Microsoft

Microsoft Energy Core

Special Report

Industry Board Meeting - Q3, 2020

Key Takeaways: ***How can the energy industry use digitalization to spur its transformation?***

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Disclaimer: The quotes highlighted in this Special Report are not verbatim.

Chapter 1: Executive Introduction

Executive Summary

Three intertwined concepts are crafting a new narrative for energy markets worldwide: growth, innovation, and sustainability. The digital tools under the umbrella of the 4th Industrial Revolution (4IR) can greatly support – if not spur – each one.

Amid its greatest upheaval in a century, the oil and gas industry must pin down a new path. It must navigate volatile commodity prices and a significant rise in energy demand with the world's increasingly stringent environmental regulations, as per the Paris Agreement. Reshaping the industry's identity won't be easy, but it is inevitable. Only the corporates who embrace the change will survive to see the next chapter.

The industry's reinvention is getting underway. Preserving both economic and environmental efficiency are equally important to ensure energy security and stability – a cornerstone of our civilization. Smartly mapping out roadmaps to manage progress will be key, with the International Energy Agency (IEA) expecting the global energy transition to cost $1trn a year for the next three years at least. Whatever the cost, the necessity for speedy change is very real.

The good news?

It is undoubtedly technically possible to achieve net zero greenhouse gas (GHG) emissions by around mid-century, according to the Energy Transitions Commission (ETC). The developed world can reach this goal by 2050 and the developing world by 2060 at the latest. And this is without relying on the permanent and significant use of offsets from afforestation, other forms of land-use change, or negative emissions technologies. Most critically, the technologies and business solutions to do so are either already available or close to being brought to market.

Digital allies

This is where the value of the digital tools of the 4th Industrial Revolution (4IR) makes its mark – an irreplaceable and well-timed ally in the oil and gas industry's operational reboot. In a lower-for-longer oil price scenario, the focus must be on cost and operational efficiency and environmental stewardship. Clearly, employing tools that better efficiency, bolster output, and strengthen sustainability are the next best steps. Many such technologies not only exist, but are already being threaded into operational norms across the oil and gas sector. Artificial intelligence (AI), Internet of Things (IoT), predictive analytics, big data, digital twins, and cloud-based technologies are among those taking the lead. But all need greater exposure throughout the industry, and more is urgently needed to smoothly blend traditional engineering technologies with those of the 4IR, i.e. data-driven analytics, machine learning, and automation. Seamlessly merging old with new will reveal some trouble spots, but avoiding building infrastructure from scratch while upping efficiency will significantly pay off.

Non-negotiable?

The full value of digital tools will not be fully realized without an innovative and collaborative environment. This means nurturing digital awareness within partnerships and joint ventures, as well as employees' digital fluency, and within academia to ensure a new generation of energy champions. This is the only route to create a holistic digital narrative for the energy industry – from boardrooms, to offices, to classrooms. The potential is certainly there. Now, let's unite to write a game plan that spurs a much-needed transformation that is a win-win for all.

Founding partners

$1trn

annual investment over the next three years is required – as per an energy sector roadmap – to spur economic growth while cutting carbon emissions, according to the IEA.

What is Microsoft Energy Core?

A global initiative and center dedicated to digital transformation in the energy sector. Building on AI and cloud-based technologies, Microsoft Energy Core supports organizations to develop AI solutions that improve operational efficiencies, enhance sustainability, increase energy innovation, and drive workforce transformation (see page 3 for the Key Pillars and page 4 for the Engagement Protocol). Based in Dubai, Microsoft Energy Core has global scope.

Source of Whitepaper

This Whitepaper focuses on the exclusive insights harvested from Microsoft Energy Core's inaugural webinar on the 22nd September 2020. Its pressing questions on what is next for global trends and challenges were harvested from the opinions and brainstorming of 27 high-level executives who dialed in from nine countries on three continents – the Middle East, Europe, and Asia. The Chatham House Rule applies to all, bar those featured.

Microsoft Energy Core's Key Pillars

Together with our valued partners, Microsoft Energy Core works across four key pillars:

1. Accelerate digital transformation

By applying advanced AI technologies such as machine learning and cognitive services against the data coming in from processes, you now have a value-added layer of insight into your data. This allows you to improve operational efficiencies, speed production, optimize equipment performance, minimize waste and maintenance costs to transform the energy value chain from the digital oil field to the connected prosumer. It also enables you to create better customer and social outcomes as a sustainable energy operator and service provider.

2. Drive responsible innovation

AI is a driver of economic opportunity. Our goal is to make AI accessible and valuable to every business by infusing intelligence across all our products and services. AI creates new opportunities for every person and every organization, with the potential to advance nearly every field of human endeavor and address countless societal challenges. But AI also poses new challenges which requires all stakeholders to develop and embrace different accountabilities and shared responsibility to ensure AI will be developed and deployed in a trusted and inclusive way. Microsoft Energy Core is working on building lasting, meaningful alliances with energy industry players, technology partners and academic institutions. Together, we will infuse the energy sector with the power of the intelligent cloud, enabling innovation to flourish.

3. Skilling and employability

AI is changing how business works across all industries. It will transform lives, transform communities, societies, and nations with people at the center – in ways unimaginable to us. We believe humans and machines will work together to not only boost productivity, but also to create new jobs that are enhanced by AI. At Microsoft, we understand the importance of constantly sharpening teams' technology skills and capabilities to keep pace with the rapid technological advances.

The Microsoft Energy Core's readiness on AI and cloud capabilities leverages Microsoft's investments in AI skilling complemented by contributions from leading universities, educational institutions, and industry partners to deliver AI readiness programs tailored for the energy sector. Through a robust and diligent curriculum, we aim to solve real world problems through industry specific workshops and hackathons. We seek to design technology that complements rather than substitutes human labor. Working with machines, humans can drive better business outcomes, discover new ways to protect and preserve the planet, cure the incurable, and transform industries.

