PETRONAS E&P Technical Data Quality Metrics Initiative – Going Green with Data

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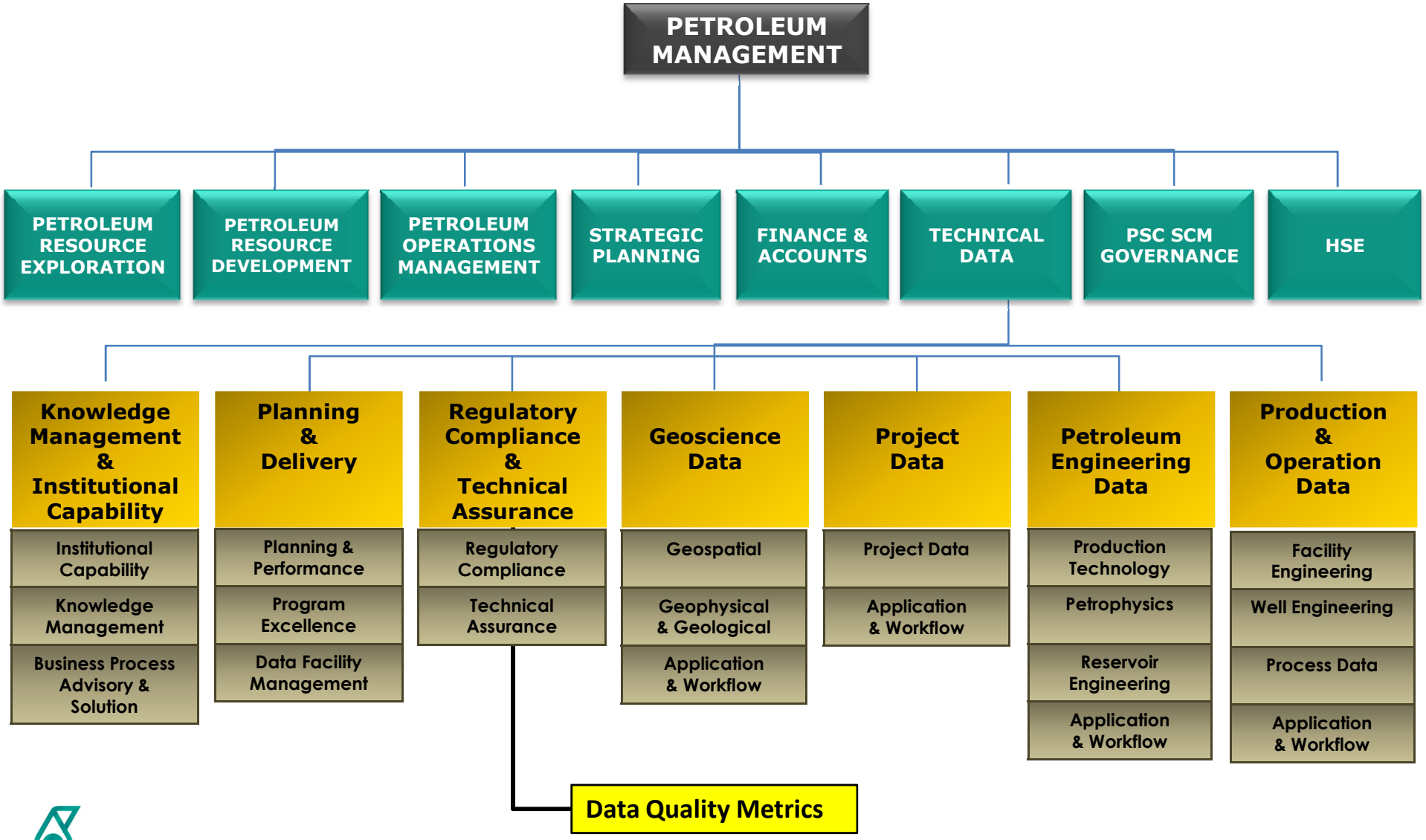
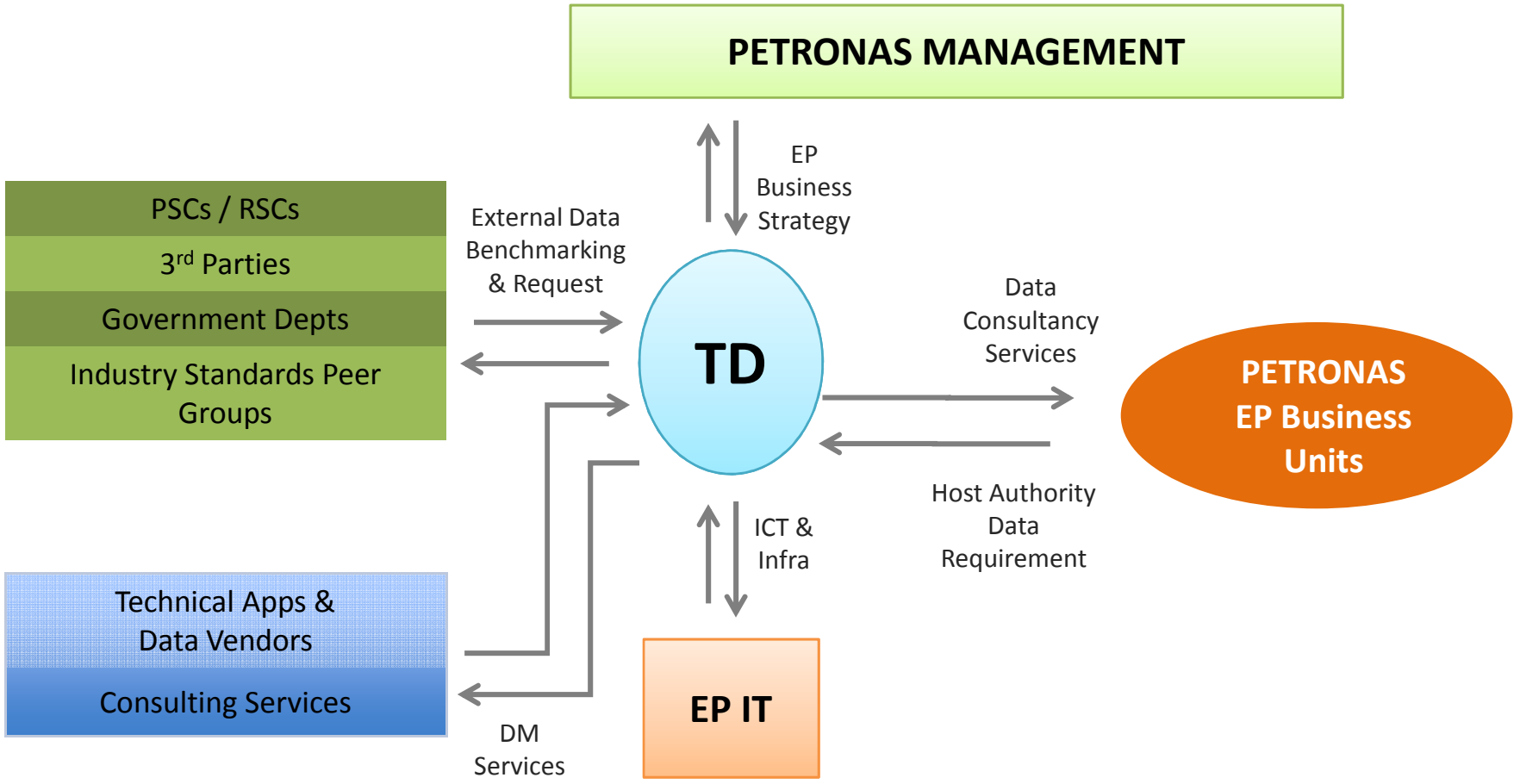
- The data quality metrics and standards connection
- Concluding remarks

