



Global Refining & Petrochemicals Congress

Future of Production: Accelerating value creation

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Agenda

- ***Why are we talking about future of production?***
- *What will it look like for downstream O&G sector?*
- *What are implications for organizations and policy makers?*

What is “Production” and why it matters!

Production is more than manufacturing...

Sectors included in production: manufacturing, trade, transportation and warehousing and support (engineering, design, admin...)



... and that's why production matters!

Collectively, these sectors have been a source of economic growth for developed and developing nations alike, providing well-paid jobs for an increasingly skilled workforce and contributing disproportionately to innovation and exports

~30%

**Global GDP
contribution**



850+ mn

Jobs worldwide



>70%

**Global innovation
(patents)**



>80%

Global exports



World is rapidly changing today with several technologies becoming more powerful - all at the same time

Technology growth trend (2015 to 2020e)

Worldwide					
IoT - No. of connected device (Mn)	Global cloud IP traffic (Exabytes)	No. of smartphone sold (Mn)	No. of Facebook users worldwide (Bn)	Big data (zettabytes)	AI revenue (Bn USD)
2015	2015	2011	2008	2015	2015
18	3,851	472	145	8	126
23	5,636	680	360	10	260
28	7,712	970	608	15	354
35	9,802	1,245	845	23	482
42	11,850	1,424	1056	32	656
50	14,076	1,495	1230	48	892
2020E	2020E	2016	2013	2020E	2020E

