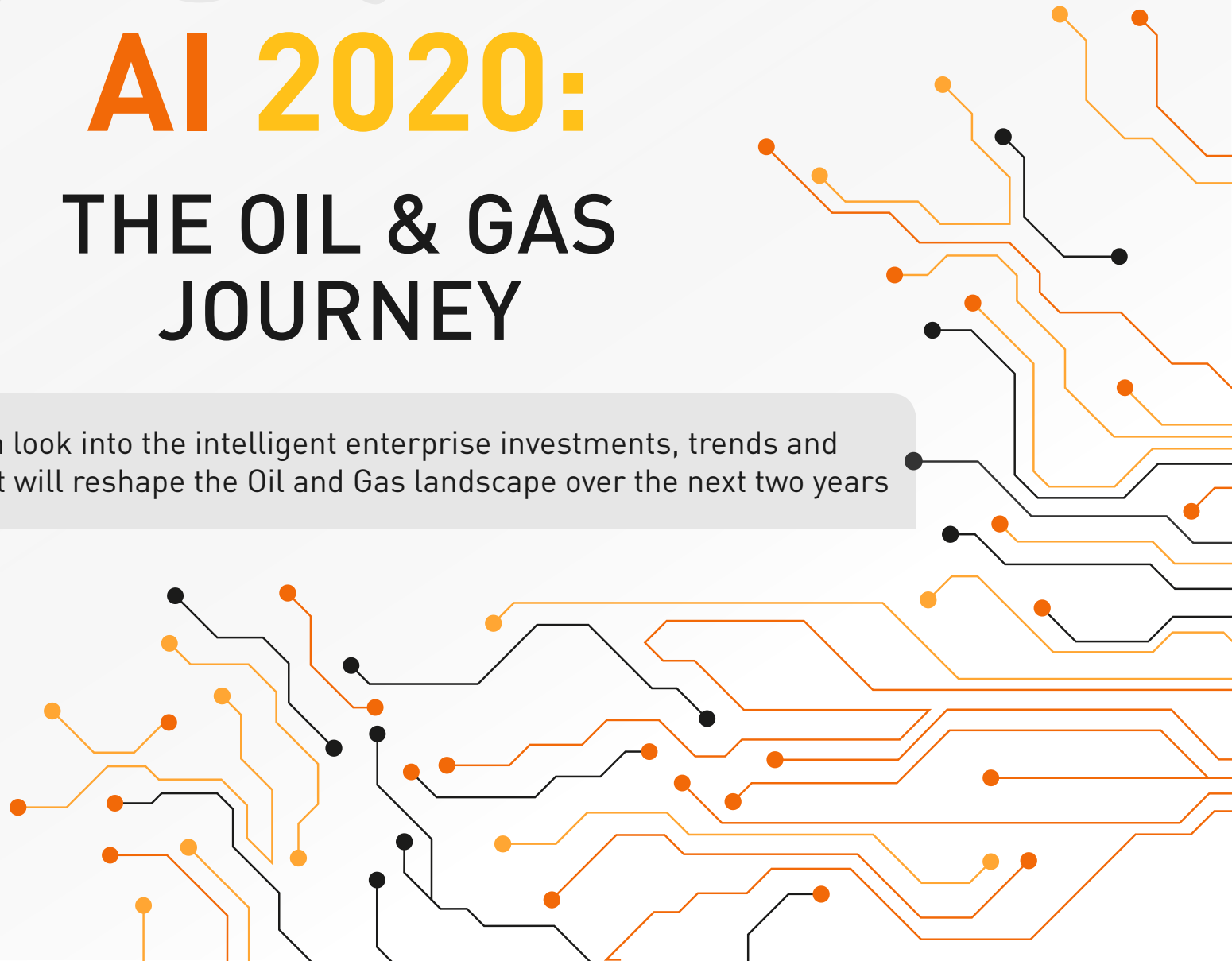
Oil & Gas iQ

AI 2020:

THE OIL & GAS JOURNEY

An in-depth look into the intelligent enterprise investments, trends and challenges that will reshape the Oil and Gas landscape over the next two years



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AI & INTELLIGENT AUTOMATION NETWORK | BUILDING THE INTELLIGENT ENTERPRISE

Contents

Introduction

The hydrocarbons industry could be on the verge of a seismic technological and structural reformation, but it will not be a painless transition

- Four out of five oil and gas professionals are "excited" by the impact of intelligent enterprise (IE) applications on the industry
- Almost three quarters believe that intelligent enterprise applications can save their company money on capex and opex
- But one in three respondents say they have either not started, or have no intention of integrating intelligent enterprise techniques into their business models

New frontiers

Intelligent enterprise – the suite of technologies that comprises innovations from artificial intelligence (AI) and intelligent automation (IA) to deep learning, predictive analytics and cognitive computing – is changing the fabric of our world.

