The Institution of Engineers of Kenya
Founded 1972

Information & Telecommunication Engineering

Helping Navigate Uncertain Times

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Calendar of events 2021

Date	Event
July 2	Fast Tracking Manufacturing of Telecommunications Equipment and Devices in Kenya: Current Status, Challenges and the Way Forward
July 7	4ᵀʰ IEK Women Engineers Summit
July 9	State Of Manufacturing In Kenya – Potential And Challenges
July 23	Engineers Golf Tournament
August 6	Industry 4.0 Automation Case Study
August 12	Irrigation Systems Design
August 20	ADR Webinar Digital Transformation And Driving Efficiency Using IOT
September 7	First IEK Young Engineers Summits
September 8-10	28ᵀʰ IEK International Conference
September 10	KAA/KQ Covid-19 Impact
September 11	Engineering Intervention With Agricultural Systems Structures For Post-Harvest Losses
September 17	Adr Webinar
December 10-23	Selected Csr Activities For Branches
December 12	Standard Gauge Railway

ENG. PROF. LAWRENCE GUMBE

> The current Covid-19 pandemic has demonstrated the importance of information and telecommunication engineering to the world. In education, universities and schools were variously forced to discontinue physical instruction and revert to virtual learning, which could not have been possible without ITE.

Modern, future worlds can't function well without Telecommunication Engineering

WE welcome you to the third edition of Engineering In Kenya (EiK). The theme of this edition is Information and Telecommunication Engineering. Civilisation is majorly about information – its generation, storage, transmission and use. Early civilisation gave rise to the need for communication over a distance greater than that feasible with the human voice. Homing pigeons, talking drums, mirrors and signal flags were used in history to communicate remotely before the harnessing and use of electricity and electromagnetic systems for telecommunication.

A functional definition of information is knowledge or data, which can be collected, analysed, stored and communicated. Telecommunication in the modern world is the transmission of information by various types of technologies over wire, radio, optical or other electromagnetic systems. The modern and future worlds cannot function without Information and Telecommunication Engineering (ITE).

The current Covid-19 pandemic has demonstrated the importance of information and telecommunication engineering to the world. In education, universities and schools were variously forced to discontinue physical instruction and revert to virtual learning, which could not have been possible without ITE.

ITE has also been instrumental in the biomedical area. The pandemic began in China in 2020. Initially, there were many deaths. The government took strict measures to control the pandemic, these measures included strict lockdown. In addition to the lockdown, the government of China was able to use ITE to trace and quarantine all the contacts of people who tested positive for the virus. Using ITE, China was also able to deploy massive resources to build (in record time), equip and run huge hospitals specifically dealing with Covid-19 patients, saving many lives. ITE was also instrumental in the development and administration of Covid-19 vaccines worldwide.

In Kenya, measures to combat the pandemic included discouraging cash transactions. ITE provided a ready solution for alternative payment methods through M-Pesa, Airtel Money etc. The filling of physical forms for government services is largely being replaced by online ones through ITE. In agriculture, various smart ITE systems for the leasing of tractors, input procurement, marketing of produce and other pertinent issues are increasingly being available to farmers.

In engineering design and infrastructure, ITE has the potential advantage of bringing about more effective and efficient design processes, faster construction through 3D printing, lower labour costs, increased complexity and/or accuracy, greater integration of function and less waste.

The significance of ITE to the world economy cannot be understated. The five largest ITE firms in the USA – the Big Tech of FAANG, Facebook, Amazon, Apple, Netflix and Google – are all valued at over US$3 trillion, which, incidentally, is the GDP of India. A walk down any street in a Kenyan town or city would immediately indicate to one the significance of the ITE industry. The streets are dominated by shops selling telephone handsets, mobile money agents and related activities. Safaricom alone is a major contributor to the Kenyan economy.

Safaricom, in its Sustainable Business Report for 2020, showed that the company's social impact was valued at KSh654 billion (US$6 billion) for the year, which is nine times the financial profit the company earned during the year. Kenya's GDP in 2019 was $95.5 billion, according to the World Bank.

Safaricom said it added economic value worth KSh358.6 billion ($3.3 billion) to the Kenyan economy during the past financial year, through operations and taxes. It also sustained more than one million direct and indirect jobs, an increase from 979,000 jobs the previous year.

The contribution of ITE to agriculture, industry, entertainment and other sectors in the Kenyan economy is immense and has potential for more spectacular growth, leading to the creation of quality stable jobs.

The primary actors in the ITE sector are engineers. Engineers are playing a leading role and will continue to do so, hopefully, very gainfully!

We would be very grateful if you give us your feedback on our articles or any comments on issues pertinent to engineering and engineers in Kenya and elsewhere. You may send the same to editor@iekennya. org and copy to engineeringinkenya@michi-media.com.

We promise you that we will continue trying our best to inform, educate and entertain you!

Information and Telecommunication Engineers driving the digital economy

ENG. MATHANIEL MATALANGA

AM delighted that issue 003 of Engineering in Kenya magazine focuses on Information and Telecommunications Engineering. This is the branch of Engineering that is supporting the emerging digital economy.

The societies before the 1980s would find it paradoxical to be convinced that future societies would be able to work from home; attend business and social meetings virtually; make financial payments electronically for goods or services purchased from the comfort of one's home; rely on a small handheld device to get the best route and be directed to one's destination upfront; mount a television camera on an office-chair-size structure (drone) and remote control and yet still transmit live content of a motor car rally race. Much still, it would not have been possible to think of an economy that is active and partly being enabled through a geographically interconnected world through a digital infrastructure.

Data centers, intelligent infrastructures, cyber and technology security, unmanned flying vehicles (drones), big data mining, machine learning, high burst rates for voice video and data convergence solutions and an inter-connected data and information engineering platforms are the current revolutions shaping the economies, lifestyles and consumer service deliveries for the better improvement of lives and societies. The revolutions have also impacted our institutions of learning and is providing a paradigm shift from the traditional delivery methods of engineering.

Automation cuts across the various sectors of the economy and is constantly getting integrated into every aspect of our life; from commerce, healthcare, education, banking, transportation, consultancy, Judiciary, governance, entertainment and many others. Soon we shall be able to communicate real time with our electrical appliances at home through Internet of Things (IoT) from wherever we shall be. The digital future of utility and industrial processes shall be made possible by automation.

Content generation, processing, packaging, transmission and delivery have attained a new frontier to the benefits of increased turnaround time in respect to response, situation analysis/resolutions and end-to-end informed decision-making process. Information and Telecommunication Engineering has turned out to be a game changer and there is no sector of our society in which it does not find a touch point.

As an Institution of learned society, the Institution of Engineers of Kenya (IEK) takes special recognition of the Information and Telecommunication Engineering practitioners. We have aligned ourselves to this new norm and are actively involved in the value chain creation, proposition and adoption of the same. Our Engineers are involved in the various sectors in which this discipline of engineering knowledge is applied into use. I continue to affirm our commitment as an institution in championing the welfare and recognition of our members and an inclusive integration with the academia in terms of relevance of curricula of the courses taught at universities to bring them to be in tandem to the industry. I also call upon the many numbers of our stakeholders in the private and public sectors to allow and promote the career growth of graduates of engineering from our universities by mentoring them to identify with their professional body. The IEK is indeed a platform through which the graduates of engineering studies benefit in terms of continuous education as they collaborate with their peers in the field.

The Institution continues to work closely with its stakeholders, and these include the players in the Information and Telecommunication Engineering field. This collaboration needs to be enhanced further to realise a unified position through which matters of policy, regulatory frameworks and regional treaties are approached. I am glad about the participation of our institution in the review of various governmental frameworks and policy draft documents that have been presented in the last few months, which have included the National Addressing Policy; National Broadband Strategy; Infrastructure Score Card, to name but a few.

Information and Telecommunication Engineering has been the rescue of the world's economy in the last one year since the Covid-19 pandemic hit our nation. To a relatively large extent, the discipline of Information and Telecommunication Engineering will continue to branch out more disciplines after we pick out the learnings through this pandemic period.

At the IEK, we continue to increase the level of participation and identification of graduate engineers who are active players in the Information and Telecommunication Engineering space. The IEK Council through the Publicity, Research and Advocacy Committee constituted the Telecommunications Sub-Committee to address capacity and industry-coordinated functions in respect to the Information and Telecommunication Engineering space.

Once again, I thank our stakeholders for their supportive collaboration with the Institution and as envisioned in our Strategic Plan, we can only realise our objectives if we adopt an inclusive approach.

ENG. MARGARET OGAI

Message from IEK Honorary Secretary

THE Institution of Engineers of Kenya (IEK) has a membership of more than 9,000, ranging from professional to graduate engineers, engineering students, technologists and technicians. The membership is drawn from practising engineers in various departments in national and county governments, universities, parastatals, industries, consultants, contractors, designers in energy, telecommunications, transportation, manufacturing, water supply and sanitation, housing, medical, agriculture, among others. Although members of IEK work in Kenya, there is a sizeable number of members based outside Kenya.

Our members include senior practitioners, policy makers, researchers, educators, young professional and represent diverse interest in all sectors of the economy.

IEK undertakes a number of programmes to engage our membership and to support professional development, welfare of engineers and advocacy to promote engineering practice in Kenya.

These include webinars, conferences, industrial visits and submission of memorandum on policy matters. Readers are invited to refer to the IEK Calendar of Events 2021 which has been published on our website.

We hosted the following webinars between April and May: Energy Saving Using Air Valves, the launch of the e-Library. Assessment of Environmental and Social Impacts (ESIA), Infrastructure Project Studies Using E-Resources to Advance the Engineering Fraternity, Alternative Dispute Resolution ("ADR") and Engineers Webinar, Kenya's Agricultural Industry's Future, Design of Multi-Storey Timber Buildings in accordance with Eurocode 5, Master the digital future of your industrial and utility processes, Cement Manufacturing in Kenya/ Africa – Role of Engineering and 8th International Women in Engineering Day.

On April 30, 2021, IEK held its 2021 Annual General Meeting via Zoom application, which drew a total of 436 members in attendance. Members were briefed on the President's Report, Treasurer's Report, Auditor's Report, and all other issues affecting members were discussed.

IEK is in the process of organising President's dinner and 28th International Engineers' Conference expected to happen in July and September, respectively. This conference will not only allow engineers from our respective organisations to network, but it will also allow us to appreciate presentations by engineers from across the continent.

The magazine's rapid growth has resulted in a significantly increased workload for the editors and editorial board members, as well as the dedicated staff of the publishing office.

As the magazine's focus has shifted, so have the expectations for publication standards and the necessary review processes.

We are grateful to the advertisers for their tremendous support since the inception of the magazine.

We also want to thank the hard-working, professional staff of the publishing office, as well as the dedicated members of our Editorial Board. The magazine's recent success attests to their dedication.

Finally, I'd like to thank you, the contributors and readers of Engineering In Kenya for your interest in the magazine, and I encourage you to keep sending us your valuable feedback and ideas for future improvements.

How IEK is rebranding Telecommunications Engineers in Kenya
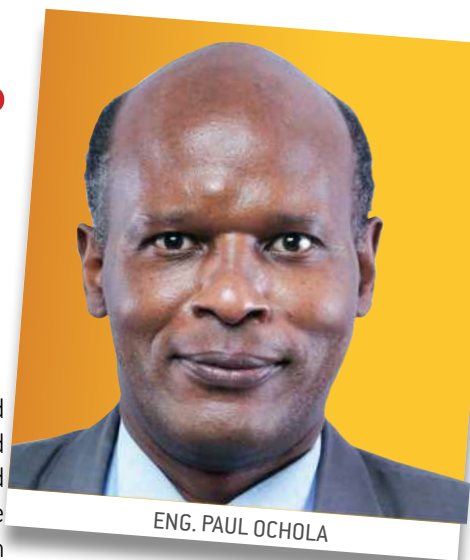
ENG. PAUL OCHOLA

THE digitisation of an end-to-end of communication system within the Telecommunications space at the millennium presented a new discipline of what was traditionally the scope and practice of telecommunications. Digitisation has impacted nearly every other sphere of engineering and occupation beyond what was limited to analogue signals for actuation and transmission of voice, video and data. The 21st century witnessed the branching out of telecommunications into other fields such as computing, data mining, intelligence-based reasoning, power systems, space science, medicine, autonomous control systems, access control and real-time virtual global collaboration.

In building construction, traditional Main Distribution Frame (MDF) rooms that would traditionally be reserved for the main telecommunications operator has today been reviewed to have other definitions like server rooms or technical rooms.

The reasons for these include the need to accommodate multiple data communication service functions, which can include the concentrator points for the Optical Fiber Cabling entry and exit points within a building, in addition to other media type platforms; need to accommodate multiple service providers of mobile and fixed data services.

In the aviation space, digitisation has presented an opportunity for much better management and administration of spectral efficiency. Radar systems and other instrument, landing and navigation systems have emerged and such solutions, which were initially diverse and isolated in functions and operations, are now integrated and considered as one total solution offering.

For the broadcasting space, digital video broadcasting and digital audio broadcasting are now simultaneously interactive and end consumers are witnessing the ability of content within content real-time transmission and broadcasting.

To the largest extent, it is a new era where the previously considered individual telecommunications autonomous systems are now integrated into one single multilayered and intelligent Information Engineering platform.

The IEK Council is cognizant of this fact and, through the Publicity, Research and Advocacy Committee, constituted the Telecommunications Sub-Committee to address capacity and industry coordinated functions in respect to the Information Engineering space.

The sub-committee is comprised of four members, namely; Eng. Paul Ochola who is the Chair, Eng. Christopher Nyarotso who is the Vice Chair, Eng. Stephen Kiambi who is the Secretary and one other member, Eng. Moshe Ojanga. The committee has to date carried out initiatives towards membership recruitment awareness campaigns; advocacy in both the private and public sector players on the role and importance of IEK as a professional body to graduates of information engineering backgrounds in the industry and the need for collaboration to enhance value as one body of authority to speak and consult on matters relevant to and affecting the industry, society, learning institutions and practising engineers.

One key observation is that graduates of information and telecommunications engineering need to re-brand and identify with their institution to advocate and champion more audibly and visibly the cause of Information and Telecommunications Engineering practice and education.

It is important to state that the strength of influence by these graduate engineers can only be advanced both at local and international levels by increased participation in the IEK's activities and by extension the wider affiliate parties. The time for the re-branded and more participative graduates of Information and Telecommunications Engineering is now and that starts with registration for IEK membership and continues with active participation in the activities of the Institution.

Eng. Ochola is the Chairperson, IEK Telecommunications Committee.

EBK committed to serving engineers

By Eng. Erastus Mwongera

THE Engineers Board of Kenya (EBK) was established by the Engineers Act 2011 with a mandate that covers registration of engineers and engineering consulting firms; regulation of engineering professional services; setting of standards; and development and general practice of engineering.

Initially, the Board regulated engineering in Kenya since 1969 under the Engineers Registration Board (ERB) created by the Engineers Registration Act, CAP 530. Before the enactment of this Act, engineering services were regulated based on British standards. The ERB Act, however, had shortcomings as it only allowed the ERB to register and license engineers to practise.

It had no mandate over critical areas of engineering such as engineering education, engineering training, engineering practice and continuing professional development. While formulating the Vision 2030, engineers and engineering professional services were identified as a critical strategic component cutting across several sectors as the Vision enablers. There was a need to streamline the legal framework to bridge the existing gap and attain an effective and efficient regulation of the entire engineering value chain in Kenya. This led to the enactment of the Engineers Act, 2011 and the repeal of the Engineers Registration Act.

Accredit Engineering Programmes

The Act empowers the Board to approve and accredit engineering programmes offered in both local and foreign universities, do assessment/evaluation of both local and foreign engineering programmes and establish collaborations on training for student engineers. Accreditation of engineering programmes is undertaken to ensure that programmes are relevant to the needs of the nation, students and industry, as well as providing an objective assessment of the quality of training and learning experience in the engineering programmes.

The Board is finalising the

LEFT TO RIGHT: *Eng. Margaret Ogai, EBK Registrar and Honorary Secretary IEK, Eng. M. M Mahamood, former Chairman EBK (2005-2007), Prof. Arch Paul M. Maringa PS, State Department of Infrastructure, Eng. Erastus Mwongera, Chairman EBK and Eng. Nicholas Musuni, former Registrar EBK, during the official launch of EBK Examination Centre. (PICTURE COURTESY EBK)*

collaboration framework with the Commission of University Education (CUE) that would see joint collaboration while undertaking accreditation of engineering programmes in line with the University Amendment Act, 2016. The collaborative MoU is expected to be signed in July 2021. The Board has so far accredited 42 engineering programmes in 11 local public universities. These 42 engineering programmes are in 17 different disciplines.

Acceding to Washington Accord

In its quest to ease the mobility of our local professional engineers, the Board is working towards attaining Signatory Status at the Washington Accord. The Board is being mentored into the International Engineering Alliance by Pakistan and Malaysia. The mentorship committee has additional representation of members from Myanmar, Australia and China.

The Accord acknowledges accreditation of engineering academic programmes as a key foundation for the practice of engineering at the professional level in each of the countries or territories covered by the Accord. The Board is keen to ensure it attains the Signatory Status at the Washington Accord by December 2022.

Graduate Engineers Internship Programme

Kenya faces an acute shortage of qualified engineers who can legally and competently practice and support the country in achieving its development agenda. The recommended UNESCO ratio of professional engineers to a middle-income country's population is 1:5,000 persons. The Board currently has 2,551 registered professional engineers. Kenya therefore has a shortage of 7,000 going by the latest Census Statistics, 2019.

The Graduate Engineers Internship Programme has been designed for efficient conversion of the graduate engineers into professional engineers through internships, mentoring and professional assessment. The Board has recruited 100 interns in two cohorts into the system and is currently finalising additional recruitment of 100 interns to be placed to various work stations in July 2021.

Registration of Engineers

The registration of engineers and consulting firms is a key mandate and function of the Board. Increased public awareness on who an engineer is and what engineering services are has led to increased demand of engineering services and the growth of registered

engineers and firms over the years. The Board in 2020/2021 Financial Year registered 1,576 Graduate Engineers, 235 Professional Engineers, 94 Consulting Engineers, 17 Temporary Engineers and 11 Consulting Firms.

Professional Examination Centre

The examination Center aims at streamlining the administration of professional examination standards and processes in order to keep up with the increase in number of applications. The Centre will assist the Board in fulfilling its strategic goals. These goals include ensuring increased transition of expected high number of graduate engineers being channelled out through the existing Graduate Internship Programme; promote ease of doing business by enhancing efficiency in the processing; and registration of engineers and firms and leverage on technology by ensuring that Professional Interview can be conducted online.

Engineers Identification Card

Engineers Identification Card is a requirement under Engineers Rules 2019 as an identification means by engineers during compliance checks. EBK has partnered with the National Bank of Kenya (NBK) to generate high quality and secure Engineer ID Card. The Engineers ID issuance is currently ongoing.

Engineers Stamp

The Board is required to issue an official rubber stamp to every

Chief Guest, Prof. Arch. Paul M. Maringa, PS Infrastructure, officially opens the EBK Examination Centre. (PICTURE COURTESY EBK)

registered professional and consulting engineer. The rubber stamp issued is used for approving or certifying engineering documents, including design calculations, drawings, technical reports and other engineering documents. Engineers are required to sign, date and affix the rubber stamp issued on any approval or certification given. To comply with this requirement, the Board has designed and invoiced all professional and consulting engineers to purchase the stamp from the Board. The stamps will be processed and issued once members have made the applicable payments.

ISO Certification

The Board in its aspiration to maintain quality services offered to clients developed and implemented a quality management system. The system was audited and the Board is now certified as per ISO 9001:2015 standard by Kenya Bureau of Standards (KEBS). This experience has made the Board to improve reporting, communication to clients and stakeholders and has improved the quality of products and service offered.

Strategic Targets

The Board has identified the strategic it wants to get into over the next five years. The strategic intention is based on the core mandate of the Board. The Board strategic intent is to:

i. Increase the registration numbers of professional engineers from 2500 to 10,000
ii. Strengthen compliance to the Engineers Act 2011 to 100% by developing and enforcing engineering standards in National and County Governments
iii. Development of the capacity of the general practice of engineering by establishing the Kenya Academy of Engineering & Technology and the Kenya School of Engineering; acceding to international accords for accreditation of engineering education and mobility of professional engineers

LAUNCH OF NEWLY REFURBISHED EXAMINATION CENTRE: Prof. Arch. Paul Maringa, Principal Secretary, State Department of Infrastructure, with Eng. Erastus K. Mwongera, Chairman Engineers Board of Kenya, during the official launch of EBK Examination Centre. (PICTURE COURTESY EBK)

Eng. Nicholas Musuni, Former EBK Registrar and Eng. Nathaniel Matalanga, President IEK, during the launch of Engineers ID. (PICTURE COURTESY EBK)

Outgoing EBK Registrar Eng. Nicholas Musuni hands over the instruments of power to incoming Registrar Eng. Margaret Ogai. In the middle is the Board Chairman, Eng. Erastus Mwongera. (PICTURE COURTESY EBK)

iv. Develop and sustain the Engineers Board of Kenya.

To achieve these strategic targets, the Board in 2021/2022 Financial Year plans to register additional 500 Professional Engineers, which is twice 2020/2021 Financial Year achieved target, and fully automate Engineers Registration Services.

Under strengthening of compliance to the Engineers Act 2011, the Board will jointly develop a collaborative framework for Sector Regulators together with The National Construction Authority (NCA) and The Board of Registration of Architects and Quantity Surveyors (BORAQS). The Board will further finalise the Gazettement of the scale of fees for Professional Engineering Services and develop Scheme of Service for Engineers in national and county governments for onward submission to the relevant appointing authorities.

Under the development of the capacity of the general practice of engineering, the Board will increase capacity of intern placement under the Graduate Engineers Internship Programme (GEIP) through the agency model, academic

model and the normal structured programme. The Board targets to enroll at least 300 interns into the three models.

Enhancing the Capacity of Its Secretariat

To accomplish these and many other programmes, the Board is enhancing the capacity of its secretariat. The Board is currently implementing a progressive human resource instruments that were developed to effectively deliver on the Board's mandate. The implementation of these instruments has ensured suitable qualified persons join the Board as it increases the capacity for its secretariat.

Conclusion

The Board is committed to ensuring the short and long-term strategic targets are implemented for the benefit of the engineers, engineering services and economic development of the nation. The Board wishes to thank all the stakeholders for their continued support.

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Eng. Erastus Mwongera, is the Chairman EBK .

Change of Guard at EBK

ON Friday 25th June, the Board feted the outgoing Registrar/ CEO, Eng. Nicholas Musuni. The colourful ceremony was graced by the top brass of Engineering fraternity including the Secretary Administration, Mr. Bernard Leparmarai representing the PS Infrastructure, the Chairman and Board members and staff of EBK, chairmen and DGs/CEOs from roads agencies, BORAQS, IEK, ACEK, among others.

As the first Registrar of EBK from 2014 to 2021, Eng. Musuni transformed the regulatory framework for engineering in the country. He will be especially remembered for developing and implementing Engineers rules 2019, first Strategic Plan (2014-2019), launch of EBK new offices and refurbishment of the Examination Centre.

During his tenure he initiated Continuous Professional Development (CPD) for Engineers and Graduate Engineers internship programme (GEIP).

As a result, the quality of Engineering services

EBK Chairman Eng. Erastus Mwongera looks on as outgoing EBK CEO Eng. Nicholas Musuni hands over instruments of power to incoming CEO Eng. Margaret Ogai at the event.(Picture Courtesy EBK)

has improved in the country, resulting in a safer built environment for citizens.

Eng. Musuni handed over to Eng. Margaret Ogai, the incoming Registrar/CEO of the Board. The Board takes this opportunity to thank Eng. Musuni for his dedicated and selfless service and wishes him all the best in his future endeavours.

EBK Management Team

ENG. MARGARET OGAI, PE

REGISTRAR/CHIEF EXECUTIVE OFFICER
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ENG. OKERE A. MAKOKHA, PE

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MR. ERICK O. OBIERO

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EBK @50

Celebration of Engineers at 50. (PICTURE COURTESY EBK)

E-commerce Will Unlock Postal Corporation of Kenya's Fortunes

By Dan Kagwe

THE adoption of e-commerce has the potential to drive intra-regional trade and attract benefits such as opening markets to isolated rural communities, servicing Africa's fast-growing consumer market, and offer citizens access to new business opportunities.

