



# **SPE: Management and Information (M&I)**

**Birol Dindoruk, Chief Scientist**  
**Shell International E&P Inc.**

**SPE Technical Director, Management & Information (M&I)**



# Annual Technical Conference and Exhibition



24–26 September 2018  
Dallas, Texas, USA  
Kay Bailey Hutchison Convention Center

## DEFINITIONS & CAUTIONARY NOTE

•Reserves: Our use of the term “reserves” in this presentation means SEC proved oil and gas reserves.

•Resources: Our use of the term “resources” in this presentation includes quantities of oil and gas not yet classified as SEC proved oil and gas reserves. Resources are consistent with the Society of Petroleum Engineers (SPE) 2P + 2C definitions.

•Discovered and prospective resources: Our use of the term “discovered and prospective resources” are consistent with SPE 2P + 2C + 2U definitions.

•Organic: Our use of the term Organic includes SEC proved oil and gas reserves excluding changes resulting from acquisitions, divestments and year-average pricing impact.

•Shales: Our use of the term “shales” refers to tight, shale and coal bed methane oil and gas acreage.

•Underlying operating expenses are defined as operating expenses less identified items. A reconciliation can be found in the quarterly results announcement.

•The companies in which Royal Dutch Shell plc directly and indirectly owns investments are separate legal entities. In this presentation “Shell”, “Shell group” and “Royal Dutch Shell” are sometimes used for convenience where references are made to Royal Dutch Shell plc and its subsidiaries in general. Likewise, the words “we”, “us” and “our” are also used to refer to Royal Dutch Shell plc and its subsidiaries in general or to those who work for them. These terms are also used where no useful purpose is served by identifying the particular entity or entities. “Subsidiaries”, “Shell subsidiaries” and “Shell companies” as used in this presentation refer to entities over which Royal Dutch Shell plc either directly or indirectly has control. Entities and unincorporated arrangements over which Shell has joint control are generally referred to as “joint ventures” and “joint operations”, respectively. Entities over which Shell has significant influence but neither control nor joint control are referred to as “associates”. The term “Shell interest” is used for convenience to indicate the direct and/or indirect ownership interest held by Shell in an entity or unincorporated joint arrangement, after exclusion of all third-party interest.

•This presentation contains forward-looking statements (within the meaning of the U.S. Private Securities Litigation Reform Act of 1995) concerning the financial condition, results of operations and businesses of Royal Dutch Shell. All statements other than statements of historical fact are, or may be deemed to be, forward-looking statements. Forward-looking statements are statements of future expectations that are based on management’s current expectations and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in these statements. Forward-looking statements include, among other things, statements concerning the potential exposure of Royal Dutch Shell to market risks and statements expressing management’s expectations, beliefs, estimates, forecasts, projections and assumptions. These forward-looking statements are identified by their use of terms and phrases such as “aim”, “ambition”, “anticipate”, “believe”, “could”, “estimate”, “expect”, “goals”, “intend”, “may”, “objectives”, “outlook”, “plan”, “probably”, “project”, “risks”, “schedule”, “seek”, “should”, “target”, “will” and similar terms and phrases. There are a number of factors that could affect the future operations of Royal Dutch Shell and could cause those results to differ materially from those expressed in the forward-looking statements included in this presentation, including (without limitation): (a) price fluctuations in crude oil and natural gas; (b) changes in demand for Shell’s products; (c) currency fluctuations; (d) drilling and production results; (e) reserves estimates; (f) loss of market share and industry competition; (g) environmental and physical risks; (h) risks associated with the identification of suitable potential acquisition properties and targets, and successful negotiation and completion of such transactions; (i) the risk of doing business in developing countries and countries subject to international sanctions; (j) legislative, fiscal and regulatory developments including regulatory measures addressing climate change; (k) economic and financial market conditions in various countries and regions; (l) political risks, including the risks of expropriation and renegotiation of the terms of contracts with governmental entities, delays or advancements in the approval of projects and delays in the reimbursement for shared costs; and (m) changes in trading conditions. No assurance is provided that future dividend payments will match or exceed previous dividend payments. All forward-looking statements contained in this presentation are expressly qualified in their entirety by the cautionary statements contained or referred to in this section. Readers should not place undue reliance on forward-looking statements. Additional risk factors that may affect future results are contained in Royal Dutch Shell’s Form 20-F for the year ended December 31, 2017 (available at [www.shell.com/investor](http://www.shell.com/investor) and [www.sec.gov](http://www.sec.gov)). These risk factors also expressly qualify all forward-looking statements contained in this presentation and should be considered by the reader. Each forward-looking statement speaks only as of the date of this presentation, September 26, 2018. Neither Royal Dutch Shell plc nor any of its subsidiaries undertake any obligation to publicly update or revise any forward-looking statement as a result of new information, future events or other information. In light of these risks, results could differ materially from those stated, implied or inferred from the forward-looking statements contained in this presentation.

