Navigating The Tectonic Shift of Digital Transformation

引导数字化转型中的构造转变

Jane Ren, CEO, Atomiton

October, 2017

Atomiton – Industrial Internet of Things Platform
工业物联网平台公司

- *Globally deployed in Oil and Gas, Precision Agriculture, Smart Cities*
- *Connect, digitize, orchestrate and optimize industrial assets and processes*

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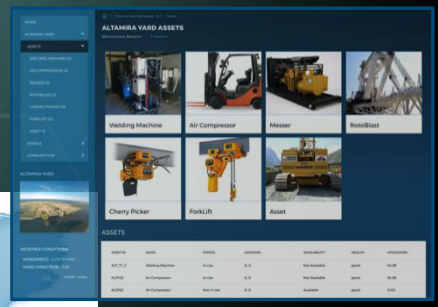
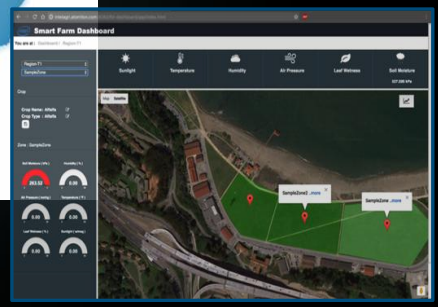
Energy/Oil and Gas



Smart Cities

Precision Agriculture



Navigating The Tectonic Shift of Digital Transformation

1. The tectonic shifts of digitization – 数字化带来的构造转变
2. The 3 architectures of transformation – 三种构架的转型
3. Understand the opportunity landscape – 了解机会所在


“统治芯片的人统治整个世界，统治数据的人统治整个世界”
"Those who rule chips will rule the entire world. Those who rule data will rule the entire world."


"Every company bas to be a software company"
"Our future is digital."
Jeff Immelt
Former Chairman, CEO,
John Flannery
Chairman, CEO, GE


UBER
Alphabet
Google
"Adapt or perish, now as ever, is nature's inexorable imperative." -- H. G. Wells

Technological Shifts

1. Merging between the physical and the digital -融合物质和数字
2. Redrawing the human machine boundary – 重画人机边界
3. Shifting foundations in the technology stack –技术堆栈的基础变革

软件定义的机器

SOFTWARE DEFINED MACHINES

Externalization of the control and processing of machine functions, which are dynamically defined by intelligent software, responding to changing environments

机器功能的控制和处理的外部化，由智能软件动态定义，响应不断变化的环境

VIRTUAL REALITY

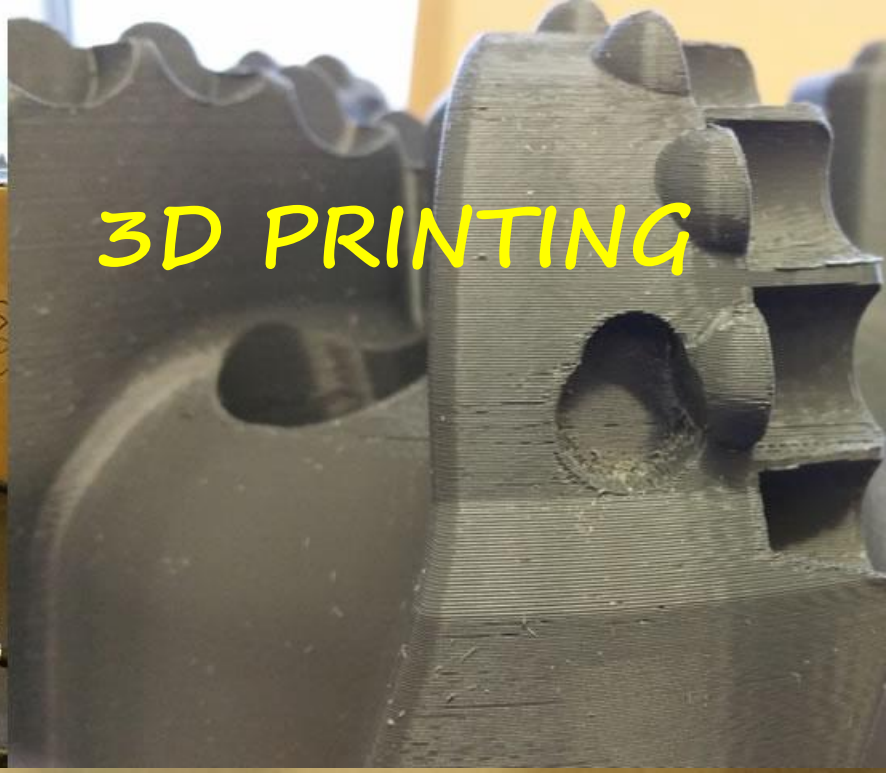
虚拟现实

Geoscientists at Shell's Virtual Reality Centre in the Netherlands interpret a subsurface model of a prospective exploration site.

