No great improvements in the lot of mankind are possible, until a great change takes place in the fundamental constituting of their modes of thought

John Stuart Mill

The True Costs of Quality

Measuring and Managing Quality-related Costs in the Digital Age

22 March 2018

Oakland Group

CQI | IRCA

Welcome to this Corporate Partners Event

Working style - getting best value from our time together

Expert Level: We know you are all experienced Quality professionals and we have pitched the class accordingly

Making it Practical: We balance teaching of tools and frameworks with time to reflect on how they can make a practical difference in your business

Mutual Learning: Recognise the depth of experience and expertise in the room – and the opportunity that this provides to learn from each other

A Unique Resource: Cover a lot of ground – some in depth, some as a reminder – with attention to pragmatic application

Oakland Group

The True Costs of Quality

Objectives

This session will focus on:

- The challenges in capturing the total costs of Quality
- A standard model for categorising the different Quality costs
- The relationship between increasing Quality awareness and lower Quality-related costs
- How advanced data analytics is helping organisations effectively manage and reduce these costs

Oakland Group

The True Costs of Quality

- **Introductions and welcome**
- **Session 1:**
  Understanding quality-related costs
- **Lunch**
- **Session 2:**
  Using advanced analytics to drive change
- **Close**

Oakland Group

Introductions

Let's introduce each other in your groups

Please tell us:

- Your name
- The number of years you have worked in a Quality role
- Your role in your business and what you are currently working on in terms of improving Quality
- Your expectations for today
- And one fun fact about yourself that we are unlikely to have guessed

Oakland Group

The True Costs of the Quality Effort

Quality and cost needs to be carefully managed

Delivering a quality product or providing a quality service, even with a high degree of customer satisfaction, is not enough

All the costs of achieving these goals and avoiding the reputational impact of getting it wrong must be carefully managed

It is these costs that are a true measure of the quality effort

The True Costs of the Quality Effort

A major challenge is capturing the totality of the costs

A Study into the Costs of Quality

Product-based organisations

1 in 3 organisations spending >20% of turnover on costs of quality failure, with 10% of organisations spending >30%

These high costs were in spite of the fact that, on average, only 40% of failure cost categories were being measured

Only 50% of organisations measured the costs of re-inspecting/re-testing products and dealing with customer complaints/product returns

Costs of quality is more than just financial – poor quality impacts customers, damages reputation and distracts management

WORLD LEADING PRODUCT MANUFACTURERS ACHIEVE 5-10% AS THEIR CoQ

Oakland Group

A Study into the Costs of Quality

Service-based organisations

25% of the service organisations that responded did not measure any of the quality failure cost categories at all

The total costs of quality failure for the Service organisations that had information available ranged from 2% - 19% of annual spend

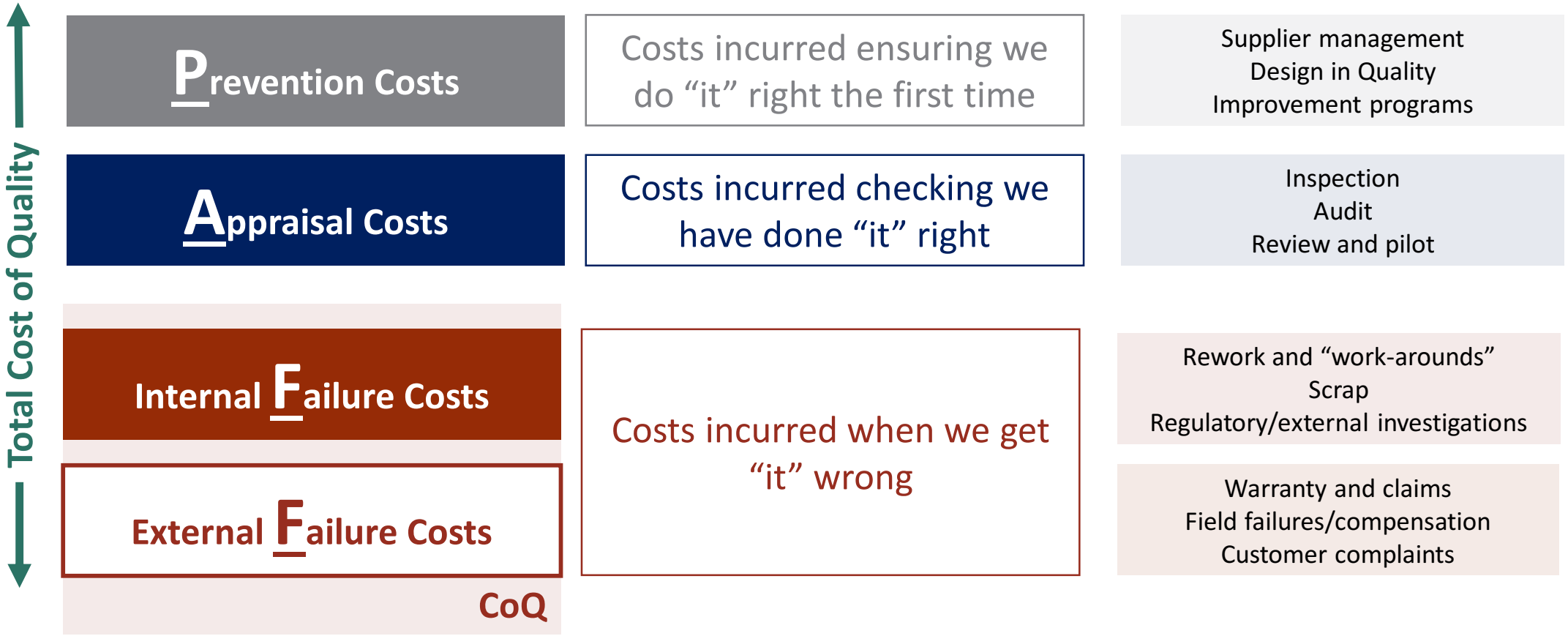
The majority of service organisations did not measure the cost of reviewing and auditing their supply chain, IT systems failures, complete service breakdowns or dealing with customer complaints

