Market Intelligence Note
Issue 3 Nov. 2013

# After-sales Service: Electronics Service Technicians

**This Technical Note offers an assessment of local electronics technicians' experiences and interests in repairing solar lamps. These findings are based on surveys conducted with 115 technicians in Kenya and Tanzania between January and May 2013.**

*The information in this article builds on previous Market Intelligence Notes. See also: http://www.lightingafrica.org/resources/market-research/-market-intelligence.html*

## Introduction

Lighting Africa recognizes the need to support manufacturers and distributors of modern off-grid lighting products in the development of their after-sales service. This is the first in a series of notes designed to provide guidance for service, maintenance and warranty practices. This information and recommendations are based on field research and interviews conducted in Kenya and Tanzania and interviews conducted with international companies working in similar markets.

This note presents results from surveys of electronics technicians in an effort to better describe the existing resources offered by local technicians. These surveys investigated technicians' current experience with repairing solar lighting products, identified knowledge gaps that are hindering their ability to service these lights, and highlighted methods that programs and companies can use to interact with local technicians. The survey was administered to 59 technicians in six towns in Kenya in January and February 2013 and to 56 technicians in six towns in Tanzania between April and May 2013.[1,2] The results from Tanzania are compared to those from Kenya to provide insight into the variability of the local repair industry.[3]

## Summary of Findings

- Local electronics and mobile phone technicians feel confident to repair products and are already doing so; nearly 70% of technicians surveyed had repaired at least one solar lantern. Nearly all technicians also already possess the tools necessary to fix most lanterns. Despite these factors, the lack of spare batteries and other product-specific spares, knowledge and training are major hindrances.
- Due to these limitations and the lack of oversight and accountability, many distributors who offer repair or replacement services for their customers recommend that customers do not take products to local technicians, but instead return them to the retailer or distributor.
- Most technicians were interested in attending trainings on the basic repair of solar lights, similar to the trainings Lighting Africa has provided in Kenya and Ghana in the past year.
- Most technicians would be interested to partner with off-grid lighting companies to perform repairs and many are interested in selling lamps as well.
- Technicians in Kenya and Tanzania appeared to possess similar skills and tools, yet the technicians differed in a few key areas: Tanzanian technicians were more likely to work in shared spaces as partners rather than owning individual workshops, but Kenyan businesses were often more formal in nature and more likely to have a business permit, advertise their services, and have access to the internet. Further, Kenyan technicians were twice as likely to have received formal education leading to either a 2-year certificate or 4-year diploma.

[1] Lighting Africa consultant, Maina Mumbi, conducted all surveys with support from Meg Harper and Dr. Arne Jacobson. Meg Harper, Patricia Lai and Dr. Arne Jacobson conducted data analysis and authored this note.

[2] A few of the questions were not included in all of the technician interviews. Nonetheless, unless otherwise noted, sample sizes for reported statistics are 59 technicians in Kenya and 56 technicians in Tanzania.

[3] This research builds on an initial pilot study conducted in 2011 in the Kenyan towns of Eldoret and Embu that provided guidance for the initial technician trainings conducted by Lighting Africa.

## Methods

Surveys were conducted in six towns in Kenya and six towns in Tanzania. In both Kenya and Tanzania, three towns were selected from each of two different regions to incorporate both regional diversity and differences in population size in the sample. All of the towns were connected to grid electricity, but were surrounded by rural and peri-urban populations who are likely to use off-grid lighting products. Also, each of the towns was large enough to have a central retail area, yet all towns were distant enough from each other so that their markets and clientele were distinct. Representative pictures of the towns are presented in Appendix A.

In Kenya, efforts were focused in the towns of Nakuru, Kericho, and Bomet in the Rift Valley Region and Machakos, Kitui, and Mwala in the Eastern Region (Figure 1). Nakuru is a large town approximately 160 km northwest of Nairobi with a population over 286,000. Kericho is a smaller town 260 km west of Nairobi with an urban population of approximately 102,000. Bomet is a small town of about 4,500 people on the road between Kericho and Nairobi. In the Eastern Region, Machakos is a large town approximately 60 km east of Nairobi with a population over 150,000. Kitui is a smaller town approximately 85 km east of Machakos with an urban population of 110,000. Mwala is a small town off the road in between Machakos and Kitui. (Population estimates are from the 2009 Kenya Population and Housing Census).

In Tanzania, surveys were conducted in Moshi, Same and Himo in the Kilimanjaro Region and Morogoro, Ifakara and Ruaha in the the Morogoro Region. Moshi is the most populated town in the Kilimanjaro Region, which is the most electrified region of the country. The urban population of Moshi is approximately 144,000, while the smaller junction towns of Himo and Same had mixed populations of approximately 22,000 and 9,000. Morogoro is the sixth largest municipality in Tanzania with an urban population of approximately 316,000. The town of Ruaha, located next to the Kilombero Sugar Company plantation, has an estimated mixed population of 28,000. Ifakara serves as the headquarters for the Kilombero district and has a mixed population of 56,000, despite only being accessible by dirt road and the Tanzania-Zambia railway. (Population estimates are from the 2012 Tanzania Census).

