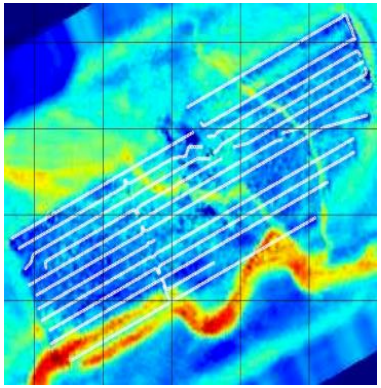
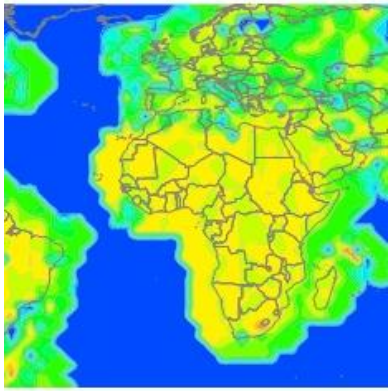
Analytics Best Practices:
What we can learn from other industries



Jess B. Kozman
Principle Consultant, Data Management Practitioner
CLTech Consulting Pte Ltd
Asia Pacific - Singapore

CLTech Consulting Pte Ltd
Asia-Pacific Resource Data Management
"Making the Unattainable ... Commonplace"

Why we need data management:

What Humans Do:
Process & Recognize
Data Patterns:

~ 36.6 Petaflops

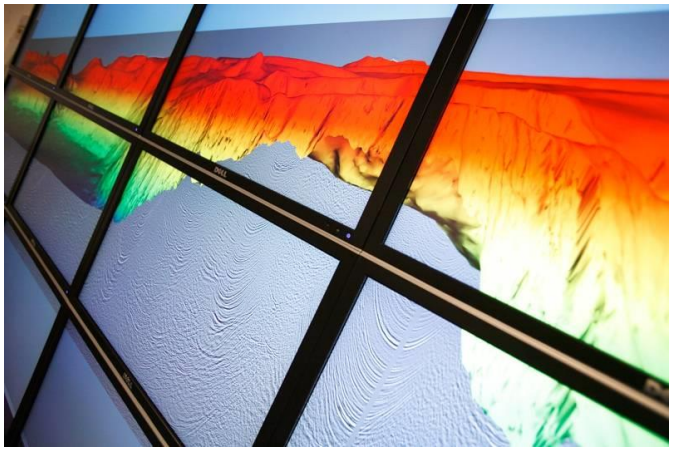
~ 3 Tb Storage

What Computers Do:
Store & Deliver Data
Total Pangea

6.7 Petaflops

26 Petabytes

Largest non-academic supercomputer
4D imaging of fluid flow
Re-tasked from seismic processing



Industries to learn from

The Usual Suspects:

Weather & Climate Prediction

Nuclear Weapons Simulation

Health Care

Aeronautics & Transport

Surprises:

