Digital Oilfield Trends & Opportunities

SPE Members in Transition

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Alex Robart

Managing Director
Unconventional Capital

CEO
Ambyint

UNCONVENTIONAL CAPITAL

ambyint™

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What is Unconventional Capital?

Background

Who is UC?	Backgrounds

UNCONVENTIONAL
CAPITAL

=

Alex Robart

+

Chris Robart

PACWEST CONSULTING PARTNERS

IHS

DIGITAL H2O

booz&co.

CRA Charles River Associates

What have we invested in?

UC Investments

DOF	General Technology

What is Ambyint?

ambyAI: artificial lift insights

Software-only solution using customer data to feed ambyint models and analytics

Implementation: IT only

AmbyAI will deliver:

- Analysis of customer artificial lift data
- Validation of value creation opportunities
- Relevant insights and optimization recommendations

Full value of ambyint solution not realized due to:

- Limited data quality
- Desktop exercise
- Inability to implement recommendations and data science insights in real time at the field-level

ambyControl: end-to-end adaptive control

Hardware+software implementation of end-to-end solution at wellsite

Implementation: field + IT

AmbyControl will deliver:

- High quality, stroke-based data (70-100 records/stroke)
- Real-time AL control (dynamic setpoint changes)
- Advanced diagnostics and predictive analytics
- Automated recommendations to engineers + field
- Automation of routine and low-level actions
- Workflow tools to automate field level tasks/reporting

50% Realization — Value Creation — 100% Realization

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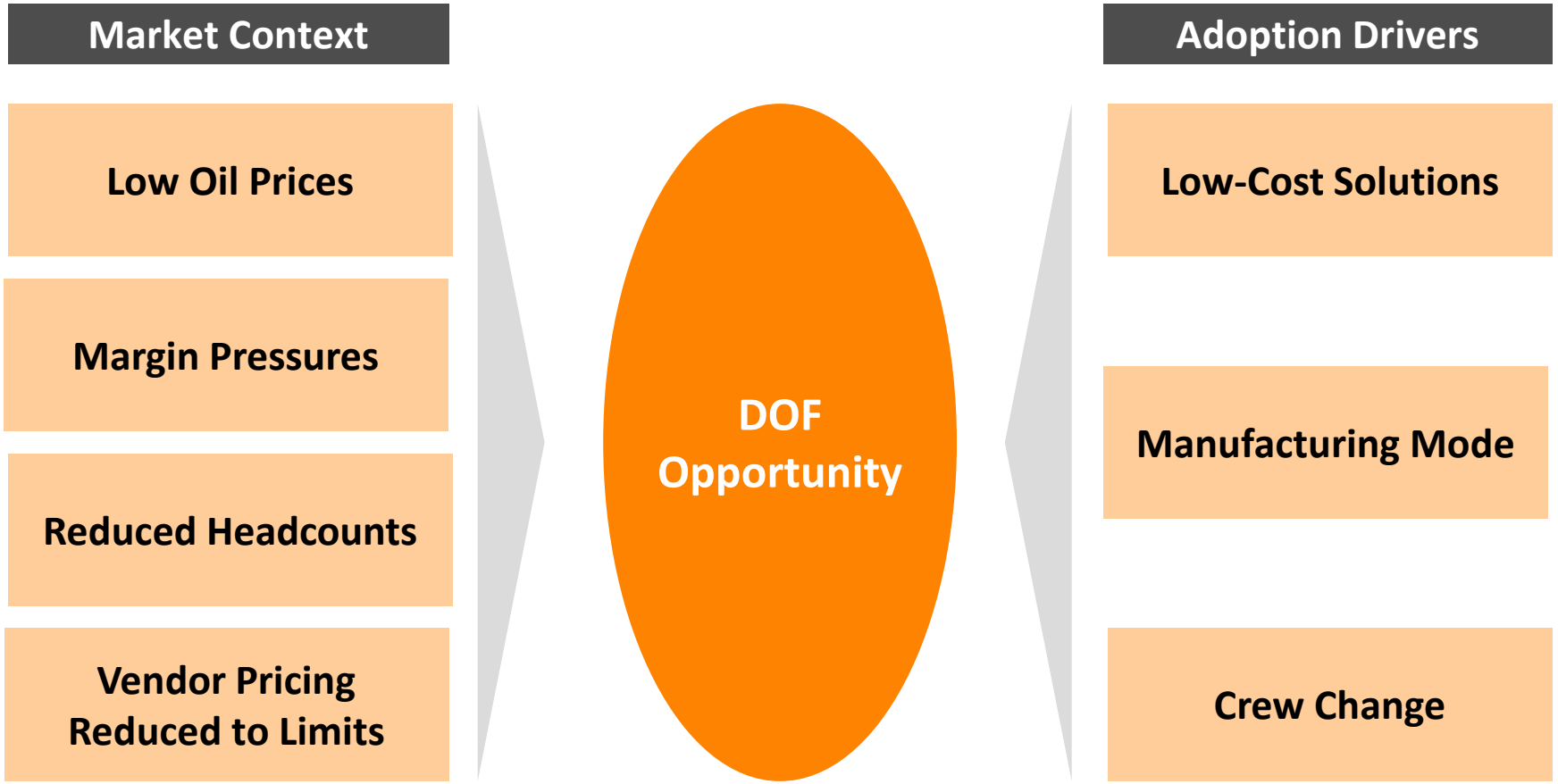
Why does Digital Oilfield (DOF) matter today?

DOF Drivers



Technology-enabled operational models will be a part of the solution

Digital oilfield opportunity is large; changing customer and market structure creating major opportunities

Market Opportunity

Market Characteristics	Description
Changing Customer Landscape	■ Legacy factors held back digital adoption, but evolving market and culture opening way for new wave of adoption
Weak Digital Infrastructure	■ Major gaps and failure to adopt leading-edge technologies
Emerging Startups	■ Early in adoption cycle; wave of immature new startups
Underfunded Landscape	■ Massive early stage gap; few investors with deep oilfield+software understanding

Industry has been a laggard in the adoption of digital oilfield solutions due to legacy barriers; evolving market structure is game-changer

Digital Oilfield Opportunity

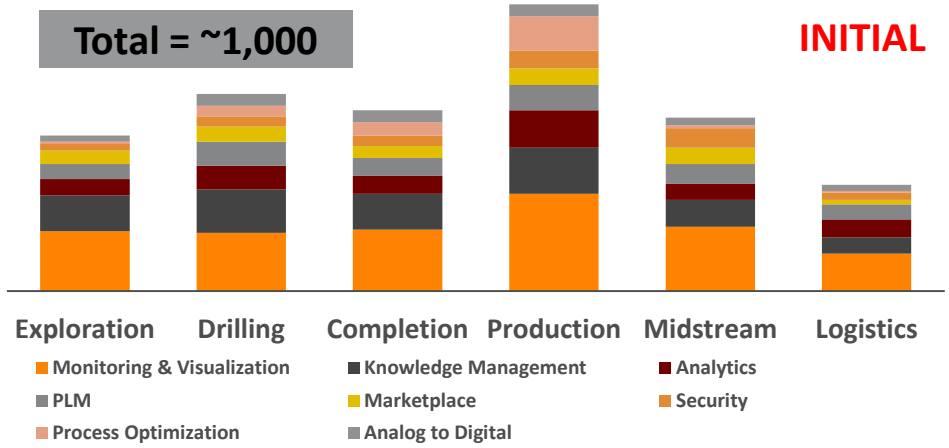
Legacy Barrier	Description	Catalyst	Outcome
Distributed Operations	■ Geographically distributed ops challenged economics of digital	Low-Cost Solutions	NEW OPPORTUNITIES
One-off Project Development	■ Traditional 'one-off' conventional development reduced benefits of digital	Manufacturing Mode	
Supplier Fragmentation	■ Fragmented and complex; barriers between producers, consumers of data	Consolidation	
Cultural Resistance	■ Cultural aversion to digital solutions at field and managerial level	Crew Change	
Production Focus	■ Priority was getting BOEs out of ground as quickly as possible	Margin Pressures	

Digital technologies will be one of the key enablers of new operational models that reduce cost structures and improve recoveries

