International Engineering Education Conference

Engineering Education Systems that are fit for the future

Sierra Leone Institution of Engineers

Young Engineers Corp – an African Catalyst Pilot Project

Monday 24th September 2018

London, United Kingdom

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Sierra Leone at a Glance

- The war ended in 2002
- Ebola was officially over in 2015
- We have just finished our 3rd democratic general elections
- 1st female elected Mayor
- 1st female Attorney General
- Engineering is the key to our development – power, water, infrastructure
- Open for business – new Hilton Hotel (2019)
- 400km of beautiful white beaches
- Hospitality!!

Engineering In Sierra Leone

- Construction accounts for about 2% of Sierra Leone's GDP (2008); 1.54% (2014)
- Most construction projects are undertaken by the government - assisted by international organisations like the African Development Bank, UNDP, DFID, EU, JICA, World Bank
- Specific engineer related ministries – Works and Public Assets, Water Resources, Energy, Mines and Minerals
- Sector specific arms of government like the JSDP (Justice Sector Development Programme) assist with infrastructure construction programs to enhance their effective service delivery, such as the building of prisons.
- Very few "large" engineering companies – mostly one owner companies with majority with staff complement of 5 – 10 permanent staff – contracting of work to staff => culture shift
- New government's focus is infrastructure – Presidential Infrastructure Initiative – new bridge, new city, new port, new coastal road – currently looking for financial and human resources to deliver

Professional Engineering Institutions in Sierra Leone

Professional Engineers Registration Council

Mission

To maintain international recognized standards of competence and commitment for the engineering profession and to license and regulate competent institutions and engineering practitioners to champion these standards thereby contributing to the well-being of humankind in Sierra Leone and beyond.

The **Vision** of PERC is that society has Confidence and trust in the Engineering profession.

Its Key Objectives are to:

(a) Register all professional Engineers in Sierra Leone.

(b) Regulate the practice of Engineering.

Sierra Leone Institution of Engineers

Formed in 1970 through a Memorandum and Articles of Association and became a statutory body by an Act of Parliament which was passed into law on 13th March 1990.

The main objectives of the Institution

- Facilitating the advancement of Engineering in all its branches for the improvement and development of Sierra Leone.
- Promoting and maintaining the unity, public usefulness, honour and interest of its members.
- Promoting sound Engineering Practice, Engineering Education in schools and Gender Participation in Engineering
- Advising Government on all Engineering Matters.

Sierra Leone's Engineering Education Systems

- 4 staged education - primary (6yrs); junior secondary (3yrs); senior secondary (3yrs); vocational/tertiary (4yrs)
  - 2/3 children illiterate (Pri. School – 73% male, 75.6% female; Sec. School – 39.9% male, 33.2% female)
  - 2nd largest consumer of the national budget (3.6% GDP – UNICEF)
  - Largest employer
  - Numerous studies; most do not address historical, economic, political, cultural factors
- 4 universities – Fourah Bay College, Njala Univeristy, MMTC, Eastern Polytechnic, Limkokwing
- Styled on British system of the 50s, 60s
- Outdated curriculum and antiquated teaching methods
  - Post Ebola – negative impact on the education system (improve access, equity, compliance)
  - Poor financing, limited staff training opportunities, ailing and limited research infrastructure, lack of effective education quality management system
  - Teaching staff unable to align content with the needs of the market

The Conundrum

- Developing nation
- Low on all indices
- Macro-environment – volatile, modest investments, poor job creation
- Uncertainty, difficult business environment, little employment growth
- Waged employment – very small (mainly in construction and mining)
- Influx of international workers (local graduates with little opportunities)

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- Self confident students looking for work - zero hour contracts
- Companies looking for graduates – national and foreign
- SLIE/PERC trying to act as a bridge
  - Perception of engineering locally
  - No belief in locally trained graduates
  - Belief that once you have graduated nothing else needed
  - Economy – no training opportunities
  - Training courses expensive
  - Time and effort to change the status quo

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Background to the Project

GOSL 2014 Budget Speech

"…..mismatch between skills required by employers and the training programmes offered by training institutions which has partly engendered a high level of unemployment among youths and women. Section 115 establishes the *Skills Development Fund (SDF)* for eligible Sierra Leoneans to undertake highly specialised skilled, technical and vocational training programmes."

