



WHITE PAPER

The Production Mandate

Sponsored by: SAP and Accenture

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IN THIS WHITE PAPER

In this white paper, IDC Energy Insights looks at the approaches that upstream oil and gas companies are taking to improve production. Findings are based on analysis of a quantitative survey and in-depth interviews conducted with line of business and IT across company ownership types, resource plays, and geographies. Of particular interest is the role that an integrated approach plays in improving data quality and acquisition, establishing consistent processes across functional business units, and utilizing operational and business applications – also known as OT/IT integration – which can help oil and gas companies achieve their business objectives.

Major findings include:

- Production management is a top priority for upstream oil and gas companies, with a focus on improving margin and reducing exposure associated with deferrals.
- Trustworthy data for decision making is not available in a timely manner. 37.8% of oil and gas companies cannot get access to onshore production data for three days or more; almost a quarter cannot get access to offshore data in that time frame. On average, revenue figures are not available for four to eight days. It takes as much as a month to get accurate cost data for 24.3% of onshore wells and 10% of offshore wells.
- Over 40% of oil and gas companies reported that if a business case is made, production management-related IT initiatives will be assigned the highest priority for immediate initiation.

SITUATION OVERVIEW

It is common knowledge that the oil and gas industry has reached the end of "easy oil." New resources are more expensive to find and develop than the conventional resources that have provided oil and gas to the world for many decades. Free cash flow – operating cash flow minus capital spending – is limited as more is expended to produce fewer barrels of oil. One example is shale gas and oil. According to the *Financial Times*, independent upstream oil and gas companies in the United States had negative free cash flow in 2012 and 2013. It was only in 2014 that these players saw positive free cash flow.

With high capital investment required, even companies with the strongest asset bases are experiencing the pressure to improve performance. Similarly, in March 2014, Shell Chief Executive Officer Ben van Beurden told the markets that "Shell has a strong asset base and industry leadership

in many of its growth themes. While this position of strength gives confidence for the future, it is also clear that we need to get a tighter grip on performance management in Shell."

The lack of free cash flow has become more pronounced with the drop in the price of oil. After experiencing a fairly steady price per barrel of oil over the past two years, the market has now seen a drop in both Brent and WTI spot market prices (see Figure 1). A lower price per barrel of oil puts some resources "out of the money." Certain plays are more expensive to find and operate than to produce. For example, the capital cost of an oil sands asset ranges from \$50 to \$107 per barrel, with operating costs ranging from \$25 to \$70 per barrel.

The price drop may be temporary, but there is the strong possibility that the market will see more price volatility going forward. Either way, with lower prices or more price volatility, there is more pressure from shareholders and governments not only to cut back on capital expenditures but also to cut costs to improve margin and cash flow for future capital investments.

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FIGURE 1

Oil Spot Prices, 1990 to 2014



Source: U.S. Energy Information Administration, 2014

The downstream segment of the business has seen low margins for years and has been quick to adopt an approach to operations similar to that of other manufacturers. The upstream segment can take advantage of lessons learned by these downstream efforts to streamline operations. Recently, the rise of unconventional plays has brought attention to "manufacturization" – a repeatable process to reduce costs. This approach makes sense where it takes many more wells distributed across a wide area to produce the same volume as conventional wells. Oil and gas companies are starting initiatives of applying manufacturization to all their upstream resources to find pockets where costs can safely be reduced.

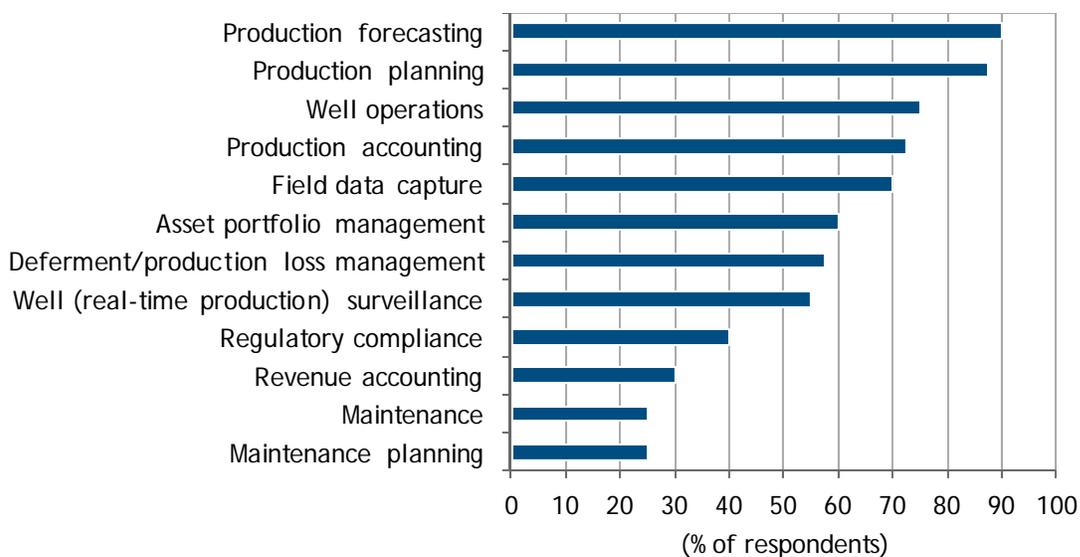
What Is Production Management?

