Industry 4.0: 101 – A Simplified Guide to the Fourth Industrial Revolution and its Application in the Oil and Gas Industry*

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Abstract

The fourth industrial revolution or Industry 4.0, is clouded today with technical jargon and confusing concepts. Concepts such as Artificial Intelligence (A.I.) and Machine Learning have attracted a lot of attention in recent times, where in fact, these concepts have been in use and actively utilized for years in various industries around the world. More specifically, the oil and gas industry has been a significant venue for the deployment of such advanced technology applications. This presentation will provide a simplified overview and a more accurate definition of Industry 4.0, discussing best practices and adoption value, to reflect how the revolution has materialized in the oil and gas industry over the past decade. This presentation will cover some of the latest industry 4.0 concepts such as IOT, IIOT Big Data, Machine Learning and A.I. in full technical detail, before diving into industry best practices, and lessons learned. We will also explore the true definition of each of these terms and how they interact, as integration is the key element in developing successful technological solutions. We discuss "Subject-Matter-Expert Machines", an integrated technological approach that has yielded significant increase in optimization and efficiency, while reducing cost in the industry. Although Industry 4.0 shows great promise, evident in recent advances and various applications in the oil and gas industry, challenges and gaps are still present and areas of high potential return are yet to be discovered.

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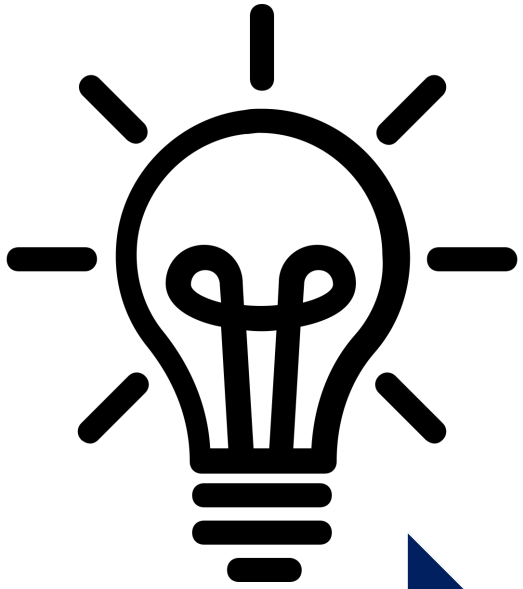
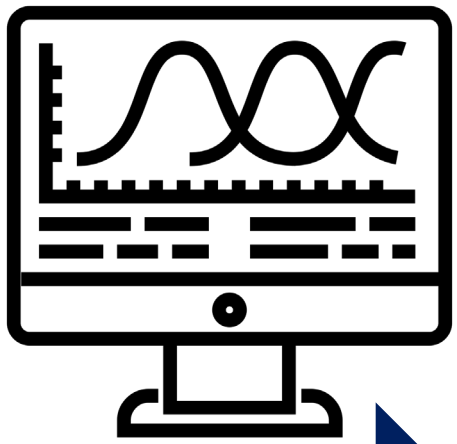
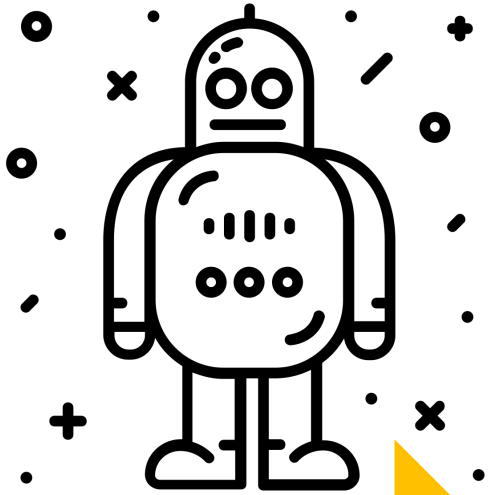