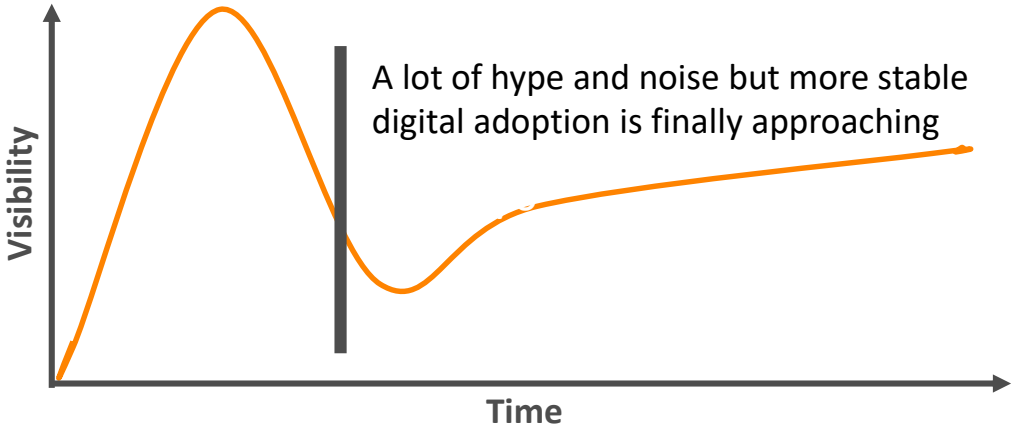
Landscape surging with immature startups, but we are still in early innings of adoption of new generation of digital solutions

Emerging Startups & Industry Adoption

Startup Landscape Mapping



Industry Hype Cycle



Implications

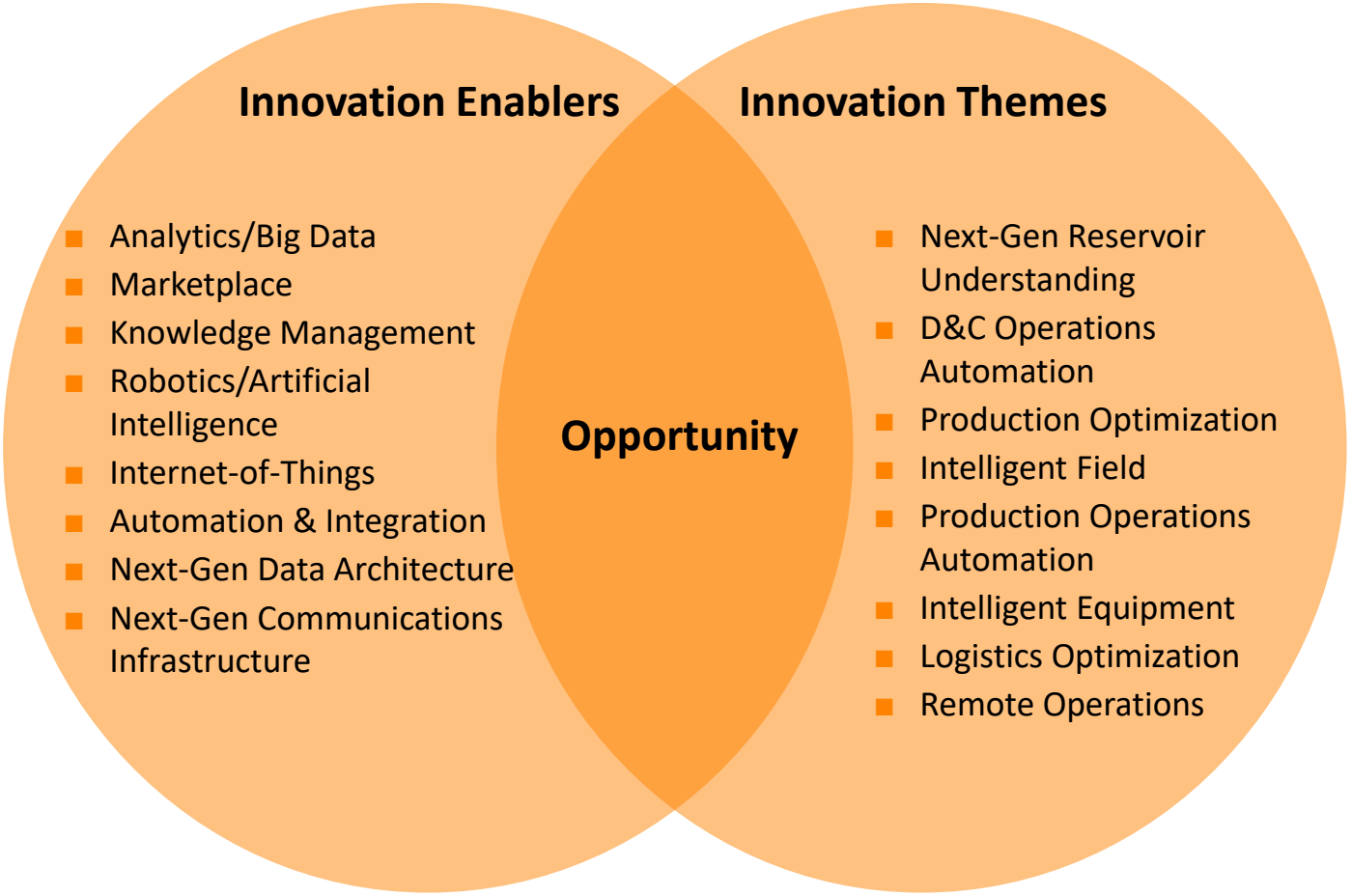
Emerging set of players that customers are struggling to make sense of

Good timing to begin working with customers to develop solutions

Notes: Update to landscaping mapping exercise is in-process

Combining leading-edge technologies to support industry priorities provide company-building opportunities

Innovation Enablers & Themes



Analytics hold great promise, but are not a stand-alone offering; require integration and deep domain expertise

Customer Priority: Big Data/Analytics

Opportunity

- Emergence of new analytics tools (led by Silicon Valley) hold great promise
- Can be generally divided into two broad sets and data architectures/tools, designed to manage different types of data:
  - Data at-rest (ie. data lake)
  - Data in-motion (ie. real-time analytics)
- Customers are enthusiastic about prospects for advanced analytics tools to deliver value across the E&P operation

Required Capabilities

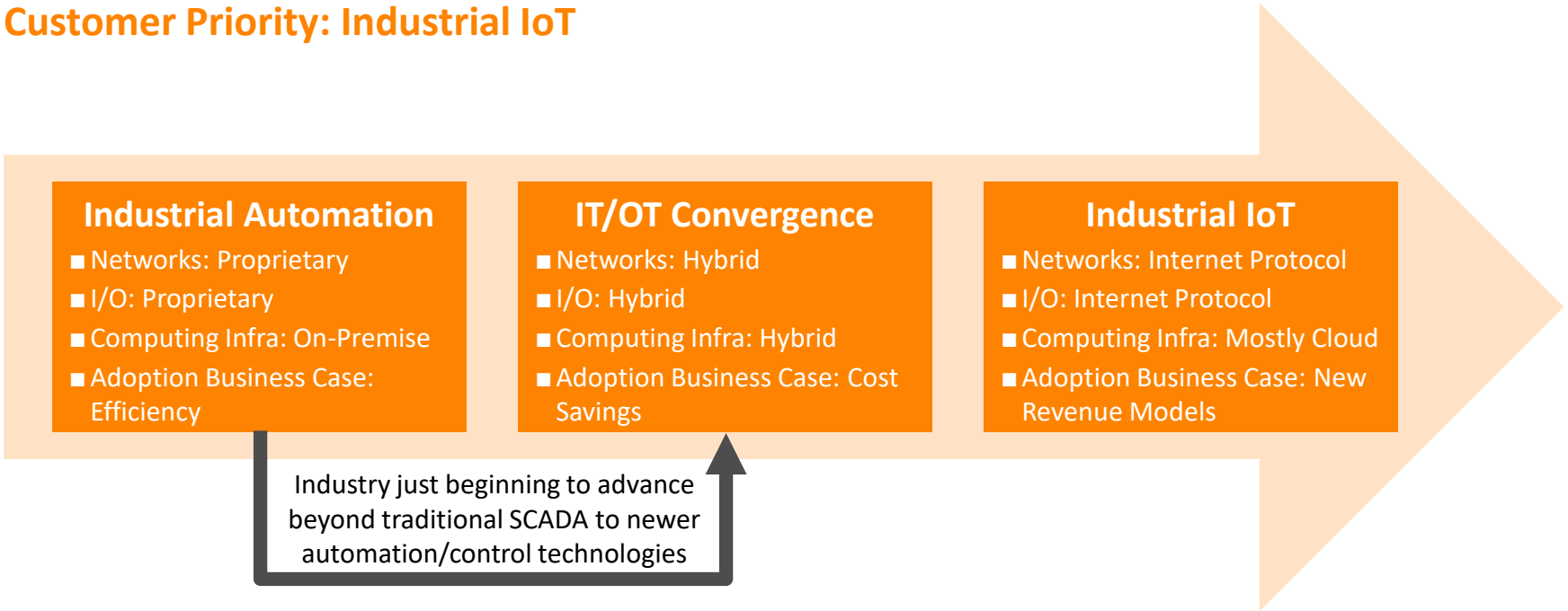
- However, big data/analytics tools require tight integration of three disciplines:
  - Data management: infrastructure in place that manages data and ensures data quality
  - Data analytics: advanced analytics tools that integrate tightly into existing workflow and technology stack
  - Domain expertise: pain point and process knowledge that develop “productized” tools that create value