The focus is clearly on better management of operations, referred to in this study as "production management." There are many functions associated with production management. Figure 2 displays the functions associated with production management by respondents to the quantitative survey. Production forecasting, production planning, well operations, and production accounting are most often associated with production management. Essentially, the object of production management is to improve the performance and profitability of assets.

FIGURE 2

Functions Associated with Production Management

Q. When you think about production management, which of the following do you associate with production management?



n = 40

Source: IDC Energy Insights, 2014

FINDINGS

Production Management Is the Top Priority for Upstream

Sentiment in the oil and gas industry has changed from maximizing revenue to optimizing production. There has been a shift from production at all costs to producing in context. This is borne out in the interviews conducted for this study. According to one company interviewed for this study, "It used to be that growing production absolutely was the only metric that our oil and gas company cared about. We've all gotten a lot more sophisticated than that, and now everybody understands if you're not growing profitable production, then it's more damaging than it is helpful." The CFO is heavily invested in understanding what capital is available and how wells are performing.

For some, improving recovery at existing wells returns more value than drilling new wells. One independent upstream company reported, "Production management is the number 1 priority for us." This company conducted a formal study based on its costs and opted to concentrate on existing wells rather than investing capital in new wells. Another executive stated, "If I can make a smaller proportion on capital investment and slow that decline, then that's all good on the top end of growth, again continuing to spend within capital. If I can take a 15% decline curve and take 2% out of that, that's huge."

There is also reason to pay attention to margin at the well level. Companies reported that this information is needed for planning purposes – to understand which wells or sub-areas within fields to offer for divestiture. In times of low oil and gas prices, the tendency is for an increase in merger and acquisition activity. According to Bloomberg, "In 1998, when oil slumped to about \$10 a barrel after the Asian financial crisis, the value of mergers and acquisitions surged more than seven times to a combined \$376 billion in that year and the next."

Reducing Deferrals Is a Top Business Objective

A review of business objectives provides further insight into business priorities (see Figure 3). The oil and gas industry has multiple business priorities. Aside from zero tolerance for safety, reducing deferrals is the top priority at corporate and business unit levels (see Figure 3). One participant in the in-depth interviews from a major oil company expressed the importance of reducing deferrals as follows: "If we reduce deferrals, for example, from 10% to 5% with a company like ours, that can already make a difference. I don't know the magic number but it can make a difference of almost \$1 billion on a yearly basis already.... If we are not producing, it basically means we are not using the capacity that we have, so that postpones production."

"It used to be that growing production absolutely was the only metric that our oil and gas company cared about. We've all gotten a lot more sophisticated than that, and now everybody understands if you're not growing profitable production, then it's more damaging than it is helpful."

FIGURE 3

Top Upstream Oil and Gas Business Objectives

Q. Using a 5-point scale, where 5 is very important and 1 is not very important, how important are the following objectives to your corporation/business unit?



n = 40

Source: IDC Energy Insights, 2014

It is interesting that there is a difference between what respondents say about their business unit goals and what they perceive the corporate goals to be. For example, 90% of respondents reported that the objective of minimizing well operating costs was important or very important for their corporation compared with 82.5% of respondents who reported that it was important or very important for their business unit. The respondents put a high premium on optimizing well profitability for the business unit.

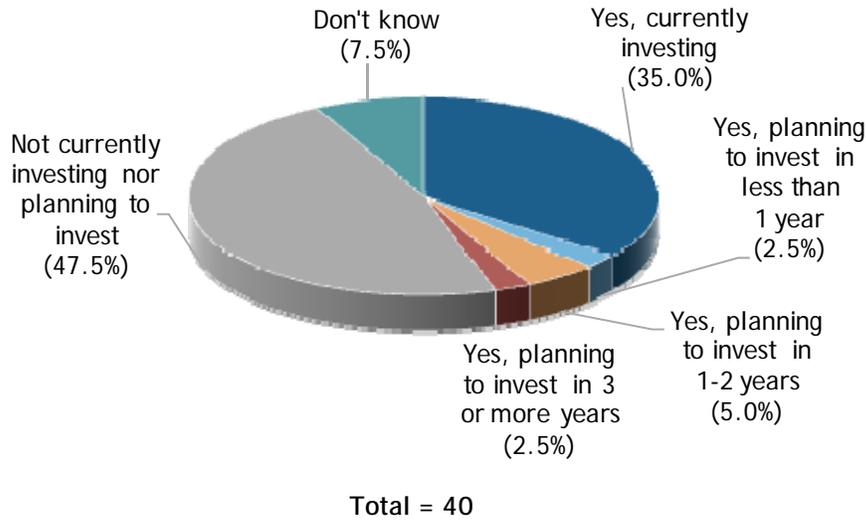
Investment in IT for Production Management Takes Priority

Over 40% of oil and gas companies reported that if a business case is made, production management-related IT initiatives will be assigned the highest priority for immediate initiation. Survey results also show that almost half of companies are investing in or planning to invest in production management (see Figure 4). Investment by national oil companies (NOCs) in production management is above average. The percentage of oil and gas companies with IT initiatives in production management may be even higher. In-depth interviews revealed that several companies had already completed production management initiatives in the past two to three years.

