



**ENGINEERING EDUCATION IN THE NEW AGE OF GLOBILIZATION AND DIGITAL TECHNOLOGY.....** by Engr. Prof. Abdulbaqi Toyin Abdulrahim FNSE, FNIMechE, FAutoEI, FNIProcE, FIPMA, MASME, MNIM,



Engr. Prof. Abdulbaqi Toyin  
FNSE, FNIMechE, FAutoEI, FNIProcE,  
FIPMA, MASME, MNIM

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### INTRODUCTION

In order to prepare our students for the challenges of the future, educators and professional owe it a duty to provide appropriate engineering curriculum and enabling environment for effective teaching and learning which should be in line with globalization, digital technologies, student desires, industry and societal needs, faculty ideals and university culture.

### OUR FOCUS:

- Engineering Education
- Globalization
- Digital Technologies

**Engineering Education** is the educational studies of engineering that prepare the graduates to practice engineering with competent technical know-how and soft skills at the professional levels.

**Globalization** is a term used to describe how trade and technology have made the world into a more connected and interdependent place.

**Digital Technologies** are electronic tools, systems, devices and resources that generate, store or process data. Well known examples include social media, online games, multimedia and mobile phones.

### CONCERNS ACROSS THE WORLD

*"Our situation is not comparable to anything in the past. It is impossible, therefore, to apply methods and measures which at an earlier age might have been sufficient. We must revolutionize our thinking, revolutionize our actions, and must have the courage to revolutionize relations among nations of the world. Clichés of yesterday will no longer do today, and will, no doubt, be hopelessly out of date tomorrow."* **Albert Einstein (1948)** in **"A Message to Intellectuals"**

*The 1998 Global Congress on Engineering Education was organized around several major themes: effective teaching methods, curriculum design and evaluation, liberal education for engineers, use of new technologies in engineering education, current issues and trends in engineering education, international collaborations, education for sustainable development, exchange mechanisms in engineering education, academic/industry collaborations, international mobility, linkages between developed and developing countries, and management of academic and engineering institutions (Russel C. Jones, 1998)*

*In Chung Chak (2011) summary of the New Demands on Engineering Graduates, he asserted that in the past, graduates of engineering traditionally worked in local engineering companies. They expected to work for lives in their home countries, not overseas. There was no need to have good entrepreneurial skills. This no longer meets the future needs. Graduates in engineering now are required to possess generic competencies such as teamwork, interpersonal skills, and ability to work in an international team with students of different disciplines and/or nationalities. Secondly, they should have broad scope of disciplines.*

*Aldert Kamp (2016) stated that over the past two decades, the world around us has changed at a dizzying pace through globalisation and digitalisation, the horizontalisation of the socio-economic world, and the blending of technical and economical and societal cultures. The world of higher engineering education has, up to now, been a very conservative one. In many cases it still stresses skills that are no longer critical in the new world and seems to ignore those that are gaining prominence.*

Engineering education will only be future-proof if it not only leads to an excellent preparedness in technical rigour, but also in operational skills for creative thinking, leadership and decision making which are required to lead successfully and solve complex projects.

According to the [“Future of Manufacturing” research report](#) recently released (ASME, 2022): “Industry voices have clearly called out the large gaps between the jobs skills required and the candidates’ skill sets. The skills gap will only widen as manufacturing firms accelerate their digital transformation to Industry 4.0,”

### **CURRICULUM DESIGN AND EVALUATION**

Project centered learning was identified as a highly effective way to develop problem solving and teamwork skills in engineering students. It was noted that engineering curricula should focus on developing these types of skills, recognizing that it is not possible to **cram all the knowledge** that a graduate will need over his or her career into **four years** of courses. It was observed that **synthesis** is more important than **analysis** in today’s engineering practice.

- Training and education to develop these “hard skills” for current and future employees
- Graduates must understand the cultures, traditions, and languages of countries where they will work, or where their designs or products will be utilized.
- Engineering education in a given country or region must reflect and respond to local conditions.
- International exchanges of engineering education tools
- Engineers and machinists will need strong “soft skills” including creative problem solving, communication, and collaboration, and interdisciplinary skills to close gaps for each job role
- Academic, industry, and government collaboration on system-level approaches to reduce “time to talent” and achieve Industry 4.0 business outcomes

### **USE OF NEW TECHNOLOGIES VERSUS TRADITIONAL TEACHING METHODS**

Serious deficiencies in traditional teaching methods have all provoked calls for changes in how engineering curricula are structured, delivered, and assessed. Issues on how engineering curricula should be structured, how engineering courses should be taught and assessed need to be seriously considered. The traditional paradigm, which has dominated engineering education since its inception, and the emerging alternative are before us.

