Value creation through exploration

David Black

Director – Energy Consulting, Wood Mackenzie, Kintore House, 74-77 Queen Street, Edinburgh, EH2 4NS, UK. Email david.black@woodmac.com www.woodmac.com

Abstract – can you replace reserves and create value?

Exploration is a key part of every upstream company's business. Companies need to replace the reserves that they produce – and by some margin if they are to be able to achieve a sustainable growth in production, one of the key metrics of upstream success in recent years. The reserve replacement ratio was, therefore, seen as one of the headline numbers by which a company's exploration success could be measured.

The oil industry now faces some significant challenges. Exploration, which has so far been the growth engine of the business, is maturing. For the super-majors and majors in particular, the exploration challenge is considerable given the volume of reserves they produce each year, and while the death of exploration has been greatly exaggerated companies need to face this reality and adjust their exploration strategies as a result.

The exploration challenges have, in part, been responsible for the failure of a number of companies to deliver the production growth that had been expected. This has led to an emerging shift from volume to value within the upstream industry as the new metrics by which their performance should be measured, although volumes will still remain important.

We believe, therefore, that it is timely to analyse companies' exploration performance on a broader range of measures than such as finding costs and success ratios. This prompted us to undertake a major multi-client study, **Value Creation through Exploration** to see which companies could replace reserves and create value from their exploration strategies.

There is no simple strategy for success based on our analysis. Exploration is an enigma – but value creation seems to be based on the ability to leverage skills (which, for some, has been harder than expected); legacy positions (to gain a competitive position through the best portfolio); and – not least – an element of luck.

What is exploration for?

This is a seemingly obvious question, but one – in our opinion – that is often overlooked (or not given the priority that it deserves) as companies develop their exploration objectives and strategies. Finding the right answers to this question is critical.

Companies must be clear about the role that exploration plays in their growth strategy. Is exploration focused on increasing reserves? Or replacing production? What is the balance between finding reserves that can be developed rapidly versus looking for long term, legacy assets? And how – and to what extent – is adding value through exploration measured? Is having the most competitive metrics such as finding costs an important driver?

The answer to the question of 'all of these' is not sufficient. Companies need to set and share clear priorities if they are to be successful. In our recent syndicated study ***Value Creation through Exploration*** all the top performing companies had this clarity of purpose in their exploration strategy and senior management alignment about exploration's role.

Value creation through exploration – key findings by company

In our **Value Creation through Exploration** multi-client study we selected a group of 25 companies, ranging from super-majors to smaller E&P companies, and analysed in some detail their exploration performance in the period 1996-2002(H1). We considered their exploration strategy and looked at the key drivers – such as 'elephant hunting' or more mature basins, focused or diverse, high-risk, high-reward or more balanced.

The 25 companies in the study group spent over US$50 billion on their international exploration strategies 1996-

2002(H1) (excluding onshore North America (Lower 48 and Western Canada) and the Gulf of Mexico shelf). This is equivalent to around US$75 billion in NPV terms.

This exploration investment has resulted in discoveries valued at almost US$100 billion (NPV[10] as at 1-Jan-03), resulting in a total value creation through exploration of US$23 billion net of exploration expenditure.

Of the study group, 16 companies (out of 25) have created value through exploration 1996-2002(H1) on our base case assumptions, and nine companies made discoveries worth less than the cost of their exploration spend in NPV terms.

Figure 1 ranks the companies by their value creation through exploration in NPV terms, with the NPV of their exploration expenditure in the same period also shown for comparison. The three super-majors, Shell, BP and ExxonMobil rank highest for value creation through exploration 1996-2002(H1), in part due to the amount they spent on exploration – although there are significant differences in the performance of these companies. At the lower end of the rankings, it is significant that a number of companies with large exploration budgets have struggled to create value through exploration. Spending more is not necessarily the answer if the exploration strategy or its implementation is flawed.

