JANEIRO DIGITAL

# MIND THE (SKILLS) GAP: FUELING DIGITAL INNOVATION AND TRANSFORMATION IN OIL AND ENERGY

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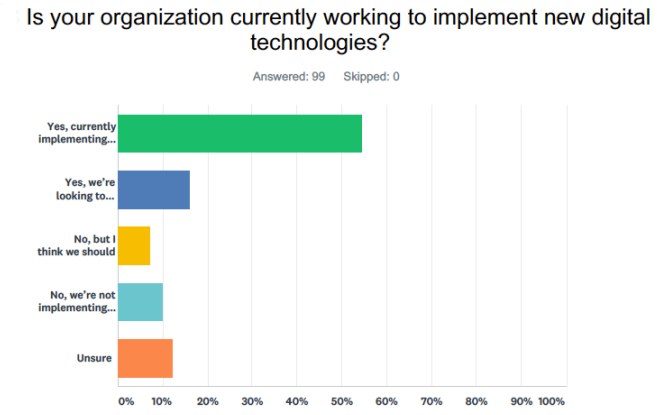
# Introduction

Oil and energy organizations are in a unique situation when it comes to digital transformation. While most industries have been forced to implement new technologies in order to compete with more nimble, digitally-native startups, established companies in oil and energy are inherently harder to disrupt given the regulatory landscape and natural limitations imposed by physical infrastructure.

That's not to say there's no impetus for digital evolution. In fact, it's quite the opposite. Competition from lean startups isn't as much of a factor, but competition within the industry is fierce—particularly when it comes to IoT. Concerns around safety and security have led businesses in oil and energy to adopt IoT for physical monitoring much more quickly than other industries out of necessity. However, with many of these industrial IoT deployments already underway or in place, unprecedented quantities of data have opened the doors to new opportunities for further innovation in the industry. Oil and energy companies are now in a race to see who can better use those deployments to gain an edge over the competition.

We surveyed 99 middle and senior-level managers in utilities, energy, and extraction to learn about their progress, current challenges, and forward-looking opportunities when it comes to digital technologies and digital transformation. The findings reveal that these companies have been quick to adopt new technology, but are still exploring how their innovations impact business strategy and translate to market leadership. Despite a daunting skills gap, oil and energy companies are primed for growth as they streamline their infrastructure and optimize their existing deployments.




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Yes, currently implementing new technologies | 54.55% | 54 |
| Yes, we're looking to implement new technologies, but haven't started yet | 16.16% | 16 |
| No, but I think we should | 7.07% | 7 |
| No, we're not implementing new technologies | 10.10% | 10 |
| Unsure | 12.12% | 12 |
| TOTAL | | 99 |

**55%**

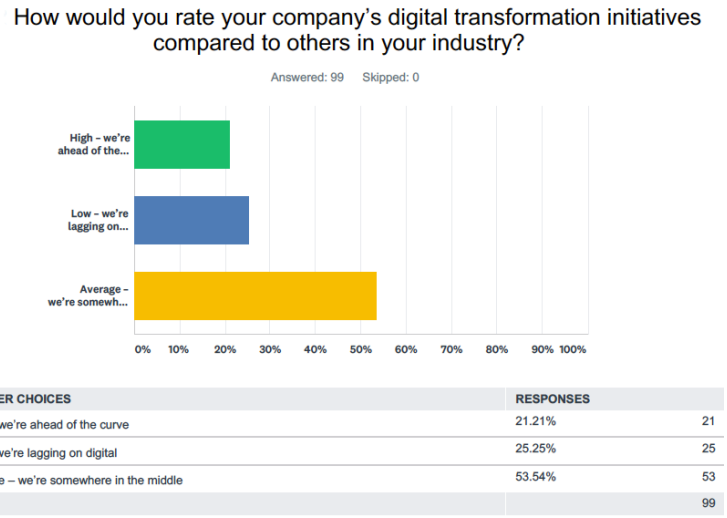
SAY THEIR COMPANY IS CURRENTLY IMPLEMENTING NEW TECHNOLOGIES.