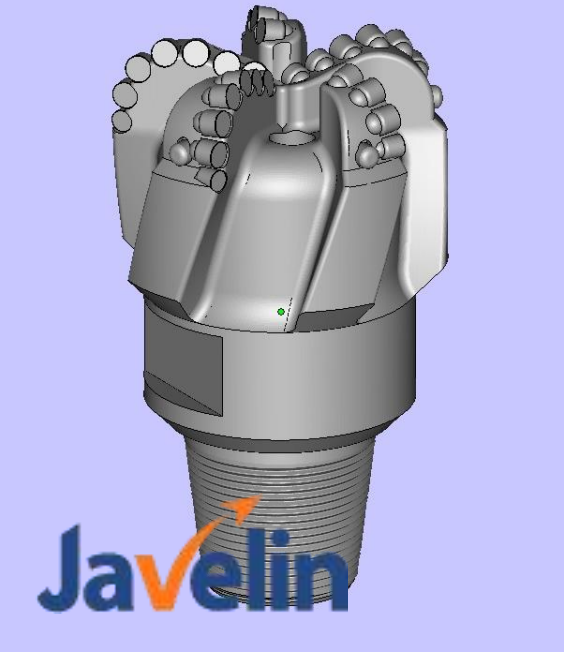
荷兰壳牌石油公司的虚拟现实中心。地质学家研究一个潜在勘探点的地下模型。


Motor A1
Power
ON
Speed
239 RPM
Current
19.60 Amps
ETM
8423 Hours
Online
YES
300.0
200.0
100.0
0.0
60
70
80
90
100
110
1 Minute
Motor A2
Motor Schematics
Wiring Diagrams
email Maintenance
Rob. G. Handy
Vendor Website
iQuest, inc.
Enter PM Action
iQuest Preventative Maintenance
Report a Problem
With this equipment
Monitoring Assets
监控仪器
VIRTUAL REALITY


VIRTUAL REALITY
Simulation for training and safety
培训和安全模拟



3D PRINTING

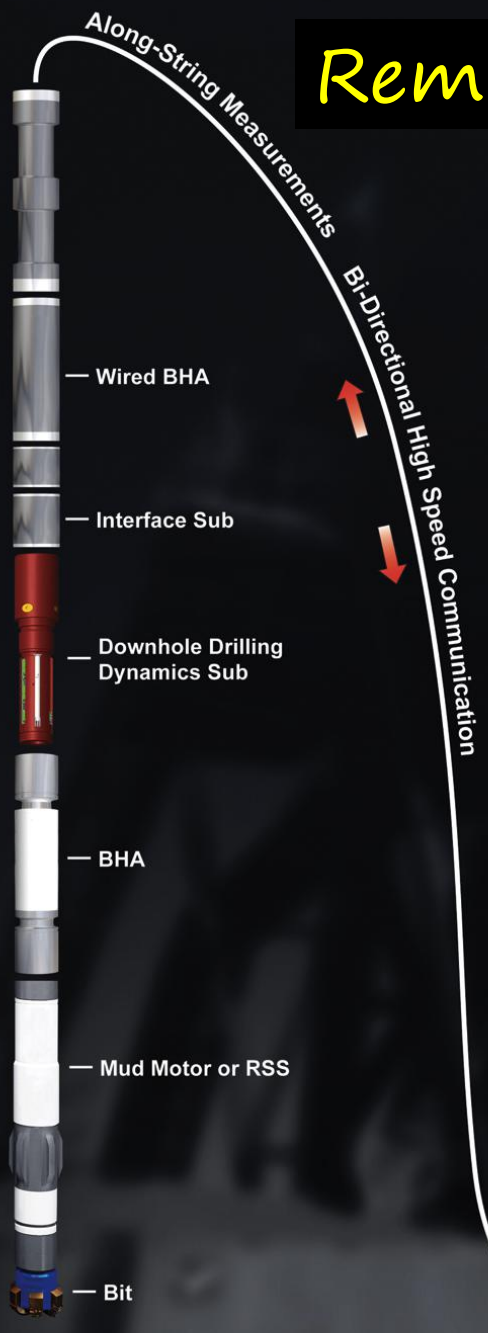


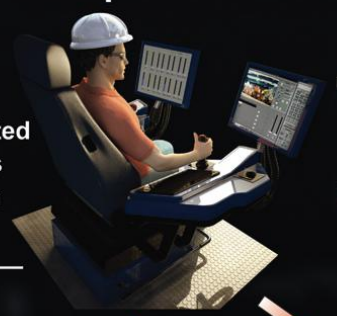
Javelin

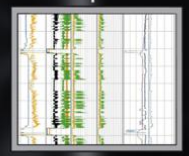
Javeline is a Canadian Supplier of Stratasys and Objet 3D

