

Oil & Gas Practice



Meeting the challenge of increasing North Sea costs

The second article in our “Future of the North Sea” series

Meeting the challenge of increasing North Sea costs

North Sea oil and gas costs have risen faster than any other industrial sector in the region, causing projects to be shelved and activity postponed, and challenging the long-term viability of existing fields and infrastructure. This article, the second in our "Future of the North Sea" series, describes the main causes of this escalation and sets out three solutions for operators to get costs back under control: increase productivity in currently operating assets; improve the economics of new investments through standardisation and simplification; and collaborate to ensure industry-wide, structural and lasting cost reduction.

The North Sea has historically been one of the most cost-efficient areas in global oil and gas. Less than fifteen years ago, most of its operating fields had average unit lifting costs of £3–5/boe, while average development costs were £4–5 — on a par with the most economic oil-producing regions of the world. Sadly, the North Sea can no longer make this claim.

Operating and development costs have risen considerably over the past decade. The basin appears increasingly uncompetitive compared with other global investment opportunities. Our analysis shows that the industry needs to act with determination to reverse this trend and preserve its long-term future.

Lifting cost has risen sharply and continued inflation will have implications for the future of the basin

Over the past decade, lifting costs have risen by ten per cent per year — nearly five times higher than the UK national rate of inflation (*Exhibit 1*). Inflation-adjusted operating expenditure was the highest in 2013 since production began on the UKCS in the 1970s¹.

The average UKCS unit lifting cost is now £17/boe or double that of 5 years ago; further, the unit lifting cost of 19 fields exceeds £30/boe, compared with only ten fields a year ago. Combined with declining production, rising costs have begun to shrink the economic life of fields: within the past 12 months, nearly 300 million boe of reserves have been deemed non-recoverable at current costs².

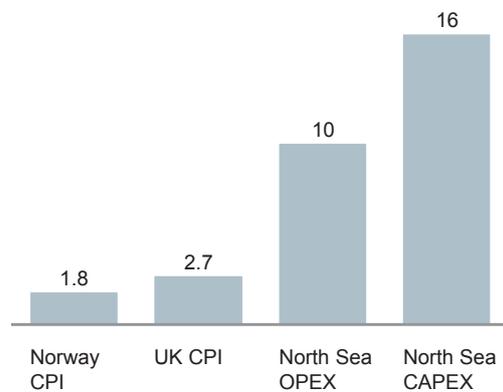
If these historical trends continue, and lifting cost inflation stays around 10% p.a. while production declines at 7% p.a., the average lifting costs for this group of fields on production today will exceed \$100 per barrel in around seven years: activity will slow with implications for the future of the basin. Even if operators were able to reduce cost inflation and production decline by half, this would push the time to reach \$100 per barrel out, but by less than a decade. It is only when overall average inflation and decline rates are reduced by 75% that unit lifting costs look sustainable in the longer-term (*Exhibit 2*).

EXHIBIT 1

North Sea inflation has far outpaced background inflation

Average estimated inflation rate

% 2003-2013



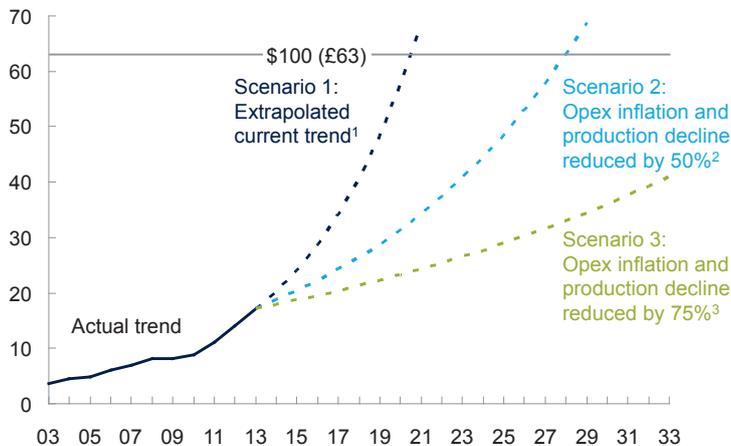
SOURCE: McKinsey Energy Insights, SSB, ONS, Oil & Gas UK (North Sea inflation GBP base currency)