Africa's early innovation and adoption of mobile payments has paved the way for it to become a pacesetter in e-commerce, with the market estimated to double in size to an estimated $75 billion (Sh8 trillion) by 2025. The Universal Postal Union-International Bureau posits that the future of the postal industry lies in the world of online shopping – seeing that the volume of online sales has increased. The new frontier for the postal services sector is e-commerce and logistics, especially during the Covid-19 pandemic era where customers are keen trade with minimal physical contact.

Despite having an unmatched network of more than 600 branches countrywide and a large fleet of delivery vehicles, as the Postal Corporation of Kenya (PCK), we have seen our revenues dip, as mail volumes tumbled and private parcel delivery companies eat into our market share.

In an era where agile private entities are leveraging on e-commerce, social media marketing informed by technology advancement such as big data and artificial intelligence, we have had our Damascus moment and we are now angling our operations for a piece of the e-commerce pie.

To buoy our fortunes in a digitalised economy where mail volumes have plummeted, we are now leveraging on the advent of digital globalisation through modern technologies and strategic partnerships. Working closely with the Ministry of Information, Communications, Technology, Innovation & Youth Affairs, we are rapidly implementing our strategy to leverage on initiatives such as the National Payment Gateway, the National Addressing System and Kenya Transport and Logistics Network for e-commerce business growth.

Unlike in the past where our systems were manual and one could not tell what was happening across our networks, we now have an Enterprise Resource Planning (ERP) system, having automated our business processes from the back-end to the front office. In line with the National ICT Policy 2020 that seeks to provide an enabling environment for the rollout of e-commerce and digital economy, the national government is expected to play a key role in the modernisation of the Corporation's ICT infrastructure.

We have re-engineered the organisation to become a formidable partner that will facilitate e-commerce by being the intermediary between the country's SMEs and foreign and local online retailers. Kenyans will also be able to shop online and Posta will deliver the purchased items to peoples' doorsteps.

Leveraging on our vast network, we have now rolled out state-of-the-art e-commerce hubs in Nairobi, Mombasa, Kisumu and Nakuru. This follows Kenya's selection by the Universal Postal Union (UPU) as one of the countries to roll out regional e-commerce hubs in East Africa. The National Logistics Hub, located in Industrial Area, Nairobi, has revolutionised Posta's e-commerce to become a first-class clearing and forwarding system in the wider sub-Saharan region.

In November 2019, Posta collaborated with Safaricom PLC to launch Mpost, a mobile-based innovation that allows users to receive letters and parcels from the Post Office. Through the service, subscribers have been offered virtual post office boxes linked to their mobile phone numbers. MPost comes in handy to those who wish to buy and ship items from overseas merchants and use postal services for last mile delivery. Through MPost, we hope to leverage on over 40 million mobile users to deliver parcels and postal items while tracking them through the value chain.

The government has established Kenya Transport and Logistics Network (KTLN), a new agency that is expected to lower the cost of doing business in the country through the provision of cost-effective infrastructure for the ports, rail and pipeline seamlessly. We are keen on being part and parcel of KTLN. Under this arrangement, the Post Office will be critical in provision of last mile delivery services to the country particularly in the development of e-commerce.

In light of the fact that we are keen on growing Africa, Europe and US commodity and digital market linkages, we have entered into partnerships with international consolidators who offer express, warehousing, trucking, logistics and customs clearance services.

We are now in the process of acquiring a National Payment Gateway system that will be the pivot for all forms of public payments in Kenya. We have already fully developed Posta Pesa, a mobile-money innovation that will make Posta the go-to payment gateway due to its many points of sale solutions. This new innovation has beento rolled out to the mass market.

Dan Kagwe is the CEO and Postmaster General of Postal Corporation of Kenya

Members of IEK during the Professional Interview Preparation Seminar at Eagle Palace in Nakuru on 7th November 2019. On the same day, South Rift Branch was launched. (PICTURE COURTESY IEK SOUTH RIFT).

IEK MASHINANI: Devolving Crucial Engineering Expertise To The Grassroots Level

By Eng. Luke Toroitich

AFTER many years of posting ideas and suggestions on how the Institution of Engineers of Kenya (IEK) can devolve its functions to reach out to its members, the term IEK Mashinani was coined. IEK Mashinani has been transformational to ensure the Institution can operate at the grassroots level, rolling out its membership drive and serving its members.

This has been achieved through the creation of new branches. Currently, IEK has Central, Western, Coast, South Rift as official branches while Capital, North Rift and North Eastern branches are in the interim stage

awaiting to be officially launched. IEK Mashinani is an excellent example of the devolvement of IEK functions to the grassroots, which is in line with the Strategic Plan 2019-2023. The plan, through its strategic objective to promote diversity and inclusivity in engineering, envisioned the IEK to establish five more branches from the three that existed at the time (Western, Central and Coast). One branch has been achieved (South Rift) and three branches are in the pipeline.

The IEK has accomplished its mandate to offer a range of services from membership drive to corporate social responsibility and has improved the visibility of the institution to the

public. How are the branches helping out the mother institution? First, each branch is run by a committee, which is headed by a branch chair, assisted by two vice chairs, honorary secretary and honorary treasure as the executive team at the branch level. In addition, to the leadership, ordinary branch members complete the apex leadership of the branch. Given the fact that members of IEK are distributed all over Kenya, whether working or residing in these areas within the country, often times there is a need for service or communication from IEK.

That is where IEK Mashinani steps in to bridge this gap. Operations

like membership registration, the endorsement of documents that are presented by members and industrial field trips can be implemented through the branches. Additionally, potential IEK members could need to interact with professional engineers within their reach, and through consultation members can network and solve their needs on the ground.

Short courses and trainings can also be implemented at the branch level, giving engineers the platform to share their knowledge and experience. Placement for industrial attachment and internship has been made possible when the companies contact the branches, requesting for qualified applicant to explore their skills in their company.

There are many success stories about IEK Mashinani. For example, when the COVID-19 pandemic hit the country last year, ravaging businesses and people's livelihoods, IEK stepped in and lent a hand in alleviating the suffering of Kenyans as a result of the curfews and travel restrictions.

IEK did a COVID-19 funds drive to help the needy in society. The implementation and rollout of the noble initiative were made possible by engaging the branches within the identified needy communities.

In the South Rift, the counties under the branch reached out to children's homes and donated foodstuff and essentials. IEK Mashinani has provided a platform for the interaction among engineers from various

Members of IEK follow proceedings during the Professional Interview Preparation Seminar at Eagle Palace in Nakuru on 7th November 2019. INSET: Graduate Eng. Luke Toroitich. (PICTURE COURTESY IEK SOUTH RIFT)

backgrounds, resulting in a database of professionals who are readily available. Natural calamities like fault lines in the Rift Valley often call upon engineers in the geotechnical field to offer their professional advise to avert future calamities.

This brings memories of the collapse of a section of Nairobi-Maai Mahiu road due to a fault line which was exposed owing to the torrential rain pounding the area. It took the intervention of local engineers to come up with a solution to restore the volume of traffic on the road.

The branch that is in close proximity to the area of the disaster provides the expertise of engineers who can comment authoritatively on the matter at hand. This method clears the issue of speculation on what could have caused the disaster. For example, when a building collapsed in Kericho, the branch visited the site of the disaster and in collaboration with the IEK main office, a detailed technical report was done, highlighting the cause of the disaster.

In the foreseeable future, the branches will spearhead a membership drive to sensitise

students on the path that a graduate takes from the time they exit the university or college to the point when they register as engineers. Moreover, the branches can coordinate industrial visits to ensure engineers are made aware of the latest technology in the industry.

The future of the IEK branches is bright, given the leadership that steers them and the spirit of embracing all members of all cadres. This will give IEK members a chance to be heard and their impact felt throughout the institution.

Devolving functions of the IEK has made the presence of the institution be felt in the country and beyond. It comes as a pleasant surprise to see some of the branch officials being elected in various international bodies. This means the leadership opportunity given to serve others at the branch level can create an impact that is notable to engineers abroad. Long Live IEK branches.

Luke Toroitich Rottok – a graduate engineer with expertise in robotics, machine vision, CAD/CAM. He is a member of South Rift Branch.

National Construction Authority Strategic Plan 2020-2025

Eng. Maurice Akech
NCA Executive Director

Introduction

NATIONAL Construction Authority (NCA) is a State Cooperation established under the National Construction Authority Act, 2011. Its mandate is to oversee the Construction Industry and coordinate its development.

In addition, the Authority is responsible for stimulation and streamlining the development of the construction industry through various activities. These include training and capacity building; registration of contractors; accreditation of Site Supervisors and Construction Workers; carrying out construction research and business Development; and carrying quality assurance, for improved performance of the construction industry.

Preparation of the NCA Strategic Plan (2020-2025) entailed stakeholder consultation and review of the previous five years past performance to inform future strategies. The review indicated that there were achievements attained while a few aspects were not fully addressed.

2. Areas of Focus in Next Five years

The areas of focus for the next five years (2020-2025) shall include the following;

- Empowerment of local contractors through improvement of their registration, access to financing, access to construction equipment and other capacity building initiatives.
- Implementation of regulations and guidelines aimed at governing foreign contractors.
- Ensure appropriate regulatory environment.
- Ensure institutional efficiency and effectiveness.
- Enhance stakeholder engagements.
- Promote quality assurance in the construction industry with focus on mitigating collapse of buildings.
- Develop and promote construction standards and best practice guides.
- Develop and implement a standardization framework on construction techniques and materials.
- Provide consultancy and advisory services related to the construction industry.
- Empower and build Capacity for Skilled Construction Workers and Construction Site Supervisors.
- Establishment of Centre for Construction Industry Development.
- Implementation of Construction Industry Policy.

3. Situational Analysis

The situational analysis in the plan evaluates the internal and external environmental conditions that affect the operations of the Authority. Internal factors include employees, organizational culture, knowledge management, organizational structure, working environment, internal policies, procedures and processes, suppliers and other stakeholders. For the external environment, the Authority considered Political, Economic, Social & Cultural, Technological, Environmental and Legal aspects, also known as the PESTEL model. In addition to the above, the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis was also carried out. Stakeholder analysis was also done which included documenting mutual expectations between stakeholders and the Authority and stakeholder mapping.

4. Strategic Direction

The strategic direction of the Authority focuses on the NCA vision, mission, core values, key result areas and their corresponding goals, strategic objectives and strategies. The vision of NCA is "An innovative, well-coordinated and prosperous construction industry". The mission of NCA is "To regulate, facilitate and build capacity in the construction industry through strategic interventions and partnerships for sustainable socio-economic development".

The Key Result Areas, Objectives and Strategies for the Authority are indicated in the table below;

KEY RESULT AREAS	STRATEGY DEJECTIVES	STRATEGIES
KRA 1 Innovation and operational excellence in the Authority	• Ensure institutional efficiency and effectiveness • Enhanced stakeholder engagement	i. Enhance service delivery ii. Mobilize adequate resources to sustain the Authority iii. Ensure ICT infrastructure iv. Enhance Corporate image v. Enhance employee skills and engagement vi. Knowledge Management vii. Enhance human resource capacity viii. Corporate governance ix. Supply chain Management x. Administrative services xi. Internal Audit xii. Risk management xiii. Stakeholder engagement
KRA 2 Transformed local construction industry through empowerment of local Contractors, Skilled Construction Workers and Site Supervisors	• Effective and efficient registration and accreditation services • Review and improvement of registration and accreditation guidelines • Encourage use of local materials and technology	i. Maintenance contractor register in which 36,000 new contractors shall be registered ii. Maintenance of skilled construction workers' database in which 200,000 new construction workers shall be accredited iii. Maintenance of skilled construction site supervisors' database in which 40,000 new Supervisors shall be accredited iv. Maintenace of foreign contractors register in which 205,000 foreign contractors shall be registered v. Maintain a construction industry information system vi. Maintain project registration database in which 22,000 new projects shall be registered vii. Improvement of registration guidelines viii. Sustainable legislation framework for contraction industry ix. Efficient self-regulation framework for contracto's association x. Maintenance of database for suppliers of construction materials, technologies and equipment xi. Develop and implement standardization framework on construction techniques and materials
KRA 3 Safety in all construction works including but not limited to building, dams, roads, electrical, mechanical, bridges etc	• Promote quality assurance in the construction industry	i. Ensure compliance to construction industry standards ii. Enforcement of Building Code iii. Enforcement of construction industry Code of Conduct iv. Develop and promote construction standards and best practice guide
KRA 4 Innovate Research and Business Development	• Undertake and commission research into matters relating to the construction industry • Provide consultancy and advisory services related to the construction industry	i. Carry out research in the construction industry ii. Dissemination of Construction Research findings iii. Develop construction industry researcg findings into innovative initiatives iv. Consult for and advise stakeholders on matters related to the construction industry
KRA 5 Capacity in the local construction industry developed and improved	• Build and improve capacity of contractors, skilled construction workers & construction site supervisors • Establishment of Centre for construction industry Development	i. Continuous professional and technical development for registered contractors, skilled workers and construction site supervisors ii. Facilitate access to affordable finance to contractors iii. Facilitate business development of contractors iv. Facilitate exportation of construction services v. Establish and operationalize a CCID at the Konza Techno City

6. **Values and Motto**: The strategic plan has also identified values and motto for the Authority. The values are Professionalism, Integrity, Efficiency, Innovation, Team Spirit and Environmental Stewardship. The motto is Excellence in the Construction Industry.

7. **Implementation Framework and Financing**: The framework for implementing this strategic plan recognizes the roles played by various players including the Board of Directors, Executive Director, General Managers, Managers and staff of the Authority. The plan envisages how to mobilize the resources for use during the plan period as well as an accountability framework for the same. It also provides for risk assessment and mitigating strategies that will ensure effective implementation of the plan. To implement this plan, the Authority will require a total of Kshs 16,166,300,000 spread over five years (2020-2025).

8. **Monitoring and Evaluation**: The role of monitoring and evaluation shall be critical in implementing the plan. It will assess the progress made in the implementation of the plan with a view of either taking corrective measures or sustaining the positive trends in the implementation process.

9. **Implementation Framework:** The Plan contains an implementation framework which purposes to facilitate achievement of the results intended. The framework identifies the strategies, activities, outputs, key performance indicators, targets and the cost that shall be incurred in activity implementation. It is hoped that by implementing the plan, the construction industry shall be better regulated and coordinated so as to achieve the national development envisaged in the Vision 2030.

By Carol Koech

AS the existing installed base of industrial automation assets grows older, and as marketplace conditions increase in complexity, more manufacturing organisations are finding it difficult to remain competitive. Many of these businesses need to modernise their machinery and systems. When modernising a plant, the degree of change required will depend on customer demands, the strategic vision of the corporate leadership, and both physical and financial considerations.

As industrial systems age, spare parts become increasingly spare. If a plant experiences a major breakdown with no spare parts available, the parts will need to be custom built at an extremely high price. Production delays could last weeks and even months, effectively putting an end to operations.

A plant shutdown for a single day could cost the company millions. To avoid costly shutdowns and ensure business resilience, companies must re-engineer core operations from the ground up.

Where should plant owners start? The first step is a thorough analysis of the entire operation and review of operational sequencing, recipe management, control systems and networks. With this information, the engineering team can plan a path to Industry 4.0 for the facility, and the benefits that can be realised from 5G interconnectivity, automation, machine learning and real-time data. Industrial automation can minimise operational risks, increase a factory's long-term profitability and introduce value-add elements such as automated reporting and operational monitoring.

An example is cited of one of the most innovative energy generation facilities in the Middle East. The site uses a host of technologies to optimise the energy efficiency of the plant's electrical network, reducing the plant's carbon footprint, and ensuring that the plant is Internet-of-Things ready, thanks to the equipment's in-built sensors.

Another key modernisation goal

BUSINESS
Resilience Drives Industrial Automation Systems in East Africa

is the desire for continuous improvement to either establish or maintain competitive advantage.

A consistent and steady approach to modernisation safeguards investments, keeps the operation running and positions the company for long-term profitability. We have always believed that industrial automation can be best achieved through scalable, open-system architecture as opposed to closed proprietary systems.

One of the Kenya's food and beverage producers recently transformed into a modern, smart establishment. Our customer operations have been digitised through a combination of software and hardware provided by Schneider Electric.

The software platform provides the operations team with vital data and analytics for production processes, allowing them to improve output, as well as the ability to track and trace produce.

Using an Internet-of-Things ap-proach and connecting all the plant's equipment has increased equipment efficiency and reduced downtime. The result is a smart manufacturing model.

The current wave of industrial transformation is about connecting and enhancing existing systems to achieve a business benefit.

By supporting the deployment of open industrial automation systems, organisations that spend on open technologies and services will enjoy a long-term advantage over those that stick with factory-wide technologies that are based on proprietary protocols. If you are a factory owner who is looking to the long term, are you ready to invest in industrial automation digital solutions that enhance manufacturing efficiency, security and output? Maybe the better question would be, why aren't you investing for the long term?

Carol Koech, Country President, Schneider Electric East Africa.

How to design data centre infrastructure for business continuity

Mr. Dinesh OP

Dinesh OP at Siemon offers key advice on how to design data centres to support business continuity for the long term.

THERE is no doubt that 2020 had a huge impact on societies around the globe and in Africa, the global pandemic has once mor IT networks.

Successfully maintaining business continuity in 2021 and continuing to expedite digital transformation plans means that African businesses must place a new emphasis on data centres and the IT infrastructure within them. Low latency, high performance networks that ensure reliability, rapid deployment and scalability are of utmost importance to cope with ever-increasing data volumes and storage requirements.

So, what are the essential considerations when designing and deploying data centre infrastructure for business continuity?

A critical component in any data centre infrastructure is a high-performance standards-based cabling system. Since the cabling is the most disruptive and labour-intensive piece of the entire IT-infrastructure when it comes to upgrades or replacements, it should be selected to last 15, 20 or more years and support 2-3 generations of network switches, servers and storage equipment.

In terms of the cabling media, fibre optic cabling has become the de-factor choice, particularly for the data centre backbone where transmission speeds are swiftly moving from 40 to 100 and 400 Gigabit Ethernet. Selecting the right fibre system on day one will determine if a data centre can support higher performance needs in the future. Here, an 8-fibre MTP fibre solution provides the most efficient, cost-effective and highest perform-

ing option for current 8-fibre 40 and 100 Gigabit applications (such as 40GBASE-SR4 and 100GBASE-SR4). Once installed, this solution also offers an easy migration path to next generation 200 Gb/s and 400 Gb/s applications as and when required. The distances that the cabling needs to cover throughout the data centre will determine whether a multimode or a single mode fibre solution must be deployed.

Besides media choice, the cabling architecture plays an important role in facilitating manageability and future data centre growth. A structured cabling design - as defined by the EN 50600 series- can fulfil these objectives, as all equipment is connected via 'fixed cabling' to one or more entirely passive zones, which are optimised for moves, adds and changes (MACS) during the operational stage and allow secure patching for added physical layer security.

Designing the right physical layer components into the data centre will also support trouble-free performance and prevent downtime.

To keep equipment running and to cool it down for optimal performance, data centres require huge amounts of power. Intelligent power distribution units (PDUs) can monitor the power usage of individual connected devices. In this way they can establish if devices operate within the intended range for energy use or if any 'irregularities' in power consumption are present (e.g. airflow blockages that make device fans spin faster to keep the temperatures under control) which could lead to device failure and potential downtime. Additional environmental control can be achieved through connected sensors that monitor humidity levels and temperature.

Infrastructure monitoring and management is another essential aspect when planning data centre infrastructure. With infrastructure monitoring tools such as Automated Infrastructure Management (AIM) systems, the entire network including copper and fibre connections can be monitored and managed with real-time e-mail alerts notifying IT or security staff when unauthorised access occurs to help prevent downtime caused by human error.

Lastly, with a growing demand for computing power, African data centre operators need to ensure they can rapidly expand existing facilities or quickly put new facilities into operation. Modern data centre design approaches that involve the use of pods can accelerate the expansion process. Pods are groups of cabinets that are typically based on capacity, function and/or application. Once defined, they can serve as a template for incremental build-outs of additional pods and, as demand increases, can be easily repeated as a data centre grows.

To ensure business continuity during global events like the Covid-19 pandemic and to progress digital transformation in Africa, businesses must renew their emphasis on data centres. A well-thought-out data centre design will provide reliable network performance, rapid deployment and scalability now and in the years to come.

Mr. Dinesh OP is a Regional Technical Manager (Africa) at The Siemon Company, a leading global network infrastructure specialist for Data Centres, Intelligent Buildings, and LAN.

You Must Protect Your Data And Privacy In The Internet Age

WHEN using the Internet, it is imperative to ensure the security and privacy of all of the user's data. Information on how to do this is provided below.

Securing the wireless network

Wireless devices broadcast via radio waves, which are sent out by a transmitter. This means any receiver within range (and tuned to the transmission frequency) will receive the signal. Thus, when personal information is to be transmitted, it must be guarded against unauthorised access (usually referred to as 'eavesdropping'). There are a number of security/privacy risks inherent in wireless communication, as outlined below:

Risks related to the use of Bluetooth devices

Bluetooth devices communicate using short-range wireless signals and operate on a frequency of between 2.4 GHz and 2.4835 GHz, achieving speeds of up to 1 Mbps. They can be used to link a mobile phone to a headset, a keyboard or a mouse to a computer and a laptop to a printer, among others. The use of Bluetooth technology presents the following security/privacy threats:

- Blue snarfing, which is the unauthorised access to personal data, such as: calendars, contact list, emails, text messages, pictures or videos.
- Blue bugging, which allows an unauthorised person to take control of another person's phone – allowing them to listen in to conversations, make calls and send messages.
- Blue jacking, which is the sending of unsolicited messages via the Bluetooth technology to other Bluetooth-enabled devices.

A subscriber using a mobile phone. (PICTURE COURTESY)

In order to protect themselves against such risks, Bluetooth users are advised to ensure that all such devises are turned off when not in use.

Mobile phones and safety and security

Because they can be used for voice transmission, as wireless modems and as web browsers, mobile phones can be accessed by unauthorised persons to obtain personal data.

Data storage on mobile phones

Most mobile phone users store a wide range of data on their phones, using either the phone's internal or external memory or in the Subscriber Identity Module (SIM) card.

The SIM card is typically used for the storage of contacts and short messages while the memory capacity of the handset is typically used for the storage of personal or other data such as photos, emails and calendar items.

In both cases, unless access to this data is protected by a PIN (Personal Identification Number) or by a security device, which is supplied with some models of mobile-phones, it is easily accessible by unauthorised persons.

Mobile phone data security

There are two main methods of securing data on a mobile phone, namely:

Via the SIM lock

This method requires the user to store data in the SIM card and to use a PIN every time the SIM card is inserted into the mobile phone. PINs are generally 4-digit code numbers, which are known only to the user of the mobile phone. By using this method of data security, the user ensures even if the phone is lost or stolen the data cannot be accessed.

Via the phone lock

Using this data-protection method, the mobile phone is locked and only by the use of specific password can

it be opened for use. When devising passwords users should note that 8-digit codes are more secure than 4-digit codes.

Protecting the mobile phone by means of accessing the IMEI number

Consumers can guarantee the safety and security of their mobile phones by ensuring that they know the IMEI (International Mobile Equipment Identity) number, which is a unique identification code that can be used by the service provider to block the phone against future use (via the SIM card and on any network). It can also be used by the police in the recovery of stolen communication equipment. Consumers are advised to use the IMEI number, which is a powerful deterrent to potential thieves. Should the phone be recovered, the network-provider can also unblock so as to restore the phone to normal use. To access the IMEI number the user should key in *#06# and note down the 15-digit number that appears on the screen.

Wireless Fidelity (Wi-Fi)

Wireless Fidelity (Wi-Fi) is a wireless data network, which allows Wi-Fi-enabled devices (such as PCs or mobile phones) to connect to the Internet – at such time as they are in the vicinity of the wireless data network. Offering low-cost implementation and high-access use, Wi-Fi areas are sometimes termed as 'hotspots' and are typically deployed in public areas – such as airports, universities, bookstores, coffee shops offices and hotels. In the interest of security and safety, users of Wi-Fi are advised to encrypt all data before transmission. Small organisations are also advised to use Wi-Fi protected areas, while larger organiaations are advised to use Virtual Private Networks (VPN).

Securing wireless networks

Any device within a wireless network can serve as an illicit entry point to the entire network if it is not properly protected. It is therefore vital to secure the entire network rather than only secure specific devices. Users wishing to secure their wireless

The usual means by which identity theft is accomplished is by 'phishing', whereby a fraudulent but credible e-mail is sent to the victim phone. (PICTURE COURTESY)

network are advised to: encrypt all data during transmission, use antivirus and anti 'spy ware' software as well as firewalls, turn off identifier broadcasting, change the identifier of the router from the default, change the router pre-set password, allow only specific computers to access the network, turn off the wireless network when it is not in use.

