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Digitalizing your intuition

Capgemini Experience

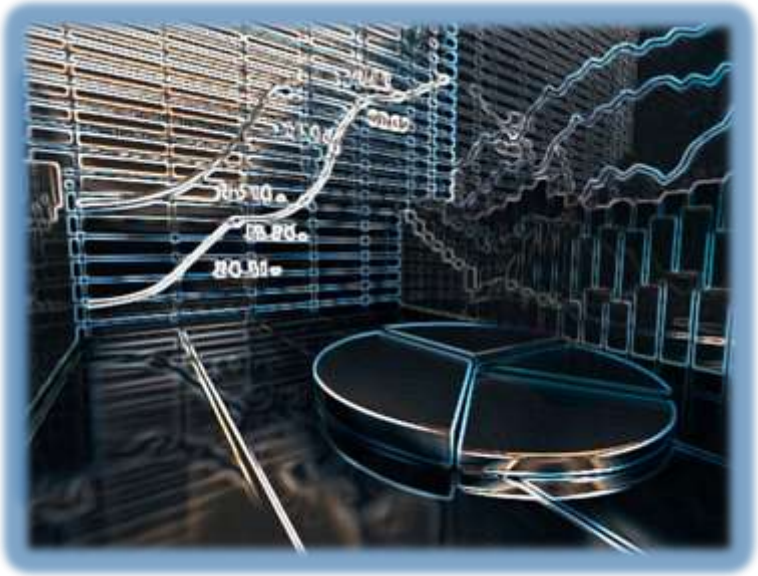
People matter, results count.

Big data meets Operational intelligence

Big Data technologies describe a new generation of technologies and architectures, designed to economically extract value from very large volumes of a wide variety of data, by enabling high velocity capture, discovery and/or analysis

Operational intelligence (OI) is a category of real-time dynamic, business analytics that delivers visibility and insight into data, streaming events and business operations.

Operational Intelligence continuously monitors and analyzes the *variety of high velocity*, *high volume Big Data sources*.



Operational data

Oil companies have collected huge amount of operational data. Seismic data, drilling data, data from process control systems, etc.

Most of operational data are structured, but collected into various systems, saved with different formats and have different time scale.

Non-structured data is also available in form of logs, journals, etc.

Collective intelligence in oil industry

Collective intelligence is shared or group intelligence that emerges from the collaboration, collective efforts, and competition of many individuals and appears in consensus decision making.
It can be understood as an emergent property from the synergies among: 1) data-information-knowledge; 2) software-hardware; and 3) experts (those with new insights as well as recognized authorities) that continually learns from feedback to produce just-in-time knowledge for better decisions than these three elements acting alone

From Wikipedia

A control system knows limits for pressure, temperature, and other sensor data from a well

Geologists know how to interpret changes in the sensor data and what kind of changes shows unwanted development in reservoir

Engineers also know how to interpret changes in the sensor data and changes of what kind indicate unwanted development in production

