Strategic alliances and knowledge interfaces

Prof. John Archer

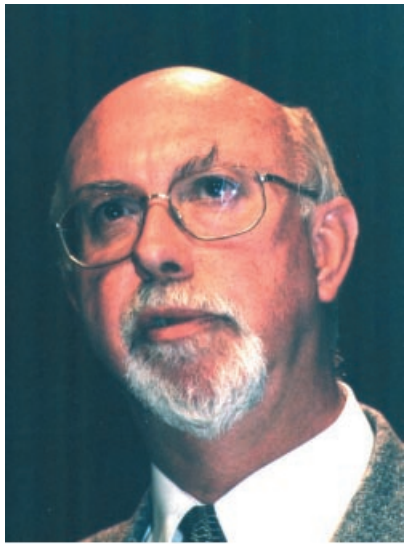
The oil and gas industry used to be pretty disorganised. I'm talking of a time more than 2000 years ago. The Chinese were leading the field onshore in bamboo casing and pit technology and there was a thriving market in natural heavy petrochemicals in which pitch was proving effective in waterproofing wicker boats and canoes. Egypt had natural gas discoveries, referred to locally as the eternal fires.

In Northern Europe the benefits of such knowledge were little known outside an emerging priesthood. The voyages of discovery about 500 years ago brought new information and interest. Columbus, for example, allegedly discovered the asphalt lakes of Trinidad. At the same time Georg Bauer, under his latinised name of Agricola wrote a treatise on fluid and gas flow in porous media and on mineralisation. He noted the drilling techniques of the times. Agricola's great friend and penpal was Erasmus of Rotterdam, and no doubt they swapped notes on emerging technologies. Simultaneously, the invention of printing presses made information more available.

Universities emerged in Scotland – initially of course to suppress heretics, but they had a secondary role in the knowledge management business. The University of St Andrews, however, no longer fulfils its founding obligation to burn to death those holding views contrary to the establishment. By the turn of the nineteenth century, Scotland had its own thriving oil shale business and its own champion in James 'Paraffin' Young. The aptly named Darcy Farm, not far from Edinburgh, was a discovery for Anglo-American in 1922 and again in 1937!

The real breakthrough came following discovery of oil and gas in the North Sea in the late 1960s followed by the setting up at Heriot-Watt University in 1973 of one of the UK's two centres of excellence in petroleum engineering. The other was at my former institution, Imperial College. The Heriot-Watt Department of Petroleum Engineering was set up by the then Secretary of State for Energy, at the instigation of the late Prof. Tom Patten, and its first head was Prof. Jim Brown.

Since that time more than 2000 postgraduate petroleum engineers from the two institutions have delivered technology transfer 'on the hoof' into a dynamic international oil and gas industry – an industry characterised by independent and multinational operators, by a global service sector, by specialist manufacturers and by consultancies. In the 30+ years that I have been associated with the industry the oil price has moved from around 160$/bbl through 40$/bbl down to 9$/bbl and now to 27$/bbl! This arena is influenced by global politics and transnational organisations. The last 30 years have seen dramatic changes in the way that petroleum corporations conduct their businesses and the way they seek to protect themselves from adverse market swings. In the 1980s the UK universities too were 'handbagged' by a determined prime minister into a public/private market economy as a result of swinging cuts to funding and seriously underfunded expansion.



When I first joined the oil industry in 1969 the multinationals were intensely competitive amongst themselves. I worked with Esso in Canada and we looked in-house for technology and training. As far as I could see it was the same with Shell, with Mobil, with Amoco and with Chevron. In those days we didn't hear so much about BP in North America. New graduates were hired at the travelling fairs and milk rounds to the universities. Engineers were expected to be technologically receptive and to have traditional analytical and numerate skills, but the company looked after through career professional development and corporate orientation using in house 'schools': for me this mostly meant Esso Production Research in Houston. The company also conducted most of its own research and it seemed that very little went out to the universities. Every so often the companies had a major clear out of staff - incentives often unintentionally spawning consultancy spin-outs and a supply of technology transfer to smaller independent companies.

In the mid-1970s several events came along which seemed to change the game and the way in which the multinationals behaved. Firstly the emergence of OPEC and a dramatic in-

*Principal and vice-chancellor, Heriot-Watt University, Edinburgh.

crease in the price of crude oil, but also the rapid development of computer technology and information systems, the use of electronic communications, the emergence of so called 'frontier' exploration areas and the shift to offshore exploration and development. The spin-off from the 'space programme' brought new ways of project management and ambitions were fuelled by the idea that almost anything was possible. It brought into play specialist contractors and a major change towards outsourcing. No longer was it regarded as cost effective for a multinational operator to design its own facilities, to drill its own wells, to log and test its own wells, and so on. The seventies and eighties saw huge investment in offshore reservoir development and some spectacular projects. The high oil prices until about 1986 allowed capital investment on a huge scale.

Developments in geophysical data acquisition and interpretation brought in the ability to map more and more reservoir detail and the addition of time lapse allowed tracking of fluid movement as a consequence of production. Advances in drilling technology and well logging provided more and more reservoir data. Mathematical modelling and reservoir simulation became limited mainly by the inability to describe reservoir characteristics at an appropriate scale throughout the reservoir space. Integration of geoscience data with geoengineering data became of age during the nineties.

In the last 20 years the universities, particularly in the UK, Holland, France and USA have worked more closely with the industry in designing Master's level education for geoscientists and geoengineers/petroleum engineers which have fitted them for direct entry into project teams. The innovative universities have largely replaced the industry research laboratories in pre-competitive and strategic research delivery and consortia research projects are relatively commonplace. The operating companies have developed partnership alliances with the service sector, which has grown proportionately.

Since 1986 there has been an increasing focus on cost and there have been mergers and downsizing amongst operators. Oil price and economic forecasting have become key determinants of behaviour. The service sector now takes a considerable portion of project risk. All the players have reinvented themselves in a global activity. Many of the Universities are no exception – after all, in Scotland they have been doing just that for over five hundred years.

Partnerships have become the order of the day. Let me give you a few examples from my own institution, Heriot-Watt University in Edinburgh. In continuing education , Heriot-Watt University is part of a recently established Network of Excellence in Training (NexT) with Schlumberger, University of Oklahoma and Texas A&M University. In research applications, a dynamic geosciences link with Fairfield Industries has been formed to assist industry in time-lapse seismic monitoring in oil fields.

The Pegasus Consortium is undertaking strategic research for the industry, and our university partners are Imperial College, Reading. Newcastle, Nottingham and Edinburgh. The three examples I have given are the shape of things to come. They represent genuine partnerships, playing to established strengths and creating new opportunities.

And what of the future? My own university intends to be a global player in Internet delivery of education. It is already the world's most successful distance learning MBA deliverer with over 9000 registered students in more than 130 different countries. We are already rolling out new programmes at UG level in partnerships with FTK, SK and university consortia. Our petroleum engineering and geoengineering distance learning programmes are both bespoke and general.

Our research capabilities are increasingly delivering strategic new knowledge and partnering for application. We hope that a positive attitude to learning and knowledge will make us effective partners in a changing world.