

# Integrated planning for a dynamic oil and gas industry

Insights from an inaugural survey of  
upstream planning practices





Significant forces have reshaped the upstream sector, exposing the limitations of traditional planning practices.

Companies are struggling to keep up with a host of interrelated changes: the shift to unconventional assets, a more dynamic asset class; the downturn and volatility of commodity prices; intensifying investor focus on returns; and continuing innovations in the field.

In this environment, upstream companies are searching for a better way to manage their businesses. In an effort to help the industry uncover planning challenges and identify barriers to improvement, we launched a new survey dedicated to the planning process in the upstream oil and gas sector.

**The survey results are in, and we believe the findings can help upstream companies create a roadmap for real improvement to their planning organizations.**

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# About our survey

KPMG and 3esi-Enersight share a common mission to help the upstream oil and gas industry evolve existing management capabilities for greater success.

From our conversations with industry executives, planners, and information technology (IT) professionals, it is clear that the exploration and production (E&P) industry has undergone massive shifts as a result of new technologies unlocking the vast potential of unconventional resources. The price volatility of recent years has further contributed to an ever-shifting E&P landscape.

Given the significant changes in how the industry operates, business practices should have likewise evolved substantially—but have they?

KPMG and 3esi-Enersight combined their respective experience in strategy consulting and planning and reserve solutions to develop an upstream planning survey to gain a deeper understanding and appreciation of the challenges facing the industry, and how these have changed as a result of industry shifts. In so doing, we also looked to uncover some of the leading practices across participants.

The survey targeted the largest North American E&P companies between August and December 2017. Survey responses comprised 78 individuals in approximately 10 different planning or operationally-focused roles ranging from analysts to senior executives, and hailing from large producers (3 million BOE/D) down to small operators (25,000 BOE/D). Respondents were offered modified versions of the survey depending on seniority, with those indicating their position was at a director level or higher being offered an “Executive” survey track, and the remainder indicating positions below a director level receiving a non-executive survey track.

The survey included questions grouped into the following topic areas:



**Focus and value of planning.** What is the perception of an organization's current planning process? How does it better the overall organization?



**Anatomy of a planning cycle.** What are the various components of an organization's planning activities, and where is major effort allocated?



**Planning norms.** What behaviors (intended and unintended) play into an organization's planning process?



**Information flow and tools.** How does an organization use systems to support its planning activities?



**Looking forward: The future of planning.** Where are companies looking to invest to change their planning practices? What new technological developments in planning may disrupt current paradigms?

While the data reaffirmed many of our hypotheses, we also uncovered evidence that challenges some of our preconceived notions. We are excited to share what we learned and look forward to discussing the insights with you.

# About the authors



KPMG helps global oil and gas companies solve their most complicated strategy, organization, and performance challenges. Recently, KPMG helped several upstream oil and gas entities, including a leading independent E&P and a major's unconventional business unit, to enhance their integrated planning and performance management capabilities. KPMG professionals take an enterprise-wide view to every business transformation, using time-tested approaches, advanced data and analytics, and deep cross-functional experience to guide companies from strategy through results.



**Tom Hiddemen**  
*Managing Director,  
Corporate Strategy*  
KPMG

Tom works across the energy value chain with a focus on the upstream and midstream oil and gas sectors. With more than 18 years of professional experience, he works with clients on strategy development, operating model transformations, enhancing integrated planning and performance management capabilities.



**Todd Blackford**  
*Director,  
Corporate Strategy*  
KPMG

Todd has more than 15 years of experience in the oil and gas industry. He specializes in the upstream sector with significant experience in integrated planning, operating model design, organizational design, and operational business process improvement, lean well delivery programs and cost reduction.



3esi-Enersight provides the E&P industry with integrated software and technology solutions for innovative planning and analysis. Executives and technical decision makers in companies around the world, including national oil companies (NOCs), super majors, emerging operators, investors, and consultants, rely on 3esi-Enersight's products and services. From corporate strategy and planning to operations, capital management, and reserves, 3esi-Enersight solutions are designed to help oil and gas companies make better investment decisions across both conventional and unconventional assets, onshore and offshore.



**Evan Howell**  
*Vice President,  
Strategic Development*  
3esi-Enersight

Evan oversees 3esi-Enersight's efforts to expand into new markets and develop cross-functional industry partnerships. He brings prior experience in strategy development and portfolio management for the upstream sector, as well as in cross-industry economic and financial analysis.



**Lillian Warren**  
*Principal Consultant*  
3esi-Enersight

Lillian has 20 years' experience working with upstream oil and gas companies ranging from small independents to super majors and NOCs. Her focus has been working with executive teams and planning teams on process design and the cultural and organizational change aspects of implementing a portfolio planning approach.

**The authors thank the following contributors to this paper:** Andy Steinhubl, Chris Click, and Josh Hesterman from KPMG; and Jim DuBois and Jeff Morgheim from 3esi-Enersight.

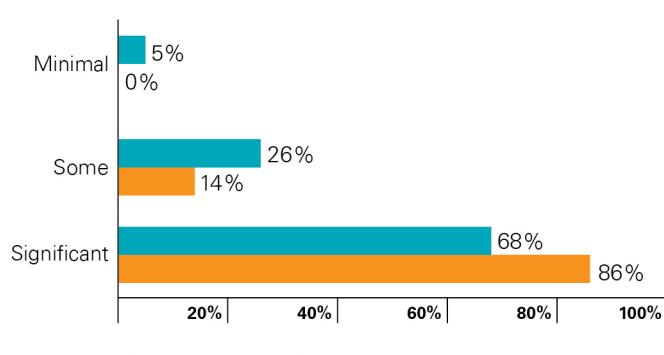
# The current state of oil and gas planning

We approached our survey with the goal of assessing the state of play for E&P planning professionals. What we found, however, suggests that the discipline of upstream planning is still very much in its adolescence. Planning's potential is tested, and there is strong universal belief in its overall importance to the organization. But most operators have yet to turn the planning discipline into a competitive advantage.

## The planning function is clearly valued throughout the oil and gas industry—it's just not as effective as it can and should be.

Survey results confirm our conversations with operators throughout the industry who share near-universal agreement about the importance of effective planning. Almost three-fourths (73 percent) of all respondents, including 86 percent of executives, said planning provided "significant" value to their organizations, the highest level among all answers.

### In your opinion, how much value does planning bring to your organization?



*May not equal 100% due to rounding*

Approximately half of all respondents also identified at least six functional areas through which planning delivered material value to their companies. Planning is deemed particularly important in the evaluation and pursuit of alternative portfolio and asset development scenarios.

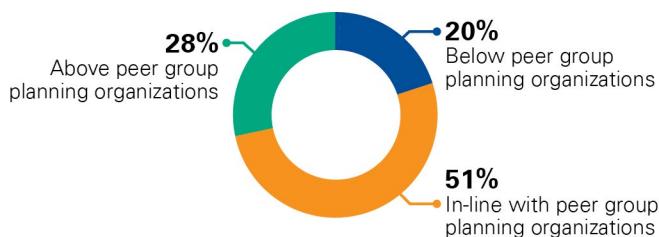
### How does your organization's planning process deliver material value to the company? (select all that apply)



*Multiple responses allowed*

And yet, most participants grade their own planning organizations as decidedly average compared to peers.

