

# Assessing and Improving Asset Information Quality

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**Data quality management practices:  
maturity assessment**

**Data quality assessment using the Hybrid  
Approach**

# What is Data Quality?

**Data that is “fit for use”**

**Dimensions:**

**Accuracy**

**Completeness**

**Timeliness**

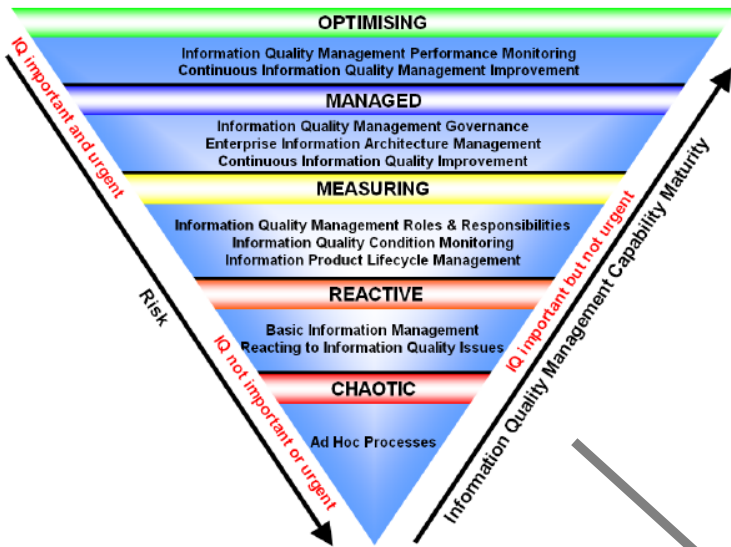
**Consistency**

**Information quality management (IQM)**

**Maintaining high quality data quality requires  
IQM practices to be in place**

# What is the IQM maturity assessment?

## IQM Maturity Model\*



## Asset management business unit



## Questions





# Structure of the IQM maturity model

<b>Maturity Level</b>	<b>Process Area</b>	<b>CSF</b>
5	IQ Management Performance Monitoring	IQ Management Benchmarking
4	Continuous IQ Improvement	IQ Management Cost-Benefit Analysis
		IQ Risk Management and Impact Assessment
		IQ Problem Root-Cause-Analysis
3	IQ Assessment	IQ Metrics
		IQ Evaluation
2	Information Storage Management	Backup and Recovery

(CSF = critical success factor)

# Results

	Organisations																			
Maturity Level	A		B		C		D		E		F		G		H		I		J	
	F	FP	F	FP	F	FP	F	FP	F	FP	F	FP	F	FP	F	FP	F	FP	F	FP
5 – Optimising	0	0	0	0	0	25	0	0	0	0	0	0	0	25	0	0	0	0	0	0
4 – Managed	0	23	8	62	54	92	0	46	0	46	0	15	15	54	15	46	8	46	0	23
3 – Measuring	7	33	13	67	73	100	20	47	7	53	0	20	53	87	33	73	7	47	13	47
2 – Reactive	100	100	100	100	100	100	93	100	100	100	93	93	93	100	93	100	93	100	64	100
1 – Chaotic	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Final Maturity Level	2		2		4		2		2		2		3		2		2		2	

F = Number of CSFs fully satisfied / Number of CSFs

FP = Number of CSFs fully satisfied or partially satisfied / Number of CSFs

(CSF = critical success factor)