In Richard M. Felder (2012) submission, some of the principal differences between the traditional paradigm (denoted by **T**) and the emerging paradigm (**E**) are as follows:

**T:** Deductive (Fundamentals Applications). Begin the first year with basic mathematics and science, teach “engineering science” in Years 2 and 3, and get to realistic engineering problems and engineering practice in the capstone course.

**E:** Integrated. Introduce engineering problems and projects starting in Year 1, and bring in the math and science (and communication and economics and ethics) in the context of the problems and projects.

**T:** Curricula and courses emphasize content.

**E:** Curricula and courses balance content and skills (analytical and critical and creative thinking, problem solving, problem formulation, technology, teamwork, communication, entrepreneurship, foreign languages and cultures,...)

**T:** Courses are compartmentalized, self-contained, and taught by an individual instructor.

**E:** Courses are horizontally integrated across subjects and disciplines and/or vertically integrated across years of the curriculum.

**T:** Design is taught in the capstone design courses.

**E:** Design is taught throughout the curriculum.

**T:** Content is determined by the syllabus (“I will cover...”).

**E:** Content is determined by learning objectives (“The students will be able to...”)

## ASSESSMENTS, CONTINUOUS ASSESSMENTS AND EXAMINATIONS

### ❖ Assessment

Assessment: A process for obtaining information that is used for making decisions about students curricula progress and educational policy. It is essential in the teaching-learning process. It helps the teacher to determine how well his students have learned what has been taught.

### ❖ Continuous Assessment (CA)

Continuous Assessment (CA) is a student evaluation system that operates at the classroom level and is integrated with the instructional process. It is supposed to serve as the basis for improved teaching and learning. CA can be formal or informal

### ❖ Examination

Examination as a term is used to refer to tests used at the end of a cycle to make decisions regarding certification, selection or promotion. Norm-Referenced and Criterion-Referenced Tests are the two common classifications: Norm-referenced tests (NRT) and Criterion-referenced Test (CRT)

## EFFECTS OF ASSESSMENT ON STUDENTS

Assessment can have **motivational effects** on the learner. Motivation being “states of the learner which activate, direct and sustain his or her attention and efforts towards the achievement of goals”

The need for assessment is also justified on the basis that, there is need to evaluate the effectiveness of teaching, provide incentive and feedback information to students, certify performances, obtain data for accountability and to ensure the maintenance of educational standards.

## E-EXAMINATION

An electronic exam (also called a Computer Based Assessment-CBA, Computer Based Testing CBT or e-exam for short) is a test conducted using a personal computer (PC) or an equivalent electronics device, in which the delivery, responses and assessment is effected electronically. E-exams were developed more than fifty years ago for professional certification in the IT industry and progressively evolving as a preferred alternative to Pen-and-Paper Test (PPT) in schools, universities, recruiting firms as well as private and public organization.

## ADVANTAGES OF E-EXAMINATIONS OVER PEN-AND-PAPER TESTING ARE AS FOLLOWS:

- Lower long-term costs (reduced costs for many elements of the testing lifecycle)
- Administration and scoring efficiency (faster decision-making as the result of immediate scoring and reporting)
- Greater flexibility with respect to location and timing (increased delivery)
- Improved reliability (machine marking is much more reliable than human marking)
- Improved test security resulting from electronic transmission and encryption Improved consistency, impartiality and unbiased test administration and scoring (machine marking does not "know" the students so does not favor nor make allowances for minor errors)
- Greater storage efficiency-tens of thousands of answer scripts can be stored on a server compared to the physical space required for paper scripts, and Increased candidate acceptance and satisfaction (lesser complaints")

## SAMPLE OF AUTHORIZING GUIDELINES FOR ELECTRONIC TESTING

1. Questions authored are objective in nature, and there are over twenty modes of objective testing implemented in eTC'system.
2. The goal in setting questions is to have the server randomly select a pre-defined number and present to students in such a way that the likelihood of any two students having the same question-configuration is virtually non-existent.
3. For randomization to be meaningful, the minimum number of questions to be submitted per course is determined as follows: Number of expected batches for that course X, number of questions a lecturer wants students to answer.