1st

Mechanization

Steam & Water Power

2nd

Mass Production

Electricity & Assembly Line

3rd

Digital

Computer & Automation

4th

Cyber-Physical

Cyber Physical Integration

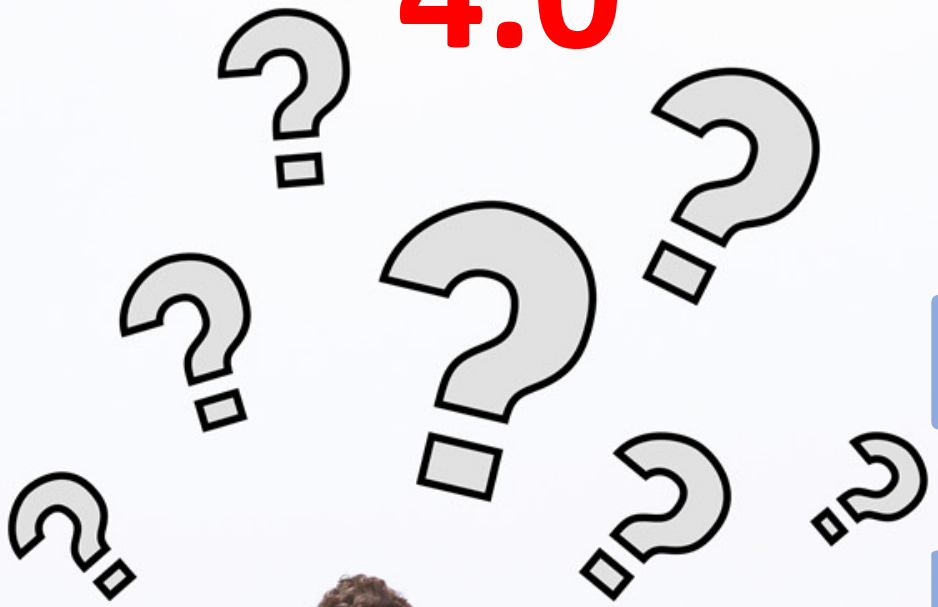
Artificial Intelligence

BIG DATA

4.0

IoT

IIoT



Deep Learning

Machine Learning

Data Science

Data Analytics

ARTIFICAL INTELLIGENCE

Machine completing a task based on a set of stipulated rules

IF object weight = 175g

AND color = orange

THEN object is an ORANGE

EXAMPLE: Car not starting if not in Park

MACHINE LEARNING

Machine making a decision based on training algorithms

Weight (g)	Color	Fruit Type
175	Orange	Orange
168	Orange	Orange
125	Red	Apple
138	Red	Apple
133	Red	?

EXAMPLE: Siri / Alexa

DEEP LEARNING

Machine generating training algorithms to make decisions on

Deep Learning algorithms given all data to autonomously create rules table of properties of fruit

EXAMPLE: Autonomous Vehicles

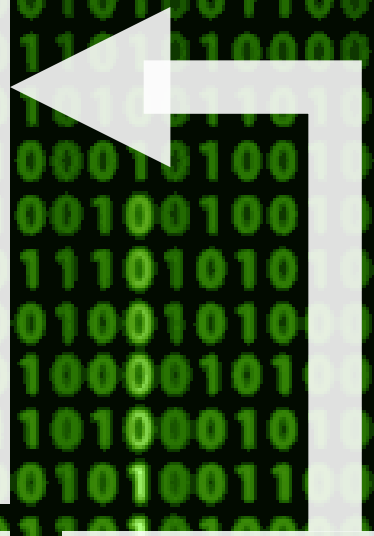
1950's 1960's 1970's 1980's 1990's 2000's 2010's

Data Science: Extraction of knowledge and insight from data

Data Analytics: Inspection of data to discover useful information for the support of decision making

Big Data: Data set too large or complex for traditional data processing software to use

Utilize **Data Science** techniques on large data sets **(Big Data)**to generate **Data Analytics** to create actionable insight from raw data