From therapeutic applications tailored specifically towards an individual's genetic make-up to the potential upheaval that could unfold in the fourth industrial revolution (4R)[2], science fiction is rapidly becoming part of a global socio-economic fact.

According to the International Data Corporation, the market for cognitive and AI solutions will hit $46bn by 2020[3], a jump of almost 500 per cent from its 2016 value.

While the finance, retail and healthcare industries are leading the way with their investment in IE systems[4], it is inconceivable that the industry responsible for more than half of the world's primary energy consumption[5] would not benefit from this new digital order.

"Making up for lost time"

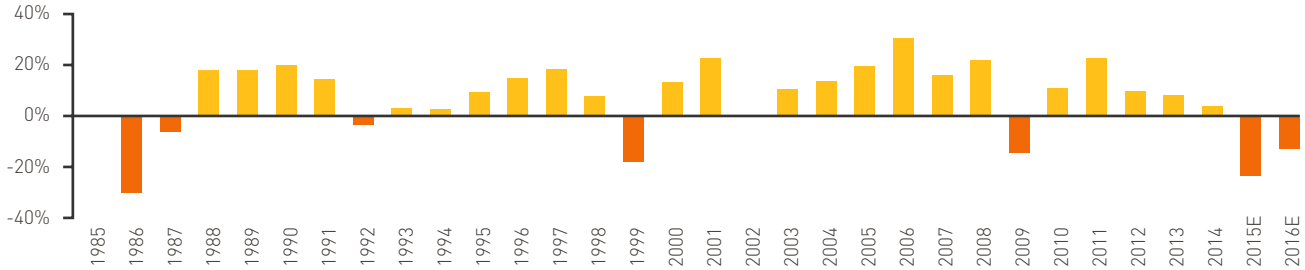
After the halving of the price of a barrel of oil since 2014 and the loss of some 350,000 jobs worldwide[6], a distressed oil and gas industry saw back-to-back years of negative spending in the upstream sector for the first time in the 21st century ***(Figure 1 below).***

In the three years of structural streamlining and enforced frugality, a post-slump oil and gas industry has begun to embrace the potential for novel technologies to enhance performance and profitability in a stabilising fiscal environment.

Speaking at International Petroleum Week in February 2017, supermajor BP's chief executive of upstream, Bernard Looney, declared that: "Big data is revolutionising big oil"[7] but conceded that the oil and gas industry had been left behind by the speed of the digital onslaught.

His assertion was that: ***"we are now making up for lost time - fast".***[8]

Figure 1. Upstream spending 1986 - 2016 percentage change



Introduction

Embracing 4R

Four months after Looney's speech, BP purchased Beyond Limits, an AI and cognitive computing start-up that is adapting Nasa technology designed for deep space exploration[9] to meet the needs of the upstream sector.

US supermajor Chevron has been using graphics processing units to visualise seismic data and create three dimensional, subsurface models to pinpoint the most suitable sites for drilling.[10]

Anglo-Dutch energy giant Shell has been developing machine learning algorithms to take raw seismic traces and automatically detect and categorise subsurface faults during the exploration phase, both on and offshore.[11]

And the accelerating adoption of high-tech solutions has not been entirely the province of those companies big enough to ride out price recessions unfettered.

