The Future Belongs to the Digital Engineer

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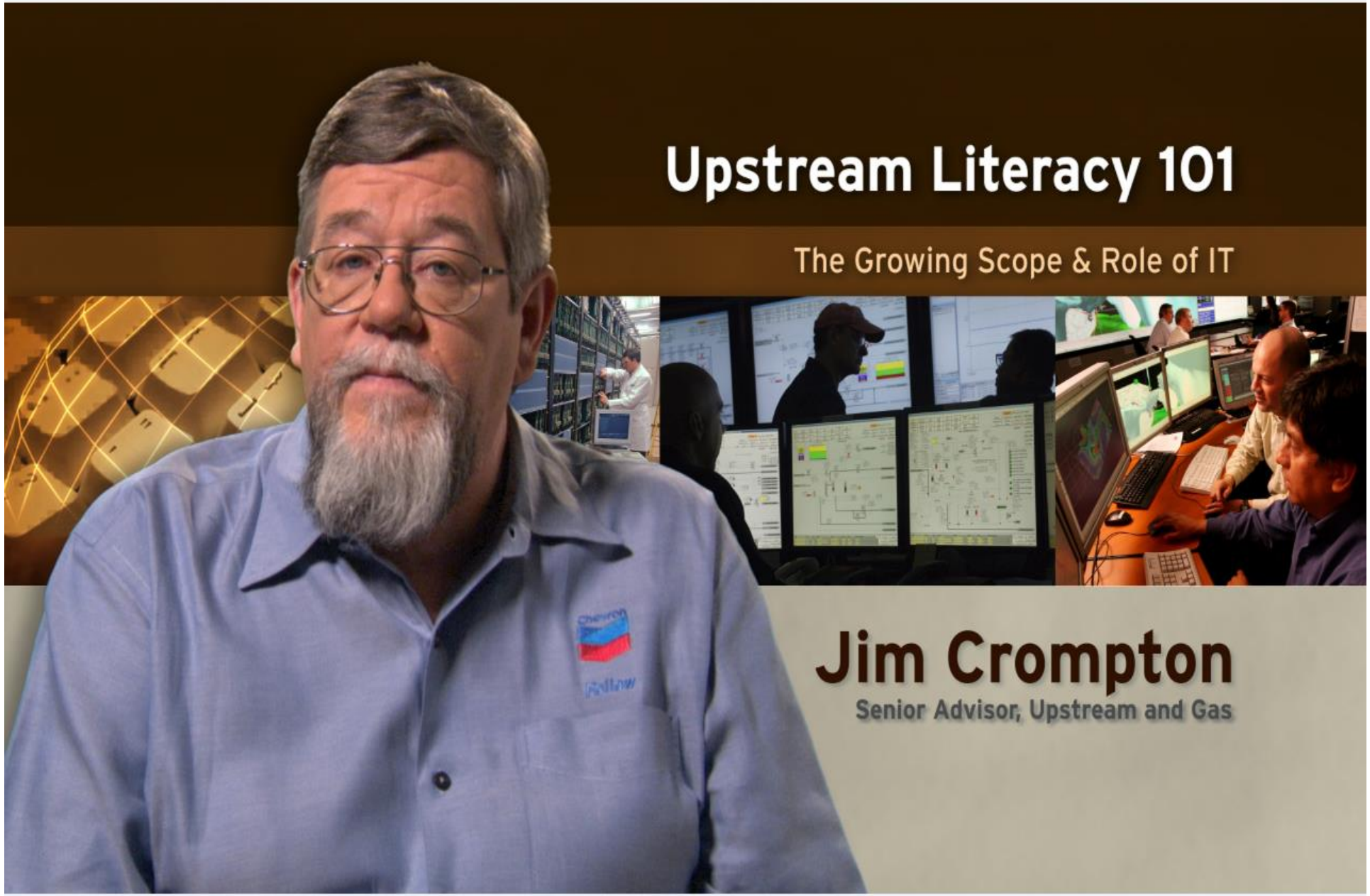