4. Sustainability and societal impact

Microsoft's cloud and AI technologies are changing not just the world of business, but the world itself. Microsoft is tackling global environmental challenges and contributing to more sustainable business practices globally. Through AI for Good, we are democratizing access to AI for everyone who wants to contribute to protecting the planet's natural resources. And one of the great things about the cloud and Azure is that it makes that democratization so simple, because anybody, anywhere with an internet connection can now have access to some of the most powerful technologies since the industrial age.

Source: Microsoft Energy Core: https://www.microsoft.com/energycore/Default.aspx

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Microsoft Energy Core's Protocol of Engagement

- Microsoft Energy Core's industry board agrees to collaborate and exchange knowledge to accelerate innovation and digital transformation in the energy sector.
- Microsoft Energy Core's industry board members will attend quarterly meetings to establish an industry challenge to solve for using AI (see page 5). The identified challenge will move onto the ideation phase of the Centre's integrated strategy where solutions will be brought to life through hackathons.
- Microsoft Energy Core Industry Board Members will be elevated as 'Featured Speakers' on a rotating basis for each quarterly board meeting.
- Microsoft Energy Core's industry board members will deploy at least one representative from their respective institutions to each hackathon to bolster the Centre's posture and commitment to advancing digital transformation in the energy sector.
- Microsoft Energy Core's industry board will commit to qualify at least one minimum viable product that emerges from each hackathon and assess its viability to be deployed in a working environment. If the pilot phase of a minimum viable product proves to be successful, Microsoft Energy Core's industry board will strive to support further incubation and establish a strategy towards scaled roll out.
- Each quarter, Microsoft Energy Core's industry board members will deploy one representative from their respective institutions into the AI Academy to conduct a lecture on the practical applications of AI and the digital skills necessary for the future of work in the energy sector.

Inaugural Hackathon Challenge

RESULTS: Energy Core's first industry challenge to solve using AI

As per the second point on the Protocol of Engagement, board members will identify an industry challenge to be solved using AI once a quarter. Each challenge will be in line with one, or more, of the Energy Core's four key pillars: accelerate digital transformation, drive responsible innovation, skilling and employability, sustainability, and societal impact. This first challenge for the Hackathon primarily fell under the latter: sustainability. In the inaugural Hackathon, technologies were closely explored to identify a roadmap for adoption.

Challenge topic:

Hydrocarbon Release and its environmental impact

Hackathon objectives:

- Identify sources of releases
- Release journey: GHG release from inception to diffusion
- Using AI and machine learning to enable operators to control and limit releases
- Establish recommendations and a roadmap for the future

Winners:

1. Repsol
2. Shell
3. Khalifa University

Summary

The term sustainability is often used interchangeably in the oil and gas industry with sustainable development, where development meets the current generation's needs without compromising the ability of future generations to meet their own needs.

Microsoft Energy Core 2nd Hackathon

The first prototype developed by the three winning teams from the inaugural hackathon will be developed further to a minimum viable product (MVP). For the new joining team, Microsoft will provide a Catalyst package to bring the team up to speed.

Areas of Focus

· Introduction of higher resolution datasets by additional satellites

· Working to integrate SCADA data, data from fixed wing readings, and Internet of Things (IOT) devices with the solutions from the inaugural hackathon.

· More accurate integration of weather data.

Criteria

· At any point of time was methane leakage over the regulatory threshold?

· Participants need to show where and when leakage happened.

· Predict the concentration of methane at a specific point of time and in a specific geographical location after the leak is identified.

· Predict the movement of the methane leakage cloud depending on the weather datasets.

Accelerate Digital Transformation

At Launch: 10 Founding Partners & 35 AI Solutions

Today: 31 Partners & 115 AI Solutions

Microsoft

Meeting new targets

Fossil fuels will remain an essential part of the energy mix, and it is on the industry to manage production safety to reduce emissions, discharges, and the ecological impact, while providing energy at a reasonable cost. In addition, companies face complex investment challenges due to the extreme price volatility and cruel operational environment of exploration and production (E&P). Proper detection, reporting and analysis mechanisms are considered key enablers of sustainable development at the oil and gas company level.

GHG emissions from oil and gas operations, especially methane, pose a critical challenge for the industry as it receives more and more scrutiny from investors, government, and the public, all of whom are demanding ambitious reductions. There are several key GHGs, such as CO_2, NO2, SO2, N2O and CH4 (methane) releases, emitted by the oil and gas industry, especially refineries and petrochemical operations. Methane is responsible for 25% of global warming, with over a third of such emissions from oil and gas. All these emissions are calculated as CO_2e (carbon dioxide equivalent). Detecting GHG emissions and leaks has been difficult due to technical, logistical, and cost limitations.

The Energy Core: A Global Facility and Initiative

Harnessing the power of AI, cloud technologies and the IoT, organizations can transform their businesses, increase productivity, drive innovation and run more efficient and sustainable operations.

Program anchors on 4 key pillars:

1 Empowering Digital Transformation

Building on AI and cloud-based technologies, Microsoft Energy Core supports organizations to develop AI solutions that improve operational efficiencies, enhance sustainability, increase energy innovation, and drive workforce transformation.

2 Coalitions for Responsible Innovation

Microsoft Energy Core is an open initiative that incorporates energy operators, leading industry partners and academics to lead responsible innovation across the energy value chain.

3 Closing the Skills Gap & Enhancing Employability

Energy Core showcases Microsoft's investments in AI skilling, complemented by contributions from leading universities, educational institutions, and industry partners to deliver AI readiness programs tailored for the energy sector.

4 Sustainability & Societal Impact

Microsoft Energy Core has a mandate to create societal impact. Together with our partners, we are pursuing innovative solutions to solve the energy industry's most pressing issues on worker safety and environmental sustainability.

Energy Core Industry Board

Thought Leadership and Responsible Innovation

The Industry Board convenes quarterly to identify top of mind challenges to solve for using AI.

