



The Power of Data:

*Big Data to Dashboards (and Beyond),
making the most out of your data
investment*

Presented by:

Simon Gibbons, Technical Director (ERM)
Natasha Hausmann PhD, Senior Scientist (ERM)
Brian Henry, Principal Consultant (ERM)

Guest Speaker:

Johan De Fraye, Head of Environmental Affairs
(Signify)

October 11, 2018

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The business of sustainability



Today's Speakers



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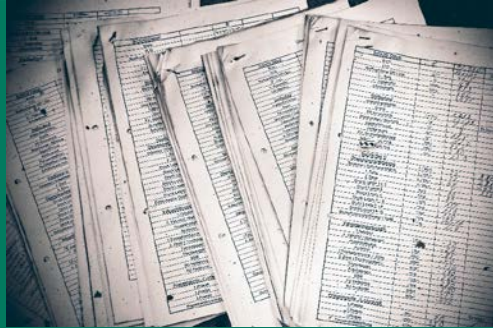
Johan De Fraye
Signify
Johan.de.fraye@signify.com

Health and Safety Moment: Insight through Visualization



- Spill modelling work has identified practical H&S risks for the workforce

Agenda



Data Management Retrospective

- Where did we come from?
- Where are we going?
- How do we most cost effectively link these together?

*Speaker: Simon Gibbons
(ERM)*



The Value of Data Management

- Case Studies: Automated Reporting
- Case Study: Advanced Analytics

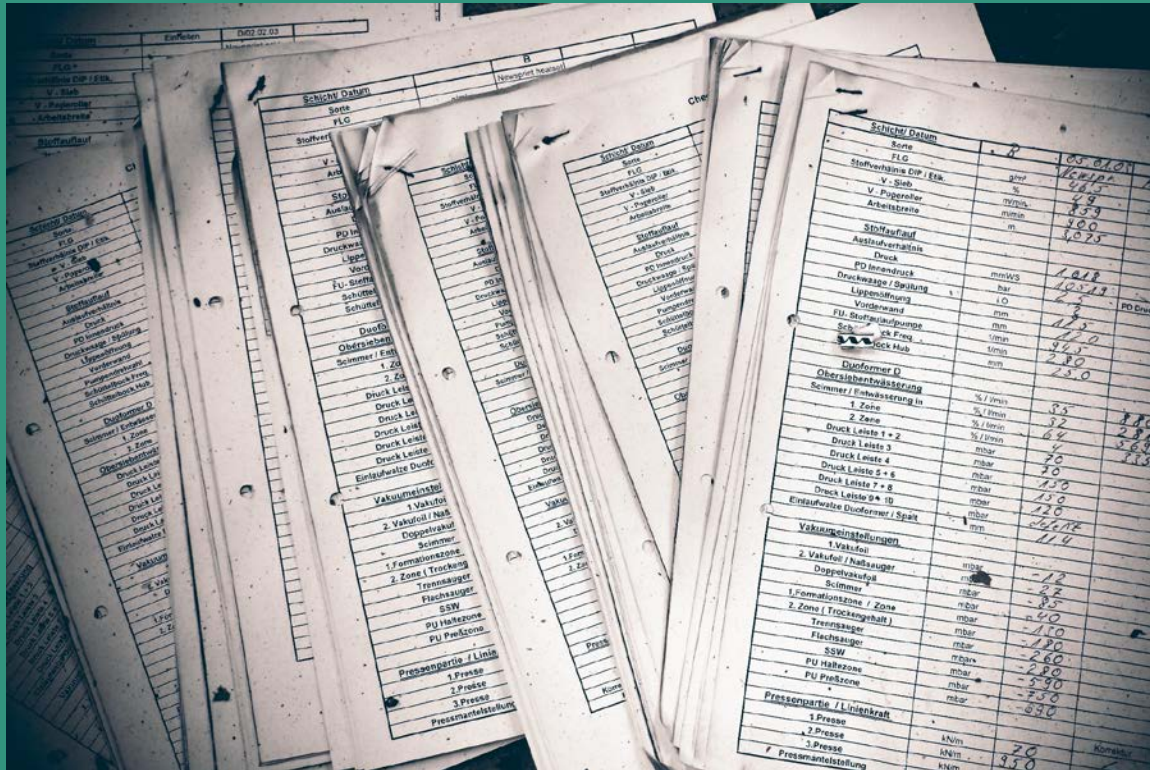
*Speaker: Tasha Haussmann
(ERM)*



The Power of Dashboards

- The Value of Dashboards
- Case Study: Use of Dashboards to facilitate change

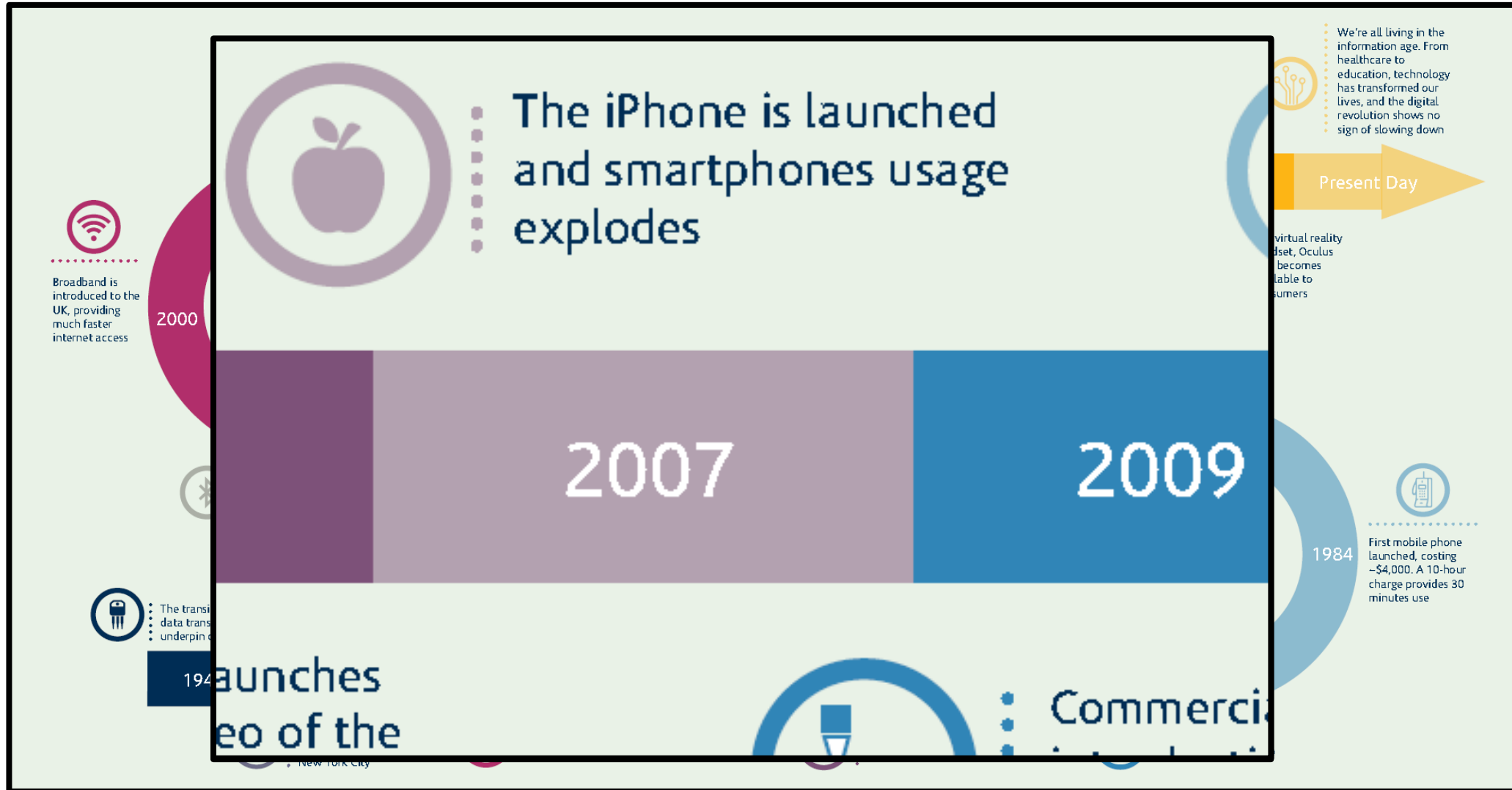
*Guest Speaker: Johan De Fraye (Signify)
Speaker: Brian Henry (ERM)*



Data Management Retrospective

Speaker: Simon Gibbons (ERM)

Technology Age



Moving on from the 1990's



The screenshot shows the Microsoft Excel 4.0a interface. The menu bar includes File, Edit, Formula, Format, Data, Options, Macro, Window, and Help. The toolbar contains icons for file operations and formatting, with the text 'Normal' displayed. The spreadsheet grid shows column headers A through G and row numbers 1 through 12. An 'About Microsoft Excel' dialog box is open, displaying the following information:

About Microsoft Excel

Microsoft Excel Version 4.0a
Copyright © 1985-1992

This copy of Microsoft Excel is licensed to:
Name
Organization

Soft-Art Dictionary and Program: Copyright © 1984-1992
Trade Secret, Soft-Art, Inc. All rights reserved.

Serial number: 00-065-0400-76116547
Available Memory: 65535 of 65535 KB Free
Math Co-processor: Present

An 'OK' button is visible in the top right corner of the dialog box.



The Role of Data and the Data Manager

Data waster

Collects data but severely underuse them



Data collector

Collects data but do not consistently maximize their value



Aspiring data manager

Understands value of data and marshals resources to take better advantage



Strategic data manager

Has well-defined data-management strategies that focus on collecting and analyzing the most valuable data



Digital Maturity – a Corporate View



The benefits from working in a maturing company...



Digital Maturity Level 1 Moving from Analog

L1 Characteristics

- Isolated Data Sets
- Pen & Paper → Excel
- Bespoke Reports
- Reports On Hard Copies/Hard Drives
- Lack Of Transparency

**INCONSISTENT AND
INEFFICIENT**



Digital Maturity Level 2 Making the Digital Leap

L2 Characteristics

- Digital Data Collection
- Single Source Of Truth
- Speed Up Decision Making Process (Real Time)
- Consistent And Efficient Reporting

**RELIABLE AND
EFFICIENT**



Digital Maturity Level 3 Integrating on Digital

L3 Characteristics

- Connecting Business Data Sources
- Data Insights Leading To Optimization
- Better Visualization (3D) → Stakeholders
- Efficient Decision Making Process