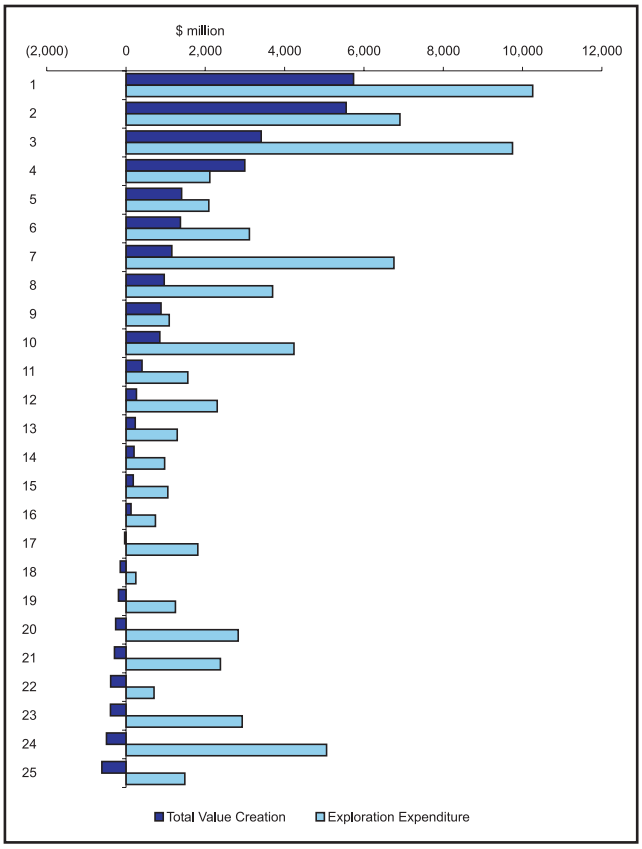
We have also analysed the impact on each company's value creation through exploration at different discount rates. Our base case calculations use a 10% nominal discount rate. We have calculated the value creation at a 5% discount rate – a rough proxy for the cost of capital for the study group – and at a 15% discount rate – in line with the return on capital employed targets that many of these companies hope to achieve.

Achieving a 15% rate of return over the full cycle, rather than from the start of development expenditure forwards, is a demanding target. The lead times between exploration spending and revenues from any subsequent developments can be considerable. This has a significant impact on the rate of return companies can achieve from exploration.

Four companies have achieved a rate of return on their exploration investment of around 15% and a further two are close to 14%. This is an excellent performance and will allow these companies to maintain a strong return on capital expenditure as these projects come forward for development. Nine companies that failed to achieve a 10% return on their exploration expenditure, including four companies did not even achieve a 5% return.

There is a wide variation in value creation at different oil prices (and using the base case discount rate). Eight companies create value through exploration on a US$15/bbl oil price scenario (future Brent oil price, remaining flat in real terms) but four companies fail to create value even on a future oil price scenario of US$25/bbl (remaining flat in real terms).

Fig. 1 – Value Creation through Exploration – Absolute by Company [1, 2, 3]



1. Companies ranked by total value creation
2. Total value creation net of exploration expenditure. NPV10 as at 1-Jan-03
3. Exploration expenditure 1996-2002(H1) in NPV terms

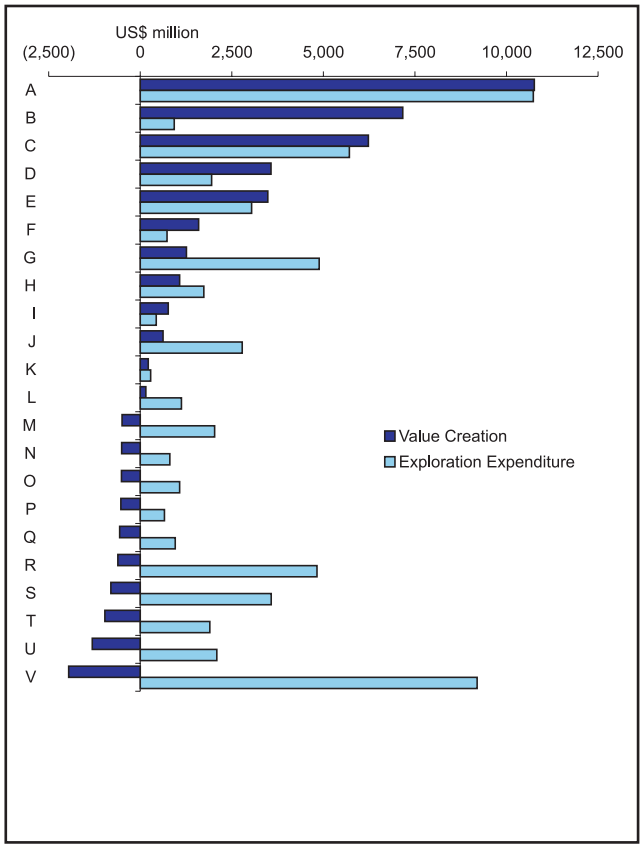
Value creation through exploration – key findings by country

The 25 companies in our study group have been active in nearly 80 countries 1996-2002(H1). Despite an apparent trend by companies towards a more focused exploration strategy, this has been a very diversified exploration effort by many companies in this period.