- **14x Global Energy Operators** represented by their **CDOs:** ADNOC, BP, Chevron, Eni, Equinor, ExxonMobil, Kuwait Petroleum, Petrobras, Repsol, Saudi Aramco, Shell, Total, Centrica, Engie
- **10x Founding Technology Partners** represented by **CEOs and Sr. Execs:** ABB, Accenture, AVEVA, BakerHughesC3.ai, Emerson, Honeywell, MAANA, Rockwell Automation, Schlumberger, Sensia
- **4x Academic Institutions*** Khalifa University, King Fahad University for Petroleum & Minerals, Heriot Watt University, Mohamed Bin Zayed University for AI
- **1x Industry Body**** represented by **CEO** Society of Petroleum Engineer (SPE)

* *More Universities – e.g. University of Houston, Texas A&M University, Rice University*
** *More Industry Bodies – e.g. International Energy Agency (IEA)*

Gamechangers?

However, existing, and upcoming emissions tracking satellites (e.g. GOSAT-2, Tropomi, GHG Sat, Bluefield, EDF methane SAT) offer a breakthrough towards precise, timely, and affordable detection on a large scale. The data these satellites can capture is relatively new and could be enhanced by applying AI and machine learning models.

Precise and scalable methane monitoring via microsatellites is a promising new technology, which will make it possible to monitor methane and other GHG releases. As with any new technology, there are limitations in terms of coverage, visibility to satellites, and front-loaded cost. However, such limitations are likely offset by the potential benefits expected.

Energy Core 1st AI Hackathon

Methane Tracking using **Satellite Imagery** towards containing its Environmental Impact

- **29 participants**
- **7 teams from 7 countries**
- **3 coaches**

» **10 days delivery**

3 Finalist Teams | Khalifa University, Shell and Repsol

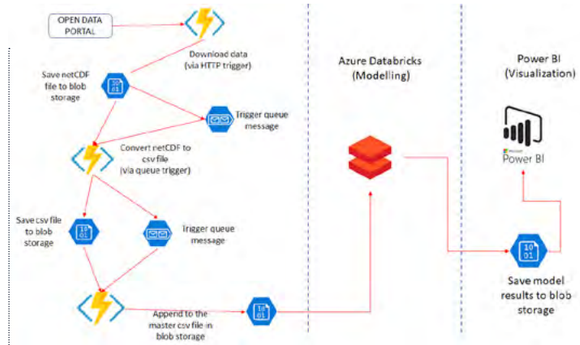
Winner: Repsol

Evaluation Criteria

- ***Success on Data Capture***
- ***Use of technology***
- ***Cleansing the data***
- ***Identified the Plumes***
- ***Included Weather Data***
- ***Tracked the Release***
- ***Identified the Source***
- ***Link to IOT or other source***

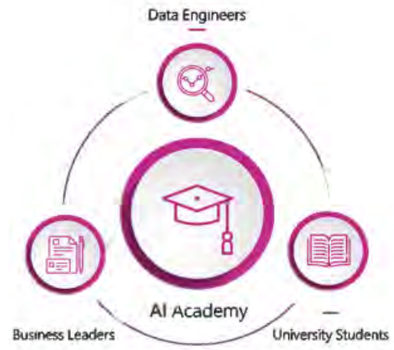
62%

of participants said they would take the learnings from this Hackathon and apply it to their Business challenges



Energy Core AI Academy

200+ Microsoft Courses & 14 Partner Courses



630 Active Users

43 Trophies

210 Badges

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Chapter 2: Zero Emissions

What steps must oil and gas companies take in the next 12 months to ensure they hit their net zero targets by 2050?

INSIGHTS

Net zero targets would've been laughed out of the vast majority of major energy boardrooms a decade ago. Now, announcements planning a greener future are fast mounting up. BP, Shell, and Total are among the growing group of energy influencers who have announced net-zero by 2050. Some, like Sweden's Lundin Petroleum, have set an even higher bar of net zero by 2030. On a government-related note is China's recent announcement in September this year to be carbon neutral by 2060. The bid by the world's biggest energy consumer will inevitably drive corporate momentum as firms worldwide race to remain relevant to what, for many, is one of their biggest customers.

DIGITAL ALLIES

Of course, oil and gas companies will progress towards a decarbonized future at different speeds. What unites them is the need to pick their speed. The template for transition is unquestionably digital. Digitalization will not only accelerate the passage, but also provide proof of the quality of their transition. Tomorrow's winners will be those who are transparent and accountable to an increasingly impatient, demanding, and critical stakeholder audience. Only through its adoption will the safe energy industry leaders of today transition into sustainable energy providers.

"We're definitely of the view that you have to tackle emissions from existing sources to reach the 2050 target. That's where technologies like CCS come into play."

Ahmed Hashmi, Chief Digital Officer and Technology Officer, Upstream, BP

RALLYING HOPE

There is good news: it is undoubtedly technically possible to achieve net zero GHG emissions by around mid-century, according to the Energy Transition Commission (ETC). Better yet, the technologies and business solutions to do so are either already available or close to being brought to market and the costs of achieving this are very small, especially compared to the large adverse consequences that unmitigated climate change would trigger by 2050 and in subsequent years, the report said. The incremental capital investments needed over the next 30 to 40 years to achieve a zero emissions economy, while huge in absolute dollar terms, are only about 1% to 2% of global GDP per annum. Amid so much change, what moves must be made in the next year to ensure the theory of net zero targets becomes a reality?

"Companies and organizations must be ambitious and set measurable targets as we look beyond to 2050. And they must ensure that they can demonstrate step-by-step progress to shareholders and consumers to give the world confidence that we are able to do more than just talk about an energy transition. No company can do it alone. It's going to take all of us working together to deliver."

Darryl Willis, Vice President of Energy, Microsoft

The three CO_2 scopes?

Greenhouse gas emissions are categorized into three groups or 'Scopes' by the most widely-used international accounting tool, the Greenhouse Gas (GHG) Protocol, according to Carbon Tracker. Scope 1 covers direct emissions from owned or controlled sources. Scope 2 covers indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by the reporting company. Scope 3 includes all other indirect emissions that occur in a company's value chain.1

TOP TAKEAWAYS

▪ **What is net zero?**
The world is trying to achieve net zero targets without an accepted definition of what that actually means. For example, many argue that net zero is not possible without addressing Scope 3 emissions (see box). Yet some companies have pledged net zero without a roadmap that identifies and reduces Scope 3 emissions. Pinning down a net zero definition for the energy industry, and indeed all industries, won't be a simple process. But it's imperative to the world's climate mitigation efforts; everyone must be racing towards the same finish line. Clarity must be achieved by the end of 2021, at the latest.