Identity theft

Identity theft is the theft of a person's name, PIN, ID card number, credit card number or other personal data. The usual means by which identity theft is accomplished is by 'phishing', whereby a fraudulent but credible e-mail is sent to the victim – soliciting all such personal data as is required. Once this personal data is obtained, it can be used to access funds, run up accounts or to facilitate broad range of fraudulent practices. There are a number of indications that identity theft has been perpetrated. They include; the appearance of invoices or proof of purchase regarding items that the user did not purchase, call from debt collection agencies relating to the same, apparent redirection of utility bills and other important correspondence and erosion of the user's credit rating. If you become a victim of identity theft, place a fraud alert on your credit

reports, close any accounts that have been accessed, file a police report and notify the relevant authority.

Some common 'spam scams'

The 419: Conmen claiming to be connected with former government officials in 'Nigeria' or another such country and offer to transfer funds to the victim's bank account given that certain fees are paid in advance. Official looking documents may follow but eventually the victim will be asked to send funds to cover such things as; transaction and transfer costs, attorney's fees. Victims are also often asked to send a blank letterhead or bank access codes.

By Editorial Team

KENYA'S first carrier neutral co-location data center has opened its doors to national and international customers. Icolo.io partnered with Siemon to equip the new facility with state-of the-art network infrastructure solutions.

With an approximate population of 180 million people, East Africa has seen tremendous growth in Internet and mobile phone adoption in recent years. This has led to an explosion of digital data and a growing demand for data hosting and co-location data center facilities in the region.

Nairobi-based icolo.io seized this opportunity and in 2015 launched into setting up the first carrier neutral co-location data centre in Kenya.

Icolo.io designs, builds and operates state-of-the art carrier neutral data centres providing co-location services, including power, security, network access, redundancy, rack space and precision cooling to national and international customers.

Located in Miritini, Mombasa, the company's new hyper-connected, Tier III facility, featuring over 550 square metres of IT space and an ability to provide 675KW of IT load to 226 cabinets, was purpose-built for the global co-location market and is set to attract telecom carriers, ISPs, IT, global cloud and content providers, as well as enterprise and financial services institutions.

"For us at icolo.io, this new data centre is a true landmark project," says Ranjith Cherickel, co-founder and CEO at icolo.io. "Not only is it the very first carrier neutral co-location site in Kenya, it also acts as the main gateway to Africa from a connectivity perspective."

The facility sits in close proximity to the landing station for all of the undersea cable operators and the international network hub for Internet traffic in the region, and it has become a core node for all terrestrial networks reaching out via high-capacity fiber routes into the rest of East and Central Africa.

Landmark co-location data centres set to be a new gateway to Africa

To ensure success from cooling to power supply to IT infrastructure, icolo.io had to partner with the best in the industry. The search for a supplier of the physical IT infrastructure components - including data cabling, cabinets and power distribution didn't take long.

"Siemon is one of the strongest networking brands globally and particularly known for high quality, high performance IT infrastructure

> ❝ For us at icolo.io, this new data centre is a true landmark project," says Ranjith Cherickel, co-founder and CEO at icolo.io. "Not only is it the very first carrier neutral co-location site in Kenya, it also acts as the main gateway to Africa from a connectivity perspective. ❞

systems and solutions in East Africa," explains Cherickel.

"Besides the comprehensive solutions set, the key decision-making factor for us to partner with Siemon was the logistical infrastructure that Siemon and distribution partner Mart Networks have in place and the flexibility this provides us."

Having operated in the African market for over two decades, Mart Networks have a strong footprint across East Africa, including warehousing facilities in Nairobi.

Local product availability means that icolo.io can react flexibly to customer demands within the shortest time frame. Best-in-class products delivered straight from the warehouse into icolo.io new facility were data centre cabinets and racks, cold aisle containment, power distribution units and high-performance pre-terminated copper and fiber optic cabling.

Icolo.io selected Siemon's V600 cabinets, which offer a number of customer benefits. As Dinesh OP, technical manager for Africa at Siemon

explains, "The V600 features flexible mounting options to support any range of equipment depths, enhanced side entry for convenient access to installed equipment and high density perforated doors that provide up to 71% perforation exceeding major IT equipment air flow requirements."

With power consumption remaining a significant operational expense in data centres, accounting for 20 to 30 percent of the total cost of ownership, it was in icolo.io's best interest to keep energy costs to a minimum while maximising energy efficiency and Power Usage Effectiveness (PUE).

Siemon's cold aisle containment solution panels can easily be attached to the V600 cabinets to contain cold air for targeted cooling to active equipment, allowing higher temperature return air to improve the efficiency of existing cooling systems and reduce energy costs while preventing over-provisioning of air conditioning units.

The panels also increase capacity by allowing greater heat densities without costly supplemental cooling. A pod of 26 cabinets has been initially deployed and this will grow as tenants move in. For the network cabling infrastructure, icolo.io specified pre-terminated copper and fiber trunking assemblies and modular patch panels.

These pre-terminated solutions, including high performance category 6A F/UTP copper trunks from Siemon's Z-MAX line, plug and play fiber assemblies using OM4 multimode

> Besides the comprehensive solutions set, the key decision-making factor for us to partner with Siemon was the logistical infrastructure that Siemon and distribution partner Mart Networks have in place and the flexibility this provides us."

cable, and as OS2 singlemode cable, are manufactured and tested in a clean factory environment and offer guaranteed performance levels.

Modular patch panels provide maximum flexibility for icolo. io's customers since they can accommodate both singlemode and multimode fiber cassettes, as well as copper connectivity and take up.

"We also valued Siemon's data centre design support as well as the on-site training and installation support they provided," adds Cherickel. "The main cross-connect design in the meet-me rooms where local network carriers bring their fiber via diverse routes into the site are entirely based on recommendations from Siemon and the cross-connect is based upon the Siemon RS rack system with the VCP range of vertical cable managers and modular patch panels." The installation work was carried out by icolo.io's team of experienced installers and the pre-terminated copper and fiber trunks proved to be a real time-saver. Compared to field-terminated links, these trunks can help reduce installation time by up to 75 percent.

After successful completion, Siemon was able to offer a comprehensive warranty covering products, performance and applications assurance. "We are very proud to have partnered with Siemon to develop a truly carrier-neutral data centre in the heart of the African digital economy. Due to the absence of these types of facilities, large international customers have in the past overlooked East Africa in favour of other locations to deploy services.

With our new co-location data centre, we have now changed the landscape, enabling our customers to bring content closer to their users, and Siemon's high-performance infrastructure solutions have been fundamental in achieving this. We are very pleased with the work Siemon has done in helping us to bring high quality and reliable services to our customers," he concludes.

From right Vodacom SA CEO Shameel Joosub, Safaricom CEO Peter Ndegwa and a representative from Sumitomo Corporation sign some documents during the awarding of the telecom licence to Safaricom and partners. (PICTURE COURTESY)

NEW FRONTIERS
Safaricom-led conglomorate gets Ethiopia Telco licence

By Dennis Mbuvi

ON May 21, 2021, as part of efforts to liberalise the economy, the Ethiopian Communications Authority awarded a telecommunications licence to Global Partnership for Ethiopia, a consortium led by Safaricom PLC.

Safaricom commands 55.7 per cent stake in the consortium, which intends to start operations in 2022. In addition to Safaricom, the partnership includes Vodacom Group, Vodafone Group, Sumimoto Corporation, and CDC Group.

The Global Partnership for Ethiopia was created to bring about transformational economic and social impact in the country. The provision of accessible, affordable and high quality mobile and internet connectivity by The Partnership will enable greater social inclusion as millions of more Ethiopians access quality telecom services.

Increased connectivity in Ethiopia will also boost the economy, impacting over 1 million jobs with digital training and skills, and bringing about productivity improvements for countless micro-entrepreneurs and small and medium sized enterprises.

Having set the pace with its contributions to the Kenyan telecommunications, digital and economic landscape, a lot is expected from Safaricom. The team is expected to leverage on its experience in Kenya to achieve even more in Ethiopia within a few years.

Ethiopia is home to over 112 million people, making it the second largest country in Africa by population. It is one of the last countries in the world to introduce competition in the telecom industry, a rigorous process started by the government in 2019 as part of its Economic Reform Agenda, with the support of the International Finance Corporation. The reforms aim to increase jobs, reduce poverty and grow the local economy in an inclusive and sustainable manner.

According to the Digital 2021 Report only about 20% of Ethiopia's population has access to the internet, less than 40% have a mobile phone and only 5.8% use social media.

Safaricom and its partners have a lot of work to do before they roll out in 2022. Speaking at a recent press conference, Safaricom CEO Peter Ndegwa addressed the opportunity in Ethiopia.

"Of course, there are risks that we need to consider as part of the overall investment but we need to look at Ethiopia as a long-term investment. In Ethiopia, we see a huge population, extremely favourable demographics and a country that is keen on advancing. One of the reasons we have structured the investment vehicle the way

> ❝ Of course, there are risks that we need to consider as part of the overall investment but we need to look at Ethiopia as a long-term investment. In Ethiopia, we see a huge population, extremely favourable demographics and a country that is keen on advancing," said Peter. ❞

we have through the Netherlands is it has a Bilateral Investment Treaty with Ethiopia," said Peter.

Safaricom has rich experience and many lessons from Kenya, having steadily risen from being a telecommunications operator into a digital platform. The firm has extended to different industries and sectors creating an extensive business ecosystem. A look at its transformative story in Kenya gives indication of what might be awaiting Ethiopia in the years to come.

The National ICT Policy 2019 indicates that by the year 2030, Kenya will have an estimated population of 66 million, with over 200 million devices and sensors connected to the internet. All aspects of our lives including money, security, governance, agriculture, tourism, education and health will be fully and seamlessly integrated into the digital economy.

Nearly a decade after its launch, M-PESA has drastically transformed the daily lives of its customers as well as Kenya's economic landscape. It has brought changes in the banking, agricultural, health and telecommunications landscape, boosted development of e-commerce and facilitated operations for thousands of small businesses, online and offline.

On its own, e-commerce has boosted self-employment and convenience with consumers shopping from the comfort of their homes; cutting down on transport, saving on time and over time, building a business network and creating trust.

Mobile money has also enabled access to credit even to low-income earners through introduction of loan apps accessible to any mobile phone user. Aside from credit access, it has also revolutionized banks' operations with card-less ATM withdrawals becoming the norm. Security risks have significantly reduced with increasing adoption of cashless payments.

With DigiFarm another revolutionary service from Safaricom, farmers can now access convenient, one-stop access to a variety of services including discounted rates and advice on inputs.

Equally, Safaricom's M-Tiba partnership with PharmAccess and CarePay empowers Kenyans who could previously not afford consultancy fees

President Uhuru Kenyatta is welcomed by Ethiopian Prime Minister Abiy Ahmed. (PICTURE COURTESY).

for health-related issues to save and access affordable diagnosis and treatment. Internationally, M-PESA has become a role model for mobile financial services and payment platforms as well as inclusive business practices.

In the excitement of current and trending technology in Kenya, and the opportunity in Ethiopia, it is often easy to forget one of the most crucial players in the telecommunications world: engineers. They are mostly forgotten because they are mostly the boots on the ground.

For us to talk on phone, the microphones in our mobile phones turn our voices into electrical signals. Mi-

> In Ethiopia, we see a huge population, extremely favourable demographics and a country that is keen on advancing. One of the reasons we have structured the investment vehicle the way we have through the Netherlands is it has a Bilateral Investment Treaty with Ethiopia," said Peter.

crochips in the phones modulate (or vary) the radio wave using the electrical signal.

The radio wave then travels through the air to a nearby cell tower; which sends your voice to the person on the other end of the line and the process is reversed so that the person on the other end can hear your voice.

Looking at it that way, the process seems complicated. However, engineers so passionately enjoy playing their role in all this so much that they are responsible for telecommunications systems operations.

From the person who fixes the fixed-line and mobile telephone networks, to the professionals who are responsible for fibre optic cabling and the settings of the digital satellite systems to the man or woman who installs and repairs new aerial rigging and related equipment, we rely on engineers for the whole existence of our company.

Safaricom will employ a lot of them – from Ethiopia and Kenya to install mobile and static antennae on buildings or masts and to set up the network system from 2G to 5G, for stronger connectivity, among other roles. All the engineers who are interested should be on the lookout for advertisements as time goes by.

Sprintex Engineering excels in motor rewinding, mechanical works

By Editorial Team

ENGINEERING repair and motor rewinding firm Sprintex Engineering Services Limited specializing in overhauling and rewinding all types of electric motors both AC/DC, generators, transformers, stepper motors, servo motors, lift motors, and welding machines, low, medium & HT motors now says it has gone international after attracting wide interest from clients outside Kenya in the last few years. The Kang'undo Road based engineering professionals provide complete range of mechanical work including gear box repairs, pump repairs, bearing journals, housing recovery, balancing and vibration analysis and troubleshooting both

Dedicated staff at work. Below: Eng. George Okoth. (PICTURE COURTESY).

in house and on site. "We offer complete refurbishment of electric motors, generators, semi hemertic compressors, transformers, welding machines, supply of carbon brushes & brush holders. Our dedication is

professional competence, optimized processes and intense commitment resulting in the highest product quality, hence, ensuring international consistent quality standards," says Eng. George Okoth, MD Sprintex Engineering Limited.

According to Springtex Engineering, services they render conform with IEC, EASA and AEMT standards. "We carry out complete diagnosis of the electrical equipment and repair them as per the laid down procedures. Their quotations are itemized and accompanied with photos showing the failures and a comprehensive technical analysis detailing the cause of motor failure, advising customers on corrective measures to prevent future reoccurrence. All repaired electric machines are subjected to thorough instrument and electrical tests before dispatch, as per IEC, EASA and AEMT standards and quality test report provided on request. We have rigorous testing control system management for all our workmanship," quips the MD.

Main Rotor and Rotating Exciter Assembly

Turbine Generator

SPRINTEX
Engineering Services Ltd

COMPANY *PROFILE*
Electric Motor Rewinding Specialist

In association with

AEMT *The Association of* Electrical & Mechanical Traders

MEMBER **EASA** The Electro-Mechanical Authority

md@sprintexengineering.com

KONZA TECHNOPOLIS PROJECT
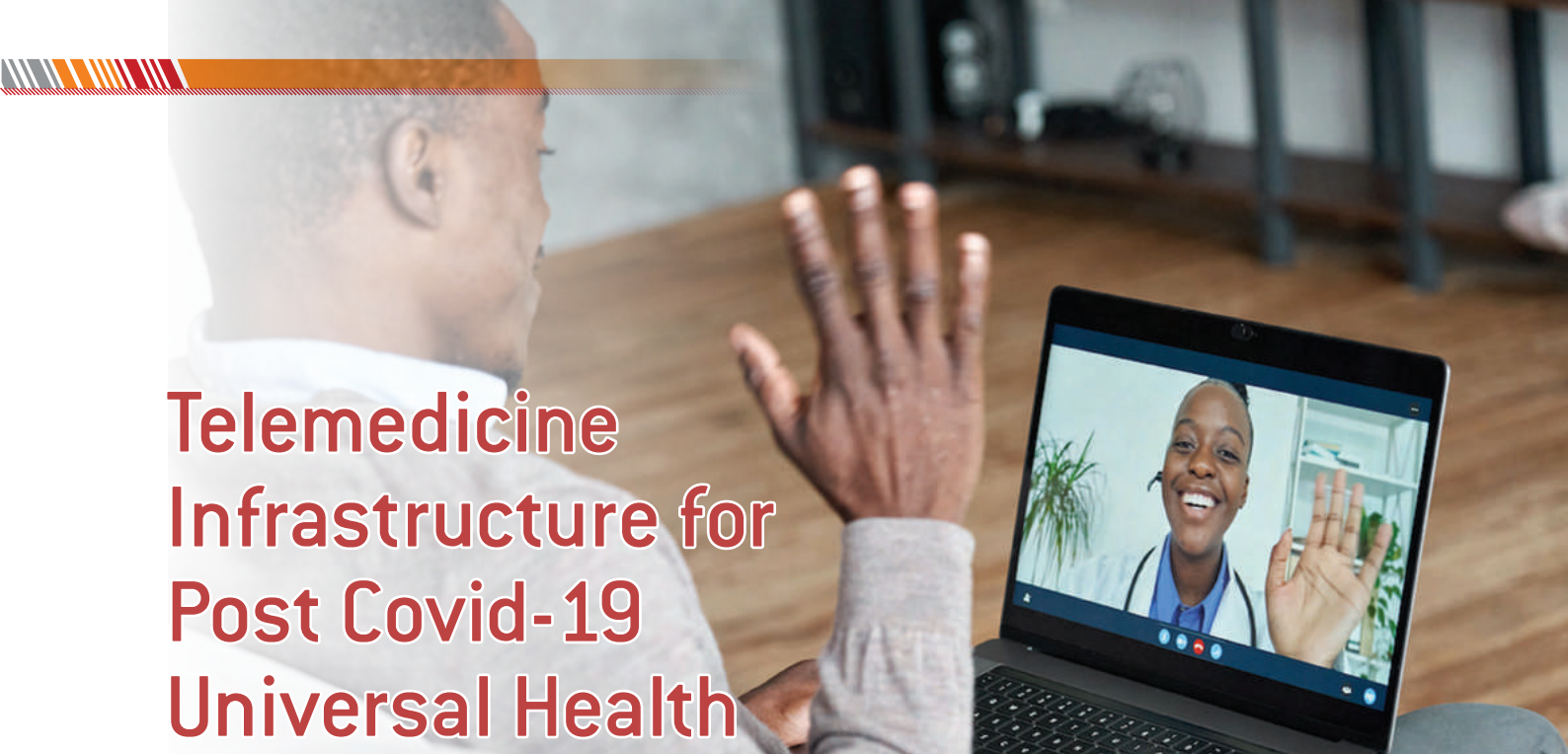
New Smart City Konza (Kenya): Infrastructure Design and Construction

Telemedicine Infrastructure for Post Covid-19 Universal Health

By Eng. Eric Wekesa Wanjala

1.0 Introduction

ACCORDING to (WHO Coronavirus Disease (COVID-19) Dashboard, 2020), over 38 Million people are infected with COVID-19 with more than 1 million deaths. Kenya has recorded 41,939 confirmed cases and 787 deaths. COVID-19 is a highly contagious disease that has endangered all populations. According to (Over 10 000 health workers in Africa infected with COVID-19, n.d.), 10,000 health workers infested with COVID-19 in Africa. It is estimated that 10% of all cases of COVID-19 infection are among health workers.

Exposure or direct contact with infected patients who are asymptomatic identified as one of the leading causes of COVID-19 infections among health workers. This occurs when patients visit the facility for other Medicare needs. Other factors are inadequate personal protective equipment, weak infection prevention and control measures, inadequate briefing of health workers prior to dispensation of Medicare and fatigue due to workload.

According to World Health Organization (WHO) assessment of clinics and hospitals, only 16% of approximately 30,000 facilities surveyed scored above 75% for prevention of infections within health facilities. A paltry 7.8% i.e. 2,213 of health facilities had isolation capacities and 1/3 had capabilities triage. Largely, most hospitals lack the desired infrastructure for implementation of infection prevention and overcrowding.

According to the Ministry of Health (MoH) Kenya, projections of general practitioners, Clinical Officers and Nurses 2013-2030, Kenya needs 136,905 active health workers by the year 2030. Implementation of urgent interventions is key to protect Health workers from COVID-19 and ensure realization of the MOH 2030 staff projections.

Adoption of telemedicine/telehealth minimizes need for physical interaction between health workers and populations thereby greatly reducing risk of infection.

Further incidences of burnout, fatigue and failure to adhere to procedures due to high work volume in emergencies becomes less.

Consideration for a model to develop a National Health Communication Infrastructure based on deployment of fiber optic technology in electricity supply infrastructure to connect all health facilities is now. The model will provide high capacity dark fibers for point to point and point to multipoint connections, faster rollout times; least cost of ownership (TCO) model for future proof broadband infrastructure, environmentally compliant broadband deployment option, highly secure, and flexible.

2.0 TELEMEDICINE

Telemedicine is the use of ICT to provide clinical services whenever health workers and patients are in separate locations. It is a means by which health workers extend practice of medicine outside the facility to distant locations.

2.1 TYPES OF SERVICES

Telemedicine/Telehealth needed for the following situations:

- Specialist referral services – Diagnosis support to a general practitioner by an expert or specialist. The specialist views the patient's data or images using ICT tools comprising video conferencing, still images and consultation /interrogation.
- Direct patient care – Remote diagnosis, treatment and or prescription done with a health professional based on a patient's medical data, audio, and video recordings. The patient may be at home, remote clinic, or remote clinic etc.
- Remote patient monitoring – Data collection done remotely using devices such as telemetry to collect important health data i.e. blood pressure, weight, etc.
- Medical education and mentoring – comprise medical support by a professional to another professional performing a medical procedure.

- Consumer medical and health information – online platforms on Internet used for access to specialized medical procedures and peer to peer support.

2.2 SERVICES OFFERED BY TELEMEDICINE

Figure 1: Service Model for Telemedicine

Source: Author, 2020

2.3 TYPICAL TELEMEDICINE OUTCOMES

Telemedicine is used in post communication of the following outcomes.

Table 1 Requirements for Telemedicine Application

USE	MEANS	RESULTS
1. Radiology	Tele radiology	Images, X-rays etc.
2. Pathology	Tele pathology	Microscopic images
3. Dermatology	Tele dermatology	Skin images
4. Psychiatry	Telepsychiatry Telephony	and video

3.0 TELEHEALTH

Telehealth model operates where the health worker and the patient are at a distance. Services offered are diagnosis, treatment, research, consumer outreach, nursing call centers, education, and exchange of information.

Telehealth enhances access to affordable Medicare hence realization of the universal health coverage objectives mainly in the rural areas and among elderly populations.

3.1 A CASE STUDY

According to WHO sponsored global health survey of 2015, over 50% of surveyed countries confirmed existence of telehealth in their eHealth policy.

Teleradiology was confirmed the most widely used telehealth solution. Others were Teledermatology, telepathology, telepsychiatry and remote patient monitoring. *Below is graph 1.*

Graph1: Percentage of countries reporting an evaluation of a government-sponsored telehealth program, from the third global health survey conducted in 2015
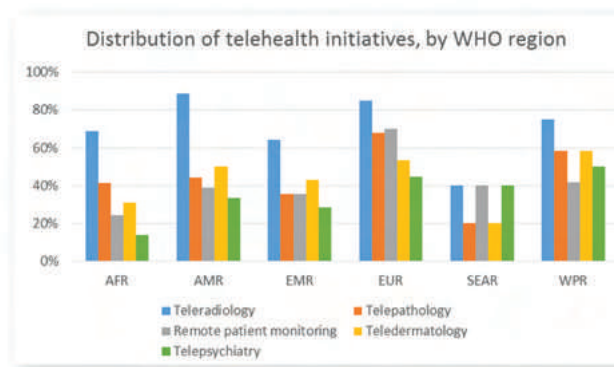
Source: WHO

4.0 ACCESS TO ELECTRICITY

According to the World Bank, access to electricity in Kenya grew to a high of 75% in 2018. This implies significant infrastructure rollout and coverage countrywide. Access to electricity for health care facilities increased by 1.5% annually in Kenya between 2004 and 2010 to a high of 98% access see table 2 below. Kenya electricity access to the population grew to approximately 74% at 2018 see graph 2 on electricity access in Kenya.

Table 2: Trends in Electricity Access in Health Care Facilities, by Facility Type, Kenya, and Rwanda

Country and Year	All facilities Percentage Percentage Change		Hospitals Only Annual Percentage Percentage	Annual Change	Other facilities Besides Hospitals Annual Percentage Percentage	
Kenya 2004 2010	65 74	1.5	98 98	0	63 72	1.5
Rwanda 2001 2007	58 82	4	92 98	1	52 81	5

Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4 168575/

Graph 2: Access to Electricity in Kenya as a Percentage (%) of the Population
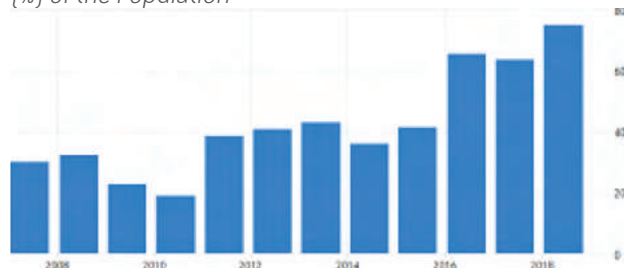
Source: World bank tradingeconomics.com

According to the data above, the central power grid covers over 90% of health facilities in Kenya. To re-use this grid infrastructure by deploying fiber optic cable provides an unrivalled opportunity for realization of a private high-speed broadband infrastructure interconnecting all grid connected health facilities.