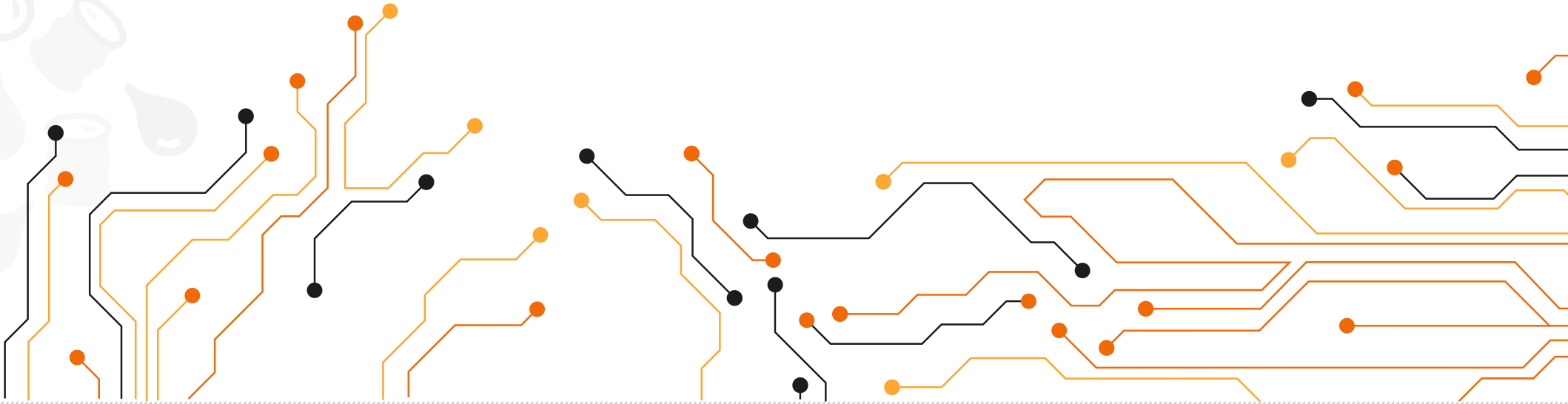
Italian multinational Eni had to cut capital expenditure in 2016 by 20 per cent after huge losses,[12] yet still launched HPC3, its new, award-winning hybrid high-performance computer for exploration and production (E&P) activities in early 2017.[13 14]

Our survey

Intelligent enterprise solutions may be all the rage in the business world, but zeitgeist has seldom been enough for the oil and gas community to venture into the relative unknown with a spendthrift attitude.

Despite forward-focusing companies taking the technological plunge, at Oil & Gas IQ, we were determined to find out whether IE adoption was simply large-scale lip service or an invaluable tool for progress.

To find out, we surveyed our 148,000-stong membership and took the temperature of the industry. We dissect the results in the analysis that follows.



The respondents

Around 200 oil and gas professionals from around the globe took part in our in-depth research into the intelligent enterprise landscape and the impact of AI as the next driver of change within the industry. Here is a brief breakdown of the participants.

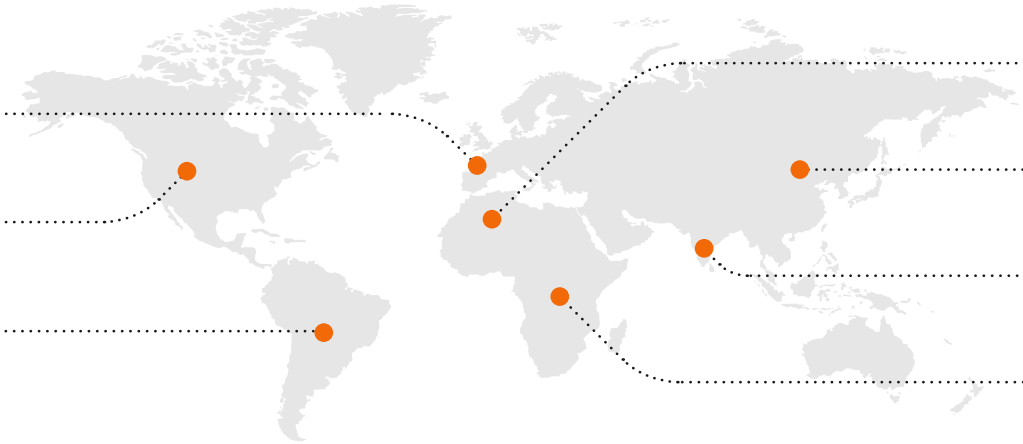
Which title best describes your current role?

Head	25%
C-level	14%
Director	14%
SVP/VP	7%

Does the impact intelligent enterprise will have on your industry:

Excite you?	81%
Worry you?	11%
Leave you indifferent?	8%

In which region are you based?



Europe	17%
North America	34%
South America	9%
MENA	8%
APAC	6%
Asian subcontinent	12%
Africa	14%

AI 2020: The technology

Which intelligent enterprise areas do you think will have the most significant impact on your business? (Respondents could choose up to three)

Predictive analytics	57%	Smart devices	23%
Intelligent Automation	50%	Chatbots / virtual assistants	9%
Cognitive analysis / computing	28%	Text / speech analytics	5%
AI	25%	RPA	4%
Machine learning	23%	DevOps and API	2%
IoT	23%	Other (please specify)	2%

Straight off the bat, we can see that the impact of two IE techniques are deemed to have a far greater effect than any other according to half of the oil and gas professionals surveyed.