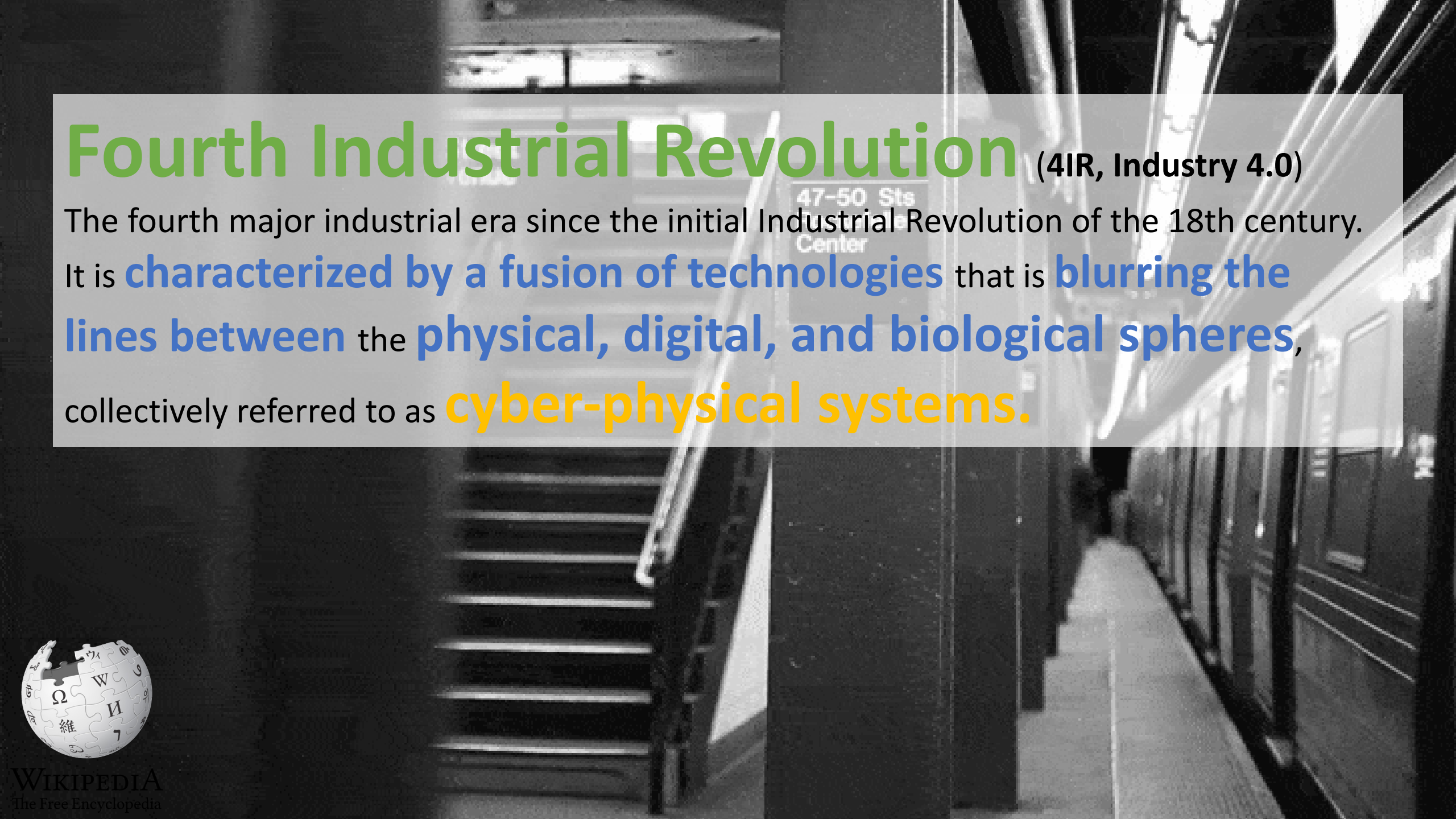


IoT: Internet of Things

IIoT: Industrial Internet of Things

network of devices, vehicles, and home appliances that contain electronics, software, actuators, and connectivity which allows these things to connect, interact and exchange data.

Generating Big Data to be processed



Fourth Industrial Revolution (4IR, Industry 4.0)

The fourth major industrial era since the initial Industrial Revolution of the 18th century. It is **characterized by a fusion of technologies** that is **blurring the lines between** the **physical, digital, and biological spheres**, collectively referred to as **cyber-physical systems.**