**INTEGRATED AND
INSIGHTFUL**



Digital Maturity Level 4 Into Data Mining

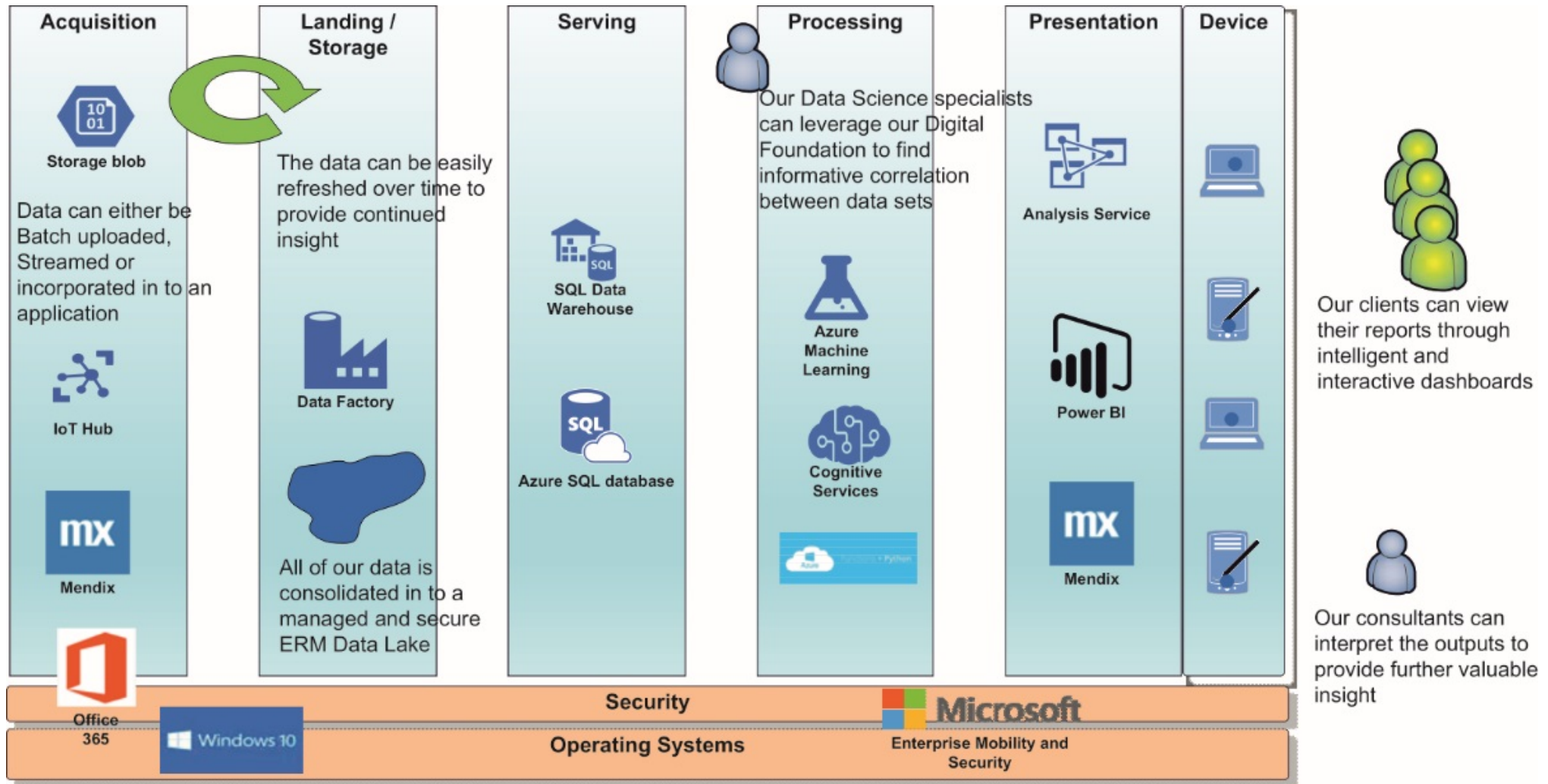
L4 Characteristics

- Predictive Analytics
- Machine Learning For Data Analysis
- Automated Decision Making

To Artificial Intelligence,
Virtual Reality And Beyond

**FORWARD-LOOKING AND
PROGRESSIVE**

Role of a Strong Digital Foundation



ERM Digital Foundation

An Example Data Workflow – ERM Nexus

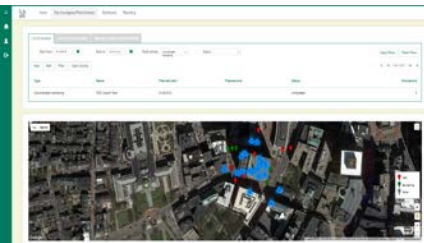
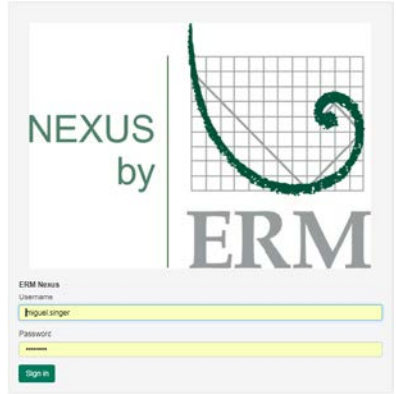
Field Planning

Field Data Collection

Data Management

Data Assessment

Data Reporting



Office

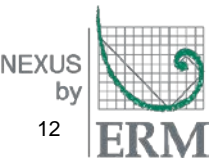


Field

Fluid Level Measurement Report			
Project:	2012011	Location:	Onsite
Client:	ABC Company Ltd	Field number:	Paper Label#012
Site name:	Onsite Street, Boston	Start/End Time:	12:00-12:05
Client address:	123 Main Street, Boston	Location Name of reference:	
Field installed:	Yes	Reference used:	PVC
Deflection measuring point:	Yes	Protective casing material:	PVC
Has pipe and grade present:	Yes	Condition of the protective casing:	Changes/needs repair
Trap and catch present:	Yes	Sealing:	Yes
Field waterproofing:	Yes	Flowing (leak-off):	Yes
Reference casing material:	PVC	Leak present:	Yes
Condition of the protective casing:	Changes/needs repair	Leak amount:	Yes
Sealing:	Yes/No/Not present		
Comments:			
Field type:	No	Depth to UIC/SI:	1.00 m
Monitoring point:	Delimited measuring point	Depth to water:	1.00 m
Flow present:	Yes	Depth to UIC/SI:	2.00 m
Flow rate:	Yes	Flow rate:	1.00 m
Flow rate unit:	Yes	Total well depth:	2.00 m
Flow rate type:	Yes		
Flow rate unit:	Yes		

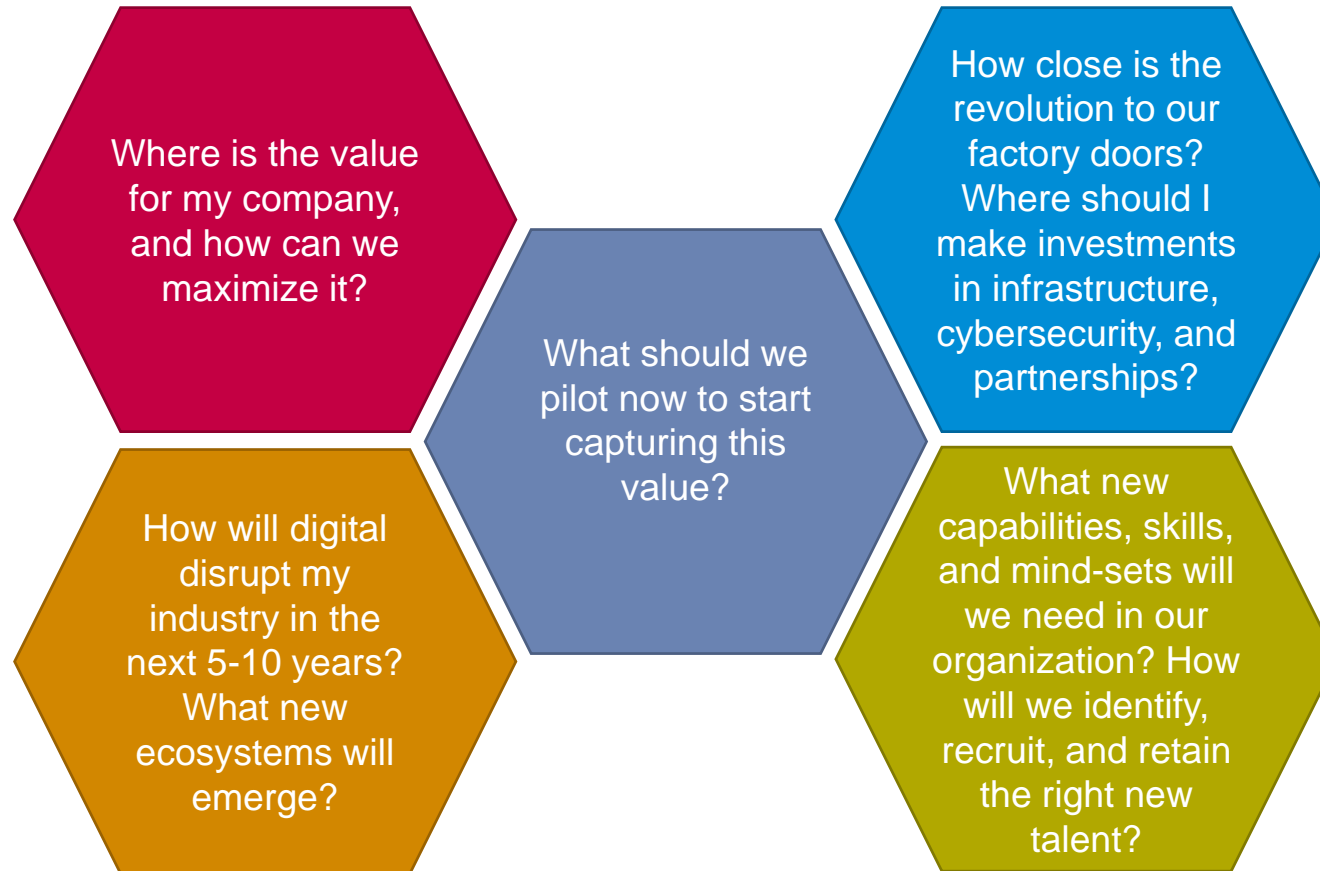


Office



What Should We Ask Ourselves?

McKinsey's C-Suite Questions... Digital = Data





The Value of Data Management

Speaker: Tasha Hausmann (ERM)

Automation and data analytics reduce reporting burden

Challenge:

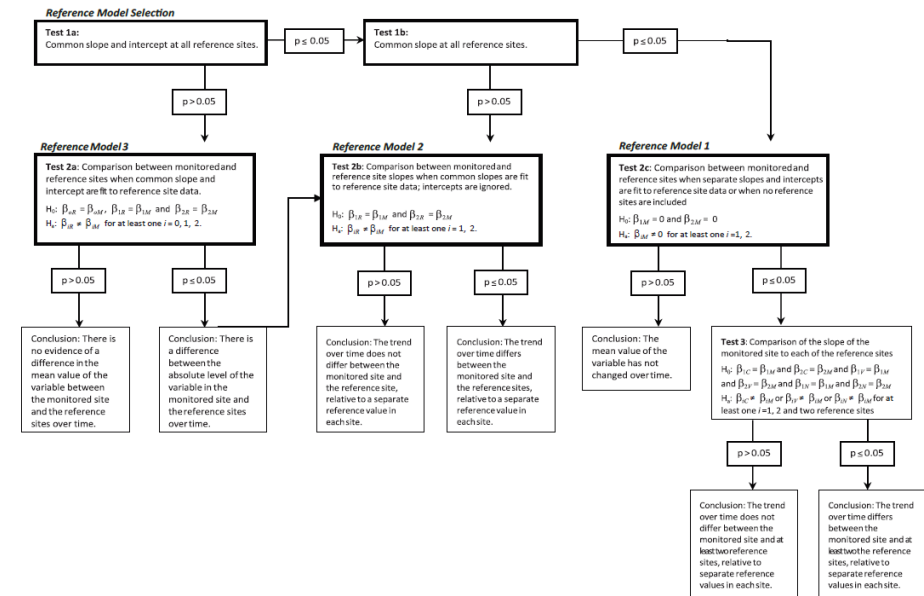
- 200 custom regulatory reports
- Must be completed annually with 4-6 weeks to complete all analyses and reports

Approach:

- Leverage R and Rstudio to create a reporting template that could be automated

Benefits:

- 65% reduction in annual statistical analysis and reporting costs and 50% reduction in report production costs.
- Overall improvement in the efficiency, accuracy, quality and timeliness of reporting.