## Rapid Change, But Slow Progress

When it comes to implementing new digital technologies, utilities, energy, and extraction professionals reported an exciting pace of change is occuring within their organizations. More than half (54.6 percent) said their organizations are currently implementing new technologies, with another 16.2 percent looking to do so in the near future. Only 10 percent reported that they weren't implementing new technologies, and were content with the status quo (page 3).

Partially driven by necessity, oil and energy companies have been quick to adopt digital technologies connecting their physical infrastructure to the IoT. Sensors tracking everything from temperatures and pressures to physical and digital security have quickly become the industry norm. This makes it easy to see why oil and energy companies appear to be so far ahead of their counterparts in other industries when it comes to digital maturity. As the next question highlights, however, these companies are still lagging when it comes to enterprise software and what they get out of it.

In conjunction with the digital maturity demonstrated in earlier findings, it was interesting to see that the majority of respondents (53.5 percent) still viewed their companies' digital transformation initiatives as "average" compared to others in their industry. In fact, only 1 in 5 (21.2 percent) saw themselves as ahead of the curve, while another quarter (25.3 percent) reported that they were lagging in digital maturity.




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| High – we're ahead of the curve | 21.21% | 21 |
| Low – we're lagging on digital | 25.25% | 25 |
| Average – we're somewhere in the middle | 53.54% | 53 |
| TOTAL | | 99 |

**79%**

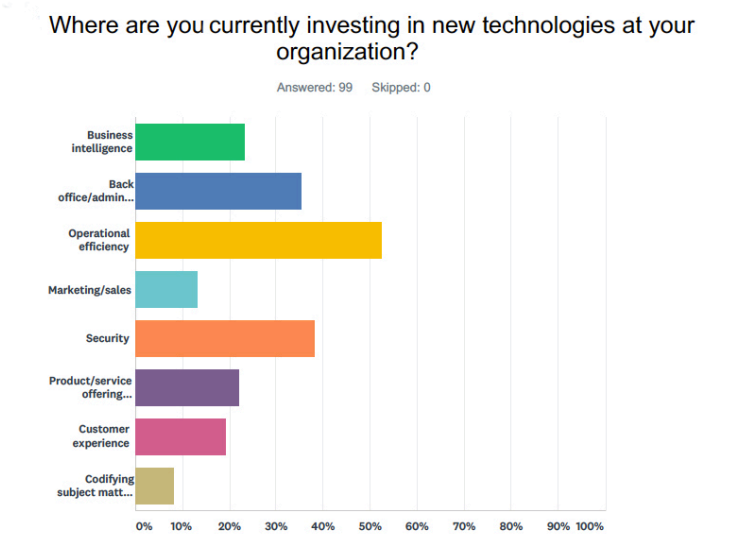
SAY THEIR COMPANY'S DIGITAL TRANSFORMATION INITIATIVE IS AVERAGE TO LAGGING IN MATURITY.

With so many oil and energy companies reporting that they're deploying new technologies, how is it possible that such a large proportion simultaneously identify as average or behind the curve? This may come back to the fact that these companies have rushed to deploy sensors and take advantage of IoT, but without a deeper level of strategy in place.

In our work with companies in the sector, we've seen businesses are rich with quantified systems and raw data, but still grappling with ways to use that information to its full extent. Companies may have more data than they know what to do with, but struggle to make connections between their monolithic systems and assign meaning to that data in order to make it actionable. They need to use and connect digital deployments to get a holistic view of the business.

## Opportunities for Digital Transformation

With all the change underway, what aspects of the business are seeing the most digital evolution? According to respondents, operational efficiency (52.5 percent) is seeing the highest investment when it comes to new technologies, followed by security (38.4 percent), and back office/administration (35.4 percent).



