Introduction

An industry discontinuity has been unleashed through the combination of horizontal drilling with advances in well fracturing and completion techniques, creating a new asset class commonly referred to as Unconventional – extracting gas and light tight oil (LTO) from shale source rock. This discontinuity has had substantial impacts on North American gas and oil prices, as well as on market participants across the value chain. The transformational impact on exploration and production (E&P) companies has yet to fully play out – a shake-out has already occurred and new winners have the opportunity to emerge. Critical capabilities which meet the specific requirements of Unconventional participation are emerging, though it will take a rigorous integration from strategy through to execution to win.
Witness the unprecedented change which has occurred in the North American natural gas market over the last several years. In the mid-2000 period, natural gas prices climbed upward as demand exceeded dwindling supply, reaching a peak of over $13 per thousand cubic feet (Mcf) and triggering the import of over 64 billion cubic feet of liquefied natural gas per month during 2007. A few independent E&P companies, followed by a wave of others, first cracked the code on shales and then quickly ramped up substantial new supplies. Gas prices plunged as low as $2 per Mcf in April, 2012, and have only gradually recovered as a result of increased demand and this past year’s cold winter. Prices for the time being have normalized around $4 to $5 per Mcf, a level at which participants in KPMG International 2014 Energy Survey expect they will stay for the foreseeable future.

Figure 1 illustrates the substantial shift in supply vs. demand now expected – with the U.S. widely expected to move into a long term natural gas export mode versus the anticipation of being a major LNG importer just a few years ago.

Underlying this pricing rollercoaster has been a parallel tumult in the sector’s competitive structure. Early innovators and entrants into the Unconventional sector have in many cases given way – either because their business model no longer fits the current environment or because they were intentionally not built for the long term – to a second wave of industry players. Many large international oil companies entered during this second wave through the acquisition of independent E&P first movers; for example, Exxon Mobil / XTO Energy, Royal Dutch Shell / East Resources, Chevron / Atlas Energy, BHP Billiton/Petrohawk.

Profitable growth during the Unconventional sector’s next stage of evolution is not a given – participants face multiple challenges. First, the land grab – during which large acreage positions were acquired at relatively low costs per acre – is over. The strategically advantaged positions, the “sweet spots” in the core basins, have largely been secured, and so companies must find other means by which to expand their positions. Second, the increased domestic supply of hydrocarbons has put pressure on commodity prices and created discounts that reduce profitability, especially in light of U.S. regulations which limit gas and permit no oil exports. Although even discounted oil prices are sufficient to support profitable drilling activity, dry gas plays in many cases are currently sub-economic. Third, the subsurface technical understanding of unconventional assets is still relatively early in its development. Many potential plays will prove uneconomic due to unfavorable geological
and geophysical characteristics; other new plays will emerge as “surprises” from areas with long-standing conventional production, such as the Permian Basin.

Industry players are working to address the challenges posed by the maturity of the land play, lower commodity prices, and the unique capability requirements of the Unconventional asset class. No clear winner has emerged as yet, but most players are assessing and taking action. Based on KPMG observations and work with clients helping to meet these challenges, we believe E&P companies must design and deploy an operating model that creates advantaged capabilities in several areas required for competitive excellence in Unconventional:

- Leverage lean manufacturing techniques, including a rigorous continuous improvement approach, to drive maximum learning and performance in drilling and completions and infrastructure design and delivery
- Customize strategic and operational planning processes to more dynamically allocate capital, optimize field developments, and integrate plans with suppliers
- Rethink core value chain activities – the roles of exploration, development and production – as they apply to identifying, de-risking, and optimizing the potential of existing unconventional land positions and plays
- Access premium markets through midstream and marketing integration
- Create an agile organizational model able both to meet the decision intensity demands at the asset level, yet allowing functional expertise to add targeted value and the ability to transfer knowledge across assets and on the next major opportunity.