Technical Data was formed to elevate functional excellence and delivery discipline of data management



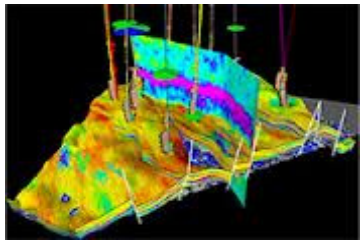
Technical Data Department Relationship Model



Background – PETRONAS EP Data Dimensions

~ 1,000 2D/3D seismic surveys
~ 12,000 wells
- All EP data types

>766 active projects
~ 159 ventures in 25 countries
~ Average 100 wells drilled per year



Measured Data
> RM35 Billion investment on data acquisition

Interpreted (Result) Data
Subsurface understanding which has direct impact on business decisions

> 1,000,000 media
> 700,000 technical docs
> 3,500 TB disk space
>120 data bases

Media & Corporate DBs
Media, hardcopies and Geosamples

Dimensions of PETRONAS EP Data Management

>250 specialized technical applications (Multiple disciplines & related application workflows)

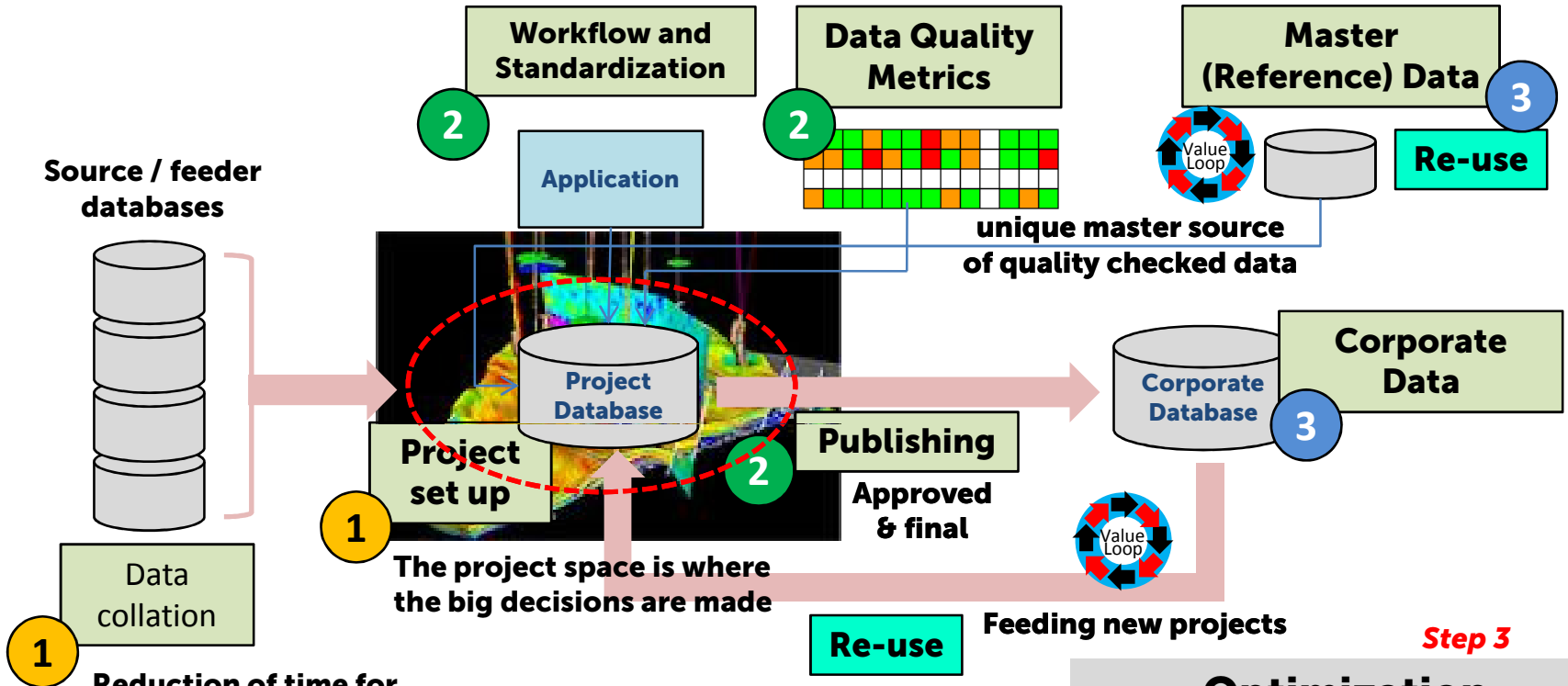
Tools
(Technical Software Application)
> RM1.2 Billion investment

End Users
> 400 geoscientists and engineers from all technical domains in E&P

External Stakeholders
Potential investors, PSCs, government agencies, universities

Role of Data Management in Value Creation

Previous studies : Geologists spend up to 60% of their time looking for & quality checking data for their projects



Step 1

Cost management

Reduce the 60% to __%

1

Step 2

Process improvement

Standards & workflows
Bring to acceptable quality
Capture work done for re-use

2

Step 3

Optimization

'One version of truth' datasets
Re-use many times

3

What Problems Are We Trying to Solve?

1- Mitigate business risks created by data quality issues

- Financial
- Confidence/Satisfaction
- Productivity
- Compliance/Legal
- Safety

What Problems Are We Trying to Solve?

2 - Value leakage in business

- Lost time due to re-checking of data
- Not re-using data because of trust issues
- Lack of awareness & enforcement on standards – inconsistent business practice
- You can't manage what you can't measure – quantification of leakage

What Problems Are We Trying to Solve?