**Do you believe your planning organization performs above, below, or in-line with the planning organizations of other companies within your peer group?**



*May not equal 100% due to rounding*

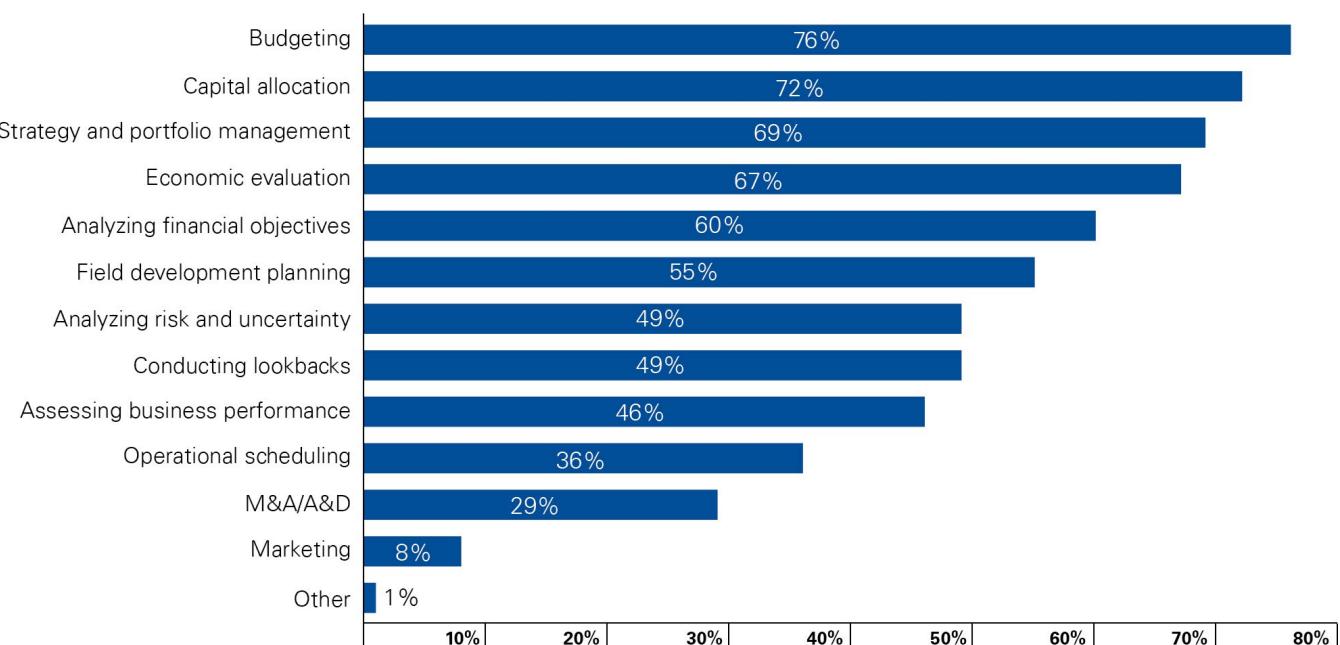
So why, if planning is so important, have more operators not turned it into competitive advantage? Our survey results suggest several complicating factors.

## No standard definition of “planning” exists in upstream oil and gas.

When we asked survey participants to outline their planning organization’s core responsibilities, all but three of the available responses were selected by nearly half or more of all respondents. This confirms our experience: across companies, rarely do we see two planning organizations organized the exact same way with the exact same mission.

We believe this is evidence of the core challenge facing planning organizations today: how to consistently add value across a diverse array of inter-disciplinary functions. Complicating this is the fact that many of the disciplines existing elsewhere within the typical E&P (for example, in drilling engineering) have evolved over time to become highly focused and specialized, a contrast to the cross-functional nature of planning.

### What are the core responsibilities of planning in your organization? (select all that apply)



Even within a single organization, we see evidence that “planning” may mean different things to different groups. Among non-executive respondents, 66 percent said that standards existed only in certain areas of their organizations, or not at all.

This is a particularly interesting response, since 52 percent of the executive respondents stated that one of the ways that the planning organization provided material value to the company was by “improving and maintaining standards.”

### To what degree is planning standardized across your organization?



13%  
Limited to no standardization exists



53%  
Standardization exists only in certain areas



33%  
Appropriate level of standardization exists



2%  
Overly standardized and restrictive

*May not equal 100% due to rounding*

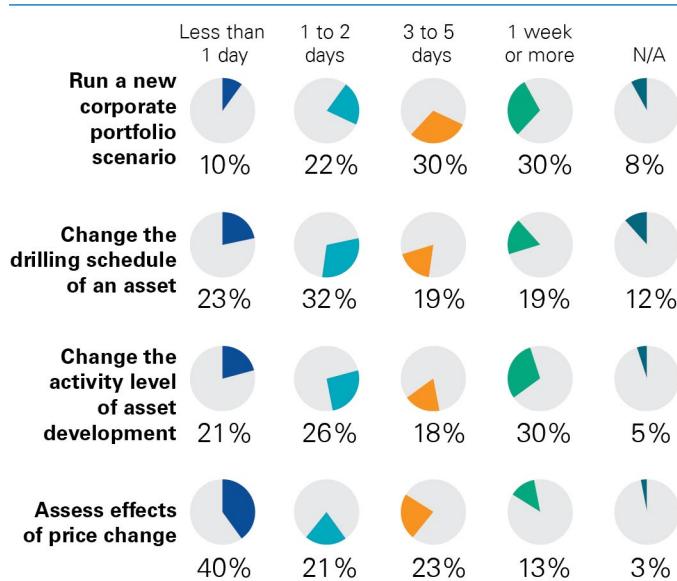


## Performance from one company to another varies widely.

Typical turnaround time runs the gamut from one day to more than a week from initial request to final report for a planning organization to perform core business functions like updating schedules or changing a price assumption.

For example, in generating a new company-level portfolio scenario, 33 percent of respondents indicated their organization could produce that in less than two days, while 30 percent indicated it would take a week or more.

### What is the (expected) typical turnaround time for your planning organization to update or change the following (measured from initial request to final report out):

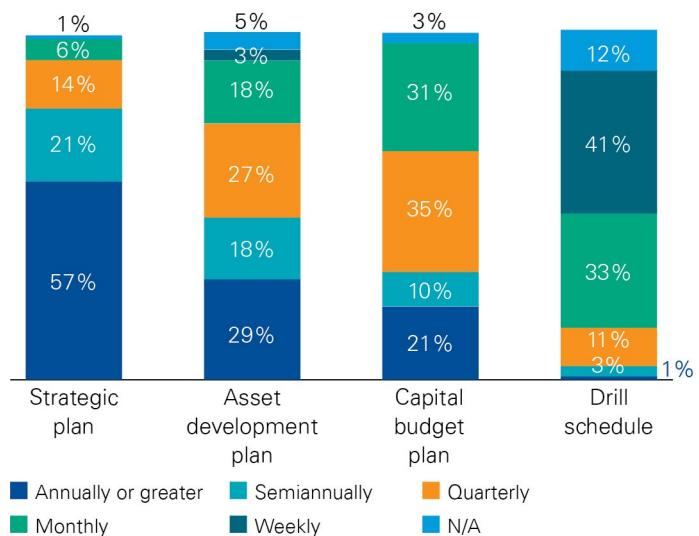


*May not equal 100% due to rounding*

We see a similar diversity of performance when looking at more cyclical, large-scale processes common across operators. More than half of survey respondents indicated that their strategic and/or long-range plans are updated only on an annual (or greater) basis. This suggests not only that many operators still view at least a portion of planning as a scheduled event rather than as a dynamic process, but that some organizations are simply unable to act with greater frequency—a performance limitation.