GOSL 2015 Budget Speech

- *110. Already Le2.1 billion mobilized this year is ring-fenced for the Skills Development Fund. In addition, Le7.0 billion will be transferred from the proceeds from the Japanese Food Aid to the Skills Development Fund to support, among others, the establishment of a **Young Engineers' Corps** and access to advanced and specialized training for young medical graduates as well as roll-out a **Young Professionals Internship Programme** for university graduates. –*
- *111. Sierra Leone has recently accepted an invitation to join other ECOWAS countries in a **Talent Mobility Partnership (TMP)** programme. The emerging initiative in the sub-region, encourages the practice of moving human resources across member countries with a view to effectively acquire, align, develop and engage high performing talents to foster national development.*

What we aimed to do

- Upskill, support and develop graduate engineers
- Help the university and industry identify the needs and the gaps
  - Register engineers with SLIE – spread the message
  - Upskill current engineers – specifically in response to industry's needs
  - Ensure graduates secure jobs
- Develop a scheme/process to meet those needs
- Identify partners that could be part of the process
  - EFC-SL
  - Commonwealth Engineering Council
  - UNOPS
  - Staff from Imperial College London
  - Champion companies undertake the training
- Work with partners to meet those partners to deliver the outcomes

Africa Catalyst - Pilot Phase

*The aim of the project is to **develop a framework** for the training of young graduate engineers that will **enhance their employability and competitiveness** in the international job market in collaboration with the University of Sierra Leone and local employers*

- Part 1 – Aimed at developing the Young Engineers' Corp for current graduates who are already in the job market and looking to improve their employability within the working environment
- Part 2 – Looked to enhance the current curriculum at the University of Sierra Leone to include pedagogical approaches that will enhance the skillsets employers currently require when hiring graduates.
- SLIE/PERC is partnering with a UK based organisation comprising of Sierra Leonean Engineers in the UK called Engineers for Change – Sierra Leone (EfC-SL) and the Commonwealth Engineering Council.
- Project Timescales: December 12th 2016 – 8th June 2017

Our Partners

- EFC-SL – UK Charity made up of engineers from the UK who regularly support the SLIE and the University of Sierra Leone. Key partner
- Commonwealth Engineering Council – supportive of the project; introduction to relevant institutions
- UNOPS – Steering Committee, independent advice, training provision
- Champion companies undertaking the training of the graduates

What Employers think about Engineering Graduates

What Qualities are you looking for in new employees, which one is most important?

Loyalty, Self Discipline, Integrity, Open-mindedness, ability to take initiative, independent thought, Commitment, Willingness to work, Good/ sound Basic Knowledge. Good Communication Skills, Willingness and dedication to duty

What do you usually find lacking in the fresh graduate Engineers you Employ?

Lack of real life experience; lack of design or site experience; inability to make sound judgements on appropriateness of solutions; the ability to work in a structured environment and to be confident about what they already know; basic communication skills mainly the skills that are not core Engineering; inability to use basic software, lack of use of instruments, lack of practical experience.

Selection of the YEC First Cohort

* Candidates participated in four tests:
  - Impromptu speech-giving test (assessing LS, IQ, and EQ)
  - Logical Reasoning test (assessing IQ and EQ)
  - Quantitative reasoning test (assessing IQ)
  - Comprehension test (assessing IQ and LS)

- 31 candidates applied
- 20 selected
- 20% women
- Top scorer – female graduate

10 week plan:

- 1 week Basic Computer Skills and Introduction to Project Management
- 2 weeks soft skills training
- 6 weeks internship with employers - include real life project
- 1 week CV/industrial report

Week 1

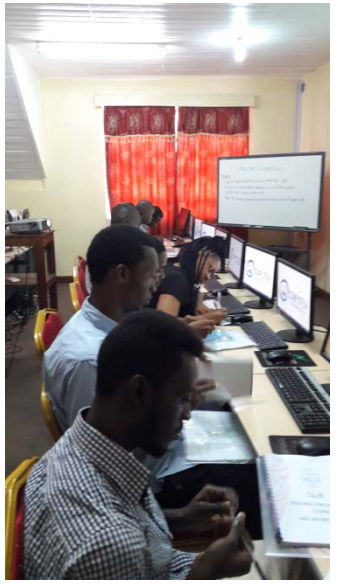
Basic Computer Skills

Microsoft Word (1 day)

