

E.S.A - MMUST

The **INNOVATOR'S** **BLUEPRINT**

ISSUE 001

PUBLISHED BY ENGINEERING STUDENTS' ASSOCIATION - MMUST



SPECIAL FOCUS:

- TECHNOLOGICAL ADVANCEMENT
- ECONOMIC TRANSFORMATION
- INFORMATION TELECOMMUNICATION & ROBOTICS

VISION

To produce productive, innovative and disciplined graduate engineers.

MISSION

To bring together students of SEBE towards ensuring provision of quality training and realization of talents.

STRATEGIC AIMS

To represent the interests of all students of the School of Engineering,

- To promote the welfare of members,
- To promote academic and extra-curricular activities among members,
- To enhance the unity among students of the School of Engineering,
- To establish good relationship with other departmental societies,
- To establish good relationship between the association and other students' organizations
- of the University and the other institutions; and
- To promote a positive image of Engineering Studies at MMUST.

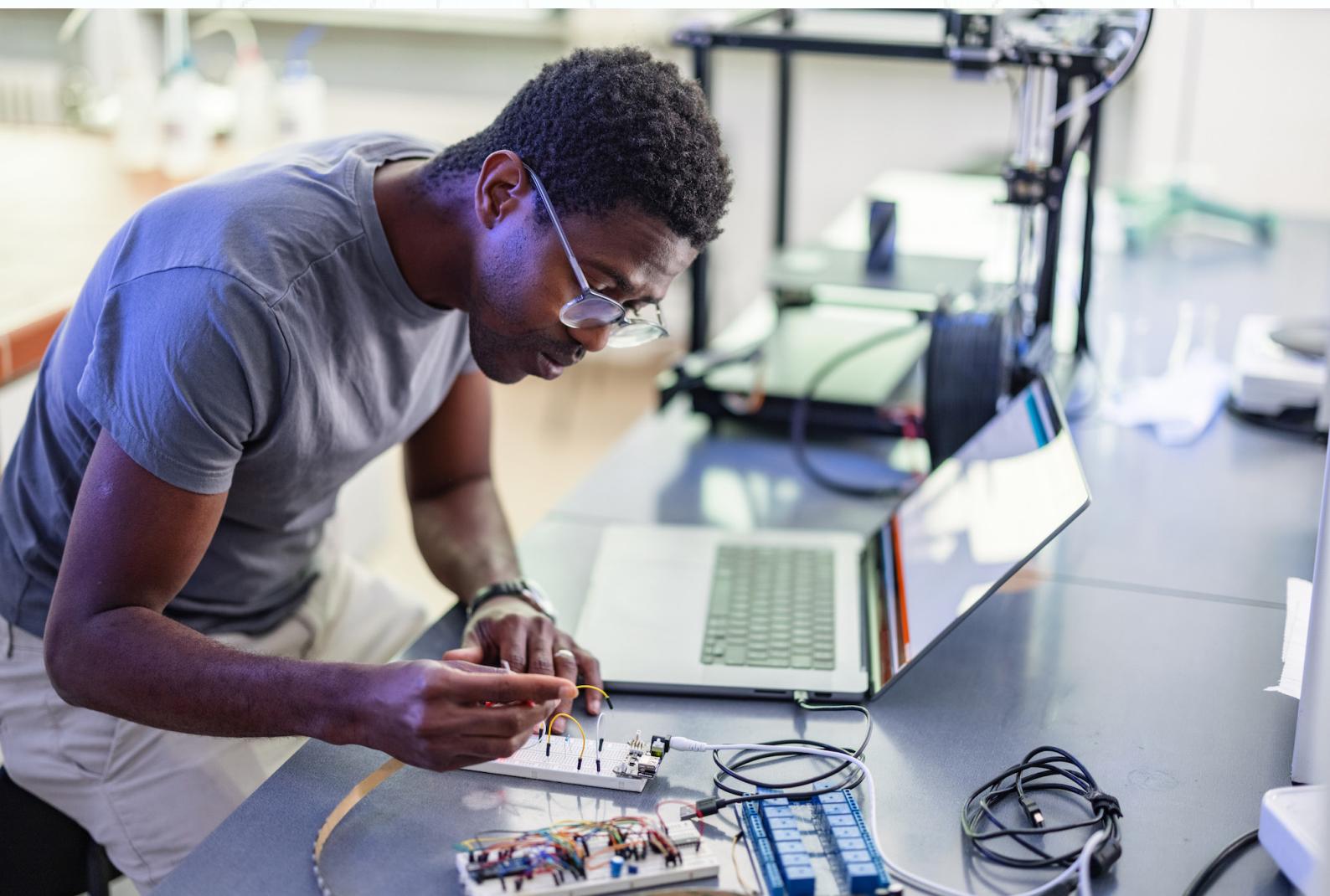


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EMPOWERING FUTURE ENGINEERS

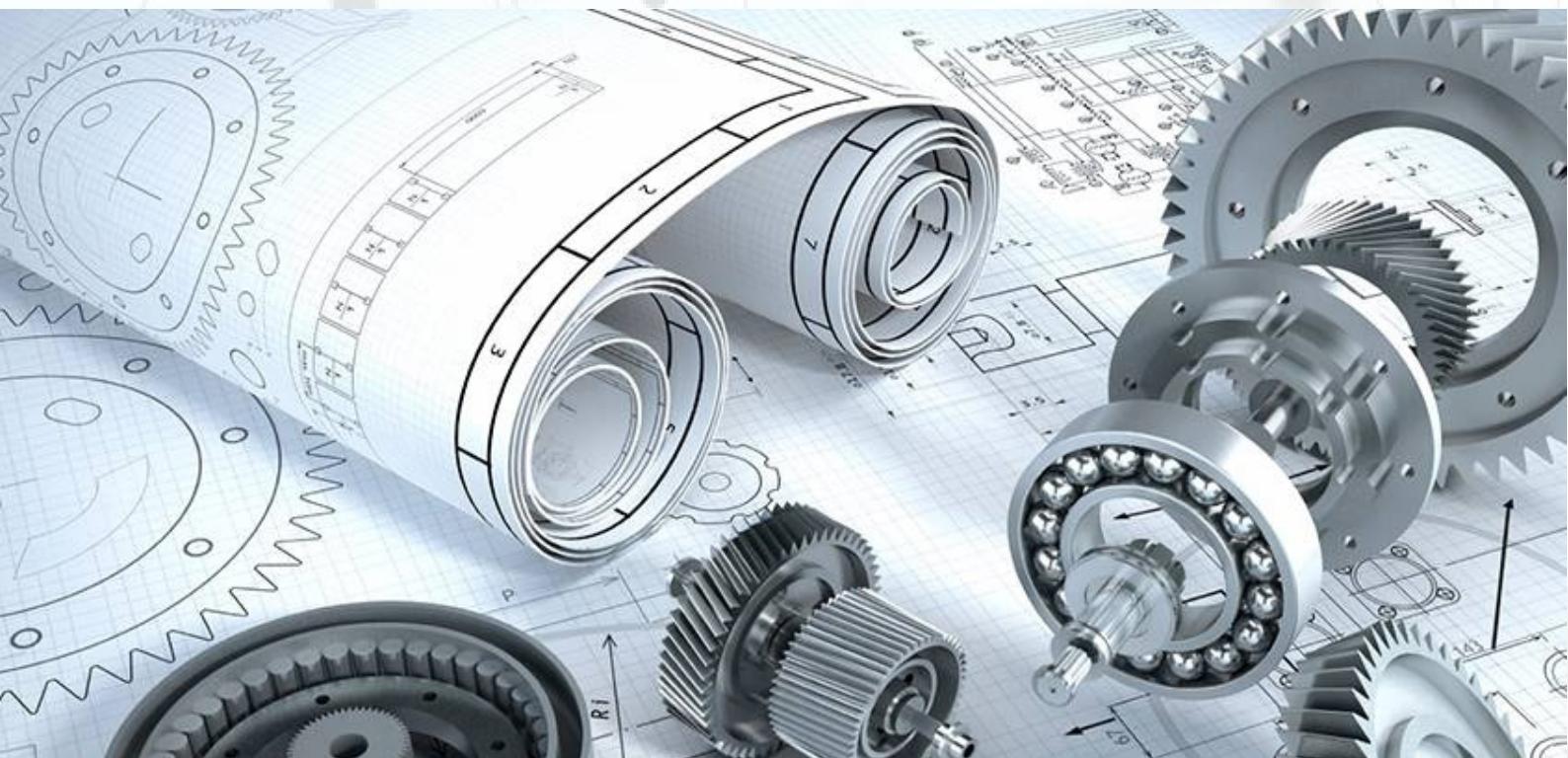
The **ESA MMUST** Story

The Engineering Students' Association stands as a vibrant and unifying force within the hallowed halls of School of Engineering and Built Environment of Masinde Muliro University of Science and Technology. Formed over a decade ago, this association represents the collective brilliance and ambition of students across three distinguished departments:

Civil and Structural Engineering, Electrical & Communication Engineering, and Mechanical & Industrial Engineering. At its core, this association serves as the vital bridge connecting academia and the dynamic world of engineering industries. It has, over the years, played a pivotal role in enriching the academic journey of its members while equipping them with real-world insights and experiences.

In an ever-evolving field like engineering, staying informed about emerging opportunities and industry trends is not just beneficial—it's imperative. This is why Engineering Students' Association shines(ESA MMUST). Its commitment to keeping students well-informed about the ever-shifting landscape of the engineering industry is a testament to its dedication to the success of its members.

As we delve deeper into the facets of this association, we will uncover its remarkable contributions, initiatives, and its unwavering commitment to nurturing the next generation of engineering professionals. The association serves as a beacon of inspiration and guidance for aspiring engineers, and its journey of connecting academia with industry continues to empower and shape the future of engineering excellence.



THE SCHOOL OF ENGINEERING AND BUILT ENVIRONMENT - MMUST

MISSION STATEMENT

To train innovative and career oriented engineers, conduct high quality research, disseminate and preserve knowledge, while enhancing ecological integrity.

VISION

To be an excellent Engineering and Technology centre for Development

GENERAL OBJECTIVE

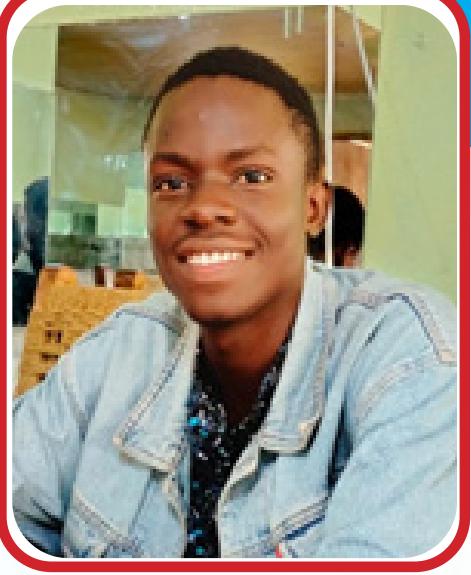
To contribute towards infrastructural development through teaching, research, consultancy and community outreach while adhering to professional ethics and sustainable development.

PHILOSOPHY

The School of Engineering and Built Environment holds the view that Science and Engineering is an indispensable tool in harnessing resources of nature for sustainable development and creating an environment in which human beings can survive and realize their potential.

CORE VALUES

- a) Customer focus The School of Engineering and Built Environment shall endeavour to ensure customer satisfaction by striving to offer superior services that exceeds the expectation of our customers.
- b) Collegiality The School of Engineering and Built Environment shall uphold cooperation between academic peers and associates as a means of building interpersonal trust during interaction.
- c) Excellence The School of Engineering and Built Environment shall encourage excellence in teaching, research, innovation and service to the public.
- d) Professionalism The School of Engineering and Built Environment shall conduct business with dignity and diligence, observe professional competence and objectivity in performing duties.
- e) Equity The School of Engineering and Built Environment shall ensure that there is equal opportunity for all irrespective of gender, status, race, creed, disability, age, religion, ethnicity or political affiliation at all times.
- f) Accountability The School of Engineering and Built Environment shall act transparently in performing our duties besides taking responsibility in all their decisions and actions.
- g) Innovativeness The School of Engineering and Built Environment shall endeavour to create and utilize new ideas in teaching, research and consultancy in addition to seeking to disseminate new knowledge and ideas in the same.



JIMMY .JIM OMONDI
*Electrical and communication
engineering*

Message from the

ESA EDITOR GENERAL

It's gratifying to observe that ESA is entering a new chapter in its evolution, aimed at building a stronger reputation and establishing itself as a unique entity within MMUST.

As the editorial team, our objective is to elevate its prominence within the school, solidifying its position as the premier hub for cutting-edge research and innovation.

Message from the

ESA CHAIRPERSON

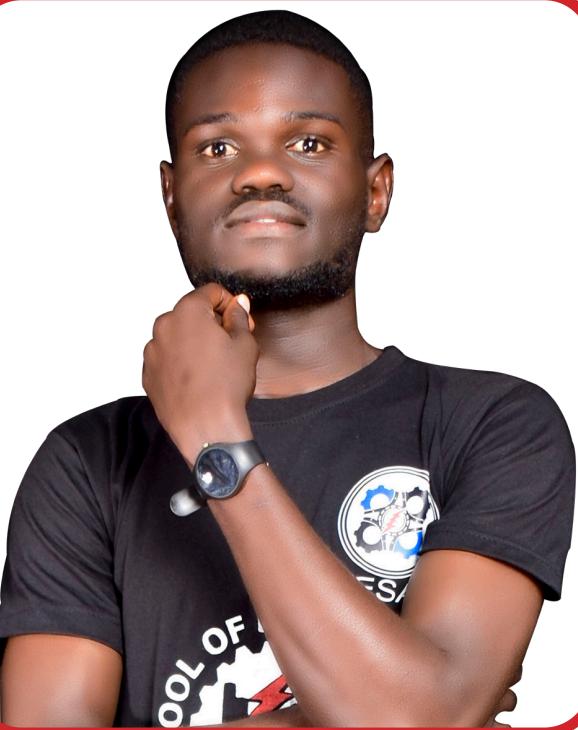
The past two years being in leadership in the Engineering Students association has been the best learning opportunity in matters leadership and management. This would not have been possible without the engineering students who put their trust in my leadership and will forever be grateful.

As student engineers, we celebrate the advancements which have been made in the past few years in the engineering field and also proud because we too are part of the achievements in our fields. I would also like to urge our institutions and all

the engineering regulatory bodies i.e EBK, BORAQS and KTRB to put more interest in the student training programs so that the coming engineers will be the ones who can be regarded as the best in the whole world.