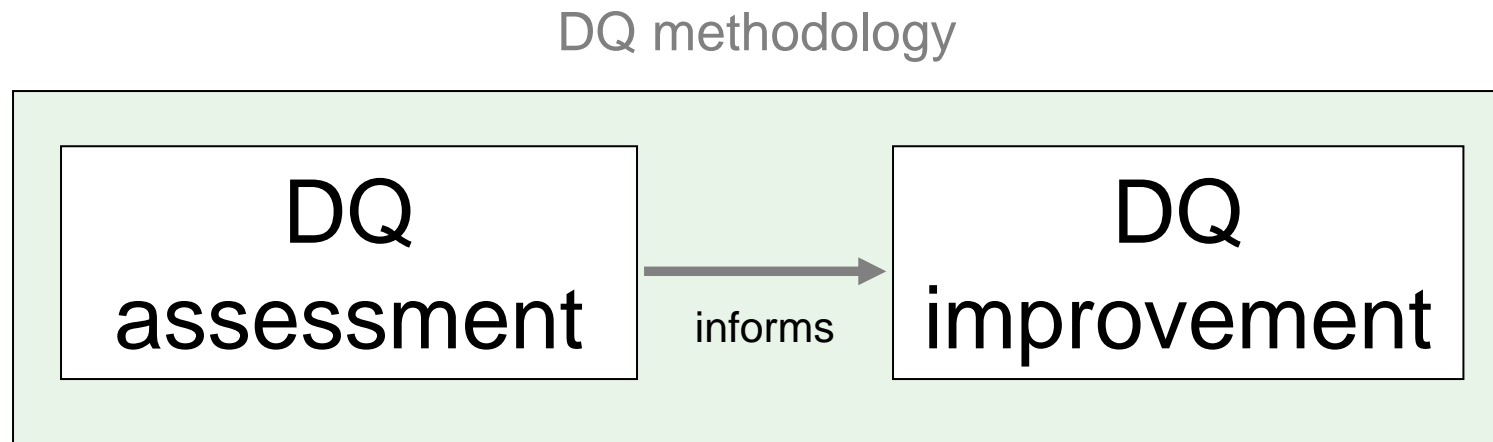
# Candidate factors for improving IQM practices

			Organisations									
			High		Maturity Level 2							
Maturity Level	Process Area	CSF	C	G	A	D	E	F	B	H	I	J
3	IQ Management Roles and Responsibilities	IQ Management Team and Project Management	S	S	P	-	P	-	P	-	-	P
3	IQ Needs Analysis	Requirements Analysis	S	S	-	-	-	-	P	P	-	-
3	IQ Needs Analysis	Requirements Management	S	S	-	-	-	-	-	P	-	-
3	Information Product Management	Information Product Visualisation	S	S	P	P	P	P	P	P	P	P
3	Information Product Management	Meta Information Management	S	S	-	-	P	-	P	P	-	-

'-' = not satisfied  
 P = partially satisfied  
 S = fully satisfied

# Data Quality Assessment using the Hybrid Approach

# What is Data Quality Assessment?



# Why is it difficult to select an assessment technique for each company?

Determine and prioritize DQ problems

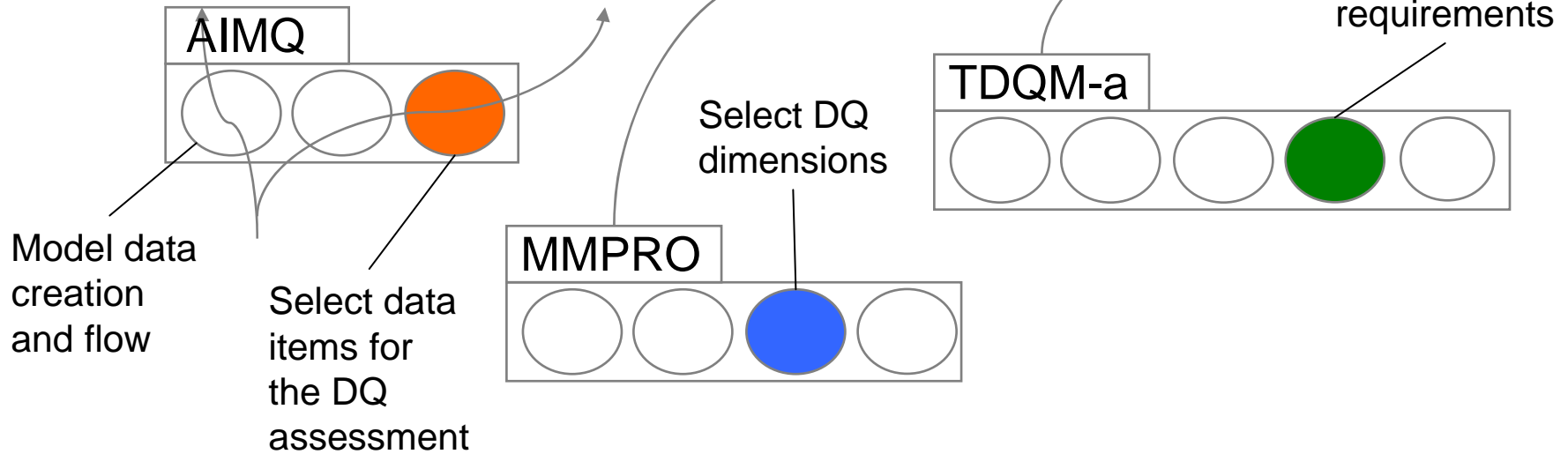
Assess a previously identified DQ problem



