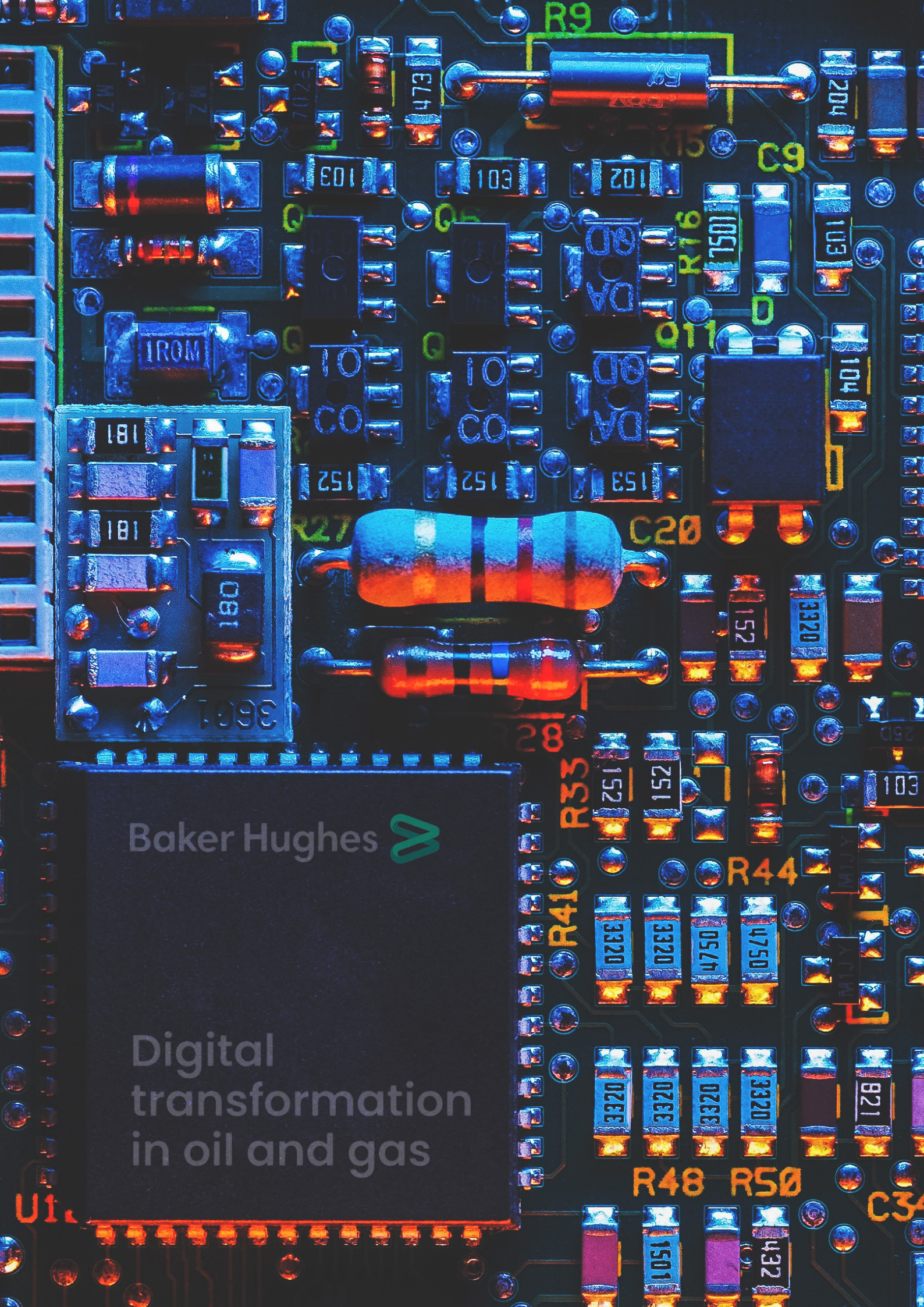

Baker Hughes
Digital transformation in oil and gas

Here's the value in digital

Oil and gas companies pioneered big data and analytics. Now they're reshaping digital strategies to capture the possibilities of automation and integrated data

We all understand the power of digital technology. From movies and music to socializing, shopping, and travel, digital has reshaped our lives. Behind the scenes, it's changed numerous industries, too—from communications, entertainment, and aerospace to retail, mobility, and medicine.