The key industry players which are engineering related should also offer more opportunities to student engineers through thorough training in attachments and graduate engineers through provision of internship opportunities and any other mentorship programs which can be provided to improve the skills.

MEMO FROM ESA SECRETARY GENERAL



Greetings, fellow engineers of Masinde Muliro University of Science and Technology! With a heart brimming with pride, I, the Secretary General of the Engineering Students Association (ESA), unveil the inaugural issue of The Innovators Blueprint magazine. This platform is dedicated to showcasing your brilliance, fostering collaboration, and igniting the spirit of innovation that defines our community.

This journey hasn't been without its challenges. Two terms anchored in the principle of "service above self" have seen us navigate hurdles and celebrate triumphs. Remember the campus buzzing with the first Engineering Dinner in four years? We reignited that tradition, ensuring it becomes an annual affair. Themed evenings like ***The role of Engineering in Environmental Sustainability*** sparked lively discussions, forging connections that transcended classrooms.

Beyond campus walls, we extended a helping hand. Our community outreach programs at

Mission to the Fatherless Children's Home resonated with compassion. First-year retreats eased the transition to university life, while CAD training sessions sharpened your digital tools. We revamped the ESA website and social media platforms, amplifying your voices across the digital landscape.

And then, there was the history-making feat - a world-class engineering tournament in collaboration with KPLC! It was a testament to the unwavering support we received. Let me express our deepest gratitude to the Dean of the School of Engineering and Built Environment, Prof. Eng. B. Sabuni, our Patron Dr. Michael Mukolwe, and the Associate Dean, Dr. Peter Cherop. A special shout-out to all the Departmental Chairs and lecturers, particularly Dr. Janet Oyaro, for your guidance and unwavering support. University staff and our incredible engineering student body, your enthusiastic participation fueled our every endeavor.

A heartfelt thank you goes out to our esteemed corporate partners and sponsors - the Engineers Board of Kenya (EBK), the Institution of Engineers of Kenya (IEK) – both Western Branch and Head Office, KPLC, KERRA, KENHA, KURA, National Construction Authority, ACEK Future Leaders, and Kakamega County Water and Sanitation Company (KACWASCO). Your moral and financial support transformed dreams into reality.

This inaugural issue is a testament to the collaborative spirit and unwavering dedication that lies at the very core of ESA. It's crafted by you, for you. So, delve into these pages, discover stories of innovation, ignite your problem-solving prowess, and let your creative spark flourish.

This is just the beginning – the blueprint for countless triumphs to come.

God bless you, and enjoy reading!

The Secretary General,

OKEYO ISACK

Electrical and Communication Engineering 5th yr

HISTORY OF THE SCHOOL OF ENGINEERING & BUILT ENVIRONMENT - MMUST

Masinde Muliro University of Science and Technology (MMUST) started offering engineering programmes inherited from Moi University in 2002 under the then faculty of science and engineering. These were Bachelor of Technology in Civil and Structural Engineering and Bachelor of Technology in Production Engineering. Later in 2003, the University started Bachelor of Technology in Electrical and Communication Engineering, also inherited from Moi University. The first group graduated in the year 2008. The School of Engineering and Built Environment (SEBE) was established in July 2008 as Faculty of engineering at MMUST, after splitting from the Faculty of Science and Engineering. This was necessitated by the unique challenges encountered in the Engineering profession such as statutory requirements, expectations of the

stakeholders (students sponsors and industries) and manpower development and retention among others. The faculty of engineering then reviewed the programs in 2008 after the mandatory five years naming them as Bachelor of Science in Civil and Structural Engineering, Bachelor of Science in Electrical and Communication Engineering and Bachelor of Science in Mechanical and Industrial Engineering. They were implemented from 2009/10 academic year. Since then, the faculty developed more programs totaling to the current sixteen (16). In 2017, the faculty of engineering was renamed school of Engineering and Built Environment, as necessitated by the current trend, with three departments, namely Civil and Structural Engineering, Electrical and Communication Engineering and Mechanical and Industrial Engineering.



STRUCTURED GOVERNING IN ESA

MESSAGE FROM ESA LEADERSHIP



"...THE STRIDES WE'VE MADE..."

Welcome to the School of Engineering and Built Environment (SEBE), one of the most prominent school at Masinde Muliro University of Science and Technology (MMUST) and a great platform for teaching, learning, research and innovation in engineering education around the region. As Dean, I have the privilege of leading this vibrant school, a place where curiosity, compassion, and intellect combine to prepare our students to meet the future challenges.

The school is going through a transformation process with the vision of becoming a proud, global institution in Kenya through excellence in teaching, leader in student experience and impactful research. The School of Engineering and Built Environment has placed itself in the forefront of this transformation process and is playing significant leadership role in achieving MMUST mission of providing excellent university education, training and research through integrating science, technology into quality programmes to suit the needs of a dynamic world.

The school provides knowledge and skill-based learning environment to our students. Over the last several years, School of Engineering has been ramping up student enrollment, staff and resources, making the school one of the best places to study engineering in the country. Our staff members and students are actively pursuing interdisciplinary research in engineering applications - artificial intelligence, water resources, renewable energy and many more.

Engineering has been declared as the “niche” at Masinde Muliro University of Science and Technology, meaning that the school will play a vital role in implementing the University Strategic Plan.

I extend my warm welcome to our school and thank all partners in making engineering a reality in solving societal problems. If you are looking for an exceptional engineering educational experience with technology and innovation, the MMUST School of Engineering and Built Environment will surely be your place.

PROF. BERNADETTE WASWA-SABUNI
**DEAN & ASSOCIATE PROFESSOR, SCHOOL OF
ENGINEERING AND BUILT ENVIRONMENT**

ARTICLES

ADVANCING AFFORDABLE HOUSING IN KENYA



Digital Twin Transformation: NCA's Path to Affordable Housing Excellence

As Kenya grapples with the ever-increasing demand for affordable housing, the National Construction Authority (NCA) finds itself at a pivotal juncture.

In a rapidly evolving world, where technological innovations are the bedrock of progress, NCA has the opportunity to revolutionize the affordable housing sector in Kenya through the adoption of Digital Twin technology. In this article, we delve into why NCA should champion the implementation

of Digital Twin technology in the government's affordable housing initiative, emphasizing how it can enhance design, construction, and long-term sustainability.

The Digital Twin Paradigm

Digital Twin technology, at its core, entails the creation of a virtual counterpart that mirrors a physical structure or system. This is no static 3D model but a dynamic, data-driven representation of the real world. Incorporating sensors and real-time data, Digital Twins offer insights into the performance and condition of physical

counterparts, making them a formidable tool for industries worldwide. As we explore the potential of Digital Twins in the context of affordable housing, NCA stands at the forefront of this transformation.

Elevating Affordable Housing Design and Efficiency

NCA's adoption of Digital Twin technology would usher in a new era of design precision and project efficiency. By crafting comprehensive digital replicas of affordable housing projects, architects and engineers can simulate and test designs meticulously.

This proactive approach allows for the early identification and resolution of potential issues before construction begins. The result? Costly errors and delays are minimized, translating into more successful and efficient affordable housing projects, a critical need in Kenya's urban landscape.

Sustainable Housing through Real-Time Monitoring

Beyond the construction phase, Digital Twins prove invaluable by facilitating real-time monitoring of affordable housing units. Equipped with sensors, these digital counterparts continuously gather data from their physical counterparts. This data empowers housing providers and maintenance teams to closely monitor building health and performance.

Structural issues are promptly detected, and maintenance plans are optimized, resulting in significant cost savings and heightened safety for residents. Furthermore, harnessing this data can enhance the energy efficiency of affordable housing

units, reducing operational costs and fostering environmental sustainability.

Informed Decision-Making for Housing Providers

Resource allocation is a critical aspect of affordable housing management. Digital Twins empower housing providers under NCA's purview with a treasure trove of performance data. This data-driven approach facilitates optimized resource allocation, improved energy efficiency, and enhanced overall project performance. Housing providers can make informed choices that elevate residents' quality of life and maximize their investments' impact, a vital consideration in Kenya's affordable housing endeavors.

A Sustainable Future for Affordable Housing

Kenya's commitment to sustainability aligns seamlessly with the capabilities of Digital Twins. Through the analysis of data related to energy consumption, waste reduction, and environmental factors,

engineers can design sustainable, eco-friendly affordable housing units.

These units not only benefit the environment but also ensure long-term cost-effectiveness and operational efficiency, further underscoring the need for Digital Twin adoption.

In conclusion, NCA holds the key to transforming the affordable housing landscape in Kenya. By embracing Digital Twin technology, NCA can enhance design accuracy, streamline construction, and facilitate sustainable, cost-effective housing solutions.

As the government of Kenya endeavors to meet the nation's affordable housing needs, NCA's commitment to championing Digital Twin adoption becomes a catalyst for positive change, shaping a brighter housing future for all Kenyan citizens.

**WRITTEN BY; Okeyo Isack & Phabbian Benard
Electrical and communication Engineering 5th year**



"LAPSSET: KENYA'S GATEWAY TO PROSPERITY AND INTEGRATION"



WRITTEN BY; Okeyo Isack & Phabbian Benard
Electrical and communication Engineering 5th year

The LAPSSET Project has the potential to serve as a linchpin for Kenya's economic development. The construction of a modern deep-sea port in Lamu, along with the associated transport corridors and infrastructure, opens up new avenues for trade and commerce. With existing ports in Mombasa already facing congestion, the Lamu Port offers a strategic alternative, reducing pressure on existing infrastructure and facilitating the efficient movement of goods. This can lead to increased trade volumes, economic diversification, and job creation, ultimately bolstering Kenya's economic resilience.

Regional integration is a key driver behind the LAPSSET Project. Kenya, as a pivotal player in the East African region, stands to benefit from strengthened economic ties with neighboring countries, particularly South Sudan and Ethiopia. By providing an efficient transport route for these landlocked nations, Kenya can foster deeper regional cooperation, cross-border trade, and mutual economic growth. This integration aligns with Kenya's position as a regional hub and can significantly enhance its geopolitical influence.

The LAPSSET Project contributes to vital infrastructure development within Kenya itself. The construction of roads, railways, and other transportation "LAPSSET: Kenya's gateway to prosperity and integration" The Government of Kenya should continue with the LAPSSET (Lamu Port-South Sudan-Ethiopia-Transport) Project for a multitude of compelling

The Government of Kenya should continue with the LAPSSET (Lamu Port-South Sudan - Ethiopia Transport) Project for a multitude of compelling reasons. This infrastructure initiative represents a significant opportunity for Kenya's economic growth, regional integration, and enhanced connectivity.

Networks not only improve connectivity within the country but also promotes balanced regional development. This development can reduce regional disparities in terms of access to markets, services, and opportunities, fostering social and economic inclusivity.

The project aligns with Kenya's commitment to sustainability and environmental responsibility. The development of eco-friendly buildings and infrastructure, as facilitated by Digital Twin technology, supports Kenya's goals of reducing its carbon footprint and promoting green practices. This commitment to sustainability is in line with global trends and can enhance Kenya's reputation as a responsible and forward-thinking nation. While the LAPSSET Project is not without its challenges, such as financing and environmental considerations, the potential benefits it offers far outweigh the difficulties. By continuing with the project, the Government of Kenya can harness its transformative power to drive economic growth, deepen regional integration, enhance infrastructure, and contribute to a more sustainable future. In doing so, Kenya can solidify its position as a regional leader and reap the rewards of a more interconnected and prosperous East African region.

ANONYMOUS SUDAN

WRITTEN BY; Okeyo Isack & Phabbian Benard
Electrical and communication Engineering 5th Year

In recent times, the security of the e-Citizen platform, a digital gateway for Kenyan citizens, has been thrust into the spotlight. Concerns have arisen about whether the government of Kenya has truly met all the necessary data security measures to protect the sensitive information of its citizens.

This concern was further exacerbated by a recent cyberattack attributed to a group calling themselves "Anonymous Sudan," which exposed vulnerabilities in the platform's defenses.

The E-Citizen Platform:

A Digital Lifeline The e-Citizen platform has been a transformative force in Kenya's governance and citizen services. It offers a convenient one-stop shop for various

government services, from business registration to passport applications. With the digitization of services, Kenyan citizens have enjoyed unprecedented access to government resources, streamlining bureaucratic processes and reducing red tape.

The Cybersecurity Imperative

However, the digital realm is not without its perils. The convenience and accessibility of online government services also attract the attention of cybercriminals and hacktivist groups. In a digital age where personal information is a valuable currency, safeguarding citizen data is paramount. Data breaches can have far-reaching consequences, from identity theft to financial fraud.

The Anonymous Sudan Attack

In a startling turn of events, the e-Citizen platform found itself in the crosshairs of a cyberattack, allegedly masterminded by a group operating under the enigmatic banner of "Anonymous Sudan."

This audacious breach not only rattled the digital gates but also thrust the vulnerabilities in the platform's security infrastructure into sharp focus. With bold claims of accessing sensitive citizen data, the attack has ignited a pressing question: just how secure is the fortress that safeguards our information?

Data Security Measures

The incident underscores the critical importance of robust

data security measures. To protect citizen data, encryption and secure network protocols must be employed rigorously. Firewalls and intrusion detection systems (IDS) should be continually updated and tested to repel cyber threats effectively. Access controls and privileged access management (PAM) are essential components of a comprehensive security strategy, limiting access to authorized personnel.

Secure Software Development Practices

Strengthening Security Information and Event Management (SIEM) systems in Kenya is imperative for bolstering the nation's cybersecurity defenses.

SIEM systems serve as vigilant guardians, collecting and analyzing security data in real-time from various sources within the government's IT infrastructure.

This real-time visibility allows for the proactive detection of anomalies and potential security incidents, enabling swift response to mitigate

cyber threats effectively. Additionally, SIEM systems aid in maintaining compliance with cyber-security regulations by providing accurate documentation of security events. SIEM systems facilitate efficient resource allocation, ensuring that cybersecurity efforts are focused on addressing the most critical threats. In an era of increasingly sophisticated cyberattacks, investing in robust SIEM technology showcases the government's commitment to cybersecurity and its adaptability in countering evolving threats. By enhancing SIEM systems, the government can fortify its overall cybersecurity posture, safeguarding the nation's digital infrastructure and sensitive data, thereby ensuring national security and fostering public trust.