Barriers

- Most E&Ps have not developed robust data infrastructures that address gaps in data quality
- Sophisticated vendors from outside of industry are struggling to adjust to o/g business models and requirements
- Shortage of O/G domain experts that also understand analytics to drive identification of use cases and “productize” offerings

Convergence of IT and OT (operations technology) will drive shift in decision-making from IT to Operations staff

Customer Priority: Industrial IoT



IT/OT Convergence

- Bulk of IT spend resided within IT org, which exercises primary control over purchasing decisions
- IT/OT convergence requires technology/capabilities be embedded within operations

Decision-Making Implications

- With technology adoption shifting beyond corporate functions, operations will increasingly take a more active role to play in digital decision-making
- Operations will increasingly manage digital spend and lead purchasing decisions

Source: 451 Research

What are customers thinking?

Voice of Customer

Drivers	Investment	Top Priorities
Better	**60%**	**Big Data/Analytics**
Faster	% of companies investing same/more in next 2 years	- Mgmt of large data sets - Real-time visualization/analysis - Real-time alarms
Cheaper	**80%**	**IoT/Automation**
	% of companies investing same/more in next 3-5 years	- Remote asset monitoring - Real-time data - HSE - “As-a-service” models

Perceived barriers: existing workflows + security

Source: Accenture/Microsoft Oil & Gas Digital & Technology Trends Survey, 2015

Industry is complex and so is digital oilfield

Digital Oilfield Segmentation

Exploration

- Seismic Ops
- Reservoir Data Processing & Interpretation
- Lease & Land Management

Drilling

- Well Ops, Planning & Optimization
- Drilling Optimization
- Drilling Ops & Automation
- Formation Evaluation
- Materials Mgmt. Optimization

Completion

- Well Ops, Planning & Optimization
- Casing/Cement Design
- Completion & Stimulation Treatment Design
- Frac Ops & Automation
- Fluids Mgmt. Optimization

Production

- Reservoir Optimization
- Field Monitoring, Automation & Optimization
- Fluids Mgmt. Optimization
- Production Optimization
- Secondary Recovery Optimization
- Asset Integrity, Inspection & R&M
- Well Maintenance & Intervention

Midstream

- EPC Ops, Planning & Optimization
- Flow Monitoring & Ops
- Equipment Automation & Optimization
- Asset Integrity, Inspection & R&M

Corporate

- ERP
- Finance, Accounting & Royalty Mgmt.
- Regulatory, HSE & Compliance
- Supply Chain Mgmt.
- Marketing & Trading

Logistics

- Fleet Ops
- Logistic Optimization

Legend

- = Subsurface Operations
- = Surface Operations
- = Sub/Surface Operations

Note: Segmentation developed by Unconventional Capital and will likely evolve over time

How big is the DOF opportunity?

Market Size

$33 billion

UC bottom-up estimate, based on ~500 companies

$43 billion

Upstream Intelligence estimate

$60 billion

UC top-down estimate, based on global production/revenue benchmark

+5%
5-yr CAGR

UC estimate, based on customer investment feedback

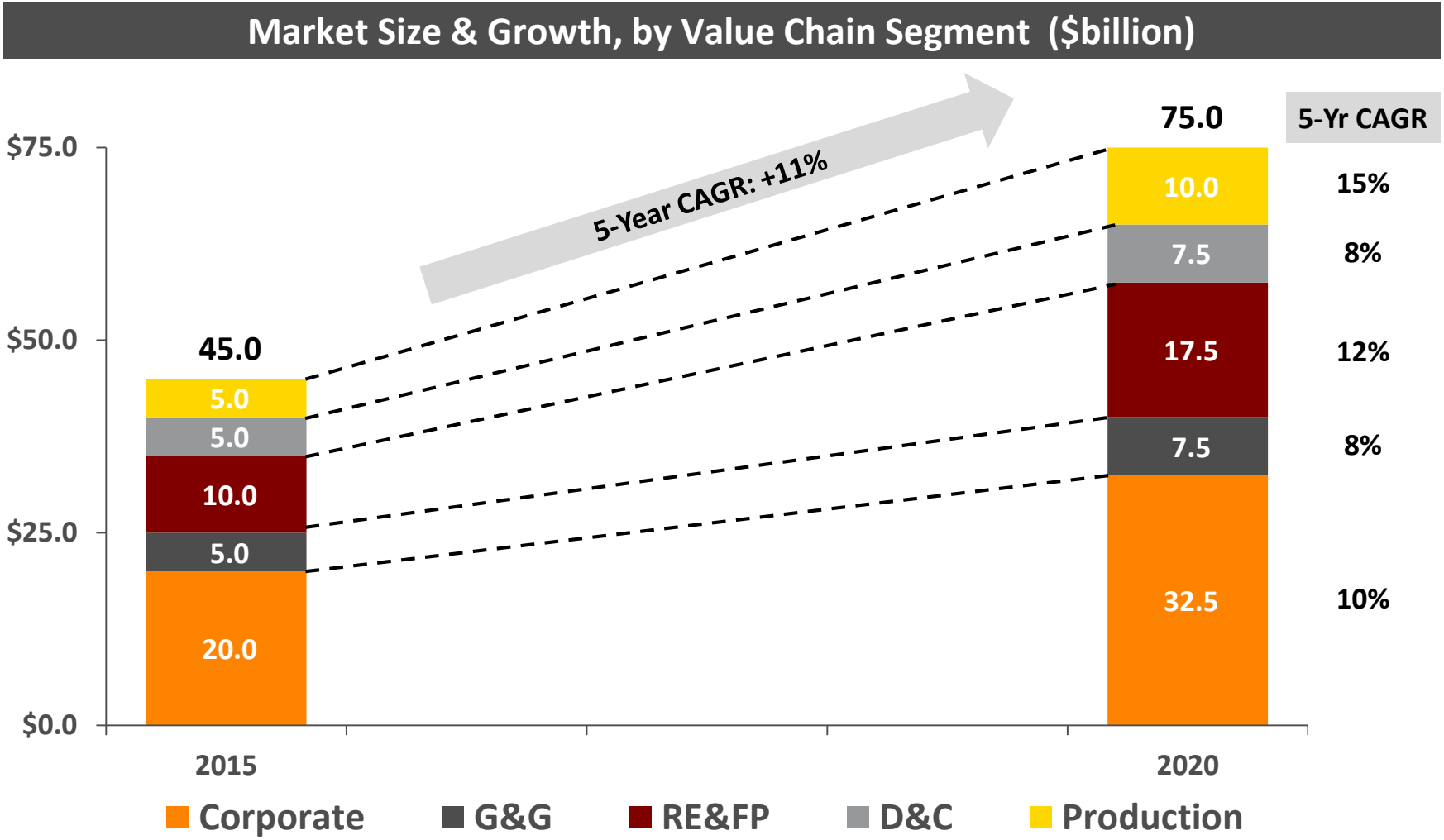
+10%
5-yr CAGR

Upstream Intelligence estimate

DOF likely to achieve above-market growth

UC estimates $45 billion market size in 2015, with 11% CAGR forecast through 2020; expect Production will be growth leader