Remote Automated Directional Drill

远程自动定向钻探







Bi-Directional Comms

Tool Communications

Downhole Data
DWOB, DTOR, Pressure, VIB
RPM, Stick Slip

APPS
1. Surface Drilling Optimizer
2. Realtime ADS
3. Well Placement
4. DD
5. Solids Control
6. Downhole Drilling Optimizer

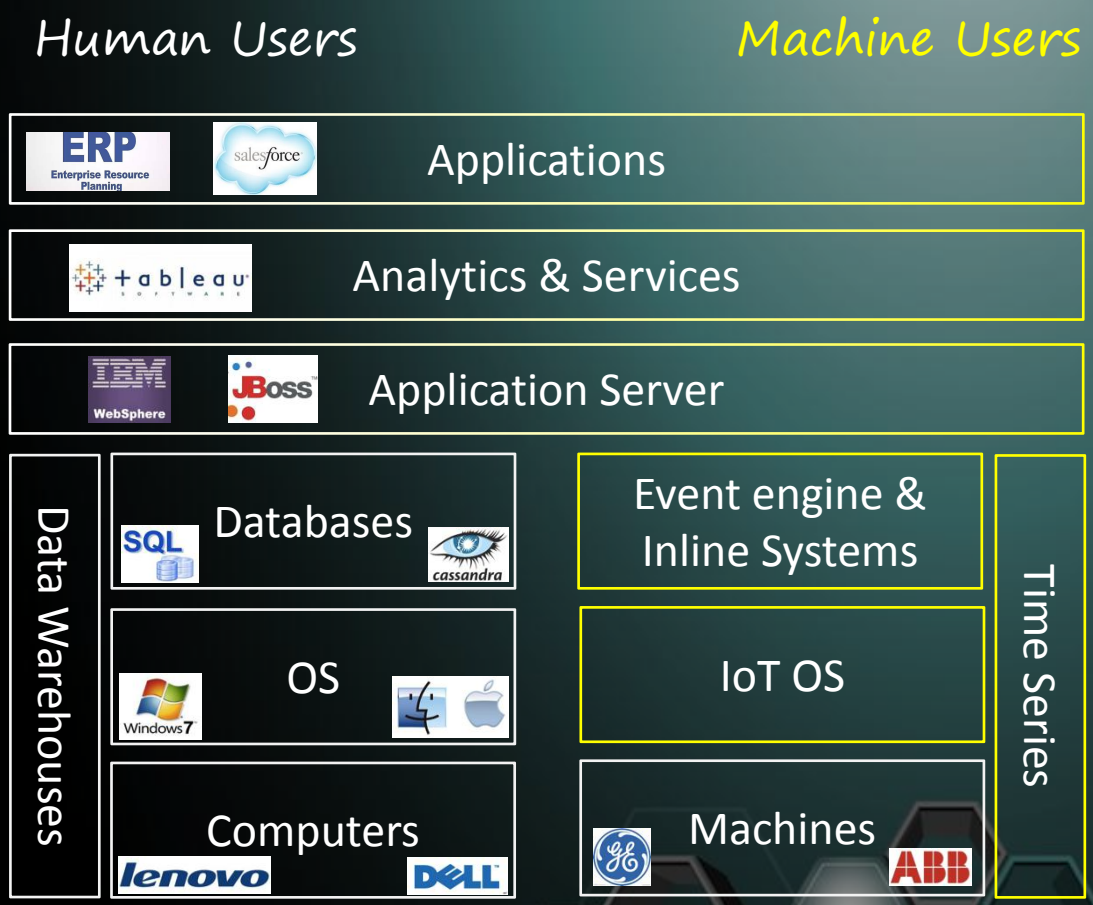
Ocean Exploration with Artificial Intelligence

用人工智能进行海洋探索

麻省理工学院的计算机科学和人工智能实验室(CSAIL)正在与埃克森美孚公司合作，为海洋勘探创建自学习潜水机器人。机器人软件和它们的“智慧”将使它们能够在恶劣的条件下自主地运行，并以自己的意愿改变任务参数来探索奇怪的异常现象。

*Shell's innovation in collaboration with Subsea 7 has created an Autonomous Inspection Vehicle that claims to provide safer and better inspections – at a significant cost savings。*壳牌石油公司与海底7合作的创新了一种自动检测车，声称提供更安全和更好的检查 – 明显降低了成本。

Foundational Changes in the Software Stack



- *Databases will no longer be the single source of truth;* 数据库将不再是真相的唯一来源。
- *Traditional servers will cease to be the only computing backbone;* 传统的服务器将不再是唯一的计算骨干网
- *People are no longer the sole user of applications;* 人们不再是应用程序的唯一用户

Business Model Disruptions

1. The transition between product and service business models - 产品与服务商业模式之间的转型
2. Industrial, hardware companies becoming digital, software companies - 工业，硬件企业成为数字，软件公司
3. Vertical competition versus horizontal competition – 垂直竞争而不是横向竞争

“Power By The Hour”

The airline does not pay for the engines, but for the time they are flying. Now the engine manufacturer has a strong incentive to improve the reliability of its engines, but also a strong lever to push out third-party maintenance providers.