EXHIBIT 2

Continued inflation will have implications for the future profitability of the basin

Unit operating costs

£/boe (2013 money)



¹ Current 2003-2012 trends of production decline of 7% p.a. (decline rate based on 34 assets producing 5.1 mmbod in 2003)

² Decline rate and opex inflation reduced to 4% p.a. and 5% p.a. respectively

³ Decline rate and opex inflation reduced to 2% p.a. and 3% p.a. respectively

SOURCE: McKinsey Energy Insights, Oil & Gas UK

Increasing development costs limit basin longevity and growth

In the UK, since 2003, the average boe development cost has increased by 16% a year. Meanwhile, the average cost of drilling a platform well in Norway has risen by 17% p.a. These cost pressures have serious implications in the basin. Development drilling has dropped by half over the past decade. In 2011–13, the industry drilled 121 development wells a year on average, compared with more than 200 a year in 2004–05³. While this is partly driven by a reduced or more complex opportunity set, costs play their role in discouraging drilling. In addition, a number of high profile developments have been postponed (e.g., the Bressay heavy oil field, Rosebank), implying a delay in more than £10 billion of investments in the region.

Shut-in production and early decommissioning of existing assets are not the only hazards of cost escalation. As investment and lifting costs peaked and production dipped in 2013, the UKCS had less free cash, creating a particular emphasis on capital efficiency. If costs continue to rise, the industry is likely to restrict exploration further and sanction fewer developments, thus imperilling future resource recovery.

We believe that sustainable costs are unlikely to be achieved without significant intervention. But if operators are to reverse this trend, it is essential first to understand what has caused this unprecedented cost escalation.

Factors behind the rise in North Sea costs

The North Sea is now a mature basin with more operators, active platforms and producing fields. Reservoirs are often complex, and safety and environmental regulation greater than a decade ago; all of these factors increase the challenge of cost containment.

Higher activity levels have put pressure on the supply chain and led to higher cost inflation. Suppliers, however, do not appear to be benefitting from the higher prices (*Exhibit 3*). Despite rapid growth in revenues, the margins for global Oilfield Services and Equipment (OFSE) have remained roughly stable in the recent past, and have in fact declined in the past year, suggesting that they too are suffering from the same input cost pressures and inefficiencies.

A deeper analysis of cost and activity data in our proprietary Offshore Operations Benchmark Database, as well as interviews or discussions with over 50 North Sea field managers, reveals that the increase in total expenditure often conceals cost inefficiencies in both OPEX and CAPEX (*Exhibit 4*) — and suggests that many operators have lacked the capabilities to combat cost escalation.

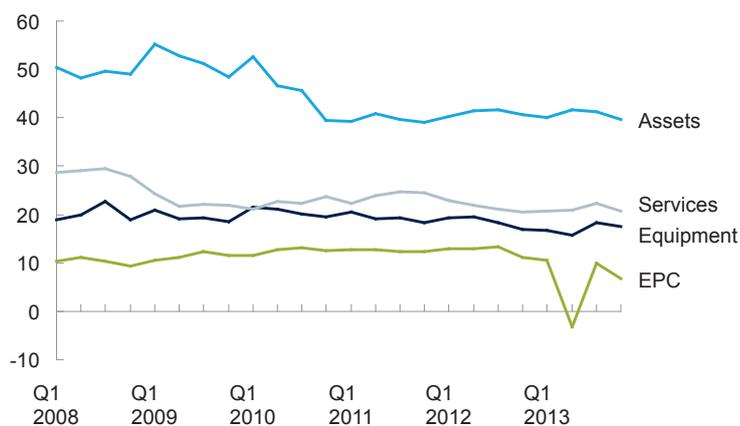
For each of the main categories of OPEX and CAPEX we disaggregated the overall annual increase in the North Sea between 2003 and 2012 into three factors: increased activity levels, increased input costs per unit of material, service or labour, and lower efficiency — i.e., using more resources to complete the same activity.