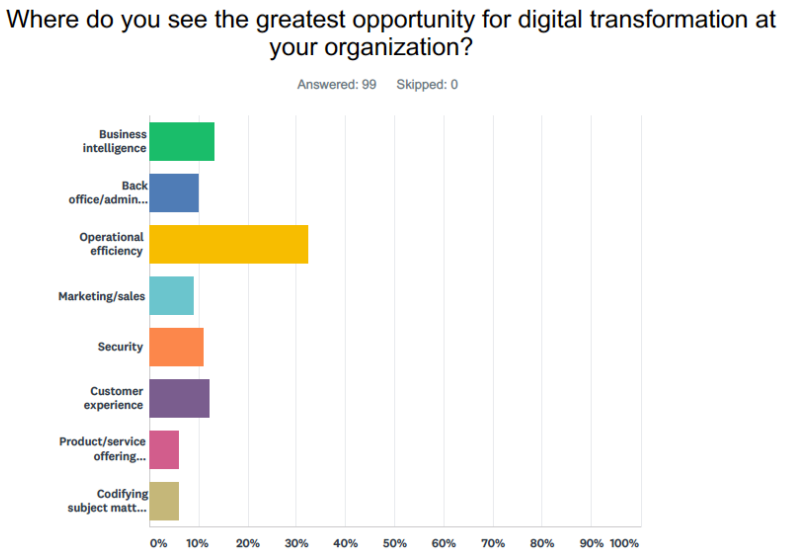

| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Business intelligence | 23.23% | 23 |
| Back office/administration | 35.35% | 35 |
| Operational efficiency | 52.53% | 52 |
| Marketing/sales | 13.13% | 13 |
| Security | 38.38% | 38 |
| Product/service offering innovation | 22.22% | 22 |
| Customer experience | 19.19% | 19 |
| Codifying subject matter experts' knowledge | 8.08% | 8 |
| Total Respondents: 99 | | |

**53%**

SAY THEIR COMPANY IS INVESTING IN NEW TECHNOLOGIES FOR OPPERATIONAL EFFICIENCY.

These findings are consistent with what we'd expect to see in businesses where the physical world is being quantified through IoT deployments. Removing the manual processes enables oil and energy companies to make large strides in operational efficiency and back office/administration in fairly short order. At the same time, this digitization opens up companies to new security challenges. Cyber attacks—state-sponsored or otherwise—are at an all time high, and infrastructure is a popular target. It's easy to see why security makes an appearance as one of the top areas of investment when it comes to new technologies.

Surprisingly, only 8.1 percent of respondents reported that their organizations were investing in codifying subject matter experts' knowledge (page 5). This comes as a shock since the skills gap in the oil and energy sector has been widely discussed and debated. Employees that have spent their lives working in plants and deeply understand how systems tie together are beginning to age out of the workforce. Meanwhile, the next generation of digitally-native employees are entering the field, often leapfrogging over the hands-on tasks that their predecessors learned. While digital savvy employees can help implement and make use of IoT systems, those that have worked at plants for decades have the deeper understanding of how everything ties together. Passing that "tribal knowledge" to the next generation by codifying it into systems seems like a natural place to invest.




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Business intelligence | 13.13% | 13 |
| Back office/administration | 10.10% | 10 |
| Operational efficiency | 32.32% | 32 |
| Marketing/sales | 9.09% | 9 |
| Security | 11.11% | 11 |
| Customer experience | 12.12% | 12 |
| Product/service offering innovation | 6.06% | 6 |
| Codifying subject matter experts' knowledge | 6.06% | 6 |
| TOTAL | | 99 |

**32%**

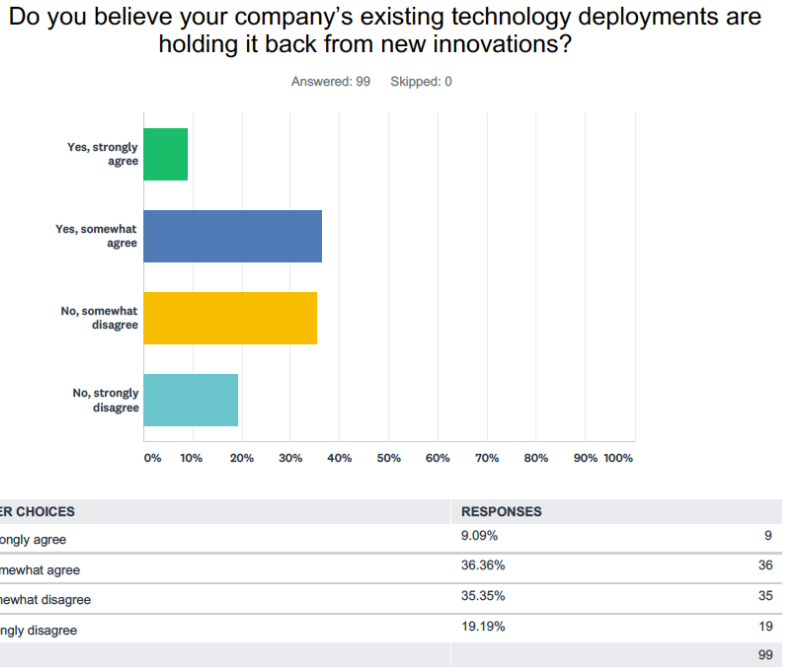
SAY OPERATIONAL EFFICIENCY IS THE GREATEST OPPORTUNITY FOR DIGITAL TRANSFORMATION.