•We may have used certain terms, such as resources, in this presentation that the United States Securities and Exchange Commission (SEC) strictly prohibits us from including in our filings with the SEC. U.S. Investors are urged to consider closely the disclosure in our Form 20-F, File No 1-32575, available on the SEC website [www.sec.gov](http://www.sec.gov).

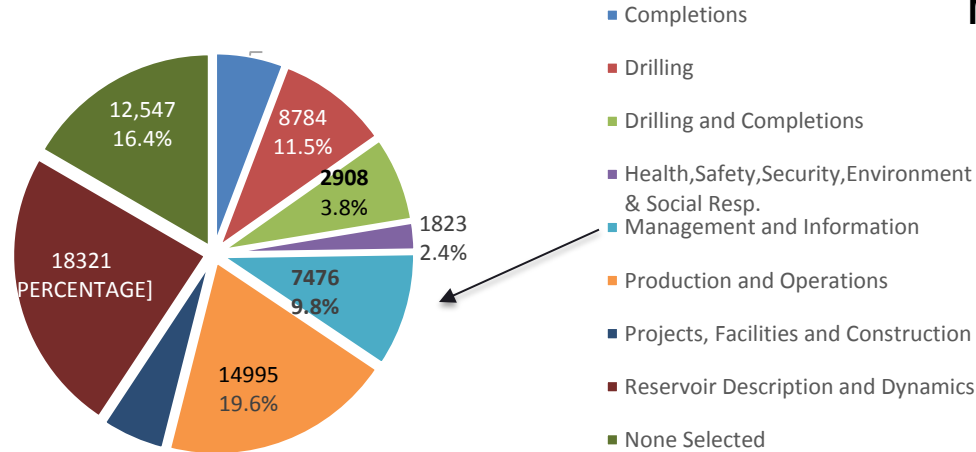


# Outline

- Metrics & Structure of M&I
  - Technical Sections
  - Advisory Board Members &
  - Committees and Task Forces
- Data/Processes/Role of M&I
- Activities and Initiatives: Updates

# Paid Professional Members by Primary Technical Discipline – Aug 2018

**Membership: 76,415**



# M&I: Advisory Board

<b>M&amp;I AC: 2018 - 2020</b>		
Birol Dindoruk	Shell	
Amr El Bakry	ExxonMobil	Houston
Andrei Popa	Chevron	Bakersfield
Ashwin Venkatraman	U of TX - Austin	Austin
Basak Kurtoglu	Quantum Energy Partners	Houston
Birol Demiral	Schlumberger	Dubai
Edward J Lewis	Shell Int'l E&P	Houston
Hisham Saadawi	Ringstone Petroleum Consultants LLC	Abu Dhabi
Jeanne Perdue	Occidental Petroleum	Houston
John Ratulowski	Schlumberger	Massachusetts
Jyoti Phirani	Indian Institute of Technology	Delhi, India
Mehmet Ozbay	Fieldlink LLC	Houston
Ram Ratnakar	Shell International	Houston
Ryosuke Okuno	U of Texas	Austin
Saeed AlMubarak	Aramco	Saudi Arabia
Sathish Sankaran	Anadarko	Houston
Shahin Negahban	U of Kansas	KS
Silviu Livescu (Dr)	Baker Hughes a GE Company	Houston
Supriya Gupta (Ms)	Schlumberger	Houston
Sushma Bhan	Shell	Houston
Tom Blasingame	Texas A&M University	College Station / NZ
Yunying Qi	Shell Global Solutions	Houston

# M&I 101

M&I has oversight over 2 (sometimes 3) technical sections (TS):

