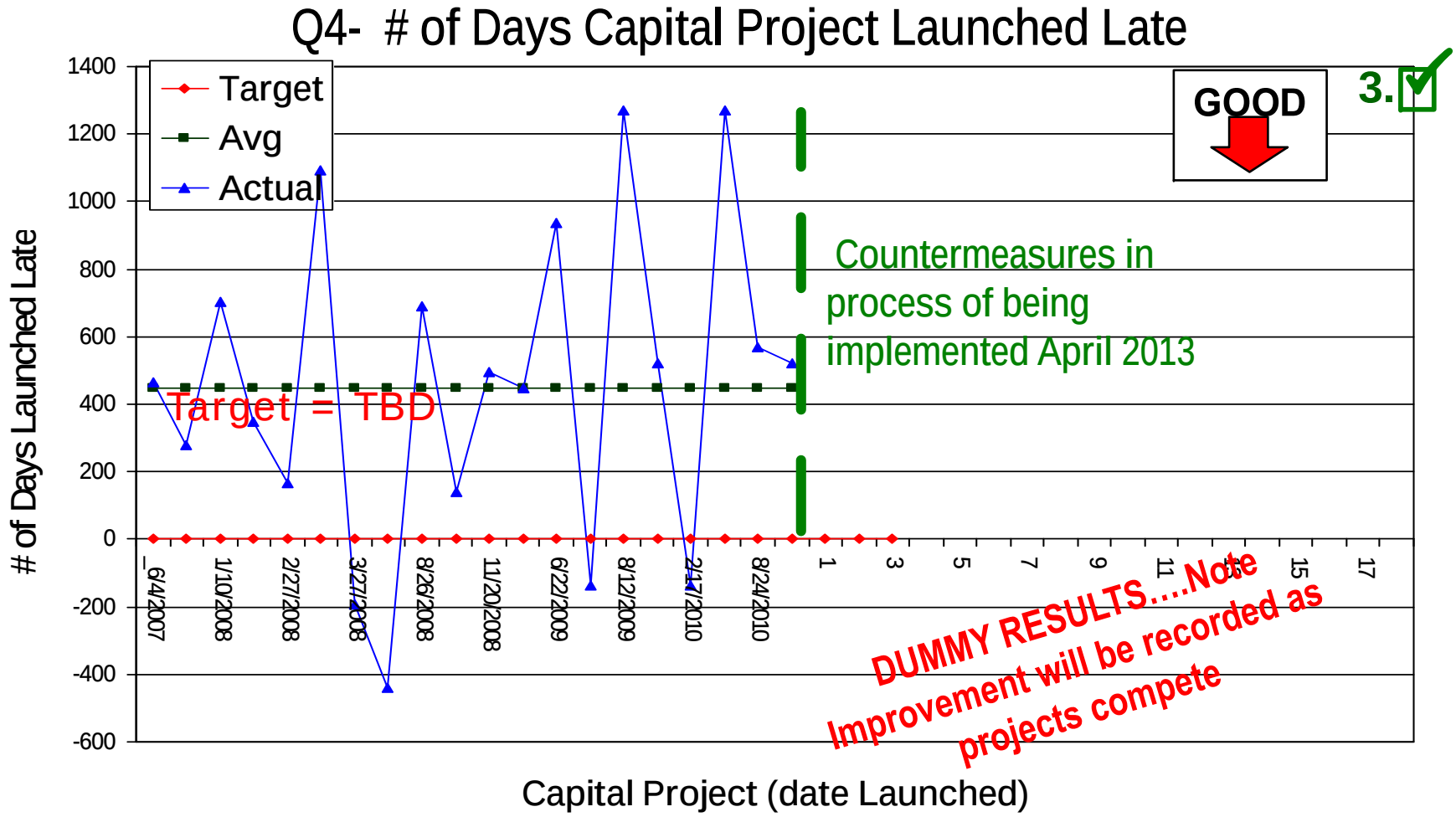
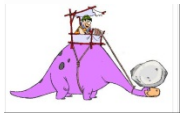
Review Results

17.,18.,19.,20.