FIGURE 4

Investments in Production Management

Q. *Is your company currently investing or planning to invest in any initiatives to improve production management?*



Source: IDC Energy Insights, 2014

In-depth interviews and surveys provide insight into the range of production management initiatives at oil and gas companies (see Table 1).

TABLE 1

Production Management Initiatives of Respondents

| Type of Initiatives | Initiatives |
|---------------------|--|
| Process | <ul style="list-style-type: none">▪ Standardization on tools and processes for production and well management, including new acquisitions▪ Integration of processes including costing, production planning, and resource allocation▪ Development of new deferment standard to determine when it is economic to perform a workover▪ Risk aggregation to determine when there are events or situations (storms, high seas, etc.) that would impact production |
| Technology | <ul style="list-style-type: none">▪ Development of decision support centers for equipment setting recommendations using multiple wells in the reservoir▪ Implementation of applications for monitoring and managing production▪ Identification of streamlining to capture data for non-instrumented wells or faulty or non-calibrated meters▪ Integration of business systems across all levels▪ Acquiring analytics and analytical tools for production forecasting |
| Data | <ul style="list-style-type: none">▪ Improving production data quality and data modeling▪ Enhancing access to real-time data and automated data acquisition to improve forecasting |

Source: IDC Energy Insights, 2014

Need for Improvement in Information to Make Business Decisions

Oil and gas companies need to make short- and long-term operational and financial decisions on when and whether to:

- Shut in a well
- Perform maintenance
- Increase or decrease production
- Plug or abandon a well

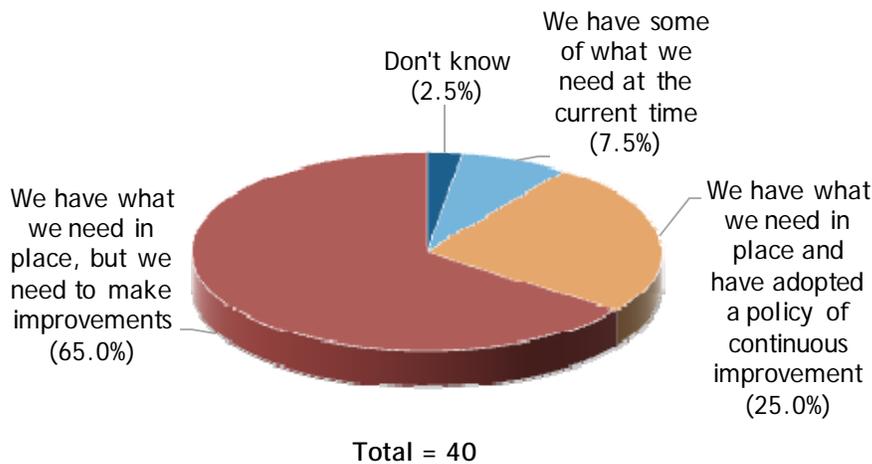
There is a surplus of data collected by oil and gas companies, but that does not mean that there is timely access to actionable information to make decisions. According to one interviewee, "... we get plenty of high granularity data that is adequate to make good production optimization decisions on, but the problem is that we spend a better part of our days, about 40%, trying to put it all together. So we have plenty of data, but it just takes us too long to use it."

There are many factors to be considered – safety, profitability (revenue and cost), and production volumes – in making these assessments. The data is being collected, but it is often not accessible, rationalized, and integrated, and there are no adequate analytics in place for decision making. 65% of oil and gas companies think that there is a need to make improvements in the information used to make short-term and long-term production decisions (see Figure 5).

FIGURE 5

Need for Improvement in Information

Q. How would you characterize your company's ability to access timely information needed to settle on the right options for addressing production/asset decisions?



Source: IDC Energy Insights, 2014

The lack of timely information is largely due to the difficulty of working with the complexity of legacy systems and poor data quality, according to in-depth interviews. With the increase in instrumentation and availability of time series data from operational applications, oil and gas companies acknowledge that there are sufficient data sources. The challenge is to get access to that data and validate the veracity of the data.

Once oil and gas companies have the information they need, companies are confident in their ability to execute on the decisions. 65% of survey respondents indicated that they have what they need to execute on decisions and have processes in place for continuous improvement. This is not surprising given that oil and gas is considered an industry that "gets things done."

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Operational and financial decisions about how to handle a well – whether and when to perform a workover, stimulate production, divest, or decommission – depend on getting timely well-level information on:

