

Critical Drivers of Exploration and Production Clockspeed

a report by

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The performance of oil and gas companies takes place in a highly competitive market where everything is related to timing. In a bull market, companies that respond the fastest to internal and external signals of growth opportunities can take measures to further accelerate their growth. In a recessionary market, companies can prevent overly steep deceleration of their business size by taking adequate action to adjust the company to the changed outlook without undue delay. Response time and timely measures are crucial for best-in-class performance, which is the result of supreme clockspeed management. Individual companies can perform better than others by monitoring the critical settings of their clockspeed and by rapidly synchronising their accelerators with the business environment when appropriate. In this article, the critical drivers of exploration and production (E&P) clockspeed and specific actions for clockspeed synchronisation and optimisation at individual companies are outlined.

Global Business Climate

The business environment for the oil and gas industry remains firmly controlled by the prices of hydrocarbon commodities, which rise and fall in step with the global economy. Although the profitability of the oil and gas business steeply receded in 2009, an impressive record was set over most of the past decade (see *Figure 1*). The oil price clearly led the profit growth as well as the decline that followed during the 2008–2009 recession. Cost of services (logs and seismics) and supplies (rigs, drilling crews, pipes, etc.) are high in times of growth and recede when the commodity market is in a down cycle. In fact, oil profits began to retreat when the cost of resources doubled in the period of 2006 to early 2008, immediately prior to the great recession. Renewed interest in exploration and new field development resulting from delayed investments by nearly all major companies caused a huge demand for E&P services and supplies in the period 2006–2008. This need for new developments at the peak of the up cycle led companies to accept higher exploration and development costs. As a result, even the steady rise in oil price in the period 2006–2008 could no longer translate to higher profitability, e.g. return on capital employed (ROCE), but only cushioned an early decline in oil ROCE (see *Figure 1*). The lower oil prices in the second half of 2008 and in 2009 accelerated the decline in corporate profits.¹

The performance of the natural gas industry, like that of the oil industry, has rarely remained immune to the global cycles of economic growth and decline; its operational profitability is commonly affected by these cycles. For example, slowing demand led to a global oversupply of natural gas in 2009 and contributed to exceptionally low natural gas prices throughout 2009.² As a result, the utilisation of gas land rigs in the US had, in 2009, dropped to 43% of the previous year's peak count.³ What is more, the reduced rig cost did not trigger a new round of exploration. Such exploration is typically led by smaller, high-risk companies that commonly venture into the non-conventional US gas plays. These companies need credit facilities for new ventures but the

financial crisis evaporated credit lines and low natural gas prices compounded the problem. Although the demand for oil and gas remains firm even in times of recession, clockspeed adjustments are continually required to keep ahead. This study inventories the actions and priorities that can help optimise the E&P clockspeed for sustained recovery from the recession.

Clockspeed Accelerators

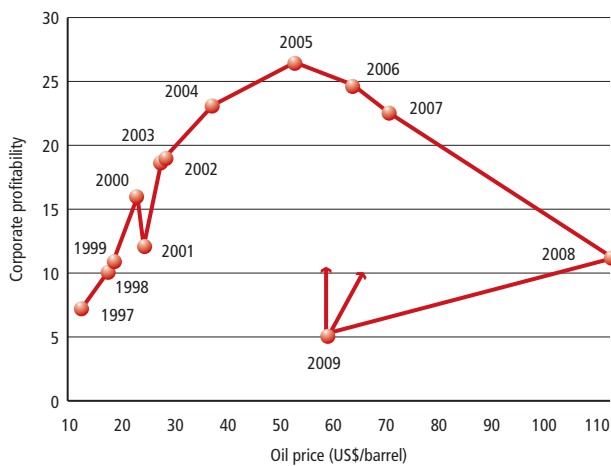
The oil and gas industry is continually challenged to develop and adopt new technologies and frontier concepts that can help optimise both the operational and financial value chains while meeting society's energy needs. Knowledge concepts and tools aimed at optimisation across the value chain provide powerful competitive instruments for the industry. A new Clockspeed Accelerator™ tool enables E&P companies to critically assess their performance in terms of operational workflow efficiency, risk management and value accrual. Clockspeed refers to the efforts of oil companies to remove obstacles from the value chain and accelerate reduction of lag-time between exploration and production, to improve the balance of risk and opportunity and to reduce response time to supply and demand volatility. What marks out industry leaders is not just superior technology, but superior technology applied in support of optimisation of workflow speed, risk mitigation and value accrual.