"One-off solutions are making a limited impact. Scale replication is a key enabler for achieving the 2050 target."

Dr. Mohamed Sidahmed, Machine Learning & AI Manager, Data Science CoE, P&T Technology (PTX), Shell Technology Center Houston (STCH)

▪ **Urgently address methane**
Digital tools are increasingly helping the energy industry address the significant and long-running environmental challenge of methane emissions – the world's second largest cause of global warming, according to the IEA. Via remote satellites and analytics (i.e. sensors, predictive analytics, and AI), companies can now detect and better mitigate methane leaks. For example, the satellite Sentinel 5P (Precursor), part of the European Space Agency (ESA) Copernicus program, provides readings of methane concentration across areas of 5 km by 7.5 km, the IEA detailed. This covered the globe on average every four days. Still, such efforts, and the levels of operational efficiency, must dramatically improve.

▪ **Establish milestones boost confidence**
Establish roadmaps with measurable goals to bolster investors and consumers' confidence: a key ingredient amid times of great change. This includes detailing 'touch points' where companies' journey can be held accountable in the global journey to 2030, 2040 and 2050. Delegates said BP's transparency serves as a good starting point for the wider energy industry. The major's journey to net zero by 2050 includes key data growth points. For example, BP aims to have a tenfold increase in carbon investment to around $5bn a year by 2030 and a twenty-fold increase in developing our net renewable generating capacity to 50GW. Among other goals, it also anticipates a tenfold increase in EV charge points and a 40% reduction in oil and gas production.

▪ **Leverage existing assets**
Waiting years to establish new energy facilities with technologies yet to be discovered is too lengthy a route. Much more significant progress must be made by using existing infrastructure and technologies. For example, this includes adding sensors and establishing algorithms to enhance operational and environmental efficiencies are two relatively low-hanging fruits, delegates shared. The same applies to capturing CO_2 emissions from existing polluters, via CCS, and data driven analytics. It's a case of better using the tools that already exist; there's not need, or time, to reinvent the wheel. Plus, one-off solutions can have a limited impact. Scale replication is a key enabler for achieving the 2050 target.

▪ **The three C's?**
Collaboration, capabilities, and customers: each is vital. Hitting goals is not an individual game plan, nor will it be easy. Therefore, the unity of talented thinkers with hands-on capabilities needs urgent strengthening to become a digitally savvy organization – one that holds relevance well into the 21st century. Plus, increasingly ensuring that customers are woven more organically – both as producers and consumers – is vital to accelerating the energy transition.

"Bringing satellite remote sensing into the energy space to detect sources of methane leaks – an environmental challenge for the industry – and then provide analytics would make a real difference. It's a great opportunity for every company – NOCs and IOCs alike."

Dr. Steve Griffiths, Senior Vice President, Research and Development, Khalifa University

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Chapter 3: Partnerships 4.0

How best to use digitalization to create a collaborative yet competitive posture in regional and international markets?

INSIGHTS

The idea behind competitive collaboration is to develop digital solutions to a problem that all energy stakeholders share. This mean that solutions are found faster – benefiting all. Good collaboration undoubtedly brings mutual benefit. Joint ventures and partnerships are a great way to spread risk and increase knowledge as well as a company's reach. Therein lies the value of initiatives in the energy sector, such as Microsoft Energy Core, that form strategic alliances between competitors and boost communication amongst stakeholders. These are vital vehicles, expediting the digital transformation throughout the industry at a time when speed really matters. When it lasts from three to five years, collaborative competition has more than a 50% chance of mutually reducing company costs throughout industry, according to the Multidisciplinary Digital Publishing Institute.

"Sometimes the pressure of politics and regulations in different countries can create difficult constraints. It can slow collaboration, or even make it impossible."

Frédéric Gimenez, Chief Digital Officer (CDO) and Digital Factory Managing Director, Total

STEP CHANGE

One delegate detailed how he'd noticed a radical difference in partnerships since 2015 – an evolution that must be echoed in the early 2020s and beyond. Five years ago, the delegate said a company would have some components from a vendor and perhaps a somewhat semi-strategic collaboration with one or two firms. Today, there are strategic collaborations and joint ventures with both major and smaller companies woven deeply into firms' core strategies. Successful partnerships don't appear overnight. R&D centers are mushrooming across the Middle East and there's a notable rise in how large corporates and academic institutions work together. But there's still much work to do

TOP TAKEAWAYS

▪ Don't reinvent the wheel

Collaborations must focus on new challenges, rather than multiplying many solutions to a single problem. Time is too short for circuitous efforts. Improving education is integral to achieving this. The more a workforce is well versed in the energy transition and digital tools, the easier it is for them to identify areas of waste versus efficiency. For example, one delegate highlighted various companies' different understanding of AI and its applicability. There must be a common and industry-wide knowledge of mainstream and influential digital tools, as well as the energy transition. As said by Henrich Greve, a Professor at INSEAD: "The traditional alliances are always about the complementarity of assets. Digital partnerships, however, are all about knowledge. This is because firms are so specialized, and knowledge is really difficult to get." Rewards from digital partnerships include the new development of new capabilities, access to new ideas, faster innovation, and faster time to market – all of which feeds back into strengthening future collaborations.

"Data underpins almost every discussion: who owns it, who's going to get access to it, and so on. It's my differentiator, your differentiator."

Craig Hayman, Chief Executive Officer, AVEVA

• Showcase successes

Put data or digital tools in the hands of those running operational facilities and there should be a noticeable improvement within weeks. This builds trust, both internally and with partners, with the positive disruption more keenly adopted by other teams. It also proves how operational expense and time can be reduced without heightening operational risk or diluting competitive advantage – a win-win for all.

• Master data sovereignty

As the data universe dramatically grows alongside a rise in collaborations, the challenge of managing the data sovereignty of companies' technologies will be an increasingly important factor in the 2020s. Industry and government must identify technical solutions that are globally compatible to ensure that healthy competition and vital collaboration continues. For example, one country may want to use the cloud to support a cross-border collaboration, but the other countries' regulations make sharing difficult. Greater clarity is critical to avoid fractured policies, and thus spur both in-country and cross-border innovation.

