## Tech Turns Transportation into a Customer Experience Journey with Digital Mobility Solutions

The transport sector in East Africa is at the beginning of a period of significant technological disruption through the rise of digital transformation, with digital products and services fundamentally shifting customer expectations and opportunities. Technology is fuelling a dramatic acceleration in the pace of change across the industry, including the transport industry, as technologies like AI, data science and machine learning are advancing how vehicles are likely to operate. These fields act as the backbone for digital mobility solutions. With growing cities there is a need to improve public transportation with a focus in Information and Communication Technologies (ICT). An example of transportation technology is the Kayoola EVS electric bus, designed and engineered by Kiira Motors Corporation (KMC).

Kiira Motors Corporation (KMC) is a state-owned enterprise established to champion the development of the Ugandan automotive value chain for job and wealth creation. KMC has designed Africa's first electric vehicle, the company's market entry product is the Kayoola EVS, a fully electric, low floor city bus with a range of 300 kilometers on battery charge.

In line with the company's pillar of ensuring customer satisfaction, Kiira Motors has engaged ICT experts and students from the Centre of Excellence for ICT in East Africa (CENIT@EA), Ivan Koojo and Jevinarlys Shabuyanga, in a 6-months internship programme, working on a project that focuses on developing an Integrated Digital Mobility System for the Kayoola EVS Passenger Experience System (KPES). The design of the system aims to offer solutions to rampant issues in urban mass transportation such as, poor financial accountability, passenger security, hefty traffic, and the risk of infectious diseases in the Covid-19 times and beyond.
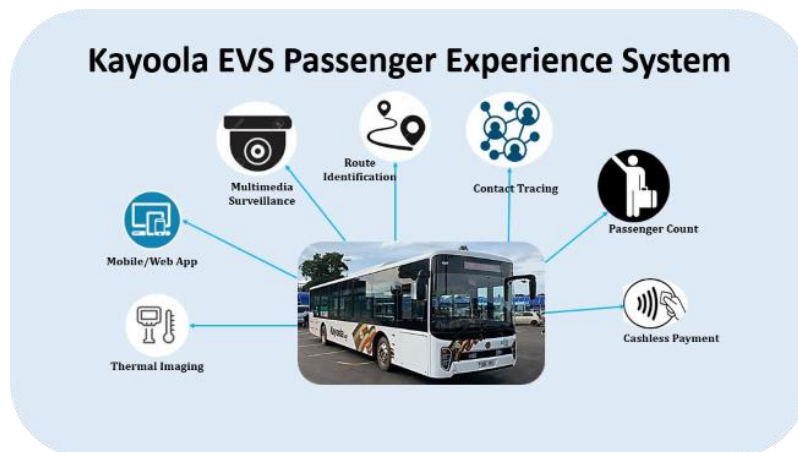
As stated by **Paul Isaac Musasizi, CEO of Kiira Motors, "The realization of this system is also aimed at utilizing technology to improve efficiency, increase productivity and capitalize on the existing technological and expert local human resource to help realize Uganda vision 2040"** said.

CENIT@EA students during a
Requirements Elicitation Exercise on
Kayoola EVS Bus
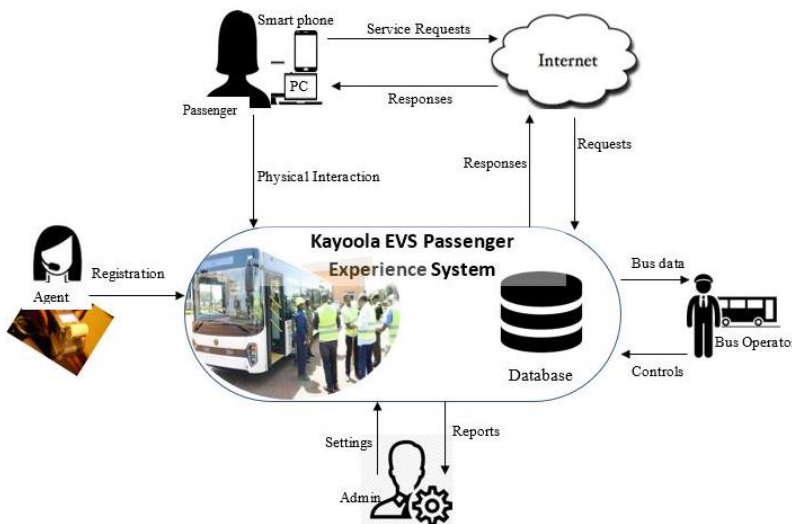
A conceptual framework design of the KPES System designed
by the CENIT@EA Young Professionals

CENIT@EA students were tasked to design systems that consists of cutting-edge technologies to bring the state-of-the-art customer-centric digital solutions to Kayoola EVS Customer Experience, including AI based passenger counting and social distance analysis, electronic ticketing and cashless payments, Thermal Imaging technology for automatic onboard temperature measurement of passengers, Multimedia Surveillance system for enhanced passenger security, GPS for route identification and automated stops announcement. The entire engagement involved students working on new innovations that offer customers mobility rather than transport through integration of digital products and services that are focused on customer needs.