Individual companies can outperform their competitors by superior clockspeed pacing when they succeed in moving each of the three clockspeed accelerators to higher settings. The three clockspeed accelerators monitor and direct the rate improvements (see *Figure 2*) for workflow speed and productivity, risk mitigation and portfolio value accrual. These three clockspeed accelerators provide practical gearshift levers for the optimisation of overall clockspeed at individual companies in time-based competition.

The competition for faster E&P clockspeed has been intensified further by the emergence of new challenges for oil and gas operators. Even the major international oil companies (IOCs) with dwindling global reserves are driven to deeper waters, colder seas and riskier political regions for access to scarce new acreage. Likewise, national oil companies (NOCs) with depleted national reserves are now also moving abroad for new opportunities. Traditionally divided into two distinct groups – IOCs and NOCs – privatisation of over a dozen NOCs in the past decade has created a third, major group of E&P players: public–private partnership NOCs (or PPP oils; see *Table 1*). The PPP oils are now increasingly contributing to the acceleration of the E&P industry's clockspeed;⁴ this is because PPP oils are rapidly learning to take on more risk as easy oil reserves have become scarce in their home countries (e.g. Statoil, OMV, ENI). These PPP companies now develop entrepreneurial strategies, which were previously mostly championed by IOCs only and distinguished them as leading in the business; it also kept the business tactics of IOCs and NOCs distinctly apart. By mastering the technology and the strategy viewpoints of both

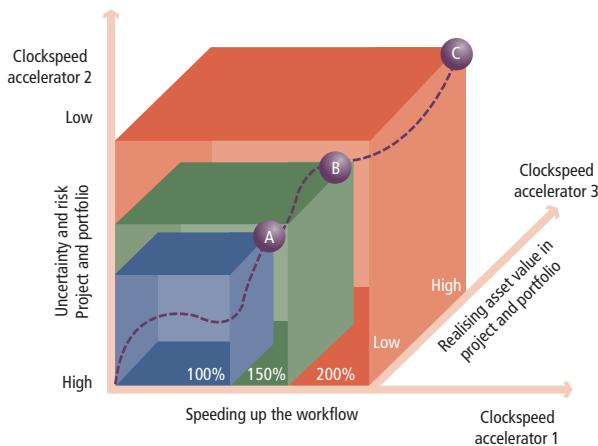
Critical Drivers of Exploration and Production Clockspeed

Figure 1: Average Oil Industry Return on Capital Employed versus Annually Averaged Oil Price (Brent Blend)



Returns on capital employed (ROCE) had fallen back to 11% in 2008 and a mere 5% in 2009, but were preceded by impressive ROCEs of 23% on average for the five-year period prior to the great recession. Arrows show likely short-term trend for 2010 and beyond.

Figure 2: Clockspeed Accelerators



Optimisation actions can improve sub-optimum settings (A), via improvements (B) to optimum setting (C).

Table 1: Selected Operators with Major Assets in the Upstream Oil and Gas Business

NOCs	PPPs	IOCs	
State oils	Transitional Oils	Supermajors	Private Oil
Aramco	ENI	Exxon	Marathon
Petronas	OMV	Chevron	Hess
Pertamina	Petrobras	Shell	Occidental
PDVSA	Statoil	BP	Valero
PEMEX	Gazprom	Total	Anadarko
CNP C	ONGC	Conoco	Apache
NNP C	CNOOC	Repsol	Sunoco

IOC = international oil company; NOC = national oil company; PPP = public-private partnership.

sides, PPP oils are now beginning to gain a considerable competitive advantage. These companies have begun to use sophisticated decision-making models for balancing business risks and opportunities, all critically subject to internal and external time dependencies.