## CONCLUSION

Issues on how **engineering curricula** should be structured, how engineering courses should be taught and assessed in the era of digital technology and globalization need to be seriously considered and look into. The professional bodies need to bring this to the awareness of the regulatory bodies like COREN, NUC e.t.c. and work together towards its achievement.

**Engineering Education** should be shape around the way our students best learn considering that they are immersed in digital media. Traditional curriculum which is a series of courses, can be redesign in a way that it will capture progressive projects linked to new machines and systems needed by the society. A shared commitment between industry and academia is needed to build a bright future for Engineering Education.

At this juncture, we really had to ask ourselves, **what is next? What are the jobs available now and the jobs of the future and the skills needed for those jobs?**

If today Engineering Education **do not produce Engineers that can fit into the present society** (needs & demands), same will **not be able to offer any thing for tomorrow needs of our society.**

**The temptation before us is that of feeding yesterday and starving tomorrow.**

## INTRODUCTION

Of recent the NIMechE was bedeviled by a serious leadership crisis which was so intense that it even threatened the survival of the Division.

If not forth timely intervention of the elders of the NIMechE, the Division would have crumbled.

To my understanding, the crisis arose as a result of unguided selection of Leaders of the Division, coupled with some self-centered interests.

The purpose of this presentation is to help us understand what leadership is all about, provide qualities and skills of a good leader so as to guide us in future selection of leaders in NIMechE.

## 2.0 DEFINATION

According to James McGregor Burns, Leadership has four primary definitional themes;

Leadership is about **who you are**: the Leaders traits, personality and character.

Leadership is about **how you act**; the exercise of power and influence

Leadership is about **what you do**; mobilizing followers and encourage change to reach the goals of the group

Leadership is about **how you work with others**; working jointly as partners to reach goals through collaborative efforts

In view of the above, for the purpose of this presentation, we will consider this short definition by John Haggai;

***“Leadership is the discipline of deliberately exerting special influence within a group to move it forward toward goals of beneficial performance that will fulfill the group’s real needs”.***

Simply said, a leader is the one who knows the way, goes the way and shows the way.

## 3.0 QUALITIES OF LEADERSHIP

**Vision**- the leader must have a vision. Vision is the key to understanding leadership. There is nothing that excites and motivate people like vision to accomplish something special.

**Discipline**– nothing worth while or significant is possible without discipline. The Leader must be self-disciplined. The disciplined leader thrives for excellence.

**Wisdom**– wisdom is the ability to apply knowledge and experience to any given situation. A Leader with wisdom resists group pressure and thinks for himself. He gathers knowledge, reads widely, takes time for others and counsel from others.

**Courage**–***“Courage is not the absence of fear; it is the mastery of it”.*** (Mark Twain)

Courage is inner strength, presence of mind against odds, determination to hang in there, to venture, persevere and withstand hardship. The courageous leader leads from the front not from the rear, remember that people are counting on you!

**Humility**– one of the surest evidences of greatness is a humble spirit. A humble leader remains the same person under all circumstances. They do not expect recognition for every achievement. When reward comes, they want to share the lime light with all the others. An effective leaders team centered and a good listener. Hel listens attentively to everyone and asks questions and allow people express themselves. He makes it easy for people to see him.

**6. Decision making**-is the thought process of selecting a logical choice from available options. The leader weighs the negatives and positives and consider all the alternatives. The steps involved are identifying the problem, gather information, identify alternatives, evaluate and choose the best alternative. Then implement and monitor.

**7. Tact and Diplomacy**-don’t lead your team with a whip, give them a dream and help them reach it. Inworking with people, the leader needs warmth, enthusiasm and sensitivity. Effective leaders make their team feel good about themselves and their work. They help people to succeed in their jobs, they show appreciation they keep their word, they are patient and reward performance.

