

Project Controls Expo – 14th November 2018

Emirates Arsenal Stadium, London

Forensic Controls
Bringing analytics to project data

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CEng MICE



Topic outline

1. What is Complex Project Analytics?
2. Why are we developing and delivering Complex Project Analytics?
3. Our data analytics approach
4. Case Study 1 – Schedule Analytics
5. Case Study 2 – Multiple Source Analysis
6. The future direction of CPA?
7. Close and Q&A



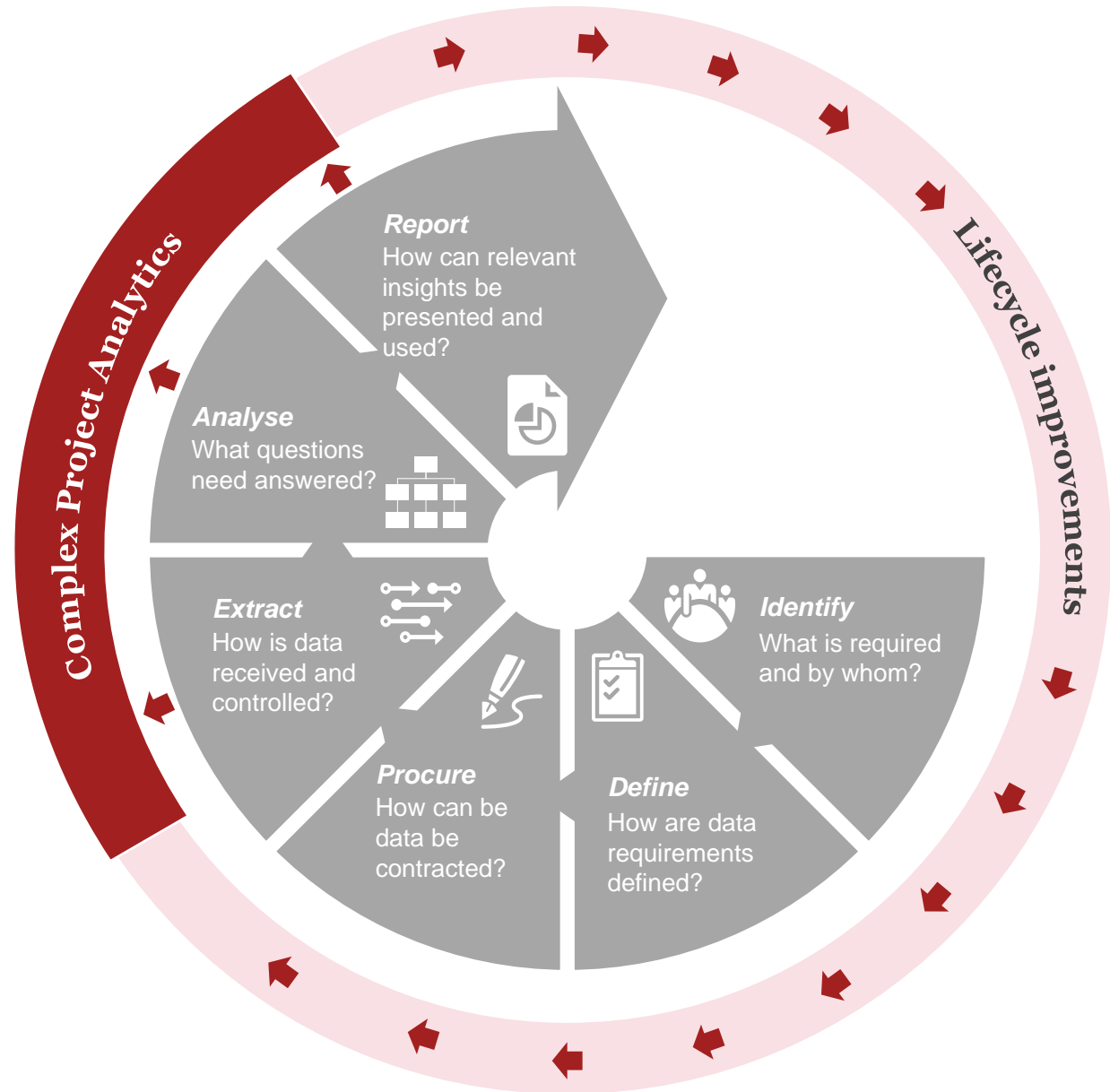
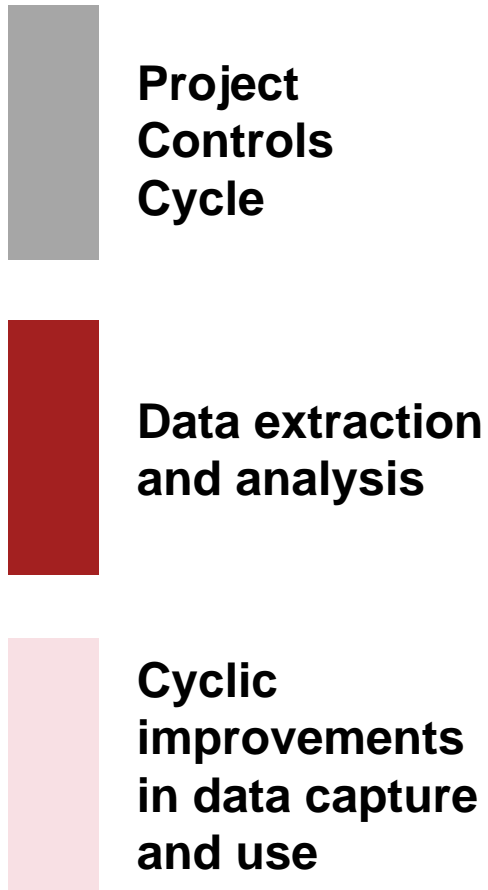
1

What is Complex
Project Analytics?

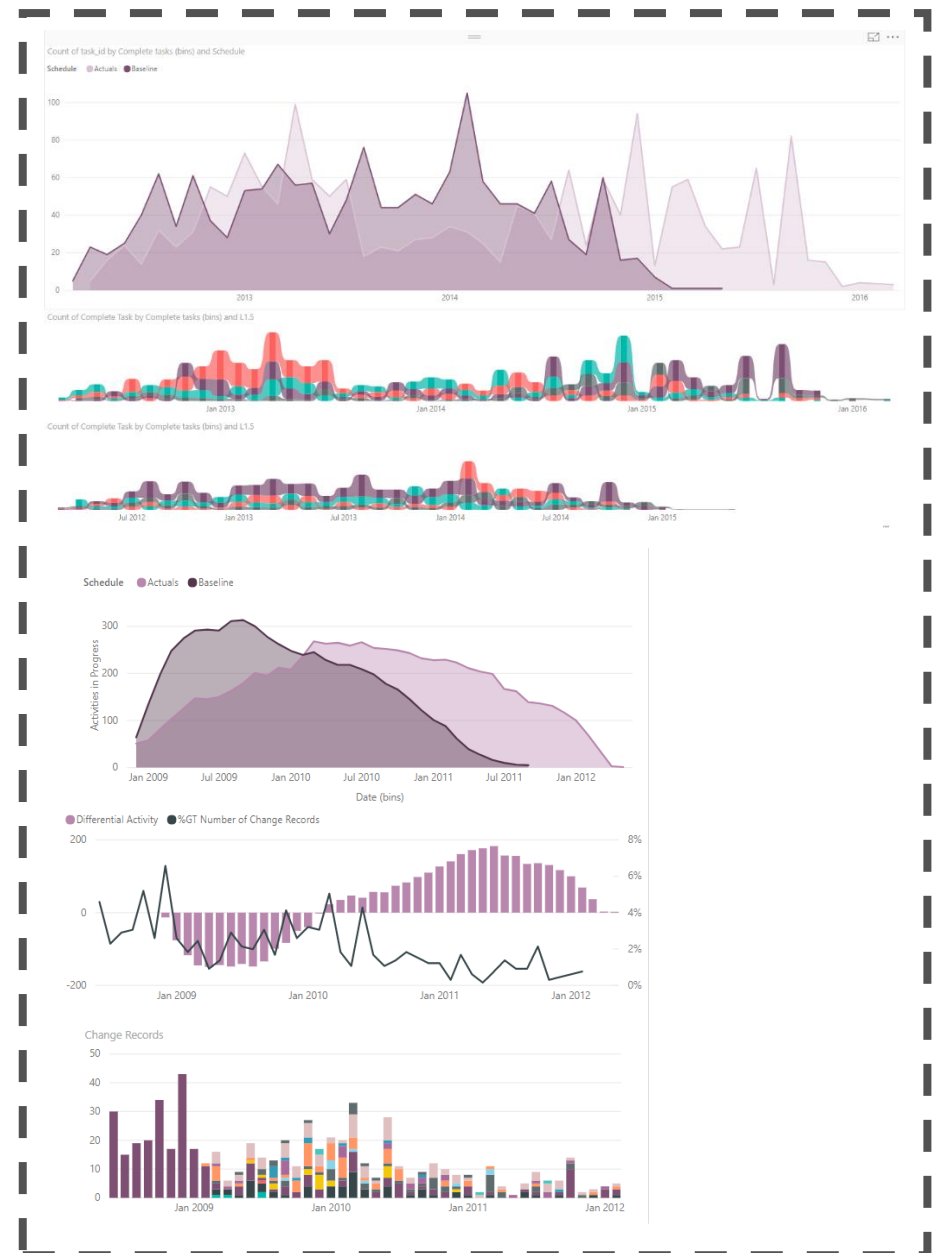
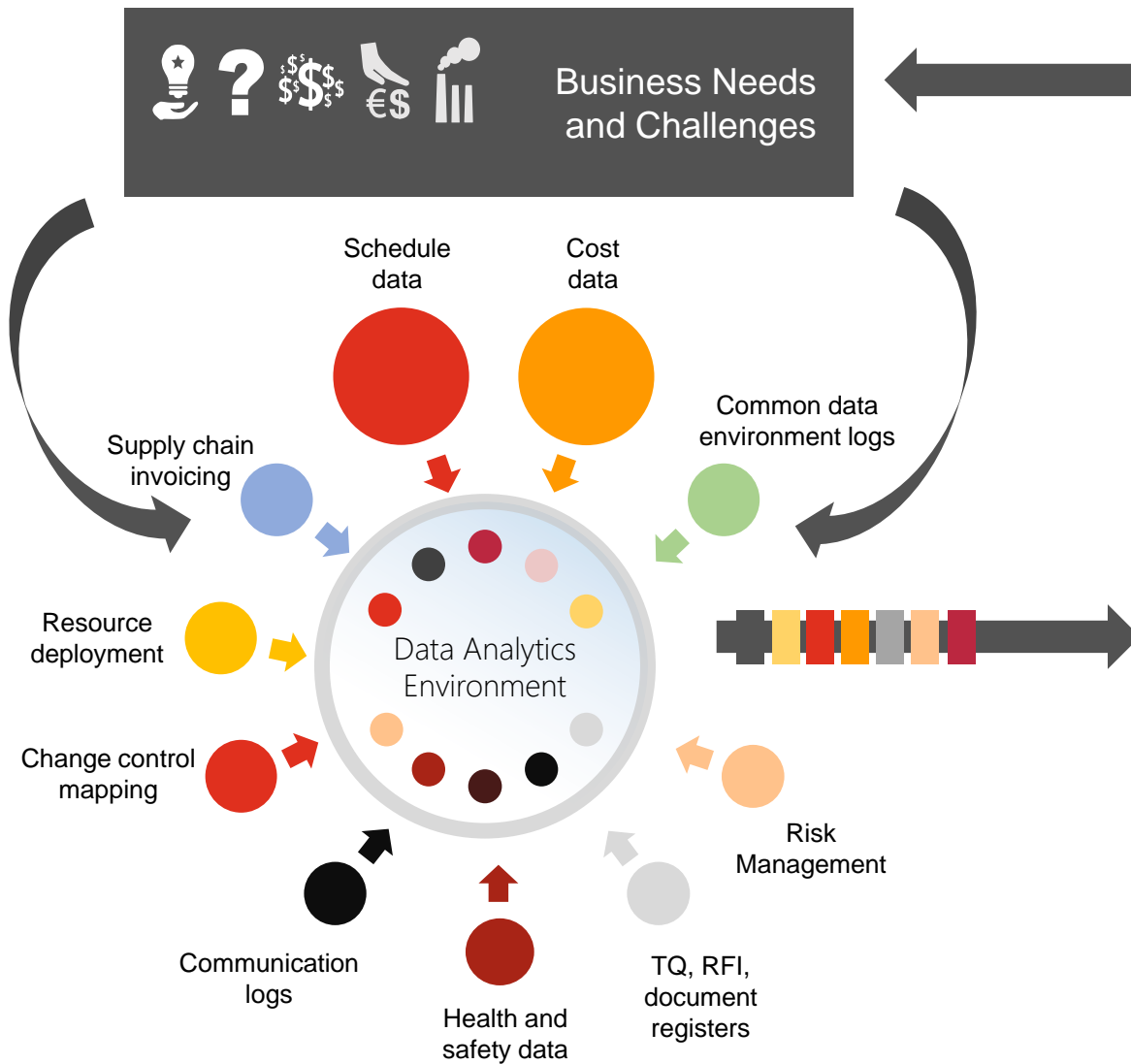


Utilising our industry expertise and creative application of **advanced analytics**, we help clients gain **control** and confidence through deriving new insights from their disconnected and disparate data, whilst creating a **future vision** of data on their projects.....