• Rethink people

People make the difference across the board: from ensuring consumers can easily engage with the digital tools of the energy transition, to the type of talent a company hires or upskills to support its transformation. One delegate said his company realized they had plenty of talent in their existing operations who can transfer over to the world of 'new energy' relatively easily. Those already running major operational projects can evolve their skillset to manage large solar power plants, for example.

"Being explicit about the areas that are best to compete and collaborate in is important. If we end up collaborating on everything, there's nothing left for the business itself. It's only through competition that companies make investments into the technologies that will drive the industry forward."

Trygve Randen, President, Software Integrated Solutions, Schlumberger

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Chapter 4: Data Sharing & Maximization

How to maximize the value of available datasets without compromising data protection and privacy?

INSIGHTS

163 zettabytes (ZB). That's the world's data creation by 2025 – ten times more than in 2017, according to Seagate's publication of a major analysis of trends in a study by the International Data Corporation (IDC). While the rapid expansion of data is hard to grasp, it's value shouldn't be undermined. It ignites innovation and best practices within the industry. But it also needs proactive management, especially as the industry moves towards data sharing amongst operators. The development of open forums (such as Open Subsurface Data Universe) for subsurface data sharing is one example of how progress is being made. And there has been a rise in sharing KPIs and micro-KPIs to benchmark performance more effectively across oil fields, which incentivizes the industry to deliver operational efficiencies to match peer groups. But the journey has only just begun.

"My father used to have a license plate that read 'Never too late' – that applies well here. In hindsight, we wish we'd done this work earlier. The best time to have started was yesterday. But the second-best time is today. There's always advantages to being a fast follower."

Ben Randell, Upstream Digital Advisor (North America), Chevron

MASTERING THE BALANCE

There are ways data can be shared without disclosing certain information, while still promoting multifaceted and complete benchmarking for more robust analysis. For example, to progress situational awareness, gathering and sharing health and safety executive (HSE) data could greatly benefit the energy industry. And a tie in with service companies' data streams could award top performers and drive innovation and reliability to meet the market needs of both the operator and service company. Plus, once a company's groundwork for data acquisition and streaming capabilities are established, for example, that company can help others in their partnerships and joint ventures scale up.

"Not all data's alike; it comes in different flavors. We've all realized that for maximum value and success, this must be a team sport. Partnerships across the data chain will be critical."

Norm Gilsdorf, President, Honeywell, High Growth Regions, Middle East, Russia, Turkey, Central Asia & Customs Union, Honeywell

EDUCATE, EDUCATE, EDUCATE

Getting this point requires improved education across the energy ecosystem. It's not a lesson that can be taught overnight; software providers must be patient and clear. It's critical that good understanding stops companies over-collecting data. Efficiency is key. Companies don't want a 'data lake' if a 'data pond' can get them to the same conclusion, just faster. Another area requiring more education is data ownership and use, as confusion still abounds (see box). This time-consuming ambiguity needs eradicating immediately to both accelerate progress and to bolster confidence and trust – both pivotal to broader digital adoption.

Data ownership?

Generally, when it comes to information governance and policies, one usually distinguishes between the data subject, the data controller, and the data custodian, or data processor. Data residency issues may put the data subject's information at risk, but from a legal or regulatory standpoint it is the data controller (responsible for the purpose and means of processing personal data) and the data custodian (who operates the infrastructure where the data is stored) who are typically considered to be in violation. The potential confusion between subject, controller and custodian is a frequent cause of finger-pointing and legal maneuvers when a data residency issue arises.

TOP TAKEAWAYS

• Establish a data language
The better the data standards, the better the data liquidity – and the faster and more accurate the data analytics. Standards must be set to enhance the ease at which data can be identified, captured, harvested, and then analyzed. This maximizes the real-time and tangible benefits. The same applies to contractual data agreements. In the past, they could be punitive and have poor results. Stakeholders must be more constructive when identifying strategic and digital commonalities and saying what they need for a two-way agreement. While companies must be held accountable, there must also be recognition for the fact that all firms are in new territory and that genuine mistakes are inevitable.

• Identify your purpose
Companies must be clear on their intentions for gathering data before they start out. This saves them having 'data lakes' of information that they either don't have the time or the skills – or both – to effectively decipher. As a business unit, ask why you want the data, what you intend to do with it, what is the longer journey, and who can help you get there? In short, how does gathering this data help create economic and environmental value in the energy transition?

• Clarify data sovereignty
Some companies, especially those in partnerships, are tempering their ability to extract all the possible value from their data due to concerns over security and data sovereignty. Such firms, and those they engage with, must enhance their understanding of the sovereignty parameters and work with regulators to ease the exchange of data. As the world becomes increasingly interconnected, having this groundwork will give companies peace of mind so they can confidently expand their data knowledge.

• Explore hybrid models
Energy stakeholders must increase their ability to siphon off their data for different purposes. This will prove especially useful in partnerships and amid increased engagement with consumers and customers. For example, the financial services' data system enables it to smoothly 'release' a subset of data while keeping other parts confidential, i.e. for customers versus regulators. This hybrid data model provides very clear boundaries for data access for all parties, thus increasing security and overall ease.

• Make it easy
Ensuring data and digital tools are presented in a format that makes it easy for consumers and customers to use is vital for broad and speedy adoption. Those bringing new technologies to market (from R&D laboratories to the commercial rollout) must ensure user ease is a central part of their offering. Data value is severely limited if customers – and companies and governments – have trouble understanding it.

"There's fatigue amongst organizations in regards to how they collect their data. Sometimes it's a wild goose chase. You don't have a purpose for the data, so you end up collecting a lot of garbage that you don't need. The better approach? Identify why you want the data first."

Uma Sandilya, General Manager, Oil & Gas, BHC3

"We're focused on removing friction, which comes from inherent risks, so we can extract the maximum value from data. Cyber risk is one area that keeps our customers awake at night; the other area to look at is legal or regulatory risk. While cyber risk is intractable to an extent, it is well understood. But there still needs to be more understanding in the legal and regulatory space."