航空公司不买发动**机，只**买飞**行**时间。这样发动**机的制造商有很大的动力来提高**发动**机的可靠性，也是推**动**第三方**维修**提供商的**强**大杠杆。**

Today, “engine manufacturers General Electric, Pratt & Whitney, and Rolls-Royce all have performance-based contracts with commercial airlines in which their compensation is tied to product availability (hours flown),”

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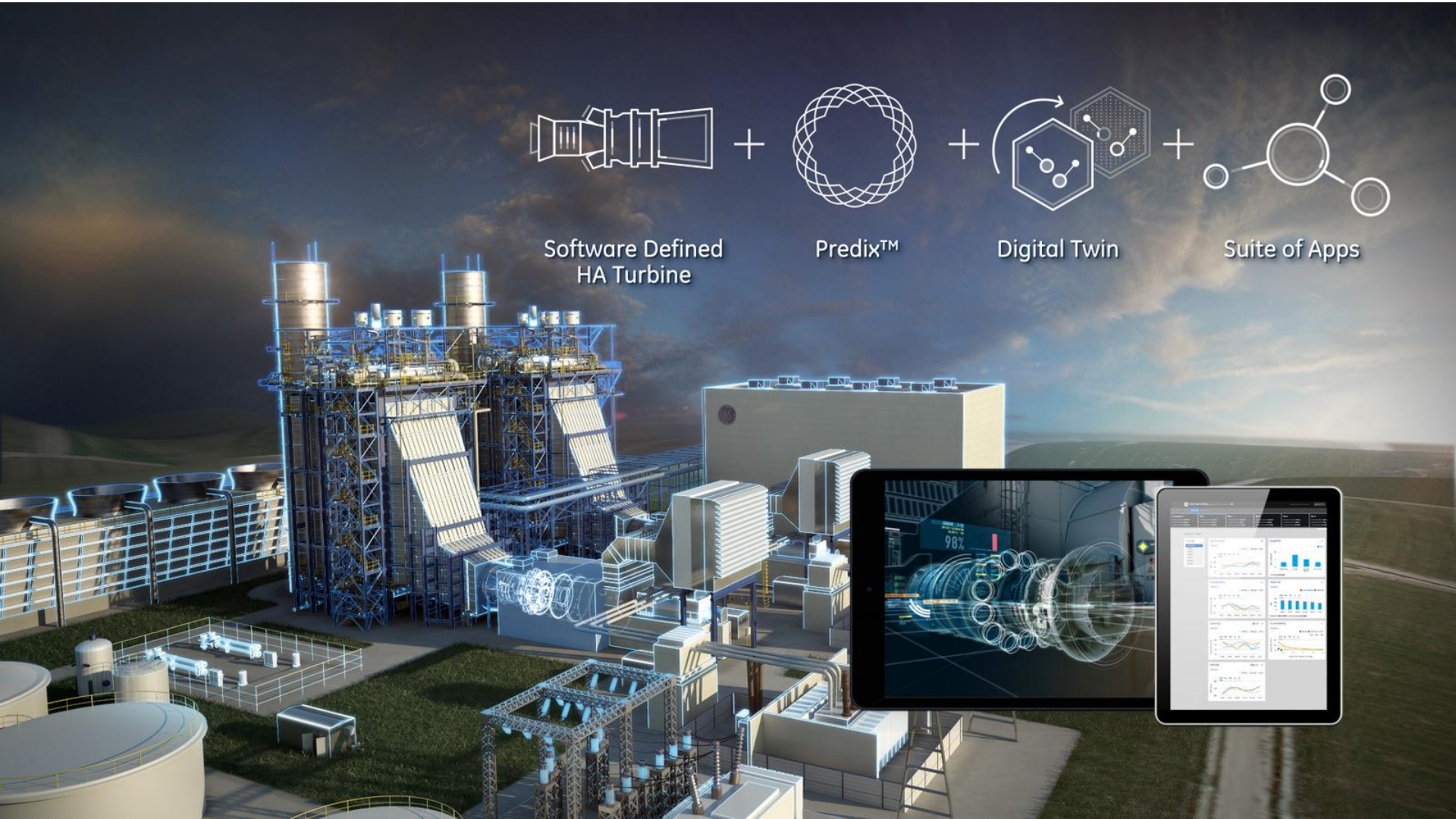
Become a digital industrial company

GE DIGITAL PORTFOLIO OVERVIEW



Schlumberger

Investor Conference 2014

TECHNOLOGY RELIABILITY EFFICIENCY INTEGRATION

Leading into the Digital Future

Ashok Belani—Executive Vice President, Technology

Schlumberger

ENVISION

The Energy Internet

Using advanced sensors and software applications to connect billions of devices, machines and systems from energy generation, transaction and consumption processes is the foundation of the Energy Internet.