3 - Managing change introduced by new technology

New data content may introduce a requirement to improve

- Data standards/guideline
- Data integration process
- Data analytics method

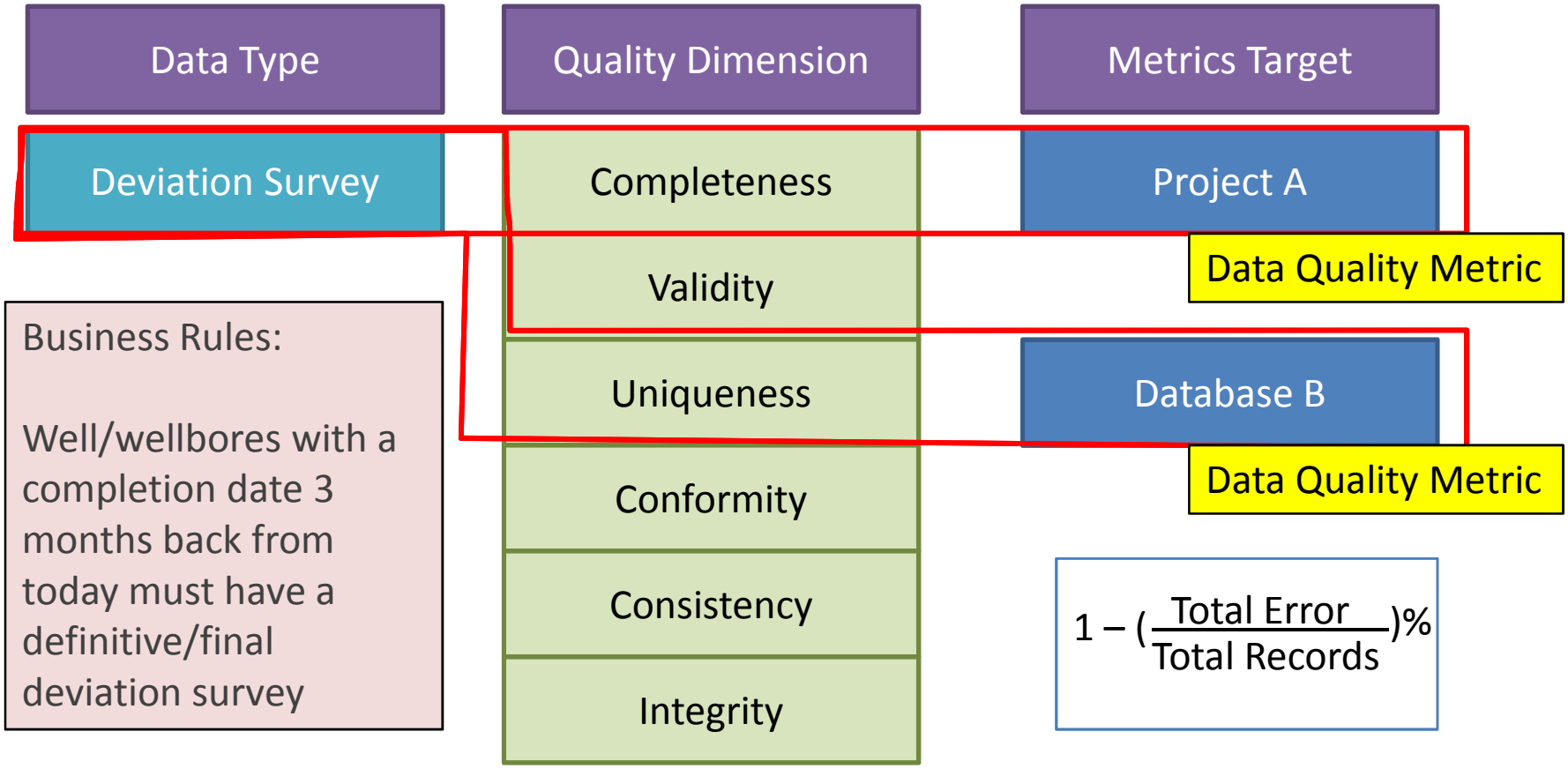
Data Quality Metrics Defined

- **Data Quality Metrics**: A measure of data quality performance

- **Data Quality Dimensions**: Perspectives from which data quality is being looked at

- **Business Rules**: Rules that must be adhered to in order to keep the business running in good/optimum condition