Our approach to analytics in the Project Controls environment



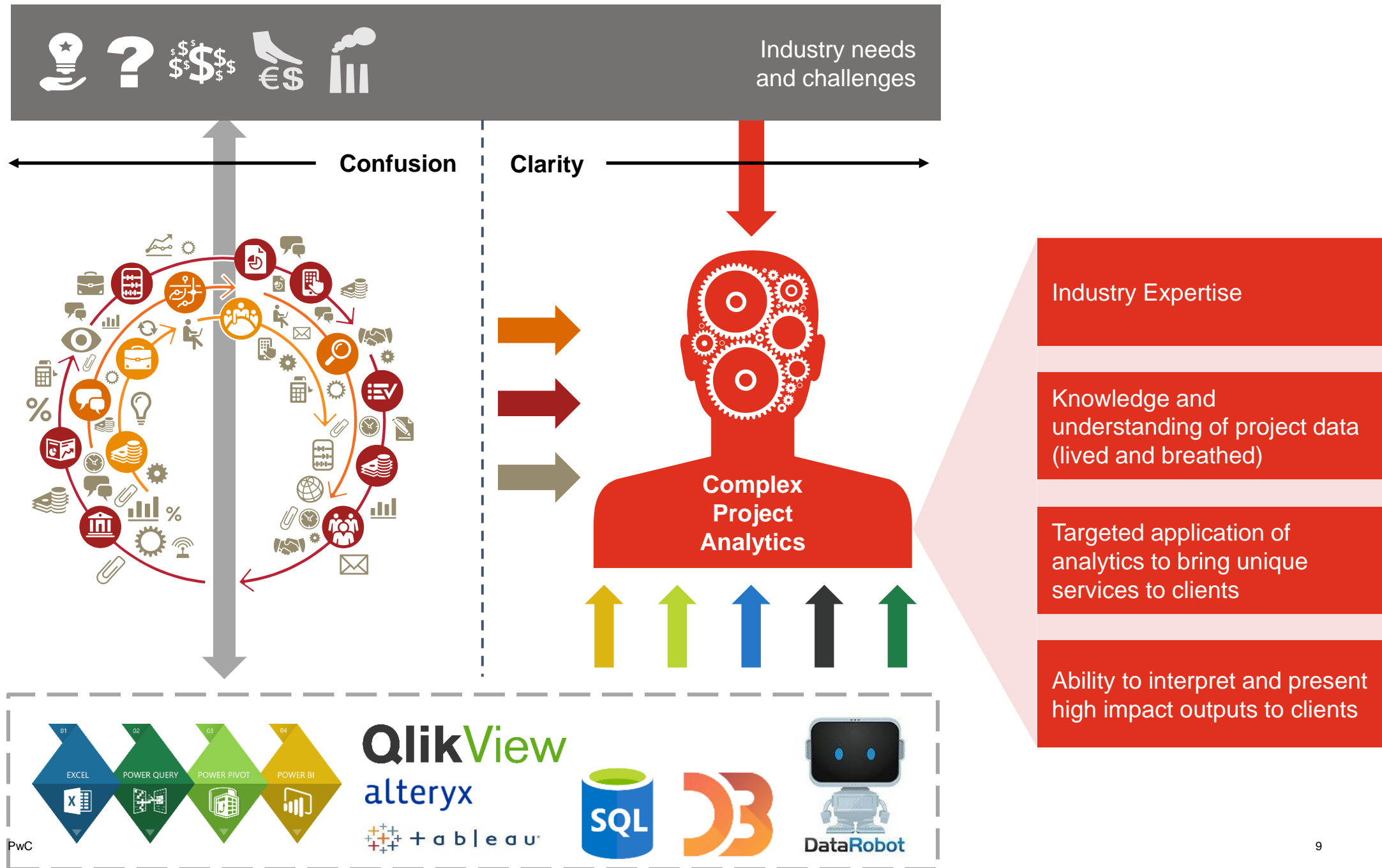
Our approach to analytics in the Project Controls environment



2

Why are we
developing and
delivering Complex
Project Analytics?

Industry experience aligned with exploratory analytics

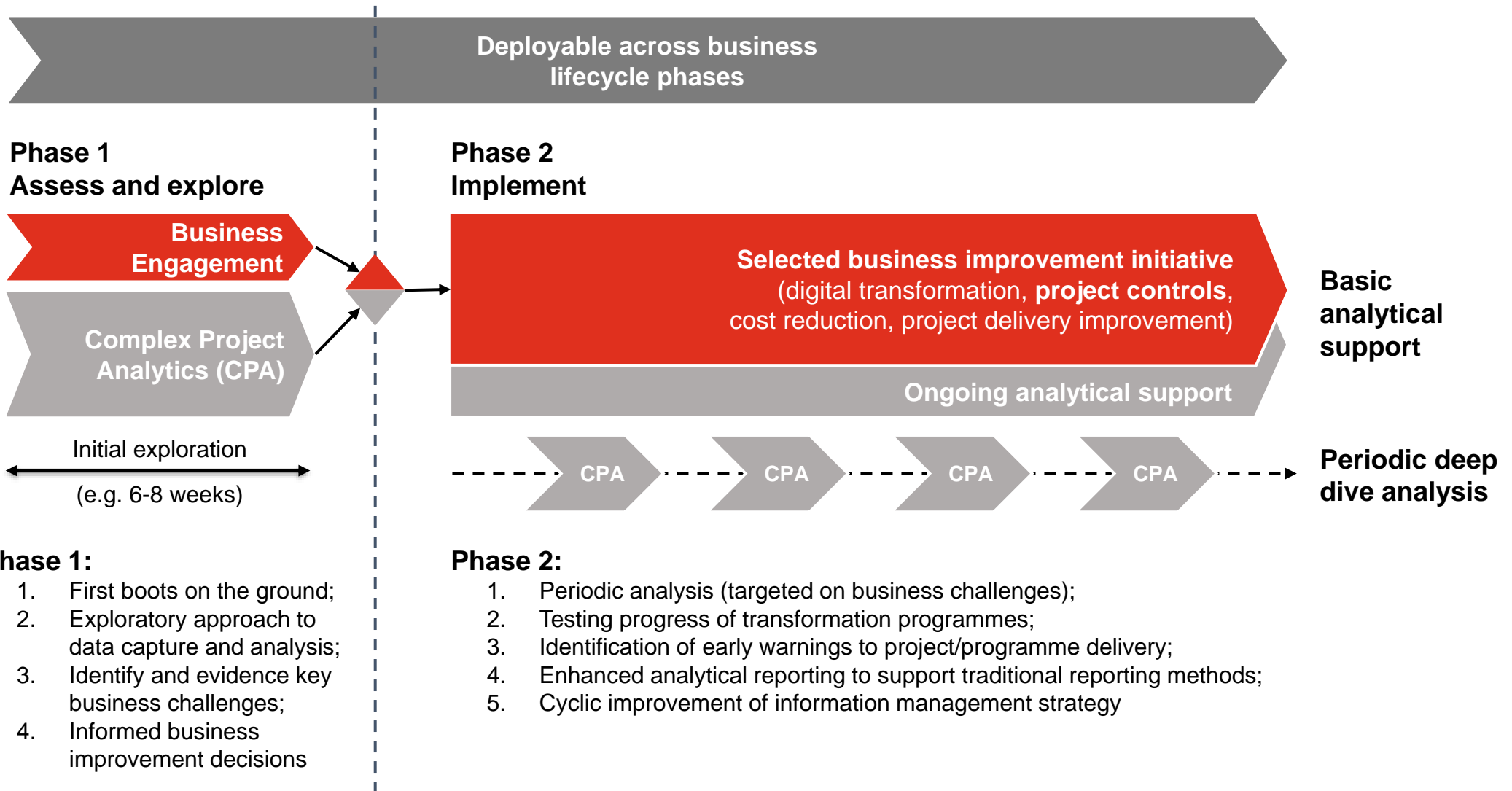


3

Our data
analytics
approach

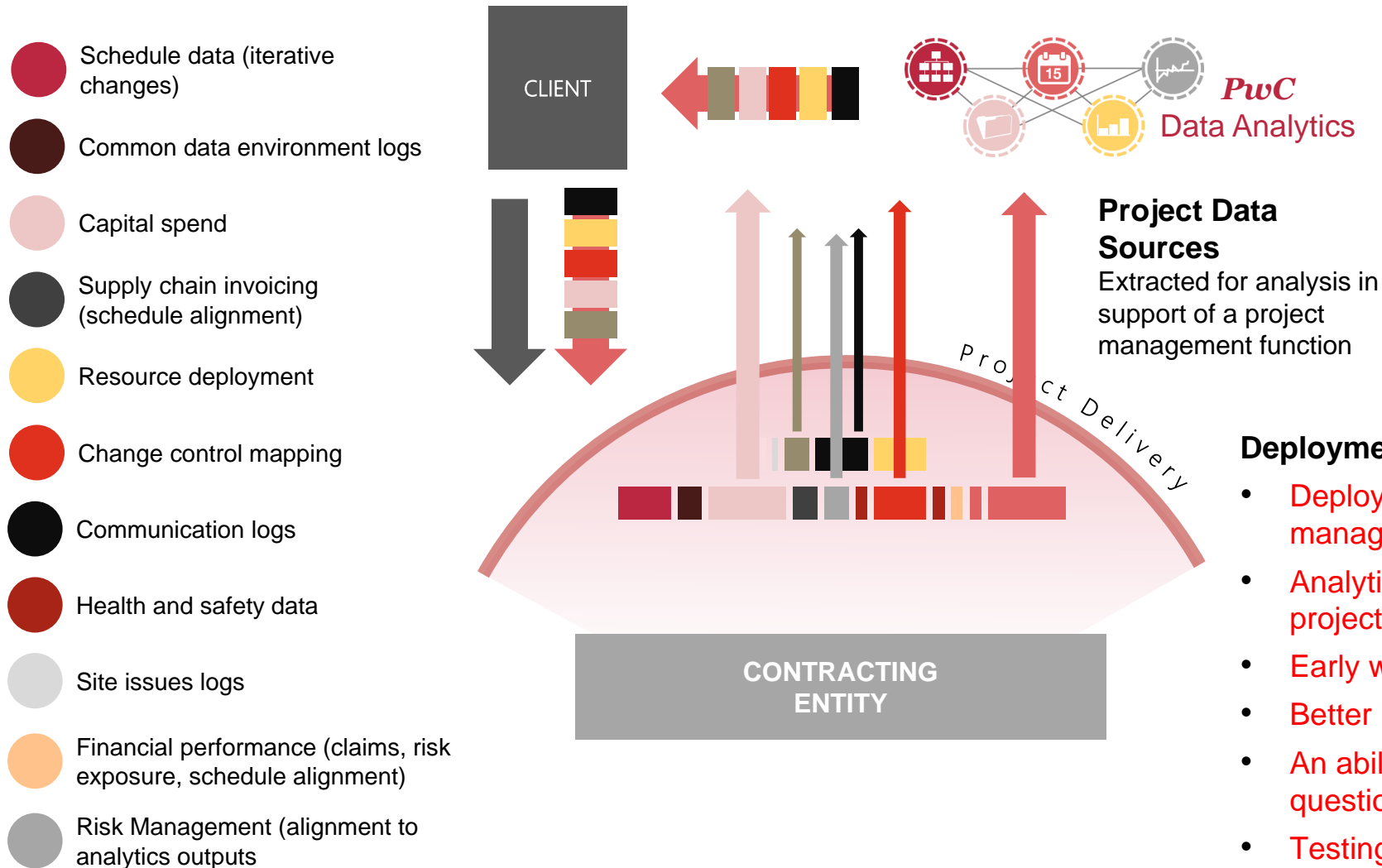
How can complex project analytics support and inform traditional project controls?