- DETS = Digital Energy Technical Section
- PD2A = Petroleum Data-Driven Analytics Technical Section
- RDTS = Research & Development Technical Section
  - Technical Sections = online groups of globally-based members focused around a specific topic
  - They follow a governance structure that guides election of officers and guidelines in Technical Sections Operations Manual (TSOM) in [spe.org](http://spe.org)
  - Each has a separate online community on SPEConnect

# Petroleum Engineering Discipline

FROM THE PAST TO THE FUTURE

Waves of  
Petroleum  
Engineering  
Methods

Slide rule and graph paper

Calculator

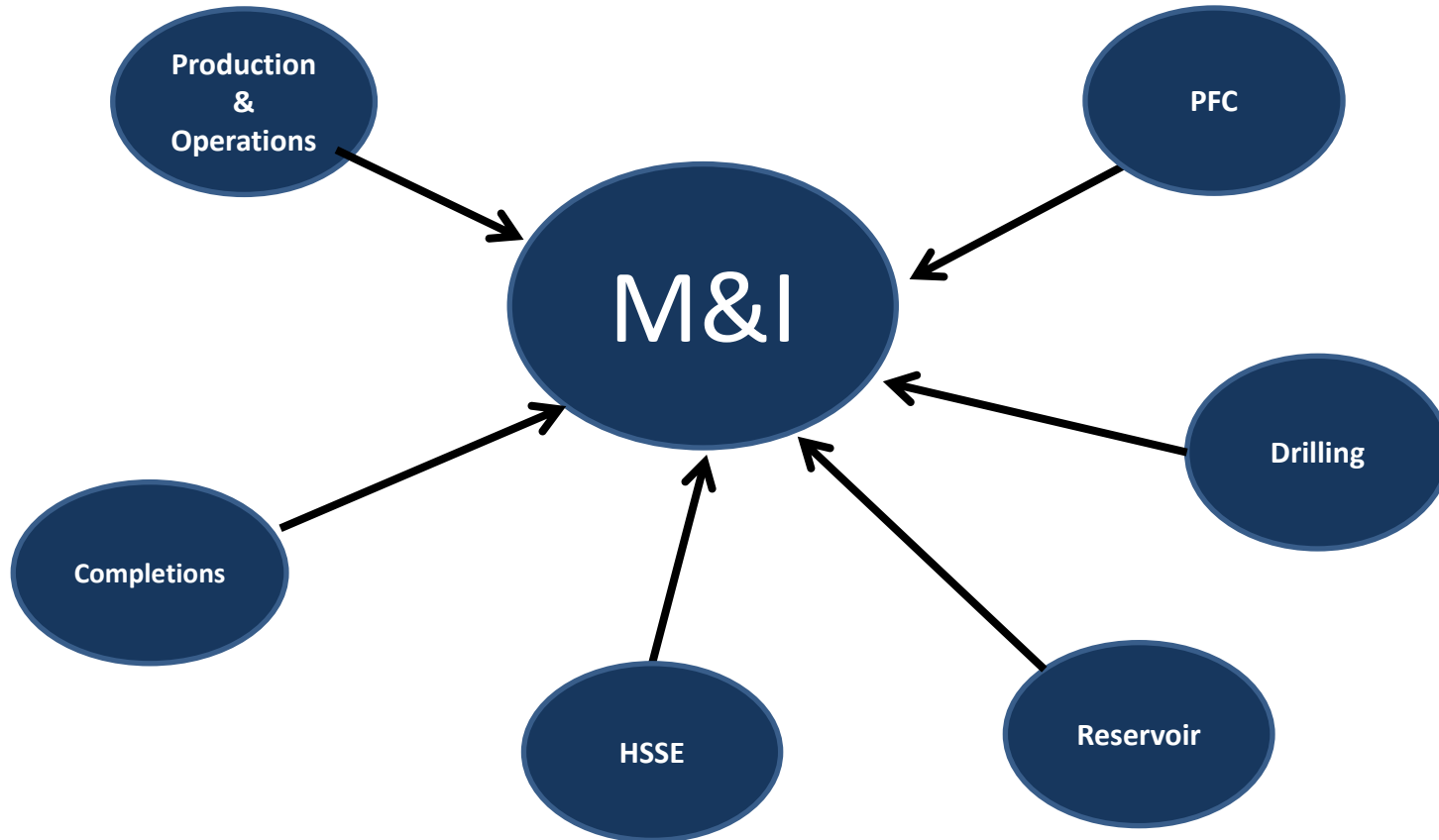
Desktop computing and large scale numerical calculations

High performance computing + visualization

Data Mining/Machine Learning

From: David Reid: Shell International E&P Inc.

