CHALLENGES FACING FEMALE ENGINEERS, TECHNICIANS AND RIDERS IN THE ELECTRIC MOBILITY SPACE IN KENYA

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1 Introduction

1.1 Overview of the Motorcycle Industry in Kenya

Motorcycle ownership and use in developing countries have skyrocketed in recent decades. Many young people in Kenya rely on the motorcycle industry for a living, and riders look to it as a source of income to support their families. The desire for economic and social survival has led many unemployed youths to pursue a variety of jobs, including motorcycle operations. As of 2018, according to the Motorcycle Assembly Association of Kenya survey, a total of 4.8 million people directly or indirectly depend on commercial motorcycle operations[1].

In the last 2 decades, the number of motorcycles in Kenya has steadily increased. According to the National Transport and Safety Board (NTSA), about 1.97million motorcycles had been registered in its database as of 2020 (KNCCI report 2022). Official data form NTSA shows that annual registration has doubled over the past half-decade to stand at 285,203 compared to 123,539 new listings in 2016[2]. This increase to a large extent has been attributed to the 2008 government fiscal policy on zero rating motorcycles that significantly lowered the prices and acutely stimulate demand.

According to the Kenya National Bureau of Statistics (KNBS) Economic Survey report of 2022, motorcycles accounted for about 71% of newly registered road transport vehicles representing 285,203 of 399,052 newly registered road vehicles[3].

The table below show the numbers of newly registered road motor vehicles and Motorcycles in Kenya between 2017-2021

Type of Vehicle/Motor Cycle	2017	2018	2019	2020	2021*
Saloon Cars	11,376	10,504	9,971	7,754	8,170
Station Wagons	55,322	64,179	72,512	57,962	64,350
Panel Vans, Pick-ups,etc	9,866	11,220	10,189	6,065	5,986
Lorries/Trucks	7,460	6,514	6,518	6,476	7,071
Buses and Coaches	1,072	1,065	1,339	900	893
Mini Buses/Matatu	459	812	1,932	1,084	822
Trailers	1,953	2,083	1,639	2,382	3,187
Wheeled Tractors	2,703	4,040	1,815	2,545	2,818
Other vehicles	860	1,619	3,836	8,960	14,202
Total Motor Vehicles	**91,071**	**102,036**	**109,751**	**94,128**	**107,499**
Motor and AutoCycles	186,434	188,994	210,103	246,705	285,203
Three Wheelers	5,167	6,259	7,322	5,896	6,350
Total Motor Cycles	**191,601**	**195,253**	**217,425**	**252,601**	**291,553**
Total Units Registered	**282,672**	**297,289**	**327,176**	**346,729**	**399,052**

Table 1: New Registration numbers of Road Motor vehicles and Motor cycles, 2017-2021 Source[3]

According to a new report of 2021 by Car and General a listed Company in the Nairobi Stock Exchange that engages in the sale of Motorcycles and associated spare parts showed that there are about 1.2 million riders in Kenya. 9 out of 10 riders engage in the commercial transport business (boda-boda) which translates to about 1 million jobs created by the industry in the Kenya economy. Of these jobs, 75% are youth and 6% are female. On average, the report estimates that a rider makes a daily income of Ksh. 1,000 resulting to a total income of Ksh. 1 billion or Ksh. 365 billion annually which represents 3.4% of Kenya's GDP. The study observes that 1 motorcycle supports approximately a household of about 6 people which translates to about 6 million people in total which is about 10% of the country's population having their livelihoods supported by this industry. Each motorcycle spends about Ksh. 300 on fuel per day which translates to a total of Ksh. 300 million per day for the industry[4].

The price of motorcycles in Kenya is affordable retailing at between Ksh. 65,000 to about Ksh. 130,000 hence can be acquired by quite a number of youth for commercial transport operations[3][4]. Those who can't afford can hire or are employed as riders without ownership and paid for as a rider. Taxi companies such as bolt and Uber have integrated motorcycle (boda-boda) taxi as part of their fleet for carrying passengers as well as making deliveries around Nairobi and other major cities in Kenya. This has been touted as revolutionary to bring sanity in the industry that has been largely considered informal and unregulated motorcycle taxis marred with cases of insecurity (business daily Africa 11th March 2022)[5].

The popular brands in the motorcycle industry in Kenya include TVS, Honda, Boxer from Bajaj, Yamaha and a host of other models from the Chinese market. Companies involved in the manufacturing of these popular brands of motorcycles have set up shops in Kenya directly or through dealerships for motorcycle assembly, maintenance, sale and manufacture of spare parts[6].
Due to low personal car ownership, rapidly expanding populations, and a lack of efficient mass transportation systems in fast-growing cities like Nairobi, Kenya, like most African countries, offers a huge potential for motorcycle ride-hailing firms[7].

1.2 Background of Electric mobility in Kenya

With the expansion of the economy, energy emissions have risen over time, with the transport sector, dominated by road transport, contributing significantly to Kenya's GHG emissions. The need to reduce GHG emissions for different sectors of the economy has become critical in efforts to mitigate the negative impacts of climate change that are attributed to these emissions. Kenya being a signatory of the Paris Agreement has committed to reducing emissions by exploring low carbon pathways. In this regard, the Kenya National Energy Efficiency and Conservation Strategy (KNEECS) of 2020 seeks to electrify 5% of Kenya's motorized transport fleet by 2025 to cut emissions from the transport sector and take advantage of a power grid with over 70% of installed capacity being from renewable energy sources (Over 90% of grid energy supply is currently from renewable)[8].

Electrifying motorized transport creates a segment in the automobile space called Electric mobility (E-mobility) that consists of different types of vehicles including cars and motorcycles[9]. The E-mobility segment in Kenya is still in its embryonic phase having been launched a few years ago. It's still a new concept for the majority of the population. As of 2020, Kenya had about 758 registered Electric vehicles (EVs) according to NTSA. In place of an internal combustion engine (ICE), EVs are propelled by one or more electric motors powered by rechargeable battery packs. EVs emit no emissions while in use, are less noisy, and require less energy to operate[10].

The E-mobility space in Kenya looks promising and as of 2020, several companies had set up shop in Kenya to assemble and sell EVs including 2-wheelers and 3-wheelers[11]. These companies include BasiGo, Opibus, Kiri, Nopea Ride, Agilitee Africa and EVM Africa. The government has put in place some fiscal interventions such as reducing the Exercise Duty on EVs to 10% to promote adoption of EVs[2]. The Kenya Bureau of Standard has also developed standard to guide the quality of EVs imported into the

country. The proposed National Building Code by NCA takes cognizant of future penetration of EVs in Kenya and provides that commercial building ensures at least 5% of their packing space has the requisite charging infrastructure[6], [12]. The development of the National E-mobility policy is currently underway being spearheaded by the ministry of Transport.

1.3 Statement of the Problem

The use of two- and three-wheelers as a means of transport as well as a commercial activity has increased tremendously in Kenya over the past two decades. This sector employs millions of young people as riders and mechanics/technicians. However, this sector is largely dominated by men. Women are underrepresented. As the sector undergoes transition to e-mobility, there is need to identify the challenges faced by female riders and technicians that inhibits active participation of more women, which forms the basis of this study.

1.4 Study Objectives

a. To establish gender dimensions in two- and three-wheeler mobility in Kenya
b. To identify challenges limiting the participation of women in two- and three-wheeler mobility as well as adoption of electric mobility
c. To propose measures that would result in a wider uptake of electric mobility by women in the two- and three-wheeler sector

2 Methodology

This study deployed the use of a descriptive survey research design due to its ability to examine the characteristics of a population of interest without influencing it in any way. The design also allows for the description of population characteristics using both quantitative and qualitative measures.

Nairobi county was selected as the target county to conduct the survey. Convenient sampling technique was adopted and a total of 94 respondents participated in the survey. The respondents comprised of 59 male riders, 12 female riders and 23 female technicians. For both the riders and technicians survey, a semi structured questionnaire was deployed for data collection. The questionnaire was structured thematically around objectives of the study and included; section 1- collected riders'/technicians' demographics, section 2- collected data on general sectoral challenges while section 3- collected data on electric mobility awareness and areas of training for technicians.