Balancing advanced analysis with traditional approaches



Who benefits from analytics?

Delivery model 1 – client/project management support



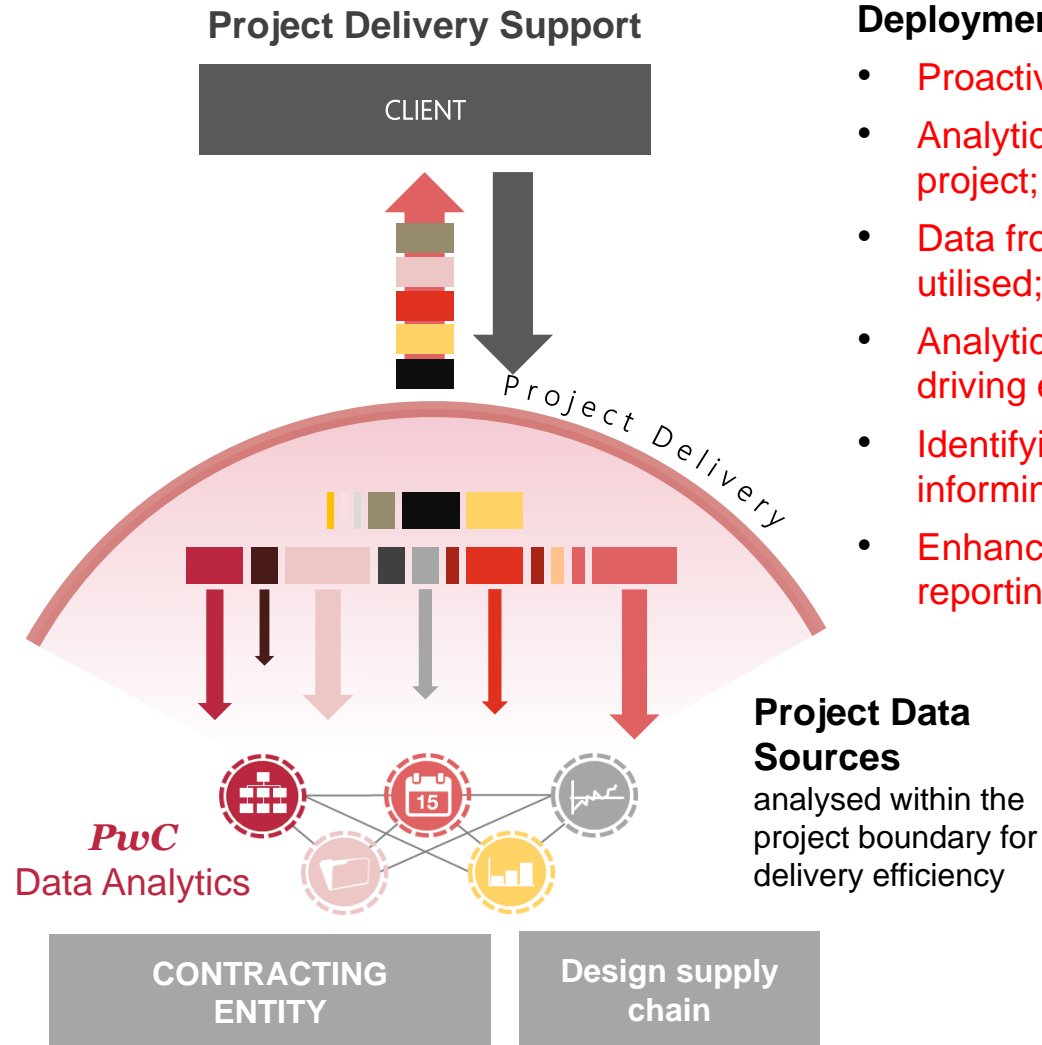
Deployment and use case:

- Deployed in support of a project management function;
- Analytics used to create greater project intelligence;
- Early warning identification;
- Better informed client;
- An ability to ask more informed questions;
- Testing traditional reporting

Who benefits from analytics?

Delivery model 1 – project delivery

- Schedule data (iterative changes)
- Common data environment logs
- Capital spend
- Supply chain invoicing (schedule alignment)
- Resource deployment
- Change control mapping
- Communication logs
- Health and safety data
- Site issues logs
- Financial performance (claims, risk exposure, schedule alignment)
- Risk Management (alignment to analytics outputs)



Deployment and use case:

- Proactive project delivery team;
- Analytics is made bespoke to the project;
- Data from multiple sources being utilised;
- Analytics used for the purposes of driving efficiency;
- Identifying delivery risk and informing early intervention;
- Enhanced and transparent reporting to the client;

4

Case Study 1 Schedule Analytics

Schedule Analytics – Project Overview



Project Overview

This dashboard provides high level project information for project stakeholders. The variance of the project's current end date is given when compared with the baseline end date.

View how the end date variance and task density changes over time by selecting the baseline and current months.

Baseline Month

Month 05

Current Month

Month 20

These statistics show the future months with the fewest and greatest number of tasks, as well as the greatest number of tasks achieved in any previous month.

By selecting a month, you can view how the greatest number of tasks to be completed compares with the greatest number of tasks completed in any previous month.

Future month with fewest number of tasks

December 2009	5
January 2010	7
October 2008	8

Greatest number of tasks completed to date

June 2007	34
April 2007	11
May 2007	10

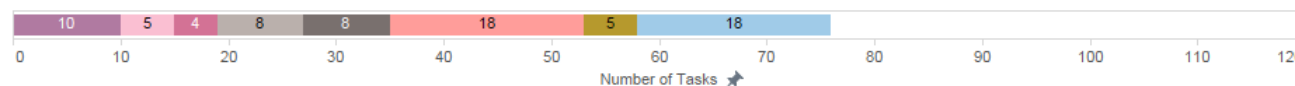
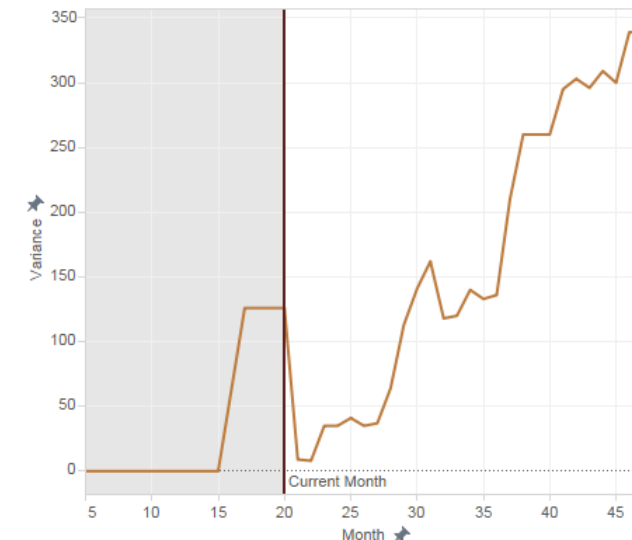
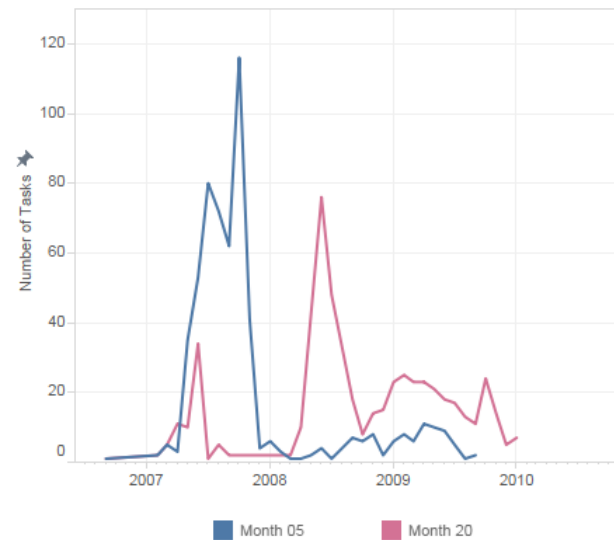
Future month with greatest number of tasks

June 2008	76
July 2008	48
August 2008	33

Baseline End Date
22/9/2009

Current End Date
26/1/2010

Variance
126 days



Schedule Analytics – Key metrics



Project Statistics

This report shows a project gantt chart at the highest WBS level. Selecting one of these WBS work streams will filter the statistics tables to the right, allowing the user to compare tasks in the baseline and current month. The final table shows the number of tasks on the critical path for the current month.



Number of Tasks Variance

Task	Baseline	Current	Change
Positive			
Pier Shafts and Head	6	191	185
Pile Caps	6	9	3
Negative			
Water Management, Roads, Drains and Earthwor..	222	0	-222
V5C1 Ch 406.244 to 406.868 (P29 - P40)	68	50	-18
Construction Design Phase	86	82	-4

Duration Variance

Task	Baseline	Current	Variance
Positive			
V5C2 Ch 406.868 to 407.456 (P41 - P52)	119	474	298.3%
V5C4 Ch 406.224 to 405.818 (P28 - P20)	105	395	276.2%
V5C1 Ch 406.244 to 406.868 (P29 - P40)	175	517	195.4%
Negative			
Finishes	522	85	-83.7%
Pile Caps	419	335	-20.0%
Piling	566	546	-3.5%

Number of Tasks on Critical Path

Pier Shafts and Head	28
Deck	19
Finishes	3

Schedule Analytics – Float Erosion Patterns



Float Erosion

This report highlights the overall project float and project end date variance. Use the current month filter to view details for a specific month.

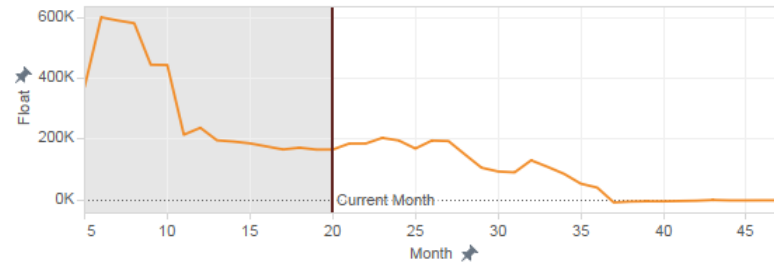
Task
 (All) [v]

Current Month
 Month 20 [v]

Legend:

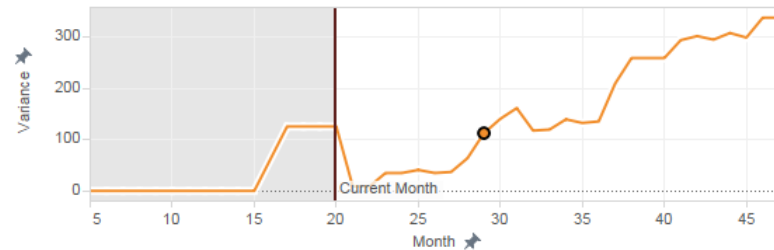
- Approvals and Per..
- Construction Desi..
- Deck
- Enabling Works - ..
- Finishes
- Pier Shafts and H..
- Pile Caps
- Piling
- Procurement and ..
- V5C1 Ch 406.244 ..
- V5C2 Ch 406.868 ..
- V5C3 Ch 407.456 ..
- V5C4 Ch 406.224 ..
- V5C5 Ch 408.056 ..
- V5C6 Ch 405.818 ..