Let us consider each in turn.

EXHIBIT 3

Suppliers are less profitable in 2013 than in previous 5 years

EBITDA margin¹ of OFSE companies



¹ Margin as announced – adjusted for different accounting/disclosure policy. Set of companies include Aker Solutions, Cameron, Dover, Drill-Quip, FMC, NOV, Oceaneering, Subsea 7, Tenaris (Equipment), AMEC, Fluor, JGC, KBR, McDermott, Petrofac, Saipem, Technip, Técnicas Reunidas, WorleyParsons (EPC), BW Offshore, Diamond Offshore Drilling, Ensco, Helmerich & Payne, Nabors, Noble, Rowan, Transocean (Assets), Baker Hughes, Basic Energy, Calfrac, Halliburton, Key Energy Services, Schlumberger, Superior, Trican, Weatherford (Services)

SOURCE: Company filings

EXHIBIT 4

Drivers of the cost growth

Estimated annual growth in total cost

% p.a., 2003-2013

	OPEX				CAPEX			
	Offshore ops & maint.	Logistics	Well maint.	Admin support	Total OPEX	Drilling and wells	Topside facilities	Total CAPEX
Increased activity	2	2	5	2	2	1	5	3
Increased input costs per unit	5	3	7	6	5	10	5	8
Lower efficiency	4	2	4	5	3	5	5	5
Total cost increase per year	11	7	16	14	10	16	15	16

SOURCE: McKinsey analysis, GBP base currency

1) Increased activity levels

The North Sea is now more complex than ten years ago. On the UKCS (as on the NCS), there are more active platforms producing from more fields. Many of these platforms are active well beyond their original design life, requiring increased maintenance and asset integrity activity to support production. This in turn elevates OPEX — since 2010, UKCS operators have spent at least £1 billion a year on facility upgrades⁴; on one large North Sea asset, for instance, maintenance and integrity-related well work-over activity went up by nearly 57% a year between 2009 and 2013. This increased maintenance work in turn drives additional logistics activity — the tonnage of deck cargo shipped by 28 North Sea installations increased by 2% per year in 2003–2013 — the same rate of increase as in industry helicopter flight hours across the UK and Norway.

On the CAPEX side, after staying in the doldrums for 3–4 years, the industry is now investing a lot more in response to supportive field allowances and new projects sanctioned. Five new projects, sanctioned in 2010 and worth 1.6 billion boe, are currently under development. Brownfield, small field and other allowances are said to have encouraged nearly £7 billion of investment in 2013.

2) Increased input costs per unit

This investment is good news for the industry. However, it exerts pressure on the supply chain through substantially higher demand for goods and services; and, in a supply-constrained world, leads to factor cost inflation. This is well illustrated in the mobile drilling unit market. Jack-up rig day-rates have increased by 60 per cent over the past three years, while semi-submersible rig day-rates have doubled over the same period⁵.

The labour market shows a similar trend. For example, core offshore workers on the UKCS rose from 19,587 in 2006 to 25,760 in 2012⁶; salaries on the UKCS increased by 6% p.a. over the same period. New developments combined with competition from international opportunities have driven up the demand for geoscience and subsurface professionals, particularly those with development experience in the North Sea. Subsea engineers, too, are in short supply⁷. Both are now scarce and expensive skills in the region.

Cost inflation shows up in other factors as well: industrial end user diesel prices have increased by 5% and 7% p.a. in the UK and Norway respectively since their collapse in 2008⁸, driving up the OPEX for gas-deficient fields; and the weighted average cost per ton of production input chemicals went up by 5% p.a. between 2007 and 2010⁹, as companies shifted to more environmentally friendly but sometimes less efficient compounds.