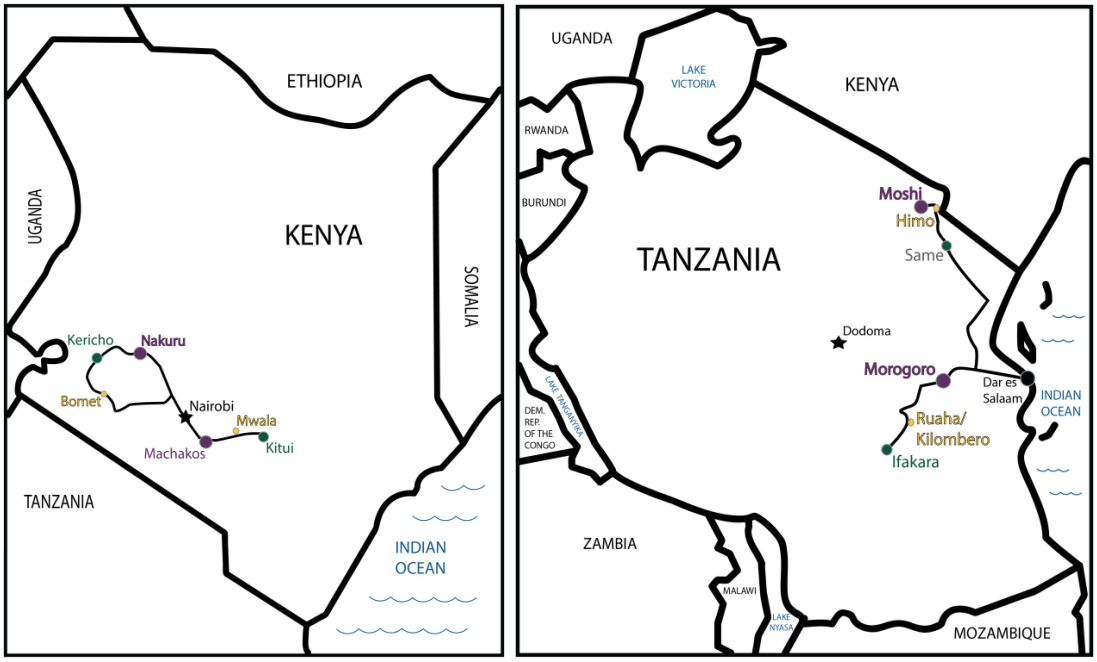


**Figure 1. Towns in Kenya and Tanzania where technician surveys were conducted. The purple dots indicate the larger towns, the green dots indicate the medium size towns and the yellow dots indicate the small towns surveyed in each region. Included for reference are Nairobi, the capital and largest city in Kenya, Dodoma, the capital of Tanzania, and Dar es Salaam, the largest city in Tanzania. Black lines show the major roads connecting each of the towns.**

After arriving in each town, researchers first located and identified electronics and mobile phone technicians by searching for marked businesses and asking retailers or other technicians. In the larger towns of Nakuru, Kericho, Machakos, Kitui, Moshi and Morogoro, areas of town with high densities of technicians, such as retail and industrial zones, were selected for the study. In the smaller towns, the study included the entire "urban" region of the town. All identified technicians in these areas were considered to be part of the sample, though some businesses were closed or refused the survey, resulting in an average response rate of 64% in Kenya and 68% in Tanzania.

The survey consisted of questions to assess the basic characteristics of the technicians and their shops, better understand technicians' existing experience with repairing solar lights, and clarify technicians' access to technology and their preferred methods of communication. An example of the survey questionnaire is in included in Appendix B. Due to time constraints, a shorter version of the survey was administered in the three towns in the Eastern region of Kenya (Figure 2).

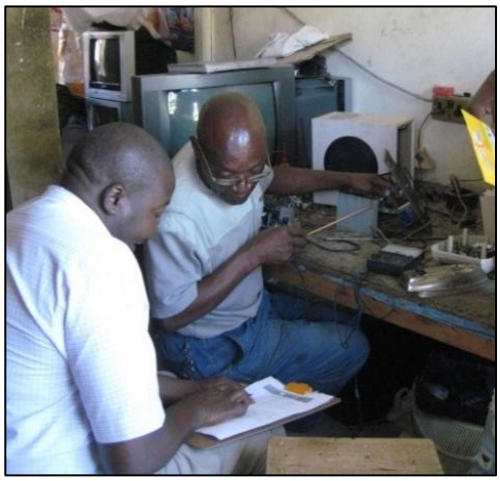

**Figure 2. Maina Mumbi interviewing an electronics technician at his workstation. (Picture credit Meg Harper)**

## Characteristics of technicians and their businesses

Technicians sampled in the survey were divided into two main categories: those that only serviced mobile phones and general electronics technicians who repaired a range of devices including TVs, DVD players, CD players, radios, and electric appliances (Figures 3 and 4). Approximately half of these general technicians stated that they also service mobile phones, but many were not interested in this work. Though not directly asked, some general technicians' lack of interest in servicing mobile phones may have stemmed from the lower marginal earnings associated with mobile phone repairs in comparison to TV repairs, the prevalence of technicians dedicated to repairing mobile phones, the difficulty of working on microelectronics, or the simultaneous need to also service mobile phone software. In contrast to the pilot work conducted in 2011, both general electronics technicians and mobile phone technicians appeared capable and interested in repairing modern off-grid lighting products.[4] Nearly all technicians interviewed possessed adequate tools to repair lights. A typical set of tools included a digital multimeter, a soldering iron, screwdrivers, pliers and cutters. Over 70% of technicians also used "rework" stations, which include a higher precision soldering iron and solder sucker.

Nearly all technicians also had experience performing repairs similar to those required for solar lights. Almost every technician stated that in their work they used a digital multimeter, repaired LEDs and circuit boards, soldered electronics, and worked with rechargeable batteries. One substantial distinction was whether technicians worked with solar products. In Kenya, 86% of general technicians and 58% of mobile phone

[4] The 2011 pilot study suggested that many mobile phone technicians were not adequately equipped to repair solar products. We suspect this situation changed after the Kenyan government prohibited technicians from unlocking counterfeit mobile phones. With the decline of this revenue stream, many mobile phone technicians who only offered this less technical service left the market. Most remaining mobile phone technicians are now focused on both doing repairs on circuit boards as well as software troubleshooting.

technicians (73% of all technicians) stated that they often repaired solar technology, while in Tanzania, 94% of general technicians and 45% of mobile phone technicians (75% of all technicians) had worked with solar. Note that solar technology was used in a broad sense to refer to any solar product, including larger panels, not solely modern off-grid lighting products, such as those supported by Lighting Global.

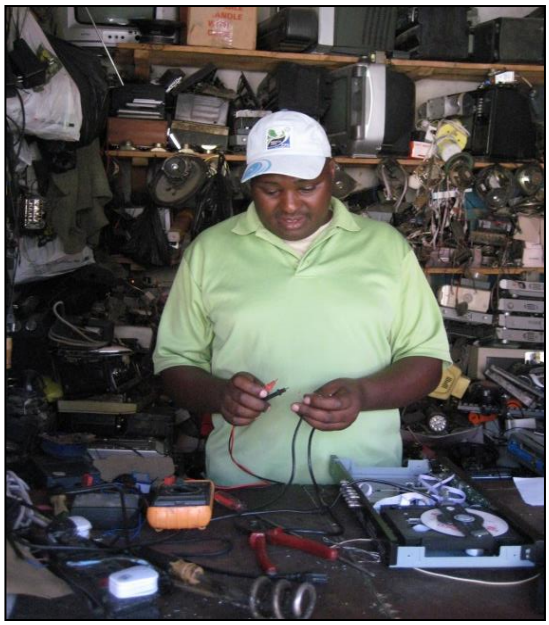

**Figure 3. A well-established shop of a general electronics technician. As in this picture, technicians commonly had a collection of old TVs, DVD players, radios and assorted electronics that were waiting to be fixed, unable to be fixed or being used for spare parts. Some common tools, including a digital multimeter, a soldering iron and wire cutters are present on the workbench. (Picture credit Meg Harper)**

Many respondents, 71% in Kenya and 54% in Tanzania, also sold other products, such as mobile phone and electronics spares and accessories, torches, mobile phones, and electronics, in addition to offering repair services. While over 25% of technicians directly expressed an interest in selling solar lamps, only six respondents in Kenya and one in Tanzania were already selling modern off-grid lighting.

