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Competitive Positioning of Upstream Technology

Distinguished Lecturer series 2003-2004
By Christiaan Luca, MSc
Manager Technology Positioning, Shell

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Presentation outline

• Know where you are
• Know where you want to go
• Make a forward plan
• Forward look
Presentation outline

• Know where you are
  – Industry analysis
  – EP R&D trends analysis
• Know where you want to go
• Make a forward plan
• Forward look
Industry analysis: Porter’s 5 Forces

- Threat of new entrants
- Bargaining power of suppliers
- Rivalry amongst existing competitors
- Threat of substitute products or services
- Bargaining power of buyers

Michael E. Porter, 1979
Upstream industry analysis

- (privatised) NOC’s
  - utilities
  - service companies

- (super)majors
  - Internationals
  - Independents
  - local companies

- resource owners
  - OPEC
  - refineries
  - pressure groups

- energy efficiency
  - de-carbonisation
  - renewables

After Michael E. Porter, 1979

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Upstream industry analysis: oil prices

Oil Prices Have Not Followed Expectations

Source: Energy Modelling Forum

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Upstream industry analysis: staff

- service companies
- employees
- banks

Age Distribution of E&P staff

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Upstream industry analysis: energy transition

Energy Transitions

% of Primary Energy

- Coal
- Oil
- Gas
- New Renewables
- Biofuels
- Nuclear

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- resource owners
- OPEC
- refineries
- pressure groups
- de-carbonisation
- renewables

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Presentation outline

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  – EP R&D trends analysis

• Know where you want to go

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• Forward look
EP droplets in a global R&D Ocean

Total world R&D: Some $700 bln per annum

Upstream R&D: $2.5-3.0 bln or 0.33% of world

Electronics 28%
Automobiles 18%
Pharma 11%
Chemicals 8%
Computer 7%
Telecoms 6%
Other 22%

Sources: IRI, IMD, EIRMA et al

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## Global R&D giants

<table>
<thead>
<tr>
<th></th>
<th>R&amp;D expen. $ million</th>
<th>Revenues $ billion</th>
<th>R&amp;D over Rev. %</th>
<th>R&amp;D per staff k$</th>
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</thead>
<tbody>
<tr>
<td>Siemens</td>
<td>6028</td>
<td>77</td>
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<td>Nokia</td>
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<td>Schlumberger</td>
<td>704</td>
<td>14</td>
<td>5.1</td>
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<tr>
<td>Exxonmobil</td>
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<td>6.2</td>
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<td>Elf Aquitaine</td>
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<td>Royal Dutch Shell</td>
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<tr>
<td>BP</td>
<td>385</td>
<td>174</td>
<td>0.2</td>
<td>3.5</td>
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</tbody>
</table>

Source: Technology Review – 2002 Corporate R&D Scorecard

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Note: Public sources have been used

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EP R&D expenditure - merger effects

Companies shown: BP, ChevronTexaco, ExxonMobil, Shell, Total and ‘Others’.

Note: Public sources have been used

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Service companies taking the lead..

Note: Public sources have been used.
Also Technology ownership is shifting

Source: American Patent Office

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## A deeper look: R&D segments

<table>
<thead>
<tr>
<th>Performance enhancement of existing business</th>
<th>Growth in conventional oil and gas</th>
<th>Growth in unconventional oil and gas</th>
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<td>Short term</td>
<td>Medium term</td>
<td>Long term</td>
</tr>
</tbody>
</table>

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A deeper look: R&D segments

Performance enhancement of existing business

Growth in conventional oil and gas

Growth in unconventional oil and gas

Short term

Medium term

Long term

“Halliburton is actively pursuing new technologies aimed at improving recovery from existing reservoirs” (industry analyst)

“Some of the (oil and gas research) funding is redirected to ... such as hydrogen and superconductivity research” (White House Office of Management and Budget)

“With the focus more on short-term performance, particularly in the service sector, technology is expected to pay sooner” (Europec 2002, opening panel session)
A deeper look: R&D segments