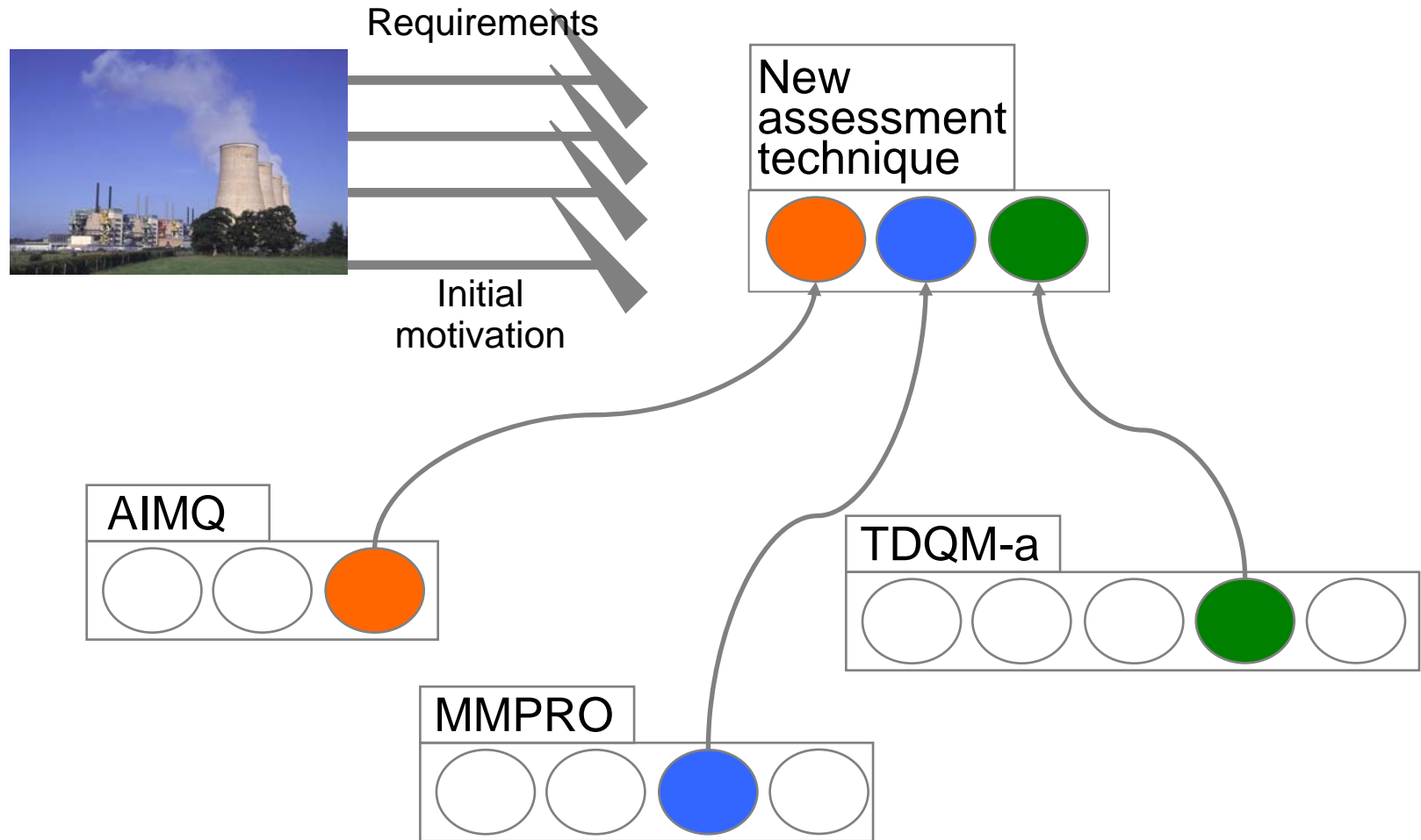
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# The Hybrid Approach to assessing DQ



