

## TOOLBOX: Bridging the gap between academia and industry

### The challenge

A key challenge for engineering in sub-Saharan Africa (SSA) is the continuing gap between academia and industry. This leads to a disconnect between engineering teaching and the evolving needs of the industry, often hampering innovation. This gap is partly due to a lack of funding, as well as various political, cultural, and organisational differences between stakeholders. Limited professional networks and a lack of capacity to actively build and/or sustain them also stifle strategic, longer term collaboration. Professional engineering institutions (PEIs) have a crucial role to play in bridging this gap.

### Initiatives

SSA PEIs lead a range of interventions to increase collaborative engagement between universities and industry, covering both opportunistic and long-term strategic partnerships. Below you will find some of the most efficient examples of this.

#### Fellowships and industry placements

PEIs facilitate exchange schemes for experienced engineers and academic staff to spur knowledge exchange

**Outcomes:** knowledge exchange; improved quality of teaching; improved relevance of education; networking and employment opportunities

**PEIs:** Institution of Engineers of Kenya, Institution of Engineers Rwanda, South African Institution Of Civil Engineering, Nigerian Institution of Mechanical Engineers, Malawi Institution of Engineers, Zimbabwe institution of Engineers, Engineers Board Kenya

#### Developing industry-relevant curricula

PEIs help identify and fill industry-related knowledge gaps in engineering curricula

**Outcomes:** improved relevance of education; increased employability; bridging knowledge gaps

**PEIs:** Federation of African Engineering Organisations, Nigerian Society of Engineers, Institution of Engineers of Kenya, South African Society for Engineering Education

#### Fostering innovation

PEIs establish central repositories and design and manufacturing centres to foster learning and engagement between industry and academic practitioners to bridge technology gap

**Outcomes:** improved engagement and knowledge exchange between industry leaders, academics, researchers and trainees; improved skills of recent graduates; increased employability

**PEIs:** Ghana Institution of Engineering, Institution of Engineers of Kenya

#### Supporting accreditation processes

PEIs support the design and implementation of rigorous accreditation processes for Engineering Higher Education degrees and CPD courses

**Outcomes:** improved standards and practices across PEIs; effective operating systems and standardised processes; improved communication around guideline implementation



**PEIs:** Sierra Leone Institution of Engineers, Zimbabwe Institute of Engineers, Uganda Institute of Professional Engineers, Engineers Registration Board Kenya



#### Case study: Nigerian Society of Engineers' (NSE) mission to develop industry-oriented curricula


NSE established links with universities and colleges as part of its mission to improve their curricula and make them more industry-oriented. The process involved engaging 26 discipline-specific professional engineering institutions and providing them with a tool to identify the current gaps between industry and academia, as well as how to bridge them. Based on the tool, discipline-specific PEIs are now establishing connections with respected industry leaders and analysing university offerings together. Features under consideration for this curriculum include mentorship opportunities for students through PEIs which can link them with senior engineers, and summer industry retreats for lecturers to help them incorporate practical insights into their teaching.

## Success factors and achievements

For each category of interventions, the table below identifies the implementation challenges and the success factors for these interventions. The table also highlights some of the strongest achievements.

Interventions	Challenges	Success factors	Examples and achievements
<p><b>Fellowships and industry placements</b></p> 	<ul style="list-style-type: none"> <li>→ Obtaining buy-in from stakeholders, the need to offer some benefits in exchange</li> <li>→ Under-resourcing to set up MOUs and other agreements</li> <li>→ Inability to properly finance student placements</li> </ul>	<ul style="list-style-type: none"> <li>→ Pre-existing relationships between representatives of the participating organisations to determine capacity needs</li> <li>→ Platforms for online interaction to take forward negotiations and online knowledge exchange</li> <li>→ A single platform through which engineers and stakeholders can interact</li> <li>→ Memorandums of understanding or other written agreements in place</li> </ul>	<ul style="list-style-type: none"> <li>→ <b>Kenya – Institution of Engineers of Kenya (IEK): Staff exchange scheme</b> Since 2018, IEK has been facilitating <b>staff exchanges</b> to allow academic staff members to participate in three-month placements in IEK member companies. In exchange, IEK professional members teach in partner universities. IEK has established <b>memorandums of understanding</b> with four universities to facilitate staff exchanges, and participants have fed back that the overall quality of academic teaching has improved as a result.</li> </ul>
<p><b>Developing industry-relevant curricula</b></p> 	<ul style="list-style-type: none"> <li>→ Limited funding to support operational costs and human resources</li> <li>→ Short timeframe to produce results or respond to emerging needs</li> <li>→ Difficulty finding mentors with appropriate technical expertise</li> </ul>	<ul style="list-style-type: none"> <li>→ Supportive leadership and dedicated funding to support collaboration through initiatives</li> <li>→ Templates developed to standardise and streamline processes across areas of operation and organisations</li> <li>→ Pre-existing personal relationships between representatives of participating organisations to help identify capacity needs / gaps</li> </ul>	<ul style="list-style-type: none"> <li>→ <b>Nigeria – Nigerian Society of Engineers (NSE): Industry-oriented curriculum</b> See case study box above</li> <li>→ <b>South Africa – South African Society for Engineering Education (SASEE): Biennial conferences</b> SASEE organises <b>conferences and workshops</b> that bring together industry and academia and focus on how to incorporate the industry's needs into university curricula and activities.</li> </ul>