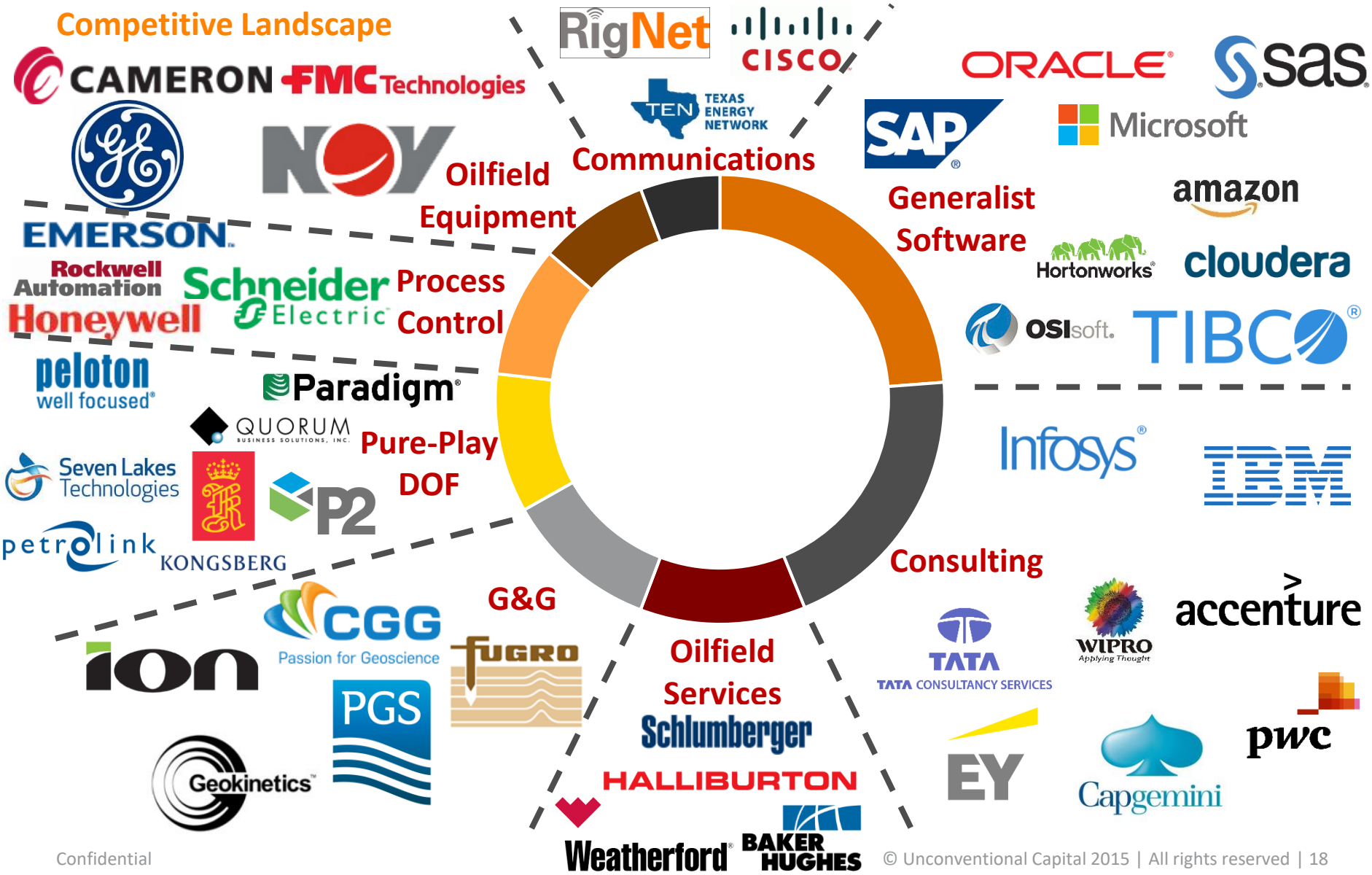
Global DOF Market



Notes: RE&WP = Reservoir Engineering & Field Planning

Source: UC analysis

Who are the players?



What business models do these DOF players employ to serve customers and generate value

Offerings / Business Models

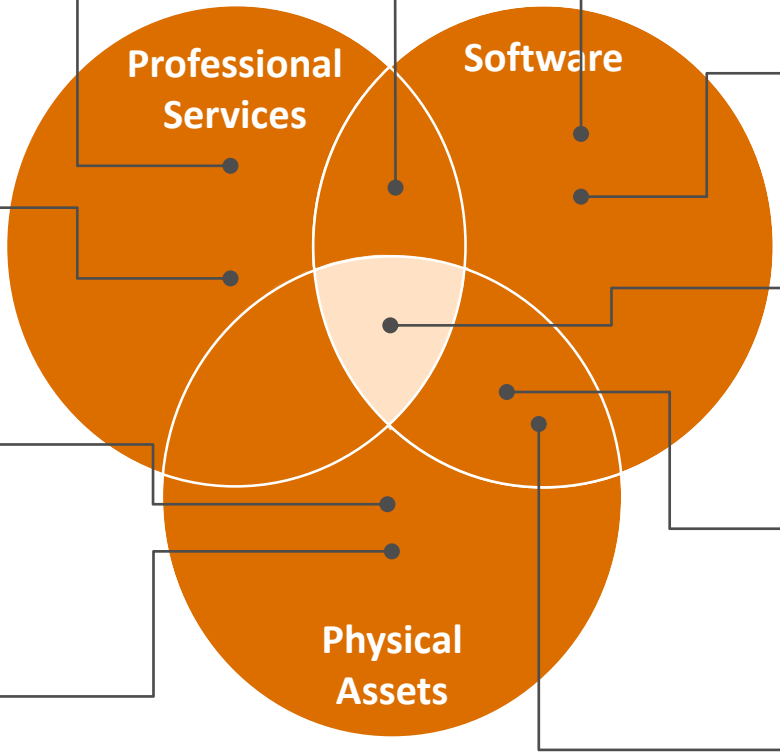
Consulting
Technical consulting services to design or implement solutions

Data/Research
Data and research/insights products

Equipment
Measurement, control, and automation tools provided along-side of equipment

Communications
Communications services, particularly 3G/LTE

Software-Enabled Consulting
Technical consulting services delivered around a software product



Cloud Software
Software delivered via public or private cloud infrastructure

On-Premise Software
Software installed on the customers' data centers or desktops

