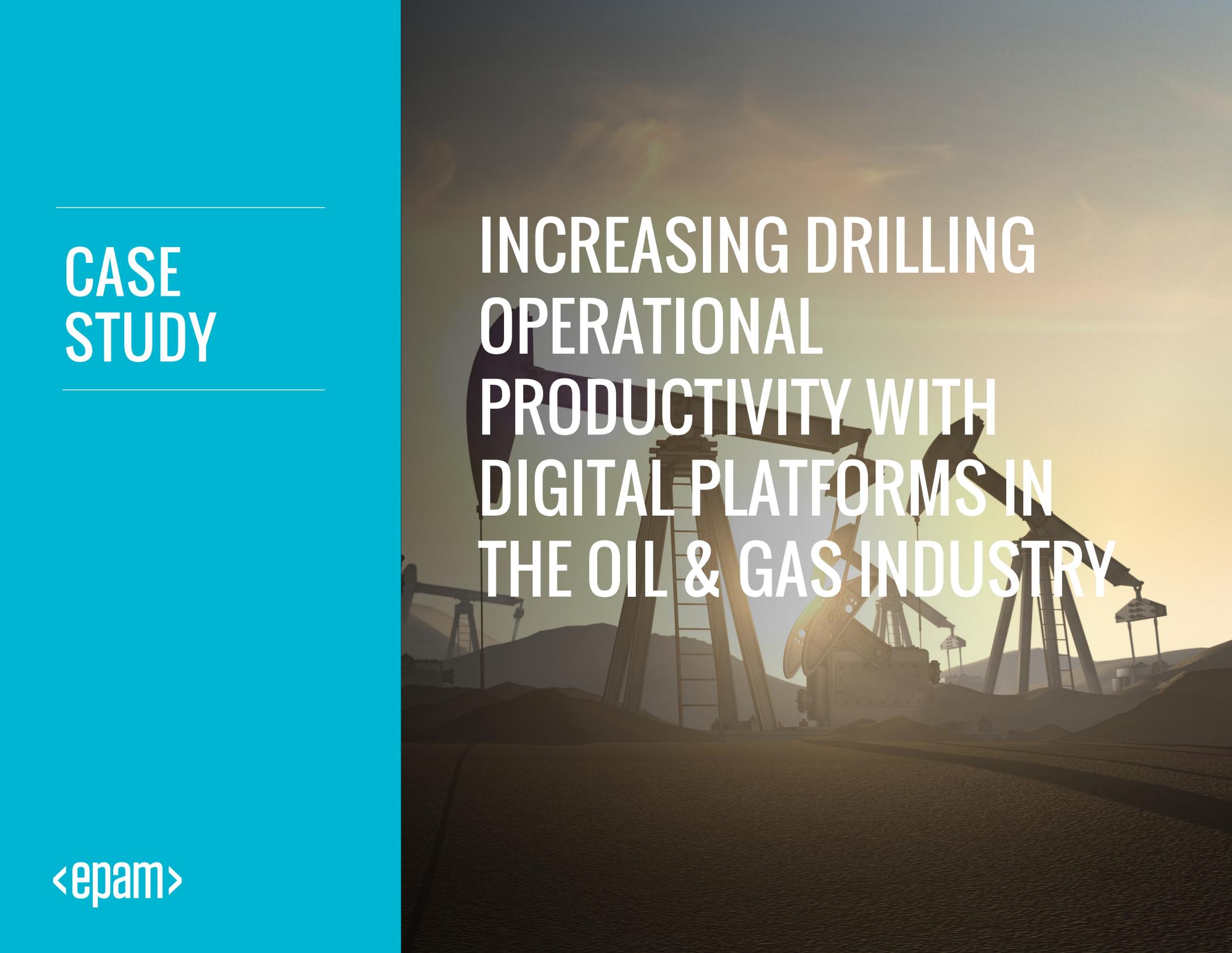

CASE
STUDY

The background of the slide is a photograph of an oil field at sunset. Several pumpjacks are visible, their silhouettes dark against the warm, orange and yellow sky. The foreground shows a dirt road or path leading into the distance. The overall mood is industrial and serene.

INCREASING DRILLING OPERATIONAL PRODUCTIVITY WITH DIGITAL PLATFORMS IN THE OIL & GAS INDUSTRY

<epam>



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ADDING VALUE THROUGHOUT THE ENTIRE SOFTWARE DEVELOPMENT LIFE CYCLE

Employing over 100,000 people across 80+ countries, the client is a leading provider of technology for reservoir characterization, drilling, production, and processing to the Oil & Gas industry. The company is committed to providing their customers with the latest technology and innovation in the industry.