Technicians' backgrounds and business arrangements differed substantially between the two countries (Figure 5). In Tanzania, many technicians were trained at youth or vocational training centers (called VETAs in Tanzania), whereas in Kenya, only one respondent said he[5] received training at one of these centers.[6]

**Figure 4. Typical work stations for mobile phone technicians. The black box in the photo on the left is a soldering rework station. Many technicians also sold accessories, spares or other retail items, as in the picture on the right. (Picture credits Meg Harper)**

While apprenticing with another technician was common in both countries, nearly 60% of technicians in Kenya received either a 2-year certificate or 4-year diploma from technical colleges or training centers in Kenya, while only 30% of technicians reported receiving certificates or diplomas in Tanzania. Further, in Kenya, 37% of these documents were 4-year diplomas, while no technicians in Tanzania reported receiving a 4-year diploma. In both countries, though some mobile phone technicians did attend technical college or VETA, it was

[5] All technicians interviewed were men. Women are severely underrepresented in the field. In the survey process, we only found one female technician, but she declined to respond.

[6] Youth or vocational training centers offer training to students following primary school. Technical colleges provide training to students who have already completed their secondary education.

more common for general electronics technicians to access these resources. All of the technicians interviewed were experienced technicians and had worked for more than one year, while over 75% of technicians interviewed in Kenya and over 85% of technicians in Tanzania had over five years of experience (Figure 5).

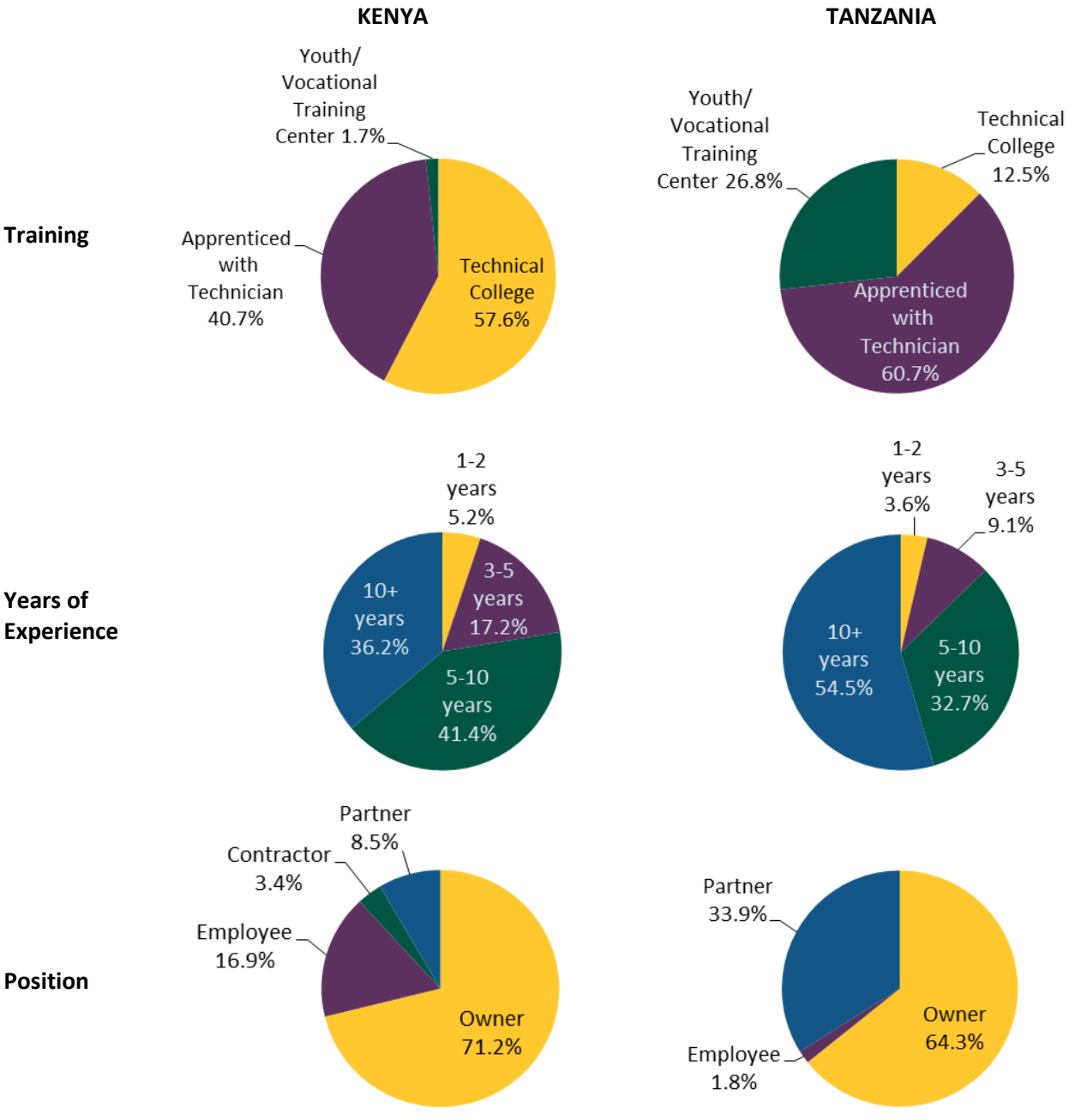


**Figure 5. Characteristics of technicians in Kenya (n=59) and Tanzania (n=56).**

One notable difference between the technicians in Kenya and Tanzania was the ownership structure of many of the workshops. While in Kenya lead technicians often either worked alone or with several employees, in Tanzania technicians more commonly formed partnerships to share overhead expenses (Figure 5). Technicians in Kenya were also more likely to possess a business permit; in Kenya 98% of respondents had a business permit, but only 69% of technicians had a business permit in Tanzania (Figure 6). This finding correlates with the survey team's observation that technicians' businesses in Kenya were typically better labeled and advertised than those in Tanzania. In Tanzania, technicians were therefore more difficult to locate and often had to be found by word-of-mouth. The ownership structure, formal registration, and visibility of the business could all impact potential arrangements between local technicians and off-grid lighting manufacturers or distributors.