Ramon Bosch, Executive, Microsoft 365 Value Engineering, Europe, EMEA

Microsoft

Chapter 5: Energy Transition

How can the tools of the 4IR be leveraged to accelerate the energy transition in the next 12 months?

INSIGHTS

After brewing for decades, the concept of a global energy transition is now well and truly underway worldwide. This year has witnessed a seismic shift in governments and companies' seriousness of a lower carbon future. Appetite for more established renewables markets like solar and wind is growing, but so is interest in hydrogen, CCS, carbon storage in rock, plugging methane leaks, and much more.

The impact of Covid-19 has also accelerated the need to use digital use to create a smooth energy transition, both economically and environmentally. The pandemic has highlighted the unpleasantness of a global disruptor which is out of our control – as unmitigated climate change will certainly be – and it's

"Covid-19 has triggered a change in culture and people have become more receptive to accepting digital technologies and how they fit into the energy transition."

Khaled Al Blooshi, Vice President, Digital Projects & Innovation, ADNOC

highlighted how large-scale financing and cross-border collaboration are available when needs be. Both are critical ingredients of expediting digital progress in the energy markets. So, how can these lessons be leveraged to support the digital face of the energy transition in the next year?

TOP TAKEAWAYS

• Use data for net zero

Improved data and tracking lie at the crux of establishing a global baseline for what net zero means. For Scope 3 emissions alone, there are multiple methodologies that can be standardized by using digital solutions. It's an ambitious timeframe, but companies, governments, academia, and society need goalposts within the next year.

• Put consumers front and center

The energy transition will fail without society's buy-in – consumers must be treated differently. The world of consumers is rapidly changing. Many are more focused on ESG than ever before and some are even becoming producers themselves,

"We need to ask whether we are going to lead more with remotely distributed teams and changes in our [energy] leadership due to Covid-19. Working differently is a big topic, which will help the sustainability agenda."

Torbjørn Folgerø, SVP & Chief Digital Officer, Equinor

"We've very much been a product centric industry and now we need to move to a more customer centric industry – one more based on solutions, rather than products. Understanding customers needs significant improvement."

Enrique Fernández Puertas, Director of Digitalization and Architecture, Repsol

i.e. via small-scale solar and wind power generation. Now is the time for industry and government to engage more deeply with consumers and ensure that all digital tools are more easily accessible, affordable, and scalable.

• Embrace digital twins

This digital tool is gaining prominence worldwide. The global digital twin industry was valued at $3.6bn in 2019 and is forecast to soar to $73.2bn by 2030, according to ResearchandMarkets. Its value has especially been proven amid the global disruption this year, supporting those with access to navigate the sharp twists and turns of the energy markets. It meant companies could better predict the supply-demand energy dynamics and operational efficiencies in real-time via the technology's simulations. This competitive advantage when trying to 'read the tea leaves' will only become more coveted.

• Clock ticking to institutionalize change

Within a year, the world will be returning to its previous status quo. That means that companies that want to accelerate the progress made during the pandemic – i.e. how to operate efficiently remotely and how to use technology to sustain business-as-usual in very unusual circumstances – must institutionalize operational changes soon. One delegate said companies should set March as their finish line.

• The magic combination?

Many technologies hold great value, but the "real magic" comes with the right combination of tools, delegates said. For example, a mobile phone dramatically improves efficiency and data tracking by hosting multiple gadgets and applications – all of which would've been individual items or systems a decade ago. Rethinking the combination of tools via data management and computing power is something that can be proactively improved in the next year. All technology combinations must efficiently and easily engage with consumers. Currently, there are some extremely sophisticated technical algorithms in the energy market that aren't user friendly enough. Consequently, their scope and subsequent use are limited.

"Digital solutions can help us define what it means to be net zero. They can establish that baseline of CO_2 emissions and other GHGs, from cradle to the grave."

Vanessa Miler, Director, Energy Innovation & Impact

Microsoft

Chapter 6: Workforce Transformation

How can industry and academia collectively identify the digital skills that the workforce needs?

INSIGHTS

The seismic shift in educational norms this year is pioneering a new and unexpected way of learning. Schools and universities' initial shock at having to master remote-learning – possible thanks to digital tools – has now revealed some unexpected benefits. But there are challenges, both pre-existing and new ones. One of the main pre-existing challenges is that the job market is changing so dramatically amid the energy transition and the 4IR that academia is racing to keep up. A new challenge is how to integrate industry engagement directly to the students with lockdowns and social distancing rules. Both need to work more closely than ever to ensure that academia is nurturing the right workforce of tomorrow.

"Our industry is still in a vastly non-digital state. It's a dilemma, which can only be solved by an injection of new talent. We must adopt new talent to really push this revolution. I'm optimistic, as the industry has successfully tackled the great crew change so far."

Rainer Ludwig, Global Director of Business Development Digital Solutions, Sensia

INNOVATIVE ECOSYSTEM

This is ideally facilitated by a space where science meets commercial vision, where large investments are channeled into human capital, and where governments establish useful policies and regulations. But none of this will be possible without the key stakeholders from academia, industry, and government coming together. Therefore, it is imperative that the education sector keep up with what is happening in the industry and identify how it can be more relevant and flexible. This requires a structured and defined dialogue that can result in meaningful improvements in 2021. Digitally savvy and intellectual agile talent is a cornerstone of a successful energy transition. Together, industry and academia must find their feet.

"It's a gamechanger having access to data and the latest software technologies from Microsoft and other vendors. It helps academia teach more effectively."

Dr. Sebastian Geiger, Energi Simulation Chair and Director of Research, Herriot Watt

TOP TAKEAWAYS

• Open the door

Enabling academia's access to the latest software technologies from Microsoft and other software and industry stakeholders revolutionizes how quickly and deeply students can learn. It means students get real-world exposure and are therefore far more able to adapt to the working world, making them more valuable contributors to companies' bottom line. Their experience is significantly enhanced when companies send staff to deliver lectures and host students in-house (the latter being trickier during the pandemic, but still effective via pre-recorded or live Zoom lectures). Part of industry's guidance is emphasizing to students that they'll need to continually develop their skill sets. The days of a single role lasting decades are over. Students, and workers, must adapt as new technologies arrive and others become extinct. Students, and workers, must understand that basic digital fluency is no longer optional.