WIKIPEDIA
The Free Encyclopedia

Robotics

Machine Learning & Artificial Intelligence

Internet of Things IoT / IIoT

3D Printing

Quantum Computing

Biotechnology

5G Wireless

Virtual Reality

DIGITAL TRANSFORMATION

EXPLORATION

AI Geological & Geophysical Data Analysis

DRILLING

Real-Time Drilling Optimization

Just-In-Time Materials Delivery

PRODUCTION

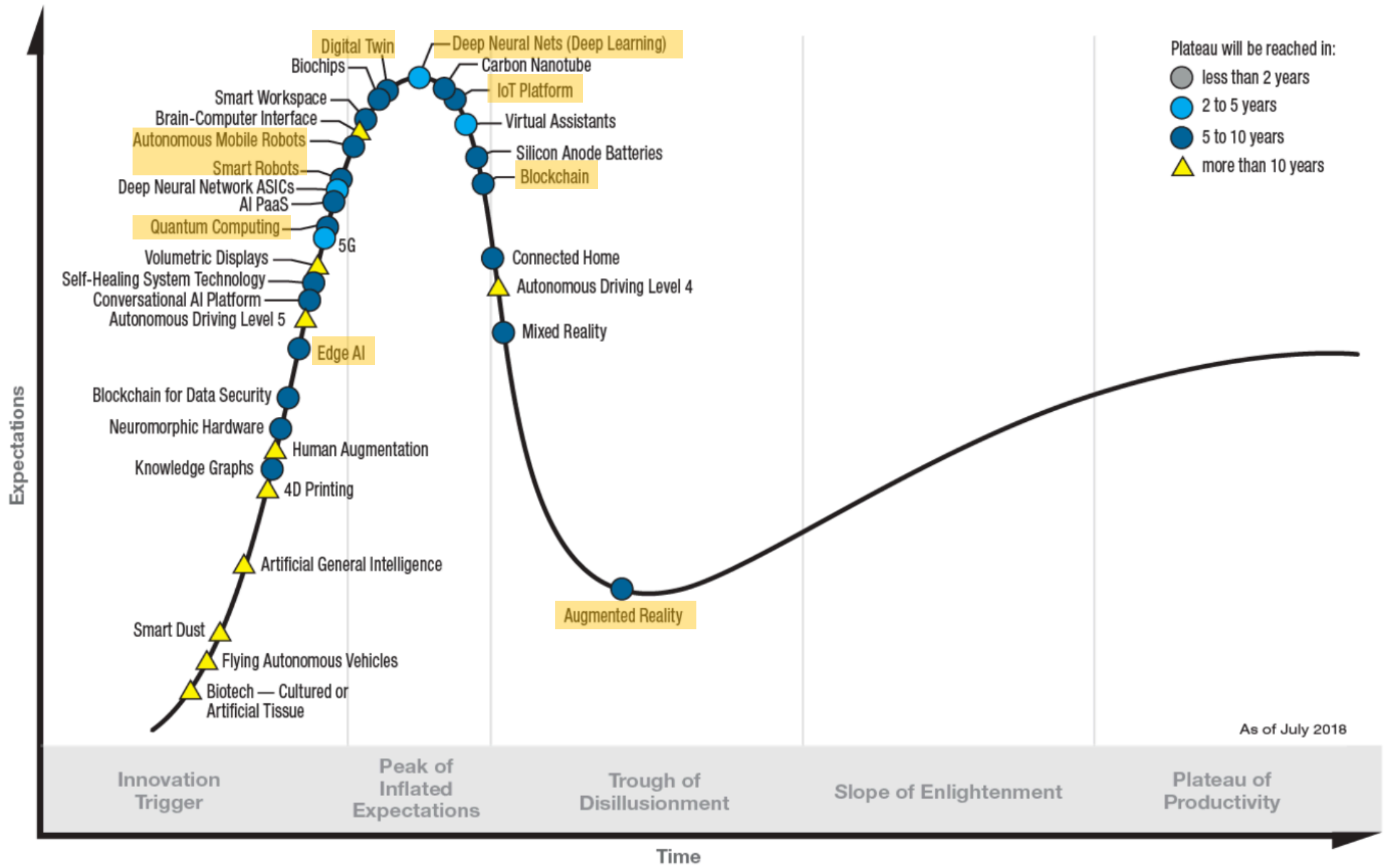
Real-Time Production Optimization

Remote Surveillance

