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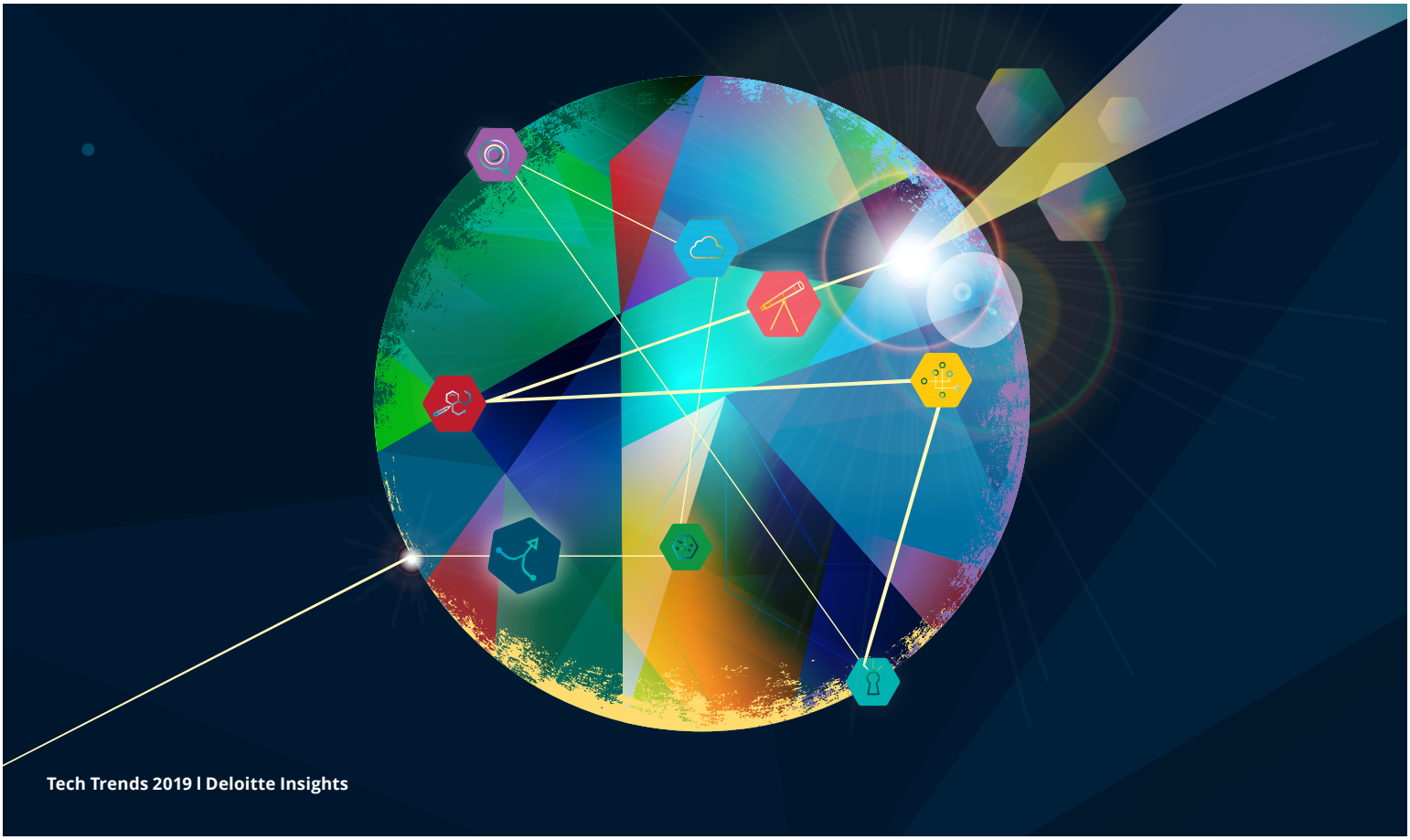

Tech Trends 2019
Oil, Gas and Chemicals perspective

Technology disruption in the Oil, Gas and Chemicals industry is accelerating the pace of change and generating a nonstop stream of questions, challenges, and opportunities. To carry out their mandates, company leaders and industry professionals need to anticipate, understand, and remain a step ahead of emerging technology trends.