EXTENSIVE OPPORTUNITIES EXIST TO REALIZE SIGNIFICANT SAVINGS

Oakland Group

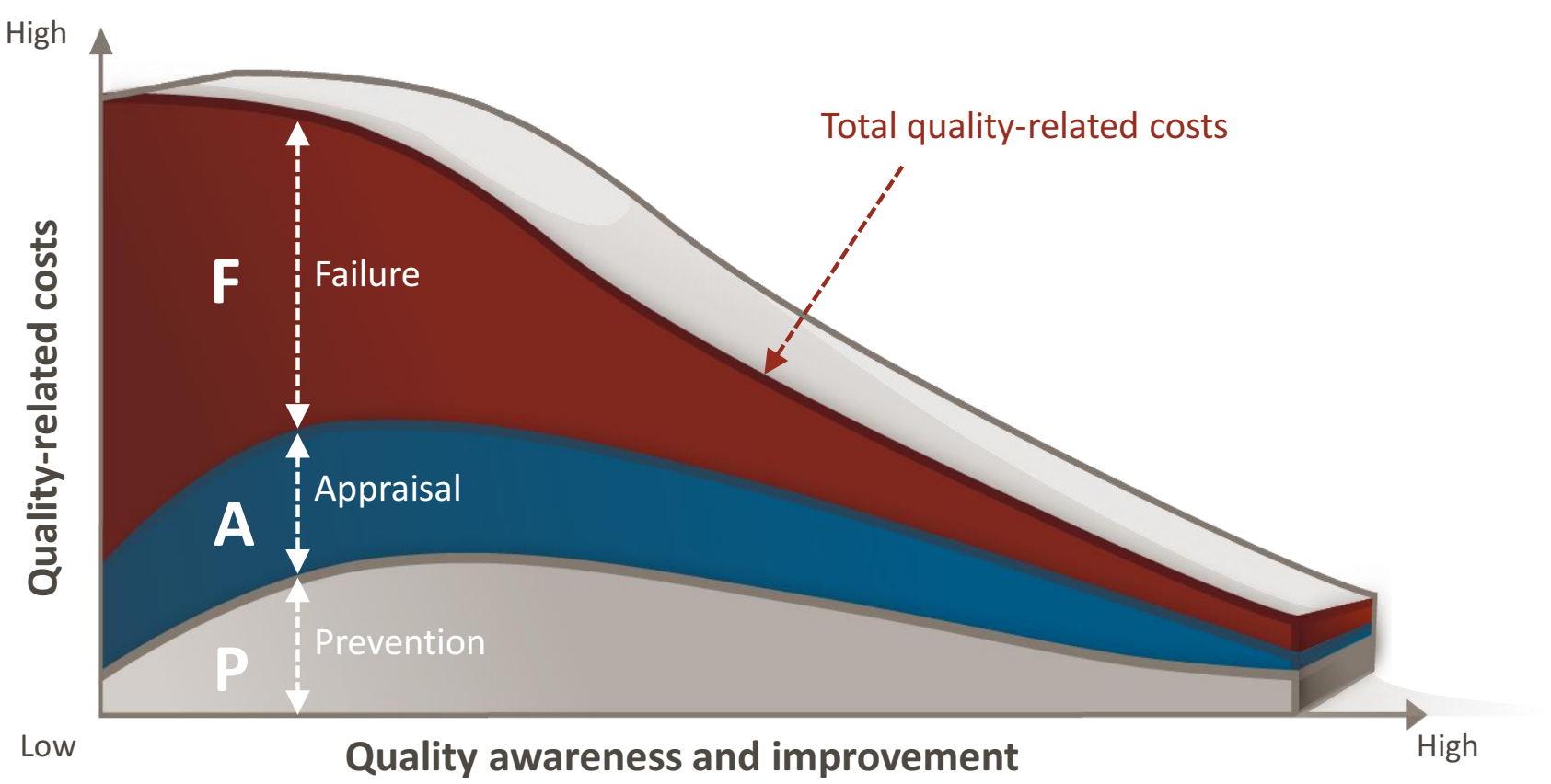
Total Costs of Quality

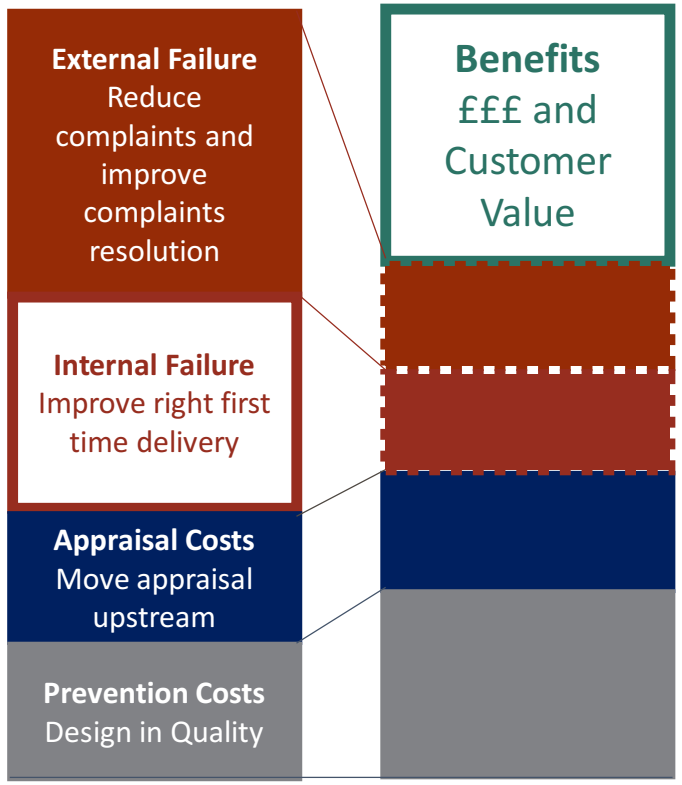
The P-A-F Model



Quality-related Costs

Costs fall as prevention activities increase





IN GENERAL THE MORE ELEMENTS AN ORGANISATION MEASURES THE LOWER ITS QUALITY-RELATED COSTS

Total Costs of Quality

Exercise to understand the different quality cost drivers and their significance

Objective:

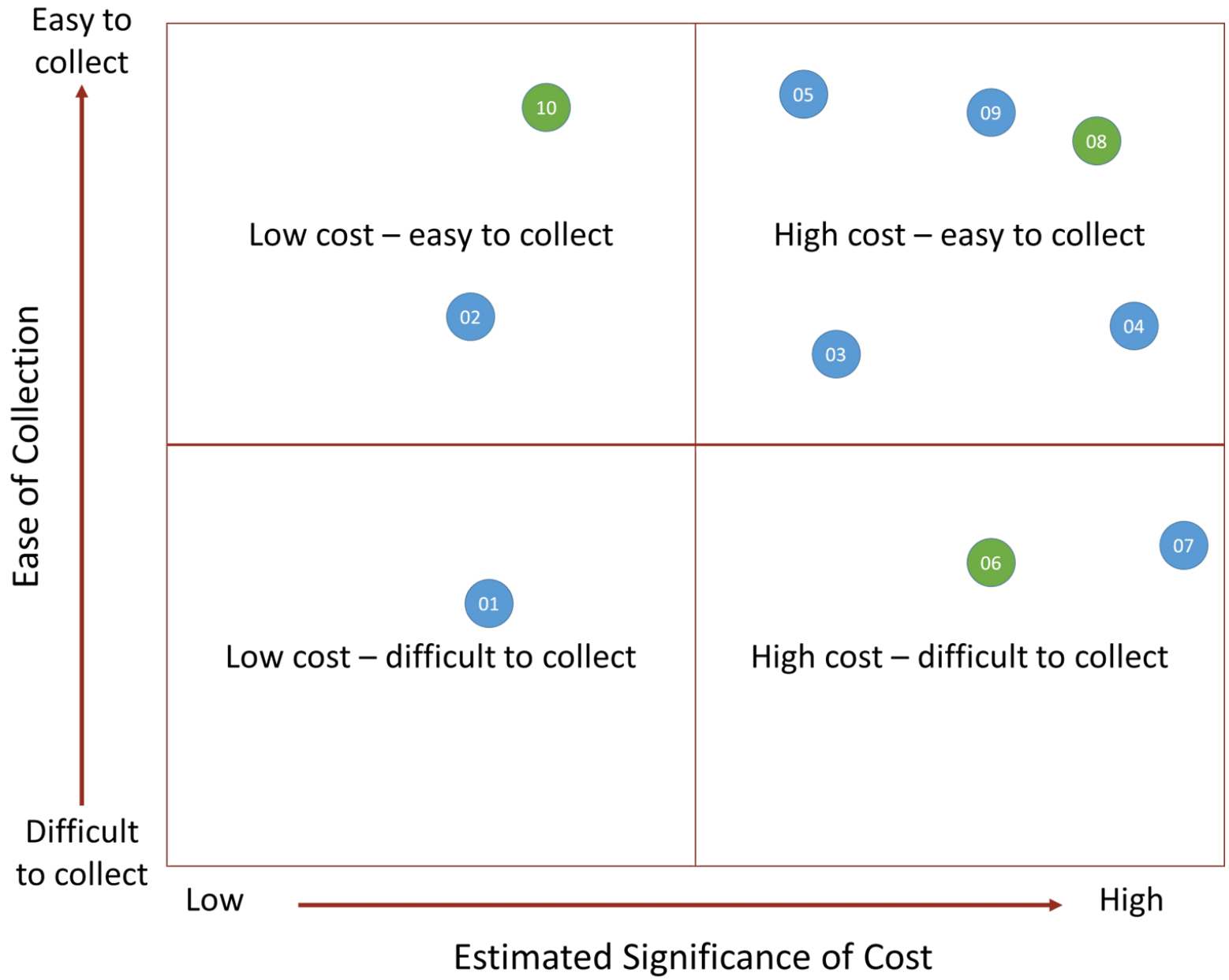
- To identify the key drivers of quality costs and categorise them based on ease of collection and significance

How:

- In groups, identify the key drivers for cost in terms of P-A-F(i)-F(e)
- **Plenary review** – where do we agree/disagree? Why?
- Use the matrix to allocate each of the key drivers, write the category number in the relevant place on the diagram
- **Plenary review** – where do we agree/disagree? Why?
- **Plenary discussion** – what have people done in their organisations to measure these costs effectively?

