Raspberry Pi, a sustainable internet connectivity solution for master craftsmen: a case study of Kenya Technical Trainers College

Authors

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Abstract

The current educational disruption brought on by the COVID-19 epidemic has prompted a slew of investments and the usage of educational technologies for blended and virtual Learning. Despite the importance of online learning for emergency remote learning in most educational institutions, internet limitations in the country has remained a concern, making learning difficult. In response to this, KTTC in collaboration with COL, identified a Raspberry Pi technology to help and mitigate the internet issue. A study was done to ascertain this claim. A thousand trainees from five county regions in Kenya were chosen to undertake courses in master craftsmen. The courses were blended, that meant that trainers would take the trainees in face to face sessions and KTTC would provide internet connectivity through the use of Raspberry Pi to the training shades. A Raspberry Pi, would provide sufficient internet to 30 trainees sited at a distance of 70 meters from each other without the need to simulate existing internet connectivity. The study showed that it is possible to provide cheap internet to remote areas of a given region, hence enhancing the blended approaches to training. This case study recommends the implementation of Raspberry Pi use in sustainable internet provision. It further allows more research to be done to ascertain its findings.

Author keywords

Training shades, Emergency Remote Learning, Raspberry Pi

Introduction

Statement of the problem

The Internet, in particular, has become a critical enabler of social and economic change, transforming how governments, businesses, and citizens interact and providing new approaches to development challenges. It has also transformed education by fostering a new culture of learning and information access. Without a doubt, the Internet has enormous potential to improve educational quality, which is one of the pillars of sustainable development. While it is important to remember that the Internet is not the solution to every educational challenge, it can help to unlock human capabilities that can improve learning and teaching. Internet access.

Due to a lack of internet connectivity during the COVID -19 pandemic, colleges and institutions were left behind in the emergency remote response. This widened the disparity between institutions in ASAL and those in urban areas. Urban colleges continued to teach, whereas those in ASAL areas remained at home, awaiting the reopening of schools. In this regard a need for solving the issue of internet access arose

Presentation of the problem

The outbreak of COVID-19 was received with different reactions especially in Kenyan education sector which was hit hard. The education system came to stand still, with no classes across Kenyan system. The sudden closure of school, colleges and universities marked the start of long journey of soul searching onto which type of technology should be used ensure learning continues during the pandemic. This affected both parents, trainers and learners from all walks of life and those who don't have same technology or support at home.

Online training being the first measure to curb the education system lockdown was faced with many drawbacks and not all students could afford technology gadgets like smartphones, tablets, laptops among others. Data bundle was also an issue to trainers and trainees especially from remote areas. According to Preeti Tarkar 2020, online training affected the structure of learning and schooling. The research further says that not all school could afford hubs. This was taken by few private schools. On the other side, low income private and government school completely closed and could not access e-learning solutions.

Kenya was likely affected by this pandemic and hence came up with immediate response team which guided on how start training in all the TVET institution. About 600 trainers were inducted and technology started being used to curb the lockdown.

According to Tadesse and Muluye, 2020 distance learning is a solution to continued education system however it is a difficult to developing countries because there is lack of necessary information and communication technology infrastructure, computer, radio and television to provide distance learning (Tedesse and Muluye, 2020). This way not so for Kenyan institutions. Internet access was the big issue as per survey done by TVET National Technical Committee in 2020. The survey noted that 50% of institutions lacked internet access and hence learning didn't continue.

The purpose of this case study is to sought for a viable solution to internet access challenges in the TVET institution.

Definition of terms

Training shades: This are informal Juakali work place. Place where Kenyan informal sector workers (commonly known as Juakali) are stationed and work.

Emergency Remote Learning: Remote learning is any kind of learning that happens outside of a traditional classroom because the learner and facilitator are separated by distance and/or time. Emergency Remote Learning is immediate act of moving training from face to face instruction to the use of online instruction modes to help prevent the spread of the virus that causes COVID-19.

Raspberry Pi: It is a series of small single-board computers and perhaps the most inspiring computer available today.