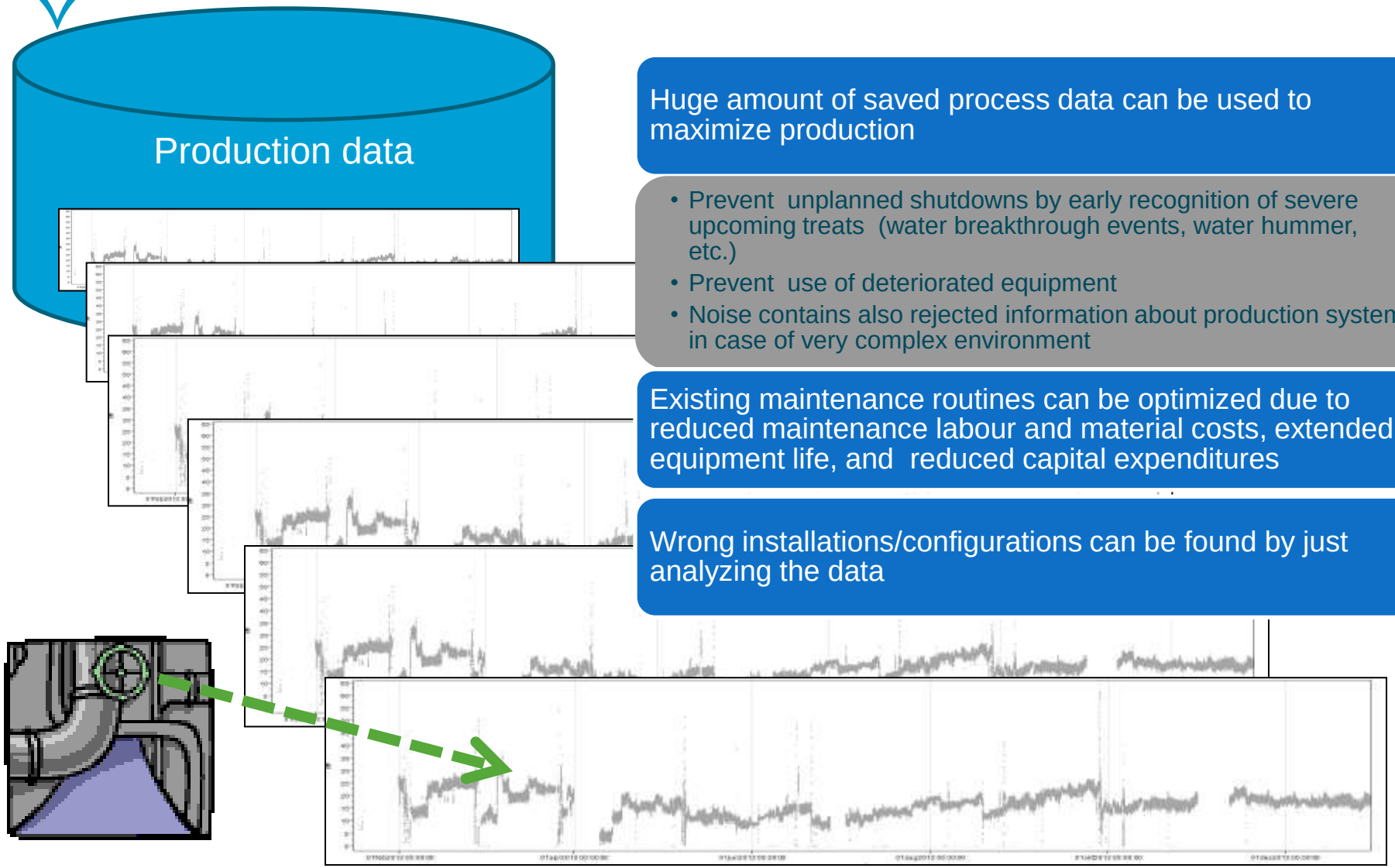
Offshore operators have their own picture of what should be changed to optimize production

Oil field chemists use results of chemical tests to interpret changes in reservoir

IT Professionals develop and improve tools and methods to prepare and process data for specific needs

D A T A

Power of Data



Huge amount of saved process data can be used to maximize production

- Prevent unplanned shutdowns by early recognition of severe upcoming treats (water breakthrough events, water hummer, etc.)
- Prevent use of deteriorated equipment
- Noise contains also rejected information about production system in case of very complex environment

Existing maintenance routines can be optimized due to reduced maintenance labour and material costs, extended equipment life, and reduced capital expenditures

Wrong installations/configurations can be found by just analyzing the data

Proof of concept: From intuition to value

Use of predictive analytics makes a paradigm shift in the modeling process, from a model based on physical properties of the object to a statistically based one.

Case 1. Pressure drop in Water Injection Line

- **Challenge:** severe pressure drop in a Water Injection Line
- **Solution:** Monitoring of pressure drop changes
- **Benefits:** Reduced costs from avoiding underwater check operations

Case 2. How to recognize malfunctioning transmitters

- **Challenge:** How automatically to recognize malfunctioning transmitters using only process data
- **Solution**: Monitoring system to detect malfunctioning equipment
- **Benefits:**
  - reducing maintenance time and material costs,
  - extended equipment life,
  - optimization of maintenance programs