3) Lower efficiency

Regardless of cost category, inefficiency — resulting from lower productivity, increasingly over-specified activities, and poor purchasing practices — is a major cause of spiralling costs. It is arguably also a driver of at least some of the increase in activity and unit input costs described above. While some of this lower inefficiency may be due to regulatory changes, the large majority is the result of operator practices and approaches.

4,5 Oil & Gas UK Annual Activity Survey 2014

6 UK Continental Shelf Offshore Workforce Demographics 2013

7 Hays – Oil and Gas Global Salary Guide Review of 2013, outlook for 2014

8 IEA Energy End-Use Prices, Platts

9 IHS Chemical

- **Lower productivity:** Work productivity has declined on both the UKCS and the NCS. In 2012 on the UKCS, 179 core personnel travelled offshore per manned installation — a 26% increase from 2006¹⁰. In the NCS, work productivity — measured as hours per activity — declined by 4% p.a. between 2001 and 2009. One explanation is the fall in the number of weeks a typical worker has to be offshore per year — requiring more staff to cover the same number of offshore positions.

On CAPEX, the time taken to drill a typical well on the UKCS has increased by 17 days over the past 5 years¹¹. On the NCS, crews drill 17 metres per day less on average today than five years ago. One operator told us that their drilling speed has dropped from 175 metres per day in 2004 to less than 100 metres per day in 2013–14. While the operator acknowledges that water and well depths have affected drilling efficiency, they believe that less experienced drilling crews and the scarcity of appropriate drilling facilities and other specialised inputs have greatly exacerbated the problem. Other analyses, comparing the time taken to drill almost identical wells on the same facilities, but a decade apart, confirm this point by highlighting a doubling on average of the time taken to carry out a broad sample of standard procedures.

- **Over-specification of activities and processes:** Over-specification — increased complexity and customisation — has magnified cost inefficiencies. When looking into CAPEX cost inflation, we compared patterns in topside design across a sample of platforms with similar production capacity, and found that, for example, the weight of living quarters per bed has climbed over time, as operators demand higher living standards and more customised materials and components. For example, increased automation and temperature and comfort requirements can lead to a nearly 50% increase in the weight of operator HVAC systems, in turn affecting the cost of the installation.

This also can drive up operating cost. Across the North Sea, work processes have become over-specified, sometimes driven by superior health, safety and environmental (HSE) requirements but often due to operator over-sight of contractor activities. For instance, at one large operator, a faulty pump would have been replaced as part of standard maintenance work in the past; now, it may be performed as a modification, making the process both more time-consuming and more costly.

- **Poor purchasing practices.** In an industry where 70%-80% of all spend is with third parties, it is deeply concerning that procurement and supply chain practices lag most other industries. According to the McKinsey Global Purchasing Excellence survey of over 400 organisations in 20 industry sectors, the oil and gas sector ranks as one of the lowest performers. Often, operators lack a clear contract strategy to ensure quality and progress in operations and capital projects. Careers in supply chain are often seen as less attractive than other disciplines. Meaningful supplier collaboration is rare, and few operators pre-qualify suppliers, a step that can significantly reduce supply chain risk in capital projects.

Although the challenge is great, many of these drivers of cost escalation can be tackled by operators themselves. We now look at solutions for getting costs back under control.

¹⁰ Oil & Gas UK Offshore Workforce Demographics Report, DECC

¹¹ Oil & Gas UK Annual Activity Survey 2014

Achieving more sustainable costs in the North Sea

As the analyses above show, many parties are responsible for the North Sea's rising costs — the industry as a whole has not been cooperating or coordinating, and individual operators and suppliers have allowed inefficiencies to creep in, with a multiplier effect. So the solution must be correspondingly broad-based and inclusive. We see three pillars:

1. Increase productivity in currently operating assets
2. Improve the economics of new investments through standardisation and simplification
3. Collaborate to ensure industry-wide, structural and lasting cost reduction.