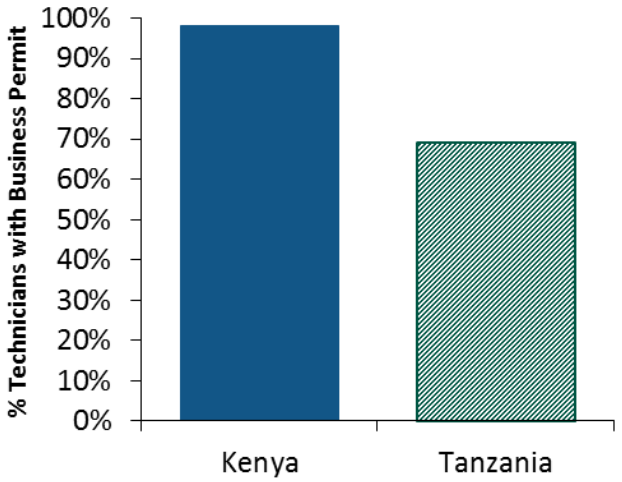


**Figure 6. Percentage of technicians who reported having a business permit in Kenya and Tanzania.**

## Treatment of product warranties

In an effort to better understand the realistic use of warranties in the market, the survey asked technicians several questions about warranties. When asked, 71% of technicians in Kenya and 55% of technicians in Tanzania stated that they do check for a warranty before repairing a product. Typically, the technicians simply ask the customer if the product is warrantied, though some mentioned checking for a manufacturer's seal. If a customer indicates that the product is under warranty, the technicians often suggested to the customer that they return the product to the dealer, but commonly still offered to repair the product and void the warranty if the customer preferred. Only one respondent suggested that they would return a product to a service center.

Only two respondents mentioned being authorized to repair products under warranty; one repaired mobile phones and one repaired solar lamps. Both of these technicians had received training from the product manufacturers. The mobile phone technician received a one-month training at the company headquarters, while the solar lamp technician received a one-week training in the nearest large town. The mobile phone technician was previously working as an independent technician and had been recruited from the town to serve as a local technician for the mobile phone company. The solar lamp technician, however, did not have prior training as a technician but already worked as a salesman for a local solar lamp distributor. He felt that the week-long training provided him with the majority of the skills he needed to repair the company's solar lamps, but that a longer training would have been beneficial.

## Repair of Solar Lamps

Nearly all technicians, regardless of whether they specialized in TV repair, mobile phone repair, or serviced general electronics, stated that they were both interested to repair solar lamps and interested to enter an agreement with a manufacturer or distributor to repair solar lamps. Technicians further stated that they were willing to repair lamps of all sizes and prices, though one technician admitted that his customers would have to wait if he had higher priority work and another said he would not work on microelectronics, such as surface-mounted components on circuit boards.

Technicians are already commonly repairing solar lights. Approximately 70% of respondents in both countries stated that they had repaired a solar lamp. When asked how many solar lights they had repaired in

the past three months, the 115 technicians surveyed reported repairing 90 lights in Kenya and 57 in Tanzania. Of these, only two technicians in Kenya and only four technicians in Tanzania stated that they were unable to fix the lamp; in all six cases, the technicians were unable to find the proper spare battery or LED. In other cases, technicians at times repaired the lamp in the absence of proper spares by improvising: technicians reported using any available rechargeable battery to replace a failed battery, and wiring replacement batteries or switches outside of the plastic body of the lamp because the available replacement parts would not fit in the existing enclosure. In discussions with solar lamp distributors, many did not recommend that products be repaired by local technicians mainly because they lacked access to spares and specialized knowledge and would at times ruin a lamp with their attempts to improvise.

Other common problems with lamps included broken connectors, wires, or switches, problems with charging circuits, and battery and LED failures. Technicians also helped customers understand how to use the lamp, cleaned and repaired lamps that faced dirt or water intrusion, and converted other rechargeable lamps to use solar (Figure 7).

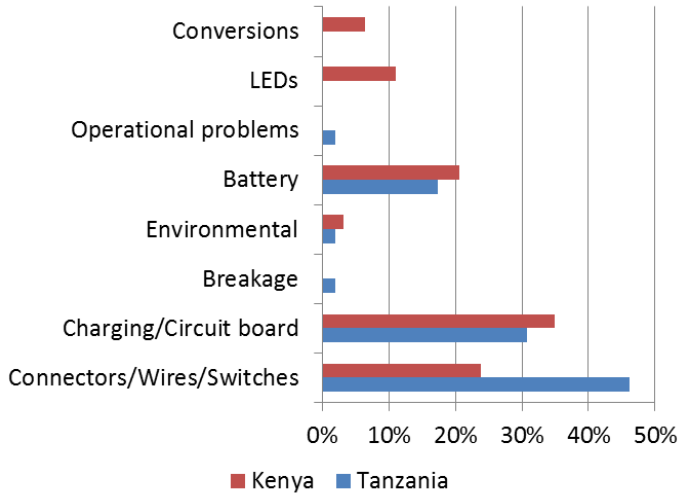


**Figure 7. Percentage breakdown of repaired lamps according to the reason the lamp was brought to the technician. Percentages are based on the 63 lamps in Kenya and 52 in Tanzania for which technicians provided descriptions of the repairs.**

When lamps are successfully repaired, technicians seem to charge relatively low rates. In Kenya, the average charge for repairs was KSH 322 (US$ 3.75) and ranged from KSH 0 to KSH 800 plus the cost of a battery (US$ 9.30 plus approximately US$ 5.00). In Tanzania, the average charge for repairs was TZS 3,422 (US$ 2.13) and ranged from TZS 0 to TZS 20,000 (US$ 12.45). These cost estimates suggest that lamps are being repaired at costs below the cost of most new solar lamps, making it more cost effective to have a failed product repaired locally than to purchase a new product.

## Technician Training Sessions

Though technicians are already successfully repairing solar lamps, 90% of technicians responded that they would attend a training to repair solar lamps if it were made available.[7] Approximately 75% agreed that this training could be a video training, while others stated that an in-person training session would be necessary to enable hands-on activities with instructor feedback.[8] Approximately 40% of technicians in both countries stated that if the training required travel to the nearest large town, the technicians would require assistance with travel expenses.