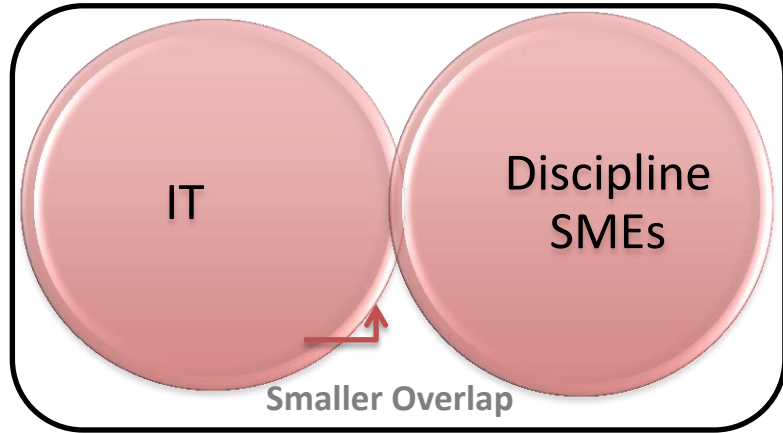
# Central Role of M&I: “Connective Tissue ?”



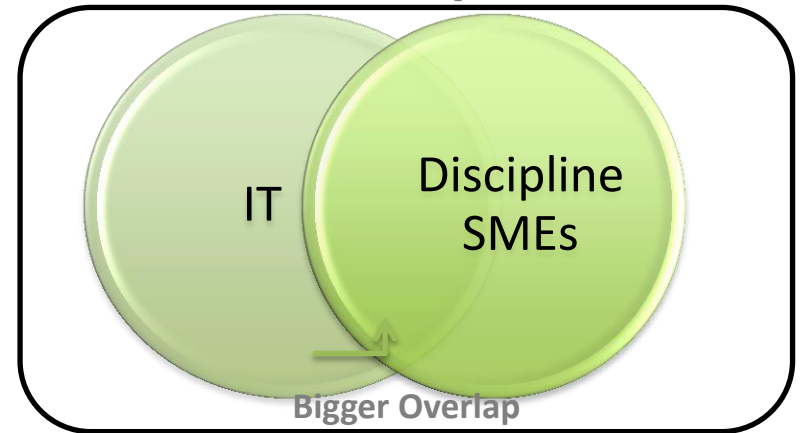


# What has evolved?

## Conventional Business Principles



## “Digital Energy” Business Principle



- Content-Expertise Are Important
- Distance between the disciplines is decreasing (C&C: complex problems and collaboration)
- Diffuse into entire value chain – Efficiency gains (at minimum)