Microsoft Excel (2 days)

Microsoft Powerpoint (1 day)

Microsoft Project (1/2 day)



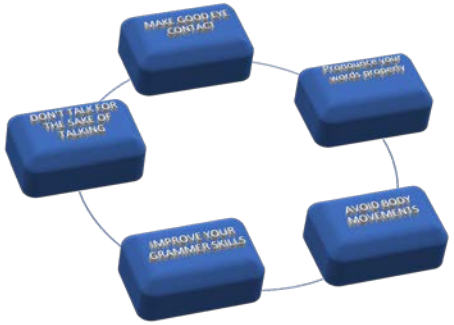
An Introduction to Project Management

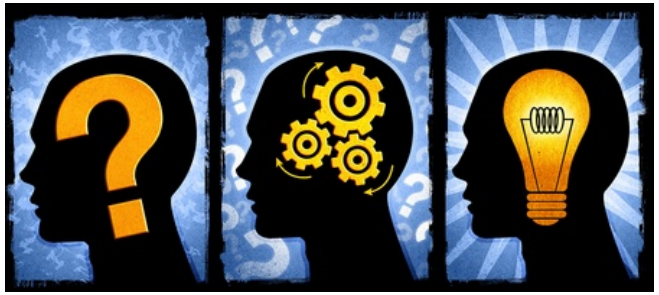
- Take an integrated approach to managing projects
- Provide a strategic perspective of how to manage projects
  - Know what a project is and understand the role of the Project Manager
  - Be able to create project plans, schedules and budgets
  - Be able to select and use the most appropriate tools in managing projects

Weeks 2 & 3

Soft Skills Training

- Communication skills – verbal and written
- Confidence and Assertiveness
- Time Management
- Thinking Skills – Lateral and Critical
- Emotional Intelligence and Empathy
- Team Building
- Leadership Skills
- Business Ethics and Etiquette
- Research Skills
- Presentation Skills
- Conflict Resolution
- Customer Service





The Engineer's Dragon's Den

Objective:

- Develop a service or product that will respond to a recognisable national challenge.
- Presented along the concept of 'The Dragon's Den'
- A panel of judges from all walks of life
- Winner has the support to present a project for the Royal Academy of Engineering's Young Innovation Project

* Engineers4Change:
  * Integrated Civil Registration Programme
* A2M3 Engineering
  * Formulation of a design chart for Contractors
* Solution Analysers
  * Low cost and affordable housing
* Sierra Engineers
  * Plastic Material and Plastic bottle recycling

Weeks 4 to 9

Internships with

- UNOPS
- EDSA
- NIMO Construction
- Cape Sierra Hotel Company
- CEMATT
- Centurion Engineering
- AfCOM
- ICS
- Axis 360 Consultancy