Nearly all technicians thought manuals would be helpful for the training, though only 46% of technicians in Kenya and 70% of technicians in Tanzania thought that a manual would be sufficient without a training session. In Tanzania, technicians were asked whether the trainings and manuals should be in English or Swahili. Approximately 82% of technicians felt that Swahili should be used, while 5% felt that English should be used exclusively and 13% stated that both languages would be needed.

[7] Questions specific to training sessions were only posed to 35 technicians in Kenya, but were asked of the full 56-technician sample in Tanzania.

[8] In both Kenya and Tanzania over 97% of respondents stated they had an easy way to watch a video. The majority of these preferred using a DVD or flash drive (thumb drive, memory stick, USB) while less than 25% of technicians stated they could easily view a video that was emailed to them, posted on the internet, or included in a mobile phone app.

Several technicians had already received trainings regarding repairing solar lamps. Two technicians in Kenya had received training through the Lighting Africa program, while two technicians in Tanzania had received trainings from solar lamp manufacturers or distributors. All technicians felt that these trainings sessions were helpful, and those receiving the Lighting Africa training suggested that it would be useful to receive continuing updates and materials regarding the repair of solar lights, new models, and new common repair methods. The technicians who had already been trained noted that the most important aspects of the training were the explanation of how solar lights work and proper use and care of the light. These aspects were also the most commonly cited topics requested by technicians who had not received trainings (Figure 8). Understanding how the lamps work not only enabled technicians to better troubleshoot and repair the lamps, but also allowed them to explain to customers how to charge and use their lamps.

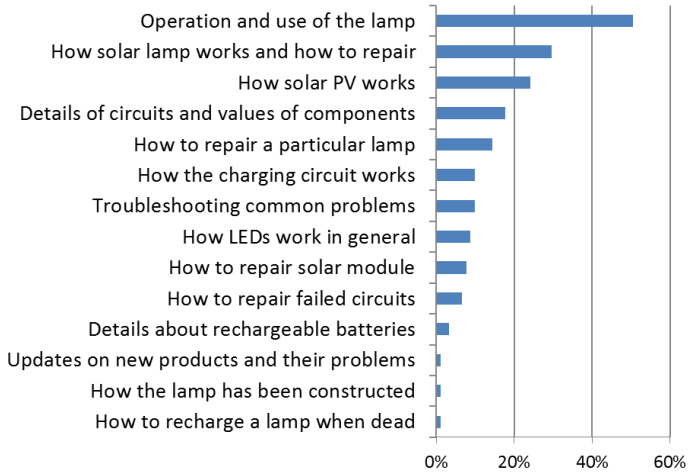


**Figure 8. Desired topics for trainings. Percentages show the percent of respondents who provided a given response.** [9]

When asked what support they would need following a training to continue to repair lamps, nearly all technicians noted the need for spares. Other suggested support included providing the necessary tools, stocking products for sale, branding the shop as a "certified" technician, sending updates on products and repairs, offering loans or financing for the shop, connecting local dealers directly with the technician, and helping the technician expand or improve his workshop.

## Methods of Communication and Access to Technology

All technicians interviewed owned at least one mobile phone and all but one technician said that they used a mobile phone for their business. Most technicians used either "normal" phones, defined as phones which cannot access the internet, or "internet" phones, defined as phones which can access the internet or a selection of internet pages, but do not have applications and the full function of a "smart" phone (Figure 9). While smart phone ownership was uncommon, some technicians did have access to these phones. Ownership of a smart phone was more common in the wealthier regions of each country: the Rift Valley region in Kenya and the Kilimanjaro region in Tanzania.

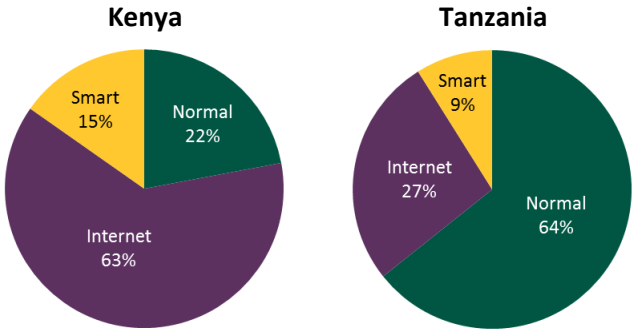


**Figure 9. Mobile phone ownership among technicians by type in Kenya and Tanzania.**

Internet access, either by phone or computer, was much higher in Kenya than in Tanzania. In Kenya, 76% of respondents said they had access to the internet, while in Tanzania only 34% stated the same. Among those who had internet access, methods of access varied between owning a computer, using a computer at a net café, using a mobile phone, or other methods such as borrowing a friend's computer (Figure 10). Some technicians in rural areas noted that even if they know how to use the internet and have access, service can be very slow and limit their ability to watch videos, access complex sites, or download files.

[9] Not all respondents were asked this question and no distinct differences were noted between Kenya and Tanzania, so responses were combined (n=91).

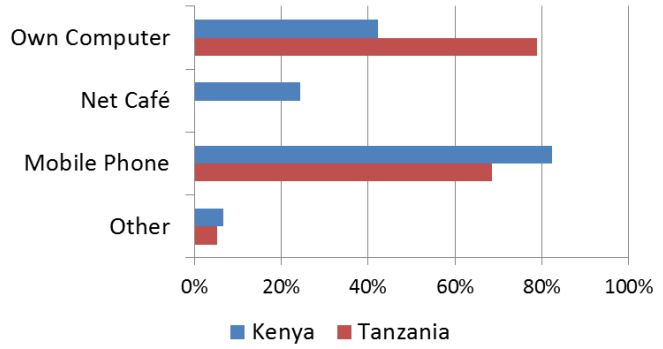


**Figure 10. Methods of accessing the internet among technicians. (For Kenya, n=45, for Tanzania, n=19.)**

Though levels and methods of access varied, all but three technicians with access to the internet stated that they used the internet to help fix products. Uses included searching for part descriptions, spare parts, equivalent circuits and components, circuit diagrams, repair manuals and suggestions, and new products. Technicians also downloaded software, mobile applications, and mobile flash files, searched YouTube for training videos, visited forums (such as the GSM forum), and used social media sites. About 42% of technicians in Kenya and 34% in Tanzania used social media sites such as Facebook.

Technicians also provided information about their preferred methods of communication. In their businesses, technicians commonly used their phones to talk with customers and distributors, send SMS or text messages, and make and receive mobile money payments (Figure 11).