The data collection process involved approaching the riders and technicians individually or in groups and requesting their permission to participate in the survey. The technicians in survey were mainly from the renewable energy and electric mobility sector in Kenya.

3 Results and Findings

The results and findings of the study are elaborated here in the order adopted for data collection.

3.1 Challenges Facing Female Riders

Demographic summary of respondents

The two-wheeler mobility sector in Nairobi is dominated by men. From the survey, out of 71 responses, 59 were male riders accounting for 83% while 12 were female riders accounting for approximately 17% as shown in Fig. 1.

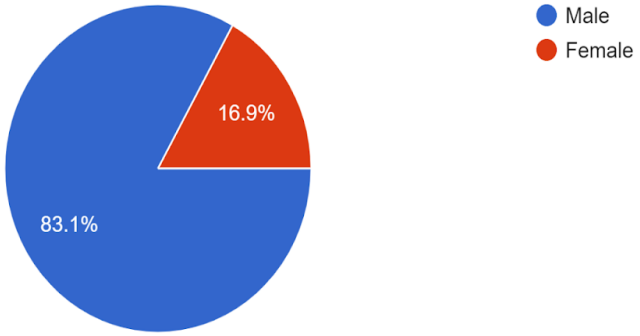

Figure 1: Riders Gender

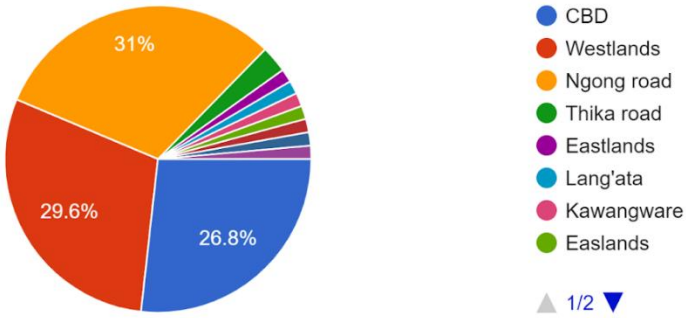

Figure 2: Riders operation area/route

Going by the survey, majority of the riders interviewed operated along Ngong road (31%) followed closely by Westlands (29.6%) area as shown in *Fig. 2*. Also 74% of the riders interviewed had attained either college or secondary level education as shown in *Fig. 3*. 9.9% and 1.4% of those interviewed were university graduates and ongoing

undergraduate students respectively. This could be explained by the fact that for riding it's not about the academic qualifications but rather the level of know how about riding.

As for the technicians in this sector, majority (95.7%) were university graduates with 4.3% being diploma holders as shown in *Fig. 4*. Based on this statistic it's clear that a certain level of technical awareness is required to be successful in this role which is acquired via training.

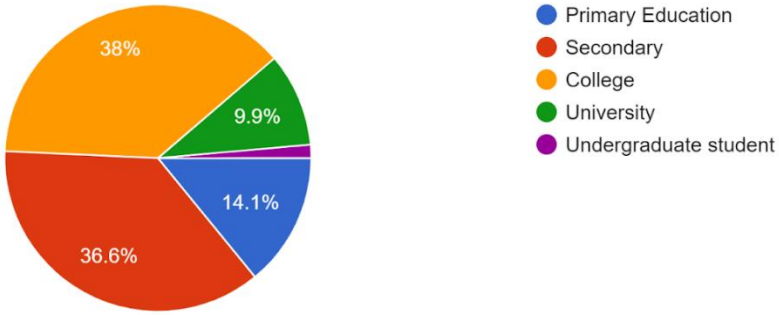

Figure 3: Education levels of riders

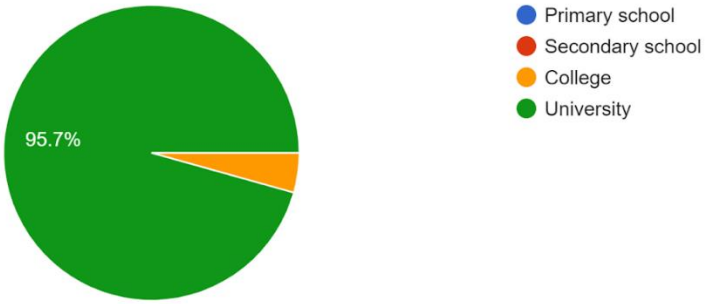

Figure 4:Highest education level for female technicians

About 76% of the riders interviewed were below the age of 35 years. Only 23.9% were above the age of 35. This clearly shows that two-wheeler mobility is largely dominated by the youth as shown in *Fig. 5.* In the e mobility space 86.9% of those interviewed were below the age of 40 years, while only 13% were above the age of 40 as shown in *Fig. 6*. Being a new trend in the transport industry, it is majorly the youth equipped with the requisite skills who are taking up the challenge to steer the e mobility space.

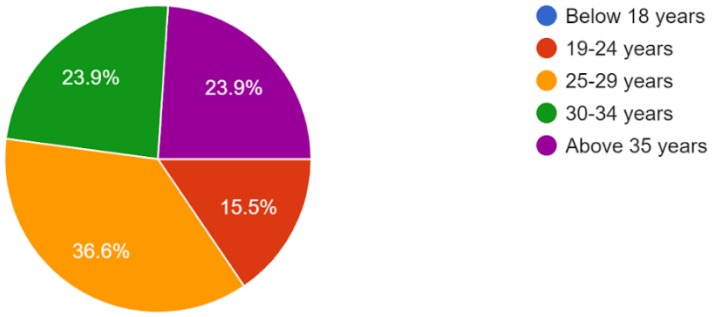

Figure 5: Age bracket of riders

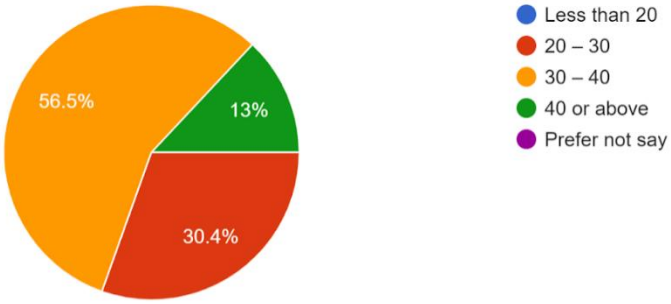

Figure 6: Age bracket of female technicians

On the nature of operations, most of the riders were using their bikes for mobility business. 35.2% used their bikes for carrying passengers and delivery trips almost equally shared while 32.4% used their bikes for more of passenger transport and little on delivery trips as shown in *Fig. 7*. 11.3% use their bikes for passenger trips only while another 11.3% use their bikes for deliveries only. Very few riders use their bikes for private use or ride as a hobby. This clearly show that the market for two wheeler business is expanding to include delivery trips and riders are adapting to market segmentation or improving their earning by taking either assignments depending on what is available.

Half the bikes (50.7%) used by the riders were rated 150cc, below 150cc (35.2%), above 150cc (8.5%) and electric bikes (5.6%) as shown in *Fig. 9*. Most riders therefore consider 150cc motorcycle engine rating to be adequate to run their errands in a fuel-efficient

manner. The uptake of electric bikes is still fairly low going by the survey despite 97.3% of the respondents confirming that they are aware of them as shown in *Fig. 10*.