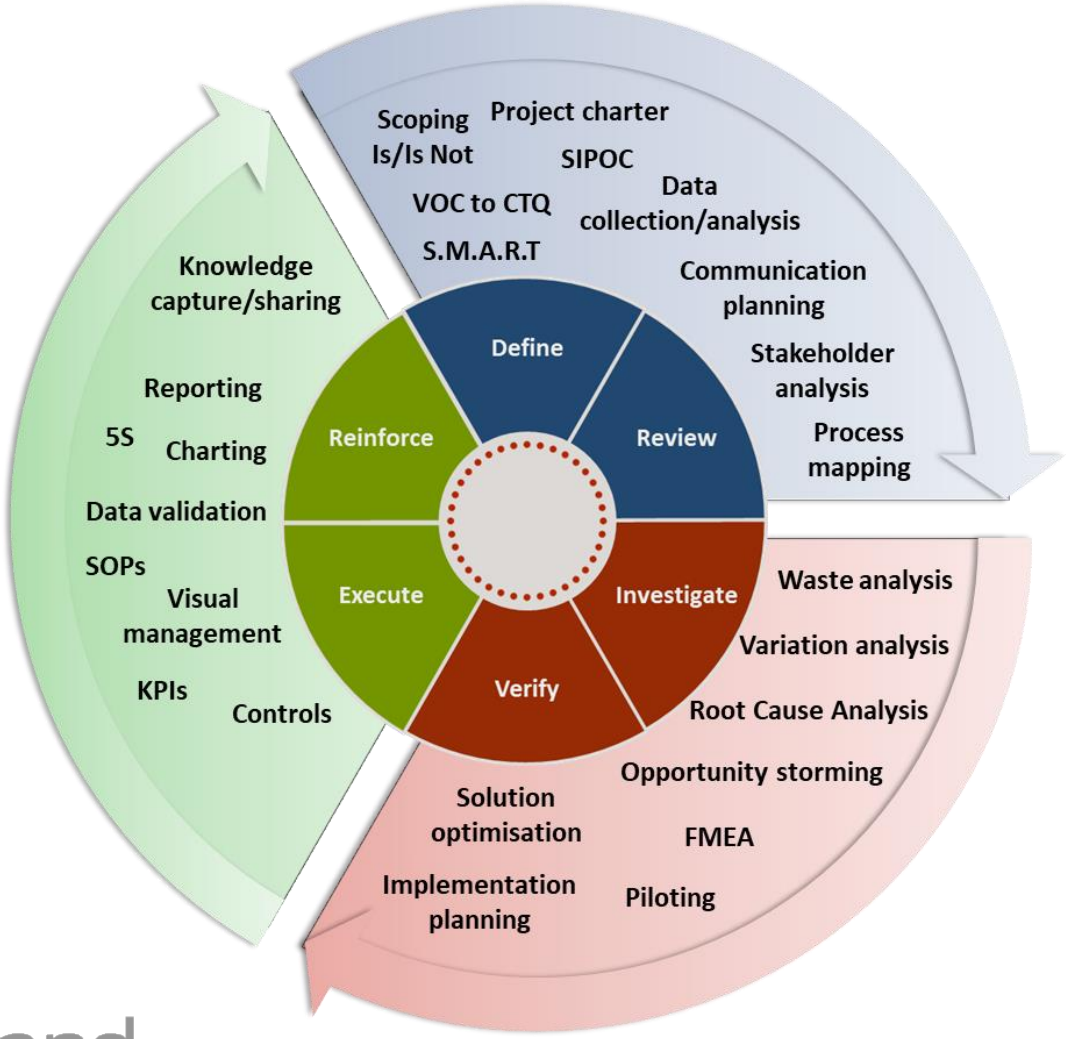
Output:

- A completed table of key cost drivers through plenary discussion
- Agreement on the relevance (or not) of monitoring and managing the different quality cost drivers
- Raised awareness on what can be done to measure and act on these costs


Easy to collect
Ease of Collection
Difficult to collect
Low cost – easy to collect
High cost – easy to collect
Low cost – difficult to collect
High cost – difficult to collect
10
05
09
08
02
04
03
01
06
07
Low
High
Estimated Significance of Cost

Addressing Costs of Poor Quality

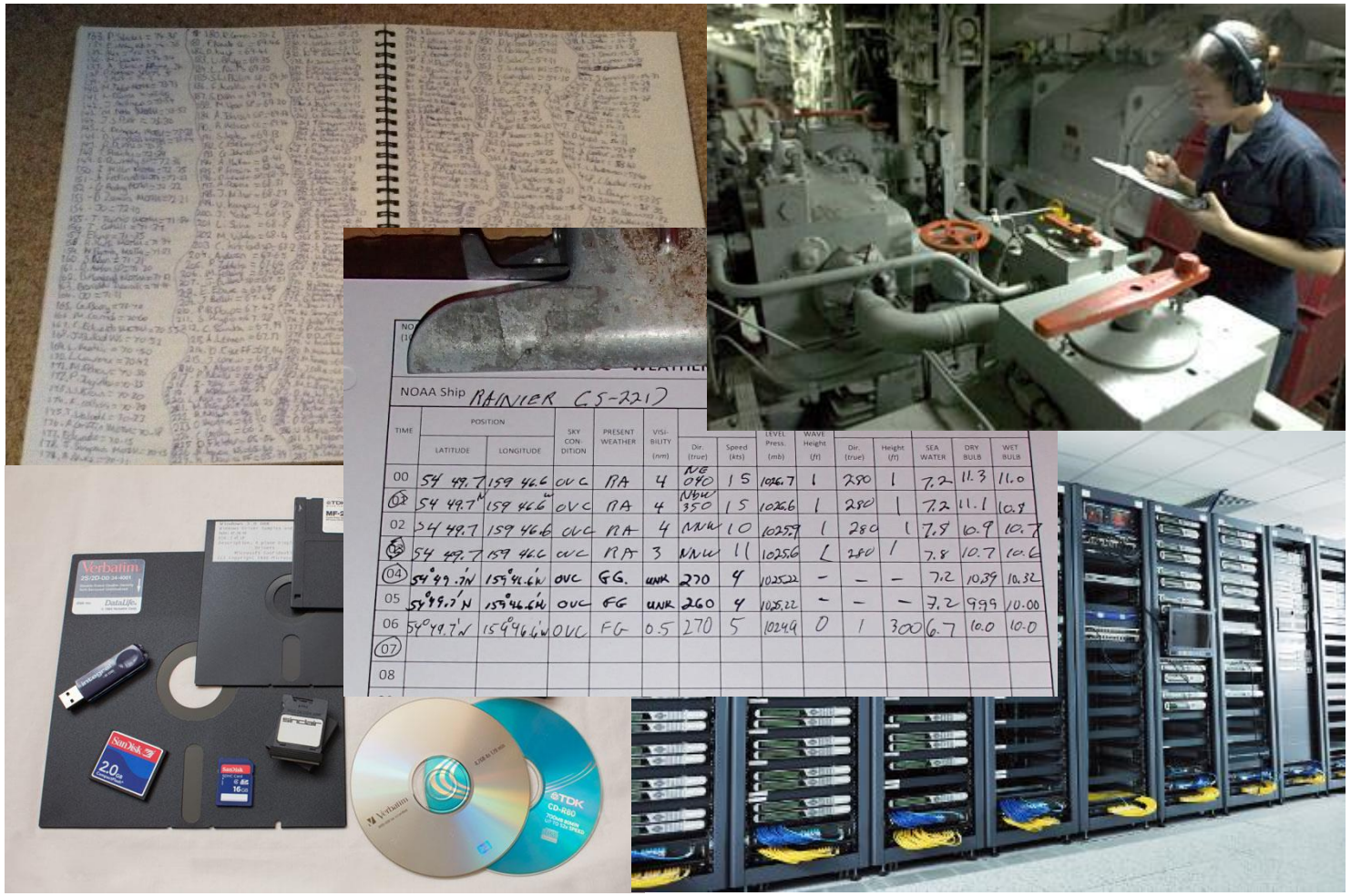
A wide range of approaches, tools and techniques at our fingertips…



Why is it so difficult?