Exploration and production (E&P) firms have also made important inroads into digital, but investments have mostly focused on IT technologies, such as CRM and ERP systems. Now, a revolution in OT technology seems imminent too, as automation and integrated data capabilities converge with domain expertise to send oil and gas companies on a new digital trajectory—with a clear line of sight to safer, more profitable outcomes.

Amid signs that the business case for digital is taking shape, we wanted to discover how oil and gas companies rate the progress of their digital journeys. So, we took a deep dive with our customers—talking to decision makers, influencers, and end-users of upstream digital solutions at IOCs, NOCs, and Independents.

Several patterns emerged from more than 70 interviews. Despite being pioneers in big data and analytics, firms still have a long way to go to meet their digital objectives: less than a third claim to have undergone a digital transformation at all, for example. But most have a firm idea of what they want to achieve and are reshaping their digital strategies and decision-making processes accordingly.

What data is the survey based on?

More than 70 interviews with key stakeholders across the upstream value chain, including decision-makers, influencers, and end-users of digital tools at IOCs, NOCs, and Independents.

What we wanted to know

Our goal was to get the pulse on how digital will shape the upstream oil and gas industry. We wanted to identify market pressures and trends, opportunities for digital investments upstream, and best practices for successful digitalization.

Why?

There are plenty of external reports and reviews, but not enough research from within the industry. We wanted to fill the gap.

How we avoided bias

To ensure the outcomes were neutral and objective, a third-party company asked the questions on our behalf, preserving the anonymity of respondents.

Examples of job roles interviewed

- SVP of Development
- VP of Drilling of Subsurface
- R&D for Digital Solutions
- Digital Platform Manager
- Global Artificial Life Manager
- Head of Remote Operations Center
- Data specialist, Operations
- Corrosion & chemicals Advisor
- Chemical Data Engineer
- VP Technology & Engineering
- Digitalizatiion Manager
- Senior Production Engineer
- Real Time Operation Centre Well Engineer
- Strategic Technical Advisor
- Strategy & Technology Development
- Former Asset of the Future Manager
- Senior Emerging Technology Strategist

Where next?

We've got a mess of databases, with very intricate connections

SVP Drillling and Completions

We don't take enough insights from our data. We capture a lot of data, but only use 10% of that data

SVP Development

Advanced analytics

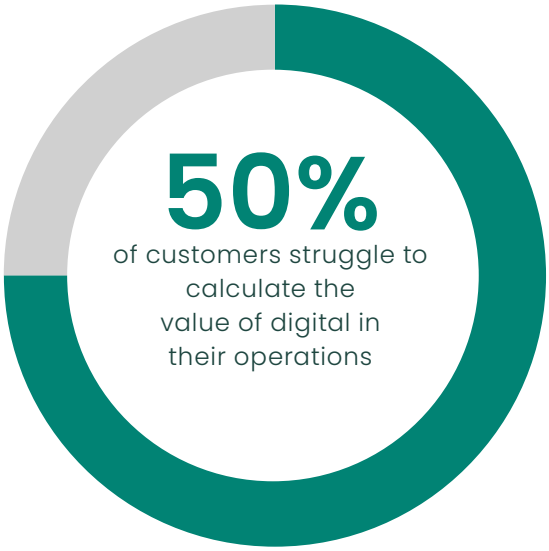
There is unanimous agreement on one thing: all our customers say there's no longer a need to make a case for digital. With the promise of better upstream performance, higher efficiency, and lower costs, its power and value are undisputed.

There's also agreement about where the value chiefly lies. Firms overwhelmingly identify digital's greatest potential as its ability to enable more productive use of upstream data. At present, data are often underutilized, respondents say—either leveraged for historical learning or ignored altogether. More than anything, E&P companies want insightful, real-time analytics that enable them to predict, rather than react.

To deliver predictive analytics, digital systems require three inputs: relevant, high-quality datasets, first-class data infrastructure, and deep domain expertise. Data and infrastructure alone are insufficient. Domain expertise is the key that unlocks their potential—the knowledge to calibrate sensors, instruments, and other hardware, sift through vast datasets at speed and extract the predictive, actionable insights that transform upstream efficiency, safety, and production.