- Performance enhancement of existing business
- Growth in conventional oil and gas
- Growth in unconventional oil and gas

- Short term
- Medium term
- Long term

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Presentation outline

• Know where you are
• Know where you want to go
  – Differentiation strategies
• Make a forward plan
• Forward look
Differentiation: business strategies

Majors & Internationals
• Deepwater, gas, Middle East & Caspian
• Focus on conventional oil and gas
• Increasingly similar geographical spread
• Head-to-head on most opportunities in most countries

Independents, locals
• Geographical focus
• Often resource specialists
Differentiation: R&D philosophy’s

“... has industry's strongest portfolio of proprietary technology and is the leading developer of world-class geoscience and engineering technology.”

“Technology is at the heart of our business ... we have confidence in our ability to be technological leaders.”

“We focus on building world-class capability in a few key technologies that really matter.”

“... is a leader in applying technology to continually improve performance and strengthen competitiveness.”

“... we don’t compete on technology ownership, but on technology application.”

Source: public statements from five majors oil companies

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Differentiation: R&D philosophy’s

“ExxonMobil has industry's strongest portfolio of proprietary technology and is the leading developer of world-class geoscience and engineering technology.”

“Technology is at the heart of our business ... we have confidence in our ability to be technological leaders (Shell)”

“We focus on building world-class capability in a few key technologies that really matter (BP).”

“ChevronTexaco is a leader in applying technology to continually improve performance and strengthen competitiveness.”

“... we don’t compete on technology ownership, but on technology application (AGIP).”
4 Basic R&D philosophy’s

- Broad Spectrum Proprietary
- Selective Proprietary
- Fast Follower
- Follower

Level of externalisation

Internal resource needs
Presentation outline

• Know where you are
• Know where you want to go
• Make a forward plan
  – I can figure it out: Play Mapping
  – I am not certain: Scenario analysis
• Forward look
Technology Play or Road Mapping

• The Technology Play or Road Map provides a comprehensive overview of the technical and competitive landscape by describing:
  - business needs
  - market dynamics,
  - key players
  - competencies

• It provides timing and priorities

• In order to make the right strategic decisions
Presentation outline

• Know where you are
• Know where you want to go
• Make a forward plan
  – I can figure it out: Play Mapping
  – I am not certain: Scenario analysis
• Summary
Scenario Development - background

Scenario’s:

• Describe major, long term uncertainties
• Must be realistic and plausible
• Are developed in broad consultation
• Are turned into ‘stories about the future’
• Are a great mental exercise
• Are used to test the robustness of strategy
Scenario Development - Application

May cover:

- Long term energy demand and supply
- Societal change
- Global geopolitics
- Transition to renewable energy sources
- Upstream technology needs during increasing shortage or oversupply of conventional oil supply (ref. peak oil debate)
Presentation outline

• Know where you are
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Forward look - issues

Business Drivers

• Cost
• Productivity
• Recovery
• Cycle-time
• Sustainability
• Risk
Forward look - dimensions

Business Drivers
- Cost
- Productivity
- Recovery
- Cycle-time
- Sustainability
- Risk

Dimensions
- Materials
- Size & location
- Time
- Sensing
- Digitisation
- People & connectivity
- Bio-technology
- Value-chain integration

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Forward look - opportunities abound

• Materials: expandables, fiber glass
• Size & location: subsea, downhole,
• Time: Real Time
• Sensing: non-seismic exploration, micro-seismic
• Digitisation: remote maintenance and operation
• People & connectivity: knowledge sharing and control
• Bio-technology: bacterial flooding
• Value-chain integration: crude upgrading

As if we barely started yet!
People, connected in real-time ...
Summary and close

• Plenty of tools – but no answers without hard work!
• A dynamic industry - no business without technology
• R&D trends – major shifts in funding and ownership
• Uncertainty – which technologies will be needed
• Technology outlook – enormous opportunity ahead

The scope for Competitive Positioning of Upstream technology is better than ever!