• Academia is fighting the clock

Industry-academic engagement in the energy industry has improved significantly in recent years. But the dramatic rate of change facing academia – i.e. remote learning throughout 2020 about an industry that itself is going through a once-in-a-century degree of upheaval – means its ability to keep pace is being tested. Academia already carefully listens and engages with industry to keep abreast of major developments. But during this period of extreme disruption, even greater industry involvement would be highly valuable. Industry delegates agreed that their historic role of providing donations, licenses, software, and lectures to universities is no longer enough.

• Industry to cast a wider net

Industry typically supports and recruits from the top ten universities per region. That must now change. Industry must also engage with lesser known schools and universities, many of which are just as innovative. Plus, they may deliver more agile and critical thinking students because they aren't blessed with all the academic conveniences of an upper-tier university.

• Promote the melting pot

A silver lining which has emerged from remote teaching is how it's uniting students from multiple continents, allowing many different views and learnings to be applied to 4IR opportunities in the energy transition. This won't fully replace the value of human contact over the long-term. But for now, academia and industry must leverage this digital convenience to drive the depth and speed of new collaborations.

Microsoft

Chapter 7: Plants of the Future

How to ensure company's technical and digital capabilities are aligned?

INSIGHTS

Improving assets and reducing expenses have never been easier, with the ability to quickly analyze years of data across systems and equipment types. Digital solutions give energy stakeholders the power to predict and prevent operational issues, reduce downtime, and boost overall asset performance and life. Now raw data can be transformed into actionable intelligence, combining robust analytics with domain expertise to transition reactive and preventative maintenance processes into predictive ones.

BUILDING MOMENTUM

This doesn't happen automatically. Companies must take proactive steps to reap these benefits. The good news is that digital management of distributed energy resources, from individual sites to entire systems, has already begun. Many energy companies have launched mobile applications for bill notification, presentment, and payment, as well as for outage management. Before long, mobile applications will extend into smart homes and connected buildings. While this is beginning to form a good foundation of positive disruption, there's still plenty more to do. First, companies must know their place. They must pin down where they want to occupy on the digital terrain, with respect to data, services, and devices. They must be able to answer this question: where in the value chain can digitization make the largest revenue contribution in the next year or two?

"When something goes wrong, we still go back and try to investigate what happened. If we had the right data, it could've been prevented. That's exactly what IoT sensors are doing; they're your eyes and ears on the ground."

Pattabhiraman Ganesh, Vice President, Digital Transformation & Lifecycle Services, Middle East & Africa, Emerson

"I implore people who have the ability to put more datasets and digital twins into the market to do so."

James Wimbury, Resources (Oil, Gas & Petrochemicals) Lead – Saudi Arabia, Accenture

TOP TAKEAWAYS

• First step first
A company's strategic vision must be smoothly aligned with the digital vision of the plant before digital technologies are rolled out. Having this foundation of clarity will maximize the value of digital aids. For example, many companies talk of establishing a roadmap, underpinned by a deep knowledge of digital tools. Yet, the underlying challenge of transparency is not addressed as fully. Information still often resides in siloes, both in-house and within partnerships. Digital transformation starts with bringing down these walls; only then can roadmaps for plants of the future be successful.

• Recognizing the balance
Digitalizing plants of the future means having multifaceted talent. On one hand, you need deeply knowledgeable skill sets, i.e. those involved only in drilling expertise. On the other hand, you need talent with a broader overview of how all different parts of the plants of the future are knitted together with digital tools. This means having a balance of vertical and horizontal talent, respectively, so that holistic digital progress can be achieved.

"Digital literacy is the next big thing. We anticipate that every professional will need a basic level of literacy, whether they've studied finance, marketing, math…"

Adel Fadhl Noor Ahmed, Dean, College of Computer Science and Engineering, KFUPM

• New blood
Companies can't expect staff with little digital expertise to become data scientists by the mid-2020s. Instead, those skills must be supported with a basic level of digital fluency, while new talent with more in-depth digital knowledge can spur the new chapter of plants of the future. Still, all employees must have their cognitive agility and digital fluency continually reinforced in-house. Having black gaps of digital knowledge in any company aspiring to have plants of the future will lead to mistakes as pressure on operational efficiency inevitably grows amid rising energy demand and a growing environmental rulebook.

• Value of IoT
Deploying IoT sensors is far less costly and time-consuming than conventional sensors, which is why maximizing their use is critical for plants of the future. They are not intrusive instruments, as installation doesn't stop plant operations.

• Push digital value stories
Energy stakeholders who are effectively using digital tools on plants of the future must better showcase their return on investments (ROI) to spur positive momentum in the industry. Pushing digital value stories certainly pays off. One delegate said that when he spoke publicly about IT and operational technology (OT) conversion rates three years ago, the attendees were predominately in the IT field. Now the room is far more multifaceted across the energy industry as understanding and appetite intensifies.

Sustainability: Microsoft's Progress

HIGHLIGHTS

The value of sustainability is deeply embedded in Microsoft's present and its future; we aim to be carbon neutral by 2030. Partnerships are a cornerstone of the multiple goals that must be achieved in order to hit this overarching target in just nine years. In that vein, below are three highlights of uniting our efforts with our key partners in September 2020 alone – all aimed at accelerating global lower carbon growth.

Microsoft & Equinor: Northern Lights CCS

Microsoft and Equinor signed a Memorandum of Understanding (MoU) to explore ways to support the Northern Lights carbon capture and storage (CCS) project as a technology partner. Microsoft will explore using the project to enable the transportation and storage of captured CO_2.

"One of the world's imperatives is the need to develop new ways to capture, transport, and permanently store carbon. This will require enormous investment and innovation, including a huge amount of computing power and data," said Brad Smith, President of Microsoft. "Our goal is not only to contribute our technology and know-how, but explore how new solutions like the Northern Lights project can help us meet our own carbon negative goals by 2030."