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



The team was encouraged by the results and will continue to monitor the countermeasures.



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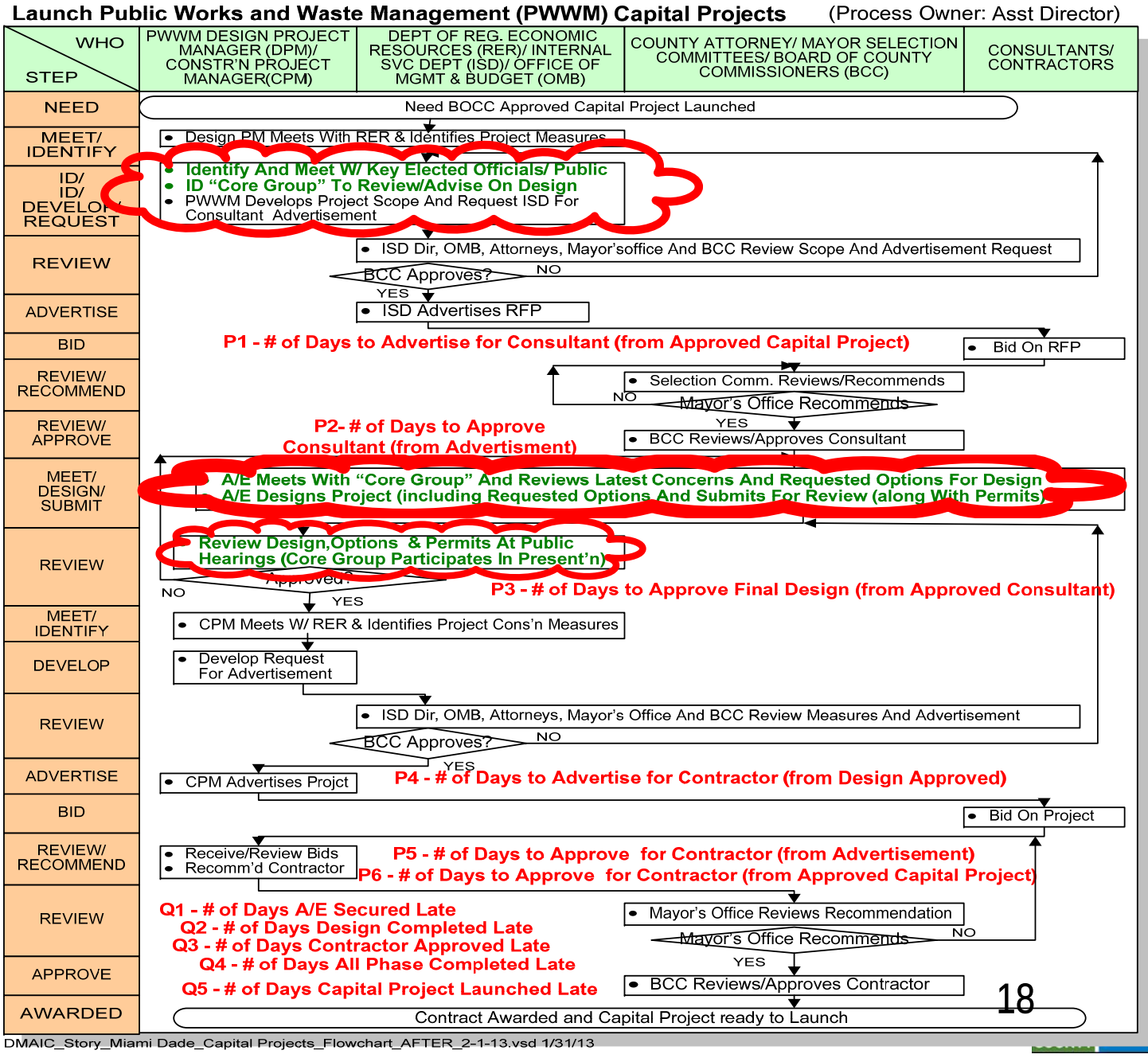
Standardize Countermeasures

21.,22.,23.