Case 3. False Alarms Recognition for Gas Detectors

- **Challenge:** How to distinguish random malfunctions from symptoms of an upcoming breakdown?
- **Solution:** a *probability model was* built. By checking compliance to the model, a decision can then be made whether there is a need for additional maintenance checks.
- **Benefits:** reducing maintenance time and materials cost

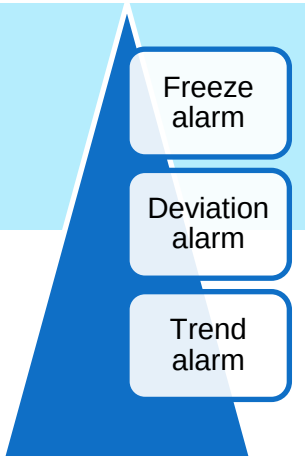
Case 4. Prevent upcoming critical events for wells

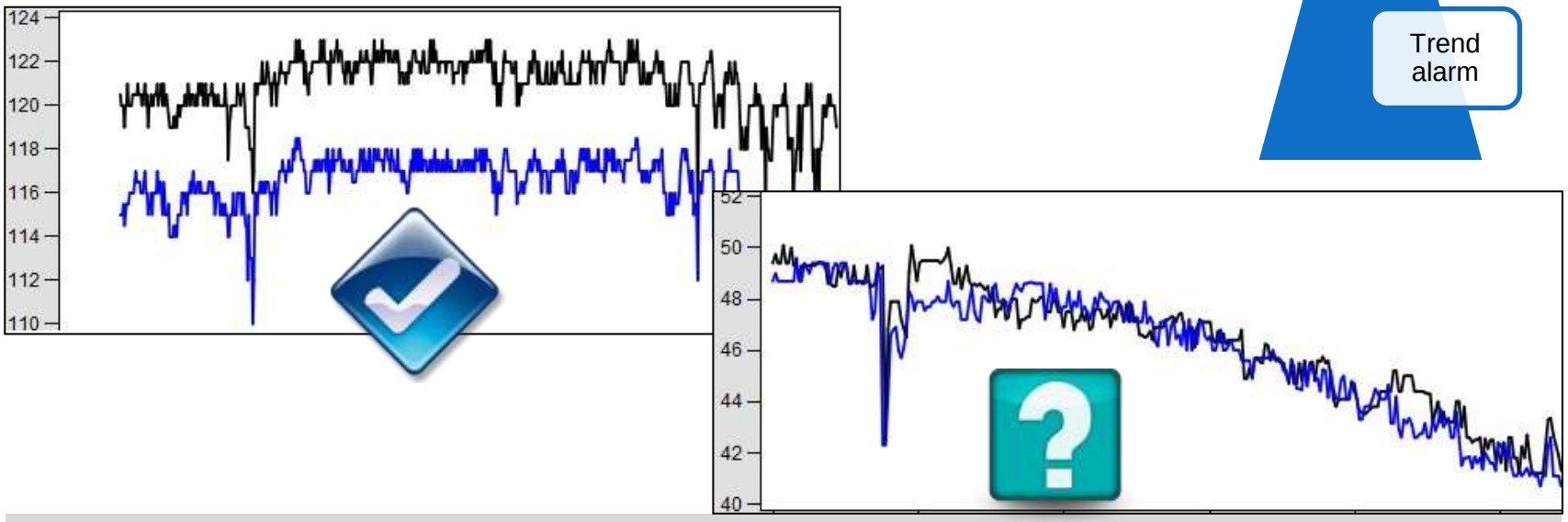
- **Challenge:** predict events like “slugging” or water breakthrough
- **Solution:** Alarms system based on spectral analysis’ warnings
- **Benefits**:
  - Increasing uptime,
  - Avoiding unplanned shutdowns
  - Reducing operations cost

Case 2. How to recognize malfunctioning transmitters

There are three main known issues with transmitters

- Transmitter is “frozen”;
- Transmitter needs recalibration
- Transmitter is unstable and shows wrong values





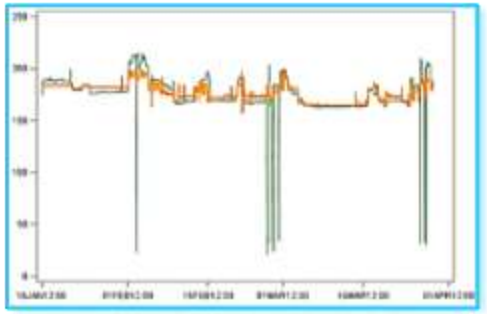
An alarm function for duplicated and almost duplicated transmitters is based on the difference between the corresponding measurements. And for independents transmitters the difference between real and predicted values is used.