Microsoft & BP: Driving Digital Energy Innovation

Microsoft and bp have agreed to collaborate as strategic partners to further digital transformation in energy systems and advance the net zero carbon goals of both companies. This includes a co-innovation effort focused on digital solutions, the continued use of Microsoft Azure as a cloud-based solution for bp infrastructure, and bp supplying renewable energy to help Microsoft meet its 2025 renewable energy goals.

"bp shares our vision for a net zero carbon future, and we are committed to working together to drive reductions in carbon emissions and fulfil demand with new renewable energy sources," said Judson Althoff, Executive Vice President of Microsoft's Worldwide Commercial Business. "A strategic partnership such as this enables each organization to bring its unique expertise for industry-leading change and the potential to positively impact billions of lives around the world."

Co-innovation

Their companies' co-innovation effort will initially be focused on four areas that combine Microsoft's digital expertise with bp's deep understanding of energy markets:

- Smart and clean cities – identifying synergies between Microsoft's 'Smart Cities' initiative and bp's 'Clean Cities' vision, with a goal of identifying areas for strategic collaboration to help cities achieve their sustainability aims.
- Clean energy parks – co-development of innovative, clean energy parks with an ecosystem of low carbon technologies, such as carbon capture use and storage (CCUS) to prevent or reduce emissions.
- Consumer energy – exploring innovative ways to harness the power of data-driven, personalized, actionable insights to empower energy consumers to manage their home energy use and reduce carbon emissions.
- Industrial Internet of Things (IoT) solutions – delivering an 'intelligent edge' of capabilities to bp production and operations facilities.

Microsoft & Shell: Addressing Carbon Emissions

Microsoft and Shell, building on a history of three decades of working together, are embarking on a new strategic alliance to support progress towards a world with net zero emissions. This builds on the strong foundation of decades of technology collaboration between the two companies. This type of strategic alliance is a model for how companies can work together to achieve their net zero ambitions.

"Cross-industry collaborations like this are fundamental to help society reach net-zero emissions by 2050, and digital transformation is key to tackling this important issue, within the energy sector and beyond," said Judson Althoff, Executive Vice President of Microsoft's Worldwide Commercial Business

Highlights of the expanded alliance includes:

- Shell will supply Microsoft with renewable energy, helping Microsoft to meet its commitment to having a 100% supply of renewable energy by 2025.
- Working together on AI, which has already driven transformation across Shell's operations through access to real-time data insights, contributing to worker and onsite safety, and delivering efficiencies that have helped reduce Shell's carbon emissions.
- Working together on new digital tools so Shell can offer its suppliers and customers effective support in reducing their carbon footprints.
- Explore working together to help advance the use of sustainable aviation fuels (SAFs).
- Using Microsoft's Azure cloud computing system and data from Shell assets to strengthen operational safety, by improving risk analysis, prediction, and prevention.

Microsoft Energy Core's Board Members

Energy Operators
Ahmed Hashmi, Chief Digital Officer and Technology Officer – Upstream, BP
Brad Davis, Innovation and Commercialization Manager, Chevron
Daniel Jeavons, General Manager, Data Science, Shell
Hamad Ahmad Al-Zaabi, Manager Innovation & Technology Group-KOC, Kuwait Petroleum
Khaled Al Blooshi, Vice President, Digital Projects & Innovation, ADNOC
Khalid S. Al-Ghamdi, Head of Digital Strategy and Growth, Saudi Aramco
Michael Deal, Chief Digital Officer, ExxonMobil
Sergio Zazzera, Business Partner, Technical Computing for Geosciences and Subsurface Operations and ICT, Eni
Torbjørn Folgerø, SVP & Chief Digital Officer, Equinor
Valero Joaquin Marin Sastron, Chief Digital Officer, Repsol

Universities
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Ling Shao, CEO and Chief Scientist at Inception Institute of Artificial Intelligence, MBZUAI
Sebastian Geiger, Energi Simulation Chair and Director of Research, Herriot Watt
Steve Griffiths, Senior Vice President, Research and Development, Khalifa University

Industry Bodies
Mark Rubin, CEO and Executive Vice President, SPE

Technology Partners
Allan Rentcome, Chief Executive Officer, Sensia
Babur Ozden, Founder & CEO, MAANA
Craig Hayman, Chief Executive Officer, AVEVA
Norm Gilsdorf, President, Honeywell, High Growth Regions, Middle East, Russia, Turkey, Central Asia & Customs Union, Honeywell
Pattabhiraman Ganesh, Vice President, Digital Transformation & Lifecycle Services, Middle East & Africa, Emerson
Paul Carthy, Managing Director – Resources Industry Lead, Middle East, Accenture
Ronan OSullivan, Vice President – Energy Industries, India, Middle East, and Africa, ABB
Susana Gonzalez, President Europe, Middle East & Africa, Rockwell Automation
Trygve Randen, President, Software Integrated Solutions, Schlumberger
Uma Sandilya, General Manager, Oil & Gas, BHC3

Microsoft
Ali Faramawy, Corporate Vice President, Digital Transformation & Partnerships
Darryl Willis, Vice President, Energy
Dave Wisenteiner, Managing Director of Energy, Microsoft Azure
Vanessa Miler, Director, Energy Innovation & Impact

Energy Core Board Meeting (Q3, 2020)
Speakers
*(*Alphabetical order)*

Energy Operators
Ahmed Hashmi, Chief Digital Officer and Technology Officer – Upstream, BP
Ben Randell, Upstream Digital Advisor (North America), Chevron
Enrique Fernández Puertas, Director of Digitalization and Architecture, Repsol
Frédéric Gimenez, Chief Digital Officer (CDO) and Digital Factory Managing Director, Total
Khaled Al Blooshi, Vice President, Digital Projects & Innovation, ADNOC
Dr. Mohamed Sidahmed, Machine Learning & AI Manager, Data Science CoE, P&T Technology (PTX), Shell Technology Center Houston (STCH)
Sergio Zazzera, Business Partner, Technical Computing for Geosciences and Subsurface Operations and ICT, Eni
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