Molecular Dynamics

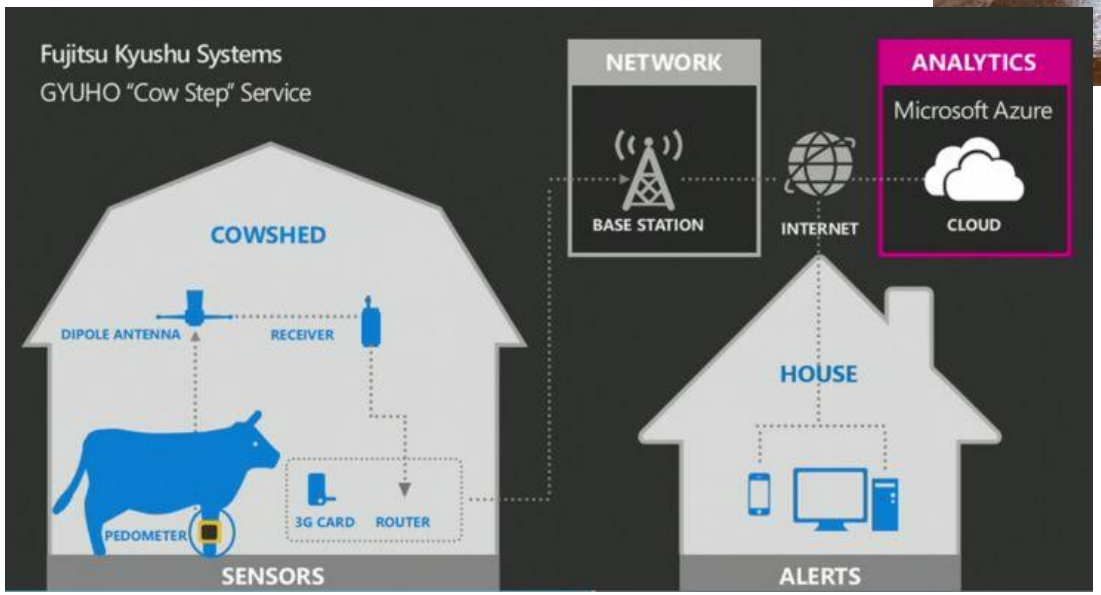
Gaming & Sports

Genetics

The Connected Cow

Cow estrus: 16 hours every 21 days, more often beginning at night or early morning, indicated by night-time pacing.

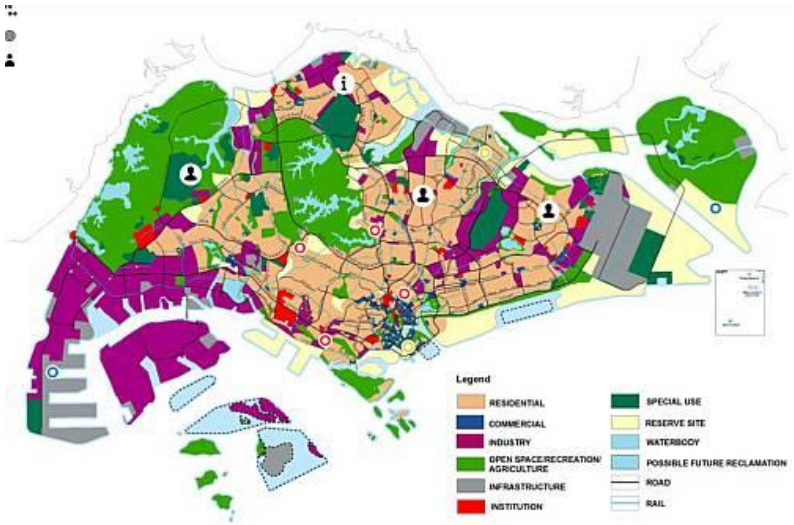
Cow pedometers connected to analytics engine

