

**PUBLIC LECTURE ON THE INSTITUTION OF ENGINEERS OF KENYA  
AT 50 COMMEMORATION CEREMONY ON 14<sup>TH</sup> OCTOBER 2022**

**THE ENGINEERING JOURNEY IN KENYA**

**BY**

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**Introduction**

I was very pleased when the Honorary Secretary of the IEK invited me to be a keynote speaker during the IEK AT 50 Public Lecture.

I am saying this because I attended the meeting held in 1972 at the Intercontinental Hotel in Nairobi when it was agreed that we register the Institution of Engineers of Kenya. I also like telling people how, when we were admitted to do engineering degree course at the University College Nairobi (a constituent College of the University of East Africa), our Lecturers persuaded us to join British engineering institutions as student members and accordingly I joined the Institution of Civil Engineers in the UK as a student member.

It is important to acknowledge that engineering involves the art of harnessing the resources of nature for the benefit of society. For example, the engineer is trained to develop infrastructure to make it possible for people to enjoy wholesome water and hydropower; again the engineer is capable of converting sunlight into solar energy for use by society; and the engineer can use rocks, sands and soils to build houses, roads, airports etc for use by the society. It is to be noted that the South East Asian countries were able to achieve rapid economic growth due to the emphasis they directed towards the provision of basic infrastructure such as roads, water supply, sanitation, irrigation, energy, telecommunications, schools and health care. They also emphasized the development of small and medium enterprises that facilitated the supply of goods and services.

It is also to be noted that for us to improve the standard of living of Kenyans and in order to achieve Vision 2030, there is need to train those engineers who are able to implement the plans which are geared towards the goals of the Vision 2030.

We must invest in both the development of strategic industries and also in the development of the required human resource that is adequately trained to manage the type of technology that is relevant to the knowledge economy. In this respect universities must rise to the occasion by offering well-structured degree programmes which are relevant to the demand of the industry now and into the future.

The plan by the Kenya Government to establish an institute in Nairobi for teaching technical and commercial courses started in 1947. The Gandhi Memorial Academy Society agreed to merge interests with those of the Government and was accordingly incorporated into the Royal Technical College which opened its doors for the first intake in April 1956 offering technical and commercial certificate courses.

In the 1960/1961 academic year the college was renamed the Royal College Nairobi on 25th June 1961 and was allowed to offer engineering degree courses of the University of London.

In the 1963/1964 academic year, following the Kenya's attainment of independence, the Royal College Nairobi changed its name on 20th May 1964 to University College, Nairobi as a constituent college of the University Of East Africa. The other constituent colleges were Makerere University College and University College Dar Es Salaam. At that time in East Africa engineering degree programmes were only available at the University College, Nairobi, Law degree programmes were only available at the University College Dar Es Salaam and those who wished to do Medicine could only do so at Makerere University College. On 1st July 1970 the University of East Africa was dissolved and each of the former constituent colleges became the national universities in their respective nations. In the case of the Republic of Kenya the University of Nairobi was set up by an Act of Parliament while Tanzania set up the University of Dar Es Salaam and Uganda set up Makerere University. With establishment of national Universities in Uganda and Tanzania both universities established their own faculties of engineering in the 1970's.

In the case of Kenya we witnessed establishment of the second public university, Moi University and then Kenyatta University as well as Egerton University in the 1980's and Jomo Kenyatta University of Agriculture and Technology in 1994. The first decade of the 21st century saw the establishment of Maseno University and Masinde Muliro University of Science and Technology.

In the second decade of the 21st century we have seen many more public universities which were established in 2012/2013. This increase of public universities followed the enactment of The Universities Act 2012. Unlike the period up to the 1970's when engineering degree programmes were only available at the University of Nairobi, we now have many universities offering engineering degree programmes in Kenya.

## **2. Engineering Academic Programmes**

Given the historical origin of engineering degree programmes many of our programmes were generally initially structured to suit the registration requirements of the United Kingdom (UK) engineering professional societies. It is important to note that in 1969, the Engineers Registration Act was enacted through an Act of Parliament which came up with the establishment of the Engineers Registration Board (ERB) and as expected the ERB recognized engineering qualifications of the University of Nairobi and UK engineering degrees and chartered qualifications for purposes of registration with ERB. The Engineers Act of 2011 which repealed the ERB Act has brought with it parameters which must be satisfied for the engineering degree programmes to be accredited for purposes of registration by the Engineers Board of Kenya (EBK).

## **3. Accreditation of Undergraduate Engineering Programmes for Kenyan Universities**

An accreditation assessment is initiated at the invitation of an institution. The evaluation of a programme is based on detailed data provided by the institution. An institution seeking accreditation of an engineering programme submits to the EBK a request for accreditation accompanied by:

- Details of the proposed programme
- Details of faculty members including their curriculum vitae
- Details of the physical training infrastructure including lecture halls, laboratories, workshops, libraries, ICT facilities etc.

