Schlumberger’s recent experience in encouraging innovation in R&E

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Director Special Projects
What is Schlumberger?

Schlumberger is the world’s leading oilfield services company, supplying technology, project management, and information solutions that optimize performance in the oil and gas industry.

- Two business segments
  - Oilfield Services
  - WesternGeco (seismic exploration) (70%)
- 50,000 people in 100 countries
- 2004 revenue: $11.4B
Schlumberger employs more than 50,000 people of over 140 nationalities and works in approximately 100 countries.

The company provides technologies from seismic exploration and formation evaluation through directional drilling, well cementation, stimulation, completion, and productivity to consulting, software, information management, and information technology services that support core oil industry operational processes.
Schlumberger and innovation

• Long history of innovation going back to 1920’s
  - Company believes that innovation is done best within the normal product development process, but is implementing new initiatives to encourage breakthroughs, because of…

• Larger, more diverse business than before
  - Technology and business drivers are very different in different business segments
    • Seismic
    • Drilling & Measurements
    • Wireline
    • Well completions and Well Services
    • Information Solutions, Data and Consulting Services, Integrated Project Management

• Larger, more diverse R&E organization
Research is part of a much larger r&E organization

<table>
<thead>
<tr>
<th>Schlumberger Research</th>
<th>Schlumberger Technology Centers</th>
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<tbody>
<tr>
<td>• Two large centers</td>
<td>• Six major sites (200+)</td>
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<tr>
<td>- Ridgefield / Boston: 150</td>
<td>- Sugar Land, Houston, Rosharon</td>
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<td>- Cambridge (UK): 120</td>
<td>- Paris, Oslo, Calgary</td>
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<td>• Three “satellite” centers</td>
<td>• A dozen(+) other sites</td>
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<tr>
<td>- Moscow: 25</td>
<td>- Gatwick, Abingdon, Stonehouse</td>
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<td>- Stavanger (Norway): 25</td>
<td>- Princeton, Edmonton, Calgary,…</td>
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<tr>
<td>- Dhahran (Saudi Arabia): 10</td>
<td>- Beijing, Fuchinobe, Moscow,…</td>
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<tr>
<td>• Staff: 330</td>
<td>• Staff: 2500</td>
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<tr>
<td>• Budget (2004): $70M (approx.)</td>
<td>• Budget (2004): $400M (approx.)</td>
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Product Lifecycle Management Process (PLMP)

Legend:
- Funded
- Concept
- Feasibility
- Development
- Close-out
- Sustaining

Phase
Checkpoint
Two-track approach to encouraging innovation

**Technology Center Innovation Funds**
- An “innovation manager” at each center controls a small pool of funds (~$1M) to support special projects
- Funds are distributed informally
- Typical grant is $50k
- Informal yearly review by SLB fellows
- Started 3 years ago
  - Several successes adapting “ready-made” technologies for new uses in oil business

**Research Breakthrough Projects**
- A central budget (~$5M) was set up to fund unusual projects: high risk or no natural business sponsor
- Funds are distributed by proposals
- Typical grant is $150k/yr for 2 years
- Yearly review by peers and managers
- Started last year
  - About 20 new projects underway
Future of Research Workshop

- Scientists and management met last fall to discuss the future of research.
- More than 130 posters describing proposals for new projects and new ways of managing research were on display in Ridgefield and Cambridge (UK) during the three-day workshop.
Projects selected based on proposals from scientists

- After the workshop, teams of scientists submitted 55 proposals for new projects expanding on ideas presented at the workshop.

- A committee of scientists from the five research centers reviewed the proposals and selected 20 new ideas for funding based on
  - Intrinsic quality of the proposed science ("fun factor in the idea")
  - Potential to make a large difference in the energy business
  - Strength of outside collaboration
  - Interdisciplinary nature or potential to cut across current business segments

- Each project receives 2 years’ funding with option to renew for an additional 2 years
Expand outside collaborations

• Projects will involve collaborations with about 20 universities.

• Much of the research will be carried by post-doctoral research associates working at Schlumberger under a two-year fellowship.

• Fifteen post-docs will start in 2005.
Disciplines needed in oilfield services research

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<td>Electrical and EM (DC to kHz)</td>
<td>Seismics (elastic waves)</td>
<td>Microsensors</td>
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<td>Nuclear physics (low energy)</td>
<td>Geology</td>
<td>Material science</td>
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<td>Acoustics</td>
<td>Microwaves (GHz)</td>
<td>Soft matter physics</td>
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<td>Rock physics</td>
<td>Optics</td>
<td>Microfluidics</td>
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<td>Mechanical engineering</td>
<td>Chemistry</td>
<td>Biotechnology</td>
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<td>Electrical engineering</td>
<td>Fluid flow (in porous media)</td>
<td>Nanotechnology</td>
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<td>Magnetic resonance</td>
<td>Radar and wireless networks</td>
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<td>Computational physics</td>
<td>Distributed sensors</td>
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<td>Inverse theory (linear)</td>
<td>Complex systems</td>
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<td>Software Engineering</td>
<td>Massively parallel computation</td>
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Theme and plans

- Innovation is highly individual and increasingly interdisciplinary
  - Requires resources, time, and flexibility (and patience)

- Will experiment with merging parts of the research and engineering innovation processes starting in 2007
  - Joint innovation workshop involving both research and technology centers

- Will also experiment in 2006 with “institute-style” workshops
  - Long sessions lasting 1 to 2 months devoted to special topics
  - Small number (~12) of internal participants from throughout the organization (research, engineering, field, finance, marketing)
  - A few outside participants
  - Mixture of education, brainstorming and problem solving