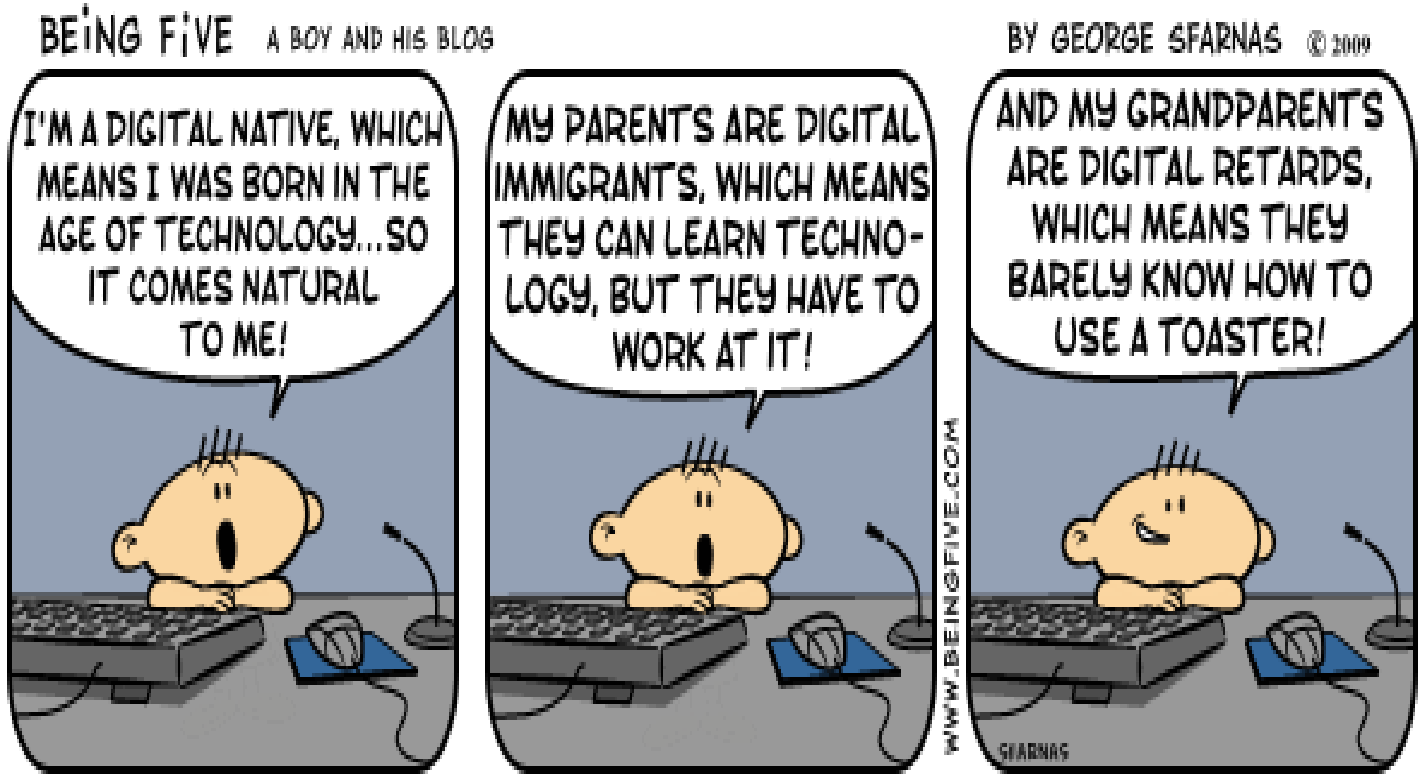
SPE Gulf Coast Members-in-Transition Workgroup
March 9, 2018