Transparency and Communication

In the aftermath of a security incident, the imperative of transparency and open communication becomes more

pronounced. It is not merely an option but a fundamental necessity for maintaining trust in the digital infrastructure. The government's obligation extends beyond acknowledging the breach; it encompasses the depth of transparency it demonstrates and the areas where transparency might have been inadvertently overlooked. To conclude, the recent cyberattack on the e-Citizen platform by "Anonymous Sudan" serves as a stark reminder of the evolving threat landscape in the digital age. It is imperative that the government of Kenya continues to invest in robust cybersecurity measures, staying ahead of emerging threats. The security of citizen data is not negotiable, and citizens rightfully expect their information to be protected with the utmost diligence. The incident should be a catalyst for reinforcing cybersecurity and data protection practices, ensuring that the e-Citizen platform remains a secure and reliable resource for all Kenyan citizens.

KENYA'S BLACKOUT MYSTERY



A DEEPER LOOK BEYOND KENYA POWER

System disturbances within Kenya Power refer to unforeseen interruptions or irregularities in the electrical power distribution network.

These disruptions encompass a spectrum of issues, including voltage fluctuations, frequency deviations, power surges, voltage drops (sags), or, in severe cases, complete power outages. These disturbances can manifest due to various factors, such as equipment malfunctions, adverse weather conditions like lightning strikes or storms, grid overloads, or faults in power generation or distribution infrastructure. When these disturbances occur, they can disrupt the consistent supply of electricity to end-users, causing inconvenience and potential harm to electrical appliances and machinery. Kenya Power, alongside relevant authorities, diligently investigates the root causes of these disturbances and initiates corrective actions to swiftly restore a stable and dependable power supply. To mitigate the repercussions of system disturbances on consumers and businesses, constant monitoring and maintenance of the electrical grid's stability remain paramount.

One significant factor contributing to power outages in Kenya is the aging infrastructure of the power generation and distribution systems. Much of the country's electrical infrastructure was established decades ago and is in dire need of modernization and maintenance. Overloaded and outdated substations, transformers, and power lines are more susceptible to faults and breakdowns, leading to power interruptions. Kenya Power, as a state-owned utility, often faces budgetary constraints that limit its ability to make the necessary investments in infrastructure upgrades and expansion. Another challenge lies in the energy mix of Kenya, which heavily relies on renewable sources like hydroelectric power. While this is a sustainable approach, it also makes the power supply vulnerable to weather-related challenges. Periods of drought can significantly impact the generation capacity of hydroelectric plants, leading to power deficits during peak demand periods. Consumer practices also contribute to the problem. Energy theft, illegal connections, and non-payment of electricity bills are widespread issues

that strain Kenya Power's resources.

Addressing these challenges requires collective efforts from both the utility and consumers, involving measures to curb theft and encourage responsible electricity usage. It is also important to note that Kenya's power outage challenges are rooted in a combination of factors, many of which extend beyond Kenya Power's control. To address this complex issue, a collaborative effort involving various stakeholders, including the government, private sector, consumers, and regulatory bodies, is needed. Modernizing infrastructure, diversifying energy sources, improving governance and regulations, and promoting responsible consumer behavior are all essential components of a comprehensive solution to the multifaceted problem of power outages in Kenya. Solely attributing blame to Kenya Power oversimplifies a much broader issue that requires collective action and systemic improvements.

WRITTEN BY: Okeyo Isack & Phabbian Benard Electrical and Communication Engineering 5th Year

UNTANGLING THE AI PUZZLE: THE PERCEIVED LAG IN MECHANICAL ENGINEERING



In the realm of mechanical engineering, the adoption of Artificial Intelligence (AI) has been rather gradual, prompting us to delve into the underlying reasons behind this cautious approach and to explore the potential advantages of narrowing this technological gap. The traditional mindset, deeply entrenched in mechanical engineering, stands as an initial obstacle. With its long history rooted in physics and mechanics, some professionals within the field perceive

AI as a deviation from these fundamental principles. Convincing mechanical engineers to embrace the paradigm shift towards AI can indeed prove to be a formidable challenge. Moreover, the awareness of AI's extensive capabilities remains limited among mechanical engineers. Many may not fully grasp the diverse ways in which AI can enhance their work, whether it's streamlining design processes, predicting maintenance needs, or optimizing quality control. It is evident that a heightened awareness campaign concerning AI's benefits and potential applications is a crucial first step in driving its adoption within the mechanical engineering community.

However, a significant impediment lies in the skill gap. AI technologies necessitate a distinctive skill set, encompassing programming, data analysis, and machine learning proficiency. Those mechanical engineers who have not encountered these competencies during their education or professional development might find the prospect of closing this gap daunting. Thus, addressing this challenge through training and educational initiatives tailored to mechanical engineers is imperative.

Furthermore, integrating AI effectively into the realm of mechanical engineering poses data-related challenges. AI heavily relies on data, while mechanical engineers often grapple with intricate physical systems that generate voluminous datasets. Implementing AI into these processes may necessitate substantial alterations in data collection,

storage, and analysis practices, creating an additional hurdle. It is also worth noting that AI's unpredictable nature and potential for malfunction can raise safety concerns, particularly within a profession that frequently deals with safety-critical systems. Ensuring the reliability and safety of AI-driven systems is paramount in mitigating these apprehensions.

Resistance to change, a common human trait, is a formidable barrier across various industries, and mechanical engineering is no exception. Engineers often grow accustomed to established workflows and may resist the adoption of new AI technologies that disrupt these familiar processes. Consequently, conveying the long-term advantages of AI adoption becomes a crucial endeavor. Furthermore, cost concerns may hinder the initial investment in AI solutions, even though the long-term benefits, such as increased efficiency and cost savings, often outweigh the upfront expenses.

Lastly, to facilitate the successful adoption of AI within mechanical engineering, fostering a culture of innovation, experimentation, and AI integration within organizations is indispensable. Encouraging collaboration between AI experts and mechanical engineers, developing AI-related education and training programs, and establishing rigorous safety standards for AI-driven systems can collectively pave the way for a brighter future where mechanical engineers confidently embrace AI as an integral part of their profession.

THE ROLE OF ACADEMIA-INDUSTRY LINKAGE IN ENGINEERING THE FUTURE

Introduction

In today's rapidly evolving world, the collaboration between academia and industry plays a pivotal role in driving innovation, economic growth, and societal progress. This synergy fosters a dynamic exchange of knowledge, skills, and resources, ultimately shaping the future landscape. In Kenya, where technological advancements are gaining momentum, the academia-industry partnership holds immense promise.

BENEFITS TO INDUSTRY AND ACADEMIA

Economic Development: Industry-academia collaborations contribute significantly to economic development. By bridging the gap between theoretical knowledge and practical application, these partnerships lead to the creation of new products, services, and markets. For instance, joint research projects between Kenyan universities and local companies have resulted in innovative solutions, such as affordable solar-powered irrigation systems for small-scale farmers.

Skills Enhancement

Industry exposure enhances students' employability by equipping them with practical skills. Internships, joint workshops, and industry-sponsored projects allow students to apply classroom learning in real-world scenarios. Masinde Muliro University of Science and Technology for instance, collaborates with leading tech companies to offer specialized training programs in data science and artificial intelligence.

Research and Development (R&D):

Industry-academia linkages accelerate R&D efforts. Kenyan universities collaborate with multinational corporations to develop cutting-edge technologies. For example, the partnership between Strathmore University and Safaricom led to the creation of M-Pesa, a mobile money transfer service that revolutionized financial inclusion in Kenya.

CHALLENGES AND OPPORTUNITIES

Alignment of Goals:

Balancing academic pursuits with industry demands can be challenging. However, when universities align their research priorities with industry needs, breakthroughs occur. Masinde Muliro University of Science and Technology (MMUST) collaborates with agribusiness companies to enhance crop productivity through precision agriculture techniques.

Intellectual Property (IP):

Clear IP policies are essential to protect innovations arising from academia-industry collaborations. Kenyan universities are working on streamlining IP processes to encourage technology transfer and commercialization.

Sustainable Partnerships:

Long-term partnerships foster trust and sustainability. The Kenya Association of Manufacturers collaborates with technical universities to develop skilled graduates who meet industry requirements.

COVID-19 RESPONSE: A TESTAMENT TO COLLABORATION

During the pandemic, academia-industry partnerships in Kenya played a critical role: Testing Kits and Tracking Apps: Kenyan universities collaborated with health authorities and private companies to develop COVID-19 testing kits and contact tracing apps.

Ventilator Production: Technical institutions partnered with manufacturers to produce low-cost ventilators, addressing the shortage during the crisis.

Vaccine Research: The Kenya Medical Research Institute (KEMRI) worked closely with global pharmaceutical companies to advance vaccine research.

Engineering Kenya's Future

In the dynamic landscape of Kenya's development, the collaboration between academia and industry plays a pivotal role in shaping the future. The Ministry of Transport and Infrastructure, in conjunction with the Engineers Board of Kenya (EBK), has been championing the cause of strengthening the ties between these two critical sectors. Let us delve into the significance of this partnership and explore how it can engineer a brighter future for Kenya.

Systems Thinking for Sustainability

To ensure the longevity of these partnerships, a systems thinking approach is essential. By modelling and synthesizing effective collaboration strategies, we can create a sustainable framework. Here are some key elements:

- Attributes:** Clearly define the attributes that make successful partnerships thrive.
- Competences:** Identify the competences required for effective collaboration.
- Resources and Equipment:** Ensure adequate resources and infrastructure for joint initiatives.

4. **International Backstopping:** Leverage global expertise and best practices.

Case Studies and Initiatives

Strengthening Industry-Academia Links

The Engineers Board of Kenya (EBK) has been at the forefront of fostering collaboration. Initiatives like secondments and workshops aim to:

- Strengthen links with local industry.
- Update engineering curricula.
- Expose academia to industry dynamics.

The overarching goal? To produce graduates who seamlessly transition into the workforce, armed with practical skills and a deep understanding of industry needs.

The Way Forward

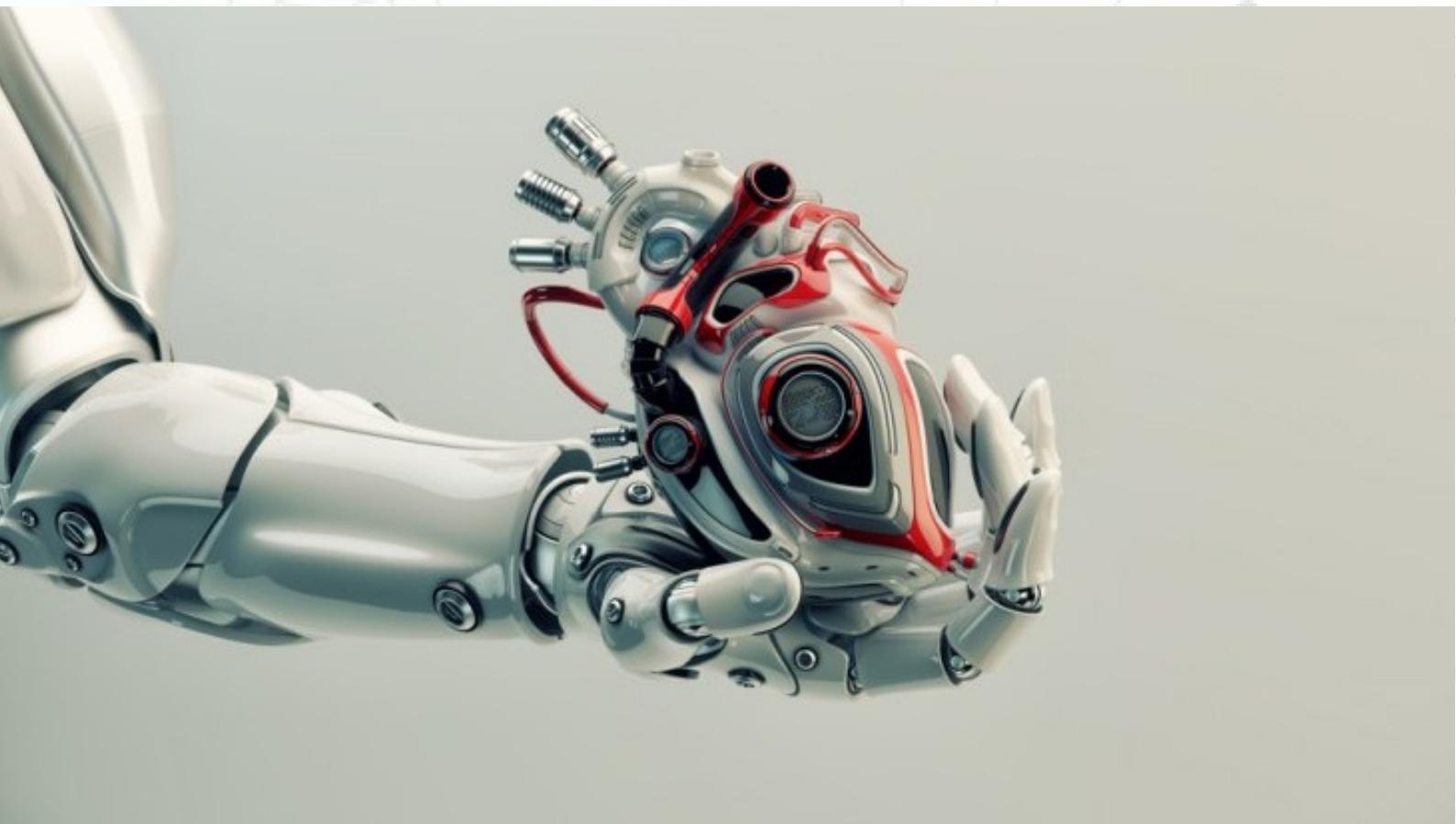
While progress has been made, challenges persist. These include aligning academic research with industry demands, addressing resource constraints, and promoting a culture of collaboration. However, with concerted efforts, Kenya can build a robust ecosystem where academia and industry co-create solutions for sustainable development.

The academia-industry linkage is not just a buzzword; it's the cornerstone of Kenya's engineering future. By nurturing this partnership, we pave the way for innovation, economic prosperity, and a brighter tomorrow.

Conclusion

The academia-industry linkage in Kenya is a powerful catalyst for progress. By nurturing collaborative ecosystems, we can engineer a future where innovation thrives, businesses flourish, and societal challenges find sustainable solutions. As Kenya continues its journey towards industrialization, these partnerships will remain pivotal in shaping a brighter tomorrow.