In aggregate the 25 companies in our study group have created value through exploration in only 22 countries (30% of the total), with value destruction from exploration in over 50 countries.

This raises an interesting issue. In our experience of working with companies in developing their exploration strategies, many companies plan for exploration success but few consider the implications of failure fully enough. Having a strategic 'road map' for each country that fits with the overall exploration strategy is vital. Measuring success is relatively easy, but quantifying failure – and knowing what to do about it – is more difficult. For example, a company's exploration strategy may fail if its exploration expenditure in a region should have been US$250 million and it only spent US$50 million (or visa versa); or that it exited the country after 15 years rather than 5 years (or again visa versa).

Fig. 2 – Value Creation through Exploration – Absolute by Country [1, 2, 3, 4]



1. Countries ranked by total value creation
2. Total value creation net of exploration expenditure. NPV10 as at 1-Jan-03
3. Exploration expenditure 1996-2002(H1) in NPV terms
4. Only include the 25 companies in the study group. Other companies active in the country may affect its result

Figure 2 illustrates a selection of the countries that have enjoyed considerable value creation through exploration 1996-2002(H1) and a number that have, in contrast, seen value erosion through exploration in the same period. Those countries which have had only modest exploration expenditure and value creation have been excluded for clarity.

Key countries for value creation through exploration include the deepwater 'hot spots' of the US Gulf of Mexico (particularly given the large discoveries made in the deepwater and its benign fiscal environment) and West Africa. Kazakhstan ranks highly with the giant Kashagan discovery, as does Egypt, with several important gas discoveries in the deepwater.

The most disappointing countries for value creation have been mature, legacy regions such as the UK that have continued to attract significant exploration expenditure that, in hindsight, has not been justified by their prospectivity. Other disappointments have included a number of countries in Latin America and North Africa, where the industry's enthusiasm to gain exploration opportunities has failed to be matched by the rewards.

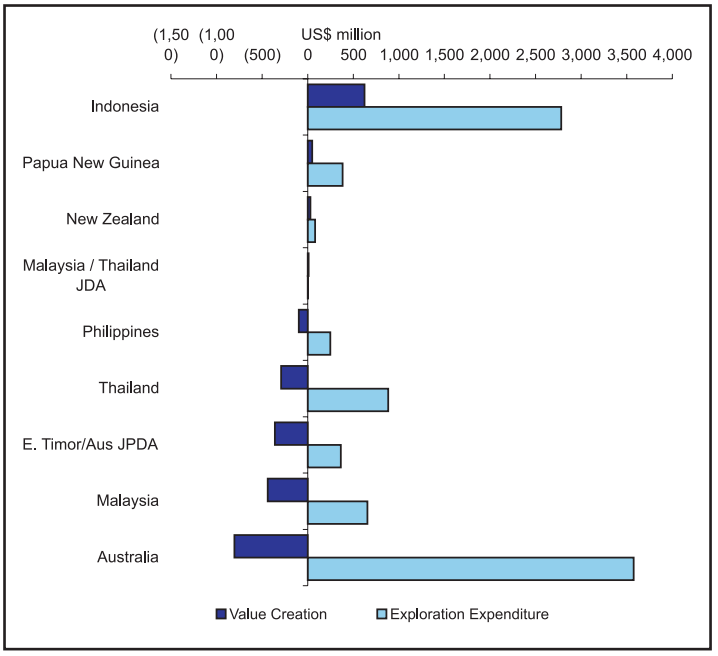
From a more local perspective, Figure 3 shows the value creation in New Zealand from the 25 companies in our study group 1996-2002(H1), together with a number of other countries. We estimate that the companies in our study group that have been active in New Zealand have spent just over US$50 million on exploration and appraisal in the country, around one third of the total exploration spending in New Zealand in this period.

The key country for value creation through exploration in the region for the 25 companies has been Indonesia (despite some disappointing performances from certain companies). Out of the nearly 80 countries where the study group of companies has been active, Indonesia ranks 10th for total value creation.

New Zealand ranks 3rd on a regional basis and 20th overall with around US$30 million of value (in NPV terms) created through exploration from the three out of 25 companies in our study group that were active in the country. While this appears encouraging at first sight, the value creation result is probably helped by the relatively low level of exploration expenditure in New Zealand and the limited number of companies in the study group active in the country.