The team revised indicators and incorporated the improvements into the Process flowchart.

The team looked to standardize the Indicator monitoring



Standardize Countermeasures

21.,22.,23.☑

The team Developed a Process Control System (PCS) to monitor the process on-going.

Process Control System						
Process Name: Launch Public Works and Waste Management (PWWM) Capital Projects				**Process Owner:** Assistant Director		
Process Customer: County Tax payer				**Critical Customer Requirements:** Launch Project Timely and acceptable to community		
Process Purpose: Secure A/E, Design and Secure Contractor timely				**Current Sigma Level:** TBD		
				Outcome Indicators: Q1, Q2, Q3, Q4		
Process and Quality Indicators		Checking / Indicator Monitoring				Contingency Plans / Misc. • Actions Required for Exceptions • Procedure References
Process Indicators And Quality Indicators		Control Limits Specs/ Targets	Data to Collect What is Checking Item or Indicator Calculation	Timeframe (Frequency) When to Collect Data?	Responsibility Who will Check?	
P1	# of Days to Advertise for Consultant (from Approved Capital Project)	TBD	# of Days to Advertise for Consultant (from Approved Capital Project)	By project	A/E PM	Capital Project Status Summary
P2	# of Days to Approve Consultant (from Advertisement)	TBD	# of Days to Approve Consultant (from Advertisement)	By project	A/E PM	Capital Project Status Summary
P3	# of Days to Approve Final Design (from Approved Consultant)	TBD	# of Days to Approve Final Design (from Approved Consultant)	By project	Design PM	Capital Project Status Summary
P4	# of Days to Advertise for Contractor (from Design Approved)	TBD	# of Days to Advertise for Contractor (from Design Approved)	By project	Const PM	Capital Project Status Summary
P5	# of Days to Approve for Contractor (from Advertisement)	TBD	# of Days to Approve for Contractor (from Advertisement)	By project	Const PM	Capital Project Status Summary
P6	# of Days to Approve for Contractor (from Approved Capital Project)	TBD	# of Days to Approve for Contractor (from Approved Capital Project)	By project	Const PM	Capital Project Status Summary
Q1	# of Days A/E Secured Late	0	(Date A/E Secured)- (Date A/E Due)	By project	A/E PM	Capital Project Status Summary
Q2	# of Days Design Completed Late	0	(Date Design Completed)- (Date Design Due)	By project	Design PM	Capital Project Status Summary
Q3	# of Days Contractor Approved Late	0	(Date Contractor Secured)- (Date Contractor Due)	By project	Const PM	Capital Project Status Summary
Q4	# of Days All Phase Completed Late	0	(Date All Phases Secured)- (Date All Phases Due)	By project	Const PM	Capital Project Status Summary
Q5	# of Days Capital Project launched Late	0	(Date Capital Project Completed)- (Date Capital project Due)	By project	Const PM	Capital Project Status Summary

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

The team looked ahead to the future.

Define → Measure → Analyze → Improve → **Control**

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Identify Lessons Learned

24.,25.

Lessons Learned

1) Root Cause Analysis tools (Single Case Bore & Fishbone) helped the team identify Potential Root Causes: “Standards that Failed or People Failing Standards”

2) DMAIC Process was systematic and effective for problem Solving. The team learned to trust the process and “Let the Data take you to the Root Causes”

3) Be open minded to new ways to do work…. Creative Thinking Techniques helped the team think “Outside the Box”

4) Centralized Data collection worked best for managing and analyzing our Capital Projects process

Next Steps

1) Implement countermeasures

2) Monitor performance

Results will take time