THE ROLE OF ENGINEERING IN BIOMEDICAL ADVANCEMENTS



THE CRUCIAL INTERSECTION OF ENGINEERING AND BIOMEDICAL ADVANCEMENTS IN KENYA: CHALLENGES AND OPPORTUNITIES

In Kenya, like many low-income countries, the field of biomedical engineering plays a vital role in addressing healthcare challenges and driving advancements in medical technologies. With a growing focus on improving healthcare access and outcomes, engineers are at the forefront of developing innovative solutions tailored to the unique needs of the population. However, alongside these opportunities come significant challenges that must be addressed to fully leverage the potential of engineering in biomedical advancements.

THE ROLE OF ENGINEERING IN BIOMEDICAL ADVANCEMENTS

Engineering is the backbone of biomedical advancements in Kenya, enabling the development of innovative medical devices, diagnostic tools, and healthcare infrastructure. From designing low-cost medical equipment to improving healthcare delivery systems, engineers contribute to every stage of the healthcare process. Here are some key areas where engineering is making a difference:

Medical Device Innovation: Engineers in Kenya are developing affordable and locally adaptable medical devices to address specific healthcare needs. This includes devices such as portable ultrasound machines, prosthetics, and diagnostic tools tailored to conditions prevalent in the region, such as malaria and tuberculosis.

Telemedicine and Healthcare Accessibility:

Through engineering innovations, telemedicine platforms are being developed to bridge the gap between healthcare providers and remote communities. These platforms enable virtual consultations, remote monitoring, and access to medical expertise, particularly in underserved rural areas.

In the intricate dance between medicine and technology, engineering plays a pivotal role in propelling biomedical advancements to unprecedented heights. From diagnostic tools to therapeutic devices, engineers collaborate with medical professionals to innovate solutions that enhance healthcare delivery, improve patient outcomes, and extend human longevity. This symbiotic relationship between engineering and biomedicine epitomizes the marriage of scientific inquiry and technological innovation, driving progress in the medical field.

One of the primary domains where engineering intersects with biomedicine is in medical imaging. Engineers develop cutting-edge imaging modalities such as MRI, CT scans, and ultrasound, enabling clinicians to visualize internal structures with

remarkable precision. By harnessing principles of physics, mathematics, and computer science, engineers refine imaging techniques, enhancing resolution, reducing scan times, and minimizing patient discomfort. These advancements not only aid in early disease detection but also guide surgical interventions with unprecedented accuracy, ultimately saving lives and improving patient care.

In the realm of prosthetics and medical devices, engineering ingenuity transforms lives. Through meticulous design and prototyping, engineers develop prosthetic limbs that mimic natural movement, restoring mobility and independence to individuals with limb loss. Advanced materials science and biomechanics principles converge to create prostheses that seamlessly integrate with the human body, facilitating fluid motion and enhancing quality of life. Additionally, medical devices such as pacemakers, defibrillators, and insulin pumps rely on engineering expertise to ensure reliability, safety, and efficacy, empowering individuals with chronic conditions to manage their health effectively.

Biomedical engineering also plays a crucial role in drug delivery and therapeutics. Engineers collaborate with pharmacologists and clinicians to design drug delivery systems that target specific tissues or organs, optimizing drug efficacy while minimizing side effects. Nanotechnology, microfluidics, and biomaterials engineering converge to create drug delivery platforms with unprecedented precision, enabling personalized medicine approaches tailored to individual patient needs. Furthermore, engineering advancements drive the development of therapeutic modalities such as gene editing technologies, immunotherapies, and regenerative medicine techniques, offering new avenues for treating previously incurable diseases.

In the era of big data and digital health, engineering innovations are revolutionizing healthcare delivery and patient monitoring. Through the development of wearable sensors, remote monitoring devices, and health informatics systems, engineers enable

continuous health monitoring outside traditional clinical settings. By integrating data analytics and machine learning algorithms, engineers derive actionable insights from vast amounts of health data, facilitating early disease detection, personalized treatment strategies, and predictive healthcare interventions. These digital health innovations not only empower individuals to take charge of their health but also enable healthcare providers to deliver more proactive and personalized care.

However, alongside the remarkable advancements enabled by engineering in biomedicine, ethical considerations and societal implications must be carefully addressed. From safeguarding patient privacy in the era of digital health to ensuring equitable access to biomedical innovations, engineers and policymakers must navigate complex ethical dilemmas to promote responsible innovation and mitigate unintended consequences.

Opportunities for Biomedical Engineering in Kenya

Despite the challenges, several opportunities exist for the application of engineering in biomedical advancements:

Collaborative Research and Innovation:

Partnerships between engineering institutions, healthcare providers, and government agencies can foster collaborative research and innovation in biomedical engineering. By pooling expertise and resources, stakeholders can address healthcare challenges more effectively.

Technology Transfer and Capacity Building:

Initiatives focused on technology transfer and capacity building can enhance the skills of local engineers and support the adoption of advanced biomedical technologies. Training programs, workshops, and knowledge-sharing platforms can facilitate the transfer of knowledge and expertise.

Entrepreneurship and Innovation Ecosystem:

Building a robust entrepreneurship and innovation ecosystem can stimulate the development of biomedical engineering start-ups and enterprises. Supportive policies, access to funding, and mentorship programs can nurture a culture of innovation and entrepreneurship in the biomedical sector.

Challenges in Biomedical Engineering in Kenya

Despite the significant contributions of engineering to biomedical advancements, several challenges hinder progress in this field:

Limited Resources and Funding: A lack of adequate funding and resources constrains the research and development of biomedical engineering solutions in Kenya. This limits the scale and impact of projects aimed at addressing healthcare challenges.

Skill Shortage: There is a shortage of skilled biomedical engineers and technicians in Kenya, hindering the development and maintenance of medical equipment and technologies. Addressing this skill gap requires investments in education and training programs tailored to biomedical engineering.

Regulatory Hurdles: Regulatory processes for medical devices and technologies in Kenya can be complex and time-consuming, delaying the introduction of innovative solutions to the market. Streamlining regulatory frameworks and improving collaboration between regulatory bodies and engineers can accelerate the adoption of

In conclusion, the role of engineering in biomedical advancements is indisputably transformative, driving progress at the intersection of science, technology, and medicine. Through interdisciplinary collaboration and relentless innovation, engineers continue to push the boundaries of what's possible, ushering in a new era of healthcare that is more precise, personalized, and patient-centred than ever before. As we stand on the brink of unprecedented scientific and technological breakthroughs, the synergy between engineering and biomedicine holds the promise of a healthier, more resilient future for humankind.

In conclusion, engineering plays a pivotal role in driving biomedical advancements in Kenya, addressing healthcare challenges, and improving the quality of life for millions of people. While challenges such as limited resources and regulatory hurdles exist, there are ample opportunities for collaboration, innovation, and capacity building to overcome these obstacles. By harnessing the power of engineering and leveraging local expertise, Kenya can continue to make significant strides in biomedical engineering and healthcare innovation.

FOOD SECURITY



FOOD SECURITY

Food security refers to the availability, access, and utilization of sufficient, safe, and nutritious food for all individuals. It is a fundamental human right and is essential for promoting health, well-being, and sustainable development. Food security is achieved when all people have access to enough food to meet their dietary needs and preferences for an active and healthy life. This includes not only having enough food available, but also ensuring that it is affordable, safe, culturally appropriate, and obtained in a dignified manner. Addressing food security requires a holistic approach that considers factors such as agricultural production, distribution systems,

food access, nutrition education, and social safety nets.

COMPONENTS OF FOOD SECURITY

Food security has four main components:

1. Availability: Sufficient quantities of food must be consistently available to all individuals within a population. This includes both food produced domestically and imported food.
2. Access: Individuals must have the economic and physical ability to obtain the food they need. This includes factors such as income levels, food prices, transportation infrastructure, and proximity to markets.
3. Utilization: The food that individuals have

access to must be safe, nutritious, and culturally appropriate. This component focuses on ensuring that people are able to utilize the food they have access to in a way that meets their dietary needs.

4. Stability: Food security also requires that these three components—availability, access, and utilization—are maintained over time. This means that individuals should have consistent access to a stable and adequate supply of food, even in the face of shocks or disruptions such as natural disasters or economic crises.

CONCEPTS OF FOOD SECURITY

1. Availability: Food security requires that there is enough food produced and available to meet the needs of all individuals. This includes having sufficient quantities of food at the global, national, and local levels to ensure that everyone has access to an adequate diet.

2. Access: In addition to availability, food security also depends on individuals' ability to access and acquire food. This includes factors such as affordability, physical access (e.g., proximity to markets or stores), and social and cultural factors that may affect people's ability to obtain food.

3. Utilization: Food security is not just about having enough food; it also requires that the food consumed is safe, nutritious, and culturally appropriate. This includes considerations of food quality, diversity, and the ability of individuals to make healthy food choices.

4. Stability: Food security is also influenced by the stability of food supplies and access over time. This includes factors such as price stability, availability of food during emergencies or crises, and the resilience of food systems to shocks and disruptions.

5. Sustainability: Achieving long-term food

security requires sustainable food production and distribution systems that do not deplete natural resources, harm the environment, or compromise the ability of future generations to meet their own food needs.

6. Resilience: Food security also involves building resilience in communities and food systems to cope with and recover from shocks such as natural disasters, conflicts, economic crises, or other disruptions that may affect food availability and access.

7. Equity: Food security should be achieved in a way that promotes equity and social justice, ensuring that all individuals, regardless of their socio-economic status, gender, ethnicity, or other factors, have equal opportunities to access and benefit from nutritious and safe food.

8. Participation: Achieving food security requires the active participation of individuals, communities, governments, civil society organizations, and other stakeholders in decision-making processes related to food production, distribution, and access. This participatory approach helps ensure that policies and programs are responsive to the needs and priorities of those most affected by food insecurity.

LEVELS OF FOOD SECURITY

Food security is a multi-dimensional concept that encompasses various levels of access to and availability of safe, nutritious, and culturally appropriate food for all individuals. There are generally four levels or categories used to describe the different aspects of food security:

1. Food Availability: This level refers to the physical presence of food in a given area or region. It considers factors such as food production, imports, exports, and food stocks.

Food availability is crucial for ensuring that there

is an adequate supply of food to meet the needs of the population.

2. Food Access: Food access focuses on the ability of individuals and households to obtain food. It includes factors such as income levels, food prices, distribution networks, transportation infrastructure, and social safety nets. Food access is essential for ensuring that people have the means to acquire the food they need.

3. Food Utilization: Food utilization refers to the ability of individuals to effectively utilize and absorb nutrients from the food they consume. This level considers factors such as dietary diversity, food safety, hygiene practices, and access to clean water and sanitation facilities. Food utilization is critical for ensuring that people can derive maximum nutritional benefits from the food they eat.

4. Food Stability: Food stability focuses on the reliability and predictability of food supplies over time. It considers factors such as climate variability, natural disasters, political instability, conflicts, and economic shocks that can disrupt food production and distribution systems. Food stability is essential for ensuring that food supplies remain secure and consistent.

By addressing these different levels of food security, policymakers, researchers, and practitioners can develop comprehensive strategies and interventions to improve food security outcomes for populations around the world.

FOOD SECURITY ENGINEERING

Food security engineering is a multidisciplinary field that focuses on developing technological solutions to enhance food production, distribution, and access in order to improve food security for populations around the world. This field combines

principles of engineering, agriculture, nutrition, and public health to address the challenges of feeding a growing global population in a sustainable and equitable manner.

Some key areas of focus in food security engineering include:

1. Agricultural technology: Developing innovative tools and technologies to improve agricultural productivity, such as precision farming techniques, irrigation systems, and crop breeding methods.

2. Food processing and preservation: Designing efficient and sustainable methods for processing, packaging, and preserving food to reduce food waste and extend shelf life.

3. Distribution systems: Improving supply chain logistics and transportation infrastructure to ensure that food reaches consumers in a timely and cost-effective manner.

4. Food safety and quality: Implementing quality control measures and food safety standards to ensure that the food supply is safe, nutritious, and free from contaminants.

5. Sustainable food production: Promoting environmentally friendly practices, such as organic farming, agroecology, and sustainable land management, to protect natural resources and mitigate the impact of climate change on food production.

ROLES OF FOOD ENGINEER

Food engineers play a crucial role in ensuring the safety, quality, and sustainability of food production processes. Some of the key roles and responsibilities of food engineers include:

1. Food Processing: Food engineers are involved in designing and optimizing food processing operations to ensure that food products are manufactured efficiently and safely. They work

on developing new technologies and methods to improve food production processes, such as thermal processing, drying, freezing, and packaging.

2. Quality Control: Food engineers are responsible for monitoring and maintaining the quality of food products throughout the production process. They develop and implement quality control procedures to ensure that food products meet regulatory standards and consumer expectations for safety, freshness, and taste.

3. Food Safety: Food engineers play a critical role in ensuring the safety of food products by identifying and mitigating potential hazards in the production process. They work on developing food safety protocols, conducting risk assessments, and implementing preventive measures to minimize the risk of contamination or foodborne illnesses.

4. Product Development: Food engineers work on developing new food products and formulations to meet consumer demands for healthier, more sustainable, and convenient food options. They collaborate with food scientists, nutritionists, and chefs to create innovative recipes and products that appeal to a diverse range of tastes and dietary preferences.

5. Sustainability: Food engineers are increasingly focused on promoting sustainable practices in food production, such as reducing waste, conserving energy and water resources, and minimizing the environmental impact of food processing operations. They work on developing eco-friendly packaging materials, optimizing production processes to reduce carbon emissions, and implementing recycling and waste management initiatives.

6. Research and Innovation: Food engineers are involved in conducting research to advance

the field of food engineering and develop new technologies for improving food production processes. They collaborate with academia, industry partners, and government agencies to address emerging challenges in food security, public health, and environmental sustainability.

HOW CAN ENGINEERING SOLVE FOOD INSECURITY

Engineering can play a significant role in addressing food insecurity by developing innovative solutions to improve food production, distribution, and access. Here are some ways in which engineering can help solve food insecurity:

1. Agricultural Engineering: Agricultural engineers work on developing technologies and practices to increase crop yields, improve soil health, and optimize water usage in agriculture. They design and implement precision farming techniques, such as sensor-based irrigation systems and automated machinery, to enhance productivity and efficiency in food production.

2. Food Processing and Preservation: Food engineers develop technologies for processing, packaging, and preserving food products to extend their shelf life and reduce food waste. By improving food preservation methods, such as freezing, drying, and canning, engineers can help ensure that perishable foods are available for longer periods, especially in regions with limited access to fresh produce.