Upstream Literacy 101
The Growing Scope & Role of IT
Jim Crompton
Senior Advisor, Upstream and Gas

The Emerging World of the Digital Engineer:
And Just in Time too



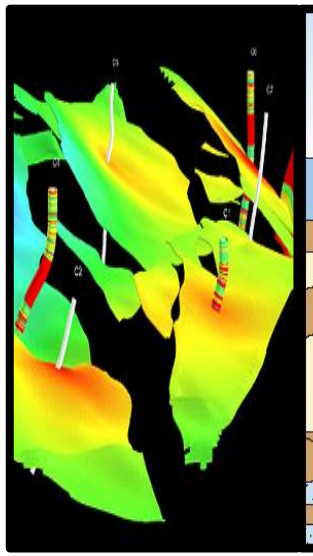
Turbulent Flow:
Leading Transformation in a Steady State Environment

No! I can't be bothered with any of this…..
Can't you see? I've got a battle to fight…..

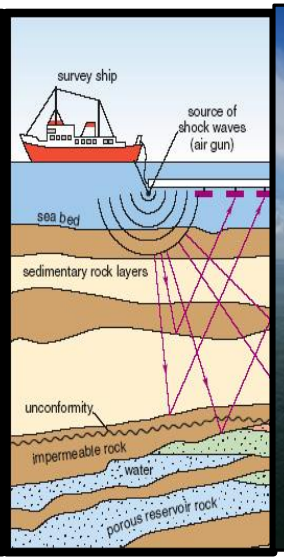
Observations

- The Digital Oil Field is a reality
  - trend of field automation,
  - real-time drilling and production systems
  - earth & reservoir modeling
  - Collaboration and Visualization
- New engineers and earth scientists are entering the workforce with high digital literacy and with some training in programming
- Petroleum engineering and earth science “intellectual property” comes in the shape of software
- “Innovation-at-the-edge” comes from working on projects, the impact of central research groups are decreasing
- Significant gaps continue to surface (lack of reuse, fragile integration, poor data foundation, lack of end-to-end system design)

Digital Oil Field



Reservoir Management



Exploration

Drilling

Productions

Operations

Facility Engineering

Digital Oil Field

- Advantages
  - Workflow solutions focusing on critical processes (production operations, facilities and equipment health, waterflood and steam optimization)
  - New field developments were “born smart” with fully instrumented facilities
- Challenges
  - Data integration and data access (master data management)
  - Data Quality and data governance
  - Complex architectures
  - Change Management (getting people to work differently)
- Major Players and Vendors
  - Major operators (BP, Shell, Chevron, Statoil, Aramco)
  - Major Oilfield Service Companies (Halliburton, Schlumberger)
  - Data Analysis tools (Spotfire)

The Digital Oilfield

Digital Intensity

- Increase in number and variety of sensors
- Field automation
- Smart equipment
- Increase in documents
- Increase in size of seismic surveys and reservoir models

Interconnected

- Remote Decision Support Centers
- Remote Control of Processes
- Decrease in proprietary networks and growth of internet
- Connected Supply Chains

Digital Oil Field of the Future Realities

- Five Myths
  - Digital Oil Field is mostly about technology
  - Digital Oil Field is an IT thing
  - Digital Oil Field is mostly about automation
  - Operators trust the models asset team builds
  - Major Capital Projects are greenfield opportunities
- Five Truths
  - Data management is worse than you think
  - Technology Capabilities >> Deployed Technologies
  - Organizational Capabilities for Digital Oil Field are more than just a strategic staffing numbers game
  - Most folks out there are too busy to listen
  - Lessons learned from refining and process industries are hard to transfer

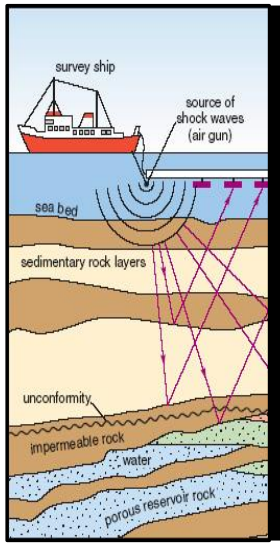
Challenges of Integration Operations

- Manage by Exception
- Simulation Bias vs. grounding in field reality
- Advanced Analytics & Serious Gaming
- Transparent connectivity to partners, suppliers (supply chain) & regulators
  - Access to global experts on demand
- Remote Operations
- Integrate traditional field (reservoir, well & production facilities) to processing plant to export

Challenges of Integration Operations

- Vulnerable & Insecure connectivity to partners, suppliers (supply chain) & regulators
- Trusted Data Foundation (structured, documents, models, transactions) and intuitive "*get my data*" button
- An architecture that integrates traditional field to processing plant to export in a:
  - flexible yet consistent
  - reliable & secure yet enables innovation at the edge
  - More like a digital battlefield than a factory