# The Hybrid Approach: London Underground

## Initial Motivation:

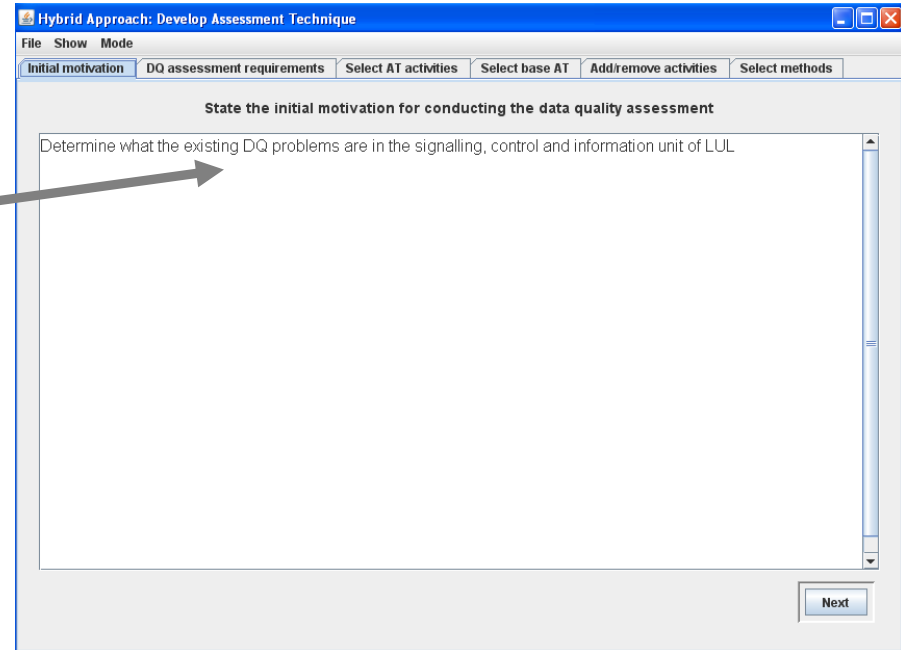
Determine what the existing DQ problems are in the signalling, control and information unit of the London Underground.

## Requirements:

1. Determine what information systems and specific data to focus on (within in the signalling, control and information business unit)
2. Group the data (the data has widely different uses, and therefore needs to be logically grouped).
3. Handle any quantity of data (because no idea how much data is used)
4. Handle structured data.
5. Inform the relevant people of the results

# The Hybrid Approach: London Underground

Initial Motivation



Hybrid Approach: Develop Assessment Technique

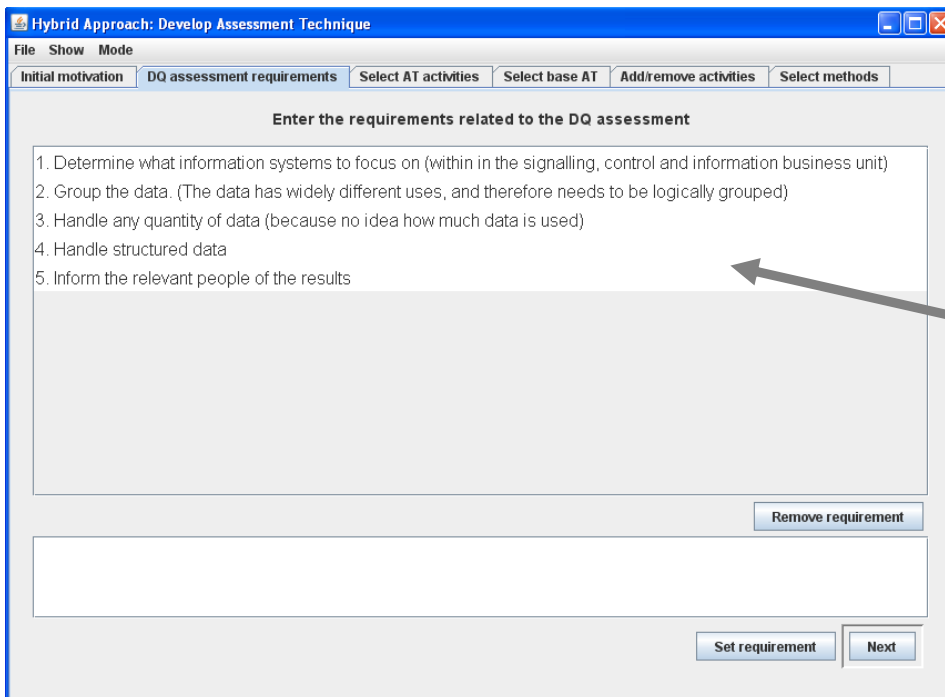
File Show Mode

Initial motivation DQ assessment requirements Select AT activities Select base AT Add/remove activities Select methods