3. Infrastructure Development: Civil engineers play a crucial role in designing and constructing infrastructure projects, such as roads, bridges, and storage facilities, that facilitate the transportation and distribution of food from farms to markets. By improving transportation networks and storage systems, engineers can help reduce food losses due to spoilage and inefficiencies in

the supply chain.

4. Energy Efficiency: Engineers work on developing sustainable energy solutions for agricultural operations, such as solar-powered irrigation systems, biogas digesters, and energy-efficient processing equipment. By reducing the reliance on fossil fuels and promoting renewable energy sources, engineers can help lower production costs for farmers and improve the overall sustainability of the food supply chain.

5. Information Technology: Engineers develop digital tools and platforms, such as mobile apps, data analytics software, and blockchain technology, to enhance traceability, transparency, and efficiency in food supply chains. By leveraging data-driven insights and real-time monitoring systems, engineers can help identify bottlenecks in food distribution networks and optimize resource allocation to ensure food reaches those in need.

6. Community Engagement: Engineers collaborate with local communities, non-profit organizations, and government agencies to design culturally appropriate solutions that address the specific needs of vulnerable populations facing food insecurity. By engaging stakeholders in the design and implementation of food security initiatives, engineers can ensure that interventions are sustainable, inclusive, and responsive to local contexts.

1. Precision Agriculture: Precision agriculture involves the use of advanced technologies, such as drones, sensors, and GPS systems, to collect data and monitor crop health, soil conditions, and weather patterns. By leveraging real-time data analytics and machine learning algorithms, farmers can make informed decisions about crop management practices, irrigation scheduling, and fertilizer application to optimize yields and reduce environmental impact.

2. Vertical Farming: Vertical farming is a sustainable agricultural practice that involves growing crops in vertically stacked layers or controlled environments, such as indoor warehouses or urban high-rises. By utilizing hydroponic or aeroponic systems, LED lighting, and climate control technologies, vertical farms can produce fresh produce year-round with minimal water usage and land footprint. This approach enables urban areas to access locally grown food and reduces the reliance on long-distance transportation.

3. Cellular Agriculture: Cellular agriculture is an emerging field that involves producing animal-based products, such as meat, dairy, and eggs, from cell cultures rather than traditional livestock farming. By using bioreactors and tissue engineering techniques, researchers can grow meat without the need for raising animals, thereby reducing greenhouse gas emissions, land use, and animal welfare concerns associated with conventional livestock production.

4. Smart Packaging: Smart packaging technologies incorporate sensors, RFID tags, and QR codes to monitor food quality, freshness, and safety throughout the supply chain. By enabling real-time tracking of temperature, humidity, and microbial contamination, smart packaging helps

WHAT ARE IMPLEMENTATIONS PUT INTO PLACE FOR FUTURE CONCERNING FOOD ENGINEERING

There are several key implementations and trends in food engineering that are shaping the future of food production, processing, and distribution. Some of the notable initiatives include:

prevent food spoilage, reduce waste, and improve traceability for consumers. These innovations also support sustainability goals by extending shelf life and reducing the need for preservatives.

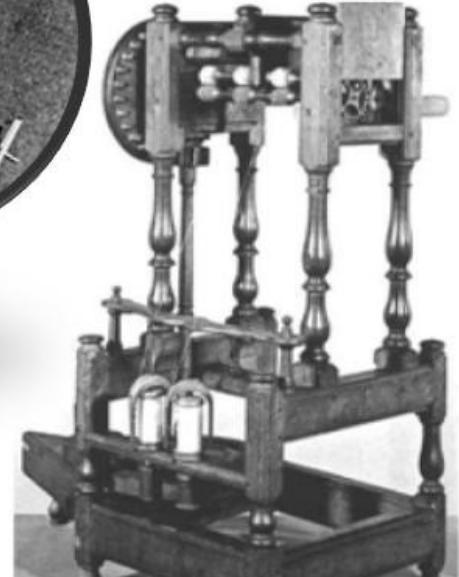
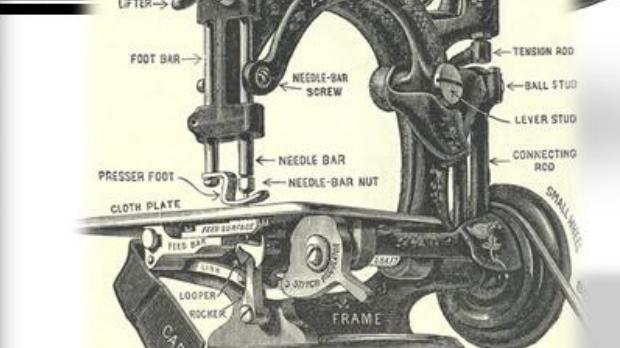
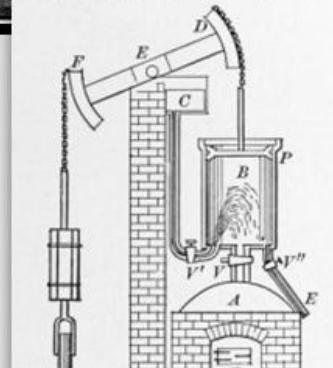
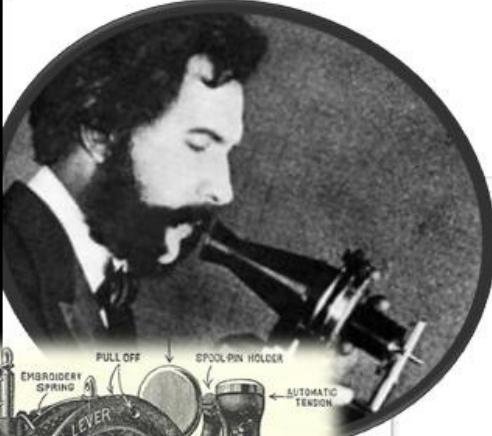
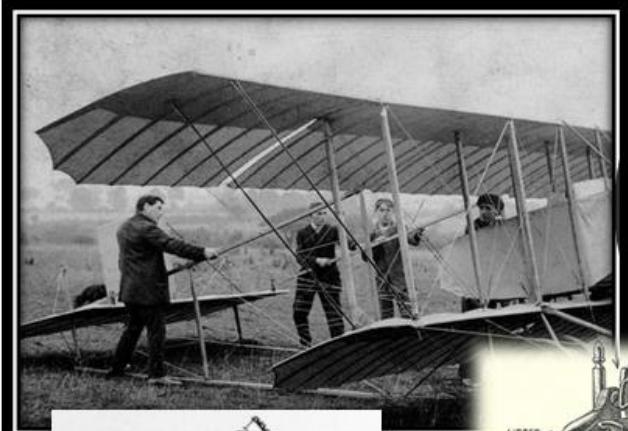
5. Blockchain and Traceability: Blockchain technology provides a secure and transparent platform for tracking food products from farm to fork. By creating immutable records of every transaction in the supply chain, blockchain enhances traceability, authenticity, and food safety by verifying the origin and handling of food items. This technology enables consumers to make informed choices about the products they purchase and promotes accountability among food producers and distributors.

6. Circular Economy: The concept of a circular economy aims to minimize waste and maximize resource efficiency by closing the loop on product lifecycles. In the context of food engineering, this

approach involves repurposing food by-products, implementing recycling programs, and promoting composting initiatives to reduce food waste and create value from surplus materials. By adopting circular economy principles, the food industry can enhance sustainability practices and contribute to a more resilient and regenerative food system. To sum up, these implementations in food engineering are driving innovation, sustainability, and resilience in the food industry to address global challenges such as food insecurity, climate change, and resource scarcity. By embracing technological advancements and collaborative approaches, stakeholders can work together to build a more equitable and sustainable food system for future generations.

by NOLDAH ADHIAMBO OCHIENG





VOLTAGE OF MY DREAM, MY ENGINEERING TALE.

Hey, am Laura Purity Nyongesa. A third year student in Electrical and communication engineering at Masinde Muliro University. Embarking on my journey at Masinde Muliro University, I was a fledgling in a nest of possibilities, eager to explore the vast skies of electrical engineering. As a woman in this field, I was not only learning about circuits and currents but also about breaking barriers and building bridges.

My first year was Spark of Curiosity, a fascinating exploration of lab practical's and the art of report writing. Each experiment was a puzzle, and every solution was a triumph.

The introduction to engineering was like a light switch flipped on, illuminating the path ahead.

My second year was the Workshop Wonders, brought me closer to the core of engineering with workshop practices. It was a hands-on experience that honed my skills and shaped my understanding of the tangible aspects of my future profession.

The Circuit of Growth is my third year, delving into the intricacies of analogue and digital electronics, which introduced me to the world of embedded software design. It was a blend of creativity and logic, where I learned to speak the language of machines. Through all these years I have gained valuable knowledge towards:

i. Communications and Networks:

A Connected Path, the principles of communication courses unveiled a potential

path in network engineering. It was a revelation, showing me how engineers connect the world, one node at a time.

ii. Electrical Machines:

The Dance of Electrons Electrical machines captivated me with their ability to convert static energy into dynamic motion. They were not just subjects to study but marvels to behold, each one a testament to human ingenuity.

iii. Programming and Passion:

Coding the Future, my programming passion was nurtured, though I still grapple with applying it to real-world projects. The challenge is a welcome one, as it pushes me to bridge the gap between theory and practice.

The journey hasn't been all about class and labs, it has been a journey of self-discovery, interactions and growth. This achieved through:

i. Professional Growth:

IEK and IEEE Events organized by IEK and IEEE provided a platform to learn from those who have already paved their paths in the engineering world. Their experiences and insights have been invaluable, offering a glimpse into the practicalities of our field.

ii. Engineering Students' Association:

Charity and Learning Being part of the Engineering Students' Association (ESA) has been transformative. Organizing charity events and visiting children's homes, I performed electrical installations, which taught me the real-world impact of my skills.

iii. Software Skills:

Mastering the Tools, ESA's focus on engineering software has equipped me with the knowledge of the right tools in my field, ensuring that I am industry-ready upon graduation.

iv. Diverse Knowledge:

The Power of Collaboration Interacting with other engineering students has broadened my knowledge base, helping me learn and grow toward becoming the best version of an electrical engineer I envision for the future.

It has really been a great journey of learning, re-learning and unlearning but I must admit I face challenges too. One of my greatest challenges has been the disconnect between academic exercises and real-world engineering problems. In the labs, we connect circuits without a clear understanding of their application in tangible projects. Moreover, there seems to be a gap between our school and the industry, leaving us uninformed about competitions and events that could enhance our learning. The support to represent our campus in these real-world challenges is often lacking, and I believe that our institution should foster an environment that encourages us to shine and become the engineers we aspire to be.

My personal Reflection from these years is, Engineering is a world of possibilities. We sometimes miss it by just aiming to pass exams, but what I know now is that it takes dedication to research every bit of knowledge given in class. It happens when you sacrifice your Tiktok time and invest in learning and perfecting your craft and gaining professional certificates along the way.

FROM COMRADE SPECIAL TO NATIONAL CRISIS:

MY NAIROBI FOOD FIASCO



The Nairobi sun beat down like a giant, angry egg. Sweat beaded on my brow faster than I could wipe it away, making my first post-shift "Comrade Special" even more crucial. For the uninitiated, a "Comrade Special" is three piping hot chapatis smothered in a glorious symphony of beans – the fuel for any city dweller. Today's mission: "Kwa Mathee," a random kibanda (street food stall) nestled within the city's controversial CBD. Let's just say the building next door had seen its fair share of scandals, giving the whole block a slightly dodgy charm.

Picture this: me, a famished comrade, inhaling my chapatis with the gusto of a man who hasn't eaten in days (which, technically, wasn't far from the truth). So focused was I on my culinary conquest, barely noticing the gaggle of street urchins morphing into a silent, bean-envy audience. A quick swig of water chased down the beans, leaving a pleasant warmth in my belly.

That's when the gremlins struck. My trusty MPesa app, the lifeline of every comrade, decided to play dead. Several frantic attempts later, I was left staring at the screen, toothpick poised mid-air, like a lone knight facing a digital dragon.

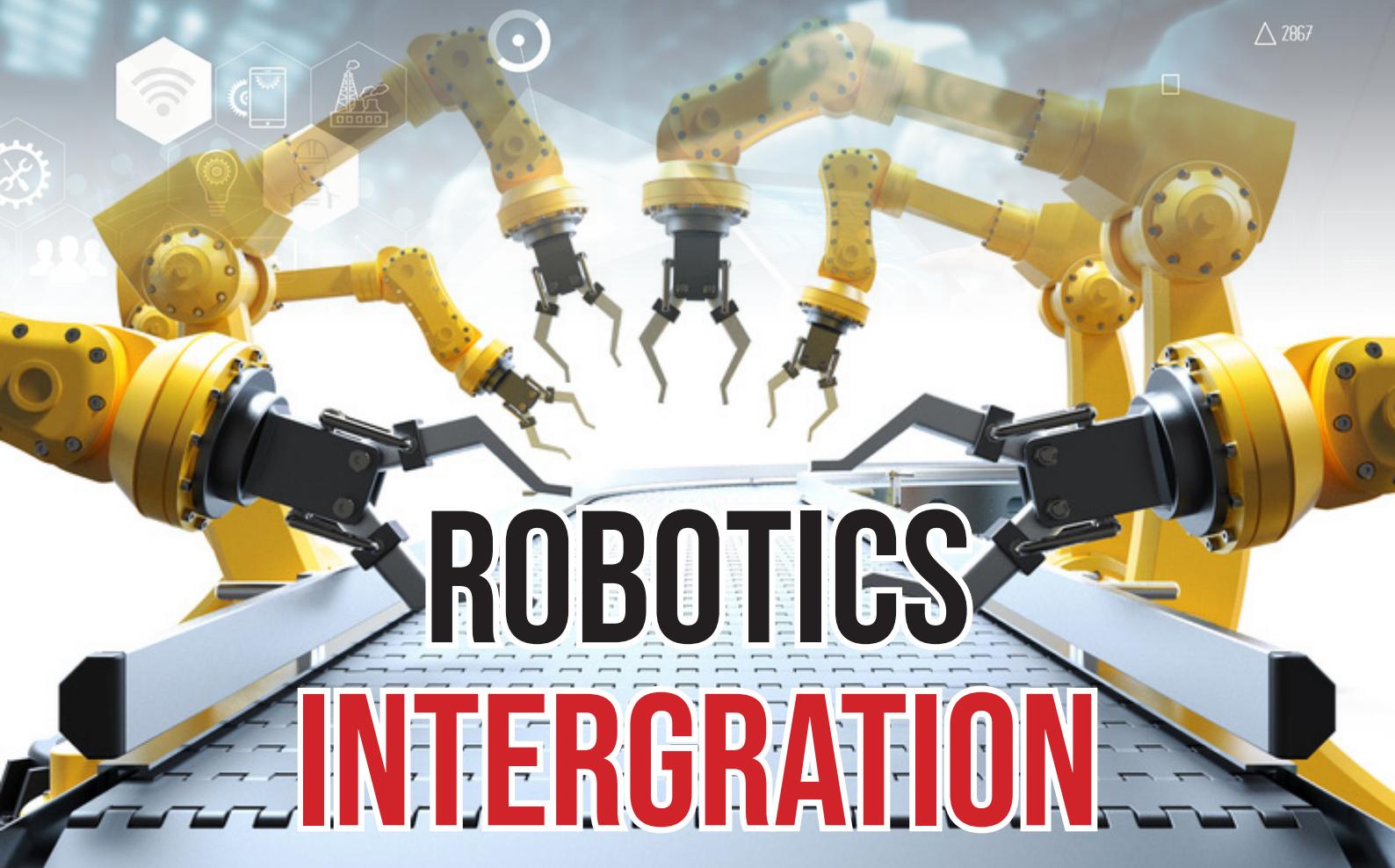
Mathee, the formidable owner of "Kwa Mathee," materialized beside me, her gaze a mix of skepticism and spicy bean fumes. "Mpesa hapana?" she boomed, clearly familiar with the "please call me,

Mathee" con artists who plagued her establishment. I wanted to laugh, but the situation was drier than a sun-baked chapati.