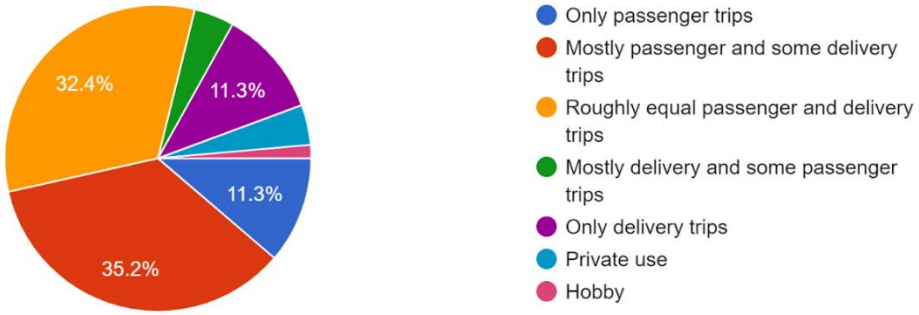

Figure 7: Nature of operations by riders

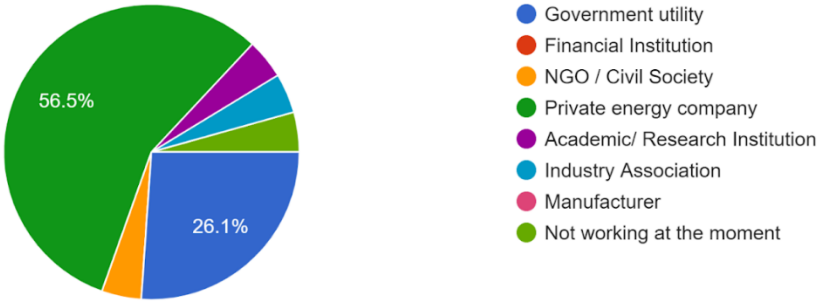

Figure 8: Female technicians organization

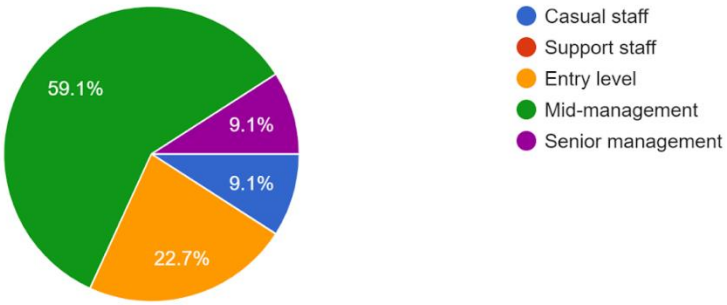

Figure 9: Position of female technicians

With regards to which organization the female technicians work with, 56.5% worked with private energy companies while 26.1% worked with government utility involved in the transition to e mobility as shown in *Fig. 8*. The findings also show that 59.1% of those interviewed worked as mid-management while 22.7% worked on entry level positions. Female technicians were more dominant in private startup companies as opposed to conventional institutions in the mobility space. This clearly shows women were

courageously taking up technical opportunities in this space that has previously been dominated by men.

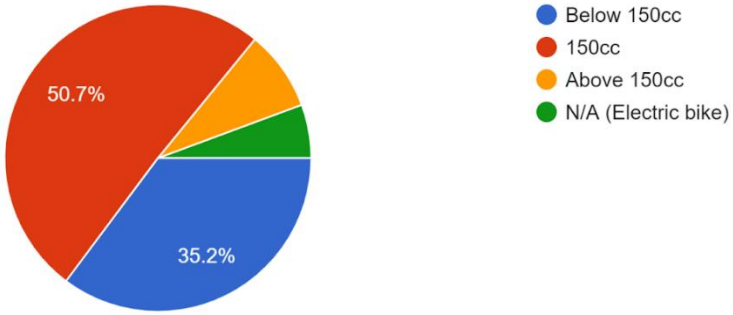

Figure 10: Engine capacity of motorcycles

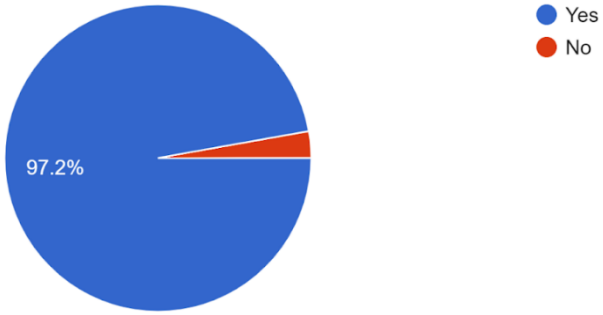

Figure 11: Electric bike awareness

On transitioning to Electric bikes for the sector, 60.6% of the riders expressed the view that they would consider owning one while 39.4% were not interested as shown in *Fig. 11*. This demonstrates that despite 97.4% awareness on electric bikes, not all riders are will to transition to the use of electric mobility. However, majority (60.9%) of those aware are willing to transition.

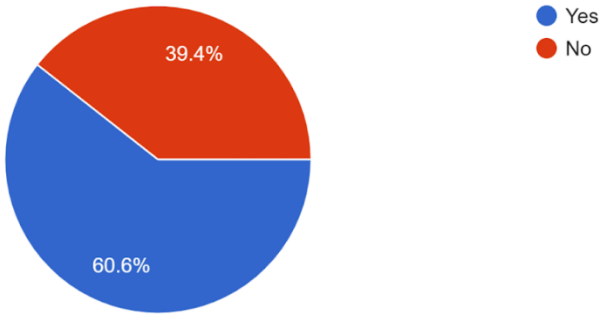

Figure 12: Opinion on Transitioning to electric mobility

In addressing their concerns on hesitation to adopt electric bikes, 33.8% of the respondents mentioned battery range and quality, 22.5% indicated charging station availability while 16.9% mentioned high cost as shown in *Fig. 12*. From the findings, it is safe to infer that most riders are skeptical about adopting electric bikes due to the reliability aspect that is determined by the storage capability, durability and availability of charging stations within Nairobi. Also Internal Combustion Engine bikes were more readily available to them as compared to electric bikes. From the findings it's clear that in as much as majority of riders are willing to transition to electric bikes, they still remain unavailable to them. Theirs is need to make them more available and price competitive compared to conventional motorcycles.

Figure 13: Concern about owning an electric bike

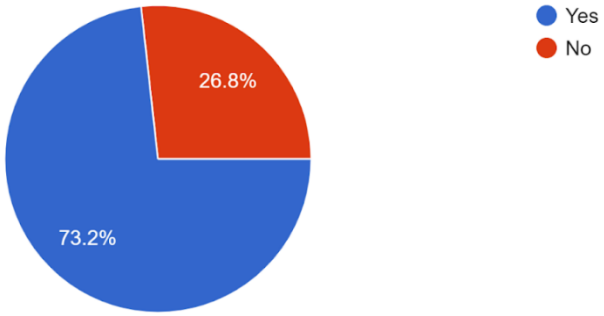

Figure 14: Bike ownership

The study also examined motorcycle ownership and the process adopted toward the same. A majority (73.2%) either own are in the process of owning a motorcycle while 26.8% do not own the motorcycles they use. They either lease, or borrow from a relative or family member. This clearly demonstrates that more and more riders are preferring to own their own bikes as opposed to leasing. On buying the motorcycle, it was observed that majority (63.1%) of the respondents paid cash upfront before acquiring their bikes, 21.5% are currently paying off while 12.3% used the hire purchase approach as shown in

Fig. 15. This shows that riders are economically empowered and this has improved their purchasing power. For the bikes acquired through hire purchase, riders paid a sum of between Ksh. 160 to about Ksh. 1,500 per day. 33% of the respondents made daily payments of Ksh. 500 and Ksh. 1,500 towards clearing the outstanding balance for hire purchase as shown in *Fig.16*.