Predictive analytics applications have been a mainstay in asset management for facility-heavy industries for a number of years. The promise of deep learning for more precise anomaly detection and failure analysis in a high-risk, capital intensive industry is a persuasive one in the smart oil environment.

Applying intelligent automation systems will have the ability to integrate data across multiple platforms to execute functions that would traditionally be carried out by personnel. The resultant efficacy would allow those work-liberated, trained staff to concentrate on higher value tasks and drive further process efficiency.

Allied to intelligent automation, more than a quarter of respondents saw cognitive computing – which uses data mining, pattern recognition and natural language processing to mimic the way the human brain works – as a powerful tool for business improvement.

Much like intelligent automation, cognitive computing has the potential to "outsource" the human decision-making process to computerised systems, rather than requiring an expert human to check the facts and crunch the numbers.

AI 2020: The impact

Where do you think intelligent enterprise applications could have the most significant impact on your business? (Respondents could choose up to three)

Cost-cutting	65%	De-risking (financial)	28%
Streamlining processes	45%	De-risking (front-line staff)	19%
Modernising business	44%		
Time-saving	42%	Staffing	16%
Staying ahead of competition	35%	Personalisation	5%
		Other (please specify)	2%

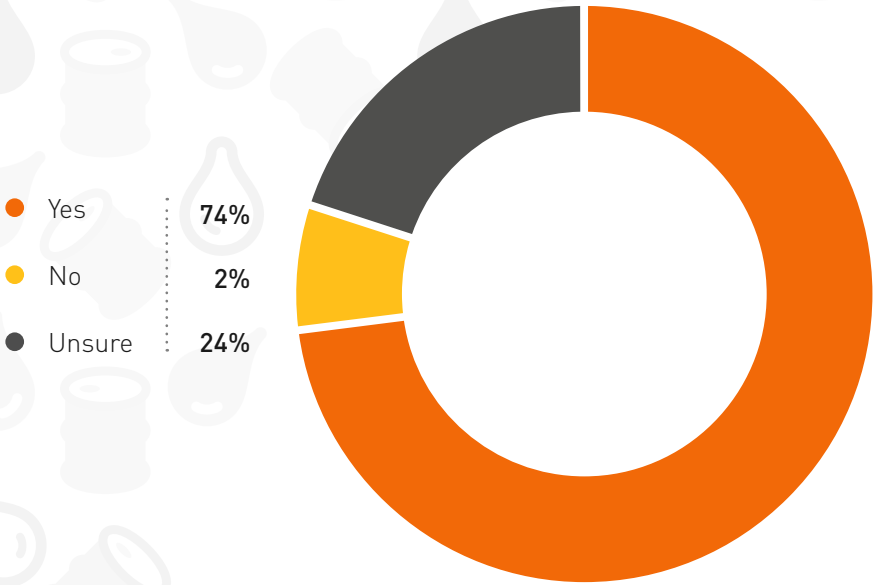
Unsurprisingly for a global industry that has just come out of its darkest period in thirty years, two in three respondents believe that the IE will drive cost savings.

The four most popular selections in this question – cost-cutting, streamlining processes, modernising business and time-saving – are core pillars of the movement towards operational excellence, a major preoccupation of the hydrocarbon supply chain since the descent of the crude price began in 2014.

