A KEYNOTE ADDRESS BY ENGR THOMAS EMETOH DURING THE MAIDEN ALUMNI HOMECOMING OF THE DEPARTMENT OF MECHANICAL ENGINEERING, UNIVERSITY OF NIGERIA, NSUKKA ON FRIDAY, OCTOBER 19, 2018 AT THE FACULTY OF ENGINEERING DRAWING HALL

REVITALIZING UNIVERSITY-INDUSTRY LINKAGES FOR NATIONAL DEVELOPMENT: BRIDGING THE GAP BETWEEN THE TOWN AND THE GOWN

The Vice Chancellor,

The Dean of the Faculty of Engineering,

The Head of Department of Mechanical Engineering,

Distinguished Professors and Lecturers,

Ladies and Gentlemen,

Good Morning.

It is with humility that I accept to deliver this key note address to this memorable occasion today. There are so many people that are more qualified than myself to stand here today, but for whatever reason, the Department decided that I must be the one. I feel very deeply honoured. Thank you.

I do not want to stand here to read a long address that may be nobody would remember a single sentence I made by the time I am done. I have therefore chosen to use this opportunity to present some thought-provoking ideas that would make everyone of us to either form an opinion and be eager to challenge me, or perhaps eager to tell me how good the speech is. But no matter how I manage to capture your attention (whether you agree or disagree with me…..), I would have achieved my objective if I have your full attention, and if no single one of you would fall asleep during my speech.

(By the way) - My friends tell me that I would make a very boring lecturer, that even though I may have the full solution of a problem in my head, I can easily send the most enthusiastic person on the subject matter fall asleep on me!! Students, you should all thank your God I am not one of your lecturers! So, for today, I have to work very hard not to bore you!

Now, more than ever, we have seen an erosion of the education standards in the country. Our universities struggle to sustain themselves due to lack of funding by the government. We have seen a huge influx of private universities in the country, some of which do not even have infrastructure that can match some of the old secondary schools established by the missionaries and the Federal Government. The overall quality of education has continuously fallen, but one thing that has kept increasing is the number of graduates. Consequently, the number of "half-baked" graduates attempting to enter the workforce has skyrocketed.

Good engineering graduates are competing with the half-baked ones, and when majority is not up to standard, the general population is regarded as not up to standard. Multinationals now prefer to hire expatriates and bring them into the country. Most companies now find it difficult to hire young graduates. They prefer to reduce the "wahala" by hiring people who have already gained some experience working for other companies. Their thinking is "at least some other companies have tried them, taught and groomed them, and hopefully they will be better employees for us".

The cost of hiring and training a new graduate is high, and is even higher when the new graduate lacks skills that can be immediately impactful at the entry level. Companies, therefore, no longer want to take risks hiring new graduates. Consequently, we see a lot of good graduates who look for jobs for years and give up and take any job they can find, whether it is related to engineering or not.

We all know there are many things the government can and should do to fix the huge problem of graduate unemployment in Nigeria……,

We also all know that there are many things the looters of our country's economy can do with all the money they have stolen to build up the manufacturing industry in Nigeria to absorb the youths and stimulate the economy to a self-sustaining state……..,

But as we explore this topic of "***Bridging the gap between the town and the gown"***, I would rather that we focus the discussion on the limited area of

- what the University can do,
- what the Faculty of Engineering can do,
- and what the Department of Mechanical Engineering can do

to ensure that the graduates of University of Nigeria, Department of Mechanical Engineering have much better prospects of gaining good employment or able to flourish on their own as owners of business start-ups.

As we explore this topic of looking at ways to make the university experience be very useful in shaping the students and getting them ready for the ever changing landscape in the corporate and business world, I will like to look at two key areas that have roles to play in making this aspiration a reality in this Department, in this Faculty and in this University of Nigeria.

I choose to categorize them into:

1. What the University can do on its own or with the students
2. What the University can work on with the external bodies (such as the government, banks, companies, investors)

In this discussion, let us put the onus (the responsibility) on the University, the Faculty and the Department.

Now, let's look at what the University can do on its own or with the students

(a) The students have to be made aware that in the real world, you will not find any company that has only mechanical engineers working there. Every company exists because it has an underlying need or a problem or set of problems, something of value to offer to the society, and earns money selling those products or services to target Customers via well designed business models. It is hard to find any product these days that has purely mechanical components. For example, the days are gone when vehicle transmission system (gear and clutch system) is purely made of mechanical components. The vehicles you drive these days, have a combination of mechanical parts, electrical parts and electronic parts. The Department has to help the engineers understand that they are going to be working with and competing against people of other backgrounds of science. If you get into the oil and gas industries, you will realize that you are not only competing against other engineering disciplines, but you engineers are also competing against people with science background like physics, maths majors, geologists, etc. When I left this university and joined Schlumberger as a young Field Engineer going to log oil wells around the world, I had colleagues that were from so many different backgrounds of Science and engineering. Knowing who you are competing against is the first step in winning the competition! The undergraduate degree allows you to be a thinker, a problem solver. That's what the work place is looking for, not someone who can design every machine known to mankind!