- Production volumes
- Revenue associated with production
- Costs

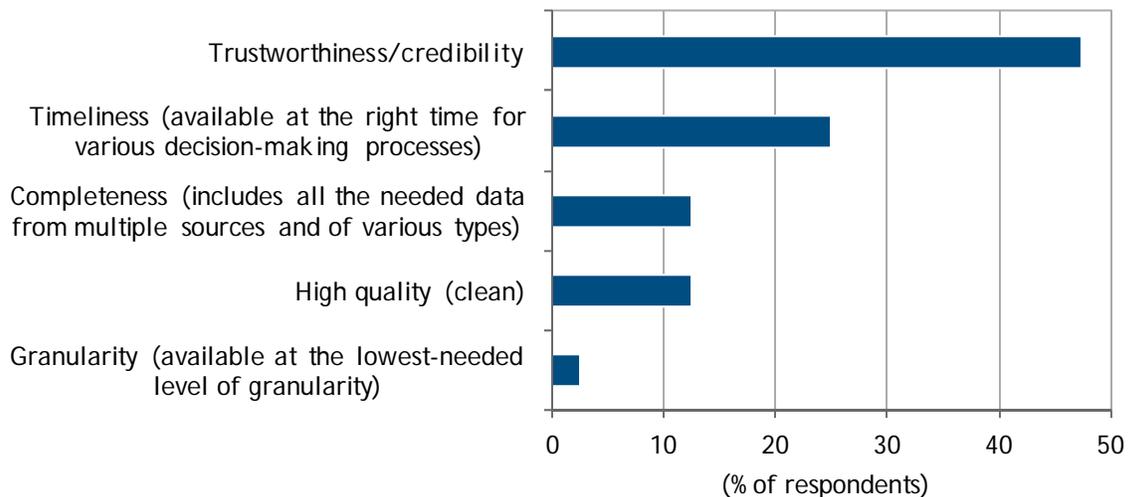
Trustworthy and Timely Production Data Is Not Available

Trustworthiness and timeliness of production data – available at the right time for decision making – are critical in managing production (see Figure 6). Changes in production volumes may indicate equipment failure, ineffective lifting strategies, changes in the reservoir, or other causes. The earlier those issues can be identified, the easier it is to take action to mitigate production losses and deferrals.

FIGURE 6

Top-Ranked Attributes of Production Data

Q. First ranked – How important are the following attributes of production data you currently have available to you and your team?



n = 40

Source: IDC Energy Insights, 2014

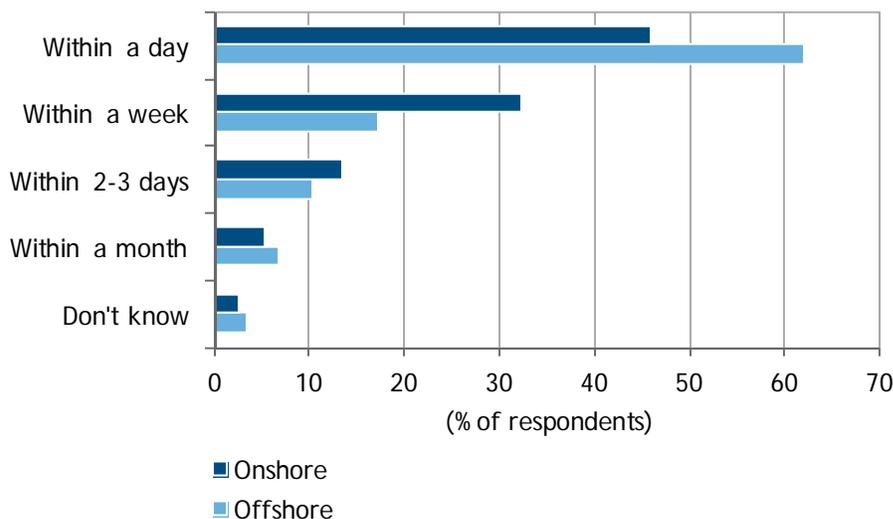
Still, production data may not be available for days. It takes more than three days for 37.8% of oil and gas respondents to get access to onshore production data. Multiple acquisition systems make it harder for production volumes to be delivered intra-day for onshore reservoirs. Offshore data is more readily available due to greater instrumentation, yet almost a quarter of companies do not see the data in three days (see Figure 7). A delay of that length could delay fixes, especially when lead time for delivering equipment is long, adding days or weeks of lost production. Without the availability of production data intra-day, there is no visibility to how company assets are performing.

It takes more than three days for 37.8% of oil and gas respondents to get access to onshore production data. Almost a quarter of companies do not see offshore data in three days.

FIGURE 7

Timeliness of Production Data

Q. How quickly can you get access to credible production data?



n = 40

Source: IDC Energy Insights, 2014

There may be data quality issues with all of these sources. According to one oil and gas company, "We've identified that a lot of the issues around allocations are related to problems with data. Some of those problems are that we're not capturing it [production] appropriately manually when we have wells that are not instrumented, and some of the problems are that we're not properly maintaining our meters for the field in the case when we do have instrumented wells. We may have some issues with the quality of those meters or the fact that we're not certain how well calibrated they are."

Getting to the Root Cause

Once production data is obtained, oil and gas companies lose valuable production time determining the cause of lapses in production. Over 33% of respondents indicated that it took more than a month to obtain a root cause analysis of production lapses for their onshore wells. For offshore wells, over 20% of respondents indicated that it took a month to get the right information. This lost time does not include time to repair or replace to restore production. With that time added, it is conceivable that for those companies, lost production could extend to 10 weeks or more. A well producing 300 barrels per day (average produced per rig in the United States) at a market price of \$80 per barrel out of commission for 10 weeks means a loss of \$1.6 million.

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Allocations Follow Complex Rules

Oil and gas companies must have a means to allocate production revenue to various owners, lease holders, joint partners, or governments for production sharing. It is somewhat simpler to get at revenue data on a per-well basis for offshore wells than for onshore wells. Shale gas and tight oil extracted through horizontal drilling cover a number of plots of land requiring multiple leases for mineral rights, which are often held by multiple parties. Expensive deep water wells almost always are joint ventures. Conventional plays have their own complexity – royalty and tax requirements and joint venture agreements.