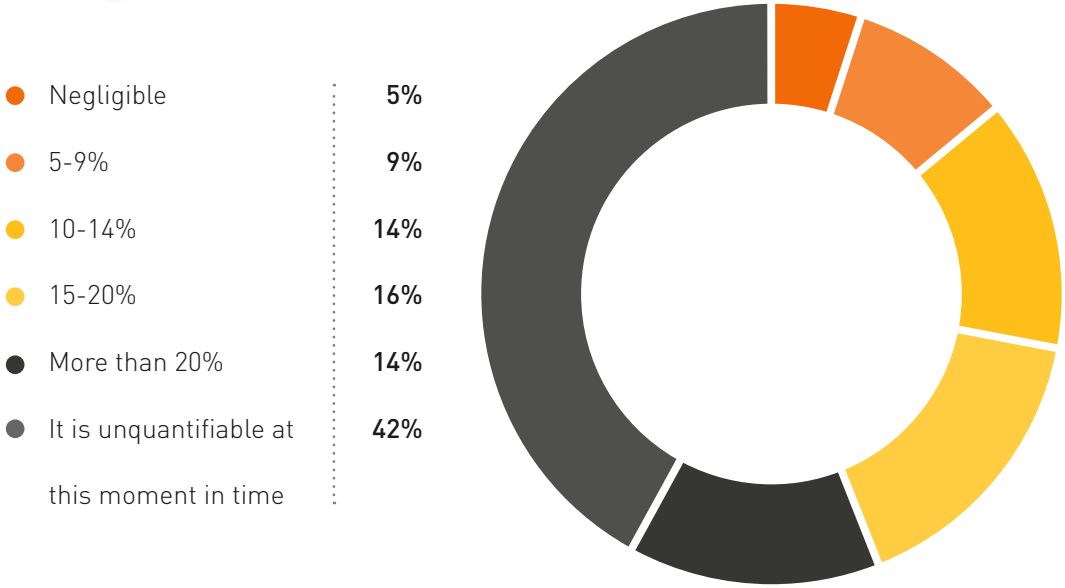
Does that mean that oil and gas professionals believe that IE technology and operational excellence are, effectively, synonymous? If so, what implications might that have for the way that the industry seeks to structure itself in the coming years?

AI 2020: The savings

Can intelligent enterprise applications save your company money on capex/opex?



If yes, how much could it save?



With two-thirds of oil and gas professionals believing that cost-cutting will be the primary advantage of IE adoption, a further three out of every four respondents believed that capex and opex efficiencies could come as a direct result of IE system integration.

Although approximately half of those surveyed believed that the amount that could be shaved off of budgets was undefinable at the present time, 14 per cent were confident enough to opt for "more than 20 per cent".

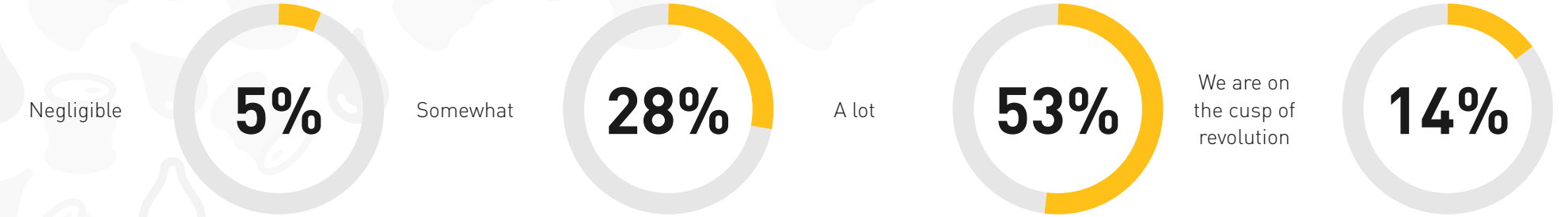
Advances in analytics are enabling integrated driver-based planning, the transparency to link and place individual assets in the context of their industry verticals and within their suite of products, leading to increased accuracy of capex projections.[15]

As IE frameworks are able to fit on top of existing legacy systems to leverage data that is already being generated by extant hardware, capex-intensive businesses like the hydrocarbons industry will see a diminution in their overheads.

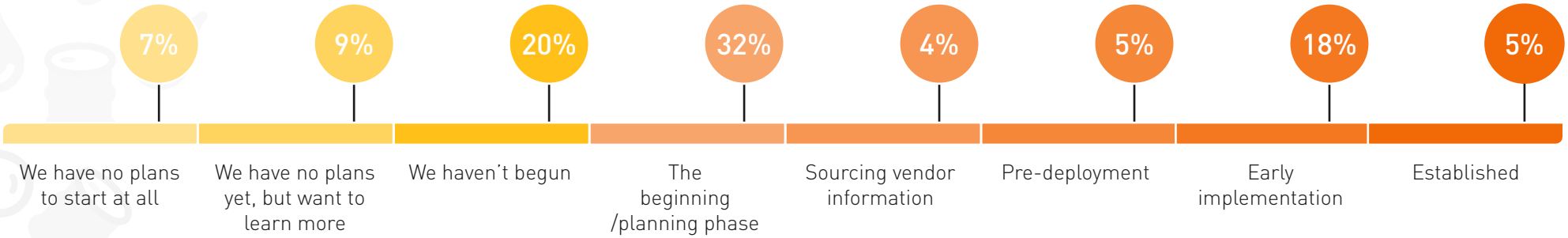
In an industry where four out of five industrial megaprojects fail in their objectives[16] this will come as welcome news.

