UEM CHALLENGES TO DELIVER SKILLED WORKFORCE TO THE BOOMING O&G INDUSTRY

The case of the Faculty of Engineering

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Faculty of Engineering, UEM
OIL & GAS INDUSTRY: TECHNOLOGY AND TECHNOLOGISTS

- Key areas for the growth in O&G industry:
  - Deepwater O&G;
  - Heavy oils; and,
  - Unconventional O&G
OIL & GAS INDUSTRY: TECHNOLOGY AND TECHNOLOGISTS

- O&G growth demand:
  - Drilling rigs;
  - Trucks;
  - Other equipment;
  - Man labour: Drill and complete wells;
  - Upstream and midstream facilities to process O&G;
  - Pipelines;
  - Downstream Processing Facilities
OIL & GAS INDUSTRY: TECHNOLOGY AND TECHNOLOGISTS

New challenges:

- New sources of O&G will come from technologically challenging reservoirs
- Alternative and innovative drilling methods and technologies will progressively become key issue;
- Emerging highly complex technology demand:
  - Increase types and degrees of professional skills and expertise
NEW CHALLENGES
O&G EMPLOYMENT

- O&G industry:
  - Important role in the global, regional and local economies;
    - Direct, indirect and induced job creation;
    - Energy resources supply; and,
    - Provider of diverse primary chemicals
SKILLS GAPS AND NEEDS

- Globally, O&G faces shortage of qualified/skilled professionals;
  - Demographic challenges
    - North: Aged and experienced workers retiring;
    - (2/3 of SPE members >40 yrs-age)
  - Consequences:
    - Reduction in production; and/or,
    - Reduction in productivity

- O&G Companies skills development strategies:
  - Vocational Education and Training programs to employees;
  - Scholarships and financial contributions to VET in schools and Universities
SKILLS GAPS AND NEEDS

- Medium and long term challenges:
  - O&G industry must develop coherent HR development policies and strategies aligned with ILO and local regulations:
    - Global training strategy;
    - Drawing talents from diverse labour supply pools not tapped properly yet;
    - Increase partnership between key stakeholders
  - 3 objectives to successfully ensure the link skills-productivity:
    - Matching supply to current skills demand;
    - Assisting employers adjust to change; and,
    - Anticipating and delivering the new skills for the future
G20 STRATEGY BY ILO:

“A skilled workforce for strong and sustainable and balanced growth”
BUILDING LOCAL SKILLED WORKFORCE

○ Expansion of O&G to new geographic locations:
  ▪ Heavy reliance on expatriate workforce:
    ○ Local unemployment;
    ○ High operational costs;
    ○ Cultural conflicts;
  ▪ Seek for local skilled workforce:
    ○ Africa: Youth approx 2/3 population;
    ○ Reduced reliance on expatriates and on costs;
    ○ Local knowledge and culture adjustment;
    ○ Benefit from best local talents and leaders;
    ○ Meeting local content policies
LOCAL VS EXPATRIATE WF

HR Trends in Oil & Gas: Expats vs Local

Imported Workforce Versus Local Workforce

<table>
<thead>
<tr>
<th>Region</th>
<th>Imported Labour</th>
<th>Local Labour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>23.4%</td>
<td>71.6%</td>
</tr>
<tr>
<td>Asia</td>
<td>21.0%</td>
<td>77.0%</td>
</tr>
<tr>
<td>Australia</td>
<td>42.4%</td>
<td>52.6%</td>
</tr>
<tr>
<td>Europe</td>
<td>36.5%</td>
<td>69.5%</td>
</tr>
<tr>
<td>Middle East</td>
<td>86.5%</td>
<td>13.5%</td>
</tr>
<tr>
<td>North America</td>
<td>73.5%</td>
<td>26.5%</td>
</tr>
<tr>
<td>Russia and CIS</td>
<td>45.2%</td>
<td>54.8%</td>
</tr>
<tr>
<td>South America</td>
<td>74.0%</td>
<td>26.0%</td>
</tr>
</tbody>
</table>

Middle East dominated by expatriates
O&G WORKFORCE OCCUPATIONAL SKILLS

- Engineers & Technologists: 57%
- Accountants & Clerks: 20%
- Managers & Administrators: 13%
- Geologists & Geophysicists: 10%

DEVELOPMENT IS AN ENGINEERING WORK!
**WORKFORCE MAIN OCCUPATION SKILLS**

![Projected Employment Levels of the Top 10 Employing Occupations in Oil, Gas Operations, Base Case, 2013-2018](image)