Assuming that companies will generally seek to keep their plans as up to date as possible, the data implies a broad difference in capabilities across operators. For example, while some (41 percent) can update a drilling schedule weekly, others can only do it monthly or quarterly (33 and 11 percent, respectively).

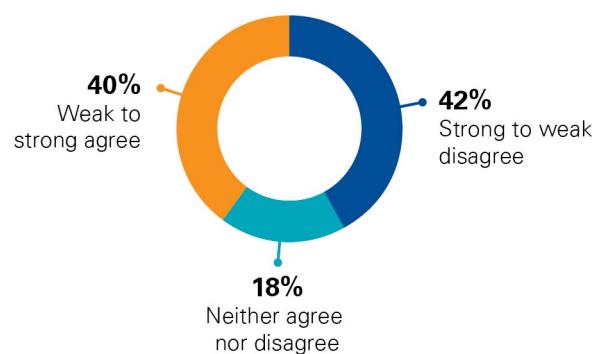
### How frequently does your organization update the following plans?



*May not equal 100% due to rounding*

It is worth noting that these differences in planning performance have material impact outside of the planning organization as well. Forty-two percent of respondents said that their organizations cannot put together a company model without burdening their asset teams.

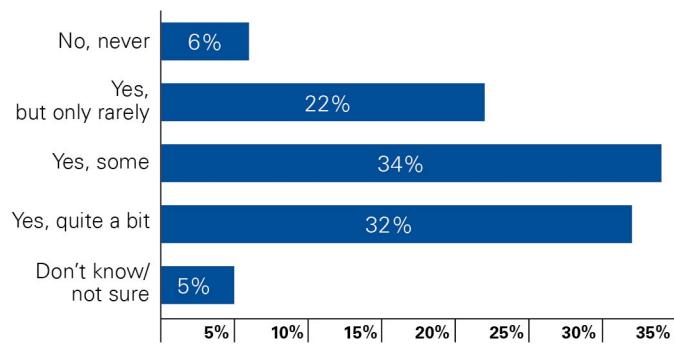
### Our organization can model enterprise-wide scenarios while minimizing the burden on asset teams



## Deep-seated structural problems underlie many of the differences in capabilities.

Eighty-eight percent say decision-making is slowed down or less efficient due to data issues such as unavailable or poor-quality data, often requiring manual manipulation and moving data from one system to another. And when asked, a significant number of participants have indicated that the desire to be overly precise during planning often slows down the process and runs counter to being agile.

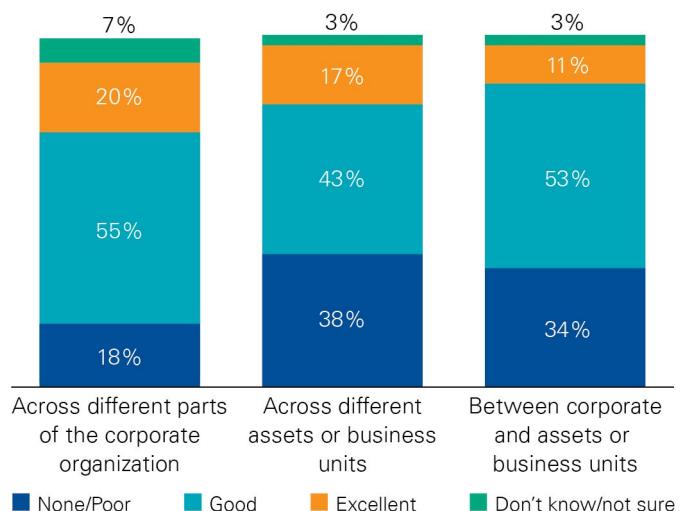
### In your experience, is decision making significantly slowed and/or made inefficient by the desire to ensure corporate planning models are fully reconciled with asset and operational plans?



*May not equal 100% due to rounding*

Perhaps most concerning is that approximately one out of three respondents indicated there was poor or no collaboration at all between business units and the corporate organization, or among various business units. The resulting incongruous data assumptions among parties leads to time wasted trying to reconcile models, and a lack of trust or confidence.

### How would you characterize the level of collaboration between planning teams within your organization?



*May not equal 100% due to rounding*

One of the more intriguing results from the survey was that minimizing staff burnout is an issue for 83 percent of respondents' organizations and is the single largest area of concern for both executive and non-executive respondents evaluating their own planning technology and systems.

In summary, while there is near universal agreement on the value of planning, it's equally clear that many aspects of planning have room for substantial improvement.



# Diagnosing the effectiveness gap

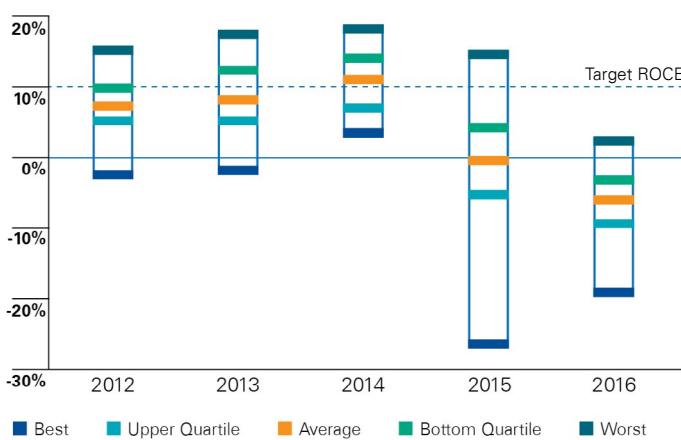
Our survey data points to a clear divide between the stated importance of planning and the reality of its execution. But before oil and gas companies can begin to fix the issues, they must first diagnose why this division exists. We see five obstacles to change that help to explain why the effectiveness gap exists, and why improvement is such a challenge.



## Heritage business practices don't work in today's environment where unconventional assets play a key role for most operators.

Oil and gas production from unconventional sources is at an all-time high, and energy companies are projecting continued capital expenditure in shale projects for the next decade and more. Yet, most industry participants are failing to achieve healthy returns on their investments in unconventional assets.

### Capital efficiency of independent E&Ps\* ROCE (2012–2016)



\*Return on capital employed (ROCE) analysis conducted on 17 of the largest independent shale producers

Source: CAP IQ

The dynamic nature of unconventional onshore drilling programs requires greater collaboration, communication, and synchronization among various levels of organizations and across assets in order to efficiently and effectively adopt new learnings and address changing market conditions—a marked difference from large offshore mega projects for which major business decisions must largely be made up front before project execution. Organizations have been slow to adjust their business practices, and they have suffered as a result.

Indeed, even while many companies tout a new “factory model” of unconventional as a volume-driven, margin-focused business, we still see the creep of legacy planning practices into this supposedly new approach. Many E&Ps continue to plan on an annual cycle, place greater focus on production over other metrics, and create budgets based on final project delivery.

The ability to constantly tweak and adjust an unconventional asset base leads to a desire for more detail at a more granular level than before. This feedback loop creates added bulk in the system, which results in less planning agility within a system explicitly designed to exploit the same.