AI 2020: The journey

How much do you think emerging intelligent enterprise technologies will affect your industry through 2020?



At what stage are you on in your intelligent enterprise journey?



Unfortunately, these statistics highlight the dichotomy between theory and practice that has hamstrung advancement in the oil and gas industry on more than one occasion.

Despite the promise that IE technology could fulfil the stated objectives of operational excellence, the fact that more than half of those surveyed believed that IE could significantly change the industry, and more than one in ten believing there could be revolutionary change afoot, inertia and unwillingness are prevailing postures.

While one in three respondents is just embarking on their IE journey, more than that number have not started.

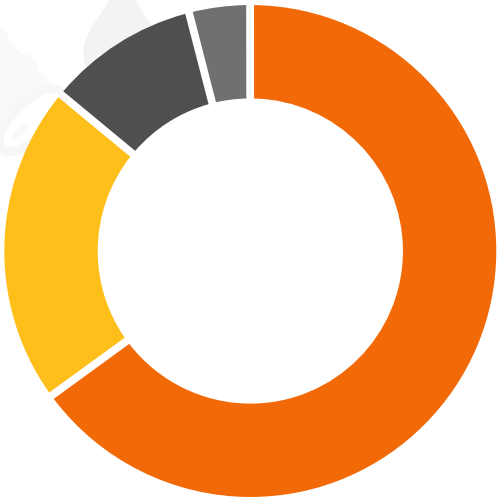
There is a higher percentage of individuals that have no immediate plans to adopt IE measures or have no plans at all to do so, than those that think that we are on the cusp of a technological revolution.

The fact that more than one third of oil and gas professionals are working for companies that might be left behind in the digital step-change of the coming years does not bode well for an industry recently ravaged by a commodity crash.

Sloth to action often belies a gluttony for punishment.

AI 2020: The value

What part of the industry can be most helped by intelligent enterprise?



All equally	65%
Upstream	21%
Downstream	10%
Midstream	4%

Which parts of the oil and gas value chain will be most affected by intelligent enterprise? (choose three)

Asset integrity & maintenance	69%
Field development	35%
Geophysical	32%
Pipelines	30%
Drilling	28%
Refining	25%
Power generation	21%
Transportation (tankers & trucks)	18%
Construction	13%
Gas processing	12%
Product marketing	9%
Liquefaction	5%
Other	4%
Storage	1%

When looking at the three streams of the oil and gas industry, the most obvious candidate for tangible transformational benefit is the upstream sector, where a raft of techniques have been used in different guises and to differing degrees of complexity for decades.

It is no surprise that three out of the four top selections chosen by our respondents fall into the upstream vertical, with asset integrity and maintenance – an all-stream discipline – having roughly double the interest of its nearest competitor.

Correlating with statistics observed earlier in this study, asset integrity practices could be greatly influenced and improved with the rolling out of predictive/cognitive analytics and intelligent automation systems.

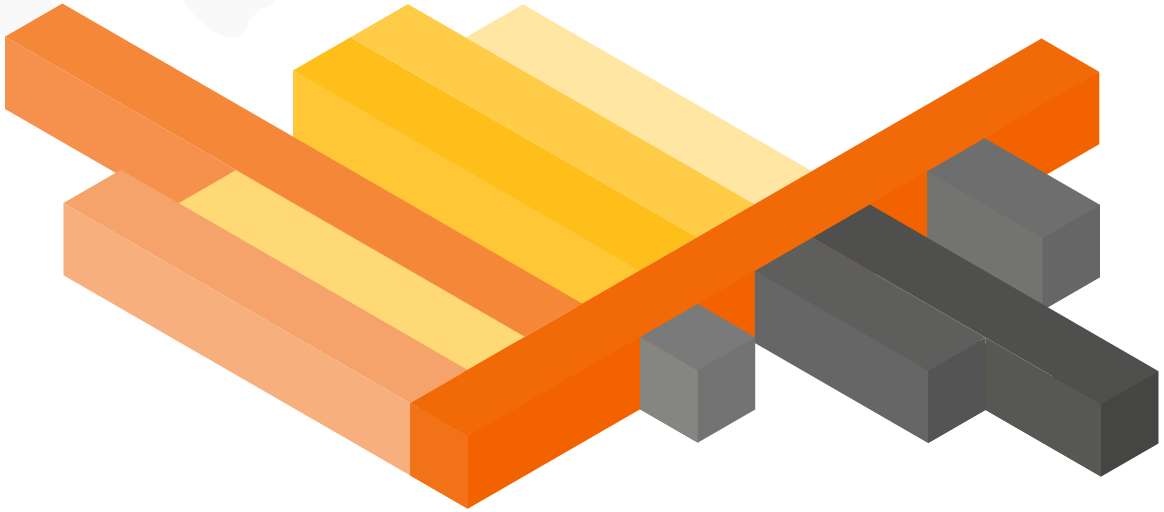
Geophysical identification, drilling and field development, stand to benefit from the fuzzy logic applications that are ingrained in IE analyses, down to the sheer volume of data and levels of uncertainty involved in their day-to-day operations.