Float Erosion

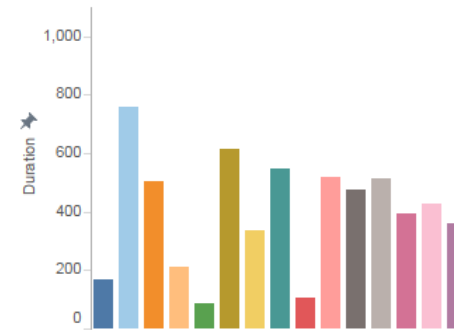


Select a month from the end date variance graph to filter the variance statistics.

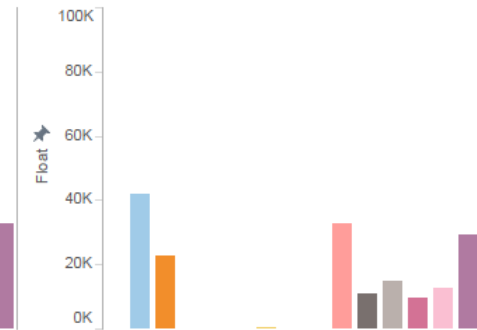
End Date Variance



Total Duration



Total Float



Variance Statistics

	Number of New Tasks	Duration Changes Positive	Duration Changes Negative	Float Changes Positive	Float Changes Negative
Approvals and Permits	0	0	0	0	0
Construction Design Phase	0	8	5	4	16
Deck	0	10	14	8	55
Enabling Works - Geotechnic..	0	0	0	0	0
Finishes	0	2	0	1	2
Pier Shafts and Head	0	21	29	1	82
Pile Caps	0	4	2	0	6
Piling	0	1	0	0	1
Procurement and Contract R..	0	0	0	0	0
V5C1 Ch 406.244 to 406.868..	0	27	0	0	25
V5C2 Ch 406.868 to 407.456..	0	4	0	0	4
V5C3 Ch 407.456 to 408.056..	0	2	0	0	3
V5C4 Ch 406.224 to 405.818..	0	3	2	0	5
V5C5 Ch 408.056 to 408.606..	0	3	2	0	5
V5C6 Ch 405.818 to 405.330..	0	5	5	0	10

Schedule Analytics – Delivery Density and Delay



Delivery Density

This dashboard shows a matrix of a number of tasks variable changes. Selecting one of these will highlight the bar charts to the right where the end date distribution can be seen.

Task

(All)

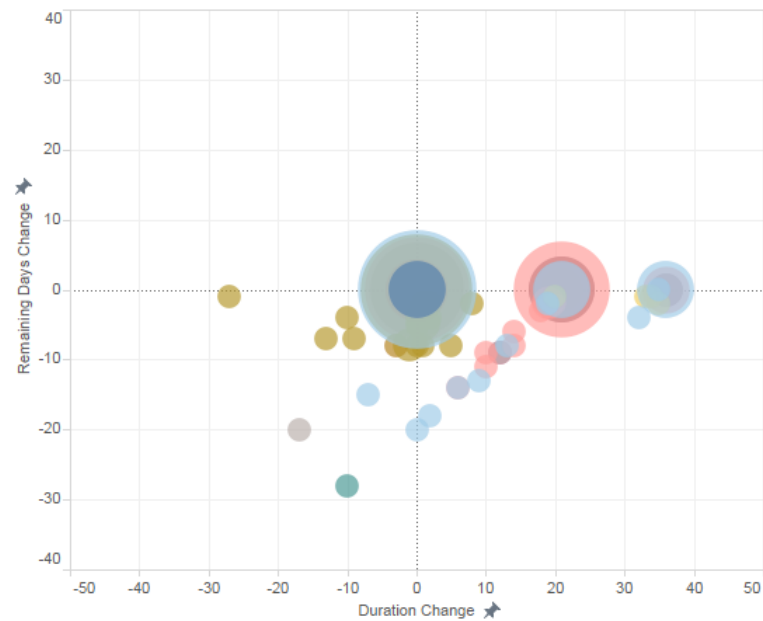
Current Month

Month 26

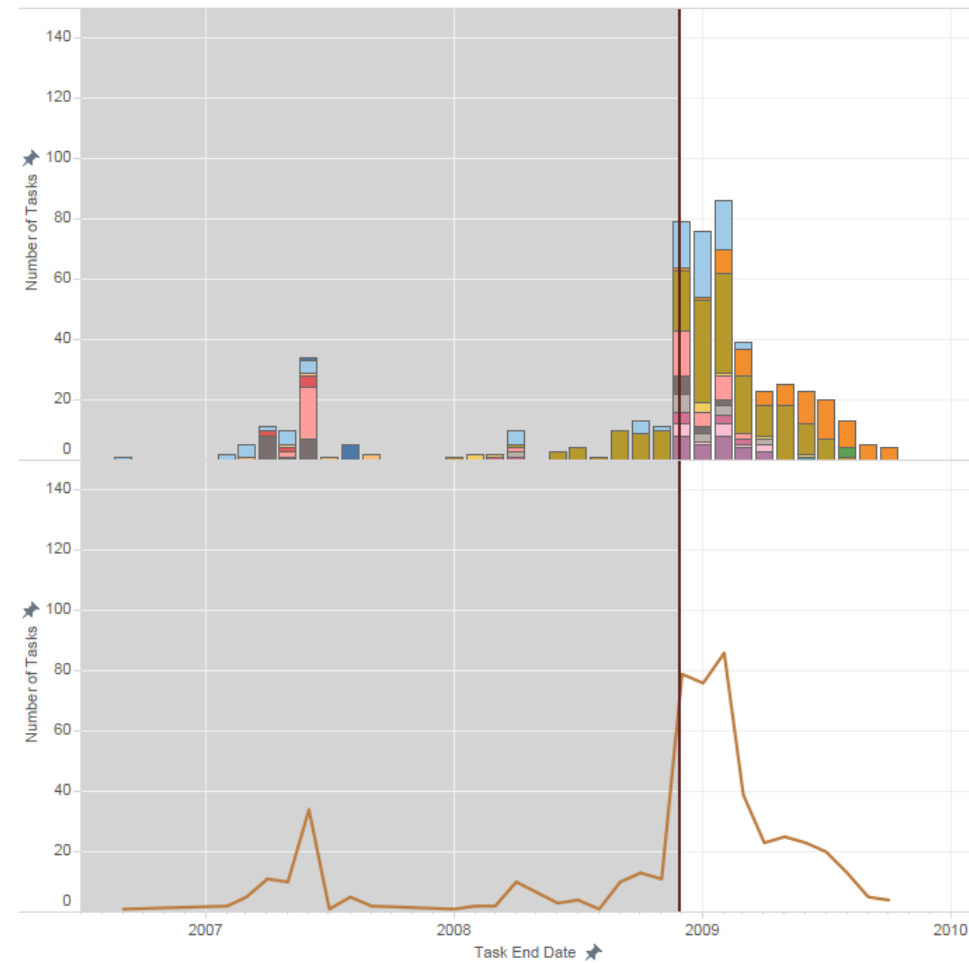
◀ ▶

- Approvals and Permits
- Construction Design Phase
- Deck
- Enabling Works - Geotech..
- Finishes
- Pier Shafts and Head
- Pile Caps
- Piling
- Procurement and Contract..
- V5C1 Ch 406.244 to 406.8..
- V5C2 Ch 406.868 to 407.4..
- V5C3 Ch 407.456 to 408.0..
- V5C4 Ch 406.224 to 405.8..
- V5C5 Ch 408.056 to 408.6..
- V5C6 Ch 405.818 to 405.3..