Big Data and Advanced Analytics



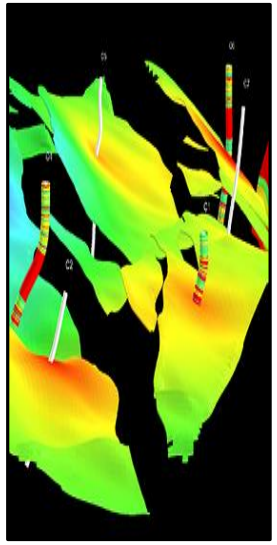
Exploration

Drilling

Production

Operations

Facility Engineering



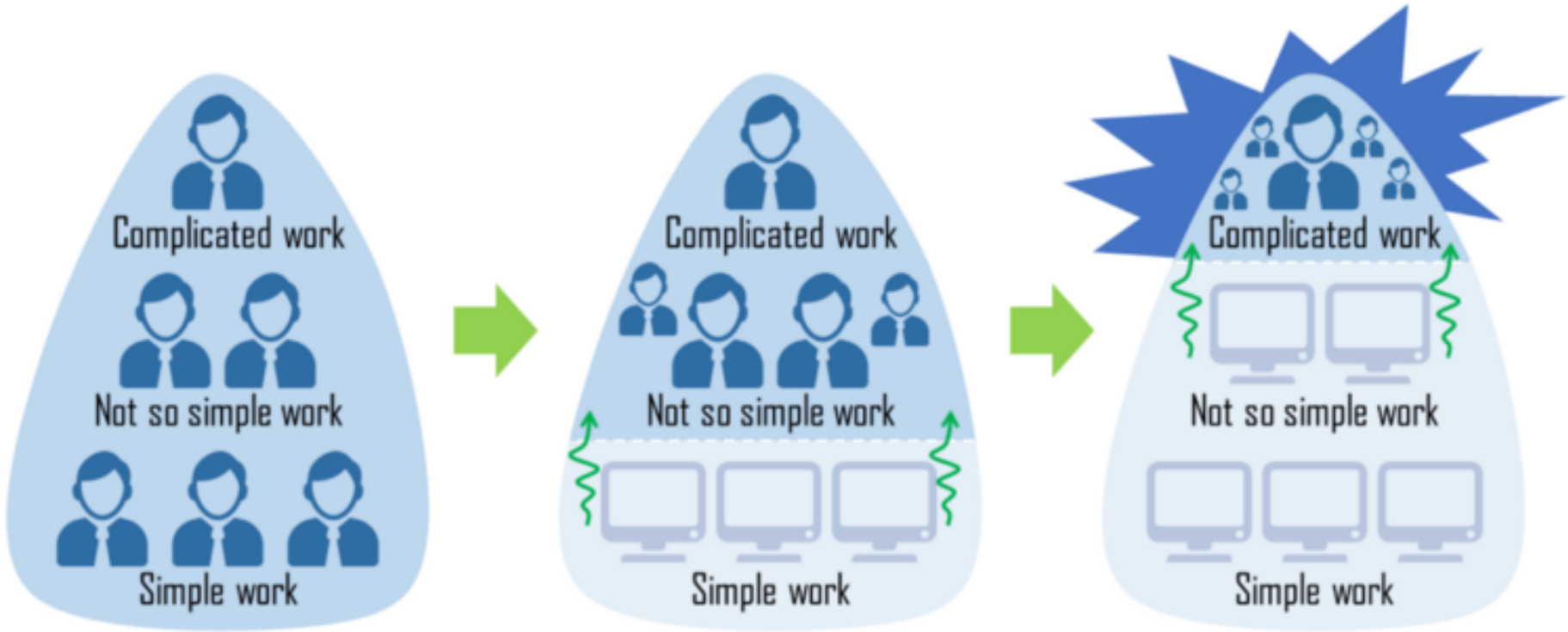
Reservoir Management

Finance

Supply Chain

Big Data and Advanced Analytics

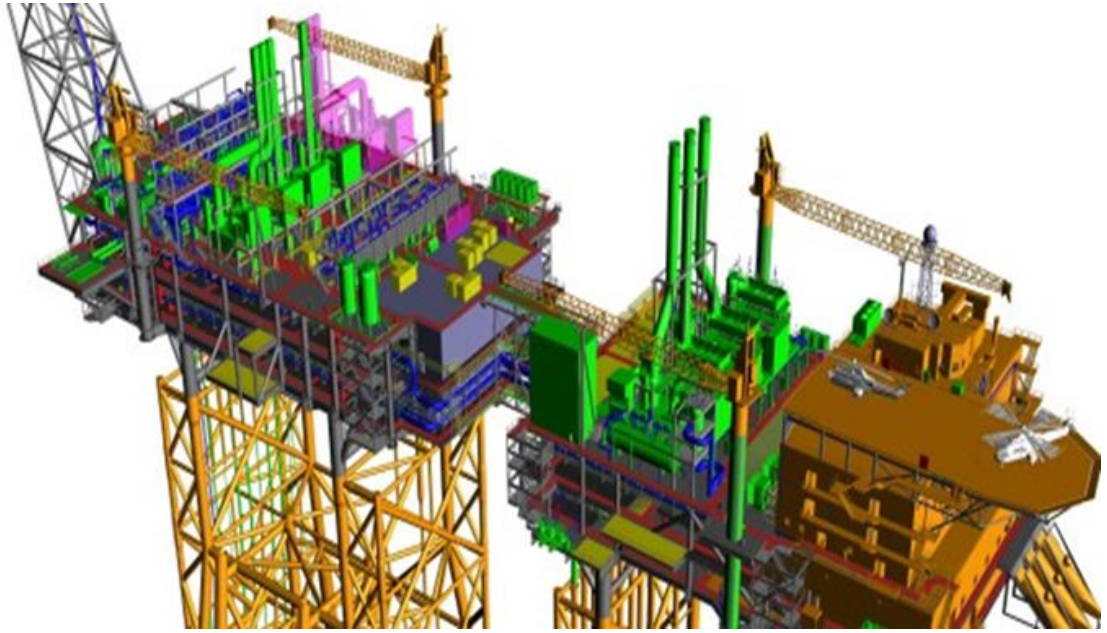
- Advantages
  - Ability to combine structured, unstructured, transaction and sensor data for deeper insight into operational issues
- Challenges
  - Data integration between ERP (transactions) and operational systems
  - How to model data between the variety of data types
  - Enterprise document management (OpenText, Documentum, Sharepoint)
- Major Players and Vendors
  - Apache Hadoop vendors (Hortonworks, Cloudera)
  - ConocoPhillips, Devon (centers of analytics)
  - Analytics Platforms (SAS, Tableau, Qlik, Platfora)
  - Data Historians (OSIsoft PI) and streaming data analytics tools (Spark, Kafka)