From a regulatory perspective, owners/operators are ultimately concerned about gross revenue (and associated costs and profitability) on behalf of all owners (royalty interest and working interest) and need to get the allocations right. Still, from a management perspective, it is important to understand net revenue on a well-by-well basis to gauge the value of the asset.

On average, revenue figures are not available for four to eight days. For some companies, allocated revenue can take months, not days. One company we interviewed reported that its allocations can take two months. The company's practice is to make distribution using production numbers. The reasoning is that it is easier to accrue and manage performance than wait for the allocation. If distribution takes two months to occur, then it is harder to analyze and assign the correct market price and observe trends. This approach, however, risks exposure if settlements do not match.

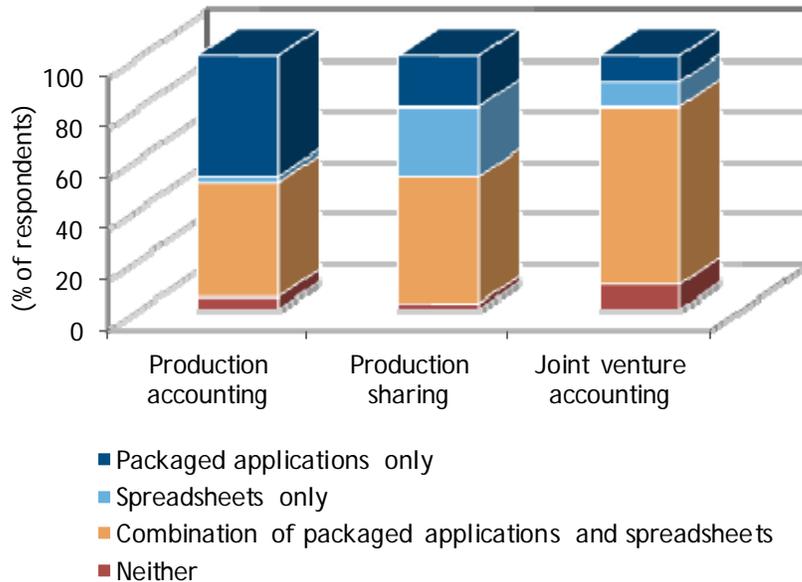
On average, revenue figures are not available for four to eight days.

To complicate matters even further, accounting protocols and regulatory requirements differ by region, country, and state/province. According to survey respondents, over one-third of allocations are performed using custom equations rather than automated rules. Most oil and gas companies have a combination of packaged applications and spreadsheets to support production accounting, joint venture accounting, and production sharing agreements. Joint venture accounting is the most likely to be done with a combination of spreadsheets and packaged applications (see Figure 8). Oil and gas companies – particularly those with global reach or growth through acquisition – are likely to have multiple instances or applications from multiple vendors.

FIGURE 8

Applications Supporting Revenue Determination

Q. For each of the following, does your company use packaged applications only, spreadsheets only, a combination of packaged applications and spreadsheets, or neither?



n = 40

Source: IDC Energy Insights, 2014

Well-Level Costs Are Difficult to Obtain

Monitoring of cost of operations has recently become more important for oil and gas companies, especially when those costs are significant. For example, chemical costs can be high in unconventional plays, so it makes sense to explore whether reducing the use of chemicals has a negative impact on production volumes. Without an established cost of a well, well profitability cannot be determined. According to one oil and gas company, "The problem ... is that you have to be able to have the costs of operating that particular well at a granular-enough level to determine when it falls below [the threshold] – how many barrels a day does it need to produce to leave it on."

Arriving at the "true cost" of a well is a challenge for oil and gas companies. Settling on the cost of a well requires agreement among business units on what constitutes well cost; in many cases, there may not be an agreement on definitions. Then too, many oil and gas companies are not organized for arriving at well-level costs. Available cost data may not be granular enough to be associated with a specific well. Fixed costs may be associated with a well, but not operational costs. For example, one company has cost data in SAP, but the right categories are not assigned, so it is difficult to trace back to the right projects. Another company does not input invoices and received materials into the system – it has only unstructured documents, so there is no good cost data readily accessible.

Further complicating this picture is that production systems and financial systems have historically been on different platforms with different views of the business. Each system has its own definition of the physical production network often with different names for individual wells. This makes any cost-versus-production comparison incredibly difficult without considerable manual manipulation of the data.

How soon cost data is available depends on the length of the reconciliation process. For 24.3% of onshore wells and 10.3% of offshore wells, it takes as much as a month to get accurate cost data. Calculations are based on data from various applications. Figure 9 displays the applications involved.

For 24.3% of onshore wells and 10.3% of offshore wells, it takes as much as a month to get accurate cost data.

FIGURE 9

Applications Involved in Cost Calculations

Q. What applications does your company use to determine the costs of operating and maintaining a specific well?



n = 40

Source: IDC Energy Insights, 2014

ESSENTIAL GUIDANCE

Even the most mature companies see there is room for improvement. For the oil and gas companies that have "real time" data, it is available only for the most important, highest production volume wells. One company wants to have production revenue and costs available on a daily basis on a global level but admits that it is not there yet.

Actions to Consider

Best-in-class companies are pursuing an integrated approach of improving data quality and acquisition, establishing consistent processes across functional business units, and utilizing operational and business applications. IDC Energy Insights has identified the following actions for firms to consider to strengthen their production management capability.