Remaining Days v Duration Change



End Date Distribution

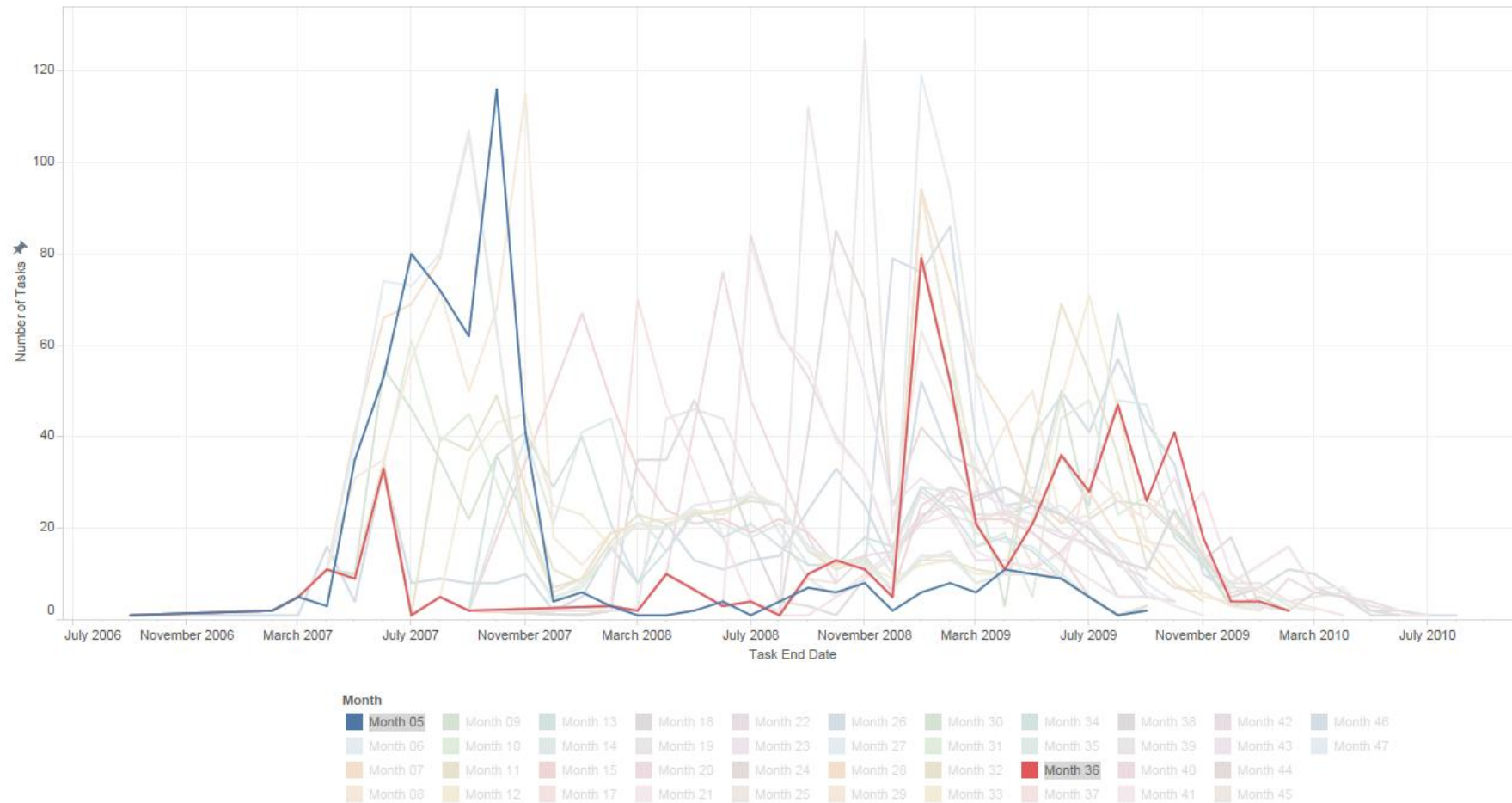


Schedule Analytics – Volumetrics



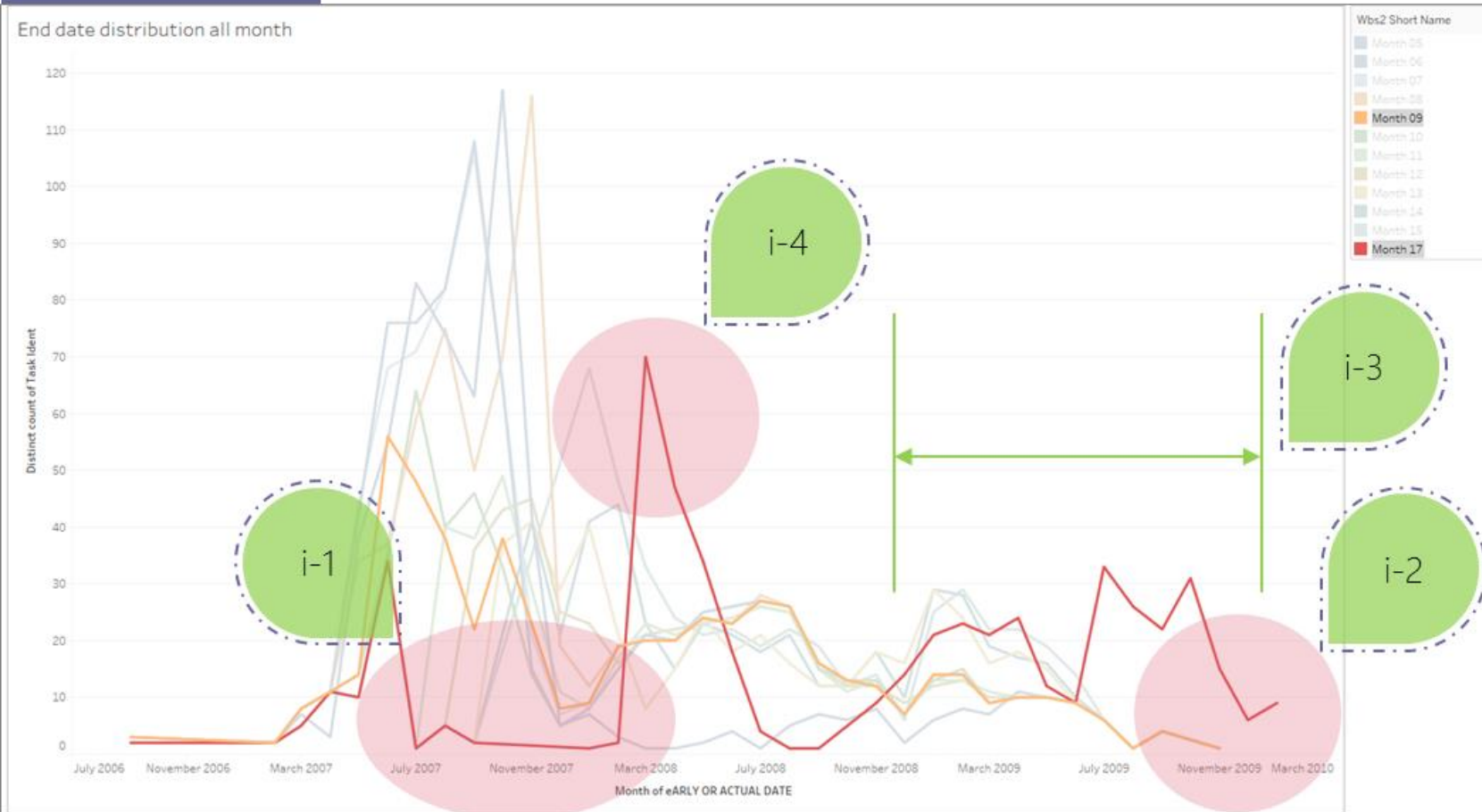
End Date Distribution

This graph shows fluctuation of the end dates of tasks over time. Select multiple months using the CTRL button on your keyboard to highlight specific months.



Schedule Analytics – Interpretation

Volumetric trends



Task summary Remaining change Duration change Remaining days delta vs Duratio... 3 definitions of delay WBS breakdown example Start date distribution by month End date distribution all month End date distribution single mon... WBS 9 b