SKIMMING FROM BELOW

CASEGREENFIELD.COM

Crossing the Chasm



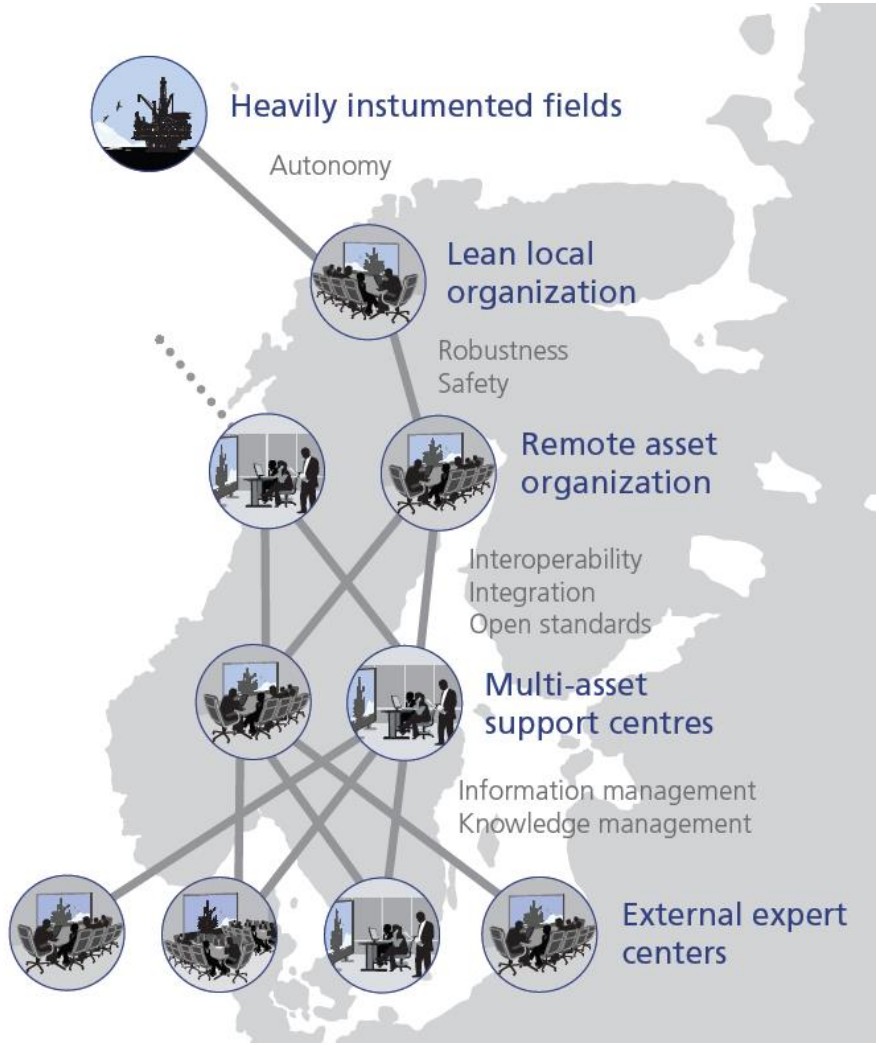
Main Objective for IO in the High North

Main objective: Demonstrate a reliable digital platform for Integrated Operation Generation 2 (IO G2)

Requirements: Come from use cases within

- Drilling & Completion
- Production & Reservoir management
- Operation & Maintenance

Key element: Handling of real-time data across applications, disciplines, locations and organizations



Convergence of Consumer and Industrial Technology

- A company version of **Facebook** to find their network connections, to answer their questions, and to collaborate and share their work.
- • A company version of **YouTube** to go to for training and references when they want, not to schedule class room versions of training classes when the trainer wants.
- • A company issued **smartphone and tablet**, preferably the latest version on the market. Forget your company PC, no one wants them anymore. This device will be more than a phone, it will be their life. They want to take IT with them, so they are ready to work whenever and wherever you need them to, but they want their life as well.
- • A company version of **Twitter,** because they want to stay in touch with their network wherever they are. Email is dead so don't expect an answer to your voice mail or repeated attempts at sending them email, send a link or a text instead.
- • A company version of **Skype or FaceTime**, when we meet virtually, which will be most meetings, why can't they see you on their screen?
- • And most importantly, a company version of **Google** for their 'get my data button'.