Since 2004, EPAM, a leading provider of platform engineering and product development services, has partnered with the client to build new software products and develop the next generation of technology for the industry. Today, EPAM remains a top-tier technology partner to the client, providing support through every stage of the software development life cycle. We provide our expertise in:

- Digital Platform Engineering
- Application Development
- Agile QA & Testing
- Continuous Integration/Continuous Development
- DevOps
- Consulting

Leveraging these services, EPAM has helped the client shorten product development time-to-market, optimize drilling operations, and make its processes more transparent, flexible, repeatable, and predictable. What follows is a breakdown of a few of the best practices and projects that demonstrate how EPAM has created valuable, game-changing software solutions that serve the Oil & Gas industry as a whole.

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SHIFTING METHODOLOGIES FOR NEXT-GEN TECHNOLOGIES

The client's products push the limits of Oil & Gas technology, combining advanced platform engineering with the modern user experience required to succeed in mission-critical scenarios and demanding environments with the ultimate goal of zero downtime. Every non-productive activity, work stoppage, and critical failure due to bugs and errors literally translates to millions of dollars in lost revenue and productivity for the company and other users of its technology.

EPAM has partnered with the client to take its product vision and make it a reality by creating advanced web technologies with interactive, engaging user interfaces. Without a cultural shift toward iterative, Agile development, these projects would not be nearly as successful going from proof-of-concept stages to alpha releases to minimum viable products (MVPs) to the commercial-grade software deployed on rigs in the field. With that in mind, here are some of the challenges that EPAM encountered toward the beginning of the engagement:

- The client was in the middle of a cultural transformation toward modern Agile software development principles and ceremonies. EPAM helped to further implement development methodologies like Agile and DevOps to make projects more efficient and iterative.
- The client was emerging from the desktop-centric software development approaches and shifting focus to develop and deliver products as web-based solutions for their customers. Challenges included not only the way software was being designed and developed, but also how it was tested, deployed, and continuously delivered.

- There was minimal time-zone overlap between locations and teams. As client teams would be starting their day, the EPAM development team would be winding down. Teams had anywhere from 2-3 hours of overlap for voice communication. This limited the time available to share progress, groom backlogs, plan sprints, and establish next steps.
- There was limited face-to-face time between the teams. Due to budget constraints, the team did not have the luxury of performing an in-person project kickoff and knowledge-sharing session. Project initiations as well as pilot stages were all remotely conducted. The first face-to-face interaction between EPAM's technical/delivery leadership and client stakeholders did not occur until after three years of working together and delivering many successful project iterations. To this day, EPAM still has client product teams who have not visited EPAM delivery locations at all, but the systems of communication have enabled teams to maintain efficiency and success across all projects.

Mitigating some of the above-mentioned challenges required finding innovative solutions, implementing general EPAM best practices, and developing entirely new approaches. EPAM continues to work with the client in many areas related to the topics mentioned in this paper while continuously improving how the two businesses work together.

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ENABLING AGILE TRANSFORMATION

In the context of each individual project, one of EPAM's ongoing roles for the client has been to lead Agile transformation throughout the software development life cycle. This means helping to adopt and improve Agile principles, ceremonies, and practices that are catered toward the client's specific needs on each project. EPAM has worked with the client to help them become more Agile through the following practices:

- Improving and, in some cases, introducing Agile ceremonies such as daily standups, sprint demos, retrospectives, code reviews, paired programming sessions, sprint planning, and backlog grooming
- Enhancing comprehensiveness of user stories acceptance criteria and definition of done
- Implementing continuous integration, continuous deployment, and DevOps/Build Engineering practices to reduce the amount of time it takes to deploy and test software on an ongoing basis and to make the process more repeatable and autonomous

- Establishing best practices for application management and the deployment life cycle to bring teams from different disciplines together to build a DevOps pipeline that enables rig deployments as part of a full ecosystem.
- Standardizing a common set of Agile toolsets to track progress in a shared server, JIRA, team dashboards, etc.
- Delegating and orchestrating project responsibilities to an onsite EPAM Business Analyst (BA)

Throughout the engagement, these Agile best practices have helped EPAM and the client to develop new products and improve existing ones faster without compromising quality. This process and methodology alignment has proven critical time after time for everything from change management to end-to-end development on a brand-new project.