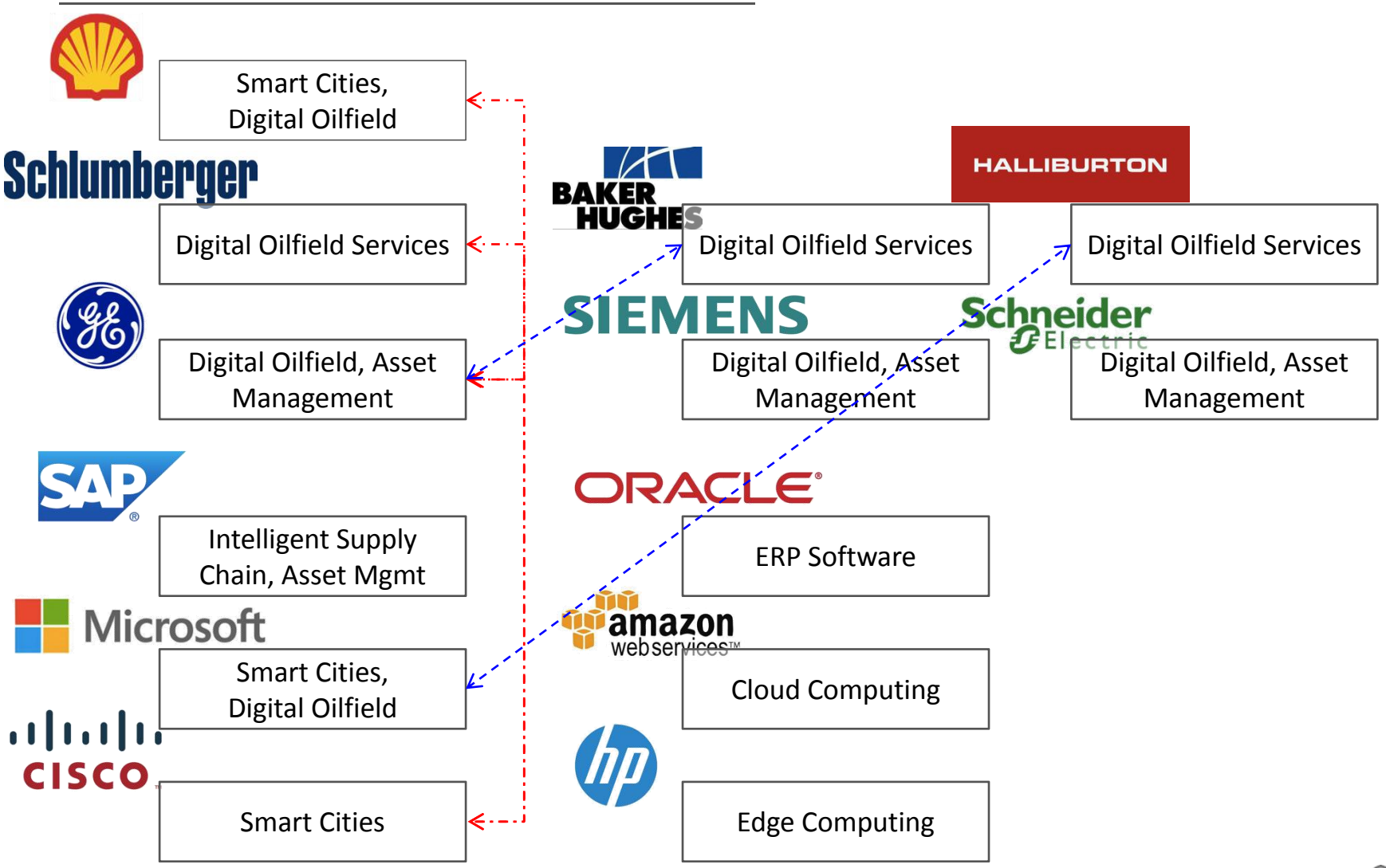
能源互联网的基础：使用先进的传感器和软件应用程序连接数十亿应用在能源生产，交易和消费流程中的设备，机器和系统。

EnOS™

EnOS™ is a smart, scalable and open platform that is enabling the Internet of Things for Energy; the Energy Internet. Through real-time computing and data analysis it provides intelligent control for how, where and when devices produce, store and use energy.

Orchestrating all types of energy infrastructure, EnOS™ connects renewable energy generation, energy storage, electric vehicles, smart grids, smart meters and appliances, and other breakthrough technologies. It is the complete solution for a future connected energy world.

From Horizontal to Vertical Competition



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The operations

1. IT and OT - 信息技术和操作技术部门之间
2. CIO taking center stage - 首席信息官担任核心职务
3. CDO and the digital talent gap - 首席数字官员和数字人才的缺乏

Clashing of the IT and OT

Operations Technology (OT)

8:00 AM

- Mechanical engineers
- Work in the field
- Run critical operations
- Must touch and see

LUNCH TIME

- On premise
- Change is costly
- Risk averse

Information Technology (IT)

8:00 AM

- Computer engineers, business analysts
- Sit in headquarters
- Fix issues when reported
- Prefer working virtually

LUNCH TIME

- Cloud centric
- Change is a norm
- Innovation is a virtue

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CIOs Taking Strategic Roles

Some 56% of CIOs report directly to the CEO in the 2016 edition of the CIO 100, an increase in the number of Chief Information Officers answering to the Chief Executive for the third consecutive year.