5.0 HEALTH SECTOR INDICATORS

According to table 3 below, Kenya had a total of 7795 health facilities in 2017 of which 16 were national hospitals. Government owned health facilities were 3956.

Dispensaries held the largest composition at 45.8% while maternity and nursing homes held the least composition at 2.5% see table 4.

Table 3: Distribution of Health Facilities by ownership and Level of Care

Key Health infrastructure	Community	Primary Care Facilities					County Hospitals	National Hospitals	Total
		Dispensaries	Health Centres	Medical Clinics	Maternity Homes	Nursing Homes			
Government		2954	682	35	1	0	268	16	3856
Faith Based		561	166	61	3	11	79		881
NGO'S		200	24	73	4	5			306
Private		196	50	2,098	32	150	116		2652
Total		3911	932	2267	40	166	463		7795

Source: KHSSP 2013-2017

Table 4: Distribution of health Facilities

Type	Number of facilities	Percent
Hospital	507	5.5
Health Center	1,012	10.9
Maternity and Nursing Home	232	2.5
Medical Clinic	2,943	31.8
Dispensary	4,239	45.8
Other	316	3.4
Total	9249	100

Source: Master Facility List/Health Information System (MFL/HIS)

According to the Economic Survey 2013 see table 5 below, dentistry had the least number of workers at 985 while registered nurses were the leading in composition with approximately 35,148 workers.

Table 5: Registered Health Personnel of Essential Cadre

Registered Health Personel	2008	2009	2010	2011	2012
Doctor's	6623	6800	7129	7549	8092
Dentists	974	859	898	930	985
Pharmacists	2860	2821	3097	2432	2532
Pharmceutical Technologists	1815	1950	2233	4436	5236
BSC Nursing	657	863	988	1173	1532
Registered	14073	26988	29678	31719	35148
Enrolled Nurses	31915	34032	34282	31719	35148
Clinical Officers	5035	7816	8598	9793	11185
Public Health Officers	6960	7192	7429	7584	8069
Public Health Technicians	5969	5969	5969	5969	5969
Total	76881	95390	100301	95960	105369

Source: Economic Survey, 2013 According to the MOH projections in table 5 below, projections for growth in health workers is bound to grow to 315,557 workers by 2030. To prevent further loss of medical workers in the line of duty during epidemics urgent adoption of "RIGHT" technology is necessary. There is every plea to ensure not only safe distancing but also limitation of contact within health facility premises between frontline health workers and patients with highly contagious diseases like COVID-19, Ebola and SARS etc.

Table 6: Projections of general practitioners, Clinical Officers and Nurses 2013-2030

Cadre		2013	2015	2020	2025	2030
General Practitioners	Active	3,443	4,148	6,051	8,117	10,310
	Norm	7,551	7,939	9,038	10,275	11,682
	Gap	4,198	3,801	2,987	2,157	1,372
Clinical Officers	Active	7,043	9,656	16,021	22,658	29,438
	Norm	15,447	16,261	18,488	21,019	23,898
	Gap	8,404	6,696	2,466	-1,638	-5,541
Nurses	Active	34,381	38,911	54,564	73,666	97,157
	Norm	75,407	79,379	90,249	102,607	116,658
	Gap	41,026	40,468	35,685	28,941	19,501

Source: MOH, USAID and Funzo Kenya, September 24, 2013

6.0 THE CONCEPT

The need to provide an ALWAYS ON broadband connectivity to every health facility is more priority now with COVID-19 epidemic than ever before. Telemedicine and telehealth service providers are present in most health sectors, yet the impact is still low. The high cost of infrastructure ownership and bandwidth is a major limitation to widespread adoption of telemedicine and telehealth.

Hospitals, clinics, and dispensary have had to lease or procure broadband services at prevailing market prices. The high prices and ever-increasing demand for more bandwidth has limited adoption of new ICT technologies in health services. This limitation can only be overcome through facilitation of broadband connectivity through a single National Health Communication Infrastructure (NHCI).

This broadband infrastructure must be high capacity technology with low total cost of ownership. The infrastructure must allow open access and "ALWAYS ON" model 27/4 to ensure hospitals and health workers benefit from widespread adoption of telemedicine and telehealth. The solution is transformation of the supply grid to provide access to electricity and broadband connectivity. The concept provides for deployment of fiber optic cable infrastructure onto existing and new electricity grid to provide access to high speed broadband/Internet infrastructure.

All grid connected health facilities are expected to have access to high speed broadband network via the electricity supply grid. The aerial fiber optic infrastructure runs to interconnect all designate health facilities. Transmission, distribution, and last mile segments of the grid are integrated with fiber optic cable. This model provides open access network where available dark fibers are assigned to specific services. The electricity utility provider assigns some dark fiber cores for distribution automation of the power grid to enhance quality of services and availability. Surplus dark fiber(s) are assigned/leased for use under the proposed National Health Communication Infrastructure. Under this concept, Level 6 Referral Hospitals, Level 5, Level 4, Level 3, Level 2, and Level 1 are interconnected into one network.

7.0 A CASE FOR KENYA POWER CO.PLC

The company, licensed distributor of electricity owns

and operates an extensive grid comprising transmission, distribution and last mile as detailed in table 6 and 7 below.

Table 6: Growth of Transmission, Distribution and Last mile Network in Kenya Power and Lighting Co. Plc

VOLTAGE	2013/14	2014/15	2015/16	2016/17	2017/18
400 kV	-	-	-	96.8	1,244.4
220 kV	1,248	1,352	1,452	1,555	1,686
132 kV	2,797	2,824	3,087	3,208	3,322
66 kV	928	952	977	1,000	1,168
33 kV	20,778	21,370	27,497	30,846	34,508
11 kV	30,860	32,823	35,383	37,234	38,968
Total HV and MV	56,611	59,322	68,396	73,940	80,897
415/240V or 433/250V	-	-	110,778	139,642	152,803
TOTAL	56,611	59,322	179,174	213,582	233,700
% INCREASE P.A.	14.0%	4.8%	15.3%	19.2%	9.4%

Source: www.kplc.co.ke - Annual Report and Financial Statement Period 2017/2018

Table 7: Transformers in Service installed capacity

Transmission Substations					
132/220 and 220/132kV	835	1,266	1,266	1,266	1,350
220/66kV	450	450	720	720	1,111
220/33 kV	46	69	69	69	69
132/66kV	360	420	420	600	600
132/33kV	916	939	1,229	1,721	1,721
132/11kV	-	-	-	-	15
TOTAL	2,607	3,144	3,704	4,376	4,866
Distribution Substations					
66/11kV	1,838	2,139	2,345	2,465	2,670
66/33kV	138	138	138	138	161
40/11kV	-	-	-	-	-
33/11kV	1,200	1,295	1,365	1,453	1,541
TOTAL	3,176	3,572	3,848	4,056	4,372
Distribution Transformers					
11/0.415kV and 33/0.415kV	6,317	6,384	7,088	7,276	7,606

KPLC Co. Plc has deployed over an estimated 4700 km of dark fiber optic infrastructure on the power grid. Dark fibers are used internally for supervisory control and data acquisition network (SCADA), billing and data networks. Surplus fiber optic capacity is however leased for revenue generation.

Table 8 below show the different technologies in the power grid.

Table 8: Optical Technology in Power Grid

Power-Grid	Segment Fiber	Voltage Level (V) optic Technology
1. Transmission	132 kV & above	Optical Ground Wire -OPGW
2. Distribution	66kV, 33kV, 11kV	All Dielectric Self Support - ADSS
3. Last mile	415V & 240V	ADSS

Source: Author 2020

With a countrywide grid connectivity, refer table 6 and 7 above, KPLC. Co. Plc dark fiber network can be extended to reach all grid connected health facilities countrywide. Aerial deployments are cost effective (3 times cheaper than underground option), faster, and environmentally friendly. The model offers least TCO model and provides an open access where dark fibers are available for dedicated applications end to end.

All grid connected health facilities, just like other customers of electricity are supplied by specific distribution transformer. See below figure 2.

Aerial deployment of fiber optic cables run end to end from transmission substations to distribution substations, transformers, and fiber access terminals FAT/Access Terminal Boxes-ATB in the premises under emerging fiber to the home FTTH technologies.

Figure 2: Proposed Fiber Optic Connectivity for Universal National Health Communication Infrastructure – Passive Layer

Fibre Cable

Transmission Substation 132/220 KV, Colocation, Fiber cable - OPGW

Power Cable

Transmission Line 132/220 KV, Fiber cable - OPGW

Distribution substation 66/33/11 KV, Colocation, Fiber cable – OPGW & ADSS

Distribution Line 66/33/11 KV, Fiber cable – OPGW & ADSS
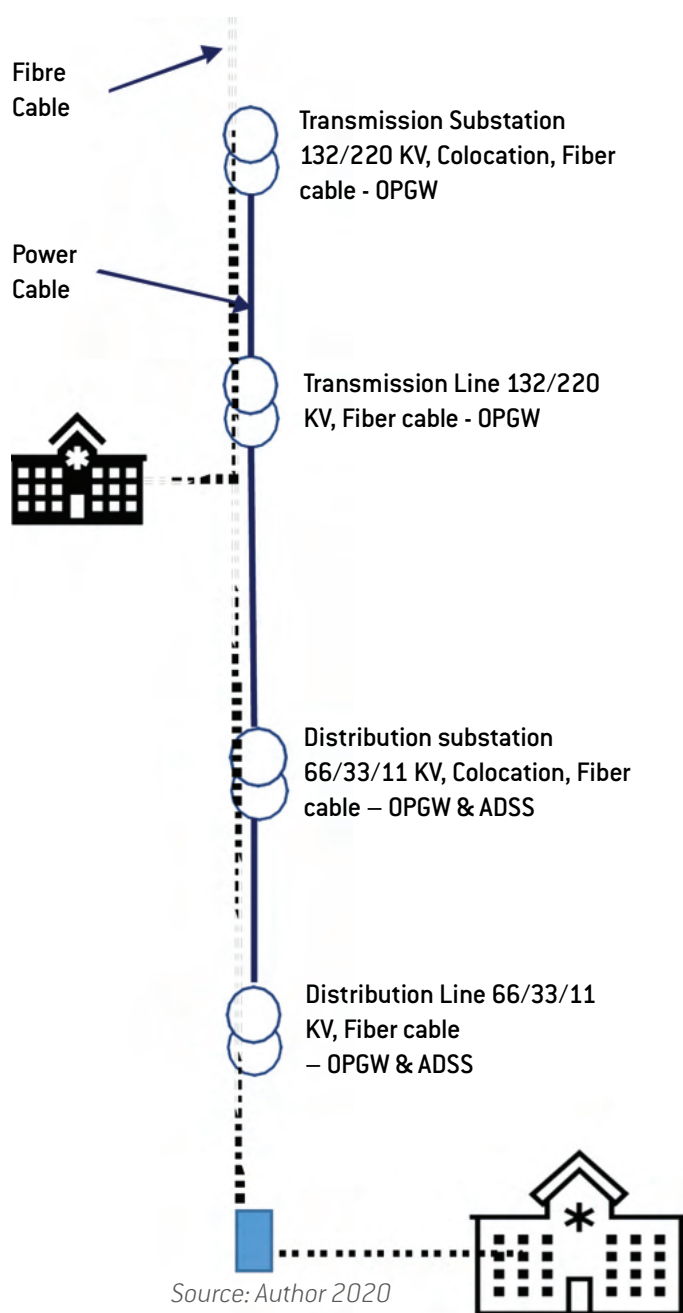
Source: Author 2020
Last mile 415/240V Fibre drop cable
To Dispensary, Clinic, Community Health Centre etc

There are intermediary points for jointing and access. The utility power station control facilities provide space for colocation of terminal equipment. These may be access terminal boxes (ATB), optical distribution frames (ODF), patch panels or aerial jointing /splice boxes.

Scalable broadband links are implementable depending on capacity of the terminal equipment. All targeted hospitals, medical and research Distribution fibre to National Referral, Large Private, County, Sub County hospitals institutions within a direct distance of 80 Km or less interconnect directly without additional amplification separately.

Health facilities over 100Km spans require separate amplification or boost. Fiber strand counts of 12, 24, 48, 96, 144, 244 etc. available. Assigning services can dedicated per core strand /pair end to end. Fiber connects and integrates all other wireline and wireless technologies inter-site. This enables either.

- Fiber to fiber connections within the hospital's functions /areas.
- Fiber to enhanced Digital subscriber DSL technologies on copper.
- Fiber to Wireless Fidelity Wi-Fi technologies
- Fiber to WiMAX
- Fiber to mobile GSM (3G, 4G, 5G) etc. within health facility premises.

7.1 STANDARDS AND INTERFACES

Fiber optic technology has various standards. IEC 60793 and IEC 60794 fiber optic cable standards define specifications and types of cables G 652 and G652D used in both OPGW and ADSS applications.

Teleradiology), generate different traffic formats ranging from audio, graphic, video, pictorials etc.

7.2 BIG DATA, ANALYTICS (AI) AND IoT

Medicare is known as the most confidential in data generation, security, and analytics. This is because the data requires high security and integrity measures as it determines health of the people. The success of modern medical care and research is largely dependent on in-depth application of data analytics and or artificial intelligence (AI). Big data forms the basis for the collection of data. Data security, credibility and privacy is therefore principal in the strategy for telemedicine or telehealth. Fiber optic technology is the only technology with such high intrusion protection at the physical layer due to electromagnetic immunity.

This concept provides for implementation of IoT or Internet of medical things (IoMT) ready infrastructure. IoT /IoMT devices connect with reliable and high capacity fiber optic technology that supports integration of all other wireless and wireline technologies.

8.0 DESIGN CONSIDERATIONS

The point-to-point links designed to ensure optimal operation. Assuming a point to point link between any two (2) hospitals, the terminal equipment must be capable to overcome the link loss budget.

Calculation

Atypical loss profile for a dark fiber link is shown in figure below.

Figure 3 *Loss Profile for a Fiber Optic Link*
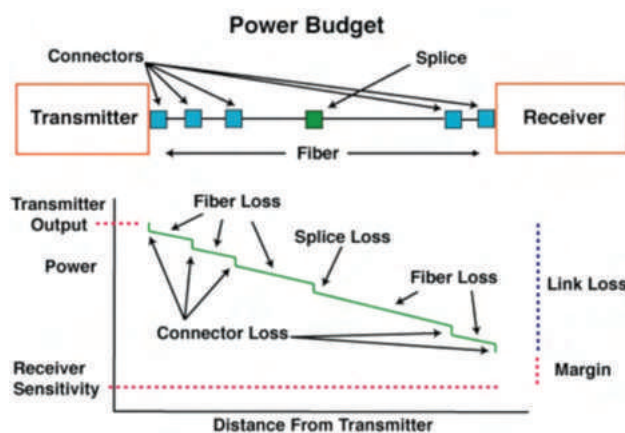
Source: *(The FOA Reference for Fiber Optics - Fiber Optic Network Design, n.d.)*

Transmit Equipment Power (dB) – Link Loss Budget > Receiver Sensitivity (dBm)

Cable Plant Link Loss Budget Analysis

Refer table 9,10,11,12,13, and 14 for end to end design steps.

Step 1. *Calculate fiber loss at the operating wavelengths (850nm,1310nm,155onm)*

	Item	
1.	Fiber cable length (km)	K
2.	Fiber type	SINGLE/Multimode
3.	Wavelength	W
4.	Fiber Attenuation	A
	Total Fiber Loss (dB)	=(A*A)

Table 9: *Fiber Loss*

Source: Author,2020

Step 2. Connector Loss Table 10: Connector Loss

	Item	
1.	Connector Loss (dB)	K
2.	Fiber type	SINGLE/Multimode
3.	Wavelength	W
4.	Fiber Attenuation	A
	Total Fiber Loss (dB)	=(K*A)

Source: *Author,2020*

Step 3. *Splice Loss*

There two (2) types of splices namely fusion and mechanical. Splices on multimode fibers have an average loss of 0.3 dB (EIA/TIA 568 standard) and fusion splices on single mode are 0.05 dB.

Table 11: Calculation of Splice Loss

	Item	
1.	Splice Loss (dB)	X
2.	No Splices	Y
3.	Total Splice Loss (dB)	=(X*Y)

Source: Author, 2020

Step 4. *Total Cable Plant Loss*

	Item	
1.	Wavelength (nm)	V
2.	Total Fiber loss (dB)	W
3.	Total Connector Loss (bD)	X
4.	Total Splice Loss	Y
5.	Other (dB)	Z
	Total	**W+X+Y+Z**

Table 12: *Calculation of Total Cable Plant Loss*

Source: Author, 2020 Step 5 Equipment Loss Budget

	Item	
1.	Operating Wavelength (nm)	V
2.	Fiber Type	
3.	Receiver Sensitivity (bBm) required BER	W
4.	Average Transmitter Output (dBn)	X
5.	Dynamic Range (dB)	X-W
6.	Recommended Excess Margin (dB)	

This is the difference between the receiver (Rx) sensitivity and the output of the source (transmitter Tx) into the fiber

Table 13: *Active Component*

	Item	
1.	Splice loss(dB)	X
2.	No of SplicesY	
3.	Total Splices loss (dB)	(X*Y)

Source: *Author, 2020*

Step 6. *Loss Margin Calculation*

It is expected that the link loss margin be greater than 3 dB as a general principle. This compensates for eventual link degradation and splicing.

Table 14: Link Loss Margin

Source: Author, 2020

Link Loss Budget (dB) = {(Average Loss (dB) per Km * Link Distance (kM) + Splice loss * No. of. Splices (dB) + Connector Loss(dB) * No. of Connectors + safety margin}…………………………………………… 1

9.0 RECOMMENDATION

1. For the success of Universal Health obligation and SDG 3, post COVID-19 period there must be realization of remote healthcare support. Crowding, asymptomatic cases, direct contact/interaction etc. has compounded and exposed frontline health workers and mounting casualties are evidence enough. Extension of utility fiber optic on electricity grid to offer broadband connectivity to all grid connected health facilities is clear. Adopt Telemedicine and telehealth across all the six (6) levels of healthcare structure in Kenya. This fiber network can provide redundant capacity where there are existing alternatives.

2. Development of policy guidelines to ensure all facilities that are grid connected enjoy full unlimited "Always ON" model 24/7 connectivity to realize proper safeguard to frontline health workers against pandemics like the COVID-19.

3. Ministry of Health MoH and partners to engage with the utility companies to advance and facilitate Proof of Concept – PoC for dark fiber extensions and lit services level implementation to provide reassurance of all facets of the concept.

4. Phased implementation of the proposed National Health Communication Infrastructure "Passive Layer". It is desirable to start with Layer 6, Layer 5 and layer 4 connectivity where congestion, crowding and need for telemedicine and telehealth is highest. Ref Appendix 1 for a proposed passive architecture.

5. Formation of Kenya Telemedicine Association KETA for advancing the understanding, interaction and development of telemedicine and telehealth in Kenya.

10. CONCLUSION

Over 10,000 healthcare infected with COVID-19 in Africa. According to Pan American Health Organization 570,000 health workers infected in America and 2,500 dead. These are catastrophic impacts where safe distance, wearing protective gears is commendable but require further intervention in health facility management for frontline workers. Congestion and or overcrowding in health facilities compounded by asymptomatic cases have exposed healthcare personnel more. A sure way of the limiting this is urgent implementation of the fiber to healthcare institutions using existing utility grid connections. This provides an open access optical network where any service provider to provide affordable services can utilize the dark fibers. The cost in US dollar / Megabit for the competitive market are high for dedicated requirements of telemedicine and telehealth. Refer appendix 2 for prevailing market rates. The cost for 1Gbps would be very high. Current mobile broadband is effective and adequate for short intervals of communication. It is bandwidth limited and costly for higher capacities needed for ALWAYS ON, 24/7 model needed for telemedicine and telehealth respectively. This passive layer network shall provide the much-needed connectivity between higher-level national referral, large private, county, and sub- county hospitals,

dispensaries, clinics, and community health facilities into one network. This shall provide connectivity for telemedicine and telehealth services and serve as an Internet of Things (IoT) ready infrastructure. The same shall extend connectivity to data centers for warehousing and analytics.

NATIONAL REFERRAL & LARGE PRIVATE, i.e. KNH, MTRH, MATHARE
Min Link Speeds > or = 1Gbps (1,000 Mbps), Team of Minimum Health Workers over 500 per facility. Application: Telehealth and Telemedicine - Hospital Management, Internet-Web browsing, email communication etc., Access to Electronic Health Records (EHR), high-quality video consultations, Closed Circuit Television surveillance (CCTV), Real-time image transfer, Remote monitoring, HD video consultations, Integration of other wireless and wireline technologies within facility i.e. WiMAX, DSL, Wi-Fi Fiber, GSM etc.

COUNTY REFERRAL & LARGE PRIVATE — Nairobi, Aga-Khan, MP-Shah, Kakamega Etc. Min Link Speeds > or = 1Gbps (1,000 Mbps), Est Team of health workers between > 25. Application: Telehealth and Telemedicine -Hospital management, email communication, web browsing etc., Access to Electronic Health Records (EHR), high-quality video consultations, Real- time image transfer, Remote monitoring, HD video consultations, CCTV surveillance, Integration of other wireless and wireline technologies i.e. WiMAX, DSL, Wi-Fi Fiber, GSM etc.

SUB-COUNTY HOSPITALS AND MEDIUM-SIZED PRIVATE HOSPITALS; Min Link Speeds > or = 100Mbps, Est team of health workers between 10-50. Application: Telehealth and Telemedicine-Hospital Management, email communication, web browsing etc., Access to Electronic Health Records (EHR), high-quality video consultations, Real-time image transfer, Remote monitoring, HD video consultations, CCTV Surveillance, Integration of other wireless and wireline technologies i.e. WiMAX, DSL, Wi-Fi Fiber, GSM etc.

HEALTH CENTRES AND MATERNITY AND NURSING HOMES.
Min Link Speeds 25 - 100Mbps., Est team of health workers between 2-25. Application: Telehealth and Telemedicine, email communication, web browsing etc., Access to electronic health records (EHR), high-quality video consultations, Real-time image transfer, Remote monitoring, HD video consultations, Integration of other wireless and wireline technologies i.e. WiMAX, DSL, Wi- Fi Fiber, GSM etc.

DISPENSARIES AND CLINICS.
Min Link Speeds 10 - 25Mbps., Est team of health workers between 1-10
Application: Telehealth and Telemedicine, Email communication, Internet / web browsing, Access to electronic health records (EHR), Supports practice management functions, Instantaneous use of EHR and high-quality video consultations, CCTV Surveillance, Non real-time image downloads, Remote Monitoring

COMMUNITY SERVICES.
Min Link Speeds 4 — 10 Mbps., Est team of health workers between 1 — 10 Application: Telehealth and Telemedicine: Supports practice management functions, email, Internet/web browsing, Concurrent use of Electronic Health Record (EHR), high-quality video consultations, non-real-time image downloads, Remote monitoring, CCTV surveillance etc.