Still, respondents in this survey find other areas of digital investment more immediately appealing. Shifting the scope to look at where respondents see the most opportunity for digital transformation—regardless of where their organization is currently investing—a clear front runner emerged: operational efficiency. Nearly a third (32.3 percent) of respondents see operational efficiency as the greatest opportunity for digital—solidly outpacing the next closest answer, business intelligence, at 13.1 percent. There is clearly still room to grow back-end efficiencies, which are areas that have professionals in oil and energy the most excited.

# Technical Debt and Common Obstacles

Several open doors for transformation through technology were highlighted by survey respondents. What, then, is holding them back from reaching that digital future?

Utilities, energy, and extraction industries tend to be dominated by legacy players, which intuitively suggests that technical debt would be an issue for those organizations undergoing digital transformation. Surprisingly, however, this survey found that few respondents (only 9.1 percent) felt strongly that their existing technology deployments are holding them back from new innovations. The majority of respondents fell somewhere in the middle—36.4 percent somewhat agreed that their existing deployments were holding them back, while 35.4 percent somewhat disagreed. A good portion, 19.2 percent, strongly disagreed.




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Yes, strongly agree | 9.09% | 9 |
| Yes, somewhat agree | 36.36% | 36 |
| No, somewhat disagree | 35.35% | 35 |
| No, strongly disagree | 19.19% | 19 |
| TOTAL | | 99 |

**55%**

DON'T THINK THEIR EXISTING TECHNOLOGY IS HOLDING THEM BACK FROM NEW INNOVATIONS.

This mixed response may be the result of the earlier finding that many organizations are already implementing new technologies and undergoing digital transformation. Considering this high rate of change, it's easy to see why there would be confusion around whether legacy technologies are helping or harming new deployments—or perhaps even whether legacy technologies are still in use at all.

Another explanation emerges when looking at the challenges or roadblocks respondents reported having experienced when they or their organization looked to implement new technologies. The top issue cited is a lack of in-house technical skill (46.5 percent), followed by legacy technology/infrastructure (37.4 percent) (page 8).


| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Lack of enthusiasm/support for change | 32.32% | 32 |
| Misalignment of stakeholder expectations | 14.14% | 14 |
| Legacy technology/infrastructure | 37.37% | 37 |
| Unrealistic timelines | 18.18% | 18 |
| Unrealistic budgets | 29.29% | 29 |
| Lack of in-house technical skill | 46.46% | 46 |
| Vendor lock-in | 5.05% | 5 |
| None of the above | 16.16% | 16 |
| Total Respondents: 99 | | |

**47%**

SAY LACK OF IN-HOUSE TECHNICAL SKILLS IS A CHALLENGE.

**37%**

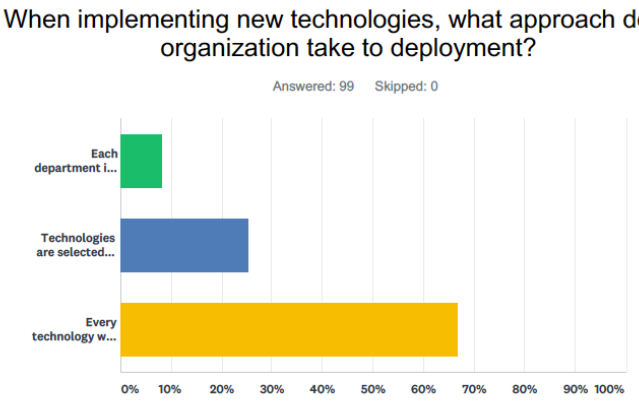
SAY LEGACY TECHNOLOGY/ INFRASTRUCTURE IS A CHALLENGE.