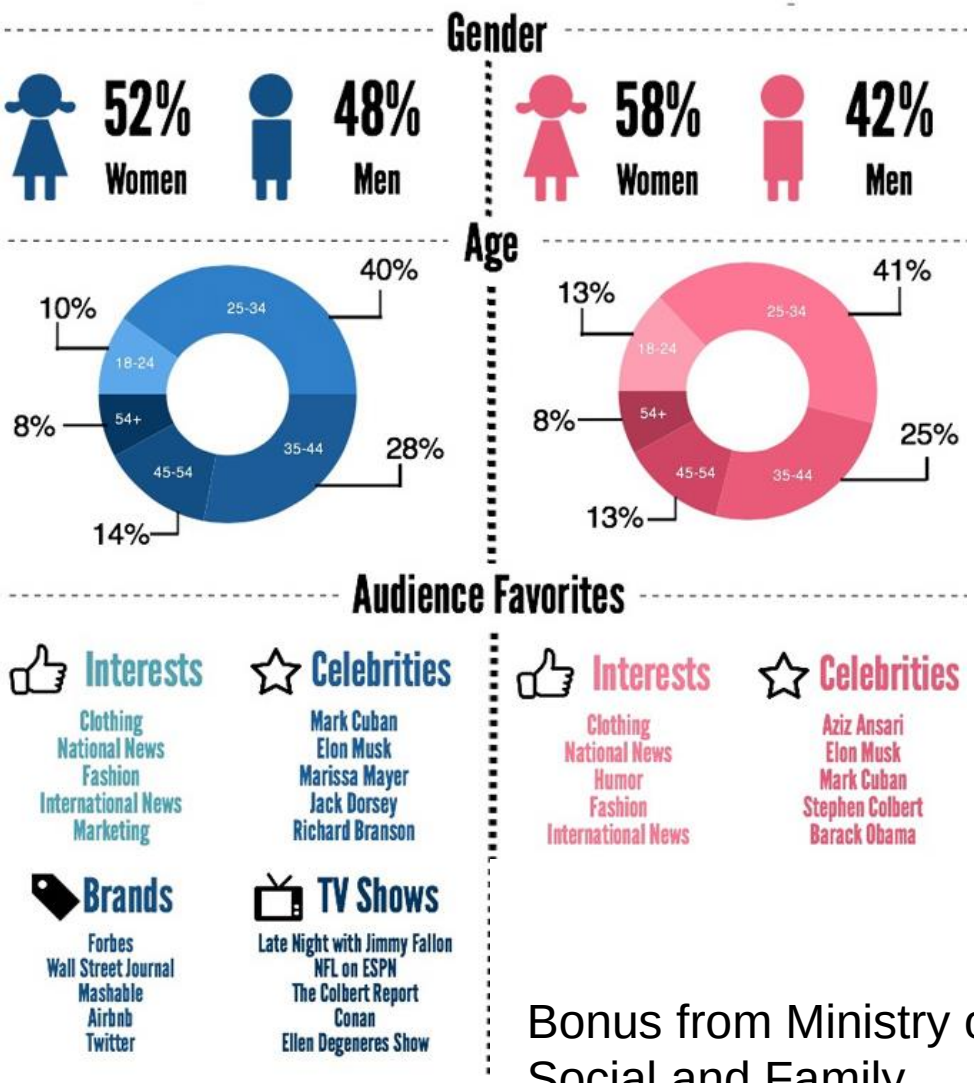


Accurate detection from less than 40% to over 95%, successful pregnancies from <30% to over 65%, and a 4 hour window that could influence the gender of calves.

The Connected City

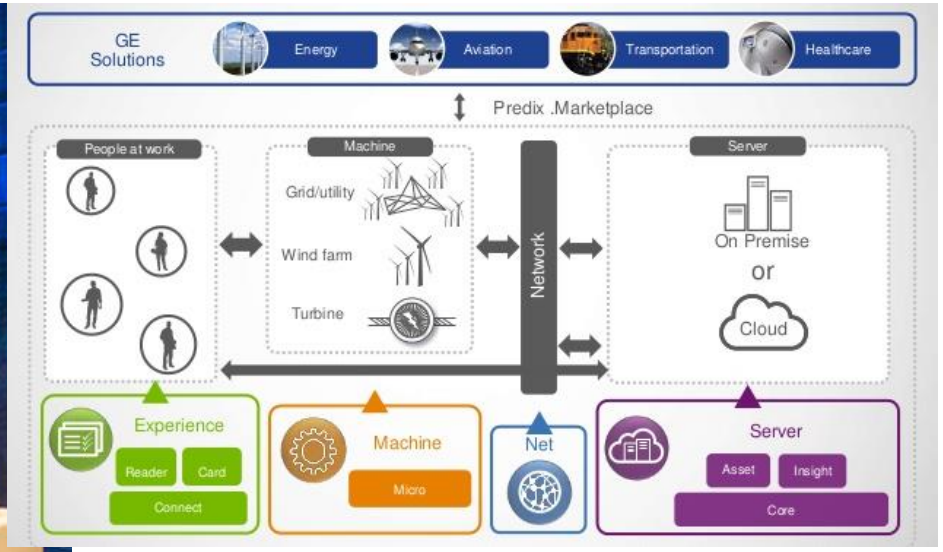
Uber Pool Analytics in Singapore, most shared rides from “heartland” destinations to Central Business District. Heartland Housing and Development Board estates have lowest fertility rates in the country.





Bonus from Ministry of Social and Family Development for couples that produce a Singaporean citizen

GE Sells Thrust, not Engines



5000 sensors recording and transmitting every second.

Air Asia: USD $30-50M in reduced costs and increased uptime

Learn from the Experts:

Southern Rail in UK

Over 50 scheduled cancellations a month due to downtime
Leveraged installation of “black boxes” required for HSE compliance
Identified critical point of failure (doors), reduced maintenance effort by 70%
Reduced cancellations by 60%
Savings in operating fines of GBP £100 M
Data now being mined for passenger comfort & fuel efficiency

Learn from the Experts:

Towed Diagnostics Vehicle – “Modern data centre in a rail car”

Safety & availability of infrastructure
Measures vehicle dynamics and overhead line maintenance
Analysis & persistent storage & display of all measurement data
Modular, flexible, extensible & highly scalable measurement
Open interfaces for development of mission critical applications
System integration of third party systems is key success factor
Maintenance & Life Cycle Management standards