(b) The university should encourage students not to stop at bachelor's degrees. Targeted efforts should be made to get as many students as possible to go for masters and PhD, or even MBA programs. I also think the university should encourage undergraduates to use their time to develop interests in the arts, economics, finance, etc. These are areas that engineers have shown acute competence in the real world, with the engineering degree helping in logical and creative/design thinking.

(c) Masters and PhD research projects should be targeted towards solving an existing problem facing local/African/developing country or even global industries or helping specific companies solve real problems facing them, with the ultimate goal of creating new opportunities. This approach not only makes the university and the research engineers and lecturers super wealthy, attracts investment interest from private equity firms and think tanks, but also ends up in the birth of real businesses (SMEs and corporations) that will employ thousands of new graduates. The university should actively seek new areas of research by proactively going to companies to ask what their immediate pressing problems are and assembling

students to focus on the problem as their research projects, PhD projects and case studies, to find solutions for the Companies.

For example, in the Niger Delta, many oil companies have a lot of produced-water issue. When you are producing oil, lots of water break in at some stage in the life of the reservoir. This is a big problem for many companies because their inability to handle the water hampers their ability to produce more oil. The current solution many of the oil companies that operate on land have is to marginally treat the water and truck it to barges and send it offshore. Some push it with the oil to Forcados terminal and pay up to >$3 per bbl of water. A proper solution which can reduce that cost to $1 or less per bbl, saving land operators hundreds of millions of dollars each year will create a new, big local company with revenue in excess of 100M$ per year, employing thousands of people.

I have a plan of my own on this …. So I won't divulge too much information on this to you guys !!!!!
A solution to this problem will need the collaboration of mechanical/electrical/electronic engineers, physicists, and even chemistry disciplines.

Here is another example. With the deregulation of telecommunications in Nigeria in the late 1990s, a number of telecom companies came into Nigeria, Econet, MTN, and subsequently Glo, and etc.
If the engineering faculty had approached the management of these telecom companies in the early 2000 to find out what their most pressing issues were, you would have discovered that one of their major headaches is just the same issue every Nigerian suffers but on a very large scale – and that is lack of constant power supply from NEPA. To expand their network coverage across the country, they had to install two generators per site, to power every single tower they built. Each tower requires probably 2 men working back to back to make sure the generator is turned on when NEPA is off and ensure they are topped up with diesel. They must have a whole network of trucks moving around to supply diesel to each tower, etc. Telecom companies in every other country in the world don't face the same issues.

As a faculty that has spent so many years researching alternative energy, especially Solar power, had you contacted the telecom companies back then, you probably would have been at the forefront of solving this huge problem for them. I am certain a company of worth hundreds of millions of dollars would have emerged from this university, providing power to every cellular tower in the country 24/7 with solar panels and batteries and automatic switching devices. This faculty would have become a very rich faculty and so many young engineers from this faculty would have been employed very gainfully.

The pressing need of power has been in this country as far back as all of us can remember and continues to stare at all of us. As a faculty that pioneered alternative energy research in Nigeria, if the research efforts had been targeted very well into

solving real life problems facing Nigerians, I would not envision the existence of any residential building, at least in the urban areas, that is not 100% powered by solar energy, not to mention other advances that could have been implemented in this country to boost power generation in the country.

It is not surprising that a lot of the high tech and very big companies in the United States were start-ups by people with advanced degree and most of them conceived the idea while doing their graduate work. – Google, Facebook, Sun Microsystems, old netscape, doubleclick, to name a few.

In fact, this is especially true for me. My first employer, Schlumberger was formed as a result of a research on a real-life problem on how to find ores deep in the ground, by Marcel and Conrad Schlumberger (A Mechanical Engineer and a Physics professor). As soon as they developed their then-very-crude way to measure the potential difference of subsurface rocks by lowering some electrodes into a well with cables, they moved immediately to form a company and within a few years they were all over the world helping companies find ores and oil and gas deposits.

Coming to today, the Company I have alliance with was a spin off formed out of a masters degree research project by a chemistry student and environmental engineering student, who worked together in an environmental issue in a university in Scotland UK. They were developing micro-emulsion chemistry and equipment to clean oil sludges, etc and down the road the application of the same technology in oil wells to enables wells produce much more became a natural progression of the applications of the technology they developed.

In the telecoms/ICT industry in Nigeria, in the pharmaceutical industry, in agriculture and so on, there are potentially dozens of extremely lucrative, indigenous engineering problems, that a University famed to have built the “Ogbunigwe” bombs, designed and constructed refineries etc. during the civil war fifty-one years ago, is positioned to solve.