The accreditation criteria are intended to ensure that students receive appropriate training and are made aware of the role and responsibilities of the professional engineering in society. The evaluation covers the programme design, programme curriculum content, faculty staff establishment, training facilities and infrastructure and training duration.

Complementary studies in humanities, social sciences, arts, management, engineering economics, communication and elements of law are expected to complement the technical content of the curriculum. The EBK makes the decision on the application for accreditation on the basis of the information obtained from the accreditation visit process as well as reports submitted by the institution at the request of the EBK.

Those students undergoing academic training are expected to cover theory courses which equip them with the basic theoretical knowledge and also incorporate laboratory and workshop training which complement the theoretical courses. It is additionally desirable for such students to undergo field attachment during vacations so that they can appreciate the application of what they have learned in theory to the world of work.

It is required that the degree programmes leading to the award of a Bachelor's degree in engineering shall be five years covering the curriculum approved by the EBK. The faculty teaching courses which are primarily engineering science and engineering design are expected to be registered professional engineers.

It is to be noted that engineering degree programs have undergone considerable metamorphosis in the last four decades with the aim of responding to the market demand of the engineering industry. The current engineering degree programmes largely "reflect the current technological knowledge in the various disciplines and in addition have brought on board courses from social sciences and humanities with the overall objective of meeting the current market demand by the industry. We have indeed witnessed developments and innovations sometimes leading to new disciplines in engineering.

#### **4. Internship and Structured Practical Training for Graduate Engineers**

The Graduate internship policy document of the Engineers Board of Kenya stipulates that "Graduating engineers are expected to have several desirable attributes that may be expressed in terms of technical and non-technical competencies. The technical competencies are categorized into two distinct areas- namely, the science of engineering and the practice of engineering. The science of engineering is the set of mathematical and scientific tools used to solve engineering problems, while the practice of engineering is the recognition and formulation of a problem and its solution the key non-technical skills include communication, team work, professional and ethical attitude which skills may not be sufficiently addressed within the university setting."

After the graduate engineer has completed his academic training i.e. has obtained Bachelors degree, he/she is expected to go through a practical training programme in the industry which should be formally structured with clearly defined deliverables on a time-line during the training period. It is required that the training be supervised by a registered professional engineer(s) to ensure that the elements of engineering practice are transmitted to and understood by the trainee engineer. The industry is required to establish a conducive training environment so that the trainee engineer is able to acquire the required practical training skills required for registration as a professional engineer as expected i.e. Within three years.

It is encouraging to note that the Engineers Act 2011 provides for a structured graduate engineers internship training programme.

The importance of the structured internship training programme is that it prepares the graduate engineer in the areas of planning, design and supervision of construction of engineering works in the field /industry.

The graduate engineers are also expected to be given the opportunity to attend courses, seminars and conferences on engineering subjects relevant to their specializations. It is believed that with the structured internship training programme for graduate engineers many more graduate engineers will manage to pass the professional examination and acquire the registration status as professional engineers and enable this country to have many more professional engineers to steer the country to the next orbit of development through industrial transformation as envisaged by the Vision 2030.

## **5. Engineering Practice**

After the engineer has acquired registration status as a professional engineer, and has paid the required license fee to be allowed to practice, he/she is authorized to carry out the task of a professional engineer. The practicing license gives him/her the authority to carry out planning, design, supervision and monitoring and evaluation of engineering projects for which if he/she carries out the exercise negligently he/she can be sued under the Engineers Act. In such a case the engineer could be deregistered or suspended from practicing the profession. That is why we require engineers to familiarize themselves with the Code of Ethics for Engineers so that one understands the fundamental principles, the fundamental canons, rules of practice and professional obligations.

The Engineers Act 2011 requires that a practicing engineer undergoes continuing development education regularly. This continuing professional development education for the engineer is expected to provide the engineer with new techniques of addressing engineering problems in line with developments in technology.

With time the professional engineer acquires experience in engineering works and in management thereby attracting promotion to head sections and departments in the relevant engineering fields.

## **6. Continuing Professional Development Education**

As indicated above the Engineers Act 2011 emphasizes the need for practicing engineers to undergo continuing professional development education where they are trained to enhance their capacity to deliver through attending seminars, short courses, holiday and evening classes, during which time the participants are exposed and taught modern techniques of addressing the tasks that they undertake including emerging engineering problems. Additionally, continuing education can provide opportunities for engineers to improve their academic and professional qualifications.