2016年56%的首席信息官直接在首席执行官下工作，向首席执行官报告，已经是连续第三年的增加。

The Chief Digital Officers

At the end of 2015 there were approximately 2,000 CDOs. CDO hires have been doubling every year and I expect there to be 2,500 CDOs by the end of 2016."

Companies like Caterpillar, Air New Zealand, Michelin, CVS, Target and GE, just to name a few, are hiring CDOs and in some cases, teams of digital experts across their business units.

"The pressure from boards of directors and influential shareholders is instigating CEO action. Appointing a CDO is a fast and effective way to signal that a company is taking digital transformation seriously."

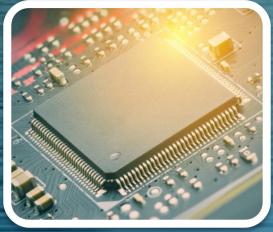
3 Architectures of Transformation

Business Architecture

- The value, ROI, offering, business models, competitive strategy, etc. underlying the ultimate success of digital transformation

Operating Architecture

- The teams, competencies, organizational alignments, processes required for execution



Technical Architecture

- The technology, architecture, solutions, systems enabling the transformation

Identify High Value Business Opportunities

Decide the WHAT

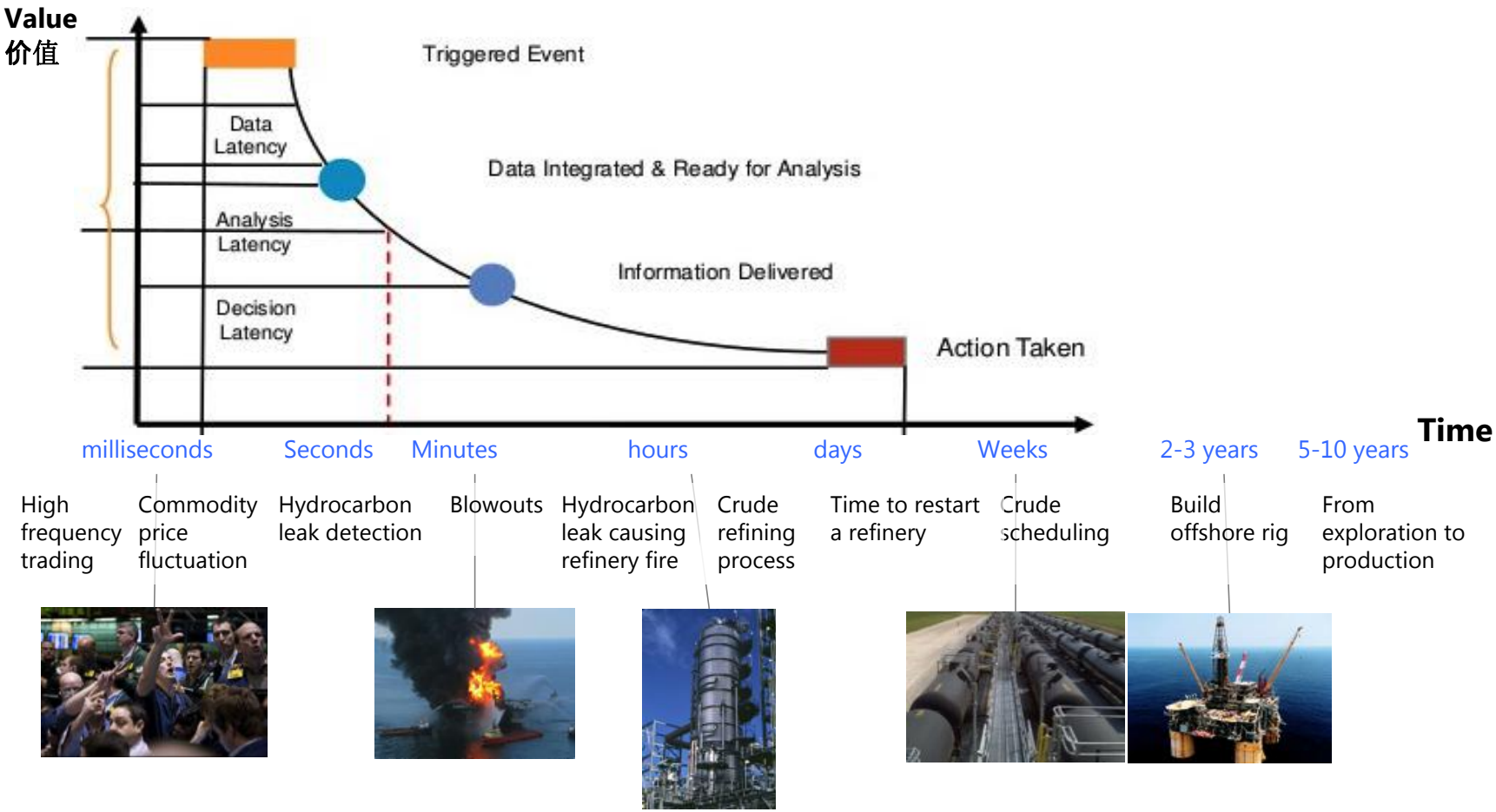
"WHAT" *drives the Who, Where, and How…*