Cost Savings

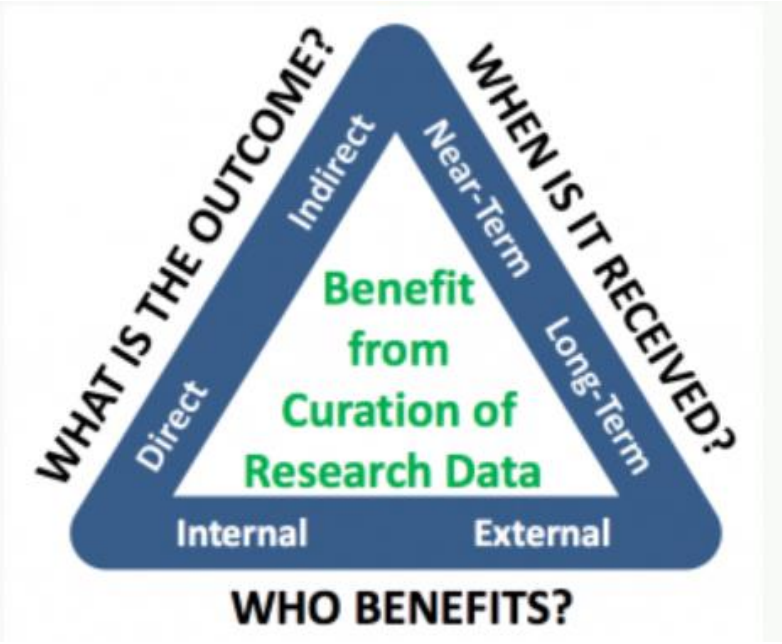
United Parcel Service
On-Road Integrated Optimization and Navigation (ORION)
Geospatial data for route optimization of 55,000 vehicles
Eliminate 206 million minutes of idling time on turns
Savings of USD$30M / year in fuel

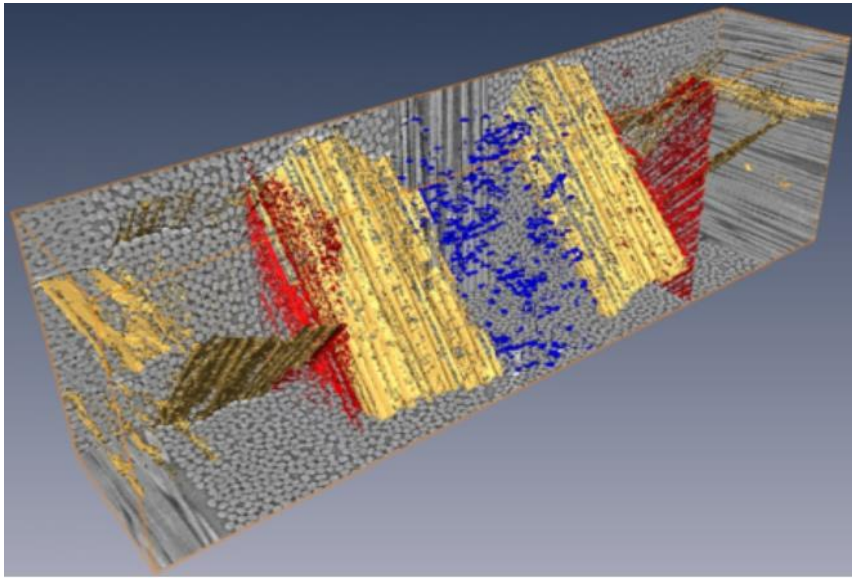
Challenge:
Behavioural Change Management
"Beat The Computer"

Source: http://www.bloomberg.com/news/articles/2013-10-30/ups-uses-big-data-to-make-routes-more-efficient-save-gas

Cost Benefit Analysis

µ-VIS Imaging Centre at the University of Southampton
Robotic generation of 3D fatique damage data
Hard disk to cloud silo storage with “11 nines” reliability
Cost of USD$1100/Tb vs. 20% chance of loss in 5 years
NPV of USD $550,000 / year