Going back to the skills gap, businesses in oil and energy can't seem to hire IT talent fast enough to support the rapid evolution within their own businesses. Further complicating the issue, we've seen another skills gap—a disconnect between the people that truly know how the plant works, and those with the technical expertise to codify knowledge. In this situation, it's easy to see why legacy technology and infrastructure would be perceived as a challenge.

A lack of enthusiasm or support for change is also mentioned as a limiting factor by nearly a third (32.3 percent) of respondents, followed by unrealistic budgets, cited by 29.3 percent. Respondents do see great opportunity for digital transformation, but their expectations are tempered when it comes to the reality of implementation. Particularly with IoT, businesses can often be overwhelmed by the vast quantities of raw data they're producing and struggle to find the best use for it, or disagree on the right approach. This confusion commonly leads to underestimated costs. While purchasing equipment and launching initial IoT deployments can be expensive and complex, there's still work to be done after those deployments are in place to make sense of the data. Businesses need to factor in those costs and keep momentum going after the initial deployment in order to get to the truly exciting phase where they're putting data into action.

# Priming Teams for Success

When organizations in utilities, energy, and extraction do implement new technologies, they largely recognize that these deployments can't occur in a silo. Two-thirds (66.7 percent) say that every new technology they deploy is a company-wide initiative. This approach truly sets up these organizations for success.




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Each department is in charge of selecting and implementing its own technologies | 8.08% | 8 |
| Technologies are selected and deployed independently by each line of business | 25.25% | 25 |
| Every technology we deploy is a company-wide initiative | 66.67% | 66 |
| TOTAL | | 99 |

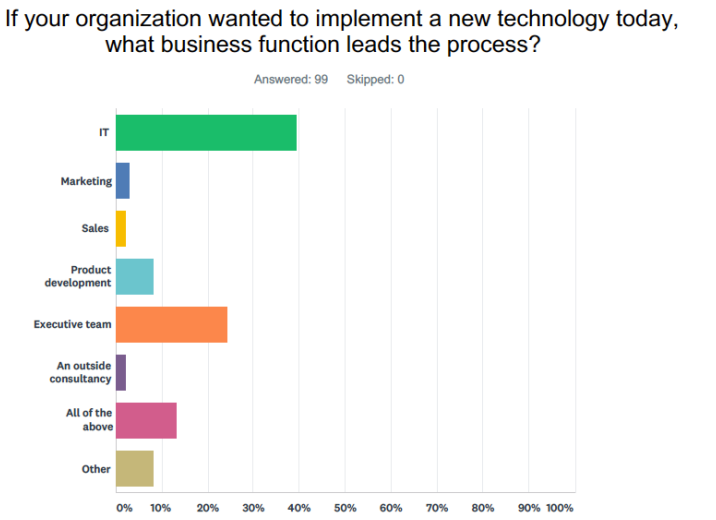
**67%**

SAY BUILDING NEW TECHNOLOGY IS A COMPANY-WIDE INITIATIVE.

Contrary to common belief, digital transformation is not just about technology, it's also about business process and organizational changes. Success with new technologies comes from alignment of stakeholders from across all facets of the organization. Rallying the team behind the company's innovation efforts, ensuring they're working off of the same playbook, and actively finding ways to build on technologies being deployed throughout the organization, is vital.

Like many other industries, IT and the executive team are the two business functions that typically lead the digital transformation process for utilities, energy, and extraction organizations. This finding is common across industries since the executive team typically has an eye on the potential upsides of innovation for the business, and IT leaders understand what technologies are available to solve business challenges and how to implement them.

It was, however, interesting to see that the IT function (39.4 percent) beat out the executive function (24.2 percent) when it came to the job title most frequently leading the digital transformation process (page 10). While IT undeniably has a role to play in the technical execution of digital implementations, business executives usually take the lead in guiding strategy, and thus get credit for efforts to modernize through digital. That dynamic being




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| IT | 39.39% | 39 |
| Marketing | 3.03% | 3 |
| Sales | 2.02% | 2 |
| Product development | 8.08% | 8 |
| Executive team | 24.24% | 24 |
| An outside consultancy | 2.02% | 2 |
| All of the above | 13.13% | 13 |
| Other | 8.08% | 8 |
| TOTAL | | 99 |