Source: Author, 2020

Appendix 2: Proposed Layer 1 Passive Network for National Health Communication Infrastructure NHCI
ppendix 2: Typical Bandwidth Prices in the Telecom Market

1. Company 1.

Source: https://isp.today/en/o/Zuku-Fiber

Name	Download	Upload	Type	Price	Payments
Fiber	50 Mbit/s	512 kbt/s	Fiber to the home	$96,61	Monthly
Fiber	29Mbit/s	512 kbit/s	Fiber to the home	$53,15	Monthly
Fiber	19 Mbit/s	512 kbit/s	Fiber to the home	$44,16	Monthly
Fiber	10 Mbit/s	512 kbits	Fibrer to the home	$28,98	Monthly

2. Company 2.

Name	Download	Upload	Type	Price USD	
Fiber	1-50 Mbit/s	512 kbt/s	Fiber to the home	$28,98 to 96,61	
Faiba Residential	2-20 Mbit/s	5-20 kbit/s	Fiber to the home	$48,33 to 193,33	
Faiba Business	3-12 Mbit/s	3-12 kbit/s	Fiber to the home	$96,66 to 289,97	

3. Company 3.

Source: https://isp.today/en/o/Monthly-Data-Bundles

Name	Download	Upload	Type	Price	Payments	FAP
Monthly Data Bundles	4.8 Mbit/s	1.1 kbt/s	Mobile broadband	$2,42	monthly	350MB
Monthly Data Bundles	4.8 Mbit/s	1.1 kbt/s	Mobile broadband	$4,33	monthly	1GB
Monthly Data Bundles	4.8 Mbit/s	1.1 kbt/s	Mobile broadband	$9,66	monthly	3GB
Monthly Data Bundles	4.8 Mbit/s	1.1 kbt/s	Mobile broadband	$19,32	monthly	7.5GB
Monthly Data Bundles	4.8 Mbit/s	1.1 kbt/s	Mobile broadband	28,99	monthly	12GB

By Eng. Eric Wekesa Wanjala, MIEK, PE, CFOSD/H, B. TECH

The challenges brought about by IoT revolution

By Prof. Marcel O. Odhiambo

1.0 Introduction

THE Internet of Things (IoT) revolution is positively impacting a variety of academic and industrial disciplines. With the world population growing at an alarming rate and expected to hit 8.5 billion by 2030, it is logical to embed IoT technologies in agricultural activities for agricultural yields to match the growing population. Environmental parameters can be controlled in smart greenhouses by the utilisation of smart sensors that send information to cloud servers for further processing.

Modern healthcare systems have incorporated IoT technologies to provide more personalised healthcare systems that enable the remote diagnosis and treatment of patients. In a bid to tackle the health challenges brought about by COVID-19 pandemic, several countries have utilised IoT technologies in the early diagnosis of COVID- 19 cases. IoT technologies are being used in the monitoring of patients round the clock to keep the disease under control. South Korea has been very successful in this regard.

IoT technologies are being used in the re-engineering of a variety of products resulting in better performances, reduced costs and improved customer experiences. Since IoT technologies reduce human-to-computer or human-to-human interactions, mistakes can be minimised. IoT technologies enable equipment to work 24 hours with no need for OFF-days as required by people, thereby increasing productivity whilst reducing costs in the process.

With the population of cities across the globe increasing exponentially, the responsible authorities have turned to IoT to convert their cities into smart cities that can intelligently deal with the consequences of overpopulation.

IoT technologies enable the establishment of environmentally-friendly and energy-efficient infrastructure in smart cities. Traffic flow is optimised by the use of IoT technologies that can automatically adjust traffic lights to suit the prevailing conditions. Smart parking aids help the drivers to park their cars using information from their smart phones. City authorities have also turned to IoT technologies to optimise waste collection efficiency in a bid to reduce costs and address environmental issues.

2.0 The Internet of Things (IoT)

The Internet of Things (IoT) [1] describes the network of physical objects - a.k.a. "things"-that are embedded with sensors, software and other technologies for the purpose of connecting and exchanging data with other devices and systems over the Internet.

Things have evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation) and others all contribute to enabling the Internet of Things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", including devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers. IoT can also be used in healthcare systems.

There are a number of serious concerns about dangers in the growth of IoT, especially in the areas of privacy and security and, consequently industry and governmental moves to address these concerns have begun including the development of international IoT standards.

2.1 History

The main concept of a network of smart devices was discussed as early as 1982, with a modified Coca-Cola vending machine at Carnegie Mellon University becoming

the first Internet-connected appliance, able to report its inventory and whether newly loaded drinks were cold or not. Mark Weiser's 1991 paper on ubiquitous computing, "The Computer of the 21st Century", as well as academic venues such as UbiComp and PerCom produced the contemporary vision of the IoT.

In 1994, Reza Raji described the concept in IEEE Spectrum as "[moving] small packets of data to a large set of nodes, so as to integrate and automate everything from home appliances to entire factories". Between 1993 and 1997, several companies proposed solutions like Microsoft's at Work or Novell's NEST. The field gained momentum when Bill Joy envisioned device-to-device communication as a part of his "Six Webs" framework, presented at the World Economic Forum at Davos in 1999.

The term "Internet of Things" was coined by Kevin Ashton of Procter & Gamble, later MIT's Auto-ID Centre, in 1999, though he prefers the phrase "Internet for things". At that point, he viewed radio-frequency identification (RFID) as essential to the Internet of Things, which would allow computers to manage all individual things. The main theme of the Internet of Things is to embed short-range mobile transceivers in various gadgets and daily necessities to enable new forms of communication between people and things, and between things themselves.

Defining the Internet of Things as "simply the point in time when more 'things or objects' were connected to the Internet than people", Cisco Systems estimated that the IoT was "born" between 2008 and 2009, with the things/people ratio growing from 0.08 in 2003 to 1.84 in 2010.

2.2 Applications of IoT

The extensive set of applications for IoT devices is often divided into consumer, commercial, industrial, and infrastructure spaces.

2.2.1 Consumer applications

A growing portion of IoT devices are created for consumer use, including connected vehicles, home automation, wearable technology, connected health, and appliances with remote monitoring capabilities.

A growing segment of the Internet is electronic commerce [2]. Consumers are looking for suppliers selling products and services on the Internet. Meanwhile, suppliers are looking for buyers to increase their market share. The vast amount of available information on the Internet causes a great deal of problems or information overload for both ends. Searching, a task executed online, is not only time consuming but boring as well. The Internet of Things (IoT) infrastructure is well suited for this type of tasks. The IoT provides a mechanism for conducting E-Commerce on the Internet. However a lot of work still needs to be done to make this feasible. Issues such as security, accessibility, fault-tolerance, authentication, infrastructure, charges

for consumed resources, privacy, data integrity and many others need to be addressed.

2.2.2 Industrial applications

Industrial Internet of Things, also known as IIoT, industrial IoT devices acquire and analyze data from connected equipment, operational technology (OT), locations and people. Combined with operational technology (OT) monitoring devices, IIoT helps regulate and monitor industrial systems. Also, the same implementation can be carried out for automated record updates of asset placement in industrial storage units as the size of the assets can vary from a small screw till the whole motor spare part and misplacement of such assets can cause a percentile loss of manpower time and money.

2.2.3 Infrastructure applications

Monitoring and controlling operations of sustainable urban and rural infrastructures like bridges, railway tracks and on-and offshore wind-farms is a key application of the IoT. The IoT infrastructure can be used for monitoring any events or changes in structural conditions that can compromise safety and increase risk.

The IoT can benefit the construction industry by cost saving, time reduction, better quality workday, paperless workflow and increase in productivity. It can help in taking faster decisions and save money with Real-Time Data Analytics. It can also be used for scheduling repair and maintenance activities in an efficient manner, by coordinating tasks between different service providers and users of these facilities.

IoT devices can also be used to control critical infrastructure like bridges to provide access to ships. Usage of IoT devices for monitoring and operating infrastructure is likely to improve incident management and emergency response coordination, and quality of service, up-times and reduce costs of operation in all infrastructure related areas. Even areas such as waste management can benefit from automation and optimization that could be brought in by the IoT.

3.0 Conclusion

This paper highlights the areas in which IoT services could be implemented. It is a shortened version of paper to be submitted as a chapter in the forthcoming book: Handbook of Research on Mitigating the Challenges of the Internet of Things. The book chapters will address various challenges of the Internet of Things. Various authors involved in IoT environment or research will contribute the book chapters.

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Role of Information Engineering and Technology in our Daily Lives

By Prof. Jalang'o Akello

I. PREAMBLE

ONE question to pose is: "How would we live today without a simple radio, television, mobile phone and the computer?" The answer to this question comes when the response from either of the gadgets collapses, due to failure of either the electronics in the gadget, or for being in a "shadow zone", the latter commonly referred to as "network failure". These are just examples from the communication and computer technologies.

We live in a world where the trends in engineering and technology define our everyday lives since they are meant to "make work easier" for all of us, in all walks of life. It can be either in a Matatu, your SUV, a lift, the office, the hospital, at work on the desk or at home.

The world is going "smart" – smart education, smart wearables, smart homes, smart cars, smart cities, smart business, smart health, and others, enabled by electronics and software engineering. The other naming goes with Informatics - the science of processing data for storage and retrieval of Big Data. Information is easily retrieved today; be it on ourselves, time, location, weather, the best trending music of choice, danger in vicinity, health conditions, power supply, industrial processing, banking, farming, transport, supply chain, and other sectors.

Gadgets fitted with electro-mechanical sensors using Artificial Intelligence (AI), and Internet of Things (IoT) perform the required functions. IoT refers to systems with devices that communicate data to each other over a network without requiring human interaction, and relaying the information to the designated recipient. It relies on Information technology (IT) - the use of computers to store or retrieve data and information. All this is through the use of "The Cloud" - servers that are accessed over the Internet, and the software and databases that run on those servers. Cloud servers are located in data centers all over the world. By using cloud computing, users and companies don't have to manage physical servers themselves or run software applications on their own machines.

II. APPLICATIONS OF IET

2.1: Smart Education

Corona Virus has taught the world to adopt online learning, which requires a minimum of the teacher, an audio and video enabled laptop or desktop, configured software and the learner.

In a larger dimension, Digital Classrooms are a modern-day pedagogy method uses of information engineering and technology is transforming the way teachers teach and students learn in schools. Smart Classroom Tools are a success because visually attractive methods of teaching engage the audio-visual equipment, proven to be more appealing to the students. This method of teaching helps students to break out of their shells and become good communicators. Listed below are other classroom tools/websites that are essential for a transformational learning experience

The other essential tools in the classroom are

- Wi-Fi/Cloud-Based Communication Systems for Teleconferencing
  The use of cloud-based communication systems in

digital classrooms through video conferencing and unified communications platforms such as KENET, Zoom, ClickMeeting, Skype, Google Duo, Google Hangouts, MS Teams, and Ekiga can transform students to virtual learning.

• **The Digital Camera/Visualises**

A visualizer or document camera is a simple to use and flexible digital learning tool that allows teachers to project documents on large screens. This much tool helps to display a wide variety of information ranging from a page in a book, a scientific diagram, a flower in all its glorious color or any other specimen and gives a clearer view to help students understand complex features.

• **The Interactive Whiteboard**

Smart whiteboards have replaced the traditional black boards. A teacher can project any subject on the touch-sensitive whiteboard surface and with the help of a projector and a computer, they can conduct lessons using their finger or with a multimedia pen or stylus. Made to match with the growing exposure of learners to smart phone and other technology, the whiteboard comes with an exciting range of features that add a sense of excitement to each classroom session.

• **The Interactive Projector**

The interactive projector is a portable solution that helps convert any surface into an interactive surface. An interactive pen will come in handy to draw, point or click just by touching the screen directly.

2.2: Smart Wearables

Tattoo detectors, garments, watches, spectacles, bracelets, pills, jewelry, footwear, and iPhones with IoT electronic hardwares and softwares serve as protectors, which can alert on the wearer's condition, be it insecurity, intoxication, proximity in social distancing,

2.3: Smart Homes

In a Smart Home, a wireless hand controller is programmed to enable remote closing of curtains and switching of lights, turning on Smart Appliances such as cookers in the kitchen, the televisions, music system, intercom, heaters and air conditioners, and closing and opening of gates for entrance and exit, as is seen in the Closed Circuit Television (CCTV) system.

2.4: Smart Cities

Globally recognized Smart Cities, the best of which is Amsterdam, have designed systems which alleviate real pains of people living in the cities. The systems are majorly for traffic management to solve traffic congestion problems, controlled water supply, waste management, urban security and safety, and environmental monitoring with the objective of reducing noise and pollution. If the current projection that by 2025, 100% of cars will be connected, and by 2035, the cars will be autonomous and ecological, the problems of congestion on roads with Google Maps will greatly aid in reduction of environmental issues and traffic jams. For balancing of power supply from thermal, hydraulic, photovoltaic and wind sources to factories, homes, offices and ecological vehicle charging points, the cities use Smart Grids. In order to improve productivity and efficiency in manufacturing, Industrial IoT (IIoT) is deployed

to drive robots instructed to perform given functions in the shop floor. Healthcare facilities in the cities include mHealth and fixed services using headsets to measure brainwaves, monitors for BP, glucose and ECG, pulse oximeters, surgical robots and device implants. Medicine, where necessary, are delivered using drones.

2.5: Smart Agriculture

Working together with a fleet of agrirobots, smart tractors, and survey drones capturing information on growths and soil conditions are used in agriculture. Farmers see transmitted and displayed data, including texted information on the wellness conditions of the livestock, enabling them to make decisions and commands at the comfort of their smart offices.

2.6: Smart Supply Chain

Supply Chain IoT solutions include higher visibility into the processes as inbound deliveries, location, and status; forecasts, recommendations, and automatic orders. Links with other enterprises is enhanced using softwares such as

• Manufacturing Execution System (MES), used in manufacturing to track and document the transformation of raw materials into finished goods;

• Warehouse Management System (WMS), which assists with savings in labour utilization, inventory reduction, warehouse utilization, picker productivity, increase shipping accuracy, increase supplier conformance, and increased inventory availability;

• The Digital Supply Chain (DSC) providing a competitive analysis of small and large global players; Enterprise Resource Planning (ERP) that manages and integrates the company's financials, operations, reporting, manufacturing, and human resource activities; and

• Production Information Management System, (also known as a "process information management system," (PIMS) - a client/server application for the acquisition, display, archiving and reporting of information from a wide variety of control, plant and business systems.

III. CONCLUSIONS

Current research and development trends concentrating on big data mining for IoT applications embracing growth in electronics and software will drive information engineering and technology for the future. It is demanding from both academia, governments and industry in both developed and developing nations to follow these trends and embrace them for saving on time, and to improve on comfort, productivity, security and wellness of citizenry. The biggest challenge is that the trends in communications technology and applications are so fast that colleges and universities with curricula in this area need to not only capture the fundaments but expand to cover current wired and wireless systems and applications in preparing graduates for today's and tomorrow's industry. For engineering designers and planners, it is crucial to select reliable systems in the market, predict the system overhaul period and optimize the long-term costs and benefits.

Prof. Robert Jalang'o Akello PhD
Lecturer in Electronics and Telecommunications
Multimedia University of Kenya

PICTURE COURTESY

Mobile GIS-based Traffic Count using AR-Traffic Count

(See Authors listed below)

1.0 Introduction

TRAFFIC data is required for the purposes of road network maintenance planning, which should be undertaken on an annual basis, with major roles in estimating traffic patterns and future traffic growth for road agencies and authorities.

Traffic Surveys are completed for different purposes, from determining vehicle speeds to traffic flow in categorized vehicle classes, to determining the current volume and type of traffic travelling on the road (ORN 40).

Traffic Count has the following advantages which are:

- Developing base year traffic data which includes ADT (Average Daily Traffic) and AADT (Annual Average Daily Traffic)

- Determining Traffic Movement patterns in different modes of transport, which can also include provide traffic diversion from existing routes with an advantage of reduced transport costs.

- Planning, prioritisation and project initiation.

- To check efficiency of the road network by comparing current traffic volume with the level of service or the calculated traffic capacity.

- Traffic forecasting models with subsequent traffic projection on road sections.

To facilitate the assessment of present and future traffic demands, for the development of need-based infrastructure, accurate information, and continuous monitoring of traffic, using an appropriate method is necessary.

Implementing authorities must ensure that adequate and appropriate data is available in order to undertake necessary planning, design, construction and maintenance of the country's road network, which is aimed at meeting the significant traffic flow, future traffic growth and loading without considerable deterioration in the quality of service.

Mobile GPS based Apps have been acting as new discipline and as an intersection between science and technology for the past decade. As we can observe, technology has now moved to the palms of our hands, from the taxi service mobile applications such as Uber to food ordering mobile applications, this all suggests that it is high time to look at the options of integrating mobile apps for conducting Traffic Counts. The introduction of mobile based app like AR-Traffic Count aims to analyse the current road traffic data collection methods.

Types of Traffic Count

Briefly we will have a look at the types of traffic count which are available:

Manual Counts

Manual Counts are normally carried out by observers situated at a count point at the side of the road, while the most usual type of manual count survey is the classified count using a piece of paper.

Automatic Counts

These counts can record traffic data for 24 hrs a day, 365 days a year, in two-way traffic flow, which normally provides a higher accuracy compared to the Manual counts, such as pneumatic tubes and buried loop counting.

Pneumatic Tube systems

The counter measures two-way traffic flow as vehicle passes in which compressed tube releases pulse of air to make a vehicle count.

Buried Loop Systems

This involves an insulated wire loop buried below surface of the road, which when the vehicle passes over the loop, the metal of the vehicle causes the inductances of the loop to be sensed by the counter.

2.0 Methodology
How AR-Traffic Count Works

This is a semi-automated mobile proprietary app which revolutionizes the paper-based traffic count to a Mobile based GPS with customized export to excel template. The app allows traffic data to be collected in person, but it is recorded directly onto a mobile device rather than on paper, thereby negating the need for the data to be typed up, or the location to be identified, since it can be automatically georeferenced, with the ability to export traffic data directly into Excel or other applications, including email, or social media platforms.

This App was developed by both Eng. Arnold M Kilaini (from Tanzania) and Eng. Ram Gopal Kachhepati (from Nepal). The rights and source code are maintained by the developers.

AR-Traffic Count System Architecture

AR-Traffic count has been programmed using Java programming language under the umbrella of the android programming interface as shown in the figure below.
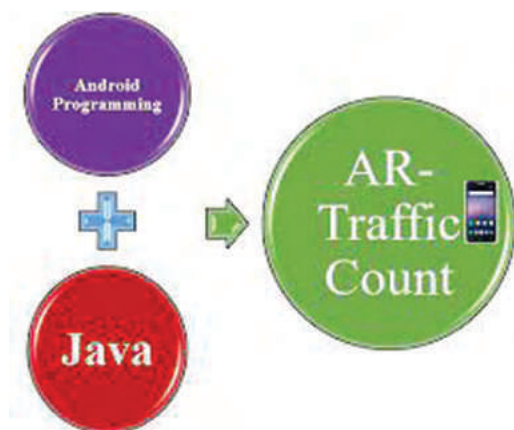
Figure 1: AR-traffic count system architecture

Vehicle Classifications

The application has customized general purpose standard general format which covers almost all vehicle categories as shown in the figure.

Figure 2: Vehicle Classification (Source: produced by the Author)

How AR-Traffic Count Works

This mobile traffic count application works by utilizing GPS allowing for a traffic count to be undertaken at a road section.

Main Menu

The Main Menu page gives you options to select "Road Info" (Road Information), "Traffic Count" process and "Reporting".
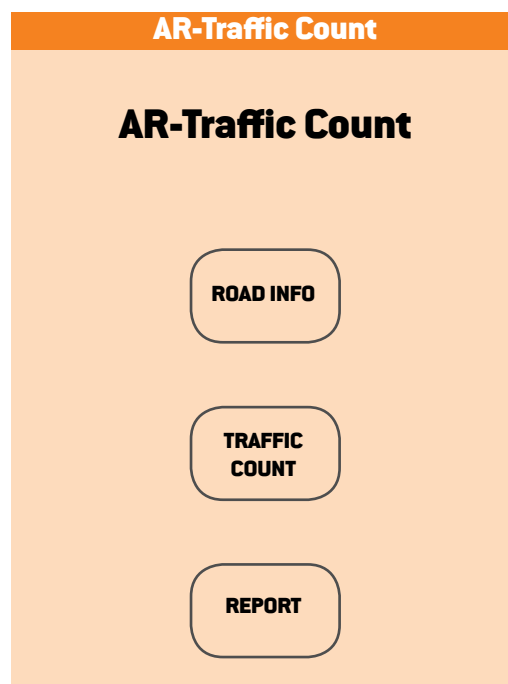
Figure 3: Showing Main Menu

Road Traffic Information

The Road Traffic Information (Road Info on Main Menu) asks you to provide road information such as road name, road code, number of lanes, and weather. The GPS position is automatically filled in based on your current location.

Figure 4: Showing Road Info attribute.

Traffic Count

The next step is to select "Traffic Count" from the Main Menu, and this is where the actual Traffic count is completed, after filling in the Road info. The below figure shows the Traffic Count Interface.

Figure 5: Showing Traffic Count Form

There are 13 Vehicle Categories in the AR-Traffic Count Application which can be selected during the Traffic Count exercise and should be selected after clicking the Plus or Minus Sign.

N.B: The Positive and Negative buttons shown above are for addition or omission of vehicle count during data collection. After finishing the Count, you can click the "Generate Report" button for Excel Report Generation.

Report Generation

This option is where the reports are generated and are ready to be shared either via email, WhatsApp or Bluetooth.

The figure below shows an example of Reports saved from the AR-Traffic Count App.

Figure 6: Showing Reports saved

Testing of the AR-Traffic Count App

The Government of the Republic of Kenya (GoK) intends to upgrade the Kiungani Road to bitumen standard. A preliminary traffic count was intended to be undertaken to understand the traffic flow and patterns of the project road.

The Design Team of the project road was appointed by the Director (Urban Roads Planning & Design). The Design team was mandated to carry out detailed topographical survey, detailed geometric design and pavement design.
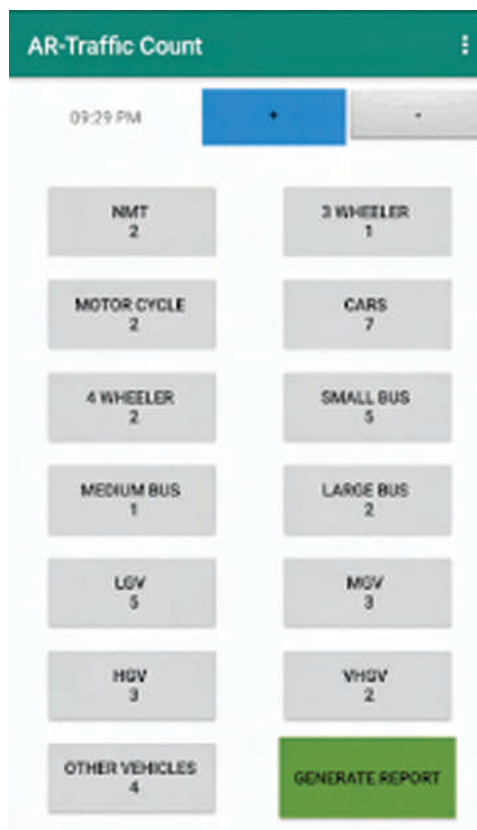
The design team constituted of the following:

Design Engineers Team

1. Eng. Doreen K. Kirima - Team Leader
2. Eng. Abdiaziz Abdullahi - Senior Engineer
3. Victoria Gakii - Engineer

Survey Team

1. Patrick Gitile - Surveyor

Kiungani Road is located within Syokimau area in Machakos County which is a heavily built up settlement with most roads in Earth or Gravel conditions. The project road measures approximately 4.0 km in total and the road reserve is of 8 – 11 m approximately. There is minimal encroachment along the road.

Upgrading of the above-mentioned road will improve access to important institutions in the area such as the Notre Dame School, as well as residential and other commercial properties and spur business opportunities and development of area.

The road location map is attached:

Figure 7: road location map (Source: developed by the Author)

Traffic Count data collection was done for Kiungani Road with both Paper based and Mobile GIS based application at a count station of location latitude -1.371808 and longitude 36.920448 recorded by the application.

Traffic count was done for 2 days whereby the first day on 6th November 2020, the count was done from 6pm to 9pm and the other count was on 7th November 2020 from 6am to 9pm.

Figure 8: showing observers doing both paper based, and Mobile GIS based AR-Traffic Count app.

3.0 Results

AR-Traffic Count has been used to collect Traffic Count Data for Kiungani Road and has enormously saved Time as the app generates report in excel per click of the button.

Figure 9: showing excel report generated for Kiungani road

AR-Traffic Count saves time in comparison with the paper-based method which requires tallying and entering data into excel. It also allows for synchronization of data between field and office and there is room to add more Traffic count data options such as peak hour traffic count in the application. Paper based Traffic count needs data to be punched and tallied in excel, which for our case there were more than 2 hours lost during the entire process of entering data in to excel.

AR-Traffic Count is a cost-effective proprietary mobile application which can work in offline mode, with internet connection required only during the sharing of the report.

The following shows the cutting-edge merits over the paper-based method.

Figure 10: Advantages of AR-Traffic Count (Source: produced by the Author)

3.1 Analysis of Traffic Data collected by AR-Traffic Count

Traffic Data is reliable as the exported data in excel can be easily analysed. For example, data was collected for 3 hours, between 6pm to 9pm for Kiungani road on 6th November 2020 and during this time 143 motorcycles were counted, accounting for 47% of all vehicle categories, while Medium buses had the least number of vehicles accounting for 0.3% of all vehicle categories.