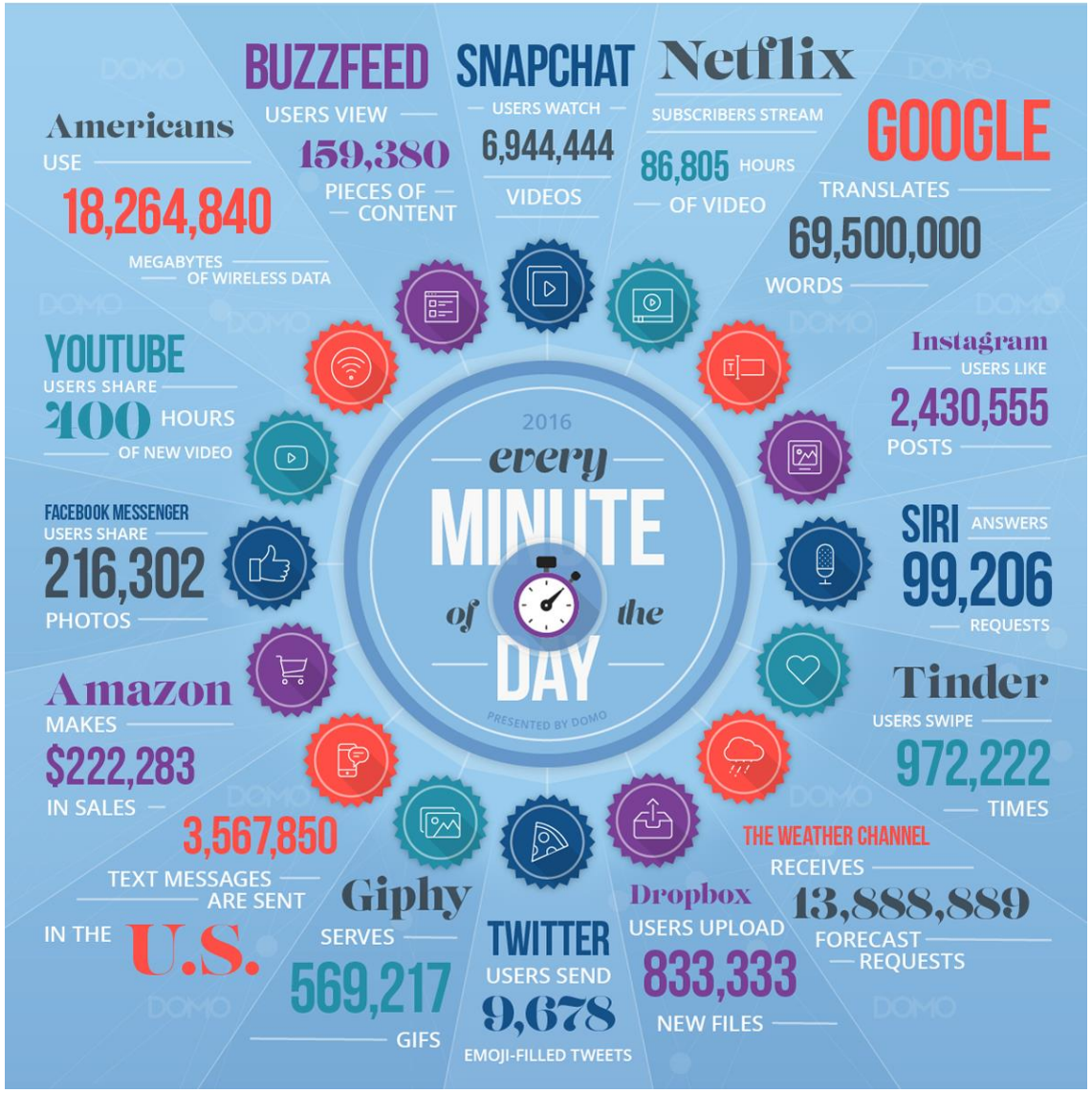
The case for change is nearly always hidden in the data

However it has not always been easy to get it or make sense of it…



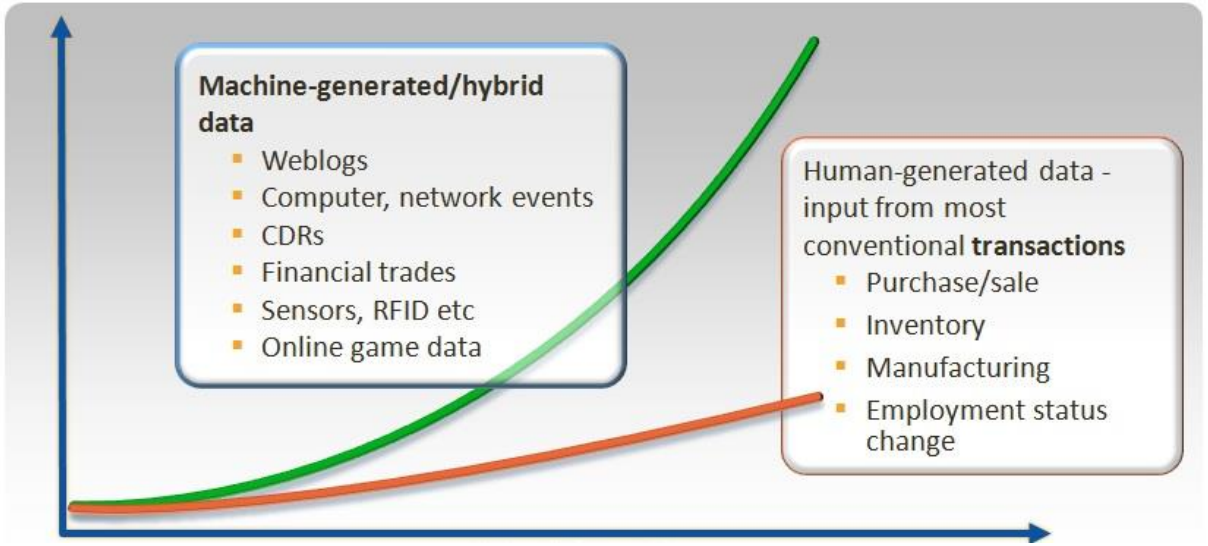
Data Data Everywhere…

Where does data come from?



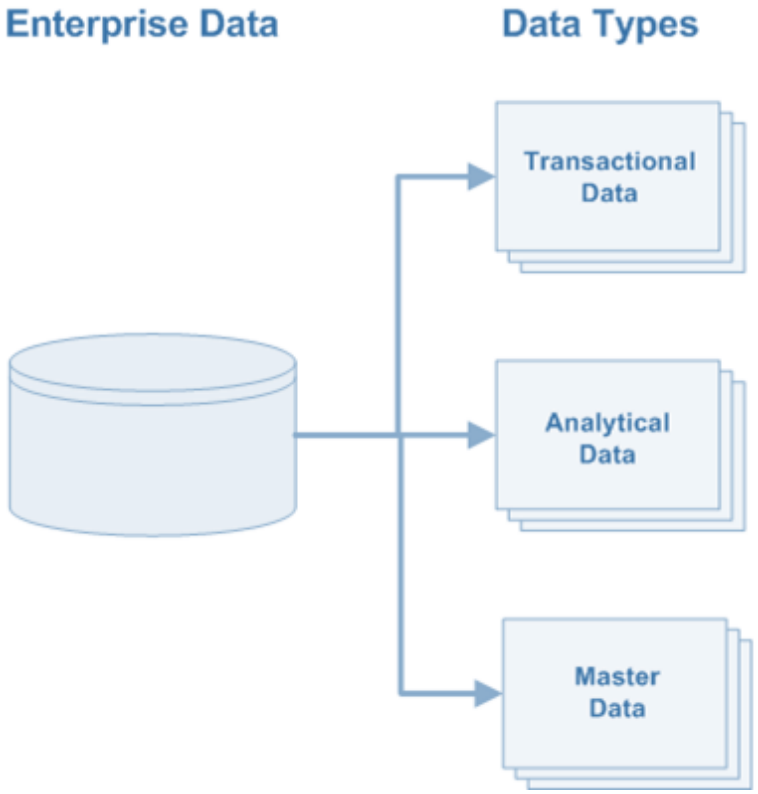
Over 90% of the data that the world has ever seen has been created in the past 2 Years…

That's 2.5 quintillion bytes (2.5 billion Gigabytes) per day



Sources and Types of Data

Within or across the value chain



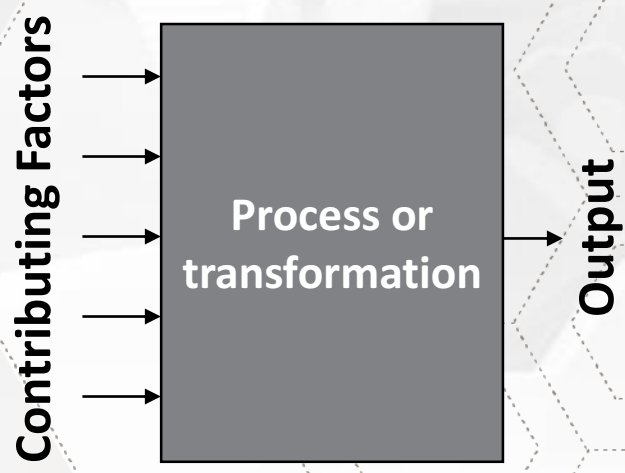
Oakland Group

Data Mashing…

What data is required to solve a problem

In your tables

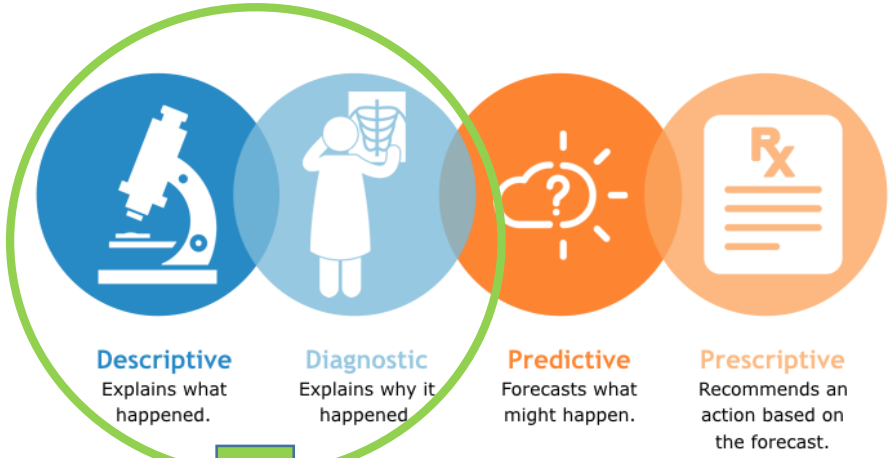
1. Think back to the challenges identified in the morning session
2. Pick a problem that you can all relate to then
   - Identify the sources of information you may need?
   - Is this structured or unstructured?
   - Is it available / accessible?
   - Is it linkable / mashable?
   - Are the known quality issues?