Continuing education can also be structured to provide industry specific programmes which can be mounted by universities jointly with relevant industries. In this spirit universities can introduce sandwich programmes and design courses which are tailor- made to suit specific industries. Indeed we need to ensure that Kenyans are trained so as to empower them to be able to manage the type of technology that is relevant to the knowledge economy and since engineers are the key actors in the infrastructure development, it is necessary to ensure that they are trained comprehensively so that they can provide the necessary professional leadership.

## **7. The Way Forward**

Given that we need to enhance the economic status of Kenyans through industrialization and given that engineers are the main drivers of industrialization, there is need for us to give engineering education and training the priority it deserves. It is therefore necessary to consider the way forward by looking at the elements that contribute towards effective engineering education and training with the objective of achieving the goals and targets envisaged in the Vision 2030.

When discussing the issue of engineering education and training in Kenya the main facilitators include: Universities, industries, and the institution of Engineers of Kenya, the Engineers Board of Kenya and the Government of Kenya.

The following outlines the way forward in respect of each of the above facilitators.

## **7.1 The Role of the Universities**

In the area of university education in engineering there is need to improve on the University-Industry linkages in order to enrich the training of engineering graduates and make them relevant and readily employable. Additionally, there is need to develop policies that encourage university staff to participate in university-industry linkages.

In order for Kenya to rise to the next development orbit level, universities must give research and development and innovation in engineering enhanced attention. This is bound to create more opportunities for training graduate engineers who are equipped with relevant technology for the future. Universities should also undertake extension services to the community with the aim of participating in the development of the industrial base.

Additionally, we must undertake to develop and maintain efficient industries and infrastructure with the accompanying properly trained human resource including engineers who have capacity to develop and manage the industries and the associated infrastructure. Universities should continue to get involved in carrying out research whose findings can eventually be adopted by industries leading to more effective university-industry linkages and the resulting enhanced economic development.

Again universities need to get engaged in lobbying the government and the industry in order to influence policy formulation, which enhances university-industry linkages. In this respect universities could carry out research aimed at developing suitable models and pilot projects which the university can incubate and transfer the same to the industry for full scale implementation thereby creating employment and enhancing the economic base of our country.

## **7.2 Role of Industries**

The role played by industries in the realization of successful engineering education and training is significant. In this respect industries should be encouraged to work closely with the university dons in order to achieve a higher adoption of modern technology in industries thereby leading to development of accompanying employment opportunities for graduate engineers as well as professional engineers.

When one looks at the industries in Kenya it is clear that many industries have little or no relationship with universities, yet not only do we need industries to have inputs in the development of the academic curricular for engineers we also need to see our industries offering opportunities to university dons and students in order to familiarize themselves with the world of work in industries through practical vocational attachments for students pursuing engineering degrees and we would also like to see staff exchange between industries and universities.

### **7.3 Role of the Government**

Given that our mainstay of Kenya's economy is agriculture where we are able to produce a large variety of raw products, the government would like to see whether it is possible to add value to these products by introducing scientific and technological know-how so that the final products can compete in the local and in the international market. Since engineers are the key actors in introducing techniques to enable conversion of raw materials into sellable final products, the Government would need to enhance the training of engineers by investing in engineering education and training as well as in the development of relevant industries.

The Government needs to take an active role in facilitating the collaboration between universities and the industries including formulating such policies and legislation as would enhance such collaboration. When such collaboration has been achieved, universities would exploit the opportunity in educating and training of engineers more efficiently and effectively.

### **7.4 Role of the Institution of Engineers of Kenya (IEK)**

The Institution of Engineers of Kenya (IEK) is generally concerned with the welfare of engineers starting from the time a student enters the university and after graduating. The IEK is also concerned about the internship of graduate engineers and even after one has acquired registration status as a professional engineer or even as a consulting engineer. As a result IEK organizes seminars and short courses to assist those preparing for professional interviews. Again IEK organizes conferences where engineers present papers on their experiences. Through such seminars and conferences the IEK is able to influence the growth pattern of students, graduate engineers and even the professional engineers.

In order to assist the engineering students IEK must undertake to ensure that industrial attachment for engineering students and graduates is an accepted responsibility by the industries in Kenya as an input towards preparing the engineering graduates for the world of work.



## **7.5 The Role of the Engineers Board of Kenya**

The main role of the Engineers Board of Kenya (EBK) as articulated in the Engineers Act 2011 is to register Graduate Engineers, Professional Engineers, Consulting Engineers, Engineering firms etc. The EBK is also expected to approve and accredit university engineering programmes and the Act also allows EBK to establish a School of Engineering for providing facilities and opportunities for learning, professional exposure and skills acquisition and cause continuing professional development programmes for engineers to be held. This shows that EBK is a main actor in the area of engineering education and training in Kenya.

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