A benchmark study⁴ of the relative clockspeed performance (using time-series and cross-sectional analysis of major key performance indicators [KPIs]) over the period 2003–2007 shows that clockspeed leaders among supermajor IOCs are Exxon, Shell and Chevron.

Laggards in this peer group of IOCs are Total, ConocoPhillips and BP. For example, BP did everything right until operational risk mitigation started to fail, leading to three major disasters: the Texas City refinery explosion (2005), the Alaskan pipeline explosion (2006) and the Thunderhorse platform collapse in the Gulf (2006, partly attributed to hurricane Katrina's impact). That made BP a clockspeed laggard over the period 2003–2007. Subsequent improvements made by BP management may well turn the company into a future clockspeed leader. For the world's top six PPP oil companies, clockspeed leaders (over the period 2003–2007) are⁴ ENI, ONGC, and Statoil. Laggards in the PPP Oil peer group are OMV, Gazprom, and Petrobras. A matrix of clockspeed accelerators inventoried in an earlier study⁵ shows where improvements can still be made for all players. For example, time elapsed in project assessment versus time spent working with partners in the early concession stages can be shortened. Methods for improving the probability of success in international co-operations have also been modelled in earlier research.^{6,7}

The above conclusions are based on performance immediately prior to the impact of the financial crisis. The great recession of 2008–2009 has not only depressed oil profits (see Figure 1), but also nose-dived share prices of all IOCs (i.e. supermajors and independents alike; see Figure 3). A recent study¹ showed that the oil business recovery for nearly all supermajors has begun since May 2009. In the years prior to the recession, oil profits (ROCEs, see Figure 1) and capital gains in oil shares (see Figure 3) generally have outperformed the S&P500 by a factor of 1.5–2. This means that the E&P industry's general pace of clockspeed has been fairly high, in spite of its portfolio with long life-cycle assets. Options for the resumption of clockspeed acceleration to recover rapidly from the great recession and actions to achieve and maintain best-in-class performance for individual companies are outlined below.

Clockspeed Drivers

Growth speeds in the up cycles of the business climate are faster, but profits must be taken during down cycles as well, particularly in a recovery from a recession. The performance of E&P clockspeed accelerators 1, 2 and 3 is commonly affected by the following external uncertainties:

- The oil price sets the stage for corporate earnings. E&P earnings are dictated by the raw commodity price and not much affected by the other business segments of vertically integrated E&P companies (except for refinery margins, which are highly sensitive to conjectural decline). High prices for oil and natural gas are good for the business, but not beyond the price elasticity that starts to favour the development of energy alternatives too fast and before the fossil fuels have been depleted. Inter-fuel competition and environmental legislation will intensify over the next decade. Energy conservation can have a substantial effect on the demand for oil and gas. Additionally, increasing volatility in the oil price provides a real challenge for field development decisions.
- The cost of supplies and services for field producers must remain in check. Increasing development costs for complex discoveries mean positive net present values (NPVs) only occur if the cost of development is matched by larger field sizes, but these are getting scarcer. Operators must be cost-effective, but still support suppliers and service companies to survive the recession. Service providers feel the impact of business cycles more than any other company in the oil

Box 1: Accelerator 1 Actions

Synchronisation – Under Recession

- Balance lower oil prices by mothballing subeconomical activities such as heavy oil projects and development of risky unconventional resources to mitigate the drop in income.
- Reduce operating expenditure by reducing payroll for redundant tasks when field development projects are stalled to maintain a high productivity per employee.
- Defer exploration activity to counter short-term drop in income and avoid steep rises in production costs.
- Retain strengths in people, technology and processes in order to ensure that the company maintains its capacity to respond when the business climate recovers from the recession to offer new growth opportunities.