Australia, in contrast, is the worst performing country in the region for value creation through exploration for the 13 (out of 25) companies in the study group that were active there 1996-2002(H1) and is ranked 69th overall. In part this reflects the level of exploration expenditure, but it is also due to the significant amounts of gas that have been discovered that we regard as technical reserves at present. Until markets have been identified for this gas we regard it as stranded and allocate it only a nominal value – and one which, in aggregate, is somewhat less than the cost of exploration and appraisal required to find it.

Fig. 3 – Value Creation through Exploration – Absolute by Country (Regional) [1, 2, 3, 4]



1. Countries ranked by total value creation
2. Total value creation net of exploration expenditure. NPV10 as at 1-Jan-03
3. Exploration expenditure 1996-2002(H1) in NPV terms
4. Only include the 25 companies in the study group. Other companies active in the country may affect its result

Reserves replacement through exploration

Reserves replacement has, in recent years, been one of the key metrics for the upstream industry (and its investors). It is a direct measure of a company's exploration success (by volume, if not value) and it is a prerequisite for a long term, sustainable growth in production.

Replacing the volume of reserves produced is, therefore, a critical issue for companies. But to put the scale of the challenge into context, BP needs to add around 1.3 billion barrels oil equivalent each year – or more than 100 million barrels each month – to sustain its position. Between them, the western majors need to find the equivalent of the current remaining reserves in Angola every 15 months or a UK North Sea every 18 months just to replace production. But most companies want to do better than that: they want to grow.

In recent years, many of the largest companies have had production growth targets in the range of 3-7% per annum. A growth of 5% in production, however, requires a reserves replacement ratio of just over 160% (assuming typical reserves' life of 13 years).

In total, 45 bnboe of commercial reserves were discovered by the 25 companies in the study group 1996-2002, plus a further 20 bnboe of technical reserves. This gives a commercial reserves replacement ratio of 120% for the study group 1996-2002, some way below the 160% required for a sustainable growth in production of 5% per annum.

Recent exploration results have been somewhat disappointing in terms of reserves replacement, particularly when measured against companies' growth expectations. Although many companies have been able to replace reserves by booking 'discoveries' through commercialising existing fields, the true amount of oil and gas actually being found is considerably less. This means that the inventory of known reserves that have not been developed is falling. It is only a matter of time until the discoveries booked under the SEC definitions must reflect this.

We believe that the difficulty in replacing reserves through exploration has been a key driver of the emerging shift from volume to value metrics within the upstream industry. In our study group of 25 companies, nine have failed to replace production with discoveries of commercial reserves. Five of these are super-majors and majors, illustrating the difficulty of achieving organic growth for these large companies.

Unless there is a shift in the paradigm, exploration cannot continue to be the main growth engine for the super-majors and majors into the future as it has been in the past. Smaller companies, with fewer reserves to replace and where a medium sized field could be a 'company-maker', may view things differently.

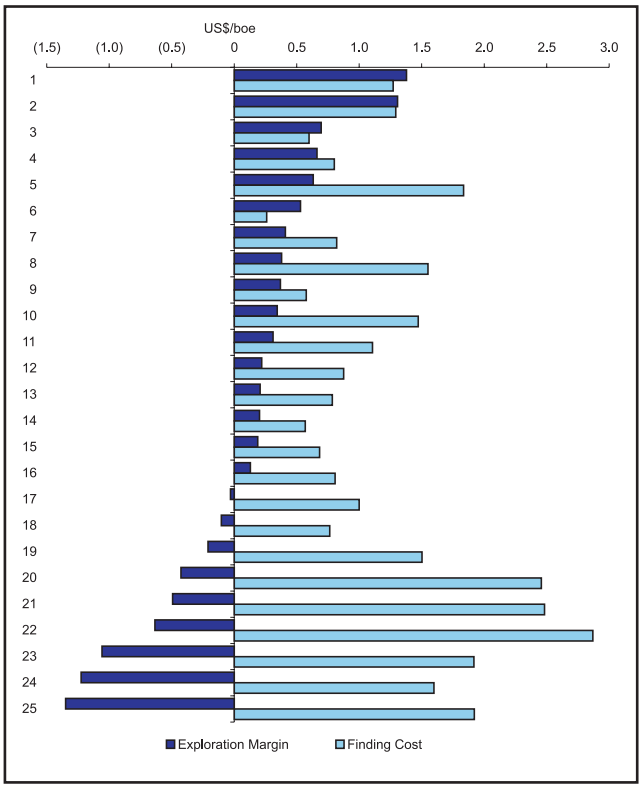
Finding costs and the exploration margin