Attributes of a Digital Engineer

The biggest challenges in developing technical talent in a global workforce:

- **Technical competency** from both the perspective of the minimal qualifications needed to be addressed by universities and the advance and specialized skills needed to be developed by Industry. The technical challenges are getting more difficult and we cannot let discipline standards slip. Advanced analytical skills are critical.
- Of the career choice between technical and management, what is the highest priority and which one are we rewarding for top talent? What are the incentives, both deliberate and unintentional, that shape future career paths?
- Technology and **knowledge transfer** to national workforce (and NOCs and local vendors)
- **Adoption of emerging technology** to be able to address the challenges of increasingly more difficult reservoirs and operating conditions
- **Career development** (have the basic skills but need to accelerate development of younger staff to fill higher levels in home organization)

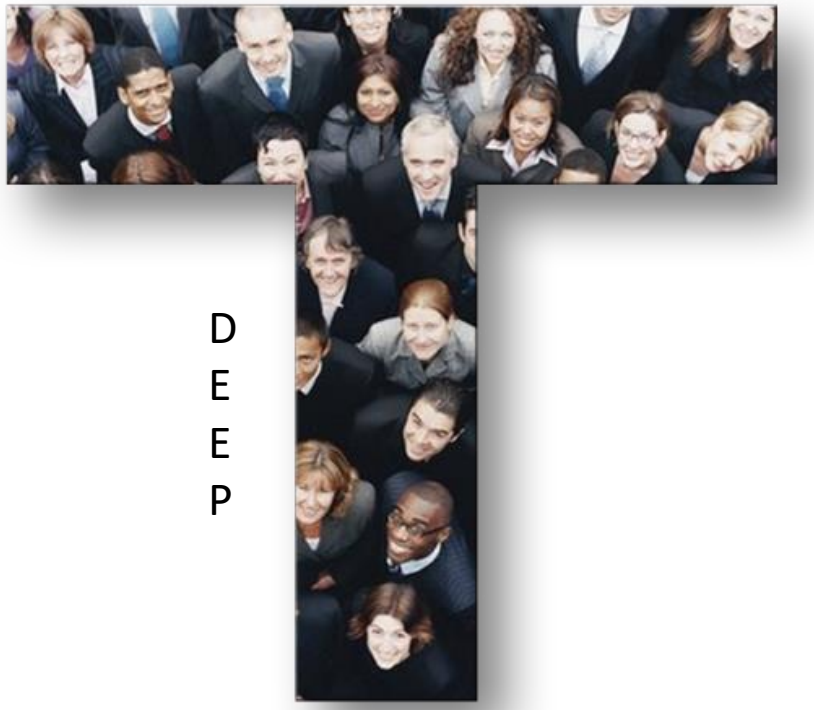
Attributes of a Digital Engineer

What additional challenges will Integrated Operations bring?

- Digital Literacy (more than just what consumer IT they use at home)
- Situational Awareness (Are there lessons to be taken from what the military and intelligence communities are doing with network centric warfare and battlefield situational awareness programs to enable the engineer to understand the reality in the field from the support center?)
- Understanding how to optimize cross functional processes for holistic performance improvements (not just moving the bottlenecks around) and be able to sustain the higher level of performance to economically recover more hydrocarbon resource from the reservoir.

