MEDICAL SCHOOL INFORMATION SERVICES
UNIVERSITY OF MICHIGAN HEALTH SYSTEM

Portable Local Area Network Empowers Sharing of Medical Education Materials in Settings with Restricted Internet & Electricity

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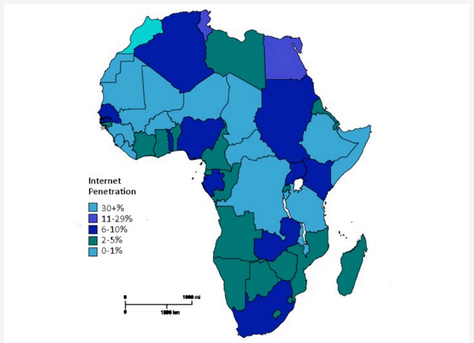
Background

Medical schools in sub-Saharan Africa commonly struggle with expensive and inconsistent power, unreliable electricity, and limited technology support.



African countries by level of Internet penetration. Image from: http://whiteafrican.com/2010/05/14/a-rising-tide-africas-tech-entrepreneurs/.

These barriers make it difficult for students and instructors to access, create, and integrate digital learning materials into their education and research activities.

Objective

To explore, deploy, and evaluate models for sharing digital learning materials at institutions with no or limited bandwidth, no or limited electricity, limited on-site support for technology, at an affordable cost.

Methods

We experimented with two models for portable, easily customizable wireless area networks for accessing and sharing learning materials:

- TP-Link MR3020 ("Library Box", http://jasongriffey.net/librarybox/).
- A Raspberry Pi model B.

Results

Both devices have been configured so that individuals within range can access the files on any Wi-Fi-enabled device with a web browser. Twenty devices are currently deployed in Ethiopia, Kenya, and Liberia – eleven configurations with the TP-Link and nine with Raspberry Pi.

Both devices:

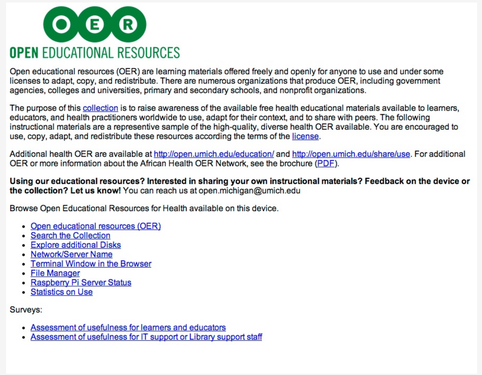
- Are small and portable in size, approximately the size of a mobile phone.
- Cost $40 - $200, depending on accessories.
- Can be powered by any USB-compatible power source (e.g. wall outlet, rechargable portable battery).
- Can be used as a wireless router, a web server, and a file server.
- Are easy to access and to revise content on a USB storage device (e.g. flash drive, external hard drive).

Library Box configuration with TP-Link MR3020.

Raspberry Pi board. Image is by SparkFunElectronics (Flickr). Shared under a CC BY license. Available at: http://farm9.staticflickr.com/8210/8248199710_4efa1fa774_o.jpg.

Conclusions

Both devices may be used for a low-cost, low-maintenance methods to share digital content locally in the absence of an Internet connection and electricity. A rechargeable USB battery can serve as a low-cost uninterruptible power supply. The Raspberry Pi offers more customization options than the TP-Link, such a full operating system that enables other services (e.g. search, analytics, stylesheets). In addition, software updates for the Raspberry Pi can be sent on a replacement SD card, which can be easily transported to partner institutions by visiting colleagues.



Screenshot of welcome screen with list of services for our custom Raspberry Pi configuration.

Screenshot of file browser interface with Library Box configuration.

Plans for Further Research

Embedding Feedback Loops within the User Interface

In order to better understand if, how, and for what purposes the devices are being used, we added a short six-question survey to each configuration. It consists of two Likert scales and four free-form text questions. There is one set of questions for learners and educators and another for technology and library support staff. (The questions are available at the link below.)

Impact on Teaching and Learning

- What impact, if any, has deploying Raspberry Pi and TP-Link MR3020 in these settings had on students and faculty sharing educational materials?
- If there are significant increases in sharing educational materials, what does this mean for academic and professional development in the short and long term in the countries affected?
- In which contexts are people gaining the most and the least from which device? Why?

Technological Design

- What is the range of the wireless signal of each device in different environments (e.g. cement vs. brick walls)?
- How many concurrent users can each device support? Does that vary by type of activity (e.g. streaming video, text-based PDFs)?
- How does the power consumption vary by type of data storage (SD card vs. USB drive)?

http://openmi.ch/rasppi-wiki

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