Finding costs are another of the key metrics for measuring exploration performance, but they give no indication of the value of the oil and/or gas discovered. We have, therefore, analysed the exploration margin achieved by the companies in the study group. This margin is the difference between the amount spent on exploration by each company and the value of the discoveries made, divided by the volume of reserves discovered. In essence, it shows the value created (or lost) by each barrel discovered.

Figure 4 shows the 25 companies in our study group ranked by the exploration margin they have achieved, with their finding costs also illustrated. Those companies with high finding costs tend to have weak or even negative exploration margins – meaning that they are eroding value through exploration.

The company with the lowest finding costs is, however, only ranked sixth for its exploration margin due to the nature of the reserves discovered, much of it being long-life (and relatively low value) gas. The companies with the highest exploration margins have finding costs four times higher than the lowest in the study group, but benefit form having discovered oil reserves in areas with established infrastructure and low marginal rates of tax. Again, it is important that a company's exploration objectives and strategy are aligned with what the portfolio is likely to be able to deliver.

Fig. 4 – Finding Costs and the Exploration Margin [1, 2]



1. Finding costs in US$/boe (nominal terms), including commercial and technical reserves
2. Exploration margin in US$/boe (NPV10 as at 1-Jan-03), including post-tax NPV of commercial and technical discoveries less NPV of exploration cost

Volume versus value

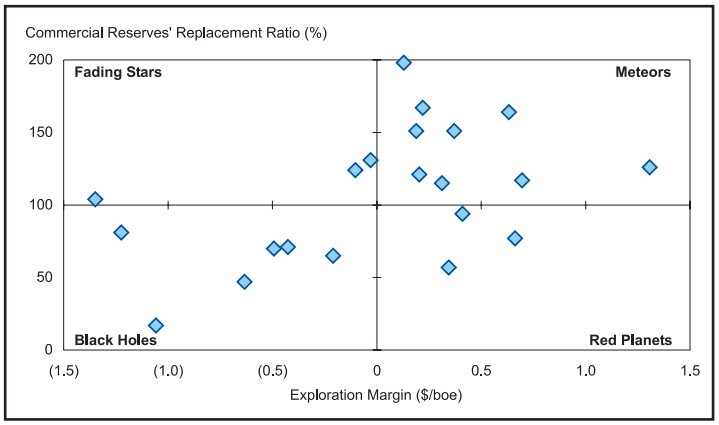
A company's response to the lack of reserves being added could be to increase the amount it spends on exploration. There are, however, limits on whether this is a viable strategy. A company may simply not have the exploration opportunities that are worth drilling and, even if it wants to explore more marginal prospects in its portfolio, partner drag may be an issue. Of more concern would be if a company is already destroying value through exploration, when an increase in its exploration budget (without a new suite of opportunities) might simply compound the problem.

The ideal exploration objective is, clearly, to be able to discover sufficient reserves and to create value through exploration in doing so. To analyse this, in Figure 5 we have plotted our peer groups, the super-majors and majors, and integrated and E&P companies, on the basis of the reserves added and value created through exploration. For volumes we have used their commercial reserves' replacement ratios. For value, we have used the exploration margin which, on a US$/boe (NPV[10] as at 1-Jan-03), encompasses the cost of a company's exploration and the value of the discoveries it has made.

We have set the axes to cross at the reserves' replacement ratio of 100% and an exploration margin of US$0/boe. This allows us to define a universe of four quadrants based on the results achieved by the companies:

- 'Fading Stars' – those companies with high reserves' replacement ratios but at the expense of negative exploration margins;
- 'Meteors' – the ideal position, with reserves being replaced and value created;
- 'Red Planets' – those companies that are failing to replace reserves but are still creating value through exploration; and
- 'Black Holes' – the unhappy combination of failing to replace reserves and destroying value through exploration, a situation which, taken to its extreme, would result in the company disappearing.