T-shaped expertise

BROAD



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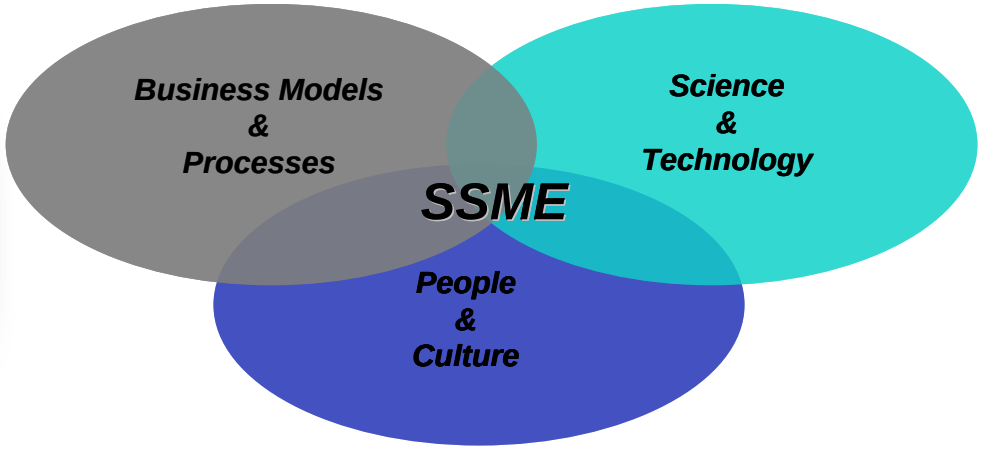
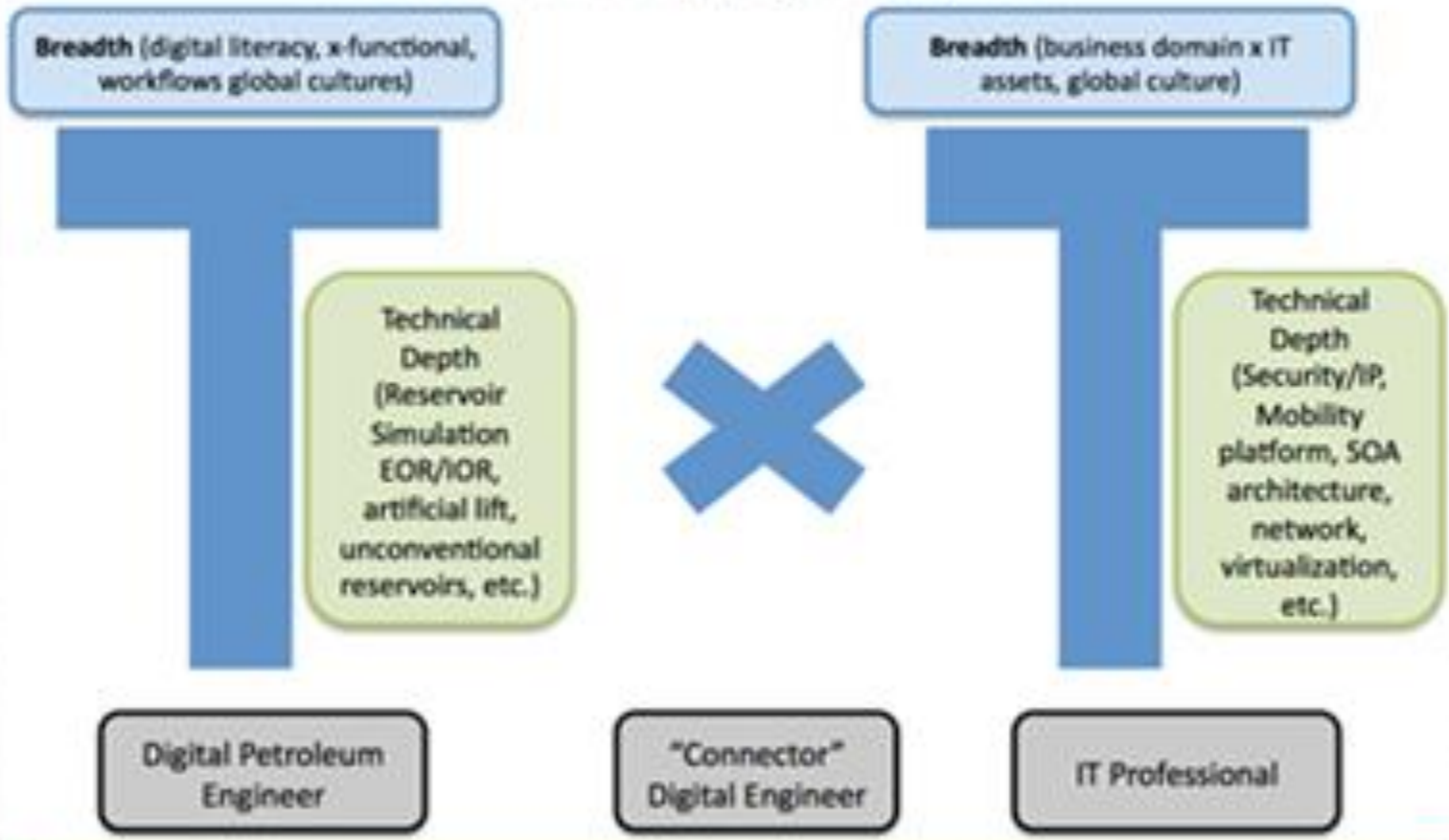
A mix of technology/science, business and management will ready future innovators for the big challenges presented by a knowledge-driven economy.