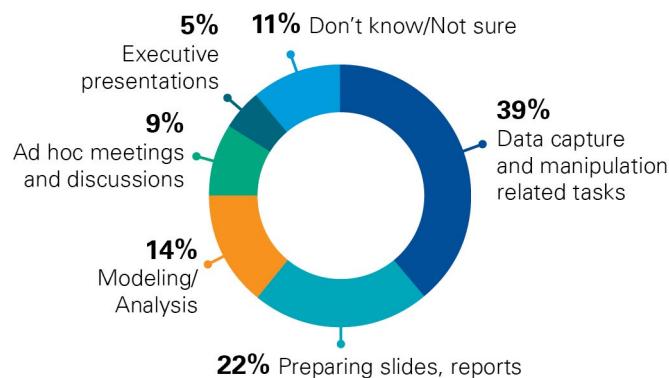
Ultimately, while the nature of oil and gas assets have changed, traditional planning processes have largely stayed the same.

## Existing planning information systems are simply not up to the task.

Low-value-added activities such as manual data gathering and report generation occupy too much time from high-value staff. Our research broadly supports that poorly constructed planning systems shoulder a large part of the blame.

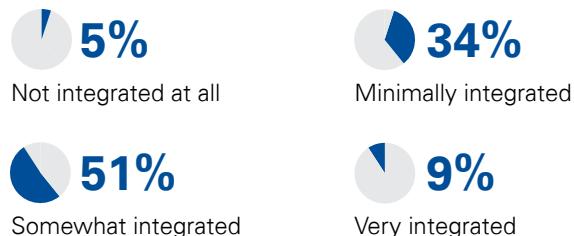
Data-related endeavors appear to be particularly egregious offenders. Almost 40 percent of respondents indicated data-related tasks were the single largest draw on their time, while only one in seven survey respondents indicated they spent more time on modeling and analysis.

### Over the course of a year, which of the following type of task consumes the largest amount of your organization's planning time?

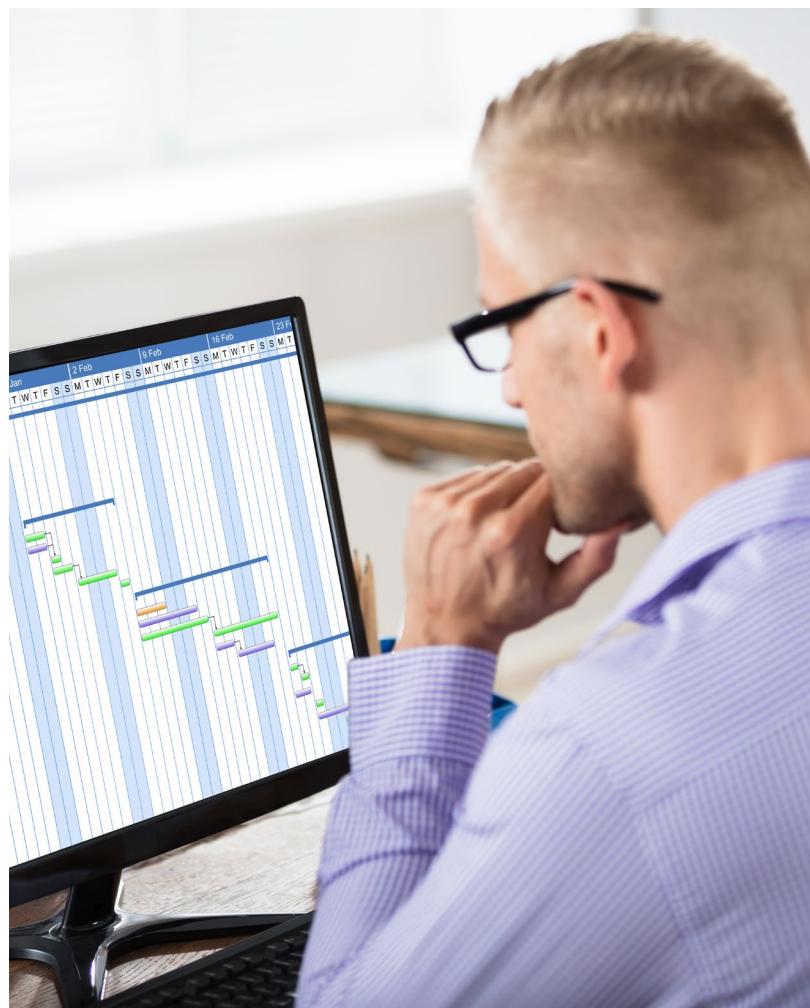


Our results suggest these may be symptoms of a larger problem: planning systems are not enabling staff to allocate high-value time to high-value activities. Only one in ten respondents said their organization's planning systems (encompassing data, information, and tools) were "very" integrated, while 39 percent said their organization's systems were "minimally" integrated or not integrated at all (the two lowest choices offered).

### How well integrated are your organization's planning systems (including data, information, and tools)?

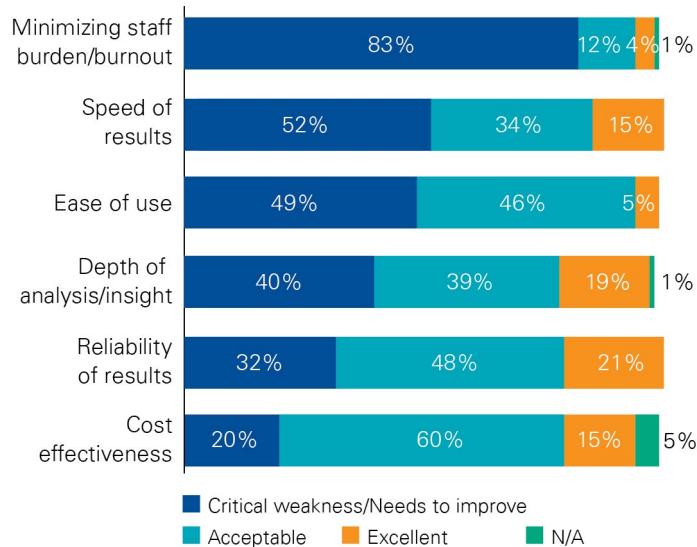


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In fact, at least a third of respondents identified critical weaknesses or at the very least a need for improvement among every area of the planning system, including speed, insight, ease of use, reliability, cost, and burden.

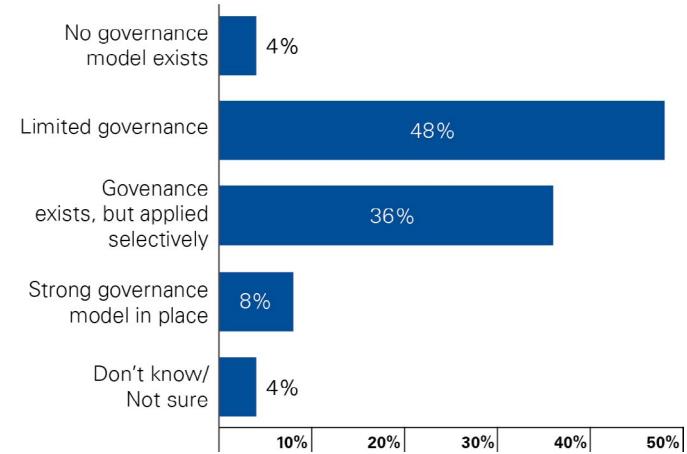
### Rate the performance of your organization's planning technology and systems in the following areas:



*May not equal 100% due to rounding*

Importantly, a planning system includes more than pure software and tools. Processes also are suffering from underinvestment. Only one in three respondents thinks there is an appropriate amount of standardization in planning across their organization, and even fewer, one in ten, believes their organization has "strong" governance.