(d) Just as in the real world, engineers don’t work in isolation, universities should develop masters and PhD research projects that cut across multiple disciplines to allow collaboration of student engineers and students of other disciplines to solve real life problems. Again, talking of real-life problems, projects should focus on problems of modern age and not fantasy. For example, the department spent a lot of energy focusing on creating solar refrigeration whereas much more advanced refrigeration systems were already in existence. Solar panels were already in existence. The research focus could have been adjusted to focus on developing much better compression systems that would use very small amount of power to operate such that a few solar panels and storage battery would be enough to power the refrigerators round the clock. This could have resulted in a real solution many people would be very willing to purchase, and new companies will be created from the research effort.

(e) Many of us still think of projects in terms of building a complete gadget, equipment or machinery. It doesn't have to be anymore. The days are gone when a single individual wants to be like Henry ford – building a car from scratch to a complete vehicle. No manufacturing company makes all their parts themselves. In most cases, > 90 percent of the parts are made by hundreds of different companies. The manufacturer designs the basics of what they want, they get companies to focus on each item which they are very good at. And the manufacturer mainly puts together the parts to produce a finished product. Similarly, researches can be focused on just one item. Just on how to make a single item better.

I am sure that in our everyday life, we use gadgets and equipment which we know one or two things that are not optimally made. In your cars, you probably know of one or two things you look at and you wonder why anyone could have designed such a thing the way it is. If you have ever thought like that, you have been watching a multimillion dollars business opportunity stare at you. A project can be geared towards making that single item better. Go back to the manufacturer of the equipment and show them how you have improved on what they have, and you may be on your way to becoming a big global parts manufacturing company.

If you come up with solutions but you can't find a suitable machine shop or fabricating company that can do it in Nigeria, google, you will find thousands of small machine shops or fabricators in the United States, Europe or China that can produce the part exactly as per your specifications.

Think of China and Taiwan when we used to ridicule anything made in China or Taiwan as being inferior. The Chinese mastered the art of copying. They tear down and copy every gadget they can lay their hands on and make cheaper versions. They have become so good that it spurred so many manufacturing plants all across china. Now most American companies design and send the design to china to manufacture it for them cheaper. Today, China is the second largest economy in the world, after the United States.
The moral of this story is for us all to realize that we all can build one small company at a time that focuses on just making one item better or cheap, and in the next 20 years, we will be surprised how far we have come as a nation in terms of engineering and manufacturing.

(f) Create programs to help your research student and lecturers file patents for any ideas they develop while doing their research or projects. You can patent your ideas in the United States, Europe or globally. Patent attorneys may not be cheap. The department can collaborate with the Law department and develop a simple and cheap method of doing all the legal stuff that surrounds filing patents in different jurisdictions across the world.

(g) The department needs to include some entrepreneurial courses and financial analysis and management courses, business model analysis, business case presentation modules. Engineers need to be groomed to think of running small start-up and early stage businesses, versus just being employees. This will completely change the perspectives of our graduates. While several will be

employed by big corporations, some will start very early to think of starting up their own companies, and of taking existing small companies to the next level.

Having entrepreneurial skills will also enable graduates of this department to perform very well as managers in any company they find themselves. They will be empowered to understand early enough that the company they are working for is in the business of making money by producing ideas, services and tangible services for CUSTOMERS – not just to produce gadgets or provide services for the sake of it.

(h) The department needs to create an online forum, populate it with the details of all the alumni, engineering faculty (not a whatsApp group), get their email addresses and send them log in information. Use this forum to share employment ideas. The forum can then be used to broadcast the need to fix some of the students needing Industrial training experience in the companies we work. For each IT period, post the students details and their current academic grades and let the alumni compete for them for IT in their companies – of course on first come first serve basis.

What the university can work on with external bodies (government, banks, companies) to achieve

(a) The university should work with government, banks, or investors to establish student loan funds in Nigeria, so that Students who want to go for higher degrees can have the means to pursue their advanced degree before coming out to join the labour market. Had I had access to such a fund, I would have gone for masters or PhD before joining Schlumberger.
It is a proven fact that people with advanced degrees perform better in companies and tend to be given higher responsibilities faster than people with bachelors only.

Students, take note! You don't have to only do higher degree in Mechanical Engineering. You can do a Master of Business Administration. You will see yourself excelling when you join a company.

We had the impression that Masters and PhD were for people who wanted to be lecturers, and that Mathematics majors are for people who could not make it into Engineering. But this is not the case in the west. Employers like to employ holders of first class and upper second engineering and maths degrees, but even more so holders of advanced degrees who show an understanding of business; they tend to be promoted faster because of their more developed ability to think and solve business problems.