State the initial motivation for conducting the data quality assessment

Determine what the existing DQ problems are in the signalling, control and information unit of LUL

Next



Hybrid Approach: Develop Assessment Technique

File Show Mode

Initial motivation DQ assessment requirements Select AT activities Select base AT Add/remove activities Select methods

Enter the requirements related to the DQ assessment

1. Determine what information systems to focus on (within in the signalling, control and information business unit)
2. Group the data. (The data has widely different uses, and therefore needs to be logically grouped)
3. Handle any quantity of data (because no idea how much data is used)
4. Handle structured data
5. Inform the relevant people of the results

Remove requirement

Set requirement Next

Requirements

# Using the Hybrid Approach: support tool

Hybrid Approach: Develop Assessment Technique

File Show Mode

Initial motivation DQ assessment requirements **Select AT activities** Select base AT Add/remove activities Select methods

Select activities which meet the requirements

Requirement	Activity
Determine what information systems to focus on (within in the signalling, control and information business unit)	Select data items for the DQ assessment
Group the data. (The data has widely different uses, and therefore needs to be logically grouped)	Group/organize data items
Handle any quantity of data (because no idea how much data is used)	<ul style="list-style-type: none"> <li>Communicate and share the results</li> <li>Conduct a small-scale measurement</li> <li>Perform a utility-driven DQ measurement</li> <li>Define DQ requirements</li> </ul>
Handle structured data	<ul style="list-style-type: none"> <li>Identify DQ problems</li> <li>Model data creation and flow</li> <li>Select organizational units for the DQ assessment</li> <li>Group/organize data items</li> </ul>
Inform the relevant people of the results	<ul style="list-style-type: none"> <li>Define IPs</li> <li>Select data items for the DQ assessment</li> <li>Plan when to conduct the DQ assessment</li> <li>Identify DQ costs</li> <li>Perform organizational assessment</li> <li>Select a team for managing and executing assessment</li> <li>Prioritize DQ dimensions</li> </ul>

# Using the Hybrid Approach: support tool

Hybrid Approach: Develop Assessment Technique

File Show Mode

Initial motivation DQ assessment requirements Select AT activities **Select base AT** Add/remove activities Select methods

Select an assessment technique as a basis

Selected technique: TQdM-a

AT Name	Matching activities ▼	# of activities	Structured	Semi	Unstruct...	monolithic	distributed	datawar...	cooperati...	web	paper
TQdM-a	3 / 3	12	h	i		f	f				
MMPRO	2 / 3	11	h	h		f					
QAFD	2 / 3	8	h			f					
COLDQ-a	1 / 3	8	h	i		f					
ORME-DQ	1 / 3	9	h	i		f					
AIMQ	0 / 3	5	h	i	i	f	i				
AMEQ-a	0 / 3	8	h	i		f					
CDQ-a	0 / 3	8	h	h		f	f		sf		
DQA-a	0 / 3	5	h			f	i				
DWQ-a	0 / 3	4	h					sf			
IQM	0 / 3	7	h	h						sf	
PM	0 / 3	3	h	i	h	i					f
TDQM-a	0 / 3	8	h	h		f	i				

sf = strongly focused f = focused h = can handle i = implicitly considered

Filter values Select Assessment Technique Next

# Using the Hybrid Approach: support tool

Hybrid Approach: Develop Assessment Technique

File Show Mode

Initial motivation DQ assessment requirements Select AT activities Select base AT Add/remove activities Select methods

Add/remove and move activities as required

Order	Activity	Optional?
1	Select data items for the DQ assessment	
2	Group/organize data items	
3	Select DQ dimensions	
4	Select a place where data is to be measured	
5	Identify reference data	Optional
6	Perform subjective DQ measurement	Optional
7	Perform objective DQ measurement	Optional
8	Communicate and share the results	

Add activity Remove activity Move down Move up Next

# Using the Hybrid Approach: support tool

Hybrid Approach: Develop Assessment Technique

File Show Mode

Initial motivation DQ assessment requirements Select AT activities Select base AT Add/remove activities **Select methods**