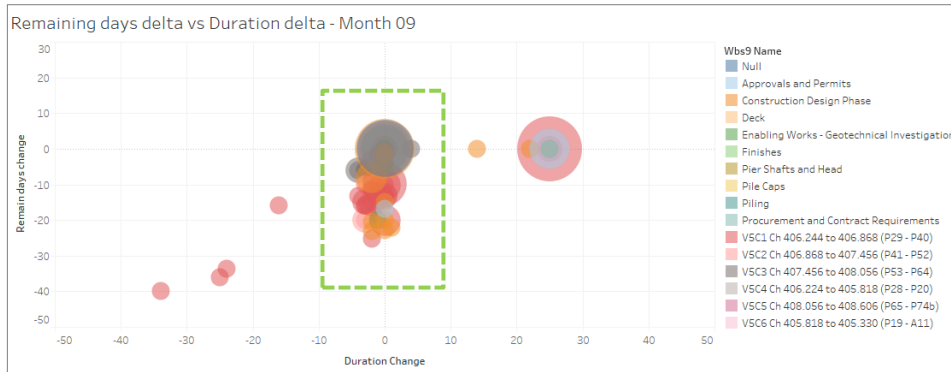
Month 9-17 volumetric comparison

Volumetric Task
Compression

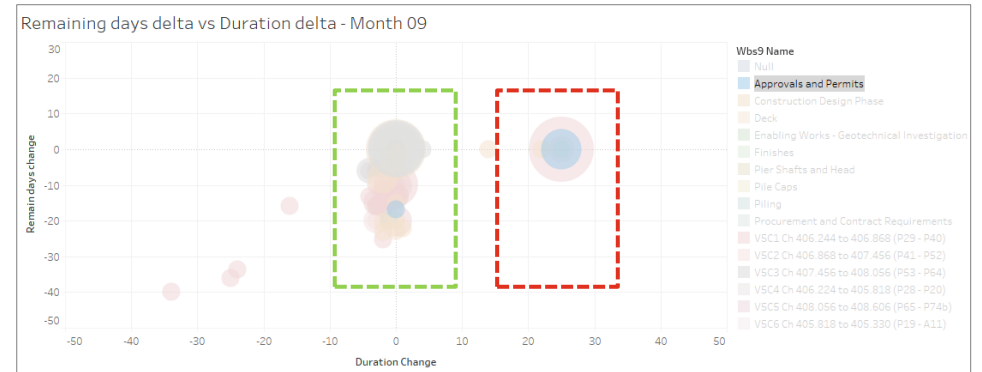
End date distribution

Flexible baseline to
current month comparison

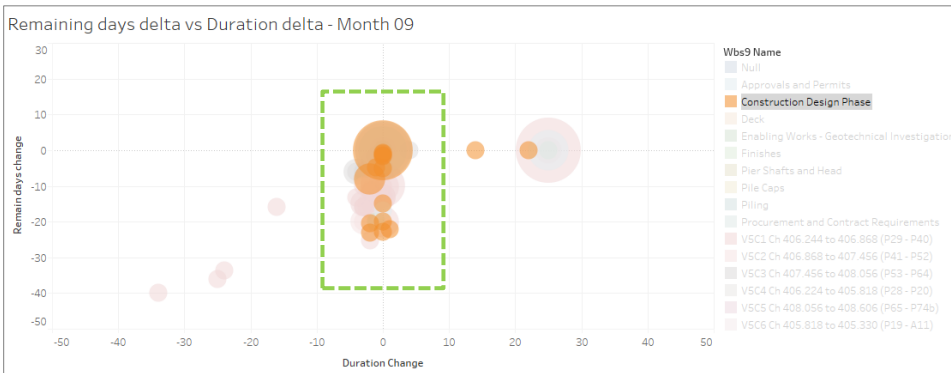
Schedule Analytics – Interpretation



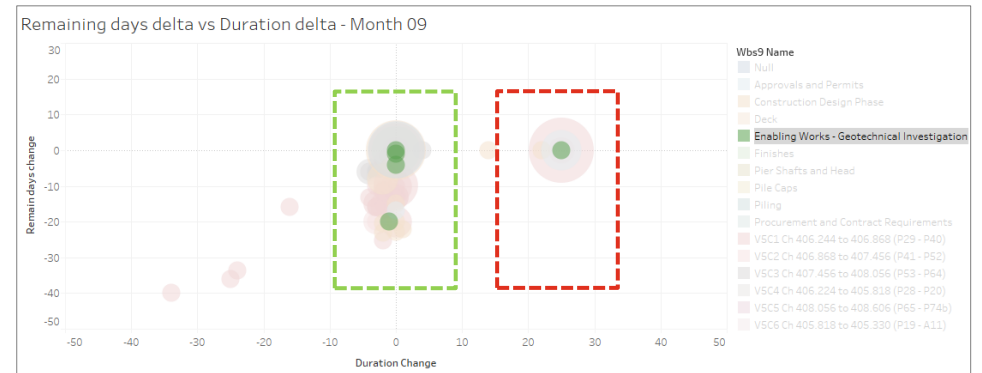
Month 9 – overall view



Month 9 – Approvals and Permits



Month 9 – Construction Design



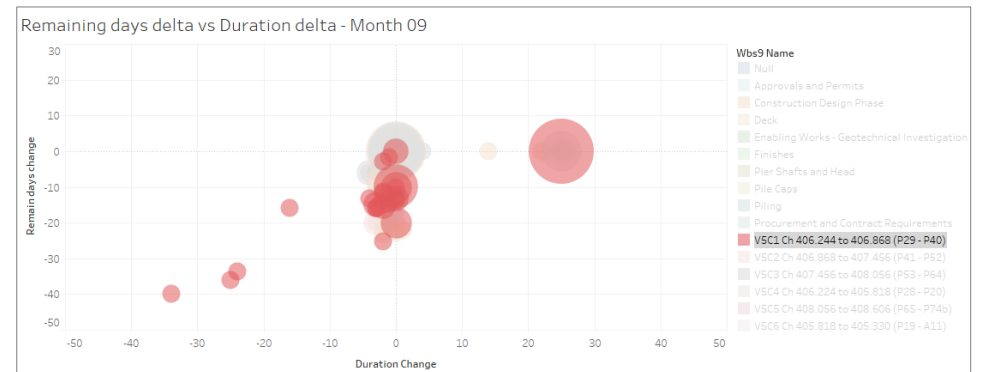
Month 9 – Enabling Works

Delay patterns

Drill-down capability into specific delay groups

Grouped project delivery structures

Identification of root cause

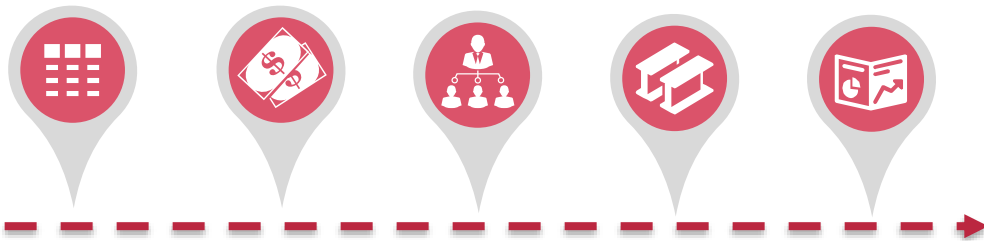


Month 9 – V5C1 construction activity

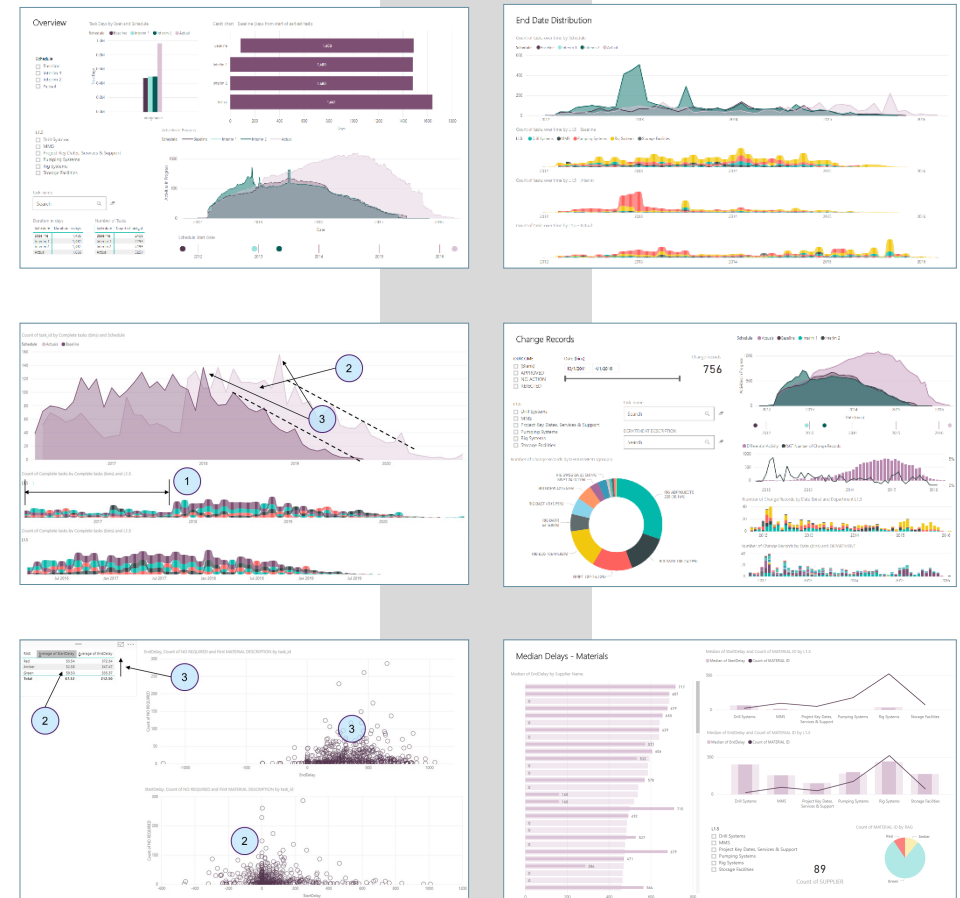
5

Case Study 2
Multiple Source
Analytics

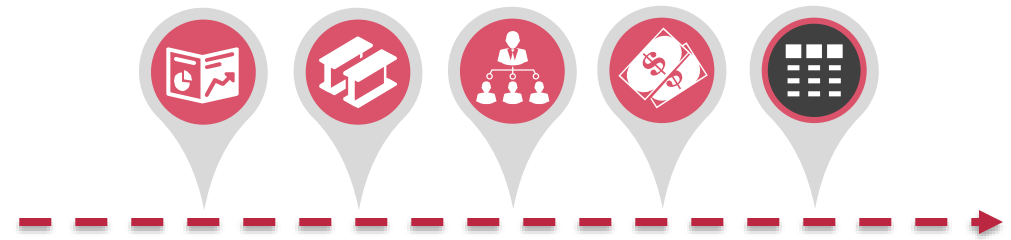
Multiple Source Analysis



1. Schedule
2. Cost
3. Resource deployment
4. Materials orders
5. Contractual change

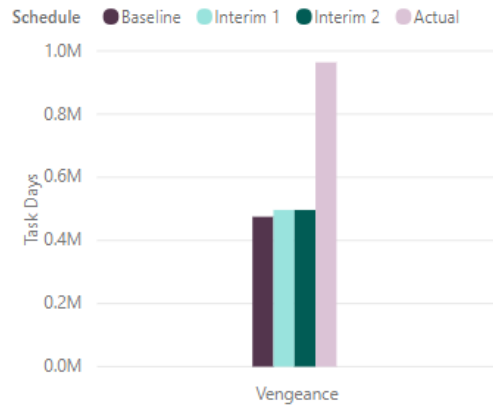


Multiple Source Analysis

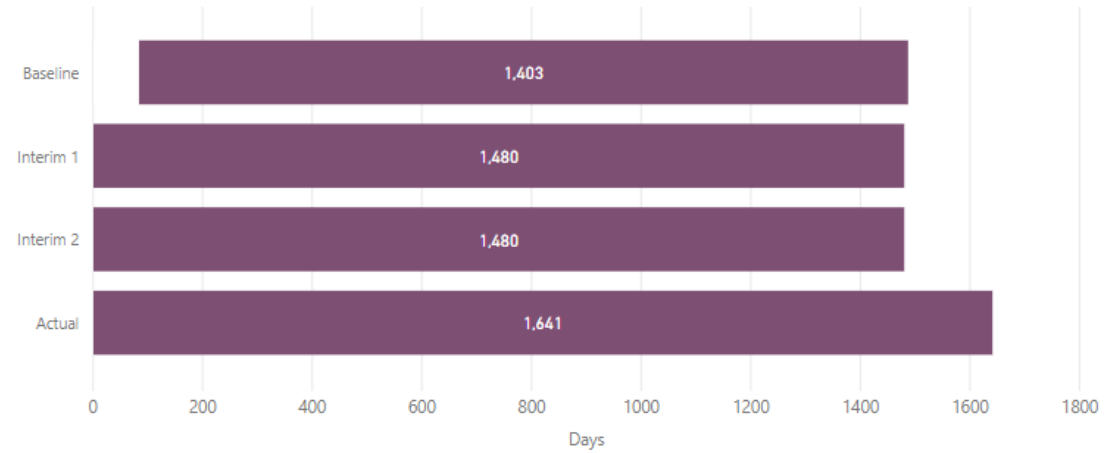


Overview

Task Days by Boat and Schedule



Gantt chart - Baseline (days from start of earliest task)



L1.5

- Drill Systems
- MMS
- Project Key Dates, Services & Support
- Pumping Systems
- Rig Systems
- Storage Facilities

task_name

Duration in days

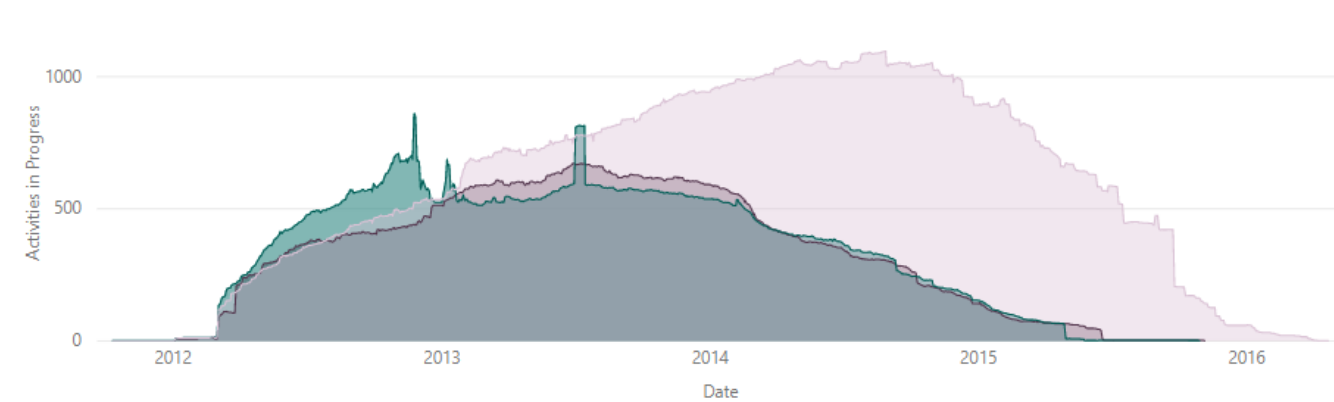
Schedule	Duration in days
Baseline	1,405
Interim 1	1,481
Interim 2	1,481
Actual	1,656

Number of Tasks

Schedule	Count of task_id
Baseline	2459
Interim 1	4255
Interim 2	4255
Actual	3251

Activities in Progress

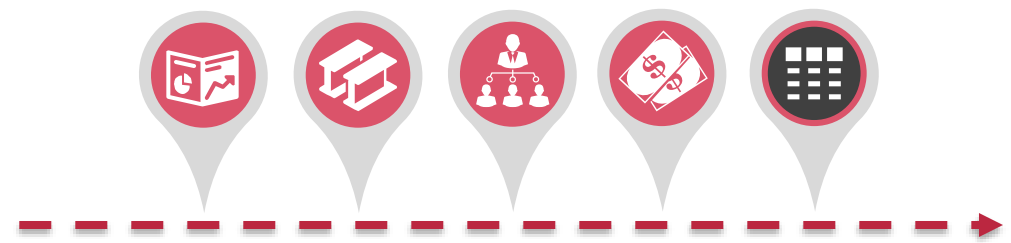
Schedule Baseline Interim 1 Interim 2 Actual



Schedule Start Date



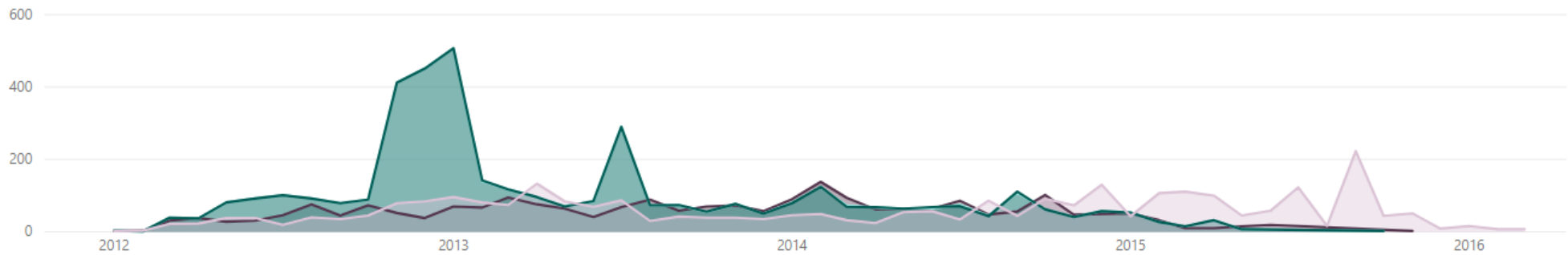
Multiple Source Analysis



End Date Distribution

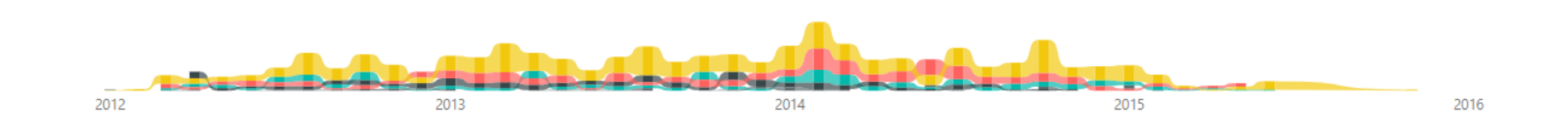
Count of tasks over time by Schedule

Schedule ● Baseline ● Interim 1 ● Interim 2 ● Actual

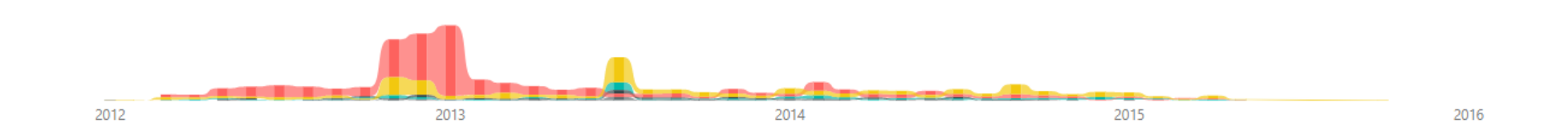


Count of tasks over time by L1.5 - Baseline

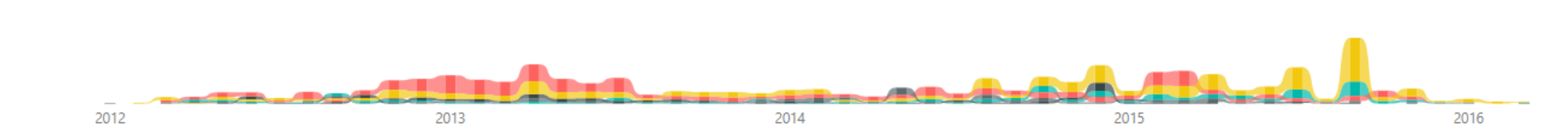
L1.5 ● Drill Systems ● MMS ● Pumping Systems ● Rig Systems ● Storage Facilities