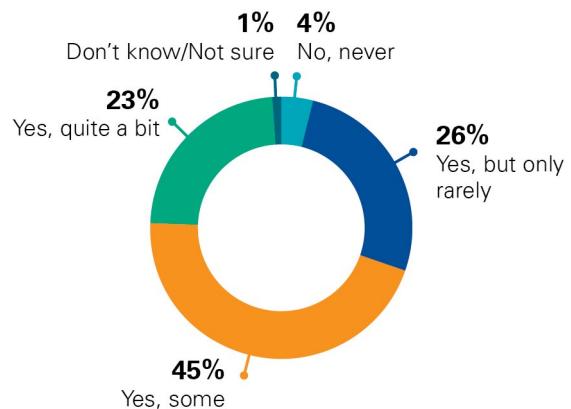
### How would you describe the current governance model that is in place to manage changes to critical planning input data (e.g., decline curves, drilling cost assumptions, etc.)?



*May not equal 100% due to rounding*

Further, 30 percent of respondents say they do not perform any type of routine lookback analysis.

### Does your company perform meaningful lookbacks or reviews in an effort to course correct or drive new learnings?



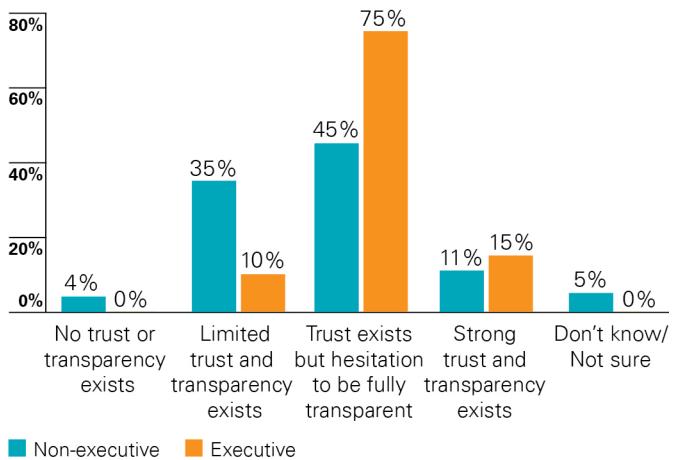
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## Cultural barriers and lack of trust hinder development.

The dynamics between groups within the planning process appear frayed. Nowhere is this more apparent than between operating elements of the company and the central corporate structure.

A significantly high 84 percent of respondents describe some level of distrust and a lack of transparency between business units and corporate.

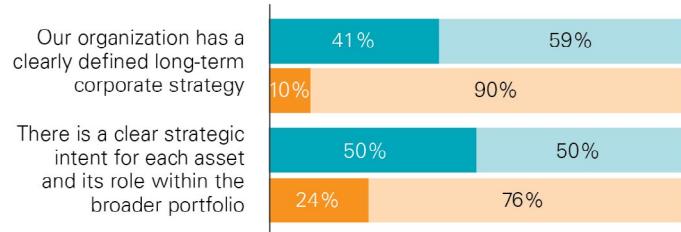
### In your opinion, how would you describe the level of trust and transparency between corporate and assets?



When asked about the level of "collaboration" between the two, one in three respondents described the interaction as "poor" or "none."

Our results also suggest a similar gulf between senior management and line staff, with the former having a more positive perception of value, performance, and capability of the company's planning function. Executives were more likely to self-grade their organization as outperforming their peers and were more likely to agree with statements such as "there is clear strategic intent for each asset" and "planning is integral to driving long-term performance."

### As it relates to your opinion of your organization today, please indicate the extent to which you agree or disagree with the following statements.



Non-executive ■ Disagree/neutral ■ Agree/Strongly agree  
Executive ■ Disagree/neutral ■ Agree/Strongly agree

*May not equal 100% due to rounding*

In our work with E&P clients, it was not uncommon to see teams add "buffers" to their planning submissions, or likewise, corporate planning modify data submissions to "fix" them. While we cannot assign causality, our findings do suggest this behavior is correlated to a material erosion of trust throughout the organization.

While some degree of tension between teams seems natural, we see our results as evidence of more than that, with potentially dire consequences. If executives cannot trust what they are hearing, a fundamental value of planning is lost.

# Bright points: Emerging technologies and solutions

**While leading practices in strategic planning are not yet widespread, several leading practices are coming to the forefront.**



**There is a move toward a more dynamic planning model**, as 36 percent of respondents indicated that they are updating their capital budgets on a quarterly basis.



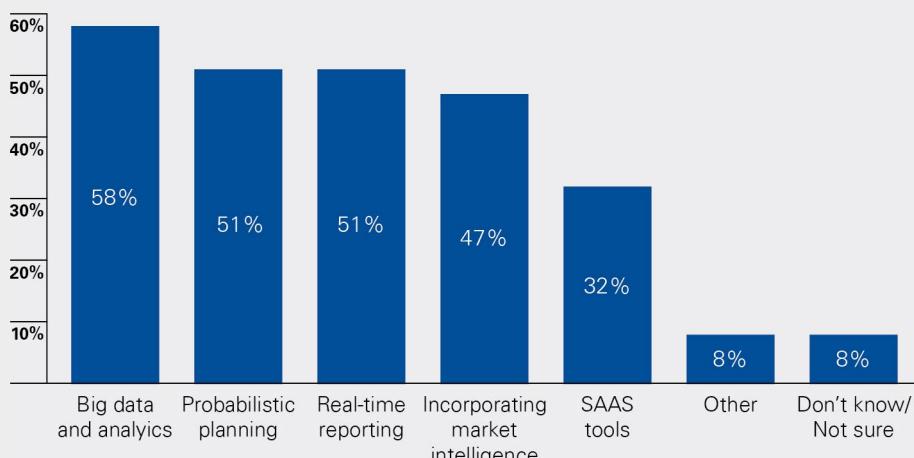
**Systems are becoming more integrated**, with 46 percent of respondents indicating that their systems are at least somewhat integrated.



**Organizations are shifting away from complete reliance on Excel as the primary tool for planning**, with 60 percent of respondents investing in a commercial planning system.

**Survey participants also showed excitement around several technology advancements on the horizon.**

**Which of the below technologies do you think represent promising near-term (within three years) advancements for planning in the upstream oil and gas industry? (select all that apply)**



## **Data platforms and integration.**

The market is moving toward one integrated platform, compared to the separate tools used by different groups today.

## **Market intelligence and data analytics.**

Increasing amounts of market and competitor data are available, enabling faster, better-informed target analysis.

**Risk and uncertainty.** New tools for project characterization and portfolio modeling are enabling oil and gas companies to better incorporate risk in their planning strategies as well as gauge uncertainty around technical forecasts and their ability to achieve goals. Companies will continue to develop capabilities to apply probabilistic planning methodology to supplement traditional deterministic approaches.

Improved portfolio analysis will determine the most efficient project mix selection, allowing management to focus on risk appetite rather than on project return expectations.