Equipment’s upcoming fault detection

by using dependencies between different measurable signals

- Neural networks
- Trend checking

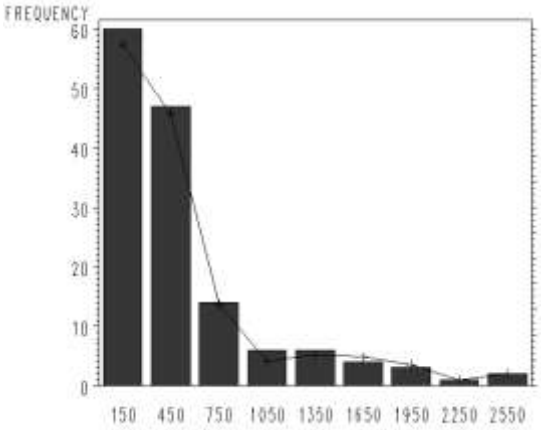
Case2 (Transmitters): A model for each single transmitter is built on a group of closely located transmitters of different types



Neural nets are trained to recognize normal (frequently happened in the past) relations between all elements in the group. Based on it, predicted values for each transmitter are calculated continuously

by analyzing distribution of the variables

Case3 (Gas detectors): model of failure for gas detectors based on distribution of number of fault signals per day



Identify-Analyze-Build a Model

Identify a problem

Formulate a hypothesis as an alarm criteria

Gather data

Confirm the hypothesis

Build a model to check the alarm criteria on real-time data

Pattern in data is changed-> Alarm-> Crash prevented

Why are we doing this

- Reduce downtime and costs
- Reduce unscheduled maintenance
- Minimize runtime from equipment failure to detection
- Optimize the interval controlled program
- Detect patterns
- Diagnose the symptoms and causes
- Predict symptoms before the event occurs
- Optimize the event handling according to the risk strategy

Why are we doing this

Telco operator case: Signaling storms

The Nordic Telecom operator experienced so called Signaling Storms at a number of occasions

The signaling storms manifest itself as the terminals start to send an avalanche of messages trying to re-establish a normal connection.