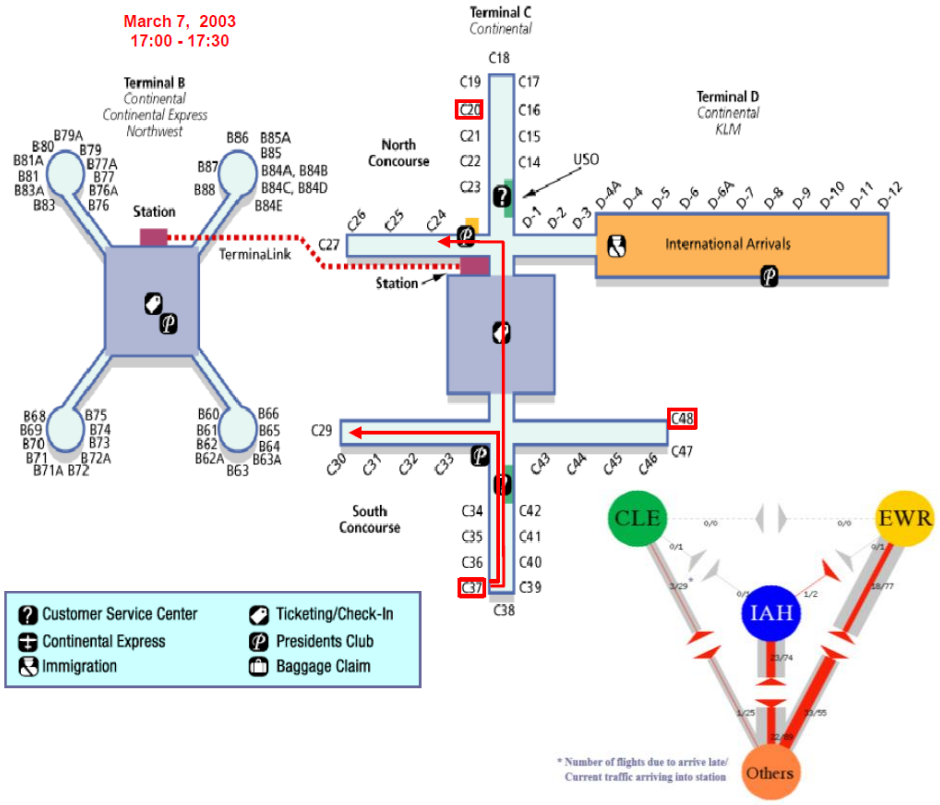


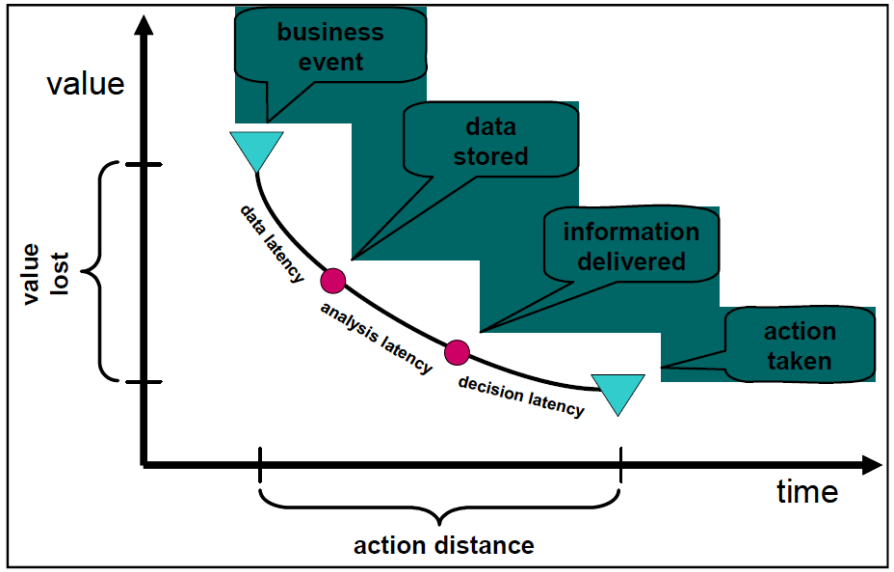
Challenge: Persistence
Benefits accrue over a longer time period than the enabling budget

Source: http://datapool.soton.ac.uk/2013/03/21/cost-benefit-analysis-experience-of-southampton-research-data-producers/

Decision Latency

Continental Airlines
Real-time transactional data warehouse
High Value customer activity at Caribbean hubs
USD $500 M in revenue enhancement