Assessing related literature

Think about Raspberry Pi, and you will be thinking about internet access solution. According to Watkins, 2017, Internet-in-a-Box is a solution to the individual's tight budget. It's hardware requirements are minimal—a Raspberry Pi 3, a 64GB microSD card, and a power supply—but it provides access to a wealth of educational resources, even to students in the most remote parts of the world. Because all of its content is stored on a microSD card, internet-in-a-Box can be configured, set up, and operated without an internet connection. As a result, regardless of one's location or access to a high-speed internet connection, it can provide rich internet content.

Less research has been conducted in this area, and there is less information available about the use of internet in a box or internet created by the use of a Raspberry Pi. The majority of research is focused on the Internet of Things.

Significance of the study

This study will impact both the institutions with internet access and those without. Since it uses its own internet connectivity, all participants will be allowed to use only the internet provided by the Raspberry Pi and bridging the gap between the two sides.

The study thus brings equality between these institutions by requiring them to use the internet from the same source. Raspberry Pi has its own internet connection, so no institutions that use the device will have to use a different internet connection; the device is also consumes less power and less expensive. With this in mind, institutions and colleges will save money on internet costs. The study will expand on the use of online training, which will be critical in resolving any other pandemic-related issues such as those seen in the COVID-19 pandemic.

Background of the research

In collaboration with COL, KTTC developed a curriculum for Juakali artisans. This curriculum is designed to assist the sector in being recognized for their prior experience. To accomplish this, training and assessment are required. The curriculum intends to deliver content using a blended approach. This necessitates the use of both face-to-face and online learning approaches. The resources are uploaded to the college's learning management system (LMS), where students can access the content and complete their assignments/assessments. Because the learners are supposed to use the LMS to learn, they must have internet access. According to the various studies, internet connectivity is a challenge for these artisans, necessitating the need for further research to identify solutions.

Presentation of data and analysis

To obtain the information used in this study, the National TVET Committee used a qualitative data collection method. TVET institutions were given questionnaire and survey tools, and 164 of them

took part. Figure 1 depicts a summary of each KATTI region participation.
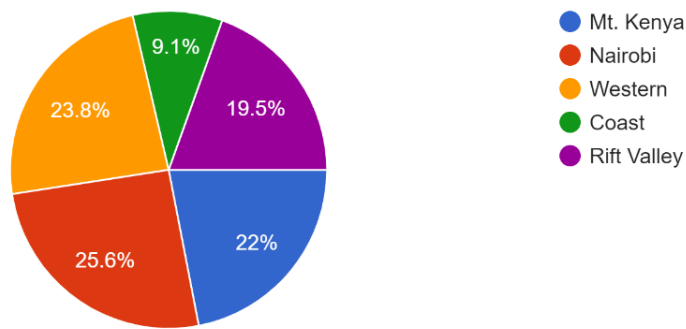

Figure 1

When asked about the platforms used to train online. The responds were as shown in figure 2.

Which platform(s) are you using for online training?
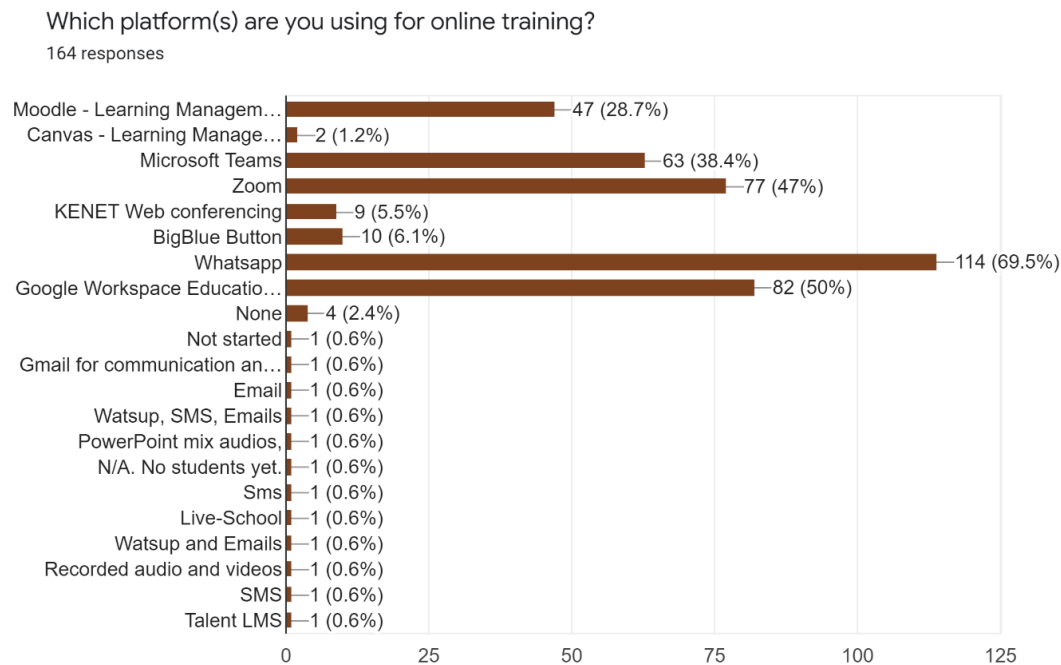164 responses