Create the Governance for Production Management

Given the importance of production management, there is likely already to be corporate support for production management. A comprehensive approach to production management, by its nature, will involve many different business units and processes at oil and gas companies, and it will be dynamic. These efforts will involve planning, production operations, maintenance, accounting, procurement, and finance across business processes such as forecasting, allocations, asset management, and supply chain.

Governance can facilitate cross-business unit agreement on terms such as coming to an agreement on a single figure for production volumes. All of the companies interviewed place high priority on a single figure; several have worked to achieve that agreement.

Standardize Data and Rationalize Applications Globally

Significant standard efforts are under way through organizations such as Energestics. Standard data models are helpful in making integration less costly and data more accessible for analysis. However, standardization in the data area is uneven at best. Best-in-class companies are focusing on standardizing data that is most important to their objectives. For example, a few companies reported efforts to standardize deferment codes to meet their objective of reducing deferments.

Rationalization of applications, especially when acquisitions have created a polyglot of applications, can help reduce costs and support consistency.

Define Cross-Business Processes and Support with Workflow

A case in point is the processes supporting allocations. According to one company, it is "important to have one number that everyone agrees on production volumes between operations, hydrocarbon production, and finance. There needs to be agreement with all of the handoffs, with operations providing real-time data and finance receiving the monthly allocated results." If companies wish to expand their options, agreements are a pre-requisite to outsourcing revenue accounting.

Another process is asset management where operations and maintenance are organized to support predictive maintenance. Best-in-class companies have already invested in moving beyond a break-fix asset management strategy. In this case, the business process starts with the anticipation of potential equipment failures and ends with the execution of the optimal approach to addressing that potential failure, based on well margin.

Enable Workflow to Support Data Delivery

Workflow is essential to supporting the work processes described previously. In addition, workflow can be applied to maintain data. One "best in class" company employs a case management system with every well as a "case." A workflow is in place to provide data (production flows, quality, drilling effectiveness, overall average flow, peak flows, downtimes, reduced flows) and action items to appropriate personnel to update or change.

Integrate Technology

Whether it is the integration of real-time data acquisition systems with business applications – process historian, flow count, metered systems of record, and the allocation system of record – or integration between business applications (land management, ERP, EAM), best-in-class companies aim to achieve supportable and dependable integration with a low total cost of ownership.

Implement Analytics

Analytics includes business intelligence and operational intelligence that represents data in a graphical display and drilldown capabilities. The CIO of one major company said, "Our CEO told IT that one of the most useful things you guys could do for us would be to make it easy for our production engineers to get at the data they need. At a high level and with so many thousands of wells this company has, it is an issue with a lot of visibility and plenty of backing for technologies or work that will improve that process." At the same time, best-in-class companies are working toward global views of performance.

Analytics also includes advanced analytics (predictive, optimization, simulation). A case is predictive analytics used to provide advanced warning about potential equipment failures or production losses.

Look for Efficiency Opportunities

Over 72% of production data is acquired through instrumentation. For NOCs, acquisition by instrumentation is about 10% lower. For the remainder of the data, manual data entry is the primary means of capturing production data, with only a quarter of non-instrumented data being captured by mobile devices. Mobile data entry can help reduce errors where there is no instrumentation.

Build for Scale

There will undoubtedly be more data to ingest and more computing speed in demand, especially as assets grow. Develop an enterprise approach to infrastructure and buy only the hardware necessary as assets are added. One company has an IT lab to run proofs of concept, which, if proven out, will be integrated into its data management and analytics platform.

Where to Start

Forward-looking companies start with an enterprise approach but phase in asset by asset. For the large, integrated international oil companies (IOCs) and NOCs, large multi-year initiatives are a way of life. However, not all oil and gas companies have the appetite for the level of investment and resources required for this approach. On the other hand, some companies get stuck in perpetual pilots that never take hold enterprisewide despite demonstrated success because attention spans are short.

Forward-looking oil and gas companies have figured out that they need to do some proofs of concept but then move on to outline an enterprise strategy about the application of information technology for production management. The most successful companies roll this out asset by asset so that they can make more efficient use of resources that are in short supply. They also take what they have learned in each rollout to inform the enterprise strategy. Getting to scale can be done by adding hardware or deploying in-memory technology.

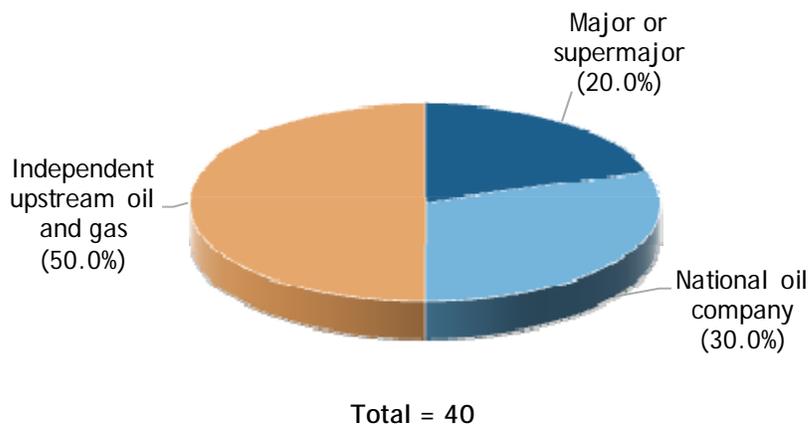
METHODOLOGY

Findings are based on analysis of the quantitative survey and the in-depth interviews conducted with line of business and IT across company ownership types, resource plays, and geographies. IDC Energy Insights also performed secondary research. Analyst insight based on observation of the industry, along with IDC Energy Insights' forecasts and other surveys of oil and gas companies, provided the foundation for the analysis.