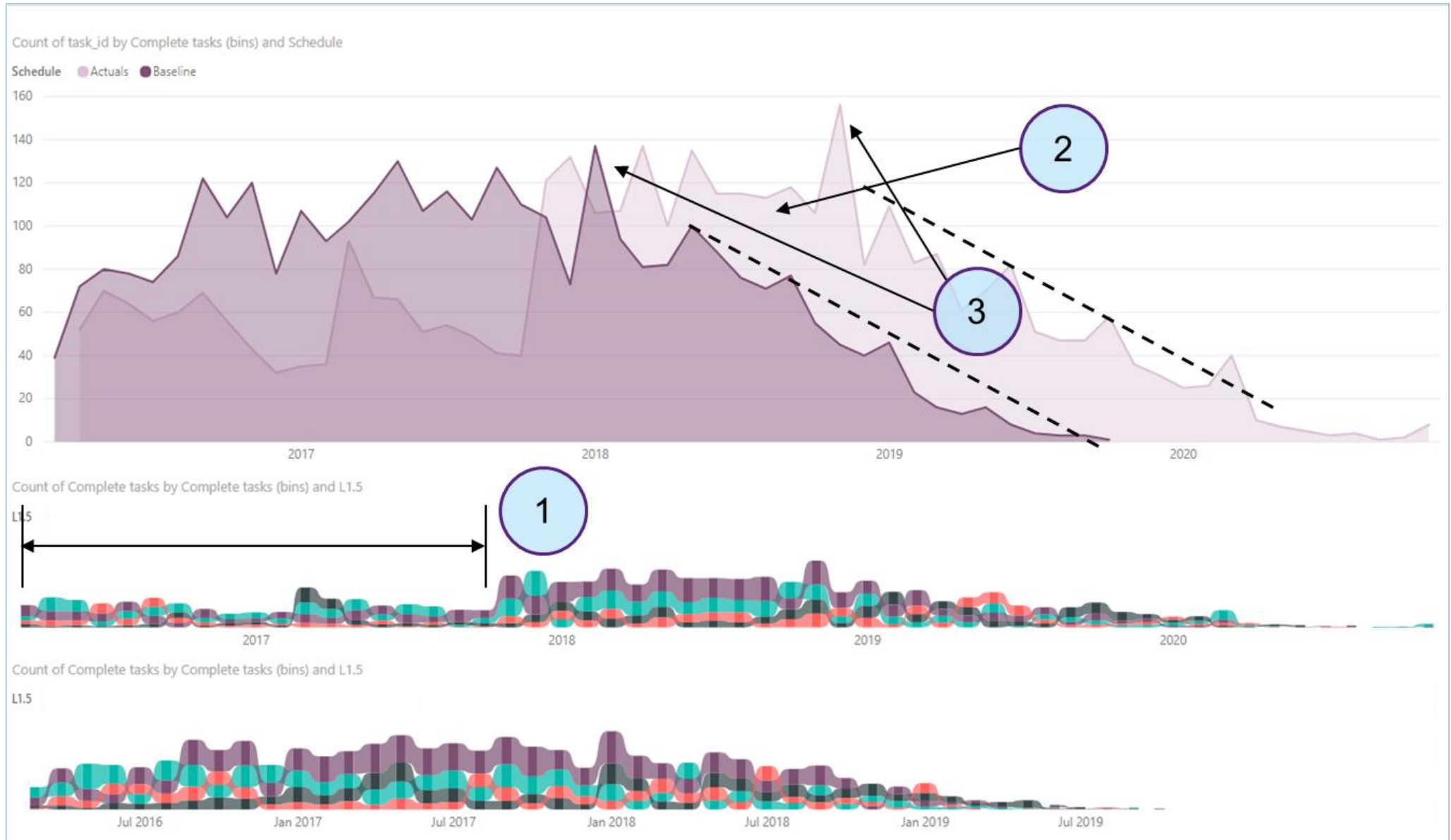
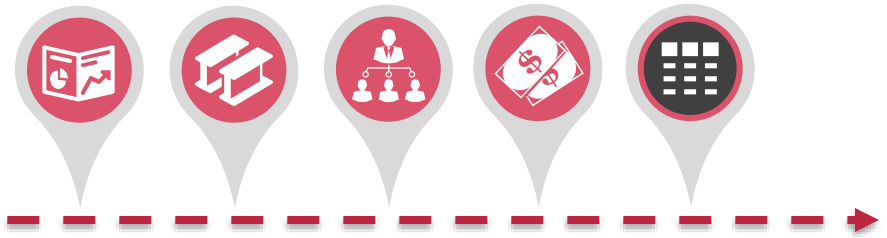
Count of tasks over time by L1.5 - Interim



Count of tasks over time by L1.5 - Actual



Multiple Source Analysis



Multiple Source Analysis



Change Records

- OUTCOME
- (Blank)
 - APPROVED
 - NO ACTION
 - REJECTED

Date (bins)

10/1/2011 4/1/2016

Change records

756

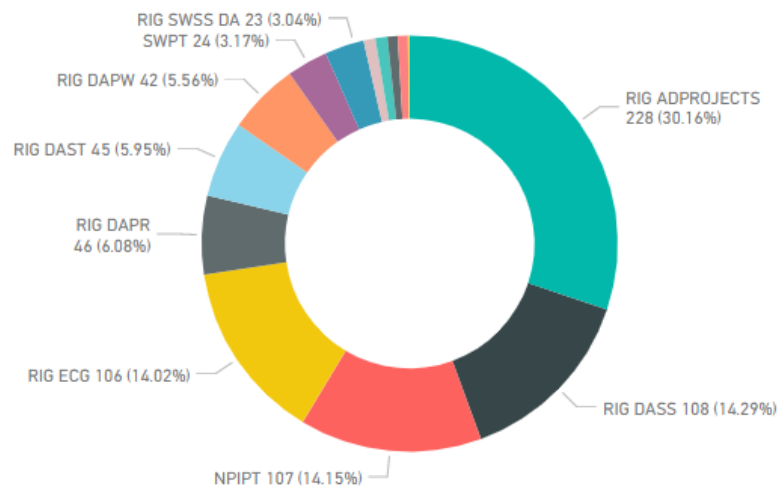
L1.5

- Drill Systems
- MMS
- Project Key Dates, Services & Support
- Pumping Systems
- Rig Systems
- Storage Facilities

task_name

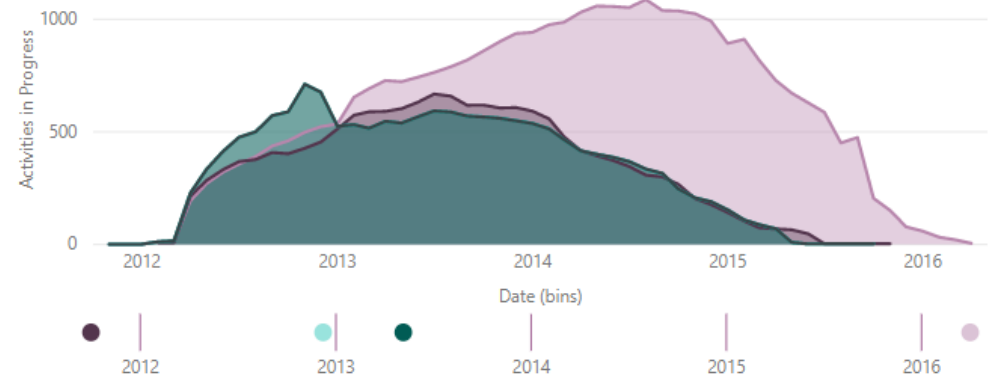
DEPARTMENT DESCRIPTION

Number of Change Records by DEPARTMENT (groups)



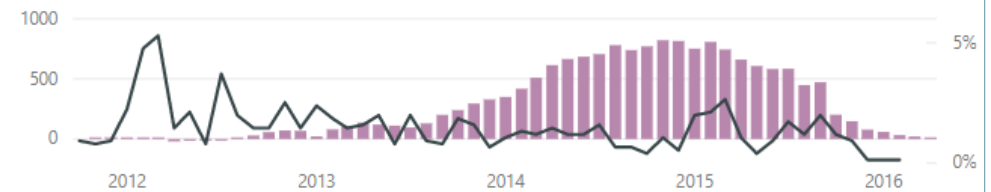
Schedule

- Actuals
- Baseline
- Interim 1
- Interim 2

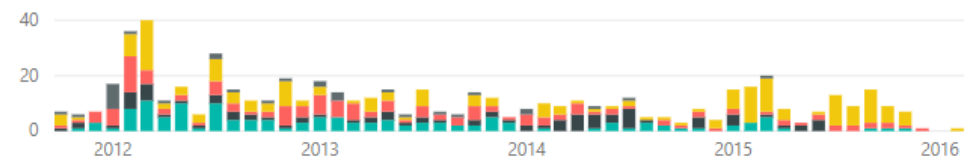


Differential Activity

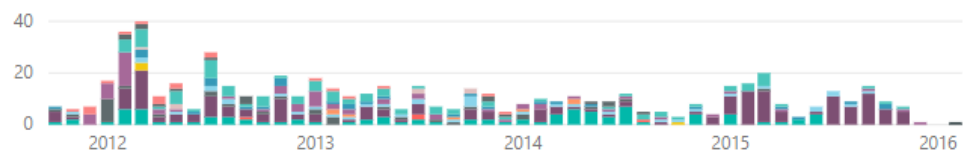
- %GT Number of Change Records



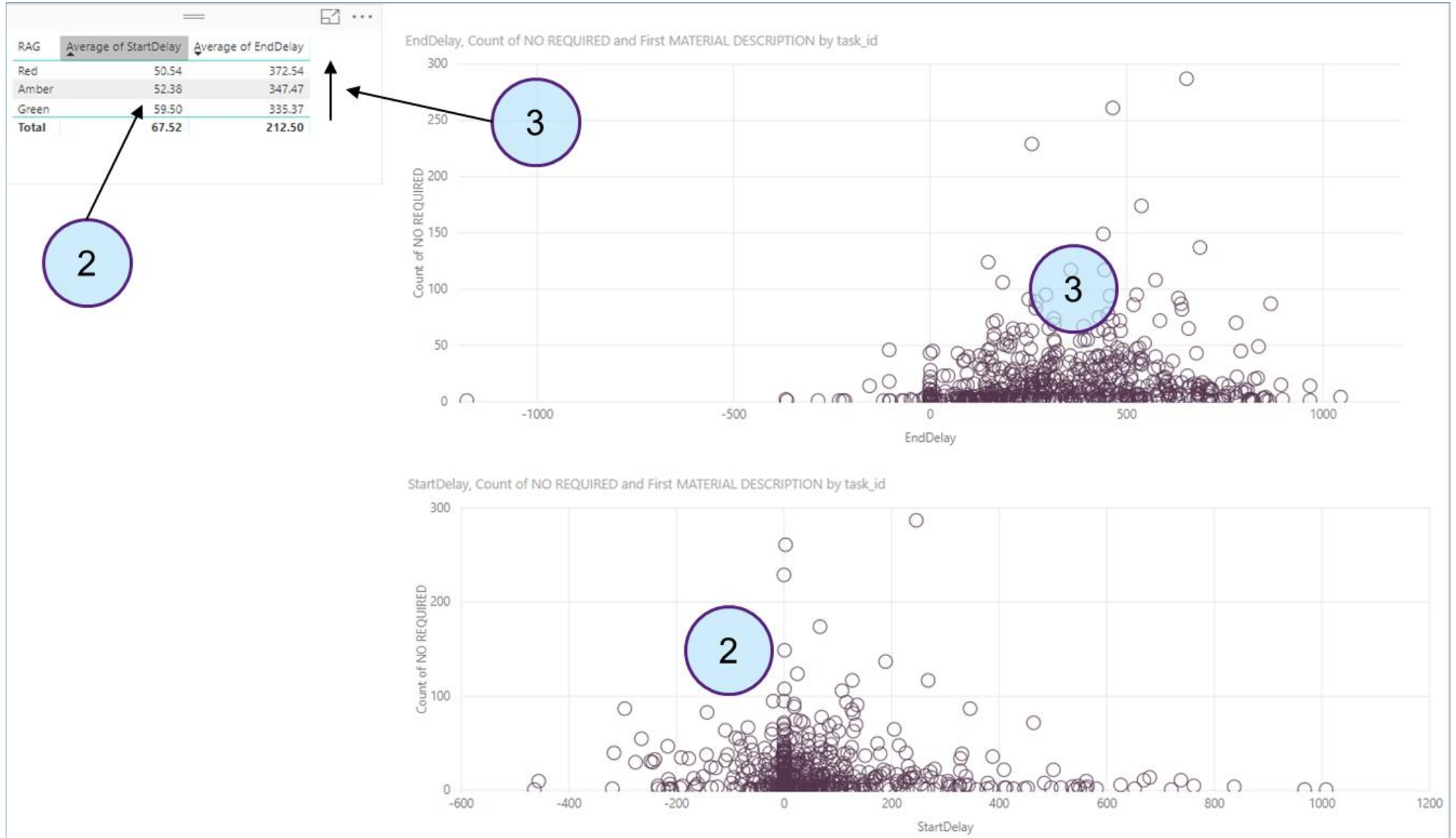
Number of Change Records by Date (bins) and Department L1.5