Figure 2

The following issues have been identified as major barriers to online and blended learning in Kenyan TVET institutions.

- A lack of necessary technology to enable online training.
- Inadequate data bundles for content access.
- Inadequate content on practicals.
- Inability to conduct real-time training and evaluation due to a lack of controls.
- A scarcity of infrastructure
- Inadequate internet connectivity

These are just a few of the many challenges presented.

Various researches show that technology tools and internet connectivity are the key to online learning. According to teachersarethebest.com, 2021, reliable smart phone, iPad, laptop or desktop computer

are important in an online learning. It is also noted that internet connectivity is also crucial in the online training.

When asked about internet connectivity, 26.2 percent of institutions said they didn't have it, and those that did, didn't have enough bandwidth for online training. The available bandwidth ranged from 2mbps to 485mbps
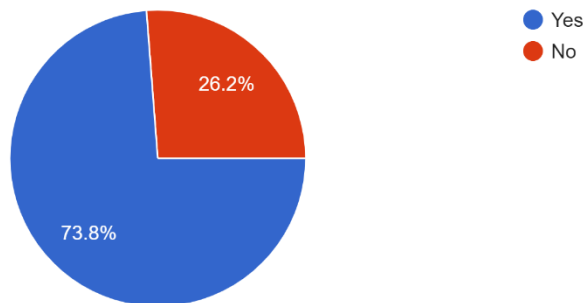

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Figure 3

A survey done by DataReportal and partners Hootsuite and We Are Social, 2021 gave the following interesting results (Figure 4).
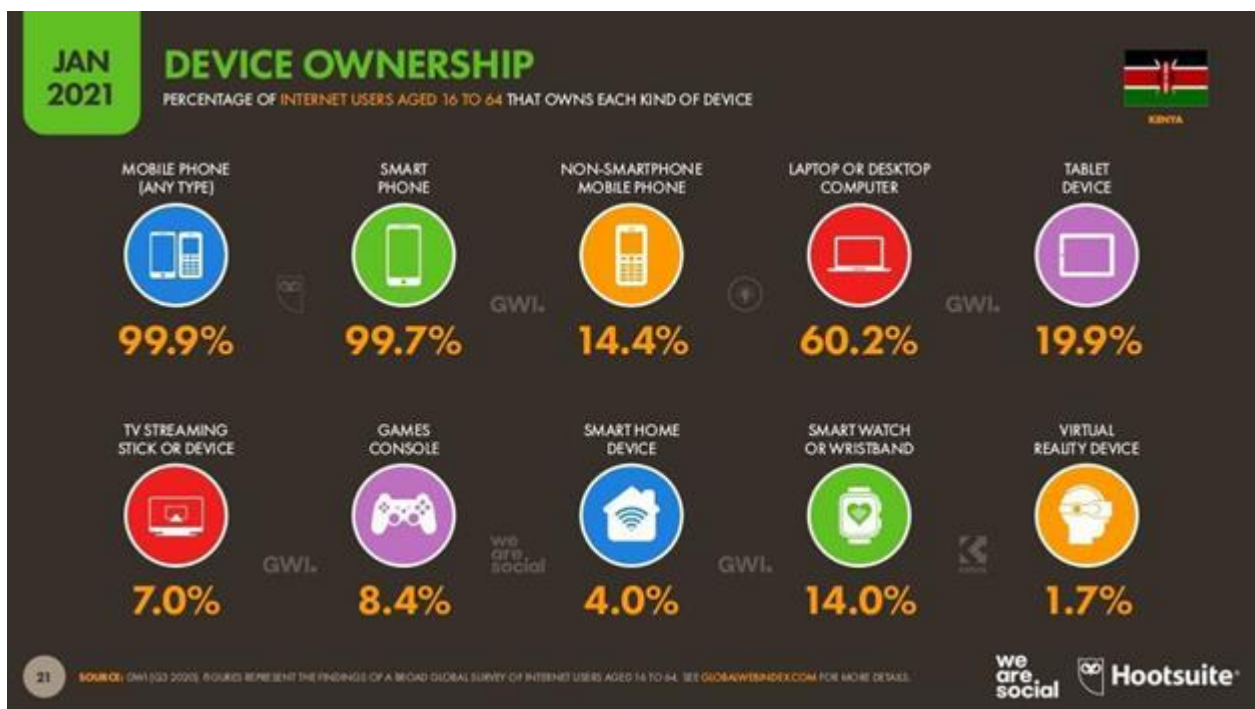