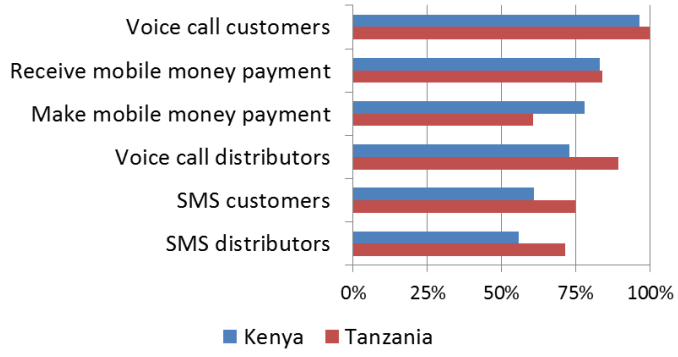


**Figure 11. Technicians' use of mobile phones in business.**

When asked about the possibility of communicating with solar lamp manufacturers or distributors regarding servicing warranties and making repairs, technicians' preferred methods of communication differed, but most suggested using SMS messages, voice calls, or emails (Figure 12). In both countries, only a few technicians stated that communicating by mail delivery (PO box) or mobile applications would be feasible, and no technicians stated these as their preferred options. When considering coordinating communication with technicians, it may be important to note that many technicians use multiple phone lines with different service providers. This factor could impact the cost of sending SMS messages, making voice calls, and processing mobile money, as well as affect the ability of a company to consistently contact a technician at a single number.

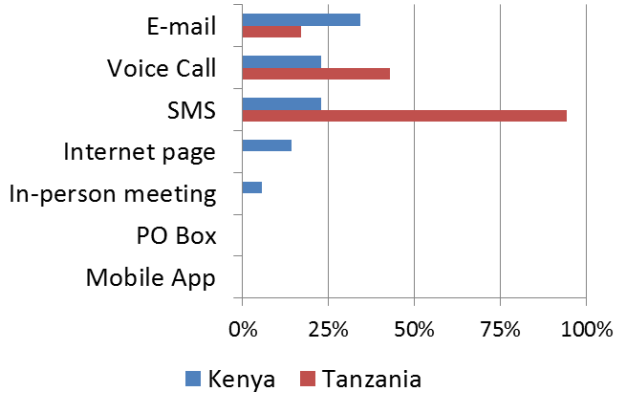


**Figure 12. Preferred methods of communication. (For Kenya, n=35, for Tanzania, n=56.)**

Should companies decide to employ local technicians to help service their warranties, a final area of interest is that of payment methods. Technicians in both Kenya and Tanzania were evenly split between those that would prefer a fixed monthly payment versus those who would prefer to get paid by the number of products they service. Only one technician stated that they would prefer to be paid by the hour. In terms of delivery of payments, technicians again were evenly split between preferring a bank transfer or a mobile money transfer. Less than 10% of technicians would prefer to be paid by check (cheque).

## Conclusions

Local electronics technicians are already repairing solar lamps and consumers will continue to bring failed lamps to these technicians into the future. As an industry, engaging with technicians to help them perform effective repairs will create greater consumer trust in the market. Individual manufacturers or distributors may further choose to train and partner with local technicians to reduce the transport costs and time involved in servicing their warranties. Some key findings from this research include:

- Technicians appear to have the tools and skills necessary to repair solar lamps, and many have experience working with solar.
- Nearly all technicians surveyed were interested in attending a training session to learn about the repair and basic operation of off-grid lighting products.
- Technicians also noted the need for product-specific spares, repair tips and manuals.
- Once trained, technicians felt that manufacturers, distributors or organizations could further support their efforts to repair solar products by branding the shop as a "certified" technician, connecting local dealers directly with the technician or enabling the technician to directly stock products for sale.
- Technicians commonly use their mobile phones in their business; similarly, mobile phones are the preferred methods for solar lamp companies to interact with technicians: through SMS, voice calls or email.
- While internet access was limited in both countries (76% in Kenya and 34% in Tanzania), nearly all those that had internet access stated that they had used the internet to help repair products.

As engagement with local technicians can be very beneficial to the low cost off-grid lighting market, this note aims to help all parties better understand the resources and needs of the local repair industry.

## Appendix A

Below are pictures of the surveyed towns to help provide context for the study (Figures 13 – 24). Additionally, while all pictures in this note depict technicians working inside a shop, several technicians encountered in both countries instead worked from outdoor kiosks. A few pictures of outdoor workshops are included for reference (Figure 25).

## Kenya Rift Valley Region: Nakuru, Kericho and Bomet


**Figure 13. A street scene in the retail center of Nakuru, Kenya, and an industrial section of town. Mobile phone technicians were more commonly found in retail areas, while general electronics technicians were often found in industrial areas. As pictured here, Kenyan technicians readily advertised with signs stating "Fundi wa Simu" or "Fundi wa Radio," while many Tanzanian technicians could only be found by word-of-mouth. (Picture credits Meg Harper)**


**Figure 14. A main street in Kericho, Kenya, and a store front for an electronics technician. (Picture credits Meg Harper and Chris Carlsen)**


**Figure 15. The main street and area near the bus station in Bomet, Kenya. (Picture credits Meg Harper)**

## Kenya Eastern Region: Machakos, Kitui and Mwala


**Figure 16. Main streets of Machakos, Kenya. (Picture credits Maina Mumbi)**


**Figure 17. A street and a workshop in Kitui, Kenya. (Picture credits Maina Mumbi)**

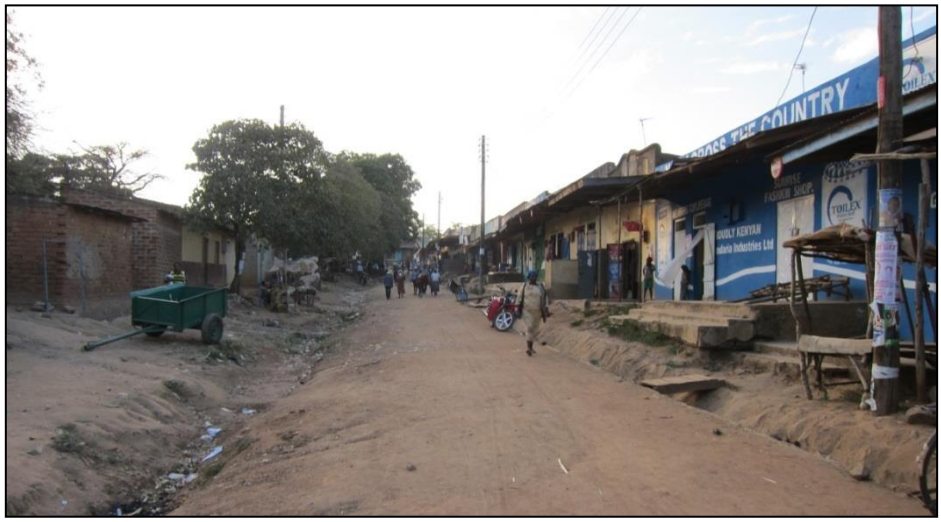


**Figure 18. A central street in Mwala, Kenya. Mwala was the smallest town sampled in Kenya. (Picture credit Maina Mumbi)**