CAGR

22%

30%

26%

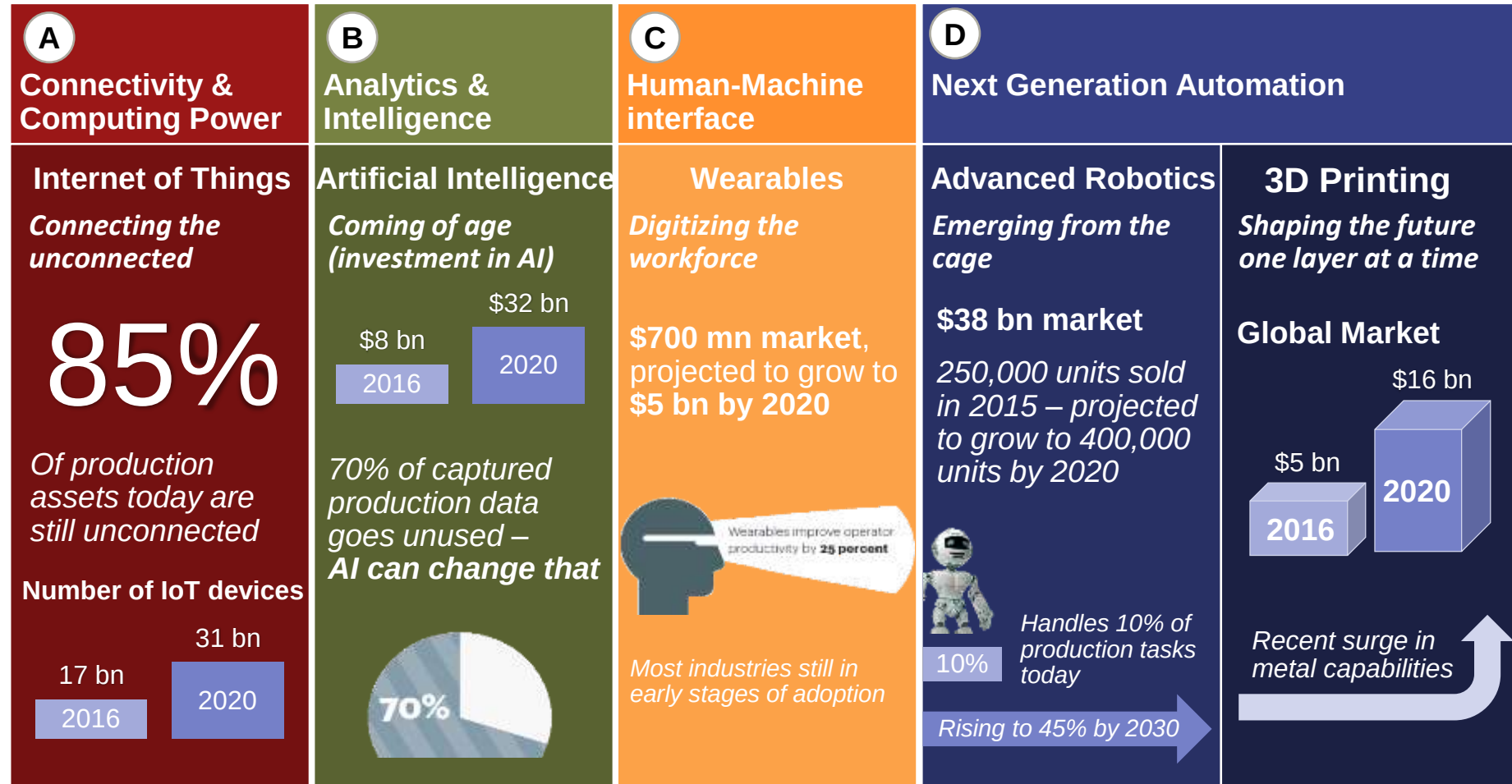
53%

45%

48%

Four key capabilities, comprised of the five digital technologies are leading this revolution...

Key Technologies of the 4th Industrial Revolution



... and are finding increasing adoption with numerous tangible business applications

