

World Federation of Engineering Organizations Fédération Mondiale des Organisations d'Ingénieurs Federación Mundial de las Organizaciones de Ingenieros



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ENGINEERING EDUCATION AND TRAINING ARE NOT COSTS BUT INVESTMENTS

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www.wfeo.org

Outline

- Context: Engineer, the protagonist of innovation
- New paradigms for engineering education
- The WFEO Engineering 2030 Plan
- Capacity building for sustainable development
- Engineering profession certification system





Industrial revolutions timeline







Waves of innovation:





Challenges of digitalisation: Internet of things, big data, robotics, artificial intelligence





Greatest engineering achievements of the 20th century

Source: National Academy of Engineering





Challenges of sustainability: Green





Innovation and sustainability





"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Gro Harlem Brundtland ("Our Common Future, 1987")



Innovation. The paradox of wealth and poverty

Scaling Up and Improving Infrastructure for Poverty Reduction:

- High quality of Engineering Education
- Responsible and committed political governance
- Adequate planning
- Sustainable access to infrastructure facilities and services









Good infrastructure wealth





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What Big Data, IOT and globalisation mean for engineering education?





Challenges in engineering education (skills and competences)





Challenges in engineering education: digitalisation





Challenges in engineering education: New pedagogical methods





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Engineering Education and Professional Development:

- A Plan to develop engineering capacity for a sustainable world through partnerships with educators, government, industry and professional engineering institutions
- A strategic initiative to address the gap in engineering capacity and the quality of engineering professionals
- Recognises that:
 - engineers are essential for sustainable development
 - good engineering is essential achieving the UN Sustainable Development Goals
 - consistent with the mission and objectives of WFEO
- WFEO will is leading and co-ordinating the Plan with its international partners





Principles for action:

- Supporting High Quality Education
- **Graduate Outcomes** that meet industry needs
- Engineering qualifications that are recognised nationally and internationally
- Continuous professional development
- Capacity Building for professional engineering institutions
- Support national and international registration for recognition of qualifications and experienced of practicing engineers
- Liaise with governments to establish consistent regulation policies for engineers
- Establish an international platform for engineering standards under auspices of WFEO and UNESCO





Engineering is essential to achieve the UN SDGs

A successful sustainable development agenda requires partnerships between governments, the private sector and civil society. These inclusive partnerships built upon principles and values, a shared vision, and shared goals that place people and the planet at the centre, are needed at the global, regional, national and local level.









Partnerships:

- 1. UNESCO and other UN bodies Member major UN Science & Technology Group
 - WFEO UNESCO Paris Declaration, 4 March 2018
- 2. WFEO Standing Technical Committees support aspects of the plan, e.g. ethical engineering practices, diversity, youth leadership
- 3. National and International Members of WFEO These are the professional engineering institutions that will both deliver and benefit from the Plan
- 4. International partners of WFEO Key bodies for international standards in engineering education
 - International Engineering Alliance (IEA)
 - International Federation of Engineering Education Societies (IFEES)
 - Federation of International Consulting Engineers (FIDIC)
 - International Network for Women Engineers and Scientists (INWES)
 - International Centre for Engineering Education (ICEE, UNESCO Centre)
 - International Science Technology and Innovation Centre for South-South Cooperation (ISTIC, Malaysia, UNESCO Centre)
 - International Science Council (ISC)



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Capacity building for sustainable development

Capacity building for sustainable development :

- Creating and enabling environment with appropriate and legal frameworks.
- Institutional development, including community participation.
- Human resources development and strengthening of managerial systems.
- Engineering education and professional experience combine to a required level of engineering capacity.





Capacity building for sustainable development

Challenges for Engineering capacity building in developing countries. The case of Sub-Saharan Africa (from Royal Academy of Engineering, 2012):

- There is a severe lack of engineering capacity in SSA. Whilst there is variation between countries, it is evident that across the region the engineering sector suffers from a shortage of skilled and experienced engineers.
- This lack of capacity at every level of the profession is a substantive obstacle to achieving almost all development goals, from the provision of basic sanitation to the reduction of rural poverty.
- The key causes of low capacity include:
 - a lack of government investment in engineering skills development right along the pipeline
 - out-of-date curricula and teaching methods at universities, resulting in graduates lacking required skills
 - weakness of professional institutions, leaving professional engineers unsupported and resulting in insufficient or non-existent registration processes
 - lack of knowledge transfer from foreign engineering firms
 - 'brain drain' of engineering talent to other sectors and other countries





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Trends and Challenges for Engineering Education:

- Globalisation of labour markets
- Mobility of students and workers
- Increased migration
- Automation
- Digitalization
- Polarisation of labour market
- Skills mismatch





Towards a global skills recognition framework:

 To translate any outcomes-based qualification, credential, entry requirements, job specification or framework level into an internationally recognised form of description which can be used in deciding on comparing qualifications or negotiating recognition or progression arrangements

(from UNESCO, 2015)





Characteristics of a EPCS:

- Engineering education and professional experience combine to a required level of engineering capacity.
- EPCS must be based on quality assurance and values.
- The initial education of engineers typically takes place in formal education in universities, universities of applied sciences and technical colleges.
- Professional competence does not describe the learning process of the individual but it assumes that learning has taken place. It may be the result of several individual paths of non-formal or informal learning processes.
- Learning outcomes and competences integrate Life Long Learning and must be assessed and verified.



Importance of a EPCS:

- Establishes a generic basis of minimum requirements of knowledge, skills and competences for the engineering profession.
- Contributes for a global mutual recognition of engineering education and engineering professional capacity at a global scale.
- Facilitate mobility for professionals under a shared and accepted system in a ever-increasing economic globalisation scenario.
- EPCS respects both nationally and internationally established systems.



The Challenge for EPCS:

– Keywords: Trust in Quality Assurance

QUALITY ASSURANCE OF:

- Engineering education
- Professional competences
- CPD and Lifelong learning



Proposed framework for EPCS



Thank you for your attention



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