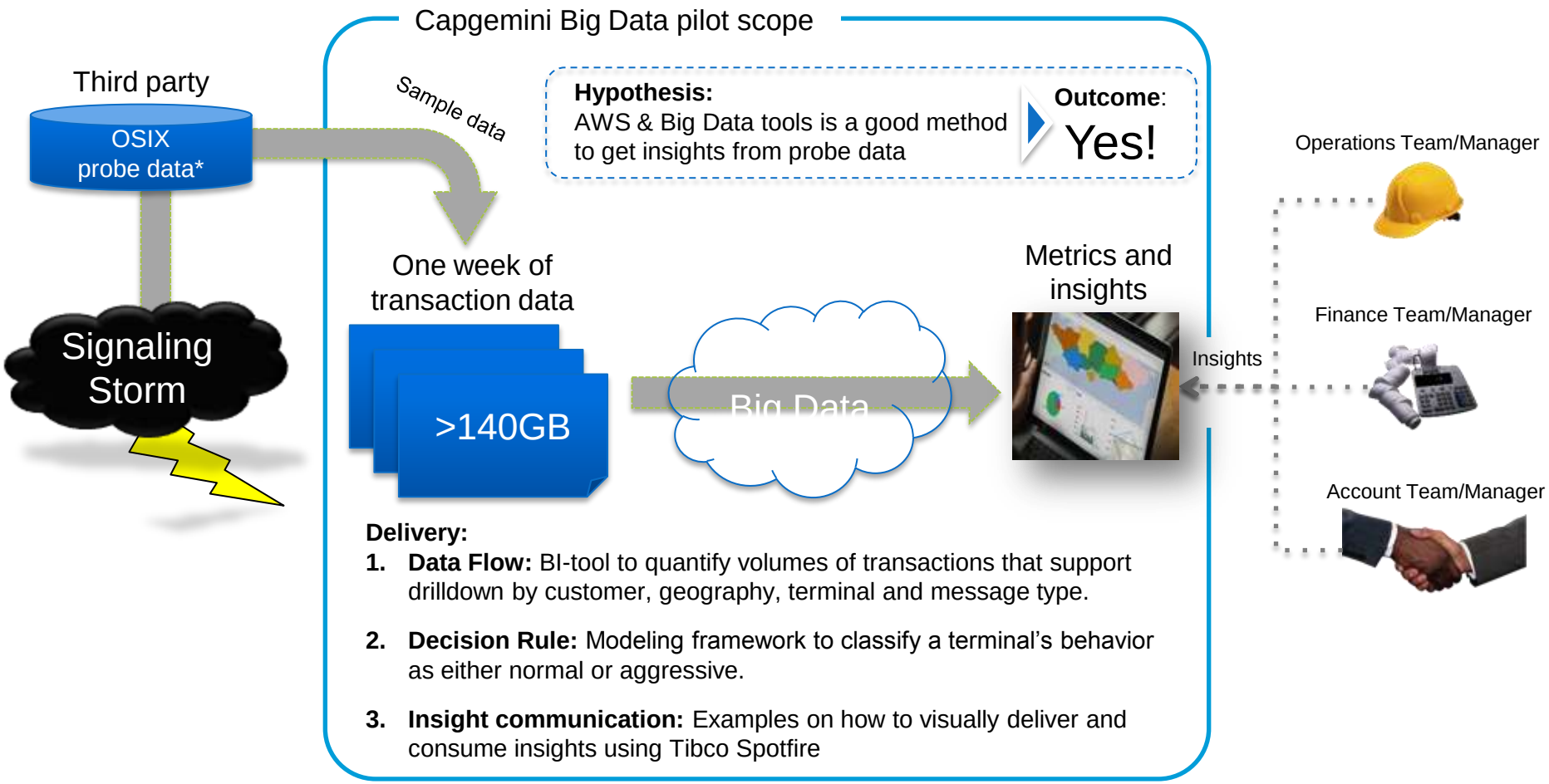
There are no real actionable insights on what is causing the storm.