<table>
<thead>
<tr>
<th>OCCUPATION</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining Engineers</td>
<td>1,940</td>
<td>2,282</td>
<td>2,695</td>
<td>3,092</td>
<td>3,345</td>
<td>3,548</td>
</tr>
<tr>
<td>Chemical, Gas, Petroleum and Power Generation Plant Operators</td>
<td>2,060</td>
<td>2,379</td>
<td>2,718</td>
<td>3,009</td>
<td>3,162</td>
<td>3,265</td>
</tr>
<tr>
<td>Accountants</td>
<td>1,702</td>
<td>1,937</td>
<td>2,221</td>
<td>2,497</td>
<td>2,675</td>
<td>2,818</td>
</tr>
<tr>
<td>Geologists and Geophysicists</td>
<td>1,306</td>
<td>1,542</td>
<td>1,828</td>
<td>2,102</td>
<td>2,276</td>
<td>2,416</td>
</tr>
<tr>
<td>Drillers, Miners and Shot Firers</td>
<td>1,328</td>
<td>1,528</td>
<td>1,790</td>
<td>2,051</td>
<td>2,195</td>
<td>2,284</td>
</tr>
<tr>
<td>Metal Fitters and Machinists</td>
<td>1,219</td>
<td>1,399</td>
<td>1,589</td>
<td>1,752</td>
<td>1,837</td>
<td>1,895</td>
</tr>
<tr>
<td>Contract, Program and Project Administrators</td>
<td>976</td>
<td>1,110</td>
<td>1,251</td>
<td>1,375</td>
<td>1,446</td>
<td>1,497</td>
</tr>
<tr>
<td>Production Managers</td>
<td>791</td>
<td>948</td>
<td>1,128</td>
<td>1,299</td>
<td>1,417</td>
<td>1,518</td>
</tr>
<tr>
<td>Industrial, Mechanical and Production Engineers</td>
<td>830</td>
<td>963</td>
<td>1,124</td>
<td>1,280</td>
<td>1,380</td>
<td>1,459</td>
</tr>
<tr>
<td>Accounting Clerks</td>
<td>900</td>
<td>1,002</td>
<td>1,105</td>
<td>1,195</td>
<td>1,246</td>
<td>1,282</td>
</tr>
</tbody>
</table>

**TOTAL**

13,052 15,090 17,449 19,652 20,979 21,982

**SOURCE: Deloitte Access Economics**
WORKFORCE MAIN OCCUPATION SKILLS

![Graph showing workforce main occupation skills from 2014 to 2018. The graph compares 'Other' and 'Technologists/Engineers' categories with a trend of increasing numbers over the years.]
## WORKFORCE MAIN OCCUPATION SKILLS

### Projected Employment Levels in Oil and Gas Operations by Broad Occupation, 2013-2018

<table>
<thead>
<tr>
<th>Occupation</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managers</td>
<td>5,518</td>
<td>6,339</td>
<td>7,255</td>
<td>8,134</td>
<td>8,755</td>
<td>9,298</td>
</tr>
<tr>
<td>Professionals</td>
<td>13,003</td>
<td>14,859</td>
<td>17,100</td>
<td>19,276</td>
<td>20,677</td>
<td>21,802</td>
</tr>
<tr>
<td>Technicians &amp; Trade Workers</td>
<td>8,166</td>
<td>9,175</td>
<td>10,222</td>
<td>11,125</td>
<td>11,592</td>
<td>11,904</td>
</tr>
<tr>
<td>Community &amp; Personal Service Workers</td>
<td>147</td>
<td>167</td>
<td>189</td>
<td>211</td>
<td>227</td>
<td>239</td>
</tr>
<tr>
<td>Clerical &amp; Administrative Workers</td>
<td>7,168</td>
<td>8,044</td>
<td>8,950</td>
<td>9,744</td>
<td>10,196</td>
<td>10,517</td>
</tr>
<tr>
<td>Sales Workers</td>
<td>568</td>
<td>631</td>
<td>703</td>
<td>770</td>
<td>811</td>
<td>841</td>
</tr>
<tr>
<td>Machinery Operators &amp; Drivers</td>
<td>2,876</td>
<td>3,179</td>
<td>3,592</td>
<td>4,015</td>
<td>4,244</td>
<td>4,381</td>
</tr>
<tr>
<td>Laborers</td>
<td>1,497</td>
<td>1,693</td>
<td>1,899</td>
<td>2,075</td>
<td>2,166</td>
<td>2,229</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>38,943</td>
<td>44,087</td>
<td>49,910</td>
<td>55,350</td>
<td>58,668</td>
<td>61,211</td>
</tr>
</tbody>
</table>