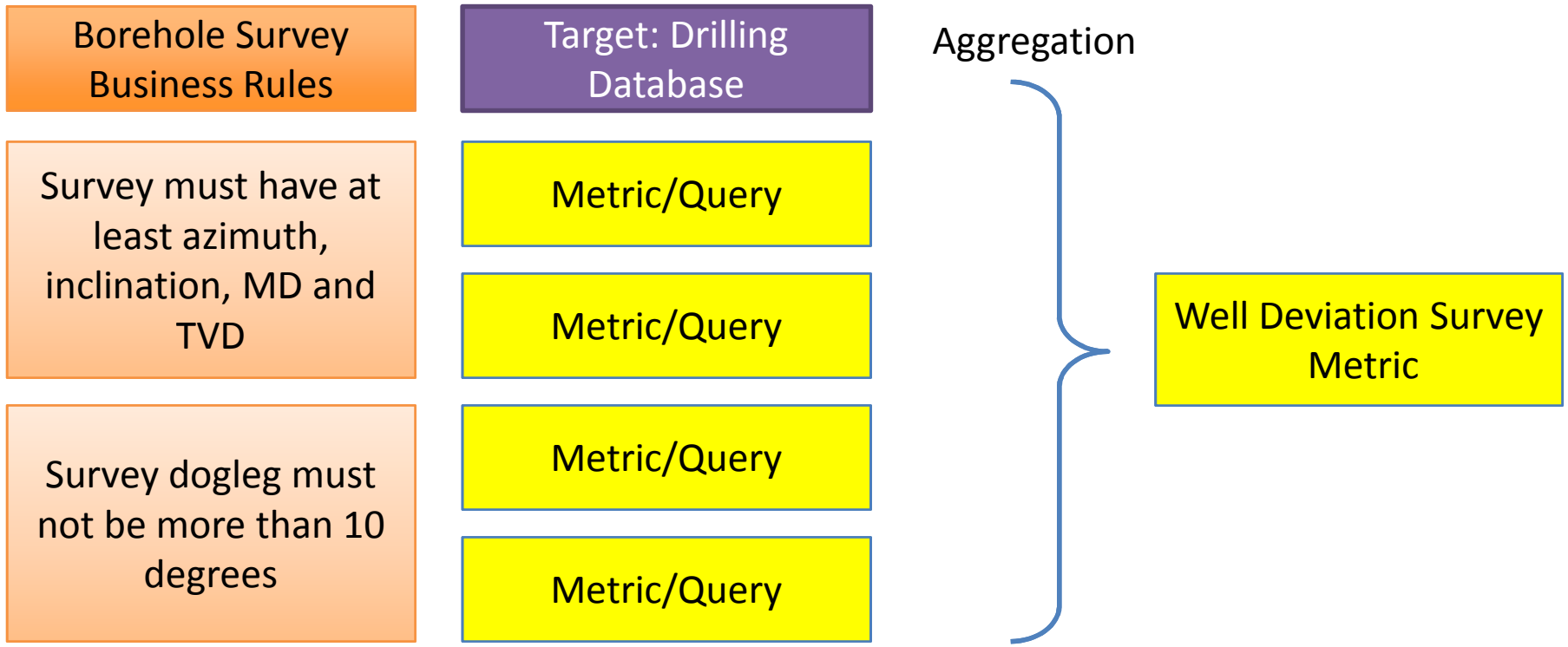
Data Quality Metrics Defined



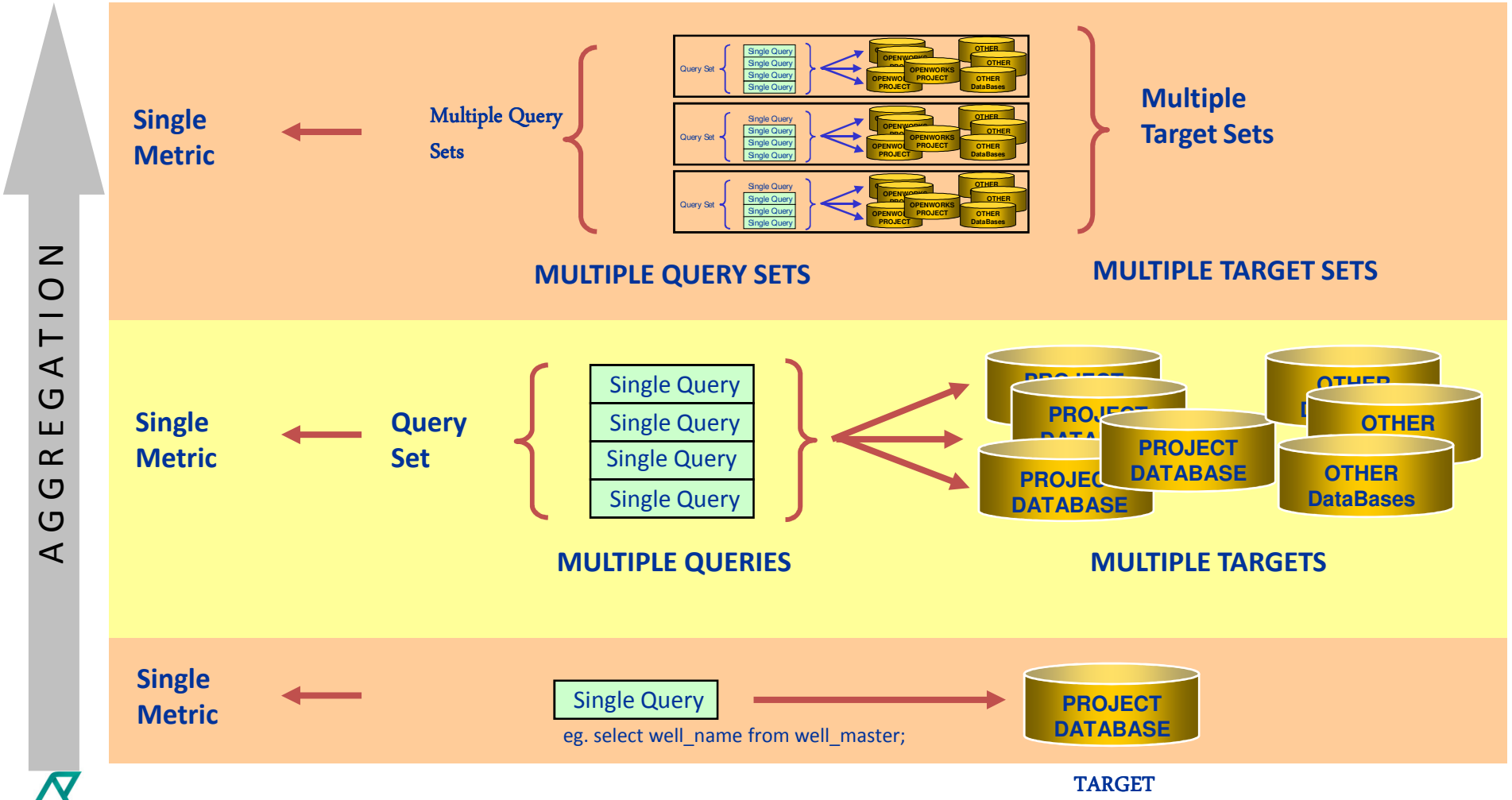
Examples of Data Quality Metrics

Metrics	
Well measured depth must be more or equal than true vertical depth	Well Header
Offshore well must have a water depth information	
A well deviation header must have end/bottom depth of the survey defined	Borehole survey depth range
A well deviation header must have start/top depth of the survey defined	
A well deviation header must have the survey contractor/company performing the job defined	
A well deviation header must have the survey tool name defined	Borehole survey tool identity
A well deviation survey point must be identifiable to a deviation survey header	
A well deviation survey point must have the calculated dog leg defined	Borehole survey measurements
A well deviation survey point must have the calculated vertical section defined	
A well deviation survey point must record the measured azimuth	
A well deviation survey point must record the measured inclination	