Stuck between a rock (my rumbling stomach) and a hard place (Mathee's accusatory stare), I braced myself for the worst. Just as a group of suspiciously meaty-fisted men began to circle, a deus ex machina arrived – my supervisor! Witnessing the unfolding drama, he swooped in like a financial superhero, settling the bill and rescuing me from a potential "Kwa Mathee" beatdown.

Little did I know, my near-starvation experience was about to become national news. Turns out, the whole MPesa fiasco wasn't just my bad luck. A notorious hacker group calling themselves "Anonymous Sudan" had decided to throw Nairobi into a digital frenzy. My desperate toothpick moment, immortalized on security footage, became the face of the crisis.

So there you have it. My near-chapo-less disaster turned into a national caper about cybersecurity, all thanks to a wonky app, a suspicious Mathee and a city with a taste for adventure. Just another day in the delightful, unpredictable chaos that is Nairobi. Now, if you'll excuse me, I have a date with three chapatis, a plate of beans and a very apologetic MPESA APP app.



ROBOTICS INTERGRATION

ABSTRACT

The incorporation of robotics into engineering practices has led to various transformations across different sectors, including manufacturing, healthcare and many more sectors. This infusion of technology has revolutionized traditional approaches and spurred the emergence of innovative solutions. This article delves into the specific applications of robotics, particularly within the context of Kenya and Africa as a whole, shedding light on some of its impacts. Additionally, it offers a forward-thinking perspective, delving into the potential future of robotics integration within Kenya's engineering space.

INTRODUCTION

In recent years, Kenya has witnessed a remarkable shift in its engineering landscape with the integration of robotics into various sectors. This transformation has not only redefined conventional practices but has also opened up unprecedented avenues for innovation and efficiency enhancement. According to data from the Kenya Association of Manufacturers, the adoption of industrial robots in the country's manufacturing sector has seen a steady rise, with companies like Mabati Rolling Mills leading

the way in implementing robotic automation to streamline production processes and elevate product quality standards. Additionally, in agriculture, the utilization of robotics, particularly drone-based crop monitoring systems, has gained significant traction among farmers in regions such as the Rift Valley, contributing to improved yields and sustainable farming practices. Moreover, advancements in healthcare, with the incorporation of surgical robotics in leading hospitals like Kenyatta National Hospital, have revolutionized surgical procedures, leading to better patient outcomes. Looking forward, the future of robotics in Kenya holds immense promise, as technological advancements continue to drive innovation and shape the trajectory of engineering in the country. This article explores specific examples of robotics applications in Kenya across manufacturing, agriculture, and healthcare sectors, offering insights into the transformative impact and potential future advancements in Kenya's engineering landscape.

MANUFACTURING REVOLUTION

The manufacturing sector in Kenya has experienced a significant revolution through the integration of robotics technology. Embracing industrial robots

for various tasks, from assembly to quality control, has become common in Kenyan industries. An example is in automotive assembly plants in Nairobi, where robotic arms are efficiently streamlining production processes, enhancing product quality, and improvement of overall efficiency. These advancements have not only led to a reduction in production costs but have also heightened the competitiveness of Kenyan manufacturing on the global stage. As a result, Kenya's manufacturing sector is set to capitalize on the benefits brought about by robotics integration, hence further solidifying its position in the international market.

Moreover, in the manufacturing industry, the future of robotics in Kenya is characterized by increased automation and efficiency across production processes.

Automation in Production: As robotics technology becomes more advanced and affordable, manufacturers can use robotic systems for tasks ranging from assembly and packaging to quality control and inventory management. Automation will improve production efficiency, reduce errors, and enhance product quality, hence help in cost saving and also make Kenyan products more competitive in foreign markets increasing our GDP.

Advanced Manufacturing Techniques: The integration of robotics with data analytics and artificial intelligence will enable ease in maintenance and adaptive manufacturing techniques. By implementing real-time data insights, manufacturers can optimize production schedules, minimize downtime, and respond rapidly to changing market demands, positioning Kenya as a center for advanced manufacturing technologies in the region.

AGRICULTURAL INNOVATION

The agricultural sector in Kenya has undergone massive transformations through the adoption of robotics technologies, particularly in regions like the Rift Valley. Here, agricultural robots are playing a major role in precision planting, crop monitoring, and harvesting. Equipped with advanced GPS

navigation systems, these robots easily and quickly navigate expansive farmlands, collecting useful data to optimize agricultural practices. As a result, Kenyan farmers experienced a significant increase in crop yields while simultaneously reducing wastage of resources hence maximizing profit and minimizing losses. Moreover, the integration of robotics has enabled farmers to embrace sustainable farming methods, contributing to both food security and economic development in the region.

Furthermore, in the agricultural sector, the future of robotics in Kenya promises to revolutionize farming practices and drive sustainable food production.

Autonomous Farming Equipment: Advancements in robotics technologies, including autonomous tractors and robotic harvesters eg more modern combined harvestors, will enable farmers to increase productivity while minimizing labor costs and environmental impact. These systems can perform tasks such as planting, irrigation, and harvesting with precision, optimizing the utility of resources and increasing crop yields.

Precision Agriculture Techniques: The development of robotic solutions for soil analysis, crop monitoring, and management will facilitate precision agriculture techniques. By leveraging robotics for real-time data collection and analysis, farmers can make informed decisions about crop health, nutrient management, and pest control, leading to improved crop quality and reduced environmental footprint

HEALTHCARE ADVANCEMENTS

In Kenya, the healthcare sector has wholeheartedly adopted robotics technology to elevate patient care standards and surgical precision. Leading hospitals in Nairobi have seamlessly integrated surgical robots into their operating rooms, empowering surgeons to conduct minimally invasive procedures with unmatched accuracy. Notably, robotic-assisted surgery has revolutionized complex orthopedic procedures, leading to shortened recovery times and enhanced patient outcomes. Moreover, the utilization of robotics in telemedicine initiatives has significantly extended healthcare access to remote

regions, effectively bridging the gap in medical services across Kenya. This integration of robotics into healthcare practices underscores Kenya's commitment to advancing healthcare delivery and ensuring equitable access to quality medical care throughout the country.

Looking ahead, the future of robotics in Kenya's healthcare sector holds immense potential for improving access to quality medical care and enhancing patient outcomes.

Robotic-assisted Surgery and Telemedicine: Ongoing advancements in robotic-assisted surgery techniques will empower healthcare professionals to perform complex procedures with greater precision. Additionally, telemedicine initiatives leveraging robotics will enable remote consultations with patients in rural and underserved areas, expanding access to specialized medical expertise and reducing healthcare disparities.

Medical Imaging Technologies: The integration of robotics into medical imaging technologies, such as MRI and CT scanners, will revolutionize diagnostic capabilities. With robotics aiding in faster and more accurate imaging, healthcare providers can make timely diagnoses and develop targeted treatment plans, ultimately improving patient outcomes and reducing morbidity rates.

FUTURE PERSPECTIVES

Looking ahead, the future of robotics in Kenya's engineering landscape holds immense promise, with potential advancements poised to transform various sectors. In manufacturing, the integration of artificial intelligence (AI) with robotics is anticipated to drive further optimization of production processes, enabling predictive maintenance and adaptive manufacturing techniques. This fusion of AI and robotics will not only enhance efficiency but also streamline operations, contributing to increased productivity and competitiveness in the global market. In agriculture, the future of robotics entails the development of autonomous drones for crop monitoring and pest control. These technological innovations will

not only improve productivity but also promote sustainability by minimizing resource wastage and reducing environmental impact. Furthermore, in the healthcare sector, robotics is expected to play a pivotal role in facilitating remote patient monitoring and personalized medicine. By leveraging robotics technology, healthcare professionals will be able to deliver high-quality medical care to both urban and rural areas in Kenya, thus revolutionizing healthcare delivery and improving overall patient outcomes. As Kenya continues to embrace robotics advancements, the synergy between technology and engineering is poised to drive transformative breakthroughs, shaping a future where robotics plays a central role in driving innovation and sustainable development across various sectors of the economy.

CONCLUSION

In conclusion, the integration of robotics into engineering practices has catalyzed a paradigm shift, ushering in a new era of innovation and efficiency across various industries in Kenya and Africa at large. From manufacturing to agriculture and healthcare, robotics technologies have revolutionized traditional methodologies, driving economic growth and societal development. As Kenya continues to embrace robotics advancements, the synergy between engineering and robotics will play a pivotal role in shaping the future of technology and engineering excellence in the region. With ongoing advancements and investments in robotics, Kenya is poised to realize transformative breakthroughs that will not only enhance productivity and competitiveness but also improve the quality of life for its citizens. As such, the trajectory of robotics integration underscores Kenya's commitment to technological advancement and sustainable development, positioning the country as a frontrunner in the global engineering landscape.

**THE INCORPORATION OF ROBOTICS INTO
ENGINEERING PRACTICES HAS LED TO
VARIOUS TRANSFORMATIONS ACROSS
DIFFERENT SECTORS**

POWERING THE FUTURE WITH WIND AND SOLAR ENERGY



In the quest for sustainable energy solutions, wind and solar power have emerged as leading contenders, offering hope for a cleaner and greener future. For over decades, climate change brought by dirty forms of energy such as the coal or fossil fuels has been a debate that has been discussed from generations to generations. Till recently where the debate to harvest solar and wind energy both in large scale and small scale has been happening all over the world. The wind and solar energy if harnessed correctly and effectively can reduce the effects of global warming and also improve the livelihood of a nation in almost all aspects.

Wind energy for years has been harnessed in small scale such as wind mills among other activities. It has since been propelled in readiness for greener future by advancements in wind technology. The advancement

in turbine technology has led to more power output and efficiency. Programs to train personnels on wind technology has been offered in various institutions across the globe to raise the awareness and technological knowhow. Wind patterns can now be studied to get to know on various areas suitable for large scale production of wind energy. Wind energy technology has become increasingly cost effective and efficient, tapping into abundant and renewable resource of wind to generate electricity.

Similarly, solar power has experienced exponential growth, driven by falling costs and wide spread adoption of photovoltaic technology. The integration of solar panels into building materials, such as roofs, windows, facades, has gained traction. BIVP offers as seamless and aesthetically pleasing integration of solar energy generation, enabling

buildings to generate their electricity while reducing the reliance on the grid. Scientists and technologists have developed semiconductor technologies and the nanotechnology some of which are directed to the advanced development of solar cells to power our cities, homes, appliances and many others. Transparent solar cells are now available and it paves way for the integration into windows in homes, offices, industries hence opening up new possibilities for energy harvesting. The decentralization of solar installations empowers individuals and communities to take control of their energy consumption while reducing reliance on centralized power sources. Some developed or even developing countries have the Net Metering Technology which helps to improve and encourage the investment on the solar energy. The synergistic effect of wind and solar energy is increasingly being recognized as a powerful solution to address the challenges of renewable energy generation. Combining wind and solar resources in the hybrid systems allows for more consistent and reliable output, as wind patterns and sunlight availability often compliment each other. Hybrid renewable energy projects are being implemented worldwide maximizing energy production while reducing the overall dependency on fossil fuels. Together, wind and solar power represent not only viable alternatives to fossil fuels but also symbols of progress in the fight against climate change and environmental degradation, signaling a transformative shift toward more sustainable paradigm.

Furthermore, the future prospects include the integration of digital technologies such as artificial intelligence AI and machine learning into wind and solar energy systems. These digital technologies optimize the operation and maintenance of renewable energy installations, enabling predictive maintenance, advanced weather forecasting, and grid integration, thereby enhancing efficiency and performance.

Wind and solar energy have experienced significant developments in the recent years revolutionizing the renewable energy landscape. Advancement in turbine design, offshore wind farms, solar cell efficiency, energy storage, and integration technologies have

propelled wind and solar energy forward, making the cost effective, efficient, and accessible than ever before. The combination of the two, opens exciting possibilities for future powered by clean sustainable energy.

Kenya is emerging as a trailblazer in renewable energy adoption. Over the decades it has made remarkable strides in expanding power access, reaching over three-quarters of its population. The projects like the Lake Turkana Wind Power Generation and the Ngong Wind Power Generation have made a boost to Kenya National Grid. The result has been reduced blackouts, more power connectivity both in the urban and rural settlements. The various solar energy large scale projects cannot be left unnoticed helping boost the national grid. Kenya has made various advancements in solar production where most homesteads have solar panels. The Rural Electrification Authority ambitious Lastmile Connectivity project aims for universal access by 2022, empowering communities across the nation. The abundant solar exposure and coastal winds makes the solar and wind energy viable options for attracting foreign investment for rural electrification initiatives.

Moreover, rather than rural electrification and foreign investment Kenya has enjoyed a diverse range of advantages from wind and solar energy like energy independence, reducing the amount of importation of energy from other countries like Uganda. They significantly support agriculture by using devices such as the wind turbine powered water pump and solar water pump that decrease the over reliance on rain fed crops. These initiatives help in achieving Kenya's sustainable development goals and the vision 2030 target.