## LEADERSHIP SKILLS

Leadership skills are skills you use when organizing other people to reach shared goals. Leadership skills require you to motivate others to complete tasks according to schedules. Some key leadership skills are:

- i. Decisiveness**— Effective leaders make decisions quickly with information they have. Decisiveness can help move projects fast and improve efficiency. Effective decisiveness requires research, evaluation, problem solving and goal-setting.
- ii. Integrity**— means having and standing by a set of strong values, being able to make ethical choices and helping the organization to have positive image.  
Leader with integrity encourages the most truthful and fair practice and outcome, and also gives a positive example of your team. A leader with integrity is diplomatic, ethical, reliable, honest, and exhibits high sense of professionalism and confidentiality.
- iii. Team Building—leadership** requires the ability to build and maintain a strong and collaborative team of individuals working towards the same goal. Team building requires effective communication skills and conflict resolution. It also requires collaborative, managerial, interpersonal and social skills.
- iv. Problem— Solving**—Good leaders are skilled at problem-solving on issues that arise on the job. Effective problem-solving requires staying calm and identifying step-by-step solutions. Leaders who are effective problem-solvers have the following skills; critical thinking, analytical skills, research ability and decisiveness.
- v. Dependability**—Being a dependable leader means that people can trust and rely on you. A dependable leader keeps promises, meets obligations and dead lines and straight forward. He also must be initiative, realistic goal-setter with timelines, with integrity and detail-oriented.
- vi. Ability to mentor**—this requires that the leader thinks less about himself and more about how to make the team as a whole successful. He should have the ability to motivate, be helpful, give positive reinforcement, recognize and reward excellence, understand members differences and have clarity of communication.

## 5.0 APPLICATION OF LEADERSHIP SKILLS FOR THE MANAGEMENT OF DIVISIONS

The Nigerian Society of Engineers functions through a structure of Divisions with the aim of achieving its objectives.

**DIVISIONS:** are created to cater for the professional responsibilities of the disciplines and allow for specialization in the emerging field of Engineering. It is the conglomeration of these Divisions that form the umbrella body, the Nigerian Society of Engineers. The Divisions are therefore the building blocks of the Society.

### APPLICATION OF LEADERSHIP SKILLS FOR THE MANAGEMENT OF DIVISIONS (Cont.)

The collective activities of the Divisions together with that of National Headquarters is what makes the progress and the advancement of the Society in each year. Divisions are therefore expected to be vibrant, dynamic and purposeful that could respond effectively to the various professional and welfare needs of members. To this end, for member aspiring to be leaders of Divisions of the Society they will need to exhibit the following leadership trends:

- a) Visionary**—Dynamic leadership is always fired by vision. A visionary leader excites and motivates people to accomplish the set objectives.
- b) Disciplined**—Nothing worthwhile or significant is achieved without discipline. The leader must therefore be self-disciplined.
- c) Has wisdom**—A leader with wisdom thinks for himself, he gathers knowledge and consistently update sit, he consults widely.
- d) Courageous**—The courageous leader has inner strength, determination and perseverance. He leads from the front and not from the rear.
- e) Humility**—A humble leader remains the same person under all circumstances. He must be able to listen to all, be team-centered to carry everyone along and should be easily accessible.
- f) An effective decision maker**—The leader must be an effective decision maker. He should be able to assess and analyze situations promptly and precisely. He should be a good time manager.
- g) Tactful and Diplomatic** — The effective leader must earn the loyalty of his team. He must show warmth, enthusiasm, sensitivity and appreciation. His warmth, enthusiasm, sensitivity and appreciation. He must be an encourager.
- h) Leadership Skills** - In addition to these general In addition to these general In addition to these general principles, the leader must equip himself with principles, the leader must equip himself with the following skills: Decisiveness, Integrity, Team building and Problem solving capabilities, solving capabilities, solving capabilities. Dependability and Mentoring attribute.

## ACHIEVING THE OBJECTIVES OF THE SOCIETY THROUGH THE DIVISIONS

### DIVISIONS

In order to meet up with the core objective of the Society, the Divisions are to keep the National Headquarters of the Society constantly updated with data that will give it enough information to take decisions and make pronouncements in relation to matters related to their respective Engineering Disciplines in the country

To encourage high standards of Engineering Studies and practice, Divisions are to pay structured visits to Universities, Polytechnics and Technical Colleges across the Country to assess performance and offer relevant professional advices.