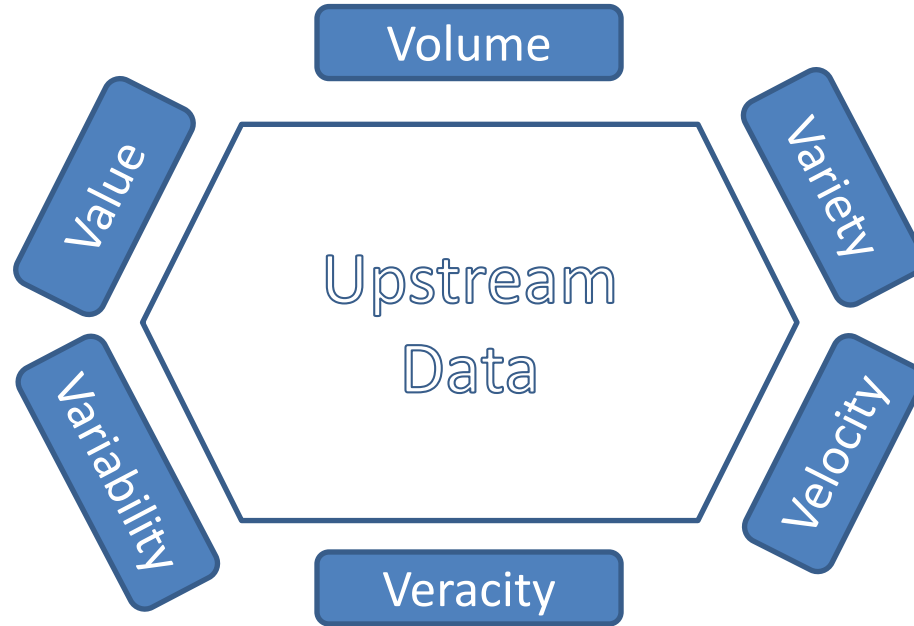
# Data/Digital Transformation → SPE

- No longer regarded as static or stale
- Raw material for business ~ asset → economic input
- Bigger Digital Exhaust:
  - Cellphone in every pocket
  - Computer in every backpack
  - Sensors everywhere ...
- Causality → simple correlations
- Core of Big data → predictions (though it is described as a part of CS as AI & more specifically an area called Machine Learning)
- Integrated and systems thinking
- More sharing ...

NEED TO CAPTURE ALL IN AN ORGANIZED WAY

UPDATE –REBRAND/REFOCUS AS CURRENT NEEDS CHANGE

# Upstream Data Types (6V\*s)



Variety: Data format - structured, semi-structured & unstructured

Velocity: Speed of data captured and streamed

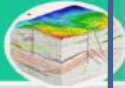




Veracity: Data biases, noises and abnormality.

Variability: Data changes during processing & lifecycle

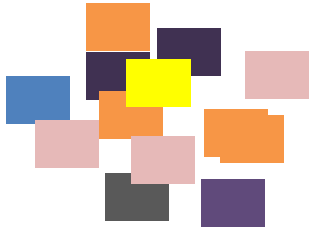
\* CIO Report 2015

# Data Analytics: Data Types

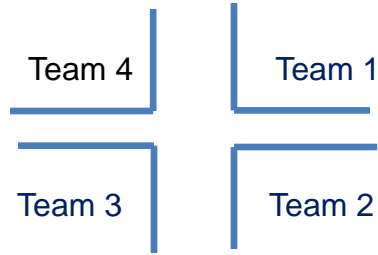
Upstream data characterized by 6V\*s

	Exploration 	Reservoir Engineering & Development 	Drilling and Completion  	Production 
<b>Volume</b>	Seismic acquisition SEGD	Facilities Reservoir Engineering	Sensors : Flow Pressure ROP	SCADA Sensors : Flow Pressure
<b>Variety</b>	Structured data : • SEGD • Pre-stack • Post-stack  Semi-structured : • Implantation Report ...	Structured data : • WITSML (XML) • PRODML • RESML  Unstructured data : • Log Curves / Drilling & Test / Lithology /Cores ...	Structured : • WITSML  Semi-structured : • Final Well Report, • Daily Drilling Report  Unstructured : • Drilling Log / Gas Log .. etc.	Structured Production data : • PRODML • RESML  Semi-structured : • Crude Analysis Report
<b>Velocity</b>	Real Time Data Acquisition : Wide azimuth data acquisition		Real Time Data Acquisition : Mud Logging / LWD/ MWD	Real Time Data Acquisition : SCADA Sensors
<b>Veracity</b>	Seismic processing	Reservoir Modeling	Sensor calibration	Sensor calibration
<b>Variability</b>	Seismic Interpretation Geology Interpretation	Reservoir Simulation Combination of seismic, drilling and production data	Data Interpretation & Optimisation	Data Interpretation
<b>Value</b>	Navigation, Visualization & Discovery Run integrated asset models	Improve Drilling Program Drive innovation with unconventional resources (shale gas, tight oil)	Reduce costs Reduce Non Productive Time (NPT) Reduce risks Improve HSE performances	Increase speed to first oil Enhancing production