**Lean Manufacturing and Continuous Improvement**

Low prices are accelerating industry efforts to “lean out” their drilling and production operations procedures often through applying the types of lean manufacturing techniques used in the automotive and other manufacturing plant industries. The starting point for an effective lean approach to Unconventional operations is the Field Development Plan. Central to the plan is the definition of the rig line, which in Unconventional E&P is analogous to a level-loaded factory in manufacturing industries. The performance of the rig line may be monitored, compared to internal and external benchmarks, and thus continuously improved.

Best-practice rig lines rely on pull signals to pace activity and to optimize “inventory” at various stages in the process. Operating the business in this manner allows for not only the improvement of basic operating activities such as rig-up and rig-moves but also supporting functional processes. For example, permitted well-sites – typically the responsibility of the Land department – represents inventory for the rig line. Depending upon the pace at which the rig line will proceed, a certain number of permitted well-sites need to be in the queue at any one time. The optimal number of Land specialists to support the rig line is the number of staff required to supply that amount of inventory. Any less and the rig line would stall due to a lack of inventory; anymore and there would be waste in the system. A similar resourcing thought process should occur in other operating areas such as pad construction, geo-steering, completion crews, and reservoir engineering as well as in administrative support functions such as revenue accounting.

Field development planning and lean rig line processes are even more beneficial when they are aligned with the planning and operating processes of key suppliers. In many instances, poor planning on the part of the E&P company leads to a need to expedite equipment or crews to a site – the higher costs of this action are passed on to the producer.
Rig line performance must be monitored based on metrics specific to Unconventional value drivers. Metrics include cost, time, and quality measures that lead to profitable production. It is important that all three of these areas are measured to avoid unintended losses – for example, it is not value maximizing to drill and complete a well on time and budget if the lateral portion of the well is out-of-zone. Other nontraditional E&P metrics are important to incorporate as well, such as inventory levels at designated points in the rig line process.

In light of the intensity of the wells delivery and continuous improvement performance management processes above, technology plays an integral enabling role. Both front line operations and back office functions are impacted by the intensity of activity and transactions involved in Unconventional. Several key technology decisions should be made now as the opportunity exists to create a competitively advantaged, next-generation lean manufacturing approach.

### Customized Planning Processes

Many companies understand the importance of an integrated planning model that links strategic planning to capital deployment, financial budgeting and forecasting, operational planning, and performance management. However, historical approaches were designed to meet the needs of long life cycle megaproject or onshore conventional oil and gas operations and are not necessarily suited to the characteristics of unconventional assets. Unique characteristics of shale and LTO plays that require adaptation include: the overlap across the exploration, development, and production stages of an unconventional play, the speed of drilling ramp-up (and potentially ramp-down) required, and the large number of small but interdependent decisions that must be managed.

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**Figure 2: Emerging best practices with respect to unconventional planning and performance management**

<table>
<thead>
<tr>
<th>Emerging Best Practices</th>
<th>Strategic Planning</th>
<th>Operational Planning</th>
<th>Capital Management</th>
<th>Financial Planning</th>
<th>Performance Management</th>
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<tbody>
<tr>
<td>Consider growth and return trade-offs and align on a long-term objective</td>
<td>Integrate field and functional plans around identified value levers for each asset</td>
<td>Capital is only allocated to ‘investment ready’ projects</td>
<td>Budgets are developed based on outputs of operational plans</td>
<td>Metrics specific to unconventional activities are developed</td>
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<tr>
<td>Qualitatively assess the maturity and value levers for each major asset or play</td>
<td>Field Development Plans address cross-functional activities and are foundation for other plans</td>
<td>Capital allocations take into account stage of maturity (i.e., appraisal vs. development)</td>
<td>Budget modeling is done by central resources and avoids over-tasking operations</td>
<td>Targets take into account relevant external benchmarks</td>
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<tr>
<td>Identify major activities required to advance asset maturity and value</td>
<td>FDPs use the ‘rig line’ as the definition of a project</td>
<td>Annual capital allocations are reviewed and revised quarterly</td>
<td>Modeling scenarios feed into annual and quarterly capital allocation reviews</td>
<td>Performance management is linked to Continuous Improvement</td>
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Perhaps the most difficult change to common planning practices is to break the traditional annual planning cycle focused on capital allocation based on bottoms-up modeling of individual assets or plays. Too often, the annual capital allocation, along with associated budgeted production and cost metrics and forecasts, becomes the de facto operating plan for business units. This approach is neither dynamic enough nor focused enough on the value levers of the Unconventional business. Rather, a top-down view of how value is best created for each asset over its life cycle should provide the foundation for other planning discussions.