Data Paralysis – “Hoarding” Data As if They Were Gold “囤积”数据就好像他们是黄金一样

- *“Data is the new gold!”*
- *“We generate megabytes of data a day. Let’s collect them all”*
- *“We have collected petabytes of data”*

Data Is Not Gold. Data Is Spinach
数据不是黄金 数据是菠菜

The Time Value of Oil and Gas Data – 石油产业数据的时间价值



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Analytics Paralysis – Data Science Without Domain Science 分析麻痹 – 无领域科学的数据科学

Today's Biggest Need in Analytics Initiatives: Common Sense

Banking CIO Outlook

"Through in-depth predictive analytics, utilizing advanced statistics, the website spurious correlations, has determined the U.S. per capita consumption of sour cream has a 99 percent correlation to motorcycle riders killed over that same period. The strategic initiative is clear, lower our consumption of sour cream and it will be safer for our neighbor to take out his Harley for a joy ride. The data is accurate and the model has been built by a Harvard PhD, but where is the common sense?"

通过深入的预测分析，利用先进的统计数据，根据网站虚伪性的关系，已确定了美国酸奶的人均消费量与同期摩托车骑手的死亡率有99%的相关性。战略举措是很明确的，如果降低酸奶的消费，我们大家就可以更安全开心地去骑哈雷戴维森摩托车了。这里的数据是准确的，模型也是由哈佛的博士建立的，但是有无常识呢？

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The Digitization Decision Grid - 决策网格

- Tacit knowledge
- Intuitive knowing : drilling operators, geologists, field engineers…

- Pipeline corrosive agents
- Leading costs of drilling
- Causes of blowouts
- Boiling ranges and yields

- "Black Swan" events
- Complex systems
- Global peaks

- What predicts equipment failure?
- What predicts production rate?
- How to optimize refinery profit?

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The Digitization Decision Grid

Information Problems
信息问题

- Tacit knowledge
- Intuitive knowing : drilling operators, geologists, field engineers…

- Pipeline corrosive agents
- Leading costs of drilling
- Causes of blowouts
- Boiling ranges and yields

UNKNOWN-KNOWN'S
潜在的知识

Shrink心理医生

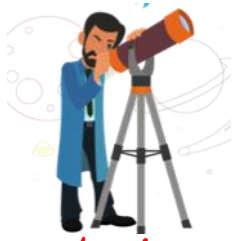
KNOWN-KNOWN'S
众所周知的

Cobbler 皮匠

Undefined
未定义的

Well-Defined
定义明确的

UNKOWN-UNKOWN'S
不明的未知数



Cosmologist宇宙学家

KNOWN-UNKNOWN'S
已知的未知数

Detective 侦探

- "Black Swan" events
- Complex systems
- Global peaks

- What predicts equipment failure?
- What predicts production rate?
- How to optimize refinery profit?

知识问题
Knowledge Problems

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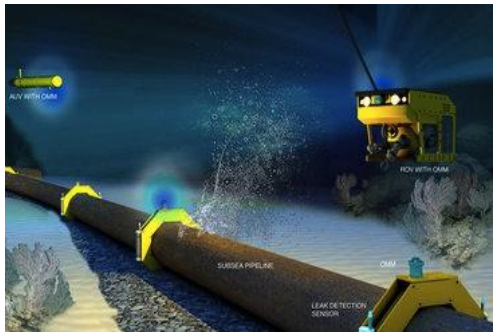
Distinguish Information Problems from Knowledge Problems

Information Problem

信息问题

Is there a leak in the underwater pipeline?



We will **find out** if we use the right means

- Solved by information technologies (detecting, processing, integration, alerts, in-time responses, workflows…)
- Need only current data (speed & quality)

Knowledge Problem

知识问题

What conditions lead to machine failures?