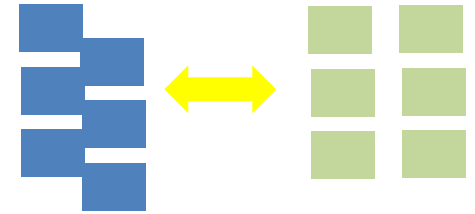
# Data Type Challenges



Data is  
Unstructured

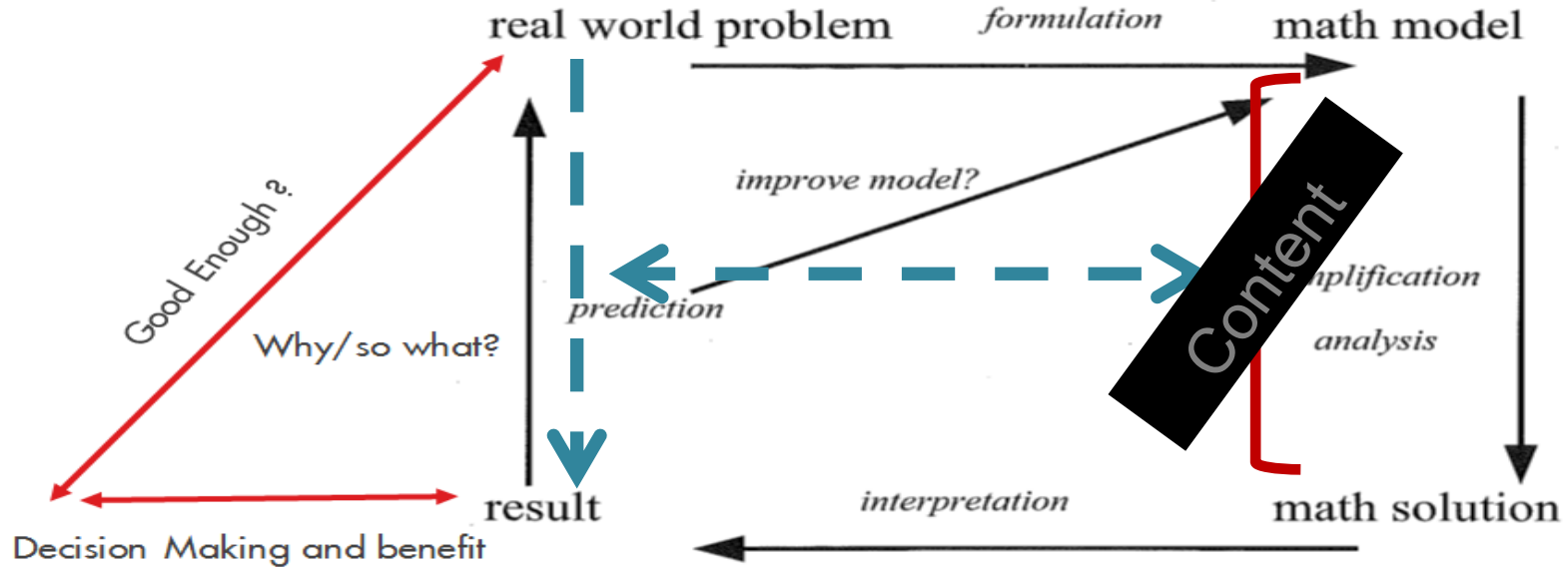


Silo nature of  
traditional workflows



Data is related and  
needs expertise

# The process of modeling real problems mathematically +

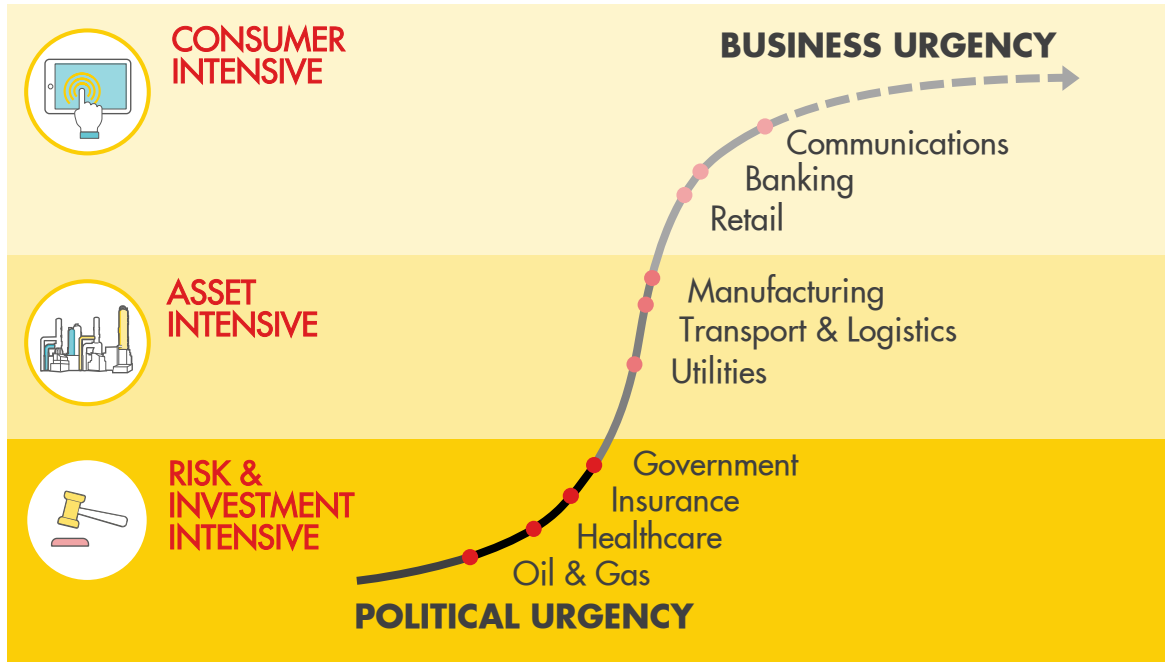


Heavily modified from -The process of modeling real problems mathematically (O'Brien - 2011).

Where we are -- Current Landscape:

Oil & Gas is lagging in digitalisation, but the competition is moving

- Industries are moving at **different paces** to implement digital transformation.



World Economic Forum focusing on digitalisation for Oil and Gas estimate a value of \$1+ TRILLION in the next 10 years

# Essentials:

## Aligning Organizational Structure for Digital Energy Projects

Required Architecture	Essentials	Results
Strategic Business	<b>Culture</b> Vision Mission Road Map Portfolio Management	Clarity and Results
Work Process	Work Process (Matrix) Business Improvement Opportunities Identified	Potential Technical and Business Processes Success
Technical Process	Technology Alignment Development Methods Enabling Capabilities	Technical Success

From SPE Digital Energy Training Program

Saeed Mubarak/Carol Piovesan 2018



# ATCE2018 SPECIAL SESSION:

## The Coolest Session of ATCE2018™

**Data Mining/Machine Learning - What is Different Now? Is it Really New?**

**Wednesday, 26 September - 8:30am – 11:55am (Room D225/226)**

**Moderators: B. Dindoruk & S. Matringe**

- Erdal Ozkan, CSM
- David Reid, Shell
- Jon Ludwig, Novilabs