The Field Development Plan, formulated during appraisal activities, is integral to this approach to planning. Field Development Planning addresses the integrated aspects of how an asset should be optimized when in full development and production. The process brings together specialists from across the company to consider issues such as land position, technical well design, midstream and marketing, organizational requirements and supplier requirements.

The overall planning process becomes more dynamic when asset life cycle plans are reviewed regularly, rather than annually, to gauge progress and trigger adjustments to capital and other resources as required. Situations can change significantly as new information becomes available and so the standard, annual allocation of capital sub-optimizes potential returns. Some companies are evolved to the point whereby capital is nominally allocated to the full, multiyear development of an asset, but annual and quarterly revisions are made based on a rolling measure of operating and financial performance.

**Rethink Core Activities and Midstream Integration**

Conventional E&P, such as offshore mega projects, lends itself to structured stage gate hand-offs across the Exploration, Development, and Production aspects of the asset life cycle. In addition, market interfaces at the wellhead for these projects are typically sufficient and transparent enough to separate E&P from midstream and marketing activity. In the case of Unconventional E&P, however, these assumptions are less valid.

In North American Unconventional E&P, the majority of an asset’s value is created during its appraisal. At this stage, the location of the most productive shale rock and associated land plays is largely known. But producers must pilot multiple extraction techniques to determine which are commercially viable and can be scaled. The distinction between traditional asset phases in Unconventional is additionally blurred as appraisal activity requires some form of production system. Many companies have integrated exploration, development and production activities at the asset level. Somewhat similarly, separating E&P from midstream and marketing can lead to value leakage in Unconventional. First, the volume of well tie-ins, oftentimes in areas with limited existing infrastructure, and subject to significant changes, challenges hand-offs between the upstream and midstream. Additionally, with the current supply surplus of natural gas and depressed oil prices due to export limitations, the need to maximize returns requires a transparent view from wellhead to end use market and prices. Conventional E&P economics are typically sufficient at the wellhead level. But, at least under current conditions, the economics and prioritization of unconventional plays requires comprehending the full value chain.
Lastly, several producers have opted to integrate into supply chain activities often outsourced to others, including ownership and operations of rigs, compression equipment, and sand mines and logistics. Typically, higher returns, as well as the benefits of management focus on core E&P activities, outweighs the benefit of operating such services and assets in house. However, some producers have argued increased accessibility and higher activity integration needed for Unconventional success warrant such investments.

The need to achieve the more comprehensive, cohesive, cross functional coordination needed to enhance Unconventional value requires the design of new core processes and organization models.

**Agile Organization**

The capabilities outlined above require an operating model that maintains and expands specific functional competencies in the center of the organization while at the same time allowing for rapid decision making within asset-operating teams. Realizing this balance often requires a change in organizational structure.

As background, many E&P companies initially entered unconventional plays with an organization structure oriented around traditional functional groups – exploration, drilling, reservoir, facilities, land, etc. While these organizations possessed deep technical competencies, they struggled to keep pace with the large number of time-dependent and cross-functional decisions common in an Unconventional development. As a result of their experience, many sector participants quickly shifted towards an “asset-team” structure in which multiple competency areas reported to a regional asset-leader. The asset-based organization model did improve cross-functional collaboration with respect to local execution; however, over time, companies saw that their functional competencies were not being shared across the broader company or keeping up with the latest, external developments in technology. In effect, the move towards asset-based organizations had simply replaced one “silo” with another.

Today, many E&P companies are using some form of “matrix” organizational structure in which technical and other staff report to both asset-team and functional leaders, and small technical organizations in the center see to the development and deployment of new technical competencies and support asset team plans in an integrated fashion. An outcome of this trend is the senior-level technical leader positions recently announced at companies including Apache Corporation, Chesapeake Energy, and Devon Energy. Although each of the above situations is slightly different, a common theme appears to be an attempt to bring together necessary functional groups in one place so that they may introduce better coordinated offerings into the asset or operating units. Matrix organizations can be notoriously difficult to manage given the inherent tensions and thus require clear allocation of roles and responsibilities and decision-making authority as well as performance metrics that align incentives with those of the business units.