Fig. 5 – Volume versus Value



The 25 companies we have assessed have employed a range of different strategies as a means to create value through exploration. Some companies, large and small, are diversified and others are focused – and both strategies have seen value creation and destruction. Several in the study group have used high equity interests (and often operatorships) to give a high gearing to their exploration efforts – with significant success in some cases and expensive failures for others. Strategic alliances have worked well for some companies, but for others experienced partners have proved disappointing. Leveraging skills into new regions has worked well for some but has been difficult for many.

From these strategies, 13 companies (out of 25) have added value through exploration and, at the same time, have replaced their production with discoveries of commercial reserves.

There is no simple strategy for success, based on our analysis of 25 companies. Exploration is an enigma – but value creation seems to be based on the ability to leverage skills (which, for some, has been harder than expected); legacy positions (to gain a competitive advantage through the best portfolio); and – not least – an element of luck.

Implications for New Zealand

The death of exploration has been greatly exaggerated. Nevertheless, the oil industry now faces significant exploration challenges. Exploration, which so far has been the growth engine of the business, is maturing. Companies are beginning to face this reality and adjust their exploration strategies if they are to continue to grow – or, at the least, avoid value erosion through exploring in areas where the returns no longer justify the costs. For the super-majors and majors particularly, the exploration challenge is large and new thinking will be required for future winners.

For countries like New Zealand and the UK, the larger companies appear to be sceptical that the remaining prospectivity is worth committing exploration dollars to. These countries are perceived as becoming the 'black holes' on our matrix of reserves replacement and the exploration margin, with a lack of materiality and poor economic returns from exploration.

The statistics seem to support this argument from the perspective of the bigger companies. We estimate that the average discovery size in New Zealand in recent years has been around 40 mmboe, compared with just under 180 mmbbls in deepwater Angola. Interestingly, the figure for the deepwater US Gulf of Mexico is only a little higher than New Zealand at around 50 mmbbls. What is different, however, is that the 'size of the prize' is routinely expected to be in the 200-500+ mmbbls range – and that, in aggregate, over 1 bnbbls has been discovered in each of the last three years in the deepwater US Gulf of Mexico.

Shell's decision in 2003 to reduce its level of funding for exploration in New Zealand reflects the current trend towards centralised, rather than regionalised, management of exploration budgets. As companies look to high-grade their exploration opportunities the lack of materiality becomes a difficult issue to overcome. Although small finds can give

attractive returns given a benign fiscal regime, the net present value – and reserves added – are just too small to be worthwhile for the larger companies.

New Zealand has one of the most attractive fiscal regimes world-wide and its recent licensing rounds have generated an upsurge in licences awarded, albeit mostly to smaller players. New Zealand's future exploration success now seems to depend on the efforts of these companies such as OMV, Todd Energy, Swift Energy and AWE.

This situation presents both an opportunity and a challenge for New Zealand. The old business model – of larger companies exploring for, developing and producing their discoveries – is becoming redundant. In its place a new business model is emerging – with smaller companies where the materiality threshold is much lower, niche players and more individualised strategies.

The transition between the two business models does have its difficulties for the smaller companies. Some lack skills and resources as fledgling players and, crucially, financing is often a constraint, especially for exploration. Equity markets (if open to the smaller companies) and venture capital funds may be prepared to fund acquisitions of producing assets, but exploration – particularly in mature provinces – is often seen as being too risky.

If these difficulties can be overcome it seems that New Zealand's exploration future post-Maui mainly lies in the commercialisation of relatively small oil and gas fields that could offer a material difference to the smaller companies that now dominate New Zealand's exploration community. The challenge for these companies – and for the government – is to create value through their exploration strategies in New Zealand in order that exploration has a viable future in the country, albeit on a different scale than that seen before.

References

Value Creation through Exploration, syndicated study published by Wood Mackenzie, 2003.

Author

DAVID joined Wood Mackenzie in 1985. He graduated in Geology from the University of Edinburgh and has some 18 years of consulting assignments in the energy industry. David was responsible for Wood Mackenzie's worldwide upstream oil and gas activities before establishing a team to focus on corporate and strategic analysis of upstream companies. He became a Director of the company in 1992.

David has been involved in leading a large number of consultancy projects, including corporate and strategic analysis and acquisition and disposal mandates. He has taken responsibility for many fair market valuation opinions of assets and companies and has been involved in legal disputes as an expert. Other assignments have involved providing advice to governments, including the UK Department of Trade and Industry and the Faroes Ministry of Petroleum. He recently acted as Project Director for two major multi client studies for Wood Mackenzie – Value Creation through Exploration and Value Creation through Acquisitions.