## Tanzania Kilimanjaro Region: Moshi, Himo and Same


**Figure 19. Retail mall and busy central street in Moshi, Tanzania. (Picture credits Maina Mumbi)**

**Figure 20. Both the central town of Himo and the roadside area called Himo Junction were included in the Himo sample. (Picture credits Meg Harper)**


**Figure 21. The main street and bus station in Same. Same was the smallest town sampled in Tanzania. (Picture credits Meg Harper)**

## Tanzania Morogoro Region: Morogoro, Ifakara and Ruaha/Kilombero


**Figure 22. Major retail areas of Morogoro. Morogoro was the largest municipality surveyed during the study. (Picture credits Maina Mumbi)**


**Figure 23. The main street and market area of Ifakara. (Picture credits Meg Harper)**



**Figure 24. The main street of Ruaha/Kilombero. Most commercial activity in the town occurred along the main street or in a small market on the side streets. (Picture credits Meg Harper)**

## Outdoor Kiosks


**Figure 25. While most technicians worked inside shops, some worked outdoors. Occasionally these technicians with outdoor kiosks were associated with the proximate retail shop. (Photo credits Maina Mumbi)**

## Appendix B

The survey questionnaire below was administered to technicians in Tanzania. Some questions with specific town names or monetary values were adapted when asked in Kenya. A shortened version of this survey was administered in the Eastern region of Kenya; questions about warranties, relationships with other companies, methods of payment and more detailed questions about trainings and communication methods were removed.

### Technician Interview Questionnaire

Interviewer:_____ Date: _____
Country: _____ Town: _____

*Business*

| | | | |
|---|---|---|---|
| Business Name | | | |
| Business Location | | GPS Point | |
| Current Bus. Permit? | ☐ Yes ☐ No | | |
| How many technicians work at this business? | | | |

*Interviewee*

| | | | |
|---|---|---|---|
| Name | | Gender | ☐ M ☐ F |
| Phone Contact | | | |
| Email address | | | |
| Training Received | ☐ Tech. College ☐ Apprenticed with Tech ☐ Youth/Vocational Training | | |
| Degree Level | ☐ Diploma ☐ Certificate ☐ Other | | |
| Years of Experience | ☐ less than 1 yr. ☐ 1-2 yrs ☐ 3-5 yrs ☐ 5-10 yrs ☐ +10 yrs | | |
| Position | ☐ Owner ☐ Technician ☐ In Training ☐ Other_____ | | |
| Status (if not Owner) | ☐ Employee ☐ Part-time contractor ☐ Partner | | |

Section 1: General Skills

1.1 What **products do you sell** from the shop?

☐ T.V. ☐ Computers ☐ Do not sell products
☐ Radio/CD/DVD ☐ Torches
☐ Cell Phones ☐ Solar Lamps
☐ Solar ☐ Batteries
☐ Electronics Spares ☐ Other_____

1.2 What **type of products** do you repair?

☐ T.V. ☐ Computers

☐ Radio/CD/DVD ☐ Torches

☐ Cell Phones ☐ Solar Lamps

☐ Other _____

1.3 Which of these is your **top earning** product?_____

1.4 Which of these do you **repair most often**? _____

1.5 When a customer brings in a product, do you **check to see if the product is under warranty**? ☐
Yes ☐ No
If so, **how do you determine** this?

1.6 If a customer brought you a product that was **under warranty**, what would you do?

1.7 In the last month, what is the **lowest cost product** you have repaired?

Product_____ Approximate Cost_____ Approximate Charge to Repair_____

1.8 Does most of your revenue from repairs come from repairing products that cost **more or less than TZS 65,000**?

☐ More than TZS 65,000 ☐ Less than TZS 65,000 ☐ Equal shares

1.9 Is the repair of solar lamps an **interesting opportunity** for you? ☐ Yes ☐ No

1.10 Solar lamps range in cost from 8000 TZS to 230,000 TZS. What is the **minimum cost** of a lamp that you would be interested in repairing?

1.11 In your work, do you often:

| | | |
|---|---|---|
| Use a **digital meter**? | ☐ Yes | ☐ No |
| Repair/replace **LEDs**? | ☐ Yes | ☐ No |
| Repair/replace **circuit boards**? | ☐ Yes | ☐ No |
| S**older** electronics? | ☐ Yes | ☐ No |
| Work with **rechargeable batteries**? | ☐ Yes | ☐ No |
| Work with **solar products?** | ☐ Yes | ☐ No |

1.12 What **type of tools** do you currently have?

☐ Digital Meter ☐ Electrical wire **small**

☐ Soldering Iron ☐ Pliers

☐ Screw Drivers **BIG** ☐ Cutters/Scissors

☐ Screw Drivers **small** ☐ Rework Station

☐ Other, _____

1.13 Do you have any **arrangements with companies for fixing products**?

☐ **YES, Continue to Question 1.13b**

☐ **NO**, I **do not have arrangements** with any companies or organizations.

1.13a. Would you be **interested in an arrangement** with a manufacturer/distributor?

☐ Yes ☐ No

**>>Skip to Section 3.**

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→ 1.13b. What **companies** and **products** do you have arrangements with?

If with **Manufacturers or Distributors**: **Continue to Section 2**

If with **Organizations or Companies** that use products (churches, hotels, etc) ask:

1.13c. **What portion** of your work comes from these arrangements?

1.13d. **How are you paid** for your work?

1.13e. Would you be **interested in an arrangement** with a manufacturer/distributor?

☐ Yes ☐ No

**>>Skip to Section 3.**

---

→ <u>Section 2. Arrangements with companies</u>

2.1 **What services do you provide** to each company?

2.2 **How are you paid** for your work for each company?