IoT
Integration of next generation hardware and software tools: SCADA 2.0

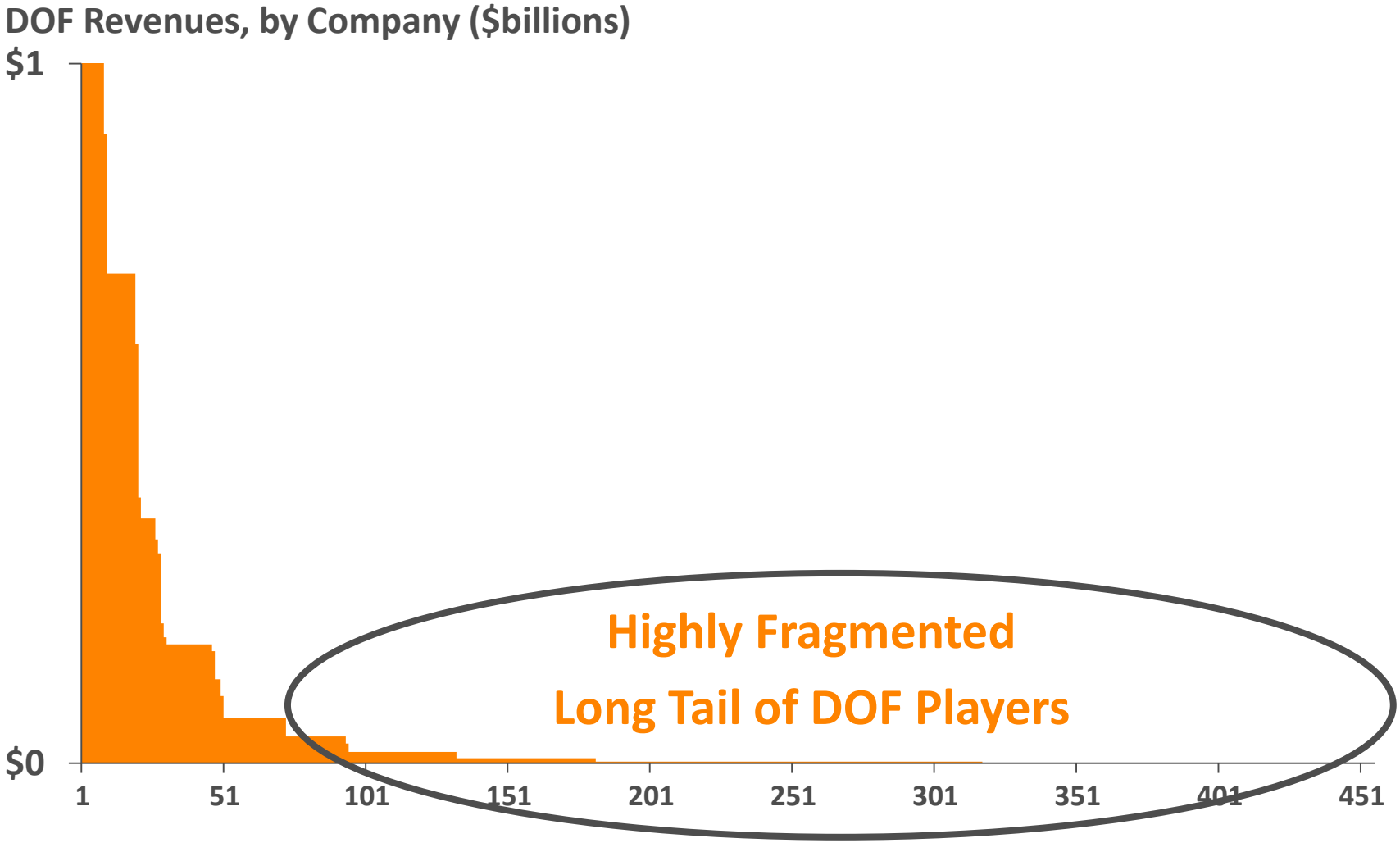
Process Control
Industrial automation offerings, including both hardware and software, such as SCADA

Intelligent Wellbore
Subsurface data acquisition and integration into RE&FP tools

Source: UC analysis

Who owns the DOF market?

Market Structure

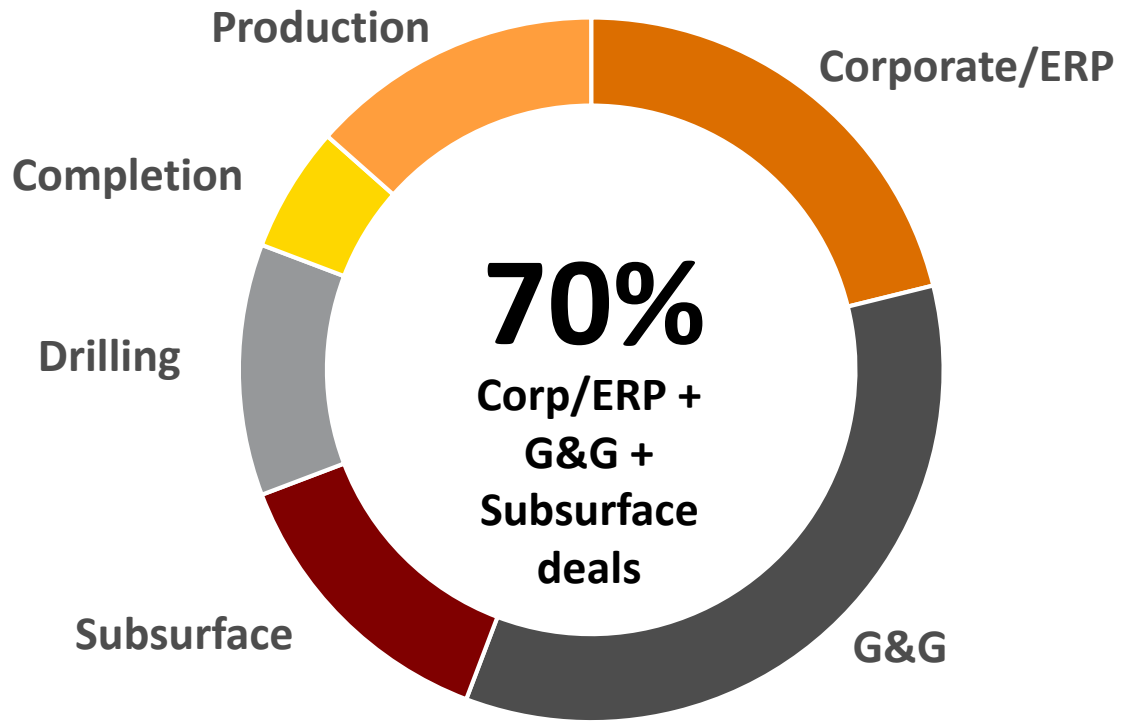


Confidential Sources: UC analysis

Where have DOF investments been focused historically?

Investment Trends

DOF Acquisitions, by Segment(s)



DOF Companies Included

Schlumberger

HALLIBURTON

Paradigm®

P2

IHS

Note: Analysis based on transaction database consisting of ~104 DOF transactions between 1996 and 2015. Acquired companies may operate in more than one software segment. G&G = Geologic & Geophysics. Subsurf. = Reservoir Engineering & Field Planning.

How should we think about investments in DOF?

Investment Prospects

Scalability

Slow customer adoption

+

Niche segments

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Limited scalability

Valuations

High DOF valuations are symptomatic of the broader tech valuation bubble that is just beginning to deflate