2. RESULTS FOR THE KOALA WATERSHED AND

2.1 Water Quality

2.1.1 General Physical Variables and Anions

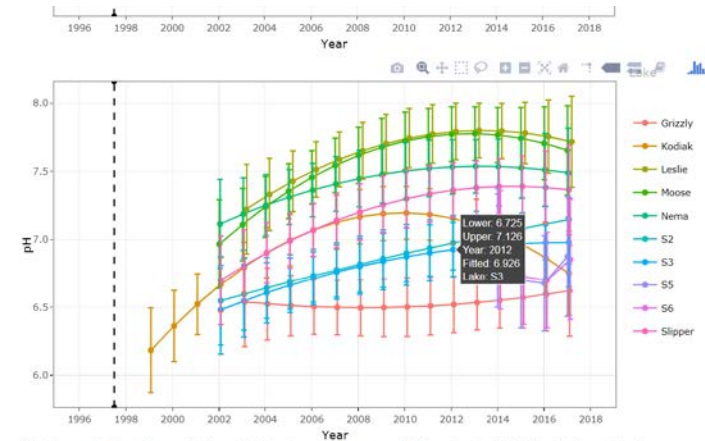
2.1.1.1 pH

2.1.1.2 Total Alkalinity

2.1.1.3 Water Hardness

2.1.2 Nutrients

2.1.3 Metals



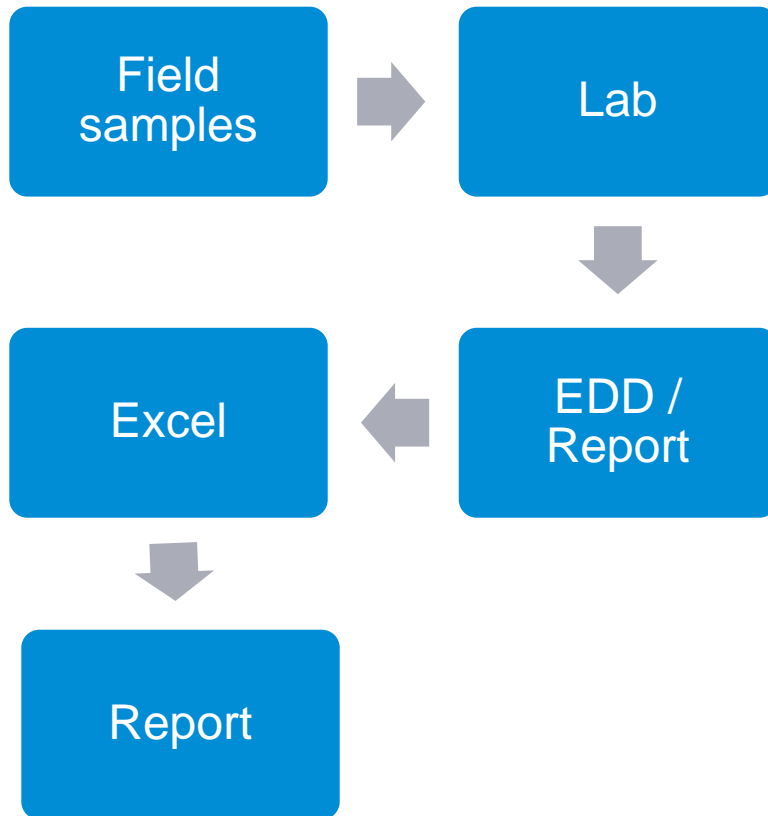
Note: The yearly observed mean for lakes during baseline years are represented by symbols only. For lakes during monitored years, the yearly observed mean is shown by symbols, and the mean and 95% confidence interval estimated by model fitting is represented by curved horizontal lines and vertical bars respectively.

0.0.0.7 Minimum Detectable Differences

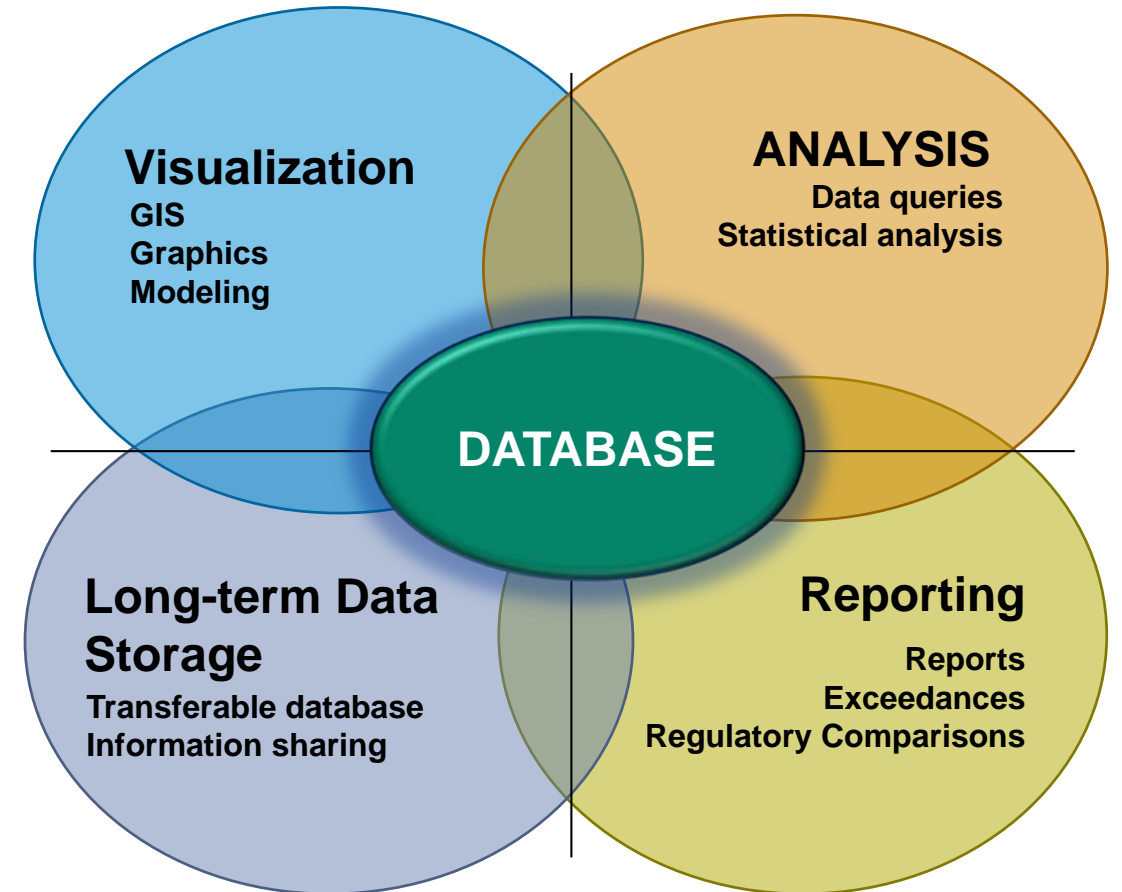
The estimated minimum detectable difference in mean pH for each monitored lake in 2017. Reference lakes are shown for comparison.

Leveraging data means modernizing work flows and processes

Manual data work flows are error prone



Move toward an Integrated Data Practice



Establishing an insights road map for Power Clients

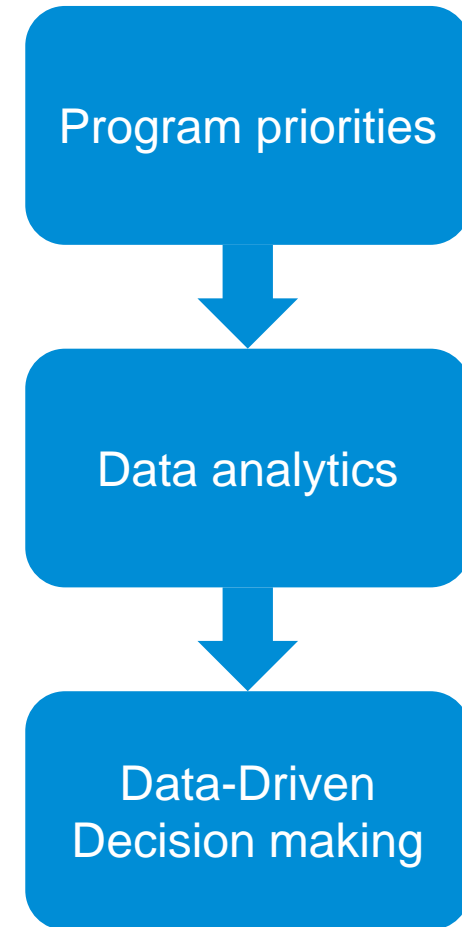
Begin with the end in mind

Client Challenge:

Establish a groundwater monitoring program for all coal ash landfills and impoundments

Recommendations

- Establish a compliant yet flexible decision framework and implement these with the right digital tools
- Employ data analytics at key strategic decision points
- Carefully consider regulatory timeline and program phases



Controlled, Web-based Access to Database

Real-time data views

The screenshot displays the Earthsoft EQuIS Enterprise dashboard. At the top, it shows the user 'cathleen.demers' and a 'Logout' button. The main content area is divided into several sections:

- SITE INFORMATION:** Includes a map widget with a satellite view of a site, showing various colored markers and a yellow grid overlay. Below the map are controls for zooming in/out, full extent, and panning.
- EDP EDD Status:** A table showing the status of EDD files. It includes a search bar and a table with columns for Status, File Name, Date, and Facility. One entry is visible: AAB0154-EIA, EFWEDD.zip, 3/15/2017 10:48:00 AM.
- Web and Email Notifications:** A table showing notifications for the user 'cathleen.demers'. It includes a search bar and a table with columns for Date, Subject, and Facility. Three entries are visible:

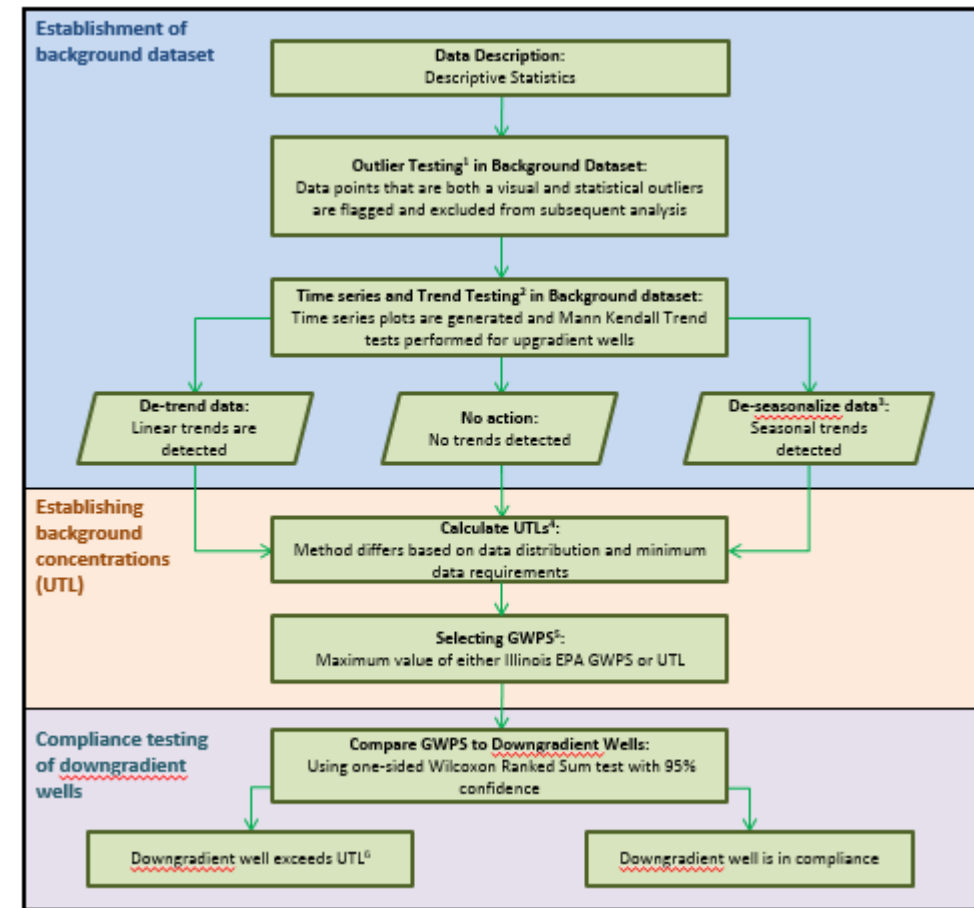
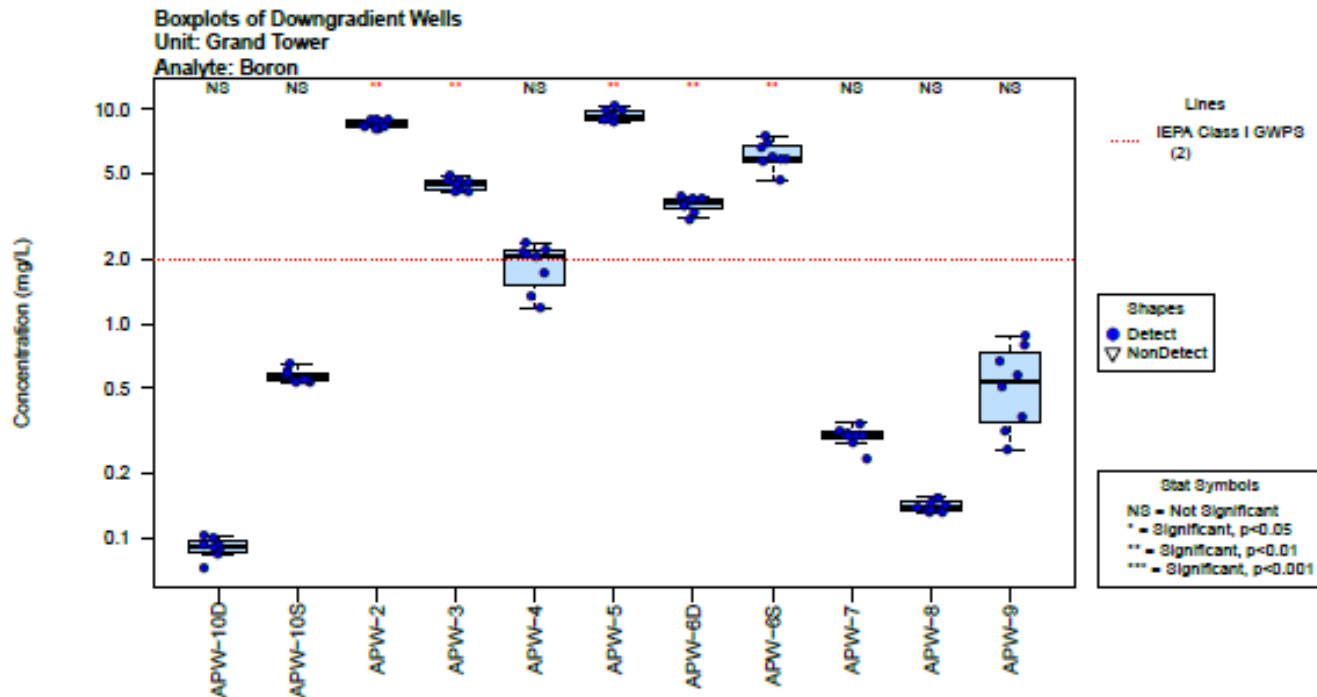
Date	Subject	Facility
3/15/2017 10:50:00 AM	Data loaded into EQuIS database	
3/15/2017 10:49:00 AM	EDD File AAB0154-EIA. EFWEDD.zip Accepted	
1/17/2017 5:32:00 AM	EQuIS Enterprise User Created	
- EVENT REPORTING:** A section with three widgets:
 - Summary of Analytical Data Report - Instructions:** Provides instructions on how to use the report widget.
 - Tables 1 and 2 (Web) - Instructions:** Provides instructions on how to use the tables widget.
 - Exceedance Table - Instructions:** Provides instructions on how to use the exceedance table widget.

Sample tracking

Automated reporting / screening against UPLS

Automated Analysis and Reporting for Compliance Testing

- R Markdown reports executes decision framework
- Auto-population of tables, figures and text
- Comparisons to regulatory limits (UCLs, UTLs, and UPLs)



- Grand Tower_-F1_OutlierPlot_2018-04-24.pdf
- Grand Tower_-F2_Timeseries_Upgradient_2018-04-24.pdf
- Grand Tower_-F3_Boxplots_Screening_2018-06-21.pdf
- Grand Tower-Analysis_2018-06-21.xlsx
- GWMR_GrandTower_20180621.docx

Dynamic Reports

Reproducible documents with appealing figures and formatted tables

Code in R studio

Text

Tables

Figures

1 DRAFT: PRIVILEGED AND CONFIDENTIAL,

/ 71

NMDS Data Gaps Tables 49 and 50 show the number of results and proportion of results in the initial dataset. The tables that follow show the number of detected results in the datasets for each NMDS run. Note that which analytes and samples are included in these datasets is based on pre-defined completeness criteria for each sample and analyte.

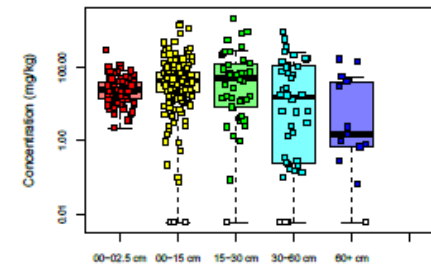
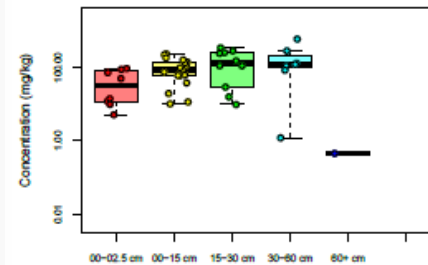
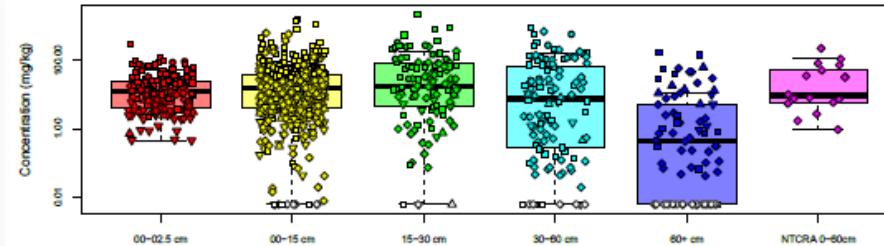
Table 49: Full Dataset: Number of results for each analyte

Group.1	Aluminum	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Total.PCBs	Zinc
UOP Soil	8	8	8	8	20	8	20	20	8	20	20
E Rutherford	21	170	170	370	380	430	530	650	370	120	390
UPIC	42	42	42	42	42	42	42	86	42	83	42
UBC	300	300	300	300	290	300	300	500	300	480	290
MBC	370	370	370	370	450	370	370	660	370	650	370
LBC	140	140	140	140	140	140	140	240	140	230	140
BCC	89	88	88	88	88	88	88	130	88	120	89

```

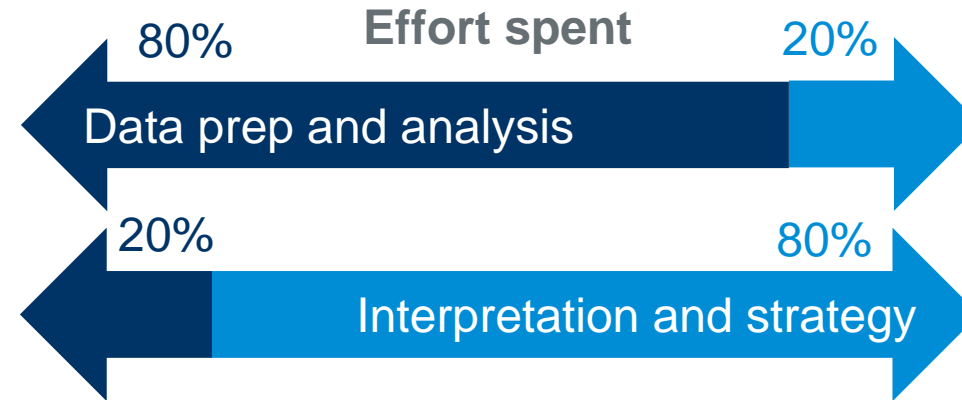
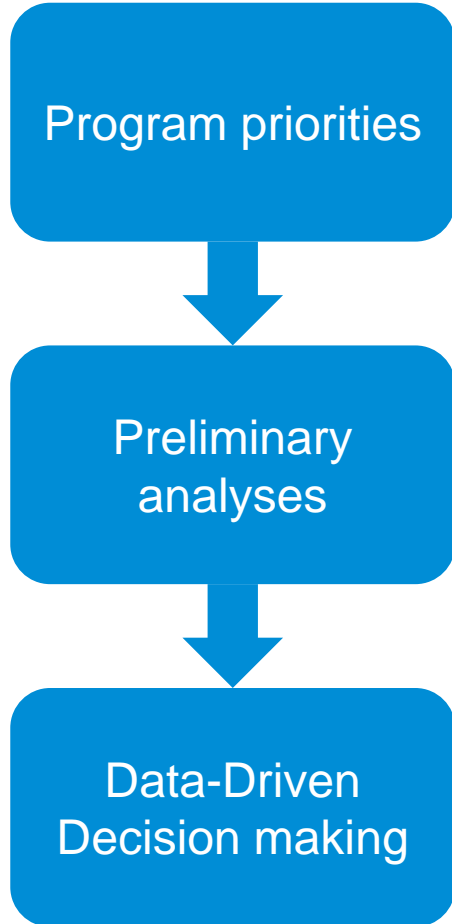
1 \documentclass{article}
2 \begin{document}
3 \begin{document}
4 \paragraph{NMDS Analysis}
5 Some of the NMDS models failed to converge meaning that they did not find multiple best solutions that had
6 similar results. For these models, a three dimensional solution was tried to see if convergence could be
7 achieved. If the model failed to converge with both two and three dimensional solutions, the best result was
8 reported. The stress of the model is also reported. Generally, a stress less than 0.1 is considered an
9 excellent model fit. Stress values between 0.1 and 0.2 are considered good model fits, and higher stress
10 values indicate that a different model solution should be considered.
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27
28 \paragraph{NMDS Analysis}
29 Some of the NMDS models failed to converge meaning that they did not find multiple best solutions that had
30 similar results. For these models, a three dimensional solution was tried to see if convergence could be
31 achieved. If the model failed to converge with both two and three dimensional solutions, the best result was
32 reported. The stress of the model is also reported. Generally, a stress less than 0.1 is considered an
33 excellent model fit. Stress values between 0.1 and 0.2 are considered good model fits, and higher stress
34 values indicate that a different model solution should be considered.
35
36
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38
39
40

```



Benefits of integrated, statistically-driven process

Flipping of the 80:20 Ratio



Increased value for CCR clients

- ☑ Compliance with CCR rule
- ☑ Data-driven, objective decision making
- ☑ Consistency across client sites
- ☑ Shift to proactive from reactive analysis
- ☑ Improved communication and access to data
- ☑ Increased data security and quality
- ☑ Effectively manage liabilities

Advanced Data Analytics Reduce Cleanup Liability

Original
cleanup
footprint

Challenge:

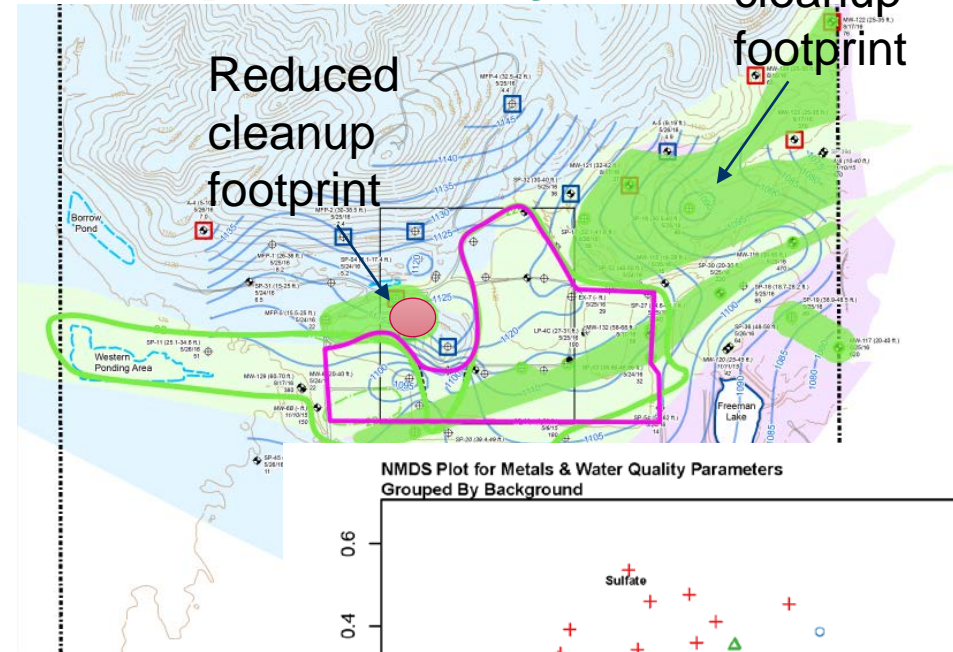
Background concentrations were not captured in the concentration limits for the site leading to an expansive plume for remediation.