- Amir Reza Rahmani, UT

# M&I: Data Science and Digital Engineering

in Upstream Oil and Gas

- CKS recognized importance of topics under M&I and approved moving forward with new online publication in June
  - Current environment
  - To fill the gap left (used to have M&I journal)
- CKS proposed the recommendation: passed to the Board for approval on Sunday (PASSED) 😊

# Data Science and Digital Engineering

in Upstream Oil and Gas – An Online Publication

Topics covered include (but not limited to):

- Data analysis applications across industry disciplines
- Artificial intelligence and its applications
- Machine learning and its applications
- Predictive analytics & Decision science
- Digital transformation
- Data analysis theoretical articles (these are more likely to be journal articles referenced in the magazine, rather than strongly theoretical articles)
- Digital energy
- Monitoring/predictive maintenance (this may be included in “predictive analytics”)
- Cybersecurity (critical for corporate, facility, and process levels)
- Robotics and automation (especially in subsea; includes intelligent equipment)
- Unmanned systems, to include drones, AUVs, ROVs, etc. (covered by robotics/automation,
- **Sensors**
- High-Performance computing ....

# Others

- SPE Technical Report on Data Analytics in Reservoir Engineering: Sathish Sankaran (~ March 2018)
- DE Training Curriculum (Saeed and Carol)
- Webinars ...



# Acknowledgements / Thank You / Questions

Any Santos of SPE  
M&I Advisory Board  
All M&I Technical Sections and Work Groups