**Source:** Deloitte Access Economics
MOZAMBIQUE STATUS

DEVELOPMENT IS AN ENGINEERING WORK!
MOZAMBIQUE STATUS

- **FEUEM**: The biggest and the most comprehensive School of Engineering:
  - Appr 170 undergrad engineers/yr
  - Chem, Civil, Mech, Env, ICT, Electrical, Electronics, Ind
  - Approx 40 grad engineers from 2017: Pet + Food Tech

- **Other schools**:
  - Approx 150 undergrad eng/yr

- **Actual need**:
  - Approx 2000 (avg) undergrad eng/year (next 5-6 years)

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![Pie chart showing unmet demand](chart.png)

- **Undergrads per year**: 16%
- **Unmet demand**: 84%
DEVELOPMENT IS AN ENGINEERING WORK!
MOZAMBIQUE STATUS

Skilled labour Annual delivery levels

<table>
<thead>
<tr>
<th>Year</th>
<th>FEUEM</th>
<th>Other</th>
<th>Demand</th>
<th>Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>200</td>
<td>100</td>
<td>300</td>
<td>100</td>
</tr>
<tr>
<td>2013</td>
<td>150</td>
<td>75</td>
<td>225</td>
<td>50</td>
</tr>
<tr>
<td>2012</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td>50</td>
</tr>
<tr>
<td>2011</td>
<td>50</td>
<td>25</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>2010</td>
<td>10</td>
<td>5</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>2009</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2008</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2007</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
O&G INDUSTRY INFLUENCE

Traditionally:
- Majority of University candidates to Social Sciences and Humanities;
- Chemical/Processing Engineering less demanded;
- Candidacy to Faculty of Engineering:
  - National entrance exam:
    - Maths & Physics;
    - Fear not appropriate to assess skills/identify talents or bright minds
- Internship:
  - not paid;
  - In general: students or the Fac to cover the internship costs
O&G INDUSTRY INFLUENCE

Presently:

- Different companies offering internships (incl allowances to students)
- In general, students sign contract with the receptor companies before completing the degree;
- Scholarships by companies tend to increase;
- More female students enrolling in Engineering training courses;
- Still not consistent:
  - Country perspective on Engineers training;
  - Companies 'role in partnership with the academia;
  - Misunderstanding prevailing between Academia and a simple recruitment centre
CHALLENGES TO UEM

- UEM has been the main University in Mozambique for more than 50 years;
  - The best ranked internationally:
    - 27th best University in Africa;
    - It hosts the biggest school of engineering in the country;
  - Senior and Renowned engineers trained in Mozambique are UEM alumni:
    - Public and Private sector;
    - Government and Parliament;
    - etc
CHALLENGES TO UEM

- Mozambican Society expects UEM a leading role:
  - Problem solving initiatives;
  - Development of human resources;
  - Development of High Education;
  - Ensuring the relevance of the training fields vis-à-vis the actual skills demand
CHALLENGES TO UEM

- Presently working in a much comprehensive strategy for training engineers and geoscientists;
- Newly established training fields:
  - Petroleum Engineering (MSc);
  - Mineral Resources Management (MSc);
  - Hydrocarbons Process Engineering (MSc-2016);
  - Environmental Engineering (MSc-2017);
  - Quality Control and Management (MSc-2016)
CHALLENGES TO UEM

- For O&G UEM needs:
  - To build and develop strong domestic institutional capacity in O&G related fields;
  - To enhance its ability to engage PPP:
    - Internships and traineeships;
    - Raise funds for institutional capacity development
      - HR, I-structure, labs, etc
  - to expand training to:
    - Law, Environment, Engineering, Economics
    - Undergraduate, Graduate levels;
    - Formal and Short-term training for professionals;
  - to strengthen its research capacity
UEM: TOP 30 AFRICAN UNIVERSITIES-2015

![Image showing the top 30 African universities in 2015 web rankings.](image)

- **University of Cape Town**
- **University of South Africa**
- **University of Pretoria**
- **University of Stellenbosch**
- **University of the Witwatersrand**
- **Cairo University**
- **University of Dar es Salaam**
- **Rhodes University**
- **Harare University**
- **University of Nairobi**
- **Alexandra University**
- **University of Winzibonotsi**
- **University of Ghana**
- **Makerere University**
- **Nelson Mandela Metropolitan University**
- **University of Dakar Salloum**
- **University of Dakar Salloum**
- **The German University in Cairo**
- **Universidade Eduardo Mondlane**
- **Obafemi Awolowo University**

*Note: The list continues with the names of the top 30 African universities.*
DEVELOPMENT IS AN ENGINEERING WORK!

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Muito Obrigado