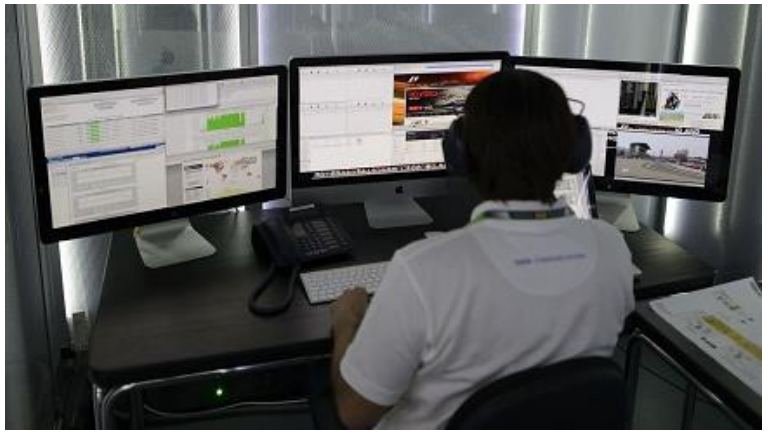


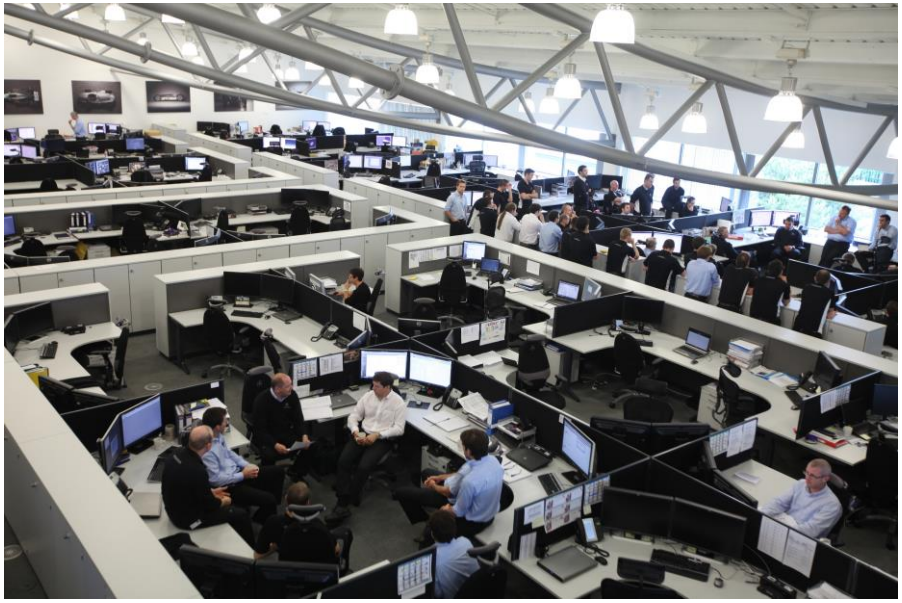
Challenge: Scaling
Roll out schedule eclipsed by changes in available technology

Source: http://faculty.wiu.edu/C-Amaravadi/is524/rdgs/continental.pdf

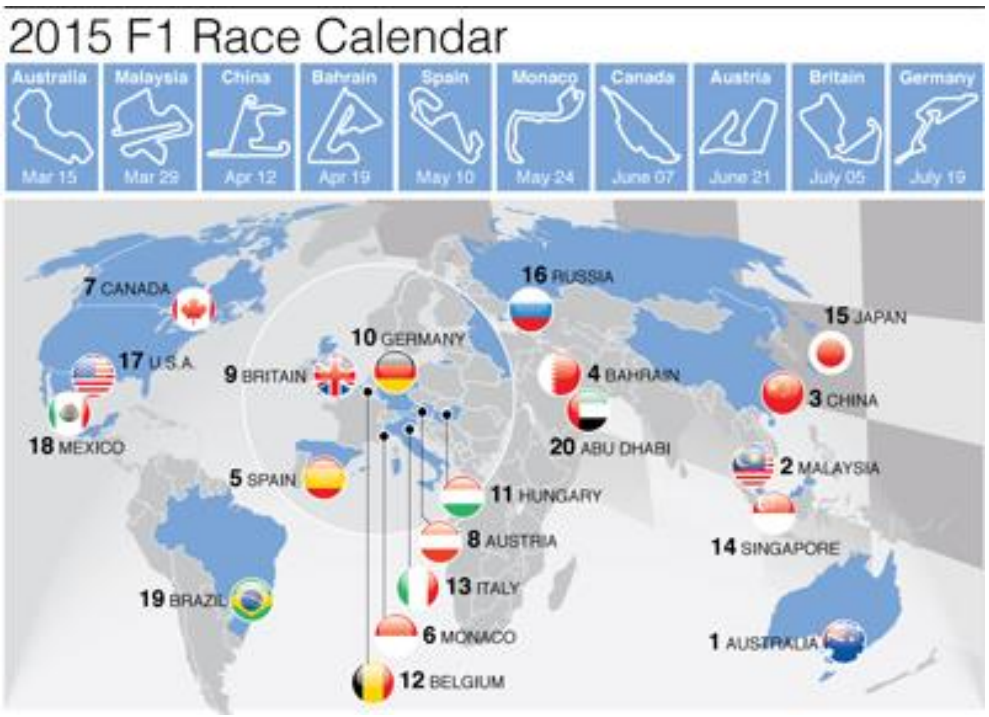
Learning from the Experts - PETRONAS

Remote support for 20 remote locations
HTHP applications
Microsecond temp & vibration data
24 staff in operations center
500,000km of subsea cabling
200,000km terrestrial network fibre
50-70 Gb per day





Learning from the Experts - PETRONAS



Who will be doing the work?