Focused, industry-relevant insights are critical to making this happen. This guide provides an Oil, Gas and Chemicals-specific perspective on Deloitte's report, *Technology Trends 2019: Beyond the digital frontier.* It examines several important trends impacting the industry— touching on the macro technology forces at play and how modern businesses can navigate digital transformation. These forces are actively shaping strategic and operational change; redefining Information Technology's (IT's) role within the enterprise; and forcing business leaders to reimagine what it means to operate in a technology-driven global economy.

Already, new digital innovations are helping to expand the supply of hydrocarbons and other resources, while lowering costs and increasing productivity. Advanced data analytics, artificial intelligence (AI), cognitive automation (CA), and machine learning (ML) are helping to convert the industry's vast troves of untapped data into actionable insights to underpin innovative business strategies. These and other technologies are also creating industry workforce opportunities and challenges.

Through real-world examples and key considerations, this publication should help Oil, Gas and Chemicals industry leaders gain a clearer view of what lies ahead and generate ideas for how they can shape that future to meet their evolving needs.

Macro technology forces at work

Nine technology forces (cloud, analytics, digital experience, blockchain, cognitive, digital reality, core modernization, cyber, and the business of technology) have been the backbone of innovation past and present. These forces are critical for organizations – their controlled collision can compound the effect of purposeful, transformational change. What is the "state of the state" of these forces today and how are organizations harnessing them?

Getting started

- **Enable the convergence of IT and OT.** Enhance synergies in your services, processes, methods, innovations, and tools.
- **Develop cohesive and agile technology strategies.** Make disruptive technologies work symbiotically to drive significant, transformational change.
- **Disrupt IT.** Reengineer the technology function to quickly and impactfully collaborate with the business.

Trends in action

Many Oil, Gas and Chemicals organizations are refreshing their digital and technology strategies, portfolios, and roadmaps to better balance risk, reward, agility, and investment. Effective portfolio management approaches are agile and flexible to accommodate how digital enablers, technologies, vendor platforms, business strategies, and market forces evolve over time.

AI-fueled organizations

Organizations in this industry are increasingly harnessing AI's potential for value chain automation, data-driven decision making, and generation of valuable insights. To become a true "AI-fueled" organization, a company needs to find AI's place in its mission, rethink its talent, focus on the human and machine interaction in its environment, and deploy machine learning across core business processes and enterprise operations.

Getting started

- **Strive to become an "AI-first" organization.** Change the question from "why AI?" to "why not?".
- **Leverage the AI continuum.** Relevant applications vary based on process area, maturity, and value potential and range from pure automation to leveraging autonomous intelligence.
- **Reskill and upskill.** A company's AI plan will determine which workforce skills it needs to add. Train current employees and hire or contract for talent as necessary.

Trends in action

In one use case, AI, CA, and ML learn from historical data and accurately image, interpret, and model the earth to enhance hydrocarbon exploration and development analytics. Combining human expertise and CA improves understanding of the sub-surface and helps to optimize identification, recovery, and production. Numerous applications of AI, CA and ML are also emerging across the production, land management, and commercial sides of the business.

NoOps in a serverless world

This industry benefits significantly from technologies and methods that help to increase productivity, effectiveness, and safety outcomes. Cloud providers have doggedly automated traditional infrastructure and security management tasks and are increasing the complexity and value of "as a Service" capabilities. As a result, technical resources are interacting less and less with the underlying system infrastructure. Operations talent can shift to increasingly agile teams focusing on higher-order (and higher-value) activities that more directly support mission outcomes.

Getting started

- **Adopt an engineering mindset.** Standardize, modernize, and synthesize so that the company can apply engineering principles to operations.
- **Go cloud native, where feasible.** Pursue technologies that do not involve managing physical infrastructure.
- **Transform processes.** Automate repeatable processes that do not require human intervention.

Trends in action

The Oil, Gas and Chemicals industry's increasing use of cloud technology and custom software calls for greater adoption of DevOps and NoOps paradigms. Some companies are turning to their cloud and software support companies to help develop these capabilities at scale for viable workloads.

Connectivity of tomorrow

Advanced networking offers a continuum of connectivity that can drive development of new products and services or transform inefficient operating models. From edge computing and mesh networks to 5G, low earth orbit satellites, and ultra-broadband, oil, gas and chemicals companies are taking advantage of advanced connectivity options to design tomorrow's enterprise networks.