Professional Development and Capacity of Members–Divisions to work closely with the National Headquarter store activate the Engineering Practice Training Centre and establish similar ones at Zonal levels. Training opportunities offered by some major Industries to be harnessed for the benefit of members.

Industry and Academia relationship– Organize workshops in selected Universities and Polytechnics with the Institutions serving as centers of such workshops .Resource persons to be drawn from both the Academia and the Industry.

Professional Ethics – Ensure that all members practice according to the WFEO model of Code of Ethics.

Codes and Standards– Divisions to ensure continuous development and update of Engineering Codes and Standard of the respective Disciplines.

The Divisions to serve as a resource pool to COREN and ensure that Engineering firms and establishments practice Engineering according to the rules and regulations of COREN.

Mentoring and Innovations–Divisions should pursue mentoring of young Engineers, identify innovations by young Engineers and reward, support and encourage them.

Promotion of Consumption of Made-in-Nigeria Goods and Services–the Division must be in the front banner of the campaign for the promotion of made-in-Nigeria goods and services.

The Division store commend to the National Headquarters products and services that are worthy of endorsement by the Society.

## **7.0 CONCLUSION**

(1) The aggregate performance of the Divisions in addition to that of the National Headquarters is what forms the success of the Society in any given year.

(2) For the Society to collectively advance the frontier of Engineering to a very high level and make the Nigerian Society of Engineers a great Society to be long by all members and be an envy to all other Professional Organizations in Nigeria, Divisions must:

**i. Wake-up to their responsibilities to meet up with the set aims and objectives.**

**ii. Elect Leaders that have requisite qualities and skills**

# ANNUAL AGM PICS STORY

Opening ceremony of the 35th International Conference and Annual General Meeting (AGM) of Nigerian Institution of Mechanical Engineers took place at the University of Ibadan International Conference Centre on Tuesday 18<sup>th</sup> –Friday 21<sup>st</sup> October 2022 by 9am daily.



*Fellowship Conferment*



*Technical Visit to the Nigerian Bottling Company Asejire plant, Ibadan.*



*Courtesy visit and Presentation of Gift to His Imperial Majesty, Olubadan of Ibadanland , Oba Sen.Lekan Balogun on his 80th Birthday on Tuesday,19th October ,2022 at his Palace*



*Maiden Edition of Fellows Roundtable*



*Students Sessions during the Conference*



*Award Night of the Nigerian Institution of Mechanical Engineers*



*Annual General Meeting/ Election*



*CULTURAL NIGHT/WELFARE NIGHT*



*COCKTAIL PARTY*



# COURTESY VISITS

Courtesy visit to the new Olowu of Owu, HRH Oba Engr.Saka Matemilola FNSE who is also friend and colleague to the National chairman, Engr. Mrs. Funmilade Akingbagbohun. Congratulatory letter from the Nigerian Institution of Mechanical Engineers was presented to him by Engr.M.Abass FNSE on behalf of the Institution. Present were past Chairman NSE Abeokuta branch, Dr.Apampa FNSE, Engr. Iyiola Olaoye ( NIMEchE lagos Chapter Secretary) and Engr.Dr.Olareawaju Adesusi ( NIMEchE Aboekuta Secretary)



Courtesy visit to the Chief of Naval Engineering, Rear Admiral Suleiman El-Ladan DSS, PhD and his team of Engineers. Special Appreciation to Rear Admiral Abolaji Orederu, Prof Toyin Ashiru FNSE FNIMEchE FAEng OON ( Chairman,NIMEchE Board of fellows) and Engr.Mohammed Alhassan FNIMEchE ( NIMEchE Deputy National Chairman)



The Nigerian Institution of Mechanical Engineers has shown commitment to ensuring that there is an adequate Water supply in the country.

In a joint meeting with the Lagos Water Corporation, the institution noted that this is to aid the SDG goal and WASH program.

It will interest you to know that the WASH program is amid at access to healthy and safe water, adequate sanitation, and improved hygiene. The WASH program works on long-term prevention and control measures for improving health, reducing poverty, and improving socio-economic development as well as responding to global emergencies and outbreaks of life-threatening illnesses.

However, to ensure the inclusion of students and young engineers to achieve the set goal, a challenge would be thrown out under the NIMEchE-WASH Program on the way forward for adequate Water supply and its conversion to energy inorser to facilitate a green Nigeria.

Also, a joint Committee has been set up comprising a team from Lagos Water cooperation and the Nigerian Institution of Mechanical Engineers to do the job which the grand finale of the competition would be held on the World Water Day Wednesday, March 22nd, 2023.

In attendance were Engr Iyiola Olaoye( NIMEchE Lagos Chapter Gen. Sec); Engr Charles Akintola FNSE, (Chairman,NIMEchE-WASH Mrs. Olufunmilade Akingbagbohun FNSE FNIMEchE (NIMEchE National Chairman); Engr Mumuni Badmus FNSE FNIMEchE (General Manager, Lagos State Water Corporation) and the Admin/HR Director for the Corporation, Engr.Abdulganiyu Tihamiyu FNIMEchE (NIMEchE Lagos Chapter Chairman).



# OTHER NEWS

The collaboration between NIMEchE with ASHRAE Nigeria has been very productive. The Indian Society of Heating, Refrigeration and Air Conditioning Engineers in collaboration with ASHRAE Nigeria organized the World's Biggest Largest and widely attended conference series on energy and environmental at Federal Palace Hotels & Casino where sustainable Development and Achieving Energy Efficiency and occupant Health through VRF Technology was discussed extensively in relation to decarbonization of building with impact of HVAC.

Present at the event was the Consul General of the Indian Consulate in Lagos, Mr. Chandramoulu Kern; President of ISHRAE, Mr. Chandrasekhar; President of ASHRAE Nigeria, Engr. Emeka Achebe FNIMEchE and very highly notable Engineers in the HVAC industry from all over the world.



The 8th Edition of African Engineering Week and 6th Africa Engineering Conference held at the Science Museum, Addis Ababa, Ethiopia.

It is noteworthy that the President of the Country, Sahle-Work Zewde was present at the opening ceremony, so many of the Ministers of the Country presented papers at the conference and hosted the delegates for dinner on each of the Days of the Conference.

Special appreciation to The Minister of Defence, H.E Abraham Belay; Minister of Works and Skills, HE Muferiat Kamil; Minister of Irrigation and Lowlands, HE Aisha Mohammed; Minister of Mines, Mamo Esmelealem Mihretu, the Prime Minister and the Minister of States for those fantastic dinners all through the program, Kudos to the Ethiopian Association of Civil Engineers for a memorable outing and hosting, your warm hospitality was excellent



Prepared by Magazine and Newsletter Committee under leadership of Engr. Dr Uche Obiajulu KSC and approved by The Chairman of Nigerian Institution of Mechanical Engineers Engr Mrs Funmilade Akingbagbohun FNIMechE FNSE.

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1. Engr. Dr. Uche Obiajulu – Chairman – (08083738358) [uche.obiajulu@yahoo.com](mailto:uche.obiajulu@yahoo.com).
2. Engr. Jide Atandeyi FNIMechE - Co Chairman - (080347366020) [boa\\_associates@yahoo.com](mailto:boa_associates@yahoo.com).
3. Engr. Basiru Oyekan MNIMechE – Member – (08067903906) [oyekanbasiru@gmail.com](mailto:oyekanbasiru@gmail.com).
4. Engr. Sikiru Olumide Adekunle MNIMechE - Member - (07035864316) [olusikiru2009@gmail.com](mailto:olusikiru2009@gmail.com).
5. Engr. Ojo Emmanuel Adedayo MNIMechE – Member – (08060423393) [emmanuelddyj@yahoo.com](mailto:emmanuelddyj@yahoo.com).
6. Engr. Adache Linus Adache MNIMechE - Member - (07030177562) [linusadache@yahoo.com](mailto:linusadache@yahoo.com).
7. Engr. Augustine Lucky MNIMechE – Member – (07061391841) [luckyaugustine@ymail.com](mailto:luckyaugustine@ymail.com).
8. Isqil Najim MNIMechE - Secretary - (0802398943) [isqilnajim@gmail.com](mailto:isqilnajim@gmail.com)

NIGERIAN INSTITUTION OF MECHANICAL ENGINEERS (DIVISION OF NIGERIAN SOCIETY OF ENGINEERS)  
National Headquarters

204 Pa Michal Imoudu Ave, Gwarinpa 900108, Abuja