Assembling digital value chains capable of embedding intelligent, time-efficient workflows and predictive software within the harsh engineering realities of upstream developments is a complex and capital-intensive undertaking. Projects typically incorporate thousands of specialized parts and tools in site-specific arrangements—everything from drill bits and coiled tubing to casing, pumps, and production trees. Successful digitalization involves placing robust and reliable sensors throughout these extensive infrastructure systems, often under testing operating conditions. Millions of sensors must then be seamlessly connected to fast, reliable, and secure data and communications systems that can capture, process, and analyze vast datasets in real time. Few companies possess these capabilities and, given the scale, complexity, and cost of developing them, it's unsurprising that upstream digital transformation remains a work in progress.

Are you getting value from your digital investments? How do you make it understandable?

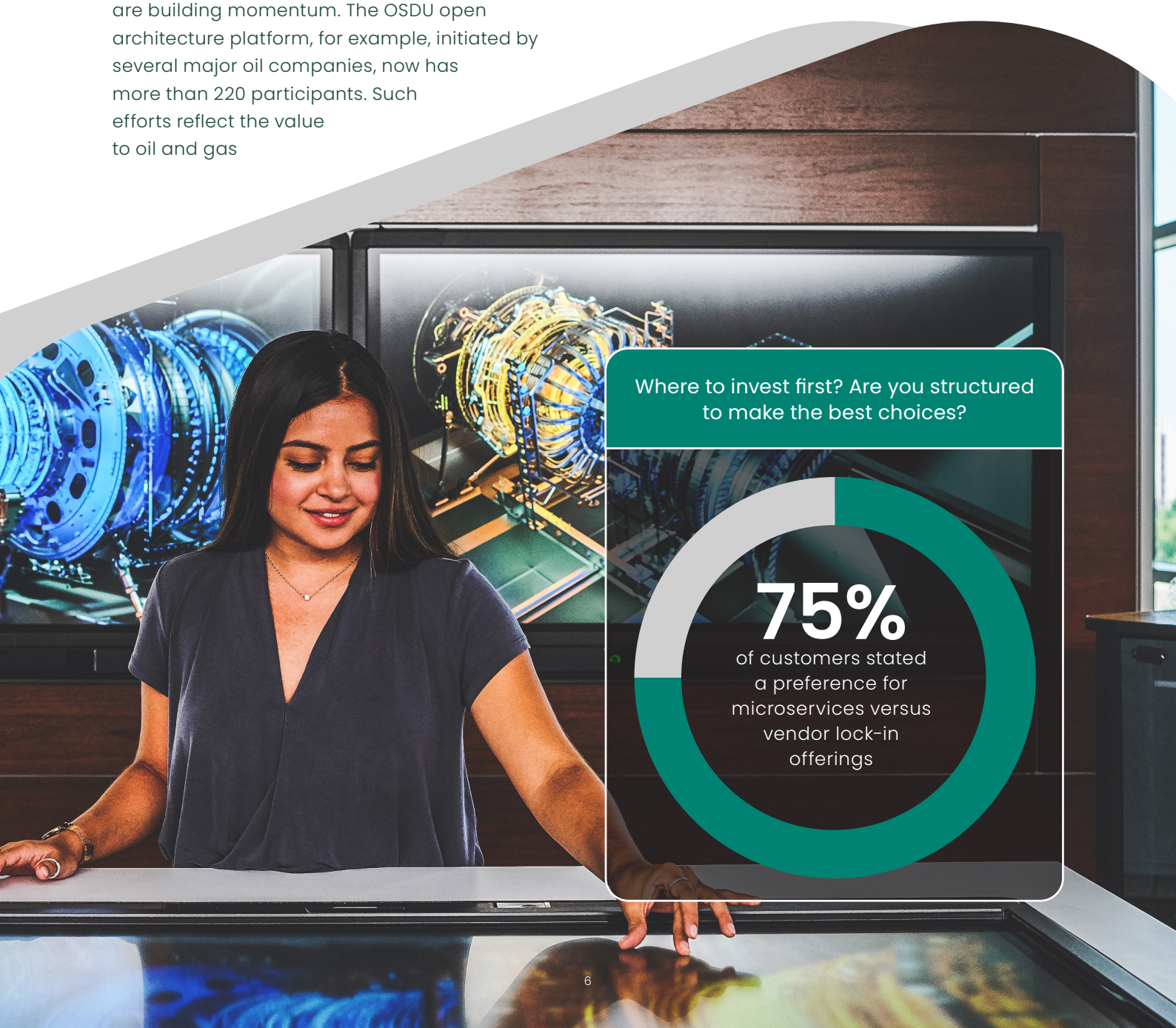


Flexible systems

There are other reasons behind the industry's hesitancy. Many survey respondents expressed concerns about the feasibility of extracting value from their data without ceding control over it. IOCs, NOCs, and Independents all want to work with vendors who know how to manage real-time data securely and whose analytics can be flexibly integrated into any digital system.