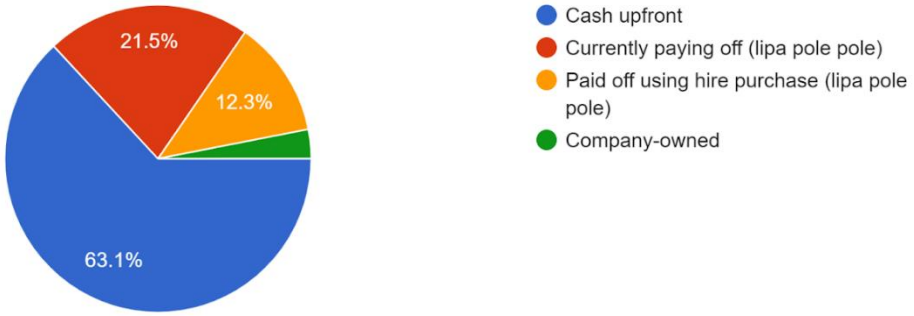

Figure 15: Means of bike ownership

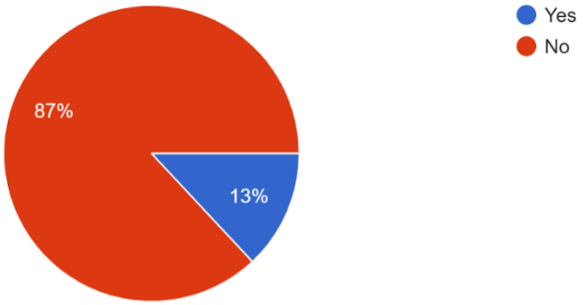

Figure 16: Ownership of electric bike or vehicle

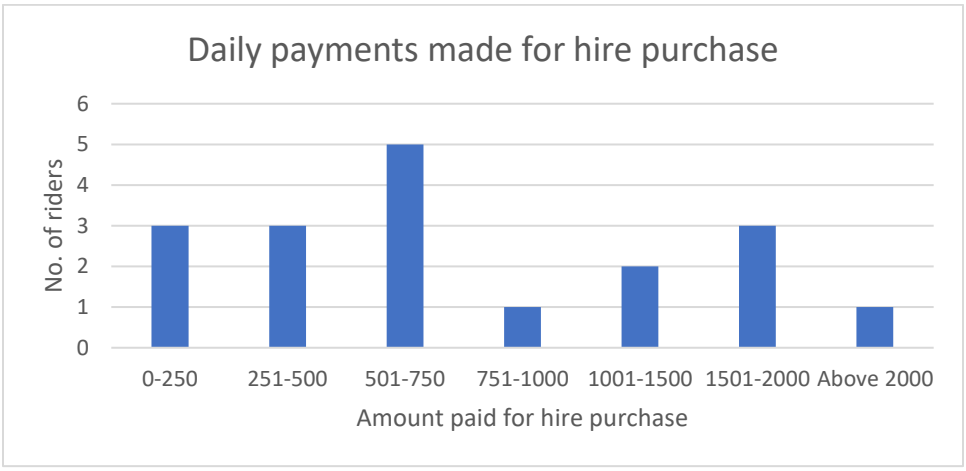

Figure 17: Daily payments made for bikes acquired on hire purchase

On expenditure incurred on maintaining the bikes on a monthly basis, varied amongst the riders depending on distance covered as well type of usage for the bike. Majority of the riders claimed to spend between Ksh.600 to about Ksh. 3,000 per month as shown in *Fig. 17*. With transition to e-bikes, riders can make a significant saving on their maintenance costs which can significantly improve their monthly revenues since it is estimated that e bikes lower maintenance costs by about 30-40%. On average distance covered, 23.9% of the riders cover about 100km on a daily basis, 11.3% covered 150km as shown in *Fig. 14*. The average range of e bikes is estimated to be about 32-160km which is suitable to handle the daily routines of riders especially with additional adequate charging infrastructure in place within the city.

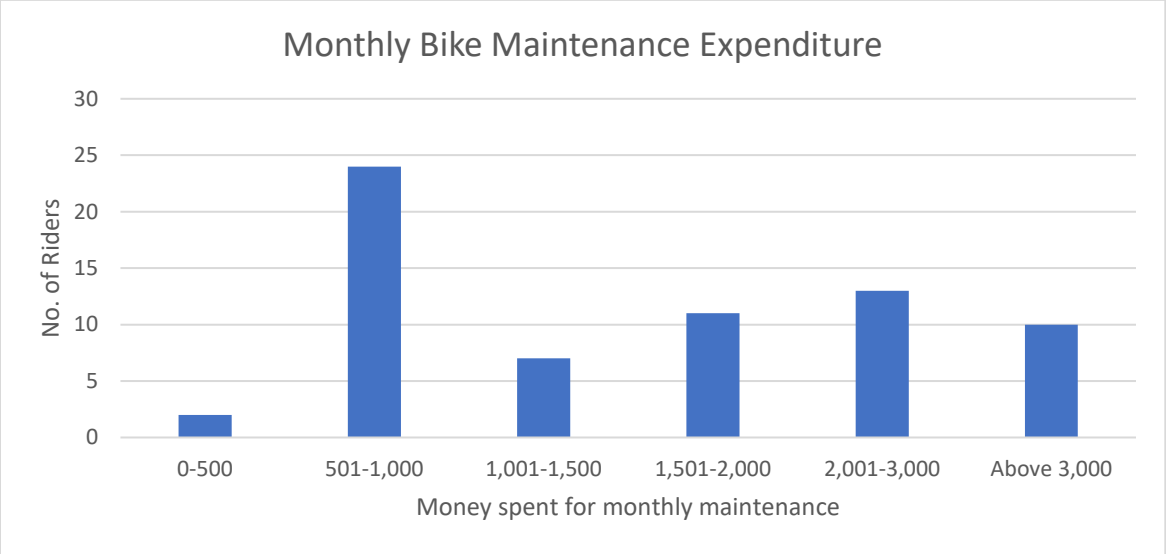

Figure 18: Monthly expenditure on bike maintenance

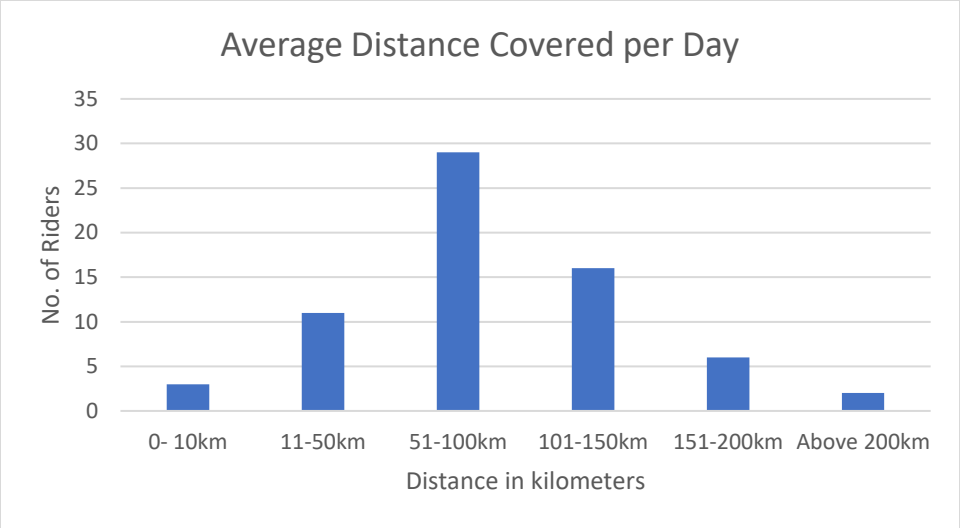

Figure 19: Average daily distance covered

On other expenses incurred by the rider such as fuel cost, 25.4% of the riders spend Ksh. 500, 19.7% (Ksh. 600), 9.9% (Ksh. 800), 8.6% (Ksh. 700) as shown in *Fig. 20.* This is a significant cost of the operating expenses of riders considering about 60% of the respondents in the survey make a daily average revenue of Ksh. 1000 to about Ksh. 2,500 as shown in *Fig.21.* Since e-bikes use highly efficient electric drive elements, transition to e bikes can significantly reduce energy operating expenses and increase revenues for riders.