Midstream and downstream areas of the industry – such as pipelines, power generation and refining – also occupy significant percentages of our respondents' opinion, reinforcing the assertion of two thirds of those surveyed that every sector will benefit equally from IE in the fullness of time.

AI 2020: The challenges

What are the biggest challenges in implementing an intelligent business strategy in your organisation? (Respondents could choose up to three)

Culture	58%
Upgrading/working with legacy systems	47%
Linking initiatives to ROI	30%
Recruiting the right people	29%
Competing priorities	28%
Gaining senior management buy-in	26%
Getting maximum value from investments	25%
Rapid changes in technology	24%
Lack of suitable vendors	16%
Assigning internal responsibility	12%
Other (please specify)	3%



From the statistics gathered, we can see that the major barriers to IE adoption can be split into two strands: people-centric and hardware-centric.

More than half, and almost two in three oil and gas professionals surveyed, agreed that their corporate culture was the single biggest impediment to the adoption of IE technologies in their places of work.

Whenever any dramatic shifts in working practices are on the horizon, it is the prevailing, ingrained culture of the organisation that will provide the most difficult hurdle to jump.

Time and time again, change necessitates top-down agenda setting from the C-level as well as champions of change working across middle management and filtering that message down to the shop floor.

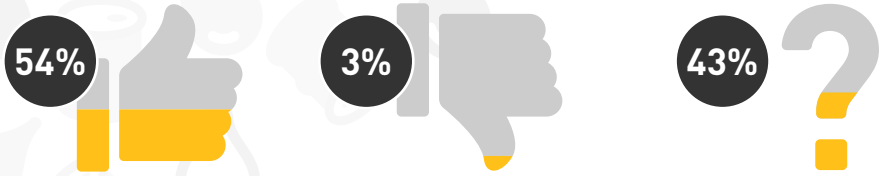
This interfaces strongly with the third of respondents that underlined that the right people need to be in place for IE to take a foothold, and one in three that believed that the case for a solid return on investment needed to be a primary concern for any initiative to pass muster.

Almost half of those surveyed believed that the rigmarole surrounding the upgrading of extant hardware or translation of legacy systems was a key concern when integrating IE systems.

In an industry where data is often still paper-based, unstructured and siloed, and where downtime equates to the loss of profit, moving to a new technological paradigm will always be met with reticence and even a modicum of fear.

AI 2020: The skills crisis

Can intelligent enterprise be a solution to the attrition of the great crew change?



Yes | No | Unsure

The oil and gas industry, particularly in the world's mature basins, is facing a demographic disaster: by 2020, half of the industry's experienced engineers and geophysicists will have reached retirement age.

An already critical skills shortage has been compounded by broad-spectrum lay-offs made in the face of plummeting crude prices.

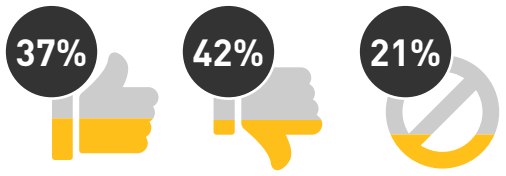
Enshrining the knowledge of millions of man hours of experience in centres of excellence and best-practice digital resources has been the goal of companies in the past decades – technology has always been seen as a crucial part of bridging the skills gap.

More than half of our respondents thought that IE technologies could be the answer to tackle the great crew change head on, yet just less than half were unsure of whether it could be a workable solution.

The replacement of expert humans with expert machines or computer systems has long been seen as a panacea for a dearth of available talent. In the eyes of oil and gas professionals, this trade-off is far from a cure-all.

AI 2020: The people

Do you expect intelligent enterprise to significantly cut jobs in your industry through 2020?



Yes | No | No change

Do you think intelligent enterprise will create more jobs in new areas by 2020?