**39%**
OF DIGITAL INITIATIVES ARE LEAD BY THE IT TEAM.

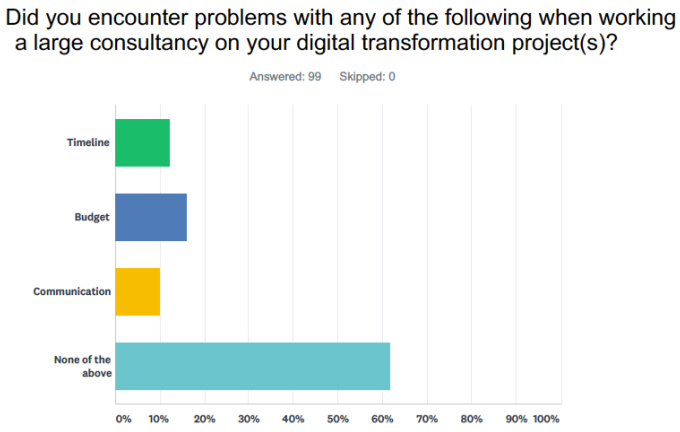
flipped may be yet another signal of the skills gap and obstacles that come into play when relatively greener IT teams are the ones dictating digital strategy for the business.

Even more of a surprise is the finding that only 2 percent of respondents report that outside consultancies typically lead the digital transformation process within their organizations. This may tie back to concerns over budget, but is nonetheless surprising considering the lack of in-house technical skill cited earlier by respondents.

## Mapping a Winning Approach

While there are many benefits to working with an outside consultancy, finding the right one is critical. Of the few respondents that had worked with a large consultancy on a digital transformation project in the past, more than two-thirds (68.4 percent) reported encountering problems during the course of the relationship. For 31.6 percent, those issues tied back to the project timeline. Another 21.1 percent reported problems with budget, while 15.8 percent had trouble with communication (page 11).

We at Janeiro Digital often meet with businesses that have dealt with all three of these challenges, which typically result in project failure—or in some extreme cases, lawsuits. That's why we developed the Rapid Alignment, Design and Development (RADD) methodology, a whole new approach to enterprise innovation that drives success for our




| ANSWER CHOICES | RESPONSES | |
|---|---|---|
| Timeline | 12.12% | 12 |
| Budget | 16.16% | 16 |
| Communication | 10.10% | 10 |
| None of the above | 61.62% | 61 |
| TOTAL | | 99 |

**68%**

OF THOSE WHO WORKED WITH A LARGE CONSULTANCY, ENCOUNTERED TIMELINE, BUDGET, OR COMMUNICATION PROBLEMS.

clients. Assumptions and vagaries can put even the best developers off track. Nearly every project that ends poorly has come back to miscommunication between and among stakeholders, and managers and developers. Having a strategy for getting everyone on the same page—internally and externally—and setting realistic expectations is crucial.

The Rapid Alignment approach carefully considers an organization's existing technology architecture and subsequent development needs, creating tangible documentation that incorporates product strategy, user experience, and technical design. This detailed timeline clearly articulates the project goals, existing dependencies, budget, and deadlines, but also helps ensure all stakeholders are being realistic about the project requirements and scope. Once the project starts, this timeline also makes it easier to see if any pieces are falling behind or going over budget—catching potential derailments before they spiral out of control and reducing risk.

The Design and Development phase of RADD is where the team executes on that plan and makes it a reality.

## Building Long-Term Market Leadership

While oil and energy companies have taken the fast lane to IoT, successful digital transformations should feel seamless and gradual. True transformation begins with building blocks that culminate over time. Organizations must build towards their ultimate digital vision while salvaging value from legacy systems, and minimizing technical debt that could hold the business back down the road.

For example, components such as hardware are necessary investments, but are also low on the value chain. We know these technologies will evolve, so it's important to avoid too much investment in that arena, which could result in infrastructure or vendor lock-in down the line.

Developing strategies for legacy modernization and integration means looking higher on the digital transformation value chain and architecting for sustainable innovation. Oil and energy professionals should be looking to connect their deployments through software that will help their businesses establish a platform that can serve as the core or "spine" of their digital enterprise. Building new integrations and solutions based on a flexible enterprise architecture will help create building blocks that can be swapped out more easily down the road as the business and physical equipment evolves.