2.3 What **portion of your work** comes from your arrangements with companies?

2.4 Did the companies provide you with **any trainings**? If so, please describe them.
☐ Yes ☐ No

2.5 Have the companies provided you with **any other materials**? If so, what?
☐ Yes ☐ No

2.6 How do you find **spare parts** for these products?

2.7 Are you **satisfied with the relationship** you have with each company?

2.8 How could the companies **improve** their interactions with you?

**If the technician has arrangements with more than one company:**
2.9 Do the companies require any **non-disclosure or confidentiality agreements**?
☐ Yes ☐ No

Section 3: Repairing Off-grid Lamps

3.1 **Have you been trained** to repair solar lamps? ☐ Yes ☐ No

3.2 Have you ever **repaired** solar lamps (aside from during a training)?

☐ **YES**, continue to Question 3.3 ☐ **NO**, skip to Section 4. >> ☐ Opened product?

---

3.3 How many solar lamps have you **repaired in the last 3 months**?_____

3.4 Explain the **3 most recent** solar lamps, the problem and if it was fixable.

| **Product Description** | **Problem** | **Fixed?** | **Price charged** |
|---|---|---|---|
| | 1. | ☐ Yes ☐ No | |
| | 2. | ☐ Yes ☐ No | |
| | 3. | ☐ Yes ☐ No | |
| | 1. | ☐ Yes ☐ No | |
| | 2. | ☐ Yes ☐ No | |
| | 3. | ☐ Yes ☐ No | |
| | 1. | ☐ Yes ☐ No | |
| | 2. | ☐ Yes ☐ No | |
| | 3. | ☐ Yes ☐ No | |

3.5 If not fixed, why was it **unable to be fixed**?

☐ **Spare parts** not available

☐ **Tools** not available

☐ I did **not know how** to fix the problem

☐ Owner did not want to **pay**

☐ Other _____

**If received a training to repair solar lamps, continue to Section 4. If not, skip to Section 5.**
Section 4: Training Evaluation (for technicians who have received trainings)

You stated earlier that you received a training to repair solar lamps, we would now like to ask you a few questions about that training.

4.1 **Who** provided the training to repair solar lamps?

4.2 **When** was the training?

4.3 Please briefly **describe the training** (how long was the training, where was the training, what topics were covered).

4.4 What were the **best parts** of the training?

4.5 What **recommendations** do you have for improving the training?

4.6 Has the training **helped you to get business** to repair solar lamps? ☐ Yes ☐ No

**If received a training to repair solar lamps, skip to Section 6. If not, continue to Section 5.**
Section 5. Training Suggestions (from technicians who HAVE NOT received trainings)

5.1 If a company wanted to offer a training on how to repair their lamps, **what topics should be included in the training**?

5.2 What **languages** are acceptable for conducting the training?

☐ English ☐ Swahili ☐ Other_____

5.3 In what manner should the **training sessions** be held?

☐ In the shop(one on one) ☐ Other_____

☐ Workshop(multiple technicians)

5.4 Would you be willing to **come to** Moshi / Morogoro for a 1-2 day training**?**

☐ Yes ☐ No, I would not be willing to go to Moshi / Morogoro.

5.5 What would **restrict** you from coming to the training?

Section 6. Additional Materials and Support (all technicians)

6.1 In addition to the training sessions would it be **helpful to have a manual**?

☐ Yes ☐ No, not necessary

6.2 Would a **manual be sufficient** without a training session?

☐ Yes ☐ No, there needs to be a training also

6.3 What **languages** are acceptable for the manual to be written in?

☐ English ☐ Swahili ☐ Other_____

6.4 Would **a video training be sufficient** without an in-person training session?

☐ Yes ☐ No, there needs to be a training also

6.5 Do you have an easy **way to watch a video training**? ☐ Yes ☐ No

6.5a. If so, what are **all the ways** that you could easily watch a video training?

☐ DVD disk ☐ File on flash disk ☐ E-mailed file ☐ Internet ☐ Mobile Phone App

6.5b. **Which way do you prefer**?_____

6.6 Following a training, what **support** would you need from a manufacturer or distributor to continue to repair solar lamps?

Section 6A. PaymentMethods

6.7 How would you prefer a company **compensate** you for lamps you repair?

- ☐ Fixed monthly fee regardless of how many products serviced
- ☐ Payment for each product serviced
- ☐ Payment for hours worked servicing products
- ☐ Other_____

6.8 How would you prefer that a company **deliver the payments**?

- ☐ Cheque (must be picked up in nearest large city)
- ☐ Bank transfer
- ☐ Mobile money transfer
- ☐ Other_____

Section 7: Mobile Phone Assessment

7.1 What **kind of mobile phone do you use** for your business?

☐ None ☐ 'Normal' ☐ 'Internet' (has internet but no apps) ☐ 'Smart' (can run apps)

7.2 **How do you use mobile phones** to run your business now? (choose all that apply)

- ☐ I don't own a mobile / I don't use a mobile phone for my business
- ☐ Communicate with my customers (indicate SMS / Voice )
- ☐ Communicate with distributors (indicate SMS / Voice)
- ☐ Receive payments from customers (Mobile money transfer)
- ☐ Make payments to distributors (Mobile money transfer)
- ☐ Other_____

Section 8: Internet Assessment

8.1 Do you know **how to use the internet**? ☐ Yes ☐ No
If no, skip to Section 9.

8.2 Do you have **access to the internet** and/or email? ☐ Yes ☐ No

If so, **how do you commonly access the internet**? (Check any that apply)

☐ My own computer ☐ Computer at net café ☐ Mobile phone ☐ Other_____

8.3 Have you ever used a **mobile phone or computer to find out how to fix a product** (any product, not just solar lamps)?
☐ Yes ☐ No

If so, how did you use them and how successful was it?

8.4 Do you use any **social network** (such as Facebook or Twitter)? ☐ Yes ☐ No

Section 9: Communication

9.1 If a manufacturer wanted to give you updated instructions on how to repair their lamps, what are **all the ways you would want to get this information**?

☐ E-mail ☐ Internet page ☐ SMS ☐ Voice call ☐ Mobile Phone App

☐ Post Office Box ☐ In-person training ☐ Other _____

7.7 a. **Which way do you prefer**?_____

9.2 If a manufacturer wanted you to provide records on lamps that you had serviced, **what are all the ways you could easily provide these records**?

☐ E-mail ☐ Internet page ☐ SMS ☐ Voice call ☐ Mobile Phone App

☐ Post Office Box ☐ In-person ☐ Other _____

7.8a. **Which way do you prefer**?_____