Yes | No | Unsure

In keeping with the results of the previous question, oil and gas professionals overwhelming believe that IE integration will not mean the phasing out of trained professionals, but will create more jobs across the industry than it will eliminate.

Double the number of respondents believed that IE systems world promote employment growth in the industry through 2020, with one in five believing that there would be no change at all in staffing.

According to a recent report published by global management consultancy, Accenture, the growth of IE applications and their effect on workforce efficacity could boost the productivity of some national economies by as much as 40 per cent by 2035.[17]

In step with the preponderance of novel IT technologies in the business sphere, a raft of roles will be created that will enable humans to direct and support operations in proactive ways.

These emergent job functions have recently been codified into three different fields[18] and are set to supplement, not replace current manpower.

Conclusion

2020 is portentous for a number of reasons. The date has been appropriated by a number of organisations as a landmark for global initiatives from carbon emissions' reduction[19] to workplace equality[20] to food security for all,[21] and more.

Fittingly, 2020 also marks the centenary of the publication of a play by Czech writer, Karel Čapek, in Prague, then the capital of the The first Czechoslovak Republic.

Čapek's oeuvre, known in English as Rossum's Universal Robots,[22] would introduce the word "robot" to lexicon for the first time in history, a translation of the Czech word for "hard labour".

Referring to artificial beings created in a factory-setting and indistinguishable from humans, the play depicts a robot worker-led revolution which all but wipes out humankind.

One hundred years later, this cautionary tale has done much to inform our vision of a future in which humans interact with artificial intelligence in a socio-economic context. It is a relationship characterised by cynicism and mistrust.

The results of this survey have shown that there is an acknowledged motive for the oil and gas industry to embrace IE technology, yet hesitancy when it comes to the actions necessary to make that happen.

The oil and gas world is innately bipolar: by turns it shows itself to be at the bleeding-edge of innovation while simultaneously displaying a risk-aversion and conservatism that is anathema to progress.

BP's Bernard Looney implored the hydrocarbon's industry to "embrace the new era, not wait for it to be thrust upon us".[23] Left to its own devices, it is unlikely that this proactivity would manifest.

A generational hope

Paradoxically, the demographic change and resultant brain drain that has threatened to rend the industry asunder for decades might also be its single best hope for salvation.

Generation Z, also known as "the iGeneration", were the first to be born into a world of omnipresent information technology. They are the first children of an end-to-end digital era.

By 2020, Generation Z will be the lifeblood of the business world, a manpower feedstock that will be more important to the oil and gas industry than most, due to its adverse age profile and burgeoning skills gap.

In order to attract the talent the industry needs, oil and gas will have to flex with the epoch. "Making up for lost time" is not just a short-term business imperative but a long-term evolutionary goal.

> **A movement that changes both people and institutions is a revolution.**
>
> Martin Luther King
> (1929 – 1968)

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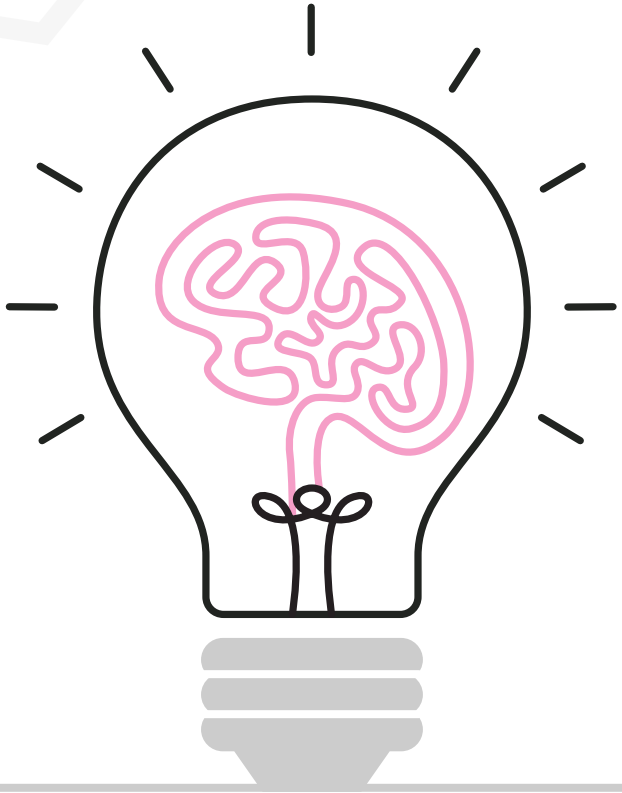

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