Figure 4: Device ownership among the Juakali sector

Source: Digital 2021: Kenya report from DataReportal and partners Hootsuite and We Are Social.

A survey conducted in 2021 by DataReportal and partners Hootsuite and We Are Social of internet users in Kenya to a group aged between 16 and 64 yielded the results described below. According to the survey report, approximately 74% of all web traffic came from a mobile device, and it was clear that the majority of people connecting to the internet, 96.1 percent, did so via a mobile phone.

Device ownership is also an intriguing metric. When it comes to Internet users aged 16 to 64, 99.7 percent own a smartphone, 14.4 percent own a feature phone, about 60 percent own a laptop or desktop computer, and nearly 20 percent own a tablet. A smart watch is owned by approximately 14% of Internet users, and a smartphone is owned by 4%.

Despite the fact that Kenya has a relatively high device ownership rate (60 percent), many people access the internet through their mobile phones, a phenomenon caused by the ease of connecting mobile phones to hotspots or 'wifi' in the 'cloud' servers as opposed to laptops or desktop computers, which would require a more sophisticated LAN or WAN connectivity infrastructure to internet servers.

Also, the survey sought to ascertain the extent to which enterprises (in the informal Juakali sector) use internet-enabled platforms to improve/promote their operations. According to Figure 5.3, approximately 80.4 percent of informal enterprises were not using any of the available platforms. Only 9.1 percent said they were using WhatsApp, while slightly more than 7.0 percent said they were using Facebook. Those who used Twitter, Instagram, and email accounted for approximately.01% of the total. This could be attributed to a lack of knowledge or a lack of data bundles (internet connectivity)
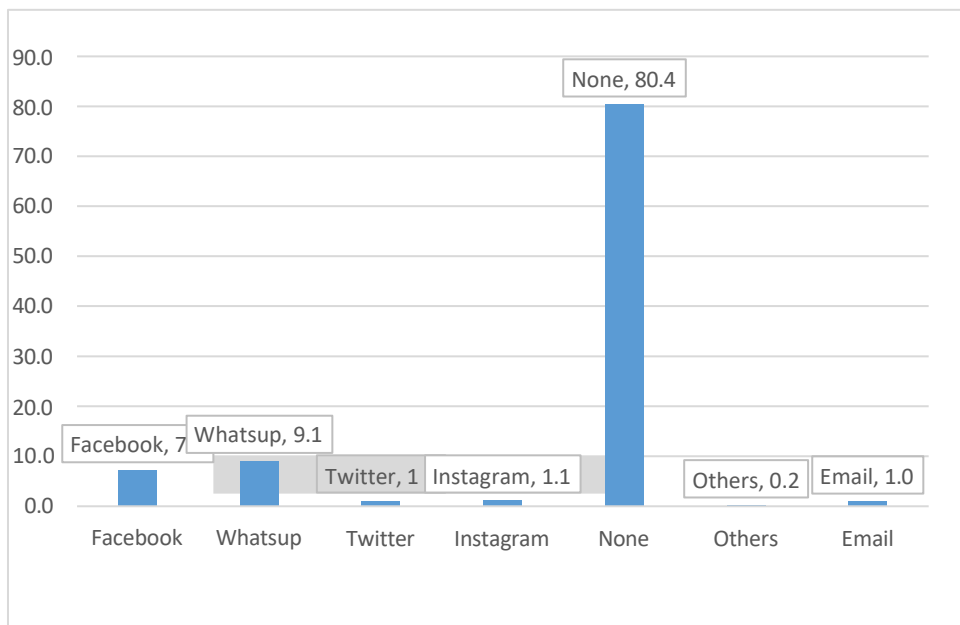