This is driving support for data standardization, the lack of which has hindered attempts to digitize workflows and processes. Industry initiatives to establish universal data standards are building momentum. The OSDU open architecture platform, for example, initiated by several major oil companies, now has more than 220 participants. Such efforts reflect the value to oil and gas companies of flexible, plug-and-play applications that will work with any digital system. Indeed, three-quarters of customers stated a preference for microservices, rather than vendor lock-in offerings.

Concerns about hacking and data losses have also slowed down investments in digital networks. This is driving demand for IT systems and networks that can clearly demonstrate they are cyber-secure, as well as fast and reliable.



Change management

Change management is more demanding than switching my technology stack. It's about change processes, my culture and how people work

Senior Director Digital Transformation

Change management is never only about technology. It's tech process and people

Chief Information Officer

Change management

But the biggest barrier that companies face in implementing digital transformations is convincing people that it's worth changing the way work is done today. An overwhelming 90% of our customers cite change management as the principal obstacle to digital transformations.

A possible explanation for this is that frontline industry employees resist digital because they fear analytics will replace hard-earned experience. Another is that, as a well-performing population with established ways of working, they see little reason to change. But given that people generally embrace change when they recognize its benefits, neither theory is convincing. A more plausible explanation is that the benefits of digital haven't been clearly articulated across the industry, with poorly thought-out user experiences, delayed rollouts, and inadequate workflows and software also discouraging uptake. Better software, data, and design—built on a foundation of digital and domain expertise and articulated through clear change-management programs—will improve engagement and support.

Uncertainty over how to quantify the business impact of digital investments is another barrier to progress. Operators want to see value expressed in the language of conventional business metrics like cost dollars per barrel, rather than IT metrics like upload speed or server capacity. But making a solid business case for digital investments isn't always straightforward. For example, the value of some digital technologies lies in their ability to prevent adverse events. If an event never occurs, however, there is no damage to quantify. Overall, half of our customers say they struggle to calculate the value of digital in their operations.

You've developed a powerful solution. Will people rally around it? Will they use it?

What “digital” means

Nobody has a good grasp of what digital means and how it’s going to affect them

General Manager Drilling

Digital is a technology like IoT and big data. Transformation is embedding these technologies into our processes

VP Digital Transformation

It’s critical to not dampen autonomy of teams, but have that line of sight to co-ordinate across the enterprise

Senior Director Digitization

The way forward

In addition, not everyone agrees on what digital means in the world of oil and gas. One of the survey's more surprising findings is that, even in 2021, four out of five companies don't define digital consistently: there are even divergent views—from company to company and sometimes within companies—on the meaning of basic terms "digital" and "digital transformation". If siloed operations within companies are creating dissonance between procurement processes and what businesses need, the digital roadmap is pointing to a dead end.

But there are also encouraging signs that the industry is tackling silos and developing more coordinated approaches to digital investment. In the past, companies have generally adopted centralized or decentralized approaches to strategic decision-making on digital matters. Each approach has merits, but neither has delivered satisfactory results. Top-down results in standard digital practices but tends to freeze business units out of innovation loops. Bottom-up gives business units freedom to innovate, but often leads to fragmented efforts and benefits, such as the proliferation of databases. Now, however, a hybrid approach may be emerging, our survey indicates, blending bottom-up innovation and buy-in with a cross-functional committee or center of excellence providing a unifying macro-vision.

That macro-vision appears focused on moving from reactive data to predictive analytics and real-time decisions that anticipate and mitigate upstream risks before they happen, while optimizing many other aspects of upstream performance. It prioritizes partnerships with suppliers that offer a combination of domain expertise, world-class data infrastructure, and visionary change-management support—but without lock-in to fully integrated service agreements or closed-source software. Watch this space.

Where to invest first? Are you structured to make the best choices?