1. Increase productivity in currently operating assets. There are myriad ways to accomplish this; we describe below approaches we have found to be particularly effective in the North Sea:

- **Stop low-value or value-destroying activities.** This represents the single simplest, most sustainable way to rein in costs — it is far easier to optimise well intervention frequency to reduce overall activity, than to become 25% more efficient at executing well interventions. However, identifying activities to cut requires two things: first, being able to challenge current working practices — of course, maintaining safe operations is rightly the top priority of any offshore operator, but overactive preventative maintenance routines can put crews in harm's way more often than necessary, for no incremental benefit. Second, it requires a rigorous and time-consuming analysis of all activities currently in progress or planned, to identify their criticality to safe operations and their economic value — for example, by examining frequency of topside repainting in light of the remaining life of the field, or by finding duplicate work between operators and maintenance personnel (*Exhibit 5*). We have found that, typically, 10–15% of activities planned for any given year neither add value nor remove risk. In addition, further savings may be achieved by optimising the way activities are planned and executed.
- **Clarify and communicate the drivers of cost throughout the organisation.** Operators who control costs more effectively tend to understand and track costs based on their operational drivers. They also require that contractor and supplier invoices are structured to provide transparency into activity levels versus per-hour, — unit, or -activity costs. They drive the right conversations from the top by actively interrogating data with their teams, and encouraging their direct reports to cascade this behaviour down. In addition, they make cost and efficiency targets real for front line workers to energise them to improve performance. This might involve setting up a highly visible whiteboard showing how many days rented maintenance equipment has been offshore or how many days in the last month the full maintenance workload has been executed; or displaying onshore how many times the 90-day plan has been changed. When we dug into one operator's above-average supply vessel costs, for example, we found the causes were unplanned sailings, low deck space utilisation, and non-productive time at platforms while waiting for crew changeovers or crane repositioning — rather than uncompetitive rates. Introducing a new sailing schedule and simple scorecards to highlight sources of non-performing time allowed the operator to release a supply vessel and reduce costs by 20%. Furthermore, as we found at this operator, a competent supply management team can serve as an equal partner to operations staff

in clarifying and containing drivers of cost. Operators who control costs more effectively have empowered supply management teams staffed with superior professionals, and make them the “keepers of spend transparency” in the organisation. They also make effective use of visual management tools, and regularly upgrade their internal practices on supplier pre-qualification, negotiation and development.

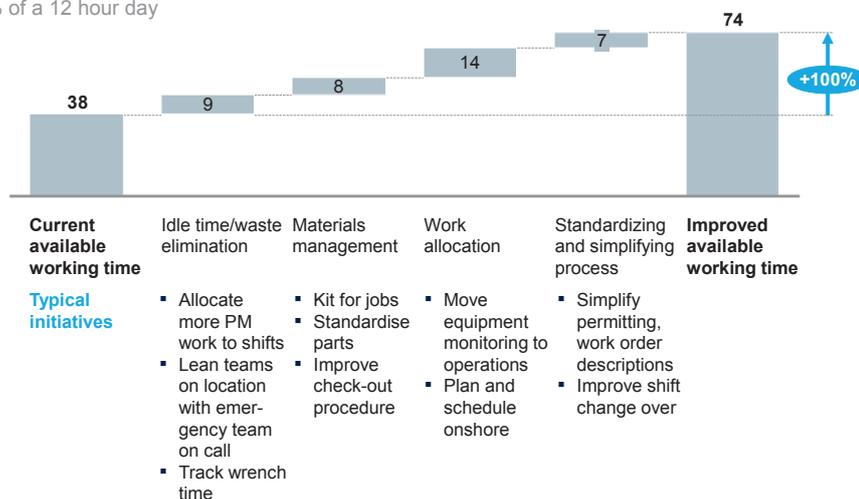
- Focusing on execution offshore.** Some North Sea operators are stuck in a vicious cycle — they fall behind on maintenance activities due to other demands, platform infrastructure deteriorates, and soon there is an ever-growing backlog of maintenance activity with no additional beds available to keep up. The resulting unplanned shutdowns are expensive, but so are the alternatives, like hiring a floatel to support enough personnel to clear the backlog (see our first paper in this series, Tackling the asset production efficiency crisis in the North Sea). Operators who get more done offshore do at least two things: first, they imbue in their onshore personnel an acute sense that offshore operations are where value is created, and that the sole purpose of onshore functions and facilities is to support offshore execution. That means no last-minute changes to the plan to suit a functional objective. And second, they apply classic lean levers to get more out of the time and beds that they have — for example, by reallocating minor maintenance work (such as monitoring or lubricating equipment) to operations, and moving all tasks that do not require direct contact with equipment (like planning and scheduling) to onshore support. In our experience, operators who ruthlessly apply these levers are twice as productive as those who do not (see Exhibit 5). The best operators also collaborate to apply these levers across the contracted workforce.