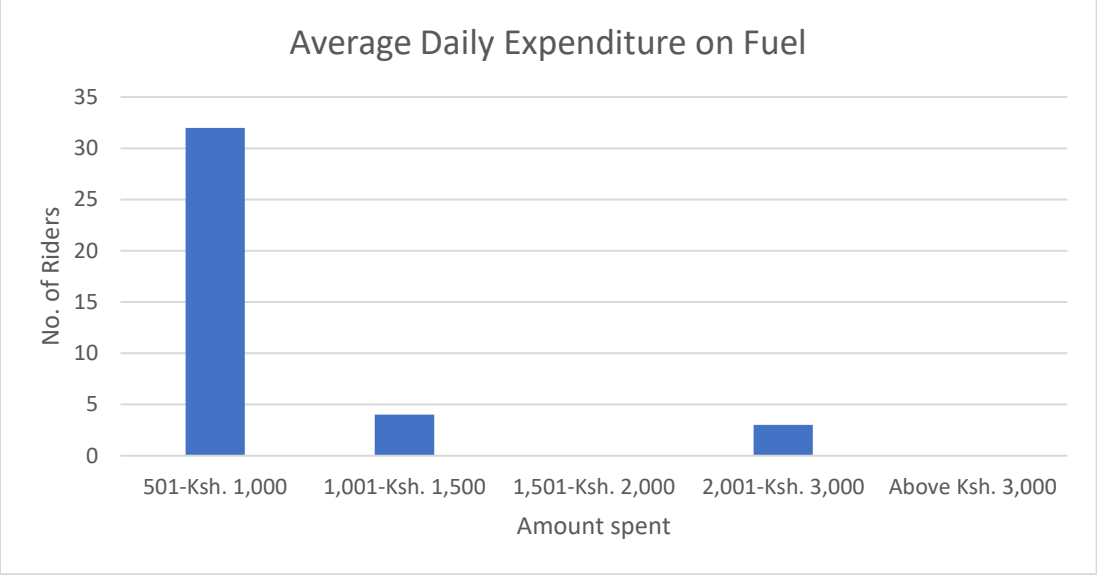

Figure 20: Average daily expense on fuel

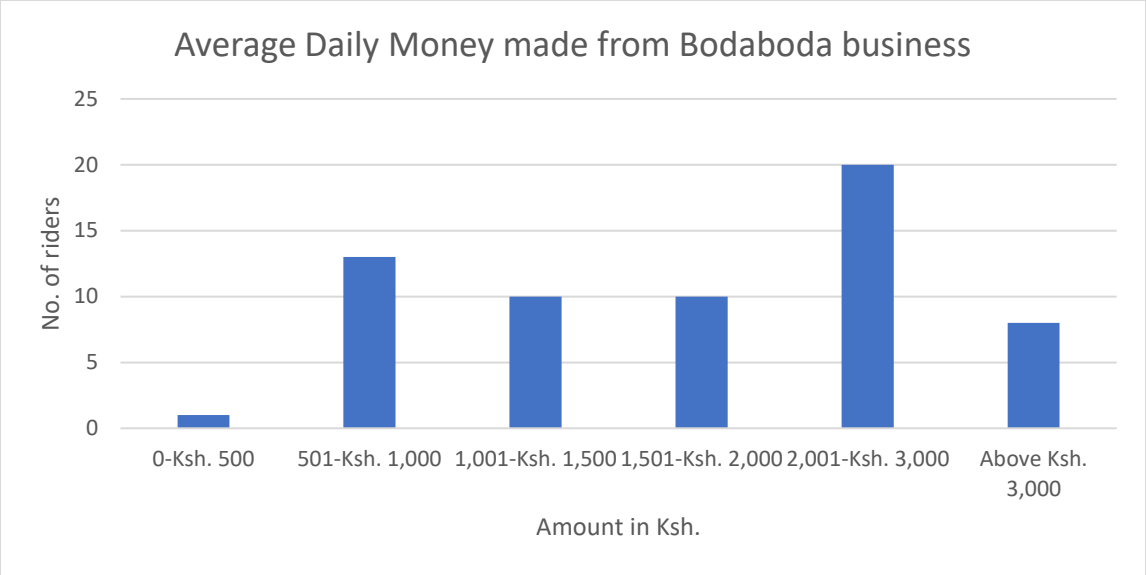

Figure 21: Average daily revenues for riders

3.2 Training Needs of Female Technicians

The study examined years of experience accrued by the female technicians in the Renewable and electric mobility sector. Most of the female technicians (90.5%) had less than 5 years of experience in the electric mobility sector while 9.5% had 5-10years experience as summarized in *Fig. 21*. This can be attributed to the fact that electric mobility is still a new concept and therefore still at its infancy stage. In the same breath, only 13% of the interviewed female technician/engineer in the electric mobility space owned an electric bike or electric vehicle as indicated in *Fig. 22*. These findings can be explained by the slow adoption of electric vehicles in general by the population in Kenya with records according to NTSA indicating there are less than 1000 registered electric vehicles in Kenya. The cost of acquiring an electric vehicle is still beyond most citizens within the country.

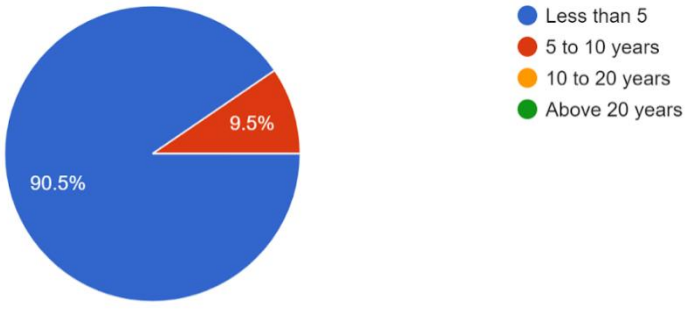

Figure 21: Years of experience in Electric mobility sector

Female technicians/engineers were requested to do a self-assessment of their level of knowledge on engineering skill set as well as operation skill set on electric mobility. The findings show that there exist gaps in the engineering skill set required to ensure the sector thrives. Under engineering, female technicians indicated they were less knowledgeable about procurement specifications, spare part specification and range estimation as summarized in *Fig. 23*. The technical operations knowledge on e-mobility was still very limited as indicated in *Fig. 24*. Majority of female technicians lacked knowledge of some key aspects such as conversion of ICE fleets, carrying out repairs, charge scheduling and network operations planning. Most of these skill sets are critical in creating a competent and confident workforce to drive the uptake of electric vehicles. It was evident that most female technicians have the basic knowledge on electric mobility and required specialized training to sharpen their competencies in electric mobility engineering and operations.