Getting started

- **Plan for a bandwidth explosion. A wirelessly connected world** will bring new demands and opportunities.
- **Seek balance.** Prices may remain dynamic, so balance demand for advanced connectivity with cost and value.
- **Stay ahead.** Expand the scope and quality of data sets that will be leveraged within new devices' connected processes.

Trends in action

Connectivity is a critical digital enabler in an industry with many remote work locations (e.g. drilling rigs, chemical refineries, field offices). Capturing real-time biometrics from remote operators significantly enhances their safety and security. Enabling operators to view and update their daily schedules, using explosion proof, intrinsically safe devices, enhances operational effectiveness.

Intelligent interfaces

Intelligent interfaces combine the latest in human-centered design with leading-edge technologies such as augmented reality, amplified intelligence, smart infrastructure and advanced machine learning models. Working in concert, these techniques and capabilities can transform exploration, development, production, safety, and maintenance activities in the industry.

Getting started

- **Look beyond the expected.** Reimagine engagement patterns for manual, time-consuming tasks such as equipment maintenance.
- **Rethink training and collaboration.** Take advantage of digitally enabled ways to connect and learn.
- **Enhance usability.** Employ intelligent interfaces to radically enhance application usability.

Trends in action

Smart interfaces are bringing humans and machines closer. Geo-aware artificial- and virtual reality-assisted interfaces can enhance remote worker performance and safety by providing operators with real-time guidance that is relevant to where they are, at any given moment. For instance, enabling the use of real-time inspection and safety check-lists, as operators read live tank gauge readings.

Beyond marketing: Experience reimagined

Today's astute customers (including both internal and external customers), are starting to expect personalized, contextualized experiences. To deliver them, leading chief marketing officers are looking inward—trading transactional customer relationships for closer partnerships with their own CIOs, and a new generation of marketing tools and techniques powered by emerging technologies.

Getting started

- **Focus on customer-experience.** Move from a reactive, asset-oriented mindset to provide an exceptional customer experience.
- **Go all-in on data.** Collect and manage customer information along the value chain to guide future interactions.
- **Think ecosystem centric.** Go beyond your immediate customer to understand your end consumer, and the impact on the value chain.

Trends in action

Oil, Gas and Chemical companies are innovating to deliver a seamless, integrated customer experience across physical and digital connection points. They are looking at the entire customer journey, identifying significant opportunities to transform and streamline processes & data, and incorporating B2C experiences into the industry value chain.

DevSecOps and the cyber imperative

To enhance their approaches to cyber and other risks, forward-thinking organizations are embedding security, privacy, policy, and controls into their evolved IT delivery models. DevSecOps fundamentally transforms cyber and risk management from compliance-based activities (typically undertaken late in the development lifecycle) into essential framing mindsets that help shape system design from the ground up.

Getting started

- **Integrate security into all IT delivery models.** Plan early to implement similar security processes, standards, and tools across IT and OT systems.
- **Broaden the lens.** Regulatory compliance remains important but a company's primary security focus should be proactive risk management.

Trends in action

Promoting a "top-down" security culture and adopting DevSecOps solutions can help align application security processes with cloud-native application development paradigms. Embedding security strategies and data privacy controls at the beginning of application design can help safeguard organizations from unintended risks and cyber-threats.

Beyond the digital frontier: Mapping your future

Digital transformation has become a rallying cry for business and technology strategists. Yet all too often, companies anchor their approach on a specific technology advance. Developing a systematic approach for identifying and harnessing opportunities born of the intersections of technology, science, and business is an essential first step in demystifying digital transformation, and making it concrete, achievable, and measurable.

Getting started

- **Scan the landscape.** New tools for competitive advantage include AI, crowdsourcing, user experience design, and the maker movement.
- **Foster digital innovation.** Encourage rapid experimentation and prototyping. Create a development environment free of bureaucratic hurdles.
- **Catalyze a new culture.** Consider investments in M&A, partnerships, and incubators.

Trends in action

New business models that address emerging trends such as fuel price aggregators, outcome-based relationships, and sustainable green living can drive next-gen digital transaction opportunities across the entire value chain. Adopting a digital-forward mindset will help Oil, Gas and Chemical companies prepare for the future.

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