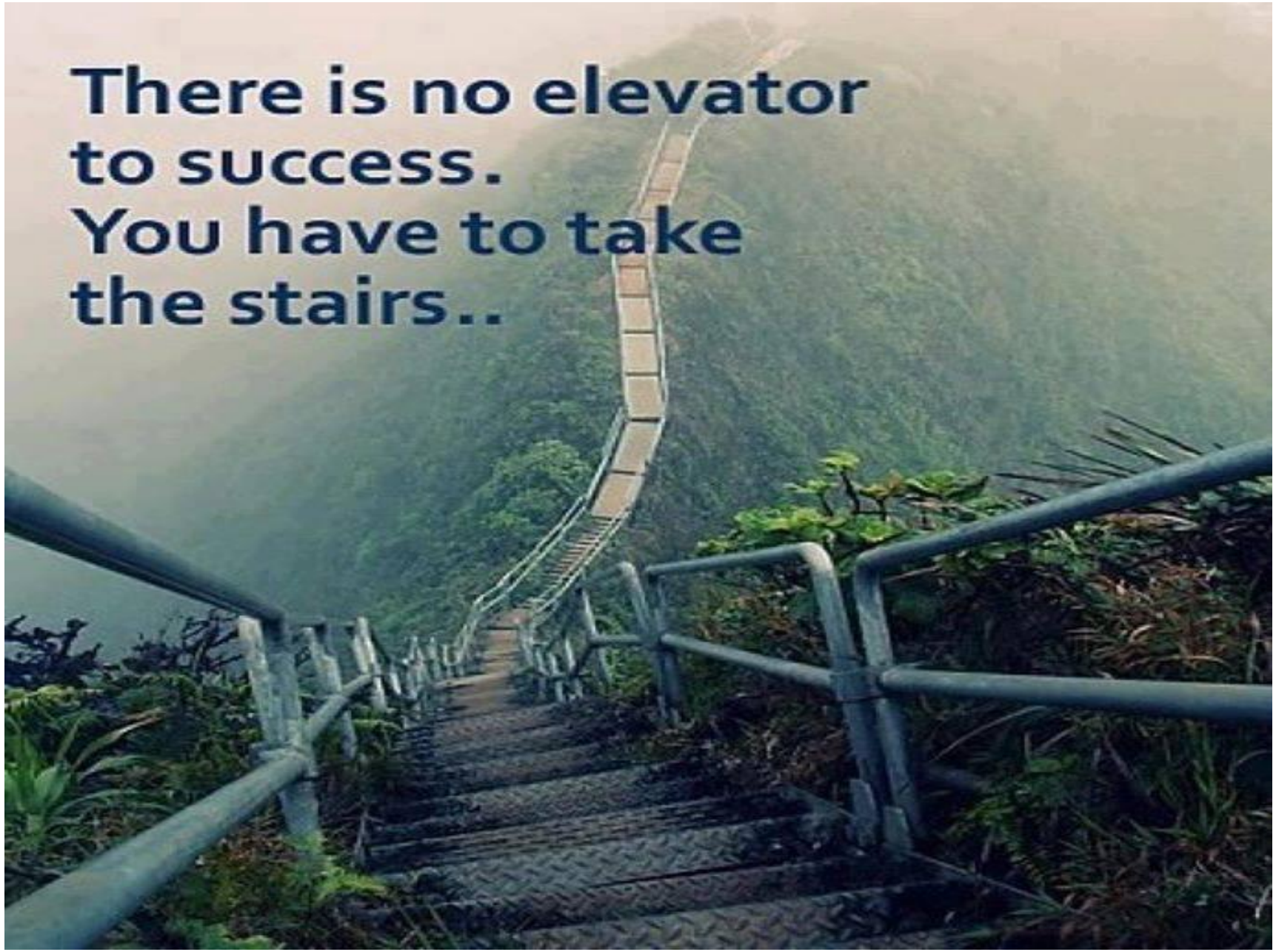


"IT professionals will need to possess expertise in multiple domains. Technical aptitude alone will no longer be enough. IT professionals must prove they can understand business realities – industry, core processes, customer bases, regulatory environment, culture and constraints. Versatility will be crucial.“ – Gartner Group IT Professional Outlook

Digital Engineer OC Challenge

What do we mean by Digital Engineer?




There is no elevator
to success.
You have to take
the stairs..

Who are we to tell than they can’t do it?

DUTCH **HOLLAND**, PHD &
JIM **CROMPTON**, MS GEOPH & MBA

THE FUTURE BELONGS TO THE DIGITAL ENGINEER

TRANSFORMING THE INDUSTRY

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