Analytics scientist

Senior Geophysicist

Job description:

- Evaluate the hydrocarbon potential of unexplored basins by analyzing and interpreting 2-D and 3-D seismic data, including fault and horizon interpretation, seismic reprocessing, depth conversion, velocity modeling and seismic attribute analysis.
- Develop a prospect inventory and identify and characterize new ventures for exploration access.
- Participate in technical meetings with partners and government agencies concerning geophysical issues.
- Mentor less-experienced geophysicists to develop capability for the company.

Requirements:

- Master's degree in geophysics; PhD preferred.
- 10-25 years' geophysical experience.
- Ability to work with a variety of geophysical datasets.
- Willingness/ability to travel up to 100% of the time.

Analytics expert

Reservoir Engineer

Job description:

- Conduct reservoir modeling and simulation using VIP and other tools to develop strategies for new well delivery, production growth, surveillance of relevant field sectors and wells, and depletion planning.
- Analyze surveillance and other data, and incorporate it into dynamic models to support optimization of new well locations.
- Lead sector reviews – integrating all relevant data to support recommendations regarding well off take and injection rates.

Requirements:

- Bachelor's degree in petroleum engineering; Master's preferred.
- 10 years of experience in field development planning and depletion planning.
- 7 years of experience in reservoir simulation in oil fields.
- Ability to analyze static and dynamic reservoir data and make operational decisions based on overall reservoir performance, and familiarity with uncertainty analysis.
- Gas and /or oil (water flood) field management experience.
- Strong communication and teamwork skills.

Analytics specialist

Technical Assistant

Job description:

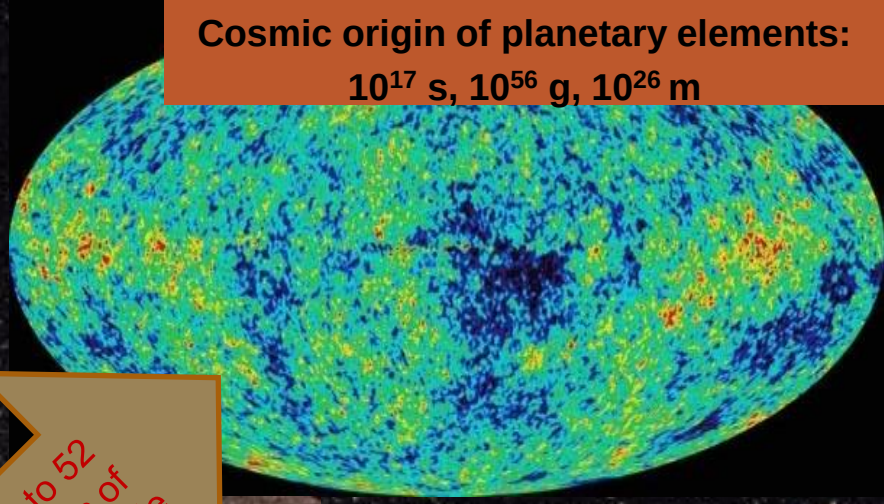
- Work in multi-disciplinary team supporting engineers, business planners and other analytics functions to solve problems, analyze data issues, and generate reports on production, financials and performance.
- Explore opportunities to streamline data management processes and improve workflows.

Requirements:

- At least an associate's degree in math, computer science, statistics or IT related field or a minimum of 3 years' experience in petroleum-related technology or computer science.
- Strong communications skills and experience working in a team environment.
- Experience with databases and other more advanced applications preferred, i.e. DSS, PEEP/DTree, MS Project, SAP, PowerTools, HIS Database, Spotfire.

http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Looming-Global-Analytics-Talent-Mismatch-Oil-Gas.pdf

To study hydrocarbon generation, you must comprehend over 100 orders of magnitude of time, mass and length. Few disciplines demand this kind of ability to think beyond our own perception and experience.