Emerging digital technologies for businesses

Not Exhaustive

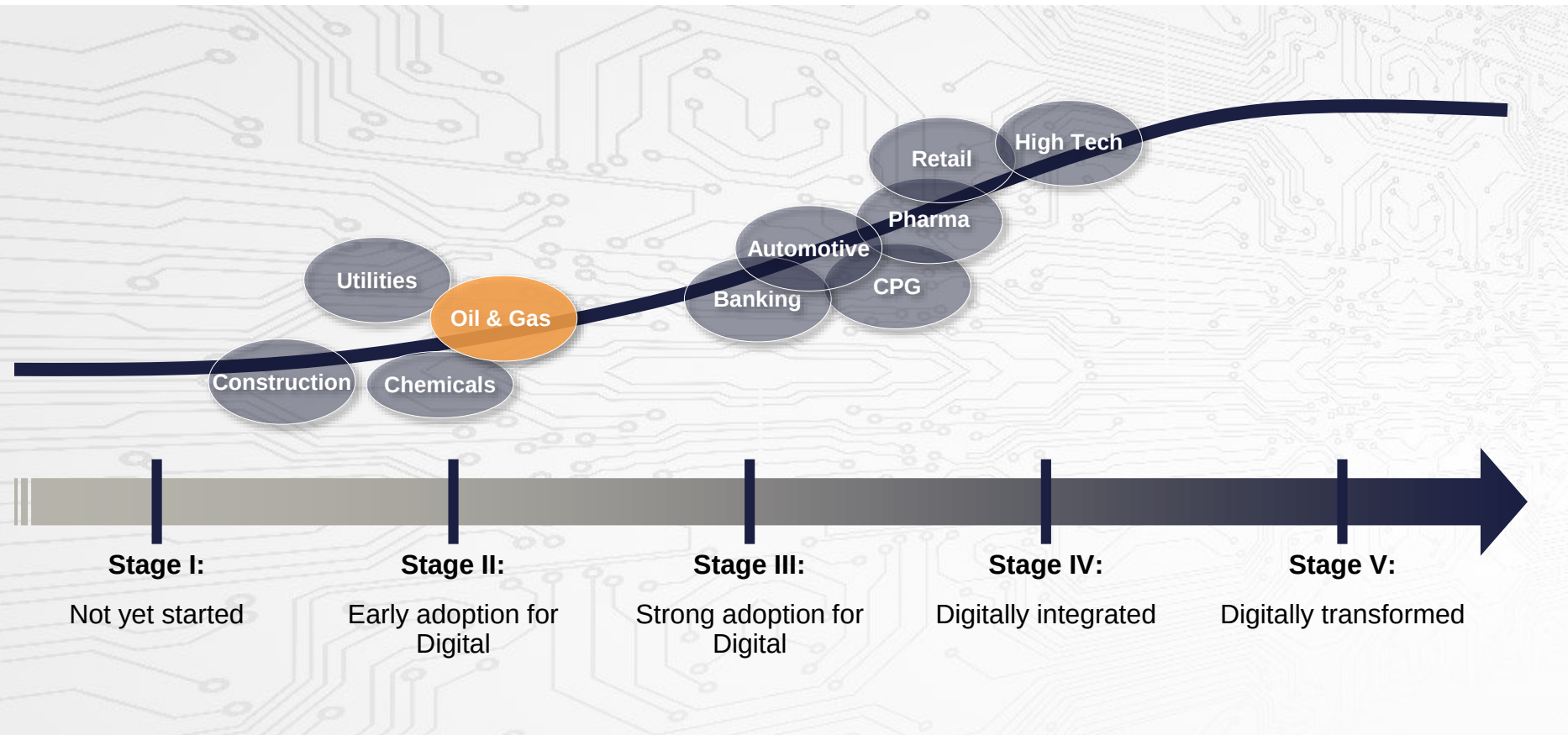
Technology	Description		Selected Applications
A	 Internet of things	Internet of things is the seamless combination of embedded intelligence, ubiquitous connectivity, and deep insights	• Connected equipment • Environment monitoring • Energy management
	 Digital knowledge	Digitization of knowledge creates a vast opportunity to improve worker training, knowledge sharing and employee collaboration, as well as a bottom-up knowledge channel	• Knowledge transfer • Training • Production planning
B	 Advanced analytics	Advanced analytics enhances business intelligence capabilities from insight (current state) to impact (what-if scenarios); example areas are predictive and big data analytics, machine learning, and location intelligence	• Predictive maintenance • Advanced planning systems
	 Machine learning & AI	Applications from machine learning (e.g. deep learning, pattern recognition) can bring automation to a large span of diagnosis and decisions (e.g. planning, resource allocation) bringing faster, more autonomous workflows	• Demand planning • Predictive maintenance • Quality control
C	 Augmented reality	The integration of digital information with live video or the user's environment in real time. AR takes an existing picture and blends new information into it	• Maintenance assistance • Materials pre-batching
	 Wearables	Electronics that can be worn on the body, either as an accessory or as part of material used in clothing. Typically connected to an intranet or the internet, enabling the capture and sharing of textual, audio, and visual data	• Personal Protective Equipment • Inventory Tracking
D	 Advanced robotics	Devices that act largely, or partly, autonomously and interact physically with people or their environment and that are capable of modifying their behavior based upon sensor data	• Smart handling robots • Collaborative robots
	 3D printing	Manufacturing process through which 3D solid objects are created; it enables the creation of physical 3D models of objects using a series of additive or layered development framework	• Spare parts / specialized components (e.g. in maintenance)

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The Oil and Gas industry has not been an early adopter of Digital... though it is now moving fast

Digital maturity curve



We anticipate digital technologies to transform entire value chain for the sector in the coming years (1/2)



Improved **asset management** through better failure prediction, predicting corrosion, use of handhelds to improve maintenance processes, robotics for inspection



Optimized **operations** through data analytics, remote operations management



Micro-segmentation of customers based on behaviour



Development and delivery of unique **propositions** to specific customers

Refinery



Product Distribution



Product Marketing

B2C



B2B



Capital Projects



Better **collaboration** across contractors using “single source of truth”, contractor tracking, efficient handover of engineering data to operations

We anticipate digital technologies to transform entire value chain for the sector in the coming years (2/2)



Improved **asset management** through better failure prediction, predicting corrosion, use of handhelds to improve maintenance processes, robotics for inspection