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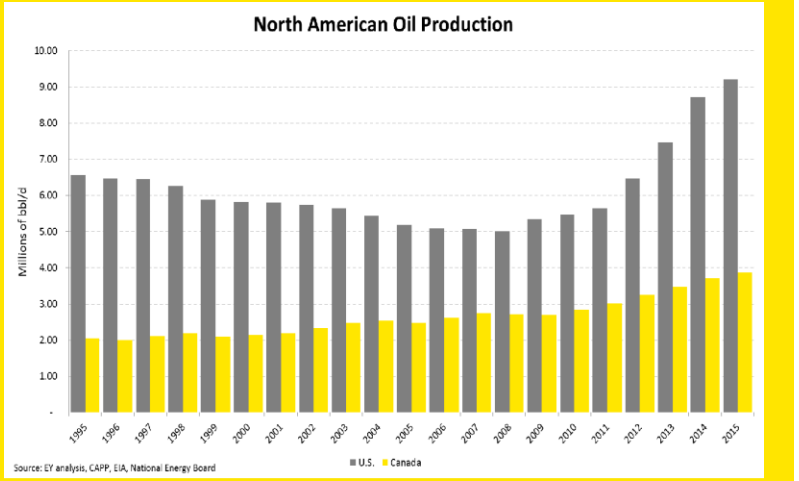
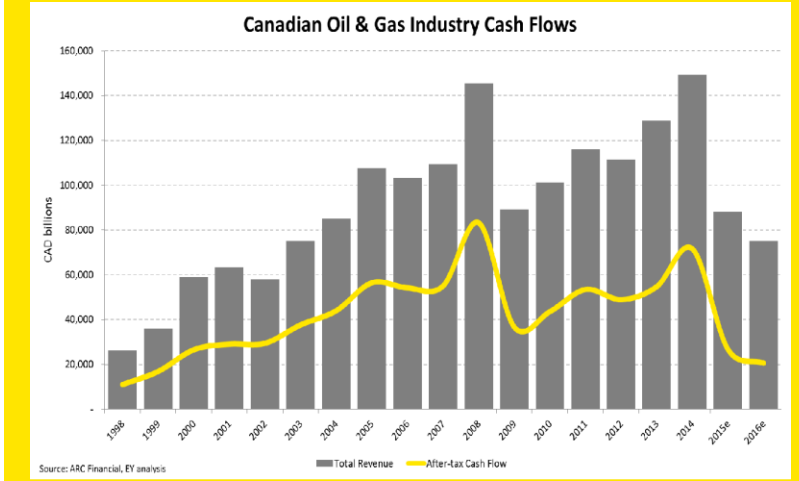
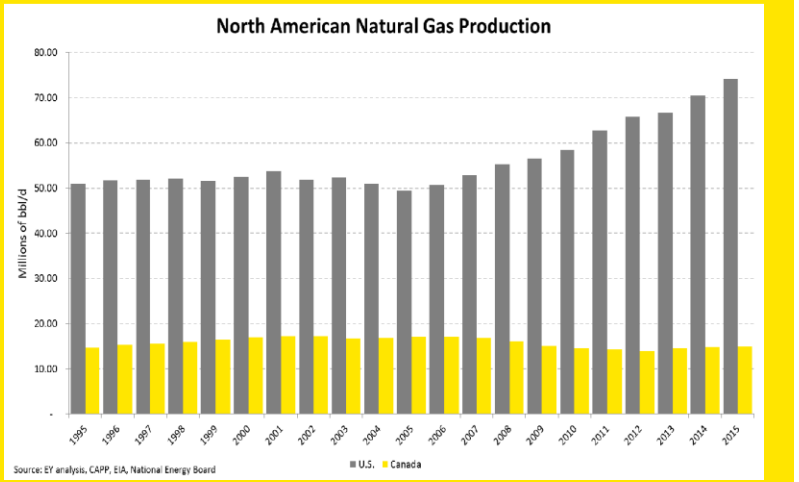
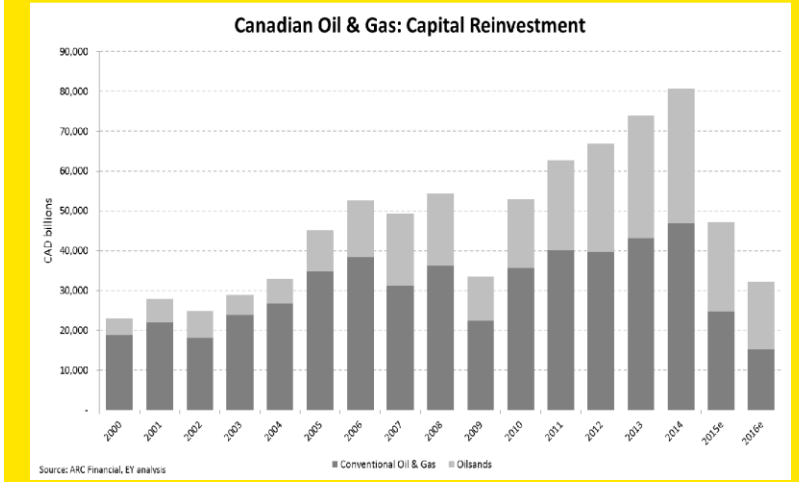
NAM oil production continues to grow…