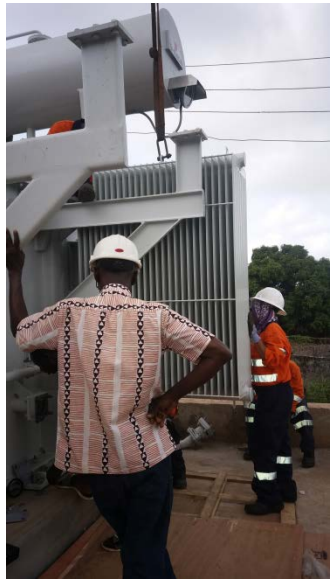






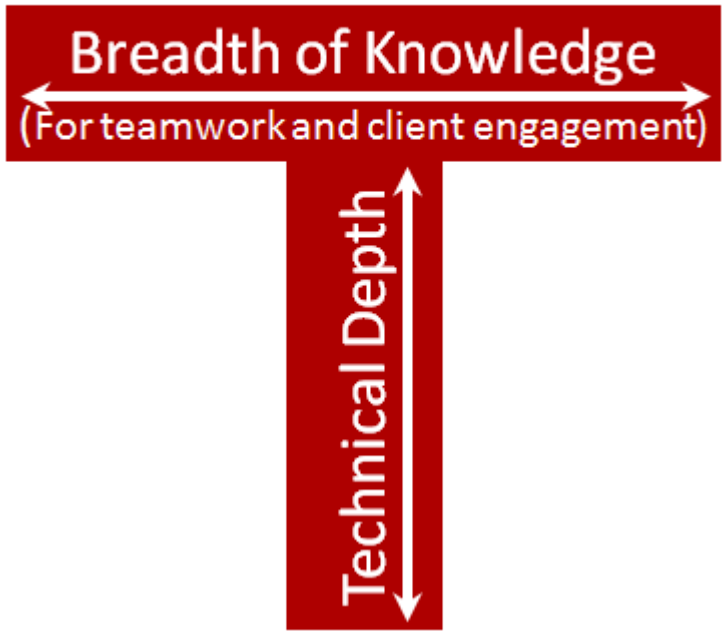

Hard Skills – Development of Training Manuals

- Civil Engineering
- Electrical Engineering
- Telecoms Engineering



Week 10 – CV Writing & Interview Skills

The "T-Shaped" Individual



Soft Skills

report writing & presentations skills; core computer skills; communication skills; commercial awareness; project management; critical thinking; problem solving; team work; stakeholder management

Sector Specific Engineering Skills

Hitting the ground running - what would you expect from a graduate on

- Day 1?
- Day 21?
- Day 42?

Part 2 - Fourah Bay College Curriculum Review

Looked to enhance the current curriculum at the University of Sierra Leone to include pedagogical approaches that will enhance the skillsets employers currently require when hiring graduates

- **Key objectives of Part 2:**
- assessing a sample of engineering degrees courses (two) offered at the university against current international standards for content and method of delivery
- assessing the employment opportunities for graduate engineers against the available capacity for 2 engineering core disciplines;
- providing support to (two) engineering departments at the University of Sierra Leone in updating and delivery of key aspects of their degree courses.

Key Findings at FBC

- Curriculum (5 year undergrad (foundation year); lacking in key knowledge, skills and abilities development)
- Technology and Research (Lecturers not keeping up to speed/ very little research/ library – outdated books)
- Access to the Internet (Basic/ limited – lecturers and students unable to teach, do basic research, fibre)
- Facilities (old dilapidated buildings, need additional classrooms, electricity etc.)
- Access to Funding (Very little experiments; few software available; therefore no sabbatical leave and delays to salaries)
- Training Facilities and Teaching Methods (Traditional approach)
- Staff motivation (Low staff motivation but highly committed and take outside employment or consultancies)

Recommendations (1)

- **Curriculum**
  - ‘Soft skills’, such as Basic Computer Skills, Report Writing, Interpersonal Skills and communication could be added as electives or taught by industry engineers with management experience on a volunteer basis.
  - Other foundational competencies should be included as Continuous Professional Development courses required for recognition as full Graduate members of SLIE.
  - Lecturers may need external support to develop curriculum in these areas
- **Internet**
  - Lobby University administration and/or Government of Sierra Leone to resolve the bureaucratic issues blocking connection to the internet
  - Research funding options or private sector sponsorship to resolve the ‘final mile’ connection and ongoing support costs
- **Facilities**
  - Ensure that current refurbishment plans are communicated to faculty members
  - Study remaining gaps in building infrastructure – assist the faculty to bid for funding for remaining infrastructure and equipment needs
  - Seek external partners who may wish to support individual departments or needs (such as a decent resource library)