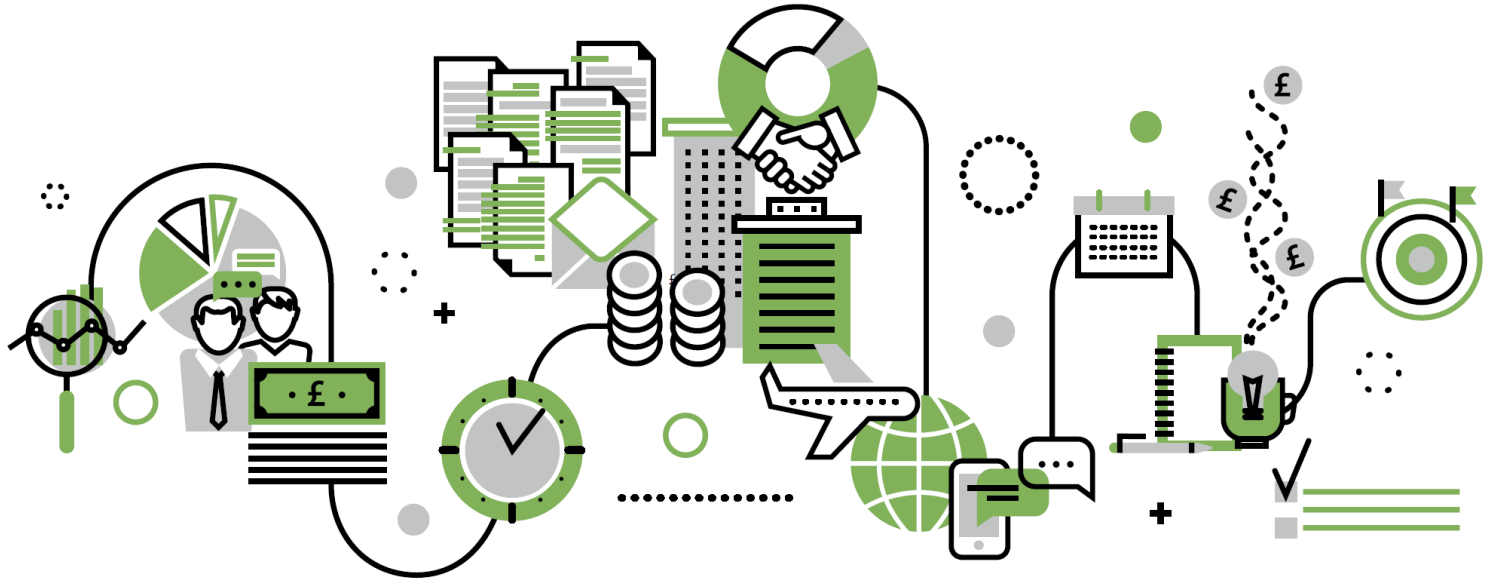
	What is it	Is it structured or unstructured	Where is it	Is it available / accessible	Is it linkable to other data	What is the quality like?
1	People Shift Data	Un-structured	Local Spreadsheets	Yes	Yes	OK (plan, not actuals)
2	Machine Logs	Structured	Machine Database	Yes	Yes	Good
3	…	…	…	…	…	…

So what would we have traditionally done next?

(whilst focusing on descriptive analytics)



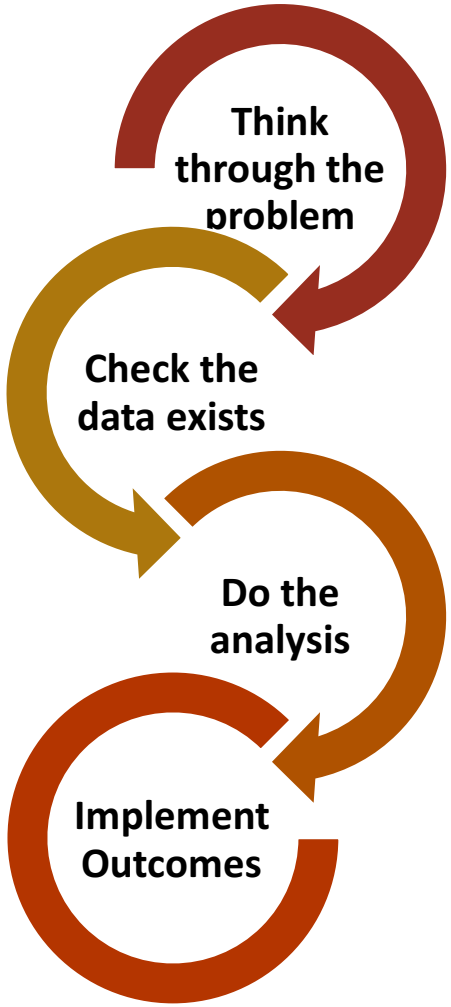
What are the limitations of this approach?



Oakland Group

An Approach to Analytics

Too many analytical interventions forget about the basics…



Spend time defining the problem

(and then think about it some more)