Approach:

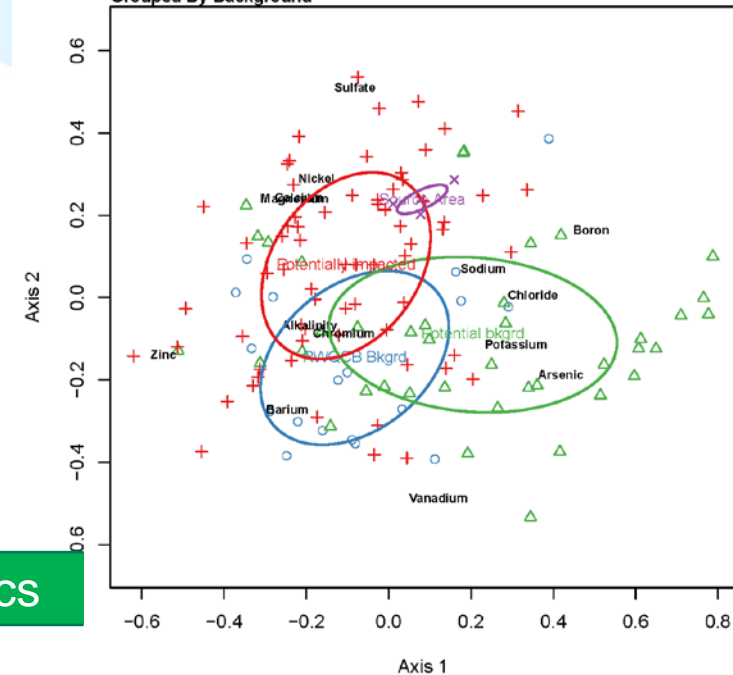
- Engaged multiple subject matter experts to develop multiple lines of evidence.
- Used advanced statistical techniques (chemical fingerprinting).

Outcome:

- Data-based decision making reduced bedrock impacts from 77 acres to less than 2, leading to \$30MM in remediation cost avoidance.
- Techniques have been applied on other projects that require source differentiation and alternate source demonstration.



NMDS Plot for Metals & Water Quality Parameters
Grouped By Background



Client saved \$30MM on remediation costs with a \$60k investment in data analytics



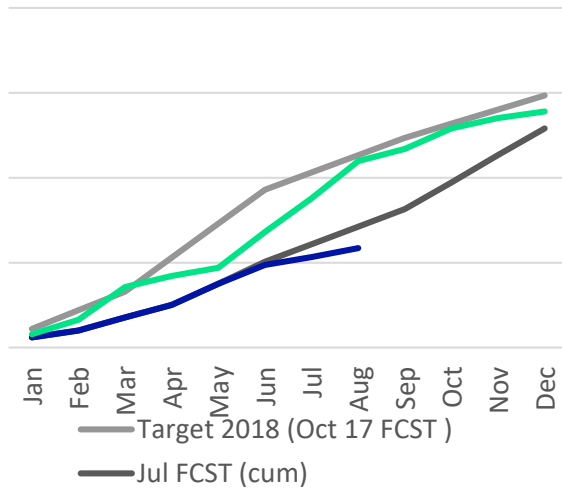
The Power of Dashboards Part 1

Speaker: Johan De Fraye (Signify)

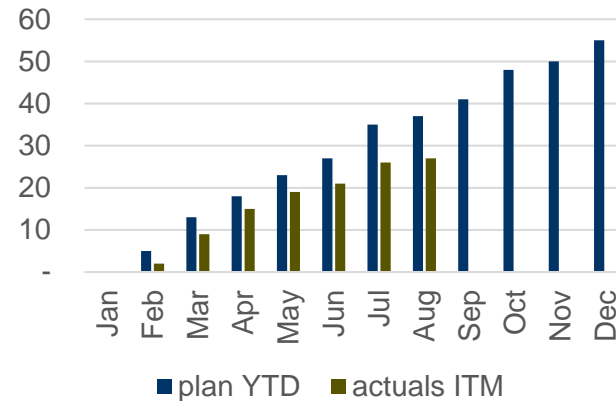
Environmental Affairs Dashboard

August 2018

YTD spend in M EUR



Milestones planned vs actual
Top 10 sites



Comments

Description
Cumulative spend in July was EUR yy mil, EUR x mil below the latest forecast. We all need to work on more accurate forecasting.
Milestone compliance dropped further to uu%, in proportional relationship with the spend slow down.
Site w: Kick-off for decommissioning was conducted with all stakeholders.
Site d: Agency meeting went well and we can now start working on remedial feasibility study.

YTD Value Add

	M EUR	Main contributions
Avoided	J.j	Site x, y, z
Releases	k.K	Site a, b, c

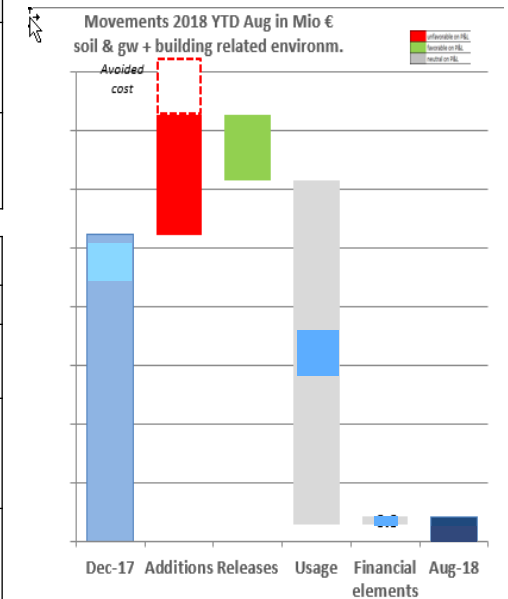
Major Risks & Issues

Risk or Issue	Impact
Site m: VI inside newly-built school	Need for engineering measures
Site n: off-site impact and exposure; more restrictive legislation	Fine and financial compensation; costly countermeasures
Site p: longer than expected redevelopment; possible additional costs for asbestos	Increase in long term costs; reputation
Site s: agency not accepting remedial closure	Additional investigations; no sale of site
Site q: bankruptcy of owner	Potential apportionment of remaining liability

Sustainability

	KPI	Actual
Remediated sites receiving green label	2	3
Sites sold for beneficial reuse	2	2

YTD Financial movements



Spotlight on

"Passion for results": **Name-surname** was able to successfully conclude negotiations with the yyy agency, to take an alternative approach to the deep impacted aquifer at site b. This led to a release of EUR nn mil.

Field Health & Safety

KPIs	YTD	Target
Field hours suppliers	xx,xxx	NA
# near misses	yy	NA
# incidents	W	0
Field walkthroughs	t	Rr

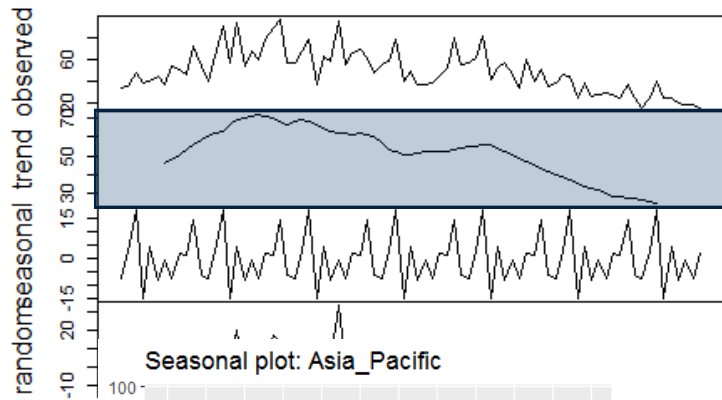


The Power of Dashboards Part 2

Speaker: Brian Henry (ERM)

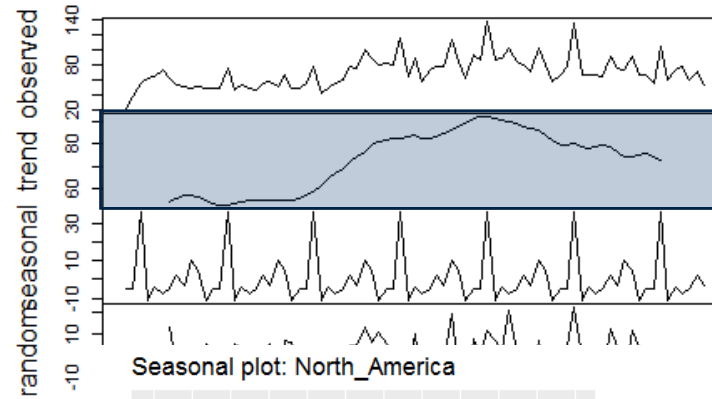
Make Your Data more Accessible

Decomposition of additive time series

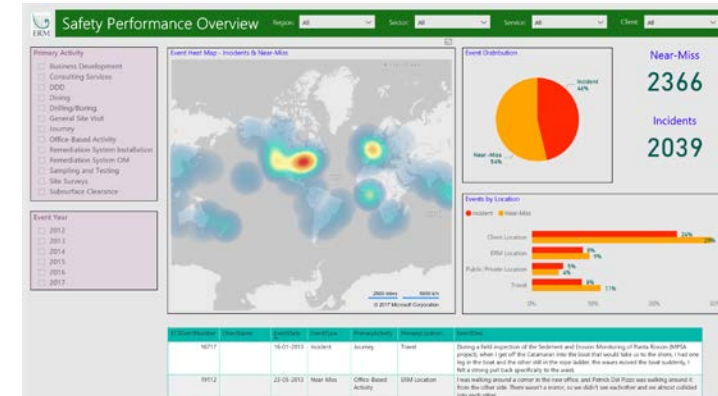
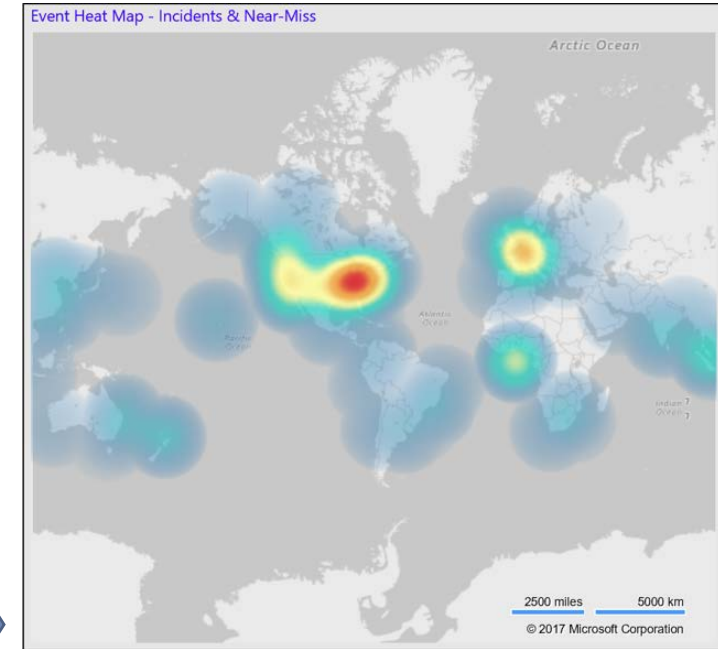
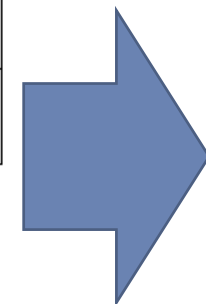