Industry Context





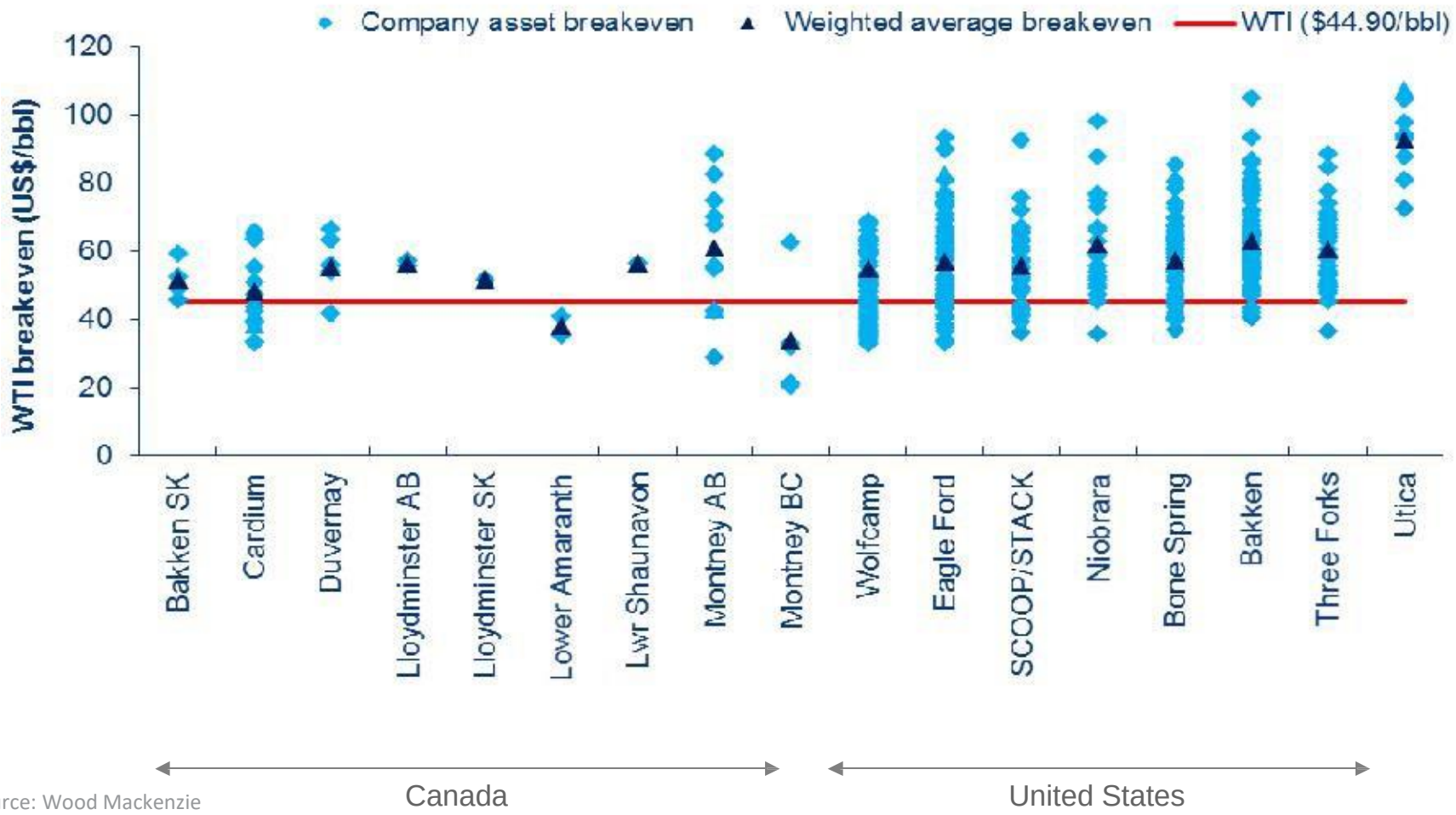




Source: ARC Institute

… While capital and operating costs continue to fall

Well Breakeven by Basin



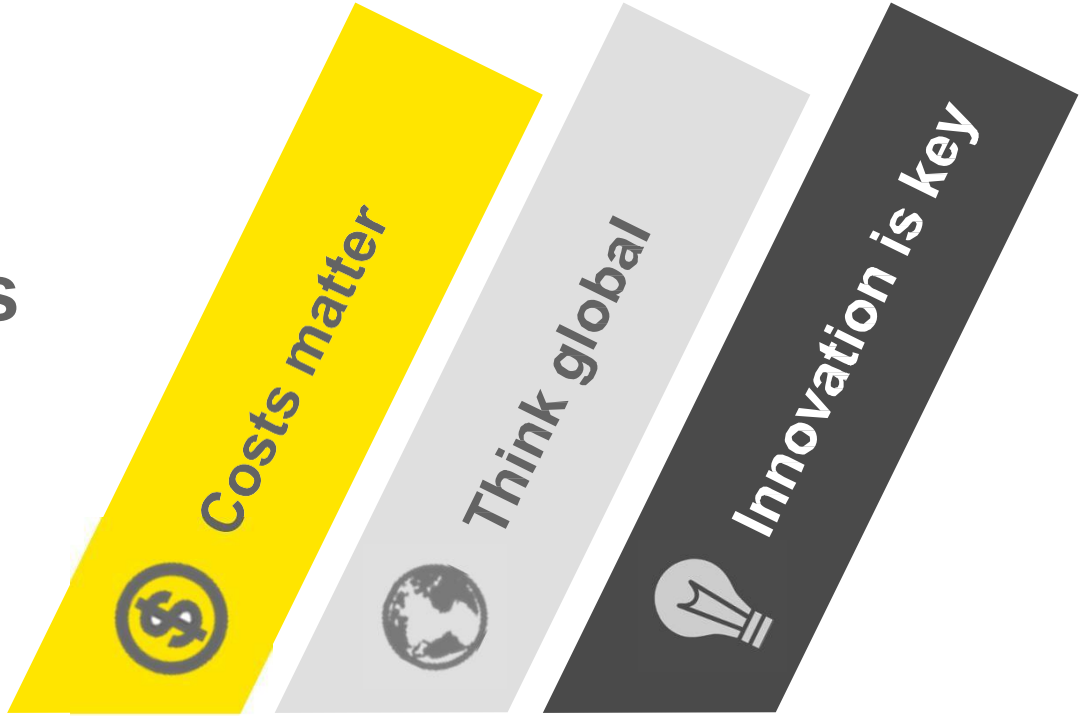
Source: Wood Mackenzie

In this “new normal” environment, costs and innovation matter

Transition Underway

From **Scarcity** to **Abundance**…

Structural changes
are underway…



…Winners and losers will emerge

Source: EY

Operational excellence is increasingly a critical factor

Operational Excellence

Operating Costs

Capital Costs

Operating Model

The survival focus to date:

- Cut operating costs
- Cut capital costs, capital spending
- Monetize assets where possible
- Preserve cash

The winner's focus for tomorrow:

- Excellence in business processes; and
- The "right" operating model

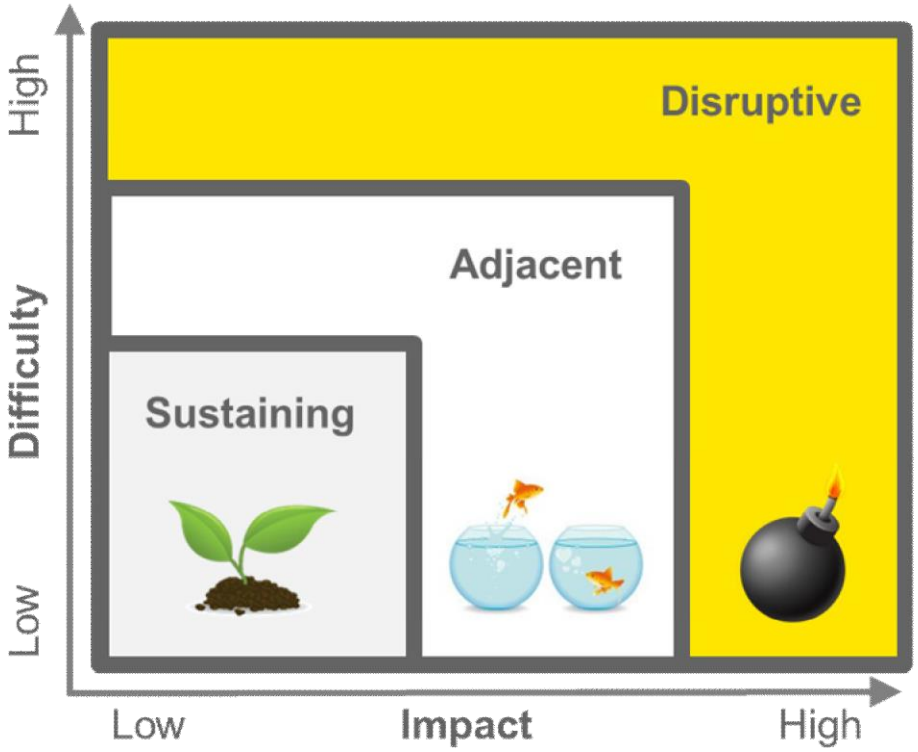
Elements of the "new" Standard Operating Procedure

- **Alignment**
- **Sustainability**
- **Rigour**
- **Collaboration**
- **Scalability**

Confidential Source: EY

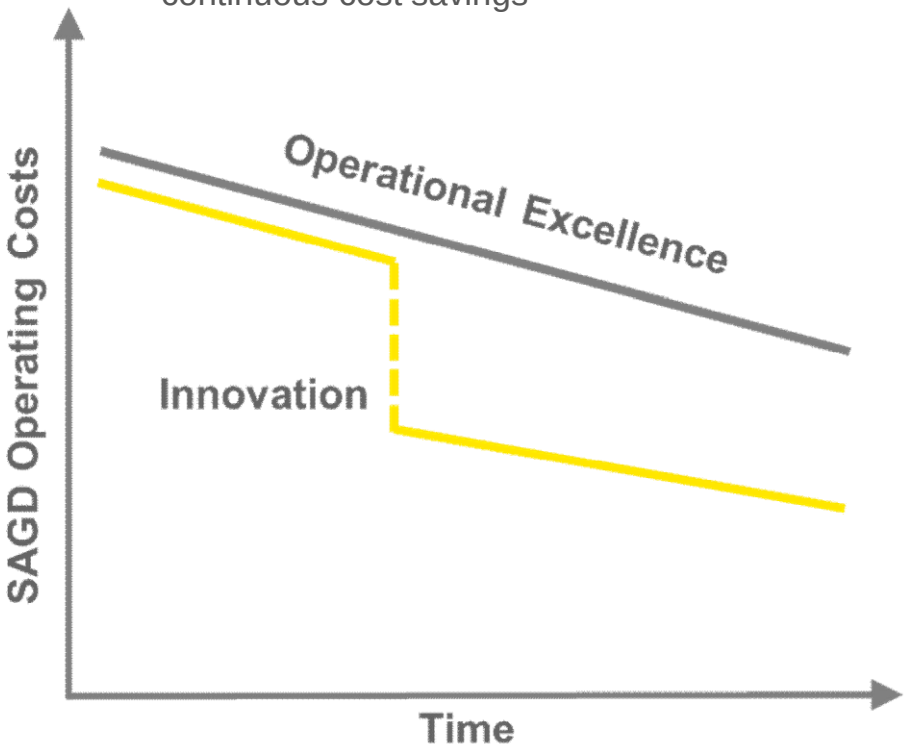
Innovation is a core element of operational excellence

Innovation



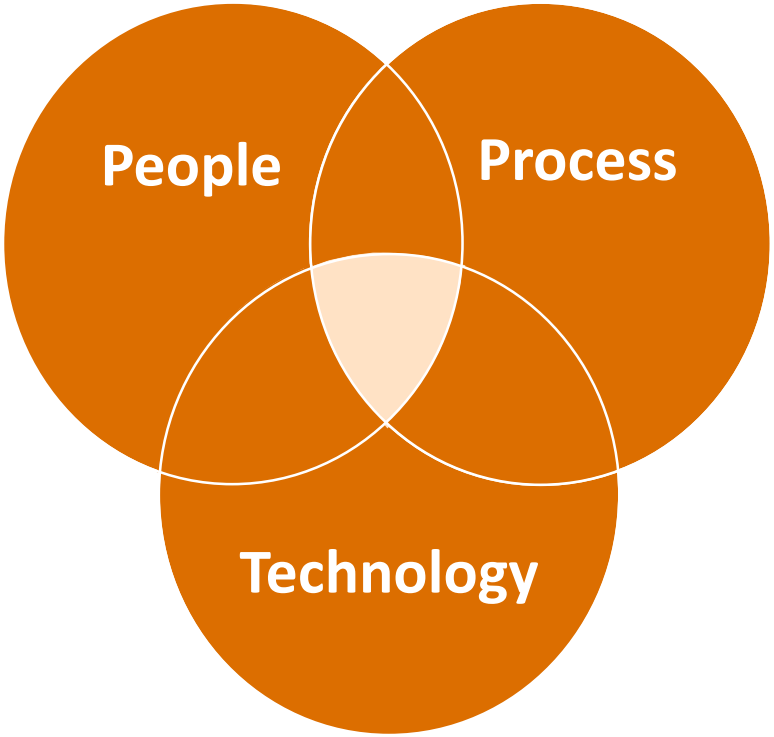
- Innovation expansion: transition through the innovation spectrum
  - moving from sustaining innovation - low cost-low impact
  - to disruptive innovation - high cost-high impact