Understand what data you need to solve the problem

Use the right tool(s) for the job

Know how you are going to use the output

Power BI

Qlik

+ableau

AlchemyAPI

FACE++

bigml

PredicSis

PredictionIO

Betaface

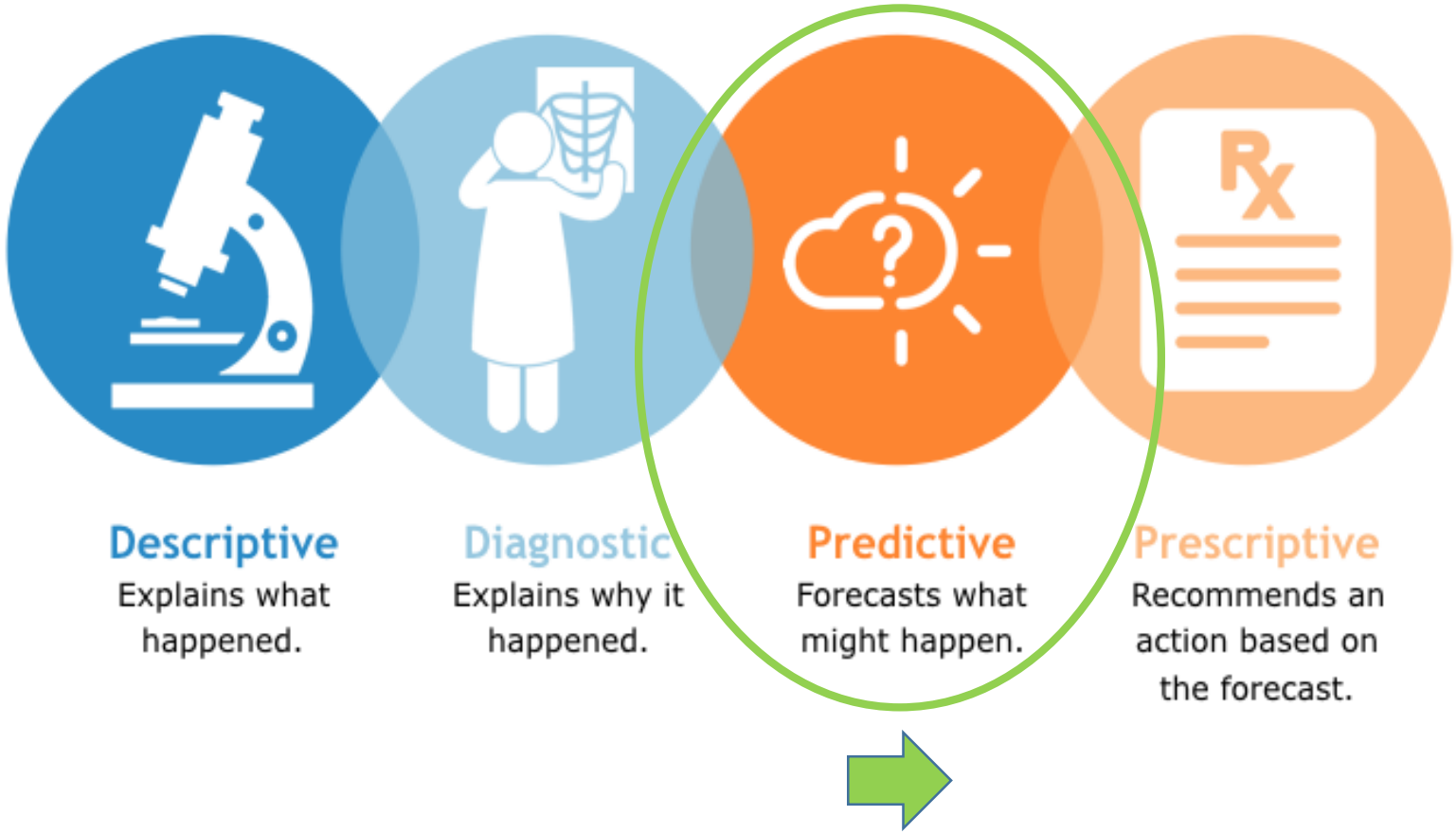
calais

lang id

Oakland Group

What is Machine Learning?

Machine learning is a field of computer science that gives computer systems the ability to "learn" (i.e. progressively improve performance on a specific task) with data, without being explicitly programmed

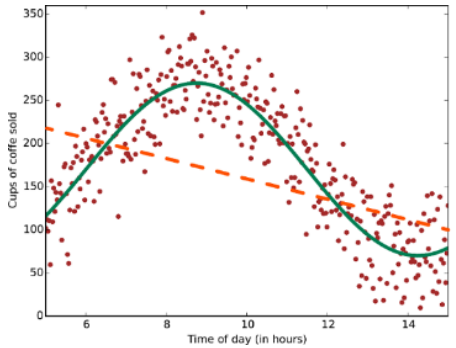


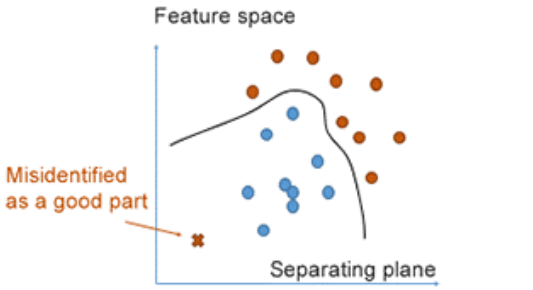
Oakland Group

What is Machine Learning?

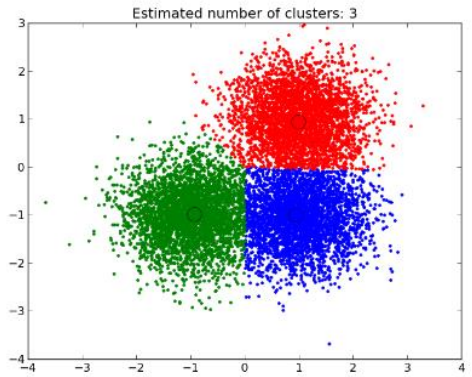
A quick overview…

- **Machine Learning**
  - **Supervised**
    - **Regression**
    - **Classification**
  - **Unsupervised**
    - **Clustering**





(a) Supervised machine learning
(Separating plane learned using good and defective samples)



We need data that is:

Relevant

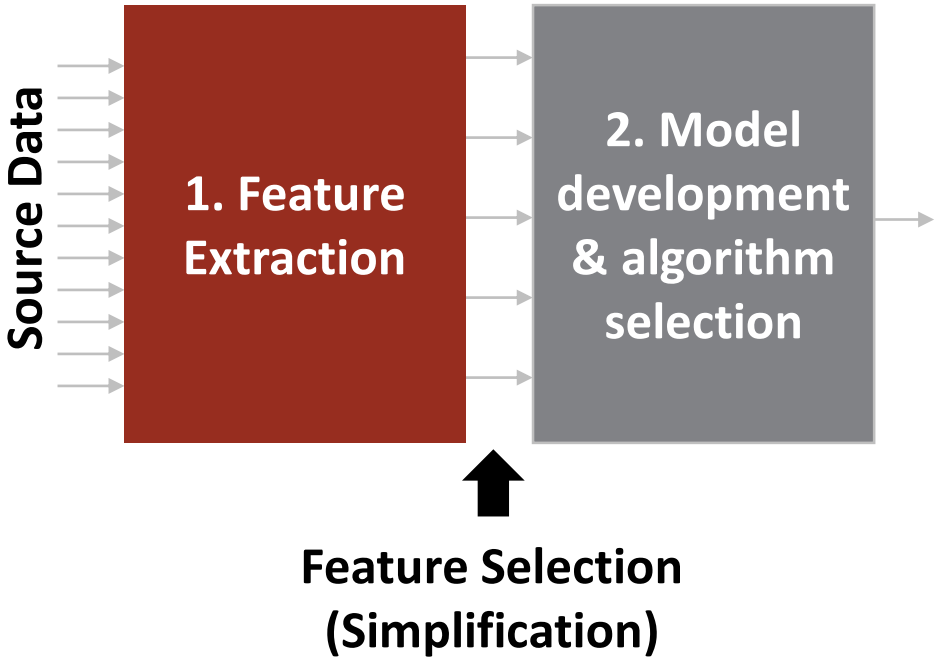
Connected

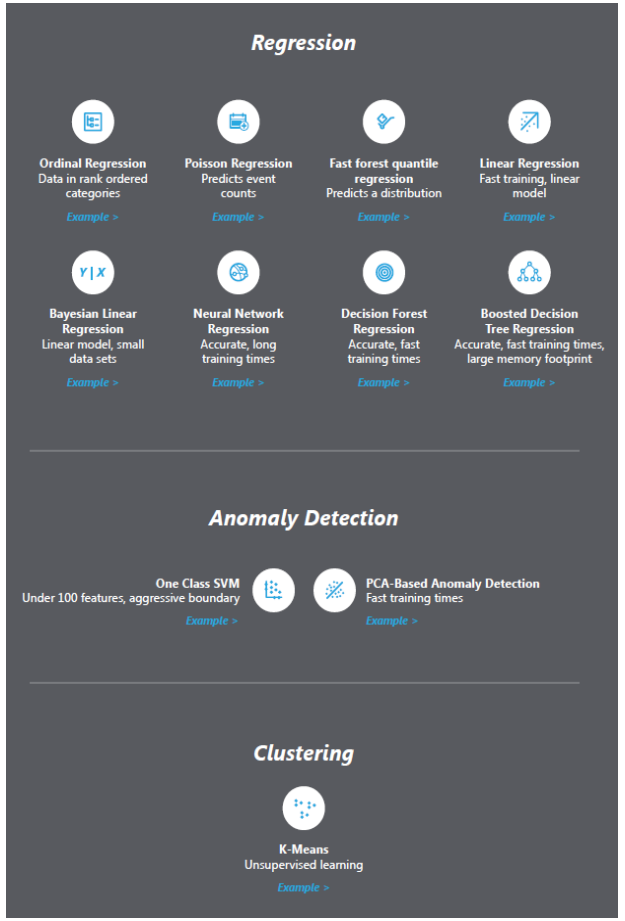
Accurate

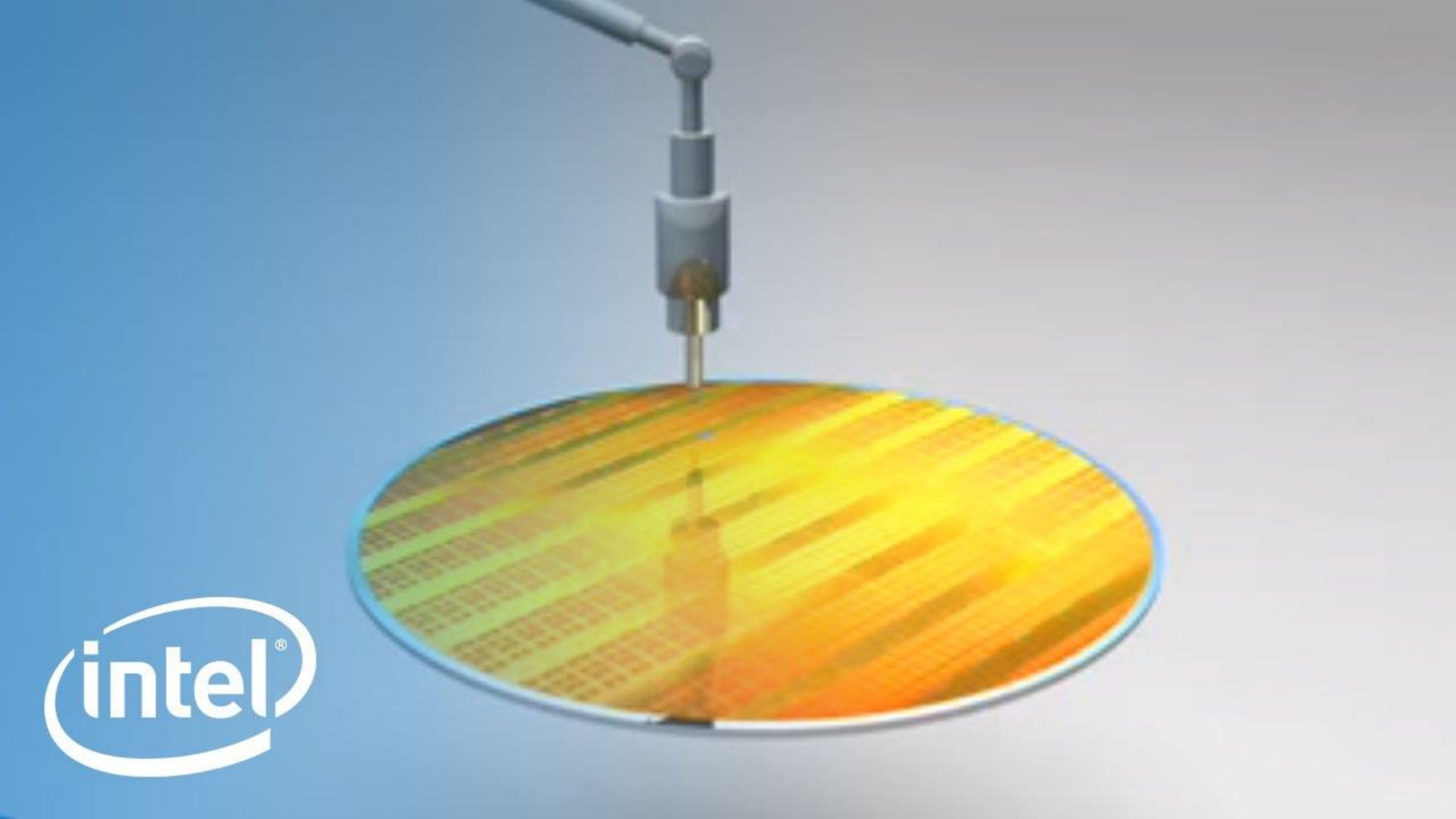
Enough to work with

Feature Selection and Algorithm Selection

Two important aspects…

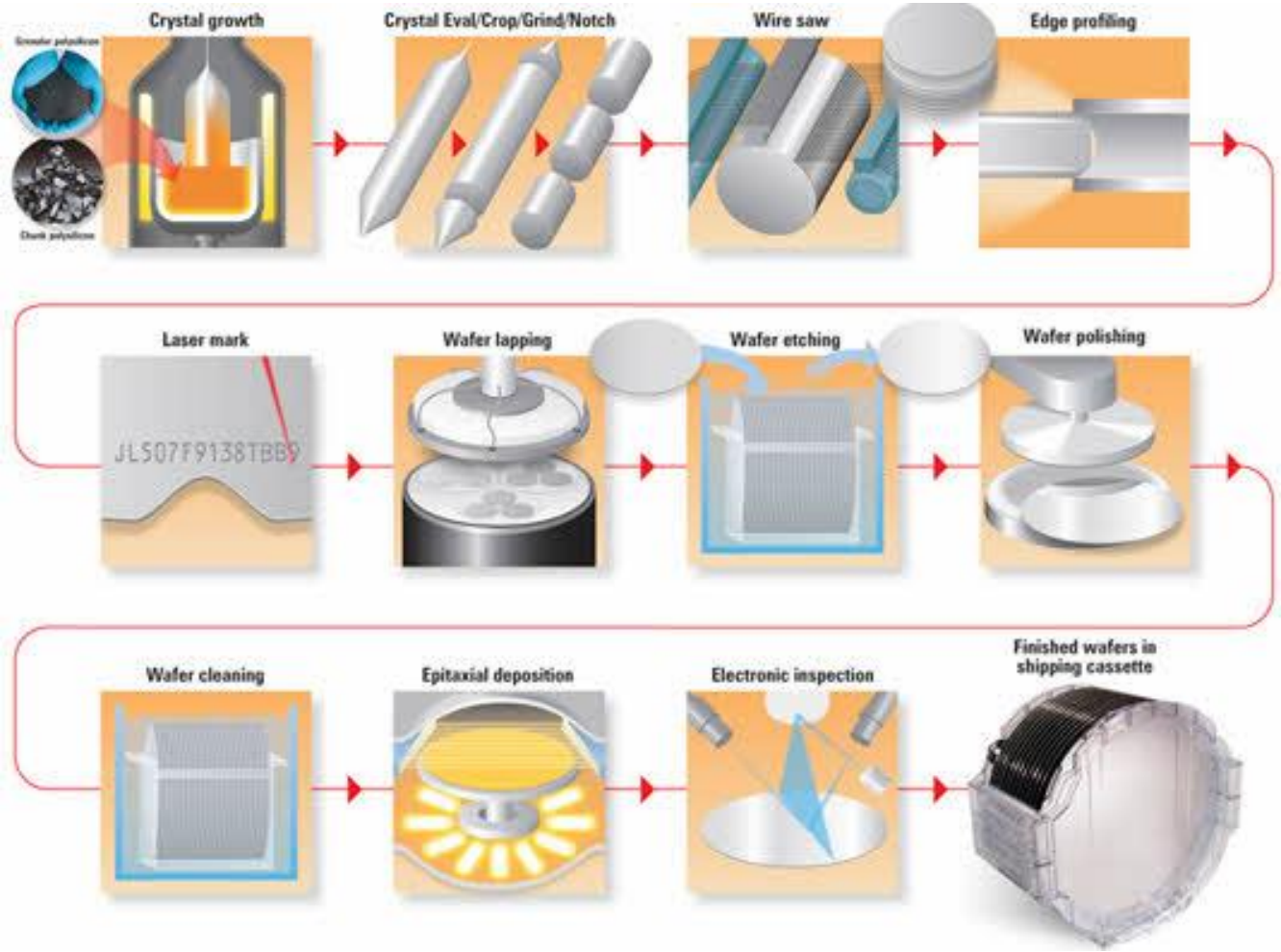





intel

Batch Manufacturing

Reducing the cost of quality in complex processes



Very complex process

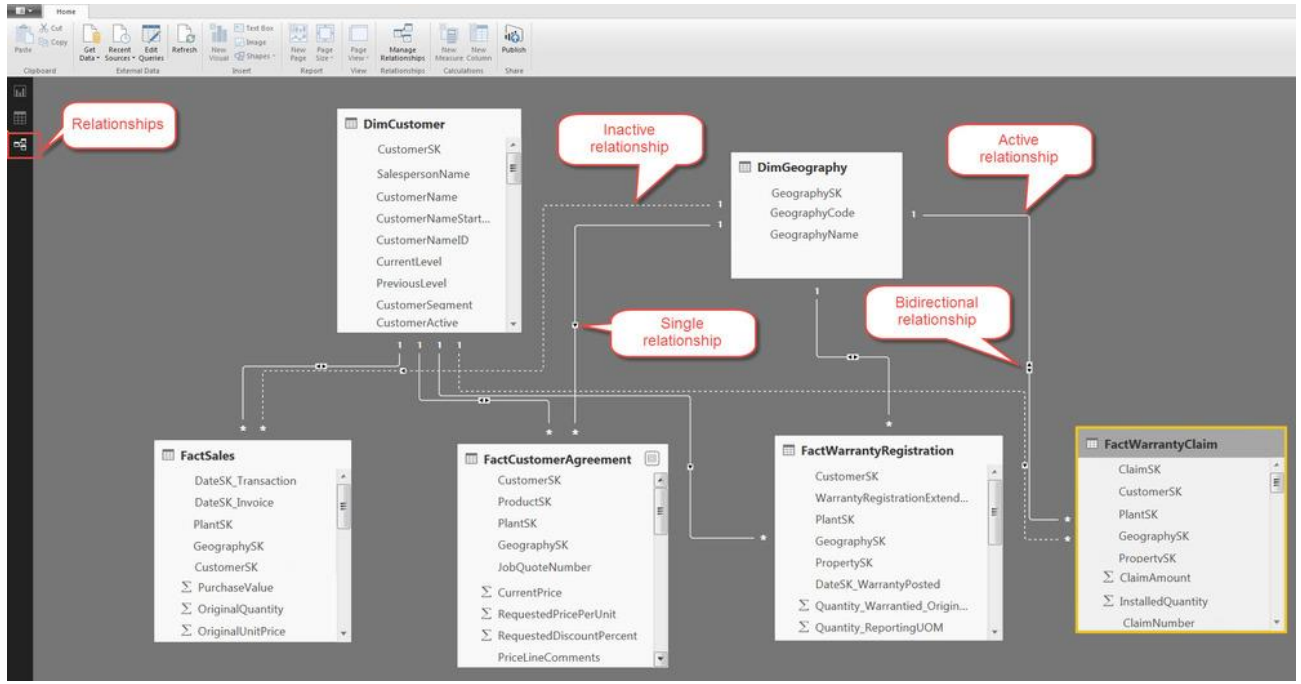
Failures may not be evident until the end of the process