We **don't know**. We want to understand

- Solved by science, data science (research, experiments, algorithms/machine learning, …)
- Need sufficient historical data (quantity & quality)

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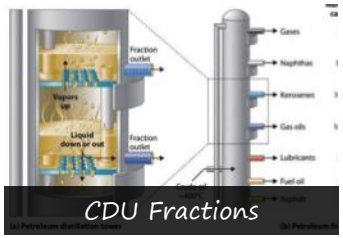
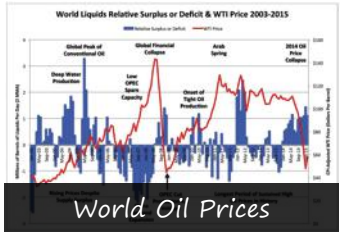
Well-Defined Problems Are Low Hanging Fruits 定义明确的问题可以开来近期的收获



KNOWN-KNOWNS

Well-defined Information Problems

- Information or knowledge exists somewhere (digitally, physically, or both)
- Inefficiencies in obtaining, integrating, distributing or using information



KNOWN-UNKNOWNS

Well-defined Knowledge Problems

- Knowledge gaps with business values
- The outcome/output is defined. Potential variables/inputs are identified
- We have some hypotheses

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3 Ways to Spot Information Problems

1. Talk to operations and field teams –
与运营和现场团队交谈
Operators, site managers, field engineers

3 Ways to Spot Information Problems

2. Recognize informational “frictions” --

认识到信息“摩擦点”

Silo’s, delays

3 Ways to Spot Information Problems

3. Look for operational variabilities –

寻找操作变量

productivity, utilization, cost

What is A Well-Defined Knowledge Problem?

Sequence of Problem Solving

1. Problem Defined | **2. Method Defined** | **3. Solution Defined**

问题定义了 | 方法定义了 | 问题解决了

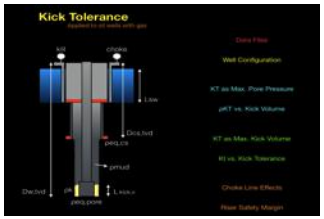
1970's

1990's

2000's

2010's

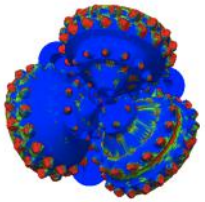
Kick tolerance calculation



Computer can automate repeating tasks

Calculation & statistics

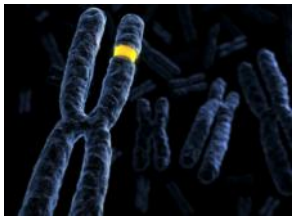
Predict bit wear using discrete element method



Computer can use selected methods to refine results

Machine Learning

Predict type 2 diabetes from generics



Computer program can automatically selects methods

Machine Learning

Predict cancer prognosis

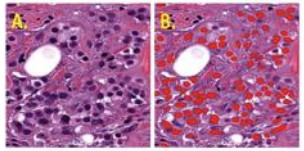


Figure. A) A hematoxylin and eosin stained Nottingham grade III breast cancer sample with B) nuclei automatically identified and segmented (masked red) and prepared for feature extraction.

Computer can extract the "features" for learning

Deep Learning

Still in a Sci-Fi movie

Only humans can define the problem
(or humanoid computers)

Strong Artificial Intelligence

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Altered Street Signs Confuse Self-Driving Cars
改变的街道标志迷惑了自驾车

Lesson #1. Most situations with dynamic, ill-defined contexts can only be interpreted by humans (for now)

Lesson #2. If you do use machine learning – take proactive steps to capture and encode contextual variables (do not let them become noise to computers)

Lesson #3. The better the problem is defined, the less likely contextual noise will obfuscate the result

Take Aways

1. Digital transformation is redefining the boundaries of business, operating and technical models
2. The value of data diminishes with time (Data is Spinach)
3. Define the WHAT – business problem first
4. Distinguish information problems from knowledge problems
5. Start from well-defined problems

Instructor

Jane Ren
CEO, Atomiton

Jane Ren is the CEO of Atomiton, Inc., a technology company delivering the next generation IoT platform. Under Jane's leadership, Atomiton was named a "Top 20 Disruptive Influence in Tech" by the CFO Magazine in 2017, for its IoT software stack deployed in oil and gas, smart cities, and industrial automation.

Prior to Atomiton Jane was the Chief Business Architect at GE Global Software Center, where she spearheaded digital business transformations across GE's Healthcare, Transportation, Aviation and Energy businesses. She product managed the core software platform to drive GE's "Industrial Internet" initiative. Previously at Cisco, Jane was responsible for GTM strategies and major customer engagements for the Service Exchange Platform.

A medical doctor by training, Jane worked as an internist and then a healthcare executive before joining the tech industry.

Jane received her MBA from University of California, Berkeley, and her MD from Peking Union Medical College (now Tsinghua University).

Workshop Agenda

1. Introductions and getting started (André, 20 min)
2. "**Navigating The Tectonic Shift of Digital Transformation**" (Jane, 25 min)
3. Introduction of PROSCI as a CM tool, including the usage of the kick off excel (André, 20 min)
4. Agile discussion and population of Kick off tool (under supervision of Jane and André, 25 min)
5. Feedback rounds and Q&A (tables to Group) plus comments J and A. (Jane leads, 30 min)

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