- Disruptive innovation - creating a step change shift, while operational excellence results in continuous cost savings



Innovation/Technology does not generate value in isolation

Delivering Value with Technology



Petroleum engineering fundamentals remain critical but new skills are increasingly important

New Skills = New Opportunities

Operations & Process	Digital & Technology
Continuous Improvement	Software Engineering
Intelligent Process Automation	Data Science
	Embedded Systems

Contents

Entrepreneurship is hard work, a lot of fun, but definitely not for everyone

Entrepreneurship?

- **What does it mean to be an entrepreneur?**
- **What are the key qualities?**
- **How do you learn to be an entrepreneur?**
- **8 qualities that I think are critical parts of entrepreneurship…**

Risk and entrepreneurship are fundamentally intertwined

Entrepreneurial Factor 1

Risk-Taking

You need to work harder than most people for a lot of years to learn enough to succeed as an entrepreneur

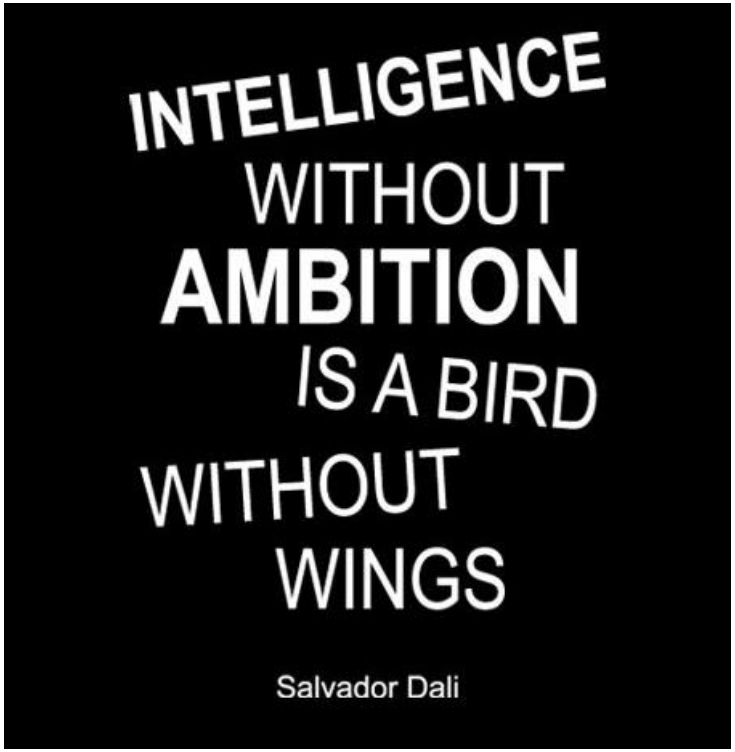
Entrepreneurial Factor 2

Hard Work

Intelligence is obviously important, but there are a lot of smart people in the world; drive just as important

Entrepreneurial Factor 3

Intelligence



Entrepreneurship involves a great deal of creativity to generate new ideas and solve problems

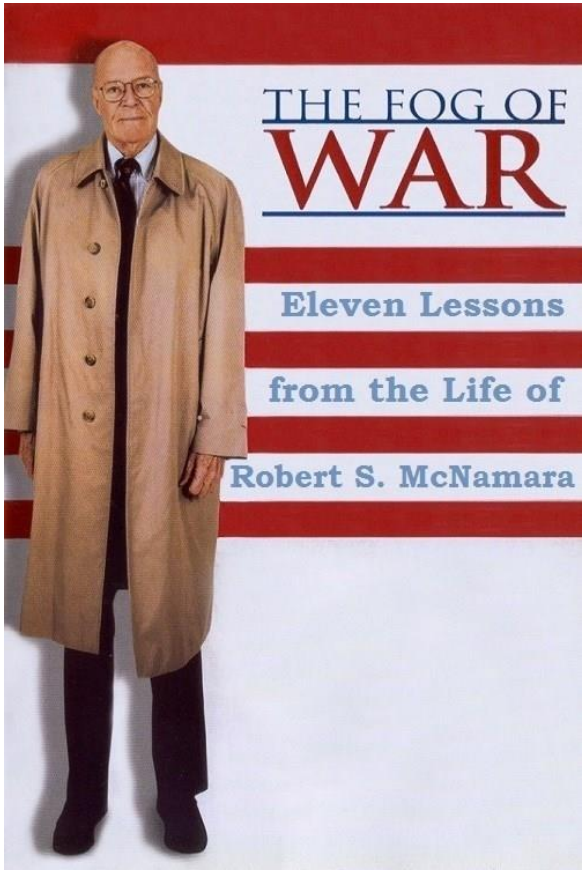
Entrepreneurial Factor 4

Creativity

Some entrepreneurs are so smart that they do not need it, but it has been critical to my success

Entrepreneurial Factor 5

Emotional Intelligence



Lesson 1
Empathize with
Your Enemy

Best laid plans… nothing ever happens according to plan

Entrepreneurial Factor 6

Adaptability

There are probably no successful entrepreneurs who didn't have at least one failure… lessons learned

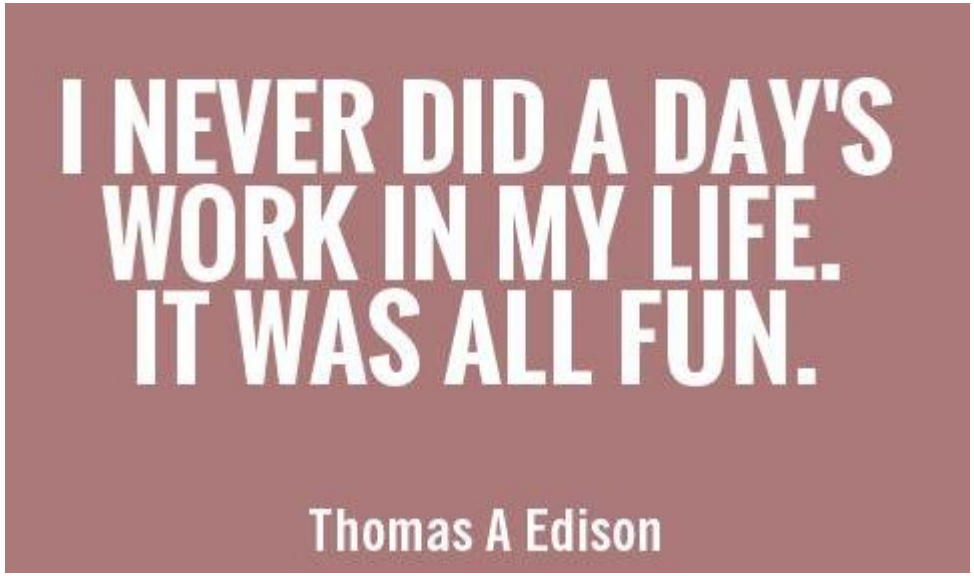
Entrepreneurial Factor 7

Failure

If you don’t enjoy what you are doing, it makes it really hard to succeed

Entrepreneurial Factor 8

Fun



Entrepreneurship is hard work, a lot of fun, but definitely not for everyone

Entrepreneurship?

- **Solving a real customer pain point?**
- **Is the solution scalable?**
- **Can the team execute?**

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Discussion?