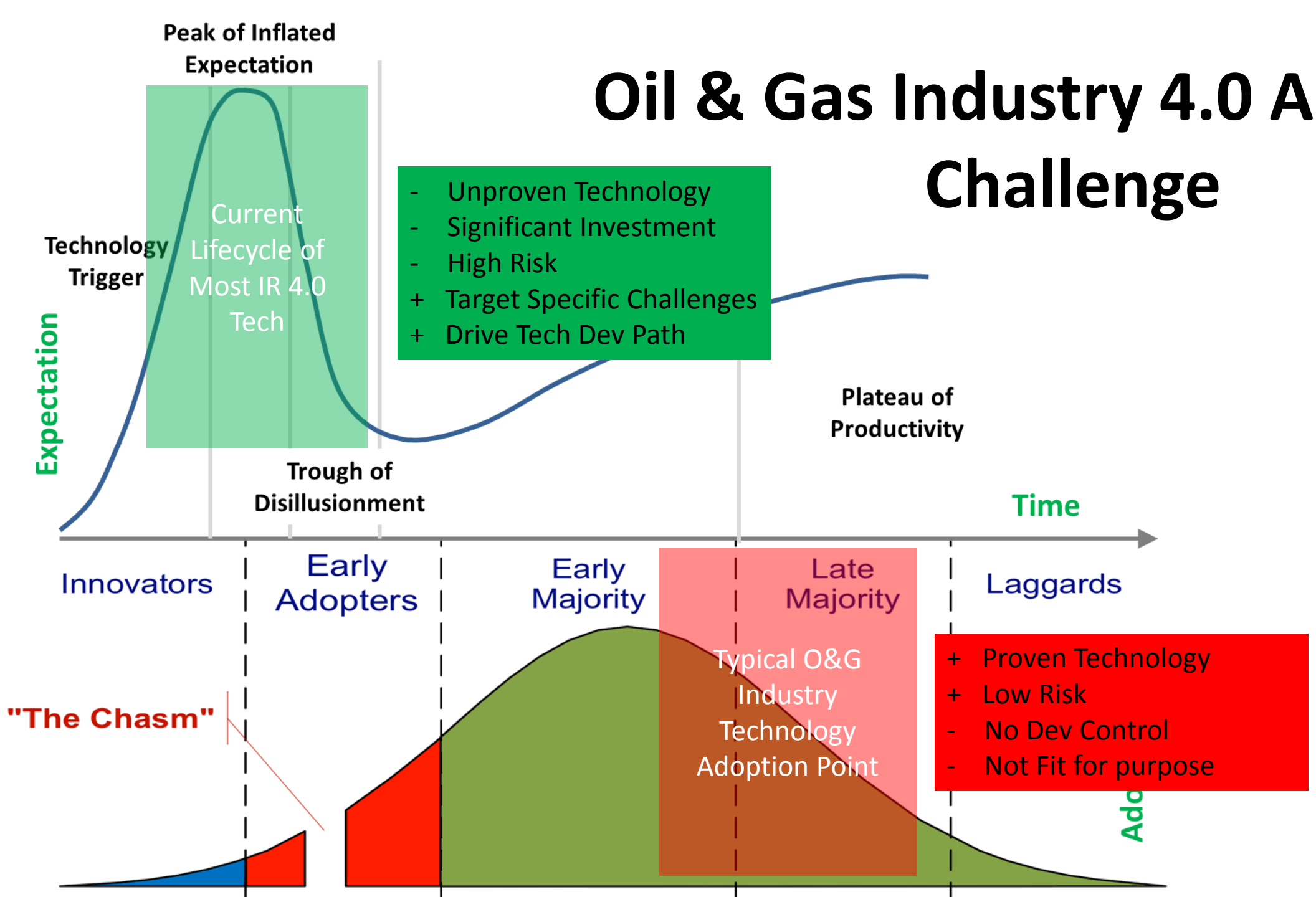
Real-Time Failure Prediction & Prevention

Predictive Maintenance

Hype Cycle for Emerging Technologies, 2018



Oil & Gas Industry 4.0 Adoption Challenge



What Will it Take?

Create, Support & Empower Technology and Digital Transformation Ecosystems

Embrace R&D projects & PAID pilots with smaller, riskier more innovative and flexible technology companies

Publish challenges and openly invite companies to submit concepts & solutions