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IMPROVING GEOGRAPHICALLY DISTRIBUTED COMMUNICATION CHANNELS & KNOWLEDGE-SHARING CAPABILITIES

Another key challenge for EPAM and the client has been aligning communication channels and knowledge-sharing capabilities across multiple delivery centers and disciplines. Since EPAM development teams and delivery centers are distributed globally, the delivery model has always been Agile and scalable by default, which turned out to be a great fit for the client once all of the logistics were worked out. Here are some of the best practices EPAM implemented to optimize communication and knowledge-sharing:

- Synchronizing teams with locations in different regions, including North America, Europe, and APAC
- Working with the client to adjust time-zone differences and improve communication channels and tools to become highly productive
- Promoting proactive engagement of all delivery team members regardless of seniority to avoid point-of-communication bottle necks and siloed teams
- Establishing repeatable onboarding processes to indoctrinate newcomers to all client workstreams and projects so they become productive from day one of the engagement.

- Facilitating ongoing training and skills ramp-up for development teams
- Following through with onsite trips for critical phases of the project to expedite the decision-making process, improve communication, spark team-building, and promote cross-team collaboration
- Building Oil & Gas industry training into day-to-day activities so that teams are up to speed on trends and best practices when it comes to realizing solution
- Conducting internal team-building events to celebrate successful releases, milestones, and accomplishments

Over time, the above-mentioned practices have resulted in a reduction of workload and effort for existing delivery teams when it comes to communicating across geographies, transferring knowledge, onboarding newcomers, and keeping existing team members engaged. This set-up has enabled EPAM to communicate effectively with the client throughout all stages of development and delivery.

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BUILDING THE RIGHT TEAM FOR ANY GIVEN PROJECT

With many projects completed over the course of the long-term partnership, EPAM has invested significant time and resources into ensuring that the right teams are developed for each and every project. Here are some of the strategies EPAM uses to make sure it gets team staffing right the first time around:

- **Vision Alignment:** The client sharing its future product roadmap and vision is essential to aligning teams to provide high-level purpose and increase the level of awareness on the impact that the team brings day to day. They also share customer success stories from the field, case studies, and industry publications written about products that are jointly developed to provide greater motivation to the teams so that they can pursue higher goals, increase levels of team engagement and product ownership, and reduce undesirable attrition as teams see the true impact on their work has on the client's business.
- **Delivery Location Strategy:** EPAM determines which delivery centers are involved in the project to enable seamless staffing of high-performing teams. EPAM balances delivery across a number of locations to achieve desired results and outcomes.

- **Proactive Resourcing & Staffing for Project Bench:** EPAM invests in bringing the right resources to ramp-up ahead of the demand to be ready and productive when the need arises for team rotations, additional capacity, and productivity boost. Even on smaller-scale engagements, EPAM has been able to leverage this best practice to be ahead of the demand and need.
- **Product Ownership Mindset:** EPAM teams take a product ownership mindset that prioritizes quality from start to finish. It requires continuous rigor, attention to detail, process tweaks, and cultural shifts, as it is sometimes very tough and challenging to achieve and balance the given product roadmap with business priorities, capacity issues, and timeline pressures, among other priorities.

Assuming there are no unforeseen circumstances or challenges, these team-building strategies and systems help EPAM ensure success before the project is even underway. All in all, these practices help to make positive results predictable, repeatable, and, most importantly, maintainable across long-term projects, as well as the engagement as a whole.

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MAKING CONTINUOUS IMPROVEMENT & ENGINEERING EXCELLENCE A PRIORITY

Standards were established to ensure that all team members shared a delivery mindset founded on continuous process improvement, proactiveness, challenging the norm, and going the extra mile to facilitate true innovation. All EPAM employees subscribe to these high standards, allowing them to achieve Engineering Excellence (EngX) through the following initiatives:

- Automating and improving processes and repeatable tasks to create turnkey solutions that increase efficiency, productivity, and quality
- Going above and beyond responsibilities by tapping into EPAM's extensive Competency Center network, working with experts in Agile, Testing, EngX,

Innovation as a Service, Cloud, DevOps, and other fields to discover the best solution on any given project

- Engaging in root cause analysis to find real root cause issues and have a plan or recommendations to address them
- Encouraging EPAM team members to be proactive, take ownership, and fix issues on a real-time basis so that nothing falls through the cracks
- Creating proof-of-concepts (PoCs) and minimum viable products (MVPs) to test out critical parts of technology products and applications to prepare for the developing the final solution



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BUILDING A CUSTOM QA & TESTING PROCESS

A major challenge for the client is building sophisticated, near-real-time software for a non-deterministic machine state that relies on satellite communication and, in some instances, requires private cloud infrastructure and topology for distributed computing. One way EPAM addresses this challenge is in its QA and testing approach, which is tailored to meet those demands as EPAM works jointly with the client to put the proper QA process into place.