# What E&Ps told us about planning: The Top 10 survey takeaways



One

**Oil and gas companies believe their planning functions can provide significant value, but results are falling short of expectations.**



Two

**Staff burnout is the biggest issue facing planning organizations today, with four in five respondents citing it as a weakness.**



Three

**Much effort is wasted on data manipulation and report generation, rather than spent on generating insights to help run the business.**



Four

**The typical lack of integration between systems only makes data access and analysis even more difficult.**



Five

**Executives have a generally positive view of their planning organization's capability and effectiveness, but this rosy view is not shared by their staff.**



Six

**Most E&Ps experience distrust and a lack of transparency between business units and corporate, hampering the planning process.**



Seven

**Planning organizations need greater standardization as few organizations have meaningful requirements or governance models in place.**



Eight

**Probabilistic information is rarely incorporated into planning work, yet the consensus is that doing so would improve results, either somewhat or substantially.**



Nine

**The majority of companies have the capital to invest in planning improvements; the chief obstacles are prioritizing planning against other initiatives and having staff time to support the work.**



Ten

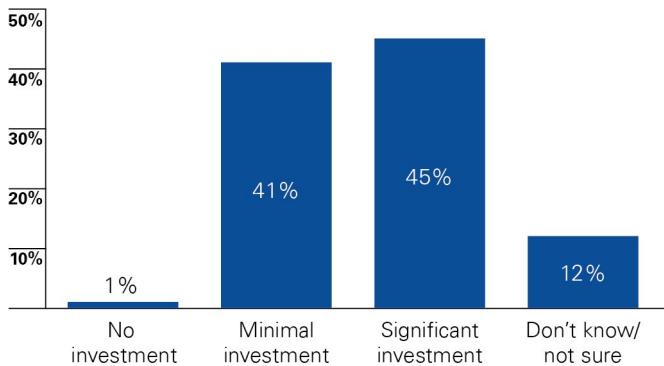
**Despite the obstacles, companies are currently investing in growing their future planning capabilities with a focus on data integration, quality and consistency, and improved analytic capability.**

## Oil and gas executives have poor visibility of the front line from the top.

Survey participants largely agree that their organizations' planning processes are integral to driving competitive performance and believe their companies should invest in planning capabilities.

But we have found that even the organizations that deem planning important still don't prioritize efforts to improve it.

### How much investment should your organization be making over the next year in improving its planning capabilities?

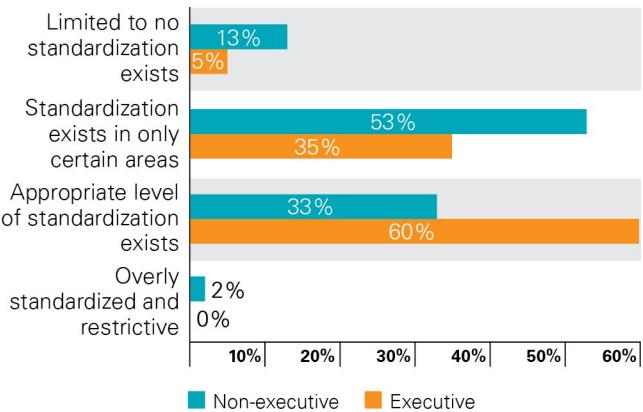


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Planning competes for attention and resources against other organizational imperatives that are often considered more critical to value generation. One reason improvements in planning may not rise to the top of the priority list is that any weaknesses in the process may not be visible to the executives.

For instance, consistent standards across an organization both ease the process for the planning staff and increase executive confidence in the results. When asked to what degree planning is standardized across the organization, 60 percent of executive respondents said it was at the appropriate level, while only 33 percent of the non-executives responded that this was the case.

### To what degree is planning standardized across your organization?

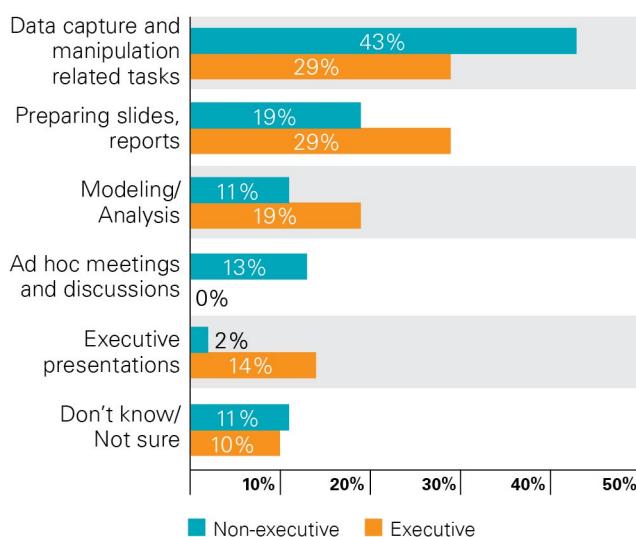


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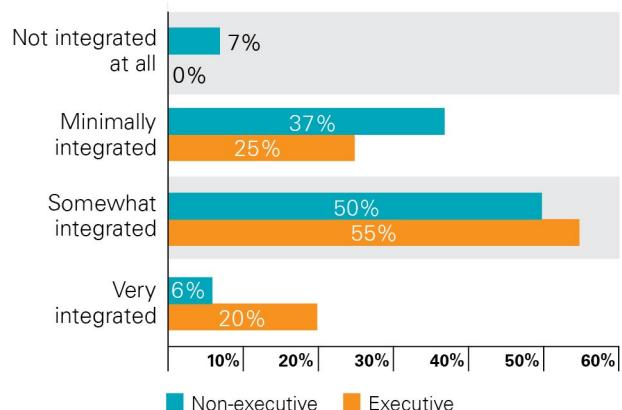
Additionally, 29 percent of executives surveyed thought that data capture and manipulation was the most time-consuming aspect of the planning process, while 43 percent of non-executives reported that it was.

### Over the course of a year, which of the following type of task consumes the largest amount of your organization's planning time?



Only 25 percent of executives stated that their planning systems were minimally integrated or not integrated at all, while 44 percent of non-executives responded that this was the case.

### How well integrated are your organization's planning systems (including data, information, and tools)?



The result is a catch 22. Staff in the trenches who personally experience the pain and see the inefficiencies don't feel they have the authority or the mandate to improve the situation. Meanwhile, executives who might logically have such a mandate are buffered from the realities.

5

## The complex cross-functional nature of planning can obscure the vision for what planning ultimately should be.

Even though many companies have recently launched targeted initiatives to make improvements to their planning process, they continue to struggle.

Part of the problem is that the scope of integrated planning varies considerably across, and at different levels within, the organization, leading to disagreement about what problems need to be solved, and in what sequence. Often so many disciplines have a hand in the process it requires a major cross-functional, coordinated, and vision-led effort to realize meaningful benefits from change.

Further, our survey results suggest many practitioners define planning based on their individual roles within their organization, rather than through a more holistic approach. With such a limited view on what issues are actually driving the pain points within planning, organizations are often unable to pinpoint what actually needs to be improved.