Janeiro Digital's software solution, for example, uses a flexible microservices architecture called the XFORM platform, which enables the most common and useful foundational components for a solution to be brought up quickly and efficiently, forming the basis for the work to come. Using XFORM, oil and energy professionals can innovate with a shortened foundational building period, and rapidly connect new solutions to business-critical legacy systems. This translates into mitigated development risk and the enablement of future innovation.

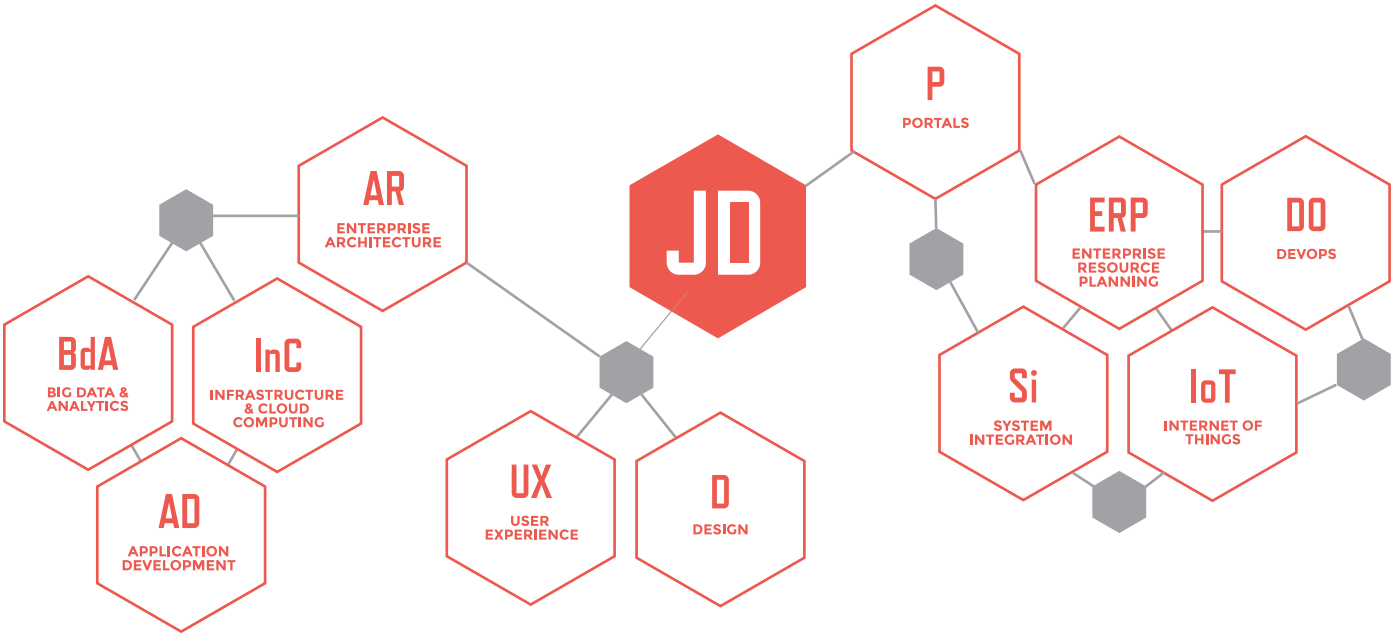
Already deploying IoT sensors and other digital technologies, oil and energy companies that leverage their investments in the right way are primed with an incredible opportunity for market leadership. As IoT becomes common practice, machine learning and smarter analytics are already appearing on the horizon. Organizations that work to connect their systems and rationalize data into actionable intelligence today will find themselves ahead of the curve when this next wave of technological disruption reaches their doorstep—and will be ready for innovation that's sustainable well into the future.

# ABOUT **JANEIRO DIGITAL**

Janeiro Digital is a digital business consulting services company. We design and build enterprise technology that fosters innovation and drives business outcomes. Utilizing technology to enable and address key digital business objectives, we don't just fix problems—we provide sustainable solutions that optimize our client's performance to better serve their customers.

Learn more at www.janeirodigital.com.

# OUR **CAPABILITIES**




Gartner

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