EXHIBIT 5

Reducing non-value adding activities can improve technician wrench time thereby reducing mean time to repair, maintenance backlog, and costs

Total improvement in wrench time

% of a 12 hour day



SOURCE: McKinsey Operations Practice, client case example

2. Improve the economics of new investments through standardisation and simplification. Inevitably, given their age, platforms in the North Sea contain different physical systems, approaches and solutions which they have accumulated over decades, sometimes from multiple owners. However, in most cases, capex spend — whether overhauling a compressor, or drilling and hooking up a new well — can be optimised through standardisation and simplification.

We have found that, in many cases, engineering designs are developed or modified without thinking about, let alone optimising, cost consequences. Simply creating transparency and prompting consideration of alternatives can reduce costs by 10–15% without changing the solution. For repeat orders of complex equipment, we sometimes even “tear down” the equipment — completely disassembling it, weighing and measuring parts — to arrive at a more accurate estimate of cost, as well as to find ways to optimise the specification to suit operator needs at lower cost.

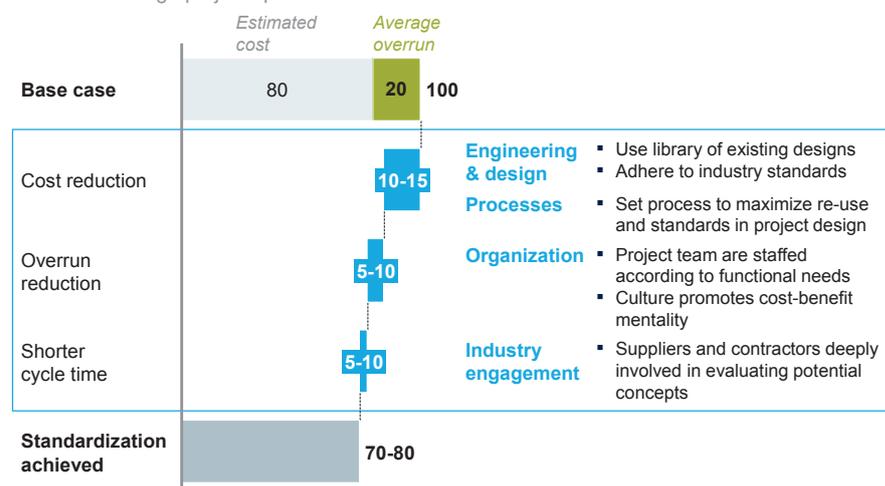
Some operators then rigorously replicate these simplified designs and buy the same equipment and materials across platforms. Implementing standardised designs can be difficult — realising the benefits requires a portfolio view to select the right design and also discipline in testing every deviation from the standard with a cost-benefit analysis. This is currently not done as well in the North Sea as in other areas, such as North American onshore gas, where a manufacturing-like standardised approach is the norm. However, standardisation can generate up to 30% in value through cost savings, limiting cost overruns and reducing time to build (*Exhibit 6*), and applies just as much to wells as to topside modification packages.