EPAM has adapted the basic testing methodologies used in two-week Agile sprints to a customized cycle of planning, development, and testing for the client. EPAM shares best practices across all workstreams and has a dedicated QA Team Leader who is responsible for setting the vision, direction, and trainings, as well as developing custom toolsets for validation, verification, automation, and regression. By documenting and sharing all of the results, EPAM has also established a virtual QA Center of Excellence for other client-related EPAM workstreams.

GENERAL QA & TESTING PROCESSES

1. SCRUM
2. Two-week sprints
3. Fixed scope for sprint
4. Change requests/production defects management
5. Team Foundation Server (TFS) for storing and tracking all project artifacts (requirements, test cases, defects, etc.)
6. Quality Dashboards in TFS with key metrics such as defect containment, code coverage, critical issues, etc.
7. Continuous improvement process and retrospective meetings
8. Field testing feedback loop

OTHER TESTING BEST PRACTICES

- Collective code ownership
- Project-specific code standards, guidelines, and patterns
- Formalized code review
- Automated static code analysis
- Unit testing and test-driven development
- Version control system branching

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ENGINEERING PLATFORM SOLUTIONS FOR THE CLIENT'S NORTH AMERICAN BUSINESS UNIT

Over the course of this long-term engagement, EPAM has had the pleasure of working with numerous client business units, including its North American Drilling unit. For these engagements, EPAM has engineered the following platforms that demonstrate a holistic approach to technical solutions in the Oil & Gas industry:

DIRECTIONAL DRILLING ADVISOR: Leading all front-end development, web services, and end-to-end QA and automation for the directional drilling advisor, EPAM engineered the platform to run with near-real-time data feed integration and, in one instance, helped the client deliver a well six days ahead of schedule with no downtime recorded due to non-optimal directional tools or rig equipment.

DRILLING ANALYSIS APPLICATION SUITE: EPAM performed front-end development for a suite of applications performing analysis on bit selection, drilling pipe, adding jars, and predicting stuck points, and also built an architecture

frontline team to help with the next-generation revamp of the architecture. EPAM helped enable workflow across all core well design and planning disciplines with focus on the client's Drilling and Completions program. For Bit, Jar Selection, Mud Design, and other platform modules, EPAM leads front-end web development and supports UI/UX design.

DRILLING DATA PLATFORM: EPAM completed back-and-front-end development for a drilling data acquisition and visualization platform aligned with the client's Rig of the Future vision. EPAM participates in the development of an integrated rig-based platform that automates end-to-end workflows at the rig site and provides real-time displays and visualizations of actual vs. planned operations.



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PLATFORM & PLUG-IN DEVELOPMENT FOR THE CLIENT'S NORWEGIAN BUSINESS UNIT

Another one of EPAM's long-term engagements is with the client's business unit in Norway. Focusing on the platform and plug-in development, EPAM has completed the following projects through various engagements:

COLLABORATION PLATFORM: EPAM oversaw the continuous development and enhancement of a platform that enables discipline experts to collaborate and make confident, informed decisions from exploration to production. EPAM participated as a key development team for a geological modeling and reservoir characterization industry solution through numerous product generations, which has transformed over time into a multidisciplinary industry platform that helps to standardize workflows and share data from exploration through production. Today, we support innovation PoCs for the next generation of the platform, including microservices architecture, cloud-based collaboration, web-based 3D rendering, and centralized analytical processing.

KNOWLEDGE-SHARING API DEVELOPMENT EPAM participated in the development of an industry application framework and toolkit that allows an ecosystem of ISV's, O&G operators, universities, and research centers to develop and share innovative technologies while retaining their intellectual property.

OTHER PROJECTS:

- Prototyping innovation projects
- Data analysis window features development and refactoring
- Petrel property modeling
- Drilling plan workflow tool
- Microseismic plug-in development
- Well section window framework and API development



QUESTIONS?
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A PROVEN TRACK RECORD OF MAXIMIZING THE CLIENT'S TECHNOLOGY INVESTMENT

Over the course of this 13+-year engagement, EPAM's expertise in Advanced Technology, Distributed Agile Development & QA, Product Development Services, Digital Platform Engineering Services, and the Oil & Gas Industry has been demonstrated through the results we have produced and the positive customer outcomes we have achieved.

In the Oil & Gas industry, EPAM helps maximize technology investments, improve operational efficiency, optimize drilling operations to reduce the cost of drilling, and speed time-to-market to ensure our customers remain competitive.