IDC Energy Insights conducted a quantitative survey with 40 upstream oil and gas companies. Figures 10-14 provide details on the companies. Figures 15-17 provide information about the respondents.

FIGURE 10

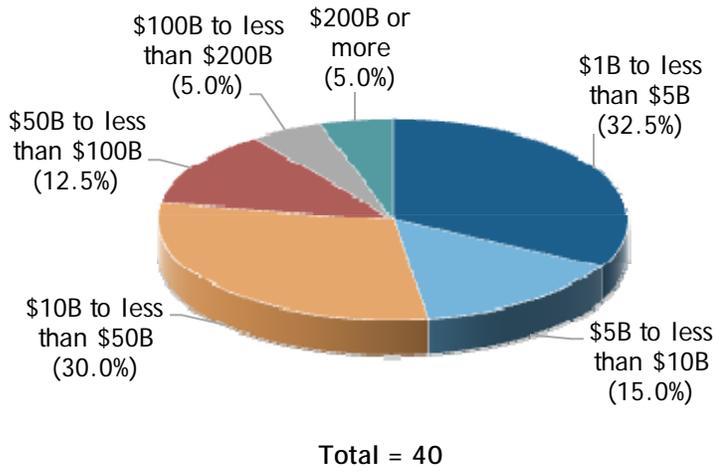
Types of Company



Source: IDC Energy Insights, 2014

FIGURE 11

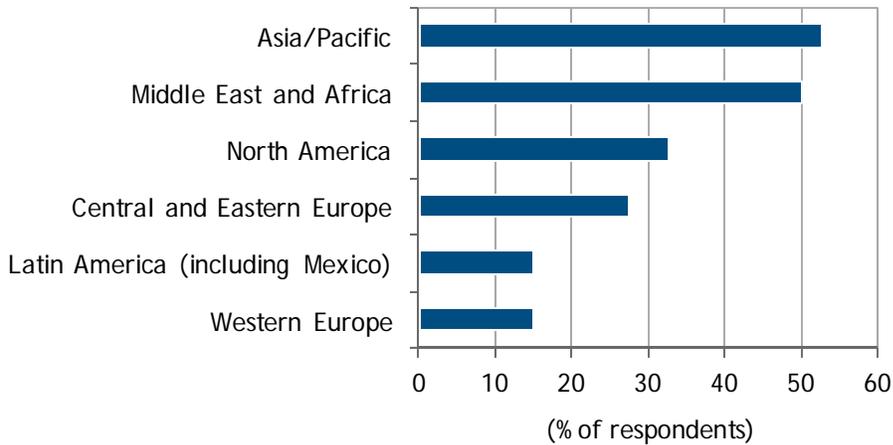
Company by Revenue



Source: IDC Energy Insights, 2014

FIGURE 12

Production Geographies

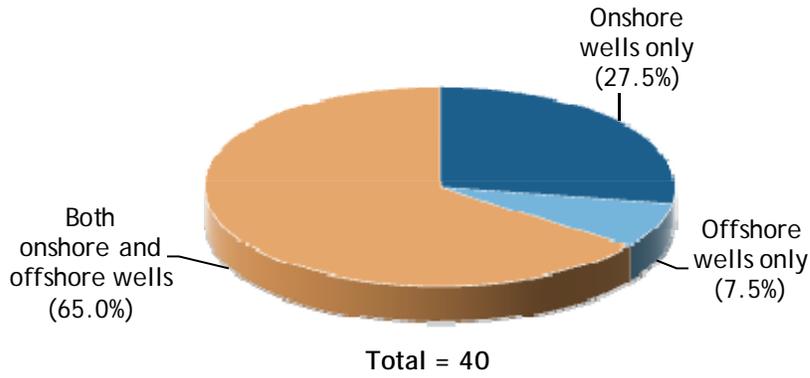


n = 40

Source: IDC Energy Insights, 2014

FIGURE 13

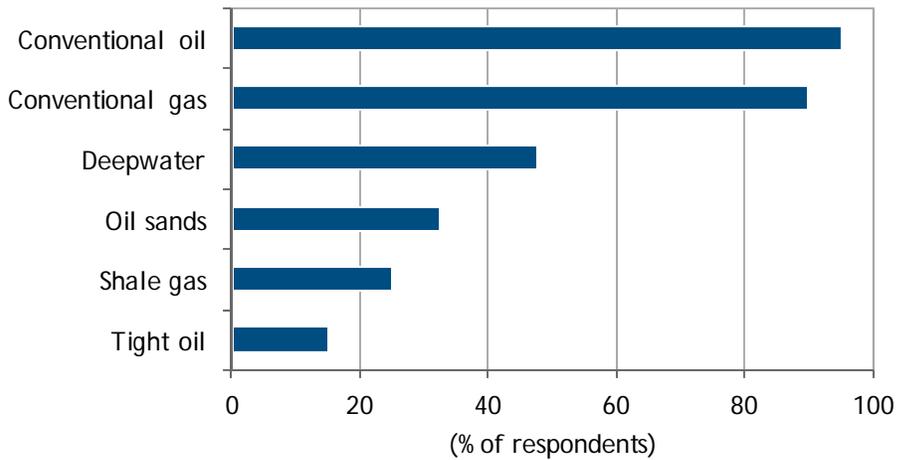
Types of Wells



Source: IDC Energy Insights, 2014

FIGURE 14

Types of Resources

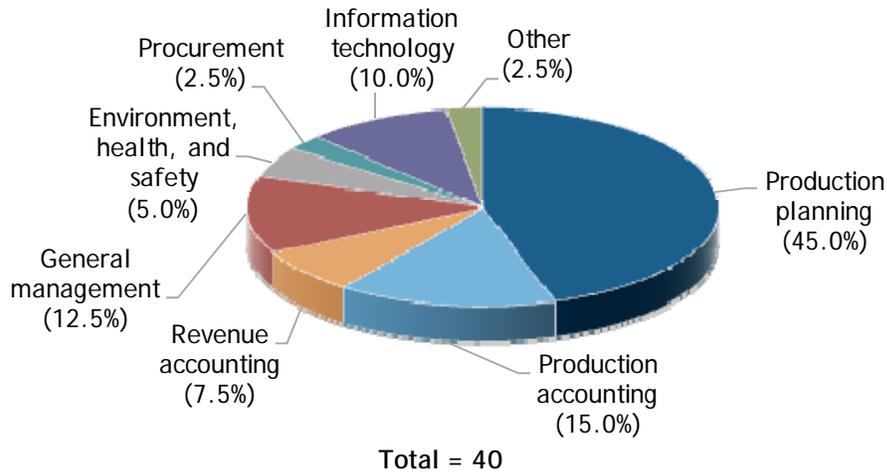


n = 40

Source: IDC Energy Insights, 2014

FIGURE 15

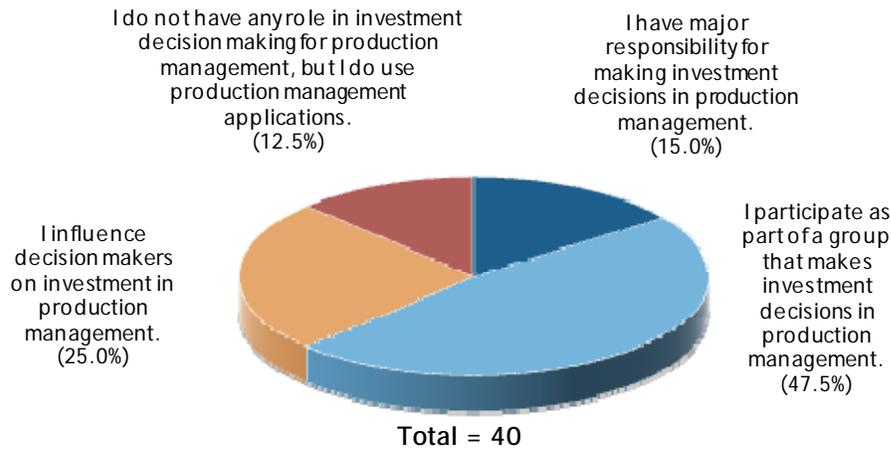
Respondent by Business Unit



Source: IDC Energy Insights, 2014

FIGURE 16

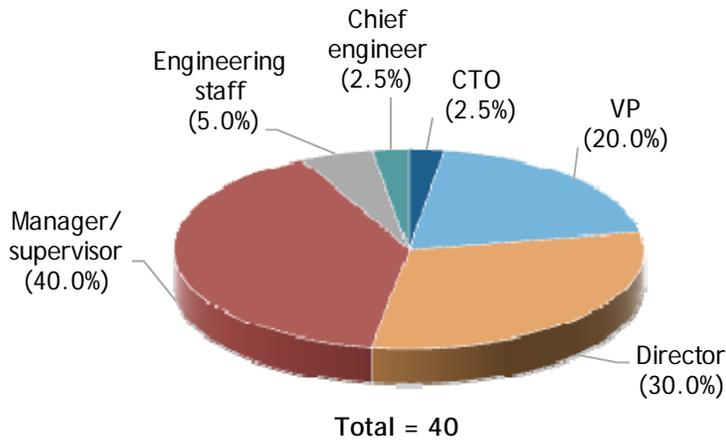
Respondent by Responsibility



Source: IDC Energy Insights, 2014

FIGURE 17

Respondent by Role



Source: IDC Energy Insights, 2014

A total of 10 in-depth interviews were conducted with oil and gas executives across the globe. Table 2 displays the company type and title of the interviewees.

TABLE 2

Company Type and Title of the Interviewees

| Type of Company | Title |
|------------------------------|---|
| Independent upstream company | CIO |
| Independent upstream company | IT Manager – Upstream Delivery |
| International oil company | Global Revenue Accounting Program Manager |
| National oil company | CIO |
| International oil company | IT Director |
| National oil company | VP of Operations |
| International oil company | Regional CIO |
| Independent upstream company | Revenue Accounting Director |
| Independent upstream company | Enterprise Architect |
| International oil company | Upstream CIO |

Source: IDC Energy Insights, 2014

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