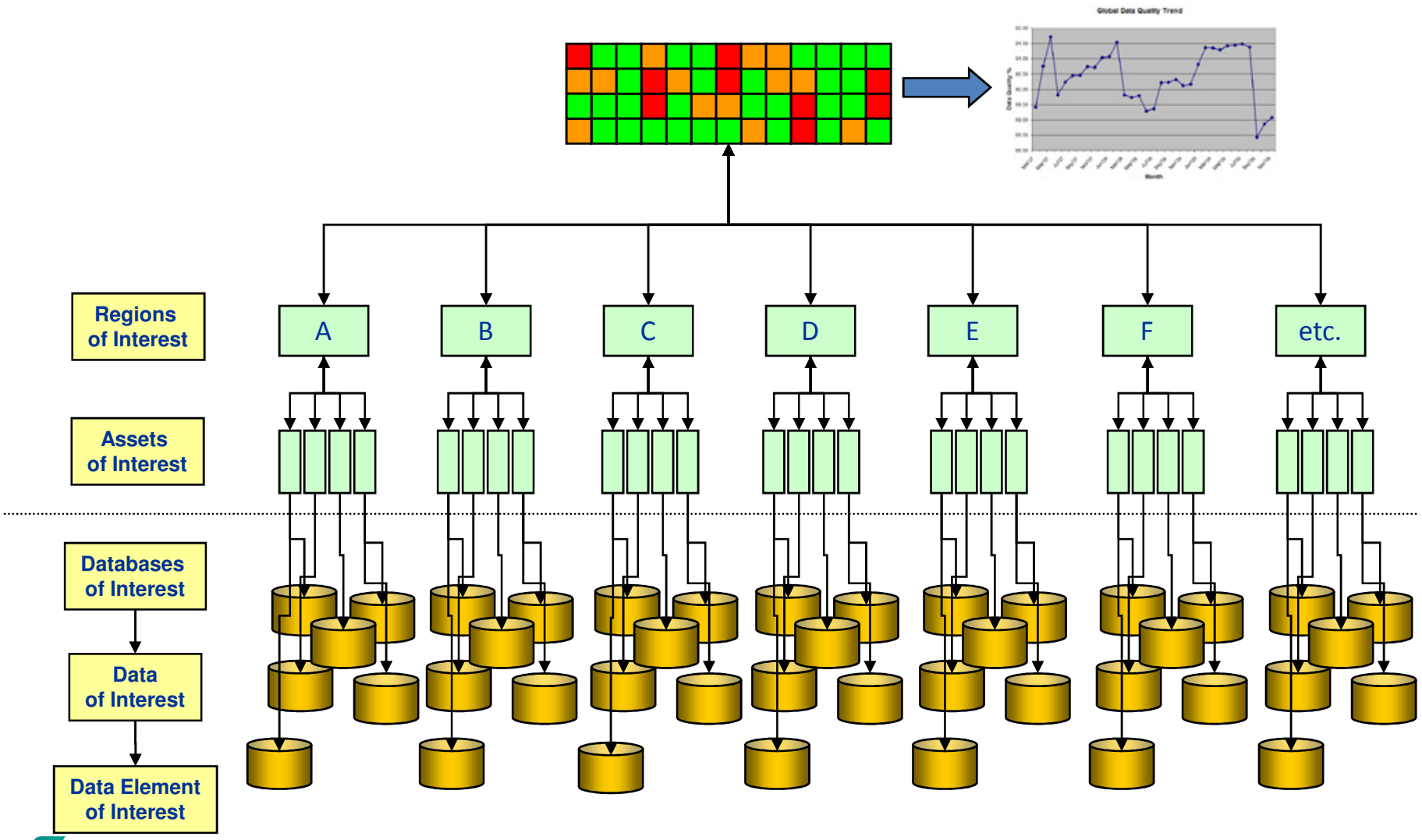
Data Quality Metrics Aggregation



Queries, Query Sets, Targets & Aggregation



Data Quality Metrics Aggregation to Dashboard



Data Quality Metrics Dashboard

	A	B	C
1	Metric	Metric	Metric
2	Metric	Metric	Metric
3	Metric	Metric	Metric

0-90	90-95	95-100
Poor	Medium	Good

$$1 - \left(\frac{\text{Total Error}}{\text{Total Records}}\right)\%$$

Data Quality Metrics Dashboard

Results by Database

Snapshot Date: 03-September-2013

Generated On: 03-September-2013 06:00

- Spatial Attributes
- Well H
- W
- H
- We
- Syn
- Well Checksho
- Rig Operation

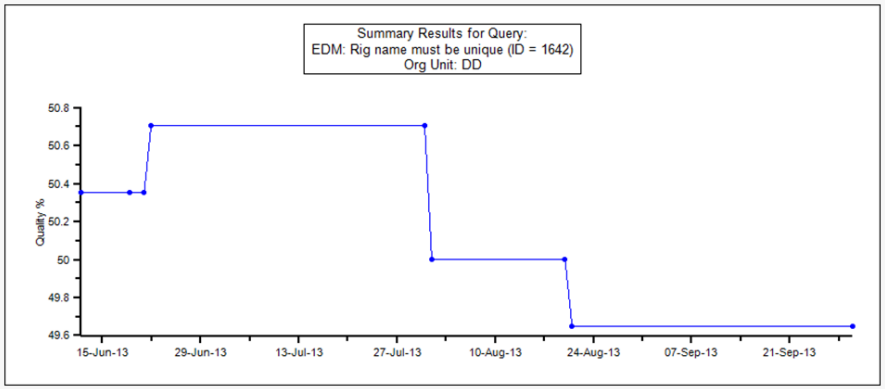
Query ID	Query Name	Data Type	Quality Type	Data Source	Weight	First Summary Date	Last Summary Date	Legacy
1416	OW2003 Well directional surveys without position logs	Well Deviation	completeness	OpenWorks 2003	1.00	19-Jun-2013	30-Sep-2013	
1420	OW2003 Well position logs with TD mismatch	Well Deviation	validity	OpenWorks 2003	1.00	19-Jun-2013	30-Sep-2013	
1417	OW2003: There must be only one definitive well directional survey for each well	Well Deviation	uniqueness	OpenWorks 2003	0.00	19-Jun-2013	30-Sep-2013	
1419	OW2003: Well directional survey must define a north reference	Well Deviation	completeness	OpenWorks 2003	1.00	19-Jun-2013	30-Sep-2013	
1418	OW2003: Well directional surveys must have the azimuth defined within 0-360 degrees range	Well Deviation	validity	OpenWorks 2003	1.00	19-Jun-2013	30-Sep-2013	
1421	OW2003: Well position logs must have more than 10 samples	Well Deviation	validity	OpenWorks 2003	1.00	19-Jun-2013	30-Sep-2013	
	Weighted average quality %							
	Sum of weighted objects							
	Sum of weighted errors							
	Summed quality %							**93.87**