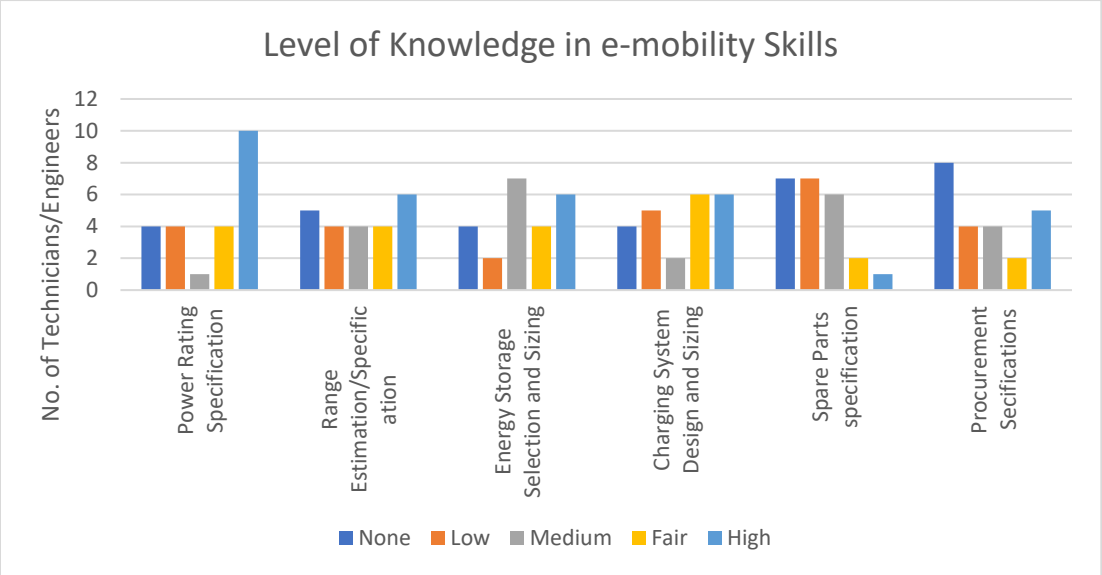

Figure 22: Level of knowledge in e-mobility engineering skills

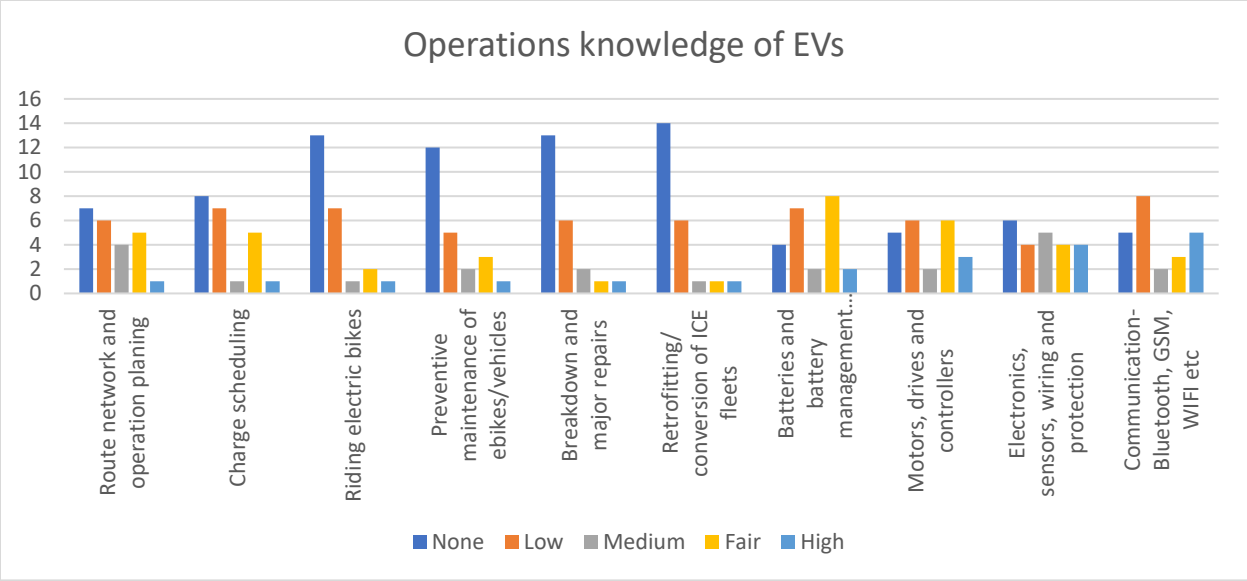

Figure 23: Level of knowledge in e-mobility operations

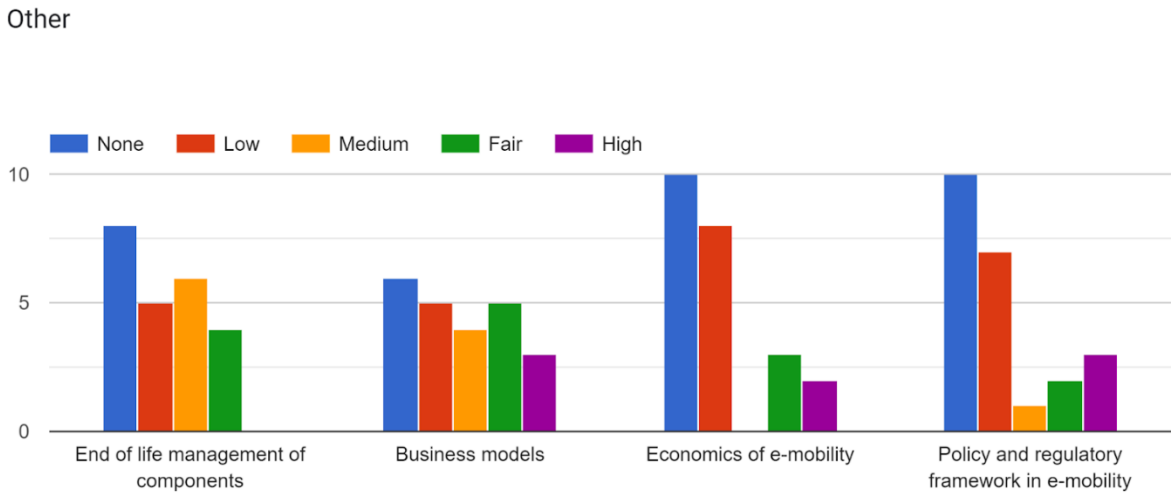

Figure 24: Level of knowledge in other aspects of e-mobility

The study also examined the priority areas for electric mobility training required by the female technicians. On a scale of 1 - 5 (1=least, 5=most), female technicians were requested to identify areas of focus for training in engineering, operations, and other useful aspects of electric mobility. The findings reveal that female technicians need training in almost all the important aspects of e-mobility as summarized in *Fig. 26-28*. Based on these findings, the level of knowledge and training by female technicians can be said to be basic. Knowledge gaps exist in core aspects of engineering and operation of electric mobility. These findings imply that there is need to invest in the training of

female technicians in the industry to ensure they make meaniful contribution to the sector.