APAC

Decomposition of additive time series



NA



Statistical Analysis (Snapshot)

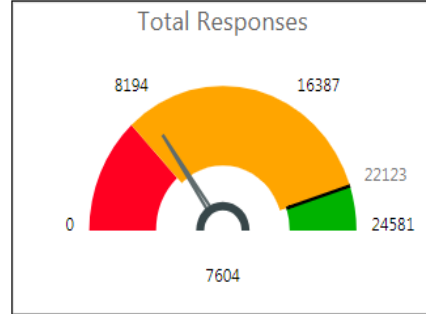
Converting to a Visual

Data...Knowledge...Insight

Safety Maturity Dashboard

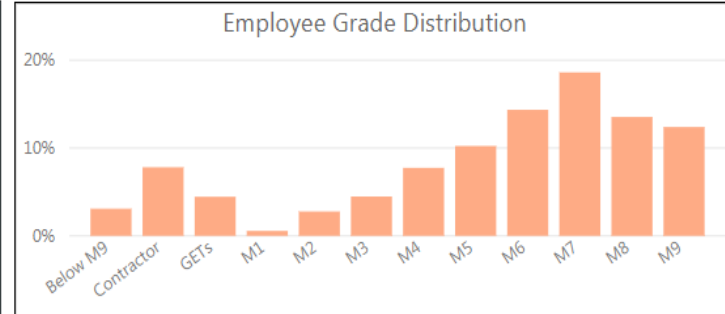
Business Units

-
-
-
-
-
-



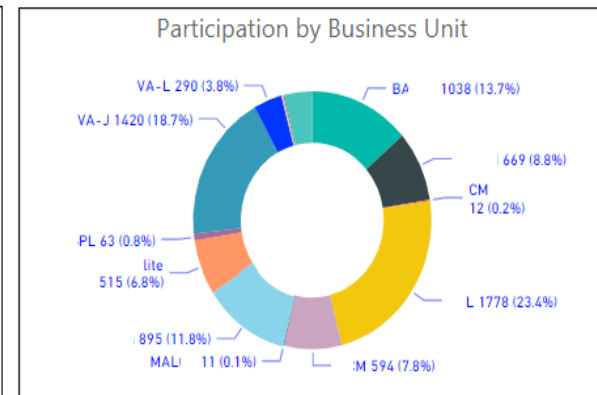
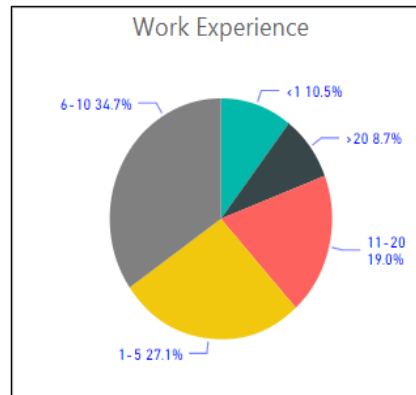
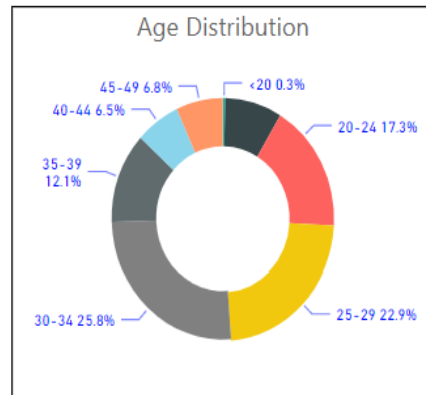
Business Units

14



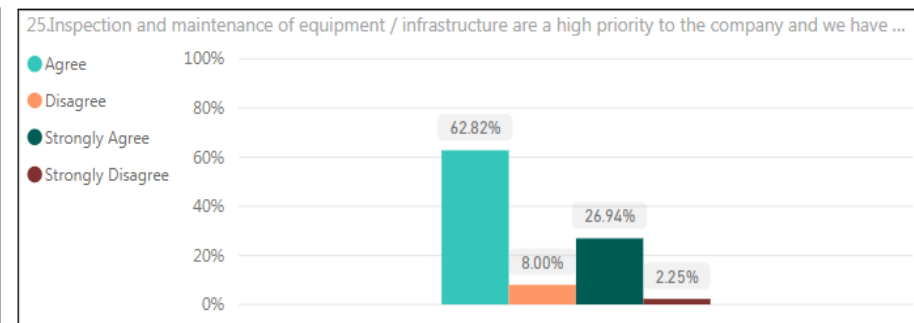
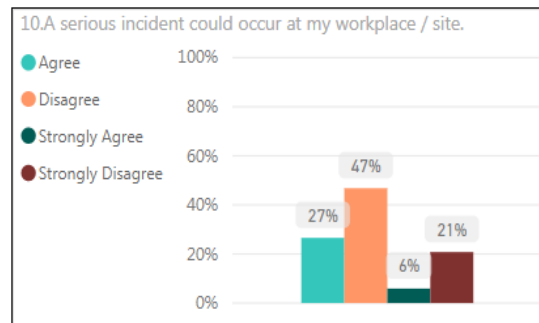
Place of Work

- (Blank)
- Both
- In the Field
- In the Office

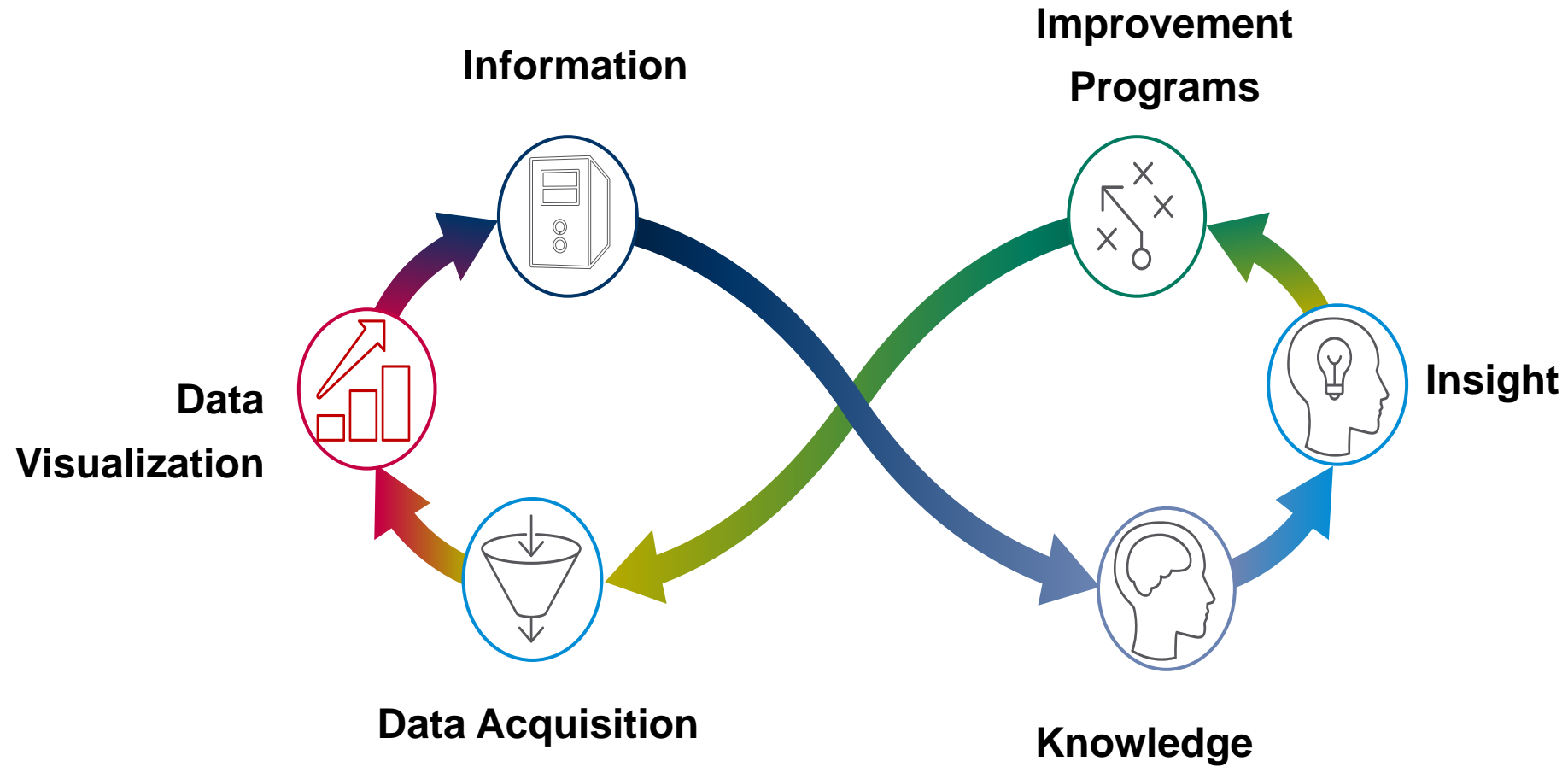


Departments

- (Blank)
- Administration
- Commercial and Procurement
- Finance
- HR
- Maintenance and Engineering
- Mines
- Occupational HSE
- Others
- Planning
- Power Plant
- Production
- Projects
- Quality Assurance
- Security



Virtuous Cycle of Analytics



Data Curation – Art and Science

Data Profiling

- Uncover data defects with data archeology – analyze the data for correctness, completeness, uniqueness, consistency and “sanity”

Data Cleansing

- After profiling is complete focus on cleaning the critical and important areas – need to prioritize effort

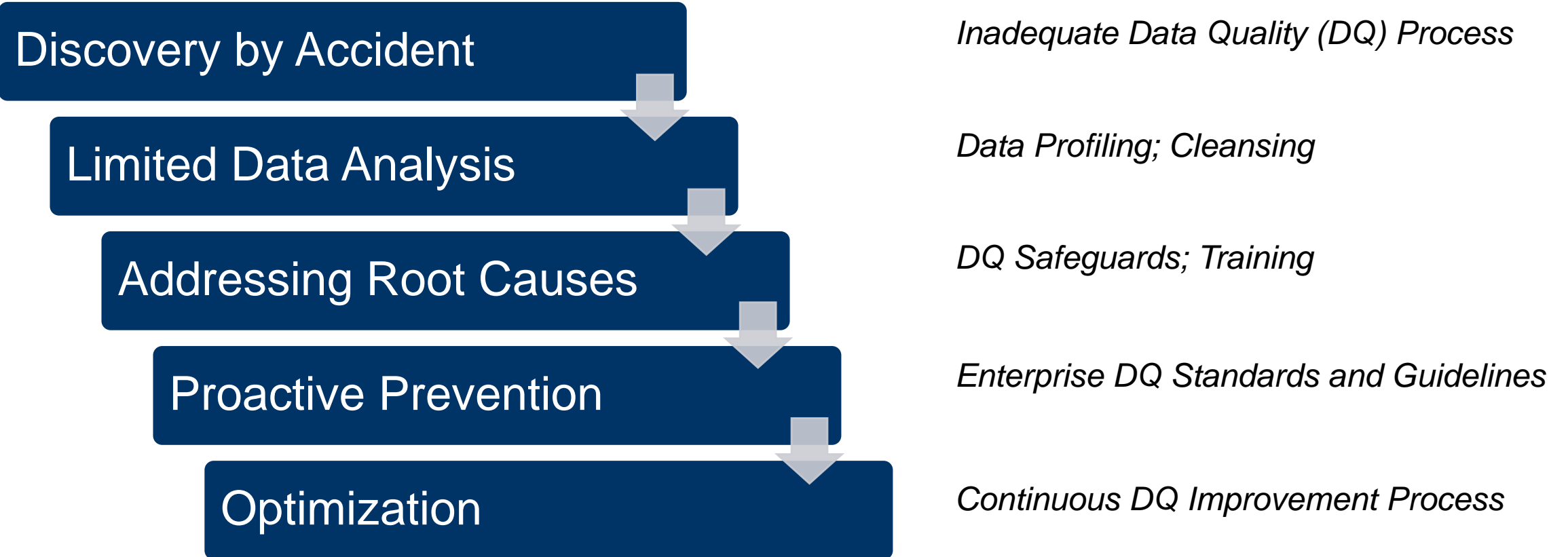
Data Quality Safeguards

- Establish logic, programming, checks to prevent future “dirty data”