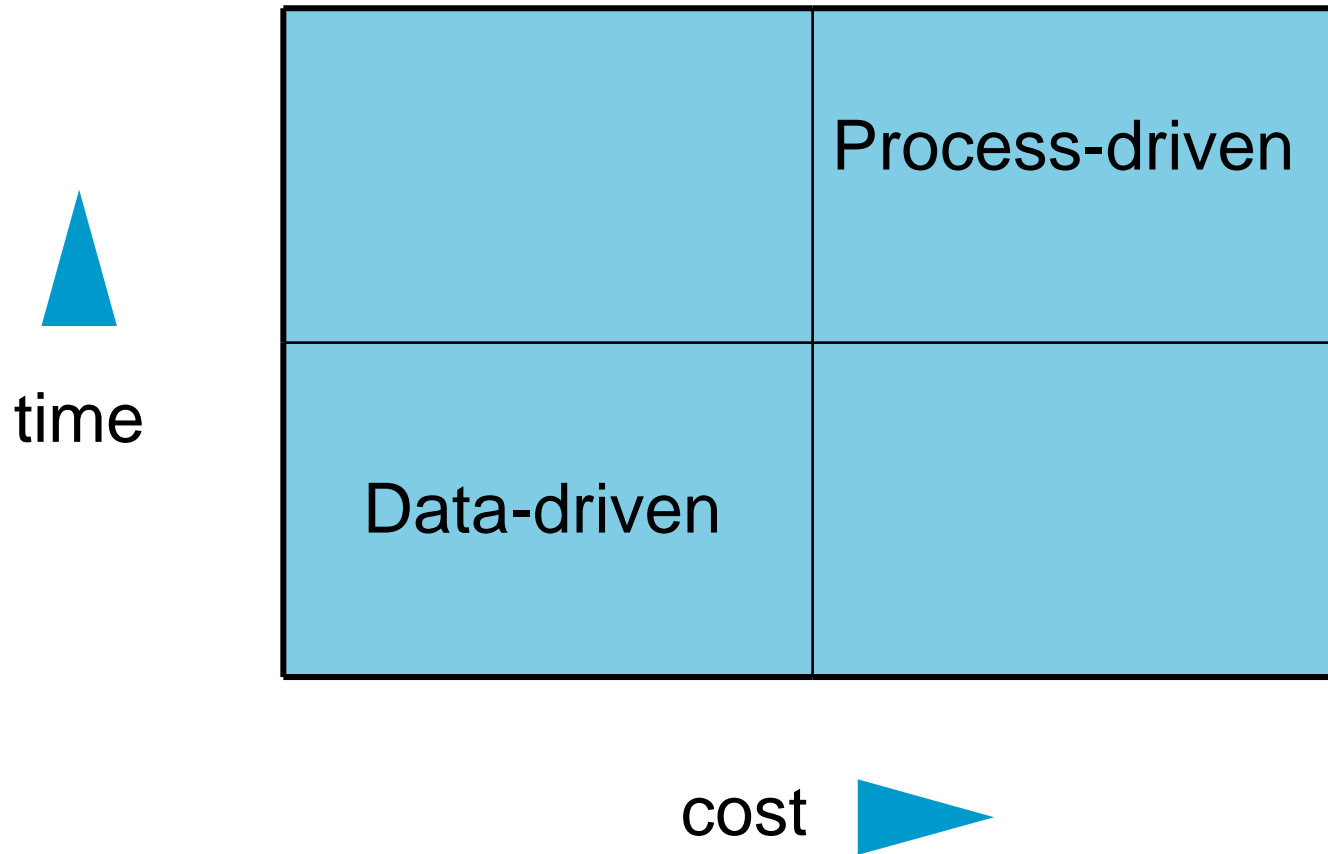
Specify the methods for each activity

Order	Activity	Optional?	Description of method	External file	People	Complete
1	Select data items for the DQ assessment		Select the relevant data values, tables, information systems, paper files etc. for the assessment.		RP	<input checked="" type="checkbox"/>
2	Group/organize data items				PW&RP	<input type="checkbox"/>
3	Select DQ dimensions				PW	<input type="checkbox"/>
4	Identify reference data	Optional			PW&RP	<input type="checkbox"/>
5	Perform subjective DQ measurement	Optional			PW	<input type="checkbox"/>
6	Perform objective DQ measurement	Optional			PW	<input type="checkbox"/>
7	Communicate and share the results			listOfPeople.doc	RP	<input type="checkbox"/>

Add external file Remove external file

# Future Work

Data quality improvement



# Information Quality for Asset Management (IQAM)

- Funded by EPSRC
- Principal Investigator: Dr. Ajith Kumar Parlikad
- Researchers: Dr. Philip Woodall, Dr. Maurizio Tomasella, Alexander Borek

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