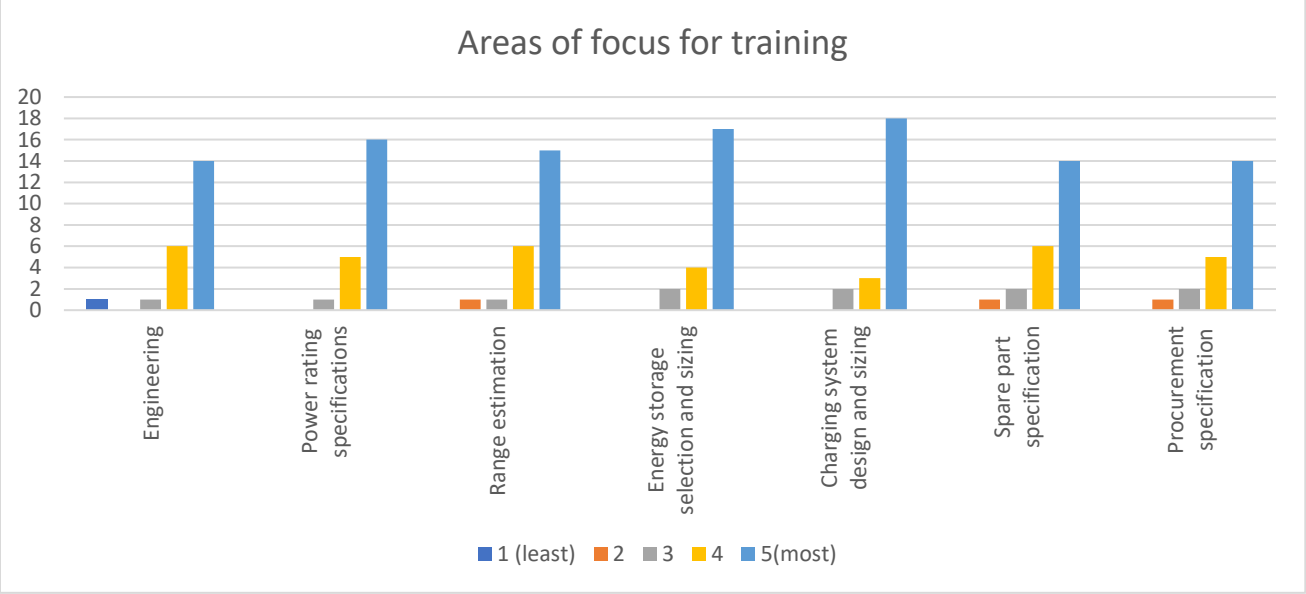

Figure 25: Areas of training in engineering aspects of e-mobility

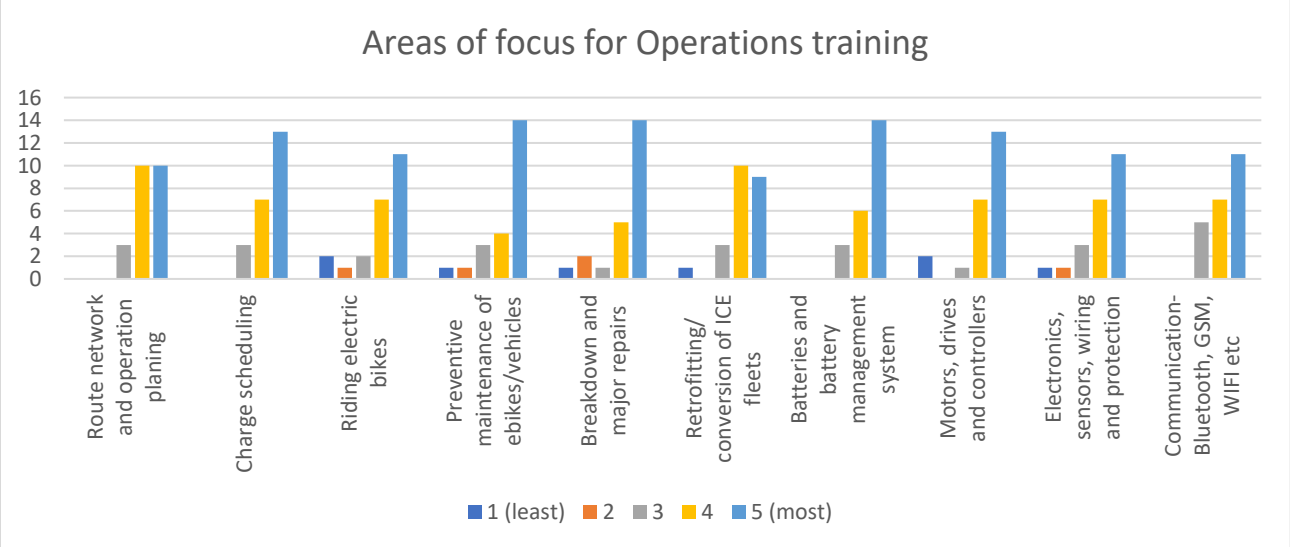

Figure 26: Areas of training in operations aspect of e-mobility

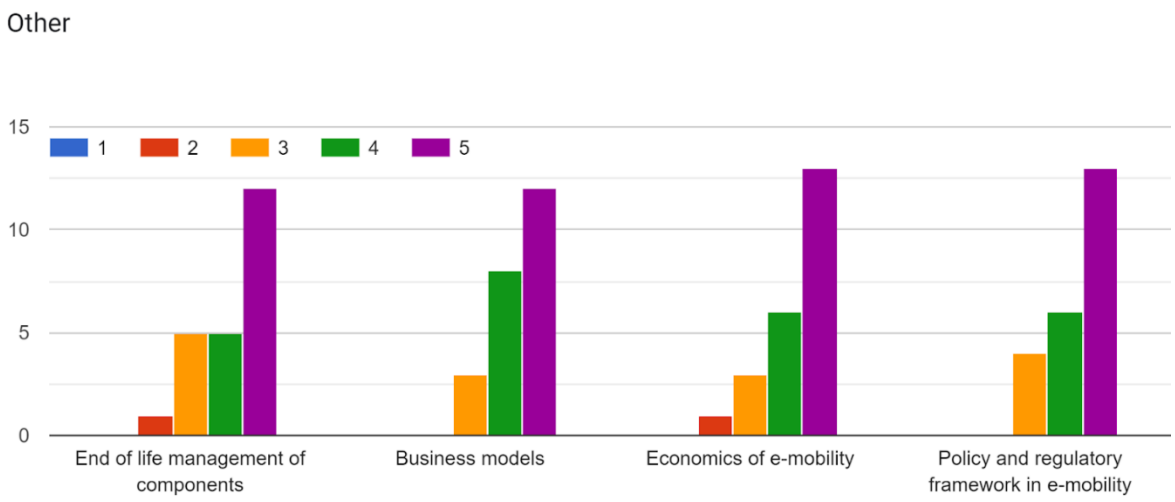

Figure 27: Other important areas of focus for training in e-mobility

3.3 Challenges of the Female Workforce in the EV space

3.3.1 Technicians/Engineers

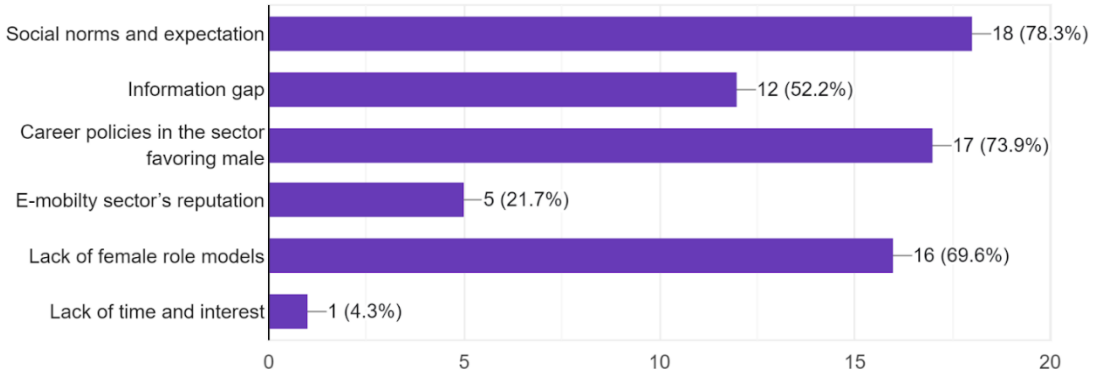

Figure 28: Challenges faced by female technicians/engineers in the e-mobility space

Limited Opportunities: The use of EVs is still at its embryonic stage in Kenya and the adoption is still acutely low hence limited opportunities for technicians. In general, the automotive industry in Kenya is heavily dominated by men[13]. At its infancy stage, the EV space has the opportunity to recalibrate its workforce and increase the participation of women in the industry. This will allow women integrate their perspective into design and development of EVs and by extension improve EV transition by women.

Lack of Mentors: Being a fairly new concept not only in Kenya but worldwide, E-mobility space has a limited number of mature experts to offer meaningful career guidance to the upcoming young female engineers and technicians in this industry. There aren't many knowledgeable and skillful people in the maintenance space of EVs in Kenya let alone women. The very few female technicians and engineers in the EV space are left feeling lonely and isolated.

Technical Skill/information gap: Technicians and engineers in the automotive industry require retraining and upskilling to make a significant contribution to the design, development and maintenance of EVs. The levels of competencies required are significantly higher in the EV engineering space to ensure handling of complex and intricate automotive technology used in EVs[14]. Also, Kenya still lacks an e-mobility policy and regulatory framework to guide transition to EVs now. From the survey conducted, female engineers and technicians in the EV space acknowledged that they still need to upskill in the engineering and operation aspects of EVs.

High Cost of Training on EV Maintenance: Most of the training sessions on EVs are conducted online for Kenyan engineers and technicians. According to the survey conducted, the cost implication of these virtual training sessions is high going by Kenyan standards. Hyundai Motor company has partnered with Kenya National Industrial Training Authority (NITA) to establish a 'Hyundai Dream Centre' in Athi River, Machakos County, with a state of the art training facilities to offer cutting edge training in hybrid electric vehicle maintenance. This will go a long way in reducing the cost of training in EVs in Kenya[15].

Social Norms and Stereotypes: Traditionally, technical jobs such as technicians and engineers have been regarded as jobs for the male gender and so incredibly dominated my men. Society at large sees these jobs being inconsistent with the female gender in terms of delivering quality job to acceptable standard level. From the survey it was noted that even some male technicians were skeptical of the quality of work undertaken by their female colleagues. However, currently in Kenya, the culture is changing and more women are taking up the challenge to study engineering, acquire required competencies and make an impact in the engineering space.