What is the spikey question?

Linking the Sources of data

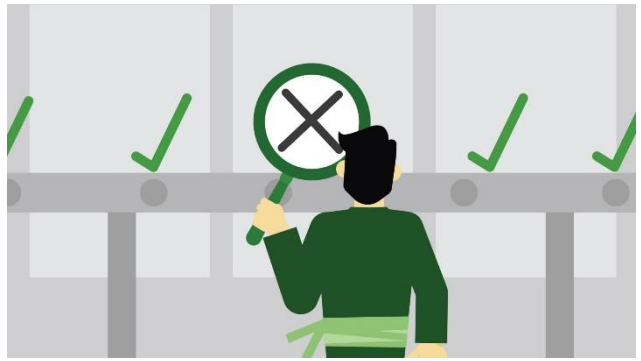
Predicting yield could involve a whole range of disparate factors

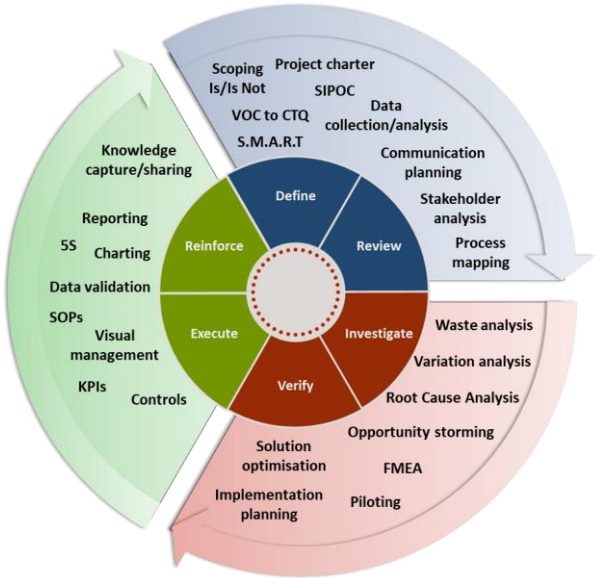
- Machine Sensor
- Machine Config’
- Materials
- Suppliers
- Shift staff
- Weather(?)
- Time
- Plant location
- Design
- …..

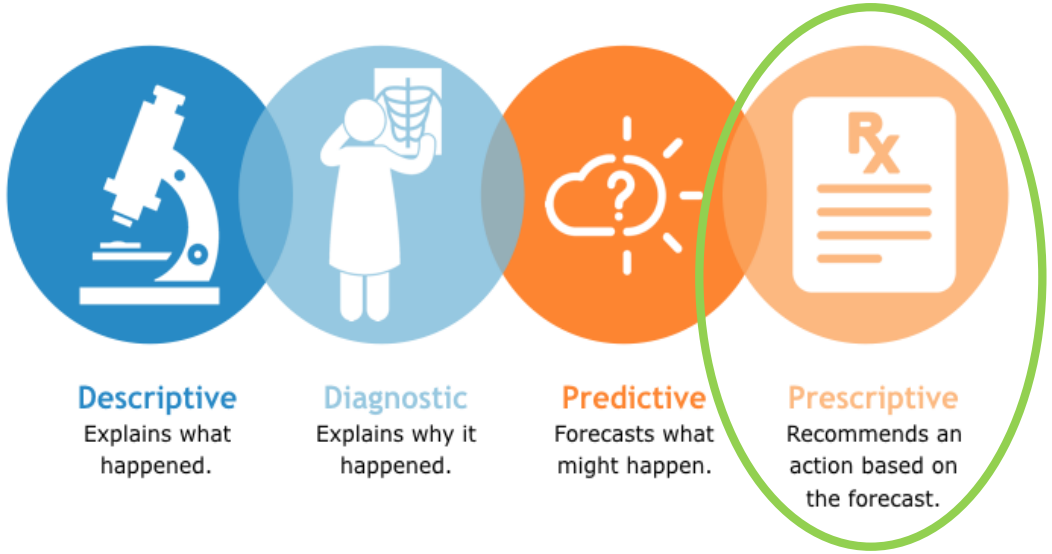


Knowing What to do with the Outputs…

Feed outputs back in to established improvement techniques







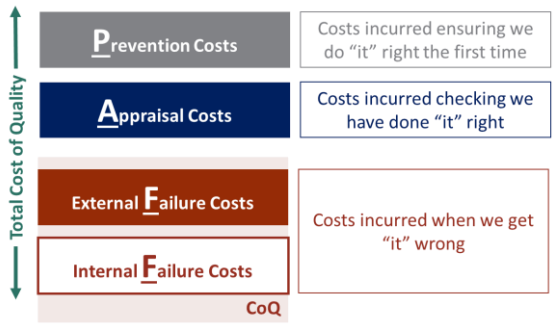
Where can this be applied?

Within or across the value chain

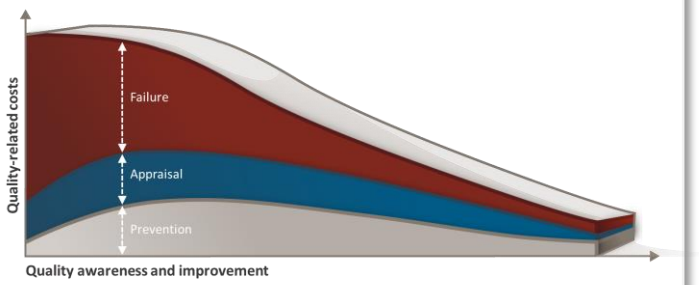
- Routing of pedestrians in google maps (avoiding dodgy/quiet areas at night)
- Identifying customers who are likely to progress to purchase
- Accurately modelling/predicting train timings in network
- Forecasting natural gas flows / prices
- Identification of outliers in financial information (corporate insurance market)
- Real-time anomaly detection in an operation with 1000s of measures
- Low-frequency failure prediction (financial services)

The True Costs of Quality

Measuring and Managing Quality-related Costs in the Digital Age

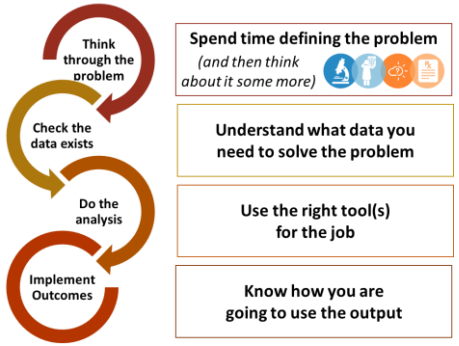


The P-A-F Model



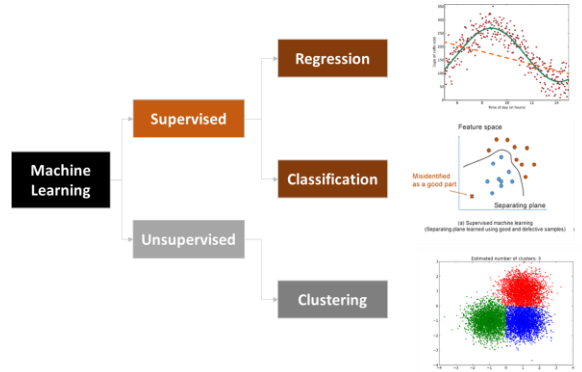
Quality awareness & improvement

Different types of analytics



An approach to analytics

Have your expectations been met?



Introduction to Machine Learning