Nevertheless…

…the storms cause the Nordic telecom operator's mobile network to go down

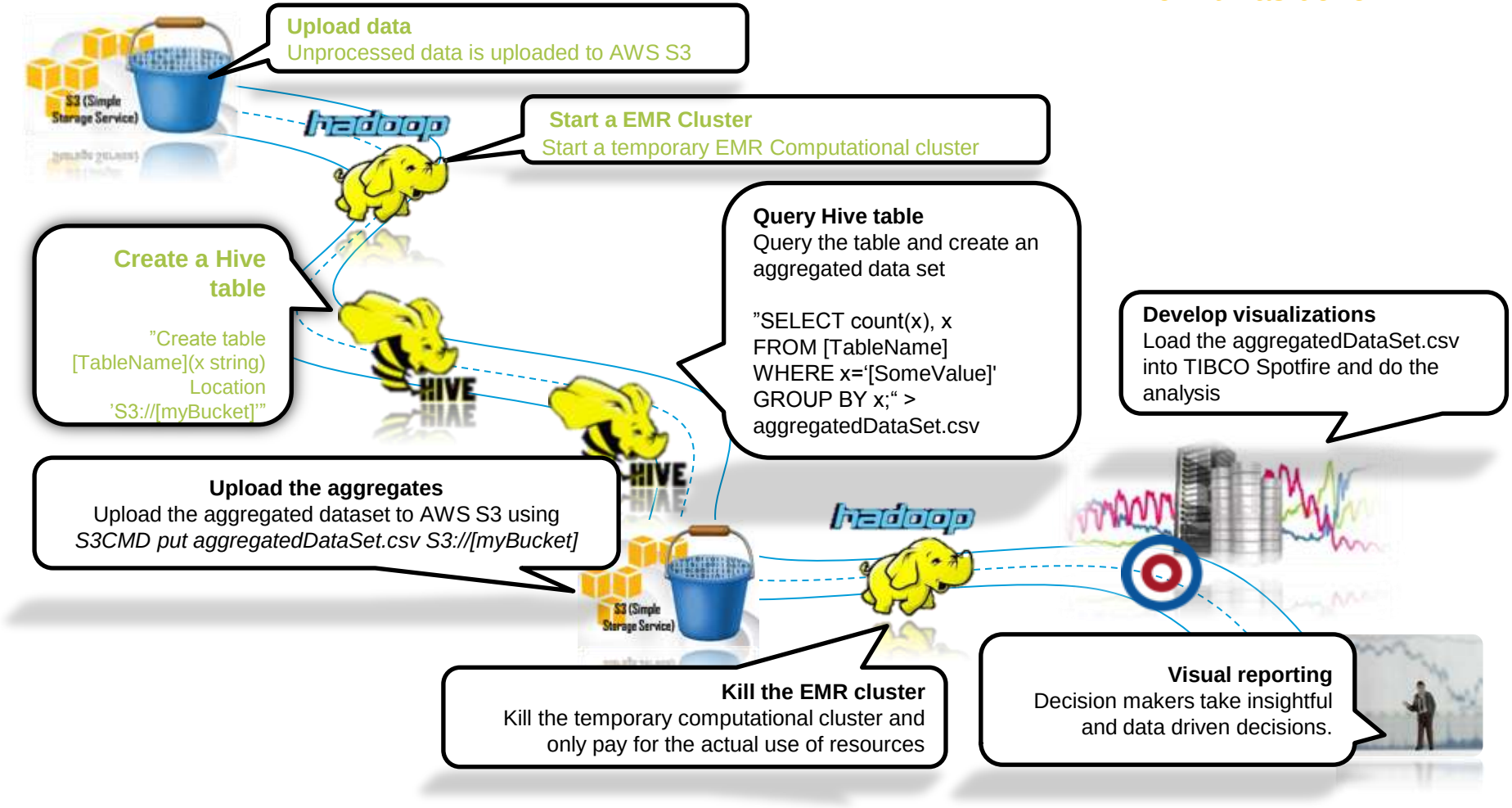
- Resulting in a number of negative impacts across Telco operator and it's customers, and the Telco's customers' customer.

The Capgemini Big Data pilot scope



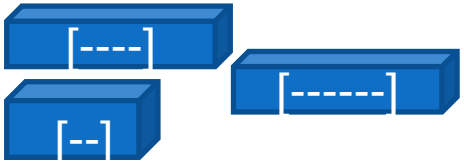
Big Data in the M2M space

How it was done?



Thinking data

- Identify key business objectives that your organization would like to solve
- Clarify your objectives
  - better understanding of
  - better tracking of
  - getting better picture of