**DENIS BITOK
PERPETUAL MUTHEU**



KENYA GOING NUCLEAR



Nuclear energy is the cleanest type of energy in the world. Thermal explosion is produced by heat emissions from nuclear reactors. The Domestic Atomic Energy Authority in the United Kingdom reported that 410 nuclear reactors will be in operation in 32 countries by 2023, 57 of which are under construction. The history of nuclear power dates back to December 21, 1951, when the heat produced by a nuclear reactor was first used to generate electricity to power four lights in a test breeder reactor. The first nuclear power plant to generate electricity was built in late 1954. In a nuclear reactor, heavy elements such as uranium or thorium undergo a chemical process to produce nuclear reactions. The released energy is used to increase the temperature. The steam room runs a generator that converts the heat in the room into all kinds of energy. Generators convert mechanical energy into electrical energy. The building has a cooling system that will take excess heat from the reactor core and transport it to other parts of the station.

The best thing about nuclear energy compared to other forms of energy production is that it can produce a lot of electricity with a small amount of nuclear

fuel. Scientific research has shown that the energy produced by processing 1 kilogram of uranium is equal to the energy produced by 4,500 tons of quality coal. Although nuclear fuel is expensive to extract compared to natural gas, the overall content of nuclear fuel is very high. Due to the depletion of natural gas resources, electricity problems occurred very quickly. Some African countries such as Kenya, South Africa and Nigeria have realized this and have made progress in using nuclear energy; because nuclear energy can be used effectively to produce fires. Electricity is not large enough to meet business and industry.

The problems faced by energy engineers when it comes to the development of nuclear power plants are undeniable. This includes, but is not limited to, the significant time required to build an operational nuclear power plant. A nuclear power plant usually takes five to ten years to build. This has huge financial costs. Although nuclear reactors do not pollute the air, the process of extracting and refining uranium ore causes land degradation and requires a lot of energy. Nuclear energy also produces radioactive substances that are very dangerous to animals around the plant.

These materials will remain for thousands of years and pose a risk to human health. The development of nuclear energy has increased the rate at which many countries develop nuclear weapons because they can easily extract plutonium or add uranium to make nuclear weapons.

The nuclear industry has come up with new designs for nuclear reactors that they say are safer. However, these designs are not tested and there is no guarantee that the designs will be built correctly or can withstand some natural disasters. With the decrease in nuclear energy, many solutions that can be reduced have emerged. Bodies such as the Intergovernmental Panel on Climate Change (IPCC) have been created to monitor the activities of the nuclear industry. Equipment used in nuclear power plants emits radiation harmful to humans, which requires machines to operate. Nuclear waste produced in this process can be disposed of using two methods: waste incineration and liquid waste evaporation. Sensors such as performance indicators have been installed in power plants in order to detect leaks in the system at an early stage. Is it time for Kenya to change power? The depletion of fossil fuels and the continued pollution of the environment. Due to increasing demand, Kenya has started working on nuclear energy production in order to diversify energy production and promote zero-carbon energy.

The Nuclear Power and Energy Agency (NuPEA) was created specifically for the cities of Kilifi and Kwale for the construction of nuclear power plants, which are expected to start between 2026-2027. We estimate the construction period to be five to ten years, from 2032 to 2034. The power plant is expected to produce up to 1,000 MW of electricity and, if completed, will be important in reducing dependence on weak energy sources. In addition to building expensive hydroelectric power plants, Kenya also plans to increase electricity distribution across the country. With internal financing and guidance from nuclear power plant pilot countries such as the United States and Russia, Kenya will be the first African country to develop nuclear energy after South Africa, which

gets 5% of its electricity from nuclear energy. Consequently, Kenya has been working hard for years to realize the dream of nuclear energy, sending students through scholarships and exchange programs to study and gain knowledge and skills in the nuclear energy business. Parastatals such as Kenya Power and Lighting Company have managed to sign international agreements with countries that have managed to operate nuclear energy. These agreements include an agreement between KPLC and King's International Institute of Postgraduate Nuclear Studies. It offers advanced training for Kenyan electrical engineers. The Nuclear Safety Commission is also prepared to address concerns regarding the safety, security and disposal of nuclear waste. The committee made clear that Kenya has a nuclear defense system that must account for the material and ensure that it does not become undesirable material.

The development of nuclear energy in Kenya is a significant opportunity for the country because nuclear energy not only produces clean electricity, but also provides diagnostics, magnetic resonance imaging (MRI) technology, supporting efforts to combat climate change, research and commercial use. The Nuclear Power and Energy Agency (NuPEA) provides a variety of public briefings, information and training aimed at debunking myths and misconceptions about nuclear energy production in the country. Yes, it is time for Kenya to change power.

BY RABARE



“ADVANCING WATER AND SEWERAGE MANAGEMENT IN KENYA: LEVERAGING TECHNOLOGY FOR SUSTAINABILITY”



Water and sewerage management in Kenya is a critical issue that impacts public health, environmental sustainability, and economic development. With rapid urbanization, population growth, and climate change, the demand for clean water and efficient sanitation services has never been higher. However, the country faces numerous challenges in meeting these demands, including water scarcity, inadequate infrastructure, pollution, and inefficiencies in service delivery. To address these challenges, there is a pressing need for technological advancements in water and sewerage management.

The integration of smart technologies and data-driven decision-making processes presents a transformative opportunity to revolutionize water and sewerage management in Kenya. Smart sensors and Internet of Things (IoT) devices, when deployed across water distribution networks and sewer systems, enable real-time monitoring of key parameters such as water quality, flow rates, and asset conditions. These technologies provide valuable insights into the performance of the infrastructure, allowing for early

detection of leaks, faults, and other issues that could lead to water loss or contamination. By identifying and addressing these issues promptly, utilities can reduce non-revenue water and ensure the efficient delivery of clean water to consumers.

Advanced data analytics and predictive modeling further enhance the management of water resources by providing insights into consumption patterns, demand trends, and potential risks. By analyzing large volumes of data collected from sensors, meters, and other sources, water utilities can better understand how water is being used and where demand is likely to increase or decrease in the future. This information can inform strategic decisions about infrastructure investments, water pricing, and conservation measures, ultimately leading to more efficient use of water resources and improved service delivery.

Remote monitoring and control systems play a crucial role in enhancing operational efficiency and reliability in water and sewerage management. These systems allow operators to remotely monitor equipment

performance, adjust operational parameters, and respond to emergencies in real-time. By reducing the reliance on manual interventions and minimizing disruptions to service, remote monitoring and control systems help ensure the continuous availability of clean water and sanitation services to consumers. This is particularly important in a country like Kenya, where water scarcity is a pressing issue and interruptions in service can have serious consequences for public health and economic development.

Asset management is another area where technology can drive significant improvements in water and sewerage management. By implementing technology-enabled asset management systems, utilities can proactively maintain and rehabilitate infrastructure to extend its lifespan and enhance resilience to climate-related hazards. These systems use data collected from sensors, inspections, and maintenance activities to prioritize investments, identify emerging issues, and optimize maintenance schedules. By adopting a proactive approach to asset management, utilities can minimize the risk of infrastructure failures and ensure the long-term reliability of water and sewerage services.

In addition to technological advancements in infrastructure and operations, community engagement

and capacity building are essential components of effective water and sewerage management. Sustainable water management requires the active participation of all stakeholders, including government agencies, utilities, communities, and civil society organizations. By involving communities in decision-making processes, raising awareness about water conservation and hygiene, and providing training and support to local water committees and service providers, technology can empower communities to take ownership of their water resources and contribute to sustainable development.

As Kenya continues to embrace technological innovation in water and sewerage management, it is essential to ensure that these technologies are accessible, affordable, and sustainable. This requires investment in research and development, capacity building, and institutional strengthening to enable the effective deployment and maintenance of technology-enabled solutions. It also requires collaboration and partnership between government agencies, utilities, academia, the private sector, and civil society to create an enabling environment for innovation and investment. By harnessing the power of technology and fostering collaboration, Kenya can overcome the challenges of water and sewerage management and ensure a sustainable water future for all its citizens.



ENGINEERING AND BETA

Engineering and BETA

Mindfully engaging every stakeholder whose vision, mandate and intervention of like mindedness is essential in delivery of the best outcome under the economic agenda for radical transformation and rapid growth. Having then a coalition of able and willing participants and centrally engineers would rapidly make impactful contributions and therefore indispensable.

Agricultural transformation and Inclusive Growth

Agriculture is the largest sector of the economy contributing to half or more of Kenya's GDP with equivalent portions directly and indirectly. About two-thirds of Kenyans derive their livelihood income from agriculture thus remaining a fundamental foundation and backbone of the economy.

The sector remains the most competitive both in traditional and emerging exports. Our manufacturing sector is largely agri-based with food processing and beverage manufacturing contributing almost half i.e 40 and 48 percent of manufacturing employment and GDP respectively. When non-food agro-processing is added, agro-processing becomes more than half of the manufacturing sector. Moreover, manufacturing that is not agro-based is highly dependent on imported raw materials. Its addition in value to our agricultural exports is a more viable route to grow our manufactured exports than industries that are heavily dependent on both imported machinery and raw materials.

How does engineering expertise then benefit this sector?

Agricultural engineers hold minds behind mechanization of farming, irrigation, crop processing, ensuring safe and efficient food production adding value to agricultural products. In a simpler term, modernizing agriculture to boost yields, income and food security is their domain!

Infrastructure, Housing and Settlement

'Housing' enshrined in the Kenya's promulgated new constitution 2010 "accessible and adequate housing and to reasonable standards of sanitation" (Art.43b) is a basic, social and economic right. Bottom-Up Economic Transformation Agenda (BETA) objective regarding new urban housing estimates 250units/year, rural Kenya too holding its fair share of land. Settlement challenges including: landless, insecure land tenure, notably also the historical squatter problem at the coast eyes for a solution in demand of an engineered service.

Regarding infrastructure, roads are arguably the country's most important infrastructure. Adoption of Low Volume Sealed Roads (LVSR) program as projected in BETA would actually reduce cost of paving low traffic roads substantially. Anyway, the need for roads remains immense!

Taking roles;

Civil engineering and like minded individuals including but not limited to Engineers, Architects, Quantity Surveyors and Contractors play a vital professional role in design and construction of this critical infrastructure (roads, railways, bridges) to enhance connectivity plus facilitating trade and stimulated economic growth.

Healthcare

Leveraging on health information technology to drive responsiveness, efficiency, seamlessness between providers transparency and fraud prevention could possibly depend on telecommunication and related disciplines. Electricity hereby is a vital economic and social service critical in production, issue of essential services such as health and security and quality life for citizens. Energy infrastructure including power plants, transmission lines and renewable energy projects ensures reliable energy supply for industries and households. Efficient production is

dependent on mechanical and industrial engineers . With concern also, this individuals take pride behind automation and robotics to improve efficiency, reducing costs and enhancing quality production in factories. Telecommunication infrastructure links areas enabling access to information, education and markets. Summarily, Engineering service displays a very significant pivotal role in shaping the policies of the economic agenda.

Digital superhighway and creative economy.

Considering the rapid integration of technology in our daily lives, commitments seem right on time. From the destructive technological innovation in the transport sector like Uber and Little Can to the new avenues arising for digital content creators to get paid through Wowzi and Spotify. Responsively, engineering disciplines champion the development of a digital superhighway incorporating the based pillars (digital government, digital business, infrastructure, digital entrepreneurship, digital skills and values) of the plan. Also, a digital public service that BETA seeks made available through E-Citizen enabling thousands of services available to Kenyans.

Creative Economy uses skills and talents to generate income and employment by empowering the creativity of the person and community. In many creative industries, innovation brings the need for materials for maintenance and preservation of cultural principles. The cultural and technological knowledge may produce designs and materials that add value to products. Many technological developments in creative industries such as Architecture and design,

for example, depend on material science and engineering. New materials are fundamental for the growth, security and quality of life. Too, they are open doors to technologies in civil,chemical, nuclear, aeronautical, mechanical, biomedical and electrical engineering. Influence to people's lives hereby comes when they buy or use a new device, machine or structure for example. In their development, creative companies use multiple materials for their development such as solid stone, fibreglass, concrete and glass reinforced with concrete. This synergy creates solutions and functionalities that add value contribute to cultural preservation and sustainability.

MSMEs and Start-ups Catalysts for economic growth and innovation
MSMEs and Start-ups are two important types of business in the big world of money and business. Micro, Small & Medium Enterprises (MSMEs) and Start-ups play a crucial objective in fostering economic growth, driving competitiveness and paving way for a prosperous future.

Catalysing a rapid growth, an engineered service holds multiple portions towards this. Technology adoption; Start-ups often lead in the adoption of emerging technologies like artificial intelligence, block chain and renewable energy. This accelerates technology penetration, benefiting the wider economy. Digital infrastructure; for an efficient operation, the stakeholders here and specifically the digital age find an option for accessible internet and technology for crucial business.

MY VIEW

ONSONGO LEWIS (CIVIL ENG. STUDENT)





NCA @10 HITS AND MISSES AND AFFORDABLE HOUSING

Kenya, like many developing countries, faces a severe housing shortage exacerbated by rapid urbanization, population growth, limited access to finance, inadequate infrastructure and land tenure issues.

Kenya's urban population has been growing at an alarming rate, leading to increased demand for housing. However, the supply of affordable and quality housing has failed to keep pace with this demand, resulting in informal settlements and overcrowded living conditions. In an attempt to address the housing deficit, informal construction practices have become widespread, often leading to substandard buildings and, tragically, building collapses most notably in Nairobi City.

Affordable housing has been a critical issue in Kenya, where rapid urbanization has led to a housing deficit estimated to be over 2 million units. In response to this pressing need, the Kenyan government launched the Affordable Housing Program (AHP) in collaboration with the National Construction Authority (NCA) ten years ago. The National Construction Authority (NCA), constituted under the Act No. 41 of 2011, is mandated to register contractors and to keep a register of builders cleared to work in Kenya.

This is aimed at weeding out rogue contractors and reducing the amount of malpractices that have seen buildings collapsing in Kenya and many key state projects being delayed.