Interventions	Challenges	Success factors	Examples and achievements
<p><b>Developing industry-relevant curricula</b></p> 	<ul style="list-style-type: none"> <li>→ Industry resistance to internships/ differing incentives for collaboration</li> <li>→ Lack of incentives for professionals to 'deviate' from their contractual performance indicators</li> </ul>	<ul style="list-style-type: none"> <li>→ Existing relationships between government, industry and academia to facilitate knowledge exchange / practical opportunities to collaborate</li> </ul>	<ul style="list-style-type: none"> <li>→ <b>Sierra Leone – Sierra Leone Institution of Engineers (SLIE): Framework for upgrading engineering education</b> SLIE ran a six-month pilot project with the University of Sierra Leone and local employers to develop a framework for the training of young graduate engineers. The project aimed to enhance the overall <b>standard, relevance and quality</b> of engineering courses and continuing professional development at the University of Sierra Leone, in turn enhancing engineers' <b>employability and competitiveness</b> in the international employment market. Students who undertook the programme demonstrated increased confidence and improved skills, particularly in technology.</li> </ul>
<p><b>Facilitating innovation</b></p> 	<ul style="list-style-type: none"> <li>→ Lack of government funding/buy-in</li> <li>→ Limited staff capacity to take forward implementation of centres</li> </ul>	<ul style="list-style-type: none"> <li>→ Interaction with and support from other PEIs which were accredited and could provide guidance and advice based on experience</li> <li>→ Agreeing a focus of collaboration with other stakeholders, including set up of memorandums of understanding/ways of working between PEIs to address technology gap</li> <li>→ Spearheading initiatives tailored to local needs</li> <li>→ Existing networking events set up to promote/check in with participants</li> </ul>	<ul style="list-style-type: none"> <li>→ <b>Ghana – Ghana Institution of Engineering (GhIE): <a href="#">Technology Design and Manufacturing Centres (TDMCs)</a></b> In April 2019, GhIE and the Ministry of Environment, Science, Technology, and Innovation announced the establishment of Technology Design and Manufacturing Centres to help bridge the technology gap in Ghana. They will operate as a repository for engineering analysis and reports on research conducted in Ghana, house a database on worldwide Ghanaian engineers, technicians and scientists, along with their areas of expertise, and provide a place for design-for-manufacturing assembly, turning innovations into commercially viable products. GhIE has agreed to lead the establishment of the first pilot centre.</li> </ul>

Interventions	Challenges	Success factors	Examples and achievements
<p><b>Supporting accreditation processes</b></p> 	<ul style="list-style-type: none"> <li>→ Funding stipends are needed to support PEIs throughout the accreditation processes</li> <li>→ Challenging to implement a monitoring and evaluation mechanism without dedicated capacity/expertise to do so</li> <li>→ Delays to implementation due to COVID-19</li> </ul>	<ul style="list-style-type: none"> <li>→ Strong collective leadership that supports investment in accreditation status</li> <li>→ Memorandums of understanding and other agreements to focus roles and responsibilities</li> <li>→ Existing links with academic institutions to remain connected on latest protocols and standards</li> <li>→ Developing templates to standardise and streamline processes across areas of operation and organisations</li> <li>→ A shared vision and values across participating organisations</li> </ul>	<ul style="list-style-type: none"> <li>→ <b>Uganda – Engineers Registration Board (ERB) and Uganda Institution of Professional Engineers (UIPE): Supervisory role in accreditation</b> In 2018, ERB and UIPE signed a <b>tripartite memorandum of understanding</b> with the National Council of Higher Education to reinforce their supervisory role in accrediting institutions' academic and professional programmes. All member representatives sit on the Joint Accreditation Committee, designed to ensure quality of engineering education and training at universities and other tertiary institutions in Uganda. Only those with a degree from an accredited course can register with UIPE and ERB.</li> <li>→ <b>Zimbabwe – Zimbabwe Institution of Engineers (ZIE) and Engineering Council of Zimbabwe (ECZ): Joint work for accreditation</b> ZIE and ECZ are working closely with the Zimbabwe Council of Higher Education on <b>strategies for accreditation</b> and improving good practices in science, technology, engineering and mathematics education. Both PEIs are also working hand in hand with the Engineering Council of South Africa on securing Washington Accord status to enhance engineers' competitiveness in the international market through accreditation.</li> </ul>