**Creating Capabilities Unique to Unconventional**

Many companies recognize the need to refine their current business model from that typically deployed in conventional E&P. The largest oil companies have each taken fundamentally different approaches to their transformations. ExxonMobil bought XTO, a leading Unconventional-focused independent E&P company, and is employing a sequenced, “arms length” approach to its integration. Royal Dutch Shell has formed a separate division within their global upstream business to customize its internal, well-formed E&P core processes to pursue Unconventional, and BP recently announced a wholly owned separation of its domestic onshore assets to catalyze a movement to lower cost and more competitive Unconventional capabilities. These represent three very different choices regarding how to develop new capabilities, yet each of these highly successful global companies recognize the need to develop capabilities new and specific to the Unconventional asset class.

Even those independent E&P companies with significant Unconventional experience have been forced to reconsider their historical business and operating models as we enter the next growth wave. Chesapeake Energy, for example, has pursued a major transformational initiative to achieve two strategic objectives: (1) financial discipline and (2) profitable and efficient growth from captured resources. Encana Corporation has restructured its organization and
realigned its capital program to better align with the company’s strategy of being the leading North American resource play company.

The critical challenge that companies face as they seek to develop new Unconventional capabilities is that the internal operating model necessary to excel at these activities is fundamentally different than traditional industry models. These differences are extensive and require changes to organizational structure, planning processes, core operating processes, and information management. Hence, the change needs are transformational vs. incremental.

The best practice to successful transformation in KPMG’s experience is to look at the Unconventional business starting with the company’s strategy, working through an aligned operating model design, and developing the mechanisms needed to support ongoing execution. The approach we use to support clients rigorously links the strategy-through-execution thought process and design process.

An effective transformation typically starts by articulating leadership’s three-to-five year financial and performance aspirations. This foundation allows for a discussion of, and ultimately agreement on, the trade-offs between growth, cost efficiency, profitability, available funding, return parameters and risk appetite as well as implications for the business and operating models.

The business model drives the essence of how a company will make money in Unconventional – what oil and gas and geographic mix the asset portfolio should take, what degree of integration across the value chain (if any), and any unique midstream and marketing aspects. These choices will be articulated, evaluated and prioritized by materiality and criticality.

As the business model options crystallize, the focus turns to deliverability. Each of the operating model elements is assessed to identify impacts on business as usual and how to redesign to fit the particular needs of Unconventional participation. For example, the need to rapidly reconcile between the estimated and actual costs of an Unconventional development in order to make timely decisions often requires a realignment of internal information systems and tools. Such operating model initiatives are captured in a migration road map, and measures and incentives are defined to monitor the progress of the transformation.

Management information and key performance indicator dashboards are created to monitor the key value drivers and customized to the drilling and completions intensity plus the importance of learning curves in the Unconventional business. The dashboard focuses on cost, time and quality (e.g., horizontal feet delivered in target zone) in order to provide management with a practical control mechanism for managing the business.

**Figure 4: Strategy to Execution Approach**

- **3-5 Year Financial Performance Targets**
- **Markets**
- **Core assets and plays**
- **Value Chain roles and advantages**
- **Core Business Processes**
- **Operational infrastructure and technology**
- **Organizational structure, governance and risk controls**
- **People & Culture**
- **Measures & Incentives**

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Conclusion

The Unconventional resource sector holds the potential to transform the domestic and international energy landscape, but we are still in the early stages of the sector’s evolution. As we enter the third phase of growth, there are multiple competitor types attempting to secure sustainable, profitable growth, but as of yet, there are no clear winners. Ultimate success will require that companies build capabilities that are unique to the characteristics of the unconventional asset class and that are realized through an operating model that is different than traditional models. The prize, today in North America, but ultimately on a global scale, is great for those companies willing to take on the challenge.
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