Hits

- Policy Framework: The establishment of the AHP and NCA provided a solid policy framework to address the housing crisis, demonstrating the government's commitment to tackling the issue.
- Infrastructure Development: A significant achievement has been the development of infrastructure in areas earmarked for affordable housing projects. This has enhanced accessibility and livability for residents.
- Job Creation: The initiatives have stimulated job creation in the construction sector, providing employment opportunities for thousands of Kenyans and boosting economic growth.
- Public-Private Partnerships (PPP): The AHP successfully fostered partnerships between the government and private sector players, leveraging resources and expertise to accelerate housing delivery.
- Innovative Financing Models: Introduction of innovative financing models such as mortgage schemes and rent-to-own arrangements has made homeownership more accessible to low and middle-income earners.
- Quality Standards: The NCA's role in ensuring compliance with construction standards has improved the quality of housing stock, safeguarding the well-being of residents and enhancing property values.
- Community Engagement: Efforts to involve local communities in the planning and implementation of affordable housing projects have fostered a sense of ownership and social cohesion.

- Technology Adoption: Embracing modern construction technologies has improved efficiency and reduced construction costs, making housing more affordable.
- Urban Renewal: The initiatives have facilitated urban renewal projects, revitalizing dilapidated neighborhoods and creating vibrant, sustainable communities.
- Impact on Poverty Alleviation: Access to affordable housing has had a positive impact on poverty alleviation, providing families with secure shelter and improving their overall quality of life.

Misses

- Pace of Implementation: Despite the ambitious targets set by the AHP, the pace of implementation has been slow, leading to delays in housing delivery.
- Land Acquisition Challenges: Land acquisition has been a major bottleneck, with bureaucratic processes, land speculation, and disputes hindering the timely rollout of housing projects.
- Affordability Criteria: The definition of “affordable” has been debated, with some housing units priced beyond the reach of the target demographic, particularly low-income earners.
- Inadequate Financing: Limited access to financing for both developers and prospective homeowners has constrained the scale and impact of the initiatives.

- Informal Settlements: The initiatives have struggled to address the needs of residents in informal settlements, where access to basic services and tenure security remain major challenges.
- Sustainability Concerns: There are concerns about the long-term sustainability of affordable housing projects, including maintenance costs and environmental impact.
- Corruption and Mismanagement: Instances of corruption and mismanagement within the housing sector have undermined public trust and diverted resources from intended beneficiaries.
- Lack of Monitoring and Evaluation: Inadequate monitoring and evaluation mechanisms have made it difficult to track progress, identify gaps, and learn from past experiences.

In conclusion, while the Affordable Housing Program and NCA @10 have made significant strides in addressing Kenya's housing challenges, there is still much work to be done. Addressing the identified misses and building on the hits will be crucial in ensuring that future initiatives effectively meet the housing needs of all Kenyans, contributing to sustainable development and inclusive growth.



**NATIONAL
CONSTRUCTION
AUTHORITY**
www.nca.go.ke

MISSION:

To regulate, streamline and build capacity in the construction industry for sustainable socio - economic development

VISION:

A well co-ordinated and developed construction industry

MOTTO:

Excellence in the construction industry



ENGINEERING WEEKEND TOURNAMENT

The highly anticipated ESA MMUST engineering tournament was back with a bang on 10th & 11th February, 2024. The ESA patron Dr Mukolwe invaluable support and ESA leaders dedication was key in ensuring the success of this year's tournament . The tournament sponsored by Kenya Power promised baskets of activities and moment's. The action packed weekend was graced by the SEBE associate dean Dr Cherop who was standing in for the dean prof. B. Sabuni. The dedicated efforts and unwavering commitments of SEBE staff Dr Osore, Dr Arasa and Willis Awandu among others was instrumental in the success of the tournament.

In a thrilling display of skill and sportsmanship, teams from KPLC, SEBE staff and various departments in the school of engineering, gathered for a two-day engineering weekend tournament that left fans on the edge of their seats. The annual engineering tournament, held at the Approved school grounds showcased the best of the best in the school of engineering, with each team vying for the coveted tournament title and the grand award. The

first day of the tournament saw intense matches as teams battled it out on the field. Spectators cheered and jeered as goals were scored and defences were brought down. The energy was palpable as players gave their all, leaving everything on the field in pursuit of victory.

The soccer teams were grouped in 2 pools, pool A consisted of three teams, 2nd years, 3rd years and 4th years while pool B had 5th years, 1st years and SRT. 3rd years topped group A with 6 points from two games, 2nd years following their shock loss to 3rd years joined the surprise casualties of the tournament finishing last in the group. In group B 1st years limped off the tournament as they were defeated in their last match by 5th years.

Group A winners 3rd years advanced to the quarters meeting with 5th years in the first semi-final, 4th years finished second in pool with two points took on SRT in the second semi-final. With 5th years defeating 3rd years they proceeded to clinching the tournament title overcoming resilient SRT team in the finals.



In chess, after the Saturday's classical matches, Jones lande, nudged a reminder by downing every opponent that came his way with a total of 5 wins, 0 draws and zero losses .Festus and Jackson completed the top three positions with each securing 4 wins. KPLC and SEBE staff squared off in a highly contested match. Despite SEBE's staff aspiration to etch their mark in the tournament, KPLC proved to be a formidable opponent, securing a 1-0 victory in a hard-fought match.



Team KPLC pose for a photo before their game against
SEBE staff



Team KPLC putting in a solid performance in the tug of war
competition against SEBE staff

Elsewhere in the ladies match, Blues beat the Maroons queens 2-0 to lift their first ever trophy at the tournament. The two goals proved the difference in a closely fought-affair.



ESA secretary General Okeyo Isaac giving what seemed to be the winning advice to his fellow fifth years students.

The tournament was not just about competition, but also about camaraderie and sportsmanship. Players from different teams came together to celebrate their shared love of the game, forging new friendships and memories that will last a lifetime.



Group photo capturing KPLC team, SEBE staff and ESA committee members

Expressing delight about the event, Eng. Okumu county business manager Kisumu who represented regional manager, he pointed out that MMUST engineering students is a hub of skills. In attendance was Eng. Eunice county Business Manager Kakamega whose effort was very instrumental in success of the event, Madam Grace HR western region, Eng. Kevin Amunga and KPLC Team coach Nyabinge among others.

As the tournament came to a close, players and fans alike left with a sense of fulfilment and pride in what they had accomplished. The two-day event had brought together communities from across the engineering fraternity, uniting them in a shared passion for games and creating memories that will be cherished for years to come.



KeRRA is a State Corporation in the Ministry of Roads & Transport which falls under the State Department for Roads established under the Kenya Roads Act 2007, with the responsibility of Management, Development, Rehabilitation and Maintenance of National Secondary Trunk Roads.

The Authority has made significant milestones towards achieving its mandate and ensuring Last Mile Connectivity in all parts of the country.

The support of the National Government, Ministry of Roads and Transport, Development Partners and Stakeholders has been instrumental in enabling the Authority make tremendous strides under the stewardship of the Board of Directors and efficient implementation of programs by Management and Staff.

Our Vision statement is Sustainable Road network for easy access to resources and services.

Our Mission statement is to Manage, Develop, Rehabilitate and Maintain National Secondary Trunk Roads for sustainable socio-economic transformation.

Our Core Values are;

- Transparency
- Professionalism
- Integrity
- Collaboration
- Sustainability

MINISTRY LEADERSHIP TEAM:

- Hon. Kipchumba O. Murkomen, EGH – Cabinet Secretary, Ministry of Roads & Transport
- Eng. Joseph Mbugua – Principal Secretary, State Department for Roads

KeRRA BOARD OF DIRECTORS:

- Prof. (Eng) Oyuko Mbeche, EBS – Chairman Board of Directors
- Samson Wangusi – Alternate to Cabinet Secretary, National Treasury and Economic Planning
- Eng. James M. Kungu – Alternate to the Principal Secretary, State Department of Infrastructure
- Eng. Dorcas M. Musingi, PE – Representative of The Institute of Engineers of Kenya
- Mr. Alvin Kibet Kirui, EBS – Representing Kenya Farmers Association
- Caroline Waithera Ndungu – Representing The Council of Governors
- Ms. Margaret Osili – Alternate to Principal Secretary Devolution Ministry of Devolution and Planning
- Eng. Philemon K. Kandie, MBS – Director General (Board Secretary)

Sigiri Bridge, Busia County



Kericho-Ainamoi-Kapsoit-Ainamoi-Thessalia Mission Roads-Premier-Kabianga-Taplotin Road-Cheborge-Kibugat Road-Cheplanket-Kapkaret Loop Road & Kericho Bypass, Kericho County





KAKAMEGA COUNTY WATER AND SANITATION COMPANY

Kefinco Hse Off Kakamega - Kisumu Rd
P.O. Box 1189-50100, Kakamega.
Call: 0799085696/0562030355
Email: kacwasco@gmail.com
Website: Kakamegawater.Co.Ke

INTRODUCTION

Kakamega County Water and Sanitation Company (KACWASCO) is a Water and Sanitation Service Provider established under the Kakamega County Water and Sanitation Services Act 2021, incorporated under the Companies Act 2015.

The Company is a wholly owned agency of the County Government of Kakamega mandated to provide Water and Sanitation services within the areas of service as approved and regulated by the Water Services Regulatory Authority (WASREB).

The Company took over Water and Sanitation Services provision from Lake Victoria North Water Services Board (Now Lake Victoria Water Works Agency) as from July 2016 following transfer of water and Sanitation Services to the County Government of Kakamega in line with the provisions of the Constitution of Kenya 2010.

VISION

To be an effective and efficient water and sanitation service provider.

MISSION

To sustainably provide quality, affordable, reliable water and sanitation Services to our stakeholders in accordance with statutory regulations.

Tindinyo treatment plant:



USSD:

KAKAMEGA COUNTY WATER AND SANITATION COMPANY

Self Service

- ~ Queries
- ~ Pay your bill
- ~ Tambua
- ~ Exhauster Services
- ~ Water Bowser
- ~ Complaints

Contact
0799 085 696 OR 056 2030355

*873*048#

A mobile phone screen displaying the USSD code *873*048#.

Contacts:

KAKAMEGA COUNTY WATER AND SANITATION COMPANY

Contact Us Today On
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"Maji Safi, Maisha Bora"
"Quality Water, Healthy Livelihood"

A black telephone handset.

How To Pay for Our Services:

KAKAMEGA COUNTY WATER AND SANITATION COMPANY

Pay for our services via the following channels

MPesa
Paybill 772 153

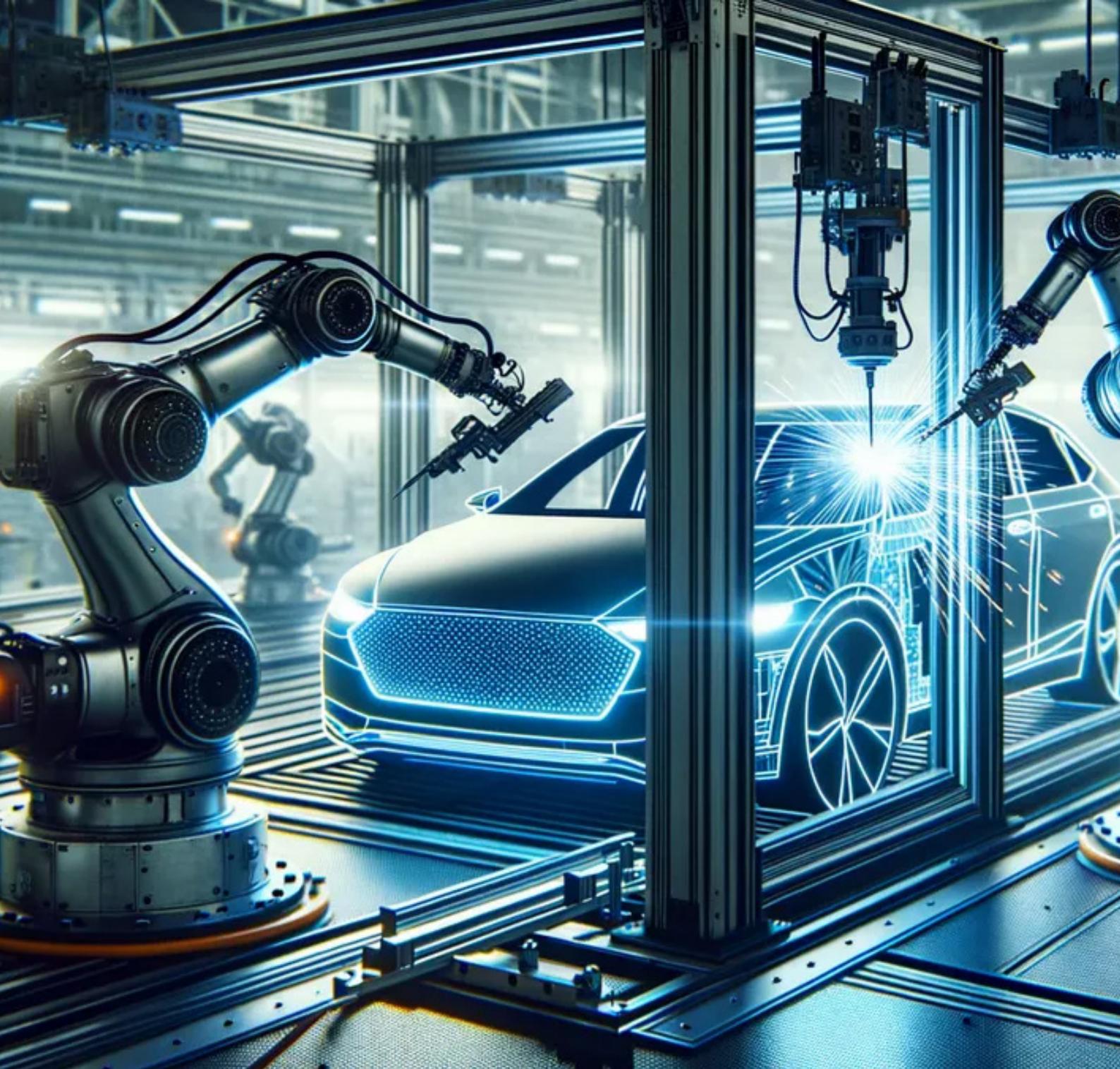
Bank
KCB Bank 1273194454
Cooperative Bank 01100632410100

Call Us : 056 2030355, 0799 085 696 | Email : info@kakamegawater.co.ke
kacwasco@gmail.com | Visit Our Website: Kakamegawater.Co.Ke

"Maji Safi, Maisha Bora"
"Quality Water, Healthy Livelihood"

Company Logo:





ENGINEERING STUDENTS ASSOCIATION
MMUST



ENGINNEERS BOARD OF KENYA
Enhancing Professionalism



**Kenya National
Highways Authority**
Quality Highways, Better Connections



NATIONAL
CONSTRUCTION
AUTHORITY