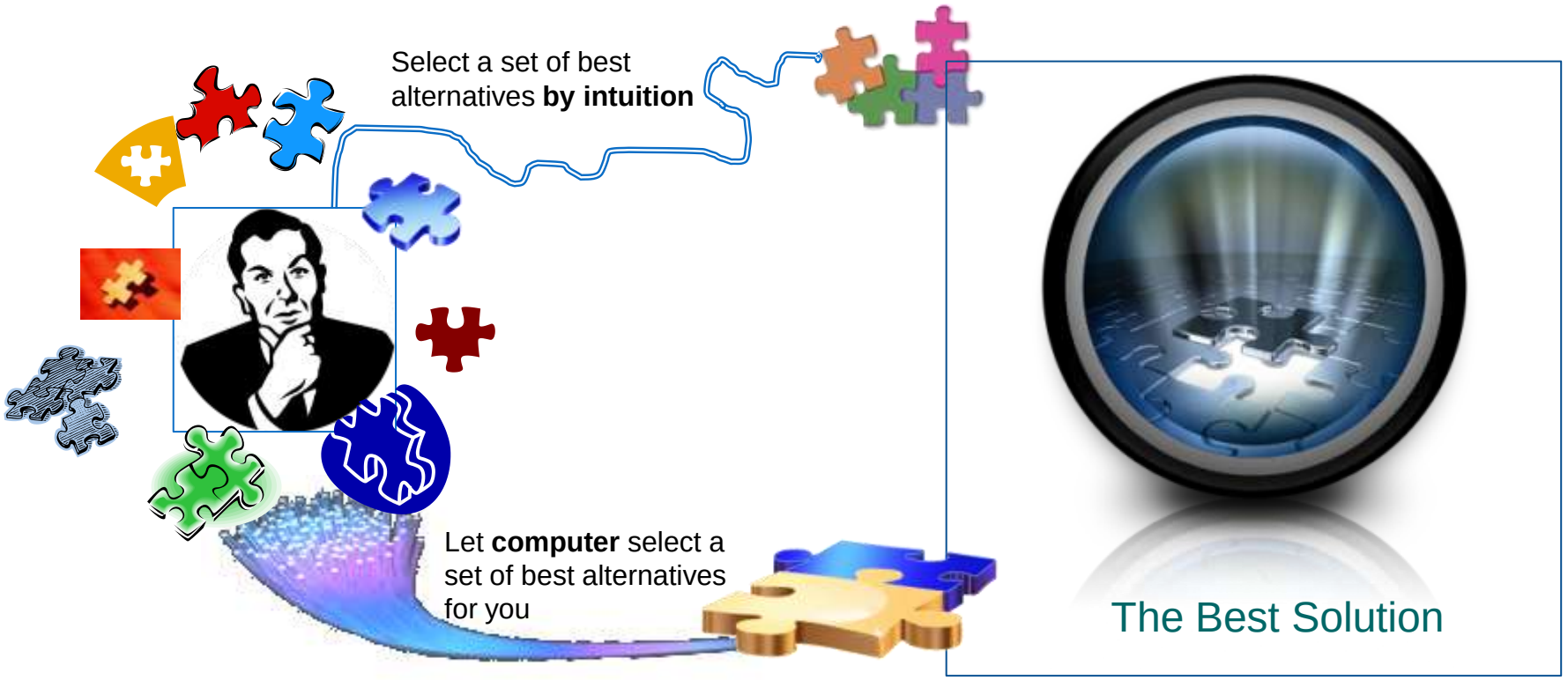
- Identify relevant data sources
- What kind of data you have?
  - Big data
  - Little data
  - Long data
- Apply advanced analytic processes to relevant data

Experts recommend: Stop getting stuck only on **big data**

- Predictive models and algorithms produce better decision guidance than human intuition alone
- Big data drives better decision making, according to The Economist Intelligence Unit

and start thinking about **l o n g d a t a:** datasets that have massive historical sweep

Not "man versus machine", but "man plus machine"



Psychologist and Nobel Prize winner Daniel Kahneman doesn't think you should take intuition at face value: "Overconfidence is a powerful source of illusions, primarily determined by the quality and coherence of the story that you can construct, not by its validity"

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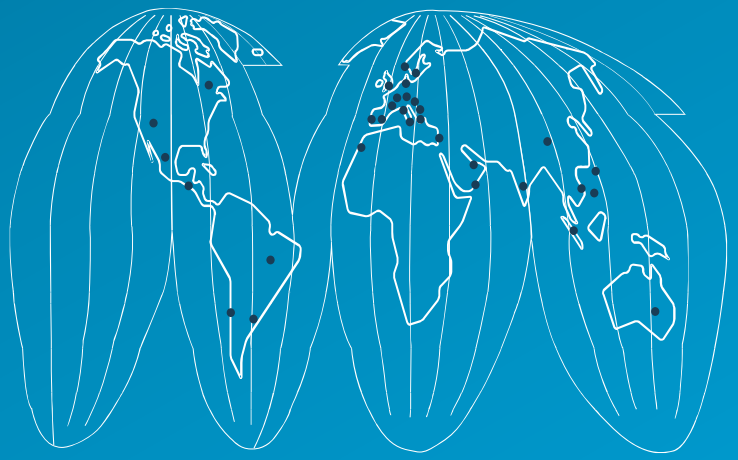
Together with its clients, Capgemini creates and delivers business and technology solutions that fit their needs and drive the results they want. A deeply multicultural organization, Capgemini has developed its own way of working, the Collaborative Business Experience™, and draws on Rightshore®, its worldwide delivery model.



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