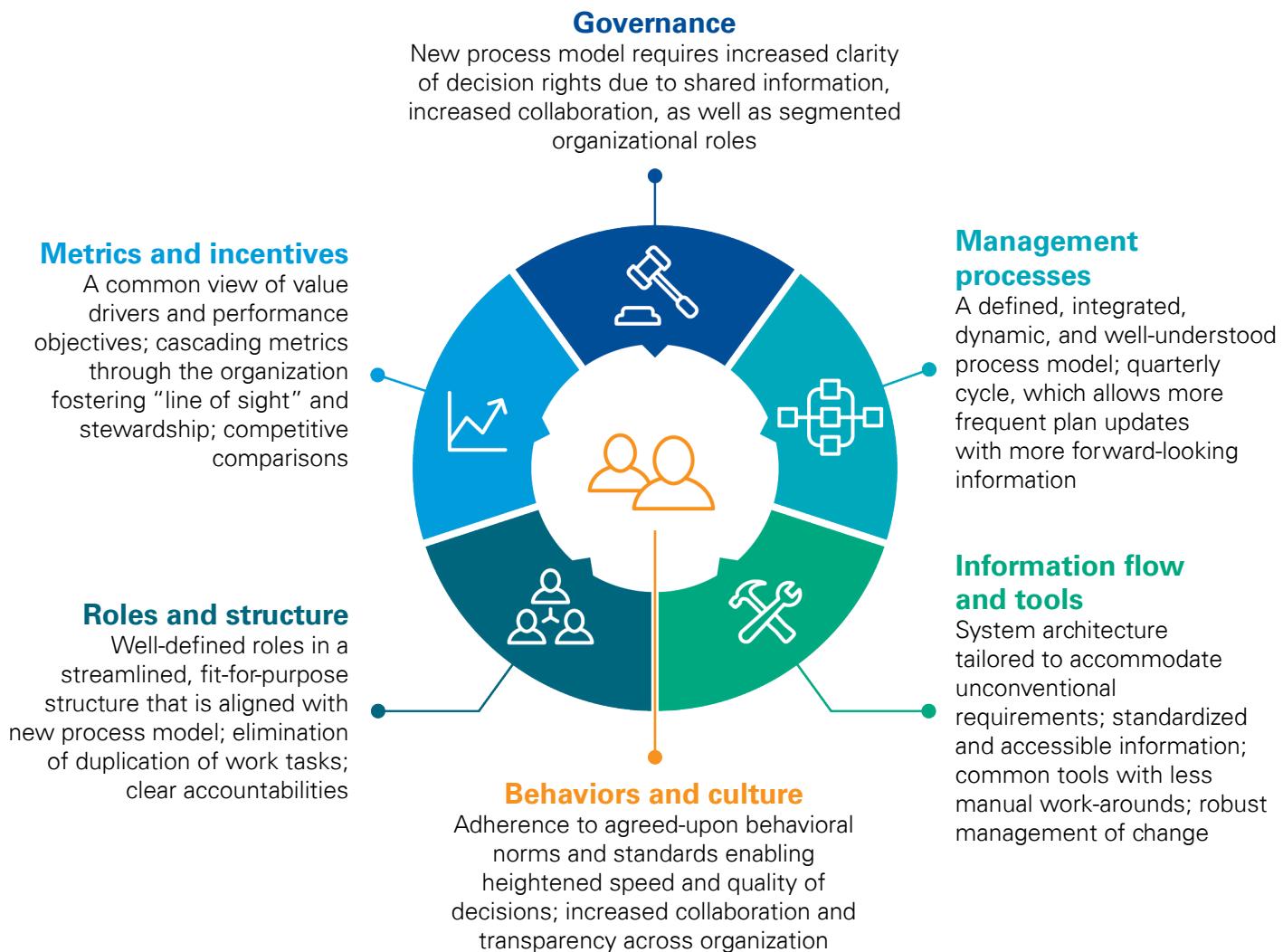
Improving planning requires full alignment across the organization; here's where to start.



# Adopting a dynamic operating model

Leading companies are adopting operating models designed for today's more dynamic oil and gas industry environment. Executives that clearly define objectives for their planning function and align their operating models accordingly are better able to lead their organizations and deliver differentiated performance.

## Future state operating model



# Examples of leading practices associated with the six elements of the future state operating model



## Behaviors and culture

- Trust exists across organization levels with full transparency of analysis and planning results
- Collaboration exists across planning teams, encouraging leading practice sharing and solutions
- Behaviors are consistent with dynamic nature of business, accepting metric tolerance levels, directional plans, and making decisions based on imperfect information



## Governance

- Delegation of authority is right-sized to allow decisions to be made at the correct level within the organization
- Adequate controls are in place to help ensure assets are following standard process and guidelines
- Clear decision rights and trust exist across planning roles, eliminating need for duplicative activities and excessive oversight



## Management processes

- A more dynamic, fully integrated planning process and performance management model
- Planning calendar is balanced and integrated across asset and corporate requirements
- Performance reviews, lookbacks, and data refreshes have a defined cadence and are done in sync with a planning cycle purpose-built around the dynamic nature of the company's business



## Information flow and tools

- Source data is used for both asset- and corporate-level planning
- Tools are standardized across assets, providing for more like-to-like comparison
- System architecture and data flows are well known and integrated to allow information to be easily accessible throughout the organization



## Roles and structures

- Organizational model is designed to provide clear ownership and accountability
- Roles are clearly defined and aligned to process model, eliminating duplicative work
- Central planning team established with embedded planning resources in the asset



## Metrics and incentives

- Clear line of sight exists on how functional level metrics align to corporate goals
- A competitive intelligence capability exists, allowing true external performance comparison
- Metrics and definitions are standard across assets, allowing for true performance comparison