Lack of Career Incentives for Women to join the EV space: The EV industry workforce is still considered male dominated. Being a technical space, there's need to put in place affirmative action measures to promote inclusion of women in the EVs ecosystem.

3.3.2 Riders

Social norms and Stereotypes: In the Kenyan context, the rider's job is considered inconsistent with the female gender to a large extent. Female riders have to contend with not being noticed as a 'female rider' due to these societal prejudicial tendencies, customers not believing in them due to negative gender discrimination. These alien norms and perceptions are demoralizing to existing female riders and potential hindrance to aspiring female riders.

Lack of knowledge on and trust in e-mobility: 2 and 3 wheeler EVs consist of rechargeable battery storage and an electric motor replacing the internal combustion engine. The use of battery storage to provide propulsion results in some limitation for EVs[14][6]. In particular, reliability and performance limitation of the battery results in range anxiety amongst riders. However, as the battery technology continues to improve, this is likely to change. In addition, a number of innovative battery business models are being explored in the country to improve performance[11].

Inadequate Charging Infrastructure: Charging infrastructure for EVs in Nairobi and the whole at large is still a challenge. Electrifying motorcycle taxis would require significant investment in charging stations and swap stations around Nairobi to enable riders charge their bike with convenience. Currently, charging stations are mostly located in major business malls around the city and its environs. Scarcity in charging infrastructure limits operation ranges of the riders inhibiting rapid adoption of EVs in motorcycle taxi business. The utility company, Kenya Power has exuded confidence its ability to accommodate EV loads on its power grid. The company has floated a tender to identify a contractor to build an e-mobility Network Infrastructure System (ENIS) in Nairobi and Nakuru as a pilot program for charging stations[16].

Lack of formal training on riding: Formal riding training and compliance to safety regulations has been of great concern for the motorcycle taxis in Kenya. Most riders in general still lack the requisite road safety skills acquired through formal training. A substantial number of riders attain their training informal and hence operate illegally according to Kenyan law. The level of noncompliance is approximated to be about 47% which includes women riders[17].

Inability to raise capital for bike acquisition: The initial purchase cost is the most significant factor preventing riders from purchasing an EV, according to riders. EVs have

lower operating costs than gasoline-powered vehicles, and more used EVs are becoming available, but the purchase price of new EVs remains a barrier for many potential owners. Some riders opt to lease instead. This barrier will become less significant as more used electric vehicles become available and battery costs fall[14].

Meagre incomes especially for those employed or leasing the bike: On average, a rider in Nairobi has an average daily net income of Ksh.700 [4]. Riders leasing a motorbike or employed as riders earn apportion of the aforementioned amount as they have to share the income with the motorcycle owners. This low income puts to question the ability of riders to accord themselves and their families a decent life in the capital.

Insecurity: Motorbikes used for motorcycle taxis have witness unprecedented cases of theft with or without violence by organized gangs. Most stolen motorbikes are transported across the border to be sold or dismantled and sold as second hand spare parts. Electrified motorcycles are no exception to this wave of theft in Nairobi. Women riders are a soft target by thieves and constantly operate under the fear of being attacked[18].

Juggling between job and attending to family: Women in the African set up under the institution of marriage are expected to perform domestic duties or chores pertaining to the family. Riders in the marriage institution are no exception. The riders job requires that the rider spend significant amount of time on the job to improve chances of increased daily earnings. Some female riders assert that this potentially compromises their ability/availability to attend to other domestic chores.

***Stiff competition from men riders*:** Motorcycle taxi business in Nairobi and Kenya at large is a male dominated enterprise. Male riders are viewed by most customers as competent on the job hence preferred by majority. From the survey conducted, it's up to the female riders in the industry of motorcycle taxi to find a niche for themselves. The taxi apps have provided a platform for women taxi riders to for instance reach clientele that have a bias or preference toward female riders.

4 Conclusions

The emergence of E-mobility is packed with opportunity for creation of green and decent jobs for the rapidly growing young population in Kenya to positively impact livelihoods. Strong fiscal and non-fiscal policies enabling policies need to be adopted to scale up penetration of EVs. Electrifying motorcycle taxis that have been widely adopted in Kenya as a means of transport would have a great impact and kick start transition to EVs.

Historically, the automotive industry has been male dominated. E-mobility presents an opportunity to recalibrate the automobile workforce and ensure inclusion of women in all the spheres of the e-mobility ecosystem. Despite a myriad of challenges facing women engineers and riders in the EV space including negative gender discrimination, women are taking up the challenge to contribute in the evolution of EVs. More efforts need to be done for instance through affirmative action measures to ensure more women are brought on board in the EV space.

5 References

[1] E. Adiambo, "the Contribution of Motorcycle Business To the Socio-Economic Wellbeing of Operators in Kisumu County, Kenya," *Int. J. Soc. Dev. Concerns*, vol. 13, no. November, pp. 55–69, 2020.

[2] Kenya National Chamber of Commerce (KNCCI), "Memorandum on various Fiscal and Non-fiscal measures aimed at promoting the adoption of E-mobility in Kenya," Nairobi, 2022.

[3] KNBS, "Decadal Survey 2022," Nairobi, 2022. [Online]. Available: https://doi.org/10.17226/26522.

[4] P. L. C. I. Report, "Car & general (kenya) plc integrated report 2021," 2021. [Online]. Available: https://www.cargen.com/wp-content/uploads/2020/06/Car-General-Integrated-Report-2021.pdf.

[5] C. Mwaniki, "How boda boda riders make Sh1bn every day," *Https://Www.Businessdailyafrica.Com/Bd/Economy/How-Boda-Boda-Riders-Make-Sh1Bn-Every-Day-3743962*, Mar. 11, 2022.

[6] J. Galuszka *et al.*, "Electric mobility in East-Africa: How the policy and stakeholder environment tackles the integration of informal transport sys-tems into low-carbon transition-case studies from Kigali, Ki-sumu, Nairobi and Dar es Salaam," no. January, 2021, doi: 10.20944/preprints202101.0029.v1.

[7] Republic of Kenya State Department for Transport, "Electric Mobility in Kenya," 2019. [Online]. Available: https://www.changing-transport.org/wp-content/uploads/2019_Electric_Mobility_in_Kenya.pdf.

[8] MoE, "Kenya National Energy Efficiency and Conservation Strategy 2020 ministry of energy," 2020, [Online]. Available: https://unepdtu.org/wp-content/uploads/2020/09/kenya-national-energy-efficiency-and-conservation-strategy-2020.pdf.

[9] D. Chaifouroosh Mamagany, "Electric Cars: Technology." pp. 0–180.

[10] Siemens Stiftung, "E-Mobility Solutions for Rural Sub-Saharan Africa: Leveraging Economic, Social and Environmental Change," 2020. [Online]. Available: www.siemens-stiftung.org.

[11] Siemens Stiftung, "Testing E-Mobility Business Models at WE Hub Victoria Limited in Kenya," 2022. [Online]. Available: www.siemens-stiftung.org.

[12] T. N. C. A. (NCA), "The Draft National Building Code," *Liquid Crystals*, vol. 21, no. 1. Kenya, pp. 1–17, 2020, [Online]. Available: https://nca.go.ke/draft-national-building-regulations/.

[13] B. Miriam, W. Jackson, and C. Faith, "KAM Automotive Sector Profile," 2020.

[14] "Republic of Rwanda Ministry of Infrastructure Strategic Paper on Electric Mobility Adaptation in Rwanda April 2021," 2021.

[15] "Hyundai Motor Opens Global Hyundai Dream Center in Kenya for Automotive Training and Education." https://www.hyundai.news/eu/articles/press-releases/global-hyundai-dream-center-kenya-for-automotive-training-and-education.html (accessed Sep. 09, 2022).
[16] J. Mutua, "Kenya Power to set up electric car charging hubs," Aug. .
[17] Y. K. Odhiambo, "Training and Regulation Compliance in Motor Cycle Transport Operations in Kisumu City a Research Project Submitted in Partial Fulfilment of the," 2018.
[18] B. News, "Boda-Bodas - the enduring menace of Kenya's motorbike taxis."