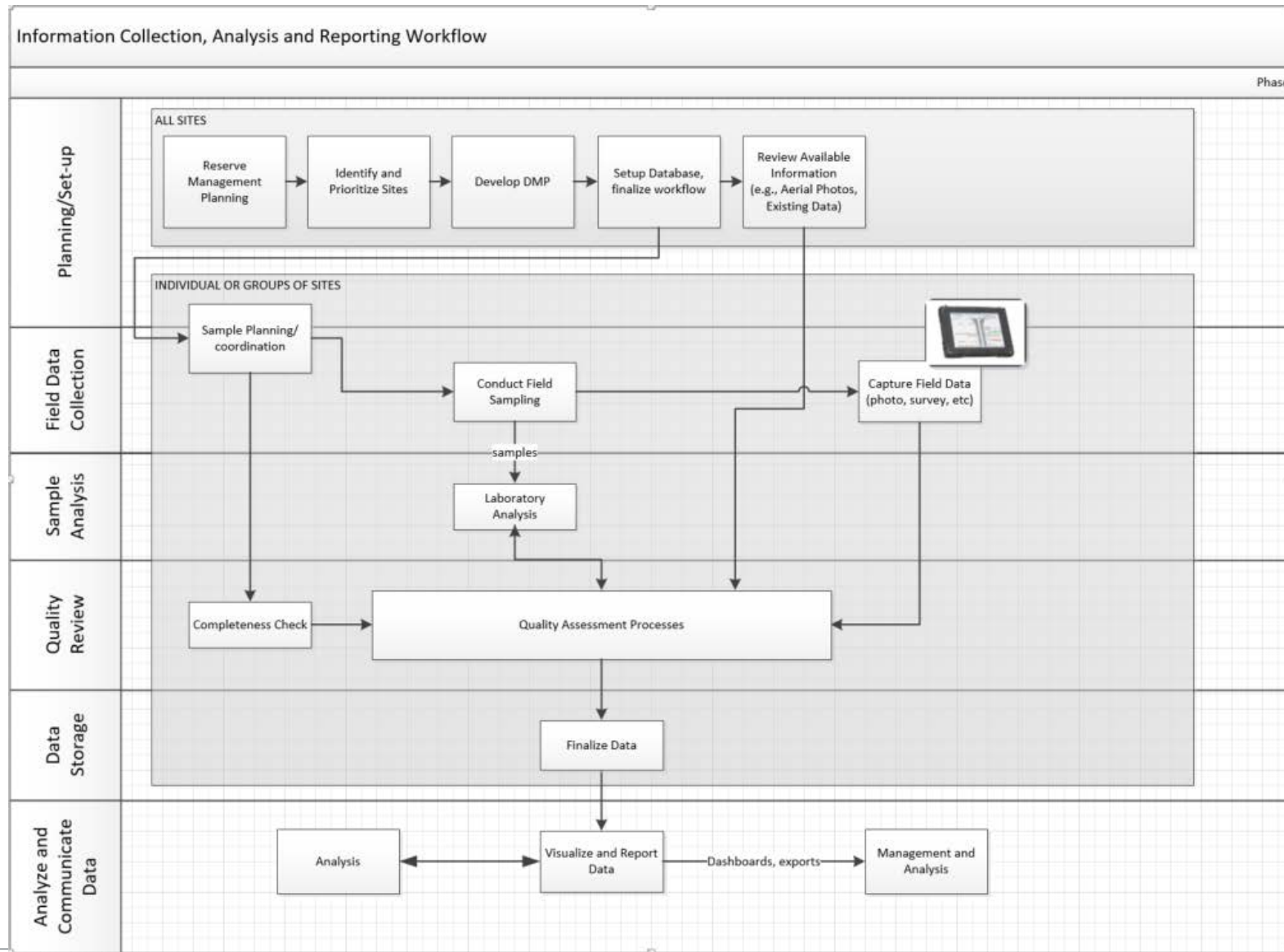
Data Quality Standards and Training

- Establish governance process, data stewards and develop training to drive these standards and guidelines across the enterprise

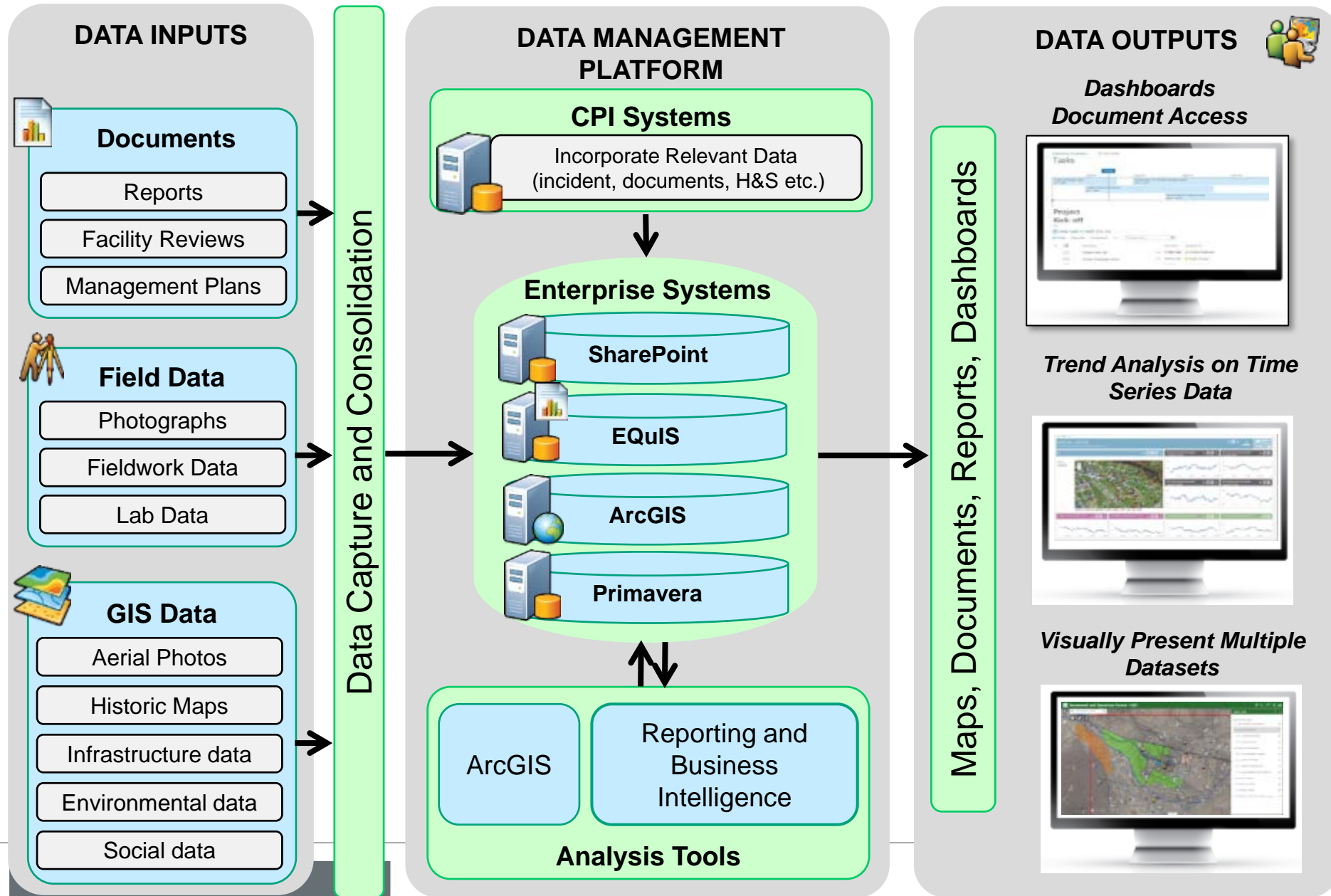
Improving Data Quality – The Journey



Start With a Well-Defined Business Process (People & Process)



Process Data Flow + Technology = Insight



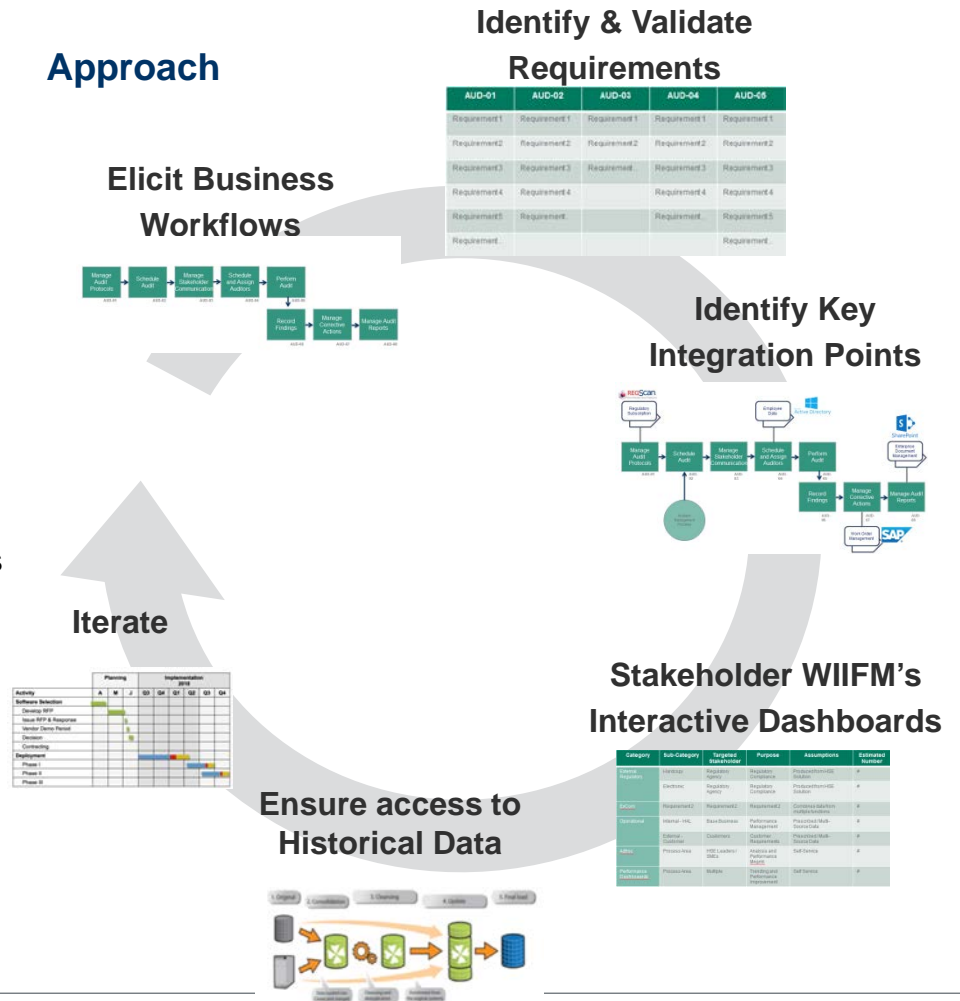
People, Process and Technology – what does your virtuous cycle look like?

Scope: Map out HSE processes and highlight common activities, measuring number of systems and communications for current state.