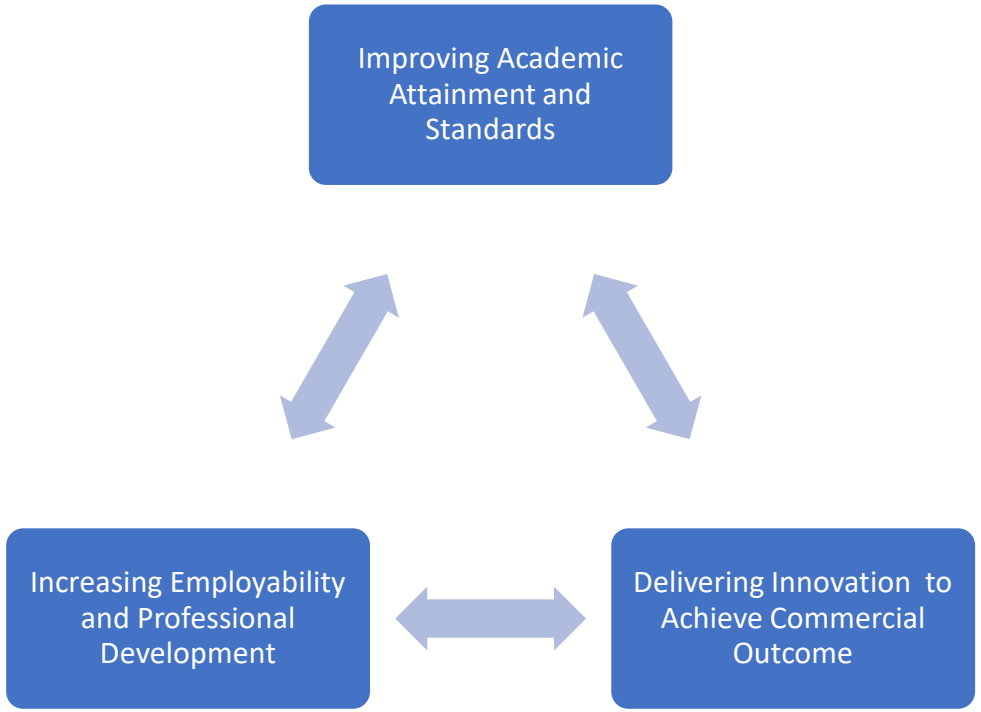
Recommendations (2)

- **Faculty training and teaching methods**
  - It is recommended that the best practice of learner centred training be used. Options may include Service Learning where lecturers give class projects to students to accomplish which provide some service to industry or community.
  - Problem-based learning and team based learning methods can be used to communicate the engineering subjects effectively.
  - More modern methods of teaching and examining students such as eLearning and student research and presentation projects should be developed
  - Teachers can learn and keep up to date by doing online research and applying for or getting involved in research projects relevant to the needs of the country and the business community
- **Developing ties with industry**
  - A stronger relationship with industry is needed
  - Look at ways of developing mutually beneficial relationships with industry – through research, industrial placements, sponsorship
  - Look at ways of formalising the provision of consultancy services to industry so that both the individual and the university benefit from this relationship
  - Encourage the Government of Sierra Leone to look to other countries in the region for examples of incentives to industry (i.e. stipends, tax breaks) to encourage taking on students for work placements.
- **Access to funds**
  - Develop a structured approach to proposal writing for funds based on relevant projects that can benefit the departments as well as aid student learning through active participation.
  - Explore options for commercialisation of services to make available to the public, so that they could raise money from those services. These include sale of distilled water, soil testing and some consultancies.
  - Partnerships with companies on projects can also assist with fund raising.

Africa Catalyst Project Phase 2 - Upgrading Engineering Education and Practice in Sierra Leone

- Part 1 – Young Engineers Corp (continuation from pilot project)
- Part 2 – Raising Standard of Academic Education at University of Sierra Leone
- Part 3 – Academic Accreditation Assessment
- Part 4 – Professional Training, CPD and Mentoring for I. Eng/ C.Eng
- Part 5 – Applying Innovation to deliver Commercial Outcomes

Objectives of the Programme



- Improving in the short-term job opportunities for graduate engineers from the University of Sierra Leone (USL)
- Improving the overall standard, relevance and quality of engineering courses and CPD being offered at the University of Sierra Leone and the professional institution
- Empowering the engineering departments at the University of Sierra Leone to be creative in introducing innovation in research, teaching and development projects in partnership with industry, funders and external partners.
- Creating a community of engineers that can drive improvement in the standard of engineering practice
- Drawing on the skills, connections and experience of the Sierra Leone diaspora community to support the objectives as listed above.

Key features of our programme

Strengths

- People prepared to go above and beyond
- Diaspora partner that understand some of the cultural nuances
- World class experts in engineering from Imperial

Challenges

- Multiple partners across 3 different countries -maintaining regular communications
- Counterpart funding
- Currency fluctuations/ Exchange rates

Demanding timescales to realise sustainable change

- A broad scope of activities
- Reliance on volunteers with other commitments

Partners on the Programme

- Sierra Leone Institution of Engineers
  - University of Sierra Leone (Faculty of Engineering)
  - United Nations Office Project Services in Sierra Leone
  - Engineering Companies
  - Ministries, Departments and Agencies linked to engineering provision

- Engineers for Change Sierra Leone (UK Charity)
  - A team of UK University academics from Imperial College, London
  - Innovation Action (Supporting training in innovation and entrepreneurship)

Thank you!

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