Data Quality Metrics Tool

IQM results: EDM: Rig name must be unique

Date	2013-09-19 05:27:40
Exec schedule	daily
Query 1642	EDM: Rig name must be unique
Query abbreviation	EDM: Rig name must be unique
Query description	
Query owner	
Target 1	EDM (DD) ()
Results owner	
Remedial hints	
Total count	143 (prior: 143)
Error count	72 (prior: 72)
Quality	49.6503% (prior: 49.6503%, trend flat)
IQM test query	http://pww.epdqm.petronas.com

	1642	EDM: Rig name must be unique	Rig Operation	uniqueness	EDM	1.00	21-Aug-2013	30-Sep-2013	143.00 72.00 49.65



DD

First Summary Date	Last Summary Date	Total Objects	Total Errors	Quality %
12-Jun-2013	19-Jun-2013	141	70	50.35
19-Jun-2013	21-Jun-2013	141	70	50.35
22-Jun-2013	31-Jul-2013	142	70	50.70
01-Aug-2013	20-Aug-2013	142	71	50.00
21-Aug-2013	30-Sep-2013	143	72	49.65

Error Report

Download to Excel

duplicates	rig_name
2	Aquamarine Driller
3	CONSTELLATION-1
2	DHIRUBHAI DEEPWATER KG 2
2	DOO SUNG
3	ENERGY SEARCHER
7	ENSCO 52
2	GSF 134
4	HARVEY H WARD
4	KM-1
2	NAGA 1
2	NAGA-1
2	PARAMESWARA
3	Rig #1
2	ROWAN GORILLA
2	SEAREX IX
2	SEDCO 600
3	STENA CLYDE
2	T-3
2	T-6
2	T-9
3	TEKNIK BERKAT
2	TREASURE SEEKER
3	TRIDENT-16
3	TRIDENT-20
4	WD KENT
2	ZPEB 747
2	ZPEB-747

```
Error Report SQL:
select dupe_table.duplicates, dupe_table.rig_name  from (

SELECT
   count(rig_name) as duplicates,
   rig_name
FROM
   CD_RIG
group by rig_name

) as dupe_table
where dupe_table.duplicates> 1
```