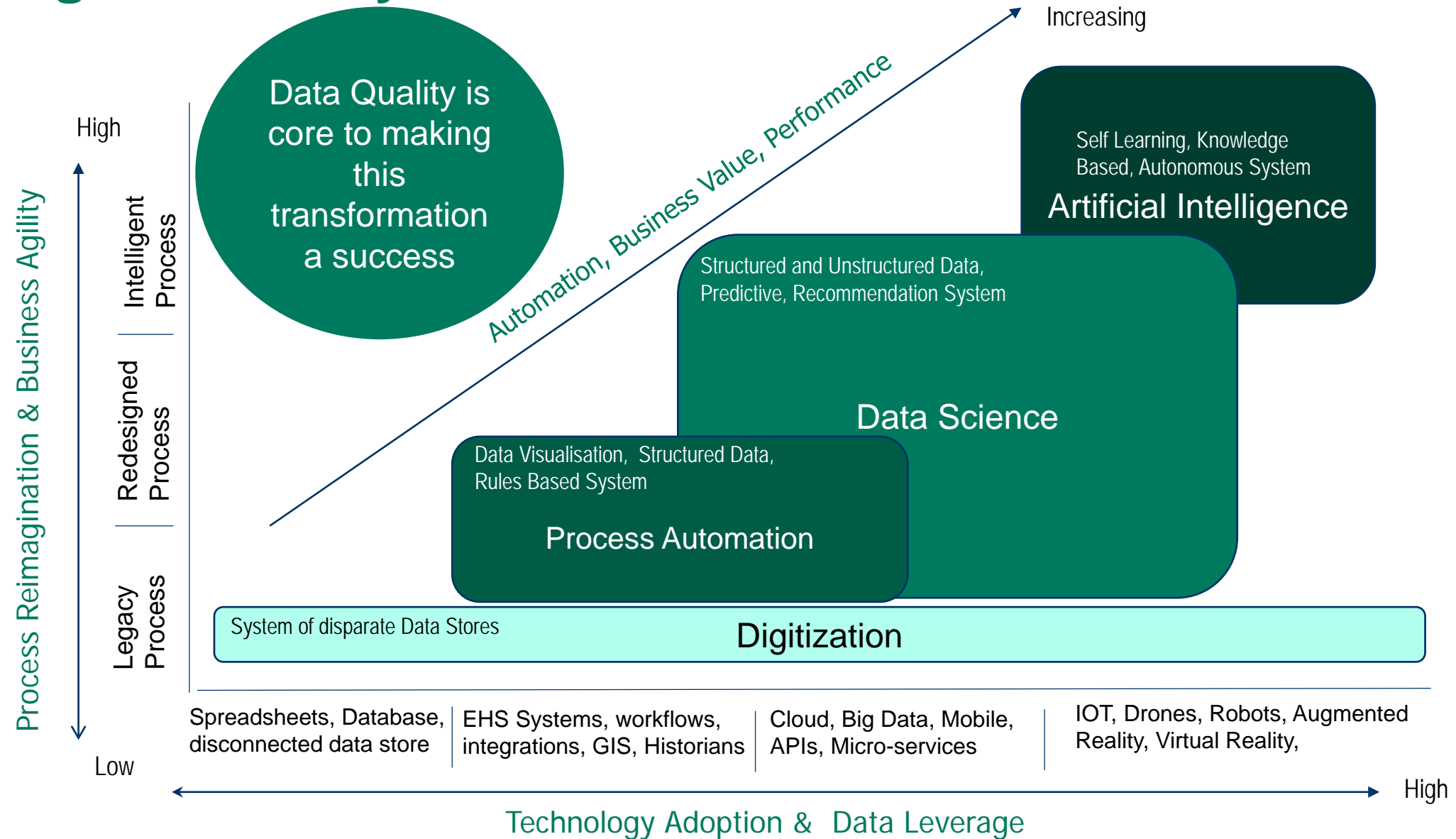
Activity

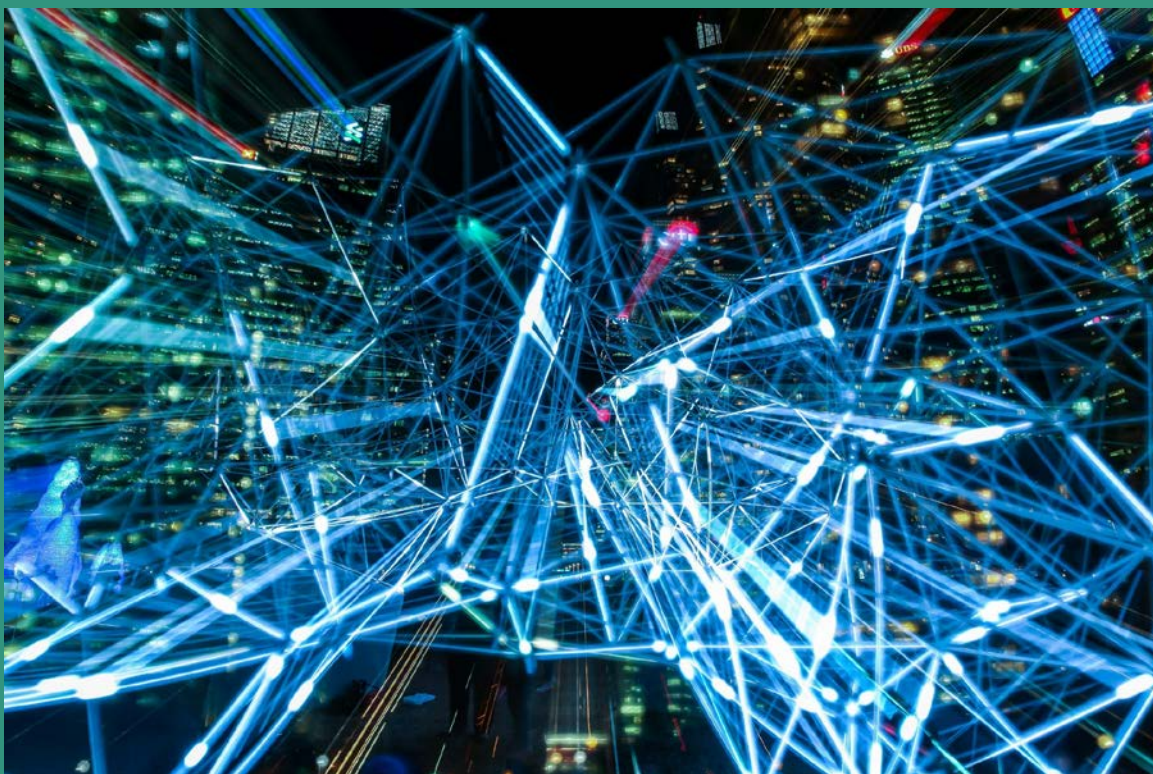
- Refine Process Workflows and High-Level Process Steps
- Validate Functional and Technical Requirements
- Identify and Document Key Integration Points
- Stakeholder WIIFM's - Interactive, Drillable, Dashboards and Reports
- Ensure Access to Historical Data – Context Matters
- Digest Learnings; Iterate

Approach



Digital Maturity Model



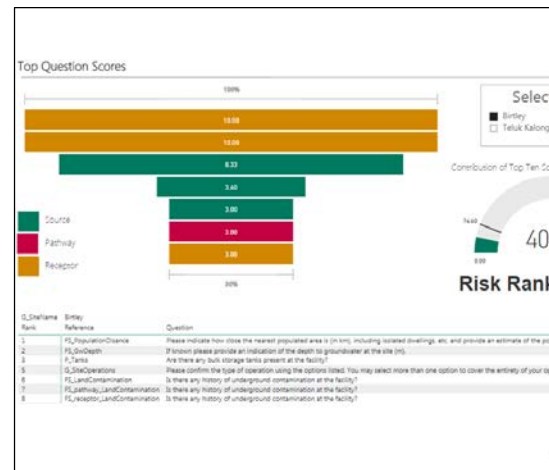
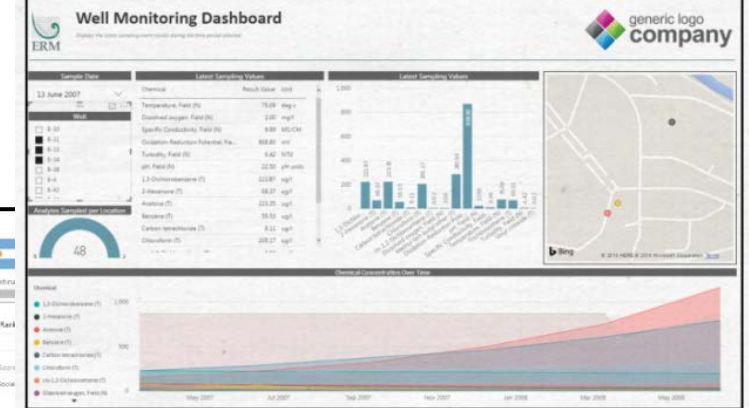


Wrap-up

Speaker: Simon Gibbons (ERM)

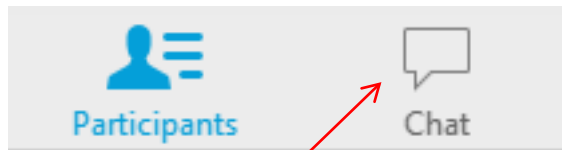
Wrap-up

1. Individual and organisational maturity
2. What are the problem statements and/or hypotheses requiring testing?
3. Don't under-estimate the value in good data management
4. Big data ≠ Big reports
5. Data is a journey

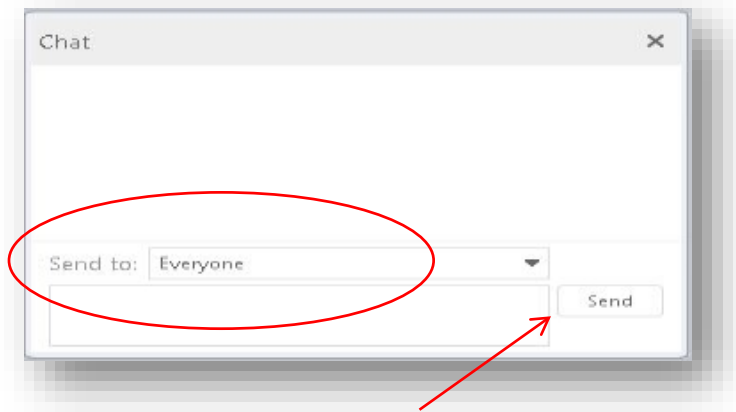


Questions?

#6 to unmute to ask a question



*Click to
chat*



*Type your question
and send*

All participants will receive a follow-up email with a link to this presentation recording next week.

**Thank you for attending
today's session!**

Remediation Roundtables

Chicago

10/18 – 10/19

Speakers:

Andy Huggins, *ERM*
Denice Nelson, *ERM*
Nadine Weinberg, *ERM*
Brett Whittleton, *AkzoNobel*
Stephan Evanoff, *Danaher*
David Fischer, *American
Chemistry Council*
David Tsao, *ITRC*

Houston

10/25 – 10/26

Speakers:

Andy Huggins, *ERM*
David Robbins, *ERM*
Katrina Patterson, *ERM*
Jeff Bauguss, *ERM*
Mitch Zimmerman, *ERM*
David Angle, *ERM*
John Kuhn, *ERM*
David DeCoursey-Bower,
ERM
Jaydeep Parikh, *ERM*
David Tsao, *ITRC*
Myna Letlow, *BHGE*

Sao Paulo

11/1

Speakers:

Andy Huggins, *ERM*
Paulo Santos, *ERM*
Michael Kohnke, *Shell
Global Solutions*
Antonio Chaves, *Umicore*
Leticia Monterio, *Bayer*
Rodrigo Silveira, *Tupy
Fundições*
Bianca Antacli, *TozziniFreire
Advogados*

More information: <https://www.erm.com/en/news-events/event-registration/erm-global-remediation-management-roundtable-in-chicago/>



Thank you

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