Figure 5: Distribution of Enterprises by use of Internet

Argument

The survey on technical Institutions show that other than lack of infrastructure and smart phone, laptops and desktop computer; internet access is a challenge. The scenarios from the Informal Juakali sector clearly show that Juakali members have access to or own a technology device that can be used for learning. However, as illustrated in figures 4 and 5, internet access is a major issue.

Valuable and concise information

Raspberry Pi setup and configuration

The first step is to put all of the gadgets together to create a unified object. An configuration image file and a Moodle file are downloaded, extracted, and transferred to a 64GB microSD card using standard internet access . After inserting the card into the Raspberry Pi 3, the computer is rebooted.

When you start it, you get an internet in a box. The Raspberry Pi3 is then configured to run Moodle. Courses can be created in this Moodle box or reinstalled from another Moodle source.
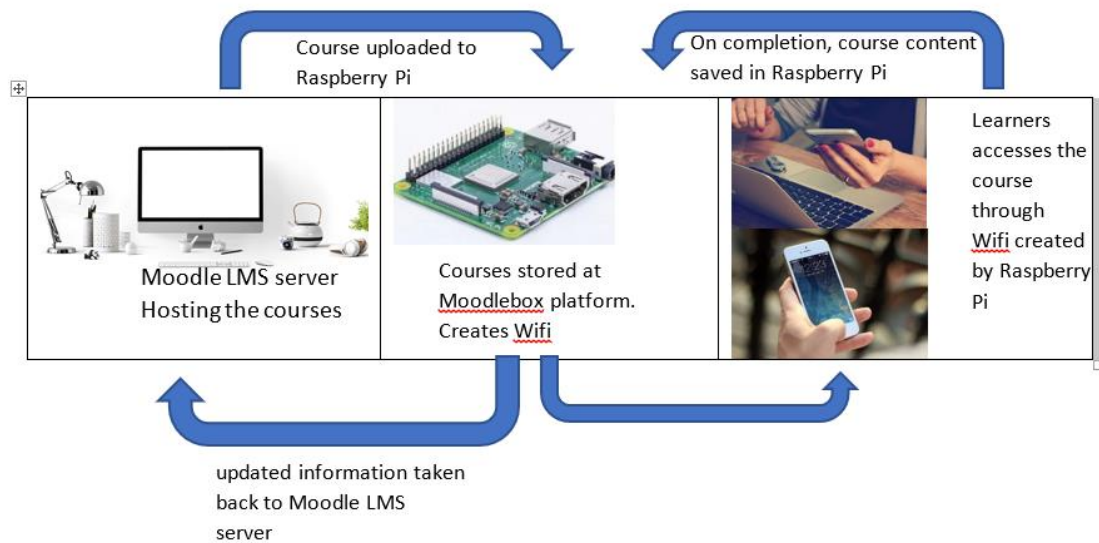

Figure 6 shows the flow of the data from the resident server to the Raspberry Pi 3 until the learners access the resources using the internet in the box.

It is worth noting that Raspberry will save the institute money on internet bundle purchases. Second, because it uses less power, the cost of paying for power consumption is lowered.

The Raspberry Pi can connect up to 30 users at a distance of 10 meters from its location. This makes it ideal for smaller institutions that cannot afford internet connectivity to the backbone else many gadgets must be connected for higher numbers.

Limitation of the use of the Raspberry

When using the Raspberry Pi, internet access is limited to the internet in the box, with no other connectivity options. Although this appears to be a security feature, it is actually a limitation.

Because the Raspberry can only connect to 30 users, it does not work well in larger institutions.

Conclusion

Recommendation

This study suggests using a Raspberry Pi to tap into internet access in ASAL and areas with limited or no internet access. Because the Raspberry Pi consumes less power, it will be very appealing to institutions with limited power sources.

Concluding statement

The researcher recommends for further research to ascertain claims found in this research.

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