Optimized **operations** through data analytics, remote operations management



Micro-segmentation of customers based on behaviour



Development and delivery of unique **propositions** to specific customers

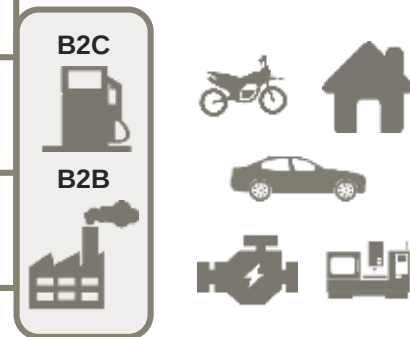
Refinery



Product Distribution



Product Marketing



Supported by

Supply Chain



Optimised **planning** and effective **scheduling** by leveraging cloud and collaboration technologies

Safety



Location tracking to alert **man down**, effective **incident response**, fatigue prediction

Workforce



Improved **productivity**, effective **training**, improved **engagement**

Enterprise



Increased **automation** (RPA), greater insights through **analytics**

Sensors and analytics will drive significant value in asset management

Asset Management



- **Predictive equipment degradation / failure** using analytics:
 - Plant-wide data as against equipment-specific data
 - Structured / unstructured data
 - Unique for each equipment
 - High accuracy
- **Benefit:** Improved availability, reduced maintenance cost



- **Predictive corrosion** using analytics
- **Benefit:** Reduced inspection costs, better availability



- **Improved maintenance effectiveness** using hand held devices



- **Use of robotics for inspection**
- **Benefit:** Improved quality of inspections, reduced risk

Digital technologies will enable real time decision making and create ubiquitous connectivity to improve operations

Operations



Optimized Operations

- **ANALYTICS** of process and other data to optimize operations
- **EARLY IDENTIFICATION** of operations issues, minimizing losses



Remote Operations

- **MANAGE** operations from a remote location using range of digital technologies
- **BENEFITS** include
 - Better leverage of **scarce skilled manpower**
 - Easier to transfer **best practices**
 - **Optimal** decision making

Digital will enable improve data transparency and collaboration in capital projects

Capital projects

Improved Project Outcomes

- “Single source of truth” data management
- Improved visualization of project control metrics

Improved Project Controls

- Better collaboration between owner and contractors leveraging **collaboration technology**

Improved Contractor Productivity

- Worker tracking
- Identifying inefficiencies

Improved Handover of Engineering Data

- **Shared platform** for efficient data handover



Digital technologies will find increasing application in supply chain optimization (1/2)

Supply Chain: Planning example



Typical Issues

- Planning cycle **takes too long**
- Data management



Digital Solutions

- Planning solutions **on cloud**
- **Integrated digital platform** for data management



Benefits

- **Quicker and easier** to do planning run
- Planning can be done much **more frequently**

Digital technologies will find increasing application in supply chain optimization (2/2)

Supply Chain: Scheduling example



Typical Issues

- Operational issues require **rescheduling at short notice**
- Extremely **dependent on scheduler availability**



Digital Solutions

- Scheduling solutions **on cloud**
- Available on **mobile devices**
- Integrated digital platform** for data management



Benefits

- Ability to **quickly reschedule** from “anywhere” ...
- ... resulting in **optimal response**