During this COVID-19 pandemic, health and safety guidelines became one of the highlights of the electric buses, where the CCTV surveillance system has been equipped with automated

monitoring and sensing technology at the entrance. Implemented as a proof of concept for the Kayoola EVS Bus is the installation of the contactless temperature sensing device that monitors passengers, using microcontrollers and sensors, having the capacity to read the temperature at 5cm distance and displays on the LCD screen. As part of the passenger experience system, Ivaan Koojo, an embedded systems student, has also implemented an integrated solution for the Kayoola EVS Passenger Security System. One of the uniqueness of the security system integration, is the real-time monitoring and tracking of passenger traffic data in the bus at any given time, the system traces and records the number count of passenger boarding the bus.

Ivaan Koojo has incorporated a device to the CCTV surveillance system camera lens, by performing Artificial Intelligence (AI) and Machine learning analysis for social distancing, people detection and counting, adding algorithms that provide data reports through the footage display of the lens.

"We have been engaged in a number of technical activities including requirements gathering, systems requirements analysis and validation, designing and modelling the architectural description for the KPES system based on stakeholder views and recommendations", states **Ivan Koojo**.

On the other hand, Jevinarlys Shabuyanga has managed to complete the design of a digital platform that provides real-time transport information, payment, and transaction processing. The cashless payment system offers passengers value add through the use of a mobile application to access mobility solutions when travelling with the Kayoola EVS Bus. Implementation of cashless payments system includes travel cards swiped by passengers to complete payments. Kiira Motors sought to add value to the features of the bus giving users and clients the advantage to enjoy a modern digital and tech-enabled transport experience. The cashless payments have been enabled via the mobile app that links passengers to mobile network platforms and bank transfer channels. Payment transactions are done either by tapping the card or scanning the QR code and accessing the mobile payment platforms to make payments for the passenger's trips. Most of the developments and enhancement will be completed offsite.

The customer-centric digital solutions are designed for the bus operators and passengers to benefit from the experience, placing a high priority to customer's needs and ensuring an experience is crafted in every part of Kayoola EVS engineering design. **"Creation of memorable experience to the transportation industry through design of fundamental features and digital mobility solutions is part of the competitive advantage that Kiira Motors has pioneered for the Ugandan and the East African market. The Kayoola EVS Bus is none like other in the region,"** explains **Simon Miyingo, Information Systems Manager at KMC.**

Through the implementation of the digital solutions, KMC envisions transforming public transit in East Africa in providing transport users with a seamless commuting experience, bringing every mode of transport together into one single app that integrates transport options from different providers and ultimately redefining the journey experience. A pilot test of the mobile app and the security system has taken place internally with KMC employees, plans are under way for public testing and collection of feedback by end of March 2021.

"As KMC was birthed out of research conducted by a team of students at Makerere University who resolved to embark on a project aimed at designing and building electric vehicles in Uganda, we believe in the power of engaging local young professionals to leverage their expertise in design thinking and conceptualization of digital innovations for the region of East Africa," Paul Isaac reaffirms.

The continued collaboration between CENIT@EA and KMC is sealed through a Memorandum of Understanding (MoU) that aims to advance research and innovation in digital mobility solutions in the East African community (EAC), in line with the global automotive technology foresight for enhancing mobility safety, security, operational and energy efficiency. The partnership will comprehend applied research, guest lecturing and pilot projects, joint capacity building, co-curated seminars and conferences, and entrepreneurship promotion activities such as hackathons and bootcamps, that will involve CENIT@EA students and beneficiaries of its project.
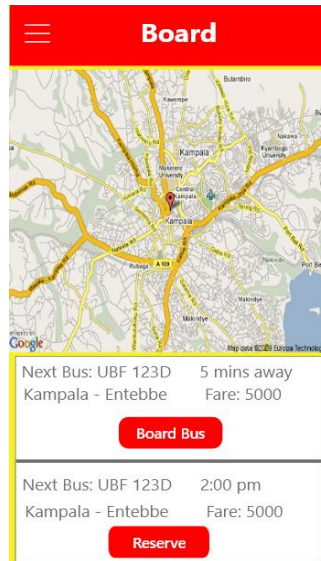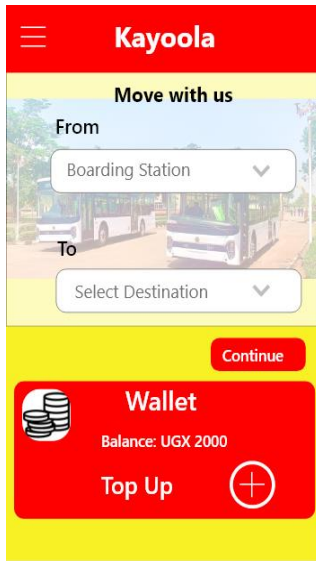
The Kayoola Mobile App User Interface wireframes

Photo: CENIT@EA students, Jevinarlys and Ivan with their host supervisor, Simon Miyingo (middle).