People with higher degrees or MBA have better ability to think of feasible solutions to problems. This is not surprising because higher degrees holders especially in the sciences tend to be more focused on solving real life problems. They try and fail so many times, but they endure and keep trying till they find the solution – a practical solution.

(b) The university should hold job fairs and encourage many companies across the nation and even multinational companies to participate. Get many companies to converge on a few days in the university, each has a booth setup to speak to students about their companies and conduct interviews for year 4 and 5 students as a first step to employing them. A friend of mine has a son who was studying in a university of Pennsylvania that got hired by Boeing while in his final year during a job fair which he reluctantly attended. I joined Schlumberger as a result of the presentation Schlumberger made to us here in early 1998. !!!!

This list of suggestions is not exhaustive. I am sure there are many other ideas on what the Department, the Faculty and the University can do. This reunion is the beginning. If the department starts up an online forum, encourage the alumni to share their ideas and suggestions to the department through the forum.

And for you Students:

I will like to close by telling you a story. Some of you may be pondering in your hearts, why a story? Are we here to listen to stories? The answer is no. But this short story is aimed to encourage you students – whom we are gathered here primarily for. This discussion so far is to help you in your future, but I want to encourage you in what you are doing right now – which is to first earn your degree.

There was this 16 yrs old boy called **Alpha**. He studied in a small secondary school in a neighbouring town to his home village. He went to take JAMB in early 1983. He never had anyone coach or someone to mentor him on how to approach the JAMB exam. On his own, he had realized that English test has 100 questions of which 75 of them are multichoice questions which he was confident he would score a very high percentage on, and there were 25 questions on reading and comprehension which he knows he will also do very well in, but it will take a longer time to complete. What this young student didn't realize is that the 25 questions carry 75% of the total marks whereas the 75 multiple choice questions carry only 25% of the marks. He devised a strategy to do the multiple-choice questions first, but by the time he came into the reading and comprehension and answered a few questions, the time was up. He was happy to have answered at least 80 questions which he was confident will get him a good score. But when he told his friends what he did, they called his attention to the fact that he had concentrated his effort on 25% of the total. He was devastated!

When the JAMB result was out, his grade point was above the cut-off point and he was admitted to the department of his choice of study. However, it happened that there was another boy named **Beta** who had scored slightly above the cut-off point but was not accepted by the department because he scored less than 50% in one subject (English) – a rule which the department had introduced that year. The young boy, Beta, went back to the results display board and scanned through all the people above the cut off to see if there is any other person that scored below 50% in any subject and lo and behold, he saw that the young Alpha had scored 48% in English, but Alpha was already admitted.

Beta went to complain, and the department called the young Alpha to break the news that his admission will be nullified. Alpha made his case why his admission should be upheld and after about two weeks of struggling and making his case from the HOD to the Dean of the Faculty and the University Registrar, the department finally agreed to uphold Alpha's admission.

The young Alpha, now knowing that he needed to prove himself, decided that in-spite of the fact that he did not attend one of the best secondary schools in the country, and the fact that never having a mentor or coach had a negative effect on his start as an undergraduate, became determined to everything within his own power and control to make the department feel vindicated for allowing his admission to hold.

Alpha graduated in 1988 as one of the 3 students with First Class honours in his department.

Ladies and gentlemen, I am standing before you here today as that young Alpha.

I told you this story for two reasons:

Firstly, to tell everyone of you students listening to me today, that no matter how bad your background was, no matter how bad your start may be, no matter how bad the support you get from others may be, if you are **determined**, if you are **focused**, if you **work very hard** and **set your eyes on goal** and what you want to achieve from this university, nothing can stop you. There is no devil in hell that can stand in your way to achieving your goal.

I am confident I am looking at people who will be leaving this department with first class and upper second-class degrees and many of you who will become Masters and PhD degree holders in the very near future and contribute to making this country a great nation that it deserves to be.

Secondly, I wish to thank the department and faculty that were willing to amend its rule to allow justice to prevail and give me a chance.

It is on this backdrop that I was encouraged to stand here today to deliver this address, with the belief that this department is and has been made up of people who are willing to adopt some of the good things that will be discussed today, and will not hesitate to make changes to its long standing rules and ways of doing things, to ensure that its students leave this department well equipped to enter the labour force in a much better position to face the future – either working for companies or creating their own companies.

When I say create their own companies, I mean every bit of it. We all grew up in a country where we were made to believe that graduates should first start by working for companies, but part of this address has focused on challenging this norm. As stated numerous times earlier, some of the biggest technology companies in the world today were started by people while they were still in the university, and I believe I am looking at a department and students who will not relent until graduates of mechanical engineering of the University of Nigeria become the envy of this country, if not of the world.

Thank you all; and may God bless you all in all your endeavours.

Engr Thomas Emetoh