Number of Change Records by Date (bins) and DEPARTMENT



Multiple Source Analysis

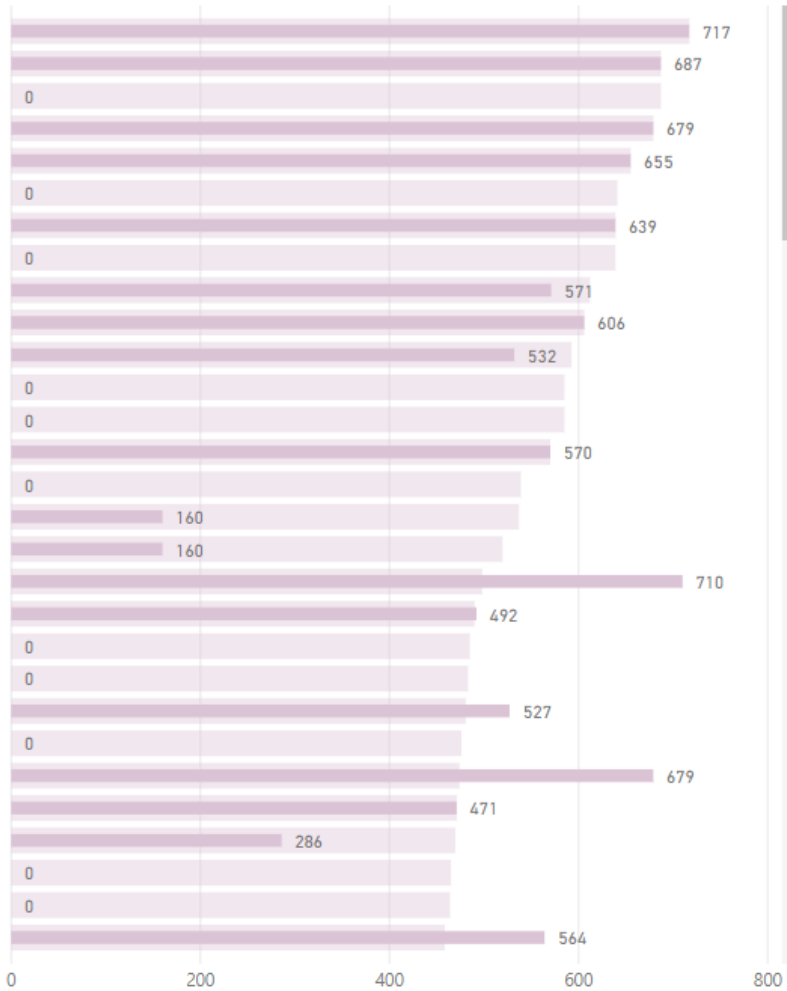


Multiple Source Analysis



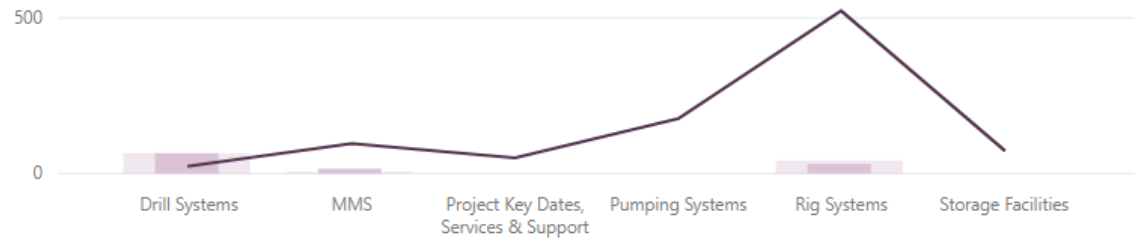
Median Delays - Materials

Median of EndDelay by Supplier Name



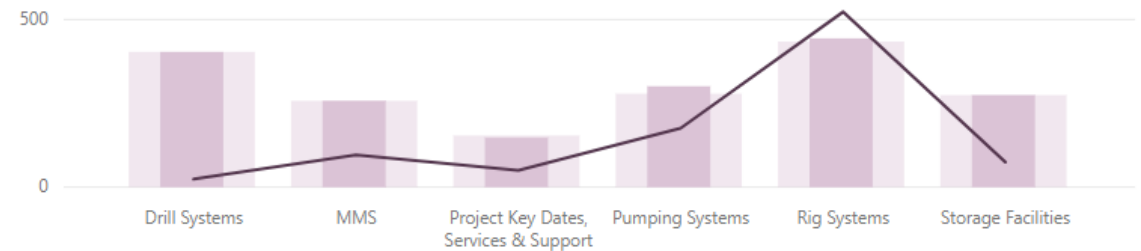
Median of StartDelay and Count of MATERIAL ID by L1.5

● Median of StartDelay ● Count of MATERIAL ID



Median of EndDelay and Count of MATERIAL ID by L1.5

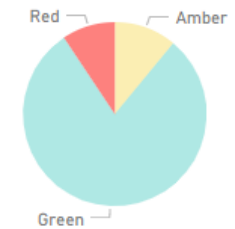
● Median of EndDelay ● Count of MATERIAL ID



L1.5

- Drill Systems
- MMS
- Project Key Dates, Services & Support
- Pumping Systems
- Rig Systems
- Storage Facilities

Count of MATERIAL ID by RAG



89

Count of SUPPLIER

Improved visibility of
delivery challenges

Identification and
evidence of delay
patterns

Key metrics and
reporting outputs

Contributed to
£140m
savings initiative

Improved approach to
future projects
£1bn deferred
in required investment

20% increase
in labour effectiveness

10% saving in
remaining delivery
programme
(£42m)

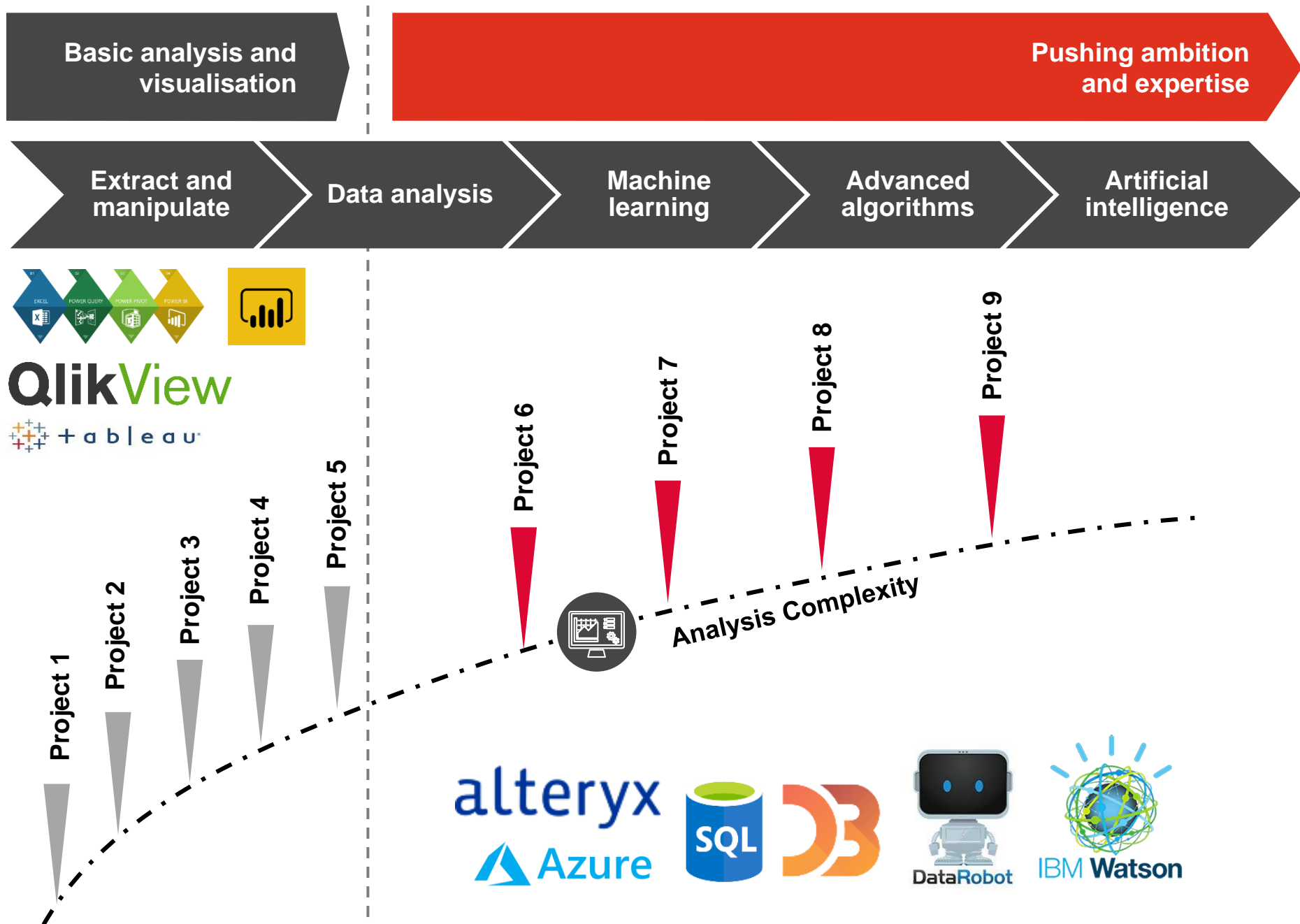
Inefficiencies identified
to inform turnaround
actions

Significant opportunity
for further savings in
next 5 year programme
(£1bn)

6

The future direction of
Complex Project Analytics

Future direction of Complex Project Analytics



Complex Project Analytics

We help projects make the most of their data. By providing end-to-end partnering, supported by advanced data analytics and technical knowledge, we are able to:

- Maximise the value of data through bespoke analytics;
- Create a future state of how data is captured and utilised;
- De-risk the delivery of projects and programmes;
- Drive cost reduction and efficiency; and
- Optimise digital construction techniques.





We help project organisations where.....

1. Cost and schedule overruns are a frequent occurrence;
2. The project faces significant challenges in supply chain engagement and performance;
3. Gaining control and confidence over schedule and cost is paramount;
4. True visibility of project performance is not possible;
5. The application of technology is daunting and causing a risk-averse culture;
6. The true value of project data is unknown or not embraced.

Thank you Q&A

Alan Lavery

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Analytics lead

PwC Capital Projects and Infrastructure

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