Cosmic origin of planetary elements:
10^{17} s, 10^{56} g, 10^{26} m

Up to 52 orders of magnitude

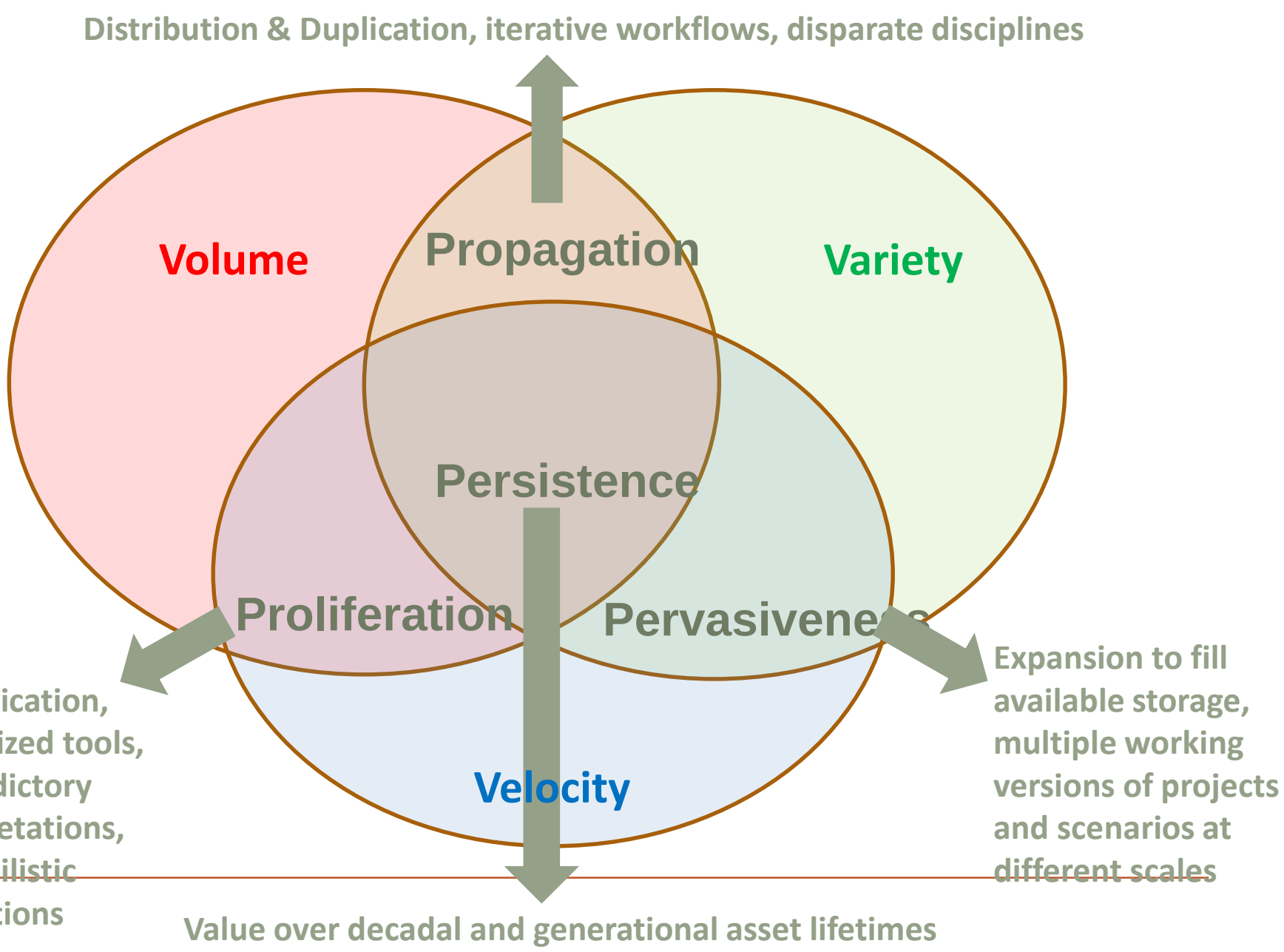
Human being:
10^{9} s, 10^{4} g, 10^{0} m

Up to 53 orders of magnitude

Radioactive heating of Earth's core:
10^{-44} s, 10^{-5} g, 10^{-35} m

A single oilfield in Qatar generates three times the volume of data that was analyzed to find the Higgs Boson, the "God Particle"

Unique Attributes of Petroleum Data



Unique Challenges of Petroleum Data

Spatially and temporally restricted data sets

Sampling below the threshold required for the business case

Mode Bias: Recent and traditional operations