EXHIBIT 6

Standardisation can deliver ~20-30% in value by reducing CAPEX and overruns and by shortening cycle time

Illustrative standardization value

% of total average project spend



SOURCE: McKinsey Operations Practice, client case example

3. Collaborate to ensure industry-wide, structural and lasting cost reduction.

Reversing the multiplier effect of individual operator and supplier actions is going to take more than just isolated improvement efforts. We see two clear areas where the industry could improve its coordination for the benefit of all parties:

- **Set and use industry standards.** There is an enormous opportunity to extend the coverage of industry standards like API and Norsk Søkkelers Konkuranseposisjon (NORSOK) to a broader range of areas, to encourage collaboration and drive simplification. For example, we estimate that about three-quarters of welding requirements differ between companies, in terms of technical specifications, worker qualifications, inspections, etc. We have not found that any of these differences are safety critical, yet they drive higher costs for suppliers which are then passed on to operators. While there are many barriers to implementing industry standards — not least internal ones related to high global company standards — we hope that the current focus on overhauling North Sea practices from the Wood Review will provide a catalyst for operators to pursue industry standards in earnest.
- **Collaborate across the supply chain.** Individual operators could collaborate to share scarce resources in the North Sea, for example by sharing standby vessels, or by coordinating the scheduling of their annual turnarounds so that each operator can access the right skill sets at the right time without overwhelming contractors. Together with simplifying and standardising new projects, and strengthening contractor management as discussed above, this lever should enable the energy sector to rise from the bottom of the pack in supply chain capabilities.

Closing thoughts: how to implement

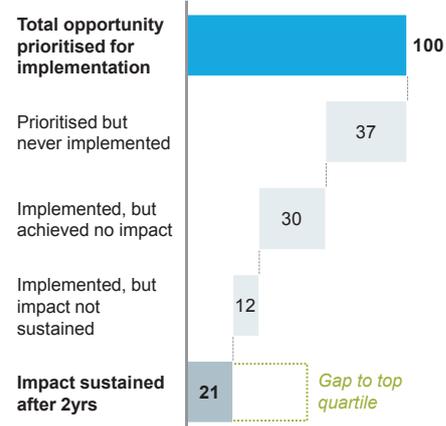
Most of these levers are not new — the industry has been talking about them for years or decades, but has for the most part failed to implement them. Pulling them effectively — and getting them to stick — requires a long view and deep management conviction (see Exhibit 7). We recently surveyed over 2,200 executives across the globe, and discovered that the average change effort captures and sustains only 21% of the value that was prioritised for implementation. The good news is that organisations with top quartile implementation capabilities ('good implementers') achieve higher performance across multiple measures. They deliver successful change efforts almost 5 times as often as the bottom quartile, they get twice as much value, and they lose significantly less value at each stage of implementation.

So, how do they do it? "Good implementers" are successful because they develop strong implementation capabilities and internal practices. They are particularly strong in "Ownership and Commitment" — with the leadership truly committed to making the change — and "Prioritisation and Planning" and, crucially, are more likely to place experienced implementers in charge of change efforts. In the North Sea, operators who have managed to turn around their platforms' cost performance ask their leaders to drive improvements for as long as it takes to reach their targets, not just for a two- or four-year rotation; they also tie most of their leaders' compensation to performance.

EXHIBIT 7

"Good Implementers" lead change efforts with their most experienced people to avoid losing most of the value

Average proportion of identified opportunity lost at each implementation stage
Percent (n = 2,230)



Most important characteristics of "Good Implementers"

Ownership and commitment

- Is the leadership truly committed to the **common outcome** — and prepared to 'invest' in it?
- Does the organisation communicate '**constancy of purpose**'?

Resources and capability

- Do we assign the **best/most suitable people** (rather than whoever is available) and support them with appropriate resources?

Prioritisation and planning

- Has the organisation identified the '**precious few**' — and allocated resources to maximise their speed?
- Do we **plan well enough** to make good decisions?

□ □ □

Rising costs in the North Sea present a continuing — and stubborn — challenge for the industry as a whole, its operators and supply chain. However, these three improvement levers — increasing productivity, improving economics, and collaboration — represent provide a formidable array of tools for operators striving to reduce costs. With concerted will and effort, operators can not only reverse the rapidly deteriorating economics of the basin but also improve its longevity and future competitiveness.

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Oil & Gas Practice
June 2014

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