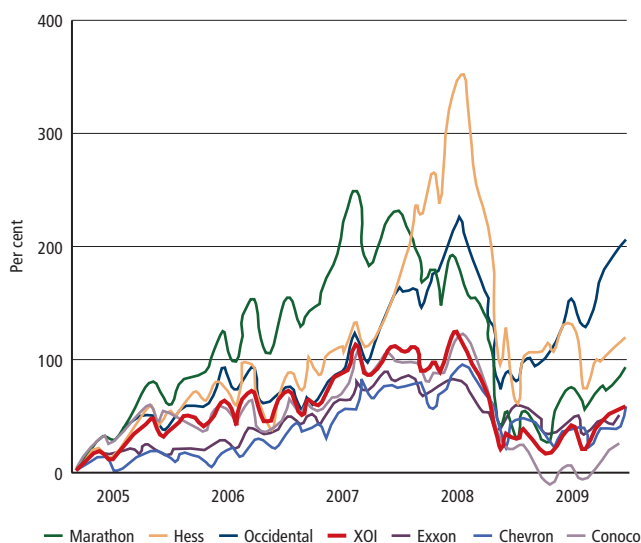
Optimisation – Always

- Complete field development projects faster, with better production efficiency and higher recovery rates.
- Avoid steep climbs in working capital, capital expenditure (CAPEX) and fixed assets, when earnings lag behind – speedy return on investment (ROI) needs to be assured in all new project investments, mergers and acquisitions.
- Hire well-trained professionals from low-labour-cost countries – if available – as this can translate into higher ROI.
- Validate income benefit (impact on net present value [NPV], internal rate of return (IRR), net present benefit [NPB]) of new technology before introducing it; pilot projects deserve extra credit to validate the potential of promising solutions.
- Increase income by enhancing the recovery rate from ageing reservoirs using technology with net income gain; keep production costs down.
- Enhance efficiency and alignment of internal business processes and ensure effective internal co-operation.
- Invest in people’s professional development, continued education and leadership succession.
- Intensify organisational learning to better integrate people, technology and business processes (i.e. boosting the corporate IQ).

and gas business.⁸ They must adjust rapidly and downsize, as there is no continuity in bulk income as is the case for production companies.

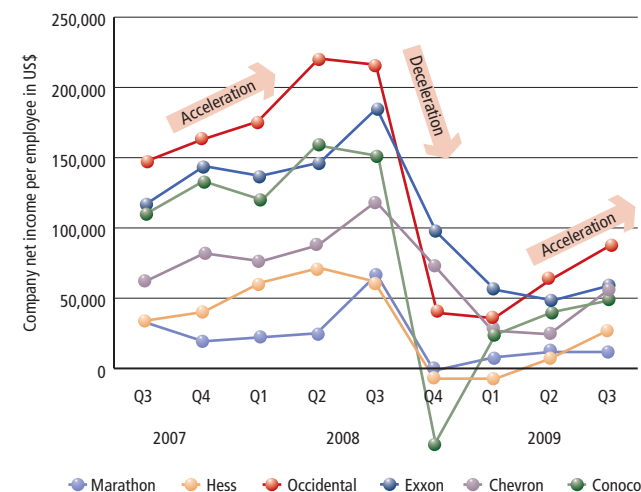
E&P companies can take the following three steps to ensure that their clockspeed management achieves optimum results under all circumstances and in any global business environment: benchmark how the company’s clockspeed performance compares with that of peers; identify which accelerators are lagging in performance; and formulate synchronisation and optimisation actions to realign the company clockspeed better with the critical drivers of the E&P business. Step 1, the clockspeed benchmarking methodology, has been described elsewhere.^{4,9} Step 2, the identification of performance lag sources, benefits from such a benchmark; benefits from such a benchmark; companies therefore should regularly assess their clockspeed drivers to identify and remediate lagging performance. Asking the right questions and seeking answers provides an alternative

Figure 3: Realtime Share Price Performance of Selected International Oil Companies



Supermajors (Exxon, Chevron and Conoco) and independents (Marathon, Hess and Occidental) prior to (2005–mid-2008) and over the great recession (mid-2008 and onward). Reference performance is given by the American Oil Index (XOI). The independents outperformed the XOI.