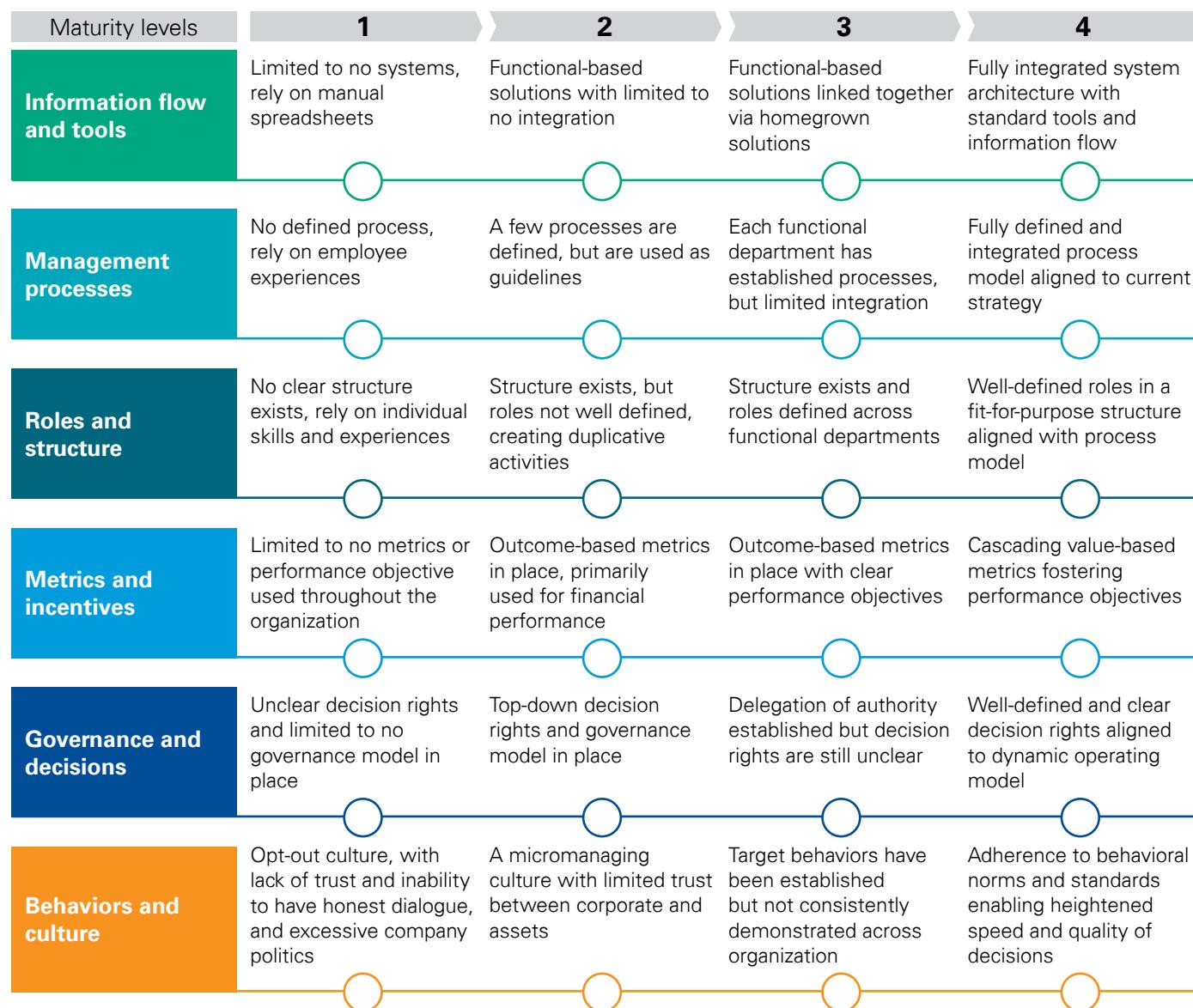
# Assess your planning process

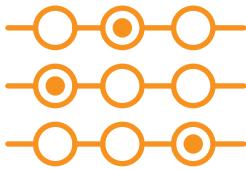
**The path to a future state operating model can seem challenging, but the first step in a successful transformation is triage: understanding where problems exist (or don't), and which problems are most severe.**

Below is a planning process Maturity Chart describing levels 1 through 4 for each of the elements of the planning operating model, with level 1 representing the least favorable performance, and level 4 representing leading practices.

You can use this chart as an assessment tool by marking where your organization's integrated planning process is today, as well as your goal level, to help determine the changes required to achieve leading practices.

Note that level 4 across all operating model elements is not the right goal for every organization. Rather, the right level depends on the role and objective of the planning function, as well as on size and complexity of your organization.





Step 1

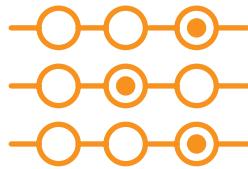
## Develop an honest baseline.

Assess your company using the Maturity Model, considering all areas of the dynamic operating model. Many companies jump the gun and focus on one area such as information flow and tools. This is insufficient and can prolong the transformational process or, worse yet, sap the organization of focus and effort to support broader change.

Resist the temptation to rely on the perceptions of a few people. Assess your organizational maturity by gathering perceptions across different levels and different areas within the planning process. Consider using the structure, questions, and findings of this survey to conduct an internal information-gathering exercise.

Once you have adequately assessed your current process, compare your findings to the maturity model and place a dot on the place in the model that best describes your current state.

While level 4 scores across all operating model elements are not needed by every organization, a total score of less than 20 suggests changes to some or all elements of the model may provide material value gains to the organization.



Step 2

## Benchmark against leading practices.

Determine at what level on the maturity model your organization should be in order to fulfill the defined role of the planning function and have a high-performing integrated planning process.

Once you have determined the appropriate target level across each one of the operating model elements, place another dot on the maturity model.

This exercise identifies the areas of the operating model that need the most improvement in order to reach target performance. The assessment can then be used to help communicate to others within your organization to determine the degree to which your planning process needs to improve, as well as prioritize the areas likely to drive the greatest impact.



Step 3

## Articulate the need for improvement

Develop a plan for communicating the need for change. The following is a list of questions to help your organization think about how to start the journey:

- Do we have a clearly defined and understood role and objective for the planning function?
- Are company leaders able to effectively utilize existing planning processes to deliver superior performance? Is planning a source of competitive advantage for our organization?
- What elements of the operating model should be changed?
- What degree of change will be required, and what would be the scope of change? What would be the value of improvement in just one area of the operating model?
- What level of support from senior leadership will be needed?
- Do we have adequate resources and know-how to deliver a planning transformation, and are there opportunities to engage with external experts?
- What is the organization's readiness for change?



# Case Study: The power of the cloud and a window into the future of E&P planning



## The challenge

The challenge will sound familiar to any large operator: This upstream producer was struggling to consistently forecast its production due to well failures and unplanned maintenance events. As a result, the company could not make timely contracting decisions around short-term capacity.

Complicating this problem was scale: the company's position included many thousands of wells with an intricate gathering structure and a complex economic model. This limited the company's ability to run "full asset" scenarios, as such analysis required computing power beyond their existing desktop computing capabilities.



## The change

The company sought an integrated, full-field system that would shrink the "time to decision" of the old spreadsheet and Access-based systems.

Deploying a multitenant, cloud-based asset development solution gave the subsurface, economics and commercial teams a single workspace in which to collaborate. The solution was designed so that individual plan components (subsurface characterizations, surface constraints, etc.) could be contributed by the appropriate team but would be viewed and analyzed as a holistic, integrated system.

The cloud-based architecture of the solution allowed any individual user to recruit additional processing power on demand. A user had the ability to access up to 20 times their base computing allotment, with no IT intervention or behind-the-scenes scripting required.

This capability facilitated one team in developing a field-wide Monte Carlo-based assessment of well failure timing, enabling a more accurate prediction of when wells would experience production impairments and to what degree. This analysis was ultimately systematized and applied to company's ongoing monthly production forecasting process.



## The business impact

**The new system ultimately provided the client a 60 percent reduction in overall process time and took a forecast of operating activities from +/- 20 percent accuracy to 1.09 percent in their most recent lookback period.**

The cloud made massively scalable computing power easily available for modeling complicated integrated problems, allowed integration with third-party applications through Web services, and provided data security and backup. Additional improvements included the following:

*New capabilities for risk and uncertainty analysis:*

Large-scale Monte Carlo simulation was now possible as a result of additional off-site computing resources that could be tapped as needed.

*Increased transparency:*

An integrated system meant data transformations were controlled and models could be shared across teams (or even to partner companies), all within a single framework.

*Better IT performance:*

Dynamic version and user control, automated deployment/upgrades, and low overall Total Cost of Ownership (TCO) are all part of the improved experience.

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# Concluding thoughts

The pace of change challenging the upstream oil and gas industry is unlikely to slow. As the business and technical environment becomes increasingly difficult to predict and adapt to, the importance of agile, effective planning grows. Organizations that are equipped to analyze, plan, and manage an integrated view of their strategy and their operations will have an edge over their competition.

We anticipate that this survey will prove to be a valuable benchmark against which the industry can measure the effectiveness of its planning processes. This year is just the beginning, as oil and gas companies learn about and implement additional leading practices.

Future analysis of the sector will shine a light on our collective success in addressing challenges such as staff burnout, trust, and transparency, as well as incorporating technical advances in areas such as data integration and probabilistic analysis. We look forward to sharing updates on the industry's progress with you.





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