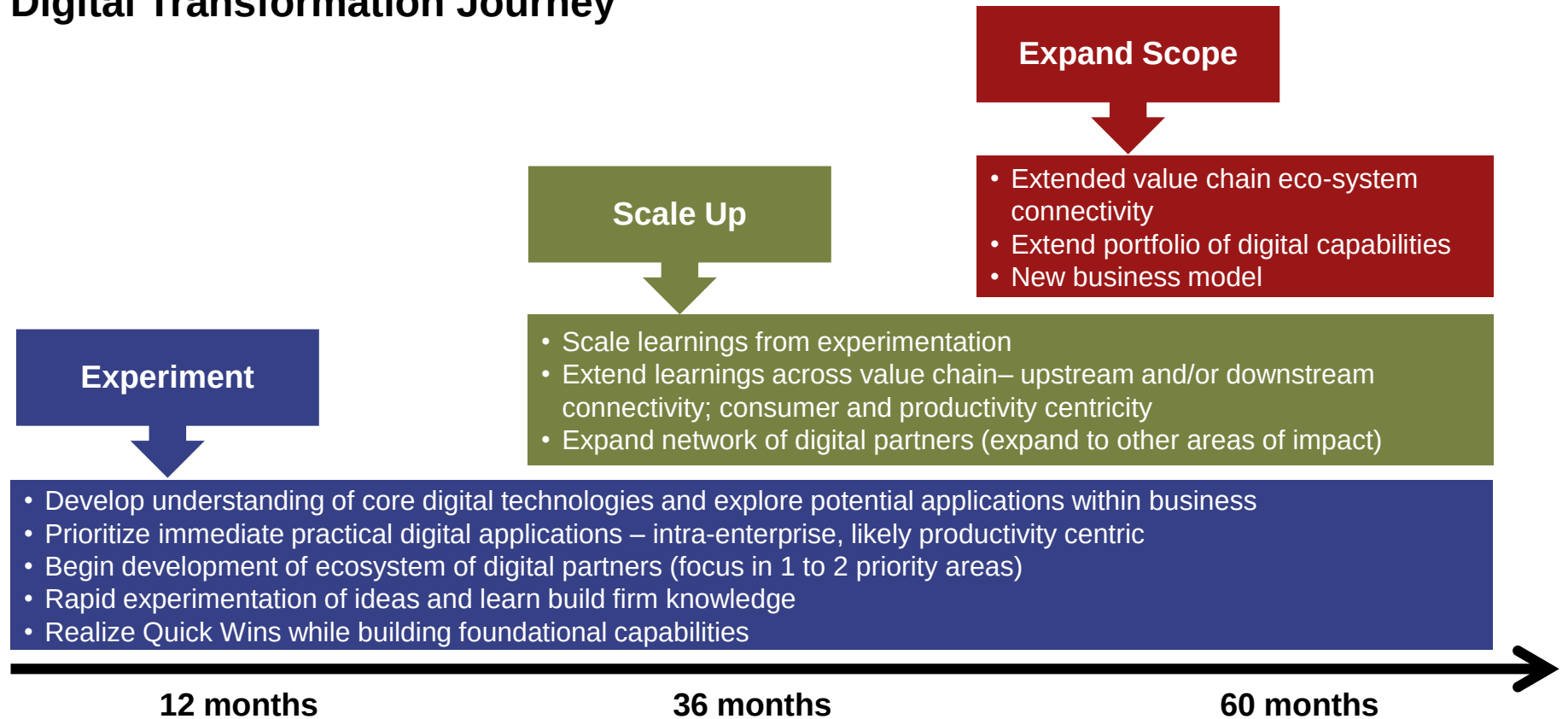
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Digitization is a transformational journey – begins with practical experimentation ...

Illustrative

Digital Transformation Journey



... that builds foundational capabilities and gain gains momentum as we build scale and scope

We see five key factors for companies to develop and successfully execute Digital Strategy

Key Success Factors in Digital Strategy

Key success factor	Description	Rationale
 Top-Down Mandate	- Establish a clear CxO level commitment and disseminate to all stakeholders - Create one digital vision	- Break up resistance to change - Break up silos of digital efforts - Align to one common goal
 Holistic Initiative	Embrace digital as a holistic transformation initiative – All aspects of business need to be addressed	- Siloed initiatives does not offer full potential - All core dimensions need to transform – product, customer experience, supply chain and operating models
 One Digital Accelerator	- Setup digital accelerator to develop, test and scale ideas to market - Direct report CxO	- Synchronize Digital activities - Faster route to market - Ensure delivery due to one clear responsibility
 Start-Up Culture	- Failure as learning – not blame - Agile working methodologies – e.g. minimum viable products	- Allow bottom-up entrepreneurship - Attract to new talents - Shorten time to market in Digital
 Active Change Management	- Communication for organizational buy-in - Digital community people pro-actively want to be involved	- Create a positive atmosphere – Digital is a change – not a threat - Scale Digital across departments for further momentum

Thank You

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