Figure 4: Rise and Fall of Earnings per Employee from Quarterly Company Reports Over the Recession Period



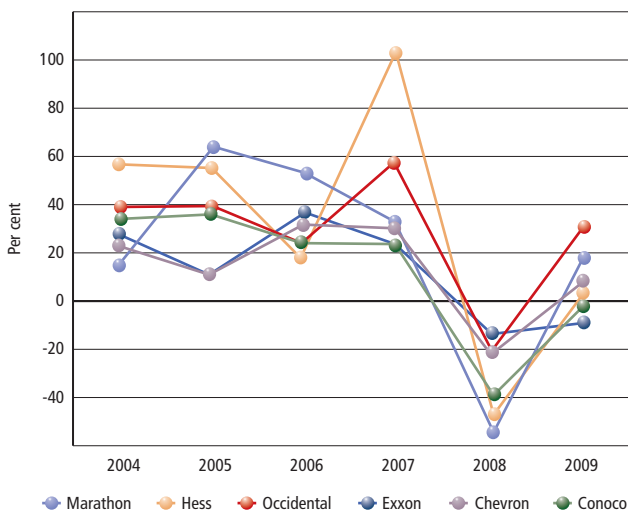
The income loss of Conoco in Q4 2008 amounted to negative earnings of 940,000 US\$/employee for that quarter, but has been truncated to preserve plotting space.

when no reliable benchmark data on clockspeed are available. Step 3 formulates practical actions to adjust critical clockspeed drivers, as outlined below. Improvement of the settings of the three clockspeed accelerators at individual companies first requires insight into how the 2008–2009 recession commonly affected E&P companies.

Impact of the Great Recession on Clockspeed Accelerator 1 of E&P Companies

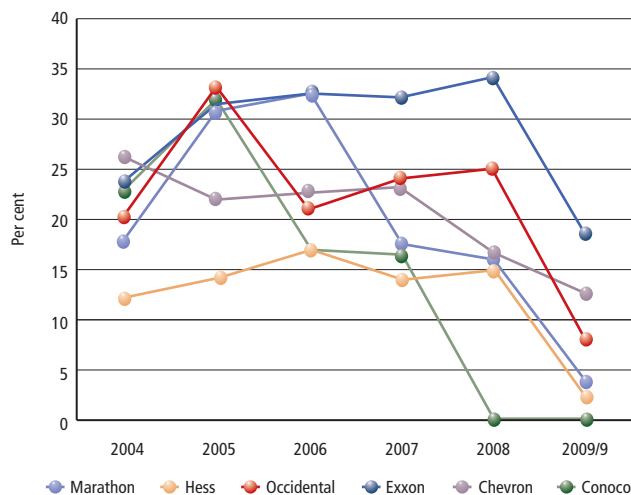
Workflow speed and workflow efficiency translate to profit per employee as people utilise tools and processes in an interconnected workflow.⁹ Workflow loops in well optimisation revolve in days and weeks, in production optimisation over months and in field optimisation over years. A concise measure for workflow efficiency is earnings per employee. Faster asset management related to workflow efficiency translates to higher net cash flows. Consequently, a driver of Clockspeed Accelerator 1 is increasing earnings per employee. Clockspeed Accelerator 1 provides a

Figure 5: Volatility in Total Shareholder Return Prior To and Over the Recession Period



Percentage returns show how many cents were earned by investors (+ %) or lost (- %) on each dollar invested in the company as the compound effect of dividends, capital gains and share buy-backs.

Figure 6: Deceleration of Returns on Capital Employed Towards the Recession Period



Conoco's negative returns on capital employed (ROCEs) for 2007 and 2008 are truncated at the abscissa.

major support tool for simultaneously monitoring and connecting performance in the product value chain and the financial value chain. Immediately prior to the recession, nearly all oil operators were accelerating earnings per employee (see Figure 4). The recession reversed the acceleration into a deceleration for all. The difference in the performance of oil companies is in their control of the deceleration rate and the subsequent recovery to rapidly resume acceleration of earnings per employee. For example, Figure 4 shows how the slope of deceleration is steeper for some than for others over the recession period. Conoco fell deep in Q4 2008, but used the down cycle to write down a US\$5 billion loss on its Lukoil assets. Earnings per employee need to recover swiftly for all companies by mitigating decline in oil and gas revenues by reducing capital and operational costs. Fine-tuning of the company's clockspeed improves the efficiency of technology deployment and project execution operations. Critical in this clockspeed approach is retaining the connection between the physical product value chain and financial value chain. The final section (see Box 1) formulates common actions to further optimise Clockspeed Accelerator 1.

Box 2: Accelerator 2 Actions

Synchronisation – Under Recession

- Review how the company is affected by the recession and take adequate measures to mitigate the negative results for the business, and seize opportunities instead.

Optimisation – Always

- Increase the reliability of equipment and facilities such that the frequency of failures is reduced.
- Avoid delays in project completions; companies that delay on projects already started but with belated delivery lose money.¹⁰
- Optimise health, safety and environment (HSE) performance under all circumstances, as this is required for ethical reasons and corporate reputation and to avert disasters that might bite hard into the corporate earnings and brand name.
- Base investment decisions on sound uncertainty modelling and risk analysis to ensure that decisions about new technology and business opportunities are supported by the right resources at the right time. The decision-making process for new investments needs to go further than net present value [NPV] calculations.
- Balance risk and opportunity to avoid a steep drop in earnings, which is a key performance indicator (KPI) for poor risk management if unsteady over the medium term.
- Avoid undue (country) risk.
- Avoid volatility in stock performance as it may upset prudent investors. Once they move away, it may be hard to lure them back from another profitable business segment.

Impact of the Great Recession on Clockspeed Accelerator 2 of E&P Companies

This most critical dimension of E&P clockspeed focuses on the improvement rate of risk mitigation. At the field level, risk mitigation involves minimising deferred production by rapid remedies to equipment failure, reservoir damage and facility malfunctioning, hand in hand with innovative development solutions so that production can be accelerated. For example, Schlumberger's while-drilling telemetry achieved a reduction of average hours between failures in dedicated programmes to boost reliability (PowerPulse started in 1993, succeeded by TeleScope in 2004; both programmes achieved a 400% improvement in reliability).⁷ Operational excellence and keen dedication to health, safety and environment (HSE) standards without costly accidents translates to extra cash earned. If companies make a mess instead, investors will recognise this as expressed in a high volatility for ROCE and higher Betas for stock price volatility. Under the financial crisis, the companies' single biggest risk exposure was a sustained implosion of their share price, wiping out market capitalisation. Investors in the oil sector have endured steep reductions in total shareholder returns (TSRs) since the onset of the great recession. Figure 5 graphs the dip in TSRs over the recession period for selected companies. Handling the crisis well at individual companies means climbing out of the recession relatively fast. The prudent investor rewards such companies for their efforts by buying into potential capital gains. A steep dive in TSR and lagging recovery is an expression of poor

financial crisis management; investors will shun such stocks if better alternatives are available. A driver of Clockspeed Acceleration 2 in times of recession is maximising TSR without undue volatility as well as fast recovery from the down cycle. The final section (see Box 2) formulates common actions to achieve this.

Impact of the Great Recession on Clockspeed Accelerator 3 of E&P Companies

Value accrual in the portfolio is concisely measured by the annual ROCEs. The ROCE shows a company's pre-tax profits as a percentage of capital employed. A driver of Clockspeed Accelerator 3 is maximising ROCE to add value to the corporate portfolio. ROCEs that are lower than interest payments on debt imply that the company is losing money on its operations. Costly takeovers that do not generate cashflow in time, such as the 2006 acquisition of Burlington Resources by ConocoPhillips and Russian joint ventures with poor returns on investment (e.g. ConocoPhillips involvement with Lukoil), can burden a company and may lead to several years of underperformance. Figure 6 tracks ROCEs for selected companies towards the recession period. Conoco's ROCEs for 2008 and 2009 are -29 and -30%, respectively. The final section (see Box 3) formulates common actions for the optimisation of value accrual in the corporate portfolio.

Recommended Actions to Improve Clockspeed

The hydrocarbon industry, commonly perceived as conservative and slow to innovate, is now first in applying the novel concept of clockspeed acceleration. Clockspeed also provides a conceptual framework that enables technology deployment and provides insight and leverage to drive competitive strategies. Technical analysis is at the core of the clockspeed benchmark,^{4,9} and uses time-series and cross-sectional analysis of production efficiencies and a range of financial KPIs (TSR, ROCE and other KPIs). The benchmark results establish the relative performance of peer group companies. Out-performers excel in each of the three clockspeed accelerator dimensions.

Translating the corporate strategy to practical clockspeed acceleration is essential for powerful direction-setting in times of change. Adjustment options for Accelerator 1 are mostly related to internal, operational efficiency and productivity; possible actions are listed in Box 1. Adjustment options for Accelerator 2 (see Box 2) are concerned with sustainable operational excellence by reducing failure rates and only taking calculated risks in field development and project options. Adjustments of Accelerator 3 focus on project robustness and portfolio value accrual (see Box 3).

Deciding which actions are appropriate for your company requires continuous assessment of the E&P clockspeed drivers. A decision-making model must ensure that decisions about resource allocation, technology solutions and project opportunities are supported by the

Box 3: Accelerator 3 Actions

Synchronisation – Under Recession

- Improve alignment of your organisational culture with the changed market dynamics in an appropriate strategic direction.
- Consider stock re-purchase programmes to buy cheap stock, and reduce weighted average cost of capital (WACC) so that the company is better geared to face growth later.
- Choose an appropriate gearing or leverage of debt and equity financing to provide a buffer for new activities.
- Explore strategic targets for mergers and acquisitions (M&As), because market values of certain companies are low under recession and in some cases below replacement cost (as follows from concurrent price-to-book (P/B) ratios).

Optimisation – Always

- Make sure that the project options are varied and numerous so that the portfolio can be fed and fitted with the right projects at the right time.
- Find the relatively easy oil reserves (to maintain reserve replacement ratio [RRR] – cash cows) rather than the complex fields (problem child), unless the production sharing agreement compensates well for the additional complexity. Complex refers to both technical challenges and government policy risks.
- Avoid capital investments in projects that tie up cash for too long before delivering positive cashflow returns.
- Monitor the performance of all projects and feed this back into the corporate project portfolio for continued optimisation: the leadership must be prepared to kill a project if sub optimum. Simultaneously, continually generate and evaluate new project options, in a timely fashion. Negotiate favourable terms for long-term joint ventures that keep the corporate operating expenditure (OPEX) low and royalties high.
- Monitor tax regime(s) and negotiate long-term fiscal commitments to ensure these remain favourable for project net present values (NPVs) over the full life-cycle.
- Align corporate strategy with external business environment.

right resources at the right time. Applying remedial actions from Boxes 1–3 requires monitoring and benchmarking of the company KPIs that translate to clockspeed acceleration. In all energy companies with resources to acquire the best technology and to hire talented people, the principal focus must be on pushing forwards from 'best practice' to structural and engrained improvement at the right clockspeed for workflow, risk mitigation and portfolio valorisation. The actions suggested here can help individual companies to further optimise their clockspeed performance. ■

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