Data Quality Metrics Dashboard – By Drilling Rig

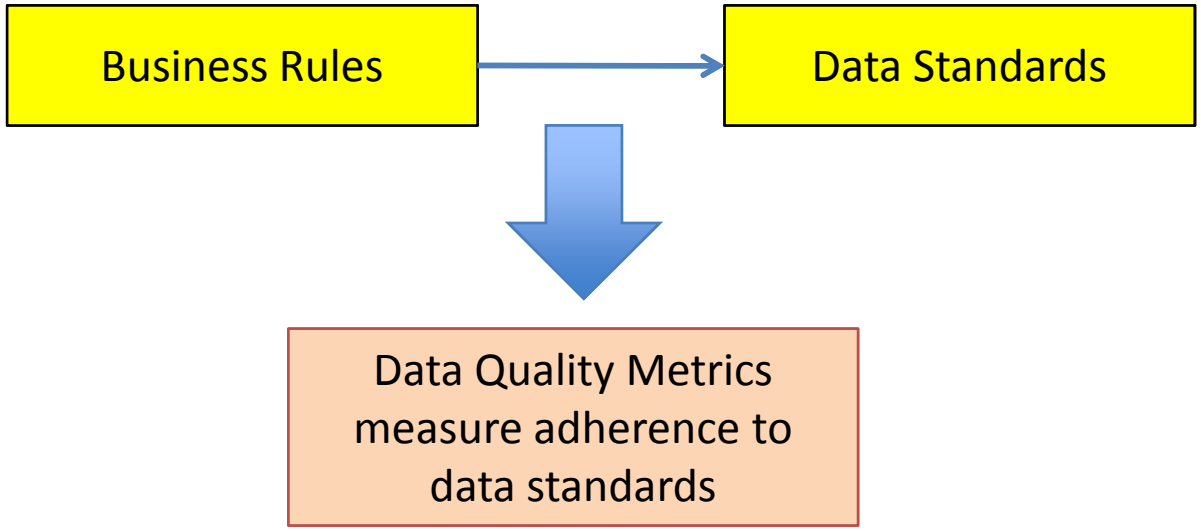
Results by Rig

Snapshot Date: 03-September-2013

Generated On: 03-September-2013 06:00

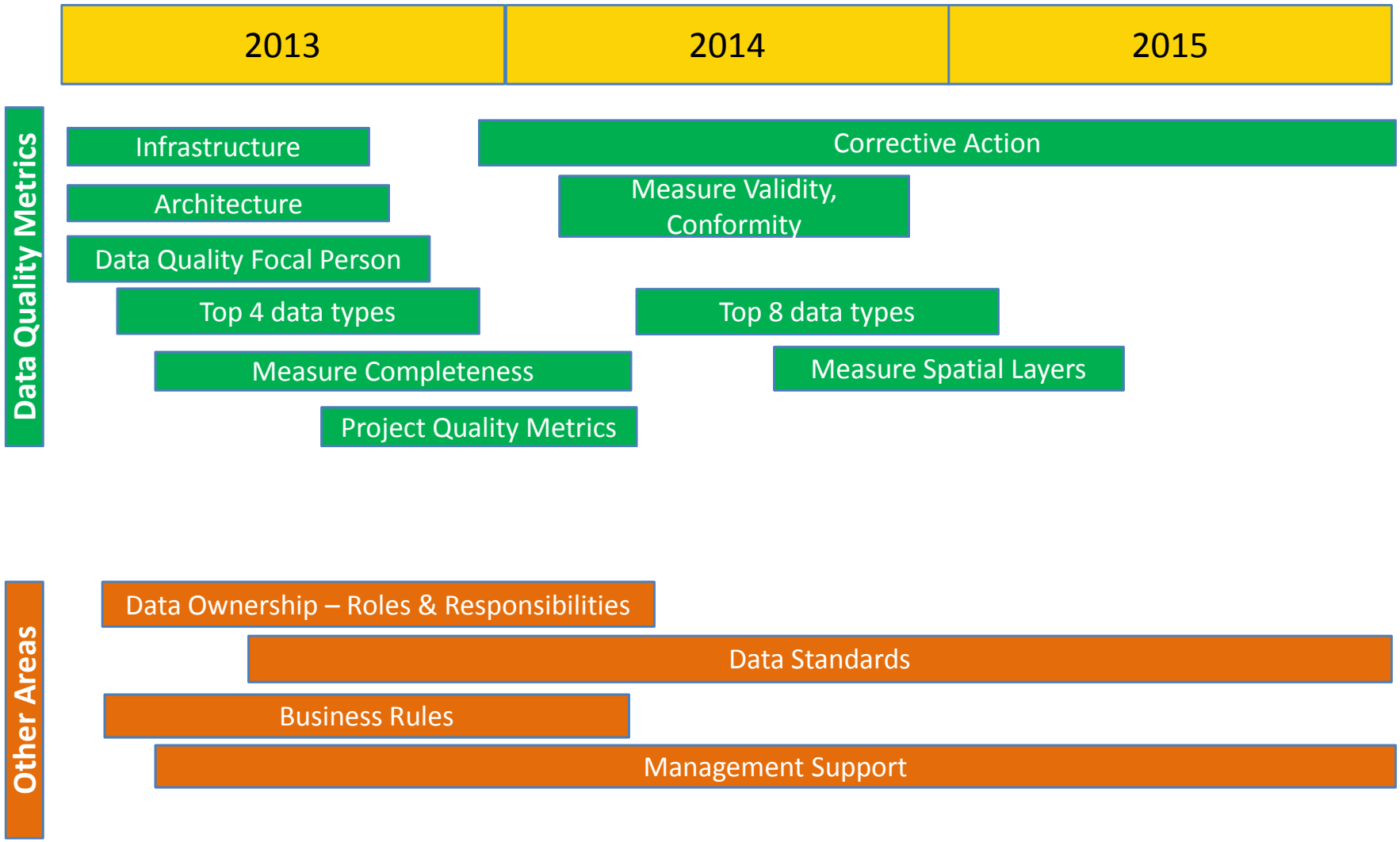
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted] Driller	[redacted]
Rig Operation	54.18 9866 21533	76.95 13106 56850	69.95 88832 295609	72.79 1369 5032	72.57 74952 273263	97.48 607 24068	98.99 300 29700		86.36 25106 184069	82.5 10965 62674

The Data Quality Metrics – Data Standards Connection



	A	B	C
1	Metric	Metric	Metric
2	Metric	Metric	Metric
3	Metric	Metric	Metric

Data Quality Metrics- High Level Roadmap



Conclusion

- Data Quality Metrics is an important part of the data management portfolio.
- A data quality metrics program needs to closely engage business lines
  - Business must play a role to define the business rules that adds value to the data.
  - Data Ownership – roles and responsibilities must be clearly defined
  - Proactive participation at the working level, and drive from the top
- Data Quality Metrics results have to tie to business owners as a measure of performance

PETRONAS

Thank You

Paper Abstract

People, process & technology are often touted as the 3 important components an organization must have in order to ensure that the data is managed properly and effectively. While that is true to a large degree, the existence of this tripartite in the organization does not necessarily support the sustainability of good data management practices over the longer term. Data quality today still remains as a significant challenge we face in the E&P industry.

For the data we use within upstream E&P, data quality metrics, when implemented in the right databases, creates a transparency that cannot be easily achieved by any other means, and provides us with a powerful tool to highlight issues before the problem becomes too big. A proper data quality framework also address data issues in holistic way and combines with data ownerships and accountabilities to ensure the right interventions and corrections get done.

This paper describes PETRONAS E&P's data quality metrics initiative that will progressively improve the quality of data used by the business and result in a traffic-light format data quality dashboard that gets more and more green.