Figure 11: A graph showing Vehicle categories of Kiungani road on 6th November 2020.

Figure 12: A graph showing Vehicle categories and road composition of Kiungani road on 7th November 2020.

Traffic Data for Kiungani road was collected on 7th November 2020 between 6am and 9pm. During this period 843 motorcycles were counted, making up 40.5% of all vehicle categories, with Heavy Good Vehicles contributing to less than 5% and Large and Medium buses accounting for 0%. This therefore demonstrates the road has few Very Heavy Good Vehicles, which could be an effect of axle loading for the road.

4.0 Discussions

As with all mobile apps, their continuous use can result in the draining of the phone battery upon using GPS position services and Traffic count button clicks, therefore the phone battery needs to be sufficient during data collection, and portable charging facilities made available. As Traffic count data is collected using mobile app, customized pdf encrypted report formats can be generated depending on the user specifications with additional Peak hour-15 mins traffic generation to be programmed from the application to acquire such information.

5.0 Conclusions

Traffic Data Collection plays a fundamental role in planning of road development and management schemes and can also enhance benefits to the society by comparing traffic volume and the number of accidents of the road sections. As we are implementing the Third Mid Term Plan (MTP III) of Vision 2030, aiming to transform Kenya into a newly industrializing, Middle-Income Country by 2030, it is high time we adopt new mobile smart technologies for Traffic data collection such as AR-Traffic Count in a clean and secure environment with a focus for Traffic Management Planning.

Eng. Arnold Mutegeki Kilaini, Eng. Ram Gopal Kachhepati and Eng. Doreen Kirima Kago (kilaini1@gmail.com; kakshyapati@gmail.com, doreenkkago2020@gmail.com)

Computer Programme for Frame Analysis and Design

(See Authors listed below)

1. Introduction

O
KOTH (2011) developed an open source computer program for 2D and 3D truss analysis. Later on, Kisia (2018) continued the project introducing analysis of 2D beams. It was recommended to not only extend the software to analyse other structural elements but also carry out the corresponding designs according to standards.

The problem was that several companies have student version software that is of a lower version of their commercial software, to build learners' capacity in analysis and design. Unfortunately, these software programs are proprietary (black box). In addition, they are complicated thus not adequate as a teaching tool to aid the learning process.

Recognizing that Finite Elements and Design courses are inadequately supported by teaching software, this paper focused on extending the program of Kisia (2018) to analyze 2D Frames. In addition, the design of beams to Eurocode 2 was introduced. The main objective was to create a software tool for self study at the institutions of higher learning in a post Covid 19 future. A tool that the student can use to compare their hand calculations and experiment with various examples in an era of limited contact with the instructor. The scope of the study was limited to analysis of two dimensional frames using Finite Element techniques and the design reinforced rectangular concrete cross sections for moment and shear.
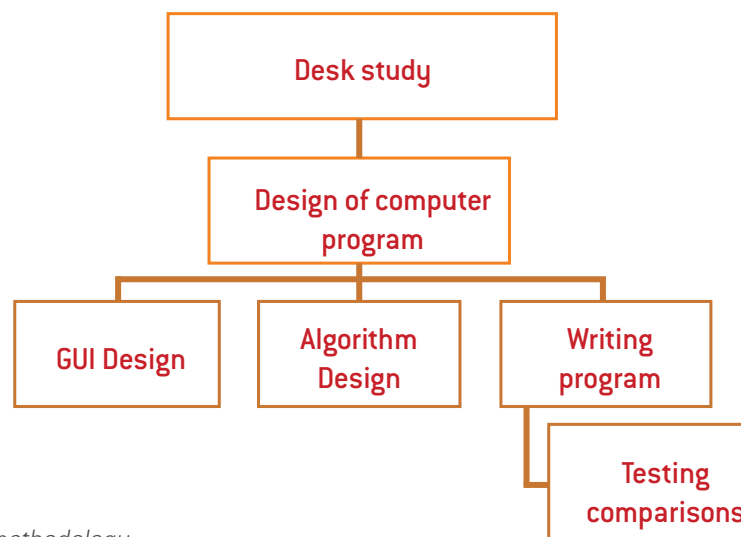

Figure 2.1: Summary of methodology

2. Materials and Methods

The following flow chart in figure 2.1 summarizes the methodology used to achieve the objectives of the project.

2.1 Desk study

2. 1.1 Finite Elements

A desk study was done to obtain background information on Finite Elements. Energy methods in combination with basic concepts from mechanics of materials, (Chennakesava, 2008), were found to be simpler and therefore used to formulate element stiffness matrices. From the study, the stiffness matrix of a 2D Frame element, equation 2.1, was found to be a superposition of the stiffness matrix of a 2D bar (truss) element and that of a 2D beam element (Hibbeler, 2012).

$$
K^e = \begin{bmatrix}
\dfrac{AE}{L} & 0 & 0 & -\dfrac{AE}{L} & 0 & 0 \\[2mm]
0 & \dfrac{12EI}{L^3} & \dfrac{6EI}{L^2} & 0 & -\dfrac{12EI}{L^3} & \dfrac{6EI}{L^2} \\[2mm]
0 & \dfrac{6EI}{L^2} & \dfrac{4EI}{L} & 0 & -\dfrac{6EI}{L^2} & \dfrac{2EI}{L} \\[2mm]
-\dfrac{AE}{L} & 0 & 0 & \dfrac{AE}{L} & 0 & 0 \\[2mm]
0 & -\dfrac{12EI}{L^3} & -\dfrac{6EI}{L^2} & 0 & \dfrac{12EI}{L^3} & -\dfrac{6EI}{L^2} \\[2mm]
0 & \dfrac{6EI}{L^2} & \dfrac{2EI}{L} & 0 & -\dfrac{6EI}{L^2} & \dfrac{4EI}{L}
\end{bmatrix}
$$

Where is the stiffness matrix, is the Flexural rigidity, is the axial rigidity, and L is the length of the element. Finite Element analysis is a formalized method and can be broken down into steps as illustrated in Figure 21: FEM steps. From the previous study (Osome, 2018) and (Okoth, 2011), the code to carry out the major steps (i.e. Assembly, partitioning and solution of linear systems of equations) was already developed and made available.

Member stifness Formulation → Assembly of stifness Matrices and Forces → Applying Boundary Conditions → Psrtition and Solve For Displacement → Recovery of Derived Quantities

Figure 21: FEM steps

2.1.2 Design Codes

Structural design codes have been formulated to enable Engineers design structures for strength and stability using steel, concrete, timber and masonry (McKenzie, 2013). In Kenya the British standards have been use for a long time. However, the British standards are no longer supported. As a result, there is a transition to the Eurocodes with the adoption of the UK Annexes. The desk study was limited to reinforced concrete beams taking into account the design for bending and shear according to Eurocode 2 (Mosley, Bungey, & Hulse, 2012).

2. 1.3 Programming

The Java programming language was initially chosen because it is open source. The language also follows the object oriented programming paradigm (Charatan & Kans, 2009). In order to have a three dimensional user interaction, jReality library was chosen for visualization purposes.

2.2 Design of computer program

The computer program was organized into key modules as shown in **Figure 22.**
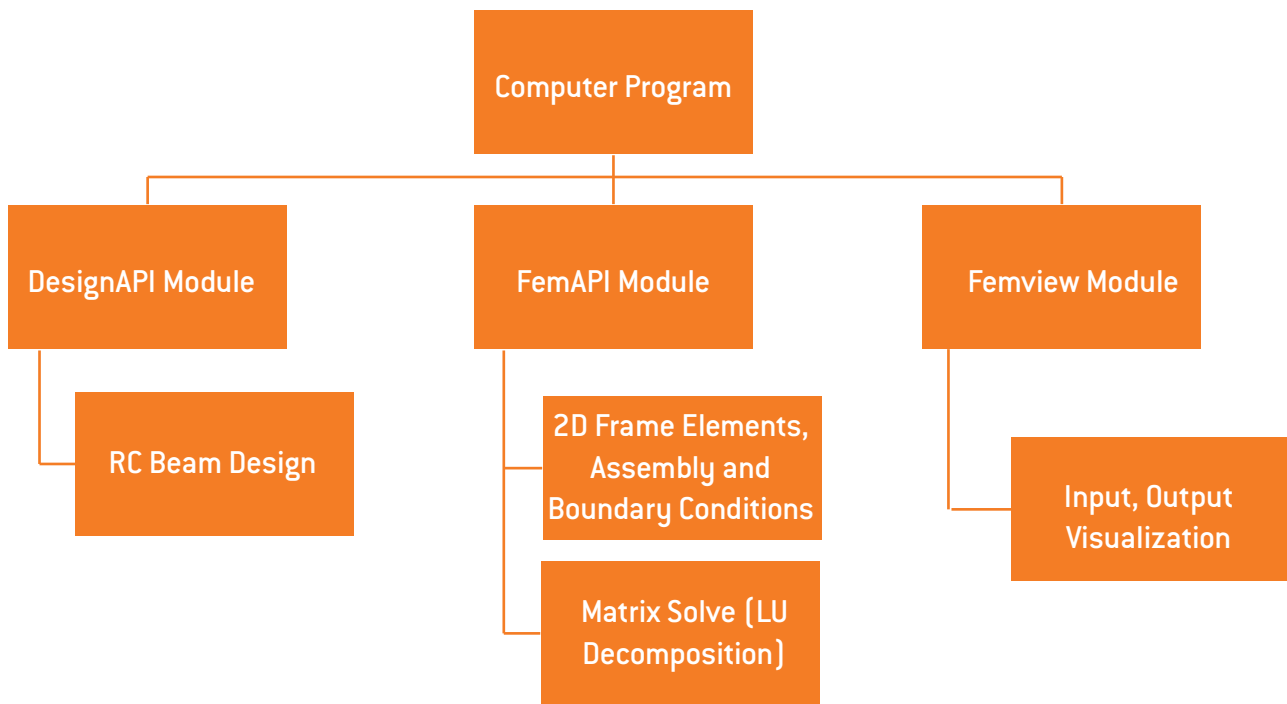
Figure 22: *Summary of Computer Program*

The design of the program consisted of two stages as follows:

a) Graphical User Interface (GUI) Design

A graphical user interface provides a means by which human beings interact with computers using widgets (i.e. windows, icons, graphics, text boxes, drop downs etc.). NetBeans provides tools for rapid user interface design by drag and drop. Graphical interfaces for input, output and visualization are all contained in the FemView Module. Visualization was achieved using jReality, a 3D scene graph library (Weissmann, Gunn, Peter, Hofmann, & Pinkall, 2009). Graphical tools were also developed to allow for automatic modeling of basic frame structures. The output of the program was presented in LaTeX form then rendered to show the steps of the computations. Bending moments, shear and displacements were superimposed on the modeled structure as part of the visualization.

b) Algorithm Design

An algorithm is a set of instructions to perform a specific task. A crucial algorithm in Finite Elements is that for solving a set of linear equation. Crout's algorithm, (Teukolsky, Vetterling, & Flannery, 1992), for solving linear systems of equations was chosen. During reinforced concrete beam design, after determining the required area of steel, an algorithm was developed to automatically determine the diameter and number of bars to be provided. Another algorithm was also developed for modeling rebar in 3D space.

c) Writing of the Program

NetBeans IDE (Integrated Development Environment) was chosen for writing the program with Java as the programming language. The IDE provides tools that make writing programs simpler for example debugging, compiling, code completion etc.

2.4 Testing and debugging

Testing and debugging is an essential process to validate the program. The tests consisted of comparisons with hand calculated examples together with commercial software. In the process of testing, debugging was done to remove errors that were identified. Testing and debugging is a continuous process which will lead to future updated of the program. An advantage of being open source is that any person who understands programming can make changes to the program and update it.
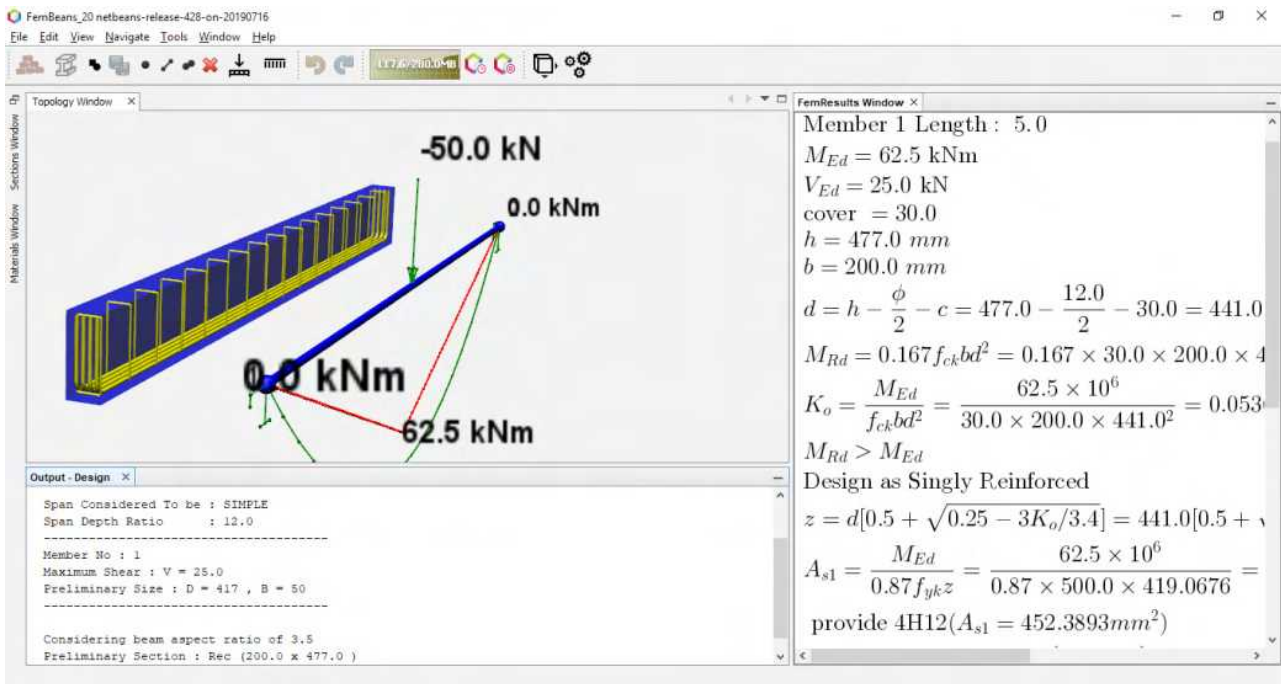
Figure 31: Graphical Interface for design of simply supported beam

3. Results

Figure 31 shows the resulting graphical user interface for the design of a simply supported beam to Eurocode 2. The results for an example of a 2D frame analysis are shown in Figure 32 and Figure 33 for moment and shear respectively. The comparisons were made against the results from Autodesk Robot Structural Analysis software. It was also observed that the program obtained the same values with those of hand calculations.
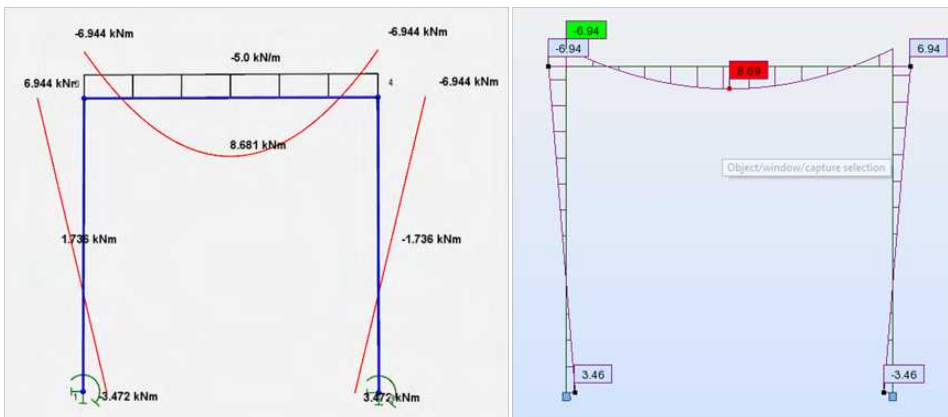
Figure 3.2: Results for Bending Moments a) using Autodesk Robot Structural Analysis b) using the program

Figure 3.3: Results for Shear a) using Autodesk Robot Structural Analysis b) using the program

For design to Eurocode 2 comparisions were made with only those of hand calculations for simply supported beams. An example with, b=275mm and effective depth, d=450mm.

Table 1: Comparison of Design by Hand calculations

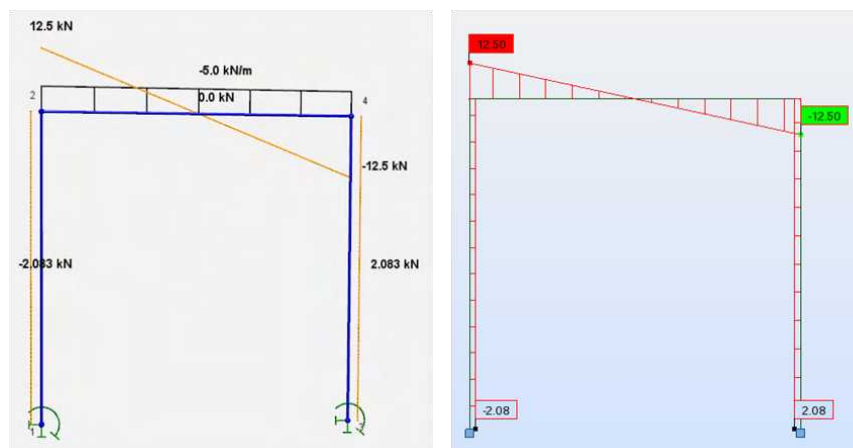|	Hand calculation	Design Module	Percentage difference
	0.124	0.124	0.000
	393.7279	3937018	0.007
	1008.3398	1008.4066	0.007
	1257	1257	0.000
No. of bars	4T20	4T20	
	501.1875	501.1875	0.000
	345.2625	345.2625	0.000

Discussions: The results yielded by the program were accurate and consistent with only discrepancies of 0.3 percent for the bending moments and reactions at the supports and 0.1 percent for the shear. The bending moment and shear force diagrams were also similar, throughout the frame. One discrepancy was observed on the shear force diagram where they had same values but different signs; this is due to the sign convention differences. It was also observed that the design of the beam cross section to Eurocode 2 was consistent with that of hand calculations.

Conclusions: It is evident that the results yielded are accurate and consistent with negligible margin of error thereby making the program an effective learning tool. The unique feature of the program is the way it enables the user to track the computational process that was used to arrive at the solution. The graphical user interface (GUI) has been fashioned in a trainer-student friendly manner that allows easier interaction of the program. An auto-generation component in the analysis program was necessary to minimize the input and element declaration phase for frames. The program can therefore be used as a tool for self study by students. Since the source code is available, the program can be further extended to cover other structural elements and design of steel and timber to Eurocodes.

Paul Sebastian Okoth, Joseph Kisia Osome, Maria Achieng Akulu, Amos Otieno Ochieng' (Moi University)

KPLC goes digital with new connections self-service portal

By Editorial Team

KENYA Power has launched a self-service portal to enable customers conveniently apply for electricity connection from the comfort of their locations.

The electric power distributor owns and operates most of the electricity transmission and distribution systems in the country and sold electricity to over 8.2 million customers as at the end of May 2021.

The company says its customers can now use Kenya Power's mobile phone App 'My Power' to apply for electricity connection or visit https://selfservice.kplc.co.ke/.

When making their applications, customers will be required to submit land/property ownership documents, ID cards and PIN certificates through the portal. Once they apply, customers will get a reference number that they can use to proactively query and track their application status via USSD code *977#. The company will also send customers text messages to update them whenever their applications move to the next stage.

"The portal is in line with one of the company's core strategic pillars of enhancing customer experience aimed at making services more accessible to customers. The convenient application process will also help drive sales, which is among the key pillars of our turnaround strategy," said Kenya Power Managing Director Bernard Ngugi. This launch follows a successful pilot phase during which 7,000 applications were processed through the online platform.

The self-service portal will also eliminate fraudsters who ask clients to pay for application forms or claim they can assist them to apply for power at a fee. "Electricity application has never attracted any charges and will remain free. This digitised process will help curtail opportunities for middlemen and fraudsters to exploit customers," said Mr. Ngugi. The online application is among several services accessible to customers through the self-service portal that the company has initiated to enhance customer experience.

Some of the services customers can access include reporting power outages, prepaid token purchase queries, submitting meter readings to get actual monthly bills for post-paid customers, among others.

At the same time, among the efforts being put in place to enhance the new connection process is the full digitisation of the network.

Once complete, this will reduce the time taken to issue a quotation after application and make it easier to locate a customer's premises in response to service requests.

By Editorial Team

Computer Learning Centre: Your go-to digital training school

ESTABLISHED 25 years ago in Kenya, Computer Learning Centre (CLC Africa) is a digital learning company that offers IT training and skill development solutions for IT professionals and businesses. CLC Africa is a leader in IT and technology training, helping individuals and organisations to build the skills they need to succeed in an ever-changing world. Our Motto is "Defining quality in Training". We represent over 20 international recongnised vendors and have trained over 10,000 students since inception. With our headquarters in Kenya, CLC Africa is able to deliver training in East, West and Central Africa.

Computer Learning Centre has certified inhouse trainers who are upskilled regularly in various courses to enable them deliver up to date content and training to students.

We have put Focus on the following technologies

Cloud Training

As the Internet becomes more affordable with higher speeds, it allows users to either process and store data on premises or the public or private cloud . Many organisations are looking at reducing CAPEX and move to a monthly OPEX subscription-based model. The cloud offers reliability and scalability without investing upfront on hardware .

Cloud computing is becoming an essential skill for any IT professional today as more and more companies are moving towards cloud for their infrastructure and service needs. As an ATC we have partnered with leading vendors in the cloud space, including AWS, Nutanix, Microsoft, Cisco and Oracle.

Cyber Security

With the advancement of the Internet we are also exposed to cyber threats both at the central point of internet connection(s) and end-user endpoint (laptop, mobile devices, IoT devices, etc) . With the rise of online banking, E-commerce, mobile money and online processing, fraudsters are finding ways to hack into secure systems to steal credentials. Spam, malware and BOTS have hidden files in E-mails and documents, which if clicked or downloaded pose a serious threat and compromise security.

Every organisation faces a growing array of complex cyber security risks. While an organisation may invest in technology designed to detect and prevent network breaches, organisations must also address the human side of the cyber security equation.

Digital Transformation

Organisations have to adapt existing business practices to new digital methods to increase efficiency and keep up with rapidly-changing market demands. This means integrating new technologies' big data, cloud computing, artificial intelligence, machine learning, IoT into every area of the business. We have partnered with Cert Nexus in order to deliver these trainings.

Infrastructure and Data centre

Companies need a secured and stable wired and wireless network to support higher speeds on enterprise LAN and WAN networks. Server rooms are now transformed into micro data centres offering power, cooling, environmental sensors and Data Centre Infrastructure Management (DCIM) software to monitor the health of an IT cabinet remotely with E-mail and SMS alerts. Centralised Data Centres offer the same facilities but in a containment with several rows of cabinets enclosed in a secured containment. Centralised power and centralised cooling with DCIM allow data centers to be managed centrally .

We offer vendor neutral trainings for courses on structured cabling (copper and fiber optics), data centre design, essentials , cooling and power , enterprise wireless with wi-fi 6, securing remote user, and many more.

Business trainings

Organisations need processes in place to ensure all staff adhere to company policies and meet the guidelines for business processes . ISO quality management certification ensures companies follow international standards on company processes. Service management and project management are key to an organisation for efficient delivery of services to both internal and external customers.

Businesses and organisations would like to achieve international standards ISO certifications. It enhances and promotes best practice frameworks and methodologies used globally by professionals working primarily in IT service management, project, programme and portfolio management and cyber resilience.We have partnered with PECB (ISO quality management training), People Cert (ITIL and Prince2) and Project Management (PMP).

*Chair of the IEK Editorial Board Prof. Eng. Lawrence Gumbe handovers a copy of the second edition of **Engineering in Kenya** Magazine to IEK President Eng. Nathaniel Matalanga in April 2021. (PHOTO COURTESY EDITORIAL TEAM).*

IEK 2021 webinars attract leading industry experts and participants

By Maria Monayo

IN the wake of the COVID-19 pandemic, the need to substitute in-person meetings and trainings became more crucial than ever before. Webinars have opened up a convenient, time efficient and affordable means to attend meetings. Leveraging on technology, the Institution of Engineers of Kenya (IEK) works with its various committees and subcommittees to organise educative sessions for information sharing for its members.

We remain committed to the continuous professional development of our members. With carefully deliberated topics, we have been fortunate to have some of the most esteemed industry experts present during our webinars. From leading elite Engineers in the country to tax consultants, international specialists, technology gurus, our pool of resources has been wide and diverse. Here is a look at the webinars we had in February 2021.

BIM in design construction and asset management

Building Information Modelling (BIM) is an intelligent 3D model-based process used to develop building design solutions to more efficiently plan, design, construct, manage and analyse buildings and infrastructure.

> A single project might require a whole team of workforce, ranging from architects, designers, engineers, contractors and sub-contractors, all working together to meet the needs of the project.

BIM data is increasingly being applied worldwide to illustrate the entire building lifecycle from inception to completion. Data is collected throughout the building project and can be analysed and used to develop ways to make processes more efficient. However, the application of BIM in the Kenyan construction industry is still lagging, resulting in poor co-ordination of information among construction project stakeholders. This webinar expounded on BIM application in the country and the challenges experienced.

Digital engineering in construction and asset management

This webinar featured two international experts in BIM. The first was Carl Collins, the Head of Digital Engineering at the Chartered Institution of Building Services Engineers (CIBSE). He has been a BIM leader for

over 12 years and has worked with various standards institutions, writing the standards that support BIM in the UK and internationally.

The second expert was Russ McKay, the Executive Solutions Architect working for IBM Cloud and AI Solutions. With over 25 years at IBM, he has led IBM's strategy, adoption and implementation of Building Information Modelling around the world.

This webinar explored how digital engineering uses data for efficient and optimised asset management by enabling informed and integrated investment decisions across the lifecycle of the assets.

Importance of air management in liquid transmission systems

The efficient operation of a liquid piping system is wholesomely dependent on the continual removal of air and wastewater gases from the liquid piping system. Air valves are hydro-mechanical devices designed to automatically release air and wastewater gases or admit air during the filling, draining or operation of liquid piping systems for water and wastewater services. Pockets of air and wastewater gases in a liquid piping system are difficult to detect and will reduce the liquid piping system's overall efficiency. Pockets of air and wastewater gases contribute to problems like pipe breaks, system noise and pipe corrosion — especially hydrogen sulfide corrosion — and can cause erratic operation of control valves, meters and equipment.

Doshi Water together with ARI Optimal Flow Solutions partnered with us to bring the "Importance of air management in liquid transmission systems" webinar. The meeting organised by the water and sanitation subcommittee under the Publicity, Research and Advocacy Committee (PRAC) exhaustively covered issues around liquid piping systems, air pockets, waste water gasses, etc, by the very best in the field. Dr. Sharon Aminov Yaniv, a PhD, Water Resources Engineering, was our guest speaker in this webinar. She is an Application Engineer and Surge Tank Product Manager at ARI Optimal Flow Solutions Ltd, a leading manufacturer and provider of solutions for the protection of liquid transmission systems worldwide.

Eng. Elisha Omega, the business development manager, Doshi & Co. Ltd, also joined in making presentations on the subject.

KRA tax webinar for engineers

There is no escaping the taxman!

The Kenya Revenue Authority (KRA) is the agency in charge of the collection and receipt of all revenue on behalf of the Kenyan government. In performing this function, it has the responsibility of administering and enforcing all laws relating to revenue.

On February 25, we had quite an engaging and informative discussion with officials from KRA in the webinar dubbed "KRA Tax Webinar for Engineers". The event, which recorded a high turnout, was organised by PRAC.

The KRA team made presentations on tax laws, Finance Act and tax compliance requirements for Engineers and Engineering firms.

ADR mechanisms opportunities for engineers

We wound up the month of February with the 'ADR mechanisms opportunities for engineers' webinar.

Alternative Dispute Resolution (ADR) refers to any out-of-court means of settling disputes. These include evaluation, negotiation, conciliation, mediation and arbitration.

Conflict is inevitable at any workplace. Engineers have to work with various individuals to successfully complete their projects. A single project might require a whole team of workforce, ranging from architects, designers, engineers, contractors and sub-contractors, all working together to meet the needs of the project. As such, the possibility of conflict arises.

Disputes can stem from communication breakdown, breach of contract, design deficiencies, labour unrest, among others. Disputes can become incredibly costly, both financially and in time delays. At best, disputes are better off avoided but in the event that they arise, it is important to have a mechanism on how to resolve them quickly to bring the project back on track.

Eng. Paul Karekezi, the Managing Director at GIBB Africa, was the main speaker at this event. He expounded on the ADR mechanism opportunities for engineers from negotiation, mediation, adjudication, arbitration and litigation.

We remain steadfast in our mandate to promote the general advancement of science and practices of engineering in Kenya and in facilitating the exchange of information and ideas on those subjects.

Hon. Secretary Eng. Margaret Ogai (far left) and Editorial Board Chair Eng. Prof. Lawrence Gumbe (far right) leading a past Editorial Board review meeting. (PHOTO COURTESY EDITORIAL TEAM).

Today, an integral part of KETRACO's high voltage power transmission lines is optical fiber cabling. INSET: KETRACO CEO, FCPA Fernandes Barasa. (PICTURE COURTESY).

KETRACO leverages overhead transmission capacity to expand fiber offering

By Dr. Lawrece Kimando

KENYA Electricity Transmission Company KETRACO has hinted setting up a state-of-the-art Data Centre in Isinya, Kajiado County. Today, an integral part of KETRACO's high voltage power transmission lines is optical fiber cabling. A fibre optic cable is strung between the tops of all new high-voltage transmission towers combining the functions of grounding and communications.

An Optical Ground Wire (OPGW) cable contains a tubular structure with one or more optical fibres in it, surrounded by layers of steel and aluminum wire. The conductive part of the cable serves to bond adjacent towers to earth ground and shields the high-voltage conductors from lightning strikes.

KETRACO's Fibre optic cables have 48 optical fibres or cores. A few of these cores have been utilized by the company for communications as part of the power management system. "Our journey into fibre business was informed by the availability of excess fibre cores and the demand for the same from Telecommunications companies. KETRACO aspires to build an estimated over 8,000 kilometres of optical fibre, crisscrossing the country, spanning from Mombasa (submarine cables) across to the borders of Ethiopia, Uganda and Tanzania. This will play a huge role in boosting internet us-

age in Kenya and inter-linking the African continent with unlimited high-speed broadband," says Dr. Lawrence Kimando, KETRACO General Manager in charge of Strategy.

Place of fiber telecommunications technology in the economy

He also contends that fiber technology will benefit e-Learning and Businesses. Today, many companies, from large enterprises to small start-ups, use eLearning to manage their employees' development: upgrade their qualifications, teach them new skills, or retrain

them for new positions. eLearning is a great boon to businesses because of benefits that may include Lower training costs, Wider coverage, Single knowledge base, Faster employee development, Easy progress tracking, Business adaptability.

e-Health

E health increases access to healthcare and benefits of a healthy workforce leads to increased productivity, lower absenteeism, improvements in talent acquisition and retention, and other areas not directly reflected in health care costs.

internet banking

Brings the Bank to people, Cuts Banking Costs, Keeps Banking Business Secure, Customizes Employee Access to Business Bank Accounts, Helps Stay Alert, Remote Deposit Capture, Increases Cash Flow, It's Easy to be Green. Licensed Internet Service Providers will be able to connect SMEs to internet services that will accrue a number of benefits that may include:

Speed

Fiber-optic Internet is many times

faster than even the highest-speed copper Internet connections, with options available that range from 5 Mbps to 100 Gbps. During periods of high demand for Internet access, the business will not notice the Internet slowing down. Research indicates that slow Internet connections cost employees "one week per year of productivity." While the time teams spend waiting on slow Internet can seem minor, it adds up significantly over time. Internet connectivity should never inhibit productivity. It should be a tool that supports employees' desire to work productively.

Cloud Access

From customer relationship management (CRM) tools to data storage, the cloud is an important business tool for apps, hosting, and more. According to Dr. Kimandio, 96% of organizations are now using the cloud in some capacity. The speed and bandwidth capabilities of fiber Internet mean faster access to data and applications stored in the cloud.

Business can benefit from fewer delays in accessing cloud-hosted information via software-as-a-service (SaaS) tools and other platforms, which means sales and customer service representatives will no longer face delays with communicating with prospects or customers. As businesses move more and more services to the cloud, fiber-optic Internet is becoming critical.

Reliability

Fiber Internet connectivity offers significant reliability advantages over copper Internet connectivity, because fiber is much stronger than copper. Fiber-optic Internet is not susceptible to inclement weather conditions, which can damage or stall data transmission via copper cabling. Fiber is also resistant to human or electrical interference unless fibers are physically cut.

Unreliable Internet connections can have real costs to businesses. Any amount of unplanned downtime can bring business communications and productivity to a complete stop. If your company requires an Internet connection to make phone calls or access applications, reliability is a necessity.

Signal Strength

With traditional broadband Internet using DSL or Ethernet over Copper, the signal degrades as the user moves away from the swtich. The signal strength of fiber-optic Internet does not degrade as quickly over distance. Organizations in relatively large spaces could benefit from better signal strength throughout the facility. This could be particularly true for employees in workspaces that are located a significant distance from the telecommunications room, which may be negatively impacted by distance with broadband Internet.

Bandwidth

For businesses with a high need for data transmission, it is relatively easy to "hit the cap" on your cable Internet bandwidth. While fiber-optic Internet for business is not truly unlimited, the bandwidth availability is significantly higher, and speed does not decrease as high demands are put on the network.

Symmetric Speed

"Symmetric speed" is a term used to refer to equal upload and download times on an Internet connection. With fiber Internet, employees can benefit from equal upload and download times.

Latency

Latency is a term used to describe delays that occur while processing data over an Internet connection. Fiber-optic Internet eliminates many of the latency issues users experience on cable Internet, particularly when downloading or uploading video or high-definition content. The business benefits of lowering your latency could include: better voice quality for VoIP users, ability to move more apps to the cloud downloads and uploads of huge files without disruption, improved collaboration between employees.

Security

Would-be hackers and information thieves can gain access to business cable Internet with relative ease, due to cable tapping or other relatively simple methodologies. The only way to penetrate fiber-optic Internet is to physically cut the fibers, which will cause the signal to disappear. While an upgrade to fiber-optic Internet connectivity will not mitigate all of your organization's risks, it's certainly an important means of protection.

Resistance to Interference

Copper cable Internet that supports

Dr. Lawrence Kimando, KETRACO General Manager in charge of Strategy.

broadband is sensitive to electromagnetic interference, which can be caused by the proximity of heavy machinery. Fiber Internet signals do not degrade or disappear due to electromagnetic interference. If an organization shares a telecommunications room with other businesses, fiber-optic Internet can protect the connectivity from disappearing if other organizations are using equipment that can interfere with the connection in the same space.

Cost Savings

Fast Internet is widely considered to be a productivity tool for businesses. As mentioned above, eliminating speed issues could result in a week's worth of productivity increases each year. If a business suffers from unreliable connectivity due to region or weather, it could be losing thousands of dollars each year. Productivity issues that are directly attributed to slow or unreliable cable Internet could disappear with fiber.

Support for HD Video

For many companies, teleconferencing and video conferencing are important tools for employee training, marketing, and sales. With a fiber-optic Internet connection, businesses can increase their investment in video conferencing as a business tool without sacrificing available bandwidth.

But what are the challenges of carrying fiber on KETRACO's network? According to Dr. Lawrence Kimando, OPGW cable has minimal risks as compared to underground cables. The common challenge KETRACO has faced so far is vandalism of the metallic splice boxes.

Dr. Kimando says investors should consider KETRACO as a prospective ICT fiber business partner for reliable fibre optic network across the country, providing access to undersea cables and offering interconnection to neighboring countries.

So, what is the place of ICT Engineers in the age of distant fiber transmission? Increased Fibre Optic transmission networks have created opportunities for ICT engineers whose expertise is required in the installation and maintenance of fiber optic networks.

The engineers install and test these cables, perform maintenance checks on them, and take care of any malfunctioning that may happen. ICT engineers are also involved in designing and overseeing the installation of telecommunications equipment and facilities, such as complex electronic switching systems, and other plain old telephone service facilities, IP networks, and microwave transmission systems.

Inside the modern tier-III Konza National Data Centre

By Lucas Omollo

K ONZA Technopolis Development Authority has developed a tier III modern data centre to provide world-class services to both government and private enterprises.

The Konza National Data Centre is modelled to draw and learn from data supplied by connected devices and sensors, embedded throughout the smart city to optimise wastewater, irrigation, public transit, traffic flow and other interconnected elements. It also delivers real-time insight to the people within the city; for example, suggesting the fastest route to a destination.

"This connectivity will support multiple sustainable elements throughout Konza, enabling the city and its residents to efficiently manage resources, infrastructure and features such as solar and rainwater harvesting," says Mr. Lucas Omollo, **(pictured above)** the Konza Technopolis Data Centre Manager. Mr. Omollo says the data centre will make Konza Africa's first LEED (Leadership in Energy and Environmental Design)-certified city. The Konza National Data Centre is already generating millions of shillings in business revenue monthly. When completed, the Technopolis hopes to grant Konza's population and workforce direct access to useful data, which may include traffic maps, emergency warnings, and detailed information describing energy and water consumption.

According to the agency, availability of data will enable Konza's population to participate directly in the operations of the city, practising more sustainable living patterns. Mr. Omollo says a smart city framework integrates six key city services using Internet of Things (IoT); Smart Energy and Lighting (ambient light levels, smart grids applications); Smart Utility (smart water and waste management, intelligent sewer system, rubbish bins real-time monitoring, pressure management system for water); and Smart Education and Healthcare (medicine monitoring, tracking systems for elderly people, virtual exhibitions and lectures.

Others are Smart Building (room automation systems, air quality monitoring, managing municipal facilities); general municipal and business services (smart Konza card, online problem-solving tools, pedestrian traffic mapping, Konza huduma services, emergency services/response, mapping, electronic signs, city information, smart parking); and public safety and security (CCTV/video surveillance, traffic lights and a traffic control system).

Figure1: Konza Smart City Framework
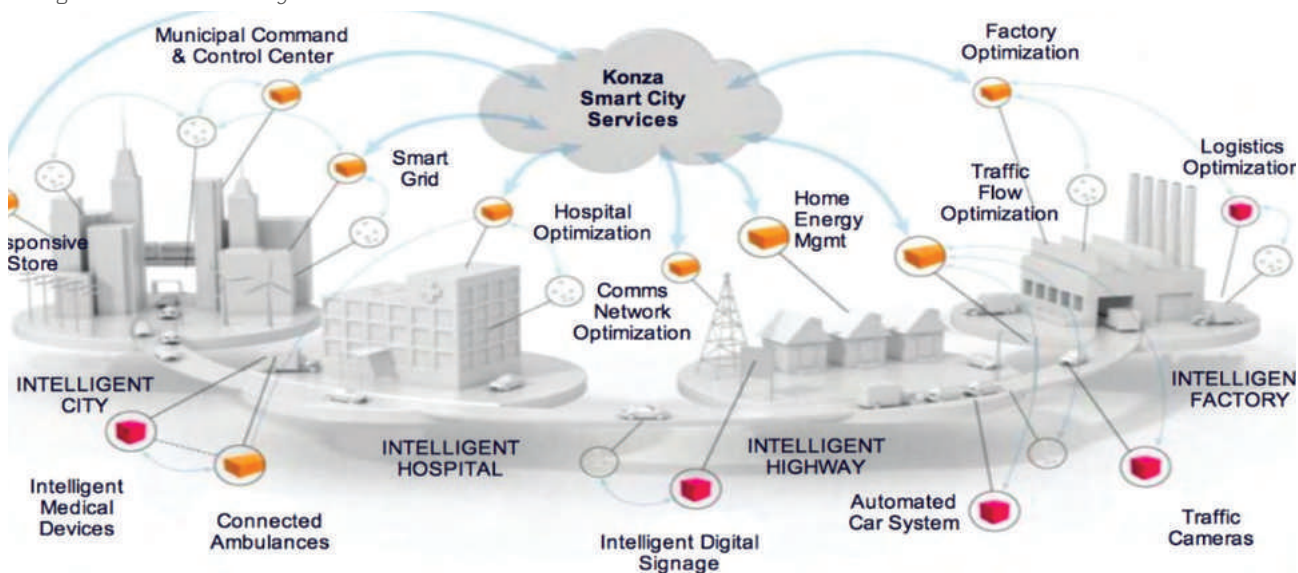
By leveraging the smart city framework, Konza hopes to optimise its services, creating a sustainable city that responds directly to the needs of its residents, workers and visitors.

As Konza continues to develop its technology network, it hopes to draw from a range of international best practices, including from the Intelligent Community Forum, Smart Cities Council and International Standards Organization's methodologies for the sustainable development of communities.

The global benchmark for Konza includes global cities that have successfully incorporated smart city frameworks, including Spain's Santander and Barcelona; Singapore; Amsterdam, The Netherlands; and Brazil's Rio de Janeiro.

Sustainability

According to the Data Centre manager, sustainability is at the heart of the masterplan for Konza.

"The Technopolis is designed to meet the highest international environmental standards. The sustainability code for the Technopolis has set standards for building fabric energy efficiency, reduced CO2 emissions from buildings, use of renewable technologies for power savings, reducing portable water demand, promoting rainwater harvesting and considering grey water treatment and recycling," says Mr. Omollo.

He also reveals that the Data Centre is built to manage surface water drainage and flood risks.

The Technopolis has planned a designated 10km buffer zone around the site to protect envisaged investments within it. The purpose of the buffer zone is to regulate development and land use within the 10km radius. In addition, it will provide for orderly and progressive development of human settlements to promote sustainability. To this end, the Authority is working with UN-HABITAT and the neighbouring counties of Machakos, Makueni and Kajiado to administer this plan.

The Konza National Data Centre currently provides cloud services such as Software as a Service (SaaS), Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Collocation. In addition, it will act as a shared services host for government ministries and to support Konza Technopolis smart facilities and services.

a) Software as a service (SaaS)	This is a service that provides software to its users over the Internet. The service can be provided to the customers using any of the following licensing method: • Service on demand • Through subscription • Pay-as--you-go • Or even at no charge
b) Platform as a Service (PaaS)	• Clients with new applications and database, requiring new hosting services but do not have Operating system • Startup enterprises requiring a platform to develop, test, host, deploy and maintain applications in the same development environment • Enterprises looking for PaaS solutions to host their applications
c) Infrastructure as a Service (Iaa)	• Clients looking for hosting destinations e.g. NHIF • Clients with existing systems (applications database, operating systems) considering alternative hosting due challenges with current environment • Clients with primary hosting services in need of backup solutions • Business enterprises within and outside KOnza in need of hosting services
d) Collection	• Clients booking for rack space renting • This service will be availble from May 2021

International standards

The data centre has been designed and implemented in compliance with the following international standards and best practices:
• LEED v4 BD+C Gold Rating or above.
• Uptime Institute Tier III Design and Construction Certification (design certification awarded in February), construction certification in process.
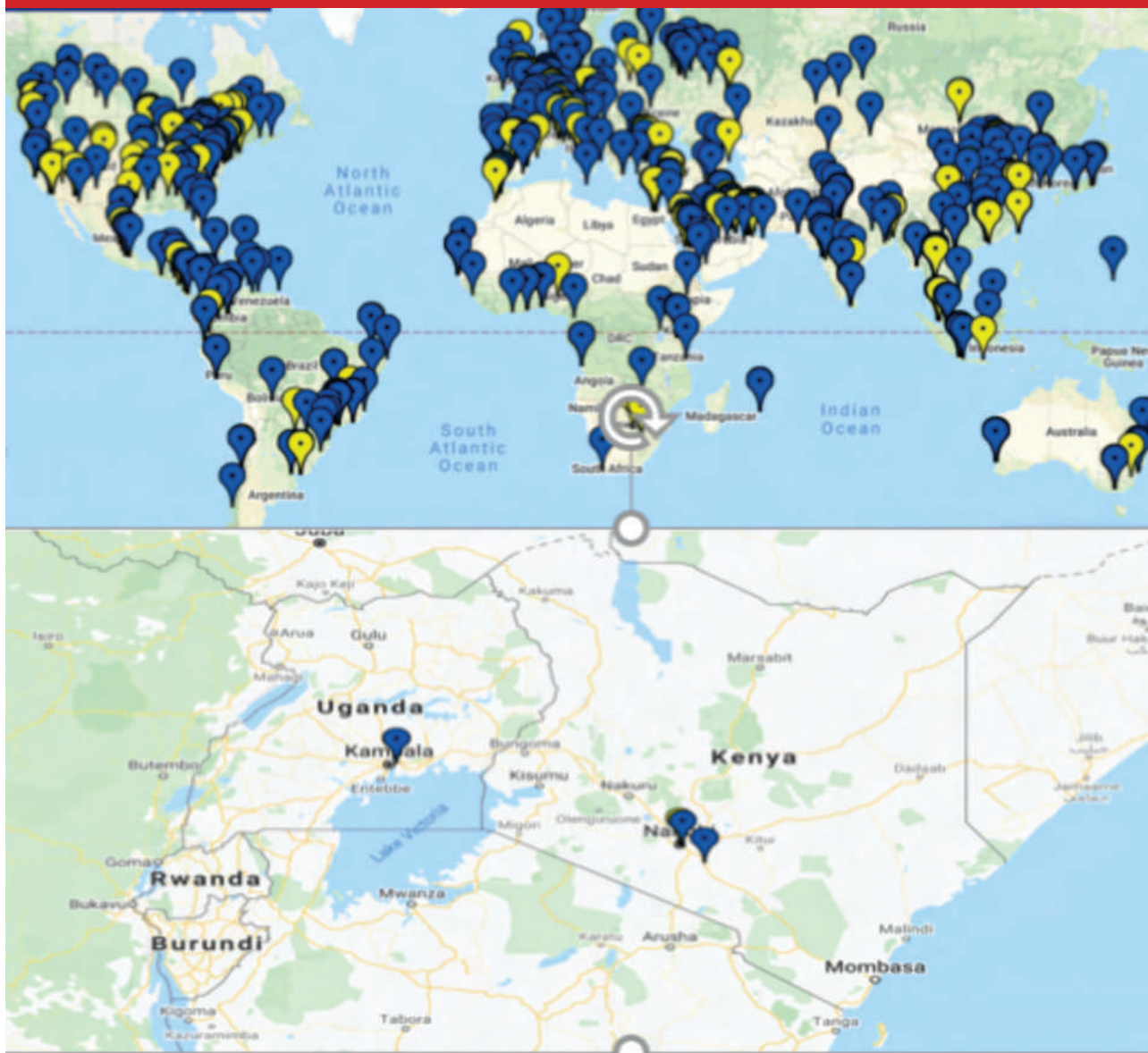
- ANSI/TIA-942-2005: Telecommunications Infrastructure Standard for Data Centers
- ANSI/TIA/EIA-568-B.1: Commercial Building Telecommunications Cabling Standard.
- ANSI/TIA/EIA-568-B.2: Commercial Building Telecommunications Cabling Standard; Part 2 Balanced Twisted-Pair Cabling Components
- ANSI/TIA/EIA-568-B.3: Optical Fiber Cabling Components Standard
- ANSI/TIA-569-B: Commercial Building Standard for Telecommunications Pathways and Spaces
- ANSI/TIA/EIA-606-A: Administration Standard for Commercial Telecommunications Infrastructure
- ANSI/TIA/EIA-J-STD-607: Commercial Building Grounding (Earthling) and Bonding Requirements for Telecommunications
- ANSI/TIA-758-A: Customer-Owned Outside Plant Telecommunications Cabling Standard
- IEEE C2-2002: National Electrical Safety Code
- NFPA 70: National Electrical Code

1.1 Backup Power

In the event of a complete state utility failure, 2+1 redundant sets of diesel generators support the data centre as dedicated power supply for continuous operation with 20,000 litres of diesel.

1.2 Uninterruptible Power Supplies (UPS)

2N redundancy battery-backed up UPS systems built from parallel 1000kVA UPS systems

provide uninterrupted power supply, filtered power to the data hall. Each cabinet feeds from two separated UPS systems, guarantee high reliability of UPS power supply.

1.3 CRAC - Computer Room Air Conditioner

The CRAC system consists of multiple sets of DX-Units – Direct Expansion in-row cooling system with cold air containment. The CRAC system runs in a full N+1 configuration, power from dedicated UPS power, guarantee continuously operation.

The system maintains a constant ambient temperature of 22 +/- 2 ºC, with a relative humidity of 40 to 60%. All the running parameters are continually monitored and recorded by the DCIM.

1.4 DCIM - Data Centre Infrastructure Management

The data centre is managed by AI based DCIM, a next-generation data centre infrastructure management system. It provides an innovative and leading intelligent O&M solution for data centres to maximise the efficiency and value of data centres. It provides basic UPS, cooling, power distribution, CCTV and various alarm management, asset life cycle management, capacity management, energy efficiency management, tenant management, video management, access control management, intelligent O&M, security management, log management.

1.5 Security

The data centre has been designed with multiple security levels: multiple access control, five-level biometric fingerprint access control from the main gate to the main building door, data hall, aisle containment access control and cabinet level access control. All the entrance records will be recorded by the DCIM. CCTV cameras – no-blindspot monitor from the perimeter of the facility to all areas inside the facility.

Available now at the Konza National Data Centre include cloud servers (virtual machines), physical server renting, cloud storage, business protection – data backup service, video conference service, email hosting services, website hosting services, Virtual Desktop Infrastructure (VDI) services.

Service catalogue available from August 2021 will include collocation, additional services under SaaS and additional services under PaaS.

Mr. Lucas Omollo, the Konza Technopolis Data Centre Manager.

Module Level ccess Control

acks Level ccess Control

X-ray Baggage Scanner   Man Trap   One-way Turnstile   Vehicle Inspection

All the Entries with Fingerprint/Password/Card Security

Monitoring Center View and management

Data Center Security Measures

Based on Data Center Security Requirement in TIA-942

Level 1 – Campus Access Control
- Vehicle Inspection System
- Security Booths/Mantrap System
- One-way turnstile
- X-ray Baggage Scanner
- Register Station

Level 2 – Room Access Control
- All the Entries Fingerprint/Password/Card Security
- CCTV Security

Level 3 – IT Module Access Control
- IT Module Cold Aisle
- Racks Level Access Control

Remote Management
- APP view and management
- Monitoring Center view and management
- Remotely control

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The 5G Technology Era: A Network Faster Than The Blink Of An Eye

By Editorial Team

WIRELESS technology has evolved rapidly in the last decade. 5G is the 5th generation mobile network. It is a relatively new global wireless standard after 1G, 2G, 3G and 4G networks. 5G is designed to connect virtually everyone and everything together, including machines, objects and devices.

Experts say 5G transmits commands faster than the blink of an eye. 5G wireless technology will bring 100 times greater Internet speeds than the current 4G in use.

Practically speaking, it takes about 26 minutes to download a three-hour-long film on 3G, six minutes on 4G but only about 3.5 minutes on 5G, according to Consumer Technology Association. 5G is meant to deliver higher multi-Gbps peak data speeds, ultra-low latency, more reliability, massive network capacity, increased availability and a more uniform user experience.

5th generation wireless technology is a software defined network. In February 2019, technology experts sent the clearest signal yet on the possibility of emerging markets beginning to deploy large-scale 5G mobile network in the next few years, leading to the rapid development of the network.

While 5G networks will not replace the need for cabling buildings and premises entirely, the network will limit extensive use of cables by operating on the cloud instead. As such, smartphone users will enjoy streamlined experiences.

5G can become a connective tissue to the Internet of Things (IoT) when deployed on commercial scale or for industrial purposes. It is currently in early phase industrial deployment, linking and controlling robots and medical devices, industrial equipment and agricultural machines.

United States technology research think-tank GSMA Intelligence Data estimates that even by 2025, 5G adoption globally is still likely to lag behind 4G and 3G in terms of mobile connections.

Mainstream existence of 5G faces numerous hurdles, the biggest being cost. Adoption of 5G could cause network operators to dismantle all currently existing business models.

3G and 4G networks benefited from the fact that they could easily roll out on already existing frequencies in the local radio spectrums of many countries. For 5G to work properly, it needs frequencies with greater bandwidth, which requires setting up of new infrastructure.

In the 5G era, multi-Radio Access Technology (2G/3G/4G/5G) networks

PICTURE COURTESY

are complex and difficult to maintain, requiring high operation and maintenance costs.

For 5G networks to be effective in large scale, therefore, basic voice, IoT and data services must be migrated to the LTE network and LTE made a bearer for basic services. In the future, the target network will evolve to "LTE+NR" and feature RAT simplifications. 5G will be a major economic driver—spurring the innovation of new industries, products, services and job creation.

Broadly speaking, 5G is used across three main types of connected services, including enhanced mobile broadband, mission-critical communications and the IoT.

A defining capability of 5G is that it is designed for forward compatibility—the ability to flexibly support future services that are unknown today.

In addition to making our smartphones better, 5G mobile technology can usher in new immersive experiences such as VR and AR with faster, more uniform data rates, lower latency and lower cost-per-bit.

The network is meant to seamlessly connect a massive number of embedded sensors in virtually everything through the ability to scale down in data rates, power and mobility—providing extremely lean and low-cost connectivity solutions. Smart factories could use 5G to run industrial ethernet to help them increase operational productivity and precision.

Presently, China's Huawei Corporation & ZTE have launched big 5G trials that have positioned both firms at the forefront of global equipment production for the relatively new engineering technology.

GSMA predicts that by 2025, nearly half of all US mobile connections will be 5G, a greater percentage than any other country or region.

It is predicted that 5G technology will be adopted quickly in key industrial zones but will take a long time to come to the rural due to expensive costs of installing newer bandwidth infrastructure.

Firm receives KCAA Certification for Commercial Drone Operations

By Editorial Team

LOCAL Kenyan firm Drone Space has received the Remote Operator's Certificate (ROC) from the Kenya Civil Aviation Authority (KCAA), paving way for the firm to fully realize the promise of Unmanned Aircraft Systems (UAS) technology to deliver innumerable economic and societal benefits.

"This landmark certification is a critical step in the use of drones to provide solutions to everyday challenges," said Drone Space Chief Executive Officer Tony Mwangi. "Over the last five years, there has been significant demand for potential drone pilots and legal operations."

ROC authorizes an operator to carry out specified drones' operations. In order to conduct a commercial operation and operate legally, pilots are required to hold a valid Remote Pilot License (RPL). Both the drone and pilot will need to operate under the ROC which is issued by the KCAA who regulate drone operations to ensure high level of air safety and competence.

"Flying a drone is legal in Kenya, however, commercial drone operations require a pilot to obtain a Remote Operators Certificate from the Authority," Tony noted.

In order to be issued with the ROC license, the applicant must demonstrate, among others, that it has its principal place of business and is registered in Kenya; an adequate organization with properly qualified staff; UAS Operator's Manual, Safety and Quality as well as supervision of flight operations; training programme, ground handling and maintenance arrangements; and obtained Ministry of Defence security clearance for matters related to defence.

Founded in 2018, Drone Space provides a range of services including helping individuals establish a commercial drone operation and also provides companies with access to accredited operators. They are licensed by the KCAA to offer training to individuals interested in gaining RPL allowing safe and secure utilization of UAS.

Following the licencing, the firm graduated over 40 students during the inaugural drone pilots graduation in East and Central Africa. The pilots received their Kenya Civil Aviation Authority (KCAA) approved Remote Pilots Licence (RPL) certificates enabling them to operate drones in the Kenyan national airspace.

Speaking during the graduation ceremony Ministry of Information, Communications, and Technology Chief Administrative Officer Maureen Mbaka said that the unmanned aircraft industry is leading the way into a new age of aviation.

"As the drone industry continues to grow and develop at a rapid rate, it is crucial that pilots and operators do the same in order to improve their own standing within the industry," Ms. Mbaka said. "Drone technology will continue to play an increasing role in optimizing various sectors including agriculture, housing, security, tourism amongst other key sectors of our economy, but first we must master how to fly and operate them right," she said.

Drone Space says it aims to build a team of KCAA—certified drone pilots who will practice flying unmanned aerial vehicles (UAVs) to meet the local demands for various sectors of the economy.

L-R: Kenya Civil Aviation Authority UAS Technical Officer Francis Kigen, Ministry of ICT, Innovation and Youth Affairs Chief Administrative Secretary Maureen Mbaka and Drone Space CEO Tony Mwangi during the graduation ceremony of first cohort of drone pilots by Drone Space. (PHOTO COURTESY)

PICTURE COURTESY

What we can learn from the Automotive Industry

TELECOMMUNICATIONS and information have come a long way, from the beating of drums to Morse codes, wired and now wireless, propelled by advances in technology as well as a likeminded community where one can access and manipulate everything from a singular dashboard.

Reinventing the wheel

Since the motor vehicle became mainstream and spurred by its obvious benefits, it attracted lots of innovations, most crucially Henry Ford developed the assembly line technique of mass production and Toyota implemented the first just-in-time production system translating to the development of better ways to achieve optimum efficiency.

Similarly, Telecommunications and Information Engineering must piggyback on the many innovation leaps like Internet-of-Things, BPO, crowd sourcing, and Artificial Intelligence, among others, thus achieving more efficient methods of harnessing technology.

Convergence of technologies

One could count the number of vehicles that do not employ integrated chips, from simple tasks like automatic windshield wipers to more complicated crash avoidance systems. These sometimes are a cocktail of several technologies from stability control to object recognition, similarly telecommunication and information through mixing and matching individual technologies to solve day-to-day problems simply.

Now that Kenya is a global leader in mobile money, where many technologies have harmoniously been implemented to solve the problem of money transfer, beating legacy products while bypassing 'obvious' technologies.

Accepting outsiders

Hybrid and electric motor vehicles are the new players in town, lest we forget that they have existed since the 19th century. The resurgence is attributed to advances in technology, stringent regulations and a more conscious customer that have created these new segments. We have seen numerous software applications that make legacy voice calls and massaging obsolete. Equally, while leveraging on

> We have seen the Kenyan mobile network operators like Safaricom having its global money transfer brand MPESA brand, additionally besides divesting in to facilitating other services like credit referencing, overdrafts etc.

telecommunications and information engineering, fresh inspiration is a key ingredient towards a beneficial sector.

Not Business as Usual

At the moment, most of the automobile manufacturers are not owned by their initial owners, in fact, most of them belong to a handful of parent companies. Furthermore, these brands have evolved to satisfy unique markets and niche segments, the likes of Volkswagen owning a dozen brands and Range Rover transforming from a farm workhorse to a luxury brand.

We have seen the Kenyan mobile network operators like Safaricom having its global money transfer brand MPESA, besides divesting into facilitating other services like credit referencing, overdrafts, etc. They are major players in the cash transfer service, directly competing with well-established companies like Visa and Paypal. On the other hand, interacting with customers has leapfrogged, aided by the Internet via social media where parties can custom advertise and track potential customers.

What next?

Ultimately, for over a century the automotive industry has had its highs and lows but eventually come out better and relevant to its customers. Therefore, to leverage on Telecommunications and Information Engineering, we must always appeal to the market's primal desires of love, vanity and improving status, while protecting it from embarrassment and shame by making sure they have pride in belonging to the cutting edge of technology.

Let's integrate road works and fiber optic cabling, says ICT Authority boss

By Editorial Team

THE ICT Authority is racing to spread fiber optic cabling across Kenya to strengthen core internet access infrastructure in far-flung areas.

A few years ago, while she taught Computer Science and Artificial Intelligence (AI) at the University of Nairobi, ICT Authority CEO, Dr. Katherine Getao, hardly imagined she would be in charge of implementing this mandate.

Tasked with rationalising and streamlining management of all government ICT functions, the ICT Authority is also in charge of enforcing ICT standards in Kenya and supervision of government electronic communication. Dr. Getao has been at the helm since December 2018.

Implementation of the National Optic Fiber Backbone Infrastructure (NOFBI) has perhaps been her biggest test yet.

"When I took office, we ascertained that there is a sense of mutually assured destruction between roads engineering and the laying of fiber networks infrastructure.

New roads destroy a significant bulk of fiber cabling. Likewise, new cabling cuts through parts of urban and rural roads. The Eldoret-Nakodok (Turkana County) fiber optic stretch was particularly problematic in this way," she says.

According to Dr. Getao, integrating roads and ICT fiber optic infrastructure will ultimately lower costs of spreading information and telecommunications, enabling internet access to reach the farthest remote areas of the country. It will also increase inter-agency coordination and is likely to reduce destruction of both roads and fiber optic cable networks whenever engineering works are underway.

For underground fiber optics, she calls upon roads and ICT sector agencies and engineers to work together in projects so as to create room for road and fibre optic cable integration during design and inception of roads projects, and minimise destruction.

Dr. Katherine Getao, ICT Authority CEO.

"It should be accepted as a standard that engineering civil works can be for both roads and telecommunications ICT infrastructure. This means fiber will easily follow roads and both infrastructures can then be developed very quickly," says the ICT Authority boss.

"Given that nowadays fiber is serving both voice and data communication, this would be a very good way of opening up the country to both ICT- and road networks-driven development opportunities."

Dr. Getao says the cost of running fiber ducts alongside roads should be incorporated into total costs of road building contracts.

"This way, we will be able to quickly extend the national fiber network countrywide from the current 8,900km to over 50,000km by 2029, opening up the country to massive development opportunities made possible by AI and Industry 4.0 era, in line with the Draft National ICT Infrastructure Master Plan that the ICT Authority has now developed," she says.

PICTURE COURTESY.

STUDENTS VOICES

JOY AKONDI
Telecommunications Graduate Engineer

As a child, I always wondered how the most valuable gadget in our house, the phone, functioned. My mother would hold it very delicately as she talked to my father. A few years later, in my senior primary school, I heard about a more powerful gadget, the computer. I landed in Bachelor of Engineering in Electrical and Telecommunications Engineering; my dream and passion, and the backbone of socio-economic development. An effective and efficient data transmission system is the heart of every aspect of development. The world is changing; human control of appliances domestically and commercially is being replaced by remote control techniques. The great minds behind AI have equipped systems with thinking and comprehension capability like the human brain. Robotics and chatbots are a manifestation of Artificial Intelligence. Information and Telecommunications Engineering is undoubtedly a connector to all systems. With connected systems, the world is a global home. Great minds need harnessing; mine is not an exception.

MONICA NAKHUMICHA
Telecommunications Graduate Engineer

Although, as a student, I have to appreciate the fact that not all concepts can be conclusively taught in class, it still worries me that perhaps the basic concepts are not enough to keep me at par with the new technology in the industry. In the event that the basic concepts taught in class comprehensively incorporate the fast-advancing technology in information and telecommunications, how can I practically build on these concepts? Meanwhile, one of the best opportunities for us to bridge the knowledge gap created is during industrial attachments and internships. It is every student's desire to get the best exposure during these periods. Unfortunately, with the Covid-19 pandemic, our options have become limited. Ultimately, I believe that as a student I can only stay up to date with the new skills in information and telecommunications by taking a personal initiative to learn on my own. Obviously, I cannot learn everything at once, but the more I learn the more curious I get. It is an ever-growing desire. It may not be the easiest way to learn, but with some guidance from mentors it is definitely attainable.

THE ENGINEERS STAMP

LEGAL PROVISIONS

The Engineers Rules 2019

Rule 10 (4): The Board shall, issue an official rubber stamp to every professional and consulting engineer registered under the ACT on payment of the fees prescribed in the Third Schedule

Rule 10 (5): The rubber stamp issued under paragraph (4) shall be used for approving or certifying engineering documents including design calculations, drawings, technical reports and other engineering documents.

Rule 10 (6): A professional engineer or a consulting engineer shall sign and date and affix the rubber stamp issued under paragraph (4) on any approval or certification given by the professional engineer or consulting engineer.

PURPOSE OF THE STAMP

Enable the Public and other stakeholders to easily and correctly identify genuine engineering documents and the certifying engineer

FEATURES OF THE STAMP

i. Self-inking with built-in internal stamp pad
ii. Protective cover on the base
iii. Serialization
iv. High quality rubber
v. EBK Logo to be affixed in the casing.
vi. The Name and Registration Number of the Engineer to appear on the stamp printout.
vii. Unique security features

TO ORDER YOUR STAMP

- Go to MPesa
- PayBill
- Paybill Number: **839300**
- Account Number: Indicate your registration number e.g. A1234
- Amount: **Pay Kshs. 5000/-** as provided for in the Third Schedule of the Engineers Rules, 2019.

ENGINEERS IDENTIFICATION CARD

LEGAL PROVISION

The Engineers Rules 2019, Rule No 10 (1), requires the Board to issue engineers with an Identification Card. The need for an identification card arose from the realization that there was no mechanism for engineers to easily identify themselves to the public or relevant authorities especially when providing services outside an office environment.

EBK IDENTIFICATION CARD

Engineers Board of Kenya (EBK) has therefore partnered with the National Bank of Kenya (NBK) to generate Smart Cards (Visa Cards) which are customized to suit the requirements of the Board but also to offer additional conveniences to engineers.

BENEFIT OF EBK IDENTIFICATION CARD

- The smart card will be your identification card as provided for in the Engineers Rules. This will help to easily weed out persons not licensed to practice as engineers. The public will be sensitized on this important identification document.
- Security – The partnership with NBK Visa Centre on the issuance of the Identification Card provides a secure identification system that is not easily replicated by unscrupulous persons.
- The Identification Card will enable engineers to conveniently carry out financial transactions such as payments for Board activities.
- The Identification Card will make it easier for you to access the Boards services, eg You will be able to avoid long queues at registration desks during the Board activities by simply swiping or scanning your card.
- The VISA – EBK co-branded card can be quickly cancelled and replaced.
- The Identification Card will offer you the control to manage and budget on expenses
- Convenience and ease of use.
- Simplified application and immediate issuance.
- The Card will be configured to be scalable and compatible with all the Board's systems.

IEK MEMBERSHIP REPORT

The IEK Membership Committee meets every month to consider applications received at the secretariat to enable clear the long list of applicants wishing to become members of the Institution in the various classes. Between April and May 2021, the number of new applicants processed was 180 as reflected in the table 1 below;

Member Entry class		Number process in Jan, Feb & March
Graduate Member – GE		172
Graduate Engineering Technician - GT		1
Graduate Engineering Technologist - GTL		3
Student Membership - S		4
TOTAL NUMBER		**180**

Table 2: Discipline Data

Discipline	Agriculture	Mechanical	Electrical	Civil
	290	1,714	1,939	4,364

Table 3: Gender Data

S/N	Gender	Number
1	Female	669
2	Male	7,636

Between April and May, one member was registered in Fellow class and 62 members transferred from Graduate to Corporate class. Their details are given below. ***Their details are given below:***

S/N	Member Name	M/No
1.	John Kipchumba Tanui	F.2284
1.	Alban Inyanza Kanali	M.7603
2.	Alex Hezron Abuya Odoyo	M.4885
3.	Alfred Alumasa Mitalo	M.3211
4.	Alfred Mwenda Joel	M.6140
5.	Allan Odondi Orimba	M.4507
6.	Amos Kipkoech Siwoi	M.5859
7.	Andrew Apollo Anyuogo	M.7085
8.	Boniface Kamanda Kinyanjui	M.9351
9.	Bruno Robert Mose	M.5017
10.	Cedric Obonyo Khasenye	M.5305
11.	Charles Ngunyi Mathenge	M.5177
12.	Charles Simiyu Wamalwa	M.7495
13.	Collins Omondi Aketch	M.8102
14.	David Kipyatich Kirop	M.6159
15.	Dickson Nyalala Ombewa	M.1495
16.	Edwin Muhuni Agala	M.7164
17.	Eric Maweu Nzola	M.3608
18.	Ezekiel Oyugi Onjure	M.7165
19.	Faith Mutheu Mutuku	M.6598
20.	Florah Mwendwa Kamanja	M.6720
21.	Fredrick Odera Obala	M.6406
22.	Gerald Kariuki Kingori	M.7208
23.	Gevas Kiprotich Korir	M.6799
24.	Gibson Gicebe Maina	M.7716
25.	Gitobu Gideon Gitonga	M.8687
26.	Grace Njeri Muna	M.7163
27.	Gregory Mutuku Nthenge	M.5602
28.	Heikal Ghazy Balala	M.7191
29.	Henry Moyi Nyakwaka	M.7056
30.	Ian Munene	M.5754
31.	Isaac Mwashumbe Mwasigwa	M.7592

S/N	Member Name	M/No
32.	Jamal Ali Sabu	M.8491
33.	Jeremiah Nguli Kisilu	M.3650
34.	John Malu Nzioki	M.6873
35.	John Oloo Otieno	M.6730
36.	Joseph Ng'ang'a Thuo	M.3993
37.	Josephat Simba Samusi Nyamweya	M.8496
38.	Kennedy Narostso Odunga	M.5471
39.	Lorena Evon Achieng Simba	M.7616
40.	Martin Kinyua	M.7940
41.	Maurice Otieno Owour	M.8438
42.	Michael Kariuki Gachau	M.4905
43.	Michael Ochieng Outa	M.7153
44.	Milton Archbon Wanyela	M.5538
45.	Mohamed Naheem Naushad Ali	M.7889
46.	Munyau Maithya	M.7975
47.	Munyau Maithya	M.7975
48.	Mustafa Mohamed Hassan	M.8479
49.	Ng'ang'a Macharia Fidel	M.7396
50.	Oscar Wesonga Nabiswa	M.8093
51.	Peter Muriuki Karigithi	M.6816
52.	Peter Mwagih Mathenge	M.8243
53.	Pius Martin Njoroge Chege	M.6412
54.	Pius Museka Kikuyu	M.1776
55.	Ronald Reagan Khamala Mudenyo	M.7150
56.	Samson Mungai Koinange	M.6939
57.	Sheth Otieno Misura	M.4658
58.	Simon Ochieng Ombwayo	M.7451
59.	Stephen Okumu Odhiambo	M.8042
60.	Thomas Kipsigei Koech	M.4441
61.	Tony Eliab Mwashuma	M.7594
62.	Victor Mwenda Mwongera	M.5614

The council is calling on its members to apply for transfer of class from Corporate to Fellow and also Graduate to Corporate. Members can check eligibility requirement and how to apply for Fellow class on our website: **https://iekenya.org/downloads/REQUIREMENTS/FELLOW%20 REQUIREMENTS%202020.pdf**

The IEK fraternity condoles with family and friends of our members who have since passed on in the recent past. May their souls rest in peace.

Condolences to family and friends of Eng. Erastus Kamara Wambugu – M.6621 who died on June 2, 2021. May his soul rest in peace.

"Death is not extinguishing the light . It is putting out the lamp because the dawn has come."

![Engineering in KENYA logo]

We value your feedback!

The Institution of Engineers of Kenya (IEK) welcomes your views and comments in regards to articles we carry in each edition of **Engineering in Kenya** *Magazine.*

Such feedback is important in enhancing the quality of content we cover for you in each edition, and will go a long way to improve our standards as we strive to be a reliable source of Scientific Engineering information in Kenya. Send us your feedback on **iek@iekenya.org** *and cc:* **ceo@iekenya.org; editor@iekenya.org** *and* **engineeringinkenya@michi-media.com.**

Call for Papers

Engineering in Kenya Magazine-July /August 2021 Issue

The Institution of Engineers of Kenya (IEK) publishes Engineering in Kenya magazine, whose target audience includes engineering professionals, practitioners, policymakers, researchers, educators and other stakeholders in engineering and related fields. The publication is distributed to its target readers free of charge through hard and soft copies.

IEK hereby invites you to contribute articles for the next and future editions. The articles should reach the Editor not later than 10th of August 2021 for our next issue whose theme shall be "Engineering in Academia Industry and Research in Kenya" and related sub-themes across all engineering disciplines. An Article can range from engineering projects to processes, machinery, management, innovation, news and academic research.

The articles must be well researched and written to appeal to our high-end audiences and to be informative to the public in Kenya and beyond. The magazine reserves the right to edit and publish the article in line with its editorial policy. The articles should be "500-1000" words, font type "Times New Roman" and font size "12".
Send your article today and get a chance to feature in the magazine!

Send your article to:
iek@iekenya.org and cc:
ceo@iekenya.org;
editor@iekenya.org and
engineeringinkenya@michi-media.com.

Building a world class National Grid

KETRACO has energized the 400/220/132kV Olkaria - Lessos - Kisumu (OLK) transmission project. The project will facilitate reliable and stable power to the Lake Basin Economic Block Counties.

